CHPRC EDC (ENGINEERING DOCUMENT CHANGE) FORM

ECR- 10- 001414

Document Identification

1. Change Title:
MCNP Calculations Replicating ARH-600 Data

Key Words:
ARH-600, MCNP, Calculations

2. Project No./Work Package No.:
N/A

3. Area	4. Building	5. Facility	6. System No.
N/A	N/A	N/A	N/A

7. Release: Release CACN

SEP 23 2010
DATE:
STA: 15
HANFORD RELEASE
ID: 3

8. USQ Required? ☐ USQ ☐ CX ☒ NA No.:

9. Distribution – Name	MSIN	Distribution – Name	MSIN
S. H. Finfrock	H8-27		
H. J. Goldberg	H8-27		
S. L. Thackham	H8-27		
^CHPRC Criticality Safety			

10. Change Description (description and reason for requested change):
Initial Release

Approvals

11. Change Originator	TA/DA	Engineering Management/TA Manager
S. H. Finfrock 9/21/10	S. H. Finfrock 9/21/10	R. J. Puigh 9/22/10
Print/Signature/Date	Print/Signature/Date	Print/Signature/Date

Title Peer Reviewer | Print/Signature/Date H. J. Goldberg Harvey Goldberg

12. Document Index

Action	Number	Title	Rev (being issued)	Change Page(s)	Config. Baseline
N	~~CH~~PRC-NS-00009	MCNP Calculations Replicating ARH-600 Data	0	All	☐

9-23-10

13. Potentially Affected Documents Not Modified By This EDC:

Document Type	Document Number/Revision	Document Owner (Organization)	Technical Authority Notified	Date Notified
N/A				

A-6004-684 (REV 4)

PRC-NS-00009
Revision 0

MCNP Calculations Replicating ARH-600 Data

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

CH2MHILL
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PRC-NS-00009
Revision 0

EDC #: ECR-10-001414

MCNP Calculations Replicating ARH-600 Data

Document Type: TR

S. H. Finfrock
CH2M HILL Plateau Remediation Company

Date Published
September 2010

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ID: 3

Nancy A Fouad 9-23-10
Release Approval Date

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Printed in the United States of America

Total Pages: 1,032

MCNP Calculations Replicating ARH-600 Data

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Richland, Washington

September 2010

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TABLE OF CONTENTS

1.0 INTRODUCTION 1-1
2.0 APPROACH 2-1
3.0 CALCULATIONS 3-1
3.1 CALCULATION OF DENSITY FOR CORE (FISSILE) REGION: 3-1
3.2 CALCULATION OF WEIGHT FRACTIONS FOR CORE REGION 3-2
3.3 LIST OF MCNP5 CROSS SECTION LIBRARIES USED IN MODEL 3-2
3.3.1 Automation Routine 3-3
3.3.2 Description of the Data 3-3
4.0 REFERENCES 4-1
APPENDIX A – INDEPENDENT REVIEW AND COMMENTS CHECKLIST A-1
APPENDIX B – CALCULATIONS AND DATA B-1

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1.0 INTRODUCTION

This report documents MCNP calculations that were performed in order to reproduce portions of the criticality handbook ARH-600. In addition, this report documents the corresponding data libraries used for the CritView code (CHPRC-00340). The original handbook data were calculated by the Atlantic Richfield Hanford (ARH) Company starting in the 1960's. As with the ARH-600 data, this report is not meant to replace final analysis of fissile systems by qualified criticality personnel. The entirety of the data that follows consists of uranium and plutonium spheres, cylinders, and slabs, of varying isotopic composition and reflector widths, modeled in MCNP (version 5.1.40). For a given isotopic composition and reflector thickness, the fissile concentration and the diameter (or thicknesses in the case of the slab geometries) were varied. The diameter for which k-effective (k_{eff}) equals one for a given concentration could then be calculated and graphed. These are the graphs shown in this report. The pages that follow describe the regions modeled, formulas for calculating the various parameters, a list of the cross-sections used in the calculations, a description of the automation routine and data, and finally the data output.

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2.0 APPROACH

Each nuclear system consists of two regions – the fissile region and the reflector (in some cases the reflector is absent). For each region, the material composition, density, and geometry were specified.

For the fissile region, the material was listed as the fissile element or the fissile-water mixture (for more information on material composition specification see Section 3.0 below). The density was calculated by first assuming a sample size of one cubic centimeter, then calculating the volume and mass of the fissile material and water in the sample, and finally calculating the total mass. This total mass is also the mass density since its volume was one cubic centimeter. The geometry was specified as either a sphere or infinite cylinder centered at the origin with radius rd, or an infinite slab symmetric about y=0 with boundaries of y=±rd.

For the reflector region, the material composition was listed as pure light water (^{1}H and ^{16}O) and the density was assumed to simply be 1 g/cc. Material fractions were 2 parts hydrogen to 1 part oxygen (normalized automatically by MCNP). The geometry of this second region was a sphere or cylindrical shell concentric with the fissile region with radius between rd and rd+rw, or two slabs located between either y=rd and y= rd+rw, or y=-rd and y= -rd-rw. The outside edge of the reflector region (or fissile region in the cases without a reflector) was treated as a vacuum boundary.

When running a model of a nuclear system in MCNP, the density of the regions described above must be taken into consideration, as well as the weight fractions of the materials in the mixture. The calculations for determining these values can be found in the next section. Also provided in the next section are the MCNP cross-section identifiers used in the calculations.

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3.0 CALCULATIONS

3.1 CALCULATION OF DENSITY FOR CORE (FISSILE) REGION:

Volume of Fissile Material (cc):

$$volC = \frac{conc}{den} * \frac{1\ (cc)}{1000\ (\frac{mg}{g})} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. Equation\ 1$$

- $volC = Volume\ of\ fissile\ material\ in\ the\ core\ region$ in (cc)
- $conc = concentration\ of\ fissile\ material\ in\ \left(\frac{mg}{cc}\right)$.
- $den = density\ of\ fissile\ material\ in\ \left(\frac{g}{cc}\right)$. $*\ See\ Table\ 1\ below$

Volume of Water (cc):

$$volW = 1\ (cc) - volC \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \ldots. Equation\ 2$$

- $volW = Volume\ of\ water\ in\ the\ core\ region$ in (cc)

Mass of Fissile Material (g):

$$massC = \frac{conc}{1000\ \left(\frac{mg}{g}\right)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \quad Equation\ 3$$

- $massC = Mass\ of\ fissile\ material\ in\ the\ core\ region$ in (g)

Mass of Water (g):

$$massW = volW * denW \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots Equation\ 4$$

- $massW = mass\ of\ water\ in\ sample\ in\ (g)$
- $denW = Density\ of\ Water - taken\ as\ 1\ (\frac{g}{cc})$.

Total Mass of Core Region (g):

$$mass = massC + massW \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. Equation\ 5$$

- $mass = total\ mass\ of\ core\ region\ in\ (g)$.

Table 1. Material and Density Specification for the fissile region

Material	Density	Reference
Plutonium	19.6 g/cc	ARH-600 Handbook Volume II Section C.1-1
Uranium	18.9 g/cc	ARH-600 Handbook Volume II Section D.1-1
Uranium Dioxide	11 g/cc*	ARH-600 Handbook Volume II Section D.2-1

* Rounded off from 10.96 in handbook value

3.2 CALCULATION OF WEIGHT FRACTIONS FOR CORE REGION

Note that the weight fractions listed below may not add up to 100 percent. MCNP automatically normalizes the fractions to 100 percent.

Weight Fraction Hydrogen:

$$WFH = \frac{massW}{mass} * \left(\frac{(2 * H)}{(2 * H) + O}\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots Equation\ 6$$

- $WFH = Weight\ Fraction\ Hydrogen$
- $H = Hydrogen\ Atomic\ Mass - Taken\ as\ 1.0079$
- $O = Oxygen\ Atomic\ Mass - Taken\ as\ 15.9994$

Weight Fraction Oxygen:

$$WFO = \frac{massW}{mass} * \left(\frac{O}{(2 * H) + O}\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots Equation\ 7$$

- $WFO = Weight\ fraction\ oxygen$

Mass Fraction of Fissile Material:

$$WFFS = massC * \frac{en}{mass} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. Equation\ 8$$

- $WFFS = Mass\ fraction\ of\ fissile\ isotope\ (U235\ or\ Pu239)\ in\ mixture$
- $en = Mass\ fraction\ of\ fissile\ isotope\ (U235\ or\ Pu239)\ in\ fissionable\ material$

Mass Fraction of Fertile Material:

$$WFF = massC * \frac{1 - en}{mass} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. Equation\ 9$$

- $WFF = Mass\ fraction\ of\ fertile\ isotope\ (U238\ or\ Pu240)\ in\ mixture$

3.3 LIST OF MCNP5 CROSS SECTION LIBRARIES USED IN MODEL

- 1001.66c – The cross section from the endf66 library modeling ^{1}H.
- 8016.66c - The cross section from the endf66 library modeling ^{16}O.
- 92235.66c - The cross section from the endf66 library modeling ^{235}U.
- 92238.66c - The cross section from the endf66 library modeling ^{238}U.
- 94239.66c - The cross section from the endf66 library modeling ^{239}Pu.
- 94240.66c - The cross section from the endf66 library modeling ^{240}Pu.
- Lwtr.60t – S(α,β) cross section from the endf6.3 library modeling H_2O

3.3.1 Automation Routine

The various systems modeled for this handbook were categorized as a set of specific values for four parameters: fissile material, geometry, enrichment, and reflector thickness. For each such set a range of concentrations were considered, and for each concentration a range of diameters (or thicknesses in the case of slabs) was analyzed with MCNP. From the resulting library of data, the diameter for which k_{eff} equals one for a given concentration, was calculated using linear interpolation for each data set. Many thousands of individual cases were required to produce these results for the ARH-600 conditions analyzed. In order to create, run, and evaluate all of these cases in an efficient manner, an automation routine was developed. The automation routine consists of batch files written in disk operating system (DOS), executable files written in Fortran, and a routine written with Perl called "worm" (worm was written and distributed by Tom Jones). The batch files consisted of buildwormset, run-set, and extract-all. Buildwormset was used to create the various input files for each isotopic composition and reflector width. Run-set was used to submit these sets to a queue, the queue being a list of files for which the computers assigned to the calculations would run. All MCNP calculations were conducted on computers for which MCNP verification test cases have been successfully run. Once an MCNP run was completed, local queueing software pulled the name of the next file out of the queue to run. Finally, once all sets were run, the extract-all batch file took the large amount of data output and consolidated it into a critview output file.

3.3.2 Description of the Data

The data contained in this manual are arranged such that for each parameter set there is a graph of the critical diameter vs. concentration. This same data is also presented as a table, and as a text listing that is in a format compatible with the CritView (version 1.02) electronic handbook code. Also included is the template file that was used by the worm script to produce the MCNP input files for that set, and a sample input file produced by the worm script. The graph of the data is provided for visual reference and comparison to the ARH-600 data. One will notice on these graphs that "full water reflection" (as indicated by ARH-600) was equated to 10 inches of water reflection (for the MCNP data). The precise thickness used in the original ARH-600 calculations is not known but 10 inches is considered a conservative value to use in these calculations. The graphs are titled with the fissile isotope percent and reflector width. If there is no fissile isotope percent, it shall be taken as 100 percent. The tables have five columns which are intended to give a summary of all the cases run for the specific parameter set. The first column contains the concentrations evaluated for the given set. The second and third columns contain the first and last diameter, in inches, analyzed for each concentration. The fourth column consists of the steps in inches to get from the first to the last diameter. The fifth, and arguably most important column, contains the interpolated diameter for which k_{eff}=1.

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4.0 REFERENCES

ARH-600, 1968, *Criticality Handbook*, R. D. Carter, G. R. Kiel, and K. R. Ridgeway, 1980 Revision, Atlantic Richfield Hanford Company, Richland, Washington.

CHPRC-00340, 2009, *CritView User's Guide*, S. H. Finfrock, CH2M HILL Plateau Remediation Company, Richland, Washington.

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APPENDIX A – INDEPENDENT REVIEW AND COMMENTS CHECKLIST

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Checklist For Technical Peer Review
Document Reviewed: PRC-NS-00009, Revision 0
Title: MCNP Calculations Replicating ARH-600 Data
Author: S. H. Finfrock
Document Date: September 2010
Scope of Review: Entire Document
Reserved for CHPRC Criticality Safety Manager use. Technical Peer Review is assigned to: Harvey Goldberg — 8/24/10 Initial and date

Yes	No*	NA		
[✓]	[ ]	[ ]		Referenced analyses appropriate.
[✓]	[ ]	[ ]		Problem scope is completely defined and the operation/process is adequately defined in the report.
[ ]	[ ]	[✓]		An approved formal hazards assessment approach was used.
[ ]	[ ]	[✓]		Contingencies or bounding analyses developed in a clear and logical manner from hazards.
[✓]	[ ]	[✓]		Necessary assumptions explicitly stated and supported.
[✓]	[ ]	[ ]		Computer codes and data files documented.
[✓]	[ ]	[ ]		Data used in calculations explicitly stated in document.
[✓]	[ ]	[ ]		Data checked for consistency with original source information as applicable. (spot check)

Yes	No*	NA		
[ ]	[ ]	[✓]		Mathematical derivations checked including dimensional consistency of results.
[✓]	[ ]	[ ]		Computational models used in k_{eff} calculations are appropriate and conservative
[ ]	[ ]	[✓]		Other models appropriate and used within range of validity, or use outside range of established validity justified.
[ ]	[ ]	[✓]		Hand calculations checked for errors. Spreadsheet results should be treated exactly the same as hand calculations.
[✓]	[ ]	[ ]		Software input correct and consistent with document reviewed. (spot checked)
[✓]	[ ]	[ ]		Software output consistent with input and with results reported in document reviewed. (spot checked)
[ ]	[ ]	[✓]		Limits, controls, engineered features and assumptions important to criticality safety are appropriate and discussed within the evaluation.
[ ]	[ ]	[✓]		Safety margins consistent with HNF-7098.
[ ]	[ ]	[✓]		Conclusions consistent with analytical results and applicable limits.
[ ]	[ ]	[✓]		Results and conclusions demonstrate that a criticality is either double contingent or not credible.
[ ]	[ ]	[✓]		Format consistent with HNF-7098.
[ ]			**	Review calculations, comments, and/or notes are attached.

H. J. Goldberg Harvey Goldberg — 16 September 2010

Technical Peer Reviewer (Signature) — Date Completed

*	All "no" responses must be explained below or on an additional sheet.
**	Notes generated as part of this review should be signed, dated and attached to this checklist. The material should be labeled and recorded in such a manner as to be understandable to a technically qualified third party.

Revision 0, May 26, 2010

The text of the document was reviewed and minor editorial changes were suggested and implemented by the author.

This document has a rather large body of data so spot checks were performed rather than checking each datum. The ARH-600 graphs were checked for consistency with the document in various cases. The input and output decks were reviewed in randomly selected cases and results were compared with the document. Interpolated values of k_{eff} were calculated and checked against the values reported in the document

Random data from the tables in the document were checked against the graph in the document for accuracy of the graphing.

In all cases the presented data were consistent with the calculations and the calculations were consistent with the geometry of ARH-600

Harvey Goldberg

16 September 2010

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APPENDIX B – CALCULATIONS AND DATA

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B.1. PLUTONIUM METAL IN WATER B-17
B.1.1. SPHERE B-17
B.1.1.1. 100% ^{239}Pu B-17
B.1.1.1.1. Unreflected B-17
B.1.1.1.2. 1" Water Reflector B-36
B.1.1.1.3. 10" Water Reflector B-55
B.1.1.2. 97% ^{239}Pu 3% ^{240}Pu B-74
B.1.1.2.1. Unreflected B-74
B.1.1.2.2. 1" Water Reflector B-89
B.1.1.2.3. 10" Water Reflector B-104
B.1.1.3. 95% ^{239}Pu 5% ^{240}Pu B-119
B.1.1.3.1. Unreflected B-119
B.1.1.3.2. 1" Water Reflector B-138
B.1.1.3.3. 10" Water Reflector B-157
B.1.2. INFINITE CYLINDER B-176
B.1.2.1. 100% ^{239}Pu B-176
B.1.2.1.1. Unreflected B-176
B.1.2.1.2. 1" Water Reflector B-195
B.1.2.1.3. 10" Water Reflector B-214
B.1.2.2. 97% ^{239}Pu 3% ^{240}Pu B-233
B.1.2.2.1. Unreflected B-233
B.1.2.2.2. 1" Water Reflector B-248
B.1.2.2.3. 10" Water Reflector B-263
B.1.2.3. 95% ^{239}Pu 5% ^{240}Pu B-278
B.1.2.3.1. Unreflected B-278
B.1.2.3.2. 1" Water Reflector B-297
B.1.2.3.3. 10" Water Reflector B-316
B.1.3. INFINITE PLANE (SLAB) B-335
B.1.3.1. 100% ^{239}Pu B-335
B.1.3.1.1. Unreflected B-335
B.1.3.1.2. 1" Water Reflector B-350

B.1.3.1.3. 10” Water Reflector B-365
B.1.3.2. 97% ^{239}Pu 3% ^{240}Pu B-380
B.1.3.2.1. Unreflected B-380
B.1.3.2.2. 1” Water Reflector B-395
B.1.3.2.3. 10” Water Reflector B-410
B.1.3.3. 95% ^{239}Pu 5% ^{240}Pu B-425
B.1.3.3.1. Unreflected B-425
B.1.3.3.2. 1” Water Reflector B-440
B.1.3.3.3. 10” Water Reflector B-455
B.2. URANIUM METAL IN WATER B-470
B.2.1. SPHERE B-470
B.2.1.1. 100% ^{235}U B-470
B.2.1.1.1. Unreflected B-470
B.2.1.1.2. 1” Water Reflector B-489
B.2.1.1.3. 10” Water Reflector B-508
B.2.1.2. 93.5% ^{235}U 6.5% ^{238}U B-527
B.2.1.2.1. Unreflected B-527
B.2.1.2.2. 1” Water Reflector B-546
B.2.1.2.3. 10” Water Reflector B-565
B.2.2. INFINITE CYLINDER B-584
B.2.2.1. 100% ^{235}U B-584
B.2.2.1.1. Unreflected B-584
B.2.2.1.2. 1” Water Reflector B-603
B.2.2.1.3. 10” Water Reflector B-622
B.2.2.2. 93.5% ^{235}U 6.5% ^{238}U B-641
B.2.2.2.1. Unreflected B-641
B.2.2.2.2. 1” Water Reflector B-660
B.2.2.2.3. 10” Water Reflector B-679
B.2.3. INFINITE PLANE (SLAB) B-698
B.2.3.1. 100% ^{235}U B-698
B.2.3.1.1. Unreflected B-698

B.2.3.1.2. 1” Water Reflector B-717
B.2.3.1.3. 10” Water Reflector B-736
B.2.3.2. 93.5% ^{235}U 6.5% ^{238}U B-755
B.2.3.2.1. Unreflected B-755
B.2.3.2.2. 1” Water Reflector B-774
B.2.3.2.3. 10” Water Reflector B-793
B.3. URANIUM OXIDES IN WATER B-812
B.3.1. SPHERE B-812
B.3.1.1. 6% ^{235}U 94% ^{238}U B-812
B.3.1.1.1. Unreflected B-812
B.3.1.1.2. 1” Water Reflector B-826
B.3.1.1.3. 10” Water Reflector B-840
B.3.1.2. 5% ^{235}U 95% ^{238}U B-854
B.3.1.2.1. Unreflected B-854
B.3.1.2.2. 1” Water Reflector B-868
B.3.1.2.3. 10” Water Reflector B-882
B.3.1.3. 4% ^{235}U 96% ^{238}U B-896
B.3.1.3.1. Unreflected B-896
B.3.1.3.2. 1” Water Reflector B-909
B.3.1.3.3. 10” Water Reflector B-922
B.3.1.4. 3% ^{235}U 97% ^{238}U B-935
B.3.1.4.1. Unreflected B-935
B.3.1.4.2. 1” Water Reflector B-948
B.3.1.4.3. 10” Water Reflector B-961
B.3.1.5. 2.5% ^{235}U 97.5% ^{238}U B-974
B.3.1.5.1. Unreflected B-974
B.3.1.5.2. 1” Water Reflector B-986
B.3.1.5.3. 10” Water Reflector B-998

LIST OF TABLES

TABLE B.1.1.1.1-1. CRITICAL DIMENSIONS FOR 100% ^{239}PU SPHERE - 0 INCHES OF WATER REFLECTION B-19

TABLE B.1.1.1.1-2. - K_{EFF} VALUES FOR 100% ^{239}PU SPHERE - 0 INCHES OF WATER REFLECTION B-23

TABLE B.1.1.1.2-1. CRITICAL DIMENSIONS FOR 100% ^{239}PU SPHERE - 1 INCH OF WATER REFLECTION B-38

TABLE B.1.1.1.2-2. K_{EFF} VALUES FOR 100% ^{239}PU SPHERE - 1 INCH OF WATER REFLECTION B-42

TABLE B.1.1.1.3-1. CRITICAL DIMENSIONS FOR 100% ^{239}PU SPHERE – 10 INCHES OF WATER REFLECTION B-57

TABLE B.1.1.1.3-2. K_{EFF} VALUES FOR 100% ^{239}PU SPHERE – 10 INCHES OF WATER REFLECTION B-61

TABLE B.1.1.2.1-1. CRITICAL DIMENSIONS FOR PLUTONIUM SPHERE(97% ^{239}PU) - 0 INCHES OF WATER REFLECTION B-76

TABLE B.1.1.2.1-2. K_{EFF} VALUES FOR PLUTONIUM SPHERE(97% ^{239}PU) - 0 INCHES OF WATER REFLECTION B-80

TABLE B.1.1.2.2-1. CRITICAL DIMENSIONS FOR PLUTONIUM SPHERE (97% ^{239}PU) - 1 INCH OF WATER REFLECTION B-91

TABLE B.1.1.2.2-2. K_{EFF} VALUES FOR PLUTONIUM SPHERE (97% ^{239}PU) - 1 INCH OF WATER REFLECTION B-95

TABLE B.1.1.2.3-1. CRITICAL DIMENSIONS FOR PLUTONIUM SPHERE (97% ^{239}PU) – 10 INCHES OF WATER REFLECTION B-106

TABLE B.1.1.2.3-2. K_{EFF} VALUES FOR PLUTONIUM SPHERE (97% ^{239}PU) – 10 INCHES OF WATER REFLECTION B-110

TABLE B.1.1.3.1-1. CRITICAL DIMENSIONS FOR 95% ^{239}PU SPHERE - 0 INCHES OF WATER REFLECTION B-121

TABLE B.1.1.3.1-2. K_{EFF} VALUES FOR 95% ^{239}PU SPHERE - 0 INCHES OF WATER REFLECTION B-125

TABLE B.1.1.3.2-1. CRITICAL DIMENSIONS FOR 95% ^{239}PU SPHERE – 1 INCH OF WATER REFLECTION B-140

TABLE B.1.1.3.2-2. K_{EFF} VALUES FOR 95% ^{239}PU SPHERE – 1 INCH OF WATER REFLECTION B-144

TABLE B.1.1.3.3-1. CRITICAL DIMENSIONS FOR 95% ^{239}PU SPHERE – 10 INCHES OF WATER REFLECTION B-159

TABLE B.1.1.3.3-2. K_{EFF} VALUES FOR 95% ^{239}PU SPHERE – 10 INCHES OF WATER REFLECTION B-163

TABLE B.1.1.3.3-2. K_{EFF} VALUES FOR 95% ^{239}PU SPHERE – 10 INCHES OF WATER REFLECTION (CONT) B-164

TABLE B.1.2.1.1-1. CRITICAL DIMENSIONS FOR 100% ^{239}PU CYLINDER – 0 INCHES OF WATER REFLECTION B-178

TABLE B.1.2.1.1-2. K_{EFF} VALUES FOR 100% ^{239}PU CYLINDER – 0 INCHES OF WATER REFLECTION B-182

TABLE B.1.2.1.2-1. CRITICAL DIMENSIONS FOR 100% ^{239}PU CYLINDER - 1 INCH OF WATER REFLECTION B-197

TABLE B.1.2.1.2-2. K_{EFF} VALUES FOR 100% ^{239}PU CYLINDER - 1 INCH OF WATER REFLECTION B-201

TABLE B.1.2.1.3-1. CRITICAL DIMENSIONS FOR 100% ^{239}PU CYLINDER - 10 INCHES OF WATER REFLECTION B-216

TABLE B.1.2.1.3-2. K_{EFF} VALUES FOR 100% ^{239}PU CYLINDER - 10 INCHES OF WATER REFLECTION B-220

TABLE B.1.2.2.1-1. CRITICAL DIMENSIONS FOR PLUTONIUM CYLINDER (97% ^{239}PU) – 0 INCHES OF WATER REFLECTION B-235

TABLE B.1.2.2.1-2. K_{EFF} VALUES FOR PLUTONIUM CYLINDER (97% ^{239}PU) – 0 INCHES OF WATER REFLECTION B-239

TABLE B.1.2.2.2-1 CRITICAL DIMENSIONS FOR PLUTONIUM CYLINDER (97% ^{239}PU) - 1 INCH OF WATER REFLECTION B-250

TABLE B.1.2.2.2-2. K_{EFF} VALUES FOR PLUTONIUM CYLINDER (97% ^{239}PU) - 1 INCH OF WATER REFLECTION B-254

TABLE B.1.2.2.3-1. CRITICAL DIMENSIONS FOR PLUTONIUM CYLINDER (97% ^{239}PU) - 10 INCHES OF REFLECTION B-265

TABLE B.1.2.2.3-2. K_{EFF} VALUES FOR PLUTONIUM CYLINDER (97% ^{239}PU) - 10 INCHES OF REFLECTION B-269

TABLE B.1.2.3.1-1. CRITICAL DIMENSIONS FOR 95% ^{239}PU CYLINDER - 0 INCHES OF WATER REFLECTION B-280

TABLE B.1.2.3.1-2. K_{EFF} VALUES FOR 95% ^{239}PU CYLINDER - 0 INCHES OF WATER REFLECTION B-284

TABLE B.1.2.3.2-1. CRITICAL DIMENSIONS FOR 95% ^{239}PU CYLINDER - 1 INCH OF WATER REFLECTION B-299

TABLE B.1.2.3.2-1. CRITICAL DIMENSIONS FOR 95% ^{239}PU CYLINDER - 1 INCH OF WATER REFLECTION B-303

TABLE B.1.2.3.3-1. CRITICAL DIMENSIONS FOR 95% ^{239}PU CYLINDER - 10 INCHES OF WATER REFLECTION B-318

TABLE B.1.2.3.3-2. K_{EFF} VALUES FOR 95% ^{239}PU CYLINDER - 10 INCHES OF WATER REFLECTION B-322

TABLE B.1.3.1.1-1. CRITICAL DIMENSIONS FOR PLUTONIUM SLAB (100% ^{239}PU) - 0 INCHES OF WATER REFLECTION B-337

TABLE B.1.3.1.1-2. K_{EFF} VALUES FOR PLUTONIUM SLAB (100% ^{239}PU) - 0 INCHES OF WATER REFLECTION B-341

TABLE B.1.3.1.2-1. CRITICAL DIMENSIONS FOR PLUTONIUM SLAB (100% ^{239}PU) - 1 INCH OF WATER REFLECTION....B-352

TABLE B.1.3.1.2-2. K_{EFF} VALUES FOR PLUTONIUM SLAB (100% ^{239}PU) - 1 INCH OF WATER REFLECTION....B-356

TABLE B.1.3.1.3-1. CRITICAL DIMENSIONS FOR PLUTONIUM SLAB (100% ^{239}PU) - 10 INCH OF WATER REFLECTION....B-367

TABLE B.1.3.1.3-2. K_{EFF} VALUES FOR PLUTONIUM SLAB (100% ^{239}PU) - 10 INCH OF WATER REFLECTION....B-371

TABLE B.1.3.2.1-1. CRITICAL DIMENSIONS FOR PLUTONIUM SLAB (97% ^{239}PU) - 0 INCHES OF WATER REFLECTION....B-382

TABLE B.1.3.2.1-2. K_{EFF} VALUES FOR PLUTONIUM SLAB (97% ^{239}PU) - 0 INCHES OF WATER REFLECTION....B-386

TABLE B.1.3.2.2-1. CRITICAL DIMENSIONS FOR PLUTONIUM SLAB (97% ^{239}PU) - 1 INCH OF WATER REFLECTION....B-397

TABLE B.1.3.2.2-2. K_{EFF} VALUES FOR PLUTONIUM SLAB (97% ^{239}PU) - 1 INCH OF WATER REFLECTION....B-401

TABLE B.1.3.2.3-1. CRITICAL DIMENSIONS FOR PLUTONIUM SLAB (97% ^{239}PU) - 10 INCHES OF WATER REFLECTION....B-412

TABLE B.1.3.2.3-2. K_{EFF} VALUES FOR PLUTONIUM SLAB (97% ^{239}PU) - 10 INCHES OF WATER REFLECTION....B-416

TABLE B.1.3.3.1-1. CRITICAL DIMENSIONS FOR PLUTONIUM SLAB (95% ^{239}PU) - 0 INCHES OF WATER REFLECTION....B-427

TABLE B.1.3.3.1-2. K_{EFF} VALUES FOR PLUTONIUM SLAB (95% ^{239}PU) - 0 INCHES OF WATER REFLECTION....B-431

TABLE B.1.3.3.2-1. CRITICAL DIMENSIONS FOR PLUTONIUM SLAB (95% ^{239}PU) - 1 INCHES OF WATER REFLECTION....B-442

TABLE B.1.3.3.2-2. K_{EFF} VALUES FOR PLUTONIUM SLAB (95% ^{239}PU) - 1 INCHES OF WATER REFLECTION....B-446

TABLE B.1.3.3.3-1. CRITICAL DIMENSIONS FOR PLUTONIUM SLAB (95% ^{239}PU) - 10 INCHES OF WATER REFLECTION....B-457

TABLE B.1.3.3.3-2. K_{EFF} VALUES FOR PLUTONIUM SLAB (95% ^{239}PU) - 10 INCHES OF WATER REFLECTION....B-461

TABLE B.2.1.1.1-1. CRITICAL DIMENSIONS FOR 100% ^{235}U SPHERE - 0 INCHES OF WATER REFLECTION....B-472

TABLE B.2.1.1.1-2. K_{EFF} VALUES FOR 100% ^{235}U SPHERE - 0 INCHES OF WATER REFLECTION....B-476

TABLE B.2.1.1.2-1. CRITICAL DIMENSIONS FOR 100% ^{235}U SPHERE – 1 INCH OF WATER REFLECTION....B-491

TABLE B.2.1.1.2-2. K_{EFF} VALUES FOR 100% ^{235}U SPHERE – 1 INCH OF WATER REFLECTION....B-495

TABLE B.2.1.1.3-1. CRITICAL DIMENSIONS FOR 100% ^{235}U SPHERE - 10 INCHES OF WATER REFLECTION B-510

TABLE B.2.1.1.3-2. K_{EFF} VALUES FOR 100% ^{235}U SPHERE - 10 INCHES OF WATER REFLECTION B-514

TABLE B.2.1.2.1-1. CRITICAL DIMENSIONS FOR 93.5% ^{235}U SPHERE - 0 INCHES OF WATER REFLECTION B-529

TABLE B.2.1.2.1-2. K_{EFF} VALUES FOR 93.5% ^{235}U SPHERE - 0 INCHES OF WATER REFLECTION B-533

TABLE B.2.1.2.2-1. CRITICAL DIMENSIONS FOR 93.5% ^{235}U SPHERE - 1 INCH OF WATER REFLECTION B-548

TABLE B.2.1.2.2-2. K_{EFF} VALUES FOR 93.5% ^{235}U SPHERE - 1 INCH OF WATER REFLECTION B-552

TABLE B.2.1.2.3-1. CRITICAL DIMENSIONS FOR 93.5% ^{235}U SPHERE - 10 INCHES OF WATER REFLECTION B-567

TABLE B.2.1.2.3-2. K_{EFF} VALUES FOR 93.5% ^{235}U SPHERE - 10 INCHES OF WATER REFLECTION B-571

TABLE B.2.2.1.1-1. CRITICAL DIMENSIONS FOR URANIUM CYLINDER (100% ^{235}U) - 0 INCHES OF WATER REFLECTION B-586

TABLE B.2.2.1.1-2. K_{EFF} VALUES FOR URANIUM CYLINDER (100% ^{235}U) - 0 INCHES OF WATER REFLECTION B-590

TABLE B.2.2.1.2-1. CRITICAL DIMENSIONS FOR URANIUM CYLINDER (100% ^{235}U) – 1 INCH OF WATER REFLECTION B-605

TABLE B.2.2.1.2-2. K_{EFF} VALUES FOR URANIUM CYLINDER (100% ^{235}U) – 1 INCH OF WATER REFLECTION B-609

TABLE B.2.2.1.3-1. CRITICAL DIMENSIONS FOR URANIUM CYLINDER (100% ^{235}U) – 10 INCHES OF WATER REFLECTION B-624

TABLE B.2.2.1.3-2. K_{EFF} VALUES FOR URANIUM CYLINDER (100% ^{235}U) – 10 INCHES OF WATER REFLECTION B-628

TABLE B.2.2.2.1-1. CRITICAL DIMENSIONS FOR URANIUM CYLINDER (93.5% ^{235}U) – 0 INCHES OF WATER REFLECTION B-643

TABLE B.2.2.2.1-2. K_{EFF} VALUES FOR URANIUM CYLINDER (93.5% ^{235}U) – 0 INCHES OF WATER REFLECTION B-647

TABLE B.2.2.2.2-1. CRITICAL DIMENSIONS FOR URANIUM CYLINDER (93.5% ^{235}U) - 1 INCH OF WATER REFLECTION B-662

TABLE B.2.2.2.2-2. K_{EFF} VALUES FOR URANIUM CYLINDER (93.5% ^{235}U) - 1 INCH OF WATER REFLECTION B-666

TABLE B.2.2.2.3-1. CRITICAL DIMENSIONS FOR URANIUM CYLINDER (93.5% ^{235}U) - 10 INCHES OF WATER REFLECTION B-681

TABLE B.2.2.2.3-2. K_{EFF} VALUES FOR URANIUM CYLINDER (93.5% ^{235}U) - 10 INCHES OF WATER REFLECTION B-685

TABLE B.2.3.1.1-1. CRITICAL DIMENSIONS FOR URANIUM SLAB (100% ^{235}U) – 0 INCHES OF WATER REFLECTION....B-700

TABLE B.2.3.1.1-2. K_{EFF} VALUES FOR URANIUM SLAB (100% ^{235}U) – 0 INCHES OF WATER REFLECTION....B-704

TABLE B.2.3.1.2-1. CRITICAL DIMENSIONS FOR URANIUM SLAB (100% ^{235}U) - 1 INCH OF WATER REFLECTION....B-719

TABLE B.2.3.1.2-2. K_{EFF} VALUES FOR URANIUM SLAB (100% ^{235}U) - 1 INCH OF WATER REFLECTION....B-723

TABLE B.2.3.1.3-1. CRITICAL DIMENSIONS FOR URANIUM SLAB (100% ^{235}U) - 10 INCHES OF WATER REFLECTION....B-738

TABLE B.2.3.1.3-2. K_{EFF} VALUES FOR URANIUM SLAB (100% ^{235}U) - 10 INCHES OF WATER REFLECTION....B-742

TABLE B.2.3.2.1-1. CRITICAL DIMENSIONS FOR ^{235}U SLAB (93.5% ^{235}U) - 0 INCHES OF WATER REFLECTION....B-757

TABLE B.2.3.2.1-2. K_{EFF} VALUES FOR ^{235}U SLAB (93.5% ^{235}U) - 0 INCHES OF WATER REFLECTION....B-761

TABLE B.2.3.2.2-1. CRITICAL DIMENSIONS FOR ^{235}U SLAB (93.5% ^{235}U) - 1 INCH OF WATER REFLECTION....B-776

TABLE B.2.3.2.2-2. K_{EFF} VALUES FOR ^{235}U SLAB (93.5% ^{235}U) - 1 INCH OF WATER REFLECTION....B-780

TABLE B.2.3.2.3-1. CRITICAL DIMENSIONS FOR ^{235}U SLAB (93.5% ^{235}U) - 10 INCHES OF WATER REFLECTION....B-795

TABLE B.2.3.2.3-2. K_{EFF} VALUES FOR ^{235}U SLAB (93.5% ^{235}U) - 10 INCHES OF WATER REFLECTION....B-799

TABLE B.3.1.1.1-1. CRITICAL DIMENSIONS FOR URANIUM DIOXIDE SPHERE (6.0% ^{235}U) - 0 INCHES OF WATER REFLECTION....B-814

TABLE B.3.1.1.1-2. K_{EFF} VALUES FOR URANIUM DIOXIDE SPHERE (6.0% ^{235}U) - 0 INCHES OF WATER REFLECTION....B-818

TABLE B.3.1.1.2-1. CRITICAL DIMENSIONS FOR URANIUM DIOXIDE SPHERE (6.0% ^{235}U) - 1 INCH OF WATER REFLECTION....B-828

TABLE B.3.1.1.2-2. K_{EFF} VALUES FOR URANIUM DIOXIDE SPHERE (6.0% ^{235}U) - 1 INCH OF WATER REFLECTION....B-832

TABLE B.3.1.1.3-1. CRITICAL DIMENSIONS FOR URANIUM DIOXIDE SPHERE (6.0% ^{235}U) - 10 INCHES OF WATER REFLECTION....B-842

TABLE B.3.1.1.3-2. K_{EFF} VALUES FOR URANIUM DIOXIDE SPHERE (6.0% ^{235}U) - 10 INCHES OF WATER REFLECTION....B-846

TABLE B.3.1.2.1-1. CRITICAL DIMENSIONS FOR URANIUM DIOXIDE SPHERE (5.0% ^{235}U) - 0 INCHES OF WATER REFLECTION....B-856

TABLE B.3.1.2.1-2. K_{EFF} VALUES FOR URANIUM DIOXIDE SPHERE (5.0% ^{235}U) - 0 INCHES OF WATER REFLECTION B-860

TABLE B.3.1.2.2-1. CRITICAL DIMENSIONS FOR URANIUM DIOXIDE SPHERE (5.0% ^{235}U) - 1 INCH OF WATER REFLECTION B-870

TABLE B.3.1.2.2-2. K_{EFF} VALUES FOR URANIUM DIOXIDE SPHERE (5.0% ^{235}U) - 1 INCH OF WATER REFLECTION.....B-874

TABLE B.3.1.2.3-1. CRITICAL DIMENSIONS FOR URANIUM DIOXIDE SPHERE (5.0% ^{235}U) - 10 INCHES OF WATER REFLECTION.....B-884

TABLE B.3.1.2.3-2. K_{EFF} VALUES FOR URANIUM DIOXIDE SPHERE (5.0% ^{235}U) - 10 INCHES OF WATER REFLECTION B-888

TABLE B.3.1.3.1-1. CRITICAL DIMENSIONS FOR URANIUM DIOXIDE SPHERE (4.0% ^{235}U) - 0 INCHES OF WATER REFLECTION.....B-898

TABLE B.3.1.3.1-2. K_{EFF} VALUES FOR URANIUM DIOXIDE SPHERE (4.0% ^{235}U) - 0 INCHES OF WATER REFLECTION B-902

TABLE B.3.1.3.2-1. CRITICAL DIMENSIONS FOR URANIUM DIOXIDE SPHERE (4.0% ^{235}U) - 1 INCH OF WATER REFLECTION B-911

TABLE B.3.1.3.2-2. K_{EFF} VALUES FOR URANIUM DIOXIDE SPHERE (4.0% ^{235}U) - 1 INCH OF WATER REFLECTION.....B-915

TABLE B.3.1.3.3-1. CRITICAL DIMENSIONS FOR URANIUM DIOXIDE SPHERE (4.0% ^{235}U) - 10 INCHES OF WATER REFLECTION.....B-924

TABLE B.3.1.3.3-2. K_{EFF} VALUES FOR URANIUM DIOXIDE SPHERE (4.0% ^{235}U) - 10 INCHES OF WATER REFLECTION B-928

TABLE B.3.1.4.1-1. CRITICAL DIMENSIONS FOR URANIUM DIOXIDE SPHERE (3.0% ^{235}U) - 0 INCHES OF WATER REFLECTION.....B-937

TABLE B.3.1.4.1-2. K_{EFF} VALUES FOR URANIUM DIOXIDE SPHERE (3.0% ^{235}U) - 0 INCHES OF WATER REFLECTION B-941

TABLE B.3.1.4.2-1. CRITICAL DIMENSIONS FOR URANIUM DIOXIDE SPHERE (3.0% ^{235}U) - 1 INCH OF WATER REFLECTION B-950

TABLE B.3.1.4.2-2. K_{EFF} VALUES FOR URANIUM DIOXIDE SPHERE (3.0% ^{235}U) - 1 INCH OF WATER REFLECTION.....B-954

TABLE B.3.1.4.3-1. CRITICAL DIMENSIONS FOR URANIUM DIOXIDE SPHERE (3.0% ^{235}U) - 10 INCHES OF WATER REFLECTION.....B-963

TABLE B.3.1.4.3-2. K_{EFF} VALUES FOR URANIUM DIOXIDE SPHERE (3.0% ^{235}U) - 10 INCHES OF WATER REFLECTION B-967

TABLE B.3.1.5.1-1. CRITICAL DIMENSIONS FOR URANIUM DIOXIDE SPHERE (2.5% ^{235}U) - 0 INCHES OF WATER REFLECTION.....B-976

TABLE B.3.1.5.1-2. K_{EFF} VALUES FOR URANIUM DIOXIDE SPHERE (2.5% ^{235}U) - 0 INCHES OF WATER REFLECTION B-980

TABLE B.3.1.5.2-1. CRITICAL DIMENSIONS FOR URANIUM DIOXIDE SPHERE (2.5% ^{235}U) - 1 INCH OF WATER REFLECTION B-988

TABLE B.3.1.5.2-2. K_{EFF} VALUES FOR URANIUM DIOXIDE SPHERE (2.5% ^{235}U) - 1 INCH OF WATER REFLECTION.....B-992

TABLE B.3.1.5.3-1. CRITICAL DIMENSIONS FOR URANIUM DIOXIDE SPHERE (2.5% ^{235}U) - 10 INCHES OF WATER REFLECTION.....B-1000

TABLE B.3.1.5.3-2. K_{EFF} VALUES FOR URANIUM DIOXIDE SPHERE (2.5% ^{235}U) - 10 INCHES OF WATER REFLECTION B-1004

LIST OF FIGURES

FIGURE B.1.1.1.1-1. 100% ^{239}PU SPHERE - 0 INCHES OF WATER REFLECTION B-18
FIGURE B.1.1.1.2-1. 100% ^{239}PU SPHERE - 1 INCH OF WATER REFLECTION.....B-37
FIGURE B.1.1.1.3-1. 100% ^{239}PU SPHERE – 10 INCHES OF WATER REFLECTION B-56
FIGURE B.1.1.2.1-1. PLUTONIUM SPHERE(97% ^{239}PU) - 0 INCHES OF WATER REFLECTION B-75
FIGURE B.1.1.2.2-1. PLUTONIUM SPHERE (97% ^{239}PU) - 1 INCH OF WATER REFLECTION B-90
FIGURE B.1.1.2.3-1. PLUTONIUM SPHERE (97% ^{239}PU) – 10 INCHES OF WATER REFLECTION B-105
FIGURE B.1.1.3.1-1. 95% ^{239}PU SPHERE - 0 INCHES OF WATER REFLECTION B-120
FIGURE B.1.1.3.2-1. 95% ^{239}PU SPHERE – 1 INCH OF WATER REFLECTION B-139
FIGURE B.1.1.3.3-1. 95% ^{239}PU SPHERE – 10 INCHES OF WATER REFLECTION.....B-158
FIGURE B.1.2.1.1-1. 100% ^{239}PU CYLINDER – 0 INCHES OF WATER REFLECTION B-177
FIGURE B.1.2.1.2-1. 100% ^{239}PU CYLINDER - 1 INCH OF WATER REFLECTION.....B-196
FIGURE B.1.2.1.3-1. 100% ^{239}PU CYLINDER - 10 INCHES OF WATER REFLECTION B-215
FIGURE B.1.2.2.1-1. PLUTONIUM CYLINDER (97% ^{239}PU) – 0 INCHES OF WATER REFLECTION.....B-234
FIGURE B.1.2.2.2-1. PLUTONIUM CYLINDER (97% ^{239}PU) - 1 INCH OF WATER REFLECTION B-249
FIGURE B.1.2.2.3-1. PLUTONIUM CYLINDER (97% ^{239}PU) - 1 INCH OF WATER REFLECTION B-264
FIGURE B.1.2.3.1-1. 95% ^{239}PU CYLINDER - 0 INCHES OF WATER REFLECTION...B-279
FIGURE B.1.2.3.2-1. 95% ^{239}PU CYLINDER - 1 INCH OF WATER REFLECTION.....B-298
FIGURE B.1.2.3.3-1. 95% ^{239}PU CYLINDER- 10 INCHES OF WATER REFLECTION..B-317
FIGURE B.1.3.1.1-1. PLUTONIUM SLAB (100% ^{239}PU) - 0 INCHES OF WATER REFLECTION B-336
FIGURE B.1.3.1.2-1. PLUTONIUM SLAB (100% ^{239}PU) - 1 INCH OF WATER REFLECTION B-351
FIGURE B.1.3.1.3-1. PLUTONIUM SLAB (100% ^{239}PU) - 10 INCH OF WATER REFLECTION B-366
FIGURE B.1.3.2.1-1. PLUTONIUM SLAB (97% ^{239}PU) - 0 INCHES OF WATER REFLECTION B-381
FIGURE B.1.3.2.2-1. PLUTONIUM SLAB (97% ^{239}PU) - 1 INCH OF WATER REFLECTION B-396

FIGURE B.1.3.2.3-1. PLUTONIUM SLAB (97% ^{239}PU) - 10 INCHES OF WATER REFLECTION B-411
FIGURE B.1.3.3.1-1. PLUTONIUM SLAB (95% ^{239}PU) - 0 INCHES OF WATER REFLECTION B-426
FIGURE B.1.3.3.2-1. PLUTONIUM SLAB (95% ^{239}PU) - 1 INCHES OF WATER REFLECTION B-441
FIGURE B.1.3.3.3-1. PLUTONIUM SLAB (95% ^{239}PU) - 10 INCHES OF WATER REFLECTION B-456
FIGURE B.2.1.1.1-1. 100% ^{235}U SPHERE - 0 INCHES OF WATER REFLECTION B-471
FIGURE B.2.1.1.2-1. 100% ^{235}U SPHERE – 1 INCH OF WATER REFLECTION B-490
FIGURE B.2.1.1.3-1. 100% ^{235}U SPHERE - 10 INCHES OF WATER REFLECTION B-509
FIGURE B.2.1.2.1-1. 93.5% ^{235}U SPHERE - 0 INCHES OF WATER REFLECTION B-528
FIGURE B.2.1.2.2-1. 93.5% ^{235}U SPHERE - 1 INCH OF WATER REFLECTION B-547
FIGURE B.2.1.2.3-1. 93.5% ^{235}U SPHERE - 10 INCHES OF WATER REFLECTION B-566
FIGURE B.2.2.1.1-1. URANIUM CYLINDER (100% ^{235}U) - 0 INCHES OF WATER REFLECTION B-585
FIGURE B.2.2.1.2-1. URANIUM CYLINDER (100% ^{235}U) – 1 INCH OF WATER REFLECTION B-604
FIGURE B.2.2.1.3-1. URANIUM CYLINDER (100% ^{235}U) – 10 INCHES OF WATER REFLECTION B-623
FIGURE B.2.2.2.1-1. URANIUM CYLINDER (93.5% ^{235}U) – 0 INCHES OF WATER REFLECTION B-642
FIGURE B.2.2.2.2-1. URANIUM CYLINDER (93.5% ^{235}U) - 1 INCH OF WATER REFLECTION B-661
FIGURE B.2.2.2.3-1. URANIUM CYLINDER (93.5% ^{235}U) - 10 INCHES OF WATER REFLECTION B-680
FIGURE B.2.3.1.1-1. URANIUM SLAB (100% ^{235}U) – 0 INCHES OF WATER REFLECTION B-699
FIGURE B.2.3.1.2-1. URANIUM SLAB (100% ^{235}U) - 1 INCH OF WATER REFLECTION B-718
FIGURE B.2.3.1.3-1. URANIUM SLAB (100% ^{235}U) - 10 INCHES OF WATER REFLECTION B-737
FIGURE B.2.3.2.1-1. ^{235}U SLAB (93.5% ^{235}U) - 0 INCHES OF WATER REFLECTION.. B-756
FIGURE B.2.3.2.2-1. ^{235}U SLAB (93.5% ^{235}U) - 1 INCH OF WATER REFLECTION B-775
FIGURE B.2.3.2.3-1. ^{235}U SLAB (93.5% ^{235}U) - 10 INCHES OF WATER REFLECTION B-794
FIGURE B.3.1.1.1-1. URANIUM DIOXIDE SPHERE (6.0% ^{235}U) - 0 INCHES OF WATER REFLECTION B-813

FIGURE B.3.1.1.2-1. URANIUM DIOXIDE SPHERE (6.0% ^{235}U) - 1 INCH OF WATER REFLECTION B-827
FIGURE B.3.1.1.3-1. URANIUM DIOXIDE SPHERE (6.0% ^{235}U) - 10 INCHES OF WATER REFLECTION B-841
FIGURE B.3.1.2.1-1. URANIUM DIOXIDE SPHERE (5.0% ^{235}U) - 0 INCHES OF WATER REFLECTION B-855
FIGURE B.3.1.2.2-1. URANIUM DIOXIDE SPHERE (5.0% ^{235}U) - 1 INCH OF WATER REFLECTION B-869
FIGURE B.3.1.2.3-1. URANIUM DIOXIDE SPHERE (5.0% ^{235}U) - 10 INCHES OF WATER REFLECTION B-883
FIGURE B.3.1.3.1-1. URANIUM DIOXIDE SPHERE (4.0% ^{235}U) - 0 INCHES OF WATER REFLECTION B-897
FIGURE B.3.1.3.2-1. URANIUM DIOXIDE SPHERE (4.0% ^{235}U) - 1 INCH OF WATER REFLECTION B-910
FIGURE B.3.1.3.3-1. URANIUM DIOXIDE SPHERE (4.0% ^{235}U) - 10 INCHES OF WATER REFLECTION B-923
FIGURE B.3.1.4.1-1. URANIUM DIOXIDE SPHERE (3.0% ^{235}U) - 0 INCHES OF WATER REFLECTION B-936
FIGURE B.3.1.4.2-1. URANIUM DIOXIDE SPHERE (3.0% ^{235}U) - 1 INCH OF WATER REFLECTION B-949
FIGURE B.3.1.4.3-1. URANIUM DIOXIDE SPHERE (3.0% ^{235}U) - 10 INCHES OF WATER REFLECTION B-962
FIGURE B.3.1.5.1-1. URANIUM DIOXIDE SPHERE (2.5% ^{235}U) - 0 INCHES OF WATER REFLECTION B-975
FIGURE B.3.1.5.2-1. URANIUM DIOXIDE SPHERE (2.5% ^{235}U) - 1 INCH OF WATER REFLECTION B-987
FIGURE B.3.1.5.3-1. URANIUM DIOXIDE SPHERE (2.5% ^{235}U) - 10 INCHES OF WATER REFLECTION B-999

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B.1. Plutonium Metal in Water

B.1.1. Sphere

B.1.1.1. 100% ^{239}Pu

B.1.1.1.1. Unreflected

Case ID: pu-sp-1000-00

Material: Plutonium metal in water

Geometry: Sphere

Isotopics: 100% ^{239}Pu

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.1.1.1.1-1. 100% ^{239}Pu Sphere - 0 Inches of Water Reflection

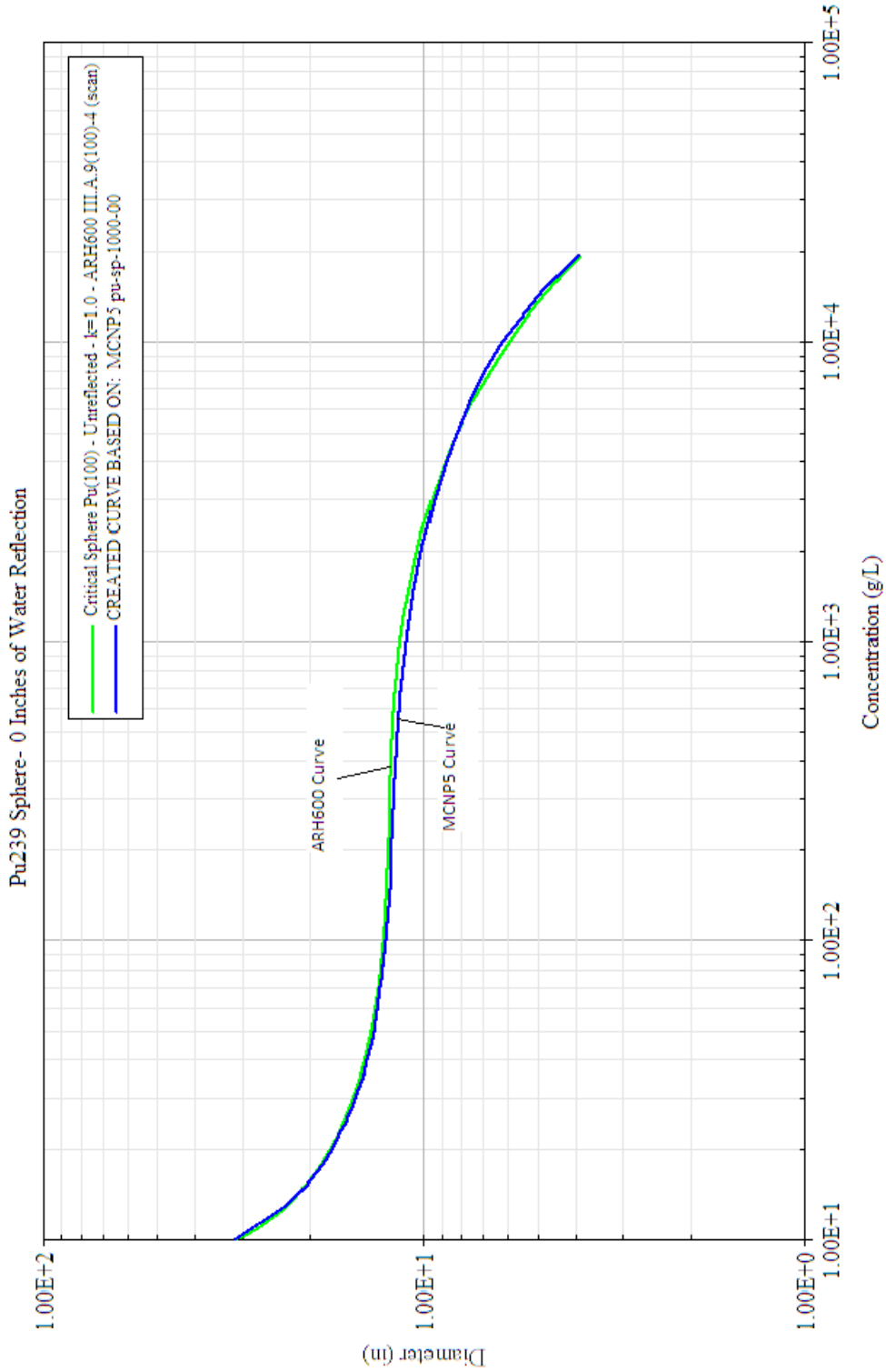

Table B.1.1.1.1-1. Critical Dimensions for 100% ^{239}Pu Sphere - 0 Inches of Water Reflection

100% ^{239}Pu Sphere - 0 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	25.000	33.400	0.400	31.6111
0.013	19.700	24.000	0.200	23.1436
0.015	18.000	21.400	0.100	20.7000
0.018	16.300	19.100	0.100	18.5330
0.020	15.600	18.100	0.100	17.5890
0.022	15.000	17.400	0.100	16.8761
0.024	14.600	16.800	0.100	16.3092
0.025	14.400	16.600	0.100	16.0628
0.026	14.200	16.300	0.100	15.8676
0.028	13.900	15.900	0.100	15.4680
0.030	13.600	15.600	0.100	15.1832
0.032	13.400	15.300	0.100	14.9240
0.036	13.100	14.900	0.100	14.4584
0.040	12.800	14.600	0.100	14.1394
0.045	12.500	14.200	0.050	13.8274
0.050	12.300	13.900	0.050	13.5798
0.075	11.700	13.200	0.050	12.9133
0.100	11.500	12.900	0.050	12.5932
0.150	11.200	12.600	0.050	12.3114
0.200	11.100	12.500	0.050	12.1620
0.350	10.900	12.300	0.050	11.9332
0.500	10.700	12.100	0.050	11.7292
0.750	10.400	11.700	0.050	11.4170
1.000	10.100	11.400	0.050	11.1271
1.500	9.700	10.900	0.050	10.5993
2.000	9.200	10.400	0.050	10.1379
2.500	8.900	10.000	0.050	9.7438
3.000	8.600	9.700	0.050	9.3756
4.000	8.000	9.000	0.050	8.7498
5.000	7.500	8.500	0.050	8.2098
6.000	7.100	8.000	0.050	7.7449
7.000	6.700	7.500	0.050	7.3265
7.500	6.500	7.300	0.050	7.1256
8.000	6.300	7.100	0.050	6.9319
9.000	6.000	6.800	0.050	6.5786
10.000	5.700	6.400	0.050	6.2459
15.000	4.400	5.000	0.050	4.8728
19.600	3.500	4.100	0.050	3.9414

MCNP5 Sample Input File

100% ^{239}Pu Sphere - 0" Reflection

```
s-, 100.0 wt% 239Pu, 01000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1065  hundreths of inches - must be integer
c radius =    13.5255 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 01000 milli-g Pu/cc
c Reflector width =  0.0 inches
c Enrichment = 1.00 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0510 cc
c Volume of water in sample 0.9490 cc
c
c Mass of crit in sample   1.0000 g
c Mass of water in sample  0.9490 g
c
c Total mass of sample  1.9490g for a 1cc sample
c Mass Density for crit material  -1.9490, expressed as negative
c
c  sphere
20 11   -1.948980   -1        imp:n=1
21  2  -1.000    -2 1        imp:n=0    $zero importance if no reflector
22  0            2          imp:n=0

1       so    13.5255              $ Sphere
2       so    13.5255        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
```

```
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu/water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 01000 milli-g Pu/cc,  1.9490
1001.66c -0.054483
8016.66c -0.432428
94239.66c -0.513089
c    94240.66c -0.000000
mt11     lwtr.60t
c
c    pu only
m12    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 01000 milli-g Pu/cc,  1.9490
94239.66c -1.000000
c    94240.66c -0.000000
c
```

Critview Compatible Data File
100% ^{239}Pu Sphere- 0" Reflection

reset:
title: MCNP5 pu-sp-1000-00
set: MCNP5 set
source: MCNP5 primary
created: Fri 07/16/2010 11:16:01.46
geometry: sphere
modmat: H2O
critmat: plutonium
isomat: Pu239 1.0
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	31.6111
0.013	23.1436
0.015	20.7000
0.018	18.5330
0.020	17.5890
0.022	16.8761
0.024	16.3092
0.025	16.0628
0.026	15.8676
0.028	15.4680
0.030	15.1832
0.032	14.9240
0.036	14.4584
0.040	14.1394
0.045	13.8274
0.050	13.5798
0.075	12.9133
0.100	12.5932
0.150	12.3114
0.200	12.1620
0.350	11.9332
0.500	11.7292
0.750	11.4170
1.000	11.1271
1.500	10.5993
2.000	10.1379
2.500	9.7438
3.000	9.3756
4.000	8.7498
5.000	8.2098
6.000	7.7449
7.000	7.3265
7.500	7.1256
8.000	6.9319
9.000	6.5786
10.00	6.2459
15.00	4.8728
19.60	3.9414

Table B.1.1.1.1-2. - K_{eff} Values for 100% ^{239}Pu Sphere - 0 Inches of Water Reflection

10 milli-g/cc			13 milli-g/cc			15 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
25.00	0.92519	0.00040	19.70	0.92265	0.00047	18.00	0.92336	0.00050
25.40	0.93080	0.00039	19.90	0.92861	0.00047	18.10	0.92650	0.00050
25.80	0.93579	0.00037	20.10	0.93399	0.00046	18.20	0.92958	0.00051
26.20	0.94130	0.00039	20.30	0.93721	0.00046	18.30	0.93312	0.00050
26.60	0.94675	0.00038	20.50	0.94272	0.00046	18.40	0.93567	0.00051
27.00	0.95203	0.00038	20.70	0.94740	0.00046	18.50	0.93897	0.00052
27.40	0.95699	0.00037	20.90	0.95217	0.00046	18.60	0.94273	0.00052
27.80	0.96158	0.00037	21.10	0.95725	0.00044	18.70	0.94529	0.00053
28.20	0.96583	0.00039	21.30	0.96220	0.00049	18.80	0.94912	0.00052
28.60	0.97060	0.00037	21.50	0.96565	0.00045	18.90	0.95180	0.00050
29.00	0.97502	0.00038	21.70	0.96930	0.00046	19.00	0.95344	0.00052
29.40	0.97836	0.00036	21.90	0.97546	0.00046	19.10	0.95624	0.00049
29.80	0.98391	0.00035	22.10	0.97919	0.00044	19.20	0.95906	0.00051
30.20	0.98682	0.00037	22.30	0.98281	0.00045	19.30	0.96227	0.00052
30.60	0.99129	0.00035	22.50	0.98633	0.00044	19.40	0.96652	0.00051
31.00	0.99345	0.00036	22.70	0.99206	0.00045	19.50	0.96948	0.00049
31.40	0.99848	0.00035	22.90	0.99490	0.00044	19.60	0.97018	0.00049
31.80	1.00136	0.00034	23.10	0.99906	0.00044	19.70	0.97309	0.00050
32.20	1.00408	0.00035	23.30	1.00337	0.00045	19.80	0.97634	0.00047
32.60	1.00834	0.00034	23.50	1.00569	0.00045	19.90	0.97975	0.00047
33.00	1.01051	0.00036	23.70	1.01051	0.00045	20.00	0.98181	0.00047
33.40	1.01356	0.00034	23.90	1.01299	0.00045	20.10	0.98439	0.00052
			24.00	1.01621	0.00043	20.20	0.98690	0.00050
						20.30	0.98982	0.00051
						20.40	0.99318	0.00050
						20.50	0.99515	0.00047
						20.60	0.99703	0.00052
						20.70	1.00000	0.00048
						20.80	1.00219	0.00049
						20.90	1.00465	0.00048
						21.00	1.00734	0.00048
						21.10	1.00873	0.00048
						21.20	1.01221	0.00050
						21.30	1.01429	0.00049

Table B.1.1.1.1-2. - K_{eff} Values for 100% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

18 milli-g/cc			20 milli-g/cc			22 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
16.30	0.92034	0.00054	15.60	0.92073	0.00058	15.00	0.91802	0.00057
16.40	0.92413	0.00058	15.70	0.92462	0.00055	15.10	0.92314	0.00060
16.50	0.92787	0.00058	15.80	0.92907	0.00059	15.20	0.92803	0.00058
16.60	0.93134	0.00056	15.90	0.93319	0.00057	15.30	0.93326	0.00059
16.70	0.93497	0.00055	16.00	0.93762	0.00057	15.40	0.93738	0.00057
16.80	0.93822	0.00054	16.10	0.94167	0.00055	15.50	0.94194	0.00059
16.90	0.94299	0.00053	16.20	0.94733	0.00057	15.60	0.94698	0.00059
17.00	0.94649	0.00055	16.30	0.94932	0.00056	15.70	0.95002	0.00057
17.10	0.95047	0.00052	16.40	0.95464	0.00058	15.80	0.95688	0.00060
17.20	0.95423	0.00055	16.50	0.95854	0.00056	15.90	0.95807	0.00057
17.30	0.95844	0.00055	16.60	0.96291	0.00056	16.00	0.96285	0.00059
17.40	0.96003	0.00052	16.70	0.96675	0.00055	16.10	0.96770	0.00061
17.50	0.96467	0.00053	16.80	0.96970	0.00058	16.20	0.97158	0.00060
17.60	0.96867	0.00053	16.90	0.97395	0.00057	16.30	0.97630	0.00059
17.70	0.97154	0.00055	17.00	0.97801	0.00057	16.40	0.98063	0.00057
17.80	0.97460	0.00055	17.10	0.98103	0.00055	16.50	0.98410	0.00058
17.90	0.97934	0.00054	17.20	0.98617	0.00058	16.60	0.98798	0.00061
18.00	0.98205	0.00055	17.30	0.99067	0.00056	16.70	0.99177	0.00058
18.10	0.98570	0.00051	17.40	0.99321	0.00057	16.80	0.99691	0.00056
18.20	0.98930	0.00055	17.50	0.99701	0.00056	16.90	1.00097	0.00059
18.30	0.99331	0.00053	17.60	1.00037	0.00057	17.00	1.00407	0.00059
18.40	0.99517	0.00053	17.70	1.00384	0.00055	17.10	1.00673	0.00057
18.50	0.99865	0.00054	17.80	1.00670	0.00057	17.20	1.01312	0.00059
18.60	1.00274	0.00056	17.90	1.01166	0.00055	17.30	1.01454	0.00059
18.70	1.00419	0.00052	18.00	1.01484	0.00054	17.40	1.01939	0.00055
18.80	1.00841	0.00054	18.10	1.01714	0.00055			
18.90	1.01119	0.00053						
19.00	1.01403	0.00052						
19.10	1.01784	0.00052						

Table B.1.1.1.1-2. - K_{eff} Values for 100% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

24 milli-g/cc			25 milli-g/cc			26 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
14.60	0.92009	0.00058	14.40	0.92057	0.00061	14.20	0.91816	0.00059
14.70	0.92541	0.00062	14.50	0.92589	0.00061	14.30	0.92399	0.00063
14.80	0.93098	0.00060	14.60	0.93220	0.00061	14.40	0.92827	0.00065
14.90	0.93500	0.00059	14.70	0.93521	0.00063	14.50	0.93555	0.00063
15.00	0.94078	0.00062	14.80	0.94063	0.00063	14.60	0.93936	0.00061
15.10	0.94653	0.00059	14.90	0.94567	0.00062	14.70	0.94402	0.00061
15.20	0.94924	0.00061	15.00	0.95020	0.00061	14.80	0.94983	0.00060
15.30	0.95711	0.00061	15.10	0.95452	0.00062	14.90	0.95398	0.00062
15.40	0.95964	0.00059	15.20	0.95941	0.00058	15.00	0.96006	0.00061
15.50	0.96305	0.00058	15.30	0.96436	0.00061	15.10	0.96503	0.00061
15.60	0.96848	0.00062	15.40	0.96921	0.00060	15.20	0.96886	0.00062
15.70	0.97285	0.00061	15.50	0.97530	0.00061	15.30	0.97404	0.00062
15.80	0.97665	0.00060	15.60	0.97784	0.00062	15.40	0.97880	0.00061
15.90	0.98273	0.00058	15.70	0.98258	0.00062	15.50	0.98230	0.00062
16.00	0.98619	0.00059	15.80	0.98914	0.00061	15.60	0.98845	0.00062
16.10	0.99184	0.00061	15.90	0.99239	0.00062	15.70	0.99358	0.00062
16.20	0.99537	0.00061	16.00	0.99718	0.00061	15.80	0.99729	0.00062
16.30	0.99968	0.00059	16.10	1.00167	0.00062	15.90	1.00130	0.00060
16.40	1.00314	0.00060	16.20	1.00539	0.00060	16.00	1.00549	0.00059
16.50	1.00787	0.00061	16.30	1.00976	0.00058	16.10	1.00990	0.00062
16.60	1.01209	0.00061	16.40	1.01347	0.00062	16.20	1.01416	0.00059
16.70	1.01561	0.00058	16.50	1.01796	0.00060	16.30	1.01769	0.00062
16.80	1.02148	0.00060	16.60	1.02155	0.00059			

Table B.1.1.1.1-2. - K_{eff} Values for 100% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

28 milli-g/cc			30 milli-g/cc			32 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
13.90	0.91708	0.00064	13.60	0.91513	0.00064	13.40	0.91667	0.00065
14.00	0.92294	0.00063	13.70	0.92212	0.00062	13.50	0.92241	0.00064
14.10	0.92999	0.00065	13.80	0.92946	0.00065	13.60	0.92981	0.00064
14.20	0.93408	0.00065	13.90	0.93283	0.00066	13.70	0.93510	0.00066
14.30	0.94058	0.00064	14.00	0.93958	0.00066	13.80	0.94028	0.00065
14.40	0.94456	0.00062	14.10	0.94496	0.00064	13.90	0.94610	0.00064
14.50	0.95024	0.00064	14.20	0.94998	0.00064	14.00	0.95065	0.00065
14.60	0.95604	0.00062	14.30	0.95629	0.00060	14.10	0.95750	0.00066
14.70	0.95908	0.00062	14.40	0.96136	0.00065	14.20	0.96265	0.00064
14.80	0.96652	0.00064	14.50	0.96613	0.00062	14.30	0.96908	0.00064
14.90	0.97151	0.00062	14.60	0.97180	0.00063	14.40	0.97384	0.00064
15.00	0.97671	0.00060	14.70	0.97604	0.00064	14.50	0.98014	0.00063
15.10	0.98187	0.00063	14.80	0.98096	0.00065	14.60	0.98488	0.00066
15.20	0.98683	0.00064	14.90	0.98697	0.00063	14.70	0.98970	0.00065
15.30	0.99055	0.00065	15.00	0.99132	0.00063	14.80	0.99685	0.00066
15.40	0.99616	0.00062	15.10	0.99568	0.00063	14.90	0.99835	0.00064
15.50	1.00181	0.00063	15.20	1.00087	0.00064	15.00	1.00522	0.00064
15.60	1.00542	0.00063	15.30	1.00707	0.00063	15.10	1.01091	0.00066
15.70	1.01096	0.00061	15.40	1.01072	0.00062	15.20	1.01496	0.00067
15.80	1.01569	0.00063	15.50	1.01575	0.00063	15.30	1.02090	0.00064
15.90	1.01929	0.00063	15.60	1.02081	0.00063			

Table B.1.1.1.1-2. - K_{eff} Values for 100% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

36 milli-g/cc			40 milli-g/cc			45 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
13.10	0.91812	0.00065	12.80	0.91842	0.00066	12.50	0.91658	0.00066
13.20	0.92617	0.00068	12.90	0.92500	0.00067	12.55	0.91893	0.00069
13.30	0.93252	0.00067	13.00	0.93038	0.00067	12.60	0.92226	0.00070
13.40	0.93840	0.00067	13.10	0.93772	0.00067	12.65	0.92720	0.00068
13.50	0.94496	0.00064	13.20	0.94336	0.00068	12.70	0.93026	0.00069
13.60	0.95168	0.00065	13.30	0.94991	0.00066	12.75	0.93303	0.00067
13.70	0.95845	0.00067	13.40	0.95639	0.00065	12.80	0.93688	0.00070
13.80	0.96208	0.00066	13.50	0.96297	0.00068	12.85	0.93850	0.00068
13.90	0.96797	0.00067	13.60	0.96625	0.00066	12.90	0.94161	0.00072
14.00	0.97340	0.00066	13.70	0.97349	0.00067	12.95	0.94678	0.00071
14.10	0.97980	0.00067	13.80	0.98199	0.00068	13.00	0.94937	0.00067
14.20	0.98450	0.00068	13.90	0.98565	0.00067	13.05	0.95216	0.00070
14.30	0.99029	0.00064	14.00	0.99261	0.00070	13.10	0.95621	0.00068
14.40	0.99672	0.00067	14.10	0.99769	0.00067	13.15	0.95921	0.00069
14.50	1.00234	0.00066	14.20	1.00356	0.00067	13.20	0.96087	0.00067
14.60	1.00760	0.00067	14.30	1.00896	0.00065	13.25	0.96386	0.00067
14.70	1.01206	0.00068	14.40	1.01485	0.00067	13.30	0.96778	0.00068
14.80	1.01855	0.00067	14.50	1.01893	0.00067	13.35	0.97059	0.00067
14.90	1.02328	0.00069	14.60	1.02606	0.00066	13.40	0.97556	0.00066
						13.45	0.97662	0.00070
						13.50	0.98183	0.00067
						13.55	0.98441	0.00070
						13.60	0.98682	0.00067
						13.65	0.99042	0.00067
						13.70	0.99213	0.00070
						13.75	0.99437	0.00067
						13.80	0.99806	0.00069
						13.85	1.00160	0.00070
						13.90	1.00378	0.00069
						13.95	1.00878	0.00068
						14.00	1.01053	0.00067
						14.05	1.01380	0.00068
						14.10	1.01655	0.00069
						14.15	1.02028	0.00067
						14.20	1.02266	0.00070

Table B.1.1.1.1-2. - K_{eff} Values for 100% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

50 milli-g/cc			75 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.30	0.91430	0.00070	11.70	0.91432	0.00072	11.50	0.92062	0.00072
12.35	0.91990	0.00068	11.75	0.91797	0.00073	11.55	0.92337	0.00075
12.40	0.92277	0.00067	11.80	0.92111	0.00072	11.60	0.92818	0.00073
12.45	0.92683	0.00069	11.85	0.92433	0.00073	11.65	0.93035	0.00073
12.50	0.93006	0.00067	11.90	0.92944	0.00072	11.70	0.93444	0.00070
12.55	0.93388	0.00068	11.95	0.93376	0.00073	11.75	0.93778	0.00071
12.60	0.93686	0.00070	12.00	0.93736	0.00073	11.80	0.94156	0.00075
12.65	0.93976	0.00068	12.05	0.94032	0.00070	11.85	0.94596	0.00074
12.70	0.94324	0.00071	12.10	0.94488	0.00070	11.90	0.94892	0.00072
12.75	0.94831	0.00069	12.15	0.94798	0.00072	11.95	0.95345	0.00073
12.80	0.94992	0.00068	12.20	0.95161	0.00071	12.00	0.95841	0.00074
12.85	0.95422	0.00070	12.25	0.95405	0.00072	12.05	0.96194	0.00075
12.90	0.95721	0.00069	12.30	0.95930	0.00075	12.10	0.96436	0.00072
12.95	0.96091	0.00071	12.35	0.96323	0.00074	12.15	0.96918	0.00072
13.00	0.96341	0.00070	12.40	0.96472	0.00069	12.20	0.97297	0.00071
13.05	0.96721	0.00068	12.45	0.96989	0.00073	12.25	0.97617	0.00074
13.10	0.96960	0.00071	12.50	0.97323	0.00072	12.30	0.97875	0.00072
13.15	0.97339	0.00067	12.55	0.97600	0.00071	12.35	0.98168	0.00072
13.20	0.97662	0.00068	12.60	0.98027	0.00071	12.40	0.98727	0.00072
13.25	0.98028	0.00069	12.65	0.98350	0.00071	12.45	0.99126	0.00073
13.30	0.98239	0.00072	12.70	0.98636	0.00074	12.50	0.99362	0.00072
13.35	0.98733	0.00069	12.75	0.99074	0.00073	12.55	0.99735	0.00074
13.40	0.98889	0.00069	12.80	0.99518	0.00073	12.60	1.00042	0.00075
13.45	0.99148	0.00070	12.85	0.99635	0.00073	12.65	1.00445	0.00073
13.50	0.99488	0.00070	12.90	0.99866	0.00072	12.70	1.00894	0.00075
13.55	0.99756	0.00069	12.95	1.00371	0.00073	12.75	1.01231	0.00074
13.60	1.00165	0.00067	13.00	1.00770	0.00070	12.80	1.01517	0.00075
13.65	1.00522	0.00070	13.05	1.01093	0.00071	12.85	1.01551	0.00073
13.70	1.00796	0.00070	13.10	1.01388	0.00071	12.90	1.02002	0.00074
13.75	1.01200	0.00068	13.15	1.01726	0.00072			
13.80	1.01251	0.00071	13.20	1.01944	0.00074			
13.85	1.01738	0.00069						
13.90	1.01856	0.00070						

Table B.1.1.1.1-2. - K_{eff} Values for 100% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

150 milli-g/cc			200 milli-g/cc			350 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.20	0.91393	0.00074	11.10	0.91707	0.00073	10.90	0.91748	0.00071
11.25	0.91843	0.00074	11.15	0.92047	0.00073	10.95	0.92445	0.00074
11.30	0.92233	0.00073	11.20	0.92607	0.00073	11.00	0.92749	0.00076
11.35	0.92685	0.00072	11.25	0.92989	0.00073	11.05	0.93157	0.00073
11.40	0.93136	0.00075	11.30	0.93304	0.00073	11.10	0.93550	0.00074
11.45	0.93434	0.00074	11.35	0.93662	0.00073	11.15	0.94033	0.00074
11.50	0.93924	0.00074	11.40	0.94141	0.00073	11.20	0.94455	0.00071
11.55	0.94412	0.00072	11.45	0.94596	0.00075	11.25	0.94848	0.00076
11.60	0.94585	0.00074	11.50	0.94770	0.00074	11.30	0.95199	0.00073
11.65	0.94912	0.00071	11.55	0.95289	0.00075	11.35	0.95576	0.00074
11.70	0.95455	0.00072	11.60	0.95678	0.00073	11.40	0.95912	0.00070
11.75	0.95969	0.00072	11.65	0.96033	0.00074	11.45	0.96390	0.00071
11.80	0.96234	0.00076	11.70	0.96471	0.00074	11.50	0.96676	0.00072
11.85	0.96729	0.00074	11.75	0.96895	0.00069	11.55	0.97102	0.00074
11.90	0.96925	0.00074	11.80	0.97268	0.00073	11.60	0.97392	0.00073
11.95	0.97454	0.00072	11.85	0.97585	0.00074	11.65	0.97880	0.00072
12.00	0.97632	0.00072	11.90	0.97837	0.00073	11.70	0.98327	0.00071
12.05	0.98079	0.00072	11.95	0.98419	0.00073	11.75	0.98749	0.00073
12.10	0.98481	0.00075	12.00	0.98640	0.00072	11.80	0.99017	0.00073
12.15	0.98941	0.00075	12.05	0.99073	0.00075	11.85	0.99386	0.00074
12.20	0.99142	0.00072	12.10	0.99479	0.00073	11.90	0.99686	0.00071
12.25	0.99418	0.00073	12.15	0.99920	0.00073	11.95	1.00159	0.00073
12.30	0.99944	0.00075	12.20	1.00252	0.00074	12.00	1.00539	0.00075
12.35	1.00189	0.00073	12.25	1.00542	0.00073	12.05	1.00798	0.00074
12.40	1.00395	0.00071	12.30	1.00847	0.00073	12.10	1.01144	0.00072
12.45	1.00858	0.00077	12.35	1.01172	0.00075	12.15	1.01419	0.00074
12.50	1.01124	0.00073	12.40	1.01501	0.00074	12.20	1.01970	0.00074
12.55	1.01659	0.00072	12.45	1.01814	0.00074	12.25	1.02383	0.00076
12.60	1.02050	0.00072	12.50	1.02231	0.00076	12.30	1.02714	0.00071

Table B.1.1.1.1-2. - K_{eff} Values for 100% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

500 milli-g/cc			750 milli-g/cc			1000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.70	0.92018	0.00071	10.40	0.91833	0.00071	10.10	0.91274	0.00071
10.75	0.92215	0.00074	10.45	0.92172	0.00071	10.15	0.91784	0.00071
10.80	0.92723	0.00071	10.50	0.92571	0.00070	10.20	0.92314	0.00073
10.85	0.93006	0.00073	10.55	0.93053	0.00069	10.25	0.92749	0.00070
10.90	0.93550	0.00072	10.60	0.93329	0.00073	10.30	0.93100	0.00072
10.95	0.93913	0.00077	10.65	0.93896	0.00069	10.35	0.93568	0.00072
11.00	0.94320	0.00072	10.70	0.94306	0.00070	10.40	0.94099	0.00071
11.05	0.94723	0.00070	10.75	0.94593	0.00072	10.45	0.94361	0.00068
11.10	0.95198	0.00072	10.90	0.95925	0.00068	10.50	0.94853	0.00072
11.15	0.95598	0.00070	10.95	0.96192	0.00069	10.55	0.95243	0.00071
11.20	0.95884	0.00072	11.00	0.96608	0.00070	10.60	0.95780	0.00071
11.25	0.96219	0.00069	11.05	0.97008	0.00072	10.65	0.96096	0.00072
11.30	0.96732	0.00073	11.10	0.97549	0.00071	10.70	0.96618	0.00069
11.35	0.97148	0.00074	11.15	0.97953	0.00070	10.75	0.97044	0.00074
11.40	0.97479	0.00071	11.20	0.98314	0.00072	10.80	0.97381	0.00072
11.45	0.97841	0.00072	11.25	0.98833	0.00072	10.85	0.97810	0.00070
11.50	0.98232	0.00072	11.30	0.99093	0.00071	10.90	0.98130	0.00074
11.55	0.98735	0.00074	11.35	0.99575	0.00071	10.95	0.98624	0.00071
11.60	0.99031	0.00073	11.40	0.99823	0.00074	11.00	0.99092	0.00072
11.65	0.99413	0.00072	11.45	1.00345	0.00073	11.05	0.99420	0.00071
11.70	0.99838	0.00073	11.50	1.00557	0.00069	11.10	0.99806	0.00071
11.75	1.00115	0.00071	11.55	1.01002	0.00074	11.15	1.00164	0.00071
11.80	1.00498	0.00071	11.60	1.01432	0.00074	11.20	1.00589	0.00071
11.85	1.00850	0.00073	11.65	1.01787	0.00072	11.25	1.00856	0.00069
11.90	1.01375	0.00072	11.70	1.02175	0.00073	11.30	1.01372	0.00070
11.95	1.01556	0.00072				11.35	1.01755	0.00074
12.00	1.02047	0.00072				11.40	1.02216	0.00073
12.05	1.02316	0.00074						
12.10	1.02841	0.00072						

Table B.1.1.1.1-2. - K_{eff} Values for 100% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

1500 milli-g/cc			2000 milli-g/cc			2500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.70	0.92060	0.00068	9.20	0.91177	0.00071	8.90	0.91758	0.00069
9.75	0.92513	0.00071	9.25	0.91717	0.00071	8.95	0.92262	0.00071
9.80	0.92958	0.00069	9.30	0.92136	0.00073	9.00	0.92624	0.00070
9.85	0.93493	0.00073	9.35	0.92739	0.00069	9.05	0.93183	0.00072
9.90	0.93958	0.00072	9.40	0.93237	0.00072	9.10	0.93698	0.00068
9.95	0.94335	0.00072	9.45	0.93588	0.00071	9.15	0.94316	0.00068
10.00	0.94915	0.00071	9.50	0.94115	0.00069	9.20	0.94878	0.00066
10.05	0.95270	0.00071	9.55	0.94639	0.00068	9.25	0.95536	0.00068
10.10	0.95671	0.00072	9.60	0.95130	0.00069	9.30	0.95731	0.00068
10.15	0.96116	0.00070	9.65	0.95516	0.00068	9.35	0.96295	0.00070
10.20	0.96573	0.00071	9.70	0.95965	0.00068	9.40	0.96689	0.00069
10.25	0.97002	0.00068	9.75	0.96444	0.00069	9.45	0.97175	0.00071
10.30	0.97504	0.00073	9.80	0.96943	0.00073	9.50	0.97726	0.00070
10.35	0.97997	0.00070	9.85	0.97354	0.00072	9.55	0.98214	0.00071
10.40	0.98294	0.00069	9.90	0.97894	0.00070	9.60	0.98759	0.00071
10.45	0.98783	0.00072	9.95	0.98326	0.00070	9.65	0.99092	0.00073
10.50	0.99053	0.00072	10.00	0.98638	0.00072	9.70	0.99582	0.00071
10.55	0.99631	0.00069	10.05	0.99163	0.00070	9.75	1.00059	0.00071
10.60	1.00005	0.00071	10.10	0.99732	0.00070	9.80	1.00631	0.00068
10.65	1.00405	0.00071	10.15	1.00086	0.00073	9.85	1.00949	0.00071
10.70	1.00812	0.00071	10.20	1.00620	0.00071	9.90	1.01530	0.00069
10.75	1.01253	0.00072	10.25	1.01062	0.00071	9.95	1.01938	0.00070
10.80	1.01707	0.00072	10.30	1.01405	0.00071	10.00	1.02326	0.00072
10.85	1.02044	0.00071	10.35	1.01785	0.00072			
10.90	1.02421	0.00069	10.40	1.02402	0.00073			

Table B.1.1.1.1-2. - K_{eff} Values for 100% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

3000 milli-g/cc			4000 milli-g/cc			5000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.60	0.92091	0.00068	8.00	0.91661	0.00066	7.50	0.91392	0.00062
8.65	0.92558	0.00068	8.05	0.92277	0.00067	7.55	0.92073	0.00063
8.70	0.93127	0.00067	8.10	0.92624	0.00064	7.60	0.92759	0.00062
8.75	0.93609	0.00067	8.15	0.93293	0.00064	7.65	0.93310	0.00063
8.80	0.94139	0.00069	8.20	0.93850	0.00066	7.70	0.94062	0.00063
8.85	0.94751	0.00068	8.25	0.94594	0.00065	7.75	0.94431	0.00064
8.90	0.95153	0.00068	8.30	0.95117	0.00067	7.80	0.95071	0.00062
8.95	0.95539	0.00070	8.35	0.95667	0.00066	7.85	0.95826	0.00065
9.00	0.96169	0.00067	8.40	0.96164	0.00069	7.90	0.96246	0.00062
9.05	0.96856	0.00067	8.45	0.96582	0.00067	7.95	0.96823	0.00064
9.10	0.97203	0.00068	8.50	0.97271	0.00066	8.00	0.97521	0.00067
9.15	0.97855	0.00068	8.55	0.97701	0.00067	8.05	0.98098	0.00065
9.20	0.98164	0.00067	8.60	0.98228	0.00068	8.10	0.98722	0.00064
9.25	0.98616	0.00069	8.65	0.98999	0.00067	8.15	0.99275	0.00067
9.30	0.99123	0.00068	8.70	0.99376	0.00068	8.20	0.99890	0.00065
9.35	0.99791	0.00069	8.75	1.00002	0.00065	8.25	1.00453	0.00066
9.40	1.00199	0.00070	8.80	1.00454	0.00067	8.30	1.00876	0.00066
9.45	1.00622	0.00067	8.85	1.01048	0.00070	8.35	1.01599	0.00065
9.50	1.01060	0.00071	8.90	1.01439	0.00066	8.40	1.02105	0.00066
9.55	1.01574	0.00067	8.95	1.02022	0.00066	8.45	1.02722	0.00067
9.60	1.02258	0.00069	9.00	1.02497	0.00067	8.50	1.03165	0.00066
9.65	1.02460	0.00066						
9.70	1.03011	0.00071						

Table B.1.1.1.1-2. - K_{eff} Values for 100% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

6000 milli-g/cc			7000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.10	0.91814	0.00056	6.70	0.91751	0.00058	6.50	0.91569	0.00055
7.15	0.92461	0.00061	6.75	0.92436	0.00056	6.55	0.92332	0.00055
7.20	0.93206	0.00059	6.80	0.93071	0.00058	6.60	0.92924	0.00057
7.25	0.93921	0.00062	6.85	0.93806	0.00057	6.65	0.93642	0.00054
7.30	0.94555	0.00061	6.90	0.94536	0.00059	6.70	0.94289	0.00055
7.35	0.95108	0.00061	6.95	0.95102	0.00055	6.75	0.95006	0.00056
7.40	0.95737	0.00061	7.00	0.95891	0.00059	6.80	0.95712	0.00056
7.45	0.96275	0.00065	7.05	0.96437	0.00058	6.85	0.96450	0.00054
7.50	0.97031	0.00064	7.10	0.97101	0.00059	6.90	0.97030	0.00056
7.55	0.97563	0.00058	7.15	0.97682	0.00059	6.95	0.97655	0.00056
7.60	0.98197	0.00064	7.20	0.98425	0.00058	7.00	0.98381	0.00060
7.65	0.98789	0.00062	7.25	0.99057	0.00059	7.05	0.98926	0.00061
7.70	0.99437	0.00061	7.30	0.99699	0.00059	7.10	0.99627	0.00058
7.75	1.00064	0.00065	7.35	1.00266	0.00062	7.15	1.00356	0.00059
7.80	1.00680	0.00064	7.40	1.00911	0.00061	7.20	1.00774	0.00061
7.85	1.01268	0.00063	7.45	1.01576	0.00060	7.25	1.01714	0.00057
7.90	1.01922	0.00063	7.50	1.02328	0.00061	7.30	1.02494	0.00059
7.95	1.02419	0.00067						
8.00	1.03031	0.00062						

Table B.1.1.1.1-2. - K_{eff} Values for 100% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

8000 milli-g/cc			9000 milli-g/cc			10000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.30	0.91129	0.00053	6.00	0.91675	0.00053	5.70	0.91648	0.00049
6.35	0.91822	0.00053	6.05	0.92307	0.00051	5.75	0.92501	0.00049
6.40	0.92552	0.00052	6.10	0.93090	0.00050	5.80	0.93228	0.00050
6.45	0.93282	0.00053	6.15	0.93789	0.00053	5.85	0.94096	0.00048
6.50	0.93994	0.00055	6.20	0.94538	0.00052	5.90	0.94808	0.00048
6.55	0.94737	0.00055	6.25	0.95262	0.00052	5.95	0.95621	0.00050
6.60	0.95345	0.00058	6.30	0.95951	0.00052	6.00	0.96256	0.00049
6.65	0.96171	0.00056	6.35	0.96804	0.00055	6.05	0.97068	0.00050
6.70	0.96694	0.00055	6.40	0.97517	0.00055	6.10	0.97727	0.00050
6.75	0.97520	0.00055	6.45	0.98186	0.00053	6.15	0.98606	0.00049
6.80	0.98114	0.00054	6.50	0.98895	0.00055	6.20	0.99525	0.00051
6.85	0.98814	0.00055	6.55	0.99669	0.00051	6.25	1.00043	0.00052
6.90	0.99562	0.00055	6.60	1.00248	0.00056	6.30	1.00672	0.00052
6.95	1.00248	0.00058	6.65	1.01067	0.00052	6.35	1.01562	0.00053
7.00	1.00982	0.00057	6.70	1.01759	0.00056	6.40	1.02227	0.00052
7.05	1.01641	0.00059	6.75	1.02413	0.00055			
7.10	1.02287	0.00056	6.80	1.03143	0.00057			

Table B.1.1.1.1-2. - K_{eff} Values for 100% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

15000 milli-g/cc			19600 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.40	0.91217	0.00039	3.50	0.90061	0.00037			
4.45	0.92122	0.00040	3.55	0.91318	0.00039			
4.50	0.93077	0.00041	3.60	0.92421	0.00039			
4.55	0.93980	0.00040	3.65	0.93597	0.00038			
4.60	0.94977	0.00043	3.70	0.94730	0.00040			
4.65	0.95886	0.00041	3.75	0.95809	0.00040			
4.70	0.96841	0.00041	3.80	0.96937	0.00039			
4.75	0.97702	0.00042	3.85	0.97957	0.00040			
4.80	0.98744	0.00041	3.90	0.99034	0.00040			
4.85	0.99615	0.00044	3.95	1.00201	0.00041			
4.90	1.00458	0.00045	4.00	1.01147	0.00042			
4.95	1.01298	0.00044	4.05	1.02394	0.00042			
5.00	1.02278	0.00044	4.10	1.03394	0.00043			

B.1.1.1.2. 1” Water Reflector

Case ID: pu-sp-1000-01

Material: Plutonium metal in water

Geometry: Sphere

Isotopics: 100% ^{239}Pu

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.1.1.1.2-1. 100% ^{239}Pu Sphere - 1 Inch of Water Reflection

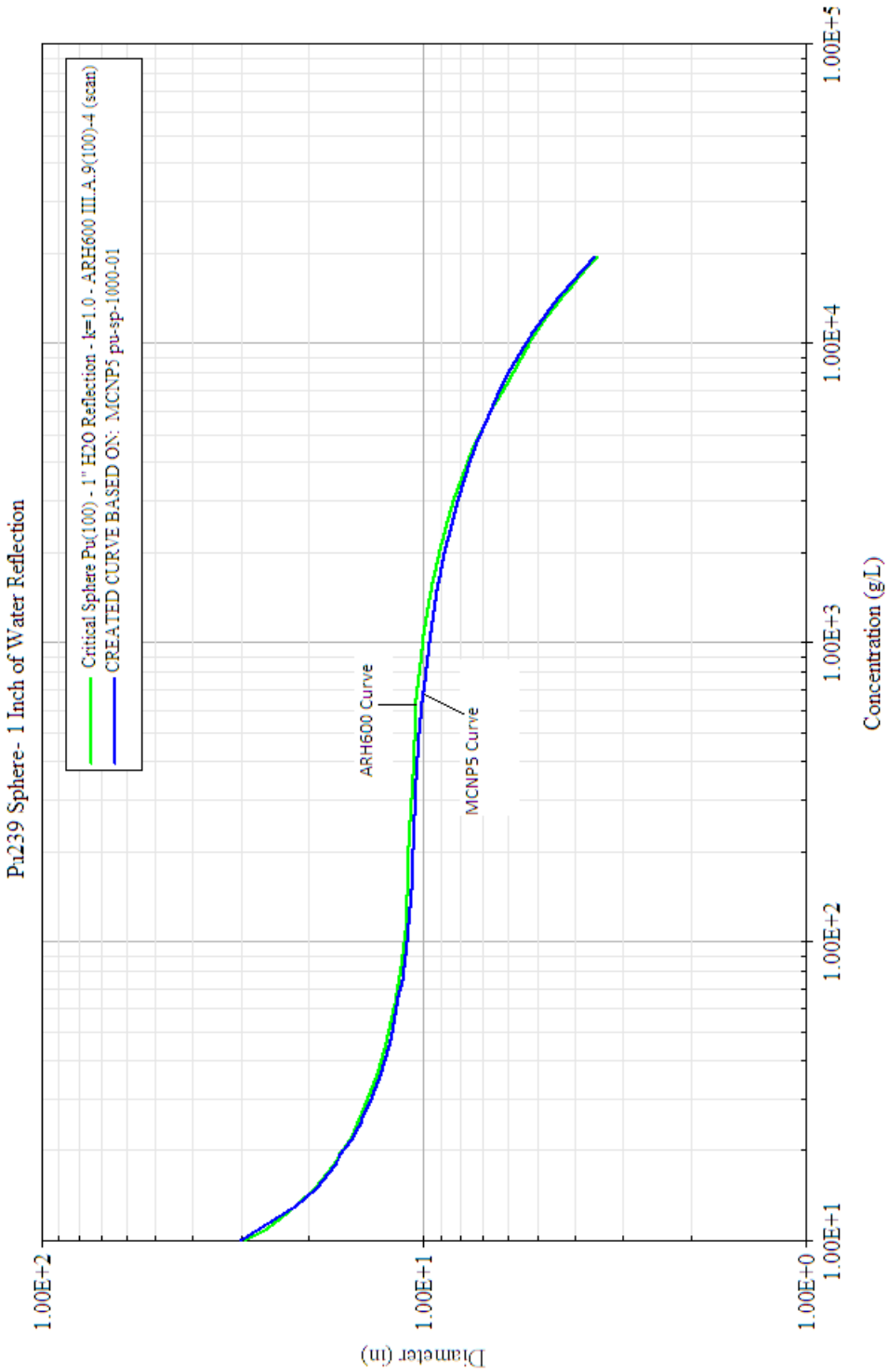

Table B.1.1.1.2-1. Critical Dimensions for 100% ^{239}Pu Sphere - 1 Inch of Water Reflection

100% ^{239}Pu Sphere - 1 Inch of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	23.500	31.700	0.400	30.1857
0.013	18.300	22.500	0.200	21.7038
0.015	16.500	19.900	0.100	19.1977
0.018	14.800	17.600	0.100	17.0310
0.020	14.100	16.600	0.100	16.1139
0.022	13.600	15.800	0.100	15.3758
0.024	13.100	15.300	0.100	14.8176
0.025	12.900	15.000	0.100	14.5766
0.026	12.700	14.800	0.100	14.3673
0.028	12.400	14.400	0.100	13.9673
0.030	12.200	14.100	0.100	13.6825
0.032	12.000	13.800	0.100	13.4038
0.036	11.600	13.300	0.050	12.9633
0.040	11.300	13.000	0.050	12.6340
0.045	11.100	12.700	0.050	12.3159
0.050	10.800	12.400	0.050	12.0610
0.075	10.200	11.700	0.050	11.3673
0.100	10.000	11.400	0.050	11.0667
0.150	9.700	11.100	0.050	10.7823
0.200	9.600	11.000	0.050	10.6554
0.350	9.400	10.700	0.050	10.4130
0.500	9.200	10.500	0.050	10.2309
0.750	9.000	10.200	0.050	9.9436
1.000	8.700	10.000	0.050	9.6866
1.500	8.300	9.500	0.050	9.2192
2.000	7.900	9.100	0.050	8.8124
2.500	7.600	8.700	0.050	8.4421
3.000	7.300	8.400	0.050	8.1412
4.000	6.800	7.800	0.050	7.5790
5.000	6.400	7.300	0.050	7.1188
6.000	6.100	6.900	0.050	6.7051
7.000	5.700	6.500	0.050	6.3354
7.500	5.600	6.400	0.050	6.1688
8.000	5.400	6.200	0.050	5.9999
9.000	5.100	5.900	0.050	5.6995
10.000	4.900	5.600	0.050	5.4304
15.000	3.900	4.500	0.050	4.2972
19.600	3.200	3.700	0.020	3.5440

MCNP5 Sample Input File
100% ^{239}Pu Sphere- 1” Reflection

```
s-, 100.0 wt% 239Pu, 00100 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1065  hundreths of inches - must be integer
c radius =    13.5255 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00100 milli-g Pu/cc
c Reflector width =  1.0 inches
c Enrichment = 1.00 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0051 cc
c Volume of water in sample 0.9949 cc
c
c Mass of crit in sample   0.1000 g
c Mass of water in sample  0.9949 g
c
c Total mass of sample  1.0949g for a 1cc sample
c Mass Density for crit material  -1.0949, expressed as negative
c
c  sphere
20 11   -1.094898   -1        imp:n=1
21  2  -1.000    -2 1        imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0

1       so    13.5255              $ Sphere
2       so    16.0655        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
```

```
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu/water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 00100 milli-g Pu/cc,  1.0949
1001.66c -0.101675
8016.66c -0.806993
94239.66c -0.091333
c    94240.66c -0.000000
mt11     lwtr.60t
c
c    pu only
m12    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 00100 milli-g Pu/cc,  1.0949
94239.66c -1.000000
c    94240.66c -0.000000
c
```

Critview Compatible Data File
100% ^{239}Pu Sphere- 1" Reflection

reset:
title: MCNP5 pu-sp-1000-01
set: MCNP5 set
source: MCNP5 primary
created: Fri 07/16/2010 11:41:35.68
geometry: sphere
modmat: H2O
critmat: plutonium
isomat: Pu239 1.0
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	30.1857
0.013	21.7038
0.015	19.1977
0.018	17.0310
0.020	16.1139
0.022	15.3758
0.024	14.8176
0.025	14.5766
0.026	14.3673
0.028	13.9673
0.030	13.6825
0.032	13.4038
0.036	12.9633
0.040	12.6340
0.045	12.3159
0.050	12.0610
0.075	11.3673
0.100	11.0667
0.150	10.7823
0.200	10.6554
0.350	10.4130
0.500	10.2309
0.750	9.9436
1.000	9.6866
1.500	9.2192
2.000	8.8124
2.500	8.4421
3.000	8.1412
4.000	7.5790
5.000	7.1188
6.000	6.7051
7.000	6.3354
7.500	6.1688
8.000	5.9999
9.000	5.6995
10.00	5.4304
15.00	4.2972
19.60	3.5440

Table B.1.1.1.2-2. K_{eff} Values for 100% ^{239}Pu Sphere - 1 inch of Water Reflection

10 milli-g/cc			13 milli-g/cc			15 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
23.50	0.92489	0.00039	18.30	0.92527	0.00046	16.50	0.92291	0.00047
23.90	0.93101	0.00039	18.50	0.92998	0.00046	16.60	0.92718	0.00048
24.30	0.93554	0.00038	18.70	0.93532	0.00046	16.70	0.93023	0.00049
24.70	0.94210	0.00038	18.90	0.94055	0.00044	16.80	0.93306	0.00050
25.10	0.94613	0.00037	19.10	0.94575	0.00047	16.90	0.93611	0.00049
25.50	0.95290	0.00037	19.30	0.94992	0.00046	17.00	0.93903	0.00049
25.90	0.95657	0.00036	19.50	0.95466	0.00045	17.10	0.94218	0.00051
26.30	0.96218	0.00037	19.70	0.96014	0.00044	17.20	0.94565	0.00049
26.70	0.96669	0.00036	19.90	0.96360	0.00046	17.30	0.94828	0.00048
27.10	0.97086	0.00037	20.10	0.96854	0.00045	17.40	0.95120	0.00049
27.50	0.97514	0.00035	20.30	0.97178	0.00045	17.50	0.95336	0.00050
27.90	0.97909	0.00035	20.50	0.97684	0.00045	17.60	0.95579	0.00048
28.30	0.98279	0.00036	20.70	0.98066	0.00045	17.70	0.96056	0.00047
28.70	0.98606	0.00036	20.90	0.98474	0.00042	17.80	0.96256	0.00047
29.10	0.99076	0.00034	21.10	0.98955	0.00046	17.90	0.96516	0.00048
29.50	0.99472	0.00034	21.30	0.99283	0.00044	18.00	0.96945	0.00047
29.90	0.99820	0.00035	21.50	0.99691	0.00044	18.10	0.96956	0.00048
30.30	1.00072	0.00036	21.70	0.99993	0.00042	18.20	0.97270	0.00050
30.70	1.00445	0.00035	21.90	1.00365	0.00043	18.30	0.97642	0.00048
31.10	1.00771	0.00035	22.10	1.00793	0.00043	18.40	0.97869	0.00049
31.50	1.01166	0.00033	22.30	1.01197	0.00043	18.50	0.98204	0.00049
31.70	1.01254	0.00034	22.50	1.01552	0.00044	18.60	0.98436	0.00048
						18.70	0.98789	0.00048
						18.80	0.98894	0.00047
						18.90	0.99210	0.00047
						19.00	0.99487	0.00048
						19.10	0.99791	0.00048
						19.20	1.00005	0.00047
						19.30	1.00122	0.00048
						19.40	1.00477	0.00048
						19.50	1.00655	0.00046
						19.60	1.00892	0.00047
						19.70	1.01192	0.00047
						19.80	1.01276	0.00048
						19.90	1.01535	0.00049

Table B.1.1.1.2-2. K_{eff} Values for 100% ^{239}Pu Sphere - 1 inch of Water Reflection (cont)

18 milli-g/cc			20 milli-g/cc			22 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
14.80	0.92045	0.00054	14.10	0.91990	0.00056	13.60	0.92334	0.00057
14.90	0.92341	0.00056	14.20	0.92409	0.00056	13.70	0.92719	0.00060
15.00	0.92845	0.00054	14.30	0.92924	0.00056	13.80	0.93318	0.00057
15.10	0.93178	0.00055	14.40	0.93401	0.00053	13.90	0.93797	0.00058
15.20	0.93483	0.00052	14.50	0.93763	0.00053	14.00	0.94235	0.00057
15.30	0.93840	0.00051	14.60	0.94203	0.00056	14.10	0.94610	0.00056
15.40	0.94225	0.00052	14.70	0.94652	0.00055	14.20	0.95143	0.00056
15.50	0.94758	0.00052	14.80	0.95028	0.00055	14.30	0.95549	0.00057
15.60	0.95027	0.00051	14.90	0.95368	0.00054	14.40	0.95958	0.00057
15.70	0.95449	0.00053	15.00	0.95901	0.00053	14.50	0.96377	0.00056
15.80	0.95799	0.00052	15.10	0.96165	0.00057	14.60	0.96779	0.00057
15.90	0.96117	0.00053	15.20	0.96709	0.00054	14.70	0.97251	0.00056
16.00	0.96583	0.00051	15.30	0.97040	0.00056	14.80	0.97619	0.00057
16.10	0.96959	0.00053	15.40	0.97405	0.00054	14.90	0.97994	0.00057
16.20	0.97190	0.00055	15.50	0.97888	0.00054	15.00	0.98589	0.00056
16.30	0.97518	0.00053	15.60	0.98175	0.00052	15.10	0.98903	0.00057
16.40	0.97907	0.00053	15.70	0.98576	0.00054	15.20	0.99283	0.00056
16.50	0.98230	0.00054	15.80	0.99034	0.00053	15.30	0.99728	0.00055
16.60	0.98448	0.00050	15.90	0.99186	0.00054	15.40	1.00087	0.00056
16.70	0.98925	0.00051	16.00	0.99653	0.00057	15.50	1.00485	0.00054
16.80	0.99311	0.00050	16.10	0.99931	0.00054	15.60	1.00925	0.00057
16.90	0.99578	0.00051	16.20	1.00426	0.00055	15.70	1.01174	0.00054
17.00	0.99896	0.00054	16.30	1.00629	0.00056	15.80	1.01572	0.00057
17.10	1.00231	0.00051	16.40	1.01055	0.00054			
17.20	1.00606	0.00053	16.50	1.01399	0.00054			
17.30	1.00789	0.00051	16.60	1.01723	0.00053			
17.40	1.01071	0.00054						
17.50	1.01532	0.00053						
17.60	1.01809	0.00050						

Table B.1.1.1.2-2. K_{eff} Values for 100% ^{239}Pu Sphere - 1 inch of Water Reflection (cont)

24 milli-g/cc			25 milli-g/cc			26 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
13.10	0.92108	0.00059	12.90	0.91923	0.00060	12.70	0.91825	0.00057
13.20	0.92636	0.00060	13.00	0.92463	0.00061	12.80	0.92334	0.00060
13.30	0.93057	0.00058	13.10	0.93008	0.00059	12.90	0.92980	0.00057
13.40	0.93491	0.00058	13.20	0.93567	0.00059	13.00	0.93343	0.00059
13.50	0.94088	0.00059	13.30	0.94027	0.00057	13.10	0.93871	0.00058
13.60	0.94537	0.00057	13.40	0.94539	0.00058	13.20	0.94460	0.00062
13.70	0.94942	0.00059	13.50	0.94967	0.00057	13.30	0.95039	0.00059
13.80	0.95353	0.00055	13.60	0.95421	0.00058	13.40	0.95447	0.00059
13.90	0.95941	0.00058	13.70	0.96042	0.00059	13.50	0.95889	0.00059
14.00	0.96332	0.00057	13.80	0.96456	0.00057	13.60	0.96484	0.00060
14.10	0.96813	0.00059	13.90	0.96870	0.00057	13.70	0.96905	0.00060
14.20	0.97200	0.00060	14.00	0.97428	0.00059	13.80	0.97431	0.00057
14.30	0.97852	0.00058	14.10	0.97872	0.00060	13.90	0.97915	0.00059
14.40	0.98192	0.00059	14.20	0.98393	0.00056	14.00	0.98326	0.00060
14.50	0.98723	0.00059	14.30	0.98875	0.00057	14.10	0.98897	0.00062
14.60	0.99029	0.00059	14.40	0.99361	0.00057	14.20	0.99217	0.00059
14.70	0.99478	0.00056	14.50	0.99680	0.00056	14.30	0.99753	0.00057
14.80	0.99891	0.00057	14.60	1.00098	0.00058	14.40	1.00120	0.00058
14.90	1.00512	0.00059	14.70	1.00585	0.00058	14.50	1.00658	0.00058
15.00	1.00766	0.00057	14.80	1.00912	0.00058	14.60	1.01049	0.00057
15.10	1.01080	0.00057	14.90	1.01351	0.00059	14.70	1.01573	0.00058
15.20	1.01638	0.00056	15.00	1.01741	0.00056	14.80	1.01992	0.00061
15.30	1.02029	0.00058						

Table B.1.1.1.2-2. K_{eff} Values for 100% ^{239}Pu Sphere - 1 inch of Water Reflection (cont)

28 milli-g/cc			30 milli-g/cc			32 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.40	0.91755	0.00061	12.20	0.92124	0.00058	12.00	0.92199	0.00063
12.50	0.92348	0.00061	12.30	0.92754	0.00063	12.10	0.92875	0.00063
12.60	0.92908	0.00062	12.40	0.93225	0.00060	12.20	0.93420	0.00062
12.70	0.93448	0.00062	12.50	0.93890	0.00060	12.30	0.94013	0.00062
12.80	0.93848	0.00062	12.60	0.94289	0.00060	12.40	0.94624	0.00062
12.90	0.94499	0.00062	12.70	0.95055	0.00059	12.50	0.95131	0.00062
13.00	0.95163	0.00060	12.80	0.95565	0.00059	12.60	0.95582	0.00061
13.10	0.95596	0.00058	12.90	0.96022	0.00060	12.70	0.96229	0.00062
13.20	0.96189	0.00060	13.00	0.96638	0.00062	12.80	0.96840	0.00062
13.30	0.96636	0.00059	13.10	0.97099	0.00063	12.90	0.97433	0.00061
13.40	0.97074	0.00057	13.20	0.97497	0.00060	13.00	0.97824	0.00063
13.50	0.97591	0.00060	13.30	0.98182	0.00064	13.10	0.98357	0.00062
13.60	0.98200	0.00061	13.40	0.98667	0.00062	13.20	0.98885	0.00063
13.70	0.98698	0.00060	13.50	0.99240	0.00063	13.30	0.99421	0.00061
13.80	0.99110	0.00061	13.60	0.99609	0.00060	13.40	0.99975	0.00063
13.90	0.99611	0.00060	13.70	1.00083	0.00060	13.50	1.00631	0.00063
14.00	1.00189	0.00060	13.80	1.00654	0.00059	13.60	1.01100	0.00064
14.10	1.00580	0.00058	13.90	1.01158	0.00060	13.70	1.01557	0.00061
14.20	1.01037	0.00059	14.00	1.01648	0.00059	13.80	1.02002	0.00062
14.30	1.01553	0.00059	14.10	1.02094	0.00060			

Table B.1.1.1.2-2. K_{eff} Values for 100% ^{239}Pu Sphere - 1 inch of Water Reflection (cont)

36 milli-g/cc			40 milli-g/cc			45 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.60	0.92061	0.00066	11.30	0.91885	0.00066	11.10	0.92317	0.00066
11.65	0.92185	0.00061	11.35	0.92094	0.00064	11.15	0.92542	0.00066
11.70	0.92659	0.00066	11.40	0.92377	0.00063	11.20	0.92868	0.00064
11.75	0.92922	0.00062	11.45	0.92672	0.00064	11.25	0.93199	0.00067
11.80	0.93240	0.00062	11.50	0.93178	0.00067	11.30	0.93566	0.00063
11.85	0.93583	0.00062	11.55	0.93399	0.00066	11.35	0.93843	0.00064
11.90	0.93948	0.00060	11.60	0.93823	0.00068	11.40	0.94329	0.00063
11.95	0.94085	0.00064	11.65	0.94014	0.00064	11.45	0.94629	0.00067
12.00	0.94410	0.00063	11.70	0.94371	0.00065	11.50	0.94860	0.00064
12.05	0.94701	0.00064	11.75	0.94659	0.00064	11.55	0.95418	0.00066
12.10	0.95023	0.00065	11.80	0.95069	0.00064	11.60	0.95646	0.00067
12.15	0.95355	0.00065	11.85	0.95426	0.00063	11.65	0.95964	0.00068
12.20	0.95703	0.00064	11.90	0.95587	0.00065	11.70	0.96232	0.00065
12.25	0.95970	0.00067	11.95	0.95989	0.00064	11.75	0.96693	0.00065
12.30	0.96167	0.00066	12.00	0.96289	0.00066	11.80	0.96827	0.00065
12.35	0.96546	0.00065	12.05	0.96576	0.00064	11.85	0.97189	0.00064
12.40	0.96770	0.00063	12.10	0.96892	0.00064	11.90	0.97458	0.00063
12.45	0.97078	0.00064	12.15	0.97193	0.00065	11.95	0.97642	0.00066
12.50	0.97435	0.00063	12.20	0.97584	0.00064	12.00	0.98070	0.00064
12.55	0.97658	0.00062	12.25	0.97667	0.00065	12.05	0.98417	0.00068
12.60	0.97995	0.00063	12.30	0.98050	0.00067	12.10	0.98809	0.00066
12.65	0.98303	0.00062	12.35	0.98441	0.00066	12.15	0.98943	0.00065
12.70	0.98548	0.00064	12.40	0.98596	0.00064	12.20	0.99232	0.00064
12.75	0.98883	0.00064	12.45	0.98941	0.00065	12.25	0.99639	0.00069
12.80	0.99017	0.00063	12.50	0.99247	0.00065	12.30	0.99924	0.00068
12.85	0.99379	0.00062	12.55	0.99562	0.00062	12.35	1.00163	0.00067
12.90	0.99683	0.00063	12.60	0.99791	0.00063	12.40	1.00634	0.00067
12.95	0.99910	0.00064	12.65	1.00098	0.00064	12.45	1.00806	0.00064
13.00	1.00249	0.00062	12.70	1.00415	0.00062	12.50	1.01093	0.00061
13.05	1.00565	0.00063	12.75	1.00587	0.00063	12.55	1.01464	0.00065
13.10	1.00840	0.00065	12.80	1.01007	0.00066	12.60	1.01825	0.00068
13.15	1.01052	0.00062	12.85	1.01159	0.00064	12.65	1.01896	0.00065
13.20	1.01429	0.00061	12.90	1.01546	0.00064	12.70	1.02320	0.00064
13.25	1.01565	0.00064	12.95	1.01946	0.00064			
13.30	1.01852	0.00062	13.00	1.02136	0.00066			

Table B.1.1.1.2-2. K_{eff} Values for 100% ^{239}Pu Sphere - 1 inch of Water Reflection (cont)

50 milli-g/cc			75 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.80	0.91475	0.00064	10.20	0.91550	0.00071	10.00	0.91965	0.00072
10.85	0.91963	0.00066	10.25	0.91760	0.00068	10.05	0.92345	0.00072
10.90	0.92262	0.00066	10.30	0.92325	0.00069	10.10	0.92938	0.00068
10.95	0.92675	0.00069	10.35	0.92664	0.00070	10.15	0.93087	0.00068
11.00	0.93046	0.00068	10.40	0.93108	0.00070	10.20	0.93615	0.00072
11.05	0.93361	0.00067	10.45	0.93464	0.00064	10.25	0.94070	0.00070
11.10	0.93674	0.00067	10.50	0.94010	0.00070	10.30	0.94414	0.00070
11.15	0.94031	0.00067	10.55	0.94243	0.00070	10.35	0.94778	0.00071
11.20	0.94356	0.00068	10.60	0.94543	0.00069	10.40	0.95185	0.00069
11.25	0.94707	0.00067	10.65	0.94883	0.00072	10.45	0.95686	0.00069
11.30	0.94919	0.00068	10.70	0.95178	0.00069	10.50	0.96007	0.00069
11.35	0.95362	0.00067	10.75	0.95609	0.00069	10.55	0.96208	0.00069
11.40	0.95731	0.00066	10.80	0.96060	0.00069	10.60	0.96533	0.00071
11.45	0.96077	0.00062	10.85	0.96256	0.00068	10.65	0.96954	0.00068
11.50	0.96471	0.00065	10.90	0.96717	0.00069	10.70	0.97354	0.00069
11.55	0.96627	0.00068	10.95	0.97030	0.00068	10.75	0.97738	0.00068
11.60	0.96929	0.00066	11.00	0.97406	0.00071	10.80	0.98055	0.00071
11.65	0.97307	0.00068	11.05	0.97861	0.00070	10.85	0.98443	0.00071
11.70	0.97641	0.00068	11.10	0.97842	0.00067	10.90	0.98771	0.00070
11.75	0.97981	0.00065	11.15	0.98372	0.00069	10.95	0.99219	0.00070
11.80	0.98334	0.00065	11.20	0.98869	0.00068	11.00	0.99445	0.00071
11.85	0.98834	0.00069	11.25	0.99208	0.00065	11.05	0.99904	0.00067
11.90	0.99140	0.00068	11.30	0.99415	0.00069	11.10	1.00192	0.00070
11.95	0.99298	0.00066	11.35	0.99894	0.00069	11.15	1.00654	0.00073
12.00	0.99601	0.00064	11.40	1.00200	0.00069	11.20	1.00929	0.00069
12.05	0.99931	0.00067	11.45	1.00466	0.00071	11.25	1.01270	0.00071
12.10	1.00246	0.00066	11.50	1.00735	0.00069	11.30	1.01621	0.00068
12.15	1.00557	0.00067	11.55	1.01209	0.00069	11.35	1.01916	0.00069
12.20	1.00963	0.00066	11.60	1.01491	0.00071	11.40	1.02211	0.00071
12.25	1.01230	0.00067	11.65	1.01771	0.00068			
12.30	1.01450	0.00066	11.70	1.02172	0.00068			
12.35	1.01735	0.00067						
12.40	1.02185	0.00067						

Table B.1.1.1.2-2. K_{eff} Values for 100% ^{239}Pu Sphere - 1 inch of Water Reflection (cont)

150 milli-g/cc			200 milli-g/cc			350 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.70	0.91684	0.00071	9.60	0.91717	0.00072	9.40	0.92044	0.00068
9.75	0.92030	0.00070	9.65	0.92294	0.00070	9.45	0.92358	0.00068
9.80	0.92511	0.00070	9.70	0.92736	0.00071	9.50	0.92844	0.00069
9.85	0.92873	0.00071	9.75	0.93125	0.00070	9.55	0.93170	0.00067
9.90	0.93246	0.00069	9.80	0.93503	0.00072	9.60	0.93685	0.00069
9.95	0.93732	0.00071	9.85	0.93892	0.00068	9.65	0.94223	0.00069
10.00	0.94074	0.00071	9.90	0.94244	0.00072	9.70	0.94569	0.00071
10.05	0.94434	0.00073	9.95	0.94689	0.00071	9.75	0.94889	0.00071
10.10	0.94802	0.00071	10.00	0.95116	0.00073	9.80	0.95175	0.00071
10.15	0.95237	0.00070	10.05	0.95475	0.00072	9.85	0.95525	0.00070
10.20	0.95595	0.00072	10.10	0.95800	0.00072	9.90	0.96123	0.00069
10.25	0.95868	0.00070	10.15	0.96280	0.00069	9.95	0.96409	0.00068
10.30	0.96449	0.00072	10.20	0.96497	0.00072	10.00	0.96818	0.00073
10.35	0.96875	0.00071	10.25	0.96896	0.00068	10.05	0.97183	0.00068
10.40	0.97129	0.00073	10.30	0.97446	0.00070	10.10	0.97681	0.00070
10.45	0.97445	0.00069	10.35	0.97736	0.00071	10.15	0.98071	0.00071
10.50	0.97903	0.00074	10.40	0.98168	0.00070	10.20	0.98280	0.00073
10.55	0.98300	0.00072	10.45	0.98393	0.00074	10.25	0.98791	0.00068
10.60	0.98598	0.00073	10.50	0.98825	0.00072	10.30	0.99136	0.00070
10.65	0.99151	0.00072	10.55	0.99274	0.00071	10.35	0.99532	0.00071
10.70	0.99458	0.00073	10.60	0.99679	0.00070	10.40	0.99925	0.00068
10.75	0.99777	0.00071	10.65	0.99943	0.00074	10.45	1.00213	0.00071
10.80	1.00122	0.00070	10.70	1.00474	0.00072	10.50	1.00619	0.00071
10.85	1.00595	0.00071	10.75	1.00675	0.00070	10.55	1.00889	0.00070
10.90	1.00679	0.00069	10.80	1.01105	0.00068	10.60	1.01289	0.00071
10.95	1.01056	0.00073	10.85	1.01321	0.00071	10.65	1.01652	0.00072
11.00	1.01539	0.00069	10.90	1.01725	0.00072	10.70	1.02077	0.00071
11.05	1.01766	0.00071	10.95	1.02131	0.00069			
11.10	1.02179	0.00069	11.00	1.02423	0.00072			

Table B.1.1.1.2-2. K_{eff} Values for 100% ^{239}Pu Sphere - 1 inch of Water Reflection (cont)

500 milli-g/cc			750 milli-g/cc			1000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.20	0.91735	0.00069	9.00	0.92254	0.00073	8.70	0.91623	0.00071
9.25	0.92294	0.00069	9.05	0.92620	0.00068	8.75	0.92149	0.00071
9.30	0.92563	0.00071	9.10	0.93073	0.00070	8.80	0.92603	0.00066
9.35	0.92977	0.00072	9.15	0.93306	0.00071	8.85	0.92958	0.00071
9.40	0.93387	0.00068	9.20	0.93977	0.00069	8.90	0.93499	0.00074
9.45	0.93817	0.00072	9.25	0.94319	0.00072	8.95	0.93888	0.00071
9.50	0.94056	0.00068	9.30	0.94757	0.00068	9.00	0.94260	0.00071
9.55	0.94602	0.00069	9.35	0.95213	0.00074	9.05	0.94680	0.00070
9.60	0.95042	0.00070	9.40	0.95697	0.00072	9.10	0.95122	0.00069
9.65	0.95540	0.00071	9.45	0.95952	0.00073	9.15	0.95596	0.00068
9.70	0.95835	0.00073	9.50	0.96324	0.00072	9.20	0.96069	0.00070
9.75	0.96422	0.00069	9.55	0.96840	0.00073	9.25	0.96366	0.00072
9.80	0.96633	0.00073	9.60	0.97100	0.00069	9.30	0.96896	0.00072
9.85	0.97220	0.00073	9.65	0.97513	0.00072	9.35	0.97226	0.00070
9.90	0.97420	0.00074	9.70	0.98088	0.00072	9.40	0.97659	0.00071
9.95	0.97691	0.00072	9.75	0.98401	0.00071	9.45	0.98140	0.00070
10.00	0.98130	0.00069	9.80	0.98862	0.00070	9.50	0.98439	0.00072
10.05	0.98685	0.00073	9.85	0.99267	0.00070	9.55	0.98754	0.00073
10.10	0.98915	0.00070	9.90	0.99569	0.00070	9.60	0.99241	0.00071
10.15	0.99369	0.00070	9.95	1.00063	0.00074	9.65	0.99667	0.00072
10.20	0.99771	0.00071	10.00	1.00415	0.00069	9.70	1.00122	0.00071
10.25	1.00142	0.00070	10.05	1.00776	0.00069	9.75	1.00614	0.00072
10.30	1.00529	0.00072	10.10	1.01199	0.00072	9.80	1.00885	0.00071
10.35	1.00832	0.00067	10.15	1.01642	0.00070	9.85	1.01464	0.00070
10.40	1.01291	0.00069	10.20	1.01937	0.00070	9.90	1.01674	0.00071
10.45	1.01547	0.00071				9.95	1.02118	0.00069
10.50	1.02040	0.00071				10.00	1.02405	0.00070

Table B.1.1.1.2-2. K_{eff} Values for 100% ^{239}Pu Sphere - 1 inch of Water Reflection (cont)

1500 milli-g/cc			2000 milli-g/cc			2500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.30	0.91804	0.00068	7.90	0.91289	0.00069	7.60	0.91439	0.00071
8.35	0.92200	0.00071	7.95	0.91754	0.00069	7.65	0.92036	0.00070
8.40	0.92684	0.00070	8.00	0.92291	0.00069	7.70	0.92506	0.00067
8.45	0.93222	0.00069	8.05	0.92817	0.00068	7.75	0.93060	0.00071
8.50	0.93587	0.00070	8.10	0.93349	0.00069	7.80	0.93471	0.00070
8.55	0.94142	0.00069	8.15	0.93722	0.00070	7.85	0.94023	0.00071
8.60	0.94511	0.00070	8.20	0.94263	0.00071	7.90	0.94561	0.00071
8.65	0.95139	0.00070	8.25	0.94734	0.00071	7.95	0.95092	0.00070
8.70	0.95473	0.00071	8.30	0.95210	0.00069	8.00	0.95638	0.00070
8.75	0.96003	0.00070	8.35	0.95709	0.00072	8.05	0.96020	0.00070
8.80	0.96388	0.00075	8.40	0.96321	0.00071	8.10	0.96496	0.00072
8.85	0.96766	0.00068	8.45	0.96737	0.00070	8.15	0.97052	0.00068
8.90	0.97281	0.00071	8.50	0.97211	0.00071	8.20	0.97559	0.00070
8.95	0.97576	0.00068	8.55	0.97491	0.00067	8.25	0.98232	0.00071
9.00	0.98069	0.00070	8.60	0.98126	0.00072	8.30	0.98510	0.00070
9.05	0.98397	0.00070	8.65	0.98685	0.00069	8.35	0.98987	0.00069
9.10	0.98898	0.00072	8.70	0.99014	0.00070	8.40	0.99579	0.00069
9.15	0.99445	0.00067	8.75	0.99581	0.00070	8.45	1.00079	0.00070
9.20	0.99837	0.00069	8.80	0.99898	0.00069	8.50	1.00416	0.00069
9.25	1.00262	0.00071	8.85	1.00310	0.00069	8.55	1.00936	0.00069
9.30	1.00779	0.00070	8.90	1.00835	0.00071	8.60	1.01521	0.00069
9.35	1.01121	0.00071	8.95	1.01179	0.00071	8.65	1.01860	0.00071
9.40	1.01568	0.00069	9.00	1.01855	0.00071	8.70	1.02340	0.00071
9.45	1.01987	0.00071	9.05	1.02062	0.00068			
9.50	1.02387	0.00072	9.10	1.02562	0.00067			

Table B.1.1.1.2-2. K_{eff} Values for 100% ^{239}Pu Sphere - 1 inch of Water Reflection (cont)

3000 milli-g/cc			4000 milli-g/cc			5000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.30	0.91303	0.00068	6.80	0.90978	0.00066	6.40	0.91169	0.00063
7.35	0.91804	0.00067	6.85	0.91752	0.00068	6.45	0.92006	0.00066
7.40	0.92346	0.00070	6.90	0.92394	0.00066	6.50	0.92499	0.00068
7.45	0.92910	0.00070	6.95	0.92881	0.00065	6.55	0.93127	0.00064
7.50	0.93357	0.00069	7.00	0.93471	0.00068	6.60	0.93892	0.00067
7.55	0.94011	0.00069	7.05	0.93947	0.00068	6.65	0.94453	0.00066
7.60	0.94552	0.00070	7.10	0.94549	0.00069	6.70	0.95020	0.00064
7.65	0.94994	0.00070	7.15	0.95164	0.00064	6.75	0.95561	0.00064
7.70	0.95522	0.00069	7.20	0.95797	0.00068	6.80	0.96219	0.00069
7.75	0.95975	0.00068	7.25	0.96473	0.00068	6.85	0.96831	0.00067
7.80	0.96610	0.00070	7.30	0.96943	0.00074	6.90	0.97476	0.00065
7.85	0.97251	0.00069	7.35	0.97456	0.00069	6.95	0.98036	0.00065
7.90	0.97661	0.00067	7.40	0.98034	0.00067	7.00	0.98641	0.00068
7.95	0.98197	0.00066	7.45	0.98624	0.00068	7.05	0.99268	0.00065
8.00	0.98633	0.00067	7.50	0.99059	0.00070	7.10	0.99829	0.00068
8.05	0.99073	0.00069	7.55	0.99668	0.00069	7.15	1.00285	0.00068
8.10	0.99738	0.00071	7.60	1.00241	0.00068	7.20	1.01033	0.00064
8.15	1.00056	0.00070	7.65	1.00873	0.00070	7.25	1.01707	0.00068
8.20	1.00706	0.00069	7.70	1.01195	0.00067	7.30	1.02148	0.00068
8.25	1.01166	0.00067	7.75	1.01721	0.00067			
8.30	1.01811	0.00070	7.80	1.02300	0.00069			
8.35	1.02113	0.00070						
8.40	1.02652	0.00069						

Table B.1.1.1.2-2. K_{eff} Values for 100% ^{239}Pu Sphere - 1 inch of Water Reflection (cont)

6000 milli-g/cc			7000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.10	0.92160	0.00065	5.70	0.91121	0.00063	5.60	0.91941	0.00064
6.15	0.92727	0.00065	5.75	0.91967	0.00061	5.65	0.92588	0.00060
6.20	0.93543	0.00063	5.80	0.92526	0.00064	5.70	0.93210	0.00064
6.25	0.94176	0.00064	5.85	0.93197	0.00062	5.75	0.94174	0.00060
6.30	0.94844	0.00064	5.90	0.93970	0.00064	5.80	0.94738	0.00062
6.35	0.95394	0.00065	5.95	0.94543	0.00062	5.85	0.95527	0.00062
6.40	0.96000	0.00064	6.00	0.95309	0.00062	5.90	0.96221	0.00063
6.45	0.96791	0.00065	6.05	0.96041	0.00063	5.95	0.96931	0.00062
6.50	0.97409	0.00063	6.10	0.96836	0.00065	6.00	0.97628	0.00063
6.55	0.97963	0.00067	6.15	0.97409	0.00065	6.05	0.98257	0.00062
6.60	0.98682	0.00066	6.20	0.98104	0.00064	6.10	0.98992	0.00062
6.65	0.99247	0.00062	6.25	0.98806	0.00064	6.15	0.99666	0.00061
6.70	0.99937	0.00064	6.30	0.99531	0.00065	6.20	1.00554	0.00065
6.75	1.00553	0.00067	6.35	1.00193	0.00065	6.25	1.00972	0.00064
6.80	1.01069	0.00067	6.40	1.00788	0.00062	6.30	1.01789	0.00063
6.85	1.01790	0.00066	6.45	1.01414	0.00064	6.35	1.02463	0.00064
6.90	1.02433	0.00067	6.50	1.02104	0.00063	6.40	1.03078	0.00063

Table B.1.1.1.2-2. K_{eff} Values for 100% ^{239}Pu Sphere - 1 inch of Water Reflection (cont)

8000 milli-g/cc			9000 milli-g/cc			10000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.40	0.91054	0.00060	5.10	0.90650	0.00059	4.90	0.91491	0.00058
5.45	0.91783	0.00059	5.15	0.91429	0.00059	4.95	0.92235	0.00057
5.50	0.92613	0.00062	5.20	0.92251	0.00058	5.00	0.93077	0.00057
5.55	0.93363	0.00060	5.25	0.92996	0.00058	5.05	0.94029	0.00062
5.60	0.94003	0.00060	5.30	0.93722	0.00057	5.10	0.94728	0.00059
5.65	0.94776	0.00061	5.35	0.94582	0.00057	5.15	0.95579	0.00058
5.70	0.95659	0.00061	5.40	0.95312	0.00062	5.20	0.96403	0.00056
5.75	0.96340	0.00061	5.45	0.96118	0.00060	5.25	0.97115	0.00058
5.80	0.97041	0.00060	5.50	0.96840	0.00059	5.30	0.97941	0.00058
5.85	0.97676	0.00065	5.55	0.97726	0.00058	5.35	0.98799	0.00056
5.90	0.98441	0.00064	5.60	0.98364	0.00063	5.40	0.99515	0.00059
5.95	0.99207	0.00062	5.65	0.99247	0.00060	5.45	1.00312	0.00060
6.00	1.00001	0.00064	5.70	1.00008	0.00059	5.50	1.00967	0.00058
6.05	1.00509	0.00065	5.75	1.00662	0.00061	5.55	1.01887	0.00060
6.10	1.01262	0.00064	5.80	1.01386	0.00061	5.60	1.02636	0.00063
6.15	1.02056	0.00063	5.85	1.02041	0.00062			
6.20	1.02605	0.00065	5.90	1.02794	0.00063			

Table B.1.1.1.2-2. K_{eff} Values for 100% ^{239}Pu Sphere - 1 inch of Water Reflection (cont)

15000 milli-g/cc			19600 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
3.90	0.92009	0.00050	3.20	0.91591	0.00045			
3.95	0.92968	0.00049	3.22	0.92081	0.00045			
4.00	0.93980	0.00049	3.24	0.92662	0.00046			
4.05	0.95047	0.00051	3.26	0.93059	0.00047			
4.10	0.96080	0.00051	3.28	0.93606	0.00046			
4.15	0.97049	0.00053	3.30	0.94114	0.00047			
4.20	0.97991	0.00052	3.32	0.94497	0.00047			
4.25	0.98964	0.00052	3.34	0.95002	0.00046			
4.30	1.00062	0.00054	3.36	0.95549	0.00046			
4.35	1.00972	0.00051	3.38	0.95986	0.00048			
4.40	1.02000	0.00054	3.40	0.96454	0.00049			
4.45	1.02906	0.00054	3.42	0.97018	0.00048			
4.50	1.03886	0.00051	3.44	0.97395	0.00047			
			3.46	0.97935	0.00046			
			3.48	0.98421	0.00048			
			3.50	0.98867	0.00048			
			3.52	0.99402	0.00049			
			3.54	0.99916	0.00050			
			3.56	1.00331	0.00048			
			3.58	1.00768	0.00047			
			3.60	1.01284	0.00047			
			3.62	1.01752	0.00050			
			3.64	1.02201	0.00047			
			3.66	1.02766	0.00050			
			3.68	1.03042	0.00049			
			3.70	1.03529	0.00048			

B.1.1.1.3. 10” Water Reflector

Case ID: pu-sp-1000-10

Material: Plutonium metal in water

Geometry: Sphere

Isotopics: 100% ^{239}Pu

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.1.1.1.3-1. 100% ^{239}Pu Sphere – 10 Inches of Water Reflection

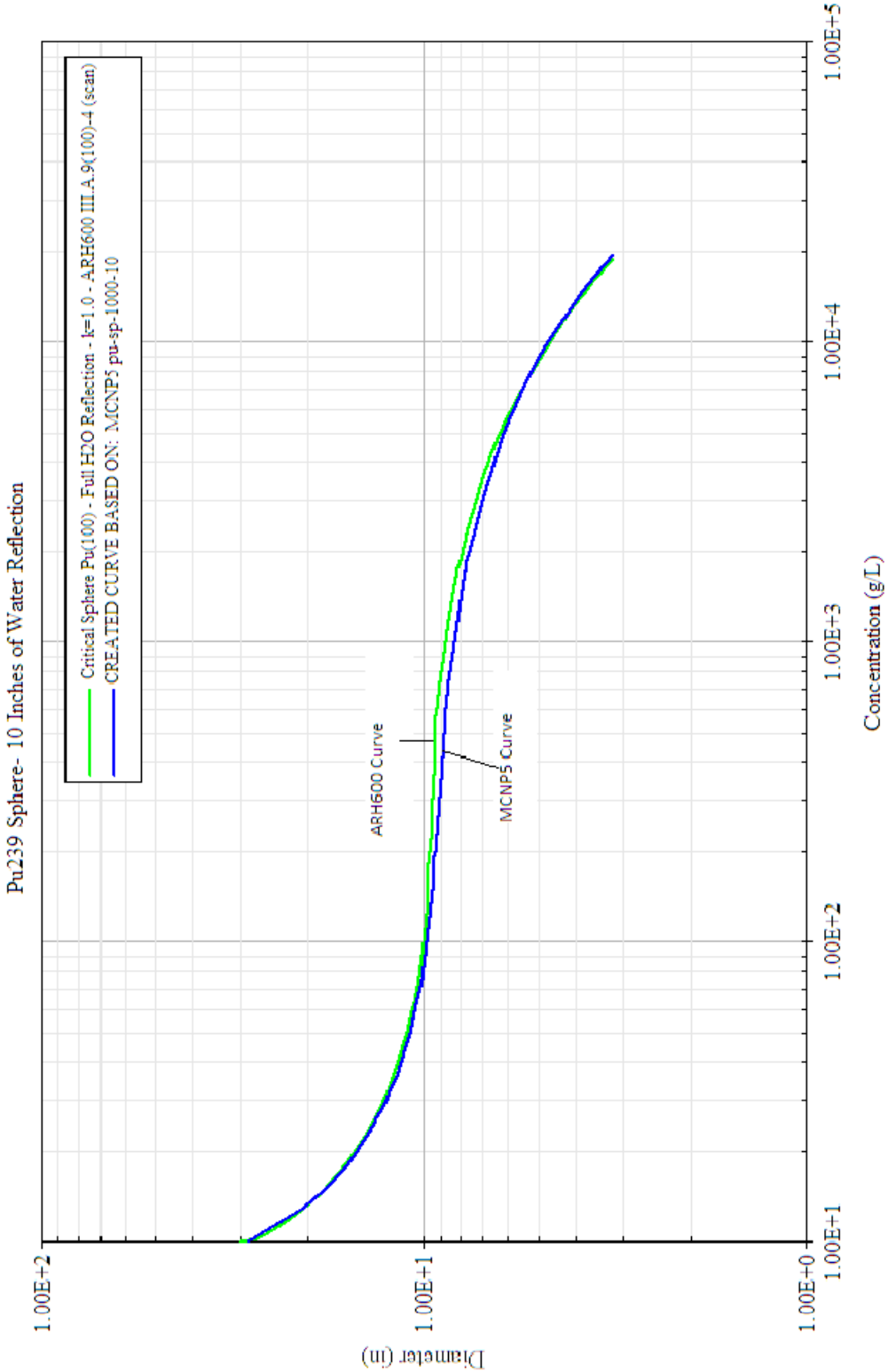

Table B.1.1.1.3-1. Critical Dimensions for 100% ^{239}Pu Sphere – 10 Inches of Water Reflection

100% ^{239}Pu Sphere – 10 Inches of Water Reflection				
Concentrations (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	21.800	30.600	0.400	28.9686
0.013	17.200	21.300	0.200	20.5602
0.015	15.100	18.800	0.100	18.0867
0.018	13.700	16.500	0.100	15.9537
0.020	12.700	15.500	0.100	14.9703
0.022	11.800	14.700	0.100	14.2918
0.024	11.500	14.200	0.100	13.7021
0.025	11.100	13.800	0.100	13.4501
0.026	11.600	13.700	0.100	13.2497
0.028	11.300	13.500	0.100	12.8347
0.030	11.100	12.900	0.100	12.5290
0.032	10.800	12.800	0.100	12.2502
0.036	10.500	12.200	0.050	11.7910
0.040	10.200	11.800	0.050	11.4612
0.045	9.900	11.500	0.050	11.1271
0.050	9.700	11.200	0.050	10.8585
0.075	9.000	10.400	0.050	10.1336
0.100	8.700	10.100	0.050	9.7907
0.150	8.400	9.700	0.050	9.4617
0.200	8.300	9.600	0.050	9.2972
0.350	8.000	9.300	0.050	9.0232
0.500	7.900	9.100	0.050	8.8332
0.750	7.600	8.800	0.050	8.5713
1.000	7.400	8.500	0.050	8.3268
1.500	7.100	8.300	0.050	7.9249
2.000	6.800	7.800	0.050	7.5719
2.500	6.500	7.500	0.050	7.2818
3.000	6.300	7.300	0.050	7.0088
4.000	5.800	6.900	0.050	6.5437
5.000	5.500	6.300	0.050	6.1547
6.000	5.200	6.000	0.050	5.8102
7.000	4.900	5.700	0.050	5.5091
7.500	4.800	5.600	0.050	5.3699
8.000	4.700	5.400	0.050	5.2322
9.000	4.500	5.200	0.050	4.9833
10.000	4.300	4.900	0.050	4.7505
15.000	3.400	4.000	0.050	3.8296
19.600	2.900	3.300	0.020	3.2102

MCNP5 Sample Input File
100% ^{239}Pu Sphere - 10” Reflection

```
s-, 100.0 wt% 239Pu, 01000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 810   hundreths of inches - must be integer
c radius =    10.2870 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 01000 milli-g Pu/cc
c Reflector width = 10.0 inches
c Enrichment = 1.00 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0510 cc
c Volume of water in sample 0.9490 cc
c
c Mass of crit in sample   1.0000 g
c Mass of water in sample  0.9490 g
c
c Total mass of sample  1.9490g for a 1cc sample
c Mass Density for crit material  -1.9490, expressed as negative
c
c  sphere
20 11   -1.948980   -1        imp:n=1
21  2  -1.000    -2 1        imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0

1       so    10.2870              $ Sphere
2       so    35.6870        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
```

```
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu/water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 01000 milli-g Pu/cc,  1.9490
1001.66c -0.054483
8016.66c -0.432428
94239.66c -0.513089
c    94240.66c -0.000000
mt11     lwtr.60t
c
c    pu only
m12    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 01000 milli-g Pu/cc,  1.9490
94239.66c -1.000000
c    94240.66c -0.000000
c
```

Critview Compatible Data File
100% ^{239}Pu Sphere- 10" Reflection

reset:
title: MCNP5 pu-sp-1000-10
set: MCNP5 set
source: MCNP5 primary
created: Mon 07/19/2010 7:55:00.52
geometry: sphere
modmat: H2O
critmat: plutonium
isomat: Pu239 1.0
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	28.9686
0.013	20.5602
0.015	18.0867
0.018	15.9537
0.020	14.9703
0.022	14.2918
0.024	13.7021
0.025	13.4501
0.026	13.2497
0.028	12.8347
0.030	12.5290
0.032	12.2502
0.036	11.7910
0.040	11.4612
0.045	11.1271
0.050	10.8585
0.075	10.1336
0.100	9.7907
0.150	9.4617
0.200	9.2972
0.350	9.0232
0.500	8.8332
0.750	8.5713
1.000	8.3268
1.500	7.9249
2.000	7.5719
2.500	7.2818
3.000	7.0088
4.000	6.5437
5.000	6.1547
6.000	5.8102
7.000	5.5091
7.500	5.3699
8.000	5.2322
9.000	4.9833
10.00	4.7505
15.00	3.8296
19.60	3.2102

Table B.1.1.1.3-2. K_{eff} Values for 100% ^{239}Pu Sphere – 10 Inches of Water Reflection

10 milli-g/cc			13 milli-g/cc			15 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
21.80	0.91554	0.00037	17.20	0.92379	0.00081	15.10	0.91195	0.00045
22.20	0.92291	0.00036	17.40	0.92941	0.00077	15.20	0.91561	0.00045
22.60	0.92790	0.00038	17.60	0.93423	0.00078	15.30	0.92002	0.00046
23.00	0.93305	0.00036	17.80	0.94073	0.00083	15.40	0.92168	0.00047
23.40	0.93914	0.00036	18.00	0.94395	0.00086	15.50	0.92433	0.00046
23.80	0.94427	0.00037	18.20	0.94917	0.00075	15.60	0.92865	0.00046
24.20	0.94942	0.00035	18.40	0.95499	0.00082	15.70	0.93185	0.00047
24.60	0.95355	0.00036	18.60	0.95913	0.00072	15.80	0.93565	0.00047
25.00	0.95887	0.00036	18.80	0.96287	0.00074	15.90	0.93917	0.00044
25.40	0.96359	0.00035	19.00	0.96845	0.00083	16.00	0.94096	0.00045
25.80	0.96812	0.00035	19.20	0.97267	0.00074	16.10	0.94435	0.00047
26.20	0.97262	0.00036	19.40	0.97763	0.00072	16.20	0.94751	0.00045
26.60	0.97707	0.00035	19.60	0.98037	0.00079	16.30	0.94939	0.00048
27.00	0.98029	0.00036	19.80	0.98449	0.00074	16.40	0.95281	0.00046
27.40	0.98509	0.00034	20.00	0.98995	0.00079	16.50	0.95576	0.00046
27.80	0.98916	0.00034	20.20	0.99414	0.00076	16.60	0.96029	0.00045
28.20	0.99282	0.00033	20.40	0.99678	0.00071	16.70	0.96207	0.00045
28.60	0.99624	0.00033	20.60	1.00080	0.00075	16.80	0.96564	0.00046
29.00	1.00032	0.00033	20.80	1.00281	0.00079	16.90	0.96768	0.00045
29.40	1.00334	0.00032	21.00	1.00998	0.00075	17.00	0.97093	0.00046
29.80	1.00678	0.00033	21.20	1.01057	0.00077	17.10	0.97405	0.00046
30.20	1.00957	0.00033	21.30	1.01301	0.00078	17.20	0.97531	0.00046
30.60	1.01174	0.00033				17.30	0.97809	0.00045
						17.40	0.98080	0.00046
						17.50	0.98387	0.00044
						17.60	0.98689	0.00047
						17.70	0.98868	0.00046
						17.80	0.99212	0.00045
						17.90	0.99493	0.00045
						18.00	0.99843	0.00046
						18.10	1.00024	0.00044
						18.20	1.00192	0.00044
						18.30	1.00420	0.00045
						18.40	1.00712	0.00046
						18.50	1.00933	0.00046
						18.60	1.01132	0.00045
						18.70	1.01383	0.00044
						18.80	1.01598	0.00044

Table B.1.1.1.3-2. K_{eff} Values for 100% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

18 milli-g/cc			20 milli-g/cc			22 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
13.70	0.91965	0.00049	12.70	0.90544	0.00052	11.80	0.88686	0.00052
13.80	0.92367	0.00049	12.80	0.90984	0.00052	11.90	0.89251	0.00053
13.90	0.92656	0.00049	12.90	0.91555	0.00052	12.00	0.89806	0.00051
14.00	0.93172	0.00051	13.00	0.91945	0.00051	12.10	0.90262	0.00054
14.10	0.93390	0.00051	13.10	0.92441	0.00052	12.20	0.90747	0.00054
14.20	0.93857	0.00048	13.20	0.92888	0.00053	12.30	0.91214	0.00052
14.30	0.94214	0.00051	13.30	0.93360	0.00051	12.40	0.91710	0.00053
14.40	0.94680	0.00049	13.40	0.93720	0.00052	12.50	0.92227	0.00054
14.50	0.94983	0.00051	13.50	0.94067	0.00051	12.60	0.92804	0.00054
14.60	0.95353	0.00049	13.60	0.94624	0.00053	12.70	0.93160	0.00053
14.70	0.95793	0.00049	13.70	0.94891	0.00051	12.80	0.93601	0.00052
14.80	0.96047	0.00050	13.80	0.95414	0.00053	12.90	0.94174	0.00052
14.90	0.96547	0.00049	13.90	0.95855	0.00050	13.00	0.94671	0.00052
15.00	0.96797	0.00049	14.00	0.96155	0.00052	13.10	0.95038	0.00052
15.10	0.97206	0.00049	14.10	0.96598	0.00052	13.20	0.95506	0.00053
15.20	0.97542	0.00051	14.20	0.97103	0.00053	13.30	0.95812	0.00054
15.30	0.97919	0.00049	14.30	0.97433	0.00053	13.40	0.96358	0.00054
15.40	0.98102	0.00048	14.40	0.97762	0.00050	13.50	0.96724	0.00054
15.50	0.98526	0.00051	14.50	0.98203	0.00051	13.60	0.97214	0.00053
15.60	0.98907	0.00051	14.60	0.98453	0.00052	13.70	0.97698	0.00053
15.70	0.99034	0.00050	14.70	0.98943	0.00050	13.80	0.98136	0.00054
15.80	0.99549	0.00047	14.80	0.99315	0.00050	13.90	0.98575	0.00051
15.90	0.99832	0.00048	14.90	0.99700	0.00050	14.00	0.98875	0.00054
16.00	1.00145	0.00048	15.00	1.00127	0.00052	14.10	0.99235	0.00054
16.10	1.00512	0.00050	15.10	1.00390	0.00052	14.20	0.99764	0.00053
16.20	1.00889	0.00047	15.20	1.00723	0.00052	14.30	1.00021	0.00055
16.30	1.01149	0.00050	15.30	1.01051	0.00050	14.40	1.00550	0.00051
16.40	1.01496	0.00046	15.40	1.01530	0.00051	14.50	1.00984	0.00054
16.50	1.01832	0.00050	15.50	1.01814	0.00050	14.60	1.01362	0.00051
						14.70	1.01593	0.00052

Table B.1.1.1.3-2. K_{eff} Values for 100% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

24 milli-g/cc			25 milli-g/cc			26 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.50	0.89352	0.00054	11.10	0.88072	0.00056	11.60	0.91888	0.00054
11.60	0.89932	0.00053	11.20	0.88541	0.00054	11.70	0.92373	0.00054
11.70	0.90404	0.00054	11.30	0.89284	0.00054	11.80	0.92940	0.00055
11.80	0.90893	0.00055	11.40	0.89778	0.00054	11.90	0.93319	0.00056
11.90	0.91500	0.00052	11.50	0.90328	0.00057	12.00	0.94025	0.00055
12.00	0.91984	0.00055	11.60	0.90954	0.00056	12.10	0.94406	0.00057
12.10	0.92455	0.00053	11.70	0.91394	0.00055	12.20	0.95044	0.00056
12.20	0.92956	0.00053	11.80	0.91977	0.00058	12.30	0.95525	0.00055
12.30	0.93492	0.00055	11.90	0.92447	0.00055	12.40	0.95917	0.00055
12.40	0.94080	0.00054	12.00	0.93023	0.00057	12.50	0.96406	0.00058
12.50	0.94505	0.00054	12.10	0.93644	0.00056	12.60	0.96941	0.00056
12.60	0.95004	0.00054	12.20	0.94073	0.00056	12.70	0.97624	0.00058
12.70	0.95505	0.00054	12.30	0.94502	0.00054	12.80	0.97852	0.00057
12.80	0.96015	0.00054	12.40	0.95147	0.00055	12.90	0.98380	0.00054
12.90	0.96437	0.00055	12.50	0.95551	0.00054	13.00	0.98892	0.00054
13.00	0.96802	0.00052	12.60	0.95981	0.00056	13.10	0.99386	0.00056
13.10	0.97338	0.00052	12.70	0.96529	0.00053	13.20	0.99787	0.00055
13.20	0.97755	0.00052	12.80	0.97013	0.00054	13.30	1.00216	0.00056
13.30	0.98131	0.00054	12.90	0.97389	0.00055	13.40	1.00705	0.00057
13.40	0.98770	0.00055	13.00	0.97970	0.00053	13.50	1.01328	0.00056
13.50	0.99172	0.00056	13.10	0.98394	0.00054	13.60	1.01679	0.00055
13.60	0.99642	0.00058	13.20	0.98818	0.00053	13.70	1.02045	0.00055
13.70	0.99989	0.00052	13.30	0.99316	0.00054			
13.80	1.00525	0.00053	13.40	0.99783	0.00054			
13.90	1.00758	0.00054	13.50	1.00216	0.00057			
14.00	1.01325	0.00054	13.60	1.00611	0.00053			
14.10	1.01734	0.00055	13.70	1.01108	0.00054			
14.20	1.02038	0.00053	13.80	1.01494	0.00055			

Table B.1.1.1.3-2. K_{eff} Values for 100% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

28 milli-g/cc			30 milli-g/cc			32 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.30	0.91801	0.00057	11.10	0.92170	0.00058	10.80	0.91646	0.00057
11.40	0.92471	0.00056	11.20	0.92843	0.00057	10.90	0.92342	0.00054
11.50	0.92968	0.00055	11.30	0.93382	0.00056	11.00	0.93009	0.00058
11.60	0.93550	0.00057	11.40	0.93964	0.00055	11.10	0.93566	0.00058
11.70	0.94119	0.00056	11.50	0.94399	0.00061	11.20	0.94117	0.00061
11.80	0.94680	0.00057	11.60	0.95138	0.00056	11.30	0.94764	0.00059
11.90	0.95205	0.00056	11.70	0.95679	0.00058	11.40	0.95354	0.00059
12.00	0.95734	0.00059	11.80	0.96191	0.00060	11.50	0.96025	0.00059
12.10	0.96289	0.00058	11.90	0.96802	0.00057	11.60	0.96447	0.00059
12.20	0.96759	0.00055	12.00	0.97237	0.00057	11.70	0.97070	0.00057
12.30	0.97406	0.00055	12.10	0.97726	0.00057	11.80	0.97637	0.00058
12.40	0.97863	0.00055	12.20	0.98172	0.00056	11.90	0.98031	0.00059
12.50	0.98319	0.00055	12.30	0.98972	0.00058	12.00	0.98694	0.00057
12.60	0.98780	0.00055	12.40	0.99331	0.00057	12.10	0.99166	0.00059
12.70	0.99368	0.00056	12.50	0.99872	0.00056	12.20	0.99711	0.00058
12.80	0.99784	0.00057	12.60	1.00314	0.00058	12.30	1.00287	0.00060
12.90	1.00406	0.00058	12.70	1.00937	0.00056	12.40	1.00719	0.00057
13.00	1.00670	0.00057	12.80	1.01507	0.00056	12.50	1.01294	0.00057
13.10	1.01145	0.00057	12.90	1.01923	0.00058	12.60	1.01756	0.00057
13.20	1.01738	0.00057				12.70	1.02255	0.00058
13.30	1.02265	0.00056				12.80	1.02666	0.00057
13.40	1.02564	0.00057						
13.50	1.03001	0.00055						

Table B.1.1.1.3-2. K_{eff} Values for 100% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

36 milli-g/cc			40 milli-g/cc			45 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.50	0.92184	0.00061	10.20	0.92005	0.00059	9.90	0.92025	0.00061
10.55	0.92560	0.00059	10.25	0.92353	0.00062	9.95	0.92198	0.00061
10.60	0.92862	0.00057	10.30	0.92670	0.00060	10.00	0.92541	0.00062
10.65	0.93163	0.00060	10.35	0.93129	0.00059	10.05	0.93017	0.00065
10.70	0.93419	0.00058	10.40	0.93371	0.00058	10.10	0.93271	0.00062
10.75	0.93831	0.00058	10.45	0.93830	0.00060	10.15	0.93695	0.00059
10.80	0.93997	0.00059	10.50	0.94119	0.00063	10.20	0.94060	0.00059
10.85	0.94403	0.00059	10.55	0.94351	0.00058	10.25	0.94343	0.00061
10.90	0.94706	0.00058	10.60	0.94761	0.00058	10.30	0.94713	0.00061
10.95	0.94970	0.00059	10.65	0.95006	0.00061	10.35	0.95036	0.00063
11.00	0.95396	0.00060	10.70	0.95412	0.00062	10.40	0.95304	0.00061
11.05	0.95525	0.00057	10.75	0.95705	0.00059	10.45	0.95726	0.00062
11.10	0.95904	0.00058	10.80	0.95919	0.00062	10.50	0.96007	0.00059
11.15	0.96214	0.00058	10.85	0.96388	0.00059	10.55	0.96260	0.00060
11.20	0.96427	0.00060	10.90	0.96725	0.00062	10.60	0.96707	0.00064
11.25	0.96757	0.00058	10.95	0.96895	0.00060	10.65	0.97154	0.00062
11.30	0.97003	0.00057	11.00	0.97262	0.00060	10.70	0.97258	0.00060
11.35	0.97448	0.00059	11.05	0.97493	0.00064	10.75	0.97554	0.00061
11.40	0.97716	0.00061	11.10	0.97829	0.00061	10.80	0.97940	0.00061
11.45	0.97915	0.00059	11.15	0.98233	0.00060	10.85	0.98289	0.00059
11.50	0.98362	0.00059	11.20	0.98470	0.00058	10.90	0.98570	0.00062
11.55	0.98564	0.00055	11.25	0.98643	0.00058	10.95	0.99049	0.00062
11.60	0.98962	0.00058	11.30	0.98969	0.00057	11.00	0.99377	0.00063
11.65	0.99143	0.00058	11.35	0.99310	0.00059	11.05	0.99510	0.00063
11.70	0.99349	0.00061	11.40	0.99615	0.00061	11.10	0.99866	0.00064
11.75	0.99656	0.00059	11.45	0.99942	0.00057	11.15	1.00113	0.00062
11.80	1.00076	0.00061	11.50	1.00200	0.00058	11.20	1.00556	0.00063
11.85	1.00288	0.00057	11.55	1.00504	0.00060	11.25	1.00850	0.00060
11.90	1.00595	0.00059	11.60	1.00764	0.00058	11.30	1.00995	0.00063
11.95	1.00724	0.00058	11.65	1.01048	0.00062	11.35	1.01235	0.00061
12.00	1.01073	0.00059	11.70	1.01278	0.00060	11.40	1.01652	0.00064
12.05	1.01467	0.00058	11.75	1.01567	0.00061	11.45	1.01974	0.00061
12.10	1.01624	0.00057	11.80	1.01844	0.00058	11.50	1.02164	0.00063
12.15	1.02002	0.00060						
12.20	1.02247	0.00059						

Table B.1.1.1.3-2. K_{eff} Values for 100% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

50 milli-g/cc			75 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.70	0.91987	0.00062	9.00	0.91597	0.00062	8.70	0.91626	0.00062
9.75	0.92361	0.00060	9.05	0.92086	0.00063	8.75	0.91897	0.00065
9.80	0.92828	0.00063	9.10	0.92315	0.00064	8.80	0.92441	0.00063
9.85	0.93143	0.00062	9.15	0.92761	0.00062	8.85	0.92957	0.00061
9.90	0.93516	0.00062	9.20	0.93261	0.00065	8.90	0.93330	0.00063
9.95	0.93811	0.00063	9.25	0.93576	0.00064	8.95	0.93543	0.00062
10.00	0.94221	0.00062	9.30	0.93949	0.00063	9.00	0.93998	0.00064
10.05	0.94594	0.00061	9.35	0.94161	0.00065	9.05	0.94367	0.00063
10.10	0.94886	0.00064	9.40	0.94723	0.00064	9.10	0.94742	0.00064
10.15	0.95235	0.00062	9.45	0.95066	0.00065	9.15	0.95165	0.00066
10.20	0.95700	0.00062	9.50	0.95512	0.00062	9.20	0.95549	0.00066
10.25	0.95882	0.00062	9.55	0.95925	0.00065	9.25	0.96033	0.00068
10.30	0.96219	0.00063	9.60	0.96183	0.00060	9.30	0.96281	0.00064
10.35	0.96625	0.00063	9.65	0.96568	0.00064	9.35	0.96702	0.00065
10.40	0.96891	0.00060	9.70	0.96996	0.00066	9.40	0.97048	0.00065
10.45	0.97249	0.00063	9.75	0.97308	0.00066	9.45	0.97553	0.00066
10.50	0.97727	0.00060	9.80	0.97703	0.00067	9.50	0.97907	0.00067
10.55	0.98119	0.00062	9.85	0.98001	0.00063	9.55	0.98276	0.00066
10.60	0.98245	0.00061	9.90	0.98338	0.00062	9.60	0.98646	0.00064
10.65	0.98649	0.00060	9.95	0.98691	0.00066	9.65	0.99084	0.00065
10.70	0.98981	0.00060	10.00	0.99175	0.00063	9.70	0.99414	0.00065
10.75	0.99230	0.00061	10.05	0.99370	0.00066	9.75	0.99695	0.00066
10.80	0.99698	0.00062	10.10	0.99805	0.00065	9.80	1.00070	0.00066
10.85	0.99951	0.00062	10.15	1.00095	0.00065	9.85	1.00440	0.00067
10.90	1.00238	0.00061	10.20	1.00611	0.00064	9.90	1.00867	0.00062
10.95	1.00564	0.00064	10.25	1.00767	0.00066	9.95	1.01179	0.00063
11.00	1.00822	0.00061	10.30	1.01191	0.00064	10.00	1.01532	0.00067
11.05	1.01116	0.00060	10.35	1.01449	0.00063	10.05	1.01953	0.00066
11.10	1.01272	0.00061	10.40	1.01848	0.00064	10.10	1.02289	0.00064
11.15	1.01819	0.00062						
11.20	1.02053	0.00062						

Table B.1.1.1.3-2. K_{eff} Values for 100% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

150 milli-g/cc			200 milli-g/cc			350 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.40	0.91657	0.00064	8.30	0.92098	0.00066	8.00	0.91630	0.00066
8.45	0.91926	0.00065	8.35	0.92543	0.00064	8.05	0.92057	0.00063
8.50	0.92518	0.00062	8.40	0.92931	0.00063	8.10	0.92498	0.00065
8.55	0.92851	0.00065	8.45	0.93317	0.00064	8.15	0.92969	0.00067
8.60	0.93150	0.00067	8.50	0.93700	0.00065	8.20	0.93354	0.00065
8.65	0.93781	0.00066	8.55	0.94114	0.00064	8.25	0.93799	0.00065
8.70	0.94171	0.00065	8.60	0.94522	0.00066	8.30	0.94222	0.00066
8.75	0.94561	0.00062	8.65	0.95026	0.00065	8.35	0.94606	0.00066
8.80	0.94970	0.00067	8.70	0.95421	0.00063	8.40	0.95083	0.00066
8.85	0.95318	0.00065	8.75	0.95696	0.00066	8.45	0.95453	0.00065
8.90	0.95643	0.00067	8.80	0.96214	0.00064	8.50	0.95913	0.00067
8.95	0.96113	0.00063	8.85	0.96466	0.00069	8.55	0.96411	0.00067
9.00	0.96444	0.00064	8.90	0.96893	0.00065	8.60	0.96649	0.00066
9.05	0.96893	0.00066	8.95	0.97369	0.00068	8.65	0.97001	0.00065
9.10	0.97179	0.00067	9.00	0.97755	0.00066	8.70	0.97463	0.00067
9.15	0.97667	0.00066	9.05	0.98228	0.00067	8.75	0.97852	0.00067
9.20	0.98010	0.00066	9.10	0.98566	0.00066	8.80	0.98336	0.00065
9.25	0.98466	0.00065	9.15	0.98955	0.00065	8.85	0.98615	0.00066
9.30	0.98789	0.00068	9.20	0.99236	0.00062	8.90	0.99023	0.00070
9.35	0.99138	0.00066	9.25	0.99657	0.00067	8.95	0.99398	0.00066
9.40	0.99483	0.00064	9.30	1.00020	0.00065	9.00	0.99871	0.00068
9.45	0.99884	0.00065	9.35	1.00414	0.00065	9.05	1.00149	0.00066
9.50	1.00381	0.00065	9.40	1.00759	0.00065	9.10	1.00629	0.00066
9.55	1.00622	0.00066	9.45	1.01215	0.00066	9.15	1.00921	0.00067
9.60	1.00976	0.00066	9.50	1.01559	0.00069	9.20	1.01309	0.00064
9.65	1.01419	0.00065	9.55	1.01766	0.00066	9.25	1.01638	0.00068
9.70	1.01797	0.00065	9.60	1.02170	0.00068	9.30	1.01977	0.00067

Table B.1.1.1.3-2. K_{eff} Values for 100% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

500 milli-g/cc			750 milli-g/cc			1000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.90	0.92283	0.00066	7.60	0.91623	0.00065	7.40	0.91740	0.00065
7.95	0.92719	0.00064	7.65	0.92102	0.00067	7.45	0.92300	0.00065
8.00	0.93214	0.00069	7.70	0.92552	0.00066	7.50	0.92643	0.00066
8.05	0.93603	0.00065	7.75	0.93030	0.00067	7.55	0.93061	0.00068
8.10	0.94016	0.00066	7.80	0.93566	0.00066	7.60	0.93450	0.00064
8.15	0.94398	0.00066	7.85	0.93933	0.00067	7.65	0.94215	0.00065
8.20	0.95019	0.00065	7.90	0.94291	0.00065	7.70	0.94526	0.00065
8.25	0.95288	0.00066	7.95	0.94769	0.00065	7.75	0.94971	0.00065
8.30	0.95678	0.00066	8.00	0.95278	0.00064	7.80	0.95446	0.00067
8.35	0.96107	0.00065	8.05	0.95674	0.00064	7.85	0.95885	0.00067
8.40	0.96524	0.00066	8.10	0.96077	0.00067	7.90	0.96110	0.00064
8.45	0.96989	0.00067	8.15	0.96465	0.00064	7.95	0.96757	0.00065
8.50	0.97271	0.00065	8.20	0.96903	0.00066	8.00	0.97144	0.00066
8.55	0.97669	0.00067	8.25	0.97376	0.00069	8.05	0.97474	0.00067
8.60	0.98126	0.00068	8.30	0.97761	0.00064	8.10	0.98011	0.00068
8.65	0.98458	0.00067	8.35	0.98223	0.00064	8.15	0.98399	0.00064
8.70	0.98851	0.00066	8.40	0.98591	0.00066	8.20	0.98941	0.00067
8.75	0.99303	0.00063	8.45	0.98985	0.00065	8.25	0.99348	0.00067
8.80	0.99759	0.00065	8.50	0.99497	0.00065	8.30	0.99811	0.00065
8.85	1.00122	0.00067	8.55	0.99839	0.00067	8.35	1.00163	0.00069
8.90	1.00489	0.00064	8.60	1.00217	0.00065	8.40	1.00453	0.00065
8.95	1.00778	0.00066	8.65	1.00649	0.00065	8.45	1.00874	0.00067
9.00	1.01318	0.00068	8.70	1.01036	0.00063	8.50	1.01436	0.00066
9.05	1.01595	0.00066	8.75	1.01319	0.00066			
9.10	1.02000	0.00066	8.80	1.01793	0.00063			

Table B.1.1.1.3-2. K_{eff} Values for 100% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

1500 milli-g/cc			2000 milli-g/cc			2500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.10	0.92304	0.00063	6.80	0.92202	0.00065	6.50	0.91929	0.00068
7.15	0.92813	0.00065	6.85	0.92787	0.00068	6.55	0.92265	0.00064
7.20	0.93315	0.00065	6.90	0.93354	0.00067	6.60	0.93118	0.00064
7.25	0.93698	0.00068	6.95	0.93841	0.00066	6.65	0.93637	0.00065
7.30	0.94187	0.00066	7.00	0.94381	0.00064	6.70	0.93992	0.00066
7.35	0.94780	0.00065	7.05	0.94947	0.00068	6.75	0.94555	0.00067
7.40	0.95173	0.00067	7.10	0.95385	0.00068	6.80	0.95055	0.00062
7.45	0.95579	0.00066	7.15	0.95812	0.00067	6.85	0.95609	0.00066
7.50	0.96124	0.00065	7.20	0.96460	0.00069	6.90	0.96134	0.00066
7.55	0.96465	0.00066	7.25	0.96815	0.00067	6.95	0.96706	0.00064
7.60	0.97007	0.00067	7.30	0.97349	0.00065	7.00	0.97125	0.00066
7.65	0.97571	0.00063	7.35	0.97862	0.00065	7.05	0.97662	0.00066
7.70	0.98034	0.00067	7.40	0.98323	0.00066	7.10	0.98301	0.00062
7.75	0.98431	0.00066	7.45	0.98683	0.00067	7.15	0.98640	0.00068
7.80	0.98900	0.00067	7.50	0.99247	0.00066	7.20	0.99192	0.00065
7.85	0.99337	0.00066	7.55	0.99794	0.00068	7.25	0.99743	0.00067
7.90	0.99753	0.00064	7.60	1.00264	0.00068	7.30	1.00147	0.00067
7.95	1.00248	0.00066	7.65	1.00587	0.00065	7.35	1.00800	0.00069
8.00	1.00607	0.00066	7.70	1.01184	0.00066	7.40	1.01285	0.00067
8.05	1.01076	0.00063	7.75	1.01674	0.00064	7.45	1.01727	0.00067
8.10	1.01510	0.00071	7.80	1.02191	0.00065	7.50	1.02286	0.00070
8.15	1.02004	0.00067						
8.20	1.02442	0.00067						
8.25	1.02805	0.00068						
8.30	1.03244	0.00066						

Table B.1.1.1.3-2. K_{eff} Values for 100% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

3000 milli-g/cc			4000 milli-g/cc			5000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.30	0.92208	0.00068	5.80	0.91014	0.00066	5.50	0.91612	0.00065
6.35	0.92709	0.00065	5.85	0.91787	0.00065	5.55	0.92128	0.00064
6.40	0.93351	0.00065	5.90	0.92394	0.00066	5.60	0.92873	0.00062
6.45	0.94030	0.00064	5.95	0.92948	0.00064	5.65	0.93596	0.00066
6.50	0.94491	0.00066	6.00	0.93625	0.00066	5.70	0.94168	0.00065
6.55	0.94948	0.00066	6.05	0.94097	0.00066	5.75	0.94874	0.00062
6.60	0.95745	0.00065	6.10	0.94783	0.00067	5.80	0.95687	0.00064
6.65	0.96196	0.00066	6.15	0.95306	0.00066	5.85	0.96075	0.00064
6.70	0.96700	0.00066	6.20	0.95948	0.00061	5.90	0.96852	0.00069
6.75	0.97271	0.00068	6.25	0.96601	0.00067	5.95	0.97491	0.00069
6.80	0.97807	0.00067	6.30	0.97197	0.00064	6.00	0.98090	0.00061
6.85	0.98420	0.00068	6.35	0.97669	0.00066	6.05	0.98643	0.00064
6.90	0.98910	0.00070	6.40	0.98381	0.00065	6.10	0.99296	0.00066
6.95	0.99404	0.00067	6.45	0.99043	0.00066	6.15	0.99929	0.00065
7.00	0.99912	0.00063	6.50	0.99491	0.00066	6.20	1.00690	0.00066
7.05	1.00411	0.00067	6.55	1.00073	0.00066	6.25	1.01280	0.00066
7.10	1.01051	0.00067	6.60	1.00671	0.00065	6.30	1.01829	0.00066
7.15	1.01481	0.00068	6.65	1.01217	0.00065			
7.20	1.01959	0.00065	6.70	1.01848	0.00066			
7.25	1.02668	0.00066	6.75	1.02408	0.00067			
7.30	1.02959	0.00068	6.80	1.02853	0.00065			
			6.85	1.03526	0.00066			
			6.90	1.04000	0.00065			

Table B.1.1.1.3-2. K_{eff} Values for 100% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

6000 milli-g/cc			7000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.20	0.91497	0.00065	4.90	0.90966	0.00063	4.80	0.91476	0.00063
5.25	0.92215	0.00063	4.95	0.91825	0.00063	4.85	0.92296	0.00060
5.30	0.92967	0.00061	5.00	0.92566	0.00061	4.90	0.93018	0.00061
5.35	0.93713	0.00066	5.05	0.93322	0.00060	4.95	0.93724	0.00061
5.40	0.94388	0.00063	5.10	0.94005	0.00067	5.00	0.94476	0.00061
5.45	0.95133	0.00063	5.15	0.94874	0.00062	5.05	0.95350	0.00063
5.50	0.95790	0.00063	5.20	0.95695	0.00064	5.10	0.96072	0.00065
5.55	0.96405	0.00064	5.25	0.96317	0.00062	5.15	0.96746	0.00063
5.60	0.97103	0.00064	5.30	0.96963	0.00064	5.20	0.97512	0.00063
5.65	0.97776	0.00063	5.35	0.97779	0.00064	5.25	0.98298	0.00064
5.70	0.98460	0.00062	5.40	0.98510	0.00061	5.30	0.98996	0.00062
5.75	0.99242	0.00065	5.45	0.99160	0.00066	5.35	0.99699	0.00064
5.80	0.99880	0.00066	5.50	0.99859	0.00065	5.40	1.00454	0.00063
5.85	1.00468	0.00065	5.55	1.00633	0.00063	5.45	1.01171	0.00063
5.90	1.01221	0.00066	5.60	1.01400	0.00062	5.50	1.01870	0.00066
5.95	1.01816	0.00066	5.65	1.02054	0.00065	5.55	1.02654	0.00063
6.00	1.02474	0.00068	5.70	1.02740	0.00066	5.60	1.03281	0.00065

Table B.1.1.1.3-2. K_{eff} Values for 100% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

8000 milli-g/cc			9000 milli-g/cc			10000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.70	0.91592	0.00062	4.50	0.92052	0.00060	4.30	0.92185	0.00061
4.75	0.92362	0.00062	4.55	0.92906	0.00059	4.35	0.93093	0.00059
4.80	0.93346	0.00059	4.60	0.93708	0.00058	4.40	0.93910	0.00061
4.85	0.94032	0.00061	4.65	0.94574	0.00061	4.45	0.94810	0.00059
4.90	0.94812	0.00064	4.70	0.95411	0.00061	4.50	0.95634	0.00059
4.95	0.95623	0.00063	4.75	0.96253	0.00062	4.55	0.96590	0.00060
5.00	0.96403	0.00062	4.80	0.97140	0.00062	4.60	0.97363	0.00061
5.05	0.97266	0.00065	4.85	0.97798	0.00063	4.65	0.98167	0.00061
5.10	0.98022	0.00063	4.90	0.98726	0.00062	4.70	0.99044	0.00061
5.15	0.98821	0.00063	4.95	0.99571	0.00064	4.75	0.99992	0.00061
5.20	0.99439	0.00059	5.00	1.00216	0.00060	4.80	1.00761	0.00062
5.25	1.00309	0.00063	5.05	1.01046	0.00063	4.85	1.01547	0.00062
5.30	1.01011	0.00061	5.10	1.01798	0.00062	4.90	1.02450	0.00063
5.35	1.01834	0.00065	5.15	1.02627	0.00061			
5.40	1.02447	0.00060	5.20	1.03277	0.00064			

Table B.1.1.1.3-2. K_{eff} Values for 100% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

15000 milli-g/cc			19600 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
3.40	0.90655	0.00054	2.90	0.91926	0.00052			
3.45	0.91729	0.00054	2.92	0.92412	0.00053			
3.50	0.92917	0.00056	2.94	0.93012	0.00050			
3.55	0.93908	0.00055	2.96	0.93517	0.00051			
3.60	0.94970	0.00057	2.98	0.93909	0.00054			
3.65	0.96106	0.00056	3.00	0.94668	0.00053			
3.70	0.97231	0.00059	3.02	0.95050	0.00053			
3.75	0.98314	0.00058	3.04	0.95566	0.00052			
3.80	0.99347	0.00058	3.06	0.96122	0.00051			
3.85	1.00449	0.00058	3.08	0.96600	0.00054			
3.90	1.01486	0.00057	3.10	0.97117	0.00054			
3.95	1.02600	0.00056	3.12	0.97630	0.00055			
4.00	1.03585	0.00057	3.14	0.98300	0.00053			
			3.16	0.98703	0.00053			
			3.18	0.99138	0.00054			
			3.20	0.99707	0.00053			
			3.22	1.00279	0.00056			
			3.24	1.00873	0.00054			
			3.26	1.01195	0.00053			
			3.28	1.01735	0.00053			
			3.30	1.02308	0.00055			

B.1.1.2. 97% ^{239}Pu 3% ^{240}Pu

B.1.1.2.1. Unreflected

Case ID: pu-sp-0970-00

Geometry: Sphere

Isotopics: 97% ^{239}Pu 3% ^{240}Pu

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.1.1.2.1-1. Plutonium Sphere(97% ^{239}Pu) - 0 Inches of Water Reflection

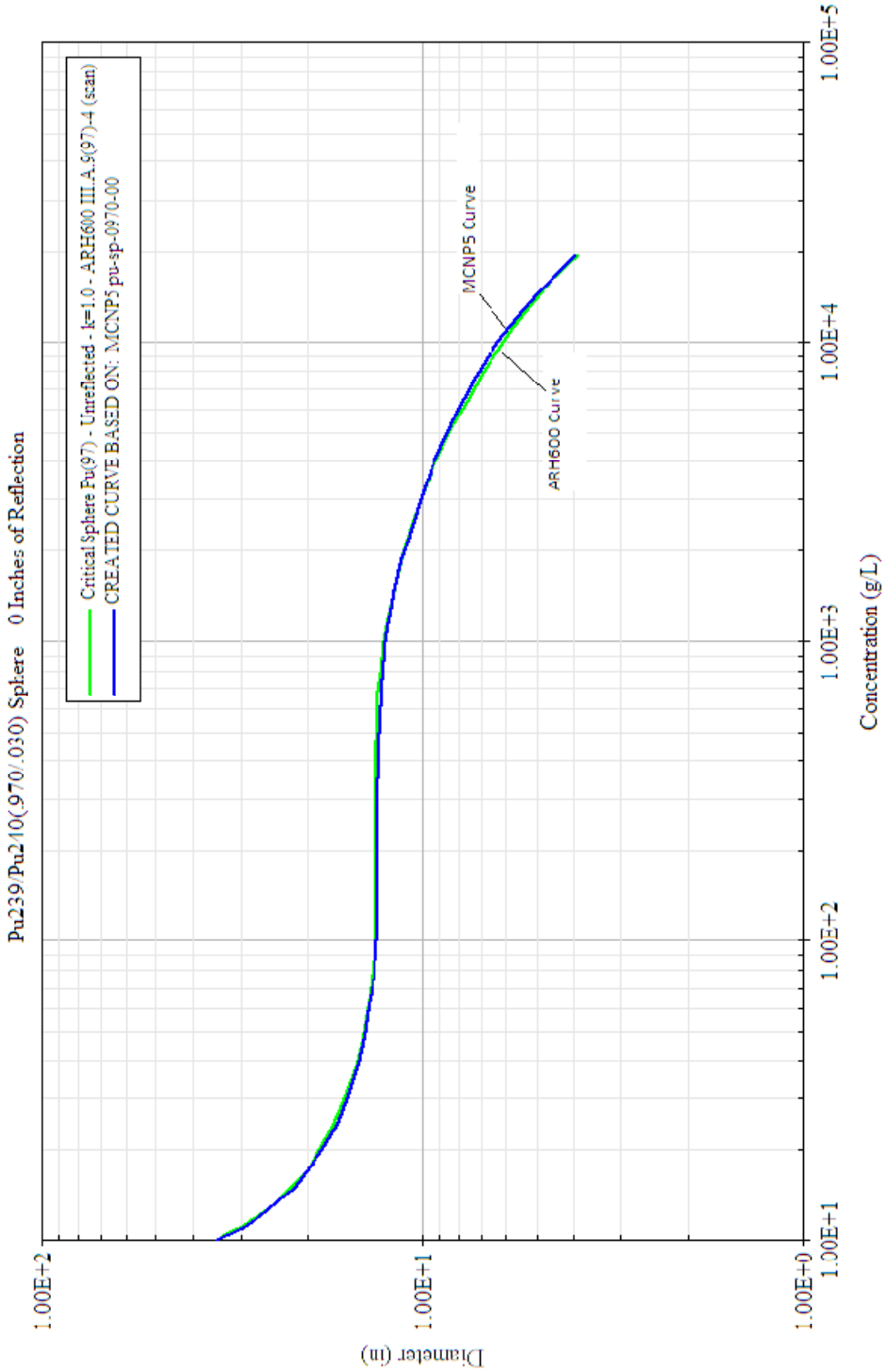

Table B.1.1.2.1-1. Critical Dimensions for Plutonium Sphere(97% ^{239}Pu) - 0 Inches of Water Reflection

Plutonium Sphere(97% ^{239}Pu) - 0 Inches of Water Reflection				
Concentrations (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	26.500	36.700	0.500	34.6627
0.011	23.900	31.000	0.300	29.6142
0.012	22.000	27.700	0.200	26.5650
0.015	18.700	22.400	0.100	21.6807
0.020	16.100	18.800	0.100	18.2558
0.025	14.800	17.100	0.100	16.6518
0.030	14.100	16.200	0.100	15.6902
0.040	13.200	15.000	0.100	14.6302
0.050	12.800	14.500	0.050	14.0947
0.075	12.200	13.800	0.050	13.4577
0.100	12.000	13.600	0.050	13.2232
0.150	11.900	13.400	0.050	13.0904
0.200	11.800	13.400	0.050	13.0834
0.350	11.800	13.400	0.050	13.0674
0.500	11.700	13.400	0.050	12.9875
0.750	11.500	13.100	0.050	12.7752
1.000	11.200	12.800	0.050	12.4498
1.500	10.600	12.200	0.050	11.8013
2.000	10.100	11.500	0.050	11.1765
2.500	9.600	10.900	0.050	10.5923
3.000	9.200	10.400	0.050	10.1115
4.000	8.400	9.500	0.050	9.2755
5.000	7.800	8.800	0.050	8.5952
7.500	6.700	7.500	0.050	7.2907
10.000	5.800	6.500	0.050	6.3352
15.000	4.400	5.100	0.050	4.9207
19.600	3.600	4.100	0.020	3.9735

MCNP5 Sample Input File
97% Pu Sphere- 0 Inches of Reflection

```
Pu sphere, 97.0 wt% 239Pu, 02000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1070  hundreths of inches - must be integer
c radius =    13.5890 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 02000 milli-g Pu/cc
c Reflector width =  0.0 inches
c Enrichment = 0.97 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 239Pu  = 239.05220
c 240Pu  = 240.05380
c
c Effective Plutonium atomic mass 239.08225
c PuO2
c Mass fraction of Pu in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.1020 cc
c Volume of water in sample 0.8980 cc
c
c Mass of crit in sample   2.0000 g
c Mass of Pu in sample   2.0000 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.8980 g
c
c Total mass of sample  2.8980g for a 1cc sample
c Mass Density for crit material  -2.8980, expressed as negative
c
c  plane
20 11   -2.897959   -1   imp:n=1
21  2  -1.000                  -2 1   imp:n=0    $zero importance if no reflector
22  0                           2   imp:n=0
```

```
1       so    13.5890            $ plane
2       so    13.5890        $ Reflection

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu / water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 02000 milli-g Pu/cc,  2.8980
1001.66c -0.034672
8016.66c -0.275188      $from water
94239.66c -0.669437
94240.66c -0.020704
mt11     lwtr.60t
c
c    pu only
m12    $ Pu, 100.0 wt% 235U, 02000 milli-g U/cc,  2.8980
94239.66c -0.669437
94240.66c -0.020704
c
```

Critview Compatible Data File
97% Pu Sphere- 0 Inches of Reflection

reset:
title: MCNP5 pu-sp-0970-00
set: MCNP5 set
source: MCNP5 primary
created: Mon 08/02/2010 12:47:31.36
geometry: sphere
modmat: H2O
critmat: plutonium
isomat: Pu239 0.970 Pu240 0.030
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	34.6627
0.011	29.6142
0.012	26.5650
0.015	21.6807
0.020	18.2558
0.025	16.6518
0.030	15.6902
0.040	14.6302
0.050	14.0947
0.075	13.4577
0.100	13.2232
0.150	13.0904
0.200	13.0834
0.350	13.0674
0.500	12.9875
0.750	12.7752
1.000	12.4498
1.500	11.8013
2.000	11.1765
2.500	10.5923
3.000	10.1115
4.000	9.2755
5.000	8.5952
7.500	7.2907
10.00	6.3352
15.00	4.9207
19.60	3.9735

Table B.1.1.2.1-2. K_{eff} Values for Plutonium Sphere(97% ^{239}Pu) - 0 Inches of Water Reflection

10 milli-g/cc			11 milli-g/cc			12 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
26.50	0.92519	0.00032	23.90	0.92569	0.00035	22.00	0.92532	0.00038
27.00	0.93081	0.00033	24.20	0.93148	0.00035	22.20	0.92936	0.00036
27.50	0.93703	0.00032	24.50	0.93524	0.00035	22.40	0.93300	0.00036
28.00	0.94225	0.00031	24.80	0.93977	0.00034	22.60	0.93680	0.00036
28.50	0.94769	0.00031	25.10	0.94460	0.00034	22.80	0.94065	0.00036
29.00	0.95285	0.00031	25.40	0.94907	0.00033	23.00	0.94392	0.00038
29.50	0.95809	0.00031	25.70	0.95324	0.00035	23.20	0.94700	0.00037
30.00	0.96278	0.00030	26.00	0.95728	0.00033	23.40	0.95141	0.00036
30.50	0.96801	0.00031	26.30	0.96135	0.00034	23.60	0.95567	0.00037
31.00	0.97158	0.00031	26.60	0.96476	0.00032	23.80	0.95828	0.00036
31.50	0.97653	0.00030	26.90	0.96944	0.00033	24.00	0.96197	0.00037
32.00	0.98104	0.00029	27.20	0.97269	0.00032	24.20	0.96470	0.00035
32.50	0.98404	0.00029	27.50	0.97626	0.00033	24.40	0.96837	0.00035
33.00	0.98793	0.00030	27.80	0.98013	0.00033	24.60	0.97139	0.00035
33.50	0.99252	0.00029	28.10	0.98249	0.00032			
34.00	0.99589	0.00030	28.40	0.98681	0.00033			
34.50	0.99891	0.00029	28.70	0.98984	0.00033			
35.00	1.00226	0.00028	29.00	0.99310	0.00033			
35.50	1.00563	0.00027	29.30	0.99643	0.00033			
36.00	1.00902	0.00029	29.60	0.99987	0.00032			
36.50	1.01230	0.00028	29.90	1.00261	0.00032			
36.70	1.01359	0.00028	30.20	1.00511	0.00033			
			30.50	1.00812	0.00031			
			30.80	1.01105	0.00032			
			31.00	1.01300	0.00031			

Table B.1.1.2.1-2. K_{eff} Values for Plutonium Sphere(97% ^{239}Pu) - 0 Inches of Water Reflection (cont)

15 milli-g/cc			20 milli-g/cc			25 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
18.70	0.92354	0.00042	16.10	0.92120	0.00047	14.80	0.91813	0.00052
18.80	0.92693	0.00042	16.20	0.92484	0.00050	14.90	0.92323	0.00050
18.90	0.92998	0.00043	16.30	0.92872	0.00047	15.00	0.92798	0.00053
19.00	0.93289	0.00043	16.40	0.93120	0.00049	15.10	0.93205	0.00051
19.10	0.93581	0.00041	16.50	0.93600	0.00046	15.20	0.93699	0.00053
19.20	0.93874	0.00043	16.60	0.94026	0.00046	15.30	0.94242	0.00052
19.30	0.94095	0.00041	16.70	0.94384	0.00047	15.40	0.94629	0.00051
19.40	0.94455	0.00040	16.80	0.94800	0.00047	15.50	0.95021	0.00050
19.50	0.94606	0.00042	16.90	0.95271	0.00047	15.60	0.95639	0.00051
19.60	0.94905	0.00041	17.00	0.95630	0.00049	15.70	0.96013	0.00052
19.70	0.95096	0.00041	17.10	0.96028	0.00046	15.80	0.96404	0.00051
19.80	0.95412	0.00041	17.20	0.96202	0.00048	15.90	0.96973	0.00051
19.90	0.95664	0.00041	17.30	0.96572	0.00047	16.00	0.97296	0.00050
20.00	0.95990	0.00041	17.40	0.97071	0.00047	16.10	0.97795	0.00052
20.10	0.96253	0.00041	17.50	0.97374	0.00045	16.20	0.98073	0.00049
20.20	0.96499	0.00042	17.60	0.97673	0.00047	16.30	0.98582	0.00052
20.30	0.96768	0.00042	17.70	0.98067	0.00047	16.40	0.98955	0.00051
20.40	0.96921	0.00043	17.80	0.98399	0.00047	16.50	0.99358	0.00050
20.50	0.97304	0.00040	17.90	0.98691	0.00047	16.60	0.99814	0.00053
20.60	0.97468	0.00041	18.00	0.99057	0.00047	16.70	1.00173	0.00050
20.70	0.97665	0.00040	18.10	0.99364	0.00046	16.80	1.00587	0.00049
20.80	0.97987	0.00041	18.20	0.99828	0.00046	16.90	1.00878	0.00051
20.90	0.98247	0.00041	18.30	1.00136	0.00047	17.00	1.01421	0.00051
21.00	0.98428	0.00040	18.40	1.00299	0.00048	17.10	1.01819	0.00051
21.10	0.98708	0.00041	18.50	1.00857	0.00048			
21.20	0.98995	0.00042	18.60	1.01020	0.00046			
21.30	0.99157	0.00041	18.70	1.01406	0.00047			
21.40	0.99271	0.00042	18.80	1.01679	0.00046			
21.50	0.99596	0.00041						
21.60	0.99833	0.00040						
21.70	1.00040	0.00040						
21.80	1.00318	0.00041						
21.90	1.00534	0.00040						
22.00	1.00670	0.00040						
22.10	1.00857	0.00040						
22.20	1.01052	0.00041						
22.30	1.01294	0.00039						
22.40	1.01564	0.00041						

Table B.1.1.2.1-2. K_{eff} Values for Plutonium Sphere(97% ^{239}Pu) - 0 Inches of Water Reflection (cont)

30 milli-g/cc			40 milli-g/cc			50 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
14.10	0.92109	0.00054	13.20	0.91808	0.00055	12.80	0.92169	0.00060
14.20	0.92627	0.00053	13.30	0.92427	0.00054	12.85	0.92618	0.00056
14.30	0.93093	0.00053	13.40	0.93049	0.00057	12.90	0.92885	0.00059
14.40	0.93439	0.00054	13.50	0.93651	0.00056	12.95	0.93130	0.00057
14.50	0.94213	0.00055	13.60	0.94225	0.00057	13.00	0.93429	0.00058
14.60	0.94585	0.00053	13.70	0.94792	0.00058	13.05	0.93808	0.00056
14.70	0.95251	0.00052	13.80	0.95412	0.00056	13.10	0.94184	0.00058
14.80	0.95725	0.00055	13.90	0.95916	0.00057	13.15	0.94355	0.00059
14.90	0.96144	0.00052	14.00	0.96561	0.00056	13.20	0.94810	0.00058
15.00	0.96663	0.00053	14.10	0.97077	0.00057	13.25	0.94952	0.00057
15.10	0.97144	0.00053	14.20	0.97588	0.00056	13.30	0.95328	0.00059
15.20	0.97678	0.00054	14.30	0.98202	0.00057	13.35	0.95685	0.00059
15.30	0.98092	0.00055	14.40	0.98808	0.00056	13.40	0.96037	0.00058
15.40	0.98640	0.00053	14.50	0.99328	0.00057	13.45	0.96305	0.00058
15.50	0.99137	0.00053	14.60	0.99892	0.00054	13.50	0.96609	0.00058
15.60	0.99613	0.00053	14.70	1.00250	0.00057	13.55	0.96774	0.00061
15.70	1.00042	0.00054	14.80	1.00860	0.00055	13.60	0.97139	0.00058
15.80	1.00541	0.00055	14.90	1.01391	0.00057	13.65	0.97626	0.00061
15.90	1.00947	0.00053	15.00	1.01899	0.00056	13.70	0.97838	0.00058
16.00	1.01330	0.00053				13.75	0.98065	0.00057
16.10	1.01819	0.00054				13.80	0.98290	0.00058
16.20	1.02175	0.00051				13.85	0.98590	0.00058
						13.90	0.98958	0.00059
						13.95	0.99213	0.00059
						14.00	0.99668	0.00059
						14.05	0.99823	0.00057
						14.10	1.00021	0.00060
						14.15	1.00348	0.00055
						14.20	1.00647	0.00056
						14.25	1.00960	0.00058
						14.30	1.01147	0.00059
						14.35	1.01581	0.00056
						14.40	1.01662	0.00056
						14.45	1.01975	0.00056
						14.50	1.02331	0.00059

Table B.1.1.2.1-2. K_{eff} Values for Plutonium Sphere(97% ^{239}Pu) - 0 Inches of Water Reflection (cont)

75 milli-g/cc			100 milli-g/cc			150 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.20	0.91736	0.00061	12.00	0.91822	0.00059	11.90	0.92143	0.00062
12.25	0.92123	0.00061	12.05	0.92231	0.00061	11.95	0.92553	0.00062
12.30	0.92503	0.00061	12.10	0.92547	0.00061	12.00	0.92807	0.00061
12.35	0.92835	0.00060	12.15	0.92891	0.00063	12.05	0.93117	0.00062
12.40	0.93095	0.00060	12.20	0.93202	0.00061	12.10	0.93583	0.00061
12.45	0.93526	0.00061	12.25	0.93612	0.00063	12.15	0.93730	0.00060
12.50	0.93763	0.00060	12.30	0.94032	0.00065	12.20	0.94194	0.00061
12.55	0.94151	0.00062	12.35	0.94157	0.00064	12.25	0.94595	0.00064
12.60	0.94599	0.00060	12.40	0.94684	0.00062	12.30	0.94799	0.00060
12.65	0.94893	0.00058	12.45	0.94946	0.00064	12.35	0.95190	0.00063
12.70	0.95144	0.00059	12.50	0.95330	0.00061	12.40	0.95596	0.00062
12.75	0.95473	0.00059	12.55	0.95687	0.00060	12.45	0.95859	0.00064
12.80	0.95873	0.00060	12.60	0.96041	0.00060	12.50	0.96259	0.00061
12.85	0.96159	0.00062	12.65	0.96321	0.00062	12.55	0.96538	0.00061
12.90	0.96531	0.00062	12.70	0.96647	0.00061	12.60	0.96965	0.00060
12.95	0.96885	0.00060	12.75	0.96833	0.00061	12.65	0.97104	0.00062
13.00	0.97077	0.00061	12.80	0.97264	0.00062	12.70	0.97424	0.00062
13.05	0.97444	0.00060	12.85	0.97599	0.00061	12.75	0.97840	0.00061
13.10	0.97903	0.00060	12.90	0.97901	0.00059	12.80	0.98093	0.00062
13.15	0.98137	0.00060	12.95	0.98422	0.00061	12.85	0.98513	0.00062
13.20	0.98408	0.00061	13.00	0.98651	0.00062	12.90	0.98836	0.00061
13.25	0.98668	0.00059	13.05	0.98783	0.00063	12.95	0.99174	0.00062
13.30	0.99036	0.00059	13.10	0.99168	0.00061	13.00	0.99442	0.00061
13.35	0.99286	0.00063	13.15	0.99480	0.00059	13.05	0.99786	0.00061
13.40	0.99531	0.00060	13.20	0.99864	0.00062	13.10	1.00051	0.00062
13.45	0.99961	0.00060	13.25	1.00157	0.00061	13.15	1.00345	0.00062
13.50	1.00215	0.00061	13.30	1.00424	0.00062	13.20	1.00742	0.00063
13.55	1.00548	0.00061	13.35	1.00767	0.00062	13.25	1.01114	0.00062
13.60	1.00837	0.00061	13.40	1.01065	0.00061	13.30	1.01287	0.00063
13.65	1.01147	0.00062	13.45	1.01470	0.00062	13.35	1.01656	0.00060
13.70	1.01418	0.00060	13.50	1.01541	0.00063	13.40	1.01869	0.00060
13.75	1.01674	0.00060	13.55	1.02012	0.00063			
13.80	1.02108	0.00058	13.60	1.02355	0.00062			

Table B.1.1.2.1-2. K_{eff} Values for Plutonium Sphere(97% ^{239}Pu) - 0 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.80	0.91617	0.00062	11.80	0.91767	0.00059	11.70	0.91639	0.00058
11.85	0.91976	0.00061	11.85	0.92124	0.00062	11.75	0.92177	0.00059
11.90	0.92268	0.00061	11.90	0.92516	0.00060	11.80	0.92244	0.00061
11.95	0.92636	0.00060	11.95	0.92760	0.00061	11.85	0.92803	0.00059
12.00	0.93052	0.00061	12.00	0.93259	0.00063	11.90	0.93033	0.00059
12.05	0.93387	0.00062	12.05	0.93547	0.00063	11.95	0.93362	0.00060
12.10	0.93700	0.00063	12.10	0.93840	0.00060	12.00	0.93687	0.00062
12.15	0.94041	0.00061	12.15	0.94180	0.00060	12.05	0.93995	0.00062
12.20	0.94275	0.00061	12.20	0.94467	0.00059	12.10	0.94505	0.00059
12.25	0.94688	0.00063	12.25	0.94850	0.00061	12.15	0.94738	0.00060
12.30	0.95131	0.00062	12.30	0.95234	0.00060	12.20	0.94899	0.00060
12.35	0.95378	0.00061	12.35	0.95588	0.00061	12.25	0.95374	0.00060
12.40	0.95780	0.00061	12.40	0.95807	0.00062	12.30	0.95709	0.00059
12.45	0.95993	0.00063	12.45	0.96201	0.00060	12.35	0.95957	0.00060
12.50	0.96404	0.00065	12.50	0.96507	0.00060	12.40	0.96206	0.00060
12.55	0.96795	0.00061	12.55	0.96766	0.00064	12.45	0.96593	0.00061
12.60	0.97005	0.00061	12.60	0.97102	0.00059	12.50	0.96987	0.00062
12.65	0.97467	0.00062	12.65	0.97505	0.00062	12.55	0.97220	0.00057
12.70	0.97756	0.00062	12.70	0.97668	0.00062	12.60	0.97456	0.00061
12.75	0.98016	0.00064	12.75	0.98052	0.00062	12.65	0.97830	0.00059
12.80	0.98263	0.00059	12.80	0.98351	0.00063	12.70	0.98231	0.00059
12.85	0.98599	0.00062	12.85	0.98706	0.00060	12.75	0.98549	0.00060
12.90	0.98933	0.00062	12.90	0.98958	0.00058	12.80	0.98786	0.00062
12.95	0.99189	0.00064	12.95	0.99271	0.00062	12.85	0.99130	0.00061
13.00	0.99580	0.00061	13.00	0.99524	0.00061	12.90	0.99339	0.00062
13.05	0.99763	0.00064	13.05	0.99904	0.00059	12.95	0.99588	0.00060
13.10	1.00118	0.00060	13.10	1.00180	0.00060	13.00	1.00138	0.00062
13.15	1.00399	0.00061	13.15	1.00394	0.00061	13.05	1.00254	0.00056
13.20	1.00664	0.00062	13.20	1.00777	0.00062	13.10	1.00496	0.00061
13.25	1.01121	0.00062	13.25	1.01080	0.00062	13.15	1.00826	0.00060
13.30	1.01297	0.00059	13.30	1.01364	0.00063	13.20	1.00981	0.00061
13.35	1.01752	0.00064	13.35	1.01685	0.00059	13.25	1.01449	0.00060
13.40	1.02091	0.00062	13.40	1.01864	0.00063	13.30	1.01734	0.00058
						13.35	1.01946	0.00061
						13.40	1.02269	0.00061

Table B.1.1.2.1-2. K_{eff} Values for Plutonium Sphere(97% ^{239}Pu) - 0 Inches of Water Reflection (cont)

750 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.50	0.91908	0.00058	11.20	0.91743	0.00059	10.60	0.91437	0.00058
11.55	0.92241	0.00059	11.25	0.92070	0.00058	10.65	0.91877	0.00056
11.60	0.92533	0.00059	11.30	0.92329	0.00058	10.70	0.92260	0.00057
11.65	0.92914	0.00060	11.35	0.92668	0.00059	10.75	0.92599	0.00058
11.70	0.93137	0.00061	11.40	0.93108	0.00059	10.80	0.93042	0.00058
11.75	0.93593	0.00060	11.45	0.93367	0.00061	10.85	0.93216	0.00055
11.80	0.94021	0.00061	11.50	0.93715	0.00059	10.90	0.93654	0.00057
11.85	0.94235	0.00058	11.55	0.94085	0.00059	10.95	0.94205	0.00059
11.90	0.94499	0.00059	11.60	0.94454	0.00058	11.00	0.94495	0.00059
11.95	0.94969	0.00060	11.65	0.94771	0.00059	11.05	0.94847	0.00057
12.00	0.95238	0.00061	11.70	0.95104	0.00060	11.10	0.95265	0.00057
12.05	0.95552	0.00060	11.75	0.95540	0.00058	11.15	0.95587	0.00057
12.10	0.95865	0.00059	11.80	0.95638	0.00061	11.20	0.95927	0.00057
12.15	0.96108	0.00062	11.85	0.96158	0.00059	11.25	0.96307	0.00057
12.20	0.96460	0.00060	11.90	0.96461	0.00059	11.30	0.96558	0.00059
12.25	0.96903	0.00059	11.95	0.96712	0.00058	11.35	0.96828	0.00058
12.30	0.97072	0.00061	12.00	0.97166	0.00058	11.40	0.97300	0.00054
12.35	0.97386	0.00061	12.05	0.97453	0.00061	11.45	0.97679	0.00059
12.40	0.97721	0.00059	12.10	0.97765	0.00060	11.50	0.98035	0.00057
12.45	0.98015	0.00059	12.15	0.98056	0.00059	11.55	0.98341	0.00057
12.50	0.98439	0.00059	12.20	0.98375	0.00060	11.60	0.98679	0.00060
12.55	0.98733	0.00059	12.25	0.98843	0.00060	11.65	0.99046	0.00057
12.60	0.99005	0.00061	12.30	0.98973	0.00060	11.70	0.99387	0.00059
12.65	0.99216	0.00059	12.35	0.99393	0.00058	11.75	0.99716	0.00059
12.70	0.99587	0.00059	12.40	0.99522	0.00060	11.80	0.99990	0.00060
12.75	0.99861	0.00061	12.45	1.00002	0.00059	11.85	1.00375	0.00059
12.80	1.00137	0.00059	12.50	1.00154	0.00060	11.90	1.00593	0.00058
12.85	1.00402	0.00058	12.55	1.00640	0.00058	11.95	1.00854	0.00061
12.90	1.00717	0.00059	12.60	1.00864	0.00058	12.00	1.01225	0.00060
12.95	1.01108	0.00059	12.65	1.01183	0.00061	12.05	1.01534	0.00059
13.00	1.01386	0.00059	12.70	1.01475	0.00061	12.10	1.02031	0.00059
13.05	1.01641	0.00058	12.75	1.01758	0.00059	12.15	1.02300	0.00058
13.10	1.01904	0.00062	12.80	1.01997	0.00058	12.20	1.02623	0.00058

Table B.1.1.2.1-2. K_{eff} Values for Plutonium Sphere(97% ^{239}Pu) - 0 Inches of Water Reflection (cont)

2000 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.10	0.91781	0.00058	9.60	0.91732	0.00054	9.20	0.92020	0.00055
10.15	0.92283	0.00057	9.65	0.91990	0.00055	9.25	0.92514	0.00054
10.20	0.92640	0.00057	9.70	0.92575	0.00056	9.30	0.92920	0.00054
10.25	0.93068	0.00058	9.75	0.92996	0.00056	9.35	0.93339	0.00054
10.30	0.93412	0.00056	9.80	0.93365	0.00058	9.40	0.93780	0.00057
10.35	0.93743	0.00057	9.85	0.93790	0.00058	9.45	0.94232	0.00055
10.40	0.94225	0.00058	9.90	0.94216	0.00055	9.50	0.94673	0.00056
10.45	0.94561	0.00057	9.95	0.94598	0.00056	9.55	0.95082	0.00056
10.50	0.94953	0.00058	10.00	0.94971	0.00056	9.60	0.95594	0.00056
10.55	0.95317	0.00056	10.05	0.95484	0.00056	9.65	0.96092	0.00055
10.60	0.95790	0.00055	10.10	0.95870	0.00056	9.70	0.96462	0.00056
10.65	0.96044	0.00056	10.15	0.96356	0.00057	9.75	0.96863	0.00057
10.70	0.96559	0.00057	10.20	0.96667	0.00055	9.80	0.97292	0.00054
10.75	0.96805	0.00056	10.25	0.97177	0.00054	9.85	0.97827	0.00056
10.80	0.97184	0.00057	10.30	0.97580	0.00056	9.90	0.98196	0.00057
10.85	0.97504	0.00057	10.35	0.97881	0.00057	9.95	0.98504	0.00056
10.90	0.97906	0.00058	10.40	0.98459	0.00058	10.00	0.99081	0.00058
10.95	0.98473	0.00058	10.45	0.98789	0.00057	10.05	0.99448	0.00056
11.00	0.98771	0.00057	10.50	0.99148	0.00057	10.10	0.99919	0.00056
11.05	0.98989	0.00058	10.55	0.99450	0.00056	10.15	1.00270	0.00054
11.10	0.99463	0.00057	10.60	1.00100	0.00056	10.20	1.00647	0.00055
11.15	0.99755	0.00056	10.65	1.00297	0.00058	10.25	1.01020	0.00054
11.20	1.00218	0.00057	10.70	1.00774	0.00055	10.30	1.01396	0.00056
11.25	1.00624	0.00058	10.75	1.00989	0.00057	10.35	1.01890	0.00058
11.30	1.00887	0.00056	10.80	1.01423	0.00058	10.40	1.02239	0.00058
11.35	1.01240	0.00057	10.85	1.01840	0.00057			
11.40	1.01557	0.00057	10.90	1.02190	0.00058			
11.45	1.02007	0.00057						
11.50	1.02295	0.00058						

Table B.1.1.2.1-2. K_{eff} Values for Plutonium Sphere(97% ^{239}Pu) - 0 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.40	0.91414	0.00054	7.80	0.91477	0.00050	6.70	0.92297	0.00044
8.45	0.91946	0.00056	7.85	0.92051	0.00051	6.75	0.92892	0.00046
8.50	0.92307	0.00052	7.90	0.92563	0.00050	6.80	0.93559	0.00046
8.55	0.92968	0.00054	7.95	0.93139	0.00052	6.85	0.94284	0.00047
8.60	0.93411	0.00054	8.00	0.93667	0.00050	6.90	0.94973	0.00046
8.65	0.94002	0.00051	8.05	0.94249	0.00052	6.95	0.95673	0.00047
8.70	0.94459	0.00055	8.10	0.94805	0.00054	7.00	0.96289	0.00049
8.75	0.94908	0.00055	8.15	0.95333	0.00052	7.05	0.96855	0.00048
8.80	0.95465	0.00054	8.20	0.95887	0.00053	7.10	0.97505	0.00047
8.85	0.95920	0.00054	8.25	0.96357	0.00054	7.15	0.98221	0.00048
8.90	0.96433	0.00053	8.30	0.96917	0.00053	7.20	0.98864	0.00049
8.95	0.96917	0.00054	8.35	0.97465	0.00052	7.25	0.99410	0.00047
9.00	0.97394	0.00055	8.40	0.97906	0.00053	7.30	1.00134	0.00047
9.05	0.97831	0.00055	8.45	0.98583	0.00050	7.35	1.00637	0.00050
9.10	0.98391	0.00056	8.50	0.99077	0.00052	7.40	1.01439	0.00050
9.15	0.98736	0.00056	8.55	0.99555	0.00053	7.45	1.01945	0.00049
9.20	0.99315	0.00054	8.60	1.00047	0.00052	7.50	1.02517	0.00050
9.25	0.99751	0.00053	8.65	1.00645	0.00052			
9.30	1.00240	0.00055	8.70	1.01054	0.00052			
9.35	1.00703	0.00054	8.75	1.01652	0.00053			
9.40	1.01197	0.00055	8.80	1.02041	0.00054			
9.45	1.01682	0.00055						
9.50	1.02182	0.00053						

Table B.1.1.2.1-2. K_{eff} Values for Plutonium Sphere(97% ^{239}Pu) - 0 Inches of Water Reflection (cont)

10000 milli-g/cc			15000 milli-g/cc			19600 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.80	0.92081	0.00041	4.40	0.90466	0.00034	3.60	0.91809	0.00032
5.85	0.92850	0.00042	4.45	0.91404	0.00035	3.62	0.92254	0.00033
5.90	0.93644	0.00041	4.50	0.92440	0.00034	3.64	0.92701	0.00034
5.95	0.94341	0.00041	4.55	0.93220	0.00034	3.66	0.93237	0.00032
6.00	0.95047	0.00042	4.60	0.94160	0.00034	3.68	0.93604	0.00033
6.05	0.95865	0.00041	4.65	0.95079	0.00035	3.70	0.94012	0.00032
6.10	0.96553	0.00042	4.70	0.96024	0.00037	3.72	0.94441	0.00034
6.15	0.97344	0.00042	4.75	0.96868	0.00037	3.74	0.94979	0.00034
6.20	0.98017	0.00044	4.80	0.97932	0.00036	3.76	0.95373	0.00034
6.25	0.98803	0.00043	4.85	0.98754	0.00037	3.78	0.95802	0.00033
6.30	0.99474	0.00043	4.90	0.99656	0.00037	3.80	0.96246	0.00034
6.35	1.00222	0.00042	4.95	1.00486	0.00038	3.82	0.96657	0.00034
6.40	1.00998	0.00043	5.00	1.01531	0.00037	3.84	0.96989	0.00033
6.45	1.01733	0.00043	5.05	1.02342	0.00037	3.86	0.97539	0.00034
6.50	1.02437	0.00043	5.10	1.03244	0.00036	3.88	0.97940	0.00035
						3.90	0.98383	0.00034
						3.92	0.98784	0.00035
						3.94	0.99298	0.00034
						3.96	0.99742	0.00034
						3.98	1.00124	0.00035
						4.00	1.00527	0.00036
						4.02	1.00907	0.00035
						4.04	1.01408	0.00036
						4.06	1.01817	0.00035
						4.08	1.02320	0.00035
						4.10	1.02719	0.00036

B.1.1.2.2. 1” Water Reflector

Case ID: pu-sp-0970-01

Material: Plutonium metal in water

Geometry: Sphere

Isotopics: 97% ^{239}Pu 3% ^{240}Pu

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.1.1.2.2-1. Plutonium Sphere (97% ^{239}Pu) - 1 Inch of Water Reflection

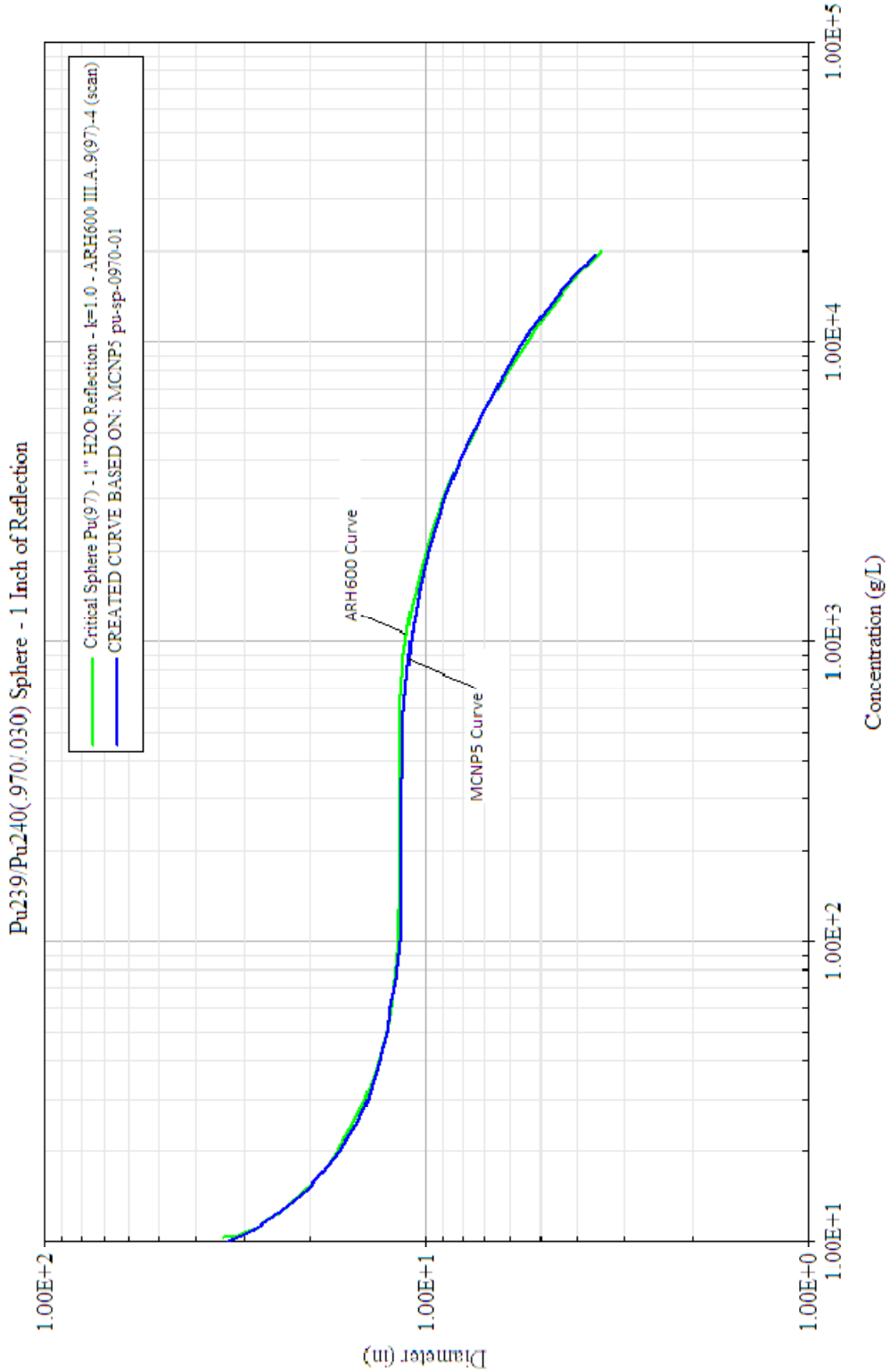

Table B.1.1.2.2-1. Critical Dimensions for Plutonium Sphere (97% ^{239}Pu) - 1 Inch of Water Reflection

Plutonium Sphere (97% ^{239}Pu)- 1 Inch of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	25.100	35.400	0.500	33.1122
0.011	22.400	29.500	0.300	28.0822
0.012	20.400	26.100	0.200	25.0725
0.015	17.200	20.900	0.100	20.1973
0.020	14.700	17.300	0.100	16.7584
0.025	13.400	15.600	0.100	15.1311
0.030	12.600	14.600	0.100	14.1920
0.040	11.700	13.500	0.100	13.1337
0.050	11.200	12.900	0.050	12.5713
0.075	10.700	12.300	0.050	11.9327
0.100	10.500	12.000	0.050	11.6863
0.150	10.300	11.900	0.050	11.5335
0.200	10.300	11.900	0.050	11.5167
0.350	10.300	11.900	0.050	11.5190
0.500	10.200	11.800	0.050	11.4636
0.750	10.000	11.600	0.050	11.2453
1.000	9.800	11.300	0.050	10.9708
1.500	9.300	10.700	0.050	10.3796
2.000	8.800	10.100	0.050	9.8259
2.500	8.400	9.600	0.050	9.3171
3.000	7.900	9.100	0.050	8.8745
4.000	7.300	8.400	0.050	8.1203
5.000	6.800	7.700	0.050	7.5149
7.500	5.800	6.600	0.050	6.3654
10.000	5.000	5.700	0.050	5.5399
15.000	3.900	4.500	0.050	4.3556
19.600	3.200	3.700	0.020	3.5845

MCNP5 Sample Input File
97% Pu Sphere- 1 Inch of Reflection

```
Pu sphere, 97.0 wt% 239Pu, 02000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 925   hundreths of inches - must be integer
c radius =    11.7475 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 02000 milli-g Pu/cc
c Reflector width =  1.0 inches
c Enrichment = 0.97 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 239Pu  = 239.05220
c Pu240  = 240.05380
c
c Effective Plutonium atomic mass 239.08225
c PuO2
c Mass fraction of Pu in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.1020 cc
c Volume of water in sample 0.8980 cc
c
c Mass of crit in sample   2.0000 g
c Mass of Pu in sample   2.0000 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.8980 g
c
c Total mass of sample  2.8980g for a 1cc sample
c Mass Density for crit material  -2.8980, expressed as negative
c
c  plane
20 11   -2.897959   -1   imp:n=1
21  2  -1.000                    -2 1   imp:n=1    $zero importance if no reflector
22  0                             2   imp:n=0
```

```
1       so    11.7475              $ plane
2       so    14.2875        $ Reflection

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu / water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 02000 milli-g Pu/cc,  2.8980
1001.66c -0.034672
8016.66c -0.275188      $from water
94239.66c -0.669437
94240.66c -0.020704
mt11     lwtr.60t
c
c    pu only
m12    $ Pu, 100.0 wt% 235U, 02000 milli-g U/cc,  2.8980
94239.66c -0.669437
94240.66c -0.020704
c
```

Critview Compatible Data File
97% Pu Sphere- 1 Inch of Reflection

reset:
title: MCNP5 pu-sp-0970-01
set: MCNP5 set
source: MCNP5 primary
created: Mon 08/02/2010 12:47:59.40
geometry: sphere
modmat: H2O
critmat: plutonium
isomat: Pu239 0.970 Pu240 0.030
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	33.1122
0.011	28.0822
0.012	25.0725
0.015	20.1973
0.020	16.7584
0.025	15.1311
0.030	14.1920
0.040	13.1337
0.050	12.5713
0.075	11.9327
0.100	11.6863
0.150	11.5335
0.200	11.5167
0.350	11.5190
0.500	11.4636
0.750	11.2453
1.000	10.9708
1.500	10.3796
2.000	9.8259
2.500	9.3171
3.000	8.8745
4.000	8.1203
5.000	7.5149
7.500	6.3654
10.00	5.5399
15.00	4.3556
19.60	3.5845

Table B.1.1.2.2-2. K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) - 1 Inch of Water Reflection

10 milli-g/cc			11 milli-g/cc			12 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
25.10	0.92569	0.00031	22.40	0.92581	0.00033	20.40	0.92334	0.00036
25.60	0.93113	0.00032	22.70	0.93043	0.00034	20.60	0.92747	0.00035
26.10	0.93761	0.00031	23.00	0.93574	0.00033	20.80	0.93151	0.00036
26.60	0.94351	0.00031	23.30	0.93969	0.00034	21.00	0.93483	0.00035
27.10	0.94896	0.00031	23.60	0.94539	0.00033	21.20	0.93886	0.00036
27.60	0.95416	0.00031	23.90	0.94823	0.00033	21.40	0.94191	0.00036
28.10	0.96023	0.00031	24.20	0.95323	0.00033	21.60	0.94534	0.00036
28.60	0.96358	0.00030	24.50	0.95721	0.00034	21.80	0.94906	0.00036
29.10	0.96870	0.00030	24.80	0.96172	0.00033	22.00	0.95316	0.00036
29.60	0.97295	0.00029	25.10	0.96594	0.00032	22.20	0.95661	0.00036
30.10	0.97712	0.00028	25.40	0.96937	0.00032	22.40	0.96015	0.00036
30.60	0.98160	0.00029	25.70	0.97259	0.00032	22.60	0.96326	0.00035
31.10	0.98547	0.00028	26.00	0.97701	0.00032	22.80	0.96663	0.00035
31.60	0.99000	0.00029	26.30	0.98101	0.00032	23.00	0.96995	0.00036
32.10	0.99353	0.00029	26.60	0.98298	0.00031	23.20	0.97280	0.00034
32.60	0.99677	0.00027	26.90	0.98751	0.00032	23.40	0.97577	0.00034
33.10	0.99992	0.00029	27.20	0.99022	0.00031	23.60	0.97932	0.00035
33.60	1.00319	0.00028	27.50	0.99344	0.00031	23.80	0.98218	0.00035
34.10	1.00685	0.00027	27.80	0.99698	0.00031	24.00	0.98519	0.00034
34.60	1.00966	0.00028	28.10	1.00019	0.00031	24.20	0.98841	0.00034
35.10	1.01233	0.00027	28.40	1.00298	0.00031	24.40	0.99055	0.00035
35.40	1.01528	0.00028	28.70	1.00510	0.00031	24.60	0.99391	0.00034
			29.00	1.00784	0.00030	24.80	0.99615	0.00034
			29.30	1.01134	0.00030	25.00	0.99893	0.00033
			29.50	1.01250	0.00031	25.20	1.00188	0.00034
						25.40	1.00364	0.00034
						25.60	1.00689	0.00034
						25.80	1.00959	0.00034
						26.00	1.01195	0.00034
						26.10	1.01375	0.00033

Table B.1.1.2.2-2. K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

15 milli-g/cc			20 milli-g/cc			25 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.20	0.92422	0.00042	14.70	0.92408	0.00045	13.40	0.92255	0.00049
17.30	0.92684	0.00042	14.80	0.92820	0.00045	13.50	0.92663	0.00050
17.40	0.92902	0.00039	14.90	0.93246	0.00047	13.60	0.93269	0.00048
17.50	0.93391	0.00040	15.00	0.93634	0.00047	13.70	0.93695	0.00047
17.60	0.93510	0.00041	15.10	0.94117	0.00047	13.80	0.94179	0.00049
17.70	0.93898	0.00040	15.20	0.94352	0.00047	13.90	0.94709	0.00047
17.80	0.94129	0.00041	15.30	0.94748	0.00047	14.00	0.95046	0.00049
17.90	0.94421	0.00040	15.40	0.95153	0.00047	14.10	0.95527	0.00047
18.00	0.94645	0.00039	15.50	0.95591	0.00044	14.20	0.95996	0.00048
18.10	0.94963	0.00040	15.60	0.95854	0.00044	14.30	0.96442	0.00049
18.20	0.95239	0.00041	15.70	0.96244	0.00045	14.40	0.96893	0.00049
18.30	0.95475	0.00040	15.80	0.96650	0.00045	14.50	0.97303	0.00049
18.40	0.95653	0.00041	15.90	0.96968	0.00045	14.60	0.97692	0.00048
18.50	0.95964	0.00040	16.00	0.97339	0.00046	14.70	0.98100	0.00049
18.60	0.96191	0.00041	16.10	0.97764	0.00044	14.80	0.98515	0.00050
18.70	0.96422	0.00040	16.20	0.98053	0.00046	14.90	0.99043	0.00049
18.80	0.96756	0.00040	16.30	0.98357	0.00044	15.00	0.99344	0.00049
18.90	0.97044	0.00040	16.40	0.98711	0.00044	15.10	0.99905	0.00047
19.00	0.97299	0.00040	16.50	0.99093	0.00044	15.20	1.00210	0.00048
19.10	0.97430	0.00040	16.60	0.99471	0.00046	15.30	1.00689	0.00049
19.20	0.97739	0.00040	16.70	0.99749	0.00046	15.40	1.00946	0.00048
19.30	0.97986	0.00042	16.80	1.00179	0.00045	15.50	1.01456	0.00048
19.40	0.98250	0.00037	16.90	1.00371	0.00044	15.60	1.01789	0.00048
19.50	0.98405	0.00042	17.00	1.00722	0.00045			
19.60	0.98748	0.00041	17.10	1.01086	0.00046			
19.70	0.98895	0.00041	17.20	1.01395	0.00045			
19.80	0.99177	0.00039	17.30	1.01706	0.00045			
19.90	0.99456	0.00042						
20.00	0.99541	0.00039						
20.10	0.99854	0.00040						
20.20	1.00004	0.00040						
20.30	1.00208	0.00038						
20.40	1.00457	0.00039						
20.50	1.00674	0.00039						
20.60	1.00928	0.00040						
20.70	1.01099	0.00041						
20.80	1.01314	0.00040						
20.90	1.01456	0.00039						

Table B.1.1.2.2-2. K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

30 milli-g/cc			40 milli-g/cc			50 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.60	0.92060	0.00051	11.70	0.91807	0.00054	11.20	0.91671	0.00055
12.70	0.92618	0.00050	11.80	0.92537	0.00055	11.25	0.92007	0.00055
12.80	0.93127	0.00053	11.90	0.92996	0.00054	11.30	0.92227	0.00055
12.90	0.93664	0.00052	12.00	0.93752	0.00055	11.35	0.92638	0.00056
13.00	0.94221	0.00051	12.10	0.94325	0.00054	11.40	0.92970	0.00055
13.10	0.94719	0.00051	12.20	0.94873	0.00054	11.45	0.93217	0.00056
13.20	0.95272	0.00051	12.30	0.95498	0.00054	11.50	0.93647	0.00055
13.30	0.95653	0.00052	12.40	0.96061	0.00053	11.55	0.94047	0.00057
13.40	0.96146	0.00051	12.50	0.96566	0.00055	11.60	0.94261	0.00057
13.50	0.96745	0.00051	12.60	0.97206	0.00054	11.65	0.94646	0.00059
13.60	0.97231	0.00051	12.70	0.97709	0.00057	11.70	0.94831	0.00054
13.70	0.97694	0.00053	12.80	0.98323	0.00053	11.75	0.95185	0.00056
13.80	0.98193	0.00051	12.90	0.98843	0.00054	11.80	0.95434	0.00054
13.90	0.98643	0.00053	13.00	0.99327	0.00053	11.85	0.95944	0.00055
14.00	0.99233	0.00051	13.10	0.99835	0.00055	11.90	0.96073	0.00057
14.10	0.99531	0.00051	13.20	1.00325	0.00055	11.95	0.96378	0.00058
14.20	1.00041	0.00051	13.30	1.01004	0.00054	12.00	0.96766	0.00056
14.30	1.00605	0.00051	13.40	1.01422	0.00054	12.05	0.97050	0.00057
14.40	1.01053	0.00051	13.50	1.01911	0.00055	12.10	0.97370	0.00056
14.50	1.01353	0.00051				12.15	0.97510	0.00056
14.60	1.01800	0.00052				12.20	0.97939	0.00058
						12.25	0.98268	0.00056
						12.30	0.98472	0.00056
						12.35	0.98863	0.00056
						12.40	0.98958	0.00056
						12.45	0.99324	0.00055
						12.50	0.99759	0.00057
						12.55	0.99800	0.00056
						12.60	1.00269	0.00055
						12.65	1.00464	0.00057
						12.70	1.00646	0.00057
						12.75	1.01147	0.00056
						12.80	1.01318	0.00055
						12.85	1.01586	0.00055
						12.90	1.01901	0.00055

Table B.1.1.2.2-2. K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

75 milli-g/cc			100 milli-g/cc			150 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.70	0.91913	0.00058	10.50	0.92019	0.00060	10.30	0.91658	0.00060
10.75	0.92421	0.00057	10.55	0.92423	0.00058	10.35	0.92043	0.00059
10.80	0.92581	0.00056	10.60	0.92720	0.00058	10.40	0.92428	0.00060
10.85	0.93061	0.00059	10.65	0.93143	0.00059	10.45	0.92735	0.00060
10.90	0.93323	0.00057	10.70	0.93490	0.00058	10.50	0.93149	0.00059
10.95	0.93634	0.00059	10.75	0.93904	0.00059	10.55	0.93531	0.00060
11.00	0.94035	0.00057	10.80	0.94195	0.00058	10.60	0.93805	0.00059
11.05	0.94399	0.00058	10.85	0.94539	0.00057	10.65	0.94144	0.00059
11.10	0.94789	0.00059	10.90	0.94793	0.00058	10.70	0.94603	0.00058
11.15	0.95080	0.00058	10.95	0.95292	0.00057	10.75	0.94752	0.00058
11.20	0.95333	0.00056	11.00	0.95589	0.00059	10.80	0.95106	0.00059
11.25	0.95742	0.00056	11.05	0.95803	0.00059	10.85	0.95645	0.00057
11.30	0.96074	0.00058	11.10	0.96252	0.00060	10.90	0.95904	0.00061
11.35	0.96262	0.00060	11.15	0.96544	0.00060	10.95	0.96148	0.00059
11.40	0.96679	0.00056	11.20	0.96879	0.00059	11.00	0.96515	0.00060
11.45	0.96978	0.00059	11.25	0.97294	0.00060	11.05	0.96960	0.00061
11.50	0.97367	0.00056	11.30	0.97618	0.00060	11.10	0.97213	0.00060
11.55	0.97579	0.00056	11.35	0.97765	0.00061	11.15	0.97567	0.00060
11.60	0.97942	0.00059	11.40	0.98175	0.00059	11.20	0.97887	0.00059
11.65	0.98304	0.00059	11.45	0.98556	0.00059	11.25	0.98142	0.00058
11.70	0.98635	0.00058	11.50	0.98853	0.00060	11.30	0.98591	0.00061
11.75	0.98942	0.00057	11.55	0.99200	0.00058	11.35	0.98797	0.00060
11.80	0.99289	0.00057	11.60	0.99485	0.00060	11.40	0.99030	0.00059
11.85	0.99610	0.00058	11.65	0.99690	0.00058	11.45	0.99470	0.00060
11.90	0.99860	0.00058	11.70	1.00117	0.00059	11.50	0.99725	0.00060
11.95	1.00074	0.00057	11.75	1.00483	0.00058	11.55	1.00135	0.00061
12.00	1.00476	0.00058	11.80	1.00714	0.00059	11.60	1.00356	0.00060
12.05	1.00780	0.00058	11.85	1.01020	0.00058	11.65	1.00668	0.00060
12.10	1.01091	0.00057	11.90	1.01295	0.00060	11.70	1.00996	0.00060
12.15	1.01328	0.00057	11.95	1.01630	0.00059	11.75	1.01293	0.00061
12.20	1.01650	0.00060	12.00	1.01920	0.00061	11.80	1.01648	0.00059
12.25	1.01932	0.00057				11.85	1.01992	0.00059
12.30	1.02151	0.00055				11.90	1.02209	0.00058

Table B.1.1.2.2-2. K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.30	0.91962	0.00061	10.30	0.92005	0.00061	10.20	0.91922	0.00058
10.35	0.92241	0.00061	10.35	0.92493	0.00059	10.25	0.92259	0.00059
10.40	0.92640	0.00060	10.40	0.92808	0.00059	10.30	0.92559	0.00059
10.45	0.92995	0.00060	10.45	0.93167	0.00061	10.35	0.92983	0.00058
10.50	0.93331	0.00059	10.50	0.93416	0.00059	10.40	0.93358	0.00059
10.55	0.93778	0.00058	10.55	0.93853	0.00058	10.45	0.93625	0.00058
10.60	0.94114	0.00062	10.60	0.94221	0.00061	10.50	0.93949	0.00059
10.65	0.94352	0.00058	10.65	0.94511	0.00059	10.55	0.94310	0.00059
10.70	0.94664	0.00060	10.70	0.94957	0.00061	10.60	0.94579	0.00057
10.75	0.95100	0.00061	10.75	0.95143	0.00060	10.65	0.94795	0.00059
10.80	0.95342	0.00057	10.80	0.95429	0.00059	10.70	0.95301	0.00057
10.85	0.95675	0.00060	10.85	0.95865	0.00059	10.75	0.95723	0.00059
10.90	0.96052	0.00059	10.90	0.96058	0.00059	10.80	0.95920	0.00058
10.95	0.96336	0.00059	10.95	0.96432	0.00058	10.85	0.96235	0.00058
11.00	0.96702	0.00061	11.00	0.96734	0.00060	10.90	0.96591	0.00058
11.05	0.97022	0.00059	11.05	0.97140	0.00058	10.95	0.96801	0.00061
11.10	0.97450	0.00059	11.10	0.97333	0.00059	11.00	0.97245	0.00061
11.15	0.97565	0.00061	11.15	0.97767	0.00059	11.05	0.97392	0.00061
11.20	0.98095	0.00061	11.20	0.98049	0.00060	11.10	0.97815	0.00060
11.25	0.98288	0.00061	11.25	0.98373	0.00060	11.15	0.98049	0.00059
11.30	0.98766	0.00060	11.30	0.98697	0.00058	11.20	0.98379	0.00059
11.35	0.98854	0.00060	11.35	0.98958	0.00059	11.25	0.98687	0.00058
11.40	0.99302	0.00059	11.40	0.99176	0.00059	11.30	0.99021	0.00060
11.45	0.99673	0.00058	11.45	0.99560	0.00059	11.35	0.99273	0.00058
11.50	0.99919	0.00060	11.50	0.99891	0.00059	11.40	0.99620	0.00062
11.55	1.00162	0.00059	11.55	1.00178	0.00059	11.45	0.99882	0.00057
11.60	1.00415	0.00060	11.60	1.00458	0.00061	11.50	1.00316	0.00061
11.65	1.00825	0.00059	11.65	1.00877	0.00061	11.55	1.00493	0.00058
11.70	1.01163	0.00060	11.70	1.01073	0.00058	11.60	1.00713	0.00061
11.75	1.01460	0.00059	11.75	1.01333	0.00058	11.65	1.01125	0.00058
11.80	1.01737	0.00058	11.80	1.01615	0.00060	11.70	1.01427	0.00058
11.85	1.02078	0.00059	11.85	1.01955	0.00058	11.75	1.01671	0.00059
11.90	1.02396	0.00060	11.90	1.02250	0.00058	11.80	1.01818	0.00058

Table B.1.1.2.2-2. K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

750 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.00	0.91857	0.00058	9.80	0.92270	0.00059	9.30	0.92105	0.00056
10.05	0.92198	0.00058	9.85	0.92559	0.00058	9.35	0.92600	0.00058
10.10	0.92610	0.00057	9.90	0.92867	0.00058	9.40	0.93012	0.00056
10.15	0.92824	0.00057	9.95	0.93245	0.00059	9.45	0.93289	0.00057
10.20	0.93232	0.00059	10.00	0.93600	0.00057	9.50	0.93707	0.00059
10.25	0.93632	0.00058	10.05	0.93891	0.00058	9.55	0.94177	0.00059
10.30	0.93887	0.00058	10.10	0.94134	0.00058	9.60	0.94403	0.00058
10.35	0.94299	0.00058	10.15	0.94539	0.00058	9.65	0.94826	0.00056
10.40	0.94574	0.00060	10.20	0.94934	0.00059	9.70	0.95164	0.00058
10.45	0.94866	0.00057	10.25	0.95215	0.00057	9.75	0.95603	0.00057
10.50	0.95241	0.00056	10.30	0.95604	0.00058	9.80	0.96074	0.00058
10.55	0.95592	0.00058	10.35	0.96003	0.00060	9.85	0.96248	0.00058
10.60	0.95868	0.00061	10.40	0.96167	0.00058	9.90	0.96548	0.00059
10.65	0.96187	0.00061	10.45	0.96541	0.00058	9.95	0.96980	0.00057
10.70	0.96499	0.00059	10.50	0.96822	0.00059	10.00	0.97313	0.00058
10.75	0.96844	0.00059	10.55	0.97272	0.00060	10.05	0.97727	0.00057
10.80	0.97121	0.00059	10.60	0.97564	0.00057	10.10	0.98077	0.00057
10.85	0.97448	0.00056	10.65	0.97989	0.00059	10.15	0.98334	0.00058
10.90	0.97752	0.00058	10.70	0.98242	0.00059	10.20	0.98685	0.00056
10.95	0.98189	0.00057	10.75	0.98447	0.00058	10.25	0.99095	0.00057
11.00	0.98365	0.00057	10.80	0.98758	0.00060	10.30	0.99373	0.00059
11.05	0.98745	0.00059	10.85	0.99123	0.00059	10.35	0.99801	0.00056
11.10	0.99055	0.00059	10.90	0.99390	0.00058	10.40	1.00137	0.00057
11.15	0.99534	0.00058	10.95	0.99878	0.00060	10.45	1.00474	0.00058
11.20	0.99536	0.00058	11.00	1.00171	0.00058	10.50	1.00693	0.00059
11.25	1.00048	0.00058	11.05	1.00428	0.00057	10.55	1.01039	0.00058
11.30	1.00262	0.00057	11.10	1.00621	0.00058	10.60	1.01394	0.00057
11.35	1.00566	0.00059	11.15	1.01091	0.00057	10.65	1.01721	0.00058
11.40	1.00912	0.00058	11.20	1.01296	0.00058	10.70	1.02161	0.00058
11.45	1.01056	0.00058	11.25	1.01645	0.00058			
11.50	1.01352	0.00059	11.30	1.02014	0.00057			
11.55	1.01730	0.00060						
11.60	1.02008	0.00058						

Table B.1.1.2.2-2. K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

2000 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.80	0.92138	0.00055	8.40	0.92300	0.00058	7.90	0.91313	0.00056
8.85	0.92531	0.00057	8.45	0.92749	0.00056	7.95	0.91778	0.00057
8.90	0.92825	0.00058	8.50	0.93169	0.00058	8.00	0.92324	0.00056
8.95	0.93209	0.00059	8.55	0.93636	0.00057	8.05	0.92650	0.00055
9.00	0.93764	0.00056	8.60	0.94092	0.00056	8.10	0.93226	0.00058
9.05	0.94182	0.00057	8.65	0.94527	0.00058	8.15	0.93575	0.00056
9.10	0.94538	0.00057	8.70	0.94922	0.00056	8.20	0.94123	0.00056
9.15	0.94889	0.00057	8.75	0.95307	0.00057	8.25	0.94497	0.00056
9.20	0.95297	0.00055	8.80	0.95680	0.00057	8.30	0.94876	0.00056
9.25	0.95734	0.00057	8.85	0.96219	0.00057	8.35	0.95456	0.00056
9.30	0.96059	0.00057	8.90	0.96657	0.00057	8.40	0.95871	0.00056
9.35	0.96474	0.00056	8.95	0.97006	0.00055	8.45	0.96226	0.00055
9.40	0.96824	0.00056	9.00	0.97477	0.00058	8.50	0.96749	0.00056
9.45	0.97214	0.00057	9.05	0.97893	0.00054	8.55	0.97207	0.00056
9.50	0.97555	0.00058	9.10	0.98259	0.00057	8.60	0.97712	0.00056
9.55	0.97968	0.00058	9.15	0.98626	0.00057	8.65	0.98026	0.00056
9.60	0.98374	0.00056	9.20	0.99089	0.00059	8.70	0.98430	0.00056
9.65	0.98748	0.00057	9.25	0.99324	0.00058	8.75	0.98982	0.00057
9.70	0.99126	0.00057	9.30	0.99837	0.00057	8.80	0.99434	0.00056
9.75	0.99501	0.00057	9.35	1.00313	0.00058	8.85	0.99822	0.00055
9.80	0.99786	0.00056	9.40	1.00572	0.00056	8.90	1.00185	0.00057
9.85	1.00199	0.00055	9.45	1.00909	0.00058	8.95	1.00550	0.00056
9.90	1.00471	0.00056	9.50	1.01386	0.00057	9.00	1.01070	0.00057
9.95	1.00855	0.00058	9.55	1.01986	0.00057	9.05	1.01498	0.00057
10.00	1.01352	0.00056	9.60	1.02139	0.00056	9.10	1.01925	0.00055
10.05	1.01621	0.00057						
10.10	1.01944	0.00058						

Table B.1.1.2.2-2. K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.30	0.91823	0.00054	6.80	0.92133	0.00054	5.80	0.92375	0.00050
7.35	0.92317	0.00053	6.85	0.92650	0.00056	5.85	0.92977	0.00053
7.40	0.92778	0.00055	6.90	0.93298	0.00055	5.90	0.93694	0.00050
7.45	0.93338	0.00055	6.95	0.93827	0.00053	6.00	0.95125	0.00051
7.50	0.93746	0.00055	7.00	0.94392	0.00053	6.05	0.95781	0.00052
7.55	0.94367	0.00055	7.05	0.94913	0.00053	6.10	0.96447	0.00052
7.60	0.94767	0.00056	7.10	0.95436	0.00054	6.15	0.97158	0.00052
7.65	0.95345	0.00057	7.15	0.96090	0.00055	6.20	0.97786	0.00051
7.70	0.95813	0.00056	7.20	0.96532	0.00056	6.25	0.98456	0.00052
7.75	0.96464	0.00055	7.25	0.97086	0.00054	6.30	0.98994	0.00051
7.80	0.96888	0.00055	7.30	0.97733	0.00054	6.35	0.99857	0.00054
7.85	0.97293	0.00055	7.35	0.98299	0.00055	6.40	1.00320	0.00054
7.90	0.97855	0.00054	7.40	0.98751	0.00056	6.45	1.01077	0.00053
7.95	0.98442	0.00056	7.45	0.99406	0.00053	6.50	1.01609	0.00052
8.00	0.98837	0.00056	7.50	0.99854	0.00055	6.55	1.02396	0.00052
8.05	0.99219	0.00057	7.55	1.00345	0.00052	6.60	1.02971	0.00052
8.10	0.99791	0.00059	7.60	1.00985	0.00055			
8.15	1.00306	0.00057	7.65	1.01490	0.00054			
8.20	1.00776	0.00056	7.70	1.02042	0.00054			
8.25	1.01186	0.00056						
8.30	1.01709	0.00057						
8.35	1.02169	0.00056						
8.40	1.02632	0.00056						

Table B.1.1.2.2-2. K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

10000 milli-g/cc			15000 milli-g/cc			19600 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.00	0.91500	0.00047	3.90	0.90896	0.00040	3.20	0.90715	0.00037
5.05	0.92245	0.00046	3.95	0.91914	0.00040	3.22	0.91242	0.00038
5.10	0.93041	0.00047	4.00	0.92963	0.00042	3.24	0.91819	0.00038
5.15	0.93882	0.00047	4.05	0.93867	0.00043	3.26	0.92290	0.00038
5.20	0.94596	0.00048	4.10	0.94891	0.00042	3.28	0.92839	0.00037
5.25	0.95468	0.00049	4.15	0.96053	0.00042	3.30	0.93243	0.00039
5.30	0.96218	0.00048	4.20	0.96976	0.00042	3.32	0.93740	0.00039
5.35	0.97038	0.00048	4.25	0.97924	0.00042	3.34	0.94230	0.00037
5.40	0.97768	0.00048	4.30	0.98962	0.00044	3.36	0.94696	0.00038
5.45	0.98593	0.00049	4.35	0.99892	0.00044	3.38	0.95213	0.00038
5.50	0.99413	0.00050	4.40	1.00858	0.00043	3.40	0.95663	0.00039
5.55	1.00149	0.00048	4.45	1.01813	0.00045	3.42	0.96146	0.00040
5.60	1.00745	0.00049	4.50	1.02765	0.00042	3.44	0.96624	0.00039
5.65	1.01588	0.00048				3.46	0.97099	0.00040
5.70	1.02412	0.00049				3.48	0.97579	0.00038
						3.50	0.98143	0.00039
						3.52	0.98616	0.00039
						3.54	0.99039	0.00038
						3.56	0.99466	0.00041
						3.58	0.99871	0.00041
						3.60	1.00440	0.00040
						3.62	1.00837	0.00039
						3.64	1.01320	0.00042
						3.66	1.01769	0.00042
						3.68	1.02322	0.00041
						3.70	1.02706	0.00041

B.1.1.2.3. 10” Water Reflector

Case ID: pu-sp-0970-10

Material: Plutonium metal in water

Geometry: Sphere

Isotopics: 97% ^{239}Pu 3% ^{240}Pu

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.1.1.2.3-1. Plutonium Sphere (97% ^{239}Pu) – 10 Inches of Water Reflection

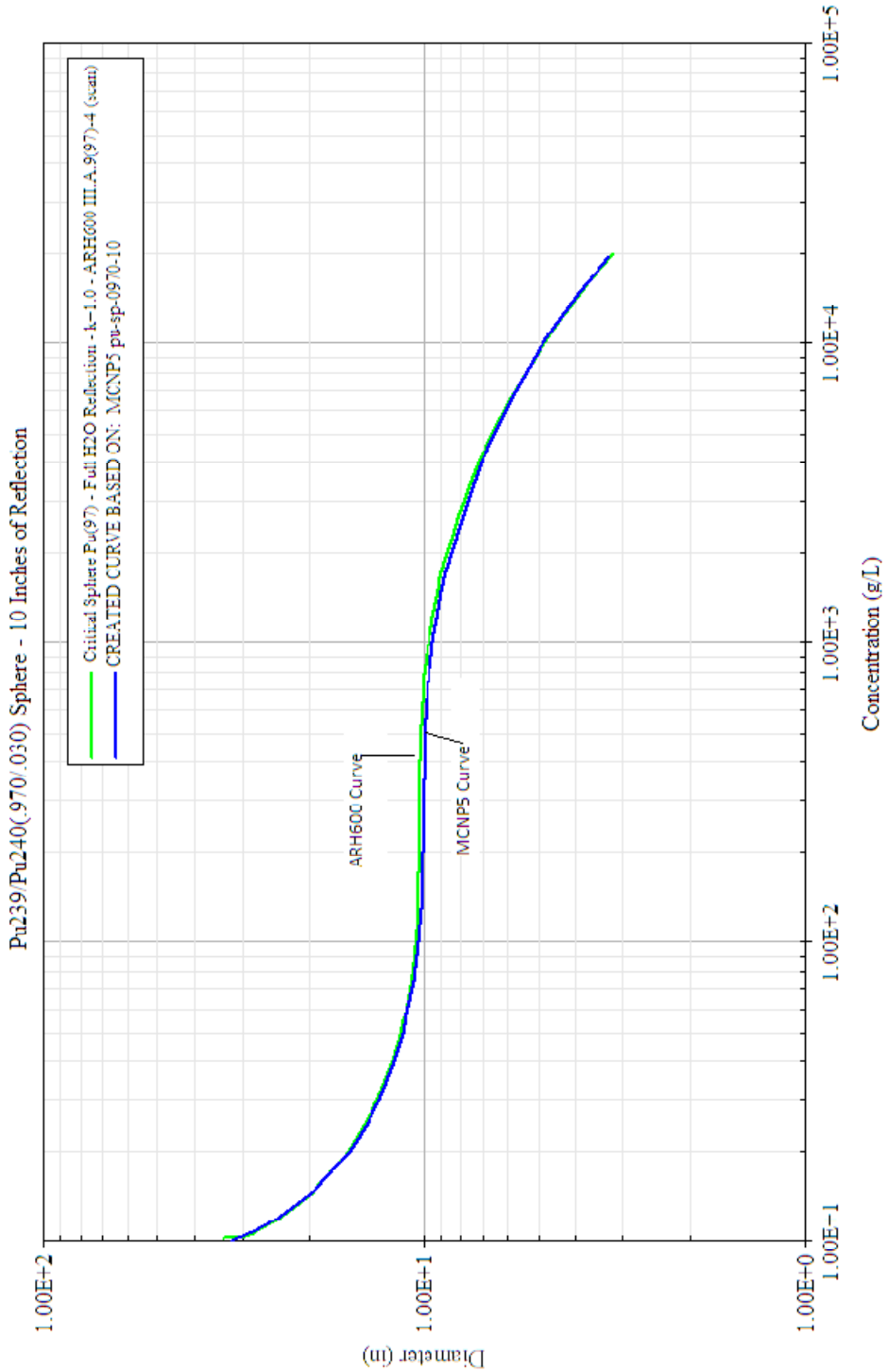

Table B.1.1.2.3-1. Critical Dimensions for Plutonium Sphere (97% ^{239}Pu) – 10 Inches of Water Reflection

Plutonium Sphere (97% ^{239}Pu) – 10 Inches of Water Reflection				
Concentrations (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	24.000	34.000	0.500	31.9986
0.011	21.300	28.400	0.300	27.0156
0.012	19.500	25.100	0.200	23.9957
0.015	16.100	19.800	0.100	19.1130
0.020	13.500	16.200	0.100	15.6728
0.025	12.300	14.500	0.100	13.9953
0.030	11.500	13.500	0.100	13.0251
0.040	10.600	12.300	0.050	11.9330
0.050	10.000	11.700	0.050	11.3346
0.075	9.400	11.000	0.050	10.6415
0.100	9.200	10.600	0.050	10.3379
0.150	9.000	10.500	0.050	10.1215
0.200	8.900	10.400	0.050	10.0544
0.350	8.800	10.300	0.050	9.9829
0.500	8.700	10.300	0.050	9.9067
0.750	8.500	10.000	0.050	9.7217
1.000	8.300	9.800	0.050	9.4419
1.500	7.900	9.200	0.050	8.9487
2.000	7.500	8.700	0.050	8.4771
2.500	7.100	8.300	0.050	8.0378
3.000	6.800	7.900	0.050	7.6712
4.000	6.300	7.300	0.050	7.0359
5.000	5.800	6.700	0.050	6.5291
7.500	5.000	5.800	0.050	5.5712
10.000	4.400	5.000	0.050	4.8809
15.000	3.500	4.000	0.020	3.8948
19.600	2.900	3.400	0.020	3.2531

MCNP5 Sample Input File
97% Pu Sphere- 10 Inches of Reflection

```
Pu sphere, 97.0 wt% 239Pu, 02000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 810   hundreths of inches - must be integer
c radius =    10.2870 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 02000 milli-g Pu/cc
c Reflector width = 10.0 inches
c Enrichment = 0.97 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 239Pu  = 239.05220
c Pu240  = 240.05380
c
c Effective Plutonium atomic mass 239.08225
c PuO2
c Mass fraction of Pu in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.1020 cc
c Volume of water in sample 0.8980 cc
c
c Mass of crit in sample   2.0000 g
c Mass of Pu in sample   2.0000 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.8980 g
c
c Total mass of sample  2.8980g for a 1cc sample
c Mass Density for crit material  -2.8980, expressed as negative
c
c  plane
20 11   -2.897959   -1   imp:n=1
21  2  -1.000                  -2 1   imp:n=1    $zero importance if no reflector
22  0                           2   imp:n=0
```

```
1       so    10.2870              $ plane
2       so    35.6870        $ Reflection

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu / water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 02000 milli-g Pu/cc,  2.8980
1001.66c -0.034672
8016.66c -0.275188      $from water
94239.66c -0.669437
94240.66c -0.020704
mt11     lwtr.60t
c
c    pu only
m12    $ Pu, 100.0 wt% 235U, 02000 milli-g U/cc,  2.8980
94239.66c -0.669437
94240.66c -0.020704
c
```

Critview Compatible Data File
97% Pu Sphere- 10 Inches of Reflection

reset:
title: MCNP5 pu-sp-0970-10
set: MCNP5 set
source: MCNP5 primary
created: Mon 08/02/2010 12:48:31.06
geometry: sphere
modmat: H2O
critmat: plutonium
isomat: Pu239 0.970 Pu240 0.030
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	31.9986
0.011	27.0156
0.012	23.9957
0.015	19.1130
0.020	15.6728
0.025	13.9953
0.030	13.0251
0.040	11.9330
0.050	11.3346
0.075	10.6415
0.100	10.3379
0.150	10.1215
0.200	10.0544
0.350	9.9829
0.500	9.9067
0.750	9.7217
1.000	9.4419
1.500	8.9487
2.000	8.4771
2.500	8.0378
3.000	7.6712
4.000	7.0359
5.000	6.5291
7.500	5.5712
10.00	4.8809
15.00	3.8948
19.60	3.2531

Table B.1.1.2.3-2. K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) – 10 Inches of Water Reflection

10 milli-g/cc			11 milli-g/cc			12 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
24.00	0.92536	0.00030	21.30	0.92531	0.00032	19.50	0.92688	0.00035
24.50	0.93115	0.00030	21.60	0.93094	0.00032	19.70	0.92969	0.00033
25.00	0.93765	0.00031	21.90	0.93462	0.00032	19.90	0.93427	0.00034
25.50	0.94345	0.00030	22.20	0.93959	0.00032	20.10	0.93835	0.00033
26.00	0.94948	0.00029	22.50	0.94477	0.00032	20.30	0.94160	0.00033
26.50	0.95344	0.00028	22.80	0.94851	0.00032	20.50	0.94547	0.00034
27.00	0.95946	0.00029	23.10	0.95286	0.00033	20.70	0.94925	0.00034
27.50	0.96336	0.00029	23.40	0.95670	0.00032	20.90	0.95255	0.00033
28.00	0.96807	0.00029	23.70	0.96121	0.00031	21.10	0.95708	0.00033
28.50	0.97334	0.00028	24.00	0.96557	0.00030	21.30	0.95988	0.00033
29.00	0.97762	0.00028	24.30	0.96906	0.00031	21.50	0.96230	0.00032
29.50	0.98184	0.00027	24.60	0.97271	0.00030	21.70	0.96640	0.00033
30.00	0.98484	0.00027	24.90	0.97656	0.00031	21.90	0.96979	0.00034
30.50	0.98942	0.00027	25.20	0.98003	0.00030	22.10	0.97288	0.00033
31.00	0.99258	0.00028	25.50	0.98311	0.00031	22.30	0.97623	0.00033
31.50	0.99634	0.00027	25.80	0.98627	0.00031	22.50	0.97948	0.00032
32.00	1.00001	0.00027	26.10	0.99035	0.00030	22.70	0.98194	0.00033
32.50	1.00320	0.00027	26.40	0.99341	0.00030	22.90	0.98502	0.00033
33.00	1.00649	0.00026	26.70	0.99747	0.00031	23.10	0.98857	0.00033
33.50	1.00906	0.00027	27.00	0.99984	0.00029	23.30	0.99105	0.00034
34.00	1.01228	0.00026	27.30	1.00292	0.00029	23.50	0.99339	0.00033
			27.60	1.00598	0.00030	23.70	0.99640	0.00032
			27.90	1.00865	0.00030	23.90	0.99867	0.00033
			28.20	1.01125	0.00029	24.10	1.00145	0.00033
			28.40	1.01351	0.00029	24.30	1.00483	0.00031
						24.50	1.00736	0.00033
						24.70	1.00952	0.00031
						24.90	1.01183	0.00032
						25.10	1.01529	0.00032

Table B.1.1.2.3-2. K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) – 10 Inches of Water Reflection (cont)

15 milli-g/cc			20 milli-g/cc			25 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
16.10	0.92292	0.00039	13.50	0.92015	0.00043	12.30	0.92332	0.00047
16.20	0.92618	0.00037	13.60	0.92437	0.00043	12.40	0.92794	0.00046
16.30	0.92993	0.00039	13.70	0.92827	0.00044	12.50	0.93284	0.00046
16.40	0.93156	0.00038	13.80	0.93214	0.00042	12.60	0.93754	0.00046
16.50	0.93443	0.00039	13.90	0.93572	0.00043	12.70	0.94235	0.00045
16.60	0.93821	0.00039	14.00	0.94046	0.00044	12.80	0.94827	0.00046
16.70	0.93997	0.00039	14.10	0.94376	0.00041	12.90	0.95133	0.00046
16.80	0.94318	0.00038	14.20	0.94810	0.00042	13.00	0.95725	0.00044
16.90	0.94603	0.00039	14.30	0.95177	0.00044	13.10	0.96141	0.00047
17.00	0.94841	0.00039	14.40	0.95551	0.00042	13.20	0.96597	0.00046
17.10	0.95205	0.00038	14.50	0.96084	0.00043	13.30	0.97075	0.00045
17.20	0.95558	0.00039	14.60	0.96305	0.00043	13.40	0.97478	0.00045
17.30	0.95717	0.00038	14.70	0.96725	0.00043	13.50	0.97893	0.00046
17.40	0.95894	0.00039	14.80	0.97042	0.00043	13.60	0.98275	0.00047
17.60	0.96403	0.00038	14.90	0.97403	0.00042	13.70	0.98700	0.00046
17.70	0.96755	0.00039	15.00	0.97768	0.00042	13.80	0.99127	0.00046
17.80	0.96968	0.00038	15.10	0.98235	0.00042	13.90	0.99611	0.00046
17.90	0.97257	0.00038	15.20	0.98427	0.00042	14.00	1.00019	0.00047
18.00	0.97543	0.00037	15.30	0.98795	0.00042	14.10	1.00388	0.00046
18.10	0.97733	0.00038	15.40	0.99165	0.00043	14.20	1.00721	0.00047
18.20	0.97975	0.00038	15.50	0.99429	0.00042	14.30	1.01137	0.00046
18.30	0.98175	0.00038	15.60	0.99773	0.00043	14.40	1.01560	0.00048
18.40	0.98464	0.00037	15.70	1.00085	0.00041	14.50	1.01980	0.00045
18.50	0.98666	0.00038	15.80	1.00455	0.00042			
18.60	0.99031	0.00037	15.90	1.00842	0.00042			
18.70	0.99197	0.00037	16.00	1.01180	0.00043			
18.80	0.99417	0.00037	16.10	1.01519	0.00042			
18.90	0.99628	0.00038	16.20	1.01860	0.00043			
19.00	0.99908	0.00037						
19.10	0.99958	0.00037						
19.20	1.00281	0.00037						
19.30	1.00422	0.00037						
19.40	1.00693	0.00037						
19.50	1.00928	0.00037						
19.60	1.01125	0.00038						
19.70	1.01363	0.00037						
19.80	1.01562	0.00037						

Table B.1.1.2.3-2 - K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) – 10 Inches of Water Reflection (cont)

30 milli-g/cc			40 milli-g/cc			50 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.50	0.92289	0.00047	10.60	0.92253	0.00049	10.00	0.91566	0.00052
11.60	0.92785	0.00047	10.65	0.92527	0.00051	10.05	0.91902	0.00051
11.70	0.93349	0.00047	10.70	0.92932	0.00051	10.10	0.92300	0.00051
11.80	0.93909	0.00049	10.75	0.93217	0.00049	10.15	0.92620	0.00051
11.90	0.94397	0.00049	10.80	0.93416	0.00051	10.20	0.92972	0.00051
12.00	0.94890	0.00049	10.85	0.93811	0.00052	10.25	0.93336	0.00052
12.10	0.95483	0.00050	10.90	0.94033	0.00052	10.30	0.93669	0.00052
12.20	0.95933	0.00048	10.95	0.94445	0.00051	10.35	0.93976	0.00052
12.30	0.96519	0.00046	11.00	0.94682	0.00049	10.40	0.94257	0.00052
12.40	0.96923	0.00048	11.05	0.94918	0.00051	10.45	0.94441	0.00053
12.50	0.97435	0.00048	11.10	0.95321	0.00052	10.50	0.94838	0.00052
12.60	0.97925	0.00049	11.15	0.95610	0.00050	10.55	0.95337	0.00052
12.70	0.98426	0.00048	11.20	0.95810	0.00050	10.60	0.95464	0.00053
12.80	0.98987	0.00047	11.25	0.96217	0.00051	10.65	0.95863	0.00052
12.90	0.99318	0.00048	11.30	0.96468	0.00051	10.70	0.96101	0.00052
13.00	0.99899	0.00047	11.35	0.96752	0.00050	10.75	0.96432	0.00053
13.10	1.00301	0.00047	11.40	0.97039	0.00051	10.80	0.96734	0.00050
13.20	1.00828	0.00050	11.45	0.97266	0.00050	10.85	0.97071	0.00051
13.30	1.01122	0.00050	11.50	0.97703	0.00052	10.90	0.97347	0.00052
13.40	1.01634	0.00047	11.55	0.97774	0.00049	10.95	0.97735	0.00050
13.50	1.02038	0.00049	11.60	0.98160	0.00050	11.00	0.97988	0.00052
			11.65	0.98349	0.00049	11.05	0.98244	0.00050
			11.70	0.98656	0.00052	11.10	0.98709	0.00053
			11.75	0.99051	0.00049	11.15	0.98824	0.00052
			11.80	0.99272	0.00051	11.20	0.99256	0.00052
			11.85	0.99561	0.00052	11.25	0.99443	0.00052
			11.90	0.99851	0.00049	11.30	0.99858	0.00054
			11.95	1.00077	0.00051	11.35	1.00063	0.00053
			12.00	1.00371	0.00049	11.40	1.00486	0.00053
			12.05	1.00709	0.00050	11.45	1.00649	0.00054
			12.10	1.00917	0.00051	11.50	1.00955	0.00053
			12.15	1.01184	0.00051	11.55	1.01136	0.00053
			12.20	1.01393	0.00051	11.60	1.01496	0.00050
			12.25	1.01644	0.00050	11.65	1.01835	0.00054
			12.30	1.01979	0.00049	11.70	1.01911	0.00053

Table B.1.1.2.3-2 - K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) – 10 Inches of Water Reflection (cont)

75 milli-g/cc			100 milli-g/cc			150 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.40	0.91683	0.00054	9.20	0.92082	0.00054	9.00	0.92070	0.00053
9.45	0.91915	0.00053	9.25	0.92522	0.00052	9.05	0.92615	0.00054
9.50	0.92483	0.00054	9.30	0.92886	0.00054	9.10	0.92929	0.00057
9.55	0.92766	0.00053	9.35	0.93229	0.00054	9.15	0.93295	0.00054
9.60	0.93076	0.00055	9.40	0.93572	0.00055	9.20	0.93573	0.00054
9.65	0.93438	0.00053	9.45	0.93936	0.00055	9.25	0.94036	0.00056
9.70	0.93862	0.00053	9.50	0.94241	0.00055	9.30	0.94290	0.00055
9.75	0.94025	0.00054	9.55	0.94677	0.00054	9.35	0.94673	0.00057
9.80	0.94508	0.00054	9.60	0.95025	0.00055	9.40	0.95135	0.00057
9.85	0.94833	0.00052	9.65	0.95333	0.00054	9.45	0.95454	0.00057
9.90	0.95190	0.00054	9.70	0.95628	0.00058	9.50	0.95815	0.00055
9.95	0.95419	0.00053	9.75	0.96067	0.00056	9.55	0.96265	0.00056
10.00	0.95816	0.00052	9.80	0.96358	0.00055	9.60	0.96562	0.00054
10.05	0.96234	0.00052	9.85	0.96747	0.00056	9.65	0.96909	0.00055
10.10	0.96442	0.00054	9.90	0.97081	0.00056	9.70	0.97155	0.00056
10.15	0.96841	0.00053	9.95	0.97412	0.00054	9.75	0.97438	0.00056
10.20	0.97165	0.00055	10.00	0.97662	0.00054	9.80	0.97769	0.00055
10.25	0.97450	0.00053	10.05	0.98082	0.00055	9.85	0.98288	0.00056
10.30	0.97762	0.00053	10.10	0.98410	0.00054	9.90	0.98531	0.00056
10.35	0.98252	0.00055	10.15	0.98752	0.00054	9.95	0.98884	0.00056
10.40	0.98508	0.00054	10.20	0.99041	0.00055	10.00	0.99256	0.00056
10.45	0.98764	0.00054	10.25	0.99376	0.00056	10.05	0.99541	0.00055
10.50	0.99092	0.00054	10.30	0.99710	0.00055	10.10	0.99895	0.00055
10.55	0.99442	0.00054	10.35	1.00093	0.00053	10.15	1.00139	0.00054
10.60	0.99633	0.00054	10.40	1.00329	0.00055	10.20	1.00520	0.00054
10.65	1.00075	0.00054	10.45	1.00680	0.00053	10.25	1.00811	0.00055
10.70	1.00485	0.00053	10.50	1.01042	0.00055	10.30	1.01125	0.00058
10.75	1.00743	0.00055	10.55	1.01251	0.00055	10.35	1.01518	0.00055
10.80	1.00934	0.00054	10.60	1.01573	0.00056	10.40	1.01655	0.00056
10.85	1.01349	0.00055				10.45	1.02162	0.00055
10.90	1.01570	0.00055				10.50	1.02444	0.00057
10.95	1.01972	0.00055						
11.00	1.02237	0.00055						

Table B.1.1.2.3-2 - K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) – 10 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.90	0.92153	0.00054	8.80	0.92091	0.00055	8.70	0.91993	0.00055
8.95	0.92432	0.00056	8.85	0.92491	0.00056	8.75	0.92296	0.00054
9.00	0.92773	0.00056	8.90	0.92738	0.00056	8.80	0.92784	0.00057
9.05	0.93204	0.00055	8.95	0.93141	0.00055	8.85	0.93063	0.00055
9.10	0.93540	0.00055	9.00	0.93496	0.00056	8.90	0.93262	0.00056
9.15	0.93963	0.00056	9.05	0.93936	0.00055	8.95	0.93731	0.00054
9.20	0.94250	0.00055	9.10	0.94215	0.00055	9.00	0.94030	0.00055
9.25	0.94597	0.00057	9.15	0.94634	0.00056	9.05	0.94472	0.00055
9.30	0.94977	0.00055	9.20	0.94949	0.00053	9.10	0.94802	0.00053
9.35	0.95215	0.00054	9.25	0.95192	0.00055	9.15	0.95169	0.00054
9.40	0.95663	0.00055	9.30	0.95664	0.00055	9.20	0.95509	0.00056
9.45	0.95995	0.00055	9.35	0.95885	0.00056	9.25	0.95825	0.00056
9.50	0.96348	0.00056	9.40	0.96260	0.00056	9.30	0.96060	0.00057
9.55	0.96626	0.00057	9.45	0.96517	0.00054	9.35	0.96417	0.00055
9.60	0.97102	0.00055	9.50	0.96783	0.00056	9.40	0.96802	0.00056
9.65	0.97379	0.00055	9.55	0.97261	0.00054	9.45	0.97156	0.00055
9.70	0.97687	0.00054	9.60	0.97557	0.00055	9.50	0.97351	0.00054
9.75	0.97947	0.00055	9.65	0.97980	0.00054	9.55	0.97683	0.00055
9.80	0.98354	0.00057	9.70	0.98098	0.00054	9.60	0.97983	0.00055
9.85	0.98751	0.00057	9.75	0.98534	0.00056	9.65	0.98413	0.00056
9.90	0.99010	0.00057	9.80	0.98823	0.00055	9.70	0.98819	0.00054
9.95	0.99288	0.00054	9.85	0.99077	0.00058	9.75	0.98991	0.00056
10.00	0.99582	0.00054	9.90	0.99531	0.00054	9.80	0.99270	0.00055
10.05	0.99970	0.00056	9.95	0.99755	0.00055	9.85	0.99637	0.00055
10.10	1.00312	0.00054	10.00	1.00127	0.00054	9.90	0.99967	0.00058
10.15	1.00664	0.00055	10.05	1.00298	0.00057	9.95	1.00212	0.00057
10.20	1.00874	0.00055	10.10	1.00656	0.00055	10.05	1.00920	0.00056
10.25	1.01257	0.00056	10.15	1.00916	0.00056	10.10	1.01117	0.00057
10.30	1.01535	0.00057	10.20	1.01264	0.00053	10.15	1.01444	0.00055
10.35	1.01963	0.00057	10.25	1.01705	0.00056	10.20	1.01704	0.00055
10.40	1.02084	0.00055	10.30	1.01844	0.00056	10.25	1.01927	0.00054
						10.30	1.02410	0.00054

Table B.1.1.2.3-2 - K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) – 10 Inches of Water Reflection (cont)

750 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.50	0.91899	0.00054	8.30	0.91948	0.00054	7.90	0.92095	0.00052
8.55	0.92236	0.00055	8.35	0.92378	0.00053	7.95	0.92522	0.00054
8.60	0.92550	0.00054	8.40	0.92628	0.00055	8.00	0.92953	0.00055
8.65	0.93029	0.00055	8.45	0.93078	0.00056	8.05	0.93410	0.00052
8.70	0.93332	0.00055	8.50	0.93408	0.00055	8.10	0.93724	0.00054
8.75	0.93657	0.00054	8.55	0.93783	0.00055	8.15	0.94155	0.00055
8.80	0.93997	0.00056	8.60	0.94110	0.00056	8.20	0.94402	0.00055
8.85	0.94304	0.00056	8.65	0.94521	0.00055	8.25	0.94826	0.00055
8.90	0.94717	0.00056	8.70	0.94896	0.00054	8.30	0.95317	0.00053
8.95	0.95029	0.00055	8.75	0.95225	0.00056	8.35	0.95697	0.00055
9.00	0.95332	0.00057	8.80	0.95537	0.00055	8.40	0.96108	0.00055
9.05	0.95661	0.00054	8.85	0.95952	0.00055	8.45	0.96470	0.00055
9.10	0.96068	0.00054	8.90	0.96273	0.00054	8.50	0.96799	0.00053
9.15	0.96418	0.00055	8.95	0.96650	0.00055	8.55	0.97164	0.00054
9.20	0.96758	0.00056	9.00	0.96938	0.00055	8.60	0.97501	0.00055
9.25	0.97061	0.00055	9.05	0.97321	0.00055	8.65	0.97781	0.00054
9.30	0.97400	0.00055	9.10	0.97653	0.00055	8.70	0.98192	0.00054
9.35	0.97722	0.00057	9.15	0.97936	0.00053	8.75	0.98600	0.00055
9.40	0.98067	0.00053	9.20	0.98364	0.00055	8.80	0.99004	0.00055
9.45	0.98358	0.00054	9.25	0.98569	0.00058	8.85	0.99312	0.00057
9.50	0.98692	0.00054	9.30	0.98959	0.00056	8.90	0.99701	0.00054
9.55	0.98889	0.00055	9.35	0.99239	0.00053	8.95	1.00008	0.00058
9.60	0.99353	0.00056	9.40	0.99652	0.00054	9.00	1.00351	0.00055
9.65	0.99561	0.00055	9.45	1.00067	0.00055	9.05	1.00718	0.00057
9.70	0.99884	0.00056	9.50	1.00202	0.00055	9.10	1.00984	0.00057
9.75	1.00151	0.00056	9.55	1.00559	0.00055	9.15	1.01283	0.00055
9.80	1.00558	0.00057	9.60	1.00839	0.00056	9.20	1.01667	0.00056
9.85	1.00853	0.00054	9.65	1.01207	0.00056			
9.90	1.01120	0.00055	9.70	1.01501	0.00056			
9.95	1.01453	0.00055	9.75	1.01903	0.00056			
10.00	1.01882	0.00054	9.80	1.02113	0.00056			

Table B.1.1.2.3-2 - K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) – 10 Inches of Water Reflection (cont)

2000 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.50	0.92054	0.00054	7.10	0.91728	0.00054	6.80	0.91927	0.00054
7.55	0.92671	0.00054	7.15	0.92130	0.00052	6.85	0.92319	0.00055
7.60	0.92961	0.00053	7.20	0.92708	0.00052	6.90	0.92822	0.00052
7.65	0.93402	0.00054	7.25	0.93033	0.00054	6.95	0.93399	0.00053
7.70	0.93876	0.00056	7.30	0.93519	0.00057	7.00	0.93805	0.00055
7.75	0.94224	0.00054	7.35	0.93997	0.00055	7.05	0.94330	0.00054
7.80	0.94838	0.00054	7.40	0.94379	0.00053	7.10	0.94707	0.00055
7.85	0.95071	0.00054	7.45	0.94875	0.00054	7.15	0.95208	0.00055
7.90	0.95453	0.00055	7.50	0.95381	0.00054	7.20	0.95660	0.00054
7.95	0.95944	0.00055	7.55	0.95819	0.00052	7.25	0.96212	0.00055
8.00	0.96302	0.00055	7.60	0.96244	0.00055	7.30	0.96688	0.00055
8.05	0.96841	0.00054	7.65	0.96626	0.00054	7.35	0.97103	0.00053
8.10	0.97083	0.00056	7.70	0.97009	0.00052	7.40	0.97514	0.00055
8.15	0.97592	0.00052	7.75	0.97489	0.00056	7.45	0.98005	0.00055
8.20	0.97899	0.00054	7.80	0.97922	0.00053	7.50	0.98539	0.00054
8.25	0.98353	0.00055	7.85	0.98347	0.00056	7.55	0.98891	0.00055
8.30	0.98665	0.00056	7.90	0.98757	0.00056	7.60	0.99418	0.00056
8.35	0.99088	0.00055	7.95	0.99245	0.00056	7.65	0.99851	0.00054
8.40	0.99465	0.00054	8.00	0.99649	0.00055	7.70	1.00202	0.00054
8.45	0.99772	0.00054	8.05	1.00113	0.00055	7.75	1.00690	0.00054
8.50	1.00192	0.00054	8.10	1.00408	0.00055	7.80	1.01059	0.00055
8.55	1.00570	0.00056	8.15	1.00843	0.00054	7.85	1.01600	0.00054
8.60	1.00962	0.00053	8.20	1.01247	0.00055	7.90	1.02060	0.00056
8.65	1.01293	0.00054	8.25	1.01625	0.00053			
8.70	1.01619	0.00055	8.30	1.02073	0.00054			

Table B.1.1.2.3-2 - K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) – 10 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.30	0.92238	0.00052	5.80	0.91481	0.00051	5.00	0.91807	0.00051
6.35	0.92731	0.00054	5.85	0.92187	0.00052	5.05	0.92593	0.00053
6.40	0.93454	0.00054	5.90	0.92736	0.00054	5.10	0.93334	0.00051
6.45	0.93888	0.00053	5.95	0.93275	0.00053	5.15	0.94052	0.00051
6.50	0.94361	0.00054	6.00	0.93913	0.00052	5.20	0.94753	0.00051
6.55	0.94957	0.00055	6.05	0.94567	0.00053	5.25	0.95515	0.00052
6.60	0.95437	0.00054	6.10	0.95070	0.00052	5.30	0.96148	0.00053
6.65	0.96010	0.00052	6.15	0.95682	0.00055	5.35	0.96985	0.00051
6.70	0.96613	0.00054	6.20	0.96234	0.00053	5.40	0.97638	0.00052
6.75	0.97059	0.00055	6.25	0.96966	0.00053	5.45	0.98283	0.00052
6.80	0.97514	0.00053	6.30	0.97450	0.00054	5.50	0.99036	0.00053
6.85	0.98060	0.00053	6.35	0.98055	0.00052	5.55	0.99738	0.00051
6.90	0.98601	0.00054	6.40	0.98608	0.00054	5.60	1.00355	0.00052
6.95	0.99108	0.00053	6.45	0.99080	0.00053	5.65	1.01129	0.00051
7.00	0.99660	0.00054	6.50	0.99556	0.00053	5.70	1.01782	0.00053
7.05	1.00133	0.00054	6.55	1.00320	0.00054	5.75	1.02497	0.00053
7.10	1.00622	0.00054	6.60	1.00830	0.00053	5.80	1.03053	0.00053
7.15	1.01043	0.00054	6.65	1.01470	0.00054			
7.20	1.01602	0.00054	6.70	1.01927	0.00055			
7.25	1.02042	0.00055						
7.30	1.02581	0.00052						

Table B.1.1.2.3-2 - K_{eff} Values for Plutonium Sphere (97% ^{239}Pu) – 10 Inches of Water Reflection (cont)

10000 milli-g/cc			15000 milli-g/cc			19600 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.40	0.91990	0.00049	3.50	0.91554	0.00046	2.90	0.90877	0.00044
4.45	0.92787	0.00048	3.52	0.92085	0.00046	2.92	0.91354	0.00043
4.50	0.93654	0.00049	3.54	0.92464	0.00045	2.94	0.91928	0.00045
4.55	0.94553	0.00049	3.56	0.92848	0.00046	2.96	0.92479	0.00043
4.60	0.95451	0.00050	3.58	0.93341	0.00046	2.98	0.93063	0.00043
4.65	0.96277	0.00049	3.60	0.93761	0.00046	3.00	0.93577	0.00044
4.70	0.97000	0.00049	3.62	0.94168	0.00047	3.02	0.93989	0.00044
4.75	0.97882	0.00053	3.64	0.94660	0.00046	3.04	0.94534	0.00043
4.80	0.98663	0.00049	3.66	0.95062	0.00044	3.06	0.95054	0.00043
4.85	0.99510	0.00050	3.68	0.95491	0.00046	3.08	0.95577	0.00044
4.90	1.00304	0.00051	3.70	0.95856	0.00047	3.10	0.96148	0.00044
4.95	1.01182	0.00051	3.72	0.96345	0.00046	3.12	0.96659	0.00044
5.00	1.01927	0.00052	3.74	0.96770	0.00047	3.14	0.97160	0.00044
			3.76	0.97174	0.00048	3.16	0.97695	0.00045
			3.78	0.97589	0.00047	3.18	0.98227	0.00045
			3.80	0.98156	0.00047	3.20	0.98719	0.00045
			3.82	0.98510	0.00049	3.22	0.99222	0.00044
			3.84	0.98920	0.00048	3.24	0.99704	0.00042
			3.86	0.99288	0.00048	3.26	1.00156	0.00045
			3.88	0.99674	0.00047	3.28	1.00749	0.00046
			3.90	1.00114	0.00049	3.30	1.01196	0.00047
			3.92	1.00513	0.00047	3.32	1.01770	0.00044
			3.94	1.00876	0.00048	3.34	1.02204	0.00046
			3.96	1.01414	0.00047	3.36	1.02713	0.00045
			3.98	1.01808	0.00048	3.38	1.03211	0.00045
			4.00	1.02278	0.00049	3.40	1.03673	0.00046

B.1.1.3. 95% ^{239}Pu 5% ^{240}Pu

B.1.1.3.1. Unreflected

Case ID: pu-sp-0950-00

Material: Plutonium metal in water

Geometry: Sphere

Isotopics: 95% ^{239}Pu 5% ^{240}Pu

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.1.1.3.1-1. 95% ^{239}Pu Sphere - 0 Inches of Water Reflection

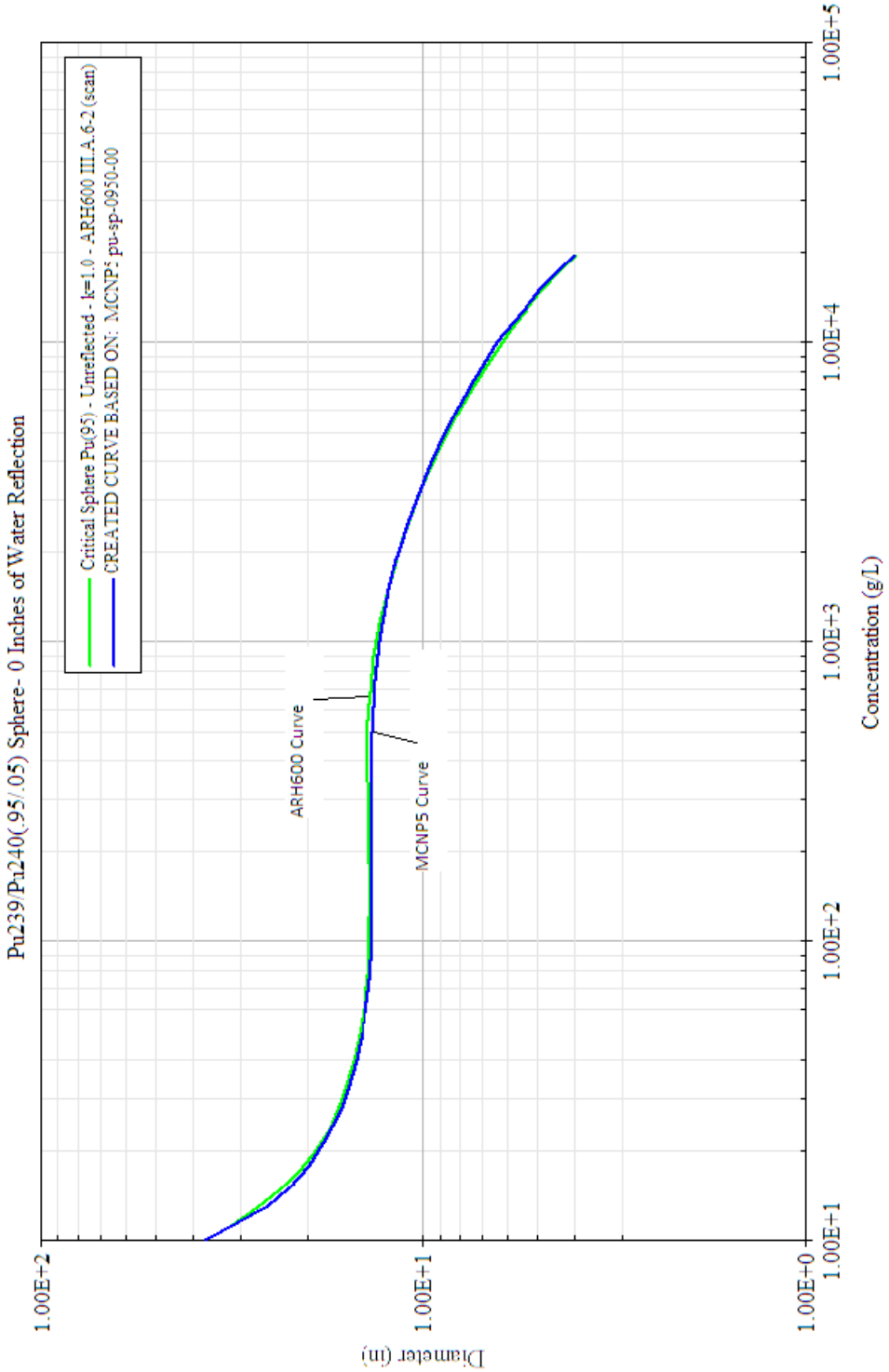

Table B.1.1.3.1-1. Critical Dimensions for 95% ^{239}Pu Sphere - 0 Inches of Water Reflection

95% ^{239}Pu Sphere - 0 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	27.800	39.400	0.500	37.0983
0.013	20.500	26.500	0.300	25.4077
0.015	19.100	23.200	0.200	22.4147
0.018	17.300	21.500	0.200	19.8956
0.020	16.500	19.300	0.100	18.7475
0.022	15.900	18.500	0.100	17.9542
0.024	15.400	17.800	0.100	17.3186
0.025	15.200	17.500	0.100	17.0480
0.026	15.000	17.300	0.100	16.7920
0.028	14.600	16.900	0.100	16.3906
0.030	14.400	16.500	0.100	16.0522
0.032	14.100	16.200	0.100	15.7723
0.036	13.800	15.700	0.100	15.3159
0.040	13.500	15.400	0.100	14.9547
0.045	13.200	15.100	0.100	14.6606
0.050	13.000	14.800	0.100	14.3849
0.075	12.500	14.200	0.050	13.7675
0.100	12.300	14.000	0.050	13.5713
0.150	12.200	13.800	0.050	13.4871
0.200	12.200	13.900	0.050	13.5079
0.350	12.200	13.900	0.050	13.5803
0.500	12.200	13.900	0.050	13.5357
0.750	11.900	13.700	0.100	13.3086
1.000	11.600	13.300	0.050	12.9705
1.500	11.000	12.500	0.050	12.2384
2.000	10.400	11.900	0.050	11.5465
2.500	9.800	11.200	0.050	10.9277
3.000	9.400	10.700	0.050	10.3684
4.000	8.600	9.700	0.050	9.4506
5.000	7.900	9.000	0.050	8.7179
6.000	7.400	8.300	0.050	8.1184
7.000	6.900	7.800	0.050	7.5910
7.500	6.700	7.600	0.050	7.3622
8.000	6.500	7.300	0.050	7.1456
9.000	6.100	6.900	0.050	6.7465
10.000	5.800	6.600	0.050	6.3810
15.000	4.500	5.100	0.050	4.9514
19.600	3.600	4.100	0.020	3.9953

```
MCNP5 Sample Input File
95% 239Pu Sphere- 0" Reflection

s-, 95.0 wt% 239Pu, 10000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 595   hundreths of inches - must be integer
c radius =     7.5565 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 10000 milli-g Pu/cc
c Reflector width =  0.0 inches
c Enrichment = 0.95 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.5102 cc
c Volume of water in sample 0.4898 cc
c
c Mass of crit in sample  10.0000 g
c Mass of water in sample  0.4898 g
c
c Total mass of sample 10.4898g for a 1cc sample
c Mass Density for crit material -10.4898, expressed as negative
c
c  sphere
20 11  -10.489796   -1        imp:n=1
21  2  -1.000    -2 1        imp:n=0    $zero importance if no reflector
22  0            2          imp:n=0

1       so     7.5565              $ Sphere
2       so     7.5565        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
```

```
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu/water mixture
m11    $ Pu/H2O Sludge, 95.0 wt% 239Pu, 10000 milli-g Pu/cc, 10.4898
1001.66c -0.005225
8016.66c -0.041468
94239.66c -0.905642
94240.66c -0.047665
mt11     lwtr.60t
c
c    pu only
m12    $ Pu/H2O Sludge, 95.0 wt% 239Pu, 10000 milli-g Pu/cc, 10.4898
94239.66c -0.950000
94240.66c -0.050000
c
```

Critview Compatible Data File
95% ^{239}Pu Sphere- 0" Reflection

reset:
title: MCNP5 pu-sp-0950-00
set: MCNP5 set
source: MCNP5 primary
created: Mon 07/19/2010 8:40:40.96
geometry: sphere
modmat: H2O
critmat: plutonium
isomat: Pu239 0.95 Pu240 0.05
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	37.0983
0.013	25.4077
0.015	22.4147
0.018	19.8956
0.020	18.7475
0.022	17.9542
0.024	17.3186
0.025	17.0480
0.026	16.7920
0.028	16.3906
0.030	16.0522
0.032	15.7723
0.036	15.3159
0.040	14.9547
0.045	14.6606
0.050	14.3849
0.075	13.7675
0.100	13.5713
0.150	13.4871
0.200	13.5079
0.350	13.5803
0.500	13.5357
0.750	13.3086
1.000	12.9705
1.500	12.2384
2.000	11.5465
2.500	10.9277
3.000	10.3684
4.000	9.4506
5.000	8.7179
6.000	8.1184
7.000	7.5910
7.500	7.3622
8.000	7.1456
9.000	6.7465
10.00	6.3810
15.00	4.9514
19.60	3.9953

Table B.1.1.3.1-2. K_{eff} Values for 95% ^{239}Pu Sphere - 0 Inches of Water Reflection

10 milli-g/cc			13 milli-g/cc			15 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
27.80	0.92746	0.00037	20.50	0.90848	0.00046	19.10	0.92115	0.00050
28.30	0.93061	0.00036	20.80	0.91485	0.00046	19.30	0.92815	0.00051
28.80	0.93644	0.00037	21.10	0.92187	0.00044	19.50	0.93147	0.00049
29.30	0.94184	0.00037	21.40	0.92829	0.00042	19.70	0.93740	0.00049
29.80	0.94663	0.00036	21.70	0.93511	0.00046	19.90	0.94279	0.00048
30.30	0.94993	0.00036	22.00	0.94059	0.00045	20.10	0.94750	0.00048
30.80	0.95562	0.00037	22.30	0.94645	0.00045	20.30	0.95230	0.00047
31.30	0.95998	0.00035	22.60	0.95273	0.00045	20.50	0.95776	0.00048
31.80	0.96389	0.00035	22.90	0.95828	0.00044	20.70	0.96271	0.00048
32.30	0.96840	0.00034	23.20	0.96348	0.00044	20.90	0.96713	0.00048
32.80	0.97109	0.00033	23.50	0.96881	0.00044	21.10	0.97120	0.00046
33.30	0.97598	0.00034	23.80	0.97325	0.00043	21.30	0.97776	0.00047
33.80	0.97965	0.00033	24.10	0.97866	0.00043	21.50	0.98108	0.00049
34.30	0.98227	0.00035	24.40	0.98370	0.00043	21.70	0.98512	0.00048
34.80	0.98641	0.00034	24.70	0.98807	0.00044	21.90	0.98922	0.00047
35.30	0.98880	0.00032	25.00	0.99358	0.00042	22.10	0.99428	0.00047
35.80	0.99224	0.00033	25.30	0.99832	0.00044	22.30	0.99781	0.00047
36.30	0.99546	0.00033	25.60	1.00300	0.00043	22.50	1.00163	0.00047
36.80	0.99898	0.00031	25.90	1.00662	0.00043	22.70	1.00559	0.00047
37.30	1.00069	0.00031	26.20	1.01170	0.00043	22.90	1.00962	0.00047
37.80	1.00432	0.00033	26.50	1.01561	0.00043	23.10	1.01385	0.00048
38.30	1.00692	0.00032				23.20	1.01531	0.00048
38.80	1.00910	0.00032						
39.30	1.01095	0.00031						
39.40	1.01205	0.00033						

Table B.1.1.3.1-2. K_{eff} Values for 95% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

18 milli-g/cc			20 milli-g/cc			22 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.30	0.92192	0.00052	16.50	0.92210	0.00055	15.90	0.92271	0.00058
17.50	0.92883	0.00054	16.60	0.92705	0.00056	16.00	0.92640	0.00058
17.70	0.93655	0.00055	16.70	0.93006	0.00054	16.10	0.93097	0.00057
17.90	0.94306	0.00051	16.80	0.93354	0.00056	16.20	0.93595	0.00057
18.10	0.94858	0.00051	16.90	0.93668	0.00055	16.30	0.93931	0.00057
18.30	0.95473	0.00052	17.00	0.94102	0.00056	16.40	0.94194	0.00056
18.50	0.96112	0.00053	17.10	0.94532	0.00055	16.50	0.94703	0.00057
18.70	0.96671	0.00052	17.20	0.94722	0.00055	16.60	0.95004	0.00058
18.90	0.97404	0.00050	17.30	0.95083	0.00055	16.70	0.95472	0.00056
19.10	0.97936	0.00054	17.40	0.95622	0.00055	16.80	0.95846	0.00059
19.30	0.98526	0.00053	17.50	0.95860	0.00057	16.90	0.96318	0.00057
19.50	0.98936	0.00053	17.60	0.96162	0.00055	17.00	0.96602	0.00057
19.70	0.99596	0.00051	17.70	0.96626	0.00055	17.10	0.97065	0.00059
19.90	1.00009	0.00055	17.80	0.96917	0.00055	17.20	0.97348	0.00056
20.10	1.00601	0.00052	17.90	0.97193	0.00056	17.30	0.97720	0.00056
20.30	1.01208	0.00051	18.00	0.97622	0.00055	17.40	0.98069	0.00057
20.50	1.01804	0.00052	18.10	0.97895	0.00058	17.50	0.98382	0.00055
20.70	1.02212	0.00053	18.20	0.98207	0.00055	17.60	0.98894	0.00057
20.90	1.02773	0.00052	18.30	0.98610	0.00055	17.70	0.99219	0.00056
21.10	1.03085	0.00051	18.40	0.98864	0.00058	17.80	0.99410	0.00057
21.30	1.03717	0.00051	18.50	0.99252	0.00051	17.90	0.99826	0.00057
21.50	1.04068	0.00050	18.60	0.99485	0.00056	18.00	1.00147	0.00057
			18.70	0.99788	0.00054	18.10	1.00504	0.00057
			18.80	1.00234	0.00057	18.20	1.00864	0.00058
			18.90	1.00371	0.00056	18.30	1.01195	0.00057
			19.00	1.00782	0.00056	18.40	1.01589	0.00057
			19.10	1.01023	0.00056	18.50	1.01757	0.00057
			19.20	1.01286	0.00055			
			19.30	1.01760	0.00055			

Table B.1.1.3.1-2. K_{eff} Values for 95% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

24 milli-g/cc			25 milli-g/cc			26 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
15.40	0.92197	0.00060	15.20	0.92196	0.00060	15.00	0.92267	0.00062
15.50	0.92684	0.00059	15.30	0.92690	0.00061	15.10	0.92644	0.00059
15.60	0.93171	0.00056	15.40	0.93245	0.00058	15.20	0.93135	0.00062
15.70	0.93571	0.00059	15.50	0.93622	0.00062	15.30	0.93656	0.00062
15.80	0.93966	0.00059	15.60	0.94064	0.00060	15.40	0.94103	0.00062
15.90	0.94234	0.00061	15.70	0.94464	0.00060	15.50	0.94561	0.00061
16.00	0.94832	0.00058	15.80	0.95019	0.00060	15.60	0.94835	0.00059
16.10	0.95201	0.00060	15.90	0.95372	0.00058	15.70	0.95428	0.00060
16.20	0.95649	0.00059	16.00	0.95710	0.00060	15.80	0.95770	0.00060
16.30	0.96013	0.00061	16.10	0.96156	0.00060	15.90	0.96314	0.00062
16.40	0.96539	0.00058	16.20	0.96701	0.00059	16.00	0.96764	0.00061
16.50	0.96829	0.00056	16.30	0.97000	0.00060	16.10	0.97105	0.00061
16.60	0.97204	0.00059	16.40	0.97365	0.00059	16.20	0.97543	0.00061
16.70	0.97604	0.00059	16.50	0.97873	0.00060	16.30	0.97965	0.00060
16.80	0.98124	0.00059	16.60	0.98245	0.00058	16.40	0.98440	0.00063
16.90	0.98488	0.00058	16.70	0.98738	0.00058	16.50	0.98837	0.00060
17.00	0.98896	0.00059	16.80	0.98992	0.00061	16.60	0.99153	0.00059
17.10	0.99151	0.00057	16.90	0.99434	0.00061	16.70	0.99611	0.00058
17.20	0.99633	0.00059	17.00	0.99780	0.00062	16.80	1.00034	0.00060
17.30	0.99923	0.00059	17.10	1.00238	0.00058	16.90	1.00264	0.00057
17.40	1.00337	0.00059	17.20	1.00655	0.00059	17.00	1.00785	0.00060
17.50	1.00727	0.00057	17.30	1.00942	0.00060	17.10	1.01175	0.00058
17.60	1.01099	0.00058	17.40	1.01382	0.00060	17.20	1.01427	0.00058
17.70	1.01450	0.00058	17.50	1.01647	0.00060	17.30	1.01857	0.00058
17.80	1.01708	0.00058						

Table B.1.1.3.1-2. K_{eff} Values for 95% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

28 milli-g/cc			30 milli-g/cc			32 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
14.60	0.91789	0.00064	14.40	0.92159	0.00064	14.10	0.91864	0.00063
14.70	0.92283	0.00063	14.50	0.92744	0.00065	14.20	0.92291	0.00062
14.80	0.92871	0.00063	14.60	0.93174	0.00063	14.30	0.92793	0.00062
14.90	0.93202	0.00062	14.70	0.93666	0.00061	14.40	0.93433	0.00065
15.00	0.93821	0.00062	14.80	0.94214	0.00062	14.50	0.93911	0.00064
15.10	0.94311	0.00063	14.90	0.94735	0.00062	14.60	0.94415	0.00063
15.20	0.94730	0.00063	15.00	0.95074	0.00063	14.70	0.94898	0.00065
15.30	0.95183	0.00062	15.10	0.95643	0.00064	14.80	0.95406	0.00062
15.40	0.95592	0.00060	15.20	0.96040	0.00064	14.90	0.95959	0.00064
15.50	0.95954	0.00061	15.30	0.96505	0.00063	15.00	0.96318	0.00065
15.60	0.96570	0.00063	15.40	0.97074	0.00064	15.10	0.96938	0.00065
15.70	0.97060	0.00062	15.50	0.97549	0.00061	15.20	0.97402	0.00062
15.80	0.97500	0.00060	15.60	0.97941	0.00062	15.30	0.97858	0.00063
15.90	0.97838	0.00060	15.70	0.98464	0.00065	15.40	0.98307	0.00066
16.00	0.98302	0.00061	15.80	0.98970	0.00060	15.50	0.98772	0.00063
16.10	0.98695	0.00062	15.90	0.99283	0.00062	15.60	0.99169	0.00066
16.20	0.99238	0.00065	16.00	0.99782	0.00061	15.70	0.99762	0.00062
16.30	0.99623	0.00062	16.10	1.00200	0.00062	15.80	1.00091	0.00061
16.40	1.00039	0.00063	16.20	1.00599	0.00063	15.90	1.00491	0.00065
16.50	1.00366	0.00062	16.30	1.01129	0.00061	16.00	1.01068	0.00064
16.60	1.00914	0.00058	16.40	1.01514	0.00063	16.10	1.01456	0.00064
16.70	1.01251	0.00058	16.50	1.01861	0.00063	16.20	1.01947	0.00061
16.80	1.01680	0.00061						
16.90	1.01961	0.00061						

Table B.1.1.3.1-2. K_{eff} Values for 95% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

36 milli-g/cc			40 milli-g/cc			45 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
13.80	0.92132	0.00063	13.50	0.91935	0.00067	13.20	0.91984	0.00070
13.90	0.92793	0.00068	13.60	0.92556	0.00069	13.30	0.92544	0.00066
14.00	0.93237	0.00066	13.70	0.93267	0.00068	13.40	0.93074	0.00068
14.10	0.93842	0.00065	13.80	0.93888	0.00068	13.50	0.93798	0.00067
14.20	0.94415	0.00066	13.90	0.94324	0.00065	13.60	0.94231	0.00066
14.30	0.95040	0.00067	14.00	0.94828	0.00067	13.70	0.94774	0.00066
14.40	0.95408	0.00065	14.10	0.95392	0.00068	13.80	0.95463	0.00069
14.50	0.95904	0.00065	14.20	0.95991	0.00065	13.90	0.95834	0.00067
14.60	0.96582	0.00065	14.30	0.96558	0.00066	14.00	0.96604	0.00067
14.70	0.96994	0.00066	14.40	0.96867	0.00066	14.10	0.96995	0.00068
14.80	0.97431	0.00065	14.50	0.97518	0.00065	14.20	0.97693	0.00068
14.90	0.98127	0.00066	14.60	0.98255	0.00065	14.30	0.98164	0.00068
15.00	0.98441	0.00067	14.70	0.98749	0.00066	14.40	0.98835	0.00067
15.10	0.98985	0.00064	14.80	0.99081	0.00066	14.50	0.99190	0.00067
15.20	0.99463	0.00064	14.90	0.99653	0.00067	14.60	0.99627	0.00066
15.30	0.99937	0.00065	15.00	1.00287	0.00065	14.70	1.00243	0.00067
15.40	1.00333	0.00063	15.10	1.00637	0.00067	14.80	1.00665	0.00068
15.50	1.00902	0.00064	15.20	1.01167	0.00063	14.90	1.01257	0.00068
15.60	1.01431	0.00064	15.30	1.01548	0.00066	15.00	1.01806	0.00066
15.70	1.01884	0.00067	15.40	1.02080	0.00066	15.10	1.02285	0.00069

Table B.1.1.3.1-2. K_{eff} Values for 95% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

50 milli-g/cc			75 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
13.00	0.91981	0.00069	12.50	0.91865	0.00069	12.30	0.91973	0.00074
13.10	0.92350	0.00067	12.55	0.92373	0.00072	12.35	0.92257	0.00073
13.20	0.93058	0.00068	12.60	0.92647	0.00070	12.40	0.92553	0.00069
13.30	0.93704	0.00069	12.65	0.92889	0.00069	12.45	0.92918	0.00072
13.40	0.94256	0.00068	12.70	0.93265	0.00072	12.50	0.93293	0.00071
13.50	0.94866	0.00069	12.75	0.93722	0.00072	12.55	0.93665	0.00071
13.60	0.95526	0.00068	12.80	0.94009	0.00068	12.60	0.93812	0.00073
13.70	0.96046	0.00067	12.85	0.94208	0.00072	12.65	0.94287	0.00071
13.80	0.96667	0.00068	12.90	0.94537	0.00072	12.70	0.94430	0.00075
13.90	0.97158	0.00069	12.95	0.94993	0.00069	12.75	0.94873	0.00072
14.00	0.97863	0.00066	13.00	0.95252	0.00072	12.80	0.95119	0.00075
14.10	0.98320	0.00069	13.05	0.95636	0.00070	12.85	0.95506	0.00071
14.20	0.98850	0.00070	13.10	0.95947	0.00070	12.90	0.95889	0.00071
14.30	0.99393	0.00071	13.15	0.96236	0.00071	12.95	0.96097	0.00072
14.40	1.00108	0.00070	13.20	0.96513	0.00074	13.00	0.96434	0.00075
14.50	1.00475	0.00069	13.25	0.96854	0.00070	13.05	0.96870	0.00071
14.60	1.01059	0.00070	13.30	0.97120	0.00072	13.10	0.97288	0.00071
14.70	1.01569	0.00067	13.35	0.97429	0.00073	13.15	0.97360	0.00073
14.80	1.02049	0.00070	13.40	0.97752	0.00070	13.20	0.97576	0.00071
			13.45	0.98088	0.00072	13.25	0.97932	0.00069
			13.50	0.98316	0.00070	13.30	0.98300	0.00072
			13.55	0.98545	0.00072	13.35	0.98653	0.00071
			13.60	0.98923	0.00069	13.40	0.98951	0.00074
			13.65	0.99229	0.00074	13.45	0.99187	0.00071
			13.70	0.99341	0.00071	13.50	0.99599	0.00076
			13.75	0.99935	0.00070	13.55	0.99834	0.00072
			13.80	1.00121	0.00072	13.60	1.00224	0.00075
			13.85	1.00377	0.00072	13.65	1.00353	0.00072
			13.90	1.00622	0.00068	13.70	1.00650	0.00074
			13.95	1.00811	0.00070	13.75	1.00960	0.00074
			14.00	1.01152	0.00073	13.80	1.01282	0.00072
			14.05	1.01479	0.00073	13.85	1.01607	0.00070
			14.10	1.01667	0.00073	13.90	1.01767	0.00075
			14.15	1.01993	0.00072	13.95	1.02099	0.00075
			14.20	1.02295	0.00073	14.00	1.02537	0.00074

Table B.1.1.3.1-2. K_{eff} Values for 95% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

150 milli-g/cc			200 milli-g/cc			350 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.20	0.91836	0.00074	12.20	0.92072	0.00069	12.20	0.91915	0.00072
12.25	0.92363	0.00072	12.25	0.92292	0.00070	12.25	0.92361	0.00073
12.30	0.92525	0.00075	12.30	0.92736	0.00073	12.30	0.92579	0.00070
12.35	0.92947	0.00074	12.35	0.92902	0.00072	12.35	0.92865	0.00069
12.40	0.93391	0.00077	12.40	0.93280	0.00072	12.40	0.93105	0.00072
12.45	0.93621	0.00071	12.45	0.93643	0.00071	12.45	0.93578	0.00073
12.50	0.93923	0.00072	12.50	0.93965	0.00072	12.50	0.93747	0.00071
12.55	0.94192	0.00071	12.55	0.94201	0.00075	12.55	0.93954	0.00073
12.60	0.94666	0.00071	12.60	0.94644	0.00072	12.60	0.94451	0.00074
12.65	0.94914	0.00073	12.65	0.94845	0.00072	12.65	0.94678	0.00070
12.70	0.95221	0.00074	12.70	0.95152	0.00074	12.70	0.94912	0.00073
12.75	0.95577	0.00073	12.75	0.95476	0.00071	12.75	0.95223	0.00071
12.80	0.95878	0.00073	12.80	0.95853	0.00071	12.80	0.95682	0.00072
12.85	0.96204	0.00075	12.85	0.96135	0.00073	12.85	0.95853	0.00071
12.90	0.96491	0.00073	12.90	0.96397	0.00074	12.90	0.96119	0.00070
12.95	0.96786	0.00074	12.95	0.96737	0.00074	12.95	0.96393	0.00070
13.00	0.97152	0.00074	13.00	0.96951	0.00074	13.00	0.96730	0.00073
13.05	0.97480	0.00074	13.05	0.97450	0.00074	13.05	0.97144	0.00069
13.10	0.97727	0.00074	13.10	0.97590	0.00072	13.10	0.97302	0.00069
13.15	0.98186	0.00072	13.15	0.98134	0.00077	13.15	0.97735	0.00072
13.20	0.98142	0.00073	13.20	0.98259	0.00073	13.20	0.98053	0.00076
13.25	0.98664	0.00068	13.25	0.98526	0.00072	13.25	0.98054	0.00072
13.30	0.98887	0.00073	13.30	0.98785	0.00069	13.30	0.98440	0.00072
13.35	0.99284	0.00073	13.35	0.99027	0.00069	13.35	0.98663	0.00073
13.40	0.99603	0.00073	13.40	0.99509	0.00072	13.40	0.98972	0.00072
13.45	0.99808	0.00072	13.45	0.99593	0.00073	13.45	0.99352	0.00074
13.50	1.00067	0.00077	13.50	0.99947	0.00073	13.50	0.99411	0.00072
13.55	1.00445	0.00073	13.55	1.00284	0.00074	13.55	0.99723	0.00073
13.60	1.00687	0.00072	13.60	1.00525	0.00073	13.60	1.00180	0.00073
13.65	1.01089	0.00072	13.65	1.00827	0.00070	13.65	1.00497	0.00072
13.70	1.01287	0.00077	13.70	1.01279	0.00074	13.70	1.00746	0.00073
13.75	1.01610	0.00072	13.75	1.01405	0.00072	13.75	1.00984	0.00072
13.80	1.01887	0.00073	13.80	1.01656	0.00073	13.80	1.01298	0.00071
			13.85	1.01949	0.00073	13.85	1.01523	0.00073
			13.90	1.02312	0.00074	13.90	1.01915	0.00071

Table B.1.1.3.1-2. K_{eff} Values for 95% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

500 milli-g/cc			750 milli-g/cc			1000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.20	0.92364	0.00071	11.90	0.91721	0.00068	11.60	0.91788	0.00066
12.25	0.92464	0.00070	12.00	0.92396	0.00068	11.65	0.91965	0.00069
12.30	0.92827	0.00071	12.10	0.92838	0.00068	11.70	0.92392	0.00068
12.35	0.93129	0.00070	12.20	0.93563	0.00069	11.75	0.92593	0.00067
12.40	0.93466	0.00070	12.30	0.94317	0.00067	11.80	0.93059	0.00068
12.45	0.93834	0.00072	12.40	0.94907	0.00070	11.85	0.93375	0.00066
12.50	0.94040	0.00070	12.50	0.95422	0.00070	11.90	0.93666	0.00070
12.55	0.94339	0.00071	12.60	0.95968	0.00068	11.95	0.93987	0.00069
12.60	0.94752	0.00068	12.70	0.96661	0.00068	12.00	0.94288	0.00066
12.65	0.94978	0.00073	12.80	0.97288	0.00069	12.05	0.94611	0.00068
12.70	0.95374	0.00074	12.90	0.97795	0.00070	12.10	0.94848	0.00069
12.75	0.95671	0.00072	13.00	0.98249	0.00070	12.15	0.95147	0.00069
12.80	0.95813	0.00069	13.10	0.98764	0.00073	12.20	0.95575	0.00068
12.85	0.96206	0.00069	13.20	0.99534	0.00071	12.25	0.95733	0.00071
12.90	0.96368	0.00068	13.30	0.99961	0.00070	12.30	0.96283	0.00069
12.95	0.96646	0.00073	13.40	1.00414	0.00069	12.35	0.96401	0.00068
13.00	0.97006	0.00069	13.50	1.01070	0.00072	12.40	0.96646	0.00071
13.05	0.97368	0.00071	13.60	1.01465	0.00070	12.45	0.96922	0.00068
13.10	0.97561	0.00073	13.70	1.02129	0.00075	12.50	0.97179	0.00067
13.15	0.97863	0.00072				12.55	0.97541	0.00069
13.20	0.98169	0.00071				12.60	0.97845	0.00069
13.25	0.98519	0.00071				12.65	0.98236	0.00069
13.30	0.98744	0.00074				12.70	0.98360	0.00068
13.35	0.99132	0.00069				12.75	0.98633	0.00069
13.40	0.99225	0.00071				12.80	0.99109	0.00069
13.45	0.99610	0.00069				12.85	0.99442	0.00068
13.50	0.99688	0.00071				12.90	0.99535	0.00071
13.55	1.00125	0.00070				12.95	0.99849	0.00069
13.60	1.00328	0.00070				13.00	1.00218	0.00070
13.65	1.00623	0.00072				13.05	1.00565	0.00069
13.70	1.00817	0.00072				13.10	1.00757	0.00069
13.75	1.01157	0.00071				13.15	1.01005	0.00067
13.80	1.01405	0.00070				13.20	1.01344	0.00069
13.85	1.01715	0.00069				13.25	1.01575	0.00070
13.90	1.01774	0.00071				13.30	1.01743	0.00070

Table B.1.1.3.1-2. K_{eff} Values for 95% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

1500 milli-g/cc			2000 milli-g/cc			2500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.00	0.91881	0.00068	10.40	0.91784	0.00067	9.80	0.91270	0.00065
11.05	0.92158	0.00067	10.45	0.92204	0.00068	9.85	0.91757	0.00065
11.10	0.92480	0.00069	10.50	0.92618	0.00069	9.90	0.92071	0.00063
11.15	0.92944	0.00067	10.55	0.92953	0.00065	9.95	0.92423	0.00067
11.20	0.93368	0.00069	10.60	0.93450	0.00065	10.00	0.93049	0.00061
11.25	0.93638	0.00068	10.65	0.93806	0.00067	10.05	0.93370	0.00066
11.30	0.93867	0.00066	10.70	0.94019	0.00066	10.10	0.93753	0.00062
11.35	0.94389	0.00067	10.75	0.94437	0.00070	10.15	0.94202	0.00065
11.40	0.94613	0.00069	10.80	0.94663	0.00065	10.20	0.94632	0.00066
11.45	0.94843	0.00065	10.85	0.95087	0.00066	10.25	0.94970	0.00062
11.50	0.95372	0.00065	10.90	0.95517	0.00068	10.30	0.95431	0.00064
11.55	0.95600	0.00069	10.95	0.96025	0.00065	10.35	0.95746	0.00066
11.60	0.96066	0.00069	11.00	0.96138	0.00067	10.40	0.96143	0.00066
11.65	0.96412	0.00069	11.05	0.96594	0.00067	10.45	0.96445	0.00065
11.70	0.96476	0.00067	11.10	0.97053	0.00065	10.50	0.96793	0.00064
11.75	0.96962	0.00068	11.15	0.97305	0.00069	10.55	0.97406	0.00067
11.80	0.97287	0.00071	11.20	0.97664	0.00066	10.60	0.97774	0.00067
11.85	0.97543	0.00068	11.25	0.98098	0.00066	10.65	0.98022	0.00066
11.90	0.97885	0.00068	11.30	0.98305	0.00066	10.70	0.98316	0.00067
11.95	0.98158	0.00067	11.35	0.98636	0.00067	10.75	0.98623	0.00065
12.00	0.98577	0.00068	11.40	0.98981	0.00063	10.80	0.99147	0.00067
12.05	0.98877	0.00068	11.45	0.99371	0.00065	10.85	0.99458	0.00067
12.10	0.99182	0.00071	11.50	0.99684	0.00068	10.90	0.99802	0.00065
12.15	0.99347	0.00066	11.55	1.00024	0.00066	10.95	1.00160	0.00066
12.20	0.99904	0.00067	11.60	1.00461	0.00067	11.00	1.00483	0.00063
12.25	1.00029	0.00068	11.65	1.00773	0.00070	11.05	1.00934	0.00067
12.30	1.00324	0.00065	11.70	1.00874	0.00066	11.10	1.01228	0.00065
12.35	1.00685	0.00066	11.75	1.01367	0.00069	11.15	1.01551	0.00066
12.40	1.01001	0.00069	11.80	1.01756	0.00066	11.20	1.02080	0.00069
12.45	1.01143	0.00069	11.85	1.02140	0.00068			
12.50	1.01490	0.00068	11.90	1.02394	0.00065			

Table B.1.1.3.1-2. K_{eff} Values for 95% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

3000 milli-g/cc			4000 milli-g/cc			5000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.40	0.92067	0.00062	8.60	0.91791	0.00062	7.90	0.91322	0.00060
9.45	0.92293	0.00063	8.65	0.92342	0.00064	7.95	0.91969	0.00059
9.50	0.92843	0.00063	8.70	0.92929	0.00059	8.00	0.92387	0.00059
9.55	0.93305	0.00064	8.75	0.93391	0.00062	8.05	0.92991	0.00058
9.60	0.93689	0.00063	8.80	0.93907	0.00060	8.10	0.93577	0.00061
9.65	0.94047	0.00066	8.85	0.94285	0.00062	8.15	0.94064	0.00060
9.70	0.94436	0.00063	8.90	0.94801	0.00060	8.20	0.94571	0.00061
9.75	0.94981	0.00064	8.95	0.95437	0.00063	8.25	0.95128	0.00063
9.80	0.95471	0.00064	9.00	0.95826	0.00063	8.30	0.95705	0.00061
9.85	0.95876	0.00068	9.05	0.96271	0.00066	8.35	0.96184	0.00061
9.90	0.96207	0.00066	9.10	0.96664	0.00066	8.40	0.96739	0.00060
9.95	0.96511	0.00064	9.15	0.97150	0.00063	8.45	0.97259	0.00060
10.00	0.97116	0.00063	9.20	0.97580	0.00063	8.50	0.97803	0.00062
10.05	0.97438	0.00063	9.25	0.98062	0.00062	8.55	0.98245	0.00061
10.10	0.97896	0.00065	9.30	0.98580	0.00060	8.60	0.98862	0.00063
10.15	0.98353	0.00064	9.35	0.98942	0.00063	8.65	0.99274	0.00062
10.20	0.98639	0.00063	9.40	0.99540	0.00062	8.70	0.99805	0.00061
10.25	0.99117	0.00064	9.45	0.99996	0.00066	8.75	1.00349	0.00061
10.30	0.99401	0.00067	9.50	1.00320	0.00064	8.80	1.00799	0.00062
10.35	0.99775	0.00067	9.55	1.00945	0.00065	8.85	1.01330	0.00059
10.40	1.00388	0.00066	9.60	1.01233	0.00066	8.90	1.01846	0.00061
10.45	1.00601	0.00064	9.65	1.01694	0.00065	8.95	1.02179	0.00063
10.50	1.00915	0.00068	9.70	1.02129	0.00064	9.00	1.02817	0.00062
10.55	1.01315	0.00067						
10.60	1.01852	0.00064						
10.65	1.02153	0.00065						
10.70	1.02562	0.00066						

Table B.1.1.3.1-2. K_{eff} Values for 95% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

6000 milli-g/cc			7000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.40	0.91850	0.00056	6.90	0.91333	0.00055	6.70	0.91480	0.00053
7.45	0.92442	0.00057	6.95	0.92001	0.00055	6.75	0.92192	0.00053
7.50	0.93024	0.00059	7.00	0.92613	0.00055	6.80	0.92834	0.00052
7.55	0.93501	0.00059	7.05	0.93315	0.00054	6.85	0.93509	0.00055
7.60	0.94202	0.00058	7.10	0.93745	0.00054	6.90	0.94182	0.00055
7.65	0.94784	0.00059	7.15	0.94504	0.00056	6.95	0.94769	0.00053
7.70	0.95290	0.00060	7.20	0.95088	0.00055	7.00	0.95477	0.00058
7.75	0.95834	0.00058	7.25	0.95794	0.00060	7.05	0.96144	0.00056
7.80	0.96342	0.00060	7.30	0.96439	0.00056	7.10	0.96723	0.00055
7.85	0.96973	0.00061	7.35	0.97016	0.00058	7.15	0.97448	0.00056
7.90	0.97572	0.00061	7.40	0.97624	0.00057	7.20	0.97979	0.00056
7.95	0.98151	0.00059	7.45	0.98237	0.00057	7.25	0.98521	0.00054
8.00	0.98795	0.00058	7.50	0.98932	0.00055	7.30	0.99338	0.00057
8.05	0.99397	0.00061	7.55	0.99580	0.00057	7.35	0.99842	0.00057
8.10	0.99726	0.00057	7.60	1.00092	0.00059	7.40	1.00492	0.00058
8.15	1.00471	0.00058	7.65	1.00701	0.00058	7.45	1.01074	0.00058
8.20	1.00976	0.00060	7.70	1.01239	0.00055	7.50	1.01562	0.00058
8.25	1.01515	0.00059	7.75	1.01807	0.00060	7.55	1.02360	0.00056
8.30	1.02059	0.00059	7.80	1.02422	0.00059	7.60	1.02893	0.00058

Table B.1.1.3.1-2. K_{eff} Values for 95% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

8000 milli-g/cc			9000 milli-g/cc			10000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.50	0.91527	0.00052	6.10	0.90976	0.00050	5.80	0.91581	0.00050
6.55	0.92270	0.00054	6.15	0.91641	0.00050	5.85	0.92145	0.00049
6.60	0.92787	0.00052	6.20	0.92394	0.00051	5.90	0.92944	0.00049
6.65	0.93557	0.00052	6.25	0.93106	0.00049	5.95	0.93716	0.00049
6.70	0.94151	0.00054	6.30	0.93800	0.00052	6.00	0.94589	0.00049
6.75	0.94851	0.00053	6.35	0.94588	0.00052	6.05	0.95261	0.00050
6.80	0.95512	0.00054	6.40	0.95239	0.00054	6.10	0.95893	0.00050
6.85	0.96242	0.00055	6.45	0.95913	0.00049	6.15	0.96732	0.00052
6.90	0.96887	0.00053	6.50	0.96646	0.00051	6.20	0.97200	0.00049
6.95	0.97438	0.00056	6.55	0.97330	0.00054	6.25	0.98180	0.00049
7.00	0.98053	0.00053	6.60	0.98022	0.00053	6.30	0.98789	0.00050
7.05	0.98804	0.00055	6.65	0.98733	0.00054	6.35	0.99509	0.00050
7.10	0.99455	0.00053	6.70	0.99403	0.00053	6.40	1.00302	0.00053
7.15	1.00052	0.00053	6.75	1.00045	0.00050	6.45	1.01015	0.00052
7.20	1.00869	0.00055	6.80	1.00713	0.00052	6.50	1.01651	0.00051
7.25	1.01385	0.00058	6.85	1.01407	0.00055	6.55	1.02464	0.00052
7.30	1.01946	0.00055	6.90	1.02272	0.00053	6.60	1.03118	0.00054

Table B.1.1.3.1-2. K_{eff} Values for 95% ^{239}Pu Sphere - 0 Inches of Water Reflection (cont)

15000 milli-g/cc			19600 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.50	0.91855	0.00041	3.60	0.91357	0.00038			
4.55	0.92697	0.00041	3.62	0.91847	0.00039			
4.60	0.93575	0.00040	3.64	0.92238	0.00039			
4.65	0.94580	0.00042	3.66	0.92689	0.00040			
4.70	0.95522	0.00041	3.68	0.93253	0.00039			
4.75	0.96458	0.00044	3.70	0.93589	0.00040			
4.80	0.97426	0.00042	3.72	0.93899	0.00040			
4.85	0.98276	0.00041	3.74	0.94501	0.00040			
4.90	0.99110	0.00044	3.76	0.94922	0.00039			
4.95	0.99971	0.00044	3.78	0.95356	0.00040			
5.00	1.00986	0.00045	3.80	0.95728	0.00039			
5.05	1.01734	0.00044	3.82	0.96232	0.00039			
5.10	1.02696	0.00045	3.84	0.96634	0.00040			
			3.86	0.97100	0.00040			
			3.88	0.97486	0.00040			
			3.90	0.97969	0.00041			
			3.92	0.98391	0.00041			
			3.94	0.98731	0.00040			
			3.96	0.99256	0.00040			
			3.98	0.99638	0.00042			
			4.00	1.00112	0.00041			
			4.02	1.00524	0.00042			
			4.04	1.00949	0.00042			
			4.06	1.01422	0.00042			
			4.08	1.01783	0.00040			
			4.10	1.02182	0.00042			

B.1.1.3.2. 1” Water Reflector

Case ID: pu-sp-0950-01

Material: Plutonium metal in water

Geometry: Sphere

Isotopics: 95% ^{239}Pu 5% ^{240}Pu

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.1.1.3.2-1. 95% ^{239}Pu Sphere – 1 Inch of Water Reflection

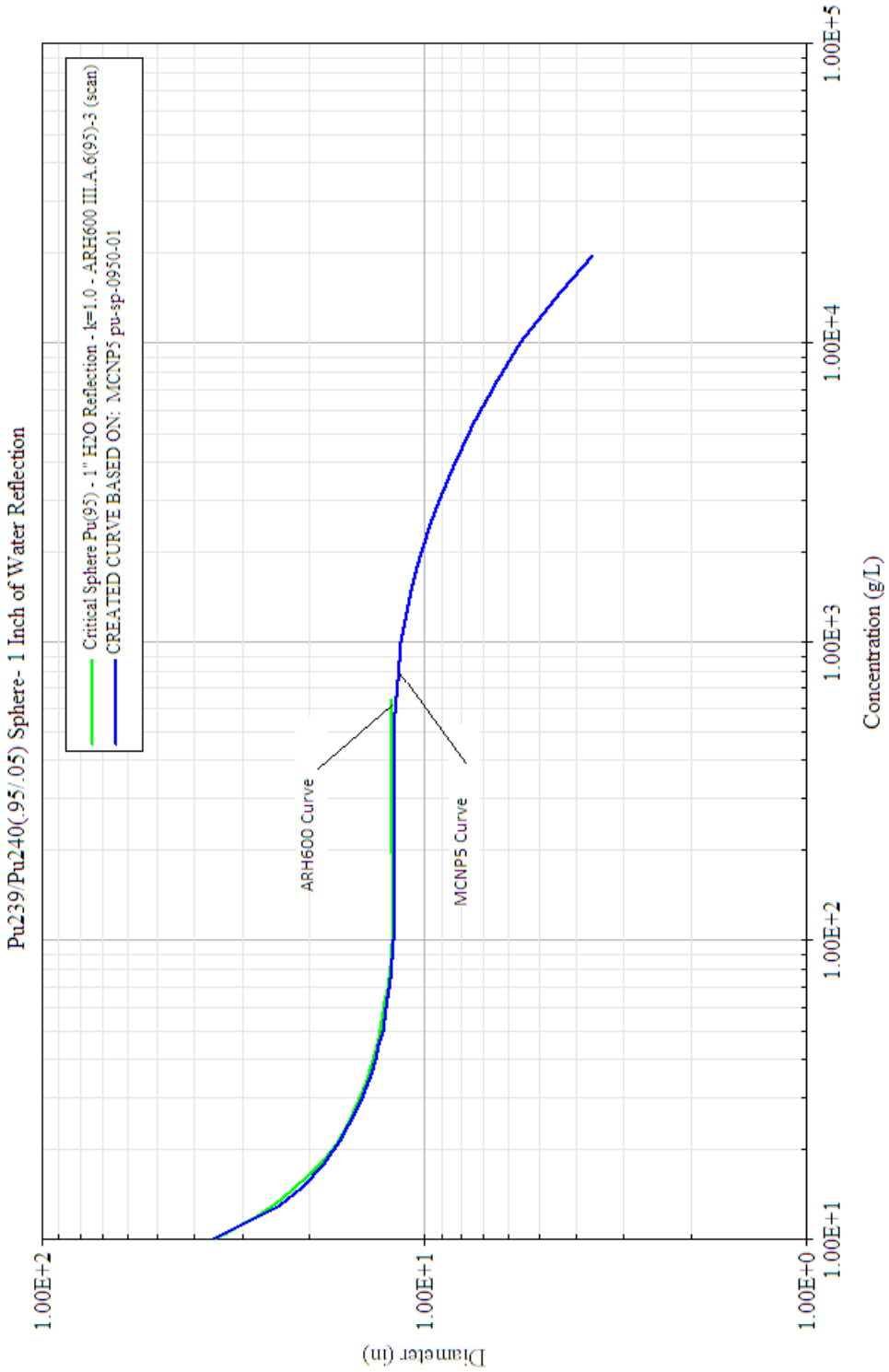

Table B.1.1.3.2-1. Critical Dimensions for 95% ^{239}Pu Sphere – 1 Inch of Water Reflection

95% ^{239}Pu Sphere – 1 Inch of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	26.300	37.900	0.500	35.5905
0.013	19.800	24.800	0.200	23.8839
0.015	17.700	21.700	0.200	20.9014
0.018	15.900	19.000	0.100	18.3470
0.020	15.000	17.800	0.100	17.2023
0.022	14.300	17.000	0.100	16.4425
0.024	13.700	16.300	0.100	15.8319
0.025	13.700	16.100	0.100	15.5456
0.026	13.500	15.700	0.100	15.3093
0.028	13.200	15.400	0.100	14.8887
0.030	12.900	15.000	0.100	14.5496
0.032	12.700	14.700	0.100	14.2571
0.036	12.300	14.200	0.100	13.7975
0.040	12.000	13.900	0.100	13.4484
0.045	11.700	13.500	0.100	13.1345
0.050	11.500	13.300	0.100	12.8746
0.075	11.000	12.600	0.050	12.2546
0.100	10.700	12.400	0.050	12.0195
0.150	10.700	12.300	0.050	11.9247
0.200	10.600	12.300	0.050	11.9310
0.350	10.800	12.400	0.050	12.0248
0.500	10.600	12.300	0.050	11.9727
0.750	10.400	12.100	0.050	11.7655
1.000	10.200	11.800	0.050	11.4820
1.500	9.600	11.100	0.050	10.8231
2.000	9.100	10.500	0.050	10.1852
2.500	8.600	9.900	0.050	9.6207
3.000	8.100	9.400	0.050	9.1297
4.000	7.500	8.600	0.050	8.2969
5.000	6.900	7.900	0.050	7.6507
6.000	6.400	7.300	0.050	7.1050
7.000	6.000	6.900	0.050	6.6495
7.500	5.800	6.700	0.050	6.4415
8.000	5.600	6.400	0.050	6.2501
9.000	5.300	6.100	0.050	5.9024
10.000	5.000	5.800	0.050	5.5977
15.000	3.900	4.500	0.050	4.3868
19.600	3.200	3.700	0.020	3.6065

```
MCNP5 Sample Input File
95% 239Pu Sphere- 1" Reflection

s-, 95.0 wt% 239Pu, 05000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 715   hundreths of inches - must be integer
c radius =     9.0805 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 05000 milli-g Pu/cc
c Reflector width =  1.0 inches
c Enrichment = 0.95 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.2551 cc
c Volume of water in sample 0.7449 cc
c
c Mass of crit in sample   5.0000 g
c Mass of water in sample  0.7449 g
c
c Total mass of sample  5.7449g for a 1cc sample
c Mass Density for crit material  -5.7449, expressed as negative
c
c  sphere
20 11   -5.744898   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0

1       so     9.0805              $ Sphere
2       so    11.6205         $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
```

```
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu/water mixture
m11    $ Pu/H2O Sludge, 95.0 wt% 239Pu, 05000 milli-g Pu/cc,  5.7449
1001.66c -0.014509
8016.66c -0.115154
94239.66c -0.826821
94240.66c -0.043517
mt11     lwtr.60t
c
c    pu only
m12    $ Pu/H2O Sludge, 95.0 wt% 239Pu, 05000 milli-g Pu/cc,  5.7449
94239.66c -0.950000
94240.66c -0.050000
c
```

Critview Compatible Data File
95% ^{239}Pu Sphere- 1" Reflection
reset:
title: MCNP5 pu-sp-0950-01
set: MCNP5 set
source: MCNP5 primary
created: Mon 07/19/2010 8:41:01.50
geometry: sphere
modmat: H2O
critmat: plutonium
isomat: Pu239 0.95 Pu240 0.05
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	35.5905
0.013	23.8839
0.015	20.9014
0.018	18.3470
0.020	17.2023
0.022	16.4425
0.024	15.8319
0.025	15.5456
0.026	15.3093
0.028	14.8887
0.030	14.5496
0.032	14.2571
0.036	13.7975
0.040	13.4484
0.045	13.1345
0.050	12.8746
0.075	12.2546
0.100	12.0195
0.150	11.9247
0.200	11.9310
0.350	12.0248
0.500	11.9727
0.750	11.7655
1.000	11.4820
1.500	10.8231
2.000	10.1852
2.500	9.6207
3.000	9.1297
4.000	8.2969
5.000	7.6507
6.000	7.1050
7.000	6.6495
7.500	6.4415
8.000	6.2501
9.000	5.9024
10.00	5.5977
15.00	4.3868
19.60	3.6065

Table B.1.1.3.2-2. K_{eff} Values for 95% ^{239}Pu Sphere – 1 Inch of Water Reflection

10 milli-g/cc			13 milli-g/cc			15 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
26.30	0.92579	0.00037	19.80	0.92747	0.00044	17.70	0.92366	0.00050
26.80	0.93072	0.00035	20.00	0.93055	0.00045	17.90	0.92947	0.00048
27.30	0.93650	0.00035	20.20	0.93402	0.00045	18.10	0.93497	0.00047
27.80	0.94214	0.00035	20.40	0.93850	0.00043	18.30	0.93880	0.00048
28.30	0.94654	0.00035	20.60	0.94269	0.00045	18.50	0.94484	0.00048
28.80	0.95086	0.00036	20.80	0.94728	0.00042	18.70	0.95133	0.00048
29.30	0.95626	0.00035	21.00	0.95089	0.00044	18.90	0.95534	0.00048
29.80	0.95949	0.00036	21.20	0.95428	0.00043	19.10	0.95969	0.00049
30.30	0.96362	0.00034	21.40	0.95767	0.00043	19.30	0.96434	0.00047
30.80	0.96772	0.00034	21.60	0.96277	0.00043	19.50	0.96957	0.00047
31.30	0.97277	0.00034	21.80	0.96638	0.00046	19.70	0.97399	0.00048
31.80	0.97627	0.00035	22.00	0.96861	0.00044	19.90	0.97900	0.00046
32.30	0.97912	0.00035	22.20	0.97203	0.00043	20.10	0.98376	0.00046
32.80	0.98337	0.00034	22.40	0.97628	0.00043	20.30	0.98745	0.00046
33.30	0.98571	0.00033	22.60	0.97935	0.00043	20.50	0.99271	0.00046
33.80	0.98987	0.00033	22.80	0.98248	0.00042	20.70	0.99586	0.00047
34.30	0.99116	0.00032	23.00	0.98605	0.00042	20.90	0.99997	0.00047
34.80	0.99624	0.00032	23.20	0.98988	0.00041	21.10	1.00437	0.00046
35.30	0.99799	0.00033	23.40	0.99214	0.00042	21.30	1.00946	0.00045
35.80	1.00145	0.00031	23.60	0.99513	0.00041	21.50	1.01164	0.00045
36.30	1.00359	0.00033	23.80	0.99883	0.00041	21.70	1.01556	0.00046
36.80	1.00642	0.00031	24.00	1.00162	0.00043			
37.30	1.00935	0.00032	24.20	1.00418	0.00042			
37.80	1.01167	0.00031	24.40	1.00764	0.00042			
37.90	1.01206	0.00031	24.60	1.00989	0.00042			
			24.80	1.01256	0.00041			

Table B.1.1.3.2-2. K_{eff} Values for 95% ^{239}Pu Sphere – 1 Inch of Water Reflection (cont)

18 milli-g/cc			20 milli-g/cc			22 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
15.90	0.92546	0.00052	15.00	0.92239	0.00052	14.30	0.91817	0.00054
16.00	0.92815	0.00052	15.10	0.92522	0.00052	14.40	0.92308	0.00057
16.10	0.93248	0.00051	15.20	0.93011	0.00055	14.50	0.92702	0.00057
16.20	0.93559	0.00052	15.30	0.93302	0.00053	14.60	0.93168	0.00055
16.30	0.94002	0.00051	15.40	0.93598	0.00054	14.70	0.93625	0.00056
16.40	0.94156	0.00053	15.50	0.94084	0.00055	14.80	0.93897	0.00056
16.50	0.94506	0.00050	15.60	0.94516	0.00055	14.90	0.94405	0.00057
16.60	0.94875	0.00053	15.70	0.94942	0.00054	15.00	0.94690	0.00058
16.70	0.95122	0.00050	15.80	0.95160	0.00053	15.10	0.95159	0.00055
16.80	0.95489	0.00053	15.90	0.95491	0.00055	15.20	0.95465	0.00053
16.90	0.95830	0.00054	16.00	0.95850	0.00051	15.30	0.95934	0.00054
17.00	0.96154	0.00053	16.10	0.96307	0.00052	15.40	0.96280	0.00055
17.10	0.96487	0.00050	16.20	0.96626	0.00053	15.50	0.96718	0.00055
17.20	0.96697	0.00051	16.30	0.96913	0.00054	15.60	0.97029	0.00056
17.30	0.97114	0.00051	16.40	0.97296	0.00051	15.70	0.97298	0.00054
17.40	0.97359	0.00052	16.50	0.97656	0.00054	15.80	0.97919	0.00052
17.50	0.97620	0.00051	16.60	0.97925	0.00056	15.90	0.98107	0.00055
17.60	0.97900	0.00050	16.70	0.98363	0.00055	16.00	0.98533	0.00055
17.70	0.98248	0.00049	16.80	0.98589	0.00054	16.10	0.98916	0.00054
17.80	0.98465	0.00049	16.90	0.98977	0.00053	16.20	0.99279	0.00054
17.90	0.98766	0.00051	17.00	0.99221	0.00055	16.30	0.99468	0.00055
18.00	0.99133	0.00050	17.10	0.99576	0.00052	16.40	0.99892	0.00056
18.10	0.99342	0.00052	17.20	0.99997	0.00052	16.50	1.00146	0.00053
18.20	0.99603	0.00050	17.30	1.00130	0.00057	16.60	1.00557	0.00055
18.30	0.99869	0.00054	17.40	1.00510	0.00052	16.70	1.00853	0.00051
18.40	1.00148	0.00051	17.50	1.00807	0.00052	16.80	1.01285	0.00052
18.50	1.00552	0.00050	17.60	1.01078	0.00052	16.90	1.01555	0.00054
18.60	1.00804	0.00050	17.70	1.01444	0.00051	17.00	1.01957	0.00056
18.70	1.01009	0.00050	17.80	1.01660	0.00051			
18.80	1.01246	0.00050						
18.90	1.01504	0.00050						
19.00	1.01700	0.00050						

Table B.1.1.3.2-2. K_{eff} Values for 95% ^{239}Pu Sphere – 1 Inch of Water Reflection (cont)

24 milli-g/cc			25 milli-g/cc			26 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
13.70	0.91290	0.00056	13.70	0.92394	0.00058	13.50	0.92240	0.00059
13.80	0.91827	0.00060	13.80	0.92619	0.00057	13.60	0.92704	0.00061
13.90	0.92312	0.00059	13.90	0.93180	0.00060	13.70	0.93156	0.00057
14.00	0.92701	0.00058	14.00	0.93712	0.00059	13.80	0.93623	0.00059
14.10	0.93227	0.00058	14.10	0.94015	0.00058	13.90	0.94002	0.00059
14.20	0.93564	0.00057	14.20	0.94518	0.00060	14.00	0.94481	0.00059
14.30	0.93969	0.00056	14.30	0.95064	0.00057	14.10	0.94870	0.00059
14.40	0.94471	0.00056	14.40	0.95425	0.00060	14.20	0.95398	0.00062
14.50	0.94852	0.00060	14.50	0.95758	0.00058	14.30	0.95907	0.00056
14.60	0.95286	0.00057	14.60	0.96204	0.00061	14.40	0.96311	0.00060
14.70	0.95650	0.00058	14.70	0.96720	0.00057	14.50	0.96648	0.00060
14.80	0.96000	0.00057	14.80	0.97043	0.00059	14.60	0.97177	0.00060
14.90	0.96479	0.00057	14.90	0.97521	0.00056	14.70	0.97543	0.00059
15.00	0.96942	0.00055	15.00	0.97760	0.00056	14.80	0.98040	0.00058
15.10	0.97320	0.00056	15.10	0.98284	0.00056	14.90	0.98343	0.00056
15.20	0.97751	0.00058	15.20	0.98692	0.00058	15.00	0.98762	0.00057
15.30	0.98112	0.00057	15.30	0.99122	0.00057	15.10	0.99268	0.00058
15.40	0.98491	0.00059	15.40	0.99488	0.00057	15.20	0.99612	0.00058
15.50	0.98952	0.00057	15.50	0.99773	0.00056	15.30	0.99954	0.00060
15.60	0.99301	0.00056	15.60	1.00271	0.00056	15.40	1.00447	0.00059
15.70	0.99584	0.00056	15.70	1.00594	0.00055	15.50	1.00831	0.00057
15.80	0.99847	0.00058	15.80	1.00860	0.00057	15.60	1.01144	0.00058
15.90	1.00327	0.00057	15.90	1.01356	0.00060	15.70	1.01643	0.00059
16.00	1.00805	0.00056	16.00	1.01674	0.00056			
16.10	1.01213	0.00055	16.10	1.01973	0.00055			
16.20	1.01473	0.00055						
16.30	1.01842	0.00056						

Table B.1.1.3.2-2. K_{eff} Values for 95% ^{239}Pu Sphere – 1 Inch of Water Reflection (cont)

28 milli-g/cc			30 milli-g/cc			32 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
13.20	0.92204	0.00058	12.90	0.92060	0.00062	12.70	0.92336	0.00061
13.30	0.92830	0.00061	13.00	0.92689	0.00058	12.80	0.92830	0.00063
13.40	0.93362	0.00060	13.10	0.93307	0.00060	12.90	0.93460	0.00060
13.50	0.93916	0.00058	13.20	0.93859	0.00058	13.00	0.93830	0.00062
13.60	0.94189	0.00058	13.30	0.94188	0.00063	13.10	0.94491	0.00061
13.70	0.94773	0.00056	13.40	0.94698	0.00059	13.20	0.94975	0.00060
13.80	0.95237	0.00057	13.50	0.95232	0.00061	13.30	0.95510	0.00060
13.90	0.95726	0.00060	13.60	0.95680	0.00062	13.40	0.96053	0.00062
14.00	0.96069	0.00059	13.70	0.96189	0.00061	13.50	0.96531	0.00061
14.10	0.96499	0.00059	13.80	0.96550	0.00060	13.60	0.96898	0.00058
14.20	0.96990	0.00059	13.90	0.97083	0.00059	13.70	0.97404	0.00059
14.30	0.97552	0.00061	14.00	0.97472	0.00062	13.80	0.97863	0.00060
14.40	0.97895	0.00060	14.10	0.98167	0.00061	13.90	0.98395	0.00061
14.50	0.98441	0.00059	14.20	0.98563	0.00061	14.00	0.98820	0.00061
14.60	0.98850	0.00059	14.30	0.98919	0.00060	14.10	0.99331	0.00060
14.70	0.99159	0.00059	14.40	0.99314	0.00062	14.20	0.99732	0.00060
14.80	0.99717	0.00060	14.50	0.99739	0.00060	14.30	1.00201	0.00060
14.90	1.00036	0.00056	14.60	1.00265	0.00062	14.40	1.00655	0.00059
15.00	1.00386	0.00058	14.70	1.00740	0.00061	14.50	1.01024	0.00060
15.10	1.00799	0.00056	14.80	1.01105	0.00062	14.60	1.01558	0.00060
15.20	1.01343	0.00059	14.90	1.01443	0.00061	14.70	1.01974	0.00059
15.30	1.01619	0.00058	15.00	1.01897	0.00058			
15.40	1.02034	0.00057						

Table B.1.1.3.2-2. K_{eff} Values for 95% ^{239}Pu Sphere – 1 Inch of Water Reflection (cont)

36 milli-g/cc			40 milli-g/cc			45 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.30	0.92270	0.00064	12.00	0.92068	0.00061	11.70	0.91993	0.00063
12.40	0.92663	0.00063	12.10	0.92750	0.00062	11.80	0.92617	0.00067
12.50	0.93265	0.00064	12.20	0.93395	0.00060	11.90	0.93081	0.00066
12.60	0.93929	0.00064	12.30	0.93899	0.00065	12.00	0.93647	0.00066
12.70	0.94533	0.00063	12.40	0.94471	0.00065	12.10	0.94338	0.00065
12.80	0.94913	0.00061	12.50	0.95016	0.00064	12.20	0.94944	0.00062
12.90	0.95519	0.00062	12.60	0.95561	0.00061	12.30	0.95346	0.00065
13.00	0.96044	0.00062	12.70	0.95944	0.00064	12.40	0.96083	0.00063
13.10	0.96467	0.00062	12.80	0.96632	0.00061	12.50	0.96670	0.00064
13.20	0.97082	0.00064	12.90	0.97145	0.00065	12.60	0.97091	0.00067
13.30	0.97607	0.00064	13.00	0.97667	0.00064	12.70	0.97845	0.00068
13.40	0.98235	0.00064	13.10	0.98140	0.00066	12.80	0.98319	0.00064
13.50	0.98639	0.00064	13.20	0.98717	0.00064	12.90	0.98871	0.00067
13.60	0.99047	0.00061	13.30	0.99269	0.00063	13.00	0.99388	0.00064
13.70	0.99732	0.00062	13.40	0.99809	0.00063	13.10	0.99820	0.00065
13.80	1.00007	0.00061	13.50	1.00204	0.00064	13.20	1.00341	0.00064
13.90	1.00529	0.00064	13.60	1.00684	0.00064	13.30	1.00926	0.00063
14.00	1.00959	0.00062	13.70	1.01154	0.00065	13.40	1.01390	0.00064
14.10	1.01420	0.00063	13.80	1.01794	0.00064	13.50	1.01948	0.00064
14.20	1.01795	0.00061	13.90	1.02216	0.00065			

Table B.1.1.3.2-2. K_{eff} Values for 95% ^{239}Pu Sphere – 1 Inch of Water Reflection (cont)

50 milli-g/cc			75 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.50	0.91990	0.00065	11.00	0.92226	0.00068	10.70	0.91590	0.00069
11.60	0.92707	0.00069	11.05	0.92603	0.00065	10.75	0.91940	0.00069
11.70	0.93187	0.00066	11.10	0.92903	0.00068	10.80	0.92270	0.00071
11.80	0.93771	0.00063	11.15	0.93162	0.00067	10.85	0.92708	0.00071
11.90	0.94372	0.00064	11.20	0.93659	0.00069	10.90	0.93001	0.00068
12.00	0.95093	0.00065	11.25	0.93853	0.00069	10.95	0.93173	0.00068
12.10	0.95649	0.00069	11.30	0.94206	0.00069	11.00	0.93585	0.00068
12.20	0.96171	0.00063	11.35	0.94555	0.00072	11.05	0.93818	0.00071
12.30	0.96829	0.00067	11.40	0.94856	0.00069	11.10	0.94283	0.00073
12.40	0.97449	0.00064	11.45	0.95163	0.00070	11.15	0.94594	0.00071
12.50	0.97963	0.00070	11.50	0.95467	0.00071	11.20	0.94935	0.00070
12.60	0.98577	0.00067	11.55	0.95766	0.00071	11.25	0.95269	0.00070
12.70	0.99082	0.00064	11.60	0.96030	0.00070	11.30	0.95391	0.00070
12.80	0.99559	0.00067	11.65	0.96410	0.00065	11.35	0.95734	0.00069
12.90	1.00150	0.00067	11.70	0.96734	0.00069	11.40	0.96188	0.00069
13.00	1.00687	0.00067	11.75	0.96973	0.00068	11.45	0.96411	0.00072
13.10	1.01185	0.00066	11.80	0.97356	0.00070	11.50	0.96954	0.00071
13.20	1.01802	0.00066	11.85	0.97697	0.00070	11.55	0.97137	0.00068
13.30	1.02111	0.00066	11.90	0.98021	0.00068	11.60	0.97349	0.00073
			11.95	0.98321	0.00068	11.65	0.97695	0.00067
			12.00	0.98558	0.00070	11.70	0.98012	0.00072
			12.05	0.98883	0.00066	11.75	0.98494	0.00068
			12.10	0.99132	0.00069	11.80	0.98496	0.00070
			12.15	0.99396	0.00071	11.85	0.99055	0.00069
			12.20	0.99819	0.00068	11.90	0.99298	0.00068
			12.25	0.99972	0.00069	11.95	0.99497	0.00073
			12.30	1.00274	0.00066	12.00	0.99868	0.00069
			12.35	1.00657	0.00068	12.05	1.00207	0.00072
			12.40	1.00918	0.00071	12.10	1.00507	0.00069
			12.45	1.01147	0.00069	12.15	1.00888	0.00072
			12.50	1.01567	0.00068	12.20	1.01064	0.00071
			12.55	1.01784	0.00070	12.25	1.01374	0.00071
			12.60	1.02026	0.00069	12.30	1.01623	0.00070
						12.35	1.01865	0.00072
						12.40	1.01996	0.00070

Table B.1.1.3.2-2. K_{eff} Values for 95% ^{239}Pu Sphere – 1 Inch of Water Reflection (cont)

150 milli-g/cc			200 milli-g/cc			350 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.70	0.92393	0.00070	10.60	0.91684	0.00071	10.80	0.92912	0.00071
10.75	0.92597	0.00072	10.65	0.92114	0.00069	10.85	0.93174	0.00070
10.80	0.92976	0.00071	10.70	0.92377	0.00068	10.90	0.93449	0.00070
10.85	0.93358	0.00071	10.75	0.92725	0.00071	10.95	0.93959	0.00068
10.90	0.93654	0.00071	10.80	0.93144	0.00069	11.00	0.94190	0.00072
10.95	0.94091	0.00072	10.85	0.93365	0.00069	11.05	0.94626	0.00070
11.00	0.94200	0.00069	10.90	0.93717	0.00072	11.10	0.94651	0.00069
11.05	0.94569	0.00072	10.95	0.94048	0.00071	11.15	0.94976	0.00069
11.10	0.94803	0.00070	11.00	0.94287	0.00069	11.20	0.95310	0.00070
11.15	0.95348	0.00071	11.05	0.94660	0.00071	11.25	0.95672	0.00071
11.20	0.95759	0.00067	11.10	0.95067	0.00071	11.30	0.95992	0.00070
11.25	0.95875	0.00071	11.15	0.95315	0.00071	11.35	0.96229	0.00069
11.30	0.96251	0.00074	11.20	0.95646	0.00070	11.40	0.96583	0.00068
11.35	0.96567	0.00070	11.25	0.95884	0.00071	11.45	0.96913	0.00071
11.40	0.96833	0.00069	11.30	0.96193	0.00067	11.50	0.97161	0.00070
11.45	0.97144	0.00071	11.35	0.96480	0.00070	11.55	0.97453	0.00069
11.50	0.97484	0.00074	11.40	0.96926	0.00071	11.60	0.97615	0.00072
11.55	0.97834	0.00070	11.45	0.97122	0.00070	11.65	0.97950	0.00074
11.60	0.98069	0.00070	11.50	0.97430	0.00072	11.70	0.98363	0.00071
11.65	0.98443	0.00067	11.55	0.97712	0.00071	11.75	0.98524	0.00069
11.70	0.98765	0.00070	11.60	0.98110	0.00068	11.80	0.98843	0.00069
11.75	0.99034	0.00070	11.65	0.98264	0.00071	11.85	0.99055	0.00069
11.80	0.99206	0.00070	11.70	0.98629	0.00070	11.90	0.99307	0.00070
11.85	0.99542	0.00067	11.75	0.98936	0.00073	11.95	0.99751	0.00070
11.90	0.99846	0.00068	11.80	0.99258	0.00074	12.00	0.99899	0.00072
11.95	1.00158	0.00071	11.85	0.99577	0.00070	12.05	1.00103	0.00071
12.00	1.00454	0.00070	11.90	0.99818	0.00070	12.10	1.00539	0.00070
12.05	1.00764	0.00069	11.95	1.00112	0.00071	12.15	1.00717	0.00070
12.10	1.01065	0.00071	12.00	1.00279	0.00072	12.20	1.00939	0.00069
12.15	1.01374	0.00073	12.05	1.00586	0.00071	12.25	1.01360	0.00069
12.20	1.01613	0.00071	12.10	1.00877	0.00071	12.30	1.01642	0.00069
12.25	1.01971	0.00072	12.15	1.01437	0.00071	12.35	1.01811	0.00072
12.30	1.02146	0.00073	12.20	1.01558	0.00071	12.40	1.02022	0.00069
			12.25	1.01753	0.00072			
			12.30	1.02100	0.00071			

Table B.1.1.3.2-2. K_{eff} Values for 95% ^{239}Pu Sphere – 1 Inch of Water Reflection (cont)

500 milli-g/cc			750 milli-g/cc			1000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.60	0.91932	0.00070	10.40	0.91873	0.00068	10.20	0.92255	0.00067
10.65	0.92202	0.00066	10.45	0.92206	0.00070	10.25	0.92519	0.00067
10.70	0.92542	0.00069	10.50	0.92482	0.00068	10.30	0.92836	0.00068
10.75	0.92801	0.00069	10.55	0.92877	0.00071	10.35	0.93245	0.00069
10.80	0.93092	0.00068	10.60	0.93094	0.00067	10.40	0.93561	0.00067
10.85	0.93354	0.00068	10.65	0.93313	0.00066	10.45	0.93757	0.00069
10.90	0.93731	0.00069	10.70	0.93783	0.00067	10.50	0.94120	0.00067
10.95	0.94193	0.00068	10.75	0.94068	0.00067	10.55	0.94424	0.00070
11.00	0.94301	0.00072	10.80	0.94336	0.00067	10.60	0.94860	0.00067
11.05	0.94683	0.00070	10.85	0.94656	0.00070	10.65	0.95079	0.00067
11.10	0.94923	0.00070	10.90	0.94883	0.00073	10.70	0.95378	0.00069
11.15	0.95297	0.00070	10.95	0.95270	0.00068	10.75	0.95600	0.00067
11.20	0.95600	0.00070	11.00	0.95497	0.00069	10.80	0.95999	0.00066
11.25	0.95984	0.00072	11.05	0.95851	0.00070	10.85	0.96440	0.00066
11.30	0.96163	0.00070	11.10	0.96159	0.00071	10.90	0.96589	0.00071
11.35	0.96413	0.00070	11.15	0.96435	0.00064	10.95	0.96862	0.00069
11.40	0.96761	0.00068	11.20	0.96658	0.00070	11.00	0.97230	0.00068
11.45	0.97022	0.00068	11.25	0.97037	0.00070	11.05	0.97505	0.00071
11.50	0.97235	0.00071	11.30	0.97125	0.00073	11.10	0.97785	0.00068
11.55	0.97588	0.00068	11.35	0.97514	0.00069	11.15	0.98214	0.00067
11.60	0.97818	0.00067	11.40	0.97701	0.00066	11.20	0.98368	0.00070
11.65	0.98125	0.00071	11.45	0.98139	0.00070	11.25	0.98681	0.00069
11.70	0.98522	0.00068	11.50	0.98503	0.00071	11.30	0.99002	0.00068
11.75	0.98643	0.00070	11.55	0.98824	0.00068	11.35	0.99332	0.00068
11.80	0.98930	0.00069	11.60	0.99005	0.00068	11.40	0.99533	0.00067
11.85	0.99326	0.00073	11.65	0.99353	0.00071	11.45	0.99814	0.00067
11.90	0.99541	0.00070	11.70	0.99599	0.00068	11.50	1.00105	0.00068
11.95	0.99901	0.00072	11.75	0.99907	0.00068	11.55	1.00377	0.00069
12.00	1.00119	0.00070	11.80	1.00207	0.00071	11.60	1.00667	0.00070
12.05	1.00530	0.00071	11.85	1.00434	0.00069	11.65	1.00917	0.00069
12.10	1.00610	0.00074	11.90	1.00887	0.00071	11.70	1.01307	0.00067
12.15	1.00781	0.00070	11.95	1.00902	0.00068	11.75	1.01261	0.00067
12.20	1.01210	0.00072	12.00	1.01263	0.00068	11.80	1.01685	0.00069
12.25	1.01423	0.00068	12.05	1.01594	0.00070			
12.30	1.01693	0.00069	12.10	1.01748	0.00070			

Table B.1.1.3.2-2. K_{eff} Values for 95% ^{239}Pu Sphere – 1 Inch of Water Reflection (cont)

1500 milli-g/cc			2000 milli-g/cc			2500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.60	0.91944	0.00070	9.10	0.92052	0.00067	8.60	0.91984	0.00067
9.65	0.92345	0.00067	9.15	0.92629	0.00069	8.65	0.92465	0.00067
9.70	0.92587	0.00068	9.20	0.92914	0.00067	8.70	0.92674	0.00067
9.75	0.93010	0.00070	9.25	0.93361	0.00067	8.75	0.93069	0.00065
9.80	0.93346	0.00065	9.30	0.93657	0.00066	8.80	0.93528	0.00066
9.85	0.93569	0.00064	9.35	0.94092	0.00067	8.85	0.93968	0.00064
9.90	0.93805	0.00067	9.40	0.94291	0.00068	8.90	0.94541	0.00066
9.95	0.94217	0.00069	9.45	0.94756	0.00065	8.95	0.94753	0.00064
10.00	0.94648	0.00069	9.50	0.95117	0.00066	9.00	0.95118	0.00068
10.05	0.95028	0.00069	9.55	0.95498	0.00067	9.05	0.95587	0.00066
10.10	0.95306	0.00066	9.60	0.95993	0.00070	9.10	0.95942	0.00066
10.15	0.95590	0.00069	9.65	0.96181	0.00068	9.15	0.96521	0.00066
10.20	0.95912	0.00066	9.70	0.96698	0.00068	9.20	0.96649	0.00066
10.25	0.96388	0.00067	9.75	0.96997	0.00065	9.25	0.97229	0.00065
10.30	0.96854	0.00069	9.80	0.97384	0.00067	9.30	0.97467	0.00069
10.35	0.97007	0.00068	9.85	0.97686	0.00067	9.35	0.98059	0.00067
10.40	0.97376	0.00067	9.90	0.97944	0.00069	9.40	0.98271	0.00064
10.45	0.97656	0.00067	9.95	0.98313	0.00065	9.45	0.98700	0.00064
10.50	0.97996	0.00066	10.00	0.98685	0.00068	9.50	0.99068	0.00066
10.55	0.98347	0.00067	10.05	0.99146	0.00069	9.55	0.99419	0.00068
10.60	0.98643	0.00070	10.10	0.99412	0.00068	9.60	0.99826	0.00069
10.65	0.99028	0.00068	10.15	0.99696	0.00068	9.65	1.00246	0.00064
10.70	0.99173	0.00068	10.20	1.00128	0.00063	9.70	1.00625	0.00065
10.75	0.99576	0.00070	10.25	1.00433	0.00066	9.75	1.00870	0.00067
10.80	0.99838	0.00068	10.30	1.00670	0.00064	9.80	1.01234	0.00065
10.85	1.00188	0.00068	10.35	1.00896	0.00067	9.85	1.01625	0.00067
10.90	1.00447	0.00067	10.40	1.01471	0.00067	9.90	1.01954	0.00065
10.95	1.00692	0.00067	10.45	1.01782	0.00068			
11.00	1.01161	0.00066	10.50	1.02079	0.00068			
11.05	1.01488	0.00069						
11.10	1.01659	0.00068						

Table B.1.1.3.2-2. K_{eff} Values for 95% ^{239}Pu Sphere – 1 Inch of Water Reflection (cont)

3000 milli-g/cc			4000 milli-g/cc			5000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.10	0.91352	0.00065	7.50	0.92232	0.00063	6.90	0.91904	0.00060
8.15	0.91649	0.00067	7.55	0.92702	0.00066	6.95	0.92532	0.00066
8.20	0.92125	0.00065	7.60	0.93204	0.00065	7.00	0.93071	0.00064
8.25	0.92538	0.00065	7.65	0.93710	0.00065	7.05	0.93687	0.00062
8.30	0.93036	0.00065	7.70	0.94277	0.00064	7.10	0.94195	0.00064
8.35	0.93419	0.00066	7.75	0.94667	0.00069	7.15	0.94808	0.00063
8.40	0.93840	0.00067	7.80	0.95364	0.00065	7.20	0.95336	0.00063
8.45	0.94402	0.00067	7.85	0.95712	0.00064	7.25	0.95898	0.00064
8.50	0.94886	0.00063	7.90	0.96198	0.00065	7.30	0.96375	0.00063
8.55	0.95179	0.00065	7.95	0.96611	0.00062	7.35	0.96874	0.00062
8.60	0.95567	0.00065	8.00	0.97158	0.00068	7.40	0.97410	0.00064
8.65	0.96125	0.00065	8.05	0.97623	0.00067	7.45	0.97973	0.00063
8.70	0.96536	0.00065	8.10	0.98076	0.00062	7.50	0.98478	0.00063
8.75	0.96951	0.00066	8.15	0.98637	0.00064	7.55	0.99060	0.00066
8.80	0.97276	0.00065	8.20	0.99013	0.00067	7.60	0.99524	0.00065
8.85	0.97657	0.00066	8.25	0.99571	0.00063	7.65	0.99993	0.00065
8.90	0.98125	0.00068	8.30	1.00028	0.00065	7.70	1.00481	0.00061
8.95	0.98500	0.00063	8.35	1.00401	0.00066	7.75	1.00974	0.00062
9.00	0.99125	0.00068	8.40	1.00880	0.00067	7.80	1.01439	0.00063
9.05	0.99327	0.00069	8.45	1.01298	0.00066	7.85	1.02014	0.00065
9.10	0.99774	0.00066	8.50	1.01727	0.00068	7.90	1.02584	0.00064
9.15	1.00154	0.00065	8.55	1.02145	0.00063			
9.20	1.00522	0.00068	8.60	1.02660	0.00067			
9.25	1.01042	0.00067						
9.30	1.01225	0.00066						
9.35	1.01614	0.00067						
9.40	1.02129	0.00067						

Table B.1.1.3.2-2. K_{eff} Values for 95% ^{239}Pu Sphere – 1 Inch of Water Reflection (cont)

6000 milli-g/cc			7000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.40	0.91584	0.00060	6.00	0.91773	0.00062	5.80	0.91322	0.00058
6.45	0.92204	0.00061	6.05	0.92291	0.00060	5.85	0.92100	0.00058
6.50	0.92908	0.00059	6.10	0.92995	0.00058	5.90	0.92756	0.00060
6.55	0.93448	0.00061	6.15	0.93620	0.00059	5.95	0.93466	0.00061
6.60	0.93959	0.00060	6.20	0.94361	0.00060	6.00	0.94099	0.00059
6.65	0.94604	0.00064	6.25	0.95031	0.00061	6.05	0.94839	0.00060
6.70	0.95350	0.00061	6.30	0.95523	0.00060	6.10	0.95517	0.00057
6.75	0.95835	0.00063	6.35	0.96297	0.00063	6.15	0.96018	0.00058
6.80	0.96478	0.00062	6.40	0.96911	0.00060	6.20	0.96737	0.00060
6.85	0.97191	0.00059	6.45	0.97553	0.00060	6.25	0.97531	0.00058
6.90	0.97530	0.00064	6.50	0.98015	0.00061	6.30	0.98008	0.00059
6.95	0.98248	0.00064	6.55	0.98739	0.00062	6.35	0.98836	0.00063
7.00	0.98818	0.00062	6.60	0.99347	0.00063	6.40	0.99417	0.00062
7.05	0.99303	0.00061	6.65	1.00007	0.00062	6.45	1.00119	0.00060
7.10	0.99947	0.00061	6.70	1.00632	0.00064	6.50	1.00686	0.00058
7.15	1.00478	0.00065	6.75	1.01290	0.00062	6.55	1.01211	0.00060
7.20	1.01151	0.00061	6.80	1.01910	0.00063	6.60	1.02029	0.00061
7.25	1.01555	0.00063	6.85	1.02426	0.00063	6.65	1.02555	0.00062
7.30	1.02221	0.00065	6.90	1.03000	0.00063	6.70	1.03239	0.00060

Table B.1.1.3.2-2. K_{eff} Values for 95% ^{239}Pu Sphere – 1 Inch of Water Reflection (cont)

8000 milli-g/cc			9000 milli-g/cc			10000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.60	0.91001	0.00057	5.30	0.91149	0.00059	5.00	0.90736	0.00055
5.65	0.91653	0.00058	5.35	0.91806	0.00057	5.05	0.91608	0.00055
5.70	0.92325	0.00058	5.40	0.92554	0.00057	5.10	0.92407	0.00054
5.75	0.93023	0.00057	5.45	0.93416	0.00055	5.15	0.93072	0.00056
5.80	0.93689	0.00056	5.50	0.94115	0.00058	5.20	0.93954	0.00057
5.85	0.94353	0.00060	5.55	0.94777	0.00060	5.25	0.94675	0.00055
5.90	0.95190	0.00057	5.60	0.95579	0.00056	5.30	0.95409	0.00058
5.95	0.95919	0.00059	5.65	0.96381	0.00057	5.35	0.96273	0.00057
6.00	0.96611	0.00060	5.70	0.97068	0.00056	5.40	0.96968	0.00056
6.05	0.97194	0.00059	5.75	0.97763	0.00059	5.45	0.97722	0.00056
6.10	0.98024	0.00061	5.80	0.98413	0.00059	5.50	0.98564	0.00059
6.15	0.98601	0.00060	5.85	0.99166	0.00060	5.55	0.99225	0.00057
6.20	0.99128	0.00060	5.90	0.99965	0.00056	5.60	1.00038	0.00057
6.25	0.99999	0.00061	5.95	1.00687	0.00060	5.65	1.00869	0.00055
6.30	1.00558	0.00061	6.00	1.01279	0.00059	5.70	1.01499	0.00055
6.35	1.01281	0.00060	6.05	1.02084	0.00062	5.75	1.02374	0.00056
6.40	1.01931	0.00061	6.10	1.02710	0.00058	5.80	1.03099	0.00059

Table B.1.1.3.2-2. K_{eff} Values for 95% ^{239}Pu Sphere – 1 Inch of Water Reflection (cont)

15000 milli-g/cc			19600 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
3.90	0.90345	0.00048	3.20	0.90313	0.00045			
3.95	0.91321	0.00049	3.22	0.90782	0.00045			
4.00	0.92333	0.00049	3.24	0.91259	0.00046			
4.05	0.93359	0.00049	3.26	0.91756	0.00044			
4.10	0.94259	0.00049	3.28	0.92273	0.00043			
4.15	0.95344	0.00049	3.30	0.92805	0.00045			
4.20	0.96400	0.00051	3.32	0.93277	0.00044			
4.25	0.97293	0.00052	3.34	0.93750	0.00044			
4.30	0.98389	0.00049	3.36	0.94223	0.00044			
4.35	0.99272	0.00052	3.38	0.94704	0.00048			
4.40	1.00262	0.00052	3.40	0.95057	0.00045			
4.45	1.01253	0.00051	3.42	0.95773	0.00045			
4.50	1.02222	0.00052	3.44	0.96116	0.00046			
			3.46	0.96543	0.00047			
			3.48	0.97134	0.00047			
			3.50	0.97555	0.00048			
			3.52	0.98086	0.00047			
			3.54	0.98503	0.00048			
			3.56	0.98950	0.00048			
			3.58	0.99394	0.00048			
			3.60	0.99850	0.00047			
			3.62	1.00314	0.00048			
			3.64	1.00882	0.00047			
			3.66	1.01260	0.00047			
			3.68	1.01792	0.00049			
			3.70	1.02134	0.00049			

B.1.1.3.3. 10” Water Reflector

Case ID: pu-sp-0950-10

Material: Plutonium metal in water

Geometry: Sphere

Isotopics: 95% ^{239}Pu 5% ^{240}Pu

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.1.1.3.3-1. 95% ^{239}Pu Sphere – 10 Inches of Water Reflection

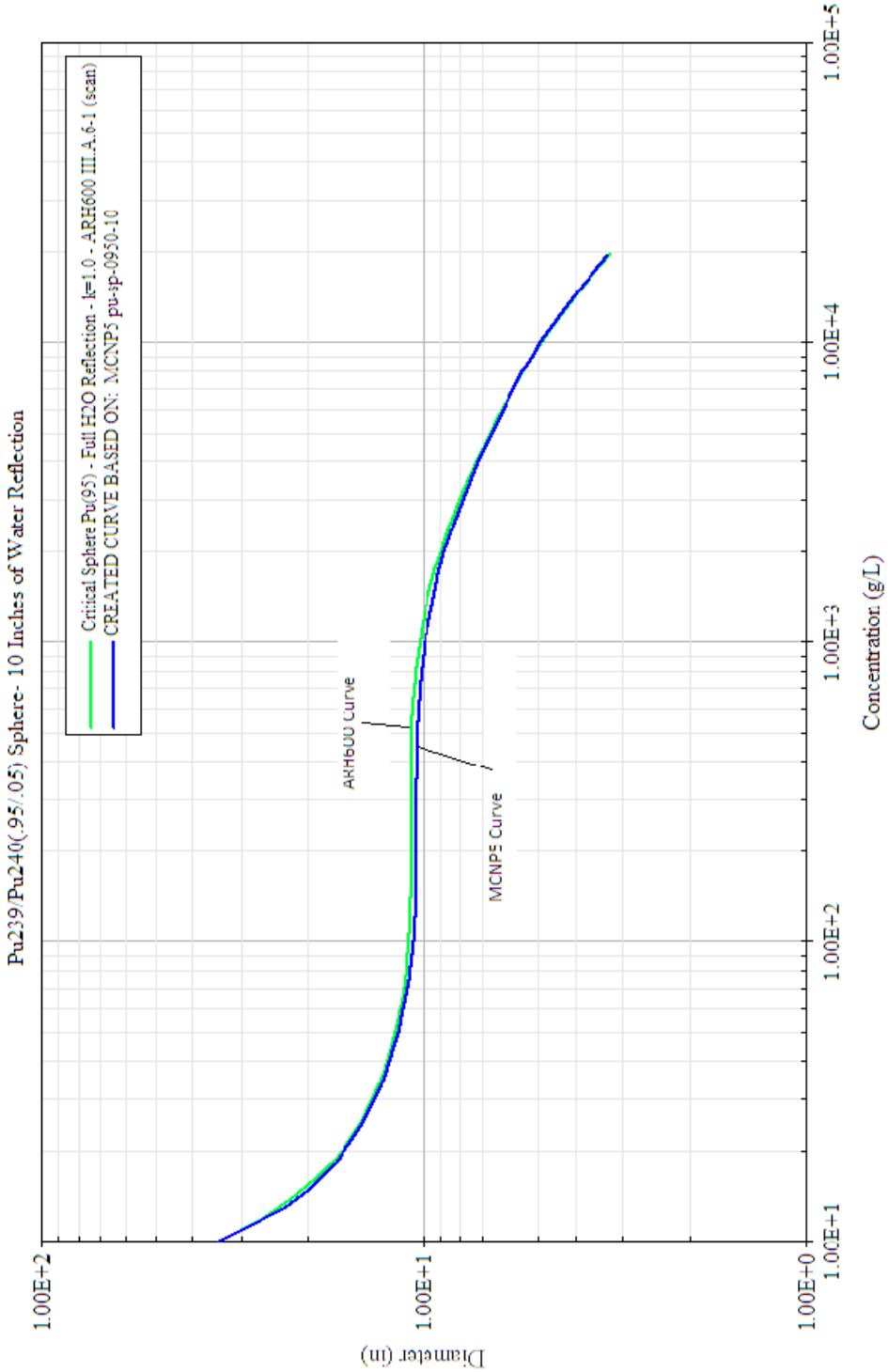

Table B.1.1.3.3-1. Critical Dimensions for 95% ^{239}Pu Sphere – 10 Inches of Water Reflection

95% ^{239}Pu Sphere – 10 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	25.300	36.700	0.500	34.4888
0.013	18.700	23.700	0.200	22.8074
0.015	16.600	20.600	0.200	19.7674
0.018	14.700	17.900	0.100	17.2131
0.020	13.900	16.700	0.100	16.1208
0.022	13.300	15.800	0.100	15.3002
0.024	12.800	15.100	0.100	14.6741
0.025	12.600	14.700	0.100	14.3792
0.026	12.300	15.200	0.100	14.1395
0.028	12.000	14.200	0.100	13.7265
0.030	11.700	13.800	0.100	13.3767
0.032	11.500	13.500	0.100	13.0708
0.036	11.100	13.000	0.100	12.6150
0.040	10.800	12.800	0.100	12.2546
0.045	10.500	12.300	0.100	11.9047
0.050	10.300	12.000	0.050	11.6411
0.075	9.700	11.300	0.050	10.9262
0.100	9.400	11.200	0.100	10.6667
0.150	9.200	10.800	0.050	10.4830
0.200	9.200	10.700	0.050	10.4338
0.350	9.200	10.800	0.050	10.4193
0.500	9.100	10.700	0.050	10.3689
0.750	8.900	10.500	0.050	10.1710
1.000	8.700	10.200	0.050	9.9114
1.500	8.200	9.600	0.050	9.3419
2.000	7.700	9.100	0.050	8.7959
2.500	7.300	8.600	0.050	8.3227
3.000	7.000	8.200	0.050	7.8956
4.000	6.400	7.400	0.050	7.2102
5.000	5.900	6.900	0.050	6.6549
6.000	5.500	6.400	0.050	6.1979
7.000	5.200	6.000	0.050	5.8271
7.500	5.000	5.800	0.050	5.6493
8.000	4.900	5.700	0.050	5.4969
9.000	4.600	5.400	0.050	5.1931
10.000	4.400	5.100	0.050	4.9351
15.000	3.500	4.100	0.050	3.9193
19.600	2.900	3.400	0.020	3.2737

MCNP5 Sample Input File
95% ^{239}Pu Sphere- 10" Reflection

```
s-, 95.0 wt% 239Pu, 07000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 565   hundreths of inches - must be integer
c radius =     7.1755 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 07000 milli-g Pu/cc
c Reflector width = 10.0 inches
c Enrichment = 0.95 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.3571 cc
c Volume of water in sample 0.6429 cc
c
c Mass of crit in sample   7.0000 g
c Mass of water in sample  0.6429 g
c
c Total mass of sample  7.6429g for a 1cc sample
c Mass Density for crit material  -7.6429, expressed as negative
c
c  sphere
20 11   -7.642857   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0

1       so     7.1755              $ Sphere
2       so    32.5755         $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
```

```
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu/water mixture
m11    $ Pu/H2O Sludge, 95.0 wt% 239Pu, 07000 milli-g Pu/cc,  7.6429
1001.66c -0.009412
8016.66c -0.074700
94239.66c -0.870093
94240.66c -0.045794
mt11     lwtr.60t
c
c    pu only
m12    $ Pu/H2O Sludge, 95.0 wt% 239Pu, 07000 milli-g Pu/cc,  7.6429
94239.66c -0.950000
94240.66c -0.050000
c
```

Critview Compatible Data File
95% ^{239}Pu Sphere- 10” Reflection

reset:
title: MCNP5 pu-sp-0950-10
set: MCNP5 set
source: MCNP5 primary
created: Mon 07/19/2010 9:08:48.30
geometry: sphere
modmat: H2O
critmat: plutonium
isomat: Pu239 0.95 Pu240 0.05
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	34.4888
0.013	22.8074
0.015	19.7674
0.018	17.2131
0.020	16.1208
0.022	15.3002
0.024	14.6741
0.025	14.3792
0.026	14.1395
0.028	13.7265
0.030	13.3767
0.032	13.0708
0.036	12.6150
0.040	12.2546
0.045	11.9047
0.050	11.6411
0.075	10.9262
0.100	10.6667
0.150	10.4830
0.200	10.4338
0.350	10.4193
0.500	10.3689
0.750	10.1710
1.000	9.9114
1.500	9.3419
2.000	8.7959
2.500	8.3227
3.000	7.8956
4.000	7.2102
5.000	6.6549
6.000	6.1979
7.000	5.8271
7.500	5.6493
8.000	5.4969
9.000	5.1931
10.00	4.9351
15.00	3.9193
19.60	3.2737

Table B.1.1.3.3-2. K_{eff} Values for 95% ^{239}Pu Sphere – 10 Inches of Water Reflection

10 milli-g/cc			13 milli-g/cc			15 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
25.30	0.92687	0.00035	18.70	0.92556	0.00041	16.60	0.92425	0.00043
25.80	0.93217	0.00033	18.90	0.93032	0.00043	16.80	0.92998	0.00046
26.30	0.93778	0.00034	19.10	0.93395	0.00041	17.00	0.93386	0.00047
26.80	0.94300	0.00035	19.30	0.93816	0.00042	17.20	0.94058	0.00045
27.30	0.94717	0.00033	19.50	0.94226	0.00040	17.40	0.94581	0.00046
27.80	0.95184	0.00035	19.70	0.94713	0.00041	17.60	0.95068	0.00045
28.30	0.95597	0.00033	19.90	0.95146	0.00041	17.80	0.95537	0.00045
28.80	0.96053	0.00033	20.10	0.95382	0.00040	18.00	0.95970	0.00045
29.30	0.96491	0.00032	20.30	0.95813	0.00041	18.20	0.96511	0.00043
29.80	0.96816	0.00032	20.50	0.96136	0.00040	18.40	0.96957	0.00044
30.30	0.97240	0.00032	20.70	0.96531	0.00042	18.60	0.97457	0.00045
30.80	0.97623	0.00032	20.90	0.96838	0.00040	18.80	0.97948	0.00044
31.30	0.97940	0.00032	21.10	0.97258	0.00042	19.00	0.98389	0.00045
31.80	0.98305	0.00032	21.30	0.97637	0.00042	19.20	0.98697	0.00043
32.30	0.98734	0.00031	21.50	0.97894	0.00041	19.40	0.99265	0.00044
32.80	0.98954	0.00031	21.70	0.98347	0.00041	19.60	0.99620	0.00045
33.30	0.99361	0.00032	21.90	0.98580	0.00039	19.80	1.00074	0.00043
33.80	0.99541	0.00032	22.10	0.98961	0.00042	20.00	1.00398	0.00044
34.30	0.99909	0.00030	22.30	0.99268	0.00040	20.20	1.00833	0.00044
34.80	1.00150	0.00031	22.50	0.99528	0.00041	20.40	1.01244	0.00044
35.30	1.00386	0.00031	22.70	0.99863	0.00040	20.60	1.01578	0.00042
35.80	1.00693	0.00030	22.90	1.00118	0.00042			
36.30	1.00963	0.00030	23.10	1.00395	0.00039			
36.70	1.01170	0.00031	23.30	1.00656	0.00040			
			23.50	1.01040	0.00039			
			23.70	1.01318	0.00039			

Table B.1.1.3.3-2. K_{eff} Values for 95% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

18 milli-g/cc			20 milli-g/cc			22 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
14.70	0.92183	0.00050	13.90	0.92252	0.00051	13.30	0.92239	0.00052
14.80	0.92496	0.00049	14.00	0.92598	0.00050	13.40	0.92785	0.00051
14.90	0.92897	0.00049	14.10	0.93015	0.00049	13.50	0.93139	0.00054
15.00	0.93213	0.00049	14.20	0.93393	0.00052	13.60	0.93564	0.00051
15.10	0.93619	0.00047	14.30	0.93678	0.00050	13.70	0.93932	0.00054
15.20	0.93861	0.00049	14.40	0.94154	0.00053	13.80	0.94298	0.00050
15.30	0.94178	0.00047	14.50	0.94545	0.00050	13.90	0.94804	0.00053
15.40	0.94617	0.00049	14.60	0.94757	0.00049	14.00	0.95136	0.00049
15.50	0.94905	0.00048	14.70	0.95261	0.00053	14.10	0.95694	0.00053
15.60	0.95176	0.00046	14.80	0.95569	0.00050	14.20	0.95934	0.00052
15.70	0.95522	0.00049	14.90	0.95908	0.00052	14.30	0.96240	0.00055
15.80	0.95944	0.00049	15.00	0.96181	0.00051	14.40	0.96802	0.00052
15.90	0.96134	0.00048	15.10	0.96574	0.00050	14.50	0.97208	0.00051
16.00	0.96436	0.00048	15.20	0.96918	0.00051	14.60	0.97520	0.00051
16.10	0.96765	0.00051	15.30	0.97287	0.00050	14.70	0.97868	0.00053
16.20	0.97192	0.00049	15.40	0.97626	0.00051	14.80	0.98161	0.00052
16.30	0.97342	0.00048	15.50	0.98070	0.00050	14.90	0.98552	0.00053
16.40	0.97697	0.00047	15.60	0.98343	0.00050	15.00	0.98957	0.00051
16.50	0.97930	0.00048	15.70	0.98658	0.00051	15.10	0.99273	0.00053
16.60	0.98166	0.00049	15.80	0.98956	0.00048	15.20	0.99541	0.00051
16.70	0.98658	0.00048	15.90	0.99416	0.00048	15.30	0.99999	0.00051
16.80	0.98815	0.00048	16.00	0.99669	0.00051	15.40	1.00452	0.00053
16.90	0.99155	0.00047	16.10	0.99925	0.00049	15.50	1.00636	0.00051
17.00	0.99310	0.00048	16.20	1.00285	0.00050	15.60	1.01045	0.00052
17.10	0.99639	0.00049	16.30	1.00538	0.00050	15.70	1.01275	0.00051
17.20	0.99961	0.00046	16.40	1.00772	0.00051	15.80	1.01669	0.00054
17.30	1.00259	0.00045	16.50	1.01180	0.00052			
17.40	1.00465	0.00047	16.60	1.01508	0.00049			
17.50	1.00844	0.00048	16.70	1.01816	0.00051			
17.60	1.01029	0.00048						
17.70	1.01285	0.00047						
17.80	1.01478	0.00047						
17.90	1.01790	0.00048						

Table B.1.1.3.3-2. K_{eff} Values for 95% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

24 milli-g/cc			25 milli-g/cc			26 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.80	0.92296	0.00055	12.60	0.92311	0.00056	12.30	0.91856	0.00055
12.90	0.92797	0.00055	12.70	0.92823	0.00054	12.40	0.92206	0.00055
13.00	0.93204	0.00052	12.80	0.93332	0.00054	12.50	0.92900	0.00055
13.10	0.93699	0.00052	12.90	0.93713	0.00053	12.60	0.93251	0.00057
13.20	0.94169	0.00052	13.00	0.94235	0.00054	12.70	0.93697	0.00054
13.30	0.94600	0.00056	13.10	0.94636	0.00055	12.80	0.94104	0.00054
13.40	0.94897	0.00053	13.20	0.95100	0.00055	12.90	0.94645	0.00055
13.50	0.95405	0.00054	13.30	0.95542	0.00055	13.00	0.95135	0.00053
13.60	0.95844	0.00054	13.40	0.95992	0.00054	13.10	0.95596	0.00058
13.70	0.96139	0.00053	13.50	0.96338	0.00054	13.20	0.96044	0.00057
13.80	0.96632	0.00054	13.60	0.96861	0.00053	13.30	0.96443	0.00055
13.90	0.97098	0.00053	13.70	0.97166	0.00053	13.40	0.96987	0.00055
14.00	0.97461	0.00054	13.80	0.97643	0.00056	13.50	0.97260	0.00054
14.10	0.97862	0.00051	13.90	0.98152	0.00054	13.60	0.97719	0.00055
14.20	0.98159	0.00054	14.00	0.98542	0.00054	13.70	0.98264	0.00054
14.30	0.98561	0.00053	14.10	0.98817	0.00054	13.80	0.98467	0.00056
14.40	0.99015	0.00051	14.20	0.99280	0.00052	13.90	0.98954	0.00055
14.50	0.99451	0.00054	14.30	0.99620	0.00054	14.00	0.99466	0.00055
14.60	0.99702	0.00055	14.40	1.00100	0.00052	14.10	0.99812	0.00054
14.70	1.00104	0.00054	14.50	1.00506	0.00054	14.20	1.00288	0.00055
14.80	1.00541	0.00053	14.60	1.00692	0.00055	14.30	1.00571	0.00053
14.90	1.00918	0.00052	14.70	1.01186	0.00053	14.40	1.01073	0.00055
15.00	1.01271	0.00051				14.50	1.01274	0.00053
15.10	1.01643	0.00053				14.60	1.01818	0.00054
						14.70	1.02130	0.00054
						14.80	1.02498	0.00054
						14.90	1.02918	0.00053
						15.00	1.03272	0.00056
						15.10	1.03634	0.00055
						15.20	1.04010	0.00053

Table B.1.1.3.3-2. K_{eff} Values for 95% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

28 milli-g/cc			30 milli-g/cc			32 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.00	0.91948	0.00054	11.70	0.91917	0.00057	11.50	0.92101	0.00055
12.10	0.92516	0.00057	11.80	0.92418	0.00058	11.60	0.92653	0.00057
12.20	0.92929	0.00056	11.90	0.92869	0.00057	11.70	0.93243	0.00057
12.30	0.93501	0.00057	12.00	0.93447	0.00057	11.80	0.93660	0.00058
12.40	0.93899	0.00056	12.10	0.93983	0.00058	11.90	0.94188	0.00058
12.50	0.94462	0.00053	12.20	0.94419	0.00058	12.00	0.94693	0.00058
12.60	0.95016	0.00057	12.30	0.94970	0.00056	12.10	0.95344	0.00058
12.70	0.95420	0.00055	12.40	0.95713	0.00057	12.20	0.95768	0.00058
12.80	0.95849	0.00056	12.50	0.96092	0.00058	12.30	0.96316	0.00057
12.90	0.96365	0.00055	12.60	0.96345	0.00059	12.40	0.96791	0.00057
13.00	0.96771	0.00056	12.70	0.96882	0.00056	12.50	0.97350	0.00056
13.10	0.97206	0.00055	12.80	0.97478	0.00057	12.60	0.97732	0.00055
13.20	0.97796	0.00056	12.90	0.97908	0.00057	12.70	0.98222	0.00057
13.30	0.98200	0.00054	13.00	0.98388	0.00057	12.80	0.98697	0.00057
13.40	0.98602	0.00057	13.10	0.98860	0.00058	12.90	0.99193	0.00057
13.50	0.99066	0.00057	13.20	0.99166	0.00057	13.00	0.99697	0.00059
13.60	0.99408	0.00058	13.30	0.99608	0.00056	13.10	1.00125	0.00058
13.70	0.99919	0.00052	13.40	1.00119	0.00055	13.20	1.00557	0.00058
13.80	1.00225	0.00056	13.50	1.00574	0.00055	13.30	1.01042	0.00056
13.90	1.00720	0.00055	13.60	1.00885	0.00057	13.40	1.01451	0.00057
14.00	1.01148	0.00055	13.70	1.01482	0.00057	13.50	1.01882	0.00059
14.10	1.01580	0.00055	13.80	1.01961	0.00056			
14.20	1.01951	0.00055						

Table B.1.1.3.3-2. K_{eff} Values for 95% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

36 milli-g/cc			40 milli-g/cc			45 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.10	0.91985	0.00059	10.80	0.92008	0.00060	10.50	0.91962	0.00060
11.20	0.92663	0.00057	10.90	0.92777	0.00061	10.60	0.92515	0.00062
11.30	0.93138	0.00057	11.00	0.93180	0.00060	10.70	0.93229	0.00060
11.40	0.93691	0.00060	11.10	0.93753	0.00060	10.80	0.93723	0.00062
11.50	0.94203	0.00059	11.20	0.94284	0.00058	10.90	0.94491	0.00061
11.60	0.94797	0.00058	11.30	0.94975	0.00061	11.00	0.94783	0.00059
11.70	0.95421	0.00057	11.40	0.95563	0.00060	11.10	0.95510	0.00059
11.80	0.95887	0.00059	11.50	0.95940	0.00059	11.20	0.96161	0.00061
11.90	0.96482	0.00057	11.60	0.96570	0.00058	11.30	0.96688	0.00060
12.00	0.96997	0.00059	11.70	0.97206	0.00061	11.40	0.97323	0.00061
12.10	0.97468	0.00059	11.80	0.97616	0.00058	11.50	0.97692	0.00062
12.20	0.98019	0.00060	11.90	0.98129	0.00058	11.60	0.98349	0.00061
12.30	0.98456	0.00060	12.00	0.98762	0.00058	11.70	0.98925	0.00059
12.40	0.98957	0.00060	12.10	0.99388	0.00060	11.80	0.99541	0.00060
12.50	0.99419	0.00060	12.20	0.99717	0.00059	11.90	0.99972	0.00060
12.60	0.99924	0.00059	12.30	1.00235	0.00060	12.00	1.00574	0.00061
12.70	1.00430	0.00058	12.40	1.00882	0.00061	12.10	1.01060	0.00060
12.80	1.01028	0.00058	12.50	1.01363	0.00059	12.20	1.01536	0.00060
12.90	1.01427	0.00058	12.60	1.01786	0.00059	12.30	1.02107	0.00062
13.00	1.01886	0.00059	12.70	1.02152	0.00058			
			12.80	1.02711	0.00060			

Table B.1.1.3.3-2. K_{eff} Values for 95% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

50 milli-g/cc			75 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.30	0.92034	0.00061	9.70	0.92048	0.00062	9.40	0.91676	0.00064
10.35	0.92280	0.00061	9.75	0.92393	0.00064	9.50	0.92542	0.00064
10.40	0.92726	0.00063	9.80	0.92753	0.00065	9.60	0.93173	0.00065
10.45	0.92985	0.00060	9.85	0.93242	0.00065	9.70	0.93794	0.00065
10.50	0.93253	0.00064	9.90	0.93447	0.00062	9.80	0.94564	0.00068
10.55	0.93578	0.00061	9.95	0.93766	0.00063	9.90	0.95201	0.00062
10.60	0.93924	0.00062	10.00	0.94167	0.00065	10.00	0.95758	0.00067
10.65	0.94248	0.00062	10.05	0.94475	0.00066	10.10	0.96435	0.00064
10.70	0.94584	0.00060	10.10	0.94622	0.00066	10.20	0.97079	0.00066
10.75	0.94765	0.00062	10.15	0.95107	0.00064	10.30	0.97665	0.00063
10.80	0.95039	0.00060	10.20	0.95401	0.00065	10.40	0.98335	0.00068
10.85	0.95468	0.00060	10.25	0.95813	0.00062	10.50	0.99066	0.00064
10.90	0.95765	0.00059	10.30	0.95965	0.00063	10.60	0.99519	0.00065
10.95	0.95936	0.00060	10.35	0.96444	0.00066	10.70	1.00240	0.00068
11.00	0.96339	0.00063	10.40	0.96581	0.00063	10.80	1.00754	0.00067
11.05	0.96621	0.00063	10.45	0.97176	0.00063	10.90	1.01406	0.00067
11.10	0.96939	0.00058	10.50	0.97297	0.00063	11.00	1.01927	0.00067
11.15	0.97302	0.00062	10.55	0.97785	0.00067	11.10	1.02516	0.00065
11.20	0.97511	0.00061	10.60	0.97911	0.00063	11.20	1.03244	0.00065
11.25	0.97795	0.00061	10.65	0.98357	0.00066			
11.30	0.98144	0.00062	10.70	0.98525	0.00066			
11.35	0.98337	0.00061	10.75	0.98854	0.00063			
11.40	0.98651	0.00061	10.80	0.99129	0.00064			
11.45	0.98913	0.00062	10.85	0.99476	0.00065			
11.50	0.99201	0.00061	10.90	0.99877	0.00063			
11.55	0.99611	0.00061	10.95	1.00112	0.00062			
11.60	0.99768	0.00060	11.00	1.00413	0.00068			
11.65	1.00050	0.00061	11.05	1.00574	0.00066			
11.70	1.00370	0.00061	11.10	1.00961	0.00067			
11.75	1.00669	0.00061	11.15	1.01160	0.00064			
11.80	1.00847	0.00060	11.20	1.01485	0.00063			
11.85	1.01140	0.00061	11.25	1.01860	0.00065			
11.90	1.01401	0.00060	11.30	1.02015	0.00062			
11.95	1.01701	0.00059						
12.00	1.01951	0.00062						

Table B.1.1.3.3-2. K_{eff} Values for 95% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

150 milli-g/cc			200 milli-g/cc			350 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.20	0.91619	0.00065	9.20	0.92178	0.00065	9.20	0.92546	0.00064
9.25	0.92020	0.00065	9.25	0.92435	0.00064	9.25	0.92756	0.00069
9.30	0.92356	0.00066	9.30	0.92774	0.00066	9.30	0.92973	0.00063
9.35	0.92762	0.00066	9.35	0.93097	0.00065	9.35	0.93453	0.00066
9.40	0.93116	0.00066	9.40	0.93612	0.00064	9.40	0.93880	0.00065
9.45	0.93614	0.00065	9.45	0.93903	0.00063	9.45	0.94241	0.00066
9.50	0.93816	0.00064	9.50	0.94084	0.00067	9.50	0.94465	0.00063
9.55	0.94050	0.00065	9.55	0.94450	0.00067	9.55	0.94754	0.00066
9.60	0.94423	0.00065	9.60	0.94813	0.00068	9.60	0.95112	0.00064
9.65	0.94786	0.00070	9.65	0.95252	0.00063	9.65	0.95353	0.00065
9.70	0.94958	0.00066	9.70	0.95469	0.00065	9.70	0.95629	0.00065
9.75	0.95352	0.00068	9.75	0.95765	0.00066	9.75	0.95953	0.00067
9.80	0.95688	0.00063	9.80	0.96056	0.00065	9.80	0.96234	0.00065
9.85	0.96177	0.00069	9.85	0.96468	0.00064	9.85	0.96615	0.00064
9.90	0.96445	0.00065	9.90	0.96743	0.00064	9.90	0.96928	0.00064
9.95	0.96611	0.00065	9.95	0.97101	0.00067	9.95	0.97259	0.00063
10.00	0.97061	0.00067	10.00	0.97482	0.00066	10.00	0.97350	0.00068
10.05	0.97373	0.00065	10.05	0.97644	0.00064	10.05	0.97884	0.00065
10.10	0.97584	0.00068	10.10	0.97982	0.00067	10.10	0.98178	0.00067
10.15	0.98001	0.00066	10.15	0.98328	0.00064	10.15	0.98514	0.00064
10.20	0.98259	0.00066	10.20	0.98522	0.00067	10.20	0.98738	0.00070
10.25	0.98579	0.00065	10.25	0.98957	0.00067	10.25	0.99032	0.00063
10.30	0.98750	0.00066	10.30	0.99360	0.00066	10.30	0.99423	0.00067
10.35	0.99212	0.00065	10.35	0.99472	0.00063	10.35	0.99654	0.00066
10.40	0.99462	0.00064	10.40	0.99751	0.00064	10.40	0.99889	0.00064
10.45	0.99729	0.00066	10.45	1.00119	0.00062	10.45	1.00176	0.00066
10.50	1.00139	0.00066	10.50	1.00487	0.00067	10.50	1.00330	0.00062
10.55	1.00521	0.00065	10.55	1.00586	0.00066	10.55	1.00731	0.00067
10.60	1.00770	0.00065	10.60	1.00992	0.00068	10.60	1.00986	0.00064
10.65	1.00995	0.00064	10.65	1.01276	0.00067	10.65	1.01208	0.00067
10.70	1.01324	0.00066	10.70	1.01595	0.00064	10.70	1.01566	0.00063
10.75	1.01519	0.00065				10.75	1.01695	0.00064
10.80	1.01947	0.00065				10.80	1.02100	0.00065

Table B.1.1.3.3-2. K_{eff} Values for 95% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

500 milli-g/cc			750 milli-g/cc			1000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.10	0.92396	0.00065	8.90	0.92134	0.00063	8.70	0.92370	0.00062
9.15	0.92570	0.00063	8.95	0.92529	0.00065	8.75	0.92791	0.00065
9.20	0.93050	0.00065	9.00	0.92892	0.00062	8.80	0.93050	0.00063
9.25	0.93248	0.00066	9.05	0.93189	0.00062	8.85	0.93394	0.00065
9.30	0.93694	0.00065	9.10	0.93446	0.00065	8.90	0.93674	0.00063
9.35	0.93901	0.00065	9.15	0.93928	0.00062	8.95	0.93975	0.00064
9.40	0.94298	0.00065	9.20	0.94069	0.00066	9.00	0.94407	0.00063
9.45	0.94583	0.00065	9.25	0.94429	0.00063	9.05	0.94734	0.00065
9.50	0.94819	0.00064	9.30	0.94843	0.00065	9.10	0.95046	0.00066
9.55	0.95264	0.00064	9.35	0.95250	0.00065	9.15	0.95342	0.00064
9.60	0.95556	0.00064	9.40	0.95420	0.00064	9.20	0.95658	0.00064
9.65	0.95717	0.00065	9.45	0.95680	0.00062	9.25	0.96063	0.00062
9.70	0.96194	0.00065	9.50	0.96113	0.00064	9.30	0.96413	0.00061
9.75	0.96409	0.00067	9.55	0.96247	0.00066	9.35	0.96562	0.00067
9.80	0.96777	0.00064	9.60	0.96632	0.00064	9.40	0.96946	0.00067
9.85	0.97034	0.00070	9.65	0.96925	0.00065	9.45	0.97362	0.00065
9.90	0.97189	0.00065	9.70	0.97265	0.00065	9.50	0.97750	0.00064
9.95	0.97692	0.00064	9.75	0.97561	0.00067	9.55	0.97798	0.00066
10.00	0.98029	0.00066	9.80	0.97840	0.00064	9.60	0.98163	0.00065
10.05	0.98124	0.00065	9.85	0.98040	0.00065	9.65	0.98490	0.00065
10.10	0.98549	0.00068	9.90	0.98391	0.00065	9.70	0.98793	0.00064
10.15	0.98728	0.00067	9.95	0.98649	0.00065	9.75	0.99020	0.00065
10.20	0.98994	0.00065	10.00	0.99003	0.00064	9.80	0.99401	0.00065
10.25	0.99441	0.00065	10.05	0.99299	0.00064	9.85	0.99722	0.00064
10.30	0.99566	0.00067	10.10	0.99583	0.00065	9.90	0.99923	0.00066
10.35	0.99921	0.00066	10.15	0.99883	0.00064	9.95	1.00262	0.00064
10.40	1.00130	0.00064	10.20	1.00162	0.00064	10.00	1.00558	0.00064
10.45	1.00446	0.00066	10.25	1.00384	0.00065	10.05	1.00789	0.00063
10.50	1.00841	0.00067	10.30	1.00703	0.00066	10.10	1.01085	0.00065
10.55	1.01002	0.00066	10.35	1.01039	0.00068	10.15	1.01369	0.00062
10.60	1.01241	0.00064	10.40	1.01358	0.00063	10.20	1.01708	0.00061
10.65	1.01518	0.00065	10.45	1.01566	0.00066			
10.70	1.01832	0.00066	10.50	1.01876	0.00067			

Table B.1.1.3.3-2. K_{eff} Values for 95% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

1500 milli-g/cc			2000 milli-g/cc			2500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.20	0.92205	0.00065	7.70	0.91708	0.00062	7.30	0.91562	0.00064
8.25	0.92525	0.00063	7.75	0.92060	0.00063	7.35	0.92019	0.00063
8.30	0.92857	0.00061	7.80	0.92500	0.00061	7.40	0.92543	0.00063
8.35	0.93166	0.00064	7.85	0.92845	0.00063	7.45	0.92809	0.00064
8.40	0.93743	0.00065	7.90	0.93436	0.00065	7.50	0.93383	0.00064
8.45	0.94040	0.00063	7.95	0.93705	0.00064	7.55	0.93717	0.00064
8.50	0.94189	0.00066	8.00	0.94149	0.00065	7.60	0.94212	0.00062
8.55	0.94830	0.00065	8.05	0.94510	0.00064	7.65	0.94606	0.00064
8.60	0.95095	0.00064	8.10	0.94912	0.00064	7.70	0.95001	0.00064
8.65	0.95480	0.00066	8.15	0.95141	0.00063	7.75	0.95296	0.00063
8.70	0.95851	0.00063	8.20	0.95579	0.00067	7.80	0.95846	0.00063
8.75	0.96138	0.00065	8.25	0.95945	0.00063	7.85	0.96329	0.00059
8.80	0.96442	0.00065	8.30	0.96256	0.00063	7.90	0.96693	0.00064
8.85	0.96728	0.00061	8.35	0.96728	0.00063	7.95	0.97060	0.00062
8.90	0.97271	0.00062	8.40	0.97105	0.00063	8.00	0.97508	0.00062
8.95	0.97647	0.00065	8.45	0.97530	0.00063	8.05	0.97903	0.00065
9.00	0.97842	0.00064	8.50	0.97858	0.00065	8.10	0.98254	0.00065
9.05	0.98127	0.00064	8.55	0.98304	0.00062	8.15	0.98722	0.00062
9.10	0.98509	0.00064	8.60	0.98545	0.00063	8.20	0.99170	0.00066
9.15	0.98915	0.00063	8.65	0.98936	0.00065	8.25	0.99410	0.00065
9.20	0.99169	0.00065	8.70	0.99302	0.00064	8.30	0.99840	0.00064
9.25	0.99468	0.00064	8.75	0.99591	0.00064	8.35	1.00193	0.00064
9.30	0.99667	0.00066	8.80	1.00037	0.00064	8.40	1.00550	0.00060
9.35	1.00064	0.00065	8.85	1.00417	0.00066	8.45	1.00983	0.00064
9.40	1.00492	0.00063	8.90	1.00730	0.00063	8.50	1.01273	0.00064
9.45	1.00743	0.00066	8.95	1.00946	0.00067	8.55	1.01666	0.00065
9.50	1.00981	0.00064	9.00	1.01542	0.00066	8.60	1.02210	0.00067
9.55	1.01337	0.00067	9.05	1.01776	0.00063			
9.60	1.01576	0.00064	9.10	1.02061	0.00065			

Table B.1.1.3.3-2. K_{eff} Values for 95% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

3000 milli-g/cc			4000 milli-g/cc			5000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.00	0.91955	0.00063	6.40	0.91770	0.00061	5.90	0.91388	0.00063
7.05	0.92503	0.00063	6.45	0.92263	0.00062	5.95	0.92120	0.00061
7.10	0.92940	0.00064	6.50	0.93028	0.00060	6.00	0.92664	0.00059
7.15	0.93428	0.00062	6.55	0.93377	0.00063	6.05	0.93154	0.00064
7.20	0.93926	0.00061	6.60	0.93926	0.00061	6.10	0.93723	0.00060
7.25	0.94393	0.00062	6.65	0.94349	0.00062	6.15	0.94310	0.00062
7.30	0.94823	0.00062	6.70	0.94936	0.00063	6.20	0.94839	0.00062
7.35	0.95212	0.00064	6.75	0.95495	0.00062	6.25	0.95509	0.00063
7.40	0.95751	0.00063	6.80	0.95985	0.00064	6.30	0.96054	0.00063
7.45	0.96221	0.00065	6.85	0.96420	0.00063	6.35	0.96695	0.00062
7.50	0.96701	0.00064	6.90	0.97024	0.00065	6.40	0.97131	0.00064
7.55	0.97022	0.00065	6.95	0.97479	0.00063	6.45	0.97704	0.00063
7.60	0.97497	0.00063	7.00	0.97901	0.00063	6.50	0.98357	0.00063
7.65	0.97928	0.00064	7.05	0.98460	0.00061	6.55	0.98911	0.00063
7.70	0.98365	0.00061	7.10	0.98991	0.00062	6.60	0.99437	0.00062
7.75	0.98785	0.00064	7.15	0.99523	0.00064	6.65	0.99953	0.00062
7.80	0.99091	0.00064	7.20	0.99884	0.00063	6.70	1.00433	0.00062
7.85	0.99507	0.00063	7.25	1.00454	0.00066	6.75	1.00934	0.00064
7.90	1.00048	0.00063	7.30	1.00892	0.00064	6.80	1.01559	0.00064
7.95	1.00302	0.00067	7.35	1.01418	0.00062	6.85	1.02198	0.00062
8.00	1.00882	0.00065	7.40	1.01800	0.00064	6.90	1.02591	0.00061
8.05	1.01188	0.00063						
8.10	1.01724	0.00062						
8.15	1.01898	0.00064						
8.20	1.02398	0.00064						

Table B.1.1.3.3-2. K_{eff} Values for 95% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

6000 milli-g/cc			7000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.50	0.91245	0.00061	5.20	0.91521	0.00059	5.00	0.90794	0.00061
5.55	0.91859	0.00061	5.25	0.92425	0.00061	5.05	0.91628	0.00059
5.60	0.92447	0.00060	5.30	0.93003	0.00060	5.10	0.92421	0.00062
5.65	0.93164	0.00061	5.35	0.93703	0.00061	5.15	0.93083	0.00059
5.70	0.93802	0.00061	5.40	0.94465	0.00059	5.20	0.93744	0.00060
5.75	0.94353	0.00063	5.45	0.95031	0.00062	5.25	0.94492	0.00058
5.80	0.95099	0.00062	5.50	0.95831	0.00060	5.30	0.95218	0.00057
5.85	0.95678	0.00062	5.55	0.96589	0.00060	5.35	0.95940	0.00059
5.90	0.96355	0.00062	5.60	0.97059	0.00060	5.40	0.96638	0.00061
5.95	0.96881	0.00058	5.65	0.97850	0.00060	5.45	0.97352	0.00059
6.00	0.97525	0.00062	5.70	0.98415	0.00062	5.50	0.97987	0.00059
6.05	0.98164	0.00064	5.75	0.99193	0.00059	5.55	0.98733	0.00064
6.10	0.98787	0.00062	5.80	0.99610	0.00062	5.60	0.99373	0.00061
6.15	0.99482	0.00061	5.85	1.00330	0.00062	5.65	1.00009	0.00061
6.20	1.00023	0.00064	5.90	1.01098	0.00061	5.70	1.00725	0.00064
6.25	1.00574	0.00062	5.95	1.01684	0.00062	5.75	1.01359	0.00062
6.30	1.01121	0.00059	6.00	1.02272	0.00061	5.80	1.02096	0.00061
6.35	1.01822	0.00061						
6.40	1.02253	0.00062						

Table B.1.1.3.3-2. K_{eff} Values for 95% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

8000 milli-g/cc			9000 milli-g/cc			10000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.90	0.91425	0.00059	4.60	0.90787	0.00058	4.40	0.91147	0.00059
4.95	0.92285	0.00059	4.65	0.91537	0.00058	4.45	0.91942	0.00056
5.00	0.92909	0.00059	4.70	0.92301	0.00057	4.50	0.92833	0.00057
5.05	0.93651	0.00059	4.75	0.93078	0.00058	4.55	0.93810	0.00057
5.10	0.94446	0.00059	4.80	0.93854	0.00060	4.60	0.94623	0.00058
5.15	0.95163	0.00059	4.85	0.94580	0.00059	4.65	0.95428	0.00058
5.20	0.95947	0.00061	4.90	0.95457	0.00060	4.70	0.96186	0.00056
5.25	0.96671	0.00060	4.95	0.96279	0.00059	4.75	0.96995	0.00057
5.30	0.97282	0.00060	5.00	0.97051	0.00060	4.80	0.97883	0.00059
5.35	0.98060	0.00061	5.05	0.97794	0.00058	4.85	0.98701	0.00059
5.40	0.98795	0.00061	5.10	0.98593	0.00059	4.90	0.99496	0.00059
5.45	0.99409	0.00061	5.15	0.99279	0.00059	4.95	1.00213	0.00058
5.50	1.00039	0.00062	5.20	1.00115	0.00059	5.00	1.01090	0.00060
5.55	1.00904	0.00061	5.25	1.00800	0.00061	5.05	1.01815	0.00061
5.60	1.01607	0.00061	5.30	1.01500	0.00060	5.10	1.02608	0.00060
5.65	1.02165	0.00060	5.35	1.02377	0.00061			
5.70	1.02919	0.00062	5.40	1.03026	0.00059			

Table B.1.1.3.3-2. K_{eff} Values for 95% ^{239}Pu Sphere – 10 Inches of Water Reflection (cont)

15000 milli-g/cc			19600 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
3.50	0.90993	0.00051	2.90	0.90355	0.00051			
3.55	0.92043	0.00054	2.92	0.90879	0.00051			
3.60	0.93087	0.00055	2.94	0.91473	0.00052			
3.65	0.94152	0.00056	2.96	0.91945	0.00051			
3.70	0.95390	0.00055	2.98	0.92527	0.00052			
3.75	0.96387	0.00055	3.00	0.93033	0.00053			
3.80	0.97381	0.00055	3.02	0.93546	0.00050			
3.85	0.98435	0.00055	3.04	0.93984	0.00052			
3.90	0.99591	0.00055	3.06	0.94569	0.00052			
3.95	1.00649	0.00056	3.08	0.95041	0.00051			
4.00	1.01550	0.00057	3.10	0.95649	0.00052			
4.05	1.02517	0.00056	3.12	0.96161	0.00053			
4.10	1.03489	0.00058	3.14	0.96620	0.00052			
			3.16	0.97204	0.00050			
			3.18	0.97632	0.00052			
			3.20	0.98118	0.00051			
			3.22	0.98654	0.00054			
			3.24	0.99082	0.00053			
			3.26	0.99669	0.00055			
			3.28	1.00154	0.00054			
			3.30	1.00691	0.00054			
			3.32	1.01079	0.00052			
			3.34	1.01589	0.00055			
			3.36	1.02144	0.00054			
			3.38	1.02711	0.00054			
			3.40	1.03159	0.00054			

B.1.2. Infinite Cylinder

B.1.2.1. 100% ^{239}Pu

B.1.2.1.1. Unreflected

Case ID: pu-cyl-1000-00

Material: Plutonium metal in water

Geometry: Infinite Cylinder

Isotopics: 100% ^{239}Pu

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.1.2.1.1-1. 100% ^{239}Pu Cylinder – 0 Inches of Water Reflection

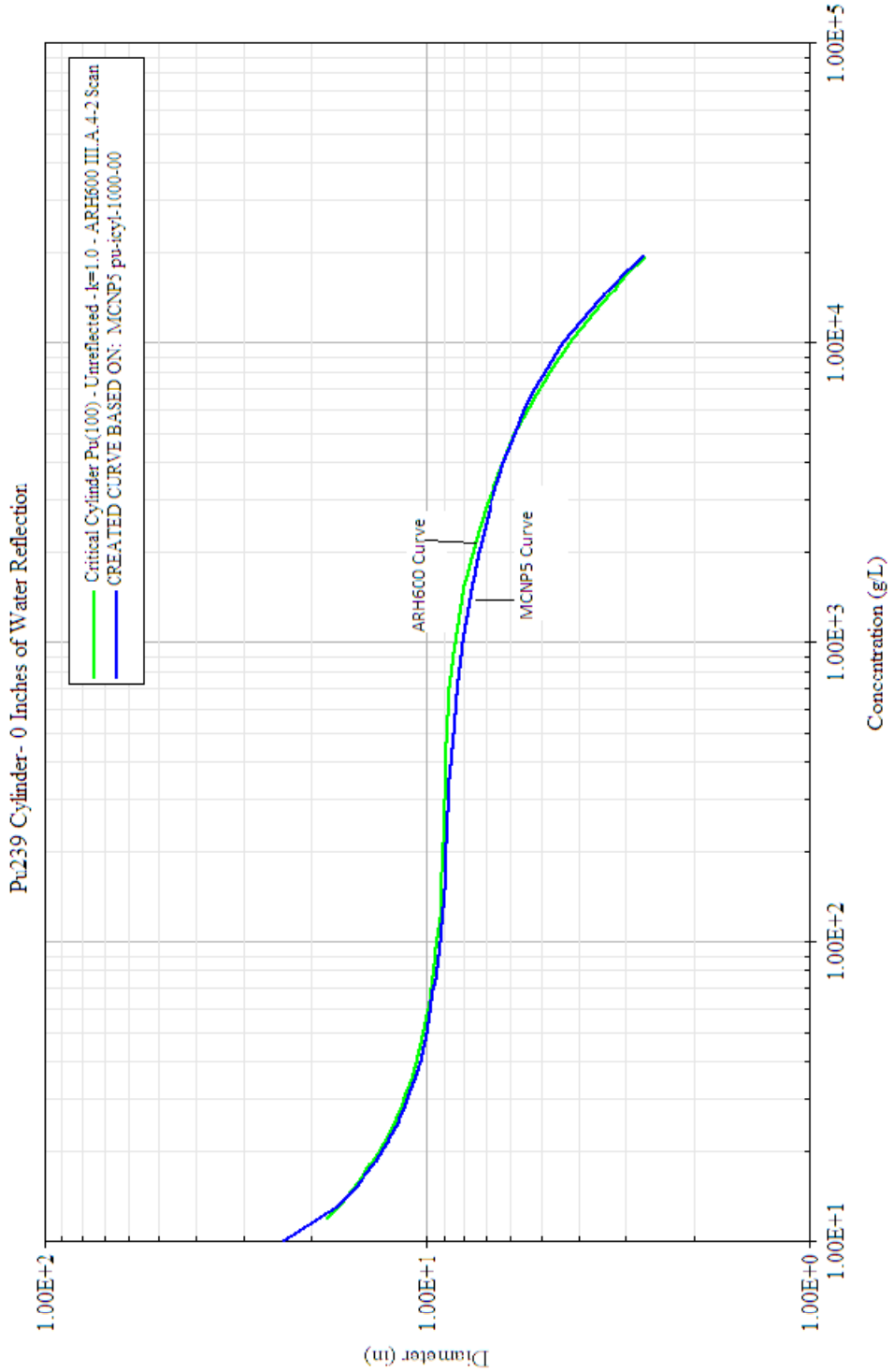

Table B.1.2.1.1-1. Critical Dimensions for 100% ^{239}Pu Cylinder – 0 Inches of Water Reflection

100% ^{239}Pu Cylinder – 0 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	18.700	25.000	0.300	23.7589
0.013	14.600	17.900	0.100	17.2827
0.015	13.300	16.000	0.100	15.4255
0.018	12.100	14.200	0.100	13.7689
0.020	11.500	13.400	0.100	13.0573
0.022	11.100	12.900	0.100	12.4757
0.024	10.800	12.400	0.050	12.0764
0.025	10.600	12.200	0.050	11.8864
0.026	10.500	12.100	0.050	11.7214
0.028	10.200	11.800	0.050	11.4373
0.030	10.000	11.500	0.050	11.1905
0.032	9.900	11.300	0.050	10.9953
0.036	9.600	11.000	0.050	10.6521
0.040	9.400	10.700	0.050	10.4057
0.045	9.200	10.500	0.050	10.1587
0.050	9.000	10.300	0.050	9.9802
0.075	8.600	9.700	0.050	9.4540
0.100	8.400	9.500	0.050	9.2074
0.150	8.200	9.300	0.050	9.0060
0.200	8.100	9.100	0.050	8.8890
0.350	7.900	9.000	0.050	8.7118
0.500	7.700	8.800	0.050	8.5406
0.750	7.500	8.600	0.050	8.3099
1.000	7.300	8.300	0.050	8.0841
1.500	7.000	7.900	0.050	7.6850
2.000	6.700	7.500	0.050	7.3371
2.500	6.400	7.200	0.050	7.0266
3.000	6.100	7.000	0.050	6.7587
4.000	5.700	6.500	0.050	6.2849
5.000	5.300	6.100	0.050	5.8802
6.000	5.000	5.700	0.050	5.5305
7.000	4.700	5.400	0.050	5.2040
7.500	4.600	5.200	0.050	5.0601
8.000	4.400	5.100	0.050	4.9166
9.000	4.200	4.800	0.050	4.6506
10.000	4.000	4.600	0.050	4.4045
15.000	3.000	3.500	0.020	3.3810
19.600	2.400	2.800	0.020	2.7025

MCNP5 Sample Input File
100% ^{239}Pu Cylinder- 0" Reflection

```
infcyl, 100.0 wt% 239Pu, 01000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 750   hundreths of inches - must be integer
c radius =     9.5250 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 01000 milli-g Pu/cc
c Reflector width =  0.0 inches
c Enrichment = 1.00 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0510 cc
c Volume of water in sample 0.9490 cc
c
c Mass of crit in sample   1.0000 g
c Mass of water in sample  0.9490 g
c
c Total mass of sample  1.9490g for a 1cc sample
c Mass Density for crit material  -1.9490, expressed as negative
c
c  infinite cylinder
20 11   -1.948980   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=0    $zero importance if no reflector
22  0            2           imp:n=0

1       cz     9.5250              $ infinite cylinder
2       cz     9.5250         $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
```

```
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu/water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 01000 milli-g Pu/cc,  1.9490
1001.66c -0.054483
8016.66c -0.432428
94239.66c -0.513089
c    94240.66c -0.000000
mt11     lwtr.60t
c
c    pu only
m12    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 01000 milli-g Pu/cc,  1.9490
94239.66c -1.000000
c    94240.66c -0.000000
c
```

Critview Compatible Data File
100% ^{239}Pu Cylinder- 0” Reflection

reset:
title: MCNP5 pu-icyl-1000-00
set: MCNP5 set
source: MCNP5 primary
created: Fri 07/16/2010 8:09:26.17
geometry: infcyl
modmat: H2O
critmat: plutonium
isomat: Pu239 1.0
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	23.7589
0.013	17.2827
0.015	15.4255
0.018	13.7689
0.020	13.0573
0.022	12.4757
0.024	12.0764
0.025	11.8864
0.026	11.7214
0.028	11.4373
0.030	11.1905
0.032	10.9953
0.036	10.6521
0.040	10.4057
0.045	10.1587
0.050	9.9802
0.075	9.4540
0.100	9.2074
0.150	9.0060
0.200	8.8890
0.350	8.7118
0.500	8.5406
0.750	8.3099
1.000	8.0841
1.500	7.6850
2.000	7.3371
2.500	7.0266
3.000	6.7587
4.000	6.2849
5.000	5.8802
6.000	5.5305
7.000	5.2040
7.500	5.0601
8.000	4.9166
9.000	4.6506
10.00	4.4045
15.00	3.3810
19.60	2.7025

Table B.1.2.1.1-2. K_{eff} Values for 100% ^{239}Pu Cylinder – 0 Inches of Water Reflection

10 milli-g/cc			13 milli-g/cc			15 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
18.70	0.92493	0.00039	14.60	0.92179	0.00047	13.30	0.92083	0.00047
19.00	0.93071	0.00039	14.70	0.92507	0.00044	13.40	0.92574	0.00049
19.30	0.93687	0.00038	14.80	0.92818	0.00045	13.50	0.92916	0.00047
19.60	0.94208	0.00038	14.90	0.93182	0.00046	13.60	0.93325	0.00049
19.90	0.94686	0.00037	15.00	0.93475	0.00045	13.70	0.93700	0.00049
20.20	0.95179	0.00038	15.10	0.93788	0.00046	13.80	0.94147	0.00049
20.50	0.95650	0.00037	15.20	0.94216	0.00045	13.90	0.94627	0.00048
20.80	0.96069	0.00037	15.30	0.94394	0.00045	14.00	0.95012	0.00047
21.10	0.96602	0.00036	15.40	0.94791	0.00046	14.10	0.95445	0.00050
21.40	0.97003	0.00034	15.50	0.95116	0.00045	14.20	0.95645	0.00047
21.70	0.97475	0.00037	15.60	0.95286	0.00045	14.30	0.96069	0.00048
22.00	0.97833	0.00035	15.70	0.95618	0.00046	14.40	0.96448	0.00048
22.30	0.98287	0.00033	15.80	0.95960	0.00044	14.50	0.96918	0.00047
22.60	0.98662	0.00035	15.90	0.96398	0.00045	14.60	0.97177	0.00048
22.90	0.99002	0.00035	16.00	0.96646	0.00045	14.70	0.97571	0.00046
23.20	0.99332	0.00035	16.10	0.96880	0.00043	14.80	0.97945	0.00049
23.50	0.99748	0.00034	16.20	0.97148	0.00045	14.90	0.98334	0.00047
23.80	1.00040	0.00035	16.30	0.97372	0.00044	15.00	0.98653	0.00048
24.10	1.00385	0.00034	16.40	0.97688	0.00045	15.10	0.98925	0.00047
24.40	1.00677	0.00034	16.50	0.97910	0.00044	15.20	0.99276	0.00047
24.70	1.00982	0.00033	16.60	0.98268	0.00044	15.30	0.99571	0.00047
25.00	1.01287	0.00032	16.70	0.98517	0.00044	15.40	0.99920	0.00046
			16.80	0.98762	0.00043	15.50	1.00234	0.00048
			16.90	0.99045	0.00045	15.60	1.00579	0.00046
			17.00	0.99346	0.00044	15.70	1.00883	0.00048
			17.10	0.99480	0.00043	15.80	1.01129	0.00046
			17.20	0.99814	0.00043	15.90	1.01496	0.00047
			17.30	1.00039	0.00046	16.00	1.01846	0.00046
			17.40	1.00315	0.00044			
			17.50	1.00554	0.00044			
			17.60	1.00799	0.00043			
			17.70	1.01027	0.00044			
			17.80	1.01197	0.00043			
			17.90	1.01493	0.00044			

Table B.1.2.1.1-2. K_{eff} Values for 100% ^{239}Pu Cylinder – 0 Inches of Water Reflection (cont)

18 milli-g/cc			20 milli-g/cc			22 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.10	0.92155	0.00054	11.50	0.91802	0.00056	11.10	0.91961	0.00057
12.20	0.92721	0.00053	11.60	0.92354	0.00055	11.20	0.92633	0.00059
12.30	0.93118	0.00052	11.70	0.92936	0.00055	11.30	0.93245	0.00057
12.40	0.93682	0.00053	11.80	0.93584	0.00055	11.40	0.93922	0.00058
12.50	0.94090	0.00053	11.90	0.94057	0.00053	11.50	0.94398	0.00058
12.60	0.94753	0.00053	12.00	0.94733	0.00055	11.60	0.94968	0.00058
12.70	0.95097	0.00052	12.10	0.95300	0.00055	11.70	0.95593	0.00056
12.80	0.95766	0.00054	12.20	0.95719	0.00055	11.80	0.96187	0.00056
12.90	0.96105	0.00054	12.30	0.96321	0.00054	11.90	0.96707	0.00055
13.00	0.96603	0.00056	12.40	0.96881	0.00053	12.00	0.97342	0.00056
13.10	0.97053	0.00053	12.50	0.97421	0.00052	12.10	0.97833	0.00058
13.20	0.97437	0.00052	12.60	0.97897	0.00057	12.20	0.98355	0.00056
13.30	0.98006	0.00053	12.70	0.98304	0.00054	12.30	0.99036	0.00056
13.40	0.98403	0.00053	12.80	0.98787	0.00055	12.40	0.99614	0.00058
13.50	0.98894	0.00053	12.90	0.99426	0.00053	12.50	1.00124	0.00055
13.60	0.99288	0.00054	13.00	0.99816	0.00055	12.60	1.00531	0.00056
13.70	0.99738	0.00052	13.10	1.00137	0.00053	12.70	1.00993	0.00057
13.80	1.00118	0.00052	13.20	1.00776	0.00054	12.80	1.01563	0.00055
13.90	1.00665	0.00051	13.30	1.01210	0.00054	12.90	1.02071	0.00056
14.00	1.00973	0.00053	13.40	1.01686	0.00056			
14.10	1.01349	0.00050						
14.20	1.01807	0.00052						

Table B.1.2.1.1-2. K_{eff} Values for 100% ^{239}Pu Cylinder – 0 Inches of Water Reflection (cont)

24 milli-g/cc			25 milli-g/cc			26 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.80	0.92259	0.00060	10.60	0.91923	0.00060	10.50	0.92105	0.00058
10.85	0.92464	0.00057	10.65	0.92145	0.00059	10.55	0.92427	0.00061
10.90	0.92812	0.00059	10.70	0.92635	0.00061	10.60	0.92861	0.00059
10.95	0.93216	0.00057	10.75	0.92921	0.00060	10.65	0.93177	0.00060
11.00	0.93601	0.00059	10.80	0.93215	0.00060	10.70	0.93604	0.00059
11.05	0.93891	0.00055	10.85	0.93498	0.00058	10.75	0.93793	0.00059
11.10	0.94122	0.00060	10.90	0.93840	0.00058	10.80	0.94131	0.00060
11.15	0.94529	0.00057	10.95	0.94298	0.00058	10.85	0.94441	0.00060
11.20	0.94837	0.00058	11.00	0.94504	0.00061	10.90	0.94801	0.00060
11.25	0.95190	0.00058	11.05	0.94864	0.00060	10.95	0.95106	0.00062
11.30	0.95545	0.00058	11.10	0.95291	0.00057	11.00	0.95459	0.00059
11.35	0.95794	0.00059	11.15	0.95438	0.00059	11.05	0.95873	0.00059
11.40	0.96058	0.00059	11.20	0.95908	0.00058	11.10	0.96119	0.00057
11.45	0.96388	0.00058	11.25	0.96178	0.00060	11.15	0.96456	0.00058
11.50	0.96764	0.00059	11.30	0.96468	0.00057	11.20	0.96815	0.00061
11.55	0.96956	0.00056	11.35	0.96782	0.00058	11.25	0.97091	0.00061
11.60	0.97225	0.00057	11.40	0.97055	0.00059	11.30	0.97362	0.00058
11.65	0.97493	0.00058	11.45	0.97367	0.00060	11.35	0.97770	0.00062
11.70	0.97821	0.00058	11.50	0.97812	0.00059	11.40	0.98137	0.00059
11.75	0.98186	0.00061	11.55	0.97900	0.00060	11.45	0.98479	0.00058
11.80	0.98459	0.00060	11.60	0.98280	0.00060	11.50	0.98638	0.00060
11.85	0.98766	0.00060	11.65	0.98687	0.00059	11.55	0.99028	0.00058
11.90	0.99011	0.00057	11.70	0.98985	0.00058	11.60	0.99428	0.00057
11.95	0.99336	0.00060	11.75	0.99241	0.00057	11.65	0.99676	0.00059
12.00	0.99618	0.00057	11.80	0.99518	0.00058	11.70	0.99881	0.00059
12.05	0.99785	0.00056	11.85	0.99828	0.00057	11.75	1.00159	0.00061
12.10	1.00192	0.00058	11.90	1.00064	0.00060	11.80	1.00430	0.00059
12.15	1.00469	0.00060	11.95	1.00394	0.00059	11.85	1.00743	0.00058
12.20	1.00725	0.00060	12.00	1.00704	0.00059	11.90	1.01069	0.00061
12.25	1.00990	0.00060	12.05	1.00960	0.00060	11.95	1.01282	0.00059
12.30	1.01285	0.00058	12.10	1.01257	0.00057	12.00	1.01580	0.00060
12.35	1.01468	0.00058	12.15	1.01330	0.00060	12.05	1.01850	0.00058
12.40	1.01825	0.00058	12.20	1.01695	0.00058	12.10	1.02237	0.00058

Table B.1.2.1.1-2. K_{eff} Values for 100% ^{239}Pu Cylinder – 0 Inches of Water Reflection (cont)

28 milli-g/cc			30 milli-g/cc			32 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.20	0.91595	0.00061	10.00	0.91441	0.00063	9.90	0.92092	0.00061
10.25	0.91913	0.00059	10.05	0.91874	0.00061	9.95	0.92443	0.00062
10.30	0.92330	0.00059	10.10	0.92167	0.00063	10.00	0.92818	0.00065
10.35	0.92593	0.00065	10.15	0.92722	0.00062	10.05	0.93082	0.00061
10.40	0.93015	0.00060	10.20	0.93081	0.00060	10.10	0.93683	0.00059
10.45	0.93469	0.00061	10.25	0.93462	0.00063	10.15	0.93952	0.00064
10.50	0.93748	0.00061	10.30	0.93776	0.00063	10.20	0.94373	0.00062
10.55	0.94065	0.00062	10.35	0.94187	0.00062	10.25	0.94643	0.00063
10.60	0.94412	0.00063	10.40	0.94563	0.00062	10.30	0.95225	0.00061
10.65	0.94835	0.00061	10.45	0.94921	0.00060	10.35	0.95456	0.00064
10.70	0.95059	0.00061	10.50	0.95283	0.00061	10.40	0.95795	0.00063
10.75	0.95561	0.00059	10.55	0.95566	0.00061	10.45	0.96146	0.00063
10.80	0.95834	0.00062	10.60	0.95985	0.00063	10.50	0.96581	0.00063
10.85	0.96114	0.00062	10.65	0.96216	0.00059	10.55	0.97032	0.00063
10.90	0.96585	0.00060	10.70	0.96574	0.00062	10.60	0.97342	0.00062
10.95	0.96916	0.00062	10.75	0.96885	0.00061	10.65	0.97706	0.00062
11.00	0.97283	0.00061	10.80	0.97326	0.00062	10.70	0.98039	0.00062
11.05	0.97549	0.00059	10.85	0.97800	0.00062	10.75	0.98413	0.00063
11.10	0.97764	0.00062	10.90	0.98042	0.00061	10.80	0.98817	0.00064
11.15	0.98288	0.00062	10.95	0.98397	0.00064	10.85	0.99158	0.00062
11.20	0.98561	0.00060	11.00	0.98804	0.00062	10.90	0.99458	0.00062
11.25	0.98942	0.00061	11.05	0.99059	0.00063	10.95	0.99778	0.00061
11.30	0.99076	0.00060	11.10	0.99443	0.00059	11.00	1.00023	0.00063
11.35	0.99425	0.00061	11.15	0.99714	0.00064	11.05	1.00304	0.00060
11.40	0.99703	0.00064	11.20	1.00067	0.00065	11.10	1.00829	0.00063
11.45	1.00101	0.00060	11.25	1.00424	0.00059	11.15	1.01181	0.00062
11.50	1.00459	0.00062	11.30	1.00802	0.00060	11.20	1.01356	0.00062
11.55	1.00890	0.00060	11.35	1.01229	0.00060	11.25	1.01718	0.00060
11.60	1.00992	0.00057	11.40	1.01398	0.00060	11.30	1.02104	0.00064
11.65	1.01289	0.00060	11.45	1.01621	0.00060			
11.70	1.01623	0.00060	11.50	1.01915	0.00060			
11.75	1.01947	0.00057						
11.80	1.02375	0.00059						

Table B.1.2.1.1-2. K_{eff} Values for 100% ^{239}Pu Cylinder – 0 Inches of Water Reflection (cont)

36 milli-g/cc			40 milli-g/cc			45 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.60	0.91722	0.00064	9.40	0.91824	0.00066	9.20	0.91949	0.00066
9.65	0.92127	0.00061	9.45	0.92334	0.00065	9.25	0.92313	0.00065
9.70	0.92680	0.00063	9.50	0.92658	0.00064	9.30	0.92677	0.00066
9.75	0.93093	0.00065	9.55	0.93059	0.00067	9.35	0.93221	0.00065
9.80	0.93317	0.00063	9.60	0.93500	0.00067	9.40	0.93670	0.00068
9.85	0.93843	0.00063	9.65	0.93964	0.00066	9.45	0.94158	0.00069
9.90	0.94292	0.00063	9.70	0.94375	0.00065	9.50	0.94494	0.00068
9.95	0.94592	0.00066	9.75	0.94725	0.00065	9.55	0.95007	0.00067
10.00	0.95071	0.00064	9.80	0.95255	0.00066	9.60	0.95301	0.00064
10.05	0.95508	0.00064	9.85	0.95655	0.00063	9.65	0.95725	0.00067
10.10	0.95810	0.00066	9.90	0.96075	0.00064	9.70	0.96262	0.00066
10.15	0.96266	0.00063	9.95	0.96429	0.00066	9.75	0.96725	0.00066
10.20	0.96474	0.00065	10.00	0.96713	0.00064	9.80	0.97151	0.00067
10.25	0.96980	0.00065	10.05	0.97281	0.00064	9.85	0.97463	0.00066
10.30	0.97280	0.00066	10.10	0.97650	0.00064	9.90	0.97745	0.00067
10.35	0.97701	0.00064	10.15	0.97987	0.00065	9.95	0.98417	0.00064
10.40	0.98196	0.00062	10.20	0.98501	0.00065	10.00	0.98676	0.00067
10.45	0.98455	0.00064	10.25	0.98807	0.00065	10.05	0.99138	0.00067
10.50	0.98765	0.00065	10.30	0.99235	0.00064	10.10	0.99553	0.00068
10.55	0.99229	0.00064	10.35	0.99552	0.00064	10.15	0.99949	0.00068
10.60	0.99492	0.00065	10.40	0.99958	0.00066	10.20	1.00241	0.00066
10.65	0.99985	0.00064	10.45	1.00325	0.00066	10.25	1.00690	0.00068
10.70	1.00341	0.00063	10.50	1.00878	0.00066	10.30	1.01091	0.00066
10.75	1.00705	0.00063	10.55	1.00984	0.00066	10.35	1.01437	0.00065
10.80	1.01057	0.00065	10.60	1.01466	0.00063	10.40	1.01942	0.00068
10.85	1.01343	0.00064	10.65	1.01747	0.00067	10.45	1.02226	0.00065
10.90	1.01659	0.00062	10.70	1.02208	0.00067	10.50	1.02577	0.00066
10.95	1.02052	0.00063						
11.00	1.02455	0.00063						

Table B.1.2.1.1-2. K_{eff} Values for 100% ^{239}Pu Cylinder – 0 Inches of Water Reflection (cont)

50 milli-g/cc			75 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.00	0.91437	0.00065	8.60	0.92057	0.00068	8.40	0.91870	0.00069
9.05	0.91862	0.00067	8.65	0.92496	0.00069	8.45	0.92462	0.00071
9.10	0.92314	0.00068	8.70	0.92852	0.00068	8.50	0.92815	0.00068
9.15	0.92733	0.00067	8.75	0.93380	0.00069	8.55	0.93700	0.00072
9.20	0.93385	0.00065	8.80	0.93871	0.00070	8.60	0.94017	0.00072
9.25	0.93764	0.00069	8.85	0.94167	0.00068	8.65	0.94385	0.00072
9.30	0.94219	0.00065	8.90	0.94856	0.00071	8.70	0.95034	0.00073
9.35	0.94548	0.00065	8.95	0.95306	0.00071	8.75	0.95444	0.00069
9.40	0.95105	0.00065	9.00	0.95835	0.00071	8.80	0.96167	0.00071
9.45	0.95593	0.00068	9.05	0.96232	0.00074	8.85	0.96487	0.00073
9.50	0.95874	0.00066	9.10	0.96820	0.00067	8.90	0.96963	0.00071
9.55	0.96354	0.00069	9.15	0.97326	0.00071	8.95	0.97363	0.00070
9.60	0.96808	0.00065	9.20	0.97628	0.00070	9.00	0.97836	0.00071
9.65	0.97110	0.00071	9.25	0.98181	0.00070	9.05	0.98420	0.00068
9.70	0.97727	0.00068	9.30	0.98641	0.00069	9.10	0.98882	0.00071
9.75	0.98141	0.00067	9.35	0.98912	0.00071	9.15	0.99366	0.00071
9.80	0.98551	0.00065	9.40	0.99588	0.00070	9.20	0.99932	0.00069
9.85	0.98824	0.00069	9.45	0.99961	0.00070	9.25	1.00391	0.00069
9.90	0.99371	0.00067	9.50	1.00447	0.00068	9.30	1.00780	0.00074
9.95	0.99646	0.00066	9.55	1.00766	0.00071	9.35	1.01171	0.00074
10.00	1.00233	0.00067	9.60	1.01406	0.00066	9.40	1.01748	0.00072
10.05	1.00571	0.00067	9.65	1.01801	0.00070	9.45	1.02082	0.00070
10.10	1.01054	0.00068	9.70	1.02183	0.00070	9.50	1.02587	0.00070
10.15	1.01348	0.00067						
10.20	1.01839	0.00069						
10.25	1.02217	0.00068						
10.30	1.02609	0.00067						

Table B.1.2.1.1-2. K_{eff} Values for 100% ^{239}Pu Cylinder – 0 Inches of Water Reflection (cont)

150 milli-g/cc			200 milli-g/cc			350 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.20	0.91892	0.00070	8.10	0.91928	0.00073	7.90	0.91711	0.00071
8.25	0.92419	0.00072	8.15	0.92375	0.00069	7.95	0.92277	0.00071
8.30	0.92973	0.00075	8.20	0.92946	0.00069	8.00	0.92733	0.00071
8.35	0.93612	0.00070	8.25	0.93535	0.00072	8.05	0.93267	0.00073
8.40	0.94033	0.00069	8.30	0.93994	0.00070	8.10	0.93895	0.00071
8.45	0.94551	0.00073	8.35	0.94482	0.00072	8.15	0.94351	0.00068
8.50	0.95101	0.00067	8.40	0.95085	0.00069	8.20	0.94955	0.00074
8.55	0.95554	0.00074	8.45	0.95625	0.00071	8.25	0.95339	0.00071
8.60	0.96014	0.00070	8.50	0.96109	0.00070	8.30	0.95981	0.00071
8.65	0.96483	0.00069	8.55	0.96601	0.00072	8.35	0.96401	0.00070
8.70	0.97059	0.00072	8.60	0.97065	0.00071	8.40	0.96956	0.00072
8.75	0.97548	0.00072	8.65	0.97553	0.00069	8.45	0.97415	0.00071
8.80	0.98033	0.00075	8.70	0.98274	0.00072	8.50	0.98080	0.00071
8.85	0.98522	0.00071	8.75	0.98569	0.00073	8.55	0.98498	0.00070
8.90	0.98971	0.00073	8.80	0.99074	0.00073	8.60	0.98963	0.00071
8.95	0.99421	0.00072	8.85	0.99671	0.00073	8.65	0.99400	0.00071
9.00	0.99925	0.00071	8.90	1.00093	0.00072	8.70	0.99846	0.00069
9.05	1.00552	0.00071	8.95	1.00369	0.00071	8.75	1.00500	0.00069
9.10	1.00905	0.00071	9.00	1.01061	0.00071	8.80	1.00882	0.00069
9.15	1.01389	0.00068	9.05	1.01457	0.00072	8.85	1.01525	0.00071
9.20	1.01841	0.00070	9.10	1.01940	0.00071	8.90	1.01861	0.00072
9.25	1.02328	0.00073				8.95	1.02398	0.00071
9.30	1.02744	0.00072				9.00	1.02892	0.00073

Table B.1.2.1.1-2. K_{eff} Values for 100% ^{239}Pu Cylinder – 0 Inches of Water Reflection (cont)

500 milli-g/cc			750 milli-g/cc			1000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.70	0.90975	0.00072	7.50	0.91210	0.00068	7.30	0.91416	0.00071
7.75	0.91828	0.00068	7.55	0.91715	0.00071	7.35	0.91731	0.00069
7.80	0.92251	0.00069	7.60	0.92292	0.00068	7.40	0.92481	0.00071
7.85	0.92706	0.00070	7.65	0.92983	0.00068	7.45	0.92987	0.00067
7.90	0.93225	0.00071	7.70	0.93484	0.00070	7.50	0.93589	0.00067
7.95	0.93773	0.00069	7.75	0.94066	0.00069	7.55	0.94177	0.00071
8.00	0.94314	0.00071	7.80	0.94634	0.00071	7.60	0.94629	0.00068
8.05	0.94874	0.00070	7.85	0.95160	0.00070	7.65	0.95295	0.00067
8.10	0.95307	0.00071	7.90	0.95532	0.00070	7.70	0.95755	0.00071
8.15	0.96005	0.00072	7.95	0.96214	0.00070	7.75	0.96299	0.00072
8.20	0.96473	0.00070	8.00	0.96712	0.00068	7.80	0.96953	0.00073
8.25	0.96960	0.00069	8.05	0.97336	0.00069	7.85	0.97488	0.00069
8.30	0.97519	0.00072	8.10	0.97859	0.00070	7.90	0.97949	0.00069
8.35	0.98017	0.00071	8.15	0.98398	0.00071	7.95	0.98626	0.00070
8.40	0.98583	0.00070	8.20	0.98823	0.00071	8.00	0.99050	0.00073
8.45	0.99010	0.00072	8.25	0.99518	0.00072	8.05	0.99716	0.00071
8.50	0.99527	0.00072	8.30	0.99879	0.00070	8.10	1.00133	0.00070
8.55	1.00109	0.00074	8.35	1.00488	0.00070	8.15	1.00712	0.00074
8.60	1.00508	0.00070	8.40	1.00841	0.00070	8.20	1.01220	0.00070
8.65	1.00986	0.00069	8.45	1.01484	0.00069	8.25	1.01839	0.00073
8.70	1.01464	0.00071	8.50	1.01964	0.00070	8.30	1.02429	0.00070
8.75	1.01942	0.00071	8.55	1.02654	0.00070			
8.80	1.02298	0.00072	8.60	1.02873	0.00070			

Table B.1.2.1.1-2. K_{eff} Values for 100% ^{239}Pu Cylinder – 0 Inches of Water Reflection (cont)

1500 milli-g/cc			2000 milli-g/cc			2500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.00	0.91873	0.00070	6.70	0.92071	0.00068	6.40	0.91805	0.00067
7.05	0.92596	0.00071	6.75	0.92686	0.00072	6.45	0.92442	0.00068
7.10	0.93068	0.00069	6.80	0.93279	0.00071	6.50	0.93232	0.00068
7.15	0.93739	0.00069	6.85	0.93990	0.00066	6.55	0.93770	0.00069
7.20	0.94335	0.00069	6.90	0.94553	0.00070	6.60	0.94440	0.00071
7.25	0.95054	0.00070	6.95	0.95274	0.00071	6.65	0.95210	0.00068
7.30	0.95686	0.00068	7.00	0.95990	0.00068	6.70	0.95749	0.00067
7.35	0.96155	0.00071	7.05	0.96597	0.00067	6.75	0.96305	0.00069
7.40	0.96734	0.00069	7.10	0.97166	0.00069	6.80	0.97101	0.00068
7.45	0.97383	0.00068	7.15	0.97687	0.00068	6.85	0.97691	0.00069
7.50	0.97868	0.00068	7.20	0.98354	0.00070	6.90	0.98506	0.00070
7.55	0.98558	0.00066	7.25	0.98984	0.00070	6.95	0.99047	0.00068
7.60	0.98996	0.00069	7.30	0.99588	0.00070	7.00	0.99620	0.00069
7.65	0.99513	0.00071	7.35	1.00143	0.00066	7.05	1.00334	0.00068
7.70	1.00208	0.00068	7.40	1.00811	0.00068	7.10	1.00897	0.00068
7.75	1.00766	0.00067	7.45	1.01435	0.00070	7.15	1.01437	0.00076
7.80	1.01369	0.00069	7.50	1.01902	0.00067	7.20	1.02179	0.00070
7.85	1.01853	0.00073						
7.90	1.02425	0.00070						

Table B.1.2.1.1-2. K_{eff} Values for 100% ^{239}Pu Cylinder – 0 Inches of Water Reflection (cont)

3000 milli-g/cc			4000 milli-g/cc			5000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.10	0.91088	0.00067	5.70	0.91169	0.00063	5.30	0.90668	0.00061
6.15	0.91709	0.00065	5.75	0.92041	0.00064	5.35	0.91569	0.00061
6.20	0.92338	0.00067	5.80	0.92809	0.00064	5.40	0.92422	0.00065
6.25	0.92973	0.00065	5.85	0.93658	0.00064	5.45	0.93193	0.00061
6.30	0.93752	0.00067	5.90	0.94254	0.00065	5.50	0.93905	0.00062
6.35	0.94453	0.00066	5.95	0.95012	0.00066	5.55	0.94808	0.00062
6.40	0.95071	0.00066	6.00	0.95877	0.00066	5.60	0.95591	0.00062
6.45	0.95929	0.00068	6.05	0.96582	0.00063	5.65	0.96491	0.00064
6.50	0.96610	0.00068	6.10	0.97170	0.00066	5.70	0.97258	0.00063
6.55	0.97241	0.00066	6.15	0.97921	0.00067	5.75	0.98006	0.00062
6.60	0.97858	0.00068	6.20	0.98806	0.00067	5.80	0.98727	0.00065
6.65	0.98638	0.00063	6.25	0.99456	0.00066	5.85	0.99473	0.00063
6.70	0.99150	0.00068	6.30	1.00236	0.00065	5.90	1.00345	0.00060
6.75	0.99886	0.00068	6.35	1.00819	0.00067	5.95	1.00950	0.00063
6.80	1.00542	0.00068	6.40	1.01662	0.00066	6.00	1.01803	0.00063
6.85	1.01192	0.00069	6.45	1.02387	0.00068	6.05	1.02534	0.00065
6.90	1.01867	0.00069	6.50	1.03061	0.00068	6.10	1.03209	0.00065
6.95	1.02502	0.00068						
7.00	1.03150	0.00070						

Table B.1.2.1.1-2. K_{eff} Values for 100% ^{239}Pu Cylinder – 0 Inches of Water Reflection (cont)

6000 milli-g/cc			7000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.00	0.91172	0.00058	4.70	0.90994	0.00056	4.60	0.91673	0.00053
5.05	0.91961	0.00060	4.75	0.91946	0.00056	4.65	0.92614	0.00056
5.10	0.92849	0.00061	4.80	0.92751	0.00058	4.70	0.93496	0.00055
5.15	0.93682	0.00061	4.85	0.93680	0.00056	4.75	0.94439	0.00054
5.20	0.94552	0.00059	4.90	0.94665	0.00056	4.80	0.95238	0.00058
5.25	0.95325	0.00060	4.95	0.95617	0.00061	4.85	0.96308	0.00057
5.30	0.96369	0.00060	5.00	0.96500	0.00057	4.90	0.97154	0.00057
5.35	0.97119	0.00060	5.05	0.97317	0.00057	4.95	0.98013	0.00057
5.40	0.97787	0.00060	5.10	0.98140	0.00061	5.00	0.98998	0.00055
5.45	0.98750	0.00060	5.15	0.98910	0.00056	5.05	0.99812	0.00058
5.50	0.99457	0.00061	5.20	0.99942	0.00058	5.10	1.00747	0.00058
5.55	1.00346	0.00059	5.25	1.00662	0.00060	5.15	1.01772	0.00058
5.60	1.01190	0.00062	5.30	1.01567	0.00060	5.20	1.02503	0.00058
5.65	1.01934	0.00062	5.35	1.02411	0.00060			
5.70	1.02844	0.00063	5.40	1.03284	0.00062			

Table B.1.2.1.1-2. K_{eff} Values for 100% ^{239}Pu Cylinder – 0 Inches of Water Reflection (cont)

8000 milli-g/cc			9000 milli-g/cc			10000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.40	0.90263	0.00054	4.20	0.91202	0.00051	4.00	0.91686	0.00049
4.45	0.91333	0.00052	4.25	0.92210	0.00052	4.05	0.92868	0.00047
4.50	0.92104	0.00056	4.30	0.93214	0.00052	4.10	0.93929	0.00048
4.55	0.93238	0.00054	4.35	0.94139	0.00053	4.15	0.94910	0.00050
4.60	0.94127	0.00056	4.40	0.95087	0.00053	4.20	0.95894	0.00049
4.65	0.95086	0.00054	4.45	0.96116	0.00053	4.25	0.97022	0.00051
4.70	0.96064	0.00056	4.50	0.97199	0.00052	4.30	0.98036	0.00051
4.75	0.96859	0.00057	4.55	0.98120	0.00053	4.35	0.99111	0.00052
4.80	0.97878	0.00055	4.60	0.99050	0.00053	4.40	0.99907	0.00051
4.85	0.98801	0.00055	4.65	0.99988	0.00055	4.45	1.00933	0.00053
4.90	0.99669	0.00057	4.70	1.01041	0.00055	4.50	1.01947	0.00051
4.95	1.00668	0.00058	4.75	1.01872	0.00054	4.55	1.02911	0.00053
5.00	1.01399	0.00059	4.80	1.02763	0.00056	4.60	1.04014	0.00052
5.05	1.02346	0.00057						
5.10	1.03248	0.00056						

Table B.1.2.1.1-2. K_{eff} Values for 100% ^{239}Pu Cylinder – 0 Inches of Water Reflection (cont)

15000 milli-g/cc			19600 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma			
3.00	0.90347	0.00042	2.40	0.90793	0.00039			
3.02	0.90823	0.00042	2.42	0.91459	0.00042			
3.04	0.91379	0.00043	2.44	0.92015	0.00041			
3.06	0.91983	0.00043	2.46	0.92638	0.00041			
3.08	0.92408	0.00044	2.48	0.93357	0.00043			
3.10	0.92876	0.00045	2.50	0.93906	0.00041			
3.12	0.93456	0.00042	2.52	0.94485	0.00042			
3.14	0.93948	0.00043	2.54	0.95043	0.00042			
3.16	0.94363	0.00044	2.56	0.95792	0.00043			
3.18	0.94958	0.00044	2.58	0.96365	0.00042			
3.20	0.95396	0.00044	2.60	0.96987	0.00045			
3.22	0.95946	0.00043	2.62	0.97590	0.00043			
3.24	0.96541	0.00045	2.64	0.98186	0.00045			
3.26	0.96999	0.00045	2.66	0.98723	0.00044			
3.28	0.97449	0.00046	2.68	0.99449	0.00045			
3.30	0.98012	0.00045	2.70	0.99923	0.00044			
3.32	0.98410	0.00044	2.72	1.00551	0.00046			
3.34	0.98965	0.00047	2.74	1.01215	0.00044			
3.36	0.99376	0.00046	2.76	1.01758	0.00046			
3.38	0.99975	0.00046	2.78	1.02362	0.00047			
3.40	1.00464	0.00045	2.80	1.03015	0.00046			
3.42	1.00967	0.00045						
3.44	1.01432	0.00046						
3.46	1.01907	0.00049						
3.48	1.02398	0.00046						
3.50	1.02820	0.00047						

B.1.2.1.2. 1” Water Reflector

Case ID: pu-cyl-1000-01

Material: Plutonium metal in water

Geometry: Infinite Cylinder

Isotopics: 100% ^{239}Pu

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.1.2.1.2-1. 100% ^{239}Pu Cylinder - 1 Inch of Water Reflection

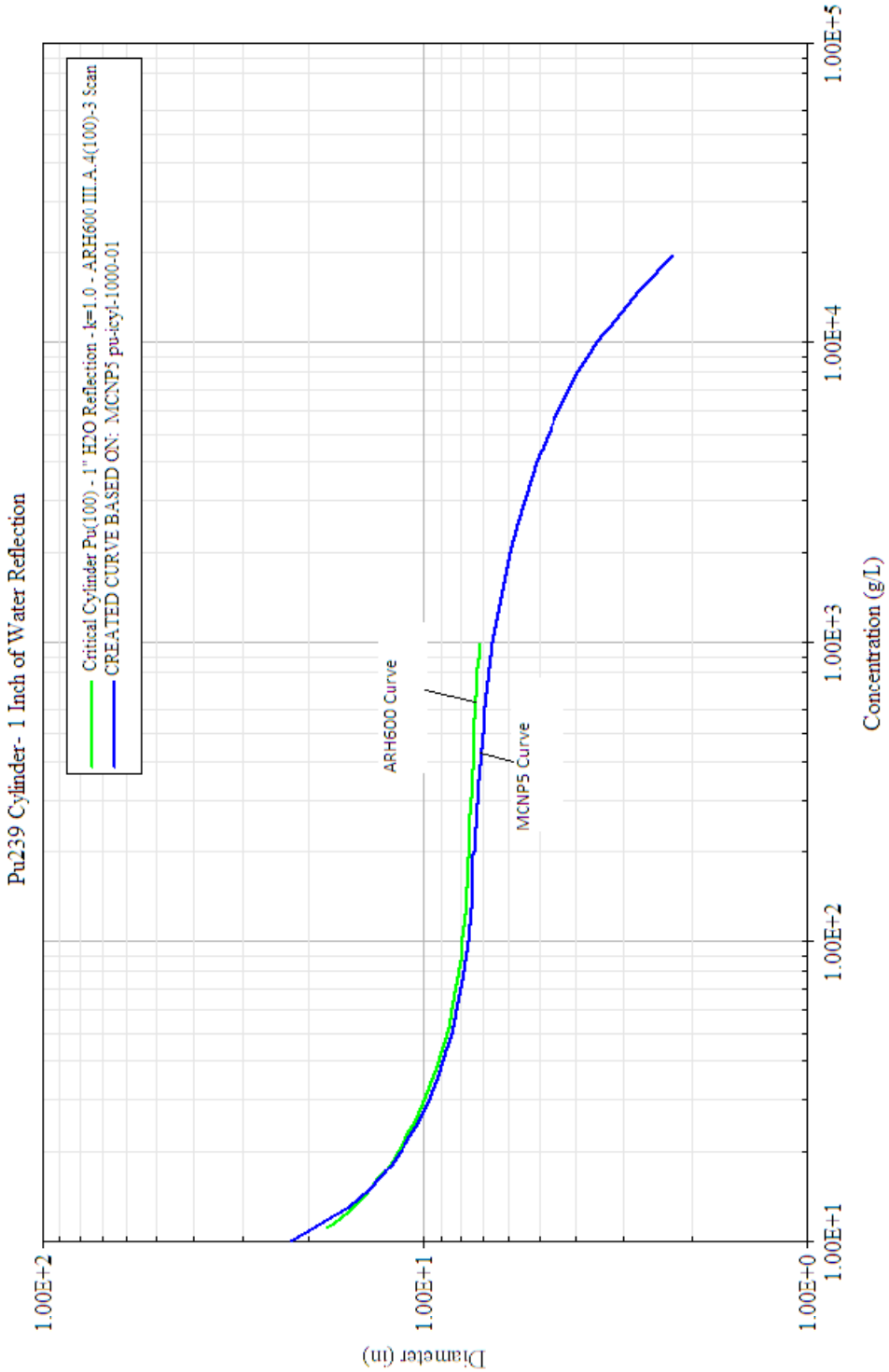

Table B.1.2.1.2-1. Critical Dimensions for 100% ^{239}Pu Cylinder - 1 Inch of Water Reflection

100% ^{239}Pu Cylinder- 1 Inch of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	17.200	23.600	0.300	22.1980
0.013	13.200	16.400	0.100	15.7500
0.015	11.800	14.000	0.100	13.9078
0.018	10.600	12.800	0.100	12.2501
0.020	10.100	11.900	0.100	11.5295
0.022	9.600	11.000	0.050	10.9879
0.024	9.300	10.900	0.050	10.5668
0.025	9.100	10.400	0.050	10.3751
0.026	9.000	10.400	0.050	10.1990
0.028	8.700	10.200	0.050	9.9149
0.030	8.500	10.000	0.050	9.6808
0.032	8.400	9.700	0.050	9.4755
0.036	8.100	9.500	0.050	9.1578
0.040	7.900	9.100	0.100	8.8831
0.045	7.700	8.900	0.050	8.6387
0.050	7.500	8.700	0.050	8.4466
0.075	7.100	8.100	0.050	7.9134
0.100	6.800	7.900	0.050	7.6824
0.150	6.700	7.700	0.050	7.4579
0.200	6.600	7.600	0.050	7.3553
0.350	6.450	7.400	0.050	7.1678
0.500	6.300	7.400	0.050	7.0317
0.750	6.100	7.000	0.050	6.8213
1.000	5.900	6.900	0.050	6.6246
1.500	5.600	6.500	0.050	6.2647
2.000	5.300	6.200	0.050	5.9829
2.500	5.100	5.900	0.050	5.7103
3.000	4.900	5.700	0.050	5.4785
4.000	4.500	5.300	0.050	5.0780
5.000	4.200	4.900	0.050	4.7386
6.000	3.900	4.600	0.050	4.4430
7.000	3.700	4.300	0.050	4.1754
7.500	3.600	4.200	0.050	4.0627
8.000	3.500	4.100	0.050	3.9448
9.000	3.300	3.900	0.050	3.7301
10.000	3.100	3.700	0.050	3.5284
15.000	2.400	2.900	0.020	2.7478
19.600	2.000	2.400	0.020	2.2445

MCNP5 Sample Input File
100% ^{239}Pu Cylinder- 1" Reflection

```
infcyl, 100.0 wt% 239Pu, 00100 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 755   hundreths of inches - must be integer
c radius =     9.5885 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00100 milli-g Pu/cc
c Reflector width =  1.0 inches
c Enrichment = 1.00 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0051 cc
c Volume of water in sample 0.9949 cc
c
c Mass of crit in sample   0.1000 g
c Mass of water in sample  0.9949 g
c
c Total mass of sample  1.0949g for a 1cc sample
c Mass Density for crit material  -1.0949, expressed as negative
c
c  infinite cylinder
20 11   -1.094898   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0

1       cz     9.5885              $ infinite cylinder
2       cz    12.1285         $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
```

```
0.00    0.00    3.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu/water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 00100 milli-g Pu/cc,  1.0949
1001.66c -0.101675
8016.66c -0.806993
94239.66c -0.091333
c    94240.66c -0.000000
mt11     lwtr.60t
c
c    pu only
m12    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 00100 milli-g Pu/cc,  1.0949
94239.66c -1.000000
c    94240.66c -0.000000
c
```

Critview Compatible Data File
100% ^{239}Pu Cylinder- 1" Reflection

reset:
title: MCNP5 pu-icyl-1000-01
set: MCNP5 set
source: MCNP5 primary
created: Fri 07/16/2010 9:16:39.97
geometry: infcyl
modmat: H2O
critmat: plutonium
isomat: Pu239 1.0
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	22.1980
0.013	15.7500
0.015	13.9078
0.018	12.2501
0.020	11.5295
0.022	10.9879
0.024	10.5668
0.025	10.3751
0.026	10.1990
0.028	9.9149
0.030	9.6808
0.032	9.4755
0.036	9.1578
0.040	8.8831
0.045	8.6387
0.050	8.4466
0.075	7.9134
0.100	7.6824
0.150	7.4579
0.200	7.3553
0.350	7.1678
0.500	7.0317
0.750	6.8213
1.000	6.6246
1.500	6.2647
2.000	5.9829
2.500	5.7103
3.000	5.4785
4.000	5.0780
5.000	4.7386
6.000	4.4430
7.000	4.1754
7.500	4.0627
8.000	3.9448
9.000	3.7301
10.00	3.5284
15.00	2.7478
19.60	2.2445

Table B.1.2.1.2-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 1 Inch of Water Reflection

10 milli-g/cc			13 milli-g/cc			15 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.20	0.92536	0.00039	13.20	0.92478	0.00043	11.80	0.92114	0.00047
17.50	0.93030	0.00036	13.30	0.92759	0.00045	11.90	0.92525	0.00048
17.80	0.93644	0.00036	13.40	0.93206	0.00043	12.00	0.92993	0.00047
18.10	0.94195	0.00036	13.50	0.93539	0.00043	12.10	0.93323	0.00049
18.40	0.94681	0.00036	13.60	0.93732	0.00044	12.20	0.93847	0.00048
18.70	0.95171	0.00036	13.70	0.94104	0.00045	12.30	0.94184	0.00048
19.00	0.95705	0.00035	13.80	0.94416	0.00045	12.40	0.94555	0.00048
19.30	0.96231	0.00036	13.90	0.94739	0.00044	12.50	0.95013	0.00048
19.60	0.96609	0.00035	14.00	0.95003	0.00043	12.60	0.95302	0.00047
19.90	0.96963	0.00036	14.10	0.95419	0.00043	12.70	0.95734	0.00047
20.20	0.97513	0.00036	14.20	0.95763	0.00043	12.80	0.96120	0.00048
20.50	0.97925	0.00035	14.30	0.95994	0.00043	12.90	0.96538	0.00047
20.80	0.98329	0.00034	14.40	0.96302	0.00043	13.00	0.96932	0.00044
21.10	0.98618	0.00034	14.50	0.96572	0.00041	13.10	0.97244	0.00046
21.40	0.99012	0.00034	14.60	0.96877	0.00042	13.20	0.97670	0.00047
21.70	0.99344	0.00034	14.70	0.97183	0.00044	13.30	0.97920	0.00046
22.00	0.99837	0.00033	14.80	0.97450	0.00045	13.40	0.98303	0.00046
22.30	1.00084	0.00034	14.90	0.97796	0.00044	13.50	0.98639	0.00047
22.60	1.00426	0.00033	15.00	0.98007	0.00043	13.60	0.98962	0.00045
22.90	1.00738	0.00033	15.10	0.98274	0.00043	13.70	0.99228	0.00046
23.20	1.00988	0.00033	15.20	0.98496	0.00042	13.80	0.99593	0.00047
23.50	1.01243	0.00033	15.30	0.98726	0.00043	13.90	0.99972	0.00045
23.60	1.01410	0.00034	15.40	0.99036	0.00041	14.00	1.00332	0.00046
			15.50	0.99320	0.00041			
			15.60	0.99615	0.00041			
			15.70	0.99788	0.00042			
			15.80	1.00212	0.00042			
			15.90	1.00239	0.00042			
			16.00	1.00613	0.00043			
			16.10	1.00809	0.00042			
			16.20	1.01134	0.00041			
			16.30	1.01109	0.00041			
			16.40	1.01482	0.00042			

Table B.1.2.1.2-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

18 milli-g/cc			20 milli-g/cc			22 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.60	0.92135	0.00052	10.10	0.92428	0.00054	9.60	0.92022	0.00054
10.70	0.92682	0.00051	10.20	0.92970	0.00053	9.65	0.92298	0.00052
10.80	0.93249	0.00052	10.30	0.93559	0.00052	9.70	0.92643	0.00054
10.90	0.93719	0.00050	10.40	0.94133	0.00052	9.75	0.92874	0.00057
11.00	0.94229	0.00049	10.50	0.94774	0.00054	9.80	0.93236	0.00056
11.10	0.94791	0.00049	10.60	0.95249	0.00052	9.85	0.93600	0.00055
11.20	0.95268	0.00051	10.70	0.95689	0.00053	9.90	0.93899	0.00054
11.30	0.95660	0.00054	10.80	0.96416	0.00052	9.95	0.94169	0.00055
11.40	0.96172	0.00053	10.90	0.96800	0.00051	10.00	0.94514	0.00052
11.50	0.96692	0.00050	11.00	0.97273	0.00053	10.05	0.94798	0.00055
11.60	0.97162	0.00051	11.10	0.97887	0.00052	10.10	0.95042	0.00054
11.70	0.97585	0.00050	11.20	0.98283	0.00053	10.15	0.95274	0.00053
11.80	0.97993	0.00051	11.30	0.98871	0.00051	10.20	0.95696	0.00056
11.90	0.98534	0.00049	11.40	0.99349	0.00052	10.25	0.95955	0.00054
12.00	0.98901	0.00050	11.50	0.99855	0.00051	10.30	0.96225	0.00055
12.10	0.99285	0.00053	11.60	1.00346	0.00053	10.35	0.96620	0.00054
12.20	0.99745	0.00049	11.70	1.00784	0.00053	10.40	0.96791	0.00054
12.30	1.00254	0.00049	11.80	1.01286	0.00053	10.45	0.97151	0.00054
12.40	1.00640	0.00049	11.90	1.01747	0.00052	10.50	0.97303	0.00055
12.50	1.01119	0.00048				10.55	0.97628	0.00054
12.60	1.01421	0.00049				10.60	0.97897	0.00054
12.70	1.01859	0.00048				10.65	0.98200	0.00052
12.80	1.02186	0.00050				10.70	0.98522	0.00053
						10.75	0.98780	0.00054
						10.80	0.99050	0.00054
						10.85	0.99185	0.00055
						10.90	0.99589	0.00053
						10.95	0.99691	0.00054
						11.00	1.00099	0.00053

Table B.1.2.1.2-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

24 milli-g/cc			25 milli-g/cc			26 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.30	0.92310	0.00055	9.10	0.91883	0.00055	9.00	0.92133	0.00057
9.35	0.92694	0.00056	9.15	0.92186	0.00056	9.05	0.92434	0.00055
9.40	0.92971	0.00058	9.20	0.92556	0.00057	9.10	0.92910	0.00057
9.45	0.93268	0.00058	9.25	0.92765	0.00059	9.15	0.93098	0.00059
9.50	0.93528	0.00058	9.30	0.93139	0.00058	9.20	0.93410	0.00056
9.55	0.93815	0.00057	9.35	0.93670	0.00057	9.25	0.93861	0.00054
9.60	0.94229	0.00055	9.40	0.93945	0.00058	9.30	0.94236	0.00058
9.65	0.94550	0.00054	9.45	0.94223	0.00055	9.35	0.94500	0.00061
9.70	0.94938	0.00057	9.50	0.94630	0.00054	9.40	0.94893	0.00058
9.75	0.95226	0.00057	9.55	0.94857	0.00058	9.45	0.95209	0.00057
9.80	0.95437	0.00055	9.60	0.95255	0.00057	9.50	0.95603	0.00057
9.85	0.95753	0.00055	9.65	0.95540	0.00058	9.55	0.95835	0.00058
9.90	0.96150	0.00056	9.70	0.95879	0.00056	9.60	0.96235	0.00059
9.95	0.96394	0.00057	9.75	0.96161	0.00057	9.65	0.96586	0.00058
10.00	0.96752	0.00059	9.80	0.96615	0.00057	9.70	0.96811	0.00057
10.05	0.97015	0.00055	9.85	0.96853	0.00056	9.75	0.97177	0.00055
10.10	0.97346	0.00054	9.90	0.97200	0.00059	9.80	0.97497	0.00056
10.15	0.97573	0.00055	9.95	0.97461	0.00057	9.85	0.97784	0.00059
10.20	0.97999	0.00055	10.00	0.97812	0.00056	9.90	0.98038	0.00057
10.25	0.98356	0.00056	10.05	0.98053	0.00059	9.95	0.98324	0.00057
10.30	0.98485	0.00055	10.10	0.98424	0.00056	10.00	0.98734	0.00058
10.35	0.98807	0.00055	10.15	0.98679	0.00057	10.05	0.99032	0.00059
10.40	0.99150	0.00056	10.20	0.98977	0.00055	10.10	0.99318	0.00058
10.45	0.99495	0.00055	10.25	0.99414	0.00056	10.15	0.99658	0.00056
10.50	0.99677	0.00056	10.30	0.99583	0.00058	10.20	1.00007	0.00055
10.55	0.99865	0.00055	10.35	0.99840	0.00056	10.25	1.00284	0.00057
10.60	1.00266	0.00055	10.40	1.00159	0.00058	10.30	1.00549	0.00058
10.65	1.00522	0.00054				10.35	1.00802	0.00056
10.70	1.00807	0.00054				10.40	1.01131	0.00055
10.75	1.01134	0.00055						
10.80	1.01300	0.00055						
10.85	1.01639	0.00056						
10.90	1.01912	0.00055						

Table B.1.2.1.2-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

28 milli-g/cc			30 milli-g/cc			32 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.70	0.91540	0.00059	8.50	0.91528	0.00060	8.40	0.92036	0.00060
8.75	0.91852	0.00056	8.55	0.91895	0.00060	8.45	0.92409	0.00061
8.80	0.92354	0.00060	8.60	0.92386	0.00058	8.50	0.92753	0.00059
8.85	0.92699	0.00058	8.65	0.92692	0.00058	8.55	0.93227	0.00059
8.90	0.93130	0.00057	8.70	0.93222	0.00060	8.60	0.93663	0.00059
8.95	0.93518	0.00057	8.75	0.93464	0.00061	8.65	0.94043	0.00061
9.00	0.93752	0.00058	8.80	0.93832	0.00058	8.70	0.94375	0.00058
9.05	0.94125	0.00057	8.85	0.94249	0.00060	8.75	0.94769	0.00060
9.10	0.94658	0.00058	8.90	0.94614	0.00060	8.80	0.95158	0.00061
9.15	0.94781	0.00058	8.95	0.94927	0.00059	8.85	0.95474	0.00057
9.20	0.95235	0.00055	9.00	0.95289	0.00056	8.90	0.95848	0.00060
9.25	0.95552	0.00056	9.05	0.95561	0.00059	8.95	0.96287	0.00061
9.30	0.95791	0.00057	9.10	0.96029	0.00057	9.00	0.96630	0.00059
9.35	0.96228	0.00055	9.15	0.96378	0.00060	9.05	0.96994	0.00061
9.40	0.96525	0.00059	9.20	0.96720	0.00059	9.10	0.97338	0.00061
9.45	0.97017	0.00058	9.25	0.97009	0.00057	9.15	0.97727	0.00059
9.50	0.97244	0.00056	9.30	0.97523	0.00060	9.20	0.98100	0.00061
9.55	0.97599	0.00057	9.35	0.97647	0.00060	9.25	0.98389	0.00059
9.60	0.98046	0.00059	9.40	0.98157	0.00059	9.30	0.98695	0.00060
9.65	0.98254	0.00059	9.45	0.98390	0.00059	9.35	0.99102	0.00059
9.70	0.98577	0.00055	9.50	0.98755	0.00059	9.40	0.99528	0.00061
9.75	0.98899	0.00059	9.55	0.99068	0.00060	9.45	0.99738	0.00060
9.80	0.99182	0.00057	9.60	0.99449	0.00060	9.50	1.00252	0.00060
9.85	0.99512	0.00057	9.65	0.99766	0.00060	9.55	1.00553	0.00059
9.90	0.99910	0.00057	9.70	1.00146	0.00061	9.60	1.00844	0.00060
9.95	1.00213	0.00057	9.75	1.00355	0.00059	9.65	1.01218	0.00060
10.00	1.00510	0.00059	9.80	1.00886	0.00058	9.70	1.01533	0.00060
10.05	1.00858	0.00059	9.85	1.01236	0.00057			
10.10	1.01157	0.00058	9.90	1.01479	0.00058			
10.15	1.01394	0.00058	9.95	1.01852	0.00058			
10.20	1.01655	0.00060	10.00	1.02065	0.00059			

Table B.1.2.1.2-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

36 milli-g/cc			40 milli-g/cc			45 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.10	0.91908	0.00061	7.90	0.91948	0.00060	7.70	0.91944	0.00065
8.15	0.92302	0.00060	8.00	0.92742	0.00061	7.75	0.92572	0.00064
8.20	0.92586	0.00062	8.05	0.93249	0.00063	7.80	0.92903	0.00063
8.25	0.93146	0.00061	8.10	0.93644	0.00063	7.85	0.93328	0.00061
8.30	0.93559	0.00061	8.15	0.93982	0.00062	7.90	0.93703	0.00065
8.35	0.93931	0.00061	8.20	0.94500	0.00064	7.95	0.94250	0.00062
8.40	0.94391	0.00061	8.25	0.95005	0.00063	8.00	0.94690	0.00064
8.45	0.94690	0.00064	8.30	0.95263	0.00062	8.05	0.95138	0.00062
8.50	0.95110	0.00063	8.35	0.95751	0.00061	8.10	0.95500	0.00063
8.55	0.95568	0.00061	8.40	0.96218	0.00062	8.15	0.95885	0.00063
8.60	0.95870	0.00063	8.45	0.96577	0.00064	8.20	0.96367	0.00063
8.65	0.96292	0.00059	8.50	0.96964	0.00063	8.25	0.96850	0.00063
8.70	0.96660	0.00061	8.55	0.97447	0.00066	8.30	0.97287	0.00062
8.75	0.97156	0.00063	8.60	0.97750	0.00064	8.35	0.97608	0.00062
8.80	0.97457	0.00060	8.65	0.98032	0.00062	8.40	0.98113	0.00063
8.85	0.97791	0.00060	8.70	0.98593	0.00062	8.45	0.98374	0.00064
8.90	0.98126	0.00061	8.75	0.98930	0.00062	8.50	0.98851	0.00064
8.95	0.98562	0.00059	8.80	0.99156	0.00062	8.55	0.99248	0.00064
9.00	0.98862	0.00062	8.85	0.99760	0.00060	8.60	0.99676	0.00064
9.05	0.99431	0.00062	8.90	1.00122	0.00062	8.65	1.00095	0.00064
9.10	0.99710	0.00060	8.95	1.00397	0.00064	8.70	1.00431	0.00064
9.15	0.99923	0.00059	9.00	1.00951	0.00063	8.75	1.00745	0.00065
9.20	1.00419	0.00060	9.05	1.01102	0.00063	8.80	1.01262	0.00062
9.25	1.00871	0.00064	9.10	1.01651	0.00062	8.85	1.01667	0.00064
9.30	1.01099	0.00060				8.90	1.01924	0.00065
9.35	1.01577	0.00062						
9.40	1.01900	0.00061						
9.45	1.02212	0.00063						
9.50	1.02476	0.00062						

Table B.1.2.1.2-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

50 milli-g/cc			75 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.50	0.91591	0.00062	7.10	0.92083	0.00067	6.80	0.91126	0.00066
7.55	0.92061	0.00065	7.15	0.92724	0.00064	6.85	0.91625	0.00068
7.60	0.92528	0.00063	7.20	0.93085	0.00065	6.90	0.92258	0.00065
7.65	0.92977	0.00065	7.25	0.93581	0.00063	6.95	0.92887	0.00067
7.70	0.93481	0.00065	7.30	0.94105	0.00066	7.00	0.93189	0.00067
7.75	0.93915	0.00065	7.35	0.94562	0.00066	7.05	0.93810	0.00066
7.80	0.94356	0.00065	7.40	0.95199	0.00068	7.10	0.94281	0.00068
7.85	0.94737	0.00065	7.45	0.95576	0.00065	7.15	0.94794	0.00068
7.90	0.95271	0.00062	7.50	0.96096	0.00065	7.20	0.95346	0.00068
7.95	0.95742	0.00066	7.55	0.96643	0.00066	7.25	0.95872	0.00068
8.00	0.96055	0.00065	7.60	0.96964	0.00066	7.30	0.96375	0.00067
8.05	0.96707	0.00061	7.65	0.97511	0.00067	7.35	0.96702	0.00068
8.10	0.97013	0.00064	7.70	0.98061	0.00066	7.40	0.97310	0.00069
8.15	0.97363	0.00064	7.75	0.98446	0.00065	7.45	0.97822	0.00066
8.20	0.97823	0.00064	7.80	0.98856	0.00069	7.50	0.98240	0.00065
8.25	0.98316	0.00066	7.85	0.99410	0.00067	7.55	0.98755	0.00068
8.30	0.98734	0.00063	7.90	0.99873	0.00070	7.60	0.99184	0.00064
8.35	0.99121	0.00064	7.95	1.00347	0.00067	7.65	0.99715	0.00067
8.40	0.99504	0.00063	8.00	1.00713	0.00065	7.70	1.00155	0.00067
8.45	1.00036	0.00064	8.05	1.01158	0.00067	7.75	1.00685	0.00069
8.50	1.00326	0.00063	8.10	1.01691	0.00066	7.80	1.01009	0.00067
8.55	1.00855	0.00066				7.85	1.01529	0.00065
8.60	1.01066	0.00064				7.90	1.02089	0.00066
8.65	1.01535	0.00065						
8.70	1.02076	0.00063						

Table B.1.2.1.2-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

150 milli-g/cc			200 milli-g/cc			350 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.70	0.92164	0.00067	6.60	0.92378	0.00068	6.45	0.92490	0.00068
6.75	0.92748	0.00070	6.65	0.92765	0.00069	6.50	0.93009	0.00066
6.80	0.93263	0.00067	6.70	0.93469	0.00068	6.55	0.93615	0.00070
6.85	0.93806	0.00068	6.75	0.93858	0.00067	6.60	0.94037	0.00069
6.90	0.94438	0.00068	6.80	0.94388	0.00068	6.65	0.94763	0.00069
6.95	0.94937	0.00069	6.85	0.95016	0.00069	6.70	0.95210	0.00070
7.00	0.95346	0.00069	6.90	0.95395	0.00069	6.75	0.95679	0.00068
7.05	0.95983	0.00068	6.95	0.96004	0.00067	6.80	0.96289	0.00069
7.10	0.96484	0.00068	7.00	0.96483	0.00068	6.85	0.96670	0.00069
7.15	0.96891	0.00067	7.05	0.96912	0.00071	6.90	0.97285	0.00067
7.20	0.97446	0.00071	7.10	0.97437	0.00068	6.95	0.97791	0.00069
7.25	0.98008	0.00069	7.15	0.97897	0.00071	7.00	0.98347	0.00069
7.30	0.98408	0.00070	7.20	0.98457	0.00067	7.05	0.98792	0.00070
7.35	0.98901	0.00070	7.25	0.98971	0.00065	7.10	0.99276	0.00067
7.40	0.99477	0.00070	7.35	0.99937	0.00073	7.15	0.99822	0.00069
7.45	0.99898	0.00072	7.40	1.00536	0.00068	7.20	1.00322	0.00069
7.50	1.00541	0.00068	7.45	1.00996	0.00068	7.25	1.00917	0.00069
7.55	1.00806	0.00068	7.50	1.01356	0.00068	7.30	1.01268	0.00069
7.60	1.01285	0.00067	7.55	1.01821	0.00070	7.35	1.01692	0.00072
7.65	1.01851	0.00068	7.60	1.02433	0.00070	7.40	1.02308	0.00068
7.70	1.02315	0.00067						

Table B.1.2.1.2-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

500 milli-g/cc			750 milli-g/cc			1000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.30	0.92222	0.00068	6.10	0.92191	0.00066	5.90	0.91853	0.00070
6.35	0.92682	0.00066	6.15	0.92777	0.00069	5.95	0.92394	0.00068
6.40	0.93216	0.00069	6.20	0.93166	0.00069	6.00	0.92978	0.00065
6.45	0.93917	0.00068	6.25	0.93810	0.00068	6.05	0.93631	0.00068
6.50	0.94422	0.00070	6.30	0.94320	0.00068	6.10	0.94334	0.00070
6.55	0.94966	0.00069	6.35	0.94854	0.00069	6.15	0.94916	0.00069
6.60	0.95467	0.00067	6.40	0.95625	0.00067	6.20	0.95223	0.00072
6.65	0.95953	0.00070	6.45	0.96084	0.00070	6.25	0.95824	0.00069
6.70	0.96569	0.00069	6.50	0.96680	0.00070	6.30	0.96430	0.00069
6.75	0.97219	0.00070	6.55	0.97247	0.00070	6.35	0.97116	0.00069
6.80	0.97548	0.00067	6.60	0.97617	0.00067	6.40	0.97777	0.00071
6.85	0.98276	0.00072	6.65	0.98262	0.00070	6.45	0.98127	0.00070
6.90	0.98579	0.00070	6.70	0.98770	0.00065	6.50	0.98736	0.00070
6.95	0.99188	0.00068	6.75	0.99330	0.00069	6.55	0.99281	0.00070
7.00	0.99683	0.00067	6.80	0.99771	0.00069	6.60	0.99683	0.00068
7.05	1.00183	0.00069	6.85	1.00308	0.00067	6.65	1.00327	0.00070
7.10	1.00658	0.00068	6.90	1.00762	0.00068	6.70	1.00837	0.00069
7.15	1.01099	0.00072	6.95	1.01358	0.00069	6.75	1.01359	0.00068
7.20	1.01708	0.00070	7.00	1.01876	0.00069	6.80	1.01852	0.00066
7.25	1.02215	0.00070				6.85	1.02439	0.00068
7.30	1.02526	0.00069				6.90	1.02939	0.00067
7.35	1.03216	0.00068						
7.40	1.03577	0.00068						

Table B.1.2.1.2-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

1500 milli-g/cc			2000 milli-g/cc			2500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.60	0.92025	0.00068	5.30	0.91384	0.00067	5.10	0.91755	0.00069
5.65	0.92605	0.00068	5.35	0.91951	0.00069	5.15	0.92507	0.00066
5.70	0.93226	0.00067	5.40	0.92777	0.00069	5.20	0.93276	0.00067
5.75	0.93821	0.00067	5.45	0.93414	0.00068	5.25	0.93914	0.00067
5.80	0.94495	0.00068	5.50	0.94015	0.00068	5.30	0.94724	0.00067
5.85	0.95066	0.00067	5.55	0.94700	0.00069	5.35	0.95209	0.00071
5.90	0.95614	0.00070	5.60	0.95294	0.00069	5.40	0.96077	0.00070
5.95	0.96226	0.00070	5.65	0.95931	0.00067	5.45	0.96625	0.00071
6.00	0.96887	0.00070	5.70	0.96680	0.00069	5.50	0.97292	0.00069
6.05	0.97346	0.00069	5.75	0.97292	0.00070	5.55	0.97865	0.00067
6.10	0.98038	0.00069	5.80	0.97818	0.00069	5.60	0.98651	0.00067
6.15	0.98564	0.00068	5.85	0.98472	0.00071	5.65	0.99305	0.00069
6.20	0.99203	0.00068	5.90	0.99112	0.00068	5.70	0.99880	0.00069
6.25	0.99840	0.00070	5.95	0.99623	0.00070	5.75	1.00461	0.00067
6.30	1.00386	0.00071	6.00	1.00196	0.00070	5.80	1.01202	0.00072
6.35	1.01001	0.00070	6.05	1.01051	0.00069	5.85	1.01734	0.00068
6.40	1.01454	0.00068	6.10	1.01537	0.00069	5.90	1.02474	0.00068
6.45	1.02061	0.00070	6.15	1.01994	0.00069			
6.50	1.02600	0.00072	6.20	1.02755	0.00070			

Table B.1.2.1.2-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

3000 milli-g/cc			4000 milli-g/cc			5000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.90	0.91870	0.00067	4.50	0.91136	0.00065	4.20	0.91088	0.00064
4.95	0.92782	0.00068	4.55	0.91953	0.00067	4.25	0.92004	0.00064
5.00	0.93372	0.00069	4.60	0.92819	0.00066	4.30	0.92839	0.00065
5.05	0.94160	0.00068	4.65	0.93734	0.00065	4.35	0.93676	0.00066
5.10	0.94858	0.00071	4.70	0.94252	0.00068	4.40	0.94545	0.00065
5.15	0.95581	0.00068	4.75	0.95105	0.00069	4.45	0.95299	0.00066
5.20	0.96174	0.00067	4.80	0.95878	0.00067	4.50	0.96286	0.00064
5.25	0.96858	0.00067	4.85	0.96695	0.00068	4.55	0.97027	0.00062
5.30	0.97591	0.00067	4.90	0.97411	0.00068	4.60	0.97765	0.00067
5.35	0.98346	0.00068	4.95	0.98030	0.00067	4.65	0.98659	0.00070
5.40	0.99066	0.00069	5.00	0.98820	0.00071	4.70	0.99368	0.00067
5.50	1.00256	0.00070	5.05	0.99602	0.00066	4.75	1.00187	0.00067
5.55	1.00969	0.00068	5.10	1.00313	0.00067	4.80	1.01027	0.00067
5.60	1.01616	0.00068	5.15	1.01166	0.00069	4.85	1.01800	0.00065
5.65	1.02436	0.00068	5.20	1.01824	0.00067	4.90	1.02556	0.00066
5.70	1.02799	0.00067	5.25	1.02607	0.00069			
			5.30	1.03259	0.00068			

Table B.1.2.1.2-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

6000 milli-g/cc			7000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
3.90	0.90465	0.00062	3.70	0.91001	0.00064	3.60	0.91147	0.00061
3.95	0.91425	0.00065	3.75	0.91989	0.00063	3.65	0.92177	0.00060
4.00	0.92344	0.00065	3.80	0.92854	0.00064	3.70	0.93103	0.00065
4.05	0.93241	0.00064	3.85	0.93968	0.00061	3.75	0.94153	0.00063
4.10	0.94169	0.00064	3.90	0.94946	0.00063	3.80	0.95173	0.00065
4.15	0.95037	0.00067	3.95	0.95934	0.00062	3.85	0.96095	0.00064
4.20	0.95916	0.00064	4.00	0.96767	0.00061	3.90	0.97169	0.00062
4.25	0.96734	0.00067	4.05	0.97664	0.00065	3.95	0.97997	0.00065
4.30	0.97652	0.00067	4.10	0.98647	0.00061	4.00	0.98895	0.00063
4.35	0.98527	0.00067	4.15	0.99504	0.00063	4.05	0.99781	0.00063
4.40	0.99339	0.00064	4.20	1.00482	0.00067	4.10	1.00640	0.00063
4.45	1.00107	0.00064	4.25	1.01339	0.00065	4.15	1.01736	0.00064
4.50	1.01060	0.00065	4.30	1.02203	0.00065	4.20	1.02629	0.00062
4.55	1.01864	0.00065						
4.60	1.02677	0.00064						

Table B.1.2.1.2-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

8000 milli-g/cc			9000 milli-g/cc			10000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
3.50	0.91196	0.00060	3.30	0.91096	0.00059	3.10	0.90534	0.00058
3.55	0.92210	0.00060	3.35	0.92101	0.00059	3.15	0.91585	0.00058
3.60	0.93325	0.00062	3.40	0.93270	0.00060	3.20	0.92730	0.00060
3.65	0.94361	0.00062	3.45	0.94222	0.00058	3.25	0.93881	0.00061
3.70	0.95281	0.00062	3.50	0.95305	0.00059	3.30	0.94903	0.00058
3.75	0.96289	0.00061	3.55	0.96380	0.00058	3.35	0.95942	0.00060
3.80	0.97274	0.00063	3.60	0.97348	0.00060	3.40	0.97201	0.00059
3.85	0.98168	0.00063	3.65	0.98507	0.00060	3.45	0.98239	0.00058
3.90	0.99118	0.00062	3.70	0.99428	0.00061	3.50	0.99345	0.00058
3.95	1.00103	0.00061	3.75	1.00378	0.00062	3.55	1.00499	0.00060
4.00	1.01141	0.00063	3.80	1.01384	0.00061	3.60	1.01538	0.00062
4.05	1.02123	0.00064	3.85	1.02417	0.00061	3.65	1.02479	0.00063
4.10	1.02945	0.00063	3.90	1.03327	0.00064	3.70	1.03527	0.00061

Table B.1.2.1.2-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

15000 milli-g/cc			19600 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
2.40	0.90074	0.00054	2.00	0.91491	0.00050			
2.42	0.90715	0.00054	2.02	0.92277	0.00049			
2.44	0.91310	0.00052	2.04	0.93011	0.00051			
2.46	0.91762	0.00055	2.06	0.93579	0.00050			
2.48	0.92485	0.00053	2.08	0.94326	0.00048			
2.50	0.93024	0.00055	2.10	0.95087	0.00051			
2.52	0.93496	0.00055	2.12	0.95667	0.00050			
2.54	0.94120	0.00053	2.14	0.96436	0.00051			
2.56	0.94722	0.00053	2.16	0.97067	0.00050			
2.58	0.95184	0.00055	2.18	0.97794	0.00050			
2.60	0.95866	0.00056	2.20	0.98538	0.00053			
2.62	0.96377	0.00054	2.22	0.99141	0.00053			
2.64	0.96959	0.00054	2.24	0.99842	0.00054			
2.66	0.97491	0.00055	2.26	1.00542	0.00053			
2.68	0.98064	0.00054	2.28	1.01254	0.00053			
2.70	0.98683	0.00053	2.30	1.01824	0.00050			
2.72	0.99146	0.00054	2.32	1.02522	0.00052			
2.74	0.99769	0.00055	2.34	1.03203	0.00052			
2.76	1.00363	0.00056	2.36	1.03867	0.00055			
2.78	1.00793	0.00053	2.38	1.04479	0.00055			
2.80	1.01391	0.00055	2.40	1.05096	0.00054			
2.82	1.01996	0.00055						
2.84	1.02395	0.00055						
2.86	1.03011	0.00056						
2.88	1.03471	0.00059						
2.90	1.04099	0.00056						

B.1.2.1.3. 10” Water Reflector

Case ID: pu-cyl-1000-10

Material: Plutonium metal in water

Geometry: Infinite Cylinder

Isotopics: 100% ^{239}Pu

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.1.2.1.3-1. 100% ^{239}Pu Cylinder - 10 Inches of Water Reflection

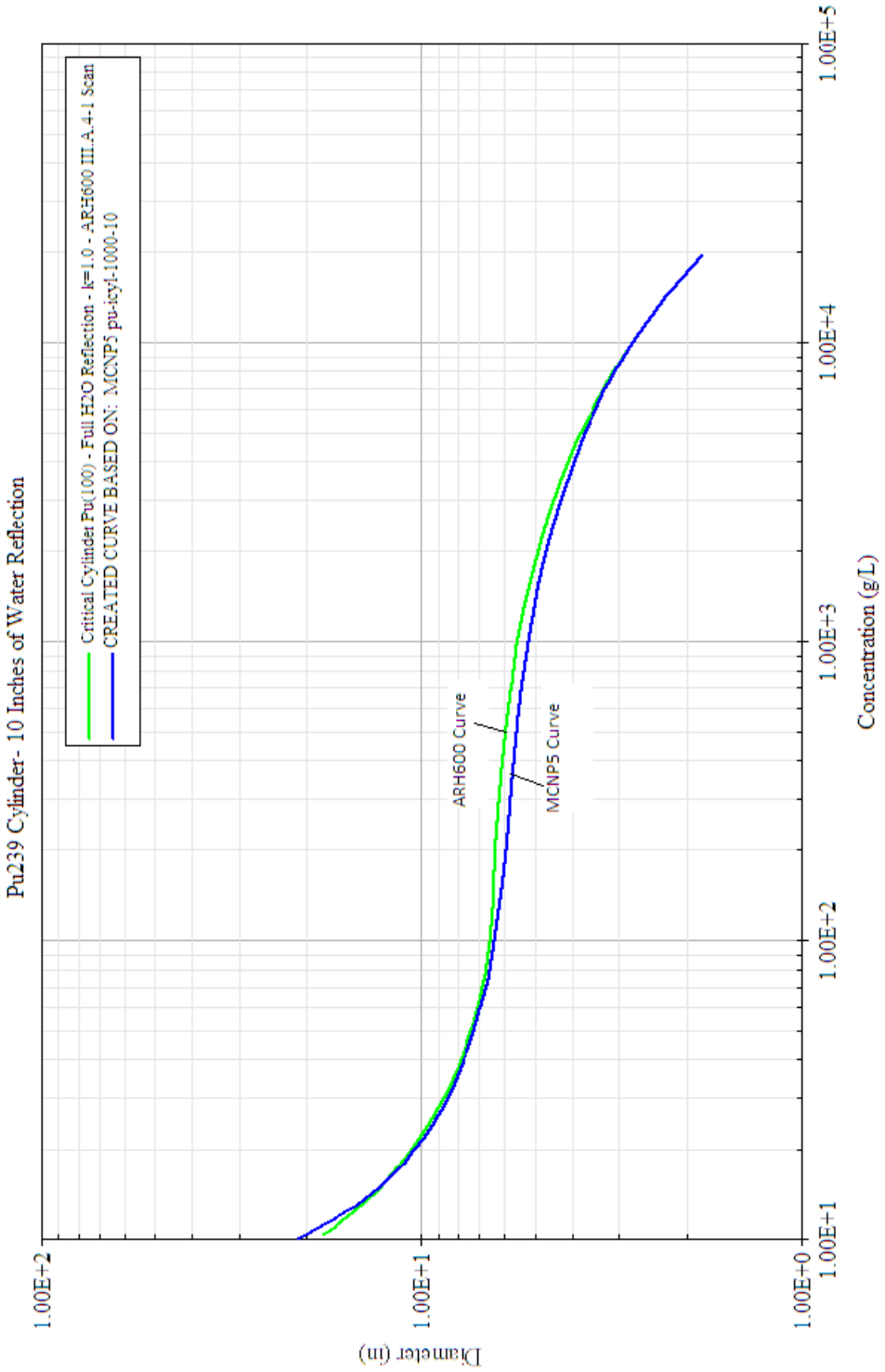

Table B.1.2.1.3-1. Critical Dimensions for 100% ^{239}Pu Cylinder - 10 Inches of Water Reflection

100% ^{239}Pu Cylinder- 10 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	16.100	22.300	0.300	21.1323
0.013	12.100	15.300	0.100	14.7116
0.015	10.800	13.300	0.100	12.8004
0.018	9.500	11.600	0.100	11.1253
0.020	9.000	10.800	0.100	10.4185
0.022	8.500	10.200	0.050	9.8530
0.024	8.200	9.800	0.050	9.4122
0.025	8.000	9.600	0.050	9.2262
0.026	7.900	9.400	0.050	9.0648
0.028	7.600	9.100	0.050	8.7611
0.030	7.400	8.800	0.050	8.5242
0.032	7.200	8.600	0.050	8.3122
0.036	7.000	8.200	0.050	7.9713
0.040	6.700	8.000	0.050	7.6922
0.045	6.500	7.700	0.050	7.4549
0.050	6.300	7.500	0.050	7.2356
0.075	5.800	6.900	0.050	6.6484
0.100	5.600	6.600	0.050	6.3779
0.150	5.300	6.300	0.050	6.1040
0.200	5.200	6.200	0.050	5.9530
0.350	5.000	6.000	0.050	5.7402
0.500	4.900	5.800	0.050	5.5956
0.750	4.700	5.600	0.050	5.4006
1.000	4.500	5.400	0.050	5.2298
1.500	4.300	5.100	0.050	4.9334
2.000	4.100	4.900	0.050	4.6881
2.500	3.900	4.700	0.050	4.4711
3.000	3.700	4.500	0.050	4.2906
4.000	3.500	4.100	0.050	3.9691
5.000	3.200	3.900	0.050	3.7065
6.000	3.000	3.600	0.050	3.4739
7.000	2.800	3.400	0.050	3.2719
7.500	2.800	3.300	0.020	3.1785
8.000	2.700	3.200	0.020	3.0896
9.000	2.500	3.100	0.050	2.9273
10.000	2.400	2.900	0.020	2.7775
15.000	1.900	2.300	0.020	2.1991
19.600	1.600	1.900	0.020	1.8299

MCNP5 Sample Input File
100% ^{239}Pu Cylinder- 10” Reflection

```
infcyl, 100.0 wt% 239Pu, 00100 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 635   hundreths of inches - must be integer
c radius =     8.0645 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00100 milli-g Pu/cc
c Reflector width =  10.0 inches
c Enrichment = 1.00 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0051 cc
c Volume of water in sample 0.9949 cc
c
c Mass of crit in sample   0.1000 g
c Mass of water in sample  0.9949 g
c
c Total mass of sample  1.0949g for a 1cc sample
c Mass Density for crit material  -1.0949, expressed as negative
c
c  infinite cylinder
20 11   -1.094898   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0

1       cz     8.0645              $ infinite cylinder
2       cz    33.4645         $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
```

```
0.00    0.00    3.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu/water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 00100 milli-g Pu/cc,  1.0949
1001.66c -0.101675
8016.66c -0.806993
94239.66c -0.091333
c    94240.66c -0.000000
mt11     lwtr.60t
c
c    pu only
m12    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 00100 milli-g Pu/cc,  1.0949
94239.66c -1.000000
c    94240.66c -0.000000
c
```

Critview Compatible Data File
100% ^{239}Pu Cylinder- 10” Reflection

reset:
title: MCNP5 pu-icyl-1000-10
set: MCNP5 set
source: MCNP5 primary
created: Fri 07/16/2010 9:33:18.19
geometry: infcyl
modmat: H2O
critmat: plutonium
isomat: Pu239 1.0
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	21.1323
0.013	14.7116
0.015	12.8004
0.018	11.1253
0.020	10.4185
0.022	9.8530
0.024	9.4122
0.025	9.2262
0.026	9.0648
0.028	8.7611
0.030	8.5242
0.032	8.3122
0.036	7.9713
0.040	7.6922
0.045	7.4549
0.050	7.2356
0.075	6.6484
0.100	6.3779
0.150	6.1040
0.200	5.9530
0.350	5.7402
0.500	5.5956
0.750	5.4006
1.000	5.2298
1.500	4.9334
2.000	4.6881
2.500	4.4711
3.000	4.2906
4.000	3.9691
5.000	3.7065
6.000	3.4739
7.000	3.2719
7.500	3.1785
8.000	3.0896
9.000	2.9273
10.00	2.7775
15.00	2.1991
19.60	1.8299

Table B.1.2.1.3-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 10 Inches of Water Reflection

10 milli-g/cc			13 milli-g/cc			15 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
16.10	0.92538	0.00036	12.10	0.92382	0.00043	10.80	0.92502	0.00044
16.40	0.93130	0.00035	12.20	0.92780	0.00042	10.90	0.92905	0.00044
16.70	0.93672	0.00034	12.30	0.93077	0.00041	11.00	0.93337	0.00043
17.00	0.94136	0.00035	12.40	0.93336	0.00040	11.10	0.93708	0.00042
17.30	0.94630	0.00035	12.50	0.93688	0.00040	11.20	0.94177	0.00046
17.60	0.95187	0.00036	12.60	0.94171	0.00041	11.30	0.94661	0.00043
17.90	0.95657	0.00034	12.70	0.94441	0.00043	11.40	0.94983	0.00045
18.20	0.96177	0.00033	12.80	0.94705	0.00041	11.50	0.95364	0.00043
18.50	0.96551	0.00033	12.90	0.95054	0.00042	11.60	0.95711	0.00045
18.80	0.96990	0.00034	13.00	0.95320	0.00040	11.70	0.96046	0.00043
19.10	0.97474	0.00033	13.10	0.95556	0.00040	11.80	0.96473	0.00046
19.40	0.97905	0.00033	13.20	0.95955	0.00041	11.90	0.96945	0.00044
19.70	0.98209	0.00032	13.30	0.96310	0.00039	12.00	0.97205	0.00044
20.00	0.98633	0.00031	13.40	0.96582	0.00041	12.10	0.97585	0.00045
20.30	0.99045	0.00033	13.50	0.96941	0.00040	12.20	0.97889	0.00040
20.60	0.99316	0.00033	13.60	0.97166	0.00041	12.30	0.98300	0.00045
20.90	0.99729	0.00033	13.70	0.97489	0.00041	12.40	0.98616	0.00042
21.20	1.00079	0.00032	13.80	0.97634	0.00041	12.50	0.98984	0.00043
21.50	1.00414	0.00032	13.90	0.97978	0.00041	12.60	0.99349	0.00043
21.80	1.00704	0.00032	14.00	0.98246	0.00040	12.70	0.99650	0.00046
22.10	1.01039	0.00031	14.10	0.98517	0.00041	12.80	0.99999	0.00044
22.30	1.01189	0.00031	14.20	0.98806	0.00041	12.90	1.00283	0.00042
			14.30	0.99002	0.00040	13.00	1.00661	0.00044
			14.40	0.99393	0.00040	13.10	1.00942	0.00045
			14.50	0.99573	0.00040	13.20	1.01232	0.00044
			14.60	0.99870	0.00040	13.30	1.01685	0.00043
			14.70	0.99970	0.00041			
			14.80	1.00228	0.00040			
			14.90	1.00499	0.00040			
			15.00	1.00799	0.00041			
			15.10	1.01066	0.00040			
			15.20	1.01331	0.00041			
			15.30	1.01588	0.00039			

Table B.1.2.1.3-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

18 milli-g/cc			20 milli-g/cc			22 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.50	0.92110	0.00048	9.00	0.92410	0.00048	8.50	0.92045	0.00050
9.60	0.92676	0.00046	9.10	0.93013	0.00051	8.55	0.92343	0.00051
9.70	0.93213	0.00045	9.20	0.93722	0.00049	8.60	0.92739	0.00051
9.80	0.93591	0.00049	9.30	0.94287	0.00046	8.65	0.92942	0.00052
9.90	0.94249	0.00049	9.40	0.94743	0.00051	8.70	0.93343	0.00050
10.00	0.94787	0.00047	9.50	0.95230	0.00048	8.75	0.93663	0.00049
10.10	0.95174	0.00047	9.60	0.95764	0.00049	8.80	0.94046	0.00051
10.20	0.95684	0.00049	9.70	0.96393	0.00050	8.85	0.94297	0.00050
10.30	0.96146	0.00048	9.80	0.96905	0.00049	8.90	0.94544	0.00052
10.40	0.96774	0.00047	9.90	0.97519	0.00049	8.95	0.94931	0.00052
10.50	0.97141	0.00048	10.00	0.97908	0.00049	9.00	0.95204	0.00052
10.60	0.97546	0.00047	10.10	0.98389	0.00048	9.05	0.95438	0.00050
10.70	0.97984	0.00046	10.20	0.98978	0.00049	9.10	0.95737	0.00050
10.80	0.98575	0.00047	10.30	0.99489	0.00049	9.15	0.96086	0.00052
10.90	0.99044	0.00046	10.40	0.99895	0.00047	9.20	0.96321	0.00050
11.00	0.99463	0.00049	10.50	1.00463	0.00050	9.25	0.96597	0.00053
11.10	0.99883	0.00046	10.60	1.00912	0.00048	9.30	0.96914	0.00049
11.20	1.00345	0.00048	10.70	1.01254	0.00051	9.35	0.97230	0.00050
11.30	1.00726	0.00047	10.80	1.01854	0.00050	9.40	0.97540	0.00050
11.40	1.01086	0.00046				9.45	0.97816	0.00051
11.50	1.01527	0.00048				9.50	0.98075	0.00052
11.60	1.01938	0.00046				9.55	0.98316	0.00052
						9.60	0.98703	0.00051
						9.65	0.98880	0.00049
						9.70	0.99189	0.00049
						9.75	0.99413	0.00050
						9.80	0.99623	0.00051
						9.85	0.99983	0.00050
						9.90	1.00265	0.00052
						9.95	1.00475	0.00051
						10.00	1.00799	0.00049
						10.05	1.00974	0.00050
						10.10	1.01282	0.00052
						10.15	1.01555	0.00049
						10.20	1.01823	0.00049

Table B.1.2.1.3-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

24 milli-g/cc			25 milli-g/cc			26 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.20	0.92418	0.00052	8.00	0.91961	0.00053	7.90	0.92210	0.00053
8.25	0.92658	0.00052	8.05	0.92282	0.00052	7.95	0.92643	0.00053
8.30	0.92896	0.00052	8.10	0.92791	0.00052	8.00	0.92908	0.00053
8.35	0.93405	0.00052	8.15	0.93047	0.00053	8.05	0.93254	0.00053
8.40	0.93716	0.00053	8.20	0.93558	0.00053	8.10	0.93763	0.00053
8.45	0.94067	0.00052	8.25	0.93792	0.00055	8.15	0.93991	0.00052
8.50	0.94460	0.00051	8.30	0.94042	0.00052	8.20	0.94442	0.00055
8.55	0.94725	0.00055	8.35	0.94433	0.00052	8.25	0.94660	0.00054
8.60	0.95033	0.00053	8.40	0.94736	0.00051	8.30	0.95104	0.00052
8.65	0.95291	0.00053	8.45	0.95201	0.00055	8.35	0.95409	0.00053
8.70	0.95693	0.00053	8.50	0.95432	0.00052	8.40	0.95693	0.00054
8.75	0.95895	0.00051	8.55	0.95741	0.00053	8.45	0.95933	0.00053
8.80	0.96269	0.00051	8.60	0.96128	0.00052	8.50	0.96410	0.00053
8.85	0.96608	0.00053	8.65	0.96339	0.00054	8.55	0.96772	0.00053
8.90	0.96881	0.00054	8.70	0.96710	0.00053	8.60	0.97045	0.00052
8.95	0.97139	0.00052	8.75	0.97023	0.00052	8.65	0.97444	0.00052
9.00	0.97547	0.00049	8.80	0.97354	0.00054	8.70	0.97721	0.00052
9.05	0.97820	0.00050	8.85	0.97746	0.00052	8.75	0.98087	0.00053
9.10	0.98082	0.00053	8.90	0.98000	0.00052	8.80	0.98392	0.00054
9.15	0.98467	0.00052	8.95	0.98259	0.00052	8.85	0.98628	0.00053
9.20	0.98705	0.00051	9.00	0.98675	0.00053	8.90	0.98930	0.00055
9.25	0.99132	0.00052	9.05	0.98907	0.00051	8.95	0.99386	0.00053
9.30	0.99267	0.00054	9.10	0.99245	0.00052	9.00	0.99687	0.00054
9.35	0.99562	0.00052	9.15	0.99586	0.00052	9.05	0.99884	0.00053
9.40	0.99914	0.00052	9.20	0.99841	0.00051	9.10	1.00277	0.00053
9.45	1.00266	0.00052	9.25	1.00144	0.00053	9.15	1.00428	0.00054
9.50	1.00581	0.00051	9.30	1.00304	0.00051	9.20	1.00832	0.00055
9.55	1.00641	0.00050	9.35	1.00752	0.00052	9.25	1.01105	0.00053
9.60	1.01122	0.00053	9.40	1.00954	0.00051	9.30	1.01440	0.00051
9.65	1.01321	0.00051	9.45	1.01188	0.00053	9.35	1.01767	0.00056
9.70	1.01602	0.00050	9.50	1.01607	0.00052	9.40	1.01905	0.00055
9.75	1.01965	0.00051	9.55	1.01878	0.00052			
9.80	1.02087	0.00050	9.60	1.02148	0.00052			

Table B.1.2.1.3-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

28 milli-g/cc			30 milli-g/cc			32 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.60	0.91836	0.00055	7.40	0.91735	0.00054	7.20	0.91605	0.00055
7.65	0.92249	0.00055	7.45	0.92193	0.00055	7.25	0.91956	0.00056
7.70	0.92558	0.00054	7.50	0.92587	0.00055	7.30	0.92377	0.00054
7.75	0.92943	0.00055	7.55	0.93057	0.00057	7.35	0.92838	0.00056
7.80	0.93336	0.00055	7.60	0.93367	0.00054	7.40	0.93138	0.00054
7.85	0.93692	0.00054	7.65	0.93815	0.00054	7.45	0.93637	0.00054
7.90	0.94120	0.00054	7.70	0.94063	0.00054	7.50	0.94051	0.00055
7.95	0.94460	0.00053	7.75	0.94507	0.00058	7.55	0.94365	0.00054
8.00	0.94872	0.00053	7.80	0.94902	0.00055	7.60	0.94714	0.00054
8.05	0.95255	0.00054	7.85	0.95256	0.00056	7.65	0.95102	0.00056
8.10	0.95571	0.00054	7.90	0.95585	0.00052	7.70	0.95543	0.00055
8.15	0.95787	0.00053	7.95	0.95944	0.00055	7.75	0.95968	0.00056
8.20	0.96158	0.00052	8.00	0.96369	0.00056	7.80	0.96338	0.00056
8.25	0.96503	0.00053	8.05	0.96785	0.00054	7.85	0.96665	0.00056
8.30	0.96915	0.00056	8.10	0.97214	0.00056	7.90	0.97145	0.00056
8.35	0.97239	0.00053	8.15	0.97388	0.00054	7.95	0.97423	0.00057
8.40	0.97588	0.00052	8.20	0.97729	0.00055	8.00	0.97782	0.00056
8.45	0.97965	0.00054	8.25	0.98158	0.00056	8.05	0.98175	0.00055
8.50	0.98192	0.00055	8.30	0.98568	0.00053	8.10	0.98530	0.00057
8.55	0.98526	0.00053	8.35	0.98856	0.00055	8.15	0.98816	0.00054
8.60	0.98971	0.00054	8.40	0.99312	0.00055	8.20	0.99161	0.00055
8.65	0.99220	0.00056	8.45	0.99537	0.00055	8.25	0.99641	0.00054
8.70	0.99614	0.00053	8.50	0.99716	0.00054	8.30	0.99889	0.00056
8.75	0.99932	0.00055	8.55	1.00303	0.00054	8.35	1.00345	0.00056
8.80	1.00238	0.00054	8.60	1.00539	0.00054	8.40	1.00505	0.00058
8.85	1.00549	0.00053	8.65	1.00953	0.00054	8.45	1.00982	0.00055
8.90	1.00891	0.00056	8.70	1.01247	0.00054	8.50	1.01355	0.00055
8.95	1.01109	0.00055	8.75	1.01437	0.00054	8.55	1.01619	0.00056
9.00	1.01463	0.00056	8.80	1.01811	0.00055	8.60	1.01981	0.00056
9.05	1.01783	0.00054						
9.10	1.02016	0.00054						

Table B.1.2.1.3-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

36 milli-g/cc			40 milli-g/cc			45 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.00	0.92207	0.00055	6.70	0.91673	0.00057	6.50	0.91777	0.00061
7.05	0.92681	0.00057	6.75	0.92076	0.00057	6.55	0.92343	0.00058
7.10	0.93107	0.00057	6.80	0.92416	0.00058	6.60	0.92596	0.00058
7.15	0.93645	0.00057	6.85	0.92994	0.00057	6.65	0.93189	0.00058
7.20	0.94030	0.00055	6.90	0.93394	0.00058	6.70	0.93507	0.00058
7.25	0.94292	0.00055	6.95	0.93835	0.00058	6.75	0.94116	0.00059
7.30	0.94826	0.00056	7.00	0.94370	0.00057	6.80	0.94549	0.00059
7.35	0.95172	0.00059	7.05	0.94651	0.00058	6.85	0.94949	0.00060
7.40	0.95693	0.00057	7.10	0.95210	0.00058	6.90	0.95516	0.00059
7.45	0.95987	0.00056	7.15	0.95457	0.00058	6.95	0.95907	0.00060
7.50	0.96474	0.00056	7.20	0.96021	0.00056	7.00	0.96320	0.00060
7.55	0.96841	0.00054	7.25	0.96363	0.00058	7.05	0.96703	0.00059
7.60	0.97251	0.00057	7.30	0.96818	0.00058	7.10	0.97134	0.00059
7.65	0.97689	0.00057	7.35	0.97238	0.00059	7.15	0.97568	0.00059
7.70	0.97914	0.00057	7.40	0.97600	0.00056	7.20	0.97907	0.00059
7.75	0.98398	0.00058	7.45	0.98062	0.00057	7.25	0.98358	0.00059
7.80	0.98752	0.00055	7.50	0.98413	0.00056	7.30	0.98812	0.00057
7.85	0.99246	0.00053	7.55	0.98870	0.00058	7.35	0.99264	0.00058
7.90	0.99560	0.00056	7.60	0.99259	0.00056	7.40	0.99814	0.00058
7.95	0.99829	0.00056	7.65	0.99554	0.00059	7.45	0.99948	0.00058
8.00	1.00231	0.00056	7.70	1.00082	0.00058	7.50	1.00477	0.00060
8.05	1.00689	0.00057	7.75	1.00476	0.00058	7.55	1.00915	0.00060
8.10	1.01039	0.00055	7.80	1.00695	0.00058	7.60	1.01265	0.00060
8.15	1.01331	0.00056	7.85	1.01190	0.00060	7.65	1.01705	0.00060
8.20	1.01742	0.00056	7.90	1.01624	0.00058	7.70	1.02131	0.00058
			7.95	1.01887	0.00058			
			8.00	1.02329	0.00057			

Table B.1.2.1.3-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

50 milli-g/cc			75 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.30	0.91455	0.00058	5.80	0.91395	0.00060	5.60	0.91966	0.00060
6.35	0.91871	0.00058	5.85	0.92186	0.00062	5.65	0.92576	0.00061
6.40	0.92467	0.00058	5.90	0.92627	0.00063	5.70	0.93139	0.00065
6.45	0.92960	0.00060	5.95	0.93150	0.00063	5.75	0.93624	0.00063
6.50	0.93326	0.00059	6.00	0.93583	0.00062	5.80	0.94246	0.00061
6.55	0.93903	0.00058	6.05	0.94119	0.00064	5.85	0.94638	0.00061
6.60	0.94405	0.00059	6.10	0.94660	0.00061	5.90	0.95157	0.00063
6.65	0.94888	0.00059	6.15	0.95165	0.00060	5.95	0.95714	0.00064
6.70	0.95307	0.00056	6.20	0.95623	0.00061	6.00	0.96296	0.00063
6.75	0.95736	0.00060	6.25	0.96219	0.00062	6.05	0.96770	0.00061
6.80	0.96254	0.00061	6.30	0.96569	0.00063	6.10	0.97256	0.00065
6.85	0.96693	0.00058	6.35	0.97050	0.00062	6.15	0.97768	0.00063
6.90	0.97160	0.00061	6.40	0.97591	0.00064	6.20	0.98299	0.00062
6.95	0.97608	0.00061	6.45	0.97980	0.00062	6.25	0.98733	0.00061
7.00	0.97982	0.00059	6.50	0.98668	0.00064	6.30	0.99307	0.00062
7.05	0.98485	0.00059	6.55	0.99015	0.00062	6.35	0.99739	0.00064
7.10	0.98801	0.00061	6.60	0.99440	0.00061	6.40	1.00206	0.00063
7.15	0.99249	0.00060	6.65	1.00018	0.00060	6.45	1.00731	0.00062
7.20	0.99716	0.00060	6.70	1.00458	0.00062	6.50	1.01224	0.00062
7.25	1.00115	0.00058	6.75	1.00917	0.00062	6.55	1.01670	0.00062
7.30	1.00534	0.00060	6.80	1.01402	0.00062	6.60	1.02207	0.00061
7.35	1.01033	0.00058	6.85	1.01830	0.00061			
7.40	1.01399	0.00059	6.90	1.02427	0.00062			
7.45	1.01768	0.00061						
7.50	1.02219	0.00059						

Table B.1.2.1.3-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

150 milli-g/cc			200 milli-g/cc			350 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.30	0.91376	0.00065	5.20	0.91765	0.00063	5.00	0.91746	0.00062
5.35	0.91980	0.00062	5.25	0.92405	0.00061	5.05	0.92487	0.00061
5.40	0.92616	0.00062	5.30	0.92972	0.00061	5.10	0.92912	0.00064
5.45	0.93160	0.00062	5.35	0.93465	0.00063	5.15	0.93575	0.00061
5.50	0.93733	0.00061	5.40	0.93989	0.00061	5.20	0.94052	0.00062
5.55	0.94297	0.00062	5.45	0.94648	0.00064	5.25	0.94717	0.00061
5.60	0.94782	0.00062	5.50	0.95193	0.00061	5.30	0.95258	0.00064
5.65	0.95353	0.00064	5.55	0.95783	0.00062	5.35	0.95946	0.00063
5.70	0.95748	0.00062	5.60	0.96221	0.00063	5.40	0.96416	0.00063
5.75	0.96374	0.00063	5.65	0.96777	0.00062	5.45	0.96890	0.00063
5.80	0.96906	0.00062	5.70	0.97302	0.00064	5.50	0.97470	0.00066
5.85	0.97332	0.00063	5.75	0.97900	0.00061	5.55	0.98069	0.00064
5.90	0.97983	0.00064	5.80	0.98283	0.00062	5.60	0.98453	0.00062
5.95	0.98493	0.00064	5.85	0.98898	0.00062	5.65	0.99074	0.00063
6.00	0.98975	0.00063	5.90	0.99340	0.00065	5.70	0.99621	0.00063
6.05	0.99349	0.00063	5.95	0.99977	0.00067	5.75	1.00092	0.00063
6.10	0.99962	0.00061	6.00	1.00365	0.00064	5.80	1.00532	0.00061
6.15	1.00435	0.00063	6.05	1.00855	0.00063	5.85	1.01154	0.00062
6.20	1.01024	0.00065	6.10	1.01405	0.00064	5.90	1.01584	0.00065
6.25	1.01544	0.00065	6.15	1.01914	0.00063	5.95	1.02100	0.00062
6.30	1.01945	0.00064	6.20	1.02423	0.00064	6.00	1.02603	0.00064

Table B.1.2.1.3-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

500 milli-g/cc			750 milli-g/cc			1000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.90	0.92335	0.00064	4.70	0.91937	0.00063	4.50	0.91300	0.00064
4.95	0.92836	0.00064	4.75	0.92581	0.00064	4.55	0.91944	0.00063
5.00	0.93530	0.00061	4.80	0.93223	0.00061	4.60	0.92624	0.00064
5.05	0.93937	0.00064	4.85	0.93719	0.00064	4.65	0.93178	0.00063
5.10	0.94580	0.00063	4.90	0.94430	0.00065	4.70	0.94009	0.00066
5.15	0.95265	0.00066	4.95	0.94905	0.00064	4.75	0.94379	0.00065
5.20	0.95746	0.00062	5.00	0.95631	0.00061	4.80	0.95035	0.00064
5.25	0.96371	0.00063	5.05	0.96090	0.00062	4.85	0.95718	0.00063
5.30	0.96859	0.00065	5.10	0.96778	0.00061	4.90	0.96352	0.00065
5.35	0.97405	0.00064	5.15	0.97257	0.00064	4.95	0.96776	0.00061
5.40	0.97879	0.00063	5.20	0.97728	0.00065	5.00	0.97380	0.00066
5.45	0.98410	0.00063	5.25	0.98321	0.00062	5.05	0.98114	0.00065
5.50	0.98955	0.00061	5.30	0.98949	0.00064	5.10	0.98687	0.00062
5.55	0.99628	0.00063	5.35	0.99519	0.00066	5.15	0.99106	0.00064
5.60	1.00036	0.00063	5.40	0.99993	0.00065	5.25	1.00226	0.00064
5.65	1.00601	0.00065	5.45	1.00595	0.00067	5.30	1.00819	0.00063
5.70	1.01066	0.00067	5.50	1.01140	0.00066	5.35	1.01395	0.00062
5.75	1.01586	0.00063	5.55	1.01780	0.00064	5.40	1.01970	0.00066
5.80	1.02004	0.00063	5.60	1.02266	0.00063			

Table B.1.2.1.3-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

1500 milli-g/cc			2000 milli-g/cc			2500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.30	0.91975	0.00065	4.10	0.92187	0.00062	3.90	0.91732	0.00063
4.35	0.92590	0.00061	4.15	0.92783	0.00064	3.95	0.92506	0.00062
4.40	0.93303	0.00063	4.20	0.93499	0.00064	4.00	0.93309	0.00065
4.45	0.93913	0.00066	4.25	0.94314	0.00064	4.05	0.93980	0.00067
4.50	0.94622	0.00064	4.30	0.94870	0.00062	4.10	0.94715	0.00066
4.55	0.95253	0.00064	4.35	0.95416	0.00066	4.15	0.95509	0.00064
4.60	0.95882	0.00065	4.40	0.96346	0.00064	4.20	0.96198	0.00065
4.65	0.96512	0.00062	4.45	0.96889	0.00064	4.25	0.96874	0.00063
4.70	0.97187	0.00064	4.50	0.97528	0.00067	4.30	0.97522	0.00065
4.75	0.97667	0.00063	4.55	0.98246	0.00066	4.35	0.98251	0.00064
4.80	0.98347	0.00065	4.60	0.98840	0.00067	4.40	0.98941	0.00065
4.85	0.98950	0.00065	4.65	0.99504	0.00065	4.45	0.99784	0.00065
4.90	0.99528	0.00065	4.70	1.00155	0.00065	4.50	1.00295	0.00067
4.95	1.00234	0.00066	4.75	1.00835	0.00065	4.55	1.00972	0.00065
5.00	1.00744	0.00066	4.80	1.01478	0.00066	4.60	1.01685	0.00066
5.05	1.01555	0.00065	4.85	1.02052	0.00065	4.65	1.02342	0.00066
5.10	1.02011	0.00065	4.90	1.02641	0.00065	4.70	1.03059	0.00065

Table B.1.2.1.3-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

3000 milli-g/cc			4000 milli-g/cc			5000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
3.70	0.91189	0.00062	3.50	0.92376	0.00064	3.20	0.91094	0.00065
3.75	0.92014	0.00063	3.55	0.93153	0.00065	3.25	0.92029	0.00064
3.80	0.92662	0.00063	3.60	0.94034	0.00066	3.30	0.92908	0.00062
3.85	0.93494	0.00068	3.65	0.95006	0.00065	3.35	0.93805	0.00064
3.90	0.94243	0.00064	3.70	0.95670	0.00062	3.40	0.94774	0.00062
3.95	0.95000	0.00064	3.75	0.96456	0.00065	3.45	0.95591	0.00065
4.00	0.95783	0.00066	3.80	0.97303	0.00064	3.50	0.96472	0.00061
4.05	0.96543	0.00067	3.85	0.98149	0.00064	3.55	0.97242	0.00065
4.10	0.97185	0.00066	3.90	0.98963	0.00065	3.60	0.98320	0.00063
4.15	0.98065	0.00065	3.95	0.99686	0.00064	3.65	0.99056	0.00065
4.20	0.98675	0.00064	4.00	1.00506	0.00063	3.70	0.99885	0.00063
4.25	0.99450	0.00065	4.05	1.01199	0.00063	3.75	1.00765	0.00064
4.30	1.00128	0.00063	4.10	1.01985	0.00064	3.80	1.01621	0.00062
4.35	1.00868	0.00066				3.85	1.02481	0.00063
4.40	1.01454	0.00065				3.90	1.03289	0.00065
4.45	1.02188	0.00066						
4.50	1.03080	0.00065						

Table B.1.2.1.3-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

6000 milli-g/cc			7000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
3.00	0.90982	0.00060	2.80	0.90284	0.00062	2.80	0.92046	0.00062
3.05	0.92078	0.00065	2.85	0.91506	0.00061	2.82	0.92474	0.00061
3.10	0.93060	0.00063	2.90	0.92585	0.00059	2.84	0.92968	0.00063
3.15	0.93922	0.00064	2.95	0.93649	0.00063	2.86	0.93457	0.00063
3.20	0.95005	0.00063	3.00	0.94599	0.00062	2.88	0.93791	0.00063
3.25	0.95879	0.00063	3.05	0.95462	0.00063	2.90	0.94222	0.00064
3.30	0.96823	0.00063	3.10	0.96642	0.00061	2.92	0.94716	0.00063
3.35	0.97896	0.00064	3.15	0.97604	0.00062	2.94	0.95121	0.00060
3.40	0.98677	0.00065	3.20	0.98606	0.00062	2.96	0.95541	0.00061
3.45	0.99513	0.00064	3.25	0.99538	0.00063	2.98	0.96077	0.00062
3.50	1.00531	0.00062	3.30	1.00591	0.00061	3.00	0.96346	0.00062
3.55	1.01358	0.00064	3.35	1.01659	0.00062	3.02	0.96795	0.00061
3.60	1.02266	0.00064	3.40	1.02371	0.00063	3.04	0.97156	0.00065
						3.06	0.97595	0.00062
						3.08	0.98046	0.00063
						3.10	0.98454	0.00062
						3.12	0.98811	0.00063
						3.14	0.99360	0.00063
						3.16	0.99609	0.00063
						3.18	1.00031	0.00063
						3.20	1.00454	0.00064
						3.22	1.00849	0.00063
						3.24	1.01215	0.00062
						3.26	1.01661	0.00064
						3.28	1.02125	0.00064
						3.30	1.02422	0.00066

Table B.1.2.1.3-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

8000 milli-g/cc			9000 milli-g/cc			10000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
2.70	0.91579	0.00063	2.50	0.90120	0.00061	2.40	0.90893	0.00060
2.72	0.92054	0.00057	2.55	0.91367	0.00059	2.42	0.91340	0.00059
2.74	0.92503	0.00061	2.60	0.92608	0.00060	2.44	0.91907	0.00060
2.76	0.92919	0.00061	2.65	0.93743	0.00061	2.46	0.92346	0.00058
2.78	0.93368	0.00061	2.70	0.94797	0.00060	2.48	0.92803	0.00060
2.80	0.93791	0.00062	2.75	0.96077	0.00060	2.50	0.93262	0.00062
2.82	0.94260	0.00063	2.80	0.97213	0.00063	2.52	0.93913	0.00061
2.84	0.94593	0.00061	2.85	0.98413	0.00062	2.54	0.94324	0.00062
2.86	0.95149	0.00061	2.90	0.99382	0.00064	2.56	0.94926	0.00060
2.88	0.95555	0.00062	2.95	1.00513	0.00061	2.58	0.95417	0.00058
2.90	0.95899	0.00063	3.00	1.01543	0.00063	2.60	0.95779	0.00061
2.92	0.96407	0.00062	3.05	1.02781	0.00061	2.62	0.96258	0.00061
2.94	0.96924	0.00062	3.10	1.03779	0.00062	2.64	0.96778	0.00060
2.96	0.97327	0.00062				2.66	0.97201	0.00060
2.98	0.97614	0.00062				2.68	0.97634	0.00060
3.00	0.98099	0.00063				2.70	0.98239	0.00060
3.02	0.98658	0.00061				2.72	0.98708	0.00062
3.04	0.98886	0.00062				2.74	0.99090	0.00060
3.06	0.99373	0.00066				2.76	0.99617	0.00062
3.08	0.99832	0.00063				2.78	1.00055	0.00063
3.10	1.00182	0.00061				2.80	1.00388	0.00062
3.12	1.00643	0.00061				2.82	1.01006	0.00063
3.14	1.01135	0.00062				2.84	1.01545	0.00060
3.16	1.01453	0.00064				2.86	1.01889	0.00063
3.18	1.01903	0.00059				2.88	1.02405	0.00062
3.20	1.02362	0.00062				2.90	1.02754	0.00063

Table B.1.2.1.3-2. K_{eff} Values for 100% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

15000 milli-g/cc			19600 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
1.90	0.90706	0.00055	1.60	0.91209	0.00055			
1.92	0.91372	0.00057	1.62	0.91967	0.00056			
1.94	0.92059	0.00057	1.64	0.92815	0.00054			
1.96	0.92705	0.00053	1.66	0.93559	0.00056			
1.98	0.93267	0.00059	1.68	0.94419	0.00055			
2.00	0.93924	0.00058	1.70	0.95207	0.00056			
2.02	0.94480	0.00058	1.72	0.95925	0.00058			
2.04	0.95129	0.00057	1.74	0.96635	0.00055			
2.06	0.95746	0.00058	1.76	0.97419	0.00057			
2.08	0.96434	0.00060	1.78	0.98192	0.00060			
2.10	0.97054	0.00058	1.80	0.98841	0.00058			
2.12	0.97672	0.00058	1.82	0.99630	0.00058			
2.14	0.98205	0.00061	1.84	1.00378	0.00057			
2.16	0.98857	0.00059	1.86	1.01135	0.00059			
2.18	0.99497	0.00058	1.88	1.01808	0.00058			
2.20	1.00024	0.00058	1.90	1.02621	0.00059			
2.22	1.00631	0.00058						
2.24	1.01205	0.00058						
2.26	1.01874	0.00059						
2.28	1.02401	0.00062						
2.30	1.03024	0.00061						

B.1.2.2. 97% ^{239}Pu 3% ^{240}Pu

B.1.2.2.1. Unreflected

Case ID: pu-cyl-0970-00

Material: Plutonium metal in water

Geometry: Infinite Cylinder

Isotopics: 97% ^{239}Pu 3% ^{240}Pu

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.1.2.2.1-1. Plutonium Cylinder (97% ^{239}Pu) – 0 Inches of Water Reflection

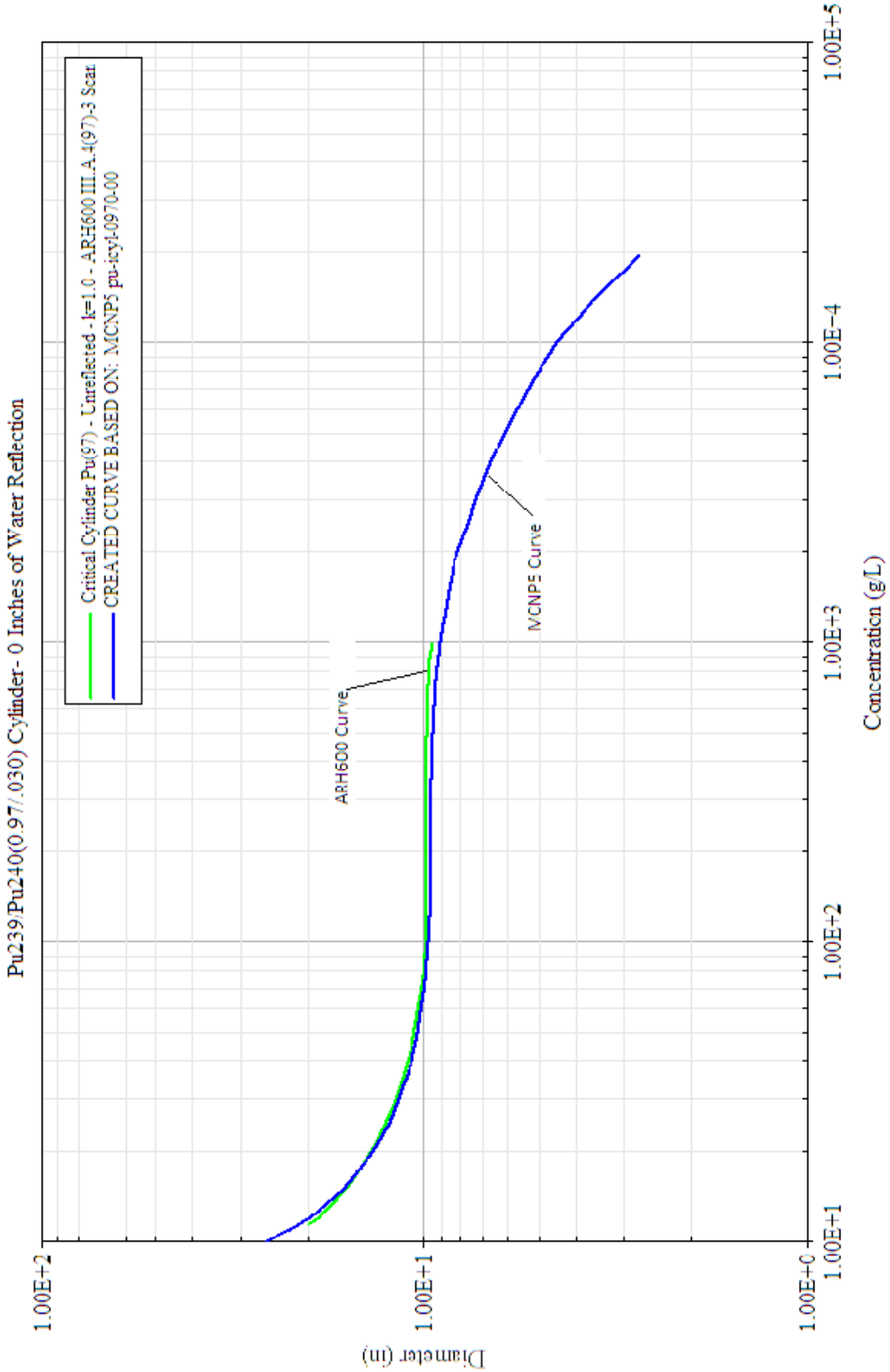

Table B.1.2.2.1-1. Critical Dimensions for Plutonium Cylinder (97% ^{239}Pu) – 0 Inches of Water Reflection

Plutonium Cylinder (97% ^{239}Pu) – 0 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	20.000	27.500	0.300	25.9844
0.011	17.900	23.300	0.200	22.2245
0.012	16.400	20.700	0.200	19.8672
0.015	13.800	16.700	0.100	16.1615
0.020	11.900	14.000	0.100	13.5556
0.025	11.000	12.700	0.050	12.3202
0.030	10.400	11.900	0.050	11.5983
0.040	9.700	11.100	0.050	10.7846
0.050	9.300	10.700	0.050	10.3511
0.075	8.900	10.200	0.050	9.8749
0.100	8.700	10.000	0.050	9.6959
0.150	8.700	9.900	0.050	9.5863
0.200	8.600	9.900	0.050	9.5685
0.350	8.600	9.800	0.050	9.5499
0.500	8.500	9.800	0.050	9.5149
0.750	8.400	9.600	0.050	9.3334
1.000	8.100	9.400	0.050	9.0844
1.500	7.700	8.800	0.050	8.5780
2.000	7.300	8.400	0.050	8.1136
2.500	6.900	7.900	0.050	7.6796
3.000	6.600	7.500	0.050	7.3041
4.000	6.000	6.900	0.050	6.6706
5.000	5.600	6.300	0.050	6.1470
7.500	4.700	5.400	0.050	5.1816
10.000	4.000	4.600	0.050	4.4675
15.000	3.100	3.500	0.020	3.4129
19.600	2.400	2.800	0.020	2.7223

```
MCNP5 Sample Input File
97% Pu Cylinder- 0 Inches of Reflection

Pu sphere, 97.0 wt% 239Pu, 00750 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 870   hundreths of inches - must be integer
c radius =    11.0490 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00750 milli-g Pu/cc
c Reflector width =  0.0 inches
c Enrichment = 0.97 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 239Pu  = 239.05220
c 240Pu  = 240.05380
c
c Effective Plutonium atomic mass 239.08225
c PuO2
c Mass fraction of Pu in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0383 cc
c Volume of water in sample 0.9617 cc
c
c Mass of crit in sample   0.7500 g
c Mass of Pu in sample   0.7500 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9617 g
c
c Total mass of sample  1.7117g for a 1cc sample
c Mass Density for crit material  -1.7117, expressed as negative
c
c  plane
20 11   -1.711735   -1   imp:n=1
21  2  -1.000                  -2 1   imp:n=0    $zero importance if no reflector
```

```
22  0                          2   imp:n=0

1       cz    11.0490              $ plane
2       cz    11.0490         $ Reflection

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    Pu / water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 00750 milli-g Pu/cc,  1.7117
1001.66c -0.062868
8016.66c -0.498980      $from water
94239.66c -0.425007
94240.66c -0.013145
mt11     lwtr.60t
c
c    Pu only
m12    $ Pu, 100.0 wt% 239Pu, 00750 milli-g Pu/cc,  1.7117
94239.66c -0.425007
94240.66c -0.013145
c
```

Critview Compatible Data File
97% Pu Cylinder- 0 Inches of Reflection

reset:
title: MCNP5 pu-icyl-0970-00
set: MCNP5 set
source: MCNP5 primary
created: Wed 08/04/2010 12:14:48.72
geometry: infcyl
modmat: H2O
critmat: plutonium
isomat: Pu239 0.970 Pu240 0.030
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	25.9844
0.011	22.2245
0.012	19.8672
0.015	16.1615
0.020	13.5556
0.025	12.3202
0.030	11.5983
0.040	10.7846
0.050	10.3511
0.075	9.8749
0.100	9.6959
0.150	9.5863
0.200	9.5685
0.350	9.5499
0.500	9.5149
0.750	9.3334
1.000	9.0844
1.500	8.5780
2.000	8.1136
2.500	7.6796
3.000	7.3041
4.000	6.6706
5.000	6.1470
7.500	5.1816
10.00	4.4675
15.00	3.4129
19.60	2.7223

Table B.1.2.2.1-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) – 0 Inches of Water Reflection

10 milli-g/cc			11 milli-g/cc			12 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
20.00	0.92719	0.00032	17.90	0.92719	0.00034	16.40	0.92485	0.00036
20.30	0.93169	0.00031	18.10	0.93151	0.00033	16.60	0.93025	0.00036
20.60	0.93739	0.00031	18.30	0.93555	0.00034	16.80	0.93506	0.00036
20.90	0.94159	0.00031	18.50	0.93921	0.00034	17.00	0.94124	0.00036
21.20	0.94548	0.00031	18.70	0.94359	0.00033	17.20	0.94574	0.00036
21.50	0.94990	0.00030	18.90	0.94669	0.00033	17.40	0.95062	0.00035
21.80	0.95409	0.00030	19.10	0.95159	0.00034	17.60	0.95419	0.00034
22.10	0.95770	0.00029	19.30	0.95423	0.00033	17.80	0.95919	0.00034
22.40	0.96239	0.00030	19.50	0.95833	0.00033	18.00	0.96347	0.00035
22.70	0.96538	0.00030	19.70	0.96136	0.00032	18.20	0.96749	0.00036
23.00	0.96880	0.00029	19.90	0.96549	0.00032	18.40	0.97202	0.00034
23.30	0.97216	0.00029	20.10	0.96815	0.00032	18.60	0.97610	0.00034
23.60	0.97617	0.00029	20.30	0.97205	0.00032	18.80	0.98049	0.00034
23.90	0.97862	0.00029	20.50	0.97522	0.00031	19.00	0.98418	0.00034
24.20	0.98208	0.00028	20.70	0.97842	0.00032	19.20	0.98808	0.00034
24.50	0.98530	0.00029	20.90	0.98154	0.00032	19.40	0.99086	0.00033
24.80	0.98894	0.00029	21.10	0.98514	0.00033	19.60	0.99592	0.00034
25.10	0.99179	0.00028	21.30	0.98729	0.00032	19.80	0.99881	0.00034
25.40	0.99525	0.00028	21.50	0.99016	0.00032	20.00	1.00235	0.00033
25.70	0.99744	0.00029	21.70	0.99349	0.00031	20.20	1.00523	0.00034
26.00	1.00014	0.00028	21.90	0.99541	0.00032	20.60	1.01226	0.00033
26.30	1.00323	0.00027	22.10	0.99822	0.00030	20.70	1.01387	0.00033
26.60	1.00440	0.00027	22.30	1.00108	0.00031			
26.90	1.00765	0.00028	22.50	1.00281	0.00032			
27.20	1.00998	0.00026	22.70	1.00650	0.00030			
27.50	1.01159	0.00027	22.90	1.00928	0.00031			
			23.10	1.01091	0.00030			
			23.30	1.01359	0.00031			

Table B.1.2.2.1-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) – 0 Inches of Water Reflection (cont)

15 milli-g/cc			20 milli-g/cc			25 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
13.80	0.92087	0.00041	11.90	0.91954	0.00046	11.00	0.92207	0.00049
13.90	0.92407	0.00041	12.00	0.92560	0.00047	11.05	0.92628	0.00050
14.00	0.92851	0.00041	12.10	0.93005	0.00045	11.10	0.92874	0.00049
14.10	0.93288	0.00040	12.20	0.93576	0.00045	11.15	0.93288	0.00049
14.20	0.93585	0.00042	12.30	0.94110	0.00045	11.20	0.93522	0.00048
14.30	0.93969	0.00040	12.40	0.94599	0.00046	11.25	0.93839	0.00049
14.40	0.94206	0.00039	12.50	0.95078	0.00046	11.30	0.94140	0.00050
14.50	0.94706	0.00040	12.60	0.95699	0.00047	11.35	0.94498	0.00049
14.60	0.95071	0.00041	12.70	0.96102	0.00045	11.40	0.94854	0.00048
14.70	0.95493	0.00041	12.80	0.96569	0.00045	11.45	0.94972	0.00049
14.80	0.95736	0.00039	12.90	0.97009	0.00048	11.50	0.95441	0.00051
14.90	0.96001	0.00041	13.00	0.97488	0.00044	11.55	0.95712	0.00051
15.00	0.96362	0.00040	13.10	0.97907	0.00045	11.60	0.95917	0.00048
15.10	0.96707	0.00040	13.20	0.98423	0.00045	11.65	0.96261	0.00048
15.20	0.97051	0.00040	13.30	0.98883	0.00045	11.70	0.96558	0.00050
15.30	0.97278	0.00040	13.40	0.99340	0.00045	11.75	0.96915	0.00048
15.40	0.97740	0.00040	13.50	0.99790	0.00045	11.80	0.97133	0.00050
15.50	0.97986	0.00039	13.60	1.00168	0.00043	11.85	0.97424	0.00049
15.60	0.98367	0.00039	13.70	1.00650	0.00044	11.90	0.97722	0.00047
15.70	0.98737	0.00039	13.80	1.01034	0.00046	11.95	0.97999	0.00049
15.80	0.98901	0.00040	13.90	1.01445	0.00045	12.00	0.98209	0.00049
15.90	0.99334	0.00039	14.00	1.01801	0.00046	12.05	0.98562	0.00050
16.00	0.99591	0.00040				12.10	0.98837	0.00049
16.10	0.99738	0.00039				12.15	0.99126	0.00050
16.20	1.00164	0.00039				12.20	0.99386	0.00049
16.30	1.00420	0.00037				12.25	0.99663	0.00050
16.40	1.00607	0.00038				12.30	0.99873	0.00050
16.50	1.00996	0.00040				12.35	1.00188	0.00049
16.60	1.01258	0.00040				12.40	1.00350	0.00048
16.70	1.01543	0.00037				12.45	1.00695	0.00048
						12.50	1.00927	0.00048
						12.55	1.01102	0.00049
						12.60	1.01426	0.00050
						12.65	1.01726	0.00049
						12.70	1.01967	0.00050

Table B.1.2.2.1-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) – 0 Inches of Water Reflection (cont)

30 milli-g/cc			40 milli-g/cc			50 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.40	0.92159	0.00050	9.70	0.91734	0.00055	9.30	0.91521	0.00056
10.45	0.92498	0.00051	9.75	0.92182	0.00055	9.35	0.91810	0.00058
10.50	0.92862	0.00052	9.80	0.92602	0.00055	9.40	0.92351	0.00058
10.55	0.93226	0.00050	9.85	0.93080	0.00054	9.45	0.92821	0.00056
10.60	0.93573	0.00050	9.90	0.93491	0.00056	9.50	0.93202	0.00056
10.65	0.93888	0.00051	9.95	0.93902	0.00053	9.55	0.93594	0.00057
10.70	0.94171	0.00052	10.00	0.94235	0.00055	9.60	0.94002	0.00057
10.75	0.94657	0.00050	10.05	0.94683	0.00055	9.65	0.94415	0.00057
10.80	0.94904	0.00052	10.10	0.94909	0.00055	9.70	0.94816	0.00056
10.85	0.95250	0.00050	10.15	0.95277	0.00054	9.75	0.95184	0.00056
10.90	0.95520	0.00053	10.20	0.95678	0.00054	9.80	0.95556	0.00057
10.95	0.95978	0.00051	10.25	0.96039	0.00058	9.85	0.96013	0.00057
11.00	0.96318	0.00051	10.30	0.96448	0.00056	9.90	0.96570	0.00054
11.05	0.96595	0.00052	10.35	0.96810	0.00055	9.95	0.96790	0.00059
11.10	0.96945	0.00051	10.40	0.97204	0.00056	10.00	0.97315	0.00057
11.15	0.97209	0.00051	10.45	0.97633	0.00056	10.05	0.97689	0.00056
11.20	0.97537	0.00050	10.50	0.97965	0.00054	10.10	0.97938	0.00057
11.25	0.97912	0.00052	10.55	0.98432	0.00054	10.15	0.98514	0.00057
11.30	0.98205	0.00052	10.60	0.98732	0.00054	10.20	0.98788	0.00057
11.35	0.98595	0.00050	10.65	0.99065	0.00055	10.25	0.99206	0.00058
11.40	0.98710	0.00051	10.70	0.99409	0.00055	10.30	0.99528	0.00058
11.45	0.99133	0.00050	10.75	0.99797	0.00054	10.35	0.99992	0.00055
11.50	0.99519	0.00051	10.80	1.00090	0.00055	10.40	1.00351	0.00054
11.55	0.99721	0.00050	10.85	1.00431	0.00055	10.45	1.00679	0.00055
11.60	1.00010	0.00053	10.90	1.00773	0.00057	10.50	1.01042	0.00055
11.65	1.00360	0.00050	10.95	1.01124	0.00055	10.55	1.01372	0.00057
11.70	1.00624	0.00052	11.00	1.01478	0.00054	10.60	1.01740	0.00055
11.75	1.00861	0.00051	11.05	1.01827	0.00054	10.65	1.02086	0.00055
11.80	1.01256	0.00051	11.10	1.02076	0.00051	10.70	1.02427	0.00056
11.85	1.01502	0.00052						
11.90	1.01748	0.00052						

Table B.1.2.2.1-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) – 0 Inches of Water Reflection (cont)

75 milli-g/cc			100 milli-g/cc			150 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.90	0.91548	0.00060	8.70	0.91071	0.00058	8.70	0.92166	0.00061
8.95	0.91866	0.00058	8.75	0.91558	0.00058	8.75	0.92670	0.00062
9.00	0.92375	0.00060	8.80	0.92121	0.00059	8.80	0.93143	0.00061
9.05	0.92926	0.00058	8.85	0.92698	0.00057	8.85	0.93595	0.00060
9.10	0.93348	0.00059	8.90	0.93086	0.00060	8.90	0.93943	0.00058
9.15	0.93784	0.00059	8.95	0.93646	0.00059	8.95	0.94465	0.00059
9.20	0.94347	0.00060	9.00	0.93919	0.00059	9.00	0.94908	0.00062
9.25	0.94718	0.00060	9.05	0.94460	0.00060	9.05	0.95531	0.00060
9.30	0.95184	0.00057	9.10	0.94798	0.00058	9.10	0.95951	0.00059
9.35	0.95616	0.00057	9.15	0.95252	0.00060	9.15	0.96248	0.00062
9.40	0.96063	0.00060	9.20	0.95801	0.00062	9.20	0.96809	0.00059
9.45	0.96475	0.00060	9.25	0.96231	0.00060	9.25	0.97195	0.00059
9.50	0.96887	0.00059	9.30	0.96605	0.00060	9.30	0.97519	0.00060
9.55	0.97291	0.00060	9.35	0.97127	0.00059	9.35	0.98046	0.00061
9.60	0.97667	0.00057	9.40	0.97508	0.00061	9.40	0.98379	0.00061
9.65	0.98177	0.00058	9.45	0.98008	0.00061	9.45	0.98980	0.00058
9.70	0.98572	0.00059	9.50	0.98400	0.00061	9.50	0.99309	0.00060
9.75	0.99111	0.00057	9.55	0.98779	0.00059	9.55	0.99793	0.00059
9.80	0.99346	0.00058	9.60	0.99163	0.00059	9.60	1.00078	0.00059
9.85	0.99758	0.00060	9.65	0.99610	0.00059	9.65	1.00566	0.00059
9.90	1.00243	0.00058	9.70	1.00035	0.00060	9.70	1.01004	0.00060
9.95	1.00604	0.00057	9.75	1.00573	0.00061	9.75	1.01454	0.00061
10.00	1.00944	0.00059	9.80	1.00848	0.00061	9.80	1.01768	0.00062
10.05	1.01327	0.00058	9.85	1.01241	0.00059	9.85	1.02209	0.00060
10.10	1.01693	0.00061	9.90	1.01704	0.00058	9.90	1.02556	0.00061
10.15	1.02168	0.00059	9.95	1.01996	0.00058			
10.20	1.02545	0.00058	10.00	1.02414	0.00057			

Table B.1.2.2.1-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) – 0 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.60	0.91458	0.00062	8.60	0.91850	0.00059	8.50	0.91456	0.00060
8.65	0.91972	0.00061	8.65	0.92278	0.00059	8.55	0.91832	0.00058
8.70	0.92438	0.00061	8.70	0.92771	0.00059	8.60	0.92428	0.00059
8.75	0.92878	0.00060	8.75	0.93175	0.00059	8.65	0.92807	0.00056
8.80	0.93302	0.00061	8.80	0.93595	0.00062	8.70	0.93226	0.00061
8.85	0.93772	0.00060	8.85	0.94132	0.00058	8.75	0.93708	0.00059
8.90	0.94310	0.00061	8.90	0.94529	0.00059	8.80	0.94176	0.00059
8.95	0.94714	0.00059	8.95	0.94933	0.00059	8.85	0.94620	0.00059
9.00	0.95255	0.00059	9.00	0.95353	0.00061	8.90	0.95047	0.00057
9.05	0.95618	0.00061	9.05	0.95772	0.00060	8.95	0.95433	0.00056
9.10	0.96024	0.00059	9.10	0.96232	0.00060	9.00	0.95914	0.00060
9.15	0.96522	0.00060	9.15	0.96559	0.00058	9.05	0.96332	0.00059
9.20	0.96926	0.00059	9.20	0.97015	0.00060	9.10	0.96855	0.00058
9.25	0.97372	0.00062	9.25	0.97429	0.00059	9.15	0.97123	0.00058
9.30	0.97748	0.00059	9.30	0.97816	0.00060	9.20	0.97476	0.00060
9.35	0.98174	0.00061	9.35	0.98233	0.00058	9.25	0.98042	0.00057
9.40	0.98726	0.00059	9.40	0.98682	0.00058	9.30	0.98287	0.00059
9.45	0.99105	0.00061	9.45	0.99050	0.00060	9.35	0.98841	0.00059
9.50	0.99517	0.00060	9.50	0.99476	0.00059	9.40	0.99172	0.00059
9.55	0.99823	0.00060	9.55	1.00001	0.00059	9.45	0.99592	0.00060
9.60	1.00302	0.00059	9.60	1.00228	0.00058	9.50	0.99937	0.00059
9.65	1.00652	0.00059	9.65	1.00654	0.00060	9.55	1.00148	0.00058
9.70	1.01079	0.00058	9.70	1.01053	0.00060	9.60	1.00779	0.00060
9.75	1.01441	0.00060	9.75	1.01536	0.00059	9.65	1.01176	0.00060
9.80	1.01872	0.00060	9.80	1.01944	0.00059	9.70	1.01556	0.00059
9.85	1.02230	0.00062				9.75	1.01936	0.00059
9.90	1.02668	0.00060				9.80	1.02236	0.00060

Table B.1.2.2.1-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) – 0 Inches of Water Reflection (cont)

750 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.40	0.92123	0.00059	8.10	0.91348	0.00056	7.70	0.91746	0.00057
8.45	0.92673	0.00059	8.15	0.91857	0.00058	7.75	0.92258	0.00057
8.50	0.92997	0.00059	8.20	0.92386	0.00057	7.80	0.92653	0.00057
8.55	0.93516	0.00058	8.25	0.92808	0.00057	7.85	0.93183	0.00056
8.60	0.93890	0.00058	8.30	0.93262	0.00058	7.90	0.93731	0.00057
8.65	0.94422	0.00057	8.35	0.93755	0.00055	7.95	0.94210	0.00055
8.70	0.94939	0.00059	8.40	0.94135	0.00057	8.00	0.94589	0.00057
8.75	0.95357	0.00059	8.45	0.94636	0.00058	8.05	0.95059	0.00056
8.80	0.95639	0.00057	8.50	0.95056	0.00058	8.10	0.95479	0.00056
8.85	0.96191	0.00058	8.55	0.95511	0.00057	8.15	0.96153	0.00056
8.90	0.96590	0.00060	8.60	0.95904	0.00057	8.20	0.96536	0.00057
8.95	0.97012	0.00060	8.65	0.96380	0.00057	8.25	0.96988	0.00058
9.00	0.97440	0.00061	8.70	0.96797	0.00058	8.30	0.97535	0.00056
9.05	0.97847	0.00060	8.75	0.97210	0.00058	8.35	0.97934	0.00057
9.10	0.98226	0.00057	8.80	0.97687	0.00056	8.40	0.98426	0.00055
9.15	0.98646	0.00057	8.85	0.98111	0.00058	8.45	0.98805	0.00058
9.20	0.99086	0.00058	8.90	0.98405	0.00059	8.50	0.99406	0.00059
9.25	0.99471	0.00056	8.95	0.98955	0.00058	8.55	0.99706	0.00059
9.30	0.99768	0.00059	9.00	0.99342	0.00058	8.60	1.00231	0.00058
9.35	1.00115	0.00058	9.05	0.99808	0.00059	8.65	1.00704	0.00058
9.40	1.00668	0.00057	9.10	1.00087	0.00060	8.70	1.01102	0.00058
9.45	1.01054	0.00058	9.15	1.00534	0.00058	8.75	1.01569	0.00057
9.50	1.01466	0.00059	9.20	1.00987	0.00059	8.80	1.01909	0.00056
9.55	1.01844	0.00059	9.25	1.01334	0.00057			
9.60	1.02188	0.00059	9.30	1.01822	0.00058			
			9.35	1.02142	0.00058			
			9.40	1.02511	0.00057			

Table B.1.2.2.1-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) – 0 Inches of Water Reflection (cont)

2000 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.30	0.91910	0.00055	6.90	0.91322	0.00055	6.60	0.91787	0.00052
7.35	0.92274	0.00055	6.95	0.92013	0.00055	6.65	0.92363	0.00053
7.40	0.92861	0.00055	7.00	0.92575	0.00055	6.70	0.92920	0.00053
7.45	0.93394	0.00058	7.05	0.93021	0.00054	6.75	0.93482	0.00054
7.50	0.93882	0.00053	7.10	0.93672	0.00053	6.80	0.94163	0.00053
7.55	0.94393	0.00056	7.15	0.94319	0.00053	6.85	0.94697	0.00053
7.60	0.94904	0.00055	7.20	0.94724	0.00055	6.90	0.95369	0.00055
7.65	0.95363	0.00056	7.25	0.95367	0.00054	7.00	0.96544	0.00056
7.70	0.96010	0.00056	7.30	0.95956	0.00056	7.05	0.97123	0.00054
7.75	0.96473	0.00056	7.35	0.96443	0.00054	7.10	0.97694	0.00055
7.80	0.96961	0.00055	7.40	0.97042	0.00055	7.15	0.98222	0.00055
7.85	0.97446	0.00057	7.45	0.97613	0.00054	7.20	0.98728	0.00055
7.90	0.98087	0.00055	7.50	0.98084	0.00055	7.25	0.99380	0.00052
7.95	0.98468	0.00056	7.55	0.98657	0.00056	7.30	0.99955	0.00056
8.00	0.99034	0.00054	7.60	0.99147	0.00056	7.35	1.00506	0.00056
8.05	0.99540	0.00055	7.65	0.99764	0.00056	7.40	1.01105	0.00054
8.10	0.99868	0.00058	7.70	1.00162	0.00054	7.45	1.01522	0.00055
8.15	1.00353	0.00055	7.75	1.00621	0.00056	7.50	1.02178	0.00056
8.20	1.00817	0.00057	7.80	1.01139	0.00056			
8.25	1.01362	0.00058	7.85	1.01679	0.00056			
8.30	1.01842	0.00056	7.90	1.02140	0.00055			
8.35	1.02288	0.00057						
8.40	1.02765	0.00057						

Table B.1.2.2.1-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) – 0 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.00	0.91223	0.00052	5.60	0.91911	0.00051	4.70	0.91657	0.00047
6.05	0.91711	0.00053	5.65	0.92703	0.00051	4.75	0.92440	0.00045
6.10	0.92453	0.00052	5.70	0.93466	0.00052	4.80	0.93387	0.00046
6.15	0.93136	0.00053	5.75	0.94181	0.00052	4.85	0.94256	0.00047
6.20	0.93901	0.00052	5.80	0.94874	0.00052	4.90	0.95185	0.00048
6.25	0.94551	0.00049	5.85	0.95641	0.00051	4.95	0.96010	0.00047
6.30	0.95168	0.00051	5.90	0.96383	0.00051	5.00	0.96948	0.00047
6.35	0.95968	0.00054	5.95	0.97165	0.00052	5.05	0.97703	0.00048
6.40	0.96489	0.00055	6.00	0.97867	0.00051	5.10	0.98640	0.00047
6.45	0.97238	0.00053	6.05	0.98446	0.00051	5.15	0.99494	0.00047
6.50	0.97903	0.00054	6.10	0.99270	0.00051	5.20	1.00294	0.00049
6.55	0.98429	0.00051	6.15	1.00047	0.00052	5.25	1.01161	0.00047
6.60	0.99058	0.00054	6.20	1.00623	0.00053	5.30	1.01918	0.00050
6.65	0.99733	0.00055	6.25	1.01306	0.00052	5.35	1.02799	0.00050
6.70	1.00382	0.00053	6.30	1.01984	0.00051	5.40	1.03645	0.00048
6.75	1.00996	0.00054						
6.80	1.01560	0.00054						
6.85	1.02260	0.00053						
6.90	1.02740	0.00053						

Table B.1.2.2.1-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) – 0 Inches of Water Reflection (cont)

10000 milli-g/cc			15000 milli-g/cc			19600 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.00	0.90593	0.00042	3.10	0.92168	0.00036	2.40	0.90161	0.00034
4.05	0.91709	0.00042	3.12	0.92659	0.00036	2.42	0.90772	0.00034
4.10	0.92662	0.00041	3.14	0.93213	0.00036	2.44	0.91434	0.00034
4.15	0.93837	0.00040	3.16	0.93734	0.00037	2.46	0.92016	0.00035
4.20	0.94833	0.00042	3.18	0.94206	0.00036	2.48	0.92668	0.00035
4.25	0.95739	0.00043	3.20	0.94697	0.00038	2.50	0.93315	0.00035
4.30	0.96809	0.00044	3.22	0.95210	0.00037	2.52	0.93869	0.00035
4.35	0.97656	0.00045	3.24	0.95701	0.00038	2.54	0.94517	0.00035
4.40	0.98754	0.00044	3.26	0.96241	0.00037	2.56	0.95097	0.00036
4.45	0.99610	0.00044	3.28	0.96718	0.00038	2.58	0.95713	0.00036
4.50	1.00727	0.00042	3.30	0.97192	0.00037	2.60	0.96353	0.00037
4.55	1.01585	0.00045	3.32	0.97633	0.00037	2.62	0.96923	0.00036
4.60	1.02569	0.00045	3.34	0.98168	0.00038	2.64	0.97523	0.00037
			3.36	0.98676	0.00037	2.66	0.98108	0.00038
			3.38	0.99172	0.00038	2.68	0.98754	0.00038
			3.40	0.99716	0.00038	2.70	0.99283	0.00037
			3.42	1.00156	0.00039	2.72	0.99939	0.00037
			3.44	1.00685	0.00040	2.74	1.00459	0.00038
			3.46	1.01098	0.00039	2.76	1.01005	0.00038
			3.48	1.01627	0.00040	2.78	1.01670	0.00038
			3.50	1.02103	0.00038	2.80	1.02245	0.00038

B.1.2.2.2. 1” Water Reflector

Case ID: pu-cyl-0970-01

Material: Plutonium metal in water

Geometry: Infinite Cylinder

Isotopics: 97% ^{239}Pu 3% ^{240}Pu

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.1.2.2.2-1. Plutonium Cylinder (97% ^{239}Pu) - 1 Inch of Water Reflection

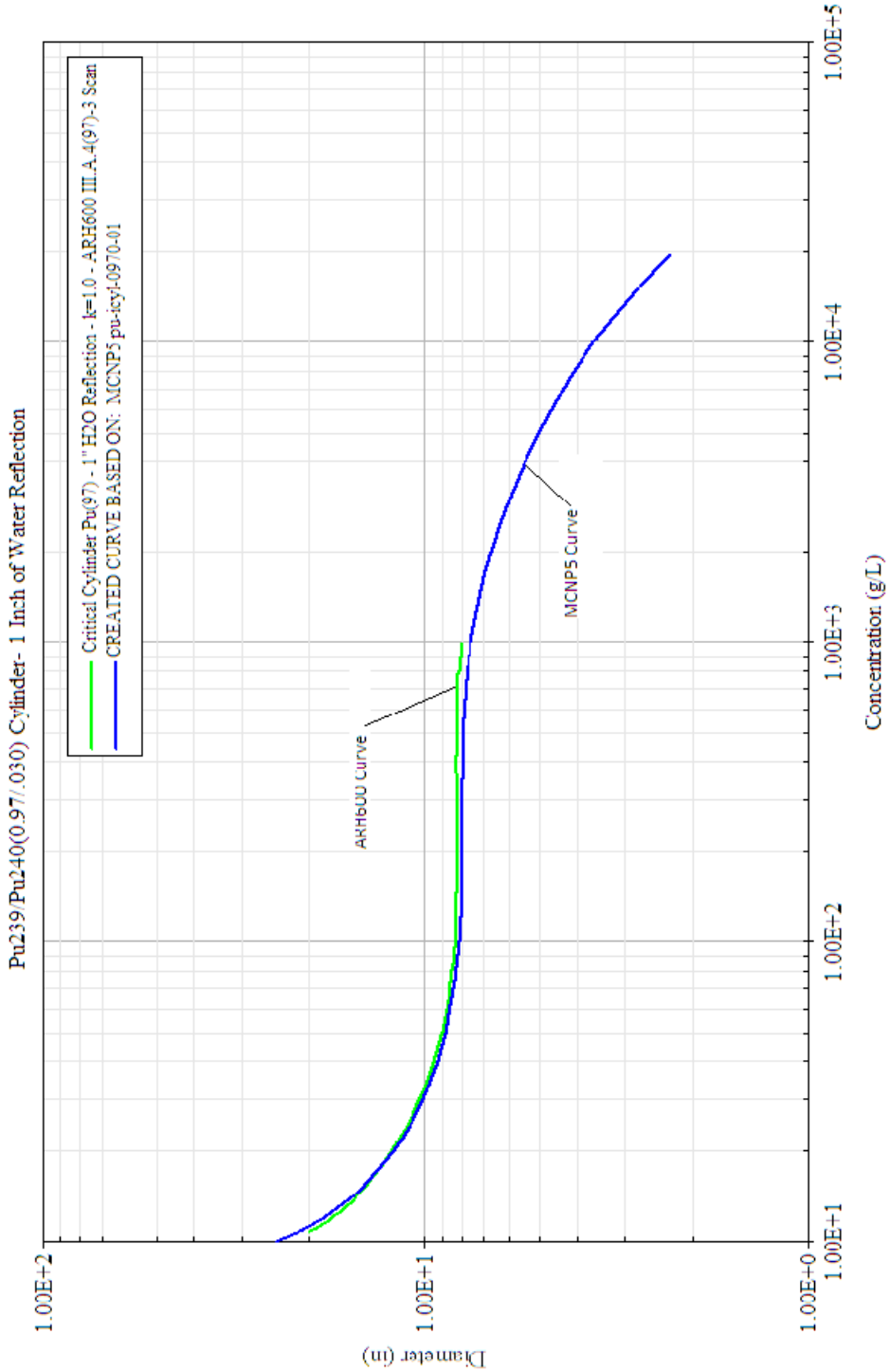

Table B.1.2.2.2-1 Critical Dimensions for Plutonium Cylinder (97% ^{239}Pu) - 1 Inch of Water Reflection

Plutonium Cylinder (97% ^{239}Pu) - 1 Inch of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	18.700	26.200	0.300	24.5110
0.011	16.700	22.000	0.200	20.6904
0.012	15.000	19.400	0.200	18.3524
0.015	12.400	15.200	0.100	14.6409
0.020	10.400	12.500	0.100	12.0481
0.025	9.500	11.200	0.050	10.8178
0.030	8.900	10.400	0.050	10.0533
0.040	8.200	9.600	0.050	9.2647
0.050	7.800	9.100	0.050	8.8338
0.075	7.400	8.600	0.050	8.3380
0.100	7.200	8.400	0.050	8.1534
0.150	7.100	8.300	0.050	8.0154
0.200	7.100	8.200	0.050	8.0033
0.350	7.000	8.300	0.050	7.9982
0.500	7.000	8.200	0.050	7.9443
0.750	6.900	8.100	0.050	7.7850
1.000	6.700	7.900	0.050	7.5860
1.500	6.300	7.400	0.050	7.1392
2.000	5.900	7.000	0.050	6.7203
2.500	5.600	6.600	0.050	6.3630
3.000	5.300	6.200	0.050	6.0294
4.000	4.900	5.700	0.050	5.4781
5.000	4.500	5.200	0.050	5.0373
7.500	3.700	4.400	0.050	4.2139
10.000	3.200	3.800	0.050	3.6263
15.000	2.500	2.900	0.020	2.7958
19.600	2.000	2.400	0.020	2.2739

```
MCNP5 Sample Input File
97% Pu Cylinder- 1 Inch of Reflection

Pu sphere, 97.0 wt% 239Pu, 00750 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 735   hundreths of inches - must be integer
c radius =     9.3345 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00750 milli-g Pu/cc
c Reflector width =  1.0 inches
c Enrichment = 0.97 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 239Pu  = 239.05220
c Pu240  = 240.05380
c
c Effective Plutonium atomic mass 239.08225
c PuO2
c Mass fraction of Pu in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0383 cc
c Volume of water in sample 0.9617 cc
c
c Mass of crit in sample   0.7500 g
c Mass of Pu in sample   0.7500 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9617 g
c
c Total mass of sample  1.7117g for a 1cc sample
c Mass Density for crit material  -1.7117, expressed as negative
c
c  plane
20 11   -1.711735   -1   imp:n=1
21  2  -1.000                    -2 1   imp:n=1    $zero importance if no reflector
```

```
22  0                          2   imp:n=0

1       cz     9.3345              $ plane
2       cz    11.8745         $ Reflection

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    Pu/water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 00750 milli-g Pu/cc,  1.7117
1001.66c -0.062868
8016.66c -0.498980      $from water
94239.66c -0.425007
94240.66c -0.013145
mt11     lwtr.60t
c
c    Pu only
m12    $ Pi oxide, 100.0 wt% 239Pu, 00750 milli-g U/cc,  1.7117
94239.66c -0.425007
94240.66c -0.013145
c
```

Critview Compatible Data File
97% Pu Cylinder- 1 Inch of Reflection

reset:
title: MCNP5 pu-icyl-0970-01
set: MCNP5 set
source: MCNP5 primary
created: Wed 08/04/2010 12:15:19.16
geometry: infcyl
modmat: H2O
critmat: plutonium
isomat: Pu239 0.970 Pu240 0.030
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	24.5110
0.011	20.6904
0.012	18.3524
0.015	14.6409
0.020	12.0481
0.025	10.8178
0.030	10.0533
0.040	9.2647
0.050	8.8338
0.075	8.3380
0.100	8.1534
0.150	8.0154
0.200	8.0033
0.350	7.9982
0.500	7.9443
0.750	7.7850
1.000	7.5860
1.500	7.1392
2.000	6.7203
2.500	6.3630
3.000	6.0294
4.000	5.4781
5.000	5.0373
7.500	4.2139
10.00	3.6263
15.00	2.7958
19.60	2.2739

Table B.1.2.2.2-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 1 Inch of Water Reflection

10 milli-g/cc			11 milli-g/cc			12 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
18.70	0.93073	0.00030	16.70	0.93285	0.00033	15.00	0.92736	0.00035
19.00	0.93467	0.00030	16.90	0.93789	0.00033	15.20	0.93309	0.00035
19.30	0.94005	0.00031	17.10	0.94204	0.00033	15.40	0.93813	0.00035
19.60	0.94461	0.00030	17.30	0.94532	0.00032	15.60	0.94276	0.00035
19.90	0.94881	0.00029	17.50	0.94963	0.00031	15.80	0.94854	0.00034
20.20	0.95220	0.00029	17.70	0.95325	0.00032	16.00	0.95210	0.00034
20.50	0.95605	0.00029	17.90	0.95711	0.00033	16.20	0.95764	0.00034
20.80	0.96079	0.00029	18.10	0.95964	0.00032	16.40	0.96146	0.00033
21.10	0.96383	0.00028	18.30	0.96354	0.00031	16.60	0.96558	0.00034
21.40	0.96832	0.00029	18.50	0.96724	0.00032	16.80	0.97056	0.00033
21.70	0.97136	0.00029	18.70	0.96948	0.00030	17.00	0.97388	0.00033
22.00	0.97494	0.00028	18.90	0.97377	0.00031	17.20	0.97797	0.00034
22.30	0.97858	0.00029	19.10	0.97645	0.00032	17.40	0.98215	0.00034
22.60	0.98125	0.00028	19.30	0.97981	0.00032	17.60	0.98594	0.00034
22.90	0.98483	0.00028	19.50	0.98274	0.00032	17.80	0.98994	0.00033
23.20	0.98772	0.00028	19.70	0.98586	0.00030	18.00	0.99332	0.00034
23.50	0.99068	0.00028	19.90	0.98963	0.00031	18.20	0.99747	0.00033
23.80	0.99373	0.00027	20.10	0.99171	0.00031	18.40	1.00079	0.00033
24.10	0.99619	0.00027	20.30	0.99463	0.00030	18.60	1.00444	0.00033
24.40	0.99892	0.00027	20.50	0.99741	0.00030	18.80	1.00810	0.00032
24.70	1.00184	0.00027	20.70	1.00013	0.00030	19.00	1.01114	0.00032
25.00	1.00415	0.00027	20.90	1.00258	0.00030	19.20	1.01453	0.00033
25.30	1.00718	0.00026	21.10	1.00439	0.00031	19.40	1.01818	0.00032
25.60	1.00961	0.00027	21.30	1.00833	0.00030			
25.90	1.01113	0.00027	21.50	1.00979	0.00030			
26.20	1.01408	0.00027	21.70	1.01289	0.00031			
			21.90	1.01447	0.00030			
			22.00	1.01658	0.00030			

Table B.1.2.2.2-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

15 milli-g/cc			20 milli-g/cc			25 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.40	0.92479	0.00040	10.40	0.91939	0.00045	9.50	0.92399	0.00048
12.50	0.92830	0.00039	10.50	0.92544	0.00045	9.55	0.92697	0.00046
12.60	0.93226	0.00039	10.60	0.93175	0.00044	9.60	0.92968	0.00048
12.70	0.93575	0.00039	10.70	0.93569	0.00045	9.65	0.93248	0.00048
12.80	0.93959	0.00039	10.80	0.94127	0.00046	9.70	0.93558	0.00047
12.90	0.94385	0.00040	10.90	0.94666	0.00044	9.75	0.94023	0.00047
13.00	0.94719	0.00039	11.00	0.95145	0.00045	9.80	0.94232	0.00048
13.10	0.95063	0.00039	11.10	0.95651	0.00045	9.85	0.94575	0.00046
13.20	0.95344	0.00039	11.20	0.96111	0.00045	9.90	0.94927	0.00048
13.30	0.95702	0.00040	11.30	0.96594	0.00044	9.95	0.95087	0.00046
13.40	0.96083	0.00040	11.40	0.97029	0.00044	10.00	0.95387	0.00047
13.50	0.96385	0.00038	11.50	0.97685	0.00044	10.05	0.95719	0.00047
13.60	0.96848	0.00037	11.60	0.98019	0.00043	10.10	0.96071	0.00049
13.70	0.97138	0.00038	11.70	0.98460	0.00044	10.15	0.96470	0.00047
13.80	0.97388	0.00040	11.80	0.98952	0.00044	10.20	0.96593	0.00048
13.90	0.97813	0.00039	11.90	0.99270	0.00043	10.25	0.96913	0.00047
14.00	0.98013	0.00039	12.00	0.99746	0.00044	10.30	0.97214	0.00047
14.10	0.98419	0.00038	12.10	1.00274	0.00044	10.35	0.97534	0.00047
14.20	0.98667	0.00039	12.20	1.00647	0.00044	10.40	0.97828	0.00047
14.30	0.98965	0.00039	12.30	1.01106	0.00044	10.45	0.98122	0.00045
14.40	0.99249	0.00038	12.40	1.01464	0.00043	10.50	0.98312	0.00048
14.50	0.99574	0.00039	12.50	1.01899	0.00045	10.55	0.98660	0.00045
14.60	0.99865	0.00039				10.60	0.98899	0.00047
14.70	1.00195	0.00038				10.65	0.99187	0.00047
14.80	1.00423	0.00038				10.70	0.99385	0.00047
14.90	1.00711	0.00038				10.75	0.99659	0.00047
15.00	1.00980	0.00038				10.80	0.99873	0.00047
15.10	1.01336	0.00038				10.85	1.00229	0.00046
15.20	1.01579	0.00036				10.90	1.00559	0.00047
						10.95	1.00790	0.00047
						11.00	1.00986	0.00047
						11.05	1.01265	0.00048
						11.10	1.01700	0.00047
						11.15	1.01807	0.00046
						11.20	1.02153	0.00047

Table B.1.2.2.2-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

30 milli-g/cc			40 milli-g/cc			50 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.90	0.92253	0.00049	8.20	0.91948	0.00053	7.80	0.91546	0.00055
8.95	0.92607	0.00049	8.25	0.92375	0.00053	7.85	0.92070	0.00054
9.00	0.93046	0.00050	8.30	0.92826	0.00052	7.90	0.92459	0.00054
9.05	0.93299	0.00048	8.35	0.93187	0.00052	7.95	0.92944	0.00053
9.10	0.93670	0.00050	8.40	0.93478	0.00054	8.00	0.93426	0.00054
9.15	0.94047	0.00049	8.45	0.93944	0.00053	8.05	0.93804	0.00054
9.20	0.94439	0.00049	8.50	0.94404	0.00051	8.10	0.94244	0.00055
9.25	0.94736	0.00049	8.55	0.94794	0.00051	8.15	0.94624	0.00053
9.30	0.94956	0.00051	8.60	0.95144	0.00052	8.20	0.95053	0.00056
9.35	0.95356	0.00049	8.65	0.95629	0.00054	8.25	0.95384	0.00053
9.40	0.95704	0.00050	8.70	0.95820	0.00054	8.30	0.95829	0.00055
9.45	0.96036	0.00050	8.75	0.96251	0.00051	8.35	0.96129	0.00052
9.50	0.96364	0.00049	8.80	0.96649	0.00053	8.40	0.96773	0.00053
9.55	0.96730	0.00050	8.85	0.97215	0.00053	8.45	0.97028	0.00052
9.60	0.96961	0.00050	8.90	0.97385	0.00052	8.50	0.97462	0.00054
9.65	0.97380	0.00049	8.95	0.97800	0.00052	8.55	0.97850	0.00054
9.70	0.97669	0.00049	9.00	0.98122	0.00052	8.60	0.98192	0.00055
9.75	0.97895	0.00048	9.05	0.98497	0.00051	8.65	0.98705	0.00054
9.80	0.98321	0.00050	9.10	0.98953	0.00051	8.70	0.99032	0.00056
9.85	0.98668	0.00051	9.15	0.99262	0.00052	8.75	0.99417	0.00054
9.90	0.98908	0.00049	9.20	0.99582	0.00053	8.80	0.99806	0.00055
9.95	0.99304	0.00050	9.25	0.99905	0.00051	8.85	1.00093	0.00054
10.00	0.99556	0.00048	9.30	1.00228	0.00052	8.90	1.00535	0.00054
10.05	0.99981	0.00049	9.35	1.00617	0.00052	8.95	1.00934	0.00053
10.10	1.00265	0.00051	9.40	1.00942	0.00052	9.00	1.01349	0.00053
10.15	1.00433	0.00048	9.45	1.01214	0.00051	9.05	1.01634	0.00056
10.20	1.00753	0.00048	9.50	1.01587	0.00051	9.10	1.01979	0.00051
10.25	1.01057	0.00048	9.55	1.02003	0.00052			
10.30	1.01352	0.00049	9.60	1.02315	0.00053			
10.35	1.01633	0.00050						
10.40	1.01815	0.00050						

Table B.1.2.2.2-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

75 milli-g/cc			100 milli-g/cc			150 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.40	0.91805	0.00055	7.20	0.91588	0.00055	7.10	0.91879	0.00057
7.45	0.92359	0.00053	7.25	0.92131	0.00056	7.15	0.92224	0.00058
7.50	0.92777	0.00054	7.30	0.92481	0.00056	7.20	0.92776	0.00056
7.55	0.93211	0.00056	7.35	0.92974	0.00058	7.25	0.93183	0.00060
7.60	0.93664	0.00058	7.40	0.93441	0.00057	7.30	0.93737	0.00060
7.65	0.94109	0.00057	7.45	0.93973	0.00058	7.35	0.94082	0.00058
7.70	0.94528	0.00056	7.50	0.94452	0.00056	7.40	0.94614	0.00058
7.75	0.95021	0.00056	7.55	0.94780	0.00057	7.45	0.95157	0.00057
7.80	0.95473	0.00058	7.60	0.95229	0.00056	7.50	0.95517	0.00056
7.85	0.95848	0.00058	7.65	0.95732	0.00055	7.55	0.95949	0.00057
7.90	0.96267	0.00055	7.70	0.96219	0.00056	7.60	0.96572	0.00058
7.95	0.96791	0.00058	7.75	0.96575	0.00057	7.65	0.96787	0.00057
8.00	0.97296	0.00056	7.80	0.97101	0.00058	7.70	0.97295	0.00058
8.05	0.97616	0.00056	7.85	0.97526	0.00056	7.75	0.97683	0.00059
8.10	0.98125	0.00056	7.90	0.97964	0.00057	7.80	0.98101	0.00058
8.15	0.98409	0.00058	7.95	0.98381	0.00057	7.85	0.98566	0.00059
8.20	0.98788	0.00056	8.00	0.98779	0.00058	7.90	0.98958	0.00057
8.25	0.99402	0.00056	8.05	0.99243	0.00056	7.95	0.99426	0.00059
8.30	0.99669	0.00057	8.10	0.99659	0.00056	8.00	0.99870	0.00058
8.35	1.00105	0.00055	8.15	0.99965	0.00057	8.05	1.00291	0.00059
8.40	1.00510	0.00057	8.20	1.00476	0.00057	8.10	1.00649	0.00059
8.45	1.00988	0.00056	8.25	1.00951	0.00058	8.15	1.01098	0.00058
8.50	1.01359	0.00055	8.30	1.01320	0.00056	8.20	1.01469	0.00056
8.55	1.01714	0.00057	8.35	1.01753	0.00057	8.25	1.01959	0.00059
8.60	1.02227	0.00057	8.40	1.02114	0.00057	8.30	1.02369	0.00058

Table B.1.2.2.2-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.10	0.92073	0.00057	7.00	0.91472	0.00057	7.00	0.91940	0.00057
7.15	0.92552	0.00055	7.05	0.91860	0.00057	7.05	0.92418	0.00056
7.20	0.93108	0.00057	7.10	0.92495	0.00058	7.10	0.92876	0.00057
7.25	0.93461	0.00058	7.15	0.92847	0.00058	7.15	0.93234	0.00058
7.30	0.93975	0.00060	7.20	0.93253	0.00056	7.20	0.93756	0.00057
7.35	0.94414	0.00060	7.25	0.93848	0.00058	7.25	0.94122	0.00057
7.40	0.94835	0.00058	7.30	0.94232	0.00057	7.30	0.94625	0.00059
7.45	0.95286	0.00060	7.35	0.94613	0.00058	7.35	0.94985	0.00057
7.50	0.95768	0.00058	7.40	0.95018	0.00060	7.40	0.95431	0.00058
7.55	0.96200	0.00057	7.45	0.95602	0.00058	7.45	0.96029	0.00057
7.60	0.96675	0.00058	7.50	0.95939	0.00058	7.50	0.96438	0.00057
7.65	0.97119	0.00057	7.60	0.96789	0.00060	7.55	0.96687	0.00058
7.70	0.97523	0.00058	7.65	0.97326	0.00058	7.60	0.97323	0.00058
7.75	0.97935	0.00060	7.70	0.97663	0.00057	7.65	0.97460	0.00059
7.80	0.98453	0.00059	7.75	0.98061	0.00058	7.70	0.98081	0.00058
7.85	0.98849	0.00059	7.80	0.98490	0.00059	7.75	0.98512	0.00058
7.90	0.99324	0.00058	7.85	0.98823	0.00058	7.80	0.98787	0.00058
7.95	0.99602	0.00058	7.90	0.99238	0.00057	7.85	0.99267	0.00056
8.00	0.99970	0.00057	7.95	0.99581	0.00058	7.90	0.99689	0.00057
8.05	1.00428	0.00059	8.00	1.00016	0.00060	7.95	1.00040	0.00057
8.10	1.00851	0.00059	8.05	1.00518	0.00057	8.00	1.00513	0.00058
8.15	1.01250	0.00058	8.10	1.00900	0.00058	8.05	1.00789	0.00059
8.20	1.01743	0.00058	8.15	1.01310	0.00057	8.10	1.01294	0.00057
			8.20	1.01688	0.00057	8.15	1.01584	0.00059
			8.25	1.02127	0.00057	8.20	1.01986	0.00058
			8.30	1.02418	0.00059			

Table B.1.2.2.2-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

750 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.90	0.92410	0.00059	6.70	0.92266	0.00056	6.30	0.91877	0.00056
6.95	0.92837	0.00057	6.75	0.92761	0.00059	6.35	0.92449	0.00057
7.00	0.93352	0.00056	6.80	0.93065	0.00057	6.40	0.92944	0.00055
7.05	0.93723	0.00056	6.85	0.93580	0.00057	6.45	0.93504	0.00055
7.10	0.94203	0.00058	6.90	0.94062	0.00057	6.50	0.94038	0.00056
7.15	0.94702	0.00058	6.95	0.94504	0.00054	6.55	0.94484	0.00057
7.20	0.95111	0.00056	7.00	0.94932	0.00056	6.60	0.94992	0.00057
7.25	0.95406	0.00059	7.05	0.95451	0.00058	6.65	0.95355	0.00056
7.30	0.95969	0.00059	7.10	0.95854	0.00056	6.70	0.95851	0.00059
7.35	0.96395	0.00057	7.15	0.96404	0.00057	6.75	0.96374	0.00058
7.40	0.96804	0.00057	7.20	0.96762	0.00057	6.80	0.96906	0.00053
7.45	0.97196	0.00058	7.25	0.97194	0.00055	6.85	0.97406	0.00056
7.50	0.97640	0.00056	7.30	0.97587	0.00058	6.90	0.97886	0.00057
7.55	0.98045	0.00058	7.35	0.98084	0.00056	6.95	0.98287	0.00057
7.60	0.98354	0.00058	7.40	0.98460	0.00059	7.00	0.98794	0.00055
7.65	0.98984	0.00060	7.45	0.98902	0.00058	7.05	0.99213	0.00056
7.70	0.99183	0.00056	7.50	0.99269	0.00057	7.10	0.99663	0.00057
7.75	0.99757	0.00057	7.55	0.99719	0.00058	7.15	1.00093	0.00058
7.80	1.00104	0.00059	7.60	1.00109	0.00056	7.20	1.00469	0.00056
7.85	1.00505	0.00056	7.65	1.00521	0.00056	7.25	1.00896	0.00058
7.90	1.00799	0.00058	7.70	1.00901	0.00058	7.30	1.01298	0.00056
7.95	1.01246	0.00056	7.75	1.01448	0.00057	7.35	1.01810	0.00056
8.00	1.01653	0.00058	7.80	1.01770	0.00057	7.40	1.02254	0.00057
8.05	1.02101	0.00057	7.90	1.02612	0.00056			
8.10	1.02452	0.00057						

Table B.1.2.2.2-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

2000 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.90	0.91403	0.00056	5.60	0.91492	0.00053	5.30	0.91190	0.00054
5.95	0.91916	0.00056	5.65	0.92144	0.00056	5.35	0.91928	0.00054
6.00	0.92506	0.00054	5.70	0.92739	0.00055	5.40	0.92424	0.00055
6.05	0.93067	0.00055	5.75	0.93196	0.00056	5.45	0.93089	0.00056
6.10	0.93602	0.00054	5.80	0.93871	0.00057	5.50	0.93787	0.00054
6.15	0.94102	0.00056	5.85	0.94410	0.00056	5.55	0.94339	0.00054
6.20	0.94586	0.00056	5.90	0.95022	0.00057	5.60	0.94908	0.00055
6.25	0.95145	0.00055	5.95	0.95555	0.00056	5.65	0.95560	0.00054
6.30	0.95633	0.00057	6.00	0.96138	0.00056	5.70	0.96184	0.00055
6.35	0.96325	0.00056	6.05	0.96712	0.00056	5.75	0.96788	0.00056
6.40	0.96774	0.00057	6.10	0.97142	0.00055	5.80	0.97305	0.00056
6.45	0.97280	0.00056	6.15	0.97795	0.00056	5.85	0.97938	0.00056
6.50	0.97739	0.00056	6.20	0.98313	0.00057	5.90	0.98501	0.00057
6.55	0.98278	0.00056	6.25	0.98816	0.00055	5.95	0.99067	0.00054
6.60	0.98809	0.00057	6.30	0.99376	0.00058	6.00	0.99698	0.00057
6.65	0.99297	0.00055	6.35	0.99862	0.00057	6.05	1.00212	0.00056
6.70	0.99792	0.00057	6.40	1.00391	0.00055	6.10	1.00781	0.00057
6.75	1.00305	0.00056	6.45	1.01003	0.00057	6.15	1.01284	0.00054
6.80	1.00705	0.00057	6.50	1.01421	0.00056	6.20	1.01896	0.00056
6.85	1.01191	0.00058	6.55	1.02011	0.00055			
6.90	1.01719	0.00056	6.60	1.02509	0.00057			
6.95	1.02154	0.00057						
7.00	1.02486	0.00057						

Table B.1.2.2.2-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.90	0.92235	0.00054	4.50	0.92015	0.00053	3.70	0.90467	0.00050
4.95	0.92895	0.00054	4.55	0.92752	0.00053	3.75	0.91463	0.00051
5.00	0.93568	0.00054	4.60	0.93529	0.00052	3.80	0.92465	0.00049
5.05	0.94225	0.00055	4.65	0.94333	0.00053	3.85	0.93446	0.00050
5.10	0.94915	0.00053	4.70	0.95177	0.00054	3.90	0.94353	0.00051
5.15	0.95717	0.00054	4.75	0.95837	0.00054	3.95	0.95293	0.00052
5.20	0.96254	0.00056	4.80	0.96526	0.00054	4.00	0.96138	0.00050
5.25	0.97028	0.00055	4.90	0.98026	0.00057	4.05	0.97150	0.00051
5.30	0.97598	0.00055	5.00	0.99497	0.00054	4.10	0.98062	0.00051
5.35	0.98437	0.00056	5.05	1.00171	0.00055	4.15	0.98853	0.00053
5.40	0.99040	0.00056	5.10	1.00873	0.00054	4.20	0.99761	0.00051
5.45	0.99610	0.00055	5.15	1.01555	0.00055	4.25	1.00621	0.00052
5.50	1.00303	0.00056	5.20	1.02346	0.00054	4.30	1.01540	0.00051
5.55	1.00754	0.00055				4.35	1.02442	0.00052
5.60	1.01455	0.00054				4.40	1.03365	0.00051
5.65	1.02130	0.00055						
5.70	1.02851	0.00055						

Table B.1.2.2.2-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

10000 milli-g/cc			15000 milli-g/cc			19600 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
3.20	0.90865	0.00048	2.50	0.91771	0.00044	2.00	0.90570	0.00041
3.25	0.92101	0.00050	2.52	0.92343	0.00044	2.02	0.91317	0.00043
3.30	0.93079	0.00049	2.54	0.92927	0.00044	2.04	0.92044	0.00041
3.35	0.94205	0.00048	2.56	0.93543	0.00045	2.06	0.92753	0.00042
3.40	0.95195	0.00048	2.58	0.94137	0.00044	2.08	0.93393	0.00041
3.45	0.96342	0.00049	2.60	0.94673	0.00045	2.10	0.94139	0.00041
3.50	0.97444	0.00048	2.62	0.95230	0.00044	2.12	0.94841	0.00041
3.55	0.98359	0.00049	2.64	0.95752	0.00045	2.14	0.95481	0.00042
3.60	0.99454	0.00049	2.66	0.96289	0.00045	2.16	0.96214	0.00043
3.65	1.00492	0.00050	2.68	0.96790	0.00044	2.18	0.96889	0.00044
3.70	1.01588	0.00050	2.70	0.97445	0.00043	2.20	0.97447	0.00042
3.75	1.02544	0.00048	2.72	0.98028	0.00046	2.22	0.98190	0.00044
3.80	1.03648	0.00050	2.74	0.98446	0.00046	2.24	0.98927	0.00043
			2.76	0.99022	0.00046	2.26	0.99484	0.00044
			2.78	0.99587	0.00045	2.28	1.00225	0.00043
			2.80	1.00111	0.00046	2.30	1.00861	0.00044
			2.82	1.00624	0.00046	2.32	1.01474	0.00044
			2.84	1.01214	0.00045	2.34	1.02124	0.00046
			2.86	1.01673	0.00047	2.36	1.02872	0.00045
			2.88	1.02288	0.00045	2.38	1.03525	0.00047
			2.90	1.02821	0.00047	2.40	1.04111	0.00044

B.1.2.2.3. 10” Water Reflector

Case ID: pu-cyl-0970-10

Material: Plutonium metal in water

Geometry: Infinite Cylinder

Isotopics: 97% ^{239}Pu 3% ^{240}Pu

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.1.2.2.3-1. Plutonium Cylinder (97% ^{239}Pu) - 1 Inch of Water Reflection

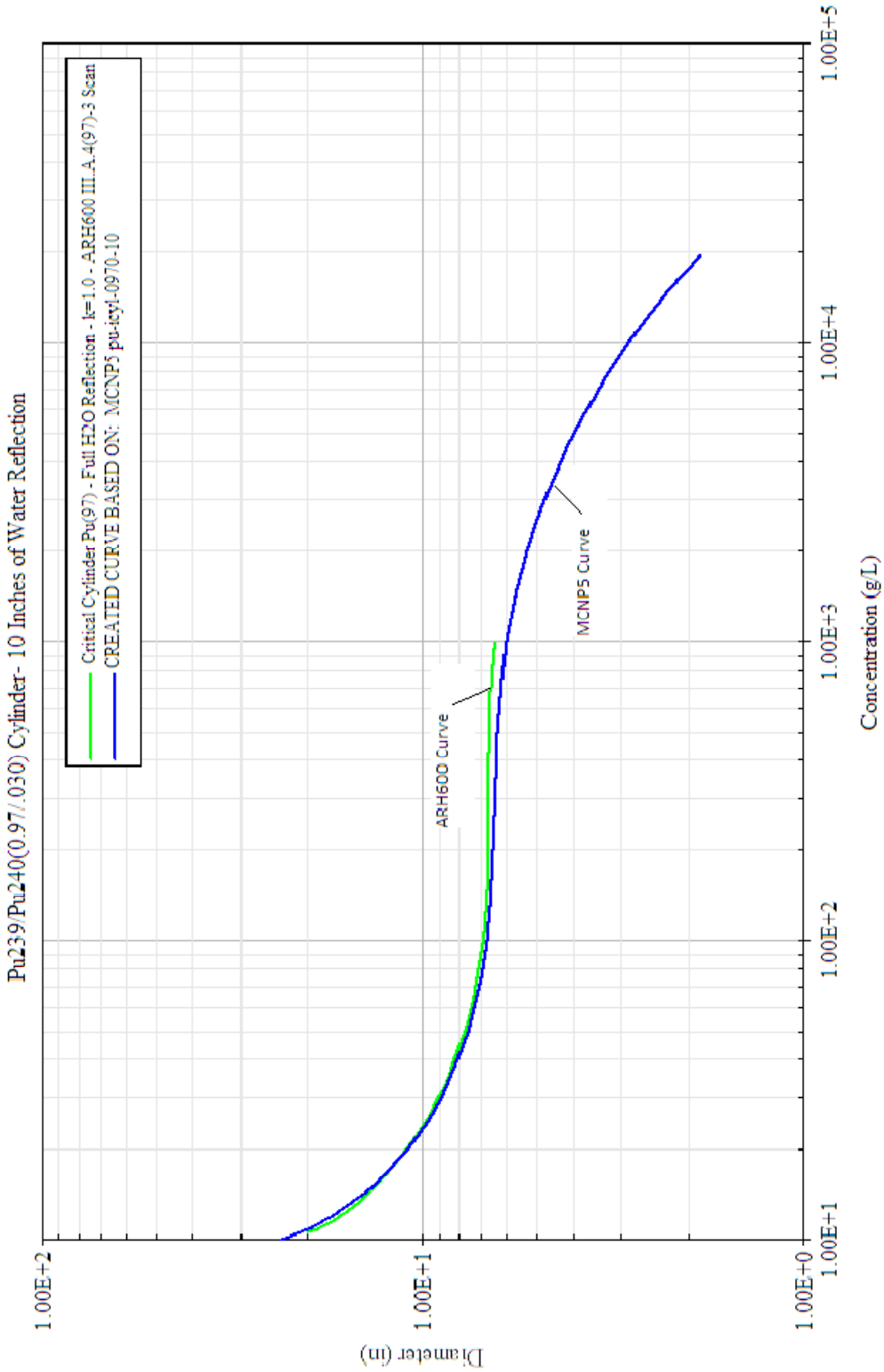

Table B.1.2.2.3-1. Critical Dimensions for Plutonium Cylinder (97% ^{239}Pu) - 10 Inches of Reflection

Plutonium Cylinder (97% ^{239}Pu)- 10 Inches of Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	17.400	24.900	0.300	23.4392
0.011	15.300	20.700	0.200	19.5870
0.012	13.800	18.100	0.200	17.2581
0.015	11.200	14.100	0.100	13.5441
0.020	9.300	11.300	0.100	10.9119
0.025	8.400	10.000	0.050	9.6405
0.030	7.800	9.200	0.050	8.8935
0.040	7.000	8.300	0.050	8.0490
0.050	6.500	7.900	0.050	7.5833
0.075	6.100	7.300	0.100	7.0267
0.100	5.700	7.000	0.050	6.7773
0.150	5.800	6.800	0.050	6.5892
0.200	5.600	6.700	0.050	6.5187
0.350	5.500	6.700	0.050	6.4269
0.500	5.500	6.600	0.050	6.3503
0.750	5.300	6.500	0.050	6.1965
1.000	5.200	6.300	0.050	6.0293
1.500	4.900	5.900	0.050	5.6558
2.000	4.600	5.500	0.050	5.3208
2.500	4.300	5.200	0.050	5.0205
3.000	4.100	5.000	0.050	4.7617
4.000	3.800	4.500	0.050	4.3291
5.000	3.500	4.200	0.050	3.9832
7.500	2.900	3.500	0.050	3.3387
10.000	2.500	3.000	0.020	2.8805
15.000	2.000	2.400	0.020	2.2552
19.600	1.600	2.000	0.020	1.8634

MCNP5 Sample Input File
97% Pu Cylinder- 10 Inches of Reflection

Pu sphere, 97.0 wt% ^{239}Pu, 00750 milli-g/cc,

```
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 575   hundreths of inches - must be integer
c radius =     7.3025 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00750 milli-g Pu/cc
c Reflector width = 10.0 inches
c Enrichment = 0.97 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 239Pu  = 239.05220
c Pu240  = 240.05380
c
c Effective Plutonium atomic mass 239.08225
c PuO2
c Mass fraction of Pu in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0383 cc
c Volume of water in sample 0.9617 cc
c
c Mass of crit in sample   0.7500 g
c Mass of Pu in sample   0.7500 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9617 g
c
c Total mass of sample  1.7117g for a 1cc sample
c Mass Density for crit material  -1.7117, expressed as negative
c
c  plane
20 11   -1.711735   -1   imp:n=1
21  2  -1.000                  -2 1   imp:n=1    $zero importance if no reflector
22  0                           2   imp:n=0
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```
1       cz     7.3025              $ plane
2       cz    32.7025        $ Reflection

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    Pu/ water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 00750 milli-g Pu/cc,  1.7117
1001.66c -0.062868
8016.66c -0.498980      $from water
94239.66c -0.425007
94240.66c -0.013145
mt11     lwtr.60t
c
c    Pu only
m12    $ Pu , 100.0 wt% 239Pu, 00750 milli-g U/cc,  1.7117
94239.66c -0.425007
94240.66c -0.013145
c
```

Critview Compatible Data File
97% Pu Cylinder- 10 Inches of Reflection

reset:
title: MCNP5 pu-icyl-0970-10
set: MCNP5 set
source: MCNP5 primary
created: Wed 08/04/2010 12:15:41.82
geometry: infcyl
modmat: H2O
critmat: plutonium
isomat: Pu239 0.970 Pu240 0.030
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	23.4392
0.011	19.5870
0.012	17.2581
0.015	13.5441
0.020	10.9119
0.025	9.6405
0.030	8.8935
0.040	8.0490
0.050	7.5833
0.075	7.0267
0.100	6.7773
0.150	6.5892
0.200	6.5187
0.350	6.4269
0.500	6.3503
0.750	6.1965
1.000	6.0293
1.500	5.6558
2.000	5.3208
2.500	5.0205
3.000	4.7617
4.000	4.3291
5.000	3.9832
7.500	3.3387
10.00	2.8805
15.00	2.2552
19.60	1.8634

Table B.1.2.2.3-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 10 Inches of Reflection

10 milli-g/cc			11 milli-g/cc			12 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.40	0.92786	0.00029	15.30	0.92663	0.00032	13.80	0.92479	0.00034
17.70	0.93199	0.00028	15.50	0.93109	0.00031	14.00	0.93051	0.00033
18.00	0.93701	0.00028	15.70	0.93513	0.00031	14.20	0.93486	0.00034
18.30	0.94164	0.00028	15.90	0.94000	0.00030	14.40	0.94046	0.00033
18.60	0.94582	0.00028	16.10	0.94310	0.00030	14.60	0.94481	0.00033
18.90	0.95033	0.00028	16.30	0.94739	0.00031	14.80	0.94946	0.00032
19.20	0.95513	0.00029	16.50	0.95117	0.00030	15.00	0.95540	0.00033
19.50	0.95833	0.00028	16.70	0.95502	0.00030	15.20	0.95875	0.00033
19.80	0.96105	0.00028	16.90	0.95850	0.00029	15.40	0.96335	0.00032
20.10	0.96523	0.00028	17.10	0.96198	0.00030	15.60	0.96864	0.00033
20.40	0.96897	0.00028	17.30	0.96519	0.00029	15.80	0.97238	0.00032
20.70	0.97316	0.00027	17.50	0.96862	0.00030	16.00	0.97623	0.00031
21.00	0.97606	0.00027	17.70	0.97152	0.00030	16.20	0.98042	0.00032
21.30	0.97970	0.00027	17.90	0.97526	0.00030	16.40	0.98442	0.00031
21.60	0.98211	0.00027	18.10	0.97818	0.00029	16.60	0.98755	0.00032
21.90	0.98575	0.00027	18.30	0.98173	0.00029	16.80	0.99131	0.00032
22.20	0.98863	0.00027	18.50	0.98476	0.00029	17.00	0.99542	0.00030
22.50	0.99161	0.00027	18.70	0.98807	0.00029	17.20	0.99891	0.00031
22.80	0.99468	0.00026	18.90	0.99080	0.00031	17.40	1.00266	0.00031
23.10	0.99729	0.00027	19.10	0.99337	0.00030	17.60	1.00592	0.00031
23.40	0.99963	0.00027	19.30	0.99600	0.00029	17.80	1.00890	0.00031
23.70	1.00246	0.00026	19.50	0.99823	0.00028	18.00	1.01231	0.00031
24.00	1.00536	0.00026	19.70	1.00230	0.00028	18.10	1.01426	0.00031
24.30	1.00822	0.00025	19.90	1.00379	0.00028			
24.60	1.01055	0.00025	20.10	1.00705	0.00028			
24.90	1.01271	0.00026	20.30	1.00950	0.00027			
			20.50	1.01067	0.00028			
			20.70	1.01319	0.00028			

Table B.1.2.2.3-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 10 Inches of Reflection (cont)

15 milli-g/cc			20 milli-g/cc			25 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.20	0.92047	0.00037	9.30	0.92104	0.00041	8.40	0.92510	0.00043
11.30	0.92431	0.00036	9.40	0.92624	0.00041	8.45	0.92873	0.00045
11.40	0.92823	0.00037	9.50	0.93141	0.00042	8.50	0.93226	0.00044
11.50	0.93296	0.00038	9.60	0.93704	0.00041	8.55	0.93541	0.00043
11.60	0.93603	0.00038	9.70	0.94219	0.00040	8.60	0.93883	0.00044
11.70	0.93978	0.00037	9.80	0.94817	0.00041	8.65	0.94175	0.00043
11.80	0.94345	0.00037	9.90	0.95264	0.00043	8.70	0.94459	0.00044
11.90	0.94625	0.00036	10.00	0.95764	0.00041	8.75	0.94765	0.00044
12.00	0.94965	0.00038	10.10	0.96226	0.00041	8.80	0.95218	0.00044
12.10	0.95425	0.00037	10.20	0.96719	0.00041	8.85	0.95464	0.00043
12.20	0.95825	0.00036	10.30	0.97215	0.00041	8.90	0.95741	0.00044
12.30	0.96126	0.00036	10.40	0.97672	0.00042	9.00	0.96265	0.00046
12.40	0.96436	0.00036	10.50	0.98122	0.00042	9.05	0.96599	0.00043
12.50	0.96730	0.00037	10.60	0.98601	0.00041	9.10	0.96868	0.00044
12.60	0.97088	0.00036	10.70	0.99030	0.00040	9.15	0.97283	0.00042
12.70	0.97390	0.00036	10.80	0.99489	0.00042	9.20	0.97559	0.00045
12.80	0.97738	0.00036	10.90	0.99945	0.00041	9.25	0.97745	0.00044
12.90	0.98082	0.00036	11.00	1.00407	0.00041	9.30	0.98061	0.00045
13.00	0.98411	0.00036	11.10	1.00809	0.00042	9.35	0.98358	0.00044
13.10	0.98756	0.00035	11.20	1.01170	0.00042	9.40	0.98637	0.00043
13.20	0.99002	0.00037	11.30	1.01674	0.00041	9.45	0.98909	0.00044
13.30	0.99292	0.00035				9.50	0.99223	0.00043
13.40	0.99691	0.00035				9.55	0.99458	0.00044
13.50	0.99868	0.00037				9.60	0.99790	0.00043
13.60	1.00167	0.00035				9.65	1.00049	0.00044
13.70	1.00542	0.00036				9.70	1.00229	0.00044
13.80	1.00715	0.00035				9.75	1.00626	0.00045
13.90	1.01146	0.00035				9.80	1.00843	0.00044
14.00	1.01368	0.00035				9.85	1.01005	0.00044
14.10	1.01595	0.00035				9.90	1.01288	0.00043
						9.95	1.01631	0.00043
						10.00	1.01856	0.00043

Table B.1.2.2.3-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 10 Inches of Reflection (cont)

30 milli-g/cc			40 milli-g/cc			50 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.80	0.92685	0.00044	7.00	0.91852	0.00049	6.50	0.90852	0.00050
7.85	0.93034	0.00046	7.05	0.92363	0.00047	6.55	0.91369	0.00049
7.90	0.93365	0.00044	7.10	0.92671	0.00047	6.60	0.91767	0.00049
7.95	0.93777	0.00045	7.15	0.93073	0.00048	6.65	0.92298	0.00049
8.00	0.94057	0.00046	7.20	0.93507	0.00048	6.70	0.92622	0.00049
8.05	0.94388	0.00046	7.25	0.93976	0.00047	6.75	0.93134	0.00049
8.10	0.94711	0.00047	7.30	0.94280	0.00049	6.80	0.93536	0.00049
8.15	0.95151	0.00047	7.35	0.94775	0.00048	6.85	0.93996	0.00049
8.20	0.95469	0.00046	7.40	0.95102	0.00047	6.90	0.94424	0.00051
8.25	0.95725	0.00045	7.45	0.95489	0.00049	6.95	0.94886	0.00050
8.30	0.96061	0.00046	7.50	0.95915	0.00048	7.00	0.95252	0.00050
8.35	0.96532	0.00045	7.55	0.96324	0.00048	7.05	0.95700	0.00050
8.40	0.96855	0.00046	7.60	0.96664	0.00047	7.10	0.96087	0.00051
8.45	0.97069	0.00047	7.65	0.97081	0.00047	7.15	0.96578	0.00051
8.50	0.97502	0.00046	7.70	0.97419	0.00049	7.20	0.96972	0.00049
8.55	0.97799	0.00047	7.75	0.97837	0.00049	7.25	0.97356	0.00049
8.60	0.98139	0.00046	7.80	0.98183	0.00048	7.30	0.97731	0.00050
8.65	0.98542	0.00047	7.85	0.98522	0.00050	7.35	0.98116	0.00048
8.70	0.98686	0.00047	7.90	0.98922	0.00048	7.40	0.98600	0.00050
8.75	0.99010	0.00046	8.00	0.99647	0.00047	7.45	0.99045	0.00049
8.80	0.99369	0.00045	8.10	1.00368	0.00048	7.50	0.99306	0.00048
8.85	0.99751	0.00044	8.15	1.00758	0.00049	7.55	0.99737	0.00050
8.90	1.00037	0.00045	8.20	1.01070	0.00049	7.60	1.00132	0.00050
8.95	1.00256	0.00046	8.25	1.01516	0.00049	7.65	1.00486	0.00049
9.00	1.00671	0.00045	8.30	1.01730	0.00050	7.70	1.00910	0.00052
9.05	1.00880	0.00046				7.75	1.01307	0.00050
9.10	1.01340	0.00047				7.80	1.01599	0.00049
9.15	1.01532	0.00047				7.85	1.02047	0.00050
9.20	1.01863	0.00046				7.90	1.02349	0.00050

Table B.1.2.2.3-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 10 Inches of Reflection (cont)

75 milli-g/cc			100 milli-g/cc			150 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.10	0.91636	0.00051	5.70	0.89830	0.00051	5.80	0.92774	0.00054
6.20	0.92711	0.00051	5.75	0.90350	0.00051	5.85	0.93353	0.00053
6.25	0.93141	0.00052	5.80	0.90890	0.00052	5.90	0.93841	0.00053
6.30	0.93562	0.00051	5.85	0.91329	0.00051	5.95	0.94221	0.00054
6.35	0.94054	0.00050	5.90	0.91795	0.00053	6.00	0.94651	0.00053
6.40	0.94424	0.00050	5.95	0.92414	0.00053	6.05	0.95202	0.00053
6.45	0.94975	0.00052	6.00	0.92846	0.00053	6.10	0.95712	0.00055
6.50	0.95381	0.00051	6.05	0.93368	0.00052	6.15	0.96173	0.00054
6.55	0.95918	0.00051	6.10	0.93802	0.00050	6.20	0.96614	0.00052
6.60	0.96359	0.00051	6.15	0.94288	0.00053	6.25	0.97054	0.00053
6.65	0.96792	0.00052	6.20	0.94852	0.00051	6.30	0.97387	0.00052
6.70	0.97305	0.00052	6.25	0.95229	0.00052	6.35	0.97951	0.00054
6.75	0.97664	0.00051	6.30	0.95656	0.00053	6.40	0.98425	0.00054
6.80	0.98105	0.00051	6.35	0.96055	0.00052	6.45	0.98803	0.00052
6.85	0.98474	0.00051	6.40	0.96625	0.00052	6.50	0.99284	0.00052
6.90	0.99037	0.00052	6.45	0.97115	0.00054	6.55	0.99753	0.00053
6.95	0.99284	0.00053	6.50	0.97503	0.00052	6.60	1.00068	0.00054
7.00	0.99790	0.00051	6.55	0.98021	0.00052	6.65	1.00572	0.00054
7.05	1.00183	0.00053	6.60	0.98453	0.00054	6.70	1.01077	0.00053
7.10	1.00624	0.00051	6.65	0.98757	0.00054	6.75	1.01468	0.00053
7.15	1.01115	0.00052	6.70	0.99294	0.00053	6.80	1.01869	0.00052
7.20	1.01561	0.00052	6.75	0.99801	0.00053			
7.25	1.01842	0.00052	6.80	1.00166	0.00052			
7.30	1.02302	0.00053	6.85	1.00536	0.00053			
			6.90	1.01067	0.00053			
			6.95	1.01518	0.00053			
			7.00	1.01897	0.00053			

Table B.1.2.2.3-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 10 Inches of Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.60	0.91589	0.00053	5.50	0.91652	0.00052	5.50	0.92326	0.00054
5.65	0.92114	0.00055	5.55	0.92144	0.00052	5.55	0.92956	0.00051
5.75	0.93168	0.00055	5.60	0.92638	0.00055	5.60	0.93325	0.00053
5.80	0.93656	0.00053	5.65	0.93126	0.00053	5.65	0.93863	0.00052
5.85	0.93996	0.00055	5.70	0.93619	0.00053	5.70	0.94253	0.00053
5.90	0.94539	0.00054	5.75	0.93963	0.00054	5.75	0.94778	0.00053
5.95	0.95030	0.00054	5.80	0.94597	0.00053	5.80	0.95296	0.00055
6.00	0.95523	0.00052	5.85	0.95000	0.00051	5.85	0.95665	0.00052
6.05	0.95926	0.00053	5.90	0.95415	0.00055	5.90	0.96101	0.00054
6.10	0.96456	0.00054	5.95	0.95887	0.00053	5.95	0.96586	0.00054
6.15	0.96894	0.00054	6.00	0.96367	0.00055	6.00	0.97005	0.00054
6.20	0.97342	0.00053	6.05	0.96778	0.00054	6.05	0.97400	0.00053
6.25	0.97642	0.00053	6.10	0.97234	0.00055	6.10	0.97841	0.00052
6.30	0.98153	0.00053	6.15	0.97684	0.00052	6.15	0.98317	0.00054
6.35	0.98702	0.00053	6.20	0.98028	0.00052	6.20	0.98770	0.00053
6.40	0.99179	0.00053	6.25	0.98609	0.00053	6.25	0.99124	0.00054
6.45	0.99517	0.00055	6.30	0.99004	0.00053	6.30	0.99571	0.00054
6.50	0.99763	0.00053	6.35	0.99475	0.00052	6.35	0.99998	0.00054
6.55	1.00398	0.00053	6.40	0.99784	0.00054	6.40	1.00304	0.00054
6.60	1.00849	0.00056	6.45	1.00186	0.00055	6.45	1.00790	0.00053
6.65	1.01247	0.00055	6.50	1.00715	0.00055	6.50	1.01232	0.00054
6.70	1.01612	0.00053	6.55	1.01117	0.00055	6.55	1.01617	0.00053
			6.60	1.01475	0.00054	6.60	1.02029	0.00053
			6.65	1.01856	0.00052			
			6.70	1.02254	0.00054			

Table B.1.2.2.3-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 10 Inches of Reflection (cont)

750 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.30	0.91870	0.00052	5.20	0.92404	0.00052	4.90	0.92476	0.00052
5.35	0.92294	0.00054	5.25	0.92792	0.00053	4.95	0.92911	0.00053
5.40	0.92850	0.00053	5.30	0.93321	0.00055	5.00	0.93420	0.00053
5.45	0.93323	0.00053	5.35	0.93788	0.00054	5.05	0.94132	0.00051
5.50	0.93855	0.00054	5.40	0.94299	0.00053	5.10	0.94494	0.00052
5.55	0.94307	0.00054	5.45	0.94839	0.00053	5.15	0.95027	0.00054
5.60	0.94768	0.00053	5.50	0.95373	0.00053	5.20	0.95513	0.00053
5.65	0.95160	0.00053	5.55	0.95784	0.00055	5.25	0.96021	0.00052
5.70	0.95757	0.00052	5.60	0.96216	0.00053	5.30	0.96593	0.00053
5.75	0.96155	0.00051	5.65	0.96693	0.00052	5.35	0.97053	0.00051
5.80	0.96653	0.00053	5.70	0.97192	0.00051	5.40	0.97460	0.00053
5.85	0.96888	0.00054	5.75	0.97641	0.00055	5.45	0.98034	0.00055
5.90	0.97367	0.00053	5.80	0.98088	0.00054	5.50	0.98529	0.00055
5.95	0.97904	0.00054	5.85	0.98505	0.00054	5.55	0.98983	0.00053
6.00	0.98296	0.00054	5.90	0.98896	0.00055	5.60	0.99549	0.00053
6.05	0.98722	0.00054	5.95	0.99306	0.00054	5.65	0.99947	0.00055
6.10	0.99245	0.00055	6.05	1.00181	0.00053	5.70	1.00406	0.00053
6.15	0.99533	0.00052	6.10	1.00777	0.00054	5.75	1.00831	0.00053
6.20	1.00035	0.00053	6.15	1.01202	0.00052	5.80	1.01295	0.00054
6.25	1.00371	0.00054	6.20	1.01513	0.00055	5.85	1.01870	0.00053
6.30	1.00786	0.00053	6.25	1.01967	0.00052	5.90	1.02313	0.00054
6.35	1.01185	0.00053	6.30	1.02394	0.00054			
6.40	1.01650	0.00054						
6.45	1.02055	0.00053						
6.50	1.02540	0.00056						

Table B.1.2.2.3-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 10 Inches of Reflection (cont)

2000 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.60	0.92115	0.00053	4.30	0.91378	0.00051	4.10	0.91650	0.00051
4.65	0.92676	0.00054	4.35	0.92013	0.00053	4.15	0.92264	0.00054
4.70	0.93272	0.00054	4.40	0.92643	0.00053	4.20	0.92922	0.00054
4.75	0.93798	0.00053	4.45	0.93309	0.00054	4.25	0.93575	0.00052
4.80	0.94428	0.00053	4.50	0.93809	0.00052	4.30	0.94153	0.00053
4.85	0.95100	0.00054	4.55	0.94507	0.00053	4.35	0.94832	0.00052
4.90	0.95566	0.00053	4.60	0.95155	0.00052	4.45	0.96094	0.00051
4.95	0.96138	0.00052	4.65	0.95719	0.00052	4.50	0.96754	0.00054
5.00	0.96653	0.00052	4.70	0.96317	0.00053	4.55	0.97356	0.00052
5.05	0.97148	0.00054	4.75	0.96870	0.00053	4.60	0.97979	0.00053
5.10	0.97638	0.00054	4.80	0.97426	0.00051	4.65	0.98641	0.00055
5.15	0.98369	0.00053	4.85	0.97981	0.00054	4.70	0.99216	0.00053
5.20	0.98748	0.00053	4.90	0.98596	0.00053	4.75	0.99852	0.00054
5.25	0.99256	0.00054	4.95	0.99127	0.00054	4.80	1.00486	0.00051
5.30	0.99761	0.00052	5.00	0.99781	0.00053	4.85	1.01045	0.00054
5.35	1.00336	0.00054	5.05	1.00314	0.00054	4.90	1.01626	0.00053
5.40	1.00747	0.00055	5.10	1.00802	0.00053	4.95	1.02232	0.00055
5.45	1.01270	0.00053	5.15	1.01370	0.00054	5.00	1.02837	0.00054
5.50	1.01820	0.00053	5.20	1.01898	0.00052			

Table B.1.2.2.3-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 10 Inches of Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
3.80	0.92451	0.00053	3.50	0.92290	0.00051	2.90	0.91312	0.00049
3.85	0.93116	0.00053	3.55	0.93192	0.00051	2.95	0.92411	0.00052
3.90	0.93868	0.00051	3.60	0.94018	0.00053	3.00	0.93456	0.00051
3.95	0.94643	0.00054	3.65	0.94787	0.00052	3.05	0.94466	0.00049
4.00	0.95347	0.00053	3.70	0.95520	0.00053	3.10	0.95421	0.00052
4.05	0.96078	0.00052	3.75	0.96408	0.00051	3.15	0.96325	0.00050
4.10	0.96792	0.00052	3.80	0.97248	0.00052	3.20	0.97325	0.00051
4.15	0.97542	0.00053	3.85	0.97996	0.00053	3.25	0.98274	0.00053
4.20	0.98249	0.00053	3.90	0.98781	0.00053	3.30	0.99288	0.00052
4.25	0.98932	0.00052	3.95	0.99495	0.00051	3.35	1.00209	0.00052
4.30	0.99575	0.00053	4.00	1.00256	0.00054	3.40	1.01153	0.00053
4.35	1.00305	0.00053	4.05	1.01063	0.00053	3.45	1.02075	0.00052
4.40	1.00961	0.00053	4.10	1.01835	0.00053	3.50	1.02974	0.00053
4.45	1.01588	0.00052	4.15	1.02610	0.00053			
4.50	1.02232	0.00053	4.20	1.03201	0.00052			

Table B.1.2.2.3-2. K_{eff} Values for Plutonium Cylinder (97% ^{239}Pu) - 10 Inches of Reflection (cont)

10000 milli-g/cc			15000 milli-g/cc			19600 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
2.50	0.91105	0.00049	2.00	0.92232	0.00046	1.60	0.89940	0.00046
2.52	0.91599	0.00050	2.02	0.92961	0.00048	1.62	0.90731	0.00047
2.54	0.91995	0.00050	2.04	0.93478	0.00047	1.64	0.91496	0.00047
2.56	0.92603	0.00051	2.06	0.94155	0.00049	1.66	0.92291	0.00047
2.58	0.93021	0.00052	2.08	0.94808	0.00047	1.68	0.93044	0.00046
2.60	0.93548	0.00051	2.10	0.95371	0.00048	1.70	0.93883	0.00046
2.62	0.93890	0.00051	2.12	0.96015	0.00048	1.72	0.94537	0.00046
2.64	0.94452	0.00049	2.14	0.96555	0.00049	1.74	0.95353	0.00048
2.66	0.94926	0.00052	2.16	0.97184	0.00048	1.76	0.96090	0.00046
2.68	0.95270	0.00051	2.20	0.98314	0.00049	1.78	0.96849	0.00048
2.70	0.95852	0.00050	2.22	0.98971	0.00050	1.80	0.97574	0.00049
2.72	0.96277	0.00050	2.24	0.99628	0.00051	1.82	0.98359	0.00049
2.74	0.96678	0.00050	2.26	1.00117	0.00049	1.84	0.99120	0.00049
2.76	0.97169	0.00050	2.28	1.00734	0.00051	1.86	0.99900	0.00048
2.78	0.97738	0.00051	2.30	1.01275	0.00050	1.88	1.00495	0.00047
2.80	0.98190	0.00049	2.32	1.01879	0.00051	1.90	1.01263	0.00047
2.82	0.98583	0.00050	2.34	1.02394	0.00049	1.92	1.02051	0.00048
2.84	0.98980	0.00051	2.36	1.03135	0.00050	1.94	1.02672	0.00048
2.86	0.99535	0.00051	2.38	1.03642	0.00050	1.96	1.03442	0.00049
2.88	0.99987	0.00050	2.40	1.04311	0.00050	1.98	1.04145	0.00048
2.90	1.00462	0.00051				2.00	1.04834	0.00049
2.92	1.00852	0.00052						
2.94	1.01286	0.00051						
2.96	1.01746	0.00051						
2.98	1.02124	0.00051						
3.00	1.02564	0.00051						

B.1.2.3. 95% ^{239}Pu 5% ^{240}Pu

B.1.2.3.1. Unreflected

Case ID: pu-cyl-0950-00

Material: Plutonium metal in water

Geometry: Infinite Cylinder

Isotopics: 95% ^{239}Pu 5% ^{240}Pu

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.1.2.3.1-1. 95% ^{239}Pu Cylinder - 0 Inches of Water Reflection

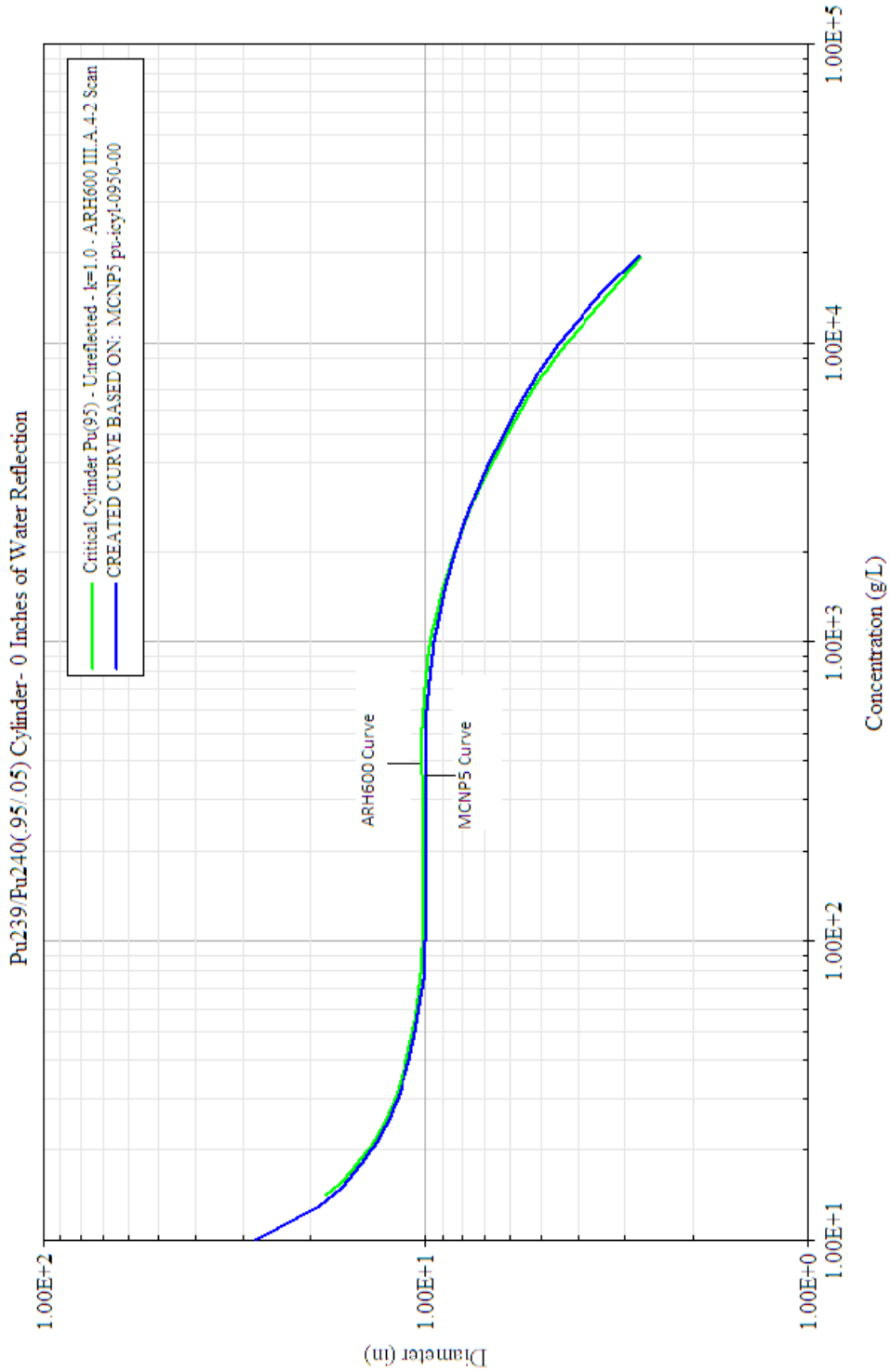

Table B.1.2.3.1-1. Critical Dimensions for 95% ^{239}Pu Cylinder - 0 Inches of Water Reflection

95% ^{239}Pu Cylinder - 0 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	20.800	30.200	0.400	27.9762
0.013	15.800	19.800	0.200	18.9935
0.015	14.300	17.400	0.100	16.6838
0.018	12.800	15.300	0.100	14.7371
0.020	12.200	14.500	0.100	13.9158
0.022	11.700	13.700	0.100	13.3164
0.024	11.300	13.200	0.100	12.8176
0.025	11.200	13.000	0.100	12.6215
0.026	11.100	12.900	0.100	12.4101
0.028	10.800	12.500	0.050	12.1196
0.030	10.600	12.300	0.050	11.8812
0.032	10.400	12.000	0.050	11.6352
0.036	10.100	11.600	0.050	11.2930
0.040	9.900	11.400	0.050	11.0262
0.045	9.700	11.100	0.050	10.7887
0.050	9.500	10.900	0.050	10.6092
0.075	9.100	10.400	0.050	10.1243
0.100	9.000	10.300	0.050	9.9570
0.150	8.900	10.200	0.050	9.8900
0.200	8.900	10.200	0.050	9.9029
0.350	8.900	10.200	0.050	9.9438
0.500	8.800	10.200	0.050	9.8921
0.750	8.700	10.000	0.050	9.7117
1.000	8.400	9.800	0.050	9.4680
1.500	8.000	9.200	0.050	8.8963
2.000	7.500	9.100	0.050	8.3804
2.500	7.100	8.200	0.050	7.9146
3.000	6.700	7.700	0.050	7.4906
4.000	6.200	7.000	0.050	6.8052
5.000	5.700	6.500	0.050	6.2503
6.000	5.200	6.000	0.050	5.7984
7.000	4.900	5.600	0.050	5.4107
7.500	4.700	5.400	0.050	5.2362
8.000	4.600	5.200	0.050	5.0736
9.000	4.300	4.900	0.050	4.7695
10.000	4.100	4.700	0.050	4.4996
15.000	3.100	3.600	0.020	3.4381
19.600	2.400	2.900	0.020	2.7397

MCNP5 Sample Input File
95% ^{239}Pu Cylinder- 0" Reflection

```
infcyl, 95.0 wt% 239Pu, 00100 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 965   hundreths of inches - must be integer
c radius =    12.2555 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00100 milli-g Pu/cc
c Reflector width =  0.0 inches
c Enrichment = 0.95 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0051 cc
c Volume of water in sample 0.9949 cc
c
c Mass of crit in sample   0.1000 g
c Mass of water in sample  0.9949 g
c
c Total mass of sample  1.0949g for a 1cc sample
c Mass Density for crit material  -1.0949, expressed as negative
c
c  infinite cylinder
20 11   -1.094898   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=0    $zero importance if no reflector
22  0            2           imp:n=0

1       cz    12.2555              $ infinite cylinder
2       cz    12.2555         $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
```

```
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu/water mixture
m11    $ Pu/H2O Sludge, 95.0 wt% 239Pu, 00100 milli-g Pu/cc,  1.0949
1001.66c -0.101675
8016.66c -0.806993
94239.66c -0.086766
94240.66c -0.004567
mt11     lwtr.60t
c
c    pu only
m12    $ Pu/H2O Sludge, 95.0 wt% 239Pu, 00100 milli-g Pu/cc,  1.0949
94239.66c -0.950000
94240.66c -0.050000
c
```

Critview Compatible Data File
95% ^{239}Pu Cylinder- 0” Reflection

reset:
title: MCNP5 pu-icyl-0950-00
set: MCNP5 set
source: MCNP5 primary
created: Fri 07/16/2010 10:01:29.40
geometry: infcyl
modmat: H2O
critmat: plutonium
isomat: Pu239 0.95 Pu240 0.05
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	27.9762
0.013	18.9935
0.015	16.6838
0.018	14.7371
0.020	13.9158
0.022	13.3164
0.024	12.8176
0.025	12.6215
0.026	12.4101
0.028	12.1196
0.030	11.8812
0.032	11.6352
0.036	11.2930
0.040	11.0262
0.045	10.7887
0.050	10.6092
0.075	10.1243
0.100	9.9570
0.150	9.8900
0.200	9.9029
0.350	9.9438
0.500	9.8921
0.750	9.7117
1.000	9.4680
1.500	8.8963
2.000	8.3804
2.500	7.9146
3.000	7.4906
4.000	6.8052
5.000	6.2503
6.000	5.7984
7.000	5.4107
7.500	5.2362
8.000	5.0736
9.000	4.7695
10.00	4.4996
15.00	3.4381
19.60	2.7397

Table B.1.2.3.1-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 0 Inches of Water Reflection

10 milli-g/cc			13 milli-g/cc			15 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
20.80	0.92488	0.00037	15.80	0.92395	0.00044	14.30	0.92529	0.00048
21.20	0.93117	0.00036	16.00	0.92939	0.00045	14.40	0.92858	0.00047
21.60	0.93620	0.00036	16.20	0.93651	0.00044	14.50	0.93238	0.00048
22.00	0.94173	0.00037	16.40	0.93991	0.00043	14.60	0.93534	0.00049
22.40	0.94740	0.00035	16.60	0.94549	0.00044	14.70	0.93999	0.00048
22.80	0.95182	0.00035	16.80	0.95110	0.00043	14.80	0.94257	0.00046
23.20	0.95692	0.00035	17.00	0.95638	0.00044	14.90	0.94654	0.00046
23.60	0.96141	0.00035	17.20	0.95974	0.00043	15.00	0.94946	0.00046
24.00	0.96504	0.00032	17.40	0.96524	0.00043	15.10	0.95246	0.00048
24.40	0.96915	0.00034	17.60	0.97066	0.00043	15.20	0.95597	0.00048
24.80	0.97331	0.00035	17.80	0.97520	0.00044	15.30	0.95965	0.00046
25.20	0.97769	0.00032	18.00	0.97923	0.00043	15.40	0.96197	0.00047
25.60	0.98144	0.00033	18.20	0.98309	0.00042	15.50	0.96584	0.00045
26.00	0.98353	0.00033	18.40	0.98835	0.00042	15.60	0.96899	0.00046
26.40	0.98778	0.00034	18.60	0.99195	0.00042	15.70	0.97118	0.00047
26.80	0.99084	0.00032	18.80	0.99611	0.00043	15.80	0.97499	0.00046
27.20	0.99486	0.00032	19.00	1.00013	0.00044	15.90	0.97773	0.00047
27.60	0.99763	0.00032	19.20	1.00426	0.00042	16.00	0.98058	0.00047
28.00	1.00015	0.00032	19.40	1.00728	0.00040	16.10	0.98400	0.00046
28.40	1.00334	0.00033	19.60	1.01111	0.00043	16.20	0.98606	0.00046
28.80	1.00640	0.00030	19.80	1.01552	0.00040	16.30	0.98809	0.00044
29.20	1.00901	0.00032				16.40	0.99123	0.00047
29.60	1.01143	0.00031				16.50	0.99495	0.00045
30.00	1.01404	0.00030				16.60	0.99674	0.00046
30.20	1.01532	0.00031				16.70	1.00063	0.00046
						16.80	1.00354	0.00046
						16.90	1.00511	0.00047
						17.00	1.00756	0.00045
						17.10	1.01023	0.00046
						17.20	1.01329	0.00045
						17.30	1.01557	0.00045
						17.40	1.01850	0.00045

Table B.1.2.3.1-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 0 Inches of Water Reflection (cont)

18 milli-g/cc			20 milli-g/cc			22 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.80	0.92051	0.00050	12.20	0.92116	0.00054	11.70	0.92032	0.00055
12.90	0.92527	0.00050	12.30	0.92610	0.00055	11.80	0.92514	0.00056
13.00	0.92923	0.00053	12.40	0.93177	0.00054	11.90	0.93073	0.00056
13.10	0.93488	0.00052	12.50	0.93693	0.00053	12.00	0.93684	0.00055
13.20	0.93918	0.00052	12.60	0.94106	0.00054	12.10	0.94071	0.00056
13.30	0.94340	0.00051	12.70	0.94648	0.00054	12.20	0.94673	0.00056
13.40	0.94774	0.00050	12.80	0.95099	0.00053	12.30	0.95316	0.00055
13.50	0.95073	0.00051	12.90	0.95592	0.00054	12.40	0.95627	0.00056
13.60	0.95517	0.00051	13.00	0.95984	0.00051	12.50	0.96226	0.00056
13.70	0.95970	0.00053	13.10	0.96450	0.00053	12.60	0.96747	0.00055
13.80	0.96450	0.00055	13.20	0.96935	0.00054	12.70	0.97216	0.00057
13.90	0.96805	0.00052	13.30	0.97310	0.00054	12.80	0.97602	0.00058
14.00	0.97198	0.00051	13.40	0.97945	0.00053	12.90	0.98131	0.00056
14.10	0.97562	0.00052	13.50	0.98171	0.00053	13.00	0.98631	0.00053
14.20	0.97991	0.00051	13.60	0.98636	0.00054	13.10	0.99033	0.00057
14.30	0.98238	0.00053	13.70	0.99178	0.00052	13.20	0.99621	0.00055
14.40	0.98767	0.00049	13.80	0.99413	0.00051	13.30	0.99918	0.00054
14.50	0.98937	0.00051	13.90	0.99948	0.00053	13.40	1.00417	0.00053
14.60	0.99494	0.00051	14.00	1.00278	0.00054	13.50	1.00852	0.00054
14.70	0.99855	0.00051	14.10	1.00736	0.00050	13.60	1.01360	0.00054
14.80	1.00246	0.00050	14.20	1.01134	0.00050	13.70	1.01647	0.00057
14.90	1.00437	0.00050	14.30	1.01501	0.00053			
15.00	1.00873	0.00050	14.40	1.01884	0.00053			
15.10	1.01249	0.00051	14.50	1.02321	0.00052			
15.20	1.01596	0.00050						
15.30	1.01929	0.00050						

Table B.1.2.3.1-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 0 Inches of Water Reflection (cont)

24 milli-g/cc			25 milli-g/cc			26 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.30	0.91746	0.00057	11.20	0.92126	0.00058	11.10	0.92296	0.00057
11.40	0.92478	0.00057	11.30	0.92656	0.00058	11.20	0.92933	0.00060
11.50	0.92890	0.00057	11.40	0.93461	0.00058	11.30	0.93611	0.00058
11.60	0.93629	0.00057	11.50	0.93825	0.00059	11.40	0.94145	0.00059
11.70	0.94072	0.00056	11.60	0.94558	0.00060	11.50	0.94828	0.00057
11.80	0.94746	0.00058	11.70	0.95105	0.00060	11.60	0.95336	0.00060
11.90	0.95309	0.00057	11.80	0.95571	0.00059	11.70	0.96033	0.00056
12.00	0.95730	0.00055	11.90	0.96206	0.00057	11.80	0.96489	0.00058
12.10	0.96208	0.00057	12.00	0.96801	0.00057	11.90	0.97105	0.00057
12.20	0.96833	0.00055	12.10	0.97243	0.00060	12.00	0.97595	0.00058
12.30	0.97426	0.00057	12.20	0.97856	0.00058	12.10	0.98254	0.00060
12.40	0.97802	0.00055	12.30	0.98305	0.00058	12.20	0.98796	0.00060
12.50	0.98401	0.00055	12.40	0.98881	0.00058	12.30	0.99283	0.00057
12.60	0.98862	0.00057	12.50	0.99388	0.00056	12.40	0.99967	0.00056
12.70	0.99337	0.00057	12.60	0.99889	0.00058	12.50	1.00295	0.00057
12.80	0.99918	0.00058	12.70	1.00405	0.00055	12.60	1.00782	0.00058
12.90	1.00383	0.00060	12.80	1.00950	0.00056	12.70	1.01256	0.00058
13.00	1.00898	0.00059	12.90	1.01406	0.00058	12.80	1.01830	0.00057
13.10	1.01360	0.00054	13.00	1.01766	0.00058	12.90	1.02275	0.00056
13.20	1.01805	0.00057						

Table B.1.2.3.1-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 0 Inches of Water Reflection (cont)

28 milli-g/cc			30 milli-g/cc			32 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.80	0.92002	0.00059	10.60	0.92168	0.00063	10.40	0.91873	0.00062
10.85	0.92209	0.00059	10.65	0.92426	0.00061	10.45	0.92210	0.00058
10.90	0.92716	0.00059	10.70	0.92867	0.00058	10.50	0.92602	0.00060
10.95	0.92908	0.00060	10.75	0.93054	0.00059	10.55	0.93044	0.00061
11.00	0.93277	0.00061	10.80	0.93422	0.00061	10.60	0.93344	0.00063
11.05	0.93823	0.00060	10.85	0.93727	0.00062	10.65	0.93640	0.00062
11.10	0.94029	0.00061	10.90	0.94132	0.00062	10.70	0.93981	0.00064
11.15	0.94306	0.00060	10.95	0.94442	0.00063	10.75	0.94300	0.00060
11.20	0.94672	0.00060	11.00	0.94794	0.00061	10.80	0.94683	0.00063
11.25	0.94880	0.00059	11.05	0.95040	0.00059	10.85	0.95008	0.00060
11.30	0.95250	0.00060	11.10	0.95421	0.00062	10.90	0.95252	0.00062
11.35	0.95563	0.00058	11.15	0.95655	0.00059	10.95	0.95684	0.00062
11.40	0.95740	0.00060	11.20	0.96074	0.00059	11.00	0.95981	0.00060
11.45	0.96077	0.00062	11.25	0.96295	0.00063	11.05	0.96333	0.00060
11.50	0.96471	0.00061	11.30	0.96704	0.00060	11.10	0.96662	0.00062
11.55	0.96808	0.00059	11.35	0.96918	0.00063	11.15	0.97118	0.00064
11.60	0.97008	0.00060	11.40	0.97198	0.00061	11.20	0.97263	0.00060
11.65	0.97272	0.00059	11.45	0.97589	0.00060	11.25	0.97681	0.00062
11.70	0.97571	0.00059	11.50	0.97973	0.00058	11.30	0.97899	0.00061
11.75	0.97960	0.00061	11.55	0.98242	0.00057	11.35	0.98200	0.00062
11.80	0.98270	0.00061	11.60	0.98441	0.00061	11.40	0.98440	0.00066
11.85	0.98560	0.00060	11.65	0.98835	0.00060	11.45	0.98746	0.00063
11.90	0.98818	0.00057	11.70	0.99048	0.00060	11.50	0.99139	0.00062
11.95	0.99025	0.00059	11.75	0.99339	0.00063	11.55	0.99560	0.00058
12.00	0.99292	0.00060	11.80	0.99616	0.00061	11.60	0.99711	0.00061
12.05	0.99626	0.00058	11.85	0.99837	0.00060	11.65	1.00121	0.00061
12.10	0.99851	0.00060	11.90	1.00098	0.00061	11.70	1.00400	0.00061
12.15	1.00232	0.00059	11.95	1.00617	0.00060	11.75	1.00644	0.00060
12.20	1.00440	0.00062	12.00	1.00694	0.00060	11.80	1.00880	0.00061
12.25	1.00700	0.00061	12.05	1.01120	0.00061	11.85	1.01212	0.00064
12.30	1.00964	0.00059	12.10	1.01122	0.00061	11.90	1.01608	0.00061
12.35	1.01193	0.00059	12.15	1.01555	0.00059	11.95	1.01920	0.00061
12.40	1.01392	0.00061	12.20	1.02038	0.00061	12.00	1.02032	0.00059
12.45	1.01763	0.00061	12.25	1.02187	0.00060			
12.50	1.02032	0.00057	12.30	1.02458	0.00060			

Table B.1.2.3.1-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 0 Inches of Water Reflection (cont)

36 milli-g/cc			40 milli-g/cc			45 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.10	0.91684	0.00062	9.90	0.91906	0.00065	9.70	0.91821	0.00065
10.15	0.92052	0.00063	9.95	0.92314	0.00062	9.75	0.92285	0.00064
10.20	0.92592	0.00063	10.00	0.92617	0.00065	9.80	0.92805	0.00067
10.25	0.93004	0.00064	10.05	0.93069	0.00061	9.85	0.93140	0.00065
10.30	0.93299	0.00064	10.10	0.93418	0.00062	9.90	0.93492	0.00068
10.35	0.93639	0.00062	10.15	0.93678	0.00064	9.95	0.93776	0.00063
10.40	0.94076	0.00066	10.20	0.94033	0.00064	10.00	0.94275	0.00067
10.45	0.94436	0.00064	10.25	0.94571	0.00065	10.05	0.94564	0.00065
10.50	0.94553	0.00063	10.30	0.94902	0.00063	10.10	0.95137	0.00064
10.55	0.94959	0.00064	10.35	0.95270	0.00065	10.15	0.95349	0.00066
10.60	0.95303	0.00065	10.40	0.95620	0.00065	10.20	0.95783	0.00069
10.65	0.95602	0.00064	10.45	0.96034	0.00066	10.25	0.96119	0.00065
10.70	0.95919	0.00062	10.50	0.96319	0.00064	10.30	0.96509	0.00067
10.75	0.96434	0.00064	10.55	0.96769	0.00063	10.35	0.96893	0.00065
10.80	0.96766	0.00064	10.60	0.97016	0.00064	10.40	0.97199	0.00064
10.85	0.97166	0.00063	10.65	0.97366	0.00064	10.45	0.97568	0.00065
10.90	0.97367	0.00066	10.70	0.97732	0.00064	10.50	0.97926	0.00067
10.95	0.97785	0.00063	10.75	0.98093	0.00063	10.55	0.98257	0.00066
11.00	0.98213	0.00064	10.80	0.98433	0.00064	10.60	0.98730	0.00064
11.05	0.98504	0.00062	10.85	0.98658	0.00063	10.65	0.99063	0.00066
11.10	0.98704	0.00062	10.90	0.99053	0.00063	10.70	0.99489	0.00066
11.15	0.99163	0.00063	10.95	0.99425	0.00063	10.75	0.99607	0.00066
11.20	0.99339	0.00063	11.00	0.99876	0.00064	10.80	1.00115	0.00067
11.25	0.99734	0.00062	11.05	1.00113	0.00063	10.85	1.00337	0.00066
11.30	1.00043	0.00064	11.10	1.00557	0.00064	10.90	1.00798	0.00067
11.35	1.00304	0.00063	11.15	1.00812	0.00061	10.95	1.01212	0.00064
11.40	1.00638	0.00062	11.20	1.01218	0.00066	11.00	1.01528	0.00065
11.45	1.01019	0.00062	11.25	1.01574	0.00067	11.05	1.01942	0.00065
11.50	1.01293	0.00063	11.30	1.01699	0.00065	11.10	1.01993	0.00063
11.55	1.01555	0.00062	11.35	1.02053	0.00064			
11.60	1.01883	0.00064	11.40	1.02359	0.00064			

Table B.1.2.3.1-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 0 Inches of Water Reflection (cont)

50 milli-g/cc			75 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.50	0.91545	0.00066	9.10	0.91462	0.00069	9.00	0.91953	0.00070
9.55	0.91905	0.00064	9.15	0.91984	0.00068	9.05	0.92447	0.00070
9.60	0.92349	0.00067	9.20	0.92337	0.00072	9.10	0.92895	0.00068
9.65	0.92754	0.00065	9.25	0.92893	0.00069	9.15	0.93312	0.00068
9.70	0.93211	0.00067	9.30	0.93250	0.00069	9.20	0.93891	0.00070
9.75	0.93490	0.00066	9.35	0.93751	0.00067	9.25	0.93970	0.00073
9.80	0.93997	0.00069	9.40	0.94230	0.00070	9.30	0.94602	0.00070
9.85	0.94284	0.00067	9.45	0.94474	0.00072	9.35	0.94901	0.00071
9.90	0.94842	0.00067	9.50	0.94918	0.00070	9.40	0.95345	0.00071
9.95	0.95135	0.00067	9.55	0.95422	0.00069	9.45	0.95885	0.00070
10.00	0.95512	0.00067	9.60	0.95801	0.00067	9.50	0.96176	0.00071
10.05	0.95900	0.00067	9.65	0.96322	0.00069	9.55	0.96720	0.00069
10.10	0.96229	0.00066	9.70	0.96626	0.00070	9.60	0.97187	0.00070
10.15	0.96736	0.00068	9.75	0.97095	0.00071	9.65	0.97471	0.00071
10.20	0.97138	0.00064	9.80	0.97376	0.00069	9.70	0.97882	0.00072
10.25	0.97417	0.00066	9.85	0.97923	0.00068	9.75	0.98362	0.00069
10.30	0.97836	0.00067	9.90	0.98259	0.00072	9.80	0.98815	0.00069
10.35	0.98141	0.00067	9.95	0.98595	0.00070	9.85	0.99132	0.00072
10.40	0.98615	0.00067	10.00	0.98932	0.00071	9.90	0.99544	0.00069
10.45	0.98843	0.00067	10.05	0.99361	0.00066	9.95	0.99957	0.00070
10.50	0.99292	0.00067	10.10	0.99864	0.00068	10.00	1.00264	0.00071
10.55	0.99739	0.00068	10.15	1.00144	0.00067	10.05	1.00587	0.00072
10.60	0.99920	0.00066	10.20	1.00635	0.00071	10.10	1.01046	0.00071
10.65	1.00353	0.00068	10.25	1.00770	0.00071	10.15	1.01523	0.00067
10.70	1.00745	0.00067	10.30	1.01309	0.00069	10.20	1.01943	0.00071
10.75	1.01072	0.00065	10.35	1.01650	0.00068	10.25	1.02220	0.00072
10.80	1.01434	0.00064	10.40	1.01955	0.00067	10.30	1.02636	0.00074
10.85	1.01856	0.00064						
10.90	1.02088	0.00065						

Table B.1.2.3.1-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 0 Inches of Water Reflection (cont)

150 milli-g/cc			200 milli-g/cc			350 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.90	0.91765	0.00073	8.90	0.91909	0.00068	8.90	0.91749	0.00068
8.95	0.92231	0.00070	8.95	0.92405	0.00069	8.95	0.92368	0.00068
9.00	0.92707	0.00070	9.00	0.92628	0.00070	9.00	0.92524	0.00072
9.05	0.93204	0.00070	9.05	0.93191	0.00068	9.05	0.93102	0.00069
9.10	0.93628	0.00068	9.10	0.93747	0.00070	9.10	0.93551	0.00071
9.15	0.94133	0.00070	9.15	0.94149	0.00072	9.15	0.94075	0.00070
9.20	0.94537	0.00069	9.20	0.94451	0.00071	9.20	0.94221	0.00067
9.25	0.94915	0.00071	9.25	0.95064	0.00073	9.25	0.94841	0.00067
9.30	0.95269	0.00071	9.30	0.95341	0.00072	9.30	0.95054	0.00069
9.35	0.95721	0.00072	9.35	0.95816	0.00071	9.35	0.95586	0.00070
9.40	0.96220	0.00069	9.40	0.96126	0.00072	9.40	0.95914	0.00072
9.45	0.96619	0.00069	9.45	0.96557	0.00069	9.45	0.96328	0.00070
9.50	0.97068	0.00070	9.50	0.96944	0.00070	9.50	0.96694	0.00075
9.55	0.97452	0.00069	9.55	0.97364	0.00069	9.55	0.97032	0.00068
9.60	0.97693	0.00073	9.60	0.97662	0.00066	9.60	0.97418	0.00073
9.65	0.98196	0.00069	9.65	0.98248	0.00070	9.65	0.97753	0.00069
9.70	0.98688	0.00070	9.70	0.98434	0.00072	9.70	0.98335	0.00070
9.75	0.98991	0.00070	9.75	0.99031	0.00070	9.75	0.98529	0.00070
9.80	0.99178	0.00072	9.80	0.99343	0.00070	9.80	0.99003	0.00069
9.85	0.99673	0.00072	9.85	0.99599	0.00069	9.85	0.99337	0.00071
9.90	1.00082	0.00071	9.90	0.99966	0.00070	9.90	0.99632	0.00068
9.95	1.00462	0.00071	9.95	1.00545	0.00071	9.95	1.00052	0.00072
10.00	1.00984	0.00069	10.00	1.00894	0.00070	10.00	1.00479	0.00069
10.05	1.01374	0.00072	10.05	1.01252	0.00073	10.05	1.00752	0.00068
10.10	1.01611	0.00071	10.10	1.01517	0.00071	10.10	1.01087	0.00069
10.15	1.02109	0.00070	10.15	1.01997	0.00072	10.15	1.01585	0.00069
10.20	1.02432	0.00072	10.20	1.02319	0.00070	10.20	1.01927	0.00071

Table B.1.2.3.1-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 0 Inches of Water Reflection (cont)

500 milli-g/cc			750 milli-g/cc			1000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.80	0.91510	0.00068	8.70	0.92064	0.00068	8.40	0.91431	0.00067
8.85	0.91737	0.00072	8.75	0.92499	0.00069	8.45	0.91837	0.00064
8.90	0.92269	0.00067	8.80	0.92861	0.00068	8.50	0.92234	0.00067
8.95	0.92742	0.00069	8.85	0.93353	0.00066	8.55	0.92706	0.00066
9.00	0.93154	0.00070	8.90	0.93646	0.00068	8.60	0.93096	0.00064
9.05	0.93460	0.00068	8.95	0.94104	0.00067	8.65	0.93597	0.00066
9.10	0.93989	0.00071	9.00	0.94506	0.00068	8.70	0.94031	0.00066
9.15	0.94243	0.00070	9.05	0.94930	0.00069	8.75	0.94295	0.00067
9.20	0.94645	0.00069	9.10	0.95168	0.00071	8.80	0.94718	0.00064
9.25	0.95156	0.00071	9.15	0.95630	0.00070	8.85	0.95162	0.00067
9.30	0.95445	0.00069	9.20	0.96020	0.00069	8.90	0.95642	0.00069
9.35	0.95900	0.00068	9.25	0.96526	0.00067	8.95	0.95993	0.00067
9.40	0.96239	0.00074	9.30	0.96836	0.00068	9.00	0.96327	0.00068
9.45	0.96523	0.00071	9.35	0.97270	0.00068	9.05	0.96854	0.00068
9.50	0.97110	0.00066	9.40	0.97630	0.00067	9.10	0.97139	0.00067
9.55	0.97380	0.00071	9.45	0.97921	0.00070	9.15	0.97612	0.00070
9.60	0.97755	0.00069	9.50	0.98369	0.00070	9.20	0.97997	0.00068
9.65	0.98162	0.00069	9.55	0.98762	0.00069	9.25	0.98319	0.00068
9.70	0.98501	0.00071	9.60	0.98963	0.00067	9.30	0.98766	0.00067
9.75	0.98928	0.00069	9.65	0.99484	0.00070	9.35	0.99128	0.00067
9.80	0.99196	0.00068	9.70	0.99915	0.00068	9.40	0.99521	0.00067
9.85	0.99619	0.00068	9.75	1.00279	0.00068	9.45	0.99862	0.00068
9.90	1.00072	0.00069	9.80	1.00538	0.00068	9.50	1.00246	0.00066
9.95	1.00221	0.00070	9.85	1.00860	0.00071	9.55	1.00549	0.00068
10.00	1.00698	0.00070	9.90	1.01356	0.00070	9.60	1.00918	0.00067
10.05	1.01139	0.00069	9.95	1.01594	0.00071	9.65	1.01400	0.00067
10.10	1.01449	0.00072	10.00	1.02035	0.00069	9.70	1.01675	0.00070
10.15	1.01776	0.00069				9.75	1.02012	0.00067
10.20	1.02216	0.00066				9.80	1.02474	0.00070

Table B.1.2.3.1-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 0 Inches of Water Reflection (cont)

1500 milli-g/cc			2000 milli-g/cc			2500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	Keff	Sigma	Diameter (inches)	K_{eff}	Sigma
8.00	0.91998	0.00069	7.50	0.91605	0.00069	7.10	0.91768	0.00064
8.05	0.92611	0.00066	7.55	0.92141	0.00064	7.15	0.92192	0.00063
8.10	0.93002	0.00067	7.60	0.92734	0.00067	7.20	0.92618	0.00066
8.15	0.93461	0.00064	7.65	0.93067	0.00065	7.25	0.93289	0.00063
8.20	0.93961	0.00065	7.70	0.93655	0.00066	7.30	0.93815	0.00064
8.25	0.94421	0.00068	7.75	0.94044	0.00065	7.35	0.94284	0.00061
8.30	0.94826	0.00069	7.80	0.94708	0.00065	7.40	0.94869	0.00065
8.35	0.95227	0.00067	7.85	0.94957	0.00065	7.45	0.95378	0.00066
8.40	0.95642	0.00066	7.90	0.95494	0.00067	7.50	0.95902	0.00064
8.45	0.96027	0.00067	7.95	0.96125	0.00067	7.55	0.96433	0.00067
8.50	0.96559	0.00065	8.00	0.96438	0.00068	7.60	0.96956	0.00064
8.55	0.96985	0.00067	8.05	0.96842	0.00065	7.65	0.97398	0.00065
8.60	0.97358	0.00065	8.10	0.97385	0.00066	7.70	0.97830	0.00068
8.65	0.97847	0.00067	8.15	0.97797	0.00064	7.75	0.98440	0.00063
8.70	0.98244	0.00065	8.20	0.98419	0.00065	7.80	0.98945	0.00066
8.75	0.98690	0.00066	8.25	0.98805	0.00066	7.85	0.99444	0.00066
8.80	0.99129	0.00067	8.30	0.99219	0.00068	7.90	0.99878	0.00066
8.85	0.99549	0.00065	8.35	0.99729	0.00064	7.95	1.00296	0.00068
8.90	1.00036	0.00065	8.40	1.00174	0.00066	8.00	1.00942	0.00064
8.95	1.00280	0.00067	8.45	1.00666	0.00064	8.05	1.01371	0.00065
9.00	1.00688	0.00064	8.50	1.00963	0.00065	8.10	1.01727	0.00065
9.05	1.01125	0.00066	8.55	1.01550	0.00066	8.15	1.02158	0.00068
9.10	1.01436	0.00068	8.60	1.01932	0.00066	8.20	1.02725	0.00066
9.15	1.01860	0.00068	8.65	1.02275	0.00069			
9.20	1.02390	0.00066	8.70	1.02758	0.00067			
			8.75	1.03162	0.00066			
			8.80	1.03717	0.00066			
			8.85	1.03914	0.00065			
			8.90	1.04436	0.00066			
			8.95	1.04635	0.00067			
			9.00	1.05217	0.00069			
			9.05	1.05743	0.00065			
			9.10	1.06028	0.00068			

Table B.1.2.3.1-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 0 Inches of Water Reflection (cont)

3000 milli-g/cc			4000 milli-g/cc			5000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.70	0.91015	0.00063	6.20	0.92358	0.00061	5.70	0.92242	0.00060
6.75	0.91702	0.00061	6.25	0.92917	0.00064	5.75	0.92954	0.00058
6.80	0.92246	0.00063	6.30	0.93558	0.00062	5.80	0.93534	0.00059
6.85	0.92959	0.00063	6.35	0.94394	0.00061	5.85	0.94369	0.00060
6.90	0.93364	0.00063	6.40	0.94977	0.00062	5.90	0.95130	0.00060
6.95	0.94004	0.00064	6.45	0.95529	0.00062	5.95	0.95764	0.00057
7.00	0.94568	0.00062	6.50	0.96203	0.00063	6.00	0.96434	0.00062
7.05	0.95084	0.00063	6.55	0.96723	0.00061	6.05	0.97143	0.00059
7.10	0.95637	0.00063	6.60	0.97488	0.00063	6.10	0.97901	0.00061
7.15	0.96183	0.00062	6.65	0.98135	0.00060	6.15	0.98508	0.00060
7.20	0.96840	0.00063	6.70	0.98720	0.00066	6.20	0.99408	0.00063
7.25	0.97313	0.00066	6.75	0.99251	0.00063	6.25	0.99996	0.00060
7.30	0.97849	0.00062	6.80	0.99950	0.00062	6.30	1.00649	0.00062
7.35	0.98414	0.00064	6.85	1.00428	0.00063	6.35	1.01325	0.00062
7.40	0.98945	0.00063	6.90	1.01002	0.00065	6.40	1.01896	0.00065
7.45	0.99627	0.00066	6.95	1.01720	0.00062	6.45	1.02455	0.00061
7.50	1.00086	0.00063	7.00	1.02145	0.00066	6.50	1.03175	0.00062
7.55	1.00604	0.00065						
7.60	1.01105	0.00064						
7.65	1.01555	0.00062						
7.70	1.02132	0.00065						

Table B.1.2.3.1-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 0 Inches of Water Reflection (cont)

6000 milli-g/cc			7000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.20	0.90817	0.00056	4.90	0.91522	0.00055	4.70	0.90779	0.00054
5.25	0.91582	0.00056	4.95	0.92309	0.00054	4.75	0.91674	0.00054
5.30	0.92298	0.00059	5.00	0.93208	0.00055	4.80	0.92437	0.00053
5.35	0.93111	0.00057	5.05	0.94126	0.00054	4.85	0.93525	0.00056
5.40	0.93981	0.00056	5.10	0.94953	0.00056	4.90	0.94265	0.00054
5.45	0.94637	0.00059	5.15	0.95772	0.00055	4.95	0.95205	0.00054
5.50	0.95443	0.00058	5.20	0.96569	0.00056	5.00	0.96063	0.00055
5.55	0.96400	0.00057	5.25	0.97435	0.00056	5.05	0.96944	0.00054
5.60	0.97008	0.00059	5.30	0.98152	0.00057	5.10	0.97806	0.00055
5.65	0.97664	0.00056	5.35	0.99071	0.00057	5.15	0.98638	0.00054
5.70	0.98631	0.00059	5.40	0.99799	0.00055	5.20	0.99399	0.00056
5.75	0.99397	0.00058	5.45	1.00740	0.00059	5.25	1.00230	0.00055
5.80	1.00020	0.00058	5.50	1.01411	0.00058	5.30	1.01120	0.00058
5.85	1.00706	0.00060	5.55	1.02279	0.00059	5.35	1.01983	0.00057
5.90	1.01566	0.00059	5.60	1.03086	0.00059	5.40	1.02743	0.00054
5.95	1.02264	0.00060						
6.00	1.02990	0.00059						

Table B.1.2.3.1-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 0 Inches of Water Reflection (cont)

8000 milli-g/cc			9000 milli-g/cc			10000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.60	0.91577	0.00052	4.30	0.91232	0.00050	4.10	0.92145	0.00050
4.65	0.92603	0.00053	4.35	0.92027	0.00050	4.15	0.93000	0.00049
4.70	0.93392	0.00053	4.40	0.93087	0.00050	4.20	0.94218	0.00049
4.75	0.94458	0.00054	4.45	0.93980	0.00049	4.25	0.95047	0.00049
4.80	0.95243	0.00052	4.50	0.94964	0.00051	4.30	0.96164	0.00051
4.85	0.96104	0.00054	4.55	0.95888	0.00053	4.35	0.97034	0.00051
4.90	0.96990	0.00053	4.60	0.96812	0.00053	4.40	0.98021	0.00051
4.95	0.97873	0.00054	4.65	0.97729	0.00050	4.45	0.98971	0.00050
5.00	0.98838	0.00054	4.70	0.98692	0.00053	4.50	1.00009	0.00050
5.05	0.99604	0.00055	4.75	0.99591	0.00052	4.55	1.01009	0.00052
5.10	1.00442	0.00056	4.80	1.00640	0.00052	4.60	1.01942	0.00052
5.15	1.01296	0.00054	4.85	1.01492	0.00052	4.65	1.02888	0.00053
5.20	1.02160	0.00055	4.90	1.02358	0.00053	4.70	1.03687	0.00052

Table B.1.2.3.1-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 0 Inches of Water Reflection (cont)

15000 milli-g/cc			19600 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
3.10	0.91661	0.00043	2.40	0.89758	0.00041			
3.12	0.92279	0.00043	2.42	0.90347	0.00042			
3.14	0.92716	0.00043	2.44	0.90988	0.00040			
3.16	0.93145	0.00043	2.46	0.91607	0.00042			
3.18	0.93669	0.00041	2.48	0.92226	0.00041			
3.20	0.94251	0.00043	2.50	0.92866	0.00042			
3.22	0.94675	0.00043	2.52	0.93313	0.00043			
3.24	0.95106	0.00044	2.54	0.94027	0.00042			
3.26	0.95696	0.00044	2.56	0.94686	0.00044			
3.28	0.96186	0.00045	2.58	0.95294	0.00042			
3.30	0.96695	0.00044	2.60	0.95943	0.00042			
3.32	0.97213	0.00044	2.62	0.96501	0.00042			
3.34	0.97676	0.00044	2.64	0.96998	0.00041			
3.36	0.98134	0.00045	2.66	0.97665	0.00044			
3.38	0.98677	0.00047	2.68	0.98242	0.00044			
3.40	0.99141	0.00046	2.70	0.98775	0.00043			
3.42	0.99657	0.00043	2.72	0.99433	0.00044			
3.44	1.00036	0.00045	2.74	1.00010	0.00046			
3.46	1.00530	0.00045	2.76	1.00611	0.00044			
3.48	1.01068	0.00044	2.78	1.01243	0.00047			
3.50	1.01586	0.00046	2.80	1.01742	0.00045			
3.52	1.01918	0.00046	2.82	1.02322	0.00045			
3.54	1.02493	0.00046	2.84	1.02955	0.00047			
3.56	1.03027	0.00047	2.86	1.03472	0.00048			
3.58	1.03462	0.00046	2.88	1.04019	0.00044			
3.60	1.03918	0.00048	2.90	1.04694	0.00045			

B.1.2.3.2. 1” Water Reflector

Case ID: pu-cyl-0950-01

Material: Plutonium metal in water

Geometry: Infinite Cylinder

Isotopics: 95% ^{239}Pu 5% ^{240}Pu

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.1.2.3.2-1. 95% ^{239}Pu Cylinder - 1 Inch of Water Reflection

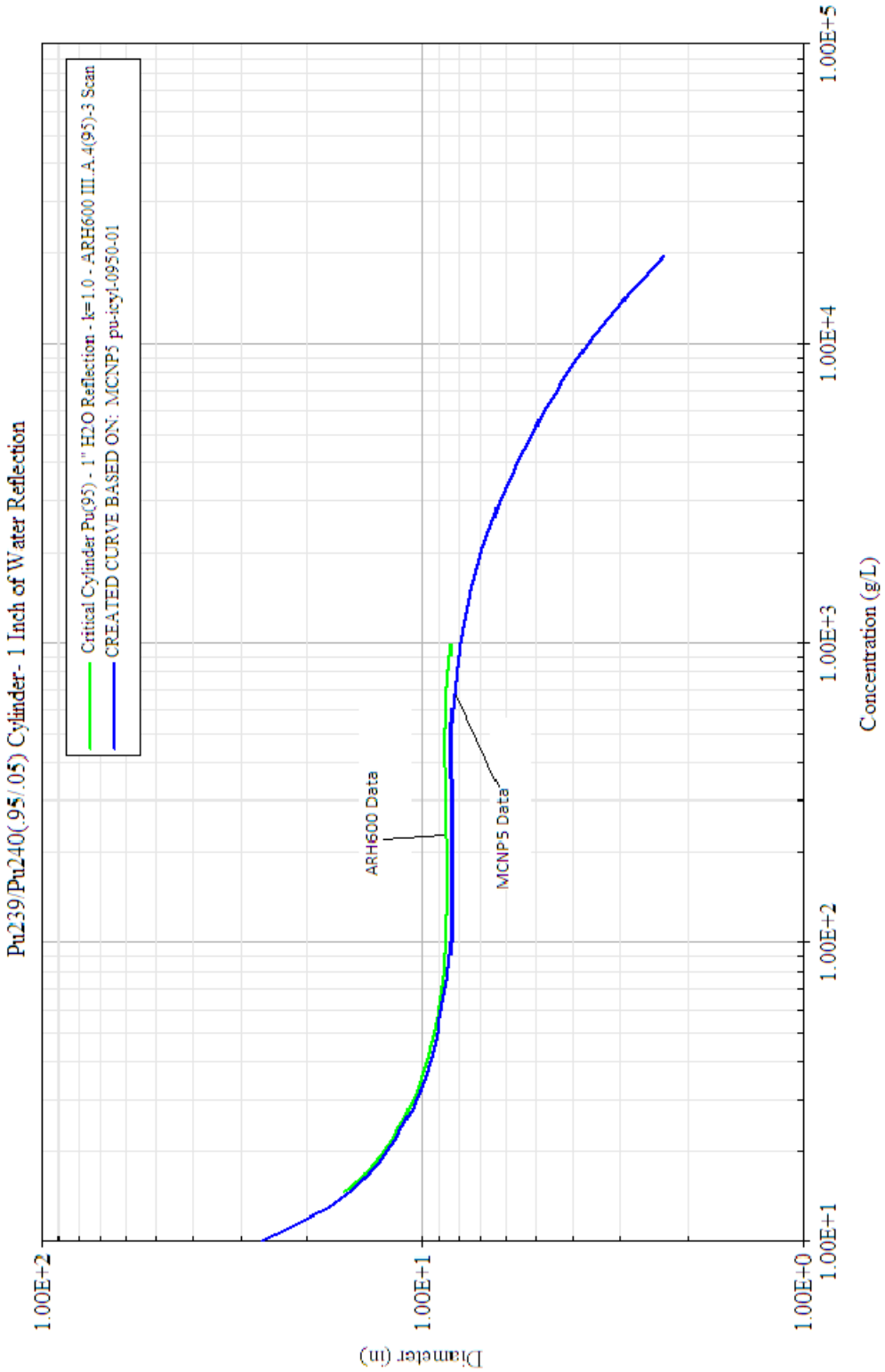

Table B.1.2.3.2-1. Critical Dimensions for 95% ^{239}Pu Cylinder - 1 Inch of Water Reflection

95% ^{239}Pu Cylinder - 1 Inch of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	19.400	28.100	0.400	26.3618
0.013	14.300	18.200	0.200	17.4557
0.015	12.800	15.800	0.100	15.1678
0.018	11.400	13.700	0.100	13.2308
0.020	10.700	12.800	0.100	12.4141
0.022	10.200	12.200	0.100	11.7715
0.024	9.900	11.600	0.050	11.3121
0.025	9.700	11.500	0.100	11.1074
0.026	9.600	11.300	0.050	10.9177
0.028	9.300	11.000	0.050	10.5935
0.030	9.100	10.700	0.050	10.3396
0.032	8.900	10.500	0.050	10.1225
0.036	8.600	10.200	0.050	9.7766
0.040	8.400	9.900	0.050	9.5036
0.045	8.200	9.500	0.050	9.2502
0.050	8.000	9.400	0.050	9.0602
0.075	7.600	8.900	0.050	8.5808
0.100	7.400	8.800	0.050	8.4039
0.150	7.300	8.600	0.050	8.3151
0.200	7.300	8.600	0.050	8.3050
0.350	7.300	8.600	0.050	8.3537
0.500	7.300	8.600	0.050	8.3406
0.750	7.200	8.400	0.050	8.1790
1.000	7.000	8.200	0.050	7.9469
1.500	6.500	7.700	0.050	7.4612
2.000	6.200	7.200	0.050	7.0035
2.500	5.800	6.800	0.050	6.5871
3.000	5.500	6.400	0.050	6.2252
4.000	5.000	5.800	0.050	5.6216
5.000	4.600	5.300	0.050	5.1372
6.000	4.200	4.900	0.050	4.7549
7.000	3.900	4.600	0.050	4.4166
7.500	3.800	4.400	0.050	4.2718
8.000	3.700	4.300	0.050	4.1330
9.000	3.400	4.000	0.050	3.8851
10.000	3.200	3.800	0.050	3.6619
15.000	2.500	2.900	0.020	2.8210
19.600	2.000	2.400	0.020	2.2910

MCNP5 Sample Input File
95% ^{239}Pu Cylinder- 1” Reflection

```
infcyl, 95.0 wt% 239Pu, 01000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 765   hundreths of inches - must be integer
c radius =     9.7155 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 01000 milli-g Pu/cc
c Reflector width =  1.0 inches
c Enrichment = 0.95 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0510 cc
c Volume of water in sample 0.9490 cc
c
c Mass of crit in sample   1.0000 g
c Mass of water in sample  0.9490 g
c
c Total mass of sample  1.9490g for a 1cc sample
c Mass Density for crit material  -1.9490, expressed as negative
c
c  infinite cylinder
20 11   -1.948980   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0

1        cz     9.7155              $ infinite cylinder
2        cz    12.2555         $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
```

```
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu/water mixture
m11    $ Pu/H2O Sludge, 95.0 wt% 239Pu, 01000 milli-g Pu/cc,  1.9490
1001.66c -0.054483
8016.66c -0.432428
94239.66c -0.487435
94240.66c -0.025654
mt11     lwtr.60t
c
c    pu only
m12    $ Pu/H2O Sludge, 95.0 wt% 239Pu, 01000 milli-g Pu/cc,  1.9490
94239.66c -0.950000
94240.66c -0.050000
c
```

Critview Compatible Data File
95% ^{239}Pu Cylinder- 1" Reflection

reset:
title: MCNP5 pu-icyl-0950-01
set: MCNP5 set
source: MCNP5 primary
created: Fri 07/16/2010 10:17:27.34
geometry: infcyl
modmat: H2O
critmat: plutonium
isomat: Pu239 0.95 Pu240 0.05
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	26.3618
0.013	17.4557
0.015	15.1678
0.018	13.2308
0.020	12.4141
0.022	11.7715
0.024	11.3121
0.025	11.1074
0.026	10.9177
0.028	10.5935
0.030	10.3396
0.032	10.1225
0.036	9.7766
0.040	9.5036
0.045	9.2502
0.050	9.0602
0.075	8.5808
0.100	8.4039
0.150	8.3151
0.200	8.3050
0.350	8.3537
0.500	8.3406
0.750	8.1790
1.000	7.9469
1.500	7.4612
2.000	7.0035
2.500	6.5871
3.000	6.2252
4.000	5.6216
5.000	5.1372
6.000	4.7549
7.000	4.4166
7.500	4.2718
8.000	4.1330
9.000	3.8851
10.00	3.6619
15.00	2.8210
19.60	2.2910

Table B.1.2.3.2-1. Critical Dimensions for 95% ^{239}Pu Cylinder - 1 Inch of Water Reflection

10 milli-g/cc			13 milli-g/cc			15 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
19.40	0.92677	0.00036	14.30	0.92447	0.00043	12.80	0.92573	0.00045
19.80	0.93264	0.00036	14.50	0.92990	0.00042	12.90	0.92907	0.00046
20.20	0.93840	0.00035	14.70	0.93634	0.00043	13.00	0.93386	0.00044
20.60	0.94341	0.00035	14.90	0.94099	0.00042	13.10	0.93503	0.00044
21.00	0.94923	0.00034	15.10	0.94673	0.00042	13.20	0.93983	0.00045
21.40	0.95349	0.00034	15.30	0.95207	0.00043	13.30	0.94270	0.00045
21.80	0.95836	0.00034	15.50	0.95670	0.00042	13.40	0.94735	0.00047
22.20	0.96211	0.00034	15.70	0.96188	0.00043	13.50	0.94976	0.00045
22.60	0.96608	0.00034	15.90	0.96602	0.00042	13.60	0.95303	0.00046
23.00	0.97056	0.00033	16.10	0.97100	0.00041	13.70	0.95798	0.00044
23.40	0.97410	0.00033	16.30	0.97548	0.00040	13.80	0.95984	0.00044
23.80	0.97809	0.00032	16.50	0.97948	0.00041	13.90	0.96319	0.00044
24.20	0.98200	0.00032	16.70	0.98332	0.00041	14.00	0.96562	0.00047
24.60	0.98593	0.00032	16.90	0.98825	0.00040	14.10	0.96866	0.00044
25.00	0.98926	0.00033	17.10	0.99146	0.00040	14.20	0.97244	0.00046
25.40	0.99208	0.00031	17.30	0.99691	0.00040	14.30	0.97532	0.00045
25.80	0.99529	0.00031	17.50	1.00088	0.00042	14.40	0.97981	0.00043
26.20	0.99871	0.00032	17.70	1.00393	0.00041	14.50	0.98117	0.00045
26.60	1.00190	0.00031	17.90	1.00803	0.00039	14.60	0.98380	0.00047
27.00	1.00407	0.00030	18.10	1.01167	0.00040	14.70	0.98635	0.00045
27.40	1.00641	0.00031	18.20	1.01278	0.00039	14.80	0.99015	0.00044
27.80	1.01013	0.00030				14.90	0.99198	0.00045
28.10	1.01173	0.00030				15.00	0.99401	0.00047
						15.10	0.99709	0.00043
						15.20	1.00138	0.00044
						15.30	1.00249	0.00043
						15.40	1.00624	0.00045
						15.50	1.00741	0.00044
						15.60	1.01150	0.00045
						15.70	1.01277	0.00044
						15.80	1.01613	0.00044

Table B.1.2.3.2-1. Critical Dimensions for 95% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

18 milli-g/cc			20 milli-g/cc			22 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.40	0.92540	0.00051	10.70	0.92179	0.00051	10.20	0.91943	0.00054
11.50	0.92986	0.00051	10.80	0.92690	0.00050	10.30	0.92572	0.00054
11.60	0.93476	0.00050	10.90	0.93210	0.00053	10.40	0.93202	0.00054
11.70	0.93974	0.00050	11.00	0.93737	0.00051	10.50	0.93702	0.00054
11.80	0.94251	0.00049	11.10	0.94220	0.00052	10.60	0.94250	0.00054
11.90	0.94735	0.00048	11.20	0.94741	0.00053	10.70	0.94685	0.00055
12.00	0.95171	0.00050	11.30	0.95199	0.00053	10.80	0.95252	0.00056
12.10	0.95585	0.00049	11.40	0.95672	0.00053	10.90	0.95879	0.00054
12.20	0.96008	0.00050	11.50	0.96029	0.00053	11.00	0.96152	0.00055
12.30	0.96434	0.00050	11.60	0.96523	0.00052	11.10	0.96666	0.00052
12.40	0.96945	0.00049	11.70	0.96964	0.00054	11.20	0.97297	0.00052
12.50	0.97276	0.00051	11.80	0.97353	0.00051	11.30	0.97769	0.00053
12.60	0.97607	0.00049	11.90	0.97874	0.00052	11.40	0.98214	0.00052
12.70	0.97991	0.00049	12.00	0.98320	0.00051	11.50	0.98660	0.00055
12.80	0.98387	0.00048	12.10	0.98721	0.00052	11.60	0.99187	0.00053
12.90	0.98818	0.00050	12.20	0.99180	0.00052	11.70	0.99804	0.00054
13.00	0.99147	0.00048	12.30	0.99537	0.00051	11.80	1.00078	0.00053
13.10	0.99517	0.00049	12.40	0.99935	0.00051	11.90	1.00540	0.00053
13.20	0.99906	0.00048	12.50	1.00397	0.00052	12.00	1.00913	0.00053
13.30	1.00211	0.00050	12.60	1.00823	0.00053	12.10	1.01423	0.00050
13.40	1.00609	0.00050	12.70	1.01185	0.00051	12.20	1.01832	0.00054
13.50	1.00867	0.00048	12.80	1.01625	0.00053			
13.60	1.01288	0.00047						
13.70	1.01573	0.00048						

Table B.1.2.3.2-1. Critical Dimensions for 95% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

24 milli-g/cc			25 milli-g/cc			26 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.90	0.92486	0.00056	9.70	0.92169	0.00059	9.60	0.92472	0.00056
9.95	0.92648	0.00054	9.80	0.92780	0.00058	9.65	0.92751	0.00055
10.00	0.92899	0.00057	9.90	0.93396	0.00056	9.70	0.93075	0.00055
10.05	0.93384	0.00055	10.00	0.94062	0.00055	9.75	0.93267	0.00059
10.10	0.93677	0.00054	10.10	0.94595	0.00057	9.80	0.93728	0.00056
10.15	0.93919	0.00054	10.20	0.95179	0.00055	9.85	0.94161	0.00057
10.20	0.94184	0.00055	10.30	0.95829	0.00057	9.90	0.94272	0.00054
10.25	0.94511	0.00055	10.40	0.96212	0.00055	9.95	0.94569	0.00056
10.30	0.94737	0.00055	10.50	0.96891	0.00054	10.00	0.94864	0.00056
10.35	0.94890	0.00056	10.60	0.97346	0.00054	10.05	0.95160	0.00056
10.40	0.95329	0.00055	10.70	0.97905	0.00055	10.10	0.95463	0.00056
10.45	0.95513	0.00055	10.80	0.98434	0.00057	10.15	0.95855	0.00058
10.50	0.95854	0.00054	10.90	0.98846	0.00056	10.20	0.96082	0.00054
10.55	0.96138	0.00054	11.00	0.99582	0.00056	10.25	0.96371	0.00055
10.60	0.96296	0.00054	11.10	0.99957	0.00056	10.30	0.96716	0.00055
10.65	0.96596	0.00056	11.20	1.00535	0.00055	10.35	0.97068	0.00059
10.70	0.96889	0.00056	11.30	1.01080	0.00056	10.40	0.97211	0.00055
10.75	0.97254	0.00055	11.40	1.01457	0.00054	10.45	0.97419	0.00057
10.80	0.97431	0.00056	11.50	1.01938	0.00054	10.50	0.97698	0.00055
10.85	0.97655	0.00053				10.55	0.98001	0.00056
10.90	0.97946	0.00055				10.60	0.98312	0.00057
10.95	0.98257	0.00053				10.65	0.98615	0.00058
11.00	0.98485	0.00057				10.70	0.98801	0.00055
11.05	0.98710	0.00055				10.75	0.99111	0.00056
11.10	0.98993	0.00052				10.80	0.99350	0.00057
11.15	0.99212	0.00056				10.85	0.99667	0.00056
11.20	0.99593	0.00053				10.90	0.99914	0.00054
11.25	0.99746	0.00057				10.95	1.00157	0.00055
11.30	0.99926	0.00055				11.00	1.00438	0.00055
11.35	1.00232	0.00055				11.05	1.00535	0.00053
11.40	1.00502	0.00053				11.10	1.00902	0.00057
11.45	1.00624	0.00052				11.15	1.01200	0.00054
11.50	1.00939	0.00056				11.20	1.01455	0.00057
11.55	1.01248	0.00055				11.25	1.01705	0.00055
11.60	1.01419	0.00053				11.30	1.01918	0.00057

Table B.1.2.3.2-1. Critical Dimensions for 95% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

28 milli-g/cc			30 milli-g/cc			32 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.30	0.92219	0.00057	9.10	0.92230	0.00061	8.90	0.91983	0.00059
9.35	0.92501	0.00056	9.15	0.92536	0.00061	8.95	0.92341	0.00061
9.40	0.92813	0.00059	9.20	0.92942	0.00057	9.00	0.92726	0.00059
9.45	0.93171	0.00057	9.25	0.93262	0.00059	9.05	0.93113	0.00060
9.50	0.93409	0.00058	9.30	0.93536	0.00060	9.10	0.93535	0.00058
9.55	0.93697	0.00057	9.35	0.93873	0.00059	9.15	0.93800	0.00060
9.60	0.94079	0.00059	9.40	0.94368	0.00056	9.20	0.94213	0.00058
9.65	0.94466	0.00058	9.45	0.94572	0.00057	9.25	0.94488	0.00062
9.70	0.94726	0.00057	9.50	0.94812	0.00057	9.30	0.94844	0.00061
9.75	0.95085	0.00056	9.55	0.95266	0.00058	9.35	0.95230	0.00062
9.80	0.95293	0.00057	9.60	0.95504	0.00059	9.40	0.95384	0.00060
9.85	0.95650	0.00059	9.65	0.95755	0.00058	9.45	0.95753	0.00058
9.90	0.95916	0.00055	9.70	0.96157	0.00056	9.50	0.96091	0.00057
9.95	0.96311	0.00058	9.75	0.96467	0.00061	9.55	0.96505	0.00060
10.00	0.96570	0.00055	9.80	0.96797	0.00060	9.60	0.96855	0.00060
10.05	0.96814	0.00056	9.85	0.97025	0.00060	9.65	0.97146	0.00060
10.10	0.97127	0.00058	9.90	0.97314	0.00060	9.70	0.97396	0.00058
10.15	0.97422	0.00056	9.95	0.97673	0.00058	9.75	0.97857	0.00059
10.20	0.97789	0.00057	10.00	0.97914	0.00059	9.80	0.98090	0.00060
10.25	0.98055	0.00059	10.05	0.98282	0.00058	9.85	0.98455	0.00058
10.30	0.98274	0.00056	10.10	0.98667	0.00057	9.90	0.98629	0.00056
10.35	0.98574	0.00059	10.15	0.99021	0.00059	9.95	0.98988	0.00060
10.40	0.98898	0.00059	10.20	0.99172	0.00059	10.00	0.99144	0.00060
10.45	0.99084	0.00057	10.25	0.99471	0.00058	10.05	0.99696	0.00059
10.50	0.99398	0.00056	10.30	0.99768	0.00059	10.10	0.99896	0.00057
10.55	0.99623	0.00057	10.35	1.00061	0.00060	10.15	1.00127	0.00059
10.60	1.00056	0.00056	10.40	1.00294	0.00056	10.20	1.00438	0.00061
10.65	1.00252	0.00055	10.45	1.00542	0.00059	10.25	1.00765	0.00058
10.70	1.00613	0.00057	10.50	1.00922	0.00057	10.30	1.01185	0.00058
10.75	1.00720	0.00057	10.55	1.01192	0.00058	10.35	1.01391	0.00057
10.80	1.01023	0.00058	10.60	1.01467	0.00060	10.40	1.01544	0.00060
10.85	1.01304	0.00058	10.65	1.01720	0.00060	10.45	1.01915	0.00059
10.90	1.01496	0.00057	10.70	1.02053	0.00057	10.50	1.02334	0.00059
10.95	1.01843	0.00059						
11.00	1.02086	0.00055						

Table B.1.2.3.2-1. Critical Dimensions for 95% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

36 milli-g/cc			40 milli-g/cc			45 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.60	0.91795	0.00060	8.40	0.92069	0.00061	8.20	0.92101	0.00061
8.65	0.92371	0.00062	8.45	0.92504	0.00060	8.25	0.92515	0.00061
8.70	0.92627	0.00064	8.50	0.92820	0.00064	8.30	0.92779	0.00063
8.75	0.92972	0.00061	8.55	0.93187	0.00060	8.35	0.93375	0.00062
8.80	0.93392	0.00062	8.60	0.93584	0.00061	8.40	0.93780	0.00065
8.85	0.93744	0.00060	8.65	0.93962	0.00062	8.45	0.94243	0.00062
8.90	0.94158	0.00061	8.70	0.94436	0.00058	8.50	0.94533	0.00061
8.95	0.94376	0.00061	8.75	0.94667	0.00063	8.55	0.94807	0.00062
9.00	0.94806	0.00060	8.80	0.95124	0.00061	8.60	0.95341	0.00061
9.05	0.95116	0.00062	8.85	0.95475	0.00062	8.65	0.95694	0.00063
9.10	0.95511	0.00061	8.90	0.95791	0.00065	8.70	0.95919	0.00064
9.15	0.95718	0.00061	8.95	0.96216	0.00061	8.75	0.96476	0.00062
9.20	0.96312	0.00059	9.00	0.96561	0.00063	8.80	0.96725	0.00062
9.25	0.96568	0.00060	9.05	0.96947	0.00061	8.85	0.97005	0.00063
9.30	0.96935	0.00061	9.10	0.97233	0.00063	8.90	0.97527	0.00062
9.35	0.97264	0.00062	9.15	0.97591	0.00063	8.95	0.97881	0.00062
9.40	0.97633	0.00061	9.20	0.98006	0.00061	9.00	0.98191	0.00065
9.45	0.97827	0.00059	9.25	0.98339	0.00062	9.05	0.98470	0.00064
9.50	0.98309	0.00060	9.30	0.98614	0.00062	9.10	0.98859	0.00064
9.55	0.98633	0.00061	9.35	0.99062	0.00062	9.15	0.99241	0.00063
9.60	0.98950	0.00059	9.40	0.99308	0.00061	9.20	0.99603	0.00063
9.65	0.99262	0.00059	9.45	0.99533	0.00063	9.25	0.99998	0.00061
9.70	0.99540	0.00061	9.50	0.99971	0.00061	9.30	1.00412	0.00064
9.75	0.99866	0.00059	9.55	1.00376	0.00063	9.35	1.00606	0.00063
9.80	1.00118	0.00061	9.60	1.00662	0.00062	9.40	1.01024	0.00062
9.85	1.00506	0.00060	9.65	1.01076	0.00064	9.45	1.01268	0.00060
9.90	1.00816	0.00060	9.70	1.01219	0.00062	9.50	1.01557	0.00061
9.95	1.01170	0.00059	9.75	1.01595	0.00060			
10.00	1.01529	0.00060	9.80	1.01966	0.00061			
10.05	1.01761	0.00060	9.85	1.02249	0.00060			
10.10	1.02094	0.00062	9.90	1.02523	0.00063			
10.15	1.02368	0.00058						
10.20	1.02702	0.00060						

Table B.1.2.3.2-1. Critical Dimensions for 95% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

50 milli-g/cc			75 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.00	0.91674	0.00061	7.60	0.91916	0.00064	7.40	0.91534	0.00066
8.05	0.92196	0.00065	7.65	0.92329	0.00066	7.45	0.91984	0.00066
8.10	0.92598	0.00064	7.70	0.92932	0.00068	7.50	0.92429	0.00065
8.15	0.93086	0.00062	7.75	0.93231	0.00069	7.55	0.92870	0.00066
8.20	0.93400	0.00063	7.80	0.93705	0.00064	7.60	0.93383	0.00071
8.25	0.93857	0.00062	7.85	0.94007	0.00066	7.65	0.93824	0.00067
8.30	0.94284	0.00062	7.90	0.94589	0.00067	7.70	0.94263	0.00068
8.35	0.94548	0.00062	7.95	0.94911	0.00066	7.75	0.94598	0.00067
8.40	0.95145	0.00063	8.00	0.95376	0.00066	7.80	0.95176	0.00067
8.45	0.95424	0.00064	8.05	0.95794	0.00064	7.85	0.95394	0.00064
8.50	0.95703	0.00063	8.10	0.96259	0.00066	7.90	0.95957	0.00066
8.55	0.96171	0.00065	8.15	0.96644	0.00069	7.95	0.96362	0.00069
8.60	0.96680	0.00064	8.20	0.97179	0.00068	8.00	0.96790	0.00069
8.65	0.96896	0.00065	8.25	0.97448	0.00068	8.05	0.97244	0.00068
8.70	0.97389	0.00064	8.30	0.97892	0.00066	8.10	0.97539	0.00067
8.75	0.97708	0.00063	8.35	0.98278	0.00064	8.15	0.98106	0.00070
8.80	0.98066	0.00063	8.40	0.98587	0.00067	8.20	0.98475	0.00067
8.85	0.98504	0.00064	8.45	0.98935	0.00069	8.25	0.98861	0.00070
8.90	0.98835	0.00063	8.50	0.99569	0.00067	8.30	0.99344	0.00066
8.95	0.99183	0.00061	8.55	0.99742	0.00069	8.35	0.99642	0.00069
9.00	0.99478	0.00063	8.60	1.00161	0.00067	8.40	0.99964	0.00069
9.05	0.99922	0.00063	8.65	1.00520	0.00068	8.45	1.00428	0.00067
9.10	1.00305	0.00064	8.70	1.00993	0.00066	8.50	1.00683	0.00067
9.15	1.00627	0.00063	8.75	1.01402	0.00066	8.55	1.01194	0.00064
9.20	1.01064	0.00065	8.80	1.01761	0.00067	8.60	1.01627	0.00067
9.25	1.01329	0.00064	8.85	1.02280	0.00070	8.65	1.01822	0.00069
9.30	1.01666	0.00064	8.90	1.02437	0.00067	8.70	1.02387	0.00068
9.35	1.02027	0.00063				8.75	1.02721	0.00069
9.40	1.02329	0.00064				8.80	1.02957	0.00067

Table B.1.2.3.2-1. Critical Dimensions for 95% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

150 milli-g/cc			200 milli-g/cc			350 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.30	0.91441	0.00069	7.30	0.91729	0.00070	7.30	0.91578	0.00067
7.35	0.91974	0.00068	7.35	0.92050	0.00070	7.35	0.92097	0.00067
7.40	0.92493	0.00069	7.40	0.92575	0.00069	7.40	0.92579	0.00066
7.45	0.92871	0.00069	7.45	0.93125	0.00067	7.45	0.93062	0.00069
7.50	0.93322	0.00066	7.50	0.93577	0.00067	7.50	0.93291	0.00068
7.55	0.93759	0.00067	7.55	0.93947	0.00069	7.55	0.93812	0.00069
7.60	0.94336	0.00067	7.60	0.94213	0.00067	7.60	0.94174	0.00065
7.65	0.94670	0.00068	7.65	0.94747	0.00070	7.65	0.94541	0.00068
7.70	0.95106	0.00067	7.70	0.95181	0.00068	7.70	0.94907	0.00067
7.75	0.95555	0.00070	7.75	0.95590	0.00069	7.75	0.95368	0.00069
7.80	0.95900	0.00070	7.80	0.96024	0.00069	7.80	0.95798	0.00067
7.85	0.96366	0.00069	7.85	0.96388	0.00069	7.85	0.96255	0.00071
7.90	0.96682	0.00067	7.90	0.96745	0.00070	7.90	0.96532	0.00068
7.95	0.97122	0.00071	7.95	0.97163	0.00070	7.95	0.96941	0.00068
8.00	0.97700	0.00067	8.00	0.97478	0.00067	8.00	0.97414	0.00069
8.05	0.97967	0.00070	8.05	0.97999	0.00071	8.05	0.97837	0.00067
8.10	0.98491	0.00071	8.10	0.98458	0.00063	8.10	0.98078	0.00068
8.15	0.98908	0.00070	8.15	0.98735	0.00069	8.15	0.98525	0.00067
8.20	0.99084	0.00070	8.20	0.99233	0.00070	8.20	0.98785	0.00069
8.25	0.99580	0.00065	8.25	0.99683	0.00066	8.25	0.99204	0.00070
8.30	0.99850	0.00069	8.30	0.99967	0.00068	8.30	0.99635	0.00066
8.35	1.00347	0.00069	8.35	1.00299	0.00069	8.35	0.99971	0.00068
8.40	1.00807	0.00067	8.40	1.00664	0.00069	8.40	1.00364	0.00068
8.45	1.01316	0.00069	8.45	1.01081	0.00067	8.45	1.00785	0.00066
8.50	1.01455	0.00068	8.50	1.01473	0.00070	8.50	1.01010	0.00069
8.55	1.01870	0.00067	8.55	1.01876	0.00069	8.55	1.01561	0.00070
8.60	1.02374	0.00070	8.60	1.02219	0.00069	8.60	1.01825	0.00068

Table B.1.2.3.2-1. Critical Dimensions for 95% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

500 milli-g/cc			750 milli-g/cc			1000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.30	0.92038	0.00068	7.20	0.92196	0.00064	7.00	0.92275	0.00065
7.35	0.92450	0.00067	7.25	0.92761	0.00069	7.05	0.92558	0.00066
7.40	0.92813	0.00065	7.30	0.93167	0.00067	7.10	0.93158	0.00068
7.45	0.93274	0.00070	7.35	0.93784	0.00067	7.15	0.93708	0.00066
7.50	0.93672	0.00067	7.40	0.93944	0.00064	7.20	0.93915	0.00068
7.55	0.94058	0.00069	7.45	0.94482	0.00068	7.25	0.94408	0.00066
7.60	0.94424	0.00066	7.50	0.94830	0.00066	7.30	0.94789	0.00065
7.65	0.94999	0.00070	7.55	0.95248	0.00068	7.35	0.95184	0.00067
7.70	0.95136	0.00069	7.60	0.95631	0.00066	7.40	0.95540	0.00063
7.75	0.95665	0.00070	7.65	0.96122	0.00066	7.45	0.95898	0.00066
7.80	0.96023	0.00065	7.70	0.96337	0.00067	7.50	0.96385	0.00068
7.85	0.96457	0.00066	7.75	0.96777	0.00067	7.55	0.96831	0.00070
7.90	0.96919	0.00070	7.80	0.97174	0.00066	7.60	0.97345	0.00068
7.95	0.97178	0.00070	7.85	0.97646	0.00067	7.65	0.97632	0.00068
8.00	0.97646	0.00069	7.90	0.97925	0.00068	7.70	0.97972	0.00069
8.05	0.97962	0.00070	7.95	0.98386	0.00068	7.75	0.98453	0.00067
8.10	0.98319	0.00070	8.00	0.98572	0.00068	7.80	0.98820	0.00069
8.15	0.98680	0.00068	8.05	0.99040	0.00067	7.85	0.99153	0.00064
8.20	0.99010	0.00068	8.10	0.99397	0.00066	7.90	0.99532	0.00065
8.25	0.99507	0.00065	8.15	0.99829	0.00067	7.95	1.00031	0.00065
8.30	0.99719	0.00072	8.20	1.00124	0.00068	8.00	1.00323	0.00067
8.35	1.00065	0.00068	8.25	1.00433	0.00068	8.05	1.00736	0.00068
8.40	1.00503	0.00068	8.30	1.00862	0.00068	8.10	1.01050	0.00066
8.45	1.00821	0.00069	8.35	1.01236	0.00068	8.15	1.01494	0.00065
8.50	1.01303	0.00068	8.40	1.01534	0.00067	8.20	1.01840	0.00066
8.55	1.01632	0.00068						
8.60	1.01818	0.00068						

Table B.1.2.3.2-1. Critical Dimensions for 95% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

1500 milli-g/cc			2000 milli-g/cc			2500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.50	0.91421	0.00066	6.20	0.92196	0.00067	5.80	0.91821	0.00062
6.55	0.91842	0.00068	6.25	0.92889	0.00064	5.85	0.92341	0.00067
6.60	0.92351	0.00065	6.30	0.93301	0.00064	5.90	0.92753	0.00064
6.65	0.92828	0.00063	6.35	0.93833	0.00068	5.95	0.93338	0.00065
6.70	0.93372	0.00067	6.40	0.94326	0.00067	6.00	0.93908	0.00068
6.75	0.93737	0.00067	6.45	0.94871	0.00064	6.05	0.94479	0.00065
6.80	0.94281	0.00066	6.50	0.95282	0.00066	6.10	0.94966	0.00067
6.85	0.94630	0.00064	6.55	0.95719	0.00067	6.15	0.95565	0.00066
6.90	0.95247	0.00069	6.60	0.96276	0.00063	6.20	0.96082	0.00066
6.95	0.95589	0.00068	6.65	0.96858	0.00064	6.25	0.96718	0.00065
7.00	0.96093	0.00067	6.70	0.97380	0.00066	6.30	0.97132	0.00067
7.05	0.96561	0.00066	6.75	0.97626	0.00065	6.35	0.97700	0.00066
7.10	0.96921	0.00068	6.80	0.98203	0.00068	6.40	0.98085	0.00064
7.15	0.97426	0.00067	6.85	0.98631	0.00064	6.45	0.98567	0.00065
7.20	0.97829	0.00069	6.90	0.99132	0.00066	6.50	0.99138	0.00062
7.25	0.98280	0.00066	6.95	0.99509	0.00067	6.55	0.99562	0.00066
7.30	0.98627	0.00066	7.00	0.99960	0.00065	6.60	1.00152	0.00066
7.35	0.99080	0.00067	7.05	1.00531	0.00066	6.65	1.00641	0.00063
7.40	0.99387	0.00067	7.10	1.00875	0.00067	6.70	1.01240	0.00065
7.45	0.99887	0.00065	7.15	1.01376	0.00069	6.75	1.01594	0.00063
7.50	1.00390	0.00066	7.20	1.01920	0.00066	6.80	1.02206	0.00067
7.55	1.00645	0.00065						
7.60	1.01165	0.00065						
7.65	1.01473	0.00067						
7.70	1.01964	0.00065						

Table B.1.2.3.2-1. Critical Dimensions for 95% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

3000 milli-g/cc			4000 milli-g/cc			5000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.50	0.91826	0.00065	5.00	0.91924	0.00065	4.60	0.92251	0.00062
5.55	0.92355	0.00068	5.05	0.92712	0.00062	4.65	0.92973	0.00063
5.60	0.93023	0.00066	5.10	0.93281	0.00065	4.70	0.93667	0.00062
5.65	0.93677	0.00068	5.15	0.94070	0.00065	4.75	0.94547	0.00062
5.70	0.94126	0.00065	5.20	0.94781	0.00062	4.80	0.95198	0.00064
5.75	0.94767	0.00066	5.25	0.95425	0.00065	4.85	0.95940	0.00064
5.80	0.95391	0.00063	5.30	0.96064	0.00064	4.90	0.96608	0.00060
5.85	0.95797	0.00062	5.35	0.96670	0.00065	4.95	0.97278	0.00063
5.90	0.96484	0.00068	5.40	0.97325	0.00062	5.00	0.97998	0.00061
5.95	0.96956	0.00063	5.45	0.97925	0.00061	5.05	0.98675	0.00064
6.00	0.97608	0.00066	5.50	0.98604	0.00063	5.10	0.99456	0.00063
6.05	0.98211	0.00066	5.55	0.99118	0.00066	5.15	1.00188	0.00066
6.10	0.98638	0.00066	5.60	0.99746	0.00066	5.20	1.00780	0.00062
6.15	0.99222	0.00064	5.65	1.00333	0.00063	5.25	1.01491	0.00064
6.20	0.99786	0.00064	5.70	1.01041	0.00065	5.30	1.02185	0.00062
6.25	1.00210	0.00063	5.75	1.01570	0.00065			
6.30	1.00909	0.00066	5.80	1.02225	0.00066			
6.35	1.01537	0.00066						
6.40	1.01812	0.00069						

Table B.1.2.3.2-1. Critical Dimensions for 95% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

6000 milli-g/cc			7000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.20	0.91193	0.00061	3.90	0.91115	0.00059	3.80	0.91474	0.00059
4.25	0.92029	0.00059	3.95	0.91941	0.00059	3.85	0.92480	0.00057
4.30	0.92916	0.00061	4.00	0.92919	0.00059	3.90	0.93277	0.00060
4.35	0.93775	0.00060	4.05	0.93749	0.00060	3.95	0.94350	0.00061
4.40	0.94492	0.00063	4.10	0.94476	0.00060	4.00	0.95088	0.00059
4.45	0.95344	0.00064	4.15	0.95450	0.00060	4.05	0.96182	0.00062
4.50	0.96183	0.00064	4.20	0.96289	0.00060	4.10	0.96993	0.00060
4.55	0.96898	0.00062	4.25	0.97151	0.00059	4.15	0.97930	0.00062
4.60	0.97732	0.00062	4.30	0.98030	0.00064	4.20	0.98720	0.00062
4.65	0.98484	0.00063	4.35	0.98829	0.00063	4.25	0.99586	0.00062
4.70	0.99319	0.00061	4.40	0.99728	0.00061	4.30	1.00535	0.00063
4.75	0.99918	0.00061	4.45	1.00549	0.00061	4.35	1.01375	0.00062
4.80	1.00762	0.00059	4.50	1.01450	0.00061	4.40	1.02192	0.00060
4.85	1.01541	0.00066	4.55	1.02224	0.00063			
4.90	1.02300	0.00063	4.60	1.02972	0.00060			

Table B.1.2.3.2-1. Critical Dimensions for 95% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

8000 milli-g/cc			9000 milli-g/cc			10000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
3.70	0.91955	0.00058	3.40	0.90240	0.00057	3.20	0.90114	0.00058
3.75	0.92757	0.00059	3.45	0.91353	0.00059	3.25	0.91250	0.00056
3.80	0.93863	0.00059	3.50	0.92304	0.00055	3.30	0.92373	0.00054
3.85	0.94795	0.00060	3.55	0.93379	0.00057	3.35	0.93394	0.00057
3.90	0.95830	0.00058	3.60	0.94472	0.00059	3.40	0.94489	0.00057
3.95	0.96737	0.00059	3.65	0.95369	0.00057	3.45	0.95612	0.00057
4.00	0.97544	0.00059	3.70	0.96341	0.00058	3.50	0.96604	0.00060
4.05	0.98529	0.00058	3.75	0.97440	0.00060	3.55	0.97668	0.00057
4.10	0.99415	0.00061	3.80	0.98396	0.00062	3.60	0.98669	0.00057
4.15	1.00301	0.00059	3.85	0.99315	0.00059	3.65	0.99773	0.00059
4.20	1.01233	0.00061	3.90	1.00292	0.00061	3.70	1.00725	0.00060
4.25	1.02082	0.00063	3.95	1.01202	0.00061	3.75	1.01734	0.00061
4.30	1.02954	0.00063	4.00	1.02218	0.00059	3.80	1.02774	0.00057

Table B.1.2.3.2-1. Critical Dimensions for 95% ^{239}Pu Cylinder - 1 Inch of Water Reflection (cont)

15000 milli-g/cc			19600 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
2.50	0.91175	0.00051	2.00	0.90107	0.00049			
2.52	0.91839	0.00052	2.02	0.90822	0.00049			
2.54	0.92369	0.00051	2.04	0.91506	0.00048			
2.56	0.92973	0.00052	2.06	0.92213	0.00050			
2.58	0.93443	0.00051	2.08	0.92831	0.00047			
2.60	0.94081	0.00049	2.10	0.93607	0.00049			
2.62	0.94655	0.00052	2.12	0.94307	0.00051			
2.64	0.95169	0.00053	2.14	0.94920	0.00049			
2.66	0.95727	0.00054	2.16	0.95664	0.00050			
2.68	0.96200	0.00052	2.18	0.96411	0.00049			
2.70	0.96703	0.00053	2.20	0.96955	0.00055			
2.72	0.97315	0.00054	2.22	0.97689	0.00052			
2.74	0.97831	0.00054	2.24	0.98462	0.00052			
2.76	0.98322	0.00054	2.26	0.99042	0.00052			
2.78	0.98979	0.00054	2.28	0.99666	0.00051			
2.80	0.99518	0.00053	2.30	1.00276	0.00049			
2.82	0.99967	0.00052	2.32	1.00984	0.00052			
2.84	1.00606	0.00054	2.34	1.01671	0.00051			
2.86	1.01051	0.00054	2.36	1.02232	0.00053			
2.88	1.01542	0.00052	2.38	1.02963	0.00051			
2.90	1.02130	0.00055	2.40	1.03597	0.00054			

B.1.2.3.3. 10” Water Reflector

Case ID: pu-cyl-0950-10

Material: Plutonium metal in water

Geometry: Infinite Cylinder

Isotopics: 95% ^{239}Pu 5% ^{240}Pu

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.1.2.3.3-1. 95% ^{239}Pu Cylinder- 10 Inches of Water Reflection

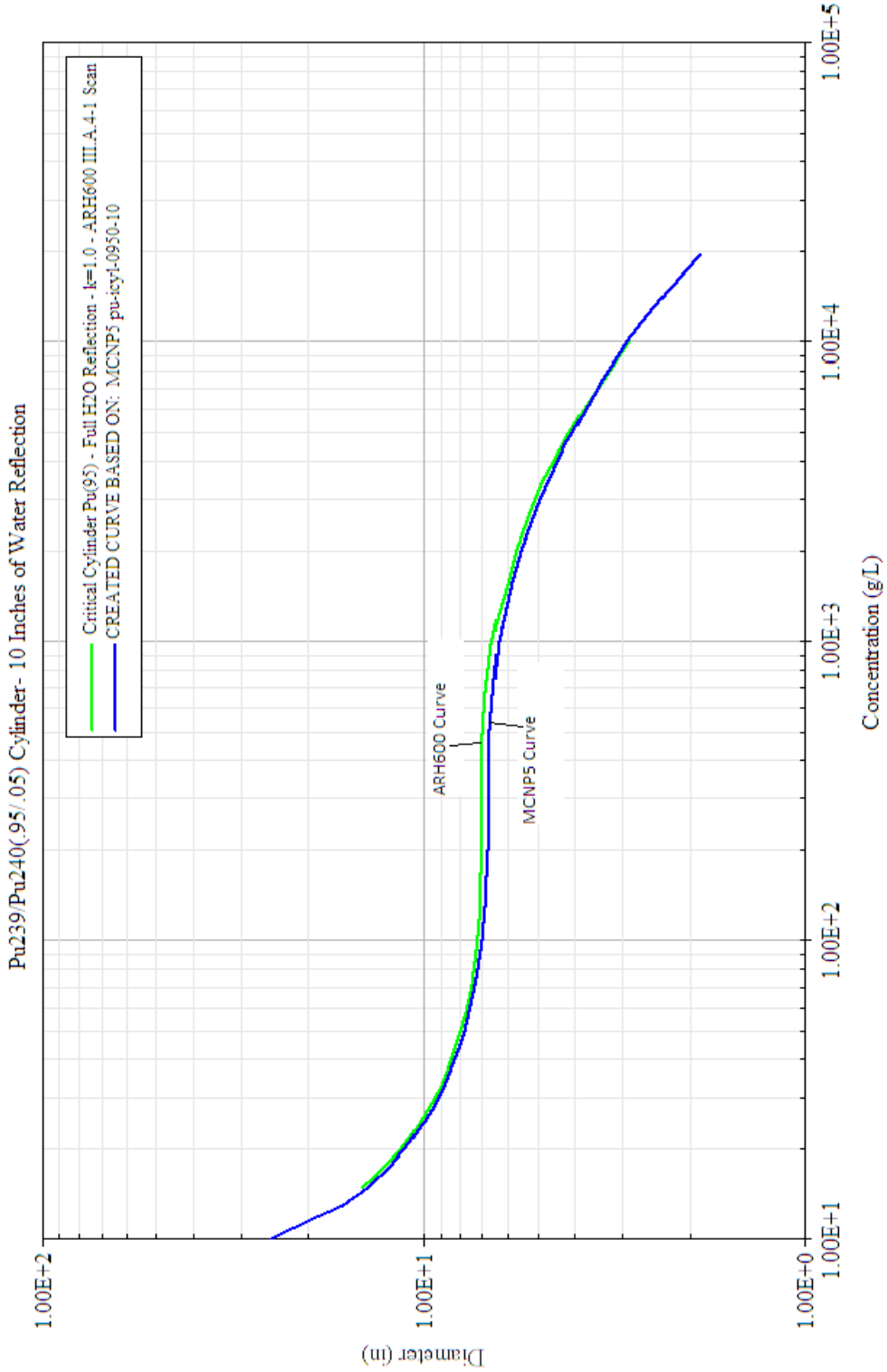

Table B.1.2.3.3-1. Critical Dimensions for 95% ^{239}Pu Cylinder - 10 Inches of Water Reflection

95% ^{239}Pu Cylinder - 10 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.010	18.200	27.200	0.400	25.2822
0.013	13.200	17.200	0.200	16.3522
0.015	11.700	14.700	0.100	14.0660
0.018	10.200	12.600	0.100	12.0885
0.020	9.600	11.700	0.100	11.2678
0.022	9.100	11.000	0.100	10.6358
0.024	8.700	10.500	0.100	10.1423
0.025	8.600	10.200	0.050	9.9481
0.026	8.400	10.100	0.050	9.7541
0.028	8.200	9.800	0.050	9.4276
0.030	7.900	9.600	0.050	9.1545
0.032	7.700	9.200	0.050	8.9230
0.036	7.500	8.900	0.050	8.5642
0.040	7.200	8.600	0.050	8.2853
0.045	7.000	8.300	0.050	8.0053
0.050	6.800	8.100	0.050	7.7901
0.075	6.300	7.500	0.050	7.2375
0.100	6.100	7.300	0.050	7.0133
0.150	5.900	7.100	0.050	6.8440
0.200	5.900	7.000	0.050	6.7769
0.350	5.800	7.000	0.050	6.7249
0.500	5.700	6.900	0.050	6.6798
0.750	5.600	6.800	0.050	6.5305
1.000	5.400	6.600	0.050	6.3285
1.500	5.100	6.200	0.050	5.9299
2.000	4.800	5.800	0.050	5.5525
2.500	4.500	5.400	0.050	5.2166
3.000	4.200	5.100	0.050	4.9294
4.000	3.900	4.700	0.050	4.4578
5.000	3.500	4.200	0.050	4.0784
6.000	3.300	3.900	0.050	3.7699
7.000	3.100	3.700	0.050	3.5078
7.500	3.000	3.500	0.020	3.3944
8.000	2.900	3.400	0.020	3.2870
9.000	2.700	3.200	0.020	3.0937
10.000	2.500	3.100	0.050	2.9236
15.000	2.000	2.400	0.020	2.2785
19.600	1.600	2.000	0.020	1.8809

MCNP5 Sample Input File
95% ^{239}Pu Cylinder- 10” Reflection

```
infcyl, 95.0 wt% 239Pu, 01000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 605   hundreths of inches - must be integer
c radius =     7.6835 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 01000 milli-g Pu/cc
c Reflector width =  10.0 inches
c Enrichment = 0.95 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0510 cc
c Volume of water in sample 0.9490 cc
c
c Mass of crit in sample   1.0000 g
c Mass of water in sample  0.9490 g
c
c Total mass of sample  1.9490g for a 1cc sample
c Mass Density for crit material  -1.9490, expressed as negative
c
c  infinite cylinder
20 11   -1.948980   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0

1       cz     7.6835              $ infinite cylinder
2       cz    33.0835         $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
```

```
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu/water mixture
m11    $ Pu/H2O Sludge, 95.0 wt% 239Pu, 01000 milli-g Pu/cc,  1.9490
1001.66c -0.054483
8016.66c -0.432428
94239.66c -0.487435
94240.66c -0.025654
mt11     lwtr.60t
c
c    pu only
m12    $ Pu/H2O Sludge, 95.0 wt% 239Pu, 01000 milli-g Pu/cc,  1.9490
94239.66c -0.950000
94240.66c -0.050000
c
```

Critview Compatible Data File
95% ^{239}Pu Cylinder- 1" Reflection

reset:
title: MCNP5 pu-icyl-0950-10
set: MCNP5 set
source: MCNP5 primary
created: Fri 07/16/2010 10:53:20.29
geometry: infcyl
modmat: H2O
critmat: plutonium
isomat: Pu239 0.95 Pu240 0.05
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.010	25.2822
0.013	16.3522
0.015	14.0660
0.018	12.0885
0.020	11.2678
0.022	10.6358
0.024	10.1423
0.025	9.9481
0.026	9.7541
0.028	9.4276
0.030	9.1545
0.032	8.9230
0.036	8.5642
0.040	8.2853
0.045	8.0053
0.050	7.7901
0.075	7.2375
0.100	7.0133
0.150	6.8440
0.200	6.7769
0.350	6.7249
0.500	6.6798
0.750	6.5305
1.000	6.3285
1.500	5.9299
2.000	5.5525
2.500	5.2166
3.000	4.9294
4.000	4.4578
5.000	4.0784
6.000	3.7699
7.000	3.5078
7.500	3.3944
8.000	3.2870
9.000	3.0937
10.00	2.9236
15.00	2.2785
19.60	1.8809

Table B.1.2.3.3-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 10 Inches of Water Reflection

10 milli-g/cc			13 milli-g/cc			15 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
18.20	0.92547	0.00034	13.20	0.92451	0.00040	11.70	0.92586	0.00041
18.60	0.93153	0.00034	13.40	0.93048	0.00042	11.80	0.92921	0.00044
19.00	0.93701	0.00035	13.60	0.93516	0.00040	11.90	0.93233	0.00043
19.40	0.94198	0.00034	13.80	0.94144	0.00040	12.00	0.93692	0.00043
19.80	0.94746	0.00033	14.00	0.94646	0.00039	12.10	0.93982	0.00043
20.20	0.95220	0.00034	14.20	0.95042	0.00041	12.20	0.94245	0.00044
20.60	0.95675	0.00031	14.40	0.95641	0.00040	12.30	0.94679	0.00041
21.00	0.96194	0.00032	14.60	0.96125	0.00040	12.40	0.95143	0.00044
21.40	0.96596	0.00033	14.80	0.96623	0.00039	12.50	0.95363	0.00043
21.80	0.97042	0.00032	15.00	0.97190	0.00037	12.60	0.95682	0.00044
22.20	0.97362	0.00031	15.20	0.97613	0.00040	12.70	0.95910	0.00044
22.60	0.97779	0.00031	15.40	0.98008	0.00039	12.80	0.96314	0.00042
23.00	0.98175	0.00032	15.60	0.98391	0.00040	12.90	0.96637	0.00042
23.40	0.98540	0.00031	15.80	0.98888	0.00039	13.00	0.96977	0.00043
23.80	0.98847	0.00030	16.00	0.99224	0.00038	13.10	0.97290	0.00043
24.20	0.99209	0.00031	16.20	0.99723	0.00040	13.20	0.97508	0.00044
24.60	0.99504	0.00031	16.40	1.00087	0.00039	13.30	0.97841	0.00042
25.00	0.99746	0.00030	16.60	1.00481	0.00038	13.40	0.98156	0.00043
25.40	1.00106	0.00031	16.80	1.00776	0.00037	13.50	0.98391	0.00043
25.80	1.00350	0.00029	17.00	1.01162	0.00040	13.60	0.98659	0.00044
26.20	1.00596	0.00030	17.20	1.01547	0.00038	13.70	0.98988	0.00042
26.60	1.00964	0.00030				13.80	0.99234	0.00043
27.00	1.01155	0.00029				13.90	0.99513	0.00042
27.20	1.01290	0.00028				14.00	0.99728	0.00042
						14.10	1.00140	0.00043
						14.20	1.00371	0.00043
						14.30	1.00655	0.00042
						14.40	1.00908	0.00041
						14.50	1.01156	0.00042
						14.60	1.01400	0.00042
						14.70	1.01651	0.00042

Table B.1.2.3.3-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

18 milli-g/cc			20 milli-g/cc			22 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K^{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.20	0.92105	0.00049	9.60	0.92379	0.00049	9.10	0.92285	0.00051
10.30	0.92631	0.00046	9.70	0.92783	0.00048	9.20	0.92794	0.00050
10.40	0.93105	0.00048	9.80	0.93406	0.00051	9.30	0.93281	0.00052
10.50	0.93462	0.00047	9.90	0.93810	0.00048	9.40	0.93822	0.00052
10.60	0.93942	0.00047	10.00	0.94381	0.00047	9.50	0.94428	0.00048
10.70	0.94419	0.00047	10.10	0.94671	0.00048	9.60	0.94937	0.00050
10.80	0.94852	0.00047	10.20	0.95296	0.00048	9.70	0.95480	0.00048
10.90	0.95397	0.00046	10.30	0.95738	0.00049	9.80	0.95875	0.00051
11.00	0.95690	0.00046	10.40	0.96272	0.00047	9.90	0.96543	0.00050
11.10	0.96193	0.00046	10.50	0.96653	0.00048	10.00	0.96982	0.00052
11.20	0.96562	0.00046	10.60	0.97153	0.00050	10.10	0.97549	0.00050
11.30	0.96986	0.00047	10.70	0.97598	0.00048	10.20	0.98027	0.00049
11.40	0.97398	0.00047	10.80	0.98088	0.00049	10.30	0.98504	0.00051
11.50	0.97795	0.00047	10.90	0.98503	0.00048	10.40	0.98893	0.00050
11.60	0.98188	0.00046	11.00	0.98958	0.00048	10.50	0.99340	0.00051
11.70	0.98490	0.00047	11.10	0.99364	0.00046	10.60	0.99794	0.00051
11.80	0.98935	0.00045	11.20	0.99673	0.00048	10.70	1.00369	0.00051
11.90	0.99243	0.00046	11.30	1.00155	0.00048	10.80	1.00724	0.00049
12.00	0.99614	0.00045	11.40	1.00500	0.00048	10.90	1.01237	0.00049
12.10	1.00050	0.00046	11.50	1.00989	0.00047	11.00	1.01619	0.00047
12.20	1.00301	0.00045	11.60	1.01317	0.00048			
12.30	1.00713	0.00046	11.70	1.01897	0.00045			
12.40	1.01069	0.00048						
12.50	1.01399	0.00047						
12.60	1.01740	0.00047						

Table B.1.2.3.3-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

24 milli-g/cc			25 milli-g/cc			26 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.70	0.92062	0.00051	8.60	0.92529	0.00052	8.40	0.92132	0.00054
8.80	0.92660	0.00053	8.65	0.92764	0.00051	8.45	0.92493	0.00054
8.90	0.93318	0.00051	8.70	0.92996	0.00052	8.50	0.92739	0.00051
9.00	0.93708	0.00049	8.75	0.93361	0.00052	8.55	0.92991	0.00051
9.10	0.94388	0.00050	8.80	0.93679	0.00051	8.60	0.93368	0.00052
9.20	0.94977	0.00053	8.85	0.93900	0.00052	8.65	0.93683	0.00052
9.30	0.95522	0.00053	8.90	0.94374	0.00051	8.70	0.94019	0.00053
9.40	0.96133	0.00053	8.95	0.94569	0.00051	8.75	0.94344	0.00053
9.50	0.96694	0.00051	9.00	0.94902	0.00053	8.80	0.94613	0.00054
9.60	0.97235	0.00050	9.05	0.95133	0.00052	8.85	0.94872	0.00054
9.70	0.97732	0.00052	9.10	0.95513	0.00050	8.90	0.95310	0.00051
9.80	0.98304	0.00050	9.15	0.95770	0.00052	8.95	0.95570	0.00053
9.90	0.98817	0.00051	9.20	0.95992	0.00050	9.00	0.95910	0.00052
10.00	0.99379	0.00054	9.25	0.96319	0.00051	9.05	0.96101	0.00055
10.10	0.99769	0.00052	9.30	0.96575	0.00051	9.10	0.96449	0.00050
10.20	1.00315	0.00051	9.35	0.96797	0.00054	9.15	0.96700	0.00051
10.30	1.00667	0.00052	9.40	0.97104	0.00051	9.20	0.96902	0.00051
10.40	1.01306	0.00051	9.45	0.97414	0.00052	9.25	0.97154	0.00054
10.50	1.01798	0.00052	9.50	0.97733	0.00051	9.30	0.97549	0.00052
			9.55	0.97910	0.00052	9.35	0.97788	0.00050
			9.60	0.98282	0.00053	9.40	0.98196	0.00053
			9.65	0.98493	0.00052	9.45	0.98438	0.00052
			9.70	0.98821	0.00051	9.50	0.98618	0.00053
			9.75	0.99073	0.00053	9.55	0.98939	0.00052
			9.80	0.99331	0.00051	9.60	0.99155	0.00052
			9.85	0.99534	0.00052	9.65	0.99533	0.00052
			9.90	0.99724	0.00053	9.70	0.99632	0.00051
			9.95	1.00011	0.00053	9.75	0.99980	0.00051
			10.00	1.00264	0.00050	9.80	1.00226	0.00051
			10.05	1.00553	0.00052	9.85	1.00529	0.00053
			10.10	1.00809	0.00050	9.90	1.00758	0.00051
			10.15	1.01033	0.00051	9.95	1.01210	0.00054
			10.20	1.01296	0.00052	10.00	1.01358	0.00051
						10.05	1.01481	0.00052
						10.10	1.01901	0.00049

Table B.1.2.3.3-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

28 milli-g/cc			30 milli-g/cc			32 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.20	0.92462	0.00052	7.90	0.91917	0.00057	7.70	0.91840	0.00053
8.25	0.92745	0.00054	7.95	0.92245	0.00054	7.75	0.92202	0.00056
8.30	0.93144	0.00053	8.00	0.92675	0.00054	7.80	0.92470	0.00056
8.35	0.93441	0.00056	8.05	0.92995	0.00054	7.85	0.92842	0.00054
8.40	0.93741	0.00053	8.10	0.93277	0.00055	7.90	0.93335	0.00054
8.45	0.94097	0.00054	8.15	0.93631	0.00054	7.95	0.93656	0.00057
8.50	0.94516	0.00054	8.20	0.93889	0.00053	8.00	0.93929	0.00055
8.55	0.94784	0.00052	8.25	0.94361	0.00056	8.05	0.94372	0.00053
8.60	0.95151	0.00054	8.30	0.94598	0.00054	8.10	0.94672	0.00054
8.65	0.95326	0.00053	8.35	0.94883	0.00054	8.15	0.94975	0.00055
8.70	0.95673	0.00052	8.40	0.95216	0.00056	8.20	0.95377	0.00055
8.75	0.96023	0.00053	8.45	0.95629	0.00054	8.25	0.95694	0.00056
8.80	0.96380	0.00054	8.50	0.95934	0.00054	8.30	0.95955	0.00054
8.85	0.96532	0.00054	8.55	0.96261	0.00054	8.35	0.96319	0.00056
8.90	0.96963	0.00052	8.60	0.96670	0.00054	8.40	0.96623	0.00055
8.95	0.97279	0.00054	8.65	0.96838	0.00055	8.45	0.97007	0.00055
9.00	0.97545	0.00052	8.70	0.97244	0.00055	8.50	0.97318	0.00053
9.05	0.97771	0.00053	8.75	0.97507	0.00054	8.55	0.97699	0.00057
9.10	0.98129	0.00053	8.80	0.97808	0.00050	8.60	0.97888	0.00057
9.15	0.98394	0.00051	8.85	0.98142	0.00052	8.65	0.98264	0.00054
9.20	0.98636	0.00053	8.90	0.98611	0.00052	8.70	0.98581	0.00055
9.25	0.98978	0.00051	8.95	0.98857	0.00053	8.75	0.98860	0.00055
9.30	0.99314	0.00051	9.00	0.99059	0.00056	8.80	0.99238	0.00056
9.35	0.99602	0.00052	9.05	0.99297	0.00053	8.85	0.99489	0.00053
9.40	0.99833	0.00052	9.10	0.99636	0.00054	8.90	0.99848	0.00055
9.45	1.00135	0.00054	9.15	0.99971	0.00054	8.95	1.00179	0.00055
9.50	1.00484	0.00054	9.20	1.00295	0.00053	9.00	1.00530	0.00055
9.55	1.00657	0.00053	9.25	1.00557	0.00055	9.05	1.00816	0.00056
9.60	1.00986	0.00055	9.30	1.00895	0.00058	9.10	1.01101	0.00053
9.65	1.01215	0.00055	9.35	1.01162	0.00056	9.15	1.01406	0.00057
9.70	1.01491	0.00053	9.40	1.01384	0.00053	9.20	1.01660	0.00057
9.75	1.01779	0.00054	9.45	1.01666	0.00055			
9.80	1.02091	0.00051	9.50	1.01943	0.00054			
			9.55	1.02263	0.00053			
			9.60	1.02544	0.00053			

Table B.1.2.3.3-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

36 milli-g/cc			40 milli-g/cc			45 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.50	0.92476	0.00059	7.20	0.92025	0.00058	7.00	0.92185	0.00059
7.55	0.92810	0.00055	7.25	0.92379	0.00056	7.05	0.92639	0.00059
7.60	0.93298	0.00059	7.30	0.92821	0.00058	7.10	0.93144	0.00056
7.65	0.93732	0.00059	7.35	0.93308	0.00057	7.15	0.93437	0.00056
7.70	0.94154	0.00058	7.40	0.93664	0.00055	7.20	0.93723	0.00056
7.75	0.94402	0.00056	7.45	0.94070	0.00057	7.25	0.94284	0.00059
7.80	0.94830	0.00055	7.50	0.94406	0.00058	7.30	0.94640	0.00058
7.85	0.95120	0.00055	7.55	0.94790	0.00056	7.35	0.95127	0.00057
7.90	0.95403	0.00057	7.60	0.95113	0.00055	7.40	0.95476	0.00059
7.95	0.95875	0.00057	7.65	0.95550	0.00057	7.45	0.95809	0.00059
8.00	0.96215	0.00056	7.70	0.95917	0.00055	7.50	0.96288	0.00059
8.05	0.96597	0.00056	7.75	0.96345	0.00058	7.55	0.96576	0.00057
8.10	0.97006	0.00056	7.80	0.96719	0.00058	7.60	0.96897	0.00057
8.15	0.97329	0.00058	7.85	0.97080	0.00056	7.65	0.97476	0.00059
8.20	0.97604	0.00057	7.90	0.97421	0.00055	7.70	0.97632	0.00060
8.25	0.97894	0.00057	7.95	0.97581	0.00056	7.75	0.98156	0.00058
8.30	0.98271	0.00056	8.00	0.97992	0.00059	7.80	0.98510	0.00058
8.35	0.98712	0.00055	8.05	0.98456	0.00056	7.85	0.98778	0.00059
8.40	0.99051	0.00056	8.10	0.98866	0.00056	7.90	0.99267	0.00056
8.45	0.99308	0.00054	8.15	0.99076	0.00058	7.95	0.99555	0.00059
8.50	0.99642	0.00057	8.20	0.99558	0.00057	8.00	0.99952	0.00059
8.55	0.99907	0.00056	8.25	0.99730	0.00057	8.05	1.00407	0.00059
8.60	1.00234	0.00058	8.30	1.00112	0.00057	8.10	1.00719	0.00058
8.65	1.00523	0.00057	8.35	1.00489	0.00056	8.15	1.00999	0.00059
8.70	1.00816	0.00056	8.40	1.00728	0.00058	8.20	1.01420	0.00059
8.75	1.01201	0.00056	8.45	1.01054	0.00056	8.25	1.01653	0.00058
8.80	1.01559	0.00055	8.50	1.01563	0.00057	8.30	1.02049	0.00059
8.85	1.01832	0.00056	8.55	1.01745	0.00058			
8.90	1.02183	0.00059	8.60	1.02154	0.00056			

Table B.1.2.3.3-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

50 milli-g/cc			75 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.80	0.92072	0.00057	6.30	0.91886	0.00061	6.10	0.92097	0.00064
6.85	0.92432	0.00060	6.35	0.92424	0.00060	6.15	0.92403	0.00059
6.90	0.92812	0.00059	6.40	0.92995	0.00061	6.20	0.93016	0.00063
6.95	0.93359	0.00060	6.45	0.93298	0.00061	6.25	0.93445	0.00061
7.00	0.93744	0.00058	6.50	0.93779	0.00061	6.30	0.93848	0.00060
7.05	0.94143	0.00057	6.55	0.94181	0.00061	6.35	0.94450	0.00061
7.10	0.94585	0.00058	6.60	0.94686	0.00064	6.40	0.94823	0.00063
7.15	0.95023	0.00058	6.65	0.95026	0.00062	6.45	0.95253	0.00064
7.20	0.95397	0.00057	6.70	0.95612	0.00060	6.50	0.95754	0.00058
7.25	0.95704	0.00060	6.75	0.95931	0.00060	6.55	0.96082	0.00061
7.30	0.96168	0.00058	6.80	0.96337	0.00061	6.60	0.96557	0.00063
7.35	0.96525	0.00060	6.85	0.96721	0.00060	6.65	0.97102	0.00064
7.40	0.97018	0.00058	6.90	0.97183	0.00062	6.70	0.97547	0.00062
7.45	0.97244	0.00057	6.95	0.97679	0.00061	6.75	0.97846	0.00061
7.50	0.97807	0.00063	7.00	0.98003	0.00061	6.80	0.98300	0.00060
7.55	0.98144	0.00058	7.05	0.98399	0.00060	6.85	0.98714	0.00066
7.65	0.98946	0.00060	7.10	0.98871	0.00061	6.90	0.99223	0.00063
7.70	0.99250	0.00061	7.15	0.99224	0.00062	6.95	0.99562	0.00066
7.75	0.99586	0.00060	7.20	0.99786	0.00064	7.00	0.99852	0.00064
7.80	1.00102	0.00058	7.25	1.00071	0.00061	7.05	1.00407	0.00061
7.85	1.00320	0.00060	7.30	1.00504	0.00061	7.10	1.00833	0.00063
7.90	1.00690	0.00060	7.35	1.00925	0.00063	7.15	1.01166	0.00061
7.95	1.01118	0.00058	7.40	1.01202	0.00060	7.20	1.01570	0.00062
8.00	1.01299	0.00059	7.45	1.01705	0.00063	7.25	1.01963	0.00061
8.05	1.01662	0.00059	7.50	1.01999	0.00061	7.30	1.02361	0.00064
8.10	1.02168	0.00057						

Table B.1.2.3.3-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

150 milli-g/cc			200 milli-g/cc			350 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.90	0.91847	0.00064	5.90	0.92535	0.00062	5.80	0.92271	0.00063
5.95	0.92275	0.00066	5.95	0.92887	0.00063	5.85	0.92796	0.00062
6.00	0.92739	0.00063	6.00	0.93408	0.00064	5.90	0.93233	0.00064
6.05	0.93315	0.00059	6.05	0.93792	0.00063	5.95	0.93595	0.00064
6.10	0.93682	0.00062	6.10	0.94250	0.00062	6.00	0.94014	0.00061
6.15	0.94251	0.00064	6.15	0.94700	0.00063	6.05	0.94503	0.00063
6.20	0.94522	0.00065	6.20	0.95300	0.00062	6.10	0.94886	0.00060
6.25	0.94990	0.00063	6.25	0.95579	0.00066	6.15	0.95316	0.00062
6.30	0.95415	0.00062	6.30	0.96047	0.00063	6.20	0.95830	0.00063
6.35	0.95966	0.00062	6.35	0.96552	0.00062	6.25	0.96217	0.00066
6.40	0.96468	0.00063	6.40	0.96987	0.00064	6.30	0.96602	0.00064
6.45	0.96827	0.00065	6.45	0.97381	0.00063	6.35	0.96930	0.00061
6.50	0.97259	0.00060	6.50	0.97794	0.00063	6.40	0.97328	0.00063
6.55	0.97533	0.00065	6.55	0.98202	0.00062	6.45	0.97784	0.00064
6.60	0.98019	0.00062	6.60	0.98518	0.00060	6.50	0.98216	0.00064
6.65	0.98527	0.00061	6.65	0.98961	0.00062	6.55	0.98504	0.00063
6.70	0.98888	0.00062	6.70	0.99351	0.00061	6.60	0.98979	0.00063
6.75	0.99313	0.00062	6.75	0.99797	0.00063	6.65	0.99369	0.00065
6.80	0.99632	0.00063	6.80	1.00175	0.00064	6.70	0.99778	0.00060
6.85	1.00050	0.00060	6.85	1.00631	0.00062	6.75	1.00223	0.00064
6.90	1.00466	0.00063	6.90	1.00919	0.00064	6.80	1.00391	0.00063
6.95	1.00921	0.00066	6.95	1.01389	0.00063	6.85	1.00877	0.00066
7.00	1.01296	0.00062	7.00	1.01830	0.00062	6.90	1.01289	0.00065
7.05	1.01778	0.00061				6.95	1.01519	0.00064
7.10	1.02206	0.00063				7.00	1.01979	0.00068

Table B.1.2.3.3-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

500 milli-g/cc			750 milli-g/cc			1000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.70	0.91936	0.00062	5.60	0.92310	0.00063	5.40	0.92032	0.00062
5.75	0.92419	0.00062	5.65	0.92801	0.00062	5.45	0.92497	0.00063
5.80	0.92909	0.00062	5.70	0.93255	0.00063	5.50	0.92851	0.00064
5.85	0.93276	0.00062	5.75	0.93625	0.00065	5.55	0.93335	0.00065
5.90	0.93665	0.00061	5.80	0.94215	0.00064	5.60	0.93858	0.00060
5.95	0.94109	0.00062	5.85	0.94561	0.00065	5.65	0.94415	0.00064
6.00	0.94543	0.00064	5.90	0.94924	0.00063	5.70	0.94703	0.00063
6.05	0.94938	0.00062	5.95	0.95336	0.00062	5.75	0.95024	0.00062
6.10	0.95392	0.00063	6.00	0.95770	0.00062	5.80	0.95513	0.00062
6.15	0.95916	0.00065	6.05	0.96352	0.00060	5.85	0.96014	0.00061
6.20	0.96215	0.00065	6.10	0.96569	0.00064	5.90	0.96520	0.00064
6.25	0.96777	0.00062	6.15	0.97034	0.00064	5.95	0.96825	0.00063
6.30	0.97020	0.00064	6.20	0.97366	0.00061	6.00	0.97229	0.00064
6.35	0.97473	0.00062	6.25	0.97863	0.00061	6.05	0.97659	0.00065
6.40	0.97889	0.00062	6.30	0.98383	0.00064	6.10	0.98111	0.00063
6.45	0.98288	0.00065	6.35	0.98639	0.00067	6.15	0.98540	0.00066
6.50	0.98681	0.00062	6.40	0.98983	0.00063	6.20	0.98853	0.00063
6.55	0.99002	0.00064	6.45	0.99340	0.00063	6.25	0.99393	0.00062
6.60	0.99320	0.00063	6.50	0.99822	0.00063	6.30	0.99728	0.00062
6.65	0.99769	0.00064	6.55	1.00114	0.00065	6.35	1.00206	0.00061
6.70	1.00156	0.00067	6.60	1.00516	0.00062	6.40	1.00391	0.00063
6.75	1.00532	0.00064	6.65	1.00870	0.00065	6.45	1.00930	0.00061
6.80	1.00934	0.00065	6.70	1.01276	0.00065	6.50	1.01196	0.00065
6.85	1.01155	0.00062	6.75	1.01692	0.00064	6.55	1.01582	0.00064
6.90	1.01720	0.00067	6.80	1.02071	0.00061	6.60	1.02118	0.00061

Table B.1.2.3.3-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

1500 milli-g/cc			2000 milli-g/cc			2500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.10	0.92324	0.00062	4.80	0.92398	0.00063	4.50	0.92069	0.00064
5.15	0.92714	0.00063	4.85	0.92862	0.00063	4.55	0.92602	0.00061
5.20	0.93324	0.00066	4.90	0.93379	0.00063	4.60	0.93222	0.00062
5.25	0.93746	0.00061	4.95	0.93916	0.00063	4.65	0.93664	0.00062
5.30	0.94287	0.00065	5.00	0.94462	0.00063	4.70	0.94197	0.00060
5.35	0.94822	0.00063	5.05	0.94927	0.00063	4.75	0.94878	0.00063
5.40	0.95266	0.00062	5.10	0.95544	0.00063	4.80	0.95520	0.00062
5.45	0.95688	0.00061	5.15	0.96051	0.00062	4.85	0.95926	0.00062
5.50	0.96157	0.00063	5.20	0.96431	0.00064	4.90	0.96531	0.00062
5.55	0.96589	0.00065	5.25	0.96972	0.00062	4.95	0.97060	0.00062
5.60	0.97054	0.00064	5.30	0.97491	0.00063	5.00	0.97676	0.00064
5.65	0.97414	0.00061	5.35	0.98123	0.00062	5.05	0.98228	0.00063
5.70	0.98004	0.00062	5.40	0.98542	0.00061	5.10	0.98647	0.00063
5.75	0.98313	0.00064	5.45	0.99018	0.00064	5.15	0.99251	0.00062
5.80	0.98928	0.00065	5.50	0.99487	0.00061	5.20	0.99790	0.00060
5.85	0.99378	0.00064	5.55	0.99976	0.00062	5.25	1.00424	0.00061
5.90	0.99631	0.00061	5.60	1.00465	0.00063	5.30	1.00834	0.00063
5.95	1.00249	0.00063	5.65	1.00949	0.00061	5.35	1.01265	0.00062
6.00	1.00621	0.00061	5.70	1.01397	0.00062	5.40	1.01828	0.00063
6.05	1.01094	0.00061	5.75	1.01920	0.00062			
6.10	1.01450	0.00062	5.80	1.02227	0.00062			
6.15	1.01909	0.00064						
6.20	1.02195	0.00066						

Table B.1.2.3.3-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

3000 milli-g/cc			4000 milli-g/cc			5000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.20	0.91042	0.00061	3.90	0.92420	0.00062	3.50	0.91004	0.00059
4.25	0.91770	0.00062	3.95	0.93084	0.00063	3.55	0.91910	0.00060
4.30	0.92454	0.00061	4.00	0.93879	0.00061	3.60	0.92701	0.00061
4.35	0.93188	0.00063	4.05	0.94592	0.00059	3.65	0.93360	0.00062
4.40	0.93650	0.00064	4.10	0.95269	0.00060	3.70	0.94276	0.00060
4.45	0.94242	0.00064	4.15	0.95909	0.00061	3.75	0.94989	0.00057
4.50	0.94927	0.00063	4.20	0.96543	0.00063	3.80	0.95790	0.00061
4.55	0.95582	0.00064	4.25	0.97335	0.00061	3.85	0.96599	0.00061
4.60	0.96061	0.00063	4.30	0.97906	0.00062	3.90	0.97307	0.00061
4.65	0.96793	0.00062	4.35	0.98571	0.00062	3.95	0.98182	0.00062
4.70	0.97266	0.00061	4.40	0.99200	0.00062	4.00	0.98903	0.00060
4.75	0.97914	0.00063	4.45	0.99895	0.00061	4.05	0.99590	0.00061
4.80	0.98495	0.00062	4.50	1.00565	0.00065	4.10	1.00313	0.00064
4.85	0.99107	0.00064	4.55	1.01212	0.00061	4.15	1.01066	0.00061
4.90	0.99651	0.00062	4.60	1.01953	0.00062	4.20	1.01742	0.00061
4.95	1.00244	0.00063	4.65	1.02602	0.00061			
5.00	1.00784	0.00062	4.70	1.02996	0.00066			
5.05	1.01487	0.00063						
5.10	1.01924	0.00062						

Table B.1.2.3.3-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

6000 milli-g/cc			7000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
3.30	0.92107	0.00060	3.10	0.92461	0.00059	3.00	0.92374	0.00057
3.35	0.92869	0.00061	3.15	0.93331	0.00064	3.02	0.92751	0.00060
3.40	0.93770	0.00058	3.20	0.94295	0.00059	3.04	0.93181	0.00062
3.45	0.94703	0.00061	3.25	0.95287	0.00060	3.06	0.93593	0.00058
3.50	0.95486	0.00062	3.30	0.96220	0.00061	3.08	0.94031	0.00062
3.55	0.96387	0.00060	3.35	0.97150	0.00063	3.10	0.94437	0.00058
3.60	0.97118	0.00061	3.40	0.98019	0.00063	3.12	0.94715	0.00059
3.65	0.97946	0.00061	3.45	0.98951	0.00060	3.14	0.95011	0.00058
3.70	0.98894	0.00062	3.50	0.99870	0.00058	3.16	0.95566	0.00060
3.75	0.99702	0.00061	3.55	1.00701	0.00061	3.18	0.95932	0.00060
3.80	1.00449	0.00062	3.60	1.01503	0.00060	3.20	0.96300	0.00059
3.85	1.01329	0.00062	3.65	1.02460	0.00064	3.22	0.96707	0.00061
3.90	1.02163	0.00060	3.70	1.03423	0.00060	3.24	0.97044	0.00060
						3.26	0.97557	0.00063
						3.28	0.97745	0.00059
						3.30	0.98323	0.00060
						3.32	0.98573	0.00059
						3.34	0.99002	0.00060
						3.36	0.99263	0.00060
						3.38	0.99668	0.00062
						3.40	1.00130	0.00058
						3.42	1.00443	0.00062
						3.44	1.00754	0.00060
						3.46	1.01177	0.00060
						3.48	1.01573	0.00062
						3.50	1.01894	0.00060

Table B.1.2.3.3-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

8000 milli-g/cc			9000 milli-g/cc			10000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
2.90	0.92325	0.00061	2.70	0.91477	0.00058	2.50	0.90301	0.00056
2.92	0.92720	0.00058	2.72	0.92004	0.00060	2.55	0.91396	0.00057
2.94	0.93147	0.00060	2.74	0.92272	0.00059	2.60	0.92607	0.00060
2.96	0.93453	0.00057	2.76	0.92796	0.00057	2.65	0.93843	0.00061
2.98	0.93917	0.00060	2.78	0.93185	0.00060	2.70	0.94918	0.00060
3.00	0.94277	0.00060	2.80	0.93678	0.00058	2.75	0.96120	0.00059
3.02	0.94706	0.00057	2.82	0.94211	0.00057	2.80	0.97286	0.00058
3.04	0.94999	0.00059	2.84	0.94605	0.00059	2.85	0.98288	0.00059
3.06	0.95546	0.00059	2.86	0.95008	0.00062	2.90	0.99496	0.00061
3.08	0.95865	0.00059	2.88	0.95555	0.00059	2.95	1.00563	0.00063
3.10	0.96347	0.00059	2.90	0.95827	0.00059	3.00	1.01734	0.00060
3.12	0.96719	0.00059	2.92	0.96275	0.00060	3.05	1.02711	0.00059
3.14	0.97070	0.00060	2.94	0.96716	0.00057	3.10	1.03842	0.00061
3.16	0.97406	0.00059	2.96	0.97199	0.00059			
3.18	0.97804	0.00059	2.98	0.97573	0.00060			
3.20	0.98265	0.00061	3.00	0.98010	0.00059			
3.22	0.98504	0.00059	3.02	0.98449	0.00061			
3.24	0.99095	0.00060	3.04	0.98826	0.00062			
3.26	0.99412	0.00061	3.06	0.99300	0.00059			
3.28	0.99874	0.00062	3.08	0.99576	0.00061			
3.30	1.00235	0.00060	3.10	1.00196	0.00061			
3.32	1.00562	0.00061	3.12	1.00472	0.00060			
3.34	1.00963	0.00060	3.14	1.00930	0.00059			
3.36	1.01409	0.00063	3.16	1.01279	0.00062			
3.38	1.01721	0.00060	3.18	1.01821	0.00062			
3.40	1.02116	0.00062	3.20	1.02140	0.00059			

Table B.1.2.3.3-2. K_{eff} Values for 95% ^{239}Pu Cylinder - 10 Inches of Water Reflection (cont)

15000 milli-g/cc			19600 milli-g/cc					
Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma
2.00	0.91581	0.00057	1.60	0.89399	0.00055			
2.02	0.92183	0.00056	1.62	0.90152	0.00054			
2.04	0.92874	0.00057	1.64	0.90920	0.00052			
2.06	0.93484	0.00057	1.66	0.91740	0.00058			
2.08	0.94057	0.00057	1.68	0.92424	0.00054			
2.10	0.94688	0.00058	1.70	0.93229	0.00055			
2.12	0.95238	0.00057	1.72	0.93976	0.00055			
2.14	0.95892	0.00056	1.74	0.94751	0.00056			
2.16	0.96542	0.00056	1.76	0.95605	0.00056			
2.18	0.96999	0.00056	1.78	0.96167	0.00056			
2.20	0.97733	0.00056	1.80	0.96952	0.00055			
2.22	0.98246	0.00057	1.82	0.97757	0.00056			
2.24	0.98888	0.00058	1.84	0.98462	0.00055			
2.26	0.99420	0.00057	1.86	0.99138	0.00058			
2.28	1.00046	0.00056	1.88	0.99971	0.00055			
2.30	1.00614	0.00058	1.90	1.00594	0.00058			
2.32	1.01136	0.00059	1.92	1.01329	0.00058			
2.34	1.01953	0.00057	1.94	1.02121	0.00059			
2.36	1.02329	0.00058	1.96	1.02784	0.00056			
2.38	1.02883	0.00057	1.98	1.03489	0.00059			
2.40	1.03492	0.00060	2.00	1.04230	0.00056			

B.1.3. Infinite Plane (Slab)

B.1.3.1. 100% ^{239}Pu

B.1.3.1.1. Unreflected

Case ID: pu-pl-1000-00

Material: Plutonium metal in water

Geometry: Infinite Plane

Isotopics: 100% ^{239}Pu

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.1.3.1.1-1. Plutonium Slab (100% ^{239}Pu) - 0 Inches of Water Reflection

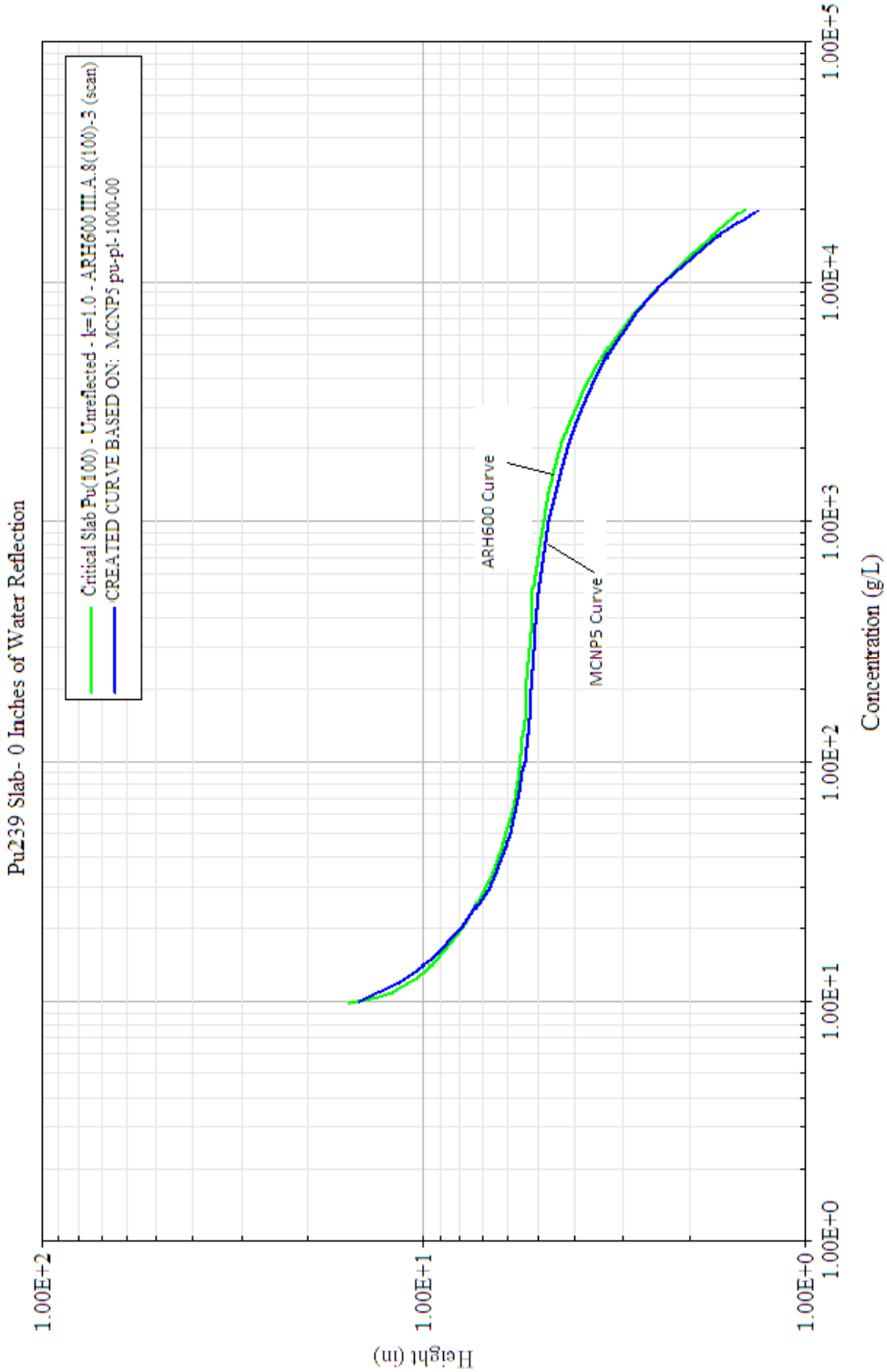

Table B.1.3.1.1-1. Critical Dimensions for Plutonium Slab (100% ^{239}Pu) - 0 Inches of Water Reflection

Plutonium Slab (100% ^{239}Pu) - 0 Inches of Water Reflection				
Concentration (g/cc)	First Height (Inches)	Last Height (Inches)	Delta (Inches)	Critical Height (Inches)
0.007	20.000	100.000	5.000	N/A
0.010	11.600	15.600	0.200	14.8183
0.012	9.500	12.400	0.100	11.5558
0.015	8.100	9.800	0.050	9.4433
0.020	6.900	8.200	0.050	7.9081
0.025	6.400	7.400	0.050	7.1666
0.030	6.000	6.900	0.050	6.7179
0.040	5.600	6.400	0.050	6.2121
0.050	5.300	6.100	0.050	5.9290
0.075	5.000	5.800	0.050	5.5849
0.100	4.900	5.600	0.050	5.4286
0.150	4.700	5.500	0.050	5.2824
0.200	4.700	5.400	0.050	5.2088
0.350	4.600	5.300	0.050	5.0773
0.500	4.500	5.200	0.050	4.9736
0.750	4.300	5.000	0.050	4.8160
1.000	4.200	4.900	0.050	4.6752
1.500	4.000	4.600	0.050	4.4108
2.000	3.800	4.400	0.050	4.1943
2.500	3.600	4.200	0.050	3.9959
3.000	3.400	4.000	0.050	3.8282
4.000	3.200	3.700	0.020	3.5274
5.000	2.900	3.400	0.020	3.2751
7.500	2.500	2.900	0.020	2.7569
10.000	2.100	2.500	0.020	2.3479
15.000	1.500	1.800	0.020	1.7259
19.600	1.100	1.400	0.020	1.3276

MCNP5 Sample Input File
100% ^{239}Pu Cylinder- 0 Inches of Reflection

```
Pu plane, 100.0 wt% 239Pu, 01000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Height = 465   hundreths of inches - must be integer
c half height =     5.9055 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 01000 milli-g Pu/cc
c Reflector width =  0.0 inches
c Enrichment = 1.00 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 239Pu  = 239.05220
c Pu240  = 240.05380
c
c Effective Plutonium atomic mass 239.05220
c PuO2
c Mass fraction of Pu in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0510 cc
c Volume of water in sample 0.9490 cc
c
c Mass of crit in sample   1.0000 g
c Mass of Pu in sample   1.0000 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9490 g
c
c Total mass of sample  1.9490g for a 1cc sample
c Mass Density for crit material  -1.9490, expressed as negative
c
c  plane
20 11   -1.948980   -1 2 -7 -5 8 6      imp:n=1
21  2  -1.000    -3 4 6 8 -7 -5 ((1 -3):(-2 4))        imp:n=0    $zero importance if no reflector
22  0            3:-4:7:5:-8:-6                    imp:n=0
```

```
1       py     5.9055              $ plane
2       py    -5.9055
3       py     5.9055         $ Reflection
4       py    -5.9055
*5        px    100
*6        px    -100
*7        pz    100
*8        pz    -100

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu / water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 01000 milli-g Pu/cc,  1.9490
1001.66c -0.054483
8016.66c -0.432428      $from water
c      8016.66c -0.000000      $from oxide
94239.66c -0.513089
c    94240.66c -0.000000
mt11     lwtr.60t
c
c    pu only
m12    $ Pu, 100.0 wt% 235U, 01000 milli-g U/cc,  1.9490
c      8016.66c -0.000000      $from oxide
94239.66c -0.513089
c    94240.66c -0.000000
c
```

Critview Compatible Data File
100% ^{239}Pu Slab- 0 Inches of Water Reflection

reset:
title: MCNP5 pu-pl-1000-00
set: MCNP5 set
source: MCNP5 primary
created: Mon 07/26/2010 9:04:26.72
geometry: infplane
modmat: H2O
critmat: plutonium
isomat: Pu239 1.0
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: height in

0.010	14.8183
0.012	11.5558
0.015	9.4433
0.020	7.9081
0.025	7.1666
0.030	6.7179
0.040	6.2121
0.050	5.9290
0.075	5.5849
0.100	5.4286
0.150	5.2824
0.200	5.2088
0.350	5.0773
0.500	4.9736
0.750	4.8160
1.000	4.6752
1.500	4.4108
2.000	4.1943
2.500	3.9959
3.000	3.8282
4.000	3.5274
5.000	3.2751
7.500	2.7569
10.00	2.3479
15.00	1.7259
19.60	1.3276

Table B.1.3.1.1-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 0 Inches of Water Reflection

7 milli-g/cc			10 milli-g/cc			12 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
20.00	0.89470	0.00040	11.60	0.92664	0.00030	9.50	0.92023	0.00035
25.00	0.92190	0.00037	11.80	0.93241	0.00031	9.60	0.92533	0.00035
30.00	0.93956	0.00036	12.00	0.93823	0.00030	9.70	0.93045	0.00035
35.00	0.95017	0.00031	12.20	0.94292	0.00029	9.80	0.93380	0.00035
40.00	0.95672	0.00034	12.40	0.94851	0.00030	9.90	0.93856	0.00034
45.00	0.96179	0.00029	12.60	0.95374	0.00030	10.00	0.94259	0.00033
50.00	0.96592	0.00028	12.80	0.95872	0.00028	10.10	0.94684	0.00034
55.00	0.96759	0.00025	13.00	0.96339	0.00029	10.20	0.95122	0.00035
60.00	0.97042	0.00025	13.20	0.96777	0.00029	10.30	0.95495	0.00035
65.00	0.97195	0.00023	13.40	0.97166	0.00028	10.40	0.95963	0.00033
70.00	0.97237	0.00023	13.60	0.97663	0.00028	10.50	0.96265	0.00034
75.00	0.97434	0.00023	13.80	0.98067	0.00029	10.60	0.96657	0.00034
80.00	0.97493	0.00023	14.00	0.98482	0.00028	10.70	0.97045	0.00034
85.00	0.97577	0.00023	14.20	0.98845	0.00028	10.80	0.97438	0.00033
90.00	0.97691	0.00025	14.40	0.99202	0.00027	10.90	0.97780	0.00034
95.00	0.97744	0.00022	14.60	0.99595	0.00028	11.00	0.98174	0.00034
100.00	0.97875	0.00023	14.80	0.99971	0.00027	11.10	0.98497	0.00033
			15.00	1.00288	0.00027	11.20	0.98843	0.00033
			15.20	1.00562	0.00028	11.30	0.99126	0.00032
			15.40	1.00916	0.00027	11.40	0.99559	0.00033
			15.60	1.01289	0.00027	11.50	0.99803	0.00034
						11.60	1.00156	0.00032
						11.70	1.00519	0.00033
						11.80	1.00787	0.00033
						11.90	1.01105	0.00032
						12.00	1.01344	0.00032
						12.10	1.01609	0.00032
						12.20	1.01925	0.00032
						12.30	1.02250	0.00032
						12.40	1.02504	0.00032

Table B.1.3.1.1-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 0 Inches of Water Reflection (cont)

15 milli-g/cc			20 milli-g/cc			25 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
8.10	0.92152	0.00039	6.90	0.91551	0.00044	6.40	0.92412	0.00047
8.15	0.92514	0.00038	6.95	0.92007	0.00044	6.45	0.92875	0.00047
8.20	0.92844	0.00038	7.00	0.92505	0.00045	6.50	0.93401	0.00047
8.25	0.93190	0.00041	7.05	0.92940	0.00043	6.55	0.93894	0.00047
8.30	0.93444	0.00038	7.10	0.93388	0.00044	6.60	0.94579	0.00047
8.35	0.93862	0.00038	7.15	0.93816	0.00043	6.65	0.95104	0.00047
8.40	0.94099	0.00040	7.20	0.94365	0.00044	6.70	0.95629	0.00048
8.45	0.94479	0.00039	7.25	0.94735	0.00045	6.75	0.96058	0.00047
8.50	0.94778	0.00039	7.30	0.95158	0.00043	6.80	0.96576	0.00047
8.55	0.95047	0.00039	7.35	0.95536	0.00044	6.85	0.96951	0.00047
8.60	0.95335	0.00039	7.40	0.96024	0.00044	6.90	0.97482	0.00048
8.65	0.95633	0.00039	7.45	0.96471	0.00044	6.95	0.97993	0.00047
8.70	0.95927	0.00038	7.50	0.96768	0.00043	7.00	0.98536	0.00047
8.75	0.96216	0.00040	7.55	0.97226	0.00044	7.05	0.98998	0.00048
8.80	0.96561	0.00038	7.60	0.97582	0.00045	7.10	0.99417	0.00047
8.85	0.96833	0.00040	7.65	0.98006	0.00044	7.15	0.99833	0.00046
8.90	0.97086	0.00038	7.70	0.98432	0.00042	7.20	1.00336	0.00047
8.95	0.97400	0.00038	7.75	0.98782	0.00042	7.25	1.00784	0.00047
9.00	0.97627	0.00039	7.80	0.99191	0.00044	7.30	1.01162	0.00047
9.05	0.97938	0.00038	7.85	0.99543	0.00044	7.35	1.01687	0.00046
9.10	0.98180	0.00039	7.90	0.99931	0.00044	7.40	1.02125	0.00047
9.15	0.98459	0.00038	7.95	1.00357	0.00044			
9.20	0.98733	0.00038	8.00	1.00669	0.00044			
9.25	0.98990	0.00037	8.05	1.00946	0.00043			
9.30	0.99301	0.00039	8.10	1.01390	0.00042			
9.35	0.99555	0.00038	8.15	1.01784	0.00043			
9.40	0.99708	0.00039	8.20	1.02166	0.00043			
9.45	1.00045	0.00038						
9.50	1.00288	0.00039						
9.55	1.00608	0.00038						
9.60	1.00796	0.00037						
9.65	1.01073	0.00039						
9.70	1.01289	0.00037						
9.75	1.01534	0.00036						
9.80	1.01761	0.00037						

Table B.1.3.1.1-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 0 Inches of Water Reflection (cont)

30 milli-g/cc			40 milli-g/cc			50 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
6.00	0.91952	0.00050	5.60	0.92164	0.00050	5.30	0.91218	0.00054
6.05	0.92500	0.00051	5.65	0.92867	0.00052	5.35	0.91988	0.00053
6.10	0.93063	0.00050	5.70	0.93603	0.00052	5.40	0.92722	0.00054
6.15	0.93688	0.00049	5.75	0.94174	0.00052	5.45	0.93499	0.00054
6.20	0.94325	0.00048	5.80	0.94890	0.00052	5.50	0.94167	0.00054
6.25	0.94919	0.00050	5.85	0.95522	0.00051	5.55	0.94858	0.00054
6.30	0.95502	0.00050	5.90	0.96172	0.00051	5.60	0.95616	0.00054
6.35	0.96044	0.00049	5.95	0.96825	0.00051	5.65	0.96297	0.00052
6.40	0.96625	0.00050	6.00	0.97445	0.00051	5.70	0.97051	0.00053
6.45	0.97144	0.00049	6.05	0.97997	0.00051	5.75	0.97687	0.00054
6.50	0.97735	0.00050	6.10	0.98729	0.00052	5.80	0.98363	0.00054
6.55	0.98304	0.00047	6.15	0.99313	0.00052	5.85	0.99116	0.00051
6.60	0.98804	0.00047	6.20	0.99838	0.00051	5.90	0.99649	0.00054
6.65	0.99337	0.00049	6.25	1.00507	0.00051	5.95	1.00255	0.00054
6.70	0.99826	0.00049	6.30	1.01109	0.00053	6.00	1.00925	0.00054
6.75	1.00311	0.00050	6.35	1.01628	0.00053	6.05	1.01591	0.00054
6.80	1.00919	0.00049	6.40	1.02298	0.00053	6.10	1.02166	0.00054
6.85	1.01356	0.00050						
6.90	1.01852	0.00049						

Table B.1.3.1.1-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 0 Inches of Water Reflection (cont)

75 milli-g/cc			100 milli-g/cc			150 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
5.00	0.91089	0.00055	4.90	0.91686	0.00056	4.70	0.90453	0.00056
5.05	0.91900	0.00056	4.95	0.92476	0.00057	4.75	0.91396	0.00057
5.10	0.92699	0.00055	5.00	0.93410	0.00056	4.80	0.92202	0.00057
5.15	0.93415	0.00053	5.05	0.94122	0.00056	4.85	0.93061	0.00057
5.20	0.94360	0.00057	5.10	0.94891	0.00057	4.90	0.93950	0.00058
5.25	0.95009	0.00056	5.15	0.95707	0.00057	4.95	0.94739	0.00057
5.30	0.95812	0.00057	5.20	0.96612	0.00056	5.00	0.95582	0.00056
5.35	0.96564	0.00056	5.25	0.97378	0.00057	5.05	0.96378	0.00057
5.40	0.97349	0.00056	5.30	0.98113	0.00058	5.10	0.97146	0.00057
5.45	0.98030	0.00055	5.35	0.98736	0.00058	5.15	0.97927	0.00059
5.50	0.98838	0.00056	5.40	0.99588	0.00054	5.20	0.98743	0.00056
5.55	0.99498	0.00055	5.45	1.00308	0.00055	5.25	0.99492	0.00058
5.60	1.00218	0.00055	5.50	1.01058	0.00056	5.30	1.00277	0.00056
5.65	1.00906	0.00058	5.55	1.01771	0.00056	5.35	1.00995	0.00058
5.70	1.01660	0.00057	5.60	1.02508	0.00057	5.40	1.01753	0.00057
5.75	1.02367	0.00056				5.45	1.02517	0.00057
5.80	1.03027	0.00055				5.50	1.03251	0.00056

Table B.1.3.1.1-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 0 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
4.70	0.91695	0.00056	4.60	0.92081	0.00055	4.50	0.92024	0.00057
4.75	0.92527	0.00058	4.65	0.92952	0.00059	4.55	0.92932	0.00057
4.80	0.93375	0.00057	4.70	0.93828	0.00057	4.60	0.93707	0.00059
4.85	0.94143	0.00060	4.75	0.94641	0.00058	4.65	0.94549	0.00056
4.90	0.95134	0.00058	4.80	0.95448	0.00058	4.70	0.95419	0.00055
4.95	0.95895	0.00056	4.85	0.96267	0.00057	4.75	0.96257	0.00059
5.00	0.96704	0.00057	4.90	0.97142	0.00058	4.80	0.97215	0.00058
5.05	0.97517	0.00058	4.95	0.97935	0.00058	4.85	0.97906	0.00059
5.10	0.98364	0.00056	5.00	0.98659	0.00056	4.90	0.98896	0.00058
5.15	0.99176	0.00059	5.05	0.99504	0.00056	4.95	0.99632	0.00056
5.20	0.99856	0.00058	5.10	1.00413	0.00056	5.00	1.00413	0.00058
5.25	1.00673	0.00058	5.15	1.01152	0.00058	5.05	1.01145	0.00058
5.30	1.01391	0.00058	5.20	1.01975	0.00055	5.10	1.01912	0.00057
5.35	1.02168	0.00057	5.25	1.02603	0.00057	5.15	1.02778	0.00058
5.40	1.02858	0.00057	5.30	1.03507	0.00057	5.20	1.03433	0.00059

Table B.1.3.1.1-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 0 Inches of Water Reflection (cont)

750 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
4.30	0.90890	0.00058	4.20	0.91470	0.00058	4.00	0.92030	0.00055
4.35	0.91957	0.00058	4.25	0.92387	0.00055	4.05	0.93108	0.00059
4.40	0.92867	0.00057	4.30	0.93353	0.00057	4.10	0.94002	0.00054
4.45	0.93746	0.00058	4.35	0.94273	0.00057	4.15	0.95163	0.00057
4.50	0.94573	0.00057	4.40	0.95198	0.00059	4.20	0.96039	0.00058
4.55	0.95483	0.00056	4.45	0.96109	0.00056	4.25	0.96891	0.00059
4.60	0.96307	0.00056	4.50	0.96975	0.00060	4.30	0.97867	0.00058
4.65	0.97270	0.00059	4.55	0.97898	0.00058	4.35	0.98811	0.00058
4.70	0.97985	0.00058	4.60	0.98680	0.00059	4.40	0.99832	0.00057
4.75	0.98853	0.00058	4.65	0.99542	0.00058	4.45	1.00612	0.00058
4.80	0.99749	0.00058	4.70	1.00449	0.00058	4.50	1.01671	0.00058
4.85	1.00531	0.00059	4.75	1.01267	0.00059	4.55	1.02335	0.00059
4.90	1.01285	0.00057	4.80	1.02220	0.00057	4.60	1.03247	0.00058
4.95	1.02144	0.00060	4.85	1.02938	0.00058			
5.00	1.02923	0.00058	4.90	1.03740	0.00059			

Table B.1.3.1.1-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 0 Inches of Water Reflection (cont)

2000 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
3.80	0.92169	0.00057	3.60	0.91400	0.00056	3.40	0.90330	0.00056
3.85	0.93075	0.00058	3.65	0.92581	0.00057	3.45	0.91652	0.00055
3.90	0.94117	0.00053	3.70	0.93700	0.00056	3.50	0.92765	0.00055
3.95	0.95170	0.00057	3.75	0.94713	0.00057	3.55	0.93888	0.00055
4.00	0.96151	0.00057	3.80	0.95798	0.00058	3.60	0.94972	0.00056
4.05	0.97194	0.00060	3.85	0.96936	0.00055	3.65	0.96152	0.00057
4.10	0.98095	0.00057	3.90	0.98003	0.00057	3.70	0.97255	0.00055
4.15	0.99118	0.00058	3.95	0.99045	0.00056	3.75	0.98304	0.00056
4.20	1.00113	0.00058	4.00	1.00085	0.00057	3.80	0.99399	0.00055
4.25	1.01115	0.00056	4.05	1.01016	0.00057	3.85	1.00463	0.00057
4.30	1.01953	0.00059	4.10	1.02040	0.00057	3.90	1.01440	0.00055
4.35	1.02957	0.00057	4.15	1.02938	0.00057	3.95	1.02492	0.00058
4.40	1.03893	0.00057	4.20	1.03915	0.00057	4.00	1.03629	0.00057

Table B.1.3.1.1-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 0 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			7500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
3.20	0.92112	0.00052	2.90	0.90248	0.00052	2.50	0.92289	0.00047
3.22	0.92452	0.00055	2.92	0.90837	0.00049	2.52	0.92909	0.00047
3.24	0.93007	0.00054	2.94	0.91216	0.00052	2.54	0.93539	0.00048
3.26	0.93596	0.00053	2.96	0.91789	0.00050	2.56	0.94160	0.00048
3.28	0.94041	0.00054	2.98	0.92417	0.00053	2.58	0.94781	0.00046
3.30	0.94513	0.00056	3.00	0.92928	0.00053	2.60	0.95351	0.00049
3.32	0.94979	0.00054	3.02	0.93392	0.00052	2.62	0.95982	0.00048
3.34	0.95503	0.00054	3.04	0.94059	0.00053	2.64	0.96523	0.00048
3.36	0.95955	0.00055	3.06	0.94518	0.00051	2.66	0.97237	0.00050
3.38	0.96482	0.00054	3.08	0.95090	0.00053	2.68	0.97771	0.00049
3.40	0.96933	0.00056	3.10	0.95608	0.00055	2.70	0.98389	0.00050
3.42	0.97323	0.00055	3.12	0.96140	0.00052	2.72	0.98844	0.00049
3.44	0.97885	0.00056	3.14	0.96571	0.00053	2.74	0.99493	0.00049
3.46	0.98408	0.00055	3.16	0.97141	0.00053	2.76	1.00094	0.00049
3.48	0.98823	0.00057	3.18	0.97572	0.00054	2.78	1.00702	0.00050
3.50	0.99310	0.00056	3.20	0.98125	0.00051	2.80	1.01238	0.00052
3.52	0.99785	0.00055	3.22	0.98667	0.00055	2.82	1.01860	0.00049
3.54	1.00365	0.00054	3.24	0.99172	0.00053	2.84	1.02370	0.00050
3.56	1.00731	0.00056	3.26	0.99559	0.00055	2.86	1.02885	0.00051
3.58	1.01235	0.00056	3.28	1.00142	0.00055	2.88	1.03494	0.00050
3.60	1.01604	0.00056	3.30	1.00722	0.00053	2.90	1.04002	0.00051
3.62	1.02128	0.00057	3.32	1.01058	0.00054			
3.64	1.02542	0.00057	3.34	1.01658	0.00054			
3.66	1.03053	0.00056	3.36	1.02132	0.00053			
3.68	1.03334	0.00055	3.38	1.02512	0.00053			
3.70	1.03879	0.00055	3.40	1.03040	0.00054			

Table B.1.3.1.1-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 0 Inches of Water Reflection (cont)

10000 milli-g/cc			15000 milli-g/cc			19600 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
2.10	0.91582	0.00043	1.50	0.90273	0.00040	1.10	0.87623	0.00040
2.12	0.92247	0.00045	1.52	0.91177	0.00039	1.12	0.88787	0.00039
2.14	0.92978	0.00043	1.54	0.91986	0.00040	1.14	0.89836	0.00040
2.16	0.93688	0.00044	1.56	0.92908	0.00042	1.16	0.90950	0.00041
2.18	0.94340	0.00046	1.58	0.93769	0.00042	1.18	0.92053	0.00040
2.20	0.95051	0.00045	1.60	0.94673	0.00041	1.20	0.93201	0.00042
2.22	0.95729	0.00046	1.62	0.95482	0.00042	1.22	0.94319	0.00041
2.24	0.96406	0.00047	1.64	0.96315	0.00041	1.24	0.95317	0.00041
2.26	0.97050	0.00046	1.66	0.97223	0.00041	1.26	0.96387	0.00041
2.28	0.97686	0.00047	1.68	0.98068	0.00043	1.28	0.97411	0.00042
2.30	0.98342	0.00044	1.70	0.98888	0.00043	1.30	0.98540	0.00043
2.32	0.99074	0.00046	1.72	0.99752	0.00043	1.32	0.99610	0.00043
2.34	0.99752	0.00047	1.74	1.00596	0.00042	1.34	1.00630	0.00043
2.36	1.00382	0.00045	1.76	1.01374	0.00043	1.36	1.01651	0.00043
2.38	1.01100	0.00046	1.78	1.02205	0.00043	1.38	1.02717	0.00044
2.40	1.01695	0.00045	1.80	1.03092	0.00044	1.40	1.03698	0.00046
2.42	1.02366	0.00046						
2.44	1.03013	0.00045						
2.46	1.03589	0.00048						
2.48	1.04183	0.00046						
2.50	1.04887	0.00047						

B.1.3.1.2. 1” Water Reflector

Case ID: pu-pl-1000-01

Material: Plutonium metal in water

Geometry: Infinite Plane

Isotopics: 100% ^{239}Pu

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.1.3.1.2-1. Plutonium Slab (100% ^{239}Pu) - 1 Inch of Water Reflection

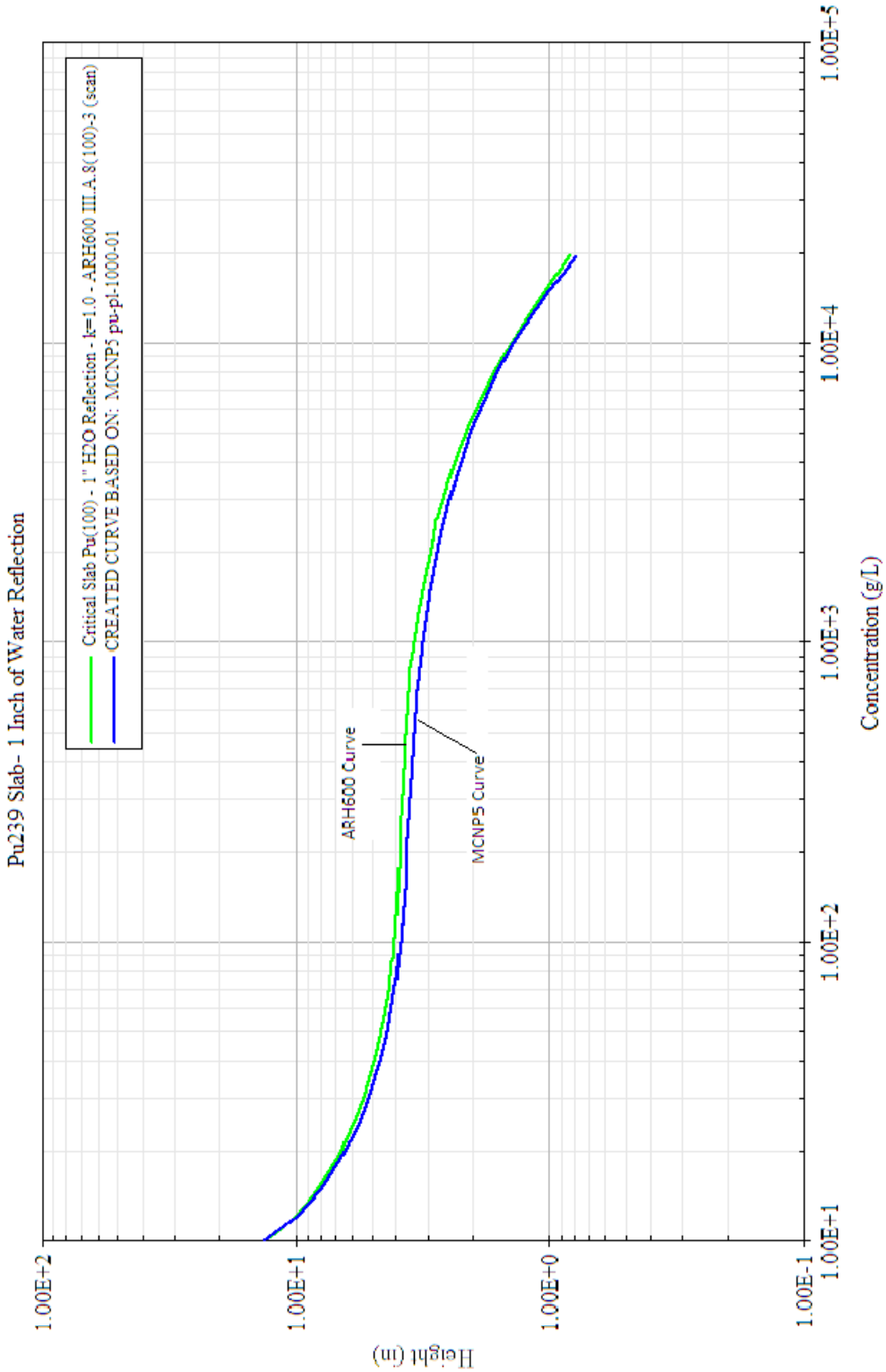

Table B.1.3.1.2-1. Critical Dimensions for Plutonium Slab (100% ^{239}Pu) - 1 Inch of Water Reflection

Plutonium Slab (100% ^{239}Pu) - 1 Inch of Water Reflection				
Concentration (g/cc)	First Height (Inches)	Last Height (Inches)	Delta (Inches)	Critical Height (Inches)
0.007	20.000	100.000	5.000	N/A
0.010	10.000	14.100	0.200	13.3114
0.012	8.100	10.500	0.100	10.0358
0.015	6.600	8.300	0.050	7.9155
0.020	5.400	6.700	0.050	6.3828
0.025	4.800	5.900	0.050	5.6376
0.030	4.500	5.400	0.050	5.1875
0.040	4.000	4.900	0.050	4.6717
0.050	3.800	4.600	0.050	4.3853
0.075	3.500	4.200	0.050	4.0313
0.100	3.300	4.000	0.050	3.8666
0.150	3.200	3.900	0.050	3.7134
0.200	3.100	3.800	0.050	3.6392
0.350	3.000	3.700	0.050	3.5176
0.500	2.900	3.600	0.050	3.4242
0.750	2.800	3.400	0.050	3.2928
1.000	2.700	3.300	0.050	3.1660
1.500	2.500	3.100	0.050	2.9539
2.000	2.400	2.900	0.020	2.7772
2.500	2.200	2.800	0.050	2.6224
3.000	2.100	2.600	0.020	2.4811
4.000	1.900	2.400	0.020	2.2461
5.000	1.700	2.200	0.020	2.0527
7.500	1.400	1.800	0.020	1.6696
10.000	1.100	1.500	0.020	1.3918
15.000	0.800	1.100	0.020	1.0073
19.600	0.600	0.900	0.020	0.7847

MCNP5 Sample Input File
100% ^{239}Pu Cylinder- 1 Inches of Reflection

```
Pu plane, 100.0 wt% 239Pu, 01000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Height = 300   hundreths of inches - must be integer
c half height =     3.8100 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 01000 milli-g Pu/cc
c Reflector width =  1.0 inches
c Enrichment = 1.00 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 239Pu  = 239.05220
c Pu240  = 240.05380
c
c Effective Plutonium atomic mass 239.05220
c PuO2
c Mass fraction of Pu in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0510 cc
c Volume of water in sample 0.9490 cc
c
c Mass of crit in sample   1.0000 g
c Mass of Pu in sample   1.0000 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9490 g
c
c Total mass of sample  1.9490g for a 1cc sample
c Mass Density for crit material  -1.9490, expressed as negative
c
c  plane
20 11   -1.948980   -1 2 -7 -5 8 6      imp:n=1
21  2  -1.000    -3 4 6 8 -7 -5 ((1 -3):(-2 4))       imp:n=1    $zero importance if no reflector
22  0            3:-4:7:5:-8:-6                    imp:n=0
```

```
1       py     3.8100              $ plane
2       py    -3.8100
3       py     6.3500         $ Reflection
4       py    -6.3500
*5       px   100
*6       px   -100
*7       pz   100
*8       pz   -100

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu / water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 01000 milli-g Pu/cc,  1.9490
1001.66c -0.054483
8016.66c -0.432428      $from water
c      8016.66c -0.000000      $from oxide
94239.66c -0.513089
c    94240.66c -0.000000
mt11     lwtr.60t
c
c    pu only
m12    $ Pu, 100.0 wt% 235U, 01000 milli-g U/cc,  1.9490
c      8016.66c -0.000000      $from oxide
94239.66c -0.513089
c    94240.66c -0.000000
c
```

Critview Compatible Data File
100% ^{239}Pu Cylinder- 1 Inches of Reflection

reset:
title: MCNP5 pu-pl-1000-01
set: MCNP5 set
source: MCNP5 primary
created: Mon 07/26/2010 9:04:49.22
geometry: infplane
modmat: H2O
critmat: plutonium
isomat: Pu239 1.0
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: height in

0.010	13.3114
0.012	10.0358
0.015	7.9155
0.020	6.3828
0.025	5.6376
0.030	5.1875
0.040	4.6717
0.050	4.3853
0.075	4.0313
0.100	3.8666
0.150	3.7134
0.200	3.6392
0.350	3.5176
0.500	3.4242
0.750	3.2928
1.000	3.1660
1.500	2.9539
2.000	2.7772
2.500	2.6224
3.000	2.4811
4.000	2.2461
5.000	2.0527
7.500	1.6696
10.00	1.3918
15.00	1.0073
19.60	0.7847

Table B.1.3.1.2-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 1 Inch of Water Reflection

7 milli-g/cc			10 milli-g/cc			12 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
20.00	0.90506	0.00039	10.00	0.92394	0.00029	8.10	0.92558	0.00034
25.00	0.92803	0.00034	10.20	0.93002	0.00029	8.20	0.92995	0.00034
30.00	0.94265	0.00034	10.40	0.93544	0.00029	8.30	0.93425	0.00032
35.00	0.95179	0.00031	10.60	0.94108	0.00030	8.40	0.93891	0.00033
40.00	0.95694	0.00032	10.80	0.94670	0.00030	8.50	0.94383	0.00034
45.00	0.96229	0.00027	11.00	0.95153	0.00028	8.60	0.94791	0.00034
50.00	0.96625	0.00027	11.20	0.95664	0.00029	8.70	0.95187	0.00034
55.00	0.96905	0.00025	11.40	0.96088	0.00029	8.80	0.95513	0.00035
60.00	0.97122	0.00026	11.60	0.96612	0.00028	8.90	0.96043	0.00032
65.00	0.97134	0.00024	11.80	0.97031	0.00027	9.00	0.96319	0.00031
70.00	0.97353	0.00024	12.00	0.97454	0.00028	9.10	0.96782	0.00032
75.00	0.97495	0.00024	12.20	0.97953	0.00028	9.20	0.97094	0.00033
80.00	0.97632	0.00023	12.40	0.98272	0.00027	9.30	0.97504	0.00032
85.00	0.97582	0.00024	12.60	0.98725	0.00028	9.40	0.97825	0.00033
90.00	0.97676	0.00023	12.80	0.99115	0.00028	9.50	0.98183	0.00032
95.00	0.97778	0.00022	13.00	0.99403	0.00027	9.60	0.98569	0.00033
100.00	0.97804	0.00022	13.20	0.99809	0.00027	9.70	0.98892	0.00033
			13.40	1.00152	0.00027	9.80	0.99212	0.00033
			13.60	1.00586	0.00027	9.90	0.99582	0.00032
			13.80	1.00778	0.00026	10.00	0.99872	0.00031
			14.00	1.01138	0.00027	10.10	1.00230	0.00032
			14.10	1.01327	0.00026	10.20	1.00515	0.00032
						10.30	1.00795	0.00032
						10.40	1.01096	0.00031
						10.50	1.01456	0.00031

Table B.1.3.1.2-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 1 Inch of Water Reflection (cont)

15 milli-g/cc			20 milli-g/cc			25 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
6.60	0.92305	0.00036	5.40	0.91695	0.00043	4.80	0.91542	0.00046
6.65	0.92579	0.00038	5.45	0.92169	0.00043	4.85	0.92116	0.00045
6.70	0.92969	0.00038	5.50	0.92686	0.00042	4.90	0.92630	0.00044
6.75	0.93272	0.00038	5.55	0.93091	0.00041	4.95	0.93152	0.00045
6.80	0.93516	0.00038	5.60	0.93537	0.00042	5.00	0.93712	0.00045
6.85	0.93876	0.00038	5.65	0.93990	0.00043	5.05	0.94169	0.00046
6.90	0.94248	0.00037	5.70	0.94415	0.00042	5.10	0.94814	0.00046
6.95	0.94469	0.00038	5.75	0.94838	0.00041	5.15	0.95286	0.00045
7.00	0.94853	0.00037	5.80	0.95237	0.00043	5.20	0.95743	0.00046
7.05	0.95104	0.00037	5.85	0.95740	0.00041	5.25	0.96263	0.00046
7.10	0.95449	0.00037	5.90	0.96098	0.00041	5.30	0.96831	0.00045
7.15	0.95743	0.00037	5.95	0.96554	0.00041	5.35	0.97129	0.00043
7.20	0.96036	0.00037	6.00	0.96993	0.00042	5.40	0.97746	0.00046
7.25	0.96336	0.00037	6.05	0.97316	0.00042	5.45	0.98291	0.00045
7.30	0.96642	0.00038	6.10	0.97768	0.00043	5.50	0.98693	0.00045
7.35	0.96903	0.00038	6.15	0.98113	0.00042	5.55	0.99119	0.00044
7.40	0.97190	0.00037	6.20	0.98523	0.00042	5.60	0.99641	0.00045
7.45	0.97458	0.00038	6.25	0.98919	0.00041	5.65	1.00119	0.00044
7.50	0.97761	0.00037	6.30	0.99318	0.00041	5.70	1.00560	0.00046
7.55	0.98003	0.00036	6.35	0.99721	0.00042	5.75	1.01046	0.00046
7.60	0.98218	0.00037	6.40	1.00146	0.00041	5.80	1.01466	0.00046
7.65	0.98551	0.00037	6.45	1.00417	0.00042	5.85	1.01919	0.00045
7.70	0.98843	0.00039	6.50	1.00823	0.00041	5.90	1.02344	0.00045
7.75	0.99106	0.00038	6.55	1.01192	0.00042			
7.80	0.99308	0.00036	6.60	1.01558	0.00040			
7.85	0.99617	0.00038	6.65	1.01876	0.00041			
7.90	0.99960	0.00036	6.70	1.02225	0.00041			
7.95	1.00089	0.00036						
8.00	1.00420	0.00036						
8.05	1.00605	0.00036						
8.10	1.00914	0.00036						
8.15	1.01102	0.00038						
8.20	1.01358	0.00037						
8.25	1.01554	0.00034						
8.30	1.01903	0.00037						

Table B.1.3.1.2-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 1 Inch of Water Reflection (cont)

30 milli-g/cc			40 milli-g/cc			50 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
4.50	0.92269	0.00049	4.00	0.91183	0.00050	3.80	0.91671	0.00052
4.55	0.92851	0.00049	4.05	0.91876	0.00050	3.85	0.92441	0.00051
4.60	0.93401	0.00049	4.10	0.92661	0.00049	3.90	0.93287	0.00051
4.65	0.94049	0.00047	4.15	0.93167	0.00051	3.95	0.94031	0.00055
4.70	0.94513	0.00047	4.20	0.93980	0.00050	4.00	0.94617	0.00052
4.75	0.95177	0.00049	4.25	0.94547	0.00049	4.05	0.95381	0.00052
4.80	0.95769	0.00047	4.30	0.95234	0.00049	4.10	0.96061	0.00052
4.85	0.96314	0.00047	4.35	0.95943	0.00051	4.15	0.96754	0.00052
4.90	0.96894	0.00048	4.40	0.96571	0.00050	4.20	0.97460	0.00051
4.95	0.97456	0.00047	4.45	0.97199	0.00049	4.25	0.98179	0.00053
5.00	0.98029	0.00047	4.50	0.97832	0.00050	4.30	0.98856	0.00050
5.05	0.98491	0.00049	4.55	0.98463	0.00050	4.35	0.99590	0.00053
5.10	0.99107	0.00047	4.60	0.99135	0.00048	4.40	1.00170	0.00052
5.15	0.99612	0.00047	4.65	0.99757	0.00050	4.45	1.00798	0.00052
5.20	1.00129	0.00047	4.70	1.00318	0.00050	4.50	1.01352	0.00052
5.25	1.00672	0.00049	4.75	1.00930	0.00051	4.55	1.02090	0.00052
5.30	1.01203	0.00047	4.80	1.01591	0.00050	4.60	1.02785	0.00054
5.35	1.01715	0.00046	4.85	1.02094	0.00051			
5.40	1.02152	0.00047	4.90	1.02687	0.00051			

Table B.1.3.1.2-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 1 Inch of Water Reflection (cont)

75 milli-g/cc			100 milli-g/cc			150 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
3.50	0.91761	0.00052	3.30	0.90882	0.00055	3.20	0.91557	0.00053
3.55	0.92537	0.00052	3.35	0.91760	0.00054	3.25	0.92476	0.00054
3.60	0.93431	0.00053	3.40	0.92622	0.00055	3.30	0.93331	0.00054
3.65	0.94234	0.00055	3.45	0.93388	0.00054	3.35	0.94053	0.00054
3.70	0.94983	0.00053	3.50	0.94104	0.00054	3.40	0.94886	0.00058
3.75	0.95710	0.00052	3.55	0.95112	0.00053	3.45	0.95746	0.00056
3.80	0.96529	0.00056	3.60	0.95791	0.00055	3.50	0.96650	0.00056
3.85	0.97368	0.00053	3.65	0.96631	0.00053	3.55	0.97407	0.00054
3.90	0.97959	0.00054	3.70	0.97448	0.00056	3.60	0.98080	0.00055
3.95	0.98802	0.00052	3.75	0.98118	0.00053	3.65	0.99006	0.00057
4.00	0.99547	0.00054	3.80	0.98918	0.00054	3.70	0.99811	0.00055
4.05	1.00270	0.00053	3.85	0.99736	0.00053	3.75	1.00518	0.00054
4.10	1.00970	0.00053	3.90	1.00529	0.00054	3.80	1.01264	0.00056
4.15	1.01634	0.00052	3.95	1.01158	0.00054	3.85	1.02042	0.00056
4.20	1.02293	0.00053	4.00	1.01868	0.00054	3.90	1.02845	0.00056

Table B.1.3.1.2-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 1 Inch of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
3.10	0.90987	0.00056	3.00	0.91371	0.00056	2.90	0.91019	0.00056
3.15	0.91967	0.00056	3.05	0.92167	0.00055	2.95	0.91842	0.00057
3.20	0.92826	0.00055	3.10	0.93072	0.00056	3.00	0.92853	0.00056
3.25	0.93618	0.00055	3.15	0.93975	0.00055	3.05	0.93706	0.00056
3.30	0.94412	0.00058	3.20	0.94852	0.00057	3.10	0.94601	0.00056
3.35	0.95244	0.00056	3.25	0.95645	0.00056	3.15	0.95449	0.00056
3.40	0.96153	0.00056	3.30	0.96534	0.00056	3.20	0.96264	0.00057
3.45	0.96998	0.00054	3.35	0.97362	0.00055	3.25	0.97168	0.00056
3.50	0.97718	0.00055	3.40	0.98201	0.00056	3.30	0.97977	0.00057
3.55	0.98671	0.00055	3.45	0.98954	0.00057	3.35	0.98780	0.00056
3.60	0.99398	0.00058	3.50	0.99731	0.00057	3.40	0.99675	0.00057
3.65	1.00165	0.00055	3.55	1.00495	0.00055	3.45	1.00346	0.00054
3.70	1.00883	0.00055	3.60	1.01334	0.00055	3.50	1.01294	0.00056
3.75	1.01644	0.00055	3.65	1.02123	0.00055	3.55	1.01984	0.00056
3.80	1.02441	0.00055	3.70	1.02835	0.00057	3.60	1.02752	0.00057

Table B.1.3.1.2-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 1 Inch of Water Reflection (cont)

750 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
2.80	0.91236	0.00056	2.70	0.91369	0.00055	2.50	0.91144	0.00056
2.85	0.92270	0.00057	2.75	0.92462	0.00055	2.55	0.91997	0.00058
2.90	0.93191	0.00055	2.80	0.93331	0.00057	2.60	0.93121	0.00057
2.95	0.94142	0.00057	2.85	0.94263	0.00055	2.65	0.94081	0.00059
3.00	0.95020	0.00055	2.90	0.95193	0.00057	2.70	0.95033	0.00056
3.05	0.95863	0.00057	2.95	0.96092	0.00057	2.75	0.96128	0.00056
3.10	0.96815	0.00055	3.00	0.96986	0.00055	2.80	0.97103	0.00059
3.15	0.97568	0.00057	3.05	0.97944	0.00056	2.85	0.97957	0.00056
3.20	0.98506	0.00056	3.10	0.98817	0.00055	2.90	0.98937	0.00058
3.25	0.99461	0.00057	3.15	0.99738	0.00057	2.95	0.99936	0.00056
3.30	1.00091	0.00058	3.20	1.00556	0.00058	3.00	1.00762	0.00057
3.35	1.01070	0.00057	3.25	1.01354	0.00058	3.05	1.01736	0.00056
3.40	1.01809	0.00056	3.30	1.02253	0.00056	3.10	1.02595	0.00058

Table B.1.3.1.2-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 1 Inch of Water Reflection (cont)

2000 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
2.40	0.92357	0.00057	2.20	0.90766	0.00056	2.10	0.91213	0.00055
2.42	0.92596	0.00057	2.25	0.91939	0.00057	2.12	0.91693	0.00055
2.44	0.93111	0.00056	2.30	0.93131	0.00056	2.14	0.92114	0.00057
2.46	0.93488	0.00057	2.35	0.94153	0.00059	2.16	0.92596	0.00055
2.48	0.93881	0.00057	2.40	0.95289	0.00056	2.18	0.93106	0.00055
2.50	0.94488	0.00057	2.45	0.96389	0.00057	2.20	0.93652	0.00057
2.52	0.94875	0.00058	2.50	0.97442	0.00057	2.22	0.94120	0.00055
2.54	0.95317	0.00056	2.55	0.98520	0.00056	2.24	0.94539	0.00055
2.56	0.95629	0.00056	2.60	0.99547	0.00058	2.26	0.95113	0.00057
2.58	0.96093	0.00056	2.65	1.00557	0.00058	2.28	0.95488	0.00058
2.60	0.96513	0.00056	2.70	1.01666	0.00057	2.30	0.95998	0.00059
2.62	0.96867	0.00055	2.75	1.02655	0.00056	2.32	0.96309	0.00057
2.64	0.97345	0.00057	2.80	1.03615	0.00057	2.34	0.96822	0.00057
2.66	0.97774	0.00055				2.36	0.97298	0.00056
2.68	0.98080	0.00057				2.38	0.97712	0.00057
2.70	0.98536	0.00059				2.40	0.98098	0.00056
2.72	0.99011	0.00058				2.42	0.98610	0.00057
2.74	0.99213	0.00056				2.44	0.99129	0.00057
2.76	0.99634	0.00056				2.46	0.99535	0.00057
2.78	1.00060	0.00059				2.48	0.99979	0.00056
2.80	1.00543	0.00055				2.50	1.00358	0.00056
2.82	1.00887	0.00055				2.52	1.00832	0.00056
2.84	1.01229	0.00058				2.54	1.01211	0.00057
2.86	1.01687	0.00056				2.56	1.01639	0.00058
2.88	1.02003	0.00056				2.58	1.02129	0.00057
2.90	1.02391	0.00057				2.60	1.02607	0.00058

Table B.1.3.1.2-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 1 Inch of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			7500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
1.90	0.91268	0.00058	1.70	0.90311	0.00055	1.40	0.91120	0.00053
1.92	0.91741	0.00054	1.72	0.90941	0.00056	1.42	0.91859	0.00051
1.94	0.92303	0.00056	1.74	0.91539	0.00054	1.44	0.92501	0.00053
1.96	0.92851	0.00056	1.76	0.92066	0.00054	1.46	0.93190	0.00055
1.98	0.93311	0.00056	1.78	0.92638	0.00055	1.48	0.93842	0.00055
2.00	0.93866	0.00055	1.80	0.93199	0.00055	1.50	0.94456	0.00055
2.02	0.94398	0.00055	1.82	0.93767	0.00055	1.52	0.95156	0.00052
2.04	0.94828	0.00057	1.84	0.94417	0.00053	1.54	0.95867	0.00053
2.06	0.95458	0.00058	1.86	0.94860	0.00055	1.56	0.96431	0.00055
2.08	0.95913	0.00056	1.88	0.95385	0.00056	1.58	0.97074	0.00054
2.10	0.96354	0.00056	1.90	0.95945	0.00055	1.60	0.97741	0.00055
2.12	0.96878	0.00057	1.92	0.96431	0.00054	1.62	0.98435	0.00052
2.14	0.97429	0.00057	1.94	0.96992	0.00056	1.64	0.98947	0.00054
2.16	0.97923	0.00057	1.96	0.97635	0.00056	1.66	0.99694	0.00054
2.18	0.98360	0.00057	1.98	0.98114	0.00054	1.68	1.00330	0.00055
2.20	0.98896	0.00056	2.00	0.98654	0.00055	1.70	1.00807	0.00055
2.22	0.99320	0.00056	2.02	0.99166	0.00056	1.72	1.01514	0.00054
2.24	0.99842	0.00056	2.04	0.99715	0.00056	1.74	1.02196	0.00055
2.26	1.00360	0.00057	2.06	1.00164	0.00057	1.76	1.02670	0.00055
2.28	1.00750	0.00059	2.08	1.00731	0.00056	1.78	1.03383	0.00054
2.30	1.01348	0.00057	2.10	1.01259	0.00057	1.80	1.03955	0.00055
2.32	1.01741	0.00056	2.12	1.01794	0.00055			
2.34	1.02211	0.00055	2.14	1.02337	0.00055			
2.36	1.02657	0.00055	2.16	1.02871	0.00056			
2.38	1.03145	0.00056	2.18	1.03213	0.00057			
2.40	1.03521	0.00057	2.20	1.03810	0.00055			

Table B.1.3.1.2-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 1 Inch of Water Reflection (cont)

10000 milli-g/cc			15000 milli-g/cc			19600 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
1.10	0.88614	0.00050	0.80	0.88875	0.00050	0.60	0.87273	0.00048
1.12	0.89450	0.00050	0.82	0.90099	0.00051	0.62	0.88724	0.00049
1.14	0.90358	0.00053	0.84	0.91150	0.00050	0.64	0.90147	0.00049
1.16	0.91005	0.00052	0.86	0.92218	0.00050	0.66	0.91512	0.00051
1.18	0.91914	0.00052	0.88	0.93377	0.00050	0.68	0.92938	0.00051
1.20	0.92648	0.00051	0.90	0.94461	0.00052	0.70	0.94330	0.00050
1.22	0.93405	0.00051	0.92	0.95528	0.00050	0.72	0.95749	0.00052
1.24	0.94282	0.00052	0.94	0.96525	0.00052	0.74	0.97017	0.00050
1.26	0.95038	0.00052	0.96	0.97546	0.00050	0.76	0.98371	0.00051
1.28	0.95896	0.00052	0.98	0.98666	0.00052	0.78	0.99714	0.00052
1.30	0.96534	0.00053	1.00	0.99663	0.00053	0.80	1.00933	0.00051
1.32	0.97398	0.00054	1.02	1.00587	0.00052	0.82	1.02234	0.00051
1.34	0.98106	0.00053	1.04	1.01683	0.00052	0.84	1.03428	0.00051
1.36	0.98891	0.00053	1.06	1.02535	0.00052	0.86	1.04682	0.00051
1.38	0.99592	0.00054	1.08	1.03512	0.00053	0.88	1.05974	0.00053
1.40	1.00284	0.00055	1.10	1.04529	0.00053	0.90	1.07143	0.00053
1.42	1.01073	0.00053						
1.44	1.01770	0.00053						
1.46	1.02539	0.00055						
1.48	1.03276	0.00054						
1.50	1.03946	0.00054						

B.1.3.1.3. 10” Water Reflector

Case ID: pu-pl-1000-10

Material: Plutonium metal in water

Geometry: Infinite Plane

Isotopics: 100% ^{239}Pu

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.1.3.1.3-1. Plutonium Slab (100% ^{239}Pu) - 10 Inch of Water Reflection

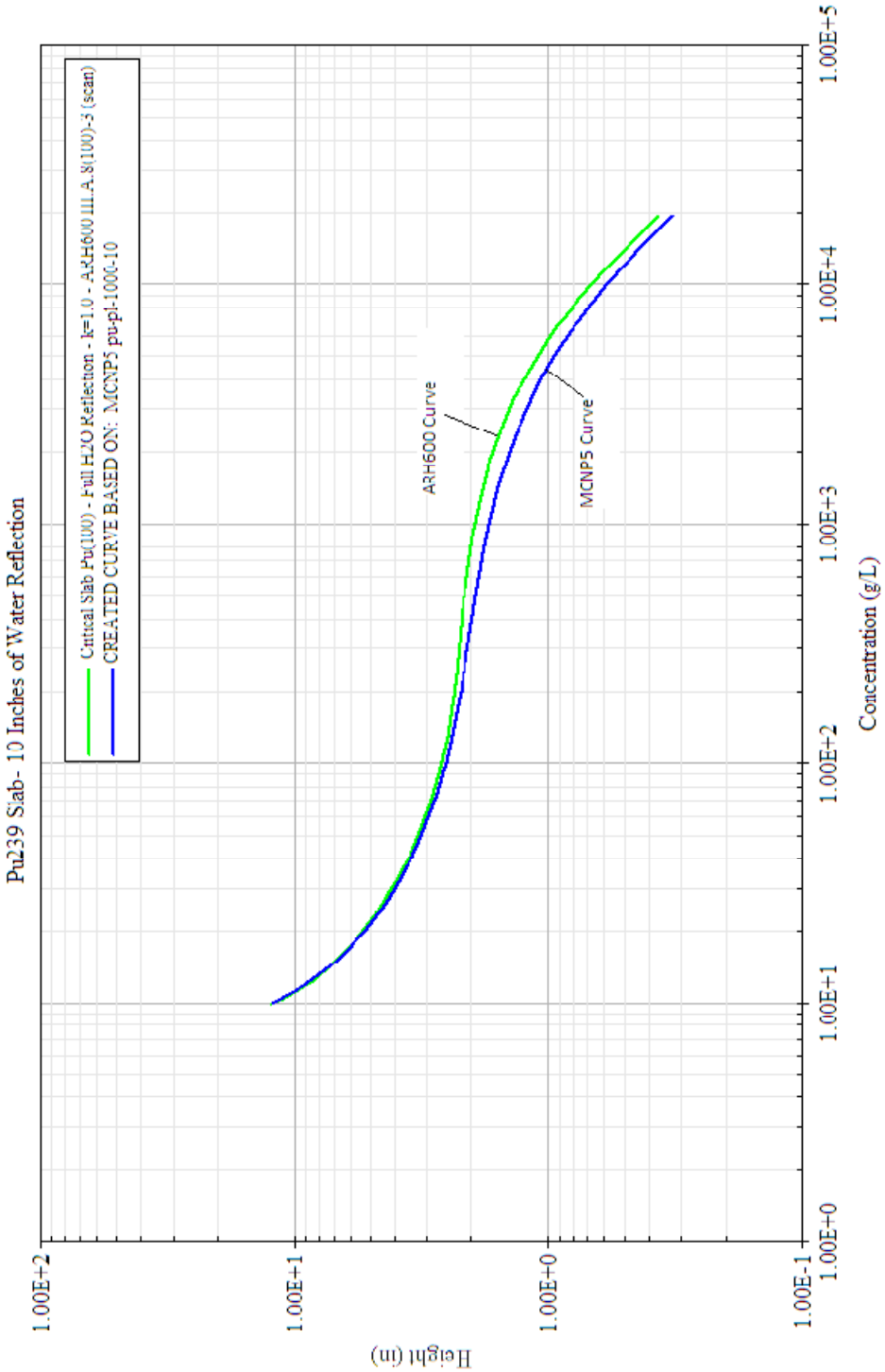

Table B.1.3.1.3-1. Critical Dimensions for Plutonium Slab (100% ^{239}Pu) - 10 Inch of Water Reflection

Plutonium Slab (100% ^{239}Pu)- 10 Inch of Water Reflection				
Concentration (g/cc)	First Height (Inches)	Last Height (Inches)	Delta (Inches)	Critical Height (Inches)
0.007	20.000	100.000	5.000	N/A
0.010	9.000	15.000	0.200	12.1921
0.012	7.000	10.000	0.100	8.9129
0.015	5.500	7.100	0.050	6.7938
0.020	4.400	5.500	0.050	5.2473
0.025	3.600	4.700	0.050	4.4847
0.030	3.400	4.200	0.050	4.0148
0.040	2.850	3.650	0.050	3.4677
0.050	2.550	3.350	0.050	3.1532
0.075	2.100	2.900	0.050	2.7398
0.100	1.900	2.700	0.050	2.5351
0.150	1.800	2.500	0.050	2.3253
0.200	1.800	2.400	0.050	2.2138
0.350	1.500	2.200	0.050	2.0429
0.500	1.500	2.100	0.050	1.9377
0.750	1.400	1.900	0.020	1.8131
1.000	1.300	1.900	0.050	1.7097
1.500	1.100	1.700	0.050	1.5480
2.000	1.000	1.500	0.020	1.4178
2.500	1.000	1.400	0.020	1.3145
3.000	0.900	1.300	0.020	1.2154
4.000	0.800	1.200	0.020	1.0657
5.000	0.700	1.000	0.020	0.9443
7.500	0.500	1.000	0.020	0.7299
10.000	0.400	0.700	0.020	0.5883
15.000	0.300	0.500	0.020	0.4146
19.600	0.240	0.380	0.010	0.3234

MCNP5 Sample Input File
100% ^{239}Pu Cylinder- 10 Inches of Reflection

```
Pu plane, 100.0 wt% 239Pu, 01000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Height = 165   hundreths of inches - must be integer
c half height =     2.0955 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 01000 milli-g Pu/cc
c Reflector width = 10.0 inches
c Enrichment = 1.00 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 239Pu  = 239.05220
c Pu240  = 240.05380
c
c Effective Plutonium atomic mass 239.05220
c PuO2
c Mass fraction of Pu in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0510 cc
c Volume of water in sample 0.9490 cc
c
c Mass of crit in sample   1.0000 g
c Mass of Pu in sample   1.0000 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9490 g
c
c Total mass of sample  1.9490g for a 1cc sample
c Mass Density for crit material  -1.9490, expressed as negative
c
c  plane
20 11   -1.948980   -1 2 -7 -5 8 6      imp:n=1
21  2  -1.000    -3 4 6 8 -7 -5 ((1 -3):(-2 4))        imp:n=1    $zero importance if no reflector
22  0            3:-4:7:5:-8:-6                        imp:n=0
```

```
1       py     2.0955              $ plane
2       py    -2.0955
3       py    27.4955         $ Reflection
4       py   -27.4955
*5       px   100
*6       px   -100
*7       pz   100
*8       pz   -100

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu / water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 01000 milli-g Pu/cc,  1.9490
1001.66c -0.054483
8016.66c -0.432428      $from water
c      8016.66c -0.000000      $from oxide
94239.66c -0.513089
c    94240.66c -0.000000
mt11     lwtr.60t
c
c    pu only
m12    $ Pu, 100.0 wt% 235U, 01000 milli-g U/cc,  1.9490
c      8016.66c -0.000000      $from oxide
94239.66c -0.513089
c    94240.66c -0.000000
c
```

Critview Compatible Data File
100% ^{239}Pu Cylinder- 10 Inches of Reflection

reset:
title: MCNP5 pu-pl-1000-10
set: MCNP5 set
source: MCNP5 primary
created: Mon 07/26/2010 9:05:08.79
geometry: infplane
modmat: H2O
critmat: plutonium
isomat: Pu239 1.0
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: height in

0.010	12.1921
0.012	8.9129
0.015	6.7938
0.020	5.2473
0.025	4.4847
0.030	4.0148
0.040	3.4677
0.050	3.1532
0.075	2.7398
0.100	2.5351
0.150	2.3253
0.200	2.2138
0.350	2.0429
0.500	1.9377
0.750	1.8131
1.000	1.7097
1.500	1.5480
2.000	1.4178
2.500	1.3145
3.000	1.2154
4.000	1.0657
5.000	0.9443
7.500	0.7299
10.00	0.5883
15.00	0.4146
19.60	0.3234

Table B.1.3.1.3-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 10 Inch of Water Reflection

7 milli-g/cc			10 milli-g/cc			12 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
20.00	0.91071	0.00021	9.00	0.92642	0.00034	7.00	0.92508	0.00036
25.00	0.93207	0.00021	9.20	0.93247	0.00032	7.10	0.93001	0.00037
30.00	0.94494	0.00019	9.40	0.93737	0.00031	7.20	0.93459	0.00036
35.00	0.95371	0.00018	9.60	0.94313	0.00033	7.30	0.93951	0.00037
40.00	0.95945	0.00017	9.80	0.94881	0.00033	7.40	0.94394	0.00038
45.00	0.96336	0.00016	10.00	0.95388	0.00031	7.50	0.94745	0.00037
50.00	0.96611	0.00016	10.20	0.95851	0.00032	7.60	0.95158	0.00038
55.00	0.96912	0.00015	10.40	0.96303	0.00032	7.70	0.95602	0.00039
60.00	0.97115	0.00015	10.60	0.96836	0.00032	7.80	0.95958	0.00036
65.00	0.97303	0.00015	10.80	0.97268	0.00031	7.90	0.96374	0.00037
70.00	0.97418	0.00015	11.00	0.97679	0.00032	8.00	0.96777	0.00037
75.00	0.97485	0.00014	11.20	0.98094	0.00032	8.10	0.97145	0.00035
80.00	0.97563	0.00014	11.40	0.98505	0.00032	8.20	0.97534	0.00036
85.00	0.97615	0.00014	11.60	0.98916	0.00030	8.30	0.97883	0.00036
90.00	0.97680	0.00014	11.80	0.99276	0.00031	8.40	0.98178	0.00036
95.00	0.97774	0.00013	12.00	0.99561	0.00030	8.50	0.98580	0.00036
100.00	0.97790	0.00013	12.20	1.00018	0.00031	8.60	0.98951	0.00036
			12.40	1.00353	0.00030	8.70	0.99286	0.00035
			12.60	1.00632	0.00031	8.80	0.99605	0.00035
			12.80	1.01033	0.00030	8.90	0.99962	0.00035
			13.00	1.01335	0.00030	9.00	1.00257	0.00036
			13.20	1.01606	0.00029	9.10	1.00516	0.00035
			13.40	1.01936	0.00030	9.20	1.00858	0.00036
			13.60	1.02126	0.00029	9.30	1.01133	0.00036
			13.80	1.02493	0.00030	9.40	1.01492	0.00034
			14.00	1.02706	0.00029	9.50	1.01746	0.00036
			14.20	1.02961	0.00029	9.60	1.02063	0.00035
			14.40	1.03272	0.00030	9.70	1.02310	0.00033
			14.60	1.03482	0.00027	9.80	1.02576	0.00035
			14.80	1.03711	0.00028	9.90	1.02865	0.00036
			15.00	1.03988	0.00028	10.00	1.03158	0.00035

Table B.1.3.1.3-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 10 Inch of Water Reflection (cont)

15 milli-g/cc			20 milli-g/cc			25 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
5.50	0.92247	0.00035	4.40	0.92719	0.00038	3.60	0.90732	0.00041
5.55	0.92587	0.00036	4.45	0.93269	0.00039	3.65	0.91313	0.00041
5.60	0.92917	0.00035	4.50	0.93773	0.00040	3.70	0.91907	0.00042
5.65	0.93202	0.00034	4.55	0.94249	0.00038	3.75	0.92393	0.00042
5.70	0.93571	0.00035	4.60	0.94572	0.00039	3.80	0.92982	0.00041
5.75	0.93886	0.00034	4.65	0.95038	0.00039	3.85	0.93533	0.00042
5.80	0.94251	0.00034	4.70	0.95428	0.00039	3.90	0.94097	0.00042
5.85	0.94567	0.00037	4.75	0.95957	0.00039	3.95	0.94656	0.00043
5.90	0.94920	0.00035	4.80	0.96399	0.00038	4.00	0.95220	0.00041
5.95	0.95164	0.00035	4.85	0.96702	0.00040	4.05	0.95724	0.00041
6.00	0.95454	0.00035	4.90	0.97229	0.00040	4.10	0.96273	0.00042
6.05	0.95782	0.00036	4.95	0.97632	0.00039	4.15	0.96761	0.00041
6.10	0.96080	0.00035	5.00	0.97992	0.00038	4.20	0.97213	0.00041
6.15	0.96353	0.00035	5.05	0.98421	0.00039	4.25	0.97691	0.00041
6.20	0.96649	0.00034	5.10	0.98858	0.00039	4.30	0.98196	0.00042
6.25	0.96961	0.00035	5.15	0.99265	0.00039	4.35	0.98713	0.00040
6.30	0.97268	0.00035	5.20	0.99584	0.00039	4.40	0.99191	0.00042
6.35	0.97505	0.00035	5.25	1.00024	0.00038	4.45	0.99687	0.00041
6.40	0.97836	0.00034	5.30	1.00394	0.00039	4.50	1.00138	0.00041
6.45	0.98091	0.00034	5.35	1.00735	0.00038	4.55	1.00643	0.00042
6.50	0.98406	0.00033	5.40	1.01136	0.00038	4.60	1.01104	0.00042
6.55	0.98632	0.00033	5.45	1.01487	0.00041	4.65	1.01514	0.00042
6.60	0.98982	0.00034	5.50	1.01845	0.00039	4.70	1.01983	0.00042
6.65	0.99210	0.00033						
6.70	0.99446	0.00034						
6.75	0.99731	0.00035						
6.80	1.00038	0.00034						
6.85	1.00224	0.00034						
6.90	1.00471	0.00035						
6.95	1.00664	0.00034						
7.00	1.00961	0.00034						
7.05	1.01204	0.00035						
7.10	1.01535	0.00034						

Table B.1.3.1.3-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 10 Inch of Water Reflection (cont)

30 milli-g/cc			40 milli-g/cc			50 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
3.40	0.92948	0.00044	2.85	0.91651	0.00044	2.55	0.91060	0.00047
3.45	0.93512	0.00043	2.90	0.92300	0.00046	2.60	0.91972	0.00047
3.50	0.94054	0.00043	2.95	0.93064	0.00046	2.65	0.92682	0.00047
3.55	0.94762	0.00042	3.00	0.93722	0.00046	2.70	0.93447	0.00047
3.60	0.95309	0.00043	3.05	0.94449	0.00045	2.75	0.94252	0.00046
3.65	0.95887	0.00042	3.10	0.95200	0.00046	2.80	0.94996	0.00046
3.70	0.96454	0.00044	3.15	0.95913	0.00047	2.85	0.95724	0.00048
3.75	0.97081	0.00043	3.20	0.96536	0.00047	2.90	0.96410	0.00049
3.80	0.97512	0.00043	3.25	0.97263	0.00047	2.95	0.97182	0.00048
3.85	0.98155	0.00044	3.30	0.97936	0.00046	3.00	0.97857	0.00047
3.90	0.98831	0.00045	3.35	0.98568	0.00045	3.05	0.98613	0.00046
3.95	0.99268	0.00045	3.40	0.99186	0.00045	3.10	0.99306	0.00046
4.00	0.99816	0.00045	3.45	0.99769	0.00045	3.15	0.99951	0.00047
4.05	1.00437	0.00044	3.50	1.00420	0.00045	3.20	1.00708	0.00048
4.10	1.00961	0.00044	3.55	1.01042	0.00045	3.25	1.01277	0.00047
4.15	1.01495	0.00041	3.60	1.01632	0.00046	3.30	1.02011	0.00048
4.20	1.01920	0.00045	3.65	1.02227	0.00048	3.35	1.02591	0.00046

Table B.1.3.1.3-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 10 Inch of Water Reflection (cont)

75 milli-g/cc			100 milli-g/cc			150 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
2.10	0.89436	0.00048	1.90	0.88986	0.00049	1.80	0.90719	0.00051
2.15	0.90318	0.00048	1.95	0.90007	0.00048	1.85	0.91687	0.00051
2.20	0.91117	0.00048	2.00	0.90850	0.00049	1.90	0.92514	0.00050
2.25	0.92066	0.00050	2.05	0.91837	0.00050	1.95	0.93570	0.00050
2.30	0.92972	0.00049	2.10	0.92630	0.00050	2.00	0.94373	0.00049
2.35	0.93766	0.00048	2.15	0.93655	0.00049	2.05	0.95298	0.00049
2.40	0.94671	0.00051	2.20	0.94525	0.00048	2.10	0.96149	0.00050
2.45	0.95468	0.00048	2.25	0.95276	0.00049	2.15	0.97071	0.00050
2.50	0.96210	0.00050	2.30	0.96179	0.00050	2.20	0.97887	0.00050
2.55	0.97013	0.00050	2.35	0.96960	0.00049	2.25	0.98749	0.00051
2.60	0.97864	0.00049	2.40	0.97857	0.00049	2.30	0.99615	0.00051
2.65	0.98613	0.00047	2.45	0.98599	0.00051	2.35	1.00375	0.00049
2.70	0.99323	0.00049	2.50	0.99470	0.00051	2.40	1.01174	0.00051
2.75	1.00174	0.00050	2.55	1.00224	0.00049	2.45	1.02005	0.00048
2.80	1.00940	0.00049	2.60	1.00997	0.00052	2.50	1.02784	0.00051
2.85	1.01695	0.00048	2.65	1.01839	0.00050			
2.90	1.02318	0.00050	2.70	1.02397	0.00049			

Table B.1.3.1.3-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 10 Inch of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
1.80	0.92769	0.00050	1.50	0.90153	0.00051	1.50	0.91985	0.00050
1.85	0.93667	0.00050	1.55	0.91133	0.00050	1.55	0.92852	0.00052
1.90	0.94551	0.00051	1.60	0.92088	0.00051	1.60	0.93881	0.00050
1.95	0.95466	0.00049	1.65	0.92996	0.00051	1.65	0.94771	0.00051
2.00	0.96380	0.00051	1.70	0.93898	0.00049	1.70	0.95806	0.00052
2.05	0.97257	0.00051	1.75	0.94848	0.00049	1.75	0.96648	0.00051
2.10	0.98079	0.00051	1.80	0.95854	0.00051	1.80	0.97599	0.00053
2.15	0.98984	0.00050	1.85	0.96719	0.00051	1.85	0.98565	0.00052
2.20	0.99786	0.00051	1.90	0.97569	0.00051	1.90	0.99307	0.00052
2.25	1.00561	0.00051	1.95	0.98460	0.00052	1.95	1.00225	0.00053
2.30	1.01438	0.00049	2.00	0.99344	0.00051	2.00	1.01066	0.00053
2.35	1.02282	0.00051	2.05	1.00109	0.00051	2.05	1.01870	0.00052
2.40	1.02960	0.00051	2.10	1.00956	0.00052	2.10	1.02757	0.00052
			2.15	1.01849	0.00050			
			2.20	1.02633	0.00050			

Table B.1.3.1.3-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 10 Inch of Water Reflection (cont)

750 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
1.40	0.92186	0.00052	1.30	0.91842	0.00051	1.10	0.90297	0.00053
1.42	0.92511	0.00050	1.35	0.92904	0.00053	1.15	0.91529	0.00051
1.44	0.93005	0.00052	1.40	0.93918	0.00052	1.20	0.92548	0.00051
1.46	0.93339	0.00050	1.45	0.95037	0.00052	1.25	0.93727	0.00052
1.48	0.93709	0.00050	1.50	0.95918	0.00050	1.30	0.94809	0.00052
1.50	0.94132	0.00052	1.55	0.96903	0.00052	1.35	0.95902	0.00051
1.52	0.94579	0.00051	1.60	0.97982	0.00054	1.40	0.96937	0.00051
1.54	0.94945	0.00051	1.65	0.98859	0.00051	1.45	0.98133	0.00053
1.56	0.95275	0.00050	1.70	0.99819	0.00053	1.50	0.98969	0.00052
1.58	0.95760	0.00050	1.75	1.00749	0.00052	1.55	1.00043	0.00052
1.60	0.96108	0.00052	1.80	1.01674	0.00053	1.60	1.01112	0.00052
1.62	0.96530	0.00052	1.85	1.02550	0.00051	1.65	1.02026	0.00053
1.64	0.96887	0.00052	1.90	1.03384	0.00052	1.70	1.02887	0.00052
1.66	0.97301	0.00052						
1.68	0.97651	0.00051						
1.70	0.97988	0.00052						
1.72	0.98426	0.00051						
1.74	0.98701	0.00052						
1.76	0.99000	0.00050						
1.78	0.99349	0.00051						
1.80	0.99745	0.00052						
1.82	1.00133	0.00052						
1.84	1.00493	0.00051						
1.86	1.00893	0.00051						
1.88	1.01233	0.00053						
1.90	1.01638	0.00052						

Table B.1.3.1.3-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 10 Inch of Water Reflection (cont)

2000 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
1.00	0.90343	0.00052	1.00	0.92480	0.00052	0.90	0.91822	0.00054
1.02	0.90815	0.00053	1.02	0.93017	0.00052	0.92	0.92330	0.00051
1.04	0.91435	0.00053	1.04	0.93542	0.00052	0.94	0.92848	0.00052
1.06	0.91802	0.00051	1.06	0.94038	0.00052	0.96	0.93478	0.00052
1.08	0.92298	0.00050	1.08	0.94514	0.00050	0.98	0.94016	0.00052
1.10	0.92822	0.00052	1.10	0.95027	0.00051	1.00	0.94471	0.00053
1.12	0.93279	0.00053	1.12	0.95419	0.00054	1.02	0.95088	0.00051
1.14	0.93742	0.00051	1.14	0.95989	0.00053	1.04	0.95504	0.00052
1.16	0.94267	0.00053	1.16	0.96445	0.00051	1.06	0.96005	0.00054
1.18	0.94722	0.00053	1.18	0.96965	0.00052	1.08	0.96596	0.00051
1.20	0.95112	0.00053	1.20	0.97480	0.00052	1.10	0.97114	0.00053
1.22	0.95598	0.00051	1.22	0.97921	0.00053	1.12	0.97578	0.00054
1.24	0.96127	0.00052	1.24	0.98428	0.00052	1.14	0.98105	0.00052
1.26	0.96603	0.00053	1.26	0.98852	0.00053	1.16	0.98583	0.00053
1.28	0.97017	0.00052	1.28	0.99316	0.00052	1.18	0.99008	0.00051
1.30	0.97428	0.00053	1.30	0.99713	0.00051	1.20	0.99621	0.00052
1.32	0.97884	0.00050	1.32	1.00108	0.00053	1.22	1.00112	0.00053
1.34	0.98287	0.00053	1.34	1.00738	0.00053	1.24	1.00575	0.00054
1.36	0.98807	0.00053	1.36	1.01079	0.00052	1.26	1.01016	0.00053
1.38	0.99193	0.00053	1.38	1.01576	0.00053	1.28	1.01431	0.00053
1.40	0.99590	0.00053	1.40	1.01966	0.00052	1.30	1.01967	0.00052
1.42	1.00051	0.00051						
1.44	1.00440	0.00053						
1.46	1.00857	0.00051						
1.48	1.01370	0.00052						
1.50	1.01665	0.00053						

Table B.1.3.1.3-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 10 Inch of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			7500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
0.80	0.92311	0.00052	0.70	0.92171	0.00052	0.50	0.90571	0.00051
0.82	0.92937	0.00053	0.72	0.92810	0.00054	0.52	0.91451	0.00050
0.84	0.93506	0.00051	0.74	0.93514	0.00050	0.54	0.92326	0.00052
0.86	0.94240	0.00051	0.76	0.94125	0.00052	0.56	0.93189	0.00053
0.88	0.94845	0.00052	0.78	0.94817	0.00052	0.58	0.94012	0.00052
0.90	0.95369	0.00051	0.80	0.95513	0.00051	0.60	0.94890	0.00050
0.92	0.95855	0.00052	0.82	0.96008	0.00053	0.62	0.95781	0.00050
0.94	0.96516	0.00050	0.84	0.96786	0.00052	0.64	0.96503	0.00052
0.96	0.97028	0.00052	0.86	0.97389	0.00051	0.66	0.97286	0.00051
0.98	0.97637	0.00051	0.88	0.98026	0.00053	0.68	0.98073	0.00051
1.00	0.98228	0.00052	0.90	0.98627	0.00055	0.70	0.98899	0.00051
1.02	0.98857	0.00053	0.92	0.99255	0.00051	0.72	0.99599	0.00052
1.04	0.99276	0.00054	0.94	0.99881	0.00054	0.74	1.00407	0.00051
1.06	0.99826	0.00052	0.96	1.00439	0.00054	0.76	1.01129	0.00053
1.08	1.00435	0.00054	0.98	1.00991	0.00052	0.78	1.01912	0.00052
1.10	1.00940	0.00052	1.00	1.01620	0.00053	0.80	1.02600	0.00051
1.12	1.01447	0.00052				0.82	1.03323	0.00052
1.14	1.02011	0.00054				0.84	1.04036	0.00052
1.16	1.02485	0.00052				0.86	1.04711	0.00052
1.18	1.02981	0.00052				0.88	1.05498	0.00053
1.20	1.03500	0.00051				0.90	1.06164	0.00052
						0.92	1.06857	0.00053
						0.94	1.07453	0.00052
						0.96	1.08049	0.00053
						0.98	1.08744	0.00053
						1.00	1.09425	0.00052

Table B.1.3.1.3-2. K_{eff} Values for Plutonium Slab (100% ^{239}Pu) - 10 Inch of Water Reflection (cont)

10000 milli-g/cc			15000 milli-g/cc			19600 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
0.40	0.90530	0.00050	0.30	0.91894	0.00051	0.24	0.92543	0.00053
0.42	0.91629	0.00051	0.32	0.93415	0.00049	0.25	0.93526	0.00050
0.44	0.92633	0.00052	0.34	0.94784	0.00051	0.26	0.94417	0.00051
0.46	0.93682	0.00051	0.36	0.96204	0.00052	0.27	0.95315	0.00052
0.48	0.94773	0.00050	0.38	0.97571	0.00053	0.28	0.96310	0.00052
0.50	0.95791	0.00053	0.40	0.99008	0.00052	0.29	0.97136	0.00051
0.52	0.96754	0.00052	0.42	1.00365	0.00053	0.30	0.98013	0.00051
0.54	0.97785	0.00053	0.44	1.01594	0.00052	0.31	0.98871	0.00053
0.56	0.98627	0.00051	0.46	1.02848	0.00053	0.32	0.99692	0.00052
0.58	0.99630	0.00054	0.48	1.04081	0.00054	0.33	1.00592	0.00052
0.60	1.00522	0.00051	0.50	1.05280	0.00053	0.34	1.01322	0.00051
0.62	1.01548	0.00052				0.35	1.02331	0.00054
0.64	1.02415	0.00052				0.36	1.03080	0.00052
0.66	1.03295	0.00052				0.37	1.03947	0.00051
0.68	1.04174	0.00053				0.38	1.04677	0.00051
0.70	1.05000	0.00052						

B.1.3.2. 97% ^{239}Pu 3% ^{240}Pu

B.1.3.2.1. Unreflected

Case ID: pu-pl-0970-00

Material: Plutonium metal in water

Geometry: Infinite Plane

Isotopics: 97% ^{239}Pu 3% ^{240}Pu

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.1.3.2.1-1. Plutonium Slab (97% ^{239}Pu) - 0 Inches of Water Reflection

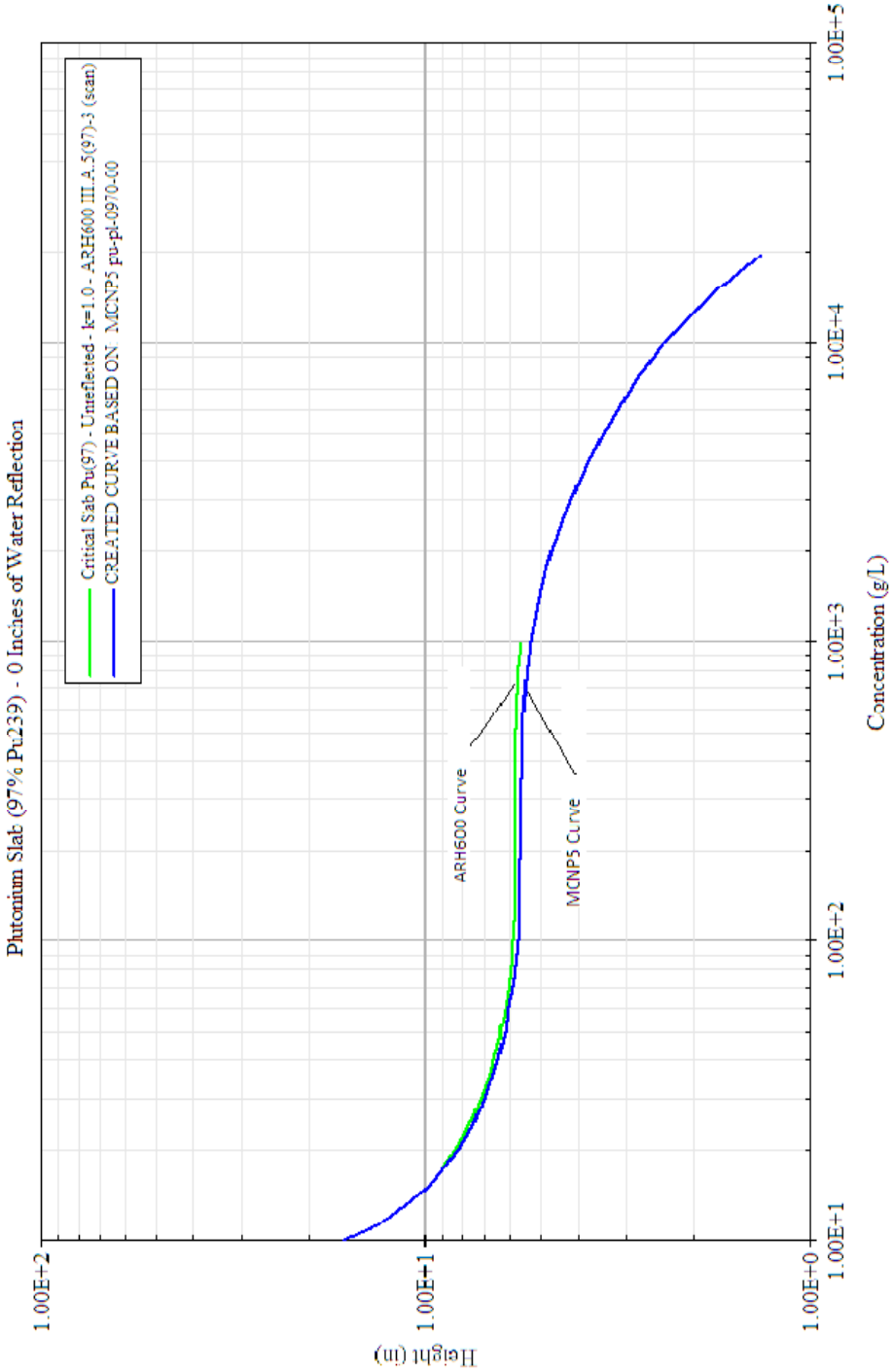

Table B.1.3.2.1-1. Critical Dimensions for Plutonium Slab (97% ^{239}Pu) - 0 Inches of Water Reflection

Plutonium Slab (97% ^{239}Pu) - 0 Inches of Water Reflection				
Concentration (g/cc)	First Height (Inches)	Last Height (Inches)	Delta (Inches)	Critical Height (Inches)
0.010	12.300	17.300	0.200	16.2640
0.011	11.000	14.600	0.100	13.8230
0.012	10.100	12.900	0.100	12.3000
0.015	8.400	10.300	0.100	9.9156
0.020	7.200	8.500	0.050	8.2443
0.025	6.600	7.700	0.050	7.4368
0.030	6.200	7.200	0.050	6.9744
0.040	5.700	6.700	0.050	6.4420
0.050	5.500	6.400	0.050	6.1656
0.075	5.200	6.000	0.050	5.8481
0.100	5.100	5.900	0.050	5.7241
0.150	5.000	5.800	0.050	5.6455
0.200	5.000	5.800	0.050	5.6287
0.350	5.000	5.800	0.050	5.6129
0.500	4.900	5.800	0.050	5.5697
0.750	4.800	5.600	0.050	5.4460
1.000	4.700	5.500	0.050	5.2931
1.500	4.400	5.100	0.050	4.9703
2.000	4.100	4.800	0.050	4.6699
2.500	3.900	4.600	0.050	4.4020
3.000	3.700	4.300	0.050	4.1612
4.000	3.300	3.900	0.050	3.7595
5.000	3.100	3.600	0.020	3.4393
7.500	2.500	3.000	0.020	2.8295
10.000	2.100	2.500	0.020	2.3860
15.000	1.500	1.800	0.020	1.7449
19.600	1.100	1.400	0.020	1.3412

```
MCNP5 Sample Input File
97% Pu Slab- 0 Inches of Reflection

Pu plane, 97.0 wt% 239Pu, 00750 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Height = 510   hundreths of inches - must be integer
c half height =     6.4770 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00750 milli-g Pu/cc
c Reflector width =  0.0 inches
c Enrichment = 0.97 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 239Pu  = 239.05220
c Pu240  = 240.05380
c
c Effective Plutonium atomic mass 239.08225
c PuO2
c Mass fraction of Pu in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0383 cc
c Volume of water in sample 0.9617 cc
c
c Mass of crit in sample   0.7500 g
c Mass of Pu in sample   0.7500 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9617 g
c
c Total mass of sample  1.7117g for a 1cc sample
c Mass Density for crit material  -1.7117, expressed as negative
c
c  plane
20 11   -1.711735   -1 2 -7 -5 8 6      imp:n=1
21  2  -1.000    -3 4 6 8 -7 -5 ((1 -3):(-2 4))        imp:n=0    $zero importance if no reflector
```

```
22  0          3:-4:7:5:-8:-6                    imp:n=0

1       py     6.4770              $ plane
2       py    -6.4770
3       py     6.4770         $ Reflection
4       py    -6.4770
*5       px    100
*6       px    -100
*7       pz    100
*8       pz    -100

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu / water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 00750 milli-g Pu/cc,  1.7117
1001.66c -0.062868
8016.66c -0.498980      $from water
c      8016.66c -0.000000      $from oxide
94239.66c -0.425007
94240.66c -0.013145
mt11     lwtr.60t
c
c    pu only
m12    $ Pu, 100.0 wt% 235U, 00750 milli-g U/cc,  1.7117
c      8016.66c -0.000000      $from oxide
94239.66c -0.425007
94240.66c -0.013145
c
```

Critview Compatible Data File
97% Pu Slab- 0 Inches of Reflection

reset:
title: MCNP5 pu-pl-0970-00
set: MCNP5 set
source: MCNP5 primary
created: Thu 08/05/2010 11:20:07.32
geometry: infplane
modmat: H2O
critmat: plutonium
isomat: Pu239 0.970 Pu240 0.030
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: height in

0.010	16.2640
0.011	13.8230
0.012	12.3000
0.015	9.9156
0.020	8.2443
0.025	7.4368
0.030	6.9744
0.040	6.4420
0.050	6.1656
0.075	5.8481
0.100	5.7241
0.150	5.6455
0.200	5.6287
0.350	5.6129
0.500	5.5697
0.750	5.4460
1.000	5.2931
1.500	4.9703
2.000	4.6699
2.500	4.4020
3.000	4.1612
4.000	3.7595
5.000	3.4393
7.500	2.8295
10.00	2.3860
15.00	1.7449
19.60	1.3412

Table B.1.3.2.1-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 0 Inches of Water Reflection

10 milli-g/cc			11 milli-g/cc			12 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
12.30	0.92524	0.00029	11.00	0.92530	0.00032	10.10	0.92591	0.00033
12.50	0.92978	0.00029	11.10	0.92890	0.00032	10.20	0.92974	0.00034
12.70	0.93484	0.00029	11.20	0.93189	0.00032	10.30	0.93415	0.00034
12.90	0.93930	0.00028	11.30	0.93587	0.00032	10.40	0.93691	0.00034
13.10	0.94416	0.00029	11.40	0.93877	0.00031	10.50	0.94194	0.00034
13.30	0.94877	0.00028	11.50	0.94170	0.00032	10.60	0.94586	0.00033
13.50	0.95220	0.00029	11.60	0.94463	0.00030	10.70	0.94913	0.00033
13.70	0.95683	0.00029	11.70	0.94796	0.00032	10.80	0.95282	0.00034
13.90	0.96113	0.00029	11.80	0.95011	0.00031	10.90	0.95636	0.00033
14.10	0.96465	0.00028	11.90	0.95374	0.00031	11.00	0.95945	0.00034
14.30	0.96838	0.00028	12.00	0.95563	0.00031	11.10	0.96285	0.00034
14.50	0.97231	0.00027	12.10	0.95844	0.00031	11.20	0.96676	0.00032
14.70	0.97539	0.00028	12.20	0.96136	0.00031	11.30	0.96986	0.00033
14.90	0.97895	0.00027	12.30	0.96418	0.00031	11.40	0.97356	0.00035
15.10	0.98224	0.00029	12.40	0.96665	0.00031	11.50	0.97647	0.00033
15.30	0.98603	0.00028	12.50	0.96912	0.00031	11.60	0.97950	0.00033
15.50	0.98806	0.00027	12.60	0.97224	0.00031	11.70	0.98230	0.00033
15.70	0.99116	0.00027	12.70	0.97427	0.00029	11.80	0.98524	0.00033
15.90	0.99451	0.00027	12.80	0.97712	0.00031	11.90	0.98826	0.00033
16.10	0.99704	0.00026	12.90	0.97911	0.00030	12.00	0.99112	0.00032
16.30	1.00065	0.00026	13.00	0.98199	0.00029	12.10	0.99403	0.00032
16.50	1.00284	0.00026	13.10	0.98409	0.00030	12.20	0.99683	0.00031
16.70	1.00530	0.00027	13.20	0.98641	0.00030	12.30	1.00000	0.00031
16.90	1.00817	0.00027	13.30	0.98903	0.00029	12.40	1.00214	0.00033
17.10	1.01044	0.00025	13.40	0.99037	0.00030	12.50	1.00520	0.00031
17.30	1.01286	0.00026	13.50	0.99299	0.00029	12.60	1.00754	0.00032
			13.60	0.99521	0.00030	12.70	1.00974	0.00032
			13.70	0.99736	0.00031	12.80	1.01290	0.00033
			13.80	0.99947	0.00028	12.90	1.01500	0.00031
			13.90	1.00177	0.00029			
			14.00	1.00244	0.00029			
			14.10	1.00508	0.00029			
			14.20	1.00763	0.00029			
			14.30	1.00859	0.00030			
			14.40	1.01109	0.00028			
			14.50	1.01307	0.00028			
			14.60	1.01447	0.00029			

Table B.1.3.2.1-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 0 Inches of Water Reflection (cont)

15 milli-g/cc			20 milli-g/cc			25 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
8.40	0.92022	0.00039	7.20	0.92211	0.00043	6.60	0.92295	0.00048
8.50	0.92642	0.00039	7.25	0.92517	0.00044	6.65	0.92722	0.00048
8.60	0.93280	0.00039	7.30	0.92953	0.00043	6.70	0.93378	0.00046
8.70	0.93792	0.00039	7.35	0.93346	0.00041	6.75	0.93764	0.00045
8.80	0.94374	0.00038	7.40	0.93719	0.00043	6.80	0.94199	0.00046
8.90	0.94937	0.00039	7.45	0.94109	0.00045	6.85	0.94771	0.00046
9.00	0.95400	0.00037	7.50	0.94549	0.00043	6.90	0.95184	0.00048
9.10	0.96018	0.00038	7.55	0.94984	0.00045	6.95	0.95712	0.00047
9.20	0.96558	0.00038	7.60	0.95313	0.00045	7.00	0.96174	0.00045
9.30	0.97053	0.00037	7.65	0.95738	0.00043	7.05	0.96645	0.00046
9.40	0.97517	0.00037	7.70	0.96103	0.00043	7.10	0.97086	0.00047
9.50	0.98039	0.00038	7.75	0.96537	0.00044	7.15	0.97472	0.00046
9.60	0.98538	0.00039	7.80	0.96963	0.00044	7.20	0.97871	0.00047
9.70	0.99061	0.00038	7.85	0.97286	0.00043	7.25	0.98353	0.00046
9.80	0.99463	0.00039	7.90	0.97692	0.00042	7.30	0.98841	0.00045
9.90	0.99934	0.00038	7.95	0.98002	0.00042	7.35	0.99224	0.00046
10.00	1.00356	0.00035	8.00	0.98395	0.00043	7.40	0.99653	0.00046
10.10	1.00819	0.00038	8.05	0.98740	0.00043	7.45	1.00125	0.00047
10.20	1.01278	0.00037	8.10	0.99096	0.00043	7.50	1.00563	0.00046
10.30	1.01656	0.00037	8.15	0.99402	0.00043	7.55	1.00907	0.00046
			8.20	0.99722	0.00043	7.60	1.01322	0.00046
			8.25	1.00036	0.00042	7.65	1.01695	0.00045
			8.30	1.00394	0.00043	7.70	1.02172	0.00047
			8.35	1.00711	0.00044			
			8.40	1.01058	0.00044			
			8.45	1.01398	0.00042			
			8.50	1.01771	0.00043			

Table B.1.3.2.1-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 0 Inches of Water Reflection (cont)

30 milli-g/cc			40 milli-g/cc			50 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
6.20	0.92011	0.00049	5.70	0.91021	0.00052	5.50	0.91382	0.00054
6.25	0.92540	0.00050	5.75	0.91645	0.00052	5.55	0.92058	0.00052
6.30	0.93025	0.00050	5.80	0.92363	0.00051	5.60	0.92709	0.00054
6.35	0.93731	0.00049	5.85	0.92996	0.00052	5.65	0.93464	0.00052
6.40	0.94241	0.00049	5.90	0.93517	0.00053	5.70	0.94115	0.00052
6.45	0.94758	0.00048	5.95	0.94186	0.00053	5.75	0.94707	0.00053
6.50	0.95296	0.00050	6.00	0.94763	0.00052	5.80	0.95408	0.00053
6.55	0.95819	0.00048	6.05	0.95427	0.00053	5.85	0.96046	0.00052
6.60	0.96336	0.00050	6.10	0.96083	0.00052	5.90	0.96770	0.00056
6.65	0.96845	0.00049	6.15	0.96723	0.00051	5.95	0.97418	0.00051
6.70	0.97358	0.00048	6.20	0.97198	0.00052	6.00	0.97976	0.00053
6.75	0.97846	0.00046	6.25	0.97736	0.00052	6.05	0.98624	0.00052
6.80	0.98427	0.00049	6.30	0.98336	0.00052	6.10	0.99249	0.00052
6.85	0.98800	0.00049	6.35	0.98915	0.00051	6.15	0.99830	0.00052
6.90	0.99322	0.00048	6.40	0.99581	0.00052	6.20	1.00374	0.00054
6.95	0.99782	0.00048	6.45	1.00080	0.00050	6.25	1.00968	0.00054
7.00	1.00228	0.00048	6.50	1.00663	0.00052	6.30	1.01546	0.00054
7.05	1.00766	0.00048	6.55	1.01149	0.00051	6.35	1.02089	0.00054
7.10	1.01222	0.00049	6.60	1.01687	0.00052	6.40	1.02683	0.00052
7.15	1.01725	0.00048	6.65	1.02185	0.00052			
7.20	1.02058	0.00050	6.70	1.02742	0.00051			

Table B.1.3.2.1-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 0 Inches of Water Reflection (cont)

75 milli-g/cc			100 milli-g/cc			150 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
5.20	0.90875	0.00057	5.10	0.91037	0.00058	5.00	0.90760	0.00056
5.25	0.91623	0.00053	5.15	0.91835	0.00056	5.05	0.91570	0.00057
5.30	0.92454	0.00054	5.20	0.92559	0.00055	5.10	0.92304	0.00059
5.35	0.93079	0.00056	5.25	0.93351	0.00056	5.15	0.93023	0.00059
5.40	0.93863	0.00055	5.30	0.94043	0.00057	5.20	0.93889	0.00059
5.45	0.94547	0.00056	5.35	0.94737	0.00057	5.25	0.94489	0.00056
5.50	0.95292	0.00053	5.40	0.95521	0.00055	5.30	0.95313	0.00057
5.55	0.95943	0.00055	5.45	0.96242	0.00057	5.35	0.95986	0.00058
5.60	0.96665	0.00055	5.50	0.96909	0.00057	5.40	0.96676	0.00059
5.65	0.97324	0.00057	5.55	0.97689	0.00056	5.45	0.97294	0.00058
5.70	0.98059	0.00056	5.60	0.98292	0.00055	5.50	0.98134	0.00057
5.75	0.98754	0.00056	5.65	0.99072	0.00056	5.55	0.98783	0.00058
5.80	0.99440	0.00058	5.70	0.99664	0.00056	5.60	0.99300	0.00057
5.85	1.00022	0.00057	5.75	1.00360	0.00056	5.65	1.00069	0.00056
5.90	1.00652	0.00057	5.80	1.01005	0.00056	5.70	1.00659	0.00056
5.95	1.01225	0.00057	5.85	1.01733	0.00055	5.75	1.01321	0.00059
6.00	1.01966	0.00056	5.90	1.02248	0.00057	5.80	1.01972	0.00055

Table B.1.3.2.1-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 0 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
5.00	0.91222	0.00058	5.00	0.91547	0.00055	4.90	0.90915	0.00056
5.05	0.91849	0.00057	5.05	0.92413	0.00056	4.95	0.91537	0.00056
5.10	0.92564	0.00058	5.10	0.93018	0.00058	5.00	0.92374	0.00056
5.15	0.93298	0.00056	5.15	0.93846	0.00057	5.05	0.93159	0.00057
5.20	0.94129	0.00060	5.20	0.94492	0.00058	5.10	0.93704	0.00057
5.25	0.94917	0.00058	5.25	0.95320	0.00056	5.15	0.94458	0.00057
5.30	0.95613	0.00056	5.30	0.95904	0.00058	5.20	0.95145	0.00057
5.35	0.96270	0.00058	5.35	0.96558	0.00056	5.25	0.95821	0.00057
5.40	0.96909	0.00054	5.40	0.97212	0.00057	5.30	0.96496	0.00056
5.45	0.97637	0.00058	5.45	0.97892	0.00057	5.35	0.97231	0.00057
5.50	0.98249	0.00058	5.50	0.98553	0.00057	5.40	0.97807	0.00059
5.55	0.98978	0.00057	5.55	0.99255	0.00058	5.45	0.98373	0.00059
5.60	0.99693	0.00056	5.60	0.99839	0.00058	5.50	0.99041	0.00056
5.65	1.00228	0.00057	5.65	1.00461	0.00055	5.55	0.99702	0.00054
5.70	1.01010	0.00057	5.70	1.01134	0.00060	5.60	1.00460	0.00056
5.75	1.01611	0.00058	5.75	1.01641	0.00054	5.65	1.00996	0.00057
5.80	1.02334	0.00060	5.80	1.02354	0.00058	5.70	1.01581	0.00060
						5.75	1.02155	0.00056
						5.80	1.02786	0.00057

Table B.1.3.2.1-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 0 Inches of Water Reflection (cont)

750 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
4.80	0.91113	0.00057	4.70	0.91712	0.00055	4.40	0.91323	0.00055
4.85	0.91794	0.00056	4.75	0.92414	0.00055	4.45	0.92170	0.00055
4.90	0.92622	0.00056	4.80	0.93196	0.00055	4.50	0.92929	0.00055
4.95	0.93334	0.00056	4.85	0.93840	0.00057	4.55	0.93762	0.00054
5.00	0.94081	0.00057	4.90	0.94614	0.00056	4.60	0.94531	0.00056
5.05	0.94711	0.00055	4.95	0.95312	0.00054	4.65	0.95338	0.00057
5.10	0.95431	0.00056	5.00	0.95879	0.00056	4.70	0.95975	0.00056
5.15	0.96141	0.00055	5.05	0.96797	0.00054	4.75	0.96839	0.00057
5.20	0.96803	0.00057	5.10	0.97464	0.00056	4.80	0.97676	0.00056
5.25	0.97392	0.00058	5.15	0.98135	0.00056	4.85	0.98299	0.00054
5.30	0.98066	0.00056	5.20	0.98834	0.00056	4.90	0.98985	0.00054
5.35	0.98766	0.00057	5.25	0.99467	0.00055	4.95	0.99739	0.00056
5.40	0.99420	0.00059	5.30	1.00085	0.00056	5.00	1.00382	0.00057
5.45	1.00051	0.00057	5.35	1.00769	0.00057	5.05	1.01178	0.00055
5.50	1.00766	0.00057	5.40	1.01398	0.00059	5.10	1.01925	0.00055
5.55	1.01357	0.00055	5.45	1.02032	0.00055			
5.60	1.01923	0.00057	5.50	1.02656	0.00057			

Table B.1.3.2.1-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 0 Inches of Water Reflection (cont)

2000 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
4.10	0.90528	0.00055	3.90	0.91140	0.00053	3.70	0.91239	0.00054
4.15	0.91501	0.00052	3.95	0.92041	0.00054	3.75	0.92340	0.00053
4.20	0.92343	0.00054	4.00	0.93051	0.00054	3.80	0.93209	0.00054
4.25	0.93238	0.00054	4.05	0.93942	0.00054	3.85	0.94216	0.00054
4.30	0.94088	0.00054	4.10	0.94866	0.00054	3.90	0.95197	0.00053
4.35	0.94959	0.00056	4.15	0.95729	0.00054	3.95	0.96166	0.00052
4.40	0.95661	0.00057	4.20	0.96563	0.00053	4.00	0.97088	0.00053
4.45	0.96526	0.00056	4.25	0.97474	0.00055	4.05	0.97953	0.00052
4.50	0.97355	0.00056	4.30	0.98374	0.00055	4.10	0.98875	0.00055
4.55	0.98214	0.00055	4.35	0.99139	0.00055	4.15	0.99795	0.00054
4.60	0.98912	0.00055	4.40	0.99964	0.00054	4.20	1.00711	0.00054
4.65	0.99651	0.00055	4.45	1.00869	0.00053	4.25	1.01558	0.00055
4.70	1.00527	0.00054	4.50	1.01641	0.00055	4.30	1.02472	0.00055
4.75	1.01298	0.00055	4.55	1.02477	0.00053			
4.80	1.02064	0.00055	4.60	1.03297	0.00055			

Table B.1.3.2.1-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 0 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			7500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
3.30	0.90095	0.00051	3.10	0.92051	0.00052	2.50	0.90501	0.00045
3.35	0.91176	0.00051	3.12	0.92567	0.00050	2.52	0.91089	0.00044
3.40	0.92311	0.00053	3.14	0.93021	0.00050	2.54	0.91715	0.00046
3.45	0.93396	0.00050	3.16	0.93459	0.00050	2.56	0.92282	0.00047
3.50	0.94539	0.00050	3.18	0.94030	0.00049	2.58	0.92885	0.00048
3.55	0.95567	0.00052	3.20	0.94483	0.00052	2.60	0.93556	0.00047
3.60	0.96644	0.00052	3.22	0.94964	0.00051	2.62	0.94063	0.00047
3.65	0.97762	0.00051	3.24	0.95398	0.00050	2.64	0.94629	0.00048
3.70	0.98741	0.00052	3.26	0.95957	0.00050	2.66	0.95171	0.00048
3.75	0.99829	0.00053	3.28	0.96394	0.00052	2.68	0.95793	0.00048
3.80	1.00727	0.00051	3.30	0.96809	0.00051	2.70	0.96340	0.00048
3.85	1.01737	0.00052	3.32	0.97313	0.00052	2.72	0.96923	0.00048
3.90	1.02810	0.00053	3.34	0.97803	0.00051	2.74	0.97530	0.00048
			3.36	0.98194	0.00050	2.76	0.98069	0.00050
			3.38	0.98703	0.00052	2.78	0.98568	0.00047
			3.40	0.99156	0.00052	2.80	0.99182	0.00047
			3.42	0.99642	0.00052	2.82	0.99712	0.00050
			3.44	1.00013	0.00051	2.84	1.00320	0.00048
			3.46	1.00547	0.00051	2.86	1.00802	0.00049
			3.48	1.00805	0.00051	2.88	1.01351	0.00049
			3.50	1.01356	0.00051	2.90	1.01914	0.00048
			3.52	1.01834	0.00051	2.92	1.02520	0.00048
			3.54	1.02357	0.00052	2.94	1.02997	0.00049
			3.56	1.02798	0.00051	2.96	1.03549	0.00047
			3.58	1.03134	0.00052	2.98	1.04104	0.00049
			3.60	1.03550	0.00052	3.00	1.04626	0.00050

Table B.1.3.2.1-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 0 Inches of Water Reflection (cont)

10000 milli-g/cc			15000 milli-g/cc			19600 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
2.10	0.90422	0.00043	1.50	0.89561	0.00040	1.10	0.87054	0.00040
2.12	0.91216	0.00044	1.52	0.90453	0.00041	1.12	0.88183	0.00039
2.14	0.91855	0.00042	1.54	0.91286	0.00040	1.14	0.89304	0.00039
2.16	0.92512	0.00043	1.56	0.92165	0.00040	1.16	0.90348	0.00041
2.18	0.93242	0.00046	1.58	0.93016	0.00042	1.18	0.91416	0.00041
2.20	0.93855	0.00044	1.60	0.93853	0.00040	1.20	0.92569	0.00042
2.22	0.94549	0.00044	1.62	0.94758	0.00040	1.22	0.93659	0.00042
2.24	0.95172	0.00044	1.64	0.95591	0.00042	1.24	0.94740	0.00041
2.26	0.95853	0.00043	1.66	0.96419	0.00042	1.26	0.95802	0.00041
2.28	0.96540	0.00043	1.68	0.97297	0.00043	1.28	0.96907	0.00043
2.30	0.97217	0.00044	1.70	0.98141	0.00043	1.30	0.97865	0.00043
2.32	0.97810	0.00044	1.72	0.98985	0.00042	1.32	0.98924	0.00042
2.34	0.98514	0.00045	1.74	0.99807	0.00043	1.34	0.99938	0.00043
2.36	0.99196	0.00044	1.76	1.00587	0.00043	1.36	1.00994	0.00044
2.38	0.99834	0.00044	1.78	1.01394	0.00044	1.38	1.02022	0.00044
2.40	1.00387	0.00045	1.80	1.02304	0.00044	1.40	1.03038	0.00044
2.42	1.01036	0.00046						
2.44	1.01700	0.00045						
2.46	1.02301	0.00048						
2.48	1.03002	0.00046						
2.50	1.03513	0.00045						

B.1.3.2.2. 1” Water Reflector

Case ID: pu-pl-0970-01

Material: Plutonium metal in water

Geometry: Infinite Plane

Isotopics: 97% ^{239}Pu 3% ^{240}Pu

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.1.3.2.2-1. Plutonium Slab (97% ^{239}Pu) - 1 Inch of Water Reflection

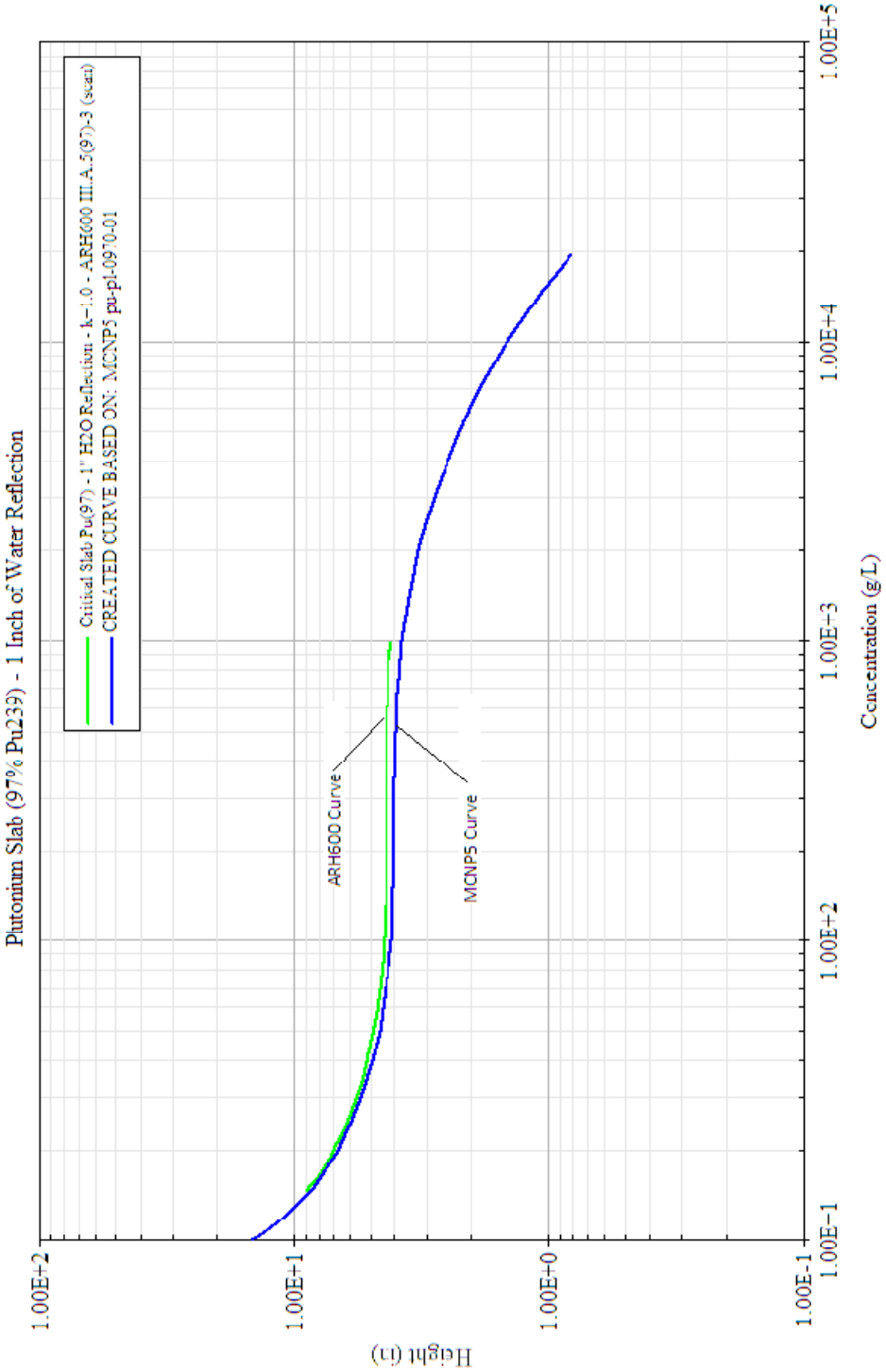

Table B.1.3.2.2-1. Critical Dimensions for Plutonium Slab (97% ^{239}Pu) - 1 Inch of Water Reflection

Plutonium Slab (97% ^{239}Pu) - 1 Inch of Water Reflection				
Concentration (g/cc)	First Height (Inches)	Last Height (Inches)	Delta (Inches)	Critical Height (Inches)
0.010	10.800	15.600	0.200	14.7500
0.011	9.600	13.000	0.100	12.3243
0.012	8.300	11.300	0.100	10.7927
0.015	6.900	8.800	0.100	8.4100
0.020	5.700	7.000	0.050	6.7142
0.025	5.000	6.200	0.050	5.9095
0.030	4.700	5.700	0.050	5.4360
0.040	4.200	5.100	0.050	4.9067
0.050	4.000	4.800	0.050	4.6192
0.075	3.700	4.500	0.050	4.2855
0.100	3.600	4.300	0.050	4.1493
0.150	3.500	4.200	0.050	4.0571
0.200	3.400	4.200	0.050	4.0319
0.350	3.400	4.200	0.050	4.0106
0.500	3.400	4.200	0.050	3.9761
0.750	3.300	4.100	0.050	3.8716
1.000	3.200	3.900	0.050	3.7458
1.500	2.900	3.700	0.050	3.4865
2.000	2.700	3.400	0.050	3.2382
2.500	2.500	3.200	0.050	3.0182
3.000	2.400	3.000	0.050	2.8204
4.000	2.100	2.600	0.020	2.5002
5.000	1.900	2.400	0.020	2.2433
7.500	1.500	1.900	0.020	1.7774
10.000	1.200	1.600	0.020	1.4589
15.000	0.800	1.100	0.020	1.0431
19.600	0.600	0.900	0.020	0.8070

MCNP5 Sample Input File
97% Pu Slab- 1 Inch of Reflection

```
Pu plane, 97.0 wt% 239Pu, 00750 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Height = 360   hundreths of inches - must be integer
c half height =     4.5720 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00750 milli-g Pu/cc
c Reflector width =  1.0 inches
c Enrichment = 0.97 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 239Pu  = 239.05220
c Pu240  = 240.05380
c
c Effective Plutonium atomic mass 239.08225
c PuO2
c Mass fraction of Pu in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0383 cc
c Volume of water in sample 0.9617 cc
c
c Mass of crit in sample   0.7500 g
c Mass of Pu in sample   0.7500 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9617 g
c
c Total mass of sample  1.7117g for a 1cc sample
c Mass Density for crit material  -1.7117, expressed as negative
c
c  plane
20 11   -1.711735   -1 2 -7 -5 8 6      imp:n=1
21  2  -1.000    -3 4 6 8 -7 -5 ((1 -3):(-2 4))       imp:n=1    $zero importance if no reflector
22  0            3:-4:7:5:-8:-6                    imp:n=0
```

```
1       py     4.5720              $ plane
2       py    -4.5720
3       py     7.1120         $ Reflection
4       py    -7.1120
*5       px    100
*6       px    -100
*7       pz    100
*8       pz    -100

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu / water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 00750 milli-g Pu/cc,  1.7117
1001.66c -0.062868
8016.66c -0.498980      $from water
c      8016.66c -0.000000      $from oxide
94239.66c -0.425007
94240.66c -0.013145
mt11     lwtr.60t
c
c    pu only
m12    $ Pu, 100.0 wt% 235U, 00750 milli-g U/cc,  1.7117
c      8016.66c -0.000000      $from oxide
94239.66c -0.425007
94240.66c -0.013145
c
```

Critview Compatible Data File
97% Pu Slab- 1 Inch of Reflection

reset:
title: MCNP5 pu-pl-0970-01
set: MCNP5 set
source: MCNP5 primary
created: Thu 08/05/2010 11:20:27.30
geometry: infplane
modmat: H2O
critmat: plutonium
isomat: Pu239 0.970 Pu240 0.030
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: height in

0.010	14.7500
0.011	12.3243
0.012	10.7927
0.015	8.4100
0.020	6.7142
0.025	5.9095
0.030	5.4360
0.040	4.9067
0.050	4.6192
0.075	4.2855
0.100	4.1493
0.150	4.0571
0.200	4.0319
0.350	4.0106
0.500	3.9761
0.750	3.8716
1.000	3.7458
1.500	3.4865
2.000	3.2382
2.500	3.0182
3.000	2.8204
4.000	2.5002
5.000	2.2433
7.500	1.7774
10.00	1.4589
15.00	1.0431
19.60	0.8070

Table B.1.3.2.2-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 1 Inch of Water Reflection

10 milli-g/cc			11 milli-g/cc			12 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
10.80	0.92491	0.00029	9.60	0.92907	0.00032	8.30	0.91397	0.00032
11.00	0.93048	0.00029	9.70	0.93244	0.00030	8.40	0.91853	0.00033
11.20	0.93504	0.00029	9.80	0.93561	0.00031	8.50	0.92194	0.00034
11.40	0.93994	0.00028	9.90	0.93851	0.00031	8.60	0.92634	0.00033
11.60	0.94406	0.00028	10.00	0.94168	0.00031	8.70	0.93007	0.00034
11.80	0.94904	0.00028	10.10	0.94482	0.00030	8.80	0.93416	0.00034
12.00	0.95290	0.00028	10.20	0.94810	0.00032	8.90	0.93826	0.00032
12.20	0.95680	0.00027	10.30	0.95099	0.00030	9.00	0.94232	0.00032
12.40	0.96144	0.00027	10.40	0.95346	0.00029	9.10	0.94590	0.00033
12.60	0.96478	0.00027	10.50	0.95622	0.00031	9.20	0.94921	0.00032
12.80	0.96863	0.00026	10.60	0.95911	0.00032	9.30	0.95260	0.00032
13.00	0.97250	0.00027	10.70	0.96192	0.00030	9.40	0.95638	0.00033
13.20	0.97608	0.00026	10.80	0.96482	0.00031	9.50	0.96087	0.00032
13.40	0.97927	0.00027	10.90	0.96742	0.00031	9.60	0.96360	0.00032
13.60	0.98188	0.00027	11.00	0.96952	0.00030	9.70	0.96693	0.00032
13.80	0.98591	0.00027	11.10	0.97194	0.00029	9.80	0.97035	0.00032
14.00	0.98869	0.00027	11.20	0.97485	0.00029	9.90	0.97398	0.00032
14.20	0.99181	0.00025	11.30	0.97729	0.00030	10.00	0.97672	0.00032
14.40	0.99503	0.00026	11.40	0.98005	0.00030	10.10	0.97954	0.00032
14.60	0.99796	0.00025	11.50	0.98199	0.00030	10.20	0.98211	0.00032
14.80	1.00068	0.00025	11.60	0.98414	0.00030	10.30	0.98568	0.00032
15.00	1.00325	0.00025	11.70	0.98675	0.00029	10.40	0.98816	0.00032
15.20	1.00618	0.00026	11.80	0.98930	0.00030	10.50	0.99226	0.00032
15.40	1.00872	0.00025	11.90	0.99120	0.00028	10.60	0.99517	0.00031
15.60	1.01036	0.00025	12.00	0.99316	0.00028	10.70	0.99733	0.00031
			12.10	0.99554	0.00029	10.80	1.00021	0.00032
			12.20	0.99706	0.00029	10.90	1.00294	0.00031
			12.30	0.99973	0.00028	11.00	1.00525	0.00031
			12.40	1.00084	0.00029	11.10	1.00808	0.00031
			12.50	1.00451	0.00028	11.20	1.01060	0.00031
			12.60	1.00569	0.00028	11.30	1.01378	0.00031
			12.70	1.00783	0.00029			
			12.80	1.00976	0.00028			
			12.90	1.01170	0.00028			
			13.00	1.01328	0.00029			

Table B.1.3.2.2-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

15 milli-g/cc			20 milli-g/cc			25 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
6.90	0.92064	0.00038	5.70	0.92321	0.00044	5.00	0.91463	0.00044
7.00	0.92684	0.00037	5.75	0.92668	0.00042	5.05	0.92000	0.00046
7.10	0.93229	0.00037	5.80	0.93163	0.00044	5.10	0.92561	0.00044
7.20	0.93952	0.00038	5.85	0.93540	0.00042	5.15	0.92991	0.00044
7.30	0.94521	0.00036	5.90	0.94027	0.00043	5.20	0.93509	0.00047
7.40	0.95025	0.00038	5.95	0.94389	0.00043	5.25	0.93934	0.00045
7.50	0.95561	0.00038	6.00	0.94712	0.00041	5.30	0.94440	0.00046
7.60	0.96096	0.00038	6.05	0.95083	0.00041	5.35	0.94992	0.00046
7.70	0.96615	0.00037	6.10	0.95507	0.00042	5.40	0.95398	0.00046
7.80	0.97153	0.00037	6.15	0.95973	0.00043	5.45	0.95928	0.00047
7.90	0.97620	0.00038	6.20	0.96276	0.00041	5.50	0.96322	0.00044
8.00	0.98131	0.00037	6.25	0.96682	0.00042	5.55	0.96831	0.00046
8.10	0.98581	0.00037	6.30	0.97150	0.00042	5.60	0.97269	0.00045
8.20	0.99141	0.00035	6.35	0.97438	0.00041	5.65	0.97692	0.00044
8.30	0.99614	0.00036	6.40	0.97760	0.00041	5.70	0.98204	0.00044
8.40	0.99945	0.00036	6.45	0.98137	0.00042	5.75	0.98637	0.00045
8.50	1.00493	0.00036	6.50	0.98521	0.00042	5.80	0.99073	0.00045
8.60	1.00910	0.00036	6.55	0.98900	0.00042	5.85	0.99492	0.00044
8.70	1.01309	0.00036	6.60	0.99123	0.00040	5.90	0.99945	0.00044
8.80	1.01763	0.00035	6.65	0.99569	0.00041	5.95	1.00233	0.00044
			6.70	0.99884	0.00041	6.00	1.00750	0.00045
			6.75	1.00292	0.00040	6.05	1.01133	0.00043
			6.80	1.00626	0.00041	6.10	1.01528	0.00044
			6.85	1.00857	0.00040	6.15	1.02008	0.00045
			6.90	1.01309	0.00041	6.20	1.02272	0.00044
			6.95	1.01523	0.00041			
			7.00	1.01826	0.00042			

Table B.1.3.2.2-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

30 milli-g/cc			40 milli-g/cc			50 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
4.70	0.92220	0.00047	4.20	0.91526	0.00050	4.00	0.91978	0.00052
4.75	0.92830	0.00047	4.25	0.92101	0.00049	4.05	0.92785	0.00050
4.80	0.93384	0.00047	4.30	0.92747	0.00049	4.10	0.93374	0.00052
4.85	0.93954	0.00047	4.35	0.93327	0.00049	4.15	0.94082	0.00051
4.90	0.94535	0.00047	4.40	0.94040	0.00050	4.20	0.94671	0.00052
4.95	0.95049	0.00047	4.45	0.94605	0.00051	4.25	0.95362	0.00051
5.00	0.95580	0.00046	4.50	0.95291	0.00050	4.30	0.96085	0.00052
5.05	0.96042	0.00047	4.55	0.95863	0.00050	4.35	0.96657	0.00051
5.10	0.96674	0.00046	4.60	0.96457	0.00051	4.40	0.97256	0.00052
5.15	0.97012	0.00048	4.65	0.97147	0.00049	4.45	0.97889	0.00051
5.20	0.97763	0.00046	4.70	0.97674	0.00050	4.50	0.98522	0.00050
5.25	0.98088	0.00047	4.75	0.98258	0.00050	4.55	0.99274	0.00052
5.30	0.98683	0.00047	4.80	0.98836	0.00051	4.60	0.99754	0.00052
5.35	0.99118	0.00048	4.85	0.99309	0.00050	4.65	1.00395	0.00052
5.40	0.99608	0.00047	4.90	0.99927	0.00050	4.70	1.00955	0.00052
5.45	1.00153	0.00047	4.95	1.00473	0.00050	4.75	1.01526	0.00050
5.50	1.00500	0.00047	5.00	1.00989	0.00049	4.80	1.02132	0.00051
5.55	1.01064	0.00046	5.05	1.01634	0.00050			
5.60	1.01482	0.00045	5.10	1.02012	0.00050			
5.65	1.02000	0.00046						
5.70	1.02452	0.00046						

Table B.1.3.2.2-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

75 milli-g/cc			100 milli-g/cc			150 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
3.70	0.91774	0.00053	3.60	0.92171	0.00053	3.50	0.92159	0.00054
3.75	0.92595	0.00052	3.65	0.92804	0.00056	3.55	0.92850	0.00053
3.80	0.93321	0.00053	3.70	0.93742	0.00054	3.60	0.93692	0.00055
3.85	0.94062	0.00053	3.75	0.94389	0.00054	3.65	0.94251	0.00055
3.90	0.94800	0.00054	3.80	0.95042	0.00054	3.70	0.95028	0.00056
3.95	0.95423	0.00055	3.85	0.95864	0.00055	3.75	0.95719	0.00056
4.00	0.96194	0.00052	3.90	0.96646	0.00054	3.80	0.96496	0.00056
4.05	0.96831	0.00054	3.95	0.97250	0.00057	3.85	0.97174	0.00056
4.10	0.97523	0.00051	4.00	0.97977	0.00055	3.90	0.97949	0.00056
4.15	0.98144	0.00053	4.05	0.98645	0.00054	3.95	0.98541	0.00055
4.20	0.98872	0.00054	4.10	0.99403	0.00053	4.00	0.99239	0.00054
4.25	0.99504	0.00053	4.15	1.00008	0.00053	4.05	0.99910	0.00057
4.30	1.00203	0.00055	4.20	1.00546	0.00056	4.10	1.00545	0.00055
4.35	1.00767	0.00052	4.25	1.01335	0.00057	4.15	1.01167	0.00056
4.40	1.01498	0.00052	4.30	1.02021	0.00056	4.20	1.01941	0.00055
4.45	1.02133	0.00054						
4.50	1.02732	0.00054						

Table B.1.3.2.2-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
3.40	0.91049	0.00055	3.40	0.91727	0.00055	3.40	0.92246	0.00055
3.45	0.91843	0.00055	3.45	0.92450	0.00056	3.45	0.92874	0.00056
3.50	0.92481	0.00057	3.50	0.93056	0.00056	3.50	0.93660	0.00057
3.55	0.93306	0.00056	3.55	0.93753	0.00056	3.55	0.94333	0.00057
3.60	0.93954	0.00055	3.60	0.94481	0.00057	3.60	0.95034	0.00055
3.65	0.94763	0.00056	3.65	0.95187	0.00058	3.65	0.95691	0.00056
3.70	0.95507	0.00058	3.70	0.95799	0.00056	3.70	0.96363	0.00056
3.75	0.96253	0.00055	3.75	0.96652	0.00056	3.75	0.97000	0.00055
3.80	0.96857	0.00055	3.80	0.97352	0.00055	3.80	0.97723	0.00055
3.85	0.97619	0.00055	3.85	0.97977	0.00054	3.85	0.98369	0.00057
3.90	0.98288	0.00056	3.90	0.98599	0.00056	3.90	0.98982	0.00056
3.95	0.98946	0.00057	3.95	0.99197	0.00056	3.95	0.99728	0.00057
4.00	0.99593	0.00054	4.00	0.99890	0.00056	4.00	1.00249	0.00057
4.05	1.00231	0.00057	4.05	1.00411	0.00055	4.05	1.00826	0.00056
4.10	1.00879	0.00057	4.10	1.01183	0.00057	4.10	1.01610	0.00054
4.15	1.01575	0.00055	4.15	1.01708	0.00058	4.15	1.02125	0.00057
4.20	1.02165	0.00056	4.20	1.02400	0.00054	4.20	1.02641	0.00055

Table B.1.3.2.2-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

750 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
3.30	0.92128	0.00056	3.20	0.92203	0.00055	2.90	0.90916	0.00057
3.35	0.92832	0.00054	3.25	0.92914	0.00056	2.95	0.91801	0.00056
3.40	0.93495	0.00055	3.30	0.93719	0.00057	3.00	0.92602	0.00056
3.45	0.94193	0.00058	3.35	0.94327	0.00056	3.05	0.93399	0.00055
3.50	0.95031	0.00055	3.40	0.95113	0.00056	3.10	0.94220	0.00055
3.55	0.95657	0.00056	3.45	0.95791	0.00057	3.15	0.94977	0.00054
3.60	0.96342	0.00056	3.50	0.96626	0.00055	3.20	0.95835	0.00056
3.65	0.97013	0.00054	3.55	0.97228	0.00056	3.25	0.96461	0.00057
3.70	0.97729	0.00056	3.60	0.97959	0.00056	3.30	0.97318	0.00055
3.75	0.98356	0.00058	3.65	0.98734	0.00056	3.35	0.97985	0.00057
3.80	0.99038	0.00055	3.70	0.99364	0.00057	3.40	0.98707	0.00055
3.85	0.99771	0.00056	3.75	1.00058	0.00055	3.45	0.99507	0.00056
3.90	1.00302	0.00056	3.80	1.00606	0.00056	3.50	1.00183	0.00055
3.95	1.00921	0.00056	3.85	1.01290	0.00055	3.55	1.00936	0.00056
4.00	1.01564	0.00054	3.90	1.01974	0.00056	3.60	1.01652	0.00054
4.05	1.02236	0.00055				3.65	1.02260	0.00057
4.10	1.02824	0.00055				3.70	1.03091	0.00055

Table B.1.3.2.2-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

2000 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
2.70	0.90911	0.00055	2.50	0.90530	0.00053	2.40	0.91804	0.00054
2.75	0.91838	0.00055	2.55	0.91650	0.00053	2.45	0.92812	0.00056
2.80	0.92812	0.00054	2.60	0.92518	0.00055	2.50	0.93808	0.00055
2.85	0.93566	0.00054	2.65	0.93487	0.00056	2.55	0.94698	0.00054
2.90	0.94579	0.00054	2.70	0.94458	0.00055	2.60	0.95748	0.00055
2.95	0.95375	0.00055	2.75	0.95350	0.00053	2.65	0.96802	0.00055
3.00	0.96191	0.00054	2.80	0.96184	0.00056	2.70	0.97771	0.00056
3.05	0.96992	0.00055	2.85	0.97132	0.00053	2.75	0.98844	0.00055
3.10	0.97847	0.00056	2.90	0.98031	0.00057	2.80	0.99613	0.00054
3.15	0.98666	0.00056	2.95	0.98861	0.00054	2.85	1.00560	0.00057
3.20	0.99466	0.00056	3.00	0.99634	0.00055	2.90	1.01354	0.00054
3.25	1.00165	0.00056	3.05	1.00639	0.00055	2.95	1.02249	0.00052
3.30	1.00942	0.00055	3.10	1.01415	0.00055	3.00	1.03173	0.00054
3.35	1.01666	0.00056	3.15	1.02218	0.00054			
3.40	1.02555	0.00055	3.20	1.02974	0.00053			

Table B.1.3.2.2-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			7500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
2.10	0.91124	0.00054	1.90	0.91467	0.00052	1.50	0.91420	0.00052
2.12	0.91543	0.00053	1.92	0.92059	0.00052	1.52	0.91991	0.00052
2.14	0.92044	0.00053	1.94	0.92563	0.00053	1.54	0.92713	0.00051
2.16	0.92533	0.00054	1.96	0.93072	0.00054	1.56	0.93325	0.00051
2.18	0.92888	0.00051	1.98	0.93582	0.00052	1.58	0.93925	0.00053
2.20	0.93465	0.00053	2.00	0.94034	0.00052	1.60	0.94620	0.00053
2.22	0.93771	0.00055	2.02	0.94565	0.00054	1.62	0.95231	0.00052
2.24	0.94256	0.00053	2.04	0.95005	0.00054	1.64	0.95822	0.00053
2.26	0.94812	0.00053	2.06	0.95596	0.00055	1.66	0.96392	0.00051
2.28	0.95178	0.00055	2.08	0.95986	0.00055	1.68	0.97065	0.00052
2.30	0.95708	0.00053	2.10	0.96540	0.00053	1.70	0.97619	0.00053
2.32	0.96133	0.00052	2.12	0.97002	0.00052	1.72	0.98318	0.00052
2.34	0.96669	0.00053	2.14	0.97443	0.00055	1.74	0.98896	0.00052
2.36	0.96986	0.00056	2.16	0.98012	0.00055	1.76	0.99529	0.00053
2.38	0.97296	0.00053	2.18	0.98505	0.00053	1.78	1.00069	0.00053
2.40	0.97872	0.00056	2.20	0.99018	0.00054	1.80	1.00691	0.00053
2.42	0.98354	0.00054	2.22	0.99457	0.00054	1.82	1.01283	0.00053
2.44	0.98811	0.00054	2.24	0.99928	0.00053	1.84	1.01858	0.00052
2.46	0.99115	0.00054	2.26	1.00358	0.00054	1.86	1.02349	0.00053
2.48	0.99562	0.00056	2.28	1.00844	0.00053	1.88	1.02892	0.00052
2.50	0.99995	0.00054	2.30	1.01335	0.00053	1.90	1.03582	0.00053
2.52	1.00419	0.00053	2.32	1.01842	0.00054			
2.54	1.00790	0.00055	2.34	1.02254	0.00054			
2.56	1.01242	0.00053	2.36	1.02732	0.00053			
2.58	1.01604	0.00055	2.38	1.03098	0.00054			
2.60	1.02013	0.00054	2.40	1.03574	0.00054			

Table B.1.3.2.2-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 1 Inch of Water Reflection (cont)

10000 milli-g/cc			15000 milli-g/cc			19600 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
1.20	0.90400	0.00052	0.80	0.87228	0.00048	0.60	0.85866	0.00048
1.22	0.91122	0.00049	0.82	0.88393	0.00049	0.62	0.87366	0.00047
1.24	0.91820	0.00050	0.84	0.89604	0.00050	0.64	0.88805	0.00050
1.26	0.92620	0.00049	0.86	0.90530	0.00050	0.66	0.90211	0.00048
1.28	0.93383	0.00050	0.88	0.91606	0.00049	0.68	0.91566	0.00049
1.30	0.94105	0.00052	0.90	0.92732	0.00050	0.70	0.92921	0.00050
1.32	0.94912	0.00050	0.92	0.93757	0.00050	0.72	0.94317	0.00050
1.34	0.95714	0.00051	0.94	0.94756	0.00049	0.74	0.95707	0.00049
1.36	0.96424	0.00050	0.96	0.95845	0.00051	0.76	0.96922	0.00049
1.38	0.97124	0.00052	0.98	0.96898	0.00050	0.78	0.98306	0.00050
1.40	0.97921	0.00051	1.00	0.97852	0.00051	0.80	0.99510	0.00051
1.42	0.98594	0.00052	1.02	0.98741	0.00049	0.82	1.00908	0.00050
1.44	0.99342	0.00050	1.04	0.99846	0.00051	0.84	1.02013	0.00050
1.46	1.00037	0.00050	1.06	1.00826	0.00051	0.86	1.03334	0.00051
1.48	1.00759	0.00052	1.08	1.01741	0.00052	0.88	1.04563	0.00049
1.50	1.01539	0.00052	1.10	1.02725	0.00051	0.90	1.05696	0.00051
1.52	1.02116	0.00053						
1.54	1.02892	0.00051						
1.56	1.03459	0.00051						
1.58	1.04215	0.00051						
1.60	1.04904	0.00052						

B.1.3.2.3. 10” Water Reflector

Case ID: pu-pl-0970-10

Material: Plutonium metal in water

Geometry: Infinite Plane

Isotopics: 97% ^{239}Pu 3% ^{240}Pu

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.1.3.2.3-1. Plutonium Slab (97% ^{239}Pu) - 10 Inches of Water Reflection

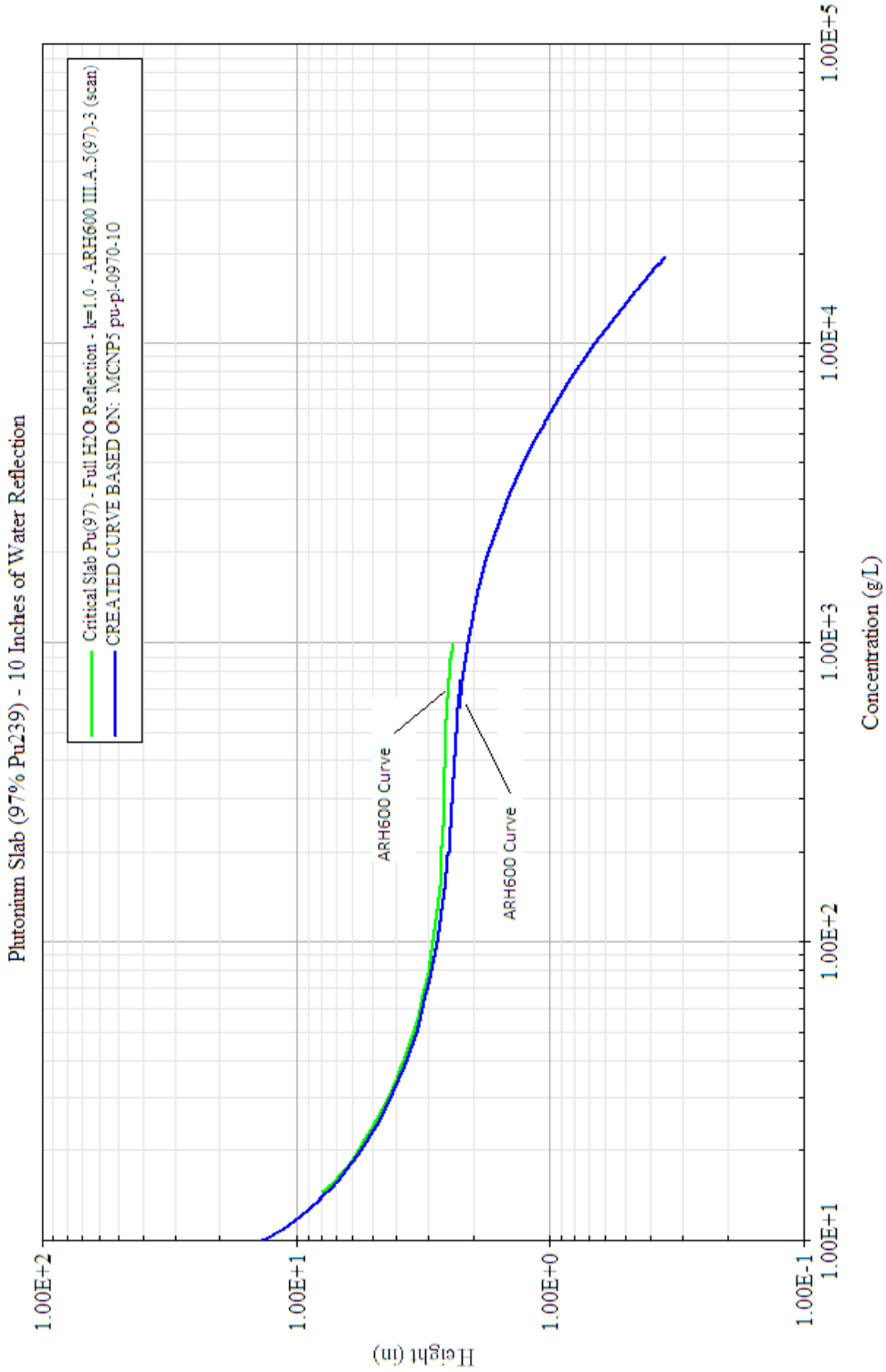

Table B.1.3.2.3-1. Critical Dimensions for Plutonium Slab (97% ^{239}Pu) - 10 Inches of Water Reflection

Plutonium Slab (97% ^{239}Pu)- 10 Inches of Water Reflection				
Concentration (g/cc)	First Height (Inches)	Last Height (Inches)	Delta (Inches)	Critical Height (Inches)
0.010	9.800	14.600	0.200	13.6189
0.011	8.400	11.900	0.100	11.1972
0.012	7.600	10.200	0.100	9.6880
0.015	5.800	7.600	0.100	7.2769
0.020	4.600	5.800	0.050	5.5694
0.025	3.900	5.000	0.050	4.7385
0.030	3.500	4.500	0.050	4.2496
0.040	3.000	3.900	0.050	3.6741
0.050	2.800	3.500	0.050	3.3550
0.075	2.400	3.100	0.050	2.9518
0.100	2.200	2.900	0.050	2.7623
0.150	2.100	2.800	0.050	2.5835
0.200	2.000	2.700	0.050	2.4986
0.350	1.900	2.600	0.050	2.3913
0.500	1.800	2.500	0.050	2.3364
0.750	1.700	2.400	0.050	2.2305
1.000	1.600	2.300	0.050	2.1228
1.500	1.400	2.100	0.050	1.9232
2.000	1.300	1.900	0.050	1.7483
2.500	1.200	1.700	0.020	1.6033
3.000	1.100	1.600	0.020	1.4754
4.000	0.900	1.400	0.020	1.2727
5.000	0.800	1.200	0.020	1.1094
7.500	0.600	0.900	0.020	0.8342
10.000	0.500	0.800	0.020	0.6630
15.000	0.300	0.500	0.020	0.4578
19.600	0.200	0.400	0.020	0.3516

```
MCNP5 Sample Input File
97% Pu Slab- 10 Inch of Reflection

Pu plane, 97.0 wt% 239Pu, 00750 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Height = 200   hundreths of inches - must be integer
c half height =     2.5400 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00750 milli-g Pu/cc
c Reflector width = 10.0 inches
c Enrichment = 0.97 wt fraction 239Pu
c
c Density of H2O 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 239Pu  = 239.05220
c Pu240  = 240.05380
c
c Effective Plutonium atomic mass 239.08225
c PuO2
c Mass fraction of Pu in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0383 cc
c Volume of water in sample 0.9617 cc
c
c Mass of crit in sample   0.7500 g
c Mass of Pu in sample   0.7500 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9617 g
c
c Total mass of sample  1.7117g for a 1cc sample
c Mass Density for crit material  -1.7117, expressed as negative
c
c  plane
20 11   -1.711735   -1 2 -7 -5 8 6      imp:n=1
21  2  -1.000    -3 4 6 8 -7 -5 ((1 -3):(-2 4))        imp:n=1    $zero importance if no reflector
```

```
22  0          3:-4:7:5:-8:-6                    imp:n=0

1       py     2.5400              $ plane
2       py    -2.5400
3       py    27.9400        $ Reflection
4       py   -27.9400
*5       px    100
*6       px    -100
*7       pz    100
*8       pz    -100

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    pu / water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 00750 milli-g Pu/cc,  1.7117
1001.66c -0.062868
8016.66c -0.498980      $from water
c      8016.66c -0.000000      $from oxide
94239.66c -0.425007
94240.66c -0.013145
mt11     lwtr.60t
c
c    pu only
m12    $ Pu, 100.0 wt% 235U, 00750 milli-g U/cc,  1.7117
c      8016.66c -0.000000      $from oxide
94239.66c -0.425007
94240.66c -0.013145
c
```

Critview Compatible Data File
97% Pu Slab- 10 Inch of Reflection

reset:
title: MCNP5 pu-pl-0970-10
set: MCNP5 set
source: MCNP5 primary
created: Thu 08/05/2010 11:21:35.34
geometry: infplane
modmat: H2O
critmat: plutonium
isomat: Pu239 0.970 Pu240 0.030
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: height in

0.010	13.6189
0.011	11.1972
0.012	9.6880
0.015	7.2769
0.020	5.5694
0.025	4.7385
0.030	4.2496
0.040	3.6741
0.050	3.3550
0.075	2.9518
0.100	2.7623
0.150	2.5835
0.200	2.4986
0.350	2.3913
0.500	2.3364
0.750	2.2305
1.000	2.1228
1.500	1.9232
2.000	1.7483
2.500	1.6033
3.000	1.4754
4.000	1.2727
5.000	1.1094
7.500	0.8342
10.00	0.6630
15.00	0.4578
19.60	0.3516

Table B.1.3.2.3-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 10 Inches of Water Reflection

10 milli-g/cc			11 milli-g/cc			12 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
9.80	0.92769	0.00027	8.40	0.92540	0.00030	7.60	0.93065	0.00031
10.00	0.93267	0.00028	8.50	0.92902	0.00029	7.70	0.93431	0.00031
10.20	0.93727	0.00027	8.60	0.93283	0.00029	7.80	0.93829	0.00030
10.40	0.94198	0.00027	8.70	0.93577	0.00030	7.90	0.94249	0.00030
10.60	0.94670	0.00026	8.80	0.93930	0.00029	8.00	0.94591	0.00031
10.80	0.95135	0.00027	8.90	0.94178	0.00028	8.10	0.95032	0.00029
11.00	0.95479	0.00027	9.00	0.94458	0.00029	8.20	0.95384	0.00031
11.20	0.95891	0.00026	9.10	0.94772	0.00029	8.30	0.95703	0.00030
11.40	0.96277	0.00026	9.20	0.95117	0.00029	8.40	0.96062	0.00030
11.60	0.96653	0.00026	9.30	0.95357	0.00028	8.50	0.96427	0.00029
11.80	0.97113	0.00026	9.40	0.95639	0.00029	8.60	0.96700	0.00029
12.00	0.97366	0.00027	9.50	0.95926	0.00029	8.70	0.97089	0.00030
12.20	0.97723	0.00026	9.60	0.96226	0.00028	8.80	0.97379	0.00029
12.40	0.98052	0.00026	9.70	0.96508	0.00028	8.90	0.97687	0.00030
12.60	0.98458	0.00025	9.80	0.96741	0.00030	9.00	0.98033	0.00030
12.80	0.98786	0.00025	9.90	0.96968	0.00029	9.10	0.98387	0.00029
13.00	0.99064	0.00024	10.00	0.97268	0.00028	9.20	0.98667	0.00030
13.20	0.99347	0.00025	10.10	0.97507	0.00027	9.30	0.98920	0.00029
13.40	0.99665	0.00024	10.20	0.97778	0.00028	9.40	0.99204	0.00030
13.60	0.99978	0.00024	10.30	0.97987	0.00028	9.50	0.99456	0.00030
13.80	1.00211	0.00025	10.40	0.98221	0.00028	9.60	0.99802	0.00030
14.00	1.00466	0.00024	10.50	0.98459	0.00028	9.70	1.00027	0.00029
14.20	1.00723	0.00025	10.60	0.98699	0.00028	9.80	1.00334	0.00030
14.40	1.00960	0.00024	10.70	0.98985	0.00029	9.90	1.00561	0.00030
14.60	1.01195	0.00024	10.80	0.99197	0.00028	10.00	1.00847	0.00030
			10.90	0.99300	0.00026	10.10	1.01111	0.00029
			11.00	0.99590	0.00028	10.20	1.01409	0.00028
			11.10	0.99790	0.00027			
			11.20	1.00006	0.00027			
			11.30	1.00181	0.00027			
			11.40	1.00469	0.00027			
			11.50	1.00657	0.00027			
			11.60	1.00842	0.00028			
			11.70	1.00973	0.00027			
			11.80	1.01203	0.00027			
			11.90	1.01394	0.00027			

Table B.1.3.3.1-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 10 Inches of Water Reflection (cont)

15 milli-g/cc			20 milli-g/cc			25 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
5.80	0.92147	0.00035	4.60	0.92483	0.00037	3.90	0.91890	0.00040
5.90	0.92740	0.00035	4.65	0.92831	0.00039	3.95	0.92576	0.00041
6.00	0.93360	0.00034	4.70	0.93359	0.00039	4.00	0.93055	0.00041
6.10	0.93983	0.00035	4.75	0.93777	0.00038	4.05	0.93543	0.00040
6.20	0.94564	0.00035	4.80	0.94178	0.00039	4.10	0.93985	0.00042
6.30	0.95139	0.00034	4.85	0.94599	0.00039	4.15	0.94568	0.00041
6.40	0.95690	0.00036	4.90	0.94942	0.00038	4.20	0.94971	0.00040
6.50	0.96221	0.00034	4.95	0.95440	0.00037	4.25	0.95488	0.00042
6.60	0.96681	0.00035	5.00	0.95834	0.00038	4.30	0.96010	0.00041
6.70	0.97287	0.00034	5.05	0.96139	0.00038	4.35	0.96496	0.00041
6.80	0.97815	0.00034	5.10	0.96574	0.00038	4.40	0.96910	0.00040
6.90	0.98241	0.00034	5.15	0.96963	0.00038	4.45	0.97480	0.00040
7.00	0.98778	0.00033	5.20	0.97382	0.00039	4.50	0.97888	0.00041
7.10	0.99229	0.00034	5.25	0.97809	0.00039	4.55	0.98315	0.00041
7.20	0.99713	0.00035	5.30	0.98050	0.00038	4.60	0.98737	0.00041
7.30	1.00086	0.00033	5.35	0.98479	0.00038	4.65	0.99246	0.00041
7.40	1.00650	0.00034	5.40	0.98794	0.00038	4.70	0.99632	0.00041
7.50	1.01095	0.00034	5.45	0.99198	0.00037	4.75	1.00110	0.00041
7.60	1.01482	0.00034	5.50	0.99578	0.00038	4.80	1.00393	0.00040
			5.55	0.99871	0.00039	4.85	1.00966	0.00041
			5.60	1.00203	0.00038	4.90	1.01363	0.00041
			5.65	1.00598	0.00038	4.95	1.01816	0.00041
			5.70	1.00877	0.00038	5.00	1.02174	0.00041
			5.75	1.01255	0.00037			
			5.80	1.01660	0.00038			

Table B.1.3.3.1-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 10 Inches of Water Reflection (cont)

30 milli-g/cc			40 milli-g/cc			50 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
3.50	0.91901	0.00043	3.00	0.91425	0.00045	2.80	0.92530	0.00046
3.55	0.92573	0.00041	3.05	0.92124	0.00046	2.85	0.93204	0.00046
3.60	0.93115	0.00043	3.10	0.92912	0.00046	2.90	0.93944	0.00045
3.65	0.93584	0.00044	3.15	0.93614	0.00045	2.95	0.94657	0.00047
3.70	0.94271	0.00043	3.20	0.94153	0.00045	3.00	0.95357	0.00046
3.75	0.94759	0.00044	3.25	0.94878	0.00045	3.05	0.96058	0.00047
3.80	0.95332	0.00043	3.30	0.95459	0.00046	3.10	0.96671	0.00047
3.85	0.95889	0.00043	3.35	0.96094	0.00046	3.15	0.97336	0.00047
3.90	0.96463	0.00043	3.40	0.96709	0.00046	3.20	0.98029	0.00048
3.95	0.96949	0.00043	3.45	0.97312	0.00047	3.25	0.98647	0.00048
4.00	0.97462	0.00043	3.50	0.97970	0.00045	3.30	0.99313	0.00048
4.05	0.98020	0.00042	3.55	0.98533	0.00047	3.35	0.99932	0.00047
4.10	0.98505	0.00043	3.60	0.99101	0.00045	3.40	1.00613	0.00047
4.15	0.98999	0.00044	3.65	0.99712	0.00044	3.45	1.01092	0.00047
4.20	0.99515	0.00044	3.70	1.00310	0.00045	3.50	1.01771	0.00047
4.25	1.00004	0.00043	3.75	1.00874	0.00045			
4.30	1.00485	0.00042	3.80	1.01372	0.00045			
4.35	1.01026	0.00043	3.85	1.01899	0.00046			
4.40	1.01470	0.00043	3.90	1.02527	0.00044			
4.45	1.01894	0.00044						
4.50	1.02443	0.00042						

Table B.1.3.3.1-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 10 Inches of Water Reflection (cont)

75 milli-g/cc			100 milli-g/cc			150 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
2.40	0.91861	0.00048	2.20	0.91413	0.00049	2.10	0.92680	0.00049
2.45	0.92658	0.00050	2.25	0.92345	0.00048	2.15	0.93422	0.00050
2.50	0.93448	0.00049	2.30	0.93121	0.00050	2.20	0.94234	0.00051
2.55	0.94252	0.00048	2.35	0.93856	0.00051	2.25	0.95051	0.00053
2.60	0.94920	0.00049	2.40	0.94682	0.00049	2.30	0.95741	0.00051
2.65	0.95804	0.00049	2.45	0.95385	0.00050	2.35	0.96524	0.00050
2.70	0.96457	0.00049	2.50	0.96181	0.00050	2.40	0.97293	0.00050
2.75	0.97241	0.00049	2.55	0.96974	0.00049	2.45	0.98078	0.00050
2.80	0.97872	0.00050	2.60	0.97700	0.00050	2.50	0.98829	0.00050
2.85	0.98554	0.00050	2.65	0.98363	0.00050	2.55	0.99486	0.00052
2.90	0.99313	0.00049	2.70	0.99081	0.00050	2.60	1.00253	0.00050
2.95	0.99977	0.00050	2.75	0.99850	0.00050	2.65	1.00791	0.00051
3.00	1.00627	0.00049	2.80	1.00462	0.00050	2.70	1.01540	0.00050
3.05	1.01312	0.00050	2.85	1.01296	0.00051	2.75	1.02288	0.00051
3.10	1.01963	0.00048	2.90	1.01952	0.00049	2.80	1.02900	0.00051

Table B.1.3.3.1-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 10 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
2.00	0.92346	0.00051	1.90	0.92721	0.00051	1.80	0.92252	0.00050
2.05	0.93249	0.00049	1.95	0.93441	0.00051	1.85	0.93089	0.00052
2.10	0.93927	0.00051	2.00	0.94255	0.00052	1.90	0.93717	0.00050
2.15	0.94826	0.00050	2.05	0.94991	0.00052	1.95	0.94489	0.00051
2.20	0.95587	0.00050	2.10	0.95736	0.00050	2.00	0.95331	0.00052
2.25	0.96249	0.00051	2.15	0.96553	0.00050	2.05	0.96080	0.00052
2.30	0.97040	0.00051	2.20	0.97228	0.00052	2.10	0.96760	0.00051
2.35	0.97771	0.00051	2.25	0.97962	0.00050	2.15	0.97513	0.00051
2.40	0.98423	0.00050	2.30	0.98673	0.00052	2.20	0.98239	0.00051
2.45	0.99247	0.00050	2.35	0.99366	0.00050	2.25	0.98933	0.00051
2.50	1.00021	0.00050	2.40	1.00134	0.00052	2.30	0.99447	0.00052
2.55	1.00591	0.00051	2.45	1.00691	0.00052	2.35	1.00207	0.00053
2.60	1.01254	0.00051	2.50	1.01369	0.00052	2.40	1.00901	0.00052
2.65	1.02017	0.00052	2.55	1.01994	0.00053	2.45	1.01646	0.00051
2.70	1.02647	0.00049	2.60	1.02625	0.00052	2.50	1.02193	0.00052

Table B.1.3.3.1-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 10 Inches of Water Reflection (cont)

750 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
1.70	0.92164	0.00052	1.60	0.91932	0.00050	1.40	0.91184	0.00050
1.75	0.92858	0.00052	1.65	0.92856	0.00050	1.45	0.92075	0.00050
1.80	0.93734	0.00050	1.70	0.93692	0.00051	1.50	0.92945	0.00052
1.85	0.94534	0.00052	1.75	0.94415	0.00050	1.55	0.93876	0.00051
1.90	0.95250	0.00051	1.80	0.95154	0.00051	1.60	0.94696	0.00052
1.95	0.96030	0.00052	1.85	0.96003	0.00051	1.65	0.95540	0.00052
2.00	0.96805	0.00052	1.90	0.96703	0.00052	1.70	0.96426	0.00050
2.05	0.97557	0.00051	1.95	0.97409	0.00051	1.75	0.97174	0.00052
2.10	0.98262	0.00052	2.00	0.98244	0.00051	1.80	0.98077	0.00051
2.15	0.98954	0.00052	2.05	0.99033	0.00050	1.85	0.98792	0.00052
2.20	0.99574	0.00053	2.10	0.99678	0.00052	1.90	0.99662	0.00051
2.25	1.00272	0.00051	2.15	1.00384	0.00051	1.95	1.00391	0.00051
2.30	1.00990	0.00051	2.20	1.01081	0.00051	2.00	1.01147	0.00050
2.35	1.01648	0.00052	2.25	1.01789	0.00052	2.05	1.01917	0.00049
2.40	1.02394	0.00054	2.30	1.02478	0.00052	2.10	1.02698	0.00051

Table B.1.3.3.1-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 10 Inches of Water Reflection (cont)

2000 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
1.30	0.91740	0.00052	1.20	0.91938	0.00050	1.10	0.91931	0.00050
1.35	0.92804	0.00052	1.22	0.92421	0.00049	1.12	0.92437	0.00050
1.40	0.93605	0.00052	1.24	0.92937	0.00051	1.14	0.92796	0.00051
1.45	0.94607	0.00053	1.26	0.93218	0.00050	1.16	0.93283	0.00048
1.50	0.95561	0.00051	1.28	0.93718	0.00051	1.18	0.93753	0.00052
1.55	0.96410	0.00051	1.30	0.94092	0.00053	1.20	0.94138	0.00049
1.60	0.97383	0.00051	1.32	0.94574	0.00051	1.22	0.94671	0.00050
1.65	0.98262	0.00052	1.34	0.94952	0.00050	1.24	0.94982	0.00052
1.70	0.99090	0.00051	1.36	0.95373	0.00051	1.26	0.95488	0.00052
1.75	1.00032	0.00053	1.38	0.95693	0.00052	1.28	0.95951	0.00049
1.80	1.00849	0.00052	1.40	0.96075	0.00051	1.30	0.96367	0.00050
1.85	1.01651	0.00051	1.42	0.96440	0.00051	1.32	0.96724	0.00050
1.90	1.02371	0.00050	1.44	0.96921	0.00051	1.34	0.97181	0.00055
			1.46	0.97309	0.00051	1.36	0.97614	0.00052
			1.48	0.97643	0.00052	1.38	0.98092	0.00052
			1.50	0.97932	0.00052	1.40	0.98398	0.00051
			1.52	0.98467	0.00051	1.42	0.98855	0.00052
			1.54	0.98812	0.00051	1.44	0.99338	0.00051
			1.56	0.99140	0.00051	1.46	0.99695	0.00051
			1.58	0.99533	0.00051	1.48	1.00092	0.00051
			1.60	0.99938	0.00052	1.50	1.00415	0.00051
			1.62	1.00318	0.00051	1.52	1.00851	0.00052
			1.64	1.00618	0.00051	1.54	1.01202	0.00050
			1.66	1.01078	0.00052	1.56	1.01650	0.00053
			1.68	1.01366	0.00051	1.58	1.02013	0.00052
			1.70	1.01686	0.00050	1.60	1.02435	0.00051

Table B.1.3.3.1-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 10 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			7500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
0.90	0.90829	0.00052	0.80	0.91249	0.00050	0.60	0.91263	0.00049
0.92	0.91316	0.00051	0.82	0.91865	0.00049	0.62	0.92066	0.00050
0.94	0.91893	0.00051	0.84	0.92456	0.00052	0.64	0.92819	0.00050
0.96	0.92314	0.00052	0.86	0.93013	0.00050	0.66	0.93636	0.00051
0.98	0.92897	0.00051	0.88	0.93609	0.00051	0.68	0.94341	0.00050
1.00	0.93466	0.00051	0.90	0.94200	0.00051	0.70	0.95180	0.00050
1.02	0.93941	0.00051	0.92	0.94745	0.00049	0.72	0.95904	0.00050
1.04	0.94382	0.00050	0.94	0.95314	0.00049	0.74	0.96660	0.00050
1.06	0.94956	0.00050	0.96	0.95911	0.00051	0.76	0.97312	0.00049
1.08	0.95469	0.00050	0.98	0.96446	0.00051	0.78	0.98127	0.00050
1.10	0.95952	0.00050	1.00	0.96920	0.00050	0.80	0.98627	0.00050
1.12	0.96355	0.00050	1.02	0.97600	0.00051	0.82	0.99483	0.00050
1.14	0.96940	0.00052	1.04	0.98136	0.00051	0.84	1.00210	0.00050
1.16	0.97414	0.00052	1.06	0.98721	0.00051	0.86	1.00819	0.00050
1.18	0.97894	0.00050	1.08	0.99176	0.00051	0.88	1.01501	0.00052
1.20	0.98341	0.00050	1.10	0.99756	0.00050	0.90	1.02152	0.00050
1.22	0.98830	0.00050	1.12	1.00275	0.00050			
1.24	0.99359	0.00049	1.14	1.00809	0.00050			
1.26	0.99705	0.00050	1.16	1.01230	0.00051			
1.28	1.00169	0.00051	1.18	1.01824	0.00050			
1.30	1.00670	0.00051	1.20	1.02272	0.00052			
1.34	1.01628	0.00052						
1.36	1.01994	0.00052						
1.38	1.02451	0.00051						
1.40	1.02903	0.00052						

Table B.1.3.3.1-2. K_{eff} Values for Plutonium Slab (97% ^{239}Pu) - 10 Inches of Water Reflection (cont)

10000 milli-g/cc			15000 milli-g/cc			19600 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
0.50	0.92620	0.00052	0.30	0.89309	0.00049	0.20	0.86139	0.00049
0.52	0.93579	0.00051	0.32	0.90720	0.00050	0.22	0.88201	0.00051
0.54	0.94515	0.00049	0.34	0.92156	0.00051	0.24	0.90023	0.00049
0.56	0.95403	0.00050	0.36	0.93507	0.00049	0.26	0.91976	0.00050
0.58	0.96400	0.00050	0.38	0.94957	0.00050	0.28	0.93780	0.00051
0.60	0.97333	0.00050	0.40	0.96259	0.00050	0.30	0.95621	0.00050
0.62	0.98195	0.00051	0.42	0.97618	0.00051	0.32	0.97345	0.00050
0.64	0.99112	0.00049	0.44	0.98849	0.00050	0.34	0.99009	0.00051
0.66	0.99860	0.00048	0.46	1.00145	0.00051	0.36	1.00719	0.00052
0.68	1.00805	0.00052	0.48	1.01337	0.00050	0.38	1.02212	0.00052
0.70	1.01565	0.00051	0.50	1.02548	0.00050	0.40	1.03754	0.00051
0.72	1.02471	0.00050						
0.74	1.03330	0.00049						
0.76	1.04081	0.00052						
0.78	1.04893	0.00052						
0.80	1.05641	0.00052						

B.1.3.3. 95% ^{239}Pu 5% ^{240}Pu

B.1.3.3.1. Unreflected

Case ID: pu-pl-0950-00

Material: Plutonium metal in water

Geometry: Infinite Plane

Isotopics: 95% ^{239}Pu 5% ^{240}Pu

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.1.3.3.1-1. Plutonium Slab (95% ^{239}Pu) - 0 Inches of Water Reflection

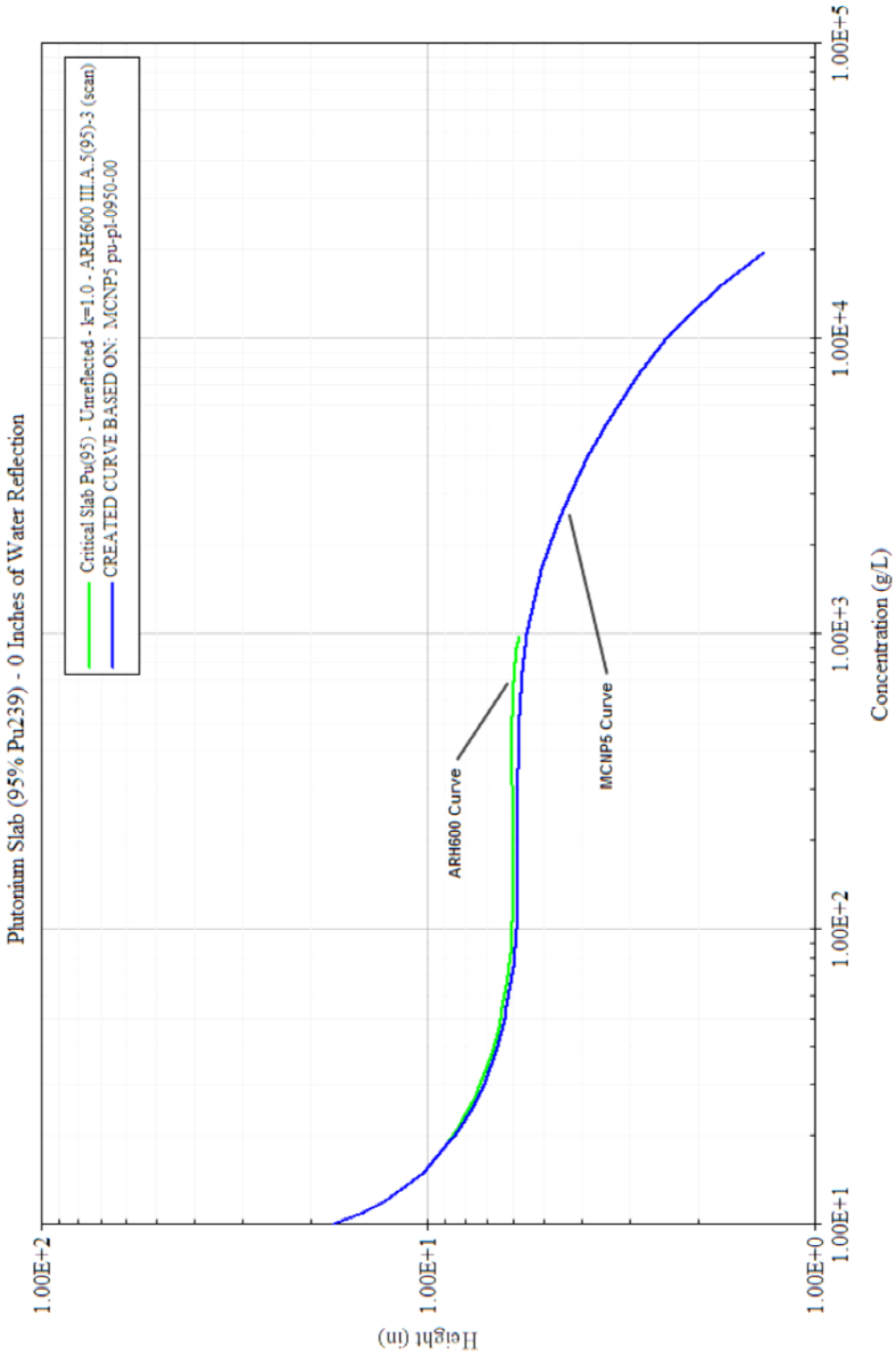

Table B.1.3.3.1-1. Critical Dimensions for Plutonium Slab (95% ^{239}Pu) - 0 Inches of Water Reflection

Plutonium Slab (95% ^{239}Pu) - 0 Inches of Water Reflection				
Concentration (g/cc)	First Height (Inches)	Last Height (Inches)	Delta (Inches)	Critical Height (Inches)
0.010	12.900	18.400	0.200	17.5855
0.011	11.400	15.000	0.100	14.6040
0.012	10.400	13.600	0.100	12.8796
0.015	8.700	10.900	0.100	10.2431
0.020	7.300	8.700	0.050	8.4663
0.025	6.700	7.900	0.050	7.6283
0.030	6.300	7.400	0.050	7.1406
0.040	5.900	6.800	0.050	6.6038
0.050	5.600	6.600	0.050	6.3147
0.075	5.400	6.300	0.050	6.0079
0.100	5.200	6.200	0.050	5.8916
0.150	5.200	6.000	0.050	5.8332
0.200	5.200	6.100	0.050	5.8310
0.350	5.200	6.300	0.050	5.8515
0.500	5.100	6.000	0.050	5.7999
0.750	5.000	7.500	0.100	5.6992
1.000	4.900	5.800	0.050	5.5338
1.500	4.600	5.300	0.050	5.1810
2.000	4.300	5.000	0.050	4.8404
2.500	4.000	4.700	0.050	4.5465
3.000	3.800	4.400	0.050	4.2806
4.000	3.400	4.000	0.050	3.8538
5.000	3.100	3.600	0.020	3.4966
7.500	2.500	3.000	0.020	2.8612
10.000	2.100	2.500	0.020	2.4075
15.000	1.500	1.900	0.020	1.7600
19.600	1.200	1.400	0.020	1.3520

MCNP5 Sample Input File
95% Pu Slab- 0 Inch of Reflection

```
Pu plane, 95.0 wt% 239Pu, 00010 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Height = 1290  hundreths of inches - must be integer
c half height =    16.3830 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00010 milli-g Pu/cc
c Reflector width =  0.0 inches
c Enrichment = 0.950 wt fraction 239Pu
c
c Density of H20 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 239Pu  = 239.05220
c Pu240  = 240.05380
c
c Effective Plutonium atomic mass 239.10228
c PuO2
c Mass fraction of Pu in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0005 cc
c Volume of water in sample 0.9995 cc
c
c Mass of crit in sample   0.0100 g
c Mass of Pu in sample   0.0100 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9995 g
c
c Total mass of sample  1.0095g for a 1cc sample
c Mass Density for crit material  -1.0095, expressed as negative
c
c  plane
  20 11   -1.009490   -1 2 -7 -5 8 6      imp:n=1
  21  2  -1.000    -3 4 6 8 -7 -5 ((1 -3):(-2 4))       imp:n=0    $zero importance if no reflector
  22  0            3:-4:7:5:-8:-6                    imp:n=0
```

```
   1       py    16.3830            $ plane
   2       py   -16.3830
   3       py    16.3830        $ Reflection
   4       py   -16.3830
   *5       px    100
   *6       px    -100
   *7       pz    100
   *8       pz    -100

mode n
kcode 2000 1.0 100  600
ksrc  0.00    0.00    0.00
     0.00    0.00    0.10
     0.00    0.00    0.50
     0.00    0.00    1.00
     0.00    0.00    2.00
     0.00    0.00    3.00
     1.00    1.00    1.00
     1.00    1.00    2.00
     1.00    1.00    3.00
     2.00    2.00    1.00
     2.00    2.00    2.00
     2.00    2.00    3.00
    -1.00   -1.00   -1.00
    -10.00   -10.00   -20.00
    -10.00   -10.00   -30.00
c
m2    $ water
        1001.66c      2
        8016.66c      1
mt2   lwtr.60t
c    pu / water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 00010 milli-g Pu/cc,  1.0095
     1001.66c -0.110786
     8016.66c -0.879308      $from water
c      8016.66c -0.000000      $from oxide
    94239.66c -0.009411
    94240.66c -0.000495
mt11     lwtr.60t
c
c    pu only
m12    $ Pu, 100.0 wt% 235U, 00010 milli-g U/cc,  1.0095
c      8016.66c -0.000000      $from oxide
    94239.66c -0.009411
    94240.66c -0.000495
c
```

Critview Compatible Data File
95% Pu Slab- 0 Inch of Reflection

reset:
title: MCNP5 pu-pl-0950-00
set: MCNP5 set
source: MCNP5 primary
created: Thu 08/25/2010 11:21:35.34
geometry: infplane
critmat: Plutonium
isomat: Pu239 0.950 Pu240 0.050
reflmat: none
modmat: H2O
keff: 1.0
reflthick: 0.00 in
var: critconc g/cc
var: height in

0.010	17.5855
0.011	14.6040
0.012	12.8796
0.015	10.2431
0.020	8.4663
0.025	7.6283
0.030	7.1406
0.040	6.6038
0.050	6.3147
0.075	6.0079
0.100	5.8916
0.150	5.8332
0.200	5.8310
0.350	5.8515
0.500	5.7999
0.750	5.6992
1.000	5.5338
1.500	5.1810
2.000	4.8404
2.500	4.5465
3.000	4.2806
4.000	3.8538
5.000	3.4966
7.500	2.8612
10.000	2.4075
15.000	1.7600
19.600	1.3520

Table B.1.3.3.1-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 0 Inches of Water Reflection

10 milli-g/cc			11 milli-g/cc			12 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
12.90	0.92465	0.00048	11.40	0.92435	0.00052	10.40	0.92303	0.00053
13.10	0.92984	0.00051	11.50	0.92716	0.00052	10.50	0.92581	0.00055
13.30	0.93391	0.00049	11.60	0.93020	0.00052	10.60	0.93100	0.00055
13.50	0.93819	0.00048	11.70	0.93281	0.00050	10.70	0.93363	0.00054
13.70	0.94226	0.00047	11.80	0.93665	0.00054	10.80	0.93835	0.00056
13.90	0.94582	0.00048	11.90	0.93949	0.00049	10.90	0.94214	0.00053
14.10	0.94923	0.00047	12.00	0.94172	0.00056	11.00	0.94562	0.00055
14.30	0.95310	0.00050	12.10	0.94434	0.00051	11.10	0.94862	0.00056
14.50	0.95782	0.00048	12.20	0.94656	0.00049	11.20	0.95197	0.00055
14.70	0.96104	0.00044	12.30	0.94933	0.00052	11.30	0.95466	0.00055
14.90	0.96389	0.00045	12.40	0.95287	0.00051	11.40	0.95853	0.00056
15.10	0.96704	0.00045	12.50	0.95396	0.00051	11.50	0.96140	0.00057
15.30	0.97062	0.00043	12.60	0.95710	0.00053	11.60	0.96473	0.00056
15.50	0.97385	0.00047	12.70	0.96005	0.00051	11.70	0.96748	0.00054
15.70	0.97686	0.00046	12.80	0.96203	0.00052	11.80	0.97041	0.00054
15.90	0.97923	0.00045	12.90	0.96466	0.00047	11.90	0.97354	0.00053
16.10	0.98149	0.00045	13.00	0.96658	0.00050	12.00	0.97636	0.00054
16.30	0.98512	0.00044	13.10	0.96959	0.00048	12.10	0.97920	0.00052
16.50	0.98822	0.00045	13.20	0.97278	0.00051	12.20	0.98215	0.00052
16.70	0.99100	0.00045	13.30	0.97333	0.00048	12.30	0.98437	0.00052
16.90	0.99181	0.00043	13.40	0.97625	0.00048	12.40	0.98714	0.00053
17.10	0.99443	0.00042	13.50	0.97843	0.00050	12.50	0.98984	0.00052
17.30	0.99694	0.00045	13.60	0.98017	0.00051	12.60	0.99186	0.00054
17.50	0.99932	0.00042	13.70	0.98193	0.00048	12.70	0.99535	0.00051
17.70	1.00091	0.00041	13.80	0.98385	0.00049	12.80	0.99751	0.00054
17.90	1.00404	0.00043	13.90	0.98706	0.00049	12.90	1.00064	0.00053
18.10	1.00526	0.00041	14.00	0.98857	0.00050	13.00	1.00123	0.00054
18.30	1.00819	0.00041	14.10	0.99092	0.00049	13.10	1.00431	0.00053
18.40	1.00953	0.00041	14.20	0.99138	0.00049	13.20	1.00775	0.00052
			14.30	0.99261	0.00051	13.30	1.00909	0.00052
			14.40	0.99581	0.00050	13.40	1.01180	0.00052
			14.50	0.99784	0.00050	13.50	1.01481	0.00052
			14.60	0.99999	0.00049	13.60	1.01561	0.00051
			14.70	1.00024	0.00049			
			14.80	1.00261	0.00047			
			14.90	1.00537	0.00046			
			15.00	1.00654	0.00047			

Table B.1.3.3.1-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 0 Inches of Water Reflection (cont)

15 milli-g/cc			20 milli-g/cc			25 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
8.70	0.92368	0.00062	7.30	0.91553	0.00072	6.70	0.91640	0.00076
8.80	0.92862	0.00064	7.35	0.91865	0.00074	6.75	0.92056	0.00079
8.90	0.93435	0.00063	7.40	0.92336	0.00072	6.80	0.92781	0.00077
9.00	0.94148	0.00059	7.45	0.92782	0.00073	6.85	0.93356	0.00083
9.10	0.94521	0.00065	7.50	0.93317	0.00077	6.90	0.93667	0.00076
9.20	0.95071	0.00064	7.55	0.93478	0.00073	6.95	0.94254	0.00077
9.30	0.95568	0.00061	7.60	0.93894	0.00073	7.00	0.94772	0.00078
9.40	0.96098	0.00062	7.65	0.94350	0.00073	7.05	0.95088	0.00074
9.50	0.96561	0.00064	7.70	0.94548	0.00072	7.10	0.95491	0.00076
9.60	0.97058	0.00060	7.75	0.95008	0.00071	7.15	0.95840	0.00078
9.70	0.97545	0.00068	7.80	0.95359	0.00069	7.20	0.96475	0.00080
9.80	0.98052	0.00066	7.85	0.95791	0.00074	7.25	0.96802	0.00076
9.90	0.98453	0.00064	7.90	0.96148	0.00070	7.30	0.97362	0.00078
10.00	0.98895	0.00059	7.95	0.96461	0.00073	7.35	0.97878	0.00076
10.10	0.99184	0.00062	8.00	0.96799	0.00068	7.40	0.98200	0.00073
10.20	0.99840	0.00061	8.05	0.97162	0.00071	7.45	0.98689	0.00078
10.30	1.00211	0.00058	8.10	0.97645	0.00072	7.50	0.98995	0.00079
10.40	1.00492	0.00059	8.15	0.97854	0.00074	7.55	0.99374	0.00075
10.50	1.00989	0.00066	8.20	0.98309	0.00066	7.60	0.99744	0.00077
10.60	1.01361	0.00058	8.25	0.98556	0.00073	7.65	1.00197	0.00073
10.70	1.01769	0.00061	8.30	0.98868	0.00074	7.70	1.00575	0.00079
10.80	1.02082	0.00063	8.35	0.99237	0.00072	7.75	1.00875	0.00074
10.90	1.02462	0.00060	8.40	0.99511	0.00073	7.80	1.01516	0.00077
			8.45	0.99909	0.00073	7.85	1.01720	0.00081
			8.50	1.00189	0.00070	7.90	1.02242	0.00073
			8.55	1.00491	0.00065			
			8.60	1.00750	0.00069			
			8.65	1.01118	0.00070			
			8.70	1.01360	0.00069			

Table B.1.3.3.1-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 0 Inches of Water Reflection (cont)

30 milli-g/cc			40 milli-g/cc			50 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
6.30	0.91557	0.00079	5.90	0.92225	0.00086	5.60	0.90974	0.00084
6.35	0.92299	0.00085	5.95	0.92627	0.00087	5.65	0.91681	0.00088
6.40	0.92681	0.00079	6.00	0.93323	0.00086	5.70	0.92429	0.00087
6.45	0.93233	0.00083	6.05	0.93625	0.00089	5.75	0.93084	0.00086
6.50	0.93704	0.00077	6.10	0.94409	0.00088	5.80	0.93689	0.00088
6.55	0.94369	0.00079	6.15	0.94951	0.00087	5.85	0.94319	0.00094
6.60	0.94774	0.00082	6.20	0.95526	0.00092	5.90	0.94910	0.00092
6.65	0.95314	0.00085	6.25	0.96129	0.00083	5.95	0.95702	0.00096
6.70	0.95874	0.00082	6.30	0.96676	0.00086	6.00	0.96338	0.00087
6.75	0.96275	0.00085	6.35	0.97280	0.00083	6.05	0.96881	0.00084
6.80	0.96745	0.00080	6.40	0.97732	0.00076	6.10	0.97466	0.00088
6.85	0.97243	0.00081	6.45	0.98308	0.00087	6.15	0.98015	0.00092
6.90	0.97719	0.00083	6.50	0.98835	0.00090	6.20	0.98623	0.00089
6.95	0.98282	0.00082	6.55	0.99519	0.00088	6.25	0.99336	0.00086
7.00	0.98718	0.00084	6.60	0.99958	0.00085	6.30	0.99819	0.00090
7.05	0.99165	0.00079	6.65	1.00508	0.00084	6.35	1.00436	0.00088
7.10	0.99473	0.00078	6.70	1.01028	0.00088	6.40	1.00778	0.00087
7.15	1.00122	0.00078	6.75	1.01563	0.00080	6.45	1.01360	0.00084
7.20	1.00562	0.00085	6.80	1.01956	0.00085	6.50	1.02038	0.00083
7.25	1.00969	0.00081				6.55	1.02515	0.00088
7.30	1.01361	0.00084				6.60	1.02935	0.00093
7.35	1.01789	0.00084						
7.40	1.02155	0.00082						

Table B.1.3.3.1-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 0 Inches of Water Reflection (cont)

75 milli-g/cc			100 milli-g/cc			150 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
5.40	0.92101	0.00091	5.20	0.90623	0.00097	5.20	0.91488	0.00069
5.45	0.92727	0.00090	5.25	0.91202	0.00096	5.25	0.92313	0.00070
5.50	0.93394	0.00097	5.30	0.92147	0.00095	5.30	0.92992	0.00071
5.55	0.94226	0.00090	5.35	0.92782	0.00091	5.35	0.93734	0.00072
5.60	0.94696	0.00095	5.40	0.93406	0.00096	5.40	0.94381	0.00071
5.65	0.95586	0.00086	5.45	0.94240	0.00088	5.45	0.95161	0.00072
5.70	0.96158	0.00093	5.50	0.94910	0.00094	5.50	0.95736	0.00072
5.75	0.96846	0.00090	5.55	0.95575	0.00096	5.55	0.96387	0.00071
5.80	0.97412	0.00090	5.60	0.96173	0.00094	5.60	0.97080	0.00072
5.85	0.98067	0.00092	5.65	0.96853	0.00096	5.65	0.97801	0.00070
5.90	0.98462	0.00091	5.70	0.97682	0.00098	5.70	0.98238	0.00075
5.95	0.99342	0.00090	5.75	0.98149	0.00098	5.75	0.98937	0.00072
6.00	0.99913	0.00085	5.80	0.98837	0.00089	5.80	0.99628	0.00073
6.05	1.00466	0.00091	5.85	0.99289	0.00099	5.85	1.00189	0.00074
6.10	1.01182	0.00090	5.90	1.00143	0.00089	5.90	1.00961	0.00071
6.15	1.01687	0.00094	5.95	1.00606	0.00091	5.95	1.01428	0.00072
6.20	1.02362	0.00091	6.00	1.01512	0.00092	6.00	1.02015	0.00072
6.25	1.02988	0.00088	6.05	1.02030	0.00094			
6.30	1.03569	0.00091	6.10	1.02268	0.00093			
			6.15	1.03213	0.00092			
			6.20	1.03501	0.00094			

Table B.1.3.3.1-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 0 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
5.20	0.91666	0.00073	5.20	0.91844	0.00072	5.10	0.91032	0.00090
5.25	0.92509	0.00070	5.25	0.92575	0.00071	5.15	0.91713	0.00092
5.30	0.93049	0.00069	5.30	0.93112	0.00072	5.20	0.92279	0.00094
5.35	0.93707	0.00074	5.35	0.93829	0.00072	5.25	0.92959	0.00091
5.40	0.94599	0.00070	5.40	0.94572	0.00074	5.30	0.93745	0.00095
5.45	0.95092	0.00072	5.45	0.95230	0.00072	5.35	0.94438	0.00095
5.50	0.95941	0.00072	5.50	0.95799	0.00067	5.40	0.94969	0.00090
5.55	0.96468	0.00074	5.55	0.96357	0.00071	5.45	0.95583	0.00094
5.60	0.97031	0.00071	5.60	0.97058	0.00070	5.50	0.96172	0.00091
5.65	0.97665	0.00074	5.65	0.97638	0.00072	5.55	0.96803	0.00094
5.70	0.98433	0.00072	5.70	0.98181	0.00071	5.60	0.97345	0.00094
5.75	0.98954	0.00071	5.75	0.98798	0.00072	5.65	0.98085	0.00090
5.80	0.99522	0.00074	5.80	0.99349	0.00074	5.70	0.98676	0.00097
5.85	1.00294	0.00072	5.85	0.99983	0.00072	5.75	0.99125	0.00096
5.90	1.00795	0.00070	5.90	1.00566	0.00070	5.80	1.00002	0.00097
5.95	1.01332	0.00070	5.95	1.01010	0.00073	5.85	1.00445	0.00093
6.00	1.02090	0.00071	6.00	1.01761	0.00070	5.90	1.00979	0.00092
6.05	1.02611	0.00073	6.05	1.02162	0.00071	5.95	1.01483	0.00097
6.10	1.03173	0.00071	6.10	1.02766	0.00071	6.00	1.02130	0.00095
			6.15	1.03282	0.00072			
			6.20	1.03929	0.00071			
			6.25	1.04482	0.00072			
			6.30	1.04859	0.00069			

Table B.1.3.3.1-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 0 Inches of Water Reflection (cont)

750 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
5.00	0.91240	0.00090	4.90	0.91607	0.00091	4.60	0.91907	0.00089
5.10	0.92750	0.00091	4.95	0.92765	0.00091	4.65	0.92693	0.00095
5.20	0.93857	0.00093	5.00	0.93182	0.00091	4.70	0.93483	0.00092
5.30	0.95345	0.00091	5.05	0.93657	0.00090	4.75	0.94097	0.00089
5.40	0.96509	0.00093	5.10	0.94611	0.00092	4.80	0.94703	0.00093
5.50	0.97714	0.00093	5.15	0.95234	0.00091	4.85	0.95708	0.00090
5.60	0.98820	0.00091	5.20	0.95730	0.00092	4.90	0.96136	0.00093
5.70	1.00010	0.00098	5.25	0.96331	0.00090	4.95	0.96844	0.00092
5.80	1.01188	0.00092	5.30	0.97175	0.00091	5.00	0.97575	0.00094
5.90	1.02459	0.00092	5.35	0.97714	0.00093	5.05	0.98409	0.00092
6.00	1.03189	0.00099	5.40	0.98392	0.00098	5.10	0.99084	0.00090
6.10	1.04239	0.00093	5.45	0.99113	0.00097	5.15	0.99668	0.00093
6.20	1.05288	0.00096	5.50	0.99623	0.00090	5.20	1.00204	0.00087
6.30	1.06222	0.00096	5.55	1.00181	0.00091	5.25	1.00939	0.00094
6.40	1.07406	0.00093	5.60	1.00683	0.00086	5.30	1.01612	0.00096
6.50	1.08289	0.00095	5.65	1.01466	0.00094			
6.60	1.09167	0.00091	5.70	1.01967	0.00093			
6.70	1.10239	0.00090	5.75	1.02432	0.00097			
6.80	1.10965	0.00091	5.80	1.03010	0.00095			
6.90	1.11823	0.00098						
7.00	1.12826	0.00092						
7.10	1.13633	0.00097						
7.20	1.14246	0.00093						
7.30	1.15181	0.00094						
7.40	1.16050	0.00094						
7.50	1.16875	0.00092						

Table B.1.3.3.1-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 0 Inches of Water Reflection (cont)

2000 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
4.30	0.91706	0.00089	4.00	0.90969	0.00092	3.80	0.91423	0.00089
4.35	0.92465	0.00093	4.05	0.91879	0.00083	3.85	0.92312	0.00087
4.40	0.93459	0.00088	4.10	0.92675	0.00087	3.90	0.93097	0.00089
4.45	0.94170	0.00085	4.15	0.93518	0.00090	3.95	0.94292	0.00090
4.50	0.94914	0.00090	4.20	0.94309	0.00088	4.00	0.95120	0.00086
4.55	0.95639	0.00090	4.25	0.95129	0.00093	4.05	0.95932	0.00090
4.60	0.96437	0.00090	4.30	0.96185	0.00087	4.10	0.96843	0.00088
4.65	0.97153	0.00091	4.35	0.96997	0.00089	4.15	0.97656	0.00087
4.70	0.98063	0.00092	4.40	0.97703	0.00093	4.20	0.98556	0.00087
4.75	0.98663	0.00090	4.45	0.98607	0.00092	4.25	0.99364	0.00086
4.80	0.99304	0.00089	4.50	0.99289	0.00091	4.30	1.00404	0.00089
4.85	1.00166	0.00091	4.55	1.00053	0.00090	4.35	1.01151	0.00088
4.90	1.00846	0.00094	4.60	1.00902	0.00095	4.40	1.01882	0.00094
4.95	1.01526	0.00095	4.65	1.01711	0.00088			
5.00	1.02181	0.00086	4.70	1.02334	0.00095			

Table B.1.3.3.1-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 0 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			7500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
3.40	0.90699	0.00089	3.10	0.90871	0.00085	2.50	0.89735	0.00073
3.45	0.91777	0.00085	3.12	0.91147	0.00082	2.52	0.90330	0.00077
3.50	0.92993	0.00092	3.14	0.91743	0.00084	2.54	0.91019	0.00078
3.55	0.94036	0.00087	3.16	0.92121	0.00083	2.56	0.91469	0.00079
3.60	0.94868	0.00085	3.18	0.92677	0.00082	2.58	0.92015	0.00078
3.65	0.96086	0.00085	3.20	0.93052	0.00083	2.60	0.92668	0.00083
3.70	0.97237	0.00087	3.22	0.93626	0.00080	2.62	0.93178	0.00074
3.75	0.98102	0.00087	3.24	0.94003	0.00080	2.64	0.93924	0.00080
3.80	0.98968	0.00088	3.26	0.94510	0.00084	2.66	0.94306	0.00079
3.85	0.99920	0.00086	3.28	0.95160	0.00087	2.68	0.94823	0.00076
3.90	1.00960	0.00084	3.30	0.95314	0.00084	2.70	0.95422	0.00078
3.95	1.01937	0.00089	3.32	0.95945	0.00080	2.72	0.96059	0.00075
4.00	1.02832	0.00083	3.34	0.96421	0.00085	2.74	0.96689	0.00077
			3.36	0.96832	0.00085	2.76	0.97176	0.00081
			3.38	0.97219	0.00088	2.78	0.97714	0.00081
			3.40	0.97780	0.00085	2.80	0.98242	0.00083
			3.42	0.98296	0.00087	2.82	0.98902	0.00079
			3.44	0.98613	0.00081	2.84	0.99354	0.00081
			3.46	0.99188	0.00089	2.86	0.99966	0.00081
			3.48	0.99602	0.00085	2.88	1.00523	0.00078
			3.50	1.00081	0.00083	2.90	1.00965	0.00078
			3.52	1.00436	0.00085	2.92	1.01423	0.00077
			3.54	1.00774	0.00086	2.94	1.02071	0.00077
			3.56	1.01404	0.00086	2.96	1.02493	0.00081
			3.58	1.01692	0.00088	2.98	1.03193	0.00081
			3.60	1.02148	0.00088	3.00	1.03625	0.00083

Table B.1.3.3.1-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 0 Inches of Water Reflection (cont)

10000 milli-g/cc			15000 milli-g/cc			19600 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
2.10	0.89831	0.00076	1.50	0.88998	0.00067	1.20	0.92073	0.00068
2.12	0.90707	0.00072	1.52	0.89818	0.00065	1.22	0.93134	0.00070
2.14	0.91222	0.00075	1.54	0.90857	0.00067	1.24	0.94076	0.00067
2.16	0.91872	0.00074	1.56	0.91572	0.00068	1.26	0.95184	0.00069
2.18	0.92549	0.00073	1.58	0.92552	0.00068	1.28	0.96358	0.00070
2.20	0.93273	0.00075	1.60	0.93470	0.00068	1.30	0.97381	0.00071
2.22	0.93834	0.00072	1.62	0.94240	0.00066	1.32	0.98407	0.00074
2.24	0.94581	0.00072	1.64	0.95077	0.00070	1.34	0.99408	0.00068
2.26	0.95277	0.00073	1.66	0.95927	0.00069	1.36	1.00395	0.00069
2.28	0.95890	0.00072	1.68	0.96724	0.00070	1.38	1.01475	0.00071
2.30	0.96464	0.00072	1.70	0.97449	0.00076	1.40	1.02565	0.00072
2.32	0.97199	0.00072	1.72	0.98445	0.00068			
2.34	0.97799	0.00076	1.74	0.99319	0.00075			
2.36	0.98548	0.00074	1.76	1.00001	0.00071			
2.38	0.99129	0.00074	1.78	1.00891	0.00073			
2.40	0.99808	0.00074	1.80	1.01734	0.00072			
2.42	1.00319	0.00079	1.82	1.02547	0.00070			
2.44	1.01025	0.00077	1.84	1.03332	0.00072			
2.46	1.01506	0.00077	1.86	1.04084	0.00071			
2.48	1.02181	0.00077	1.88	1.05008	0.00069			
2.50	1.02979	0.00080	1.90	1.05668	0.00070			

B.1.3.3.2. 1” Water Reflector

Case ID: pu-pl-0950-01

Material: Plutonium metal in water

Geometry: Infinite Plane

Isotopics: 95% ^{239}Pu 5% ^{240}Pu

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.1.3.3.2-1. Plutonium Slab (95% ^{239}Pu) - 1 Inches of Water Reflection

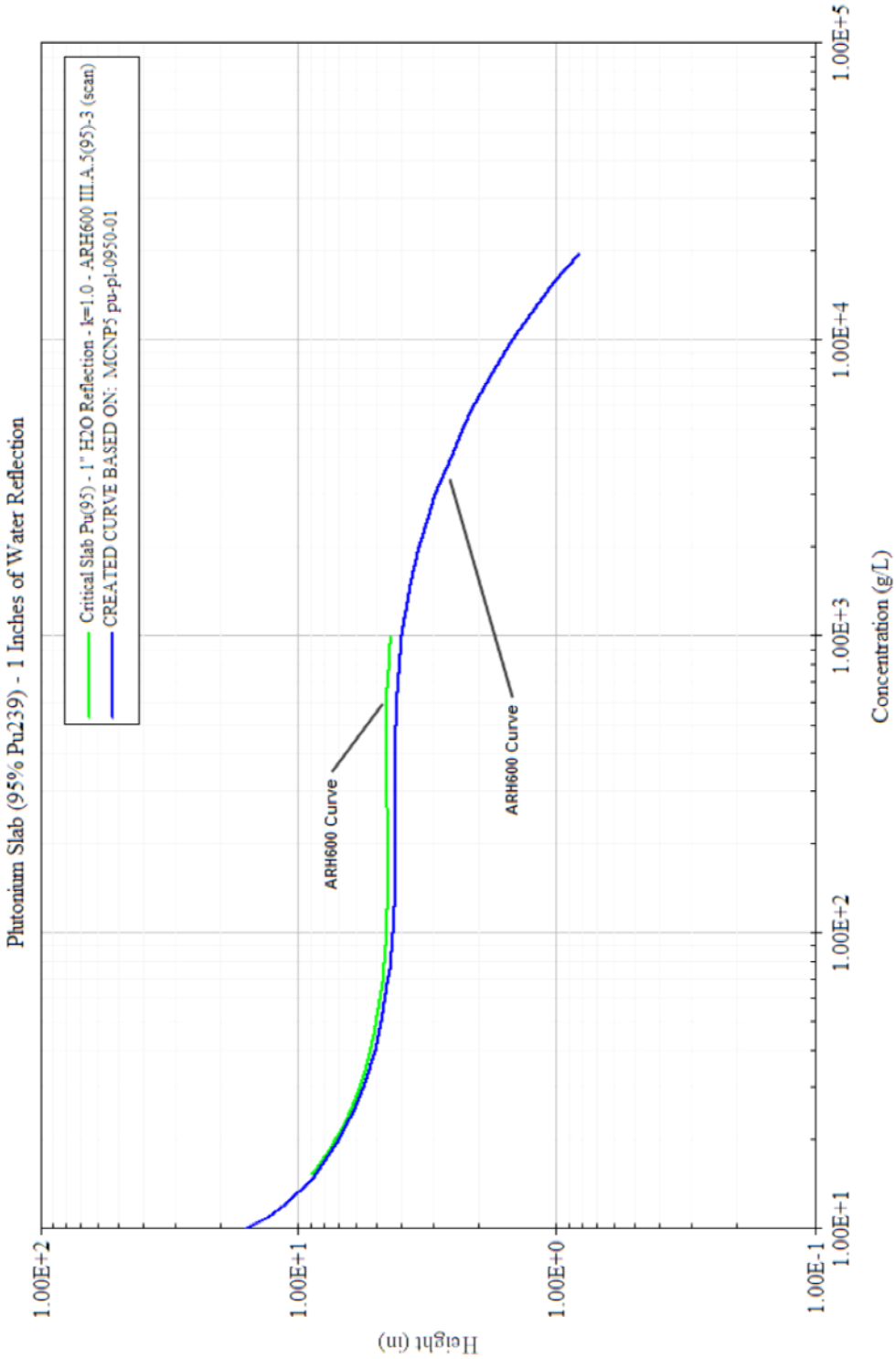

Table B.1.3.3.2-1. Critical Dimensions for Plutonium Slab (95% ^{239}Pu) - 1 Inches of Water Reflection

Plutonium Slab (95% ^{239}Pu) - 1 Inches of Water Reflection				
Concentration (g/cc)	First Height (Inches)	Last Height (Inches)	Delta (Inches)	Critical Height (Inches)
0.01	11.500	16.500	0.200	17.5855
0.011	9.900	13.800	0.200	14.6040
0.012	8.900	12.100	0.100	12.8796
0.015	7.200	9.100	0.100	10.2431
0.020	5.900	7.200	0.050	8.4663
0.025	5.200	6.300	0.050	7.6283
0.030	4.800	5.800	0.050	7.1406
0.040	4.300	5.300	0.050	6.6038
0.050	4.100	4.900	0.050	6.3147
0.075	3.800	4.700	0.050	6.0079
0.100	3.700	4.500	0.050	5.8916
0.150	3.600	4.400	0.050	5.8332
0.200	3.600	4.400	0.050	5.8310
0.350	3.600	4.400	0.050	5.8515
0.500	3.600	4.400	0.050	5.7999
0.750	3.500	4.300	0.050	5.6992
1.000	3.300	4.200	0.050	5.5338
1.500	3.100	3.800	0.050	5.1810
2.000	2.900	4.100	0.050	4.8404
2.500	2.700	3.300	0.050	4.5465
3.000	2.500	3.100	0.050	4.2806
4.000	2.200	2.700	0.020	3.8538
5.000	1.900	2.400	0.020	3.4966
7.500	1.500	1.900	0.020	2.8612
10.000	1.200	1.600	0.020	2.4075
15.000	0.900	1.100	0.020	1.7600
19.600	0.700	0.900	0.020	1.3520

MCNP5 Sample Input File
95% Pu Slab- 1 Inch of Reflection

```
Pu plane, 95.0 wt% 239Pu, 00010 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Height = 1150  hundreths of inches - must be integer
c half height =    14.6050 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00010 milli-g Pu/cc
c Reflector width =  1.0 inches
c Enrichment = 0.950 wt fraction 239Pu
c
c Density of H20 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 239Pu  = 239.05220
c Pu240  = 240.05380
c
c Effective Plutonium atomic mass 239.10228
c PuO2
c Mass fraction of Pu in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0005 cc
c Volume of water in sample 0.9995 cc
c
c Mass of crit in sample   0.0100 g
c Mass of Pu in sample   0.0100 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9995 g
c
c Total mass of sample  1.0095g for a 1cc sample
c Mass Density for crit material  -1.0095, expressed as negative
c
c  plane
  20 11   -1.009490   -1 2 -7 -5 8 6      imp:n=1
  21  2  -1.000    -3 4 6 8 -7 -5 ((1 -3):(-2 4))       imp:n=1    $zero importance if no reflector
  22  0            3:-4:7:5:-8:-6                    imp:n=0
```

```
   1       py    14.6050            $ plane
   2       py   -14.6050
   3       py    17.1450        $ Reflection
   4       py   -17.1450
   *5        px    100
   *6        px    -100
   *7        pz    100
   *8        pz    -100

mode n
kcode 2000 1.0 100  600
ksrc  0.00    0.00    0.00
     0.00    0.00    0.10
     0.00    0.00    0.50
     0.00    0.00    1.00
     0.00    0.00    2.00
     0.00    0.00    3.00
     1.00    1.00    1.00
     1.00    1.00    2.00
     1.00    1.00    3.00
     2.00    2.00    1.00
     2.00    2.00    2.00
     2.00    2.00    3.00
    -1.00   -1.00   -1.00
    -10.00   -10.00   -20.00
    -10.00   -10.00   -30.00
c
m2    $ water
        1001.66c      2
        8016.66c      1
mt2   lwtr.60t
c    pu / water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 00010 milli-g Pu/cc,  1.0095
     1001.66c -0.110786
     8016.66c -0.879308      $from water
c      8016.66c -0.000000      $from oxide
    94239.66c -0.009411
    94240.66c -0.000495
mt11     lwtr.60t
c
c    pu only
m12    $ Pu, 100.0 wt% 235U, 00010 milli-g U/cc,  1.0095
c      8016.66c -0.000000      $from oxide
    94239.66c -0.009411
    94240.66c -0.000495
c
```

Critview Compatible Data File
95% Pu Slab- 1 Inch of Reflection

reset:
title: MCNP5 pu-pl-0950-01
set: MCNP5 set
source: MCNP5 primary
created: Thu 08/25/2010 11:21:35.34
geometry: infplane
critmat: Plutonium
isomat: Pu239 0.950 Pu240 0.050
reflmat: none
modmat: H2O
keff: 1.0
reflthick: 1.00 in
var: critconc g/cc
var: height in

0.010	16.0193
0.011	13.1361
0.012	11.3885
0.015	8.7396
0.020	6.9479
0.025	6.1021
0.030	5.6019
0.040	5.0422
0.050	4.7663
0.075	4.4402
0.100	4.3077
0.150	4.2348
0.200	4.2173
0.350	4.2312
0.500	4.2184
0.750	4.1112
1.000	3.9899
1.500	3.6823
2.000	3.4062
2.500	3.1543
3.000	2.9494
4.000	2.5848
5.000	2.3147
7.500	1.8154
10.000	1.4850
15.000	1.0575
19.600	0.8178

Table B.1.3.3.2-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 1 Inches of Water Reflection

10 milli-g/cc			11 milli-g/cc			12 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
11.50	0.92689	0.00047	9.90	0.92548	0.00051	8.90	0.92500	0.00055
11.70	0.93312	0.00047	10.10	0.93067	0.00051	9.00	0.92802	0.00056
11.90	0.93705	0.00048	10.30	0.93658	0.00050	9.10	0.93164	0.00057
12.10	0.94075	0.00048	10.50	0.94162	0.00046	9.20	0.93518	0.00055
12.30	0.94502	0.00049	10.70	0.94743	0.00050	9.30	0.94013	0.00054
12.50	0.94785	0.00045	10.90	0.95301	0.00050	9.40	0.94188	0.00053
12.70	0.95240	0.00045	11.10	0.95709	0.00051	9.50	0.94489	0.00053
12.90	0.95561	0.00046	11.30	0.96295	0.00051	9.60	0.94847	0.00053
13.10	0.95941	0.00043	11.50	0.96663	0.00047	9.70	0.95314	0.00055
13.30	0.96271	0.00045	11.70	0.97104	0.00048	9.80	0.95551	0.00053
13.50	0.96589	0.00045	11.90	0.97591	0.00052	9.90	0.95857	0.00053
13.70	0.96910	0.00043	12.10	0.98092	0.00048	10.00	0.96249	0.00054
13.90	0.97243	0.00048	12.30	0.98444	0.00051	10.10	0.96561	0.00052
14.10	0.97515	0.00046	12.50	0.99004	0.00048	10.20	0.96806	0.00054
14.30	0.97883	0.00043	12.70	0.99259	0.00047	10.30	0.97080	0.00054
14.50	0.98107	0.00042	12.90	0.99607	0.00044	10.40	0.97454	0.00056
14.70	0.98425	0.00044	13.10	0.99937	0.00047	10.50	0.97728	0.00050
14.90	0.98749	0.00048	13.30	1.00286	0.00048	10.60	0.97911	0.00051
15.10	0.98880	0.00043	13.50	1.00747	0.00046	10.70	0.98243	0.00050
15.30	0.99119	0.00042	13.70	1.00960	0.00044	10.80	0.98492	0.00053
15.50	0.99378	0.00040	13.80	1.01170	0.00046	10.90	0.98760	0.00053
15.70	0.99647	0.00042				11.00	0.99077	0.00053
15.90	0.99802	0.00040				11.10	0.99332	0.00052
16.10	1.00134	0.00043				11.20	0.99555	0.00048
16.30	1.00319	0.00041				11.30	0.99723	0.00052
16.50	1.00506	0.00042				11.40	1.00036	0.00050
						11.50	1.00236	0.00049
						11.60	1.00468	0.00047
						11.70	1.00744	0.00052
						11.80	1.01019	0.00051
						11.90	1.01152	0.00052
						12.00	1.01482	0.00050
						12.10	1.01699	0.00049

Table B.1.3.3.2-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 1 Inches of Water Reflection (cont)

15 milli-g/cc			20 milli-g/cc			25 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
7.20	0.92476	0.00059	5.90	0.92552	0.00066	5.20	0.92069	0.00074
7.30	0.92870	0.00060	5.95	0.92879	0.00071	5.25	0.92481	0.00074
7.40	0.93686	0.00062	6.00	0.93236	0.00068	5.30	0.93120	0.00074
7.50	0.94129	0.00061	6.05	0.93721	0.00074	5.35	0.93438	0.00078
7.60	0.94714	0.00061	6.10	0.94209	0.00072	5.40	0.93983	0.00077
7.70	0.95148	0.00058	6.15	0.94316	0.00074	5.45	0.94317	0.00079
7.80	0.95720	0.00063	6.20	0.94866	0.00071	5.50	0.94910	0.00078
7.90	0.96024	0.00063	6.25	0.95197	0.00069	5.55	0.95223	0.00077
8.00	0.96817	0.00061	6.30	0.95588	0.00072	5.60	0.95906	0.00075
8.10	0.97101	0.00063	6.35	0.95789	0.00067	5.65	0.96243	0.00073
8.20	0.97580	0.00062	6.40	0.96311	0.00071	5.70	0.96666	0.00078
8.30	0.98062	0.00063	6.45	0.96682	0.00071	5.75	0.97010	0.00075
8.40	0.98415	0.00062	6.50	0.97136	0.00068	5.80	0.97399	0.00078
8.50	0.99007	0.00060	6.55	0.97305	0.00067	5.85	0.97873	0.00076
8.60	0.99275	0.00060	6.60	0.97812	0.00070	5.90	0.98455	0.00075
8.70	0.99850	0.00059	6.65	0.98016	0.00069	5.95	0.98781	0.00071
8.80	1.00229	0.00059	6.70	0.98288	0.00067	6.00	0.99171	0.00077
8.90	1.00581	0.00061	6.75	0.98760	0.00066	6.05	0.99579	0.00074
9.00	1.01028	0.00060	6.80	0.99036	0.00067	6.10	0.99977	0.00074
9.10	1.01370	0.00057	6.85	0.99288	0.00066	6.15	1.00527	0.00073
			6.90	0.99703	0.00074	6.20	1.00777	0.00075
			6.95	1.00013	0.00070	6.25	1.01238	0.00075
			7.00	1.00464	0.00070	6.30	1.01497	0.00073
			7.05	1.00709	0.00068			
			7.10	1.01056	0.00068			
			7.15	1.01336	0.00069			
			7.20	1.01743	0.00069			

Table B.1.3.3.2-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 1 Inches of Water Reflection (cont)

30 milli-g/cc			40 milli-g/cc			50 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
4.80	0.91955	0.00074	4.30	0.91193	0.00085	4.10	0.91839	0.00079
4.85	0.92495	0.00079	4.35	0.91988	0.00085	4.15	0.92352	0.00086
4.90	0.92882	0.00083	4.40	0.92474	0.00080	4.20	0.93068	0.00090
4.95	0.93542	0.00079	4.45	0.93070	0.00082	4.25	0.93809	0.00082
5.00	0.94177	0.00078	4.50	0.93615	0.00083	4.30	0.94454	0.00082
5.05	0.94547	0.00079	4.55	0.94325	0.00084	4.35	0.95008	0.00090
5.10	0.95104	0.00079	4.60	0.94939	0.00090	4.40	0.95671	0.00090
5.15	0.95669	0.00086	4.65	0.95608	0.00083	4.45	0.96245	0.00082
5.20	0.96173	0.00078	4.70	0.95981	0.00083	4.50	0.96815	0.00087
5.25	0.96570	0.00081	4.75	0.96646	0.00079	4.55	0.97507	0.00084
5.30	0.97079	0.00077	4.80	0.97118	0.00081	4.60	0.98053	0.00084
5.35	0.97645	0.00079	4.85	0.97653	0.00083	4.65	0.98793	0.00086
5.40	0.98094	0.00074	4.90	0.98319	0.00085	4.70	0.99172	0.00082
5.45	0.98573	0.00074	4.95	0.98913	0.00081	4.75	0.99832	0.00083
5.50	0.99057	0.00077	5.00	0.99439	0.00081	4.80	1.00348	0.00086
5.55	0.99493	0.00078	5.05	1.00103	0.00085	4.85	1.00858	0.00085
5.60	0.99982	0.00073	5.10	1.00357	0.00083	4.90	1.01458	0.00084
5.65	1.00457	0.00074	5.15	1.00899	0.00083			
5.70	1.00852	0.00078	5.20	1.01515	0.00084			
5.75	1.01218	0.00076	5.25	1.01953	0.00082			
5.80	1.01636	0.00072	5.30	1.02527	0.00081			

Table B.1.3.3.2-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 1 Inches of Water Reflection (cont)

75 milli-g/cc			100 milli-g/cc			150 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
3.80	0.91544	0.00091	3.70	0.91763	0.00069	3.60	0.91587	0.00095
3.85	0.92216	0.00088	3.75	0.92483	0.00068	3.65	0.92283	0.00097
3.90	0.92949	0.00090	3.80	0.93274	0.00067	3.70	0.92959	0.00092
3.95	0.93721	0.00093	3.85	0.93829	0.00068	3.75	0.93502	0.00091
4.00	0.94336	0.00092	3.90	0.94586	0.00068	3.80	0.94317	0.00090
4.05	0.95155	0.00090	3.95	0.95266	0.00069	3.85	0.95049	0.00094
4.10	0.95751	0.00089	4.00	0.95897	0.00070	3.90	0.95670	0.00099
4.15	0.96284	0.00084	4.05	0.96596	0.00068	3.95	0.96344	0.00099
4.20	0.97048	0.00090	4.10	0.97503	0.00070	4.00	0.97234	0.00096
4.25	0.97769	0.00091	4.15	0.97884	0.00066	4.05	0.97722	0.00093
4.30	0.98229	0.00088	4.20	0.98573	0.00067	4.10	0.98155	0.00095
4.35	0.98947	0.00092	4.25	0.99189	0.00068	4.15	0.99029	0.00090
4.40	0.99546	0.00087	4.30	0.99908	0.00067	4.20	0.99694	0.00098
4.45	1.00111	0.00089	4.35	1.00508	0.00069	4.25	1.00134	0.00092
4.50	1.00789	0.00090	4.40	1.01099	0.00066	4.30	1.00925	0.00094
4.55	1.01396	0.00094	4.45	1.01781	0.00072	4.35	1.01464	0.00092
4.60	1.02040	0.00091	4.50	1.02316	0.00069	4.40	1.02142	0.00093
4.65	1.02506	0.00088						
4.70	1.03183	0.00087						

Table B.1.3.3.2-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 1 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
3.60	0.91700	0.00094	3.60	0.91836	0.00089	3.60	0.92488	0.00094
3.65	0.92432	0.00096	3.65	0.92592	0.00091	3.65	0.92924	0.00091
3.70	0.93413	0.00089	3.70	0.93472	0.00091	3.70	0.93607	0.00090
3.75	0.93793	0.00096	3.75	0.94004	0.00093	3.75	0.94298	0.00093
3.80	0.94497	0.00094	3.80	0.94692	0.00096	3.80	0.95068	0.00097
3.85	0.95167	0.00094	3.85	0.95319	0.00093	3.85	0.95713	0.00093
3.90	0.95885	0.00095	3.90	0.95935	0.00099	3.90	0.96019	0.00098
3.95	0.96657	0.00090	3.95	0.96536	0.00090	3.95	0.97034	0.00090
4.00	0.97231	0.00092	4.00	0.97308	0.00095	4.00	0.97504	0.00093
4.05	0.97973	0.00087	4.05	0.97872	0.00093	4.05	0.97988	0.00095
4.10	0.98517	0.00094	4.10	0.98299	0.00096	4.10	0.98825	0.00097
4.15	0.99040	0.00089	4.15	0.99123	0.00092	4.15	0.99263	0.00094
4.20	0.99793	0.00096	4.20	0.99561	0.00096	4.20	0.99741	0.00095
4.25	1.00391	0.00095	4.25	1.00265	0.00098	4.25	1.00443	0.00092
4.30	1.01086	0.00094	4.30	1.00729	0.00093	4.30	1.00922	0.00095
4.35	1.01657	0.00097	4.35	1.01378	0.00098	4.35	1.01504	0.00093
4.40	1.02179	0.00094	4.40	1.01829	0.00092	4.40	1.02095	0.00092

Table B.1.3.3.2-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 1 Inches of Water Reflection (cont)

750 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
3.50	0.92228	0.00089	3.30	0.91053	0.00095	3.10	0.91619	0.00091
3.55	0.92767	0.00092	3.35	0.91819	0.00091	3.15	0.92390	0.00092
3.60	0.93733	0.00096	3.40	0.92381	0.00091	3.20	0.93148	0.00090
3.65	0.94282	0.00091	3.45	0.93138	0.00091	3.25	0.93936	0.00087
3.70	0.94849	0.00097	3.50	0.94013	0.00096	3.30	0.94608	0.00095
3.75	0.95555	0.00094	3.55	0.94579	0.00089	3.35	0.95398	0.00096
3.80	0.96082	0.00096	3.60	0.95191	0.00094	3.40	0.96151	0.00092
3.85	0.96821	0.00094	3.65	0.95894	0.00095	3.45	0.96811	0.00092
3.90	0.97425	0.00089	3.70	0.96394	0.00098	3.50	0.97479	0.00090
3.95	0.97883	0.00089	3.75	0.97201	0.00099	3.55	0.98294	0.00091
4.00	0.98557	0.00090	3.80	0.97760	0.00098	3.60	0.98688	0.00091
4.05	0.99139	0.00093	3.85	0.98428	0.00094	3.65	0.99434	0.00091
4.10	0.99835	0.00089	3.90	0.99107	0.00092	3.70	1.00309	0.00092
4.15	1.00573	0.00093	3.95	0.99548	0.00096	3.75	1.00857	0.00094
4.20	1.00994	0.00090	4.00	1.00115	0.00090	3.80	1.01566	0.00094
4.25	1.01442	0.00094	4.05	1.00801	0.00089			
4.30	1.02101	0.00093	4.10	1.01334	0.00099			
			4.15	1.01766	0.00096			
			4.20	1.02538	0.00092			

Table B.1.3.3.2-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 1 Inches of Water Reflection (cont)

2000 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
2.90	0.92161	0.00071	2.70	0.92216	0.00090	2.50	0.91781	0.00091
2.95	0.92925	0.00068	2.75	0.93067	0.00091	2.55	0.92910	0.00096
3.00	0.93795	0.00068	2.80	0.94043	0.00089	2.60	0.93715	0.00090
3.05	0.94523	0.00070	2.85	0.94995	0.00082	2.65	0.94706	0.00088
3.10	0.95439	0.00067	2.90	0.95746	0.00089	2.70	0.95619	0.00092
3.15	0.96194	0.00066	2.95	0.96707	0.00089	2.75	0.96396	0.00091
3.20	0.96938	0.00066	3.00	0.97406	0.00097	2.80	0.97387	0.00092
3.25	0.97825	0.00069	3.05	0.98272	0.00087	2.85	0.98213	0.00092
3.30	0.98427	0.00069	3.10	0.99089	0.00090	2.90	0.99241	0.00092
3.35	0.99223	0.00067	3.15	0.99940	0.00093	2.95	1.00010	0.00086
3.40	0.99906	0.00068	3.20	1.00632	0.00087	3.00	1.00909	0.00086
3.45	1.00668	0.00068	3.25	1.01291	0.00091	3.05	1.01929	0.00090
3.50	1.01309	0.00066	3.30	1.02039	0.00091	3.10	1.02807	0.00090
3.55	1.01958	0.00067						
3.60	1.02756	0.00069						
3.65	1.03319	0.00069						
3.70	1.04225	0.00069						
3.75	1.04804	0.00065						
3.80	1.05552	0.00065						
3.85	1.06015	0.00068						
3.90	1.06691	0.00068						
3.95	1.07284	0.00069						
4.00	1.08085	0.00074						
4.05	1.08677	0.00068						
4.10	1.09188	0.00066						

Table B.1.3.3.2-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 1 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			7500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
2.20	0.91719	0.00093	1.90	0.90054	0.00085	1.50	0.90326	0.00084
2.22	0.92108	0.00090	1.92	0.90551	0.00089	1.52	0.90956	0.00080
2.24	0.92623	0.00090	1.94	0.91174	0.00088	1.54	0.91405	0.00088
2.26	0.92957	0.00092	1.96	0.91703	0.00087	1.56	0.92200	0.00081
2.28	0.93463	0.00087	1.98	0.92155	0.00087	1.58	0.92833	0.00089
2.30	0.94067	0.00087	2.00	0.92653	0.00089	1.60	0.93542	0.00086
2.32	0.94474	0.00092	2.02	0.93074	0.00088	1.62	0.94255	0.00086
2.34	0.94835	0.00087	2.04	0.93682	0.00093	1.66	0.95207	0.00087
2.36	0.95239	0.00087	2.06	0.94089	0.00089	1.68	0.95951	0.00086
2.38	0.95709	0.00088	2.08	0.94400	0.00089	1.70	0.96458	0.00087
2.40	0.96068	0.00092	2.10	0.95091	0.00091	1.72	0.97119	0.00091
2.42	0.96663	0.00088	2.12	0.95523	0.00085	1.74	0.97766	0.00091
2.44	0.97058	0.00085	2.14	0.95986	0.00088	1.76	0.98337	0.00087
2.46	0.97364	0.00089	2.16	0.96541	0.00087	1.78	0.98872	0.00080
2.48	0.97743	0.00092	2.18	0.97122	0.00090	1.80	0.99515	0.00089
2.50	0.98125	0.00092	2.20	0.97240	0.00090	1.82	1.00145	0.00088
2.52	0.98635	0.00090	2.22	0.97939	0.00085	1.84	1.00526	0.00088
2.54	0.98942	0.00086	2.24	0.98346	0.00085	1.86	1.01260	0.00089
2.56	0.99435	0.00085	2.26	0.98755	0.00092	1.88	1.01765	0.00086
2.58	0.99913	0.00096	2.28	0.99313	0.00086	1.90	1.02351	0.00090
2.60	1.00279	0.00087	2.30	0.99622	0.00086			
2.62	1.00616	0.00087	2.32	1.00135	0.00092			
2.64	1.01040	0.00092	2.34	1.00713	0.00087			
2.66	1.01458	0.00091	2.36	1.01166	0.00092			
2.68	1.01733	0.00092	2.38	1.01545	0.00089			
2.70	1.02137	0.00087	2.40	1.01899	0.00089			

Table B.1.3.3.2-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 1 Inches of Water Reflection (cont)

10000 milli-g/cc			15000 milli-g/cc			19600 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
1.20	0.89431	0.00086	0.90	0.91955	0.00079	0.70	0.92385	0.00083
1.22	0.90246	0.00083	0.92	0.93131	0.00082	0.72	0.93486	0.00078
1.24	0.91007	0.00080	0.94	0.93987	0.00083	0.74	0.94912	0.00087
1.26	0.91732	0.00085	0.96	0.95061	0.00080	0.76	0.96282	0.00080
1.28	0.92687	0.00087	0.98	0.96153	0.00080	0.78	0.97569	0.00078
1.30	0.93314	0.00085	1.00	0.97039	0.00087	0.80	0.98889	0.00080
1.32	0.94089	0.00084	1.02	0.98195	0.00084	0.82	1.00135	0.00082
1.34	0.94700	0.00086	1.04	0.99179	0.00086	0.84	1.01231	0.00084
1.36	0.95584	0.00082	1.06	1.00118	0.00085	0.86	1.02646	0.00082
1.38	0.96325	0.00085	1.08	1.01046	0.00086	0.88	1.03830	0.00086
1.40	0.96981	0.00086	1.10	1.01982	0.00087	0.90	1.04933	0.00084
1.42	0.97625	0.00090						
1.44	0.98334	0.00087						
1.46	0.99138	0.00084						
1.48	0.99823	0.00090						
1.50	1.00530	0.00082						
1.52	1.01155	0.00089						
1.54	1.01884	0.00088						
1.56	1.02608	0.00096						
1.58	1.03332	0.00089						
1.60	1.03864	0.00086						

B.1.3.3.3. 10” Water Reflector

Case ID: pu-pl-0950-10

Material: Plutonium metal in water

Geometry: Infinite Plane

Isotopics: 95% ^{239}Pu 5% ^{240}Pu

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.1.3.3.3-1. Plutonium Slab (95% ^{239}Pu) - 10 Inches of Water Reflection

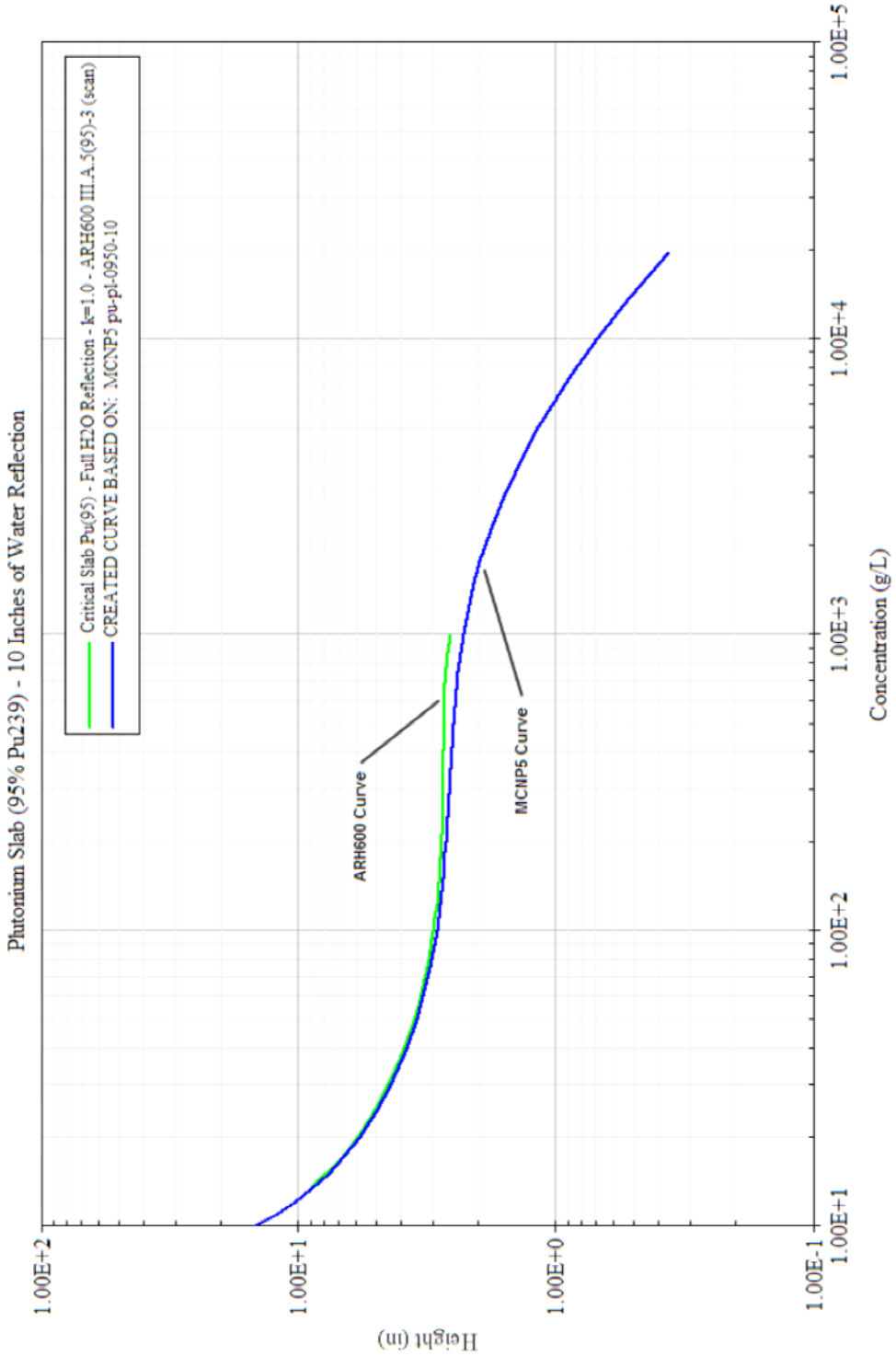

Table B.1.3.3.3-1. Critical Dimensions for Plutonium Slab (95% ^{239}Pu) - 10 Inches of Water Reflection

Plutonium Slab (95% ^{239}Pu) - 10 Inches of Water Reflection				
Concentration (g/cc)	First Height (Inches)	Last Height (Inches)	Delta (Inches)	Critical Height (Inches)
0.01	10.3	15.6	4.5236	14.8236
0.011	8.9	12.8	3.1063	12.0063
0.012	7.8	11	2.4741	10.2741
0.015	6.1	8	1.5095	7.6095
0.02	4.7	6	1.09	5.7900
0.025	4.1	5.1	0.8234	4.9234
0.03	3.6	4.6	0.806	4.4060
0.04	3.1	4	0.7151	3.8151
0.05	2.9	3.7	0.5863	3.4863
0.075	2.5	3.4	0.5895	3.0895
0.1	2.3	3	0.5938	2.8938
0.15	2.2	2.9	0.5294	2.7294
0.2	2.1	2.8	0.5564	2.6564
0.35	2	2.65	0.5724	2.5724
0.5	1.9	2.7	0.6119	2.5119
0.75	1.8	2.5	0.5983	2.3983
1	1.7	2.5	0.5938	2.2938
1.5	1.5	2.3	0.5782	2.0782
2	1.4	2	0.4811	1.8811
2.5	1.3	1.8	0.4155	1.7155
3	1.2	1.7	0.374	1.5740
4	1	1.5	0.3474	1.3474
5	0.8	1.3	0.369	1.1690
7.5	0.6	1	0.2735	0.8735
10	0.5	0.8	0.1889	0.6889
15	0.3	0.6	0.1737	0.4737
19.6	0.2	0.4	0.1635	0.3635

```
MCNP5 Sample Input File
95% Pu Slab- 10 Inch of Reflection

Pu plane, 95.0 wt% 239Pu, 00010 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Height = 1030  hundreths of inches - must be integer
c half height =    13.0810 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00010 milli-g Pu/cc
c Reflector width = 10.0 inches
c Enrichment = 0.95 wt fraction 239Pu
c
c Density of H20 1.00000
c Density of Pu 19.60000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 239Pu  = 239.05220
c 240PU = 240.05380
c
c Effective Plutonium atomic mass 239.10228
c PuO2
c Mass fraction of Pu in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0005 cc
c Volume of water in sample 0.9995 cc
c
c Mass of crit in sample   0.0100 g
c Mass of Pu in sample   0.0100 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9995 g
c
c Total mass of sample  1.0095g for a 1cc sample
c Mass Density for crit material  -1.0095, expressed as negative
c
c  plane
   20 11   -1.009490   -1 2 -7 -5 8 6      imp:n=1
   21  2  -1.000    -3 4 6 8 -7 -5 ((1 -3):(-2 4))        imp:n=1    $zero importance if no reflector
```

```
  22  0          3:-4:7:5:-8:-6                    imp:n=0

   1       py    13.0810              $ plane
   2       py   -13.0810
   3       py    38.4810        $ Reflection
   4       py   -38.4810
   *5       px    100
   *6       px    -100
   *7       pz    100
   *8       pz    -100

mode n
kcode 2000 1.0 100  600
ksrc  0.00    0.00    0.00
     0.00    0.00    0.10
     0.00    0.00    0.50
     0.00    0.00    1.00
     0.00    0.00    2.00
     0.00    0.00    3.00
     1.00    1.00    1.00
     1.00    1.00    2.00
     1.00    1.00    3.00
     2.00    2.00    1.00
     2.00    2.00    2.00
     2.00    2.00    3.00
    -1.00   -1.00   -1.00
    -10.00   -10.00   -20.00
    -10.00   -10.00   -30.00
c
m2    $ water
        1001.66c      2
        8016.66c      1
mt2   lwtr.60t
c    pu / water mixture
m11    $ Pu/H2O Sludge, 100.0 wt% 239Pu, 00010 milli-g Pu/cc,  1.0095
      1001.66c -0.110786
      8016.66c -0.879308      $from water
c      8016.66c -0.000000      $from oxide
    94239.66c -0.009411
    94240.66c -0.000495
mt11     lwtr.60t
c
c    pu only
m12    $ Pu, 100.0 wt% 235U, 00010 milli-g U/cc,  1.0095
c      8016.66c -0.000000      $from oxide
    94239.66c -0.009411
    94240.66c -0.000495
c
```

Critview Compatible Data File
95% Pu Slab- 10 Inch of Reflection

reset:
title: MCNP5 pu-pl-0950-10
set: MCNP5 set
source: MCNP5 primary
created: Thu 08/25/2010 11:21:35.34
geometry: infplane
critmat: plutonium
isomat: Pu239 0.950 Pu240 0.050
reflmat: none
modmat: H2O
keff: 1.0
reflthick: 10.00 in
var: critconc g/cc
var: height in

0.010	14.8236
0.011	12.0063
0.012	10.2741
0.015	7.6095
0.020	5.7900
0.025	4.9234
0.030	4.4060
0.040	3.8151
0.050	3.4863
0.075	3.0895
0.100	2.8938
0.150	2.7294
0.200	2.6564
0.350	2.5724
0.500	2.5119
0.750	2.3983
1.000	2.2938
1.500	2.0782
2.000	1.8811
2.500	1.7155
3.000	1.5740
4.000	1.3474
5.000	1.1690
7.500	0.8735
10.000	0.6889
15.000	0.4737
19.600	0.3635

Table B.1.3.3.3-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 10 Inches of Water Reflection

10 milli-g/cc			11 milli-g/cc			12 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
10.30	0.92542	0.00045	8.90	0.92731	0.00046	7.80	0.92458	0.00051
10.50	0.93004	0.00046	9.10	0.93313	0.00051	7.90	0.92854	0.00051
10.70	0.93362	0.00044	9.30	0.93894	0.00047	8.00	0.93210	0.00052
10.90	0.93829	0.00043	9.50	0.94484	0.00049	8.10	0.93548	0.00052
11.10	0.94230	0.00041	9.70	0.94995	0.00049	8.20	0.93870	0.00053
11.30	0.94697	0.00044	9.90	0.95543	0.00047	8.30	0.94229	0.00049
11.50	0.95056	0.00044	10.10	0.95923	0.00047	8.40	0.94647	0.00050
11.70	0.95409	0.00041	10.30	0.96441	0.00046	8.50	0.94968	0.00051
11.90	0.95800	0.00043	10.50	0.97053	0.00046	8.60	0.95336	0.00050
12.10	0.96083	0.00043	10.70	0.97430	0.00044	8.70	0.95577	0.00049
12.30	0.96473	0.00045	10.90	0.97874	0.00045	8.80	0.95943	0.00046
12.50	0.96862	0.00043	11.10	0.98292	0.00048	8.90	0.96244	0.00050
12.70	0.97109	0.00042	11.30	0.98594	0.00044	9.00	0.96498	0.00053
12.90	0.97377	0.00043	11.50	0.99000	0.00043	9.10	0.96782	0.00050
13.10	0.97800	0.00042	11.70	0.99406	0.00046	9.20	0.97177	0.00048
13.30	0.97982	0.00041	11.90	0.99796	0.00043	9.30	0.97451	0.00049
13.50	0.98306	0.00042	12.10	1.00180	0.00041	9.40	0.97619	0.00048
13.70	0.98556	0.00041	12.30	1.00615	0.00043	9.50	0.97987	0.00049
13.90	0.98854	0.00043	12.50	1.00899	0.00044	9.60	0.98199	0.00048
14.10	0.99124	0.00044	12.70	1.01220	0.00044	9.70	0.98598	0.00045
14.30	0.99299	0.00040	12.80	1.01424	0.00044	9.80	0.98784	0.00051
14.50	0.99520	0.00042				9.90	0.99084	0.00051
14.70	0.99785	0.00039				10.00	0.99330	0.00049
14.90	1.00133	0.00039				10.10	0.99679	0.00050
15.10	1.00193	0.00039				10.20	0.99857	0.00049
15.30	1.00508	0.00040				10.30	1.00050	0.00048
15.50	1.00710	0.00042				10.40	1.00270	0.00047
15.60	1.00788	0.00039				10.50	1.00557	0.00049
						10.60	1.00793	0.00047
						10.70	1.01026	0.00049
						10.80	1.01283	0.00046
						10.90	1.01545	0.00048
						11.00	1.01670	0.00046

Table B.1.3.3.3-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 10 Inches of Water Reflection (cont)

15 milli-g/cc			20 milli-g/cc			25 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
6.10	0.92587	0.00056	4.70	0.91920	0.00064	4.10	0.92705	0.00068
6.20	0.93080	0.00060	4.75	0.92335	0.00067	4.15	0.93032	0.00071
6.30	0.93662	0.00055	4.80	0.92762	0.00063	4.20	0.93576	0.00072
6.40	0.94131	0.00057	4.85	0.93167	0.00068	4.25	0.94005	0.00066
6.50	0.94703	0.00057	4.90	0.93602	0.00059	4.30	0.94571	0.00067
6.60	0.95338	0.00058	4.95	0.93972	0.00061	4.35	0.95038	0.00066
6.70	0.95753	0.00059	5.00	0.94467	0.00064	4.40	0.95473	0.00067
6.80	0.96302	0.00057	5.05	0.94657	0.00064	4.45	0.95932	0.00066
6.90	0.96795	0.00053	5.10	0.95098	0.00065	4.50	0.96393	0.00070
7.00	0.97228	0.00053	5.15	0.95529	0.00063	4.55	0.96892	0.00067
7.10	0.97834	0.00056	5.20	0.95853	0.00061	4.60	0.97238	0.00069
7.20	0.98252	0.00055	5.25	0.96330	0.00064	4.65	0.97688	0.00070
7.30	0.98742	0.00057	5.30	0.96603	0.00062	4.70	0.98171	0.00068
7.40	0.99065	0.00057	5.35	0.97087	0.00064	4.75	0.98504	0.00072
7.50	0.99601	0.00054	5.40	0.97336	0.00066	4.80	0.98986	0.00066
7.60	0.99953	0.00054	5.45	0.97838	0.00059	4.85	0.99441	0.00066
7.70	1.00446	0.00055	5.50	0.98082	0.00063	4.90	0.99786	0.00068
7.80	1.00755	0.00055	5.55	0.98462	0.00062	4.95	1.00243	0.00066
7.90	1.01196	0.00054	5.60	0.98778	0.00066	5.00	1.00699	0.00070
8.00	1.01576	0.00055	5.65	0.99173	0.00064	5.05	1.01040	0.00068
			5.70	0.99515	0.00063	5.10	1.01571	0.00066
			5.75	0.99682	0.00060			
			5.80	1.00080	0.00060			
			5.85	1.00353	0.00062			
			5.90	1.00725	0.00063			
			5.95	1.01102	0.00067			
			6.00	1.01466	0.00067			

Table B.1.3.3.3-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 10 Inches of Water Reflection (cont)

30 milli-g/cc			40 milli-g/cc			50 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
3.60	0.91654	0.00075	3.10	0.91626	0.00078	2.90	0.92581	0.00077
3.65	0.92227	0.00070	3.15	0.92111	0.00073	2.95	0.93224	0.00082
3.70	0.92861	0.00076	3.20	0.92608	0.00076	3.00	0.93715	0.00077
3.75	0.93469	0.00075	3.25	0.93419	0.00077	3.05	0.94628	0.00082
3.80	0.93926	0.00074	3.30	0.93879	0.00074	3.10	0.95154	0.00076
3.85	0.94433	0.00070	3.35	0.94647	0.00079	3.15	0.95895	0.00073
3.90	0.95081	0.00073	3.40	0.95289	0.00073	3.20	0.96378	0.00075
3.95	0.95584	0.00072	3.45	0.95971	0.00077	3.25	0.97207	0.00081
4.00	0.96119	0.00070	3.50	0.96417	0.00078	3.30	0.97730	0.00075
4.05	0.96619	0.00071	3.55	0.97017	0.00077	3.35	0.98383	0.00076
4.10	0.97138	0.00069	3.60	0.97645	0.00073	3.40	0.98977	0.00076
4.15	0.97532	0.00075	3.65	0.98151	0.00076	3.45	0.99478	0.00079
4.20	0.98108	0.00071	3.70	0.98773	0.00073	3.50	1.00197	0.00083
4.25	0.98494	0.00068	3.75	0.99257	0.00077	3.55	1.00825	0.00081
4.30	0.99096	0.00066	3.80	0.99832	0.00077	3.60	1.01375	0.00079
4.35	0.99418	0.00072	3.85	1.00388	0.00078	3.65	1.01991	0.00078
4.40	0.99941	0.00072	3.90	1.00953	0.00076	3.70	1.02493	0.00081
4.45	1.00429	0.00071	3.95	1.01510	0.00071			
4.50	1.00888	0.00074	4.00	1.01946	0.00075			
4.55	1.01267	0.00075						
4.60	1.01756	0.00070						

Table B.1.3.3.3-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 10 Inches of Water Reflection (cont)

75 milli-g/cc			100 milli-g/cc			150 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
2.50	0.92004	0.00079	2.30	0.91560	0.00077	2.20	0.92443	0.00084
2.55	0.92606	0.00081	2.35	0.92305	0.00082	2.25	0.93228	0.00088
2.60	0.93399	0.00078	2.40	0.92998	0.00087	2.30	0.94055	0.00083
2.65	0.94100	0.00080	2.45	0.93733	0.00085	2.35	0.94799	0.00083
2.70	0.94915	0.00079	2.50	0.94523	0.00088	2.40	0.95470	0.00082
2.75	0.95616	0.00085	2.55	0.95307	0.00083	2.45	0.96248	0.00086
2.80	0.96234	0.00084	2.60	0.95911	0.00080	2.50	0.96826	0.00083
2.85	0.97029	0.00082	2.65	0.96650	0.00083	2.55	0.97688	0.00087
2.90	0.97738	0.00081	2.70	0.97613	0.00080	2.60	0.98300	0.00083
2.95	0.98352	0.00083	2.75	0.98046	0.00080	2.65	0.98965	0.00085
3.00	0.98923	0.00080	2.80	0.98906	0.00081	2.70	0.99363	0.00084
3.05	0.99633	0.00084	2.85	0.99332	0.00081	2.75	1.00445	0.00086
3.10	1.00097	0.00083	2.90	1.00094	0.00086	2.80	1.01057	0.00087
3.15	1.00905	0.00081	2.95	1.00841	0.00083	2.85	1.01557	0.00081
3.20	1.01612	0.00080	3.00	1.01318	0.00085	2.90	1.02235	0.00082
3.25	1.02076	0.00084						
3.30	1.02568	0.00084						
3.35	1.03429	0.00082						
3.40	1.03932	0.00083						

Table B.1.3.3.3-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 10 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
2.10	0.92356	0.00081	2.00	0.92493	0.00084	1.90	0.91881	0.00086
2.15	0.92907	0.00084	2.05	0.93109	0.00081	1.95	0.92564	0.00089
2.20	0.93761	0.00083	2.10	0.93885	0.00084	2.00	0.93240	0.00084
2.25	0.94389	0.00088	2.15	0.94542	0.00085	2.05	0.93934	0.00084
2.30	0.95216	0.00086	2.20	0.95214	0.00083	2.10	0.94611	0.00081
2.35	0.95975	0.00083	2.25	0.95885	0.00082	2.15	0.95386	0.00080
2.40	0.96614	0.00089	2.30	0.96540	0.00086	2.20	0.96158	0.00083
2.45	0.97295	0.00081	2.35	0.97199	0.00088	2.25	0.96722	0.00087
2.50	0.98026	0.00090	2.40	0.97930	0.00086	2.30	0.97446	0.00088
2.55	0.98580	0.00085	2.45	0.98465	0.00084	2.35	0.98021	0.00085
2.60	0.99380	0.00088	2.50	0.99204	0.00088	2.40	0.98640	0.00088
2.65	0.99922	0.00088	2.55	0.99768	0.00088	2.45	0.99262	0.00081
2.70	1.00536	0.00081	2.60	1.00286	0.00091	2.50	0.99833	0.00085
2.75	1.01296	0.00085	2.65	1.01017	0.00086	2.55	1.00536	0.00091
2.80	1.01796	0.00086				2.60	1.01011	0.00086
						2.65	1.01645	0.00090
						2.70	1.02309	0.00086

Table B.1.3.3.3-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 10 Inches of Water Reflection (cont)

750 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
1.80	0.91796	0.00086	1.70	0.91717	0.00082	1.50	0.91101	0.00087
1.85	0.92514	0.00085	1.75	0.92348	0.00085	1.55	0.91835	0.00086
1.90	0.93236	0.00083	1.80	0.93243	0.00085	1.60	0.92777	0.00078
1.95	0.94209	0.00084	1.85	0.93926	0.00085	1.65	0.93566	0.00088
2.00	0.94581	0.00082	1.90	0.94663	0.00085	1.70	0.94398	0.00090
2.05	0.95320	0.00088	1.95	0.95283	0.00085	1.75	0.95347	0.00085
2.10	0.95975	0.00085	2.00	0.96199	0.00084	1.80	0.95875	0.00084
2.15	0.96546	0.00088	2.05	0.96762	0.00082	1.85	0.96780	0.00090
2.20	0.97433	0.00082	2.10	0.97466	0.00086	1.90	0.97494	0.00085
2.25	0.97985	0.00088	2.15	0.98102	0.00088	1.95	0.98195	0.00084
2.30	0.98750	0.00086	2.20	0.98894	0.00084	2.00	0.98908	0.00083
2.35	0.99213	0.00087	2.25	0.99450	0.00080	2.05	0.99663	0.00085
2.40	1.00028	0.00087	2.30	1.00078	0.00084	2.10	1.00261	0.00091
2.45	1.00514	0.00088	2.35	1.00653	0.00084	2.15	1.00881	0.00088
2.50	1.01195	0.00091	2.40	1.01369	0.00085	2.20	1.01653	0.00084
			2.45	1.02038	0.00089	2.25	1.02374	0.00086
			2.50	1.02567	0.00083	2.30	1.03062	0.00085

Table B.1.3.3.3-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 10 Inches of Water Reflection (cont)

2000 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
1.40	0.91928	0.00080	1.30	0.92235	0.00081	1.20	0.92626	0.00084
1.45	0.92641	0.00085	1.32	0.92771	0.00083	1.22	0.93001	0.00086
1.50	0.93668	0.00085	1.34	0.93182	0.00080	1.24	0.93330	0.00079
1.55	0.94641	0.00088	1.36	0.93480	0.00081	1.26	0.93737	0.00086
1.60	0.95393	0.00087	1.38	0.93840	0.00085	1.28	0.94145	0.00093
1.65	0.96363	0.00086	1.40	0.94371	0.00086	1.30	0.94628	0.00084
1.70	0.97015	0.00087	1.42	0.94634	0.00086	1.32	0.95120	0.00083
1.75	0.98009	0.00083	1.44	0.95252	0.00085	1.34	0.95599	0.00078
1.80	0.98731	0.00085	1.46	0.95414	0.00080	1.36	0.95980	0.00081
1.85	0.99538	0.00084	1.48	0.95811	0.00087	1.38	0.96332	0.00082
1.90	1.00280	0.00086	1.50	0.96078	0.00090	1.40	0.96630	0.00088
1.95	1.00932	0.00082	1.52	0.96600	0.00085	1.42	0.97002	0.00086
2.00	1.01688	0.00083	1.54	0.96827	0.00083	1.44	0.97278	0.00082
			1.56	0.97282	0.00087	1.46	0.97948	0.00082
			1.58	0.97627	0.00083	1.48	0.98108	0.00089
			1.60	0.98042	0.00084	1.50	0.98712	0.00086
			1.62	0.98354	0.00086	1.52	0.99034	0.00082
			1.64	0.98757	0.00084	1.54	0.99340	0.00089
			1.66	0.99037	0.00083	1.56	0.99672	0.00086
			1.68	0.99317	0.00090	1.58	1.00141	0.00085
			1.70	0.99927	0.00087	1.60	1.00564	0.00084
			1.72	1.00021	0.00083	1.62	1.00911	0.00083
			1.74	1.00269	0.00086	1.64	1.01165	0.00091
			1.76	1.00792	0.00090	1.66	1.01561	0.00088
			1.78	1.01139	0.00082	1.68	1.02101	0.00086
			1.80	1.01280	0.00085	1.70	1.02481	0.00087

Table B.1.3.3.3-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 10 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			7500 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
1.00	0.91813	0.00079	0.80	0.89860	0.00081	0.60	0.90178	0.00082
1.02	0.92243	0.00083	0.82	0.90316	0.00084	0.62	0.90955	0.00079
1.04	0.92859	0.00078	0.84	0.91089	0.00082	0.64	0.91753	0.00080
1.06	0.93487	0.00085	0.86	0.91613	0.00085	0.66	0.92330	0.00082
1.08	0.93761	0.00085	0.88	0.92279	0.00083	0.68	0.93084	0.00084
1.10	0.94492	0.00085	0.90	0.92696	0.00083	0.70	0.93925	0.00083
1.12	0.94848	0.00084	0.92	0.93453	0.00082	0.72	0.94819	0.00081
1.14	0.95215	0.00088	0.94	0.93894	0.00083	0.74	0.95408	0.00083
1.16	0.95806	0.00082	0.96	0.94533	0.00084	0.76	0.96118	0.00082
1.18	0.96133	0.00084	0.98	0.95090	0.00082	0.78	0.96751	0.00086
1.20	0.96796	0.00080	1.00	0.95547	0.00084	0.80	0.97530	0.00086
1.22	0.97232	0.00084	1.02	0.96254	0.00082	0.82	0.98165	0.00082
1.24	0.97708	0.00084	1.04	0.96515	0.00086	0.84	0.98815	0.00087
1.26	0.98213	0.00082	1.06	0.97171	0.00088	0.86	0.99467	0.00082
1.28	0.98577	0.00088	1.08	0.97733	0.00086	0.88	1.00257	0.00081
1.30	0.99018	0.00083	1.10	0.98107	0.00081	0.90	1.00937	0.00086
1.32	0.99354	0.00082	1.12	0.98744	0.00083	0.92	1.01545	0.00081
1.34	0.99821	0.00084	1.14	0.99202	0.00084	0.94	1.02004	0.00084
1.36	1.00305	0.00087	1.16	0.99783	0.00086	0.96	1.02860	0.00089
1.38	1.00682	0.00086	1.18	1.00264	0.00088	0.98	1.03443	0.00087
1.40	1.01250	0.00086	1.20	1.00646	0.00084	1.00	1.03956	0.00086
1.42	1.01654	0.00084	1.22	1.01407	0.00082			
1.44	1.02115	0.00086	1.24	1.01678	0.00089			
1.46	1.02522	0.00089	1.26	1.02150	0.00085			
1.48	1.03072	0.00083	1.28	1.02756	0.00088			
1.50	1.03437	0.00087	1.30	1.03280	0.00082			

Table B.1.3.3.3-2. K_{eff} Values for Plutonium Slab (95% ^{239}Pu) - 10 Inches of Water Reflection (cont)

10000 milli-g/cc			15000 milli-g/cc			19600 milli-g/cc		
Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma	Height (inches)	Keff	Sigma
0.50	0.91451	0.00082	0.30	0.88334	0.00086	0.20	0.85272	0.00078
0.52	0.92444	0.00083	0.32	0.89718	0.00080	0.22	0.87248	0.00081
0.54	0.93247	0.00085	0.34	0.91183	0.00076	0.24	0.89255	0.00081
0.56	0.94416	0.00084	0.36	0.92586	0.00083	0.26	0.91105	0.00081
0.58	0.95201	0.00083	0.38	0.93983	0.00083	0.28	0.92824	0.00084
0.60	0.96047	0.00082	0.40	0.95213	0.00084	0.30	0.94735	0.00082
0.64	0.97927	0.00087	0.42	0.96556	0.00088	0.32	0.96419	0.00084
0.66	0.98810	0.00080	0.44	0.97833	0.00085	0.34	0.98005	0.00079
0.68	0.99574	0.00085	0.46	0.99147	0.00084	0.36	0.99740	0.00081
0.70	1.00530	0.00086	0.50	1.01629	0.00082	0.38	1.01242	0.00082
0.72	1.01306	0.00086	0.52	1.02624	0.00085	0.40	1.02836	0.00085
0.74	1.02067	0.00083	0.54	1.03896	0.00085			
0.76	1.02949	0.00083	0.56	1.05165	0.00087			
0.78	1.03745	0.00087	0.58	1.06263	0.00088			
0.80	1.04534	0.00084	0.60	1.07189	0.00087			

B.2. Uranium Metal in Water

B.2.1. Sphere

B.2.1.1. 100% ^{235}U

B.2.1.1.1. Unreflected

Case ID: u5-sp-1000-00

Material: Uranium metal in water

Geometry: Sphere

Isotopics: 100% ^{235}U

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.2.1.1.1-1. 100% ^{235}U Sphere - 0 Inches of Water Reflection

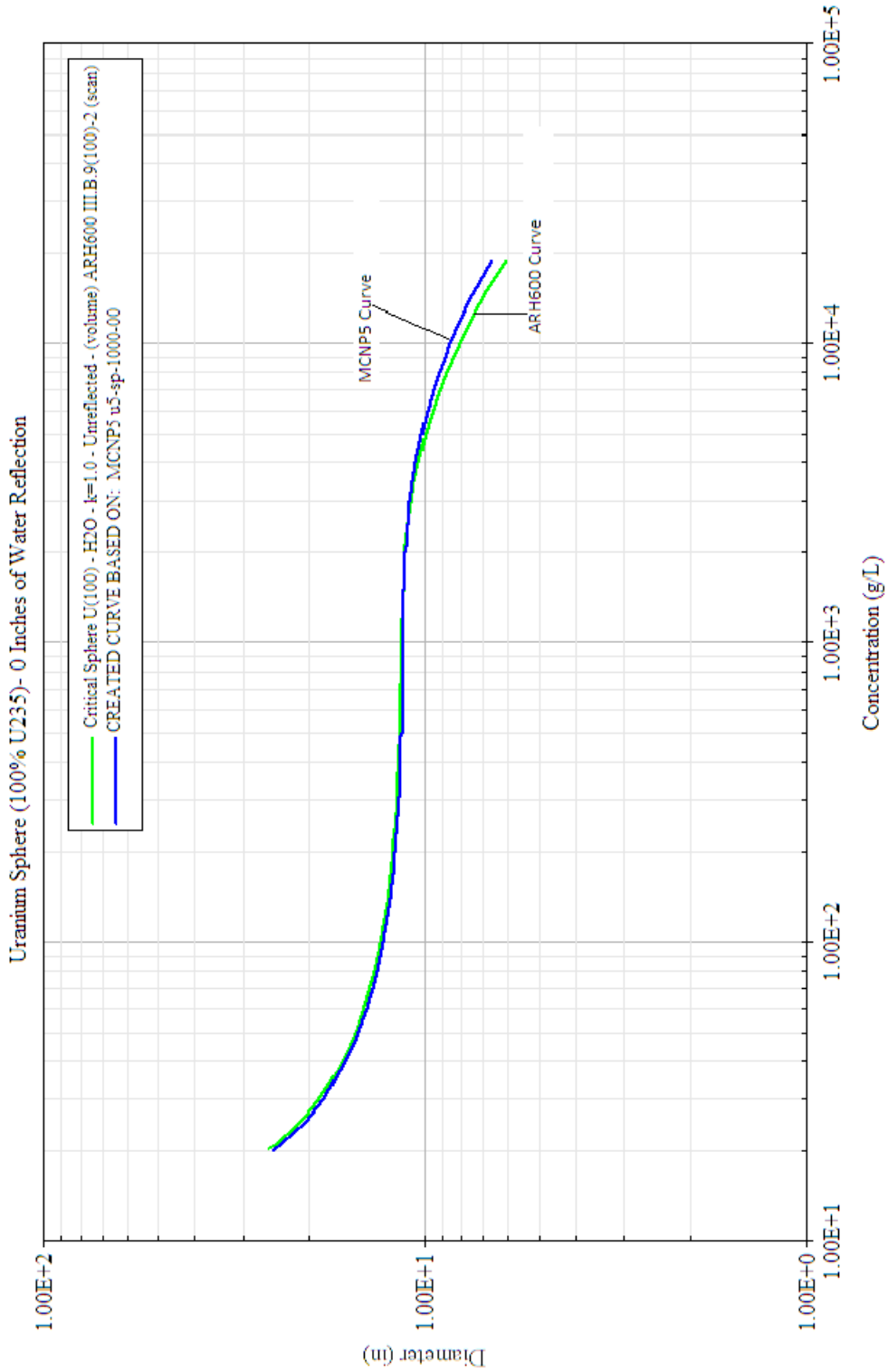

Table B.2.1.1.1-1. Critical Dimensions for 100% ^{235}U Sphere - 0 Inches of Water Reflection

100% ^{235}U Sphere -0 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Dimension (Inches)
0.020	20.900	26.000	0.200	24.9667
0.025	17.900	21.300	0.100	20.5944
0.030	16.200	19.000	0.100	18.3832
0.040	14.500	16.600	0.100	16.1261
0.045	13.900	15.900	0.100	15.4566
0.050	13.500	15.300	0.100	14.9322
0.055	13.200	14.900	0.050	14.5296
0.060	12.900	14.600	0.050	14.2049
0.065	12.600	14.300	0.050	13.9352
0.070	12.500	14.100	0.050	13.6961
0.080	12.100	13.700	0.050	13.3349
0.100	11.700	13.200	0.050	12.8421
0.130	11.300	12.700	0.050	12.3944
0.150	11.200	12.500	0.050	12.2115
0.170	11.000	12.400	0.050	12.0713
0.200	10.900	12.200	0.050	11.9075
0.350	10.600	11.900	0.050	11.5669
0.500	10.500	11.800	0.050	11.4572
0.800	10.400	11.700	0.050	11.3786
1.000	10.300	11.700	0.050	11.3539
1.500	10.300	11.600	0.050	11.2997
1.700	10.200	11.600	0.050	11.2530
1.900	10.200	11.500	0.050	11.2172
2.000	10.100	11.500	0.050	11.1902
2.100	10.100	11.500	0.050	11.1687
2.500	10.000	11.400	0.050	11.0583
3.000	9.800	11.200	0.050	10.9041
4.000	9.500	10.900	0.050	10.5430
5.000	9.200	10.500	0.050	10.1782
6.000	8.900	10.100	0.050	9.8191
7.000	8.600	9.700	0.050	9.4728
7.500	8.400	9.600	0.050	9.3020
8.000	8.300	9.400	0.050	9.1532
9.000	8.000	9.100	0.050	8.8466
10.000	7.800	8.800	0.050	8.5644
15.000	6.700	7.600	0.050	7.3939
18.900	6.000	6.800	0.050	6.6307

MCNP5 Sample Input File
100% ^{235}U Sphere- 0" Reflection

```
U sphere, 100.0 wt% 235U, 00130 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1140  hundreths of inches - must be integer
c radius =    14.4780 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00130 milli-g Pu/cc
c Reflector width =  0.0 inches
c Enrichment = 1.00 wt fraction 235U
c
c Density of H2O 1.00000
c Density of U 18.90000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0069 cc
c Volume of water in sample 0.9931 cc
c
c Mass of crit in sample   0.1300 g
c Mass of water in sample  0.9931 g
c
c Total mass of sample  1.1231g for a 1cc sample
c Mass Density for crit material  -1.1231, expressed as negative
c
c  sphere
20 11   -1.123122   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=0    $zero importance if no reflector
22  0            2           imp:n=0

1       so    14.4780              $ Sphere
2       so    14.4780         $ Reflection

mode n
kcode 2000 1.0 100  4100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
```

```
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u/water mixture
m11    $ U/H2O Sludge, 100.0 wt% 235U, 00130 milli-g U/cc,  1.1231
1001.66c -0.098943
8016.66c -0.785308
92235.66c -0.115749
c    92238.66c -0.000000
mt11     lwtr.60t
c
c    u only
m12    $ U, 100.0 wt% 235U, 00130 milli-g U/cc,  1.1231
92235.66c -1.000000
c    92238.66c -0.000000
c
```

Critview Compatible Data File
100% ^{235}U Sphere- 0” Reflection

reset:
title: MCNP5 u5-sp-1000-00
set: MCNP5 set
source: MCNP5 primary
created: Mon 07/19/2010 10:57:43.05
geometry: sphere
modmat: H2O
critmat: uranium
isomat: U235 1.0
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.020	24.9667
0.025	20.5944
0.030	18.3832
0.040	16.1261
0.045	15.4566
0.050	14.9322
0.055	14.5296
0.060	14.2049
0.065	13.9352
0.070	13.6961
0.080	13.3349
0.100	12.8421
0.130	12.3944
0.150	12.2115
0.170	12.0713
0.200	11.9075
0.350	11.5669
0.500	11.4572
0.800	11.3786
1.000	11.3539
1.500	11.2997
1.700	11.2530
1.900	11.2172
2.000	11.1902
2.100	11.1687
2.500	11.0583
3.000	10.9041
4.000	10.5430
5.000	10.1782
6.000	9.8191
7.000	9.4728
7.500	9.3020
8.000	9.1532
9.000	8.8466
10.00	8.5644
15.00	7.3939
18.90	6.6307

Table B.2.1.1.1-2. K_{eff} Values for 100% ^{235}U Sphere - 0 Inches of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma
20.90	0.92415	0.00023	17.90	0.92312	0.00026	16.20	0.92047	0.00027
21.10	0.92795	0.00022	18.00	0.92612	0.00026	16.30	0.92436	0.00029
21.30	0.93329	0.00023	18.10	0.92954	0.00026	16.40	0.92908	0.00028
21.50	0.93670	0.00022	18.20	0.93296	0.00025	16.50	0.93241	0.00027
21.70	0.94129	0.00022	18.30	0.93555	0.00025	16.60	0.93599	0.00028
21.90	0.94534	0.00023	18.40	0.93893	0.00025	16.70	0.93989	0.00028
22.10	0.94951	0.00022	18.50	0.94222	0.00024	16.80	0.94450	0.00027
22.30	0.95388	0.00022	18.60	0.94532	0.00025	16.90	0.94786	0.00028
22.50	0.95790	0.00022	18.70	0.94789	0.00025	17.00	0.95130	0.00027
22.70	0.96101	0.00022	18.80	0.95130	0.00025	17.10	0.95542	0.00027
22.90	0.96470	0.00022	18.90	0.95413	0.00025	17.20	0.95847	0.00028
23.10	0.96874	0.00022	19.00	0.95681	0.00025	17.30	0.96235	0.00028
23.30	0.97199	0.00022	19.10	0.95945	0.00026	17.40	0.96586	0.00027
23.50	0.97584	0.00022	19.20	0.96281	0.00025	17.50	0.96957	0.00027
23.70	0.97916	0.00022	19.30	0.96536	0.00025	17.60	0.97303	0.00027
23.90	0.98311	0.00021	19.40	0.96797	0.00025	17.70	0.97684	0.00028
24.10	0.98627	0.00021	19.50	0.97091	0.00025	17.80	0.98018	0.00028
24.30	0.98941	0.00021	19.60	0.97400	0.00025	17.90	0.98334	0.00027
24.50	0.99270	0.00022	19.70	0.97681	0.00025	18.00	0.98669	0.00027
24.70	0.99598	0.00021	19.80	0.97973	0.00025	18.10	0.99066	0.00027
24.90	0.99892	0.00021	19.90	0.98149	0.00025	18.20	0.99402	0.00027
25.10	1.00216	0.00021	20.00	0.98470	0.00026	18.30	0.99718	0.00027
25.30	1.00525	0.00021	20.10	0.98730	0.00025	18.40	1.00057	0.00027
25.50	1.00774	0.00021	20.20	0.98927	0.00025	18.50	1.00269	0.00026
25.70	1.01104	0.00021	20.30	0.99260	0.00025	18.60	1.00566	0.00028
25.90	1.01432	0.00021	20.40	0.99429	0.00024	18.70	1.00899	0.00027
26.00	1.01525	0.00020	20.50	0.99746	0.00024	18.80	1.01316	0.00027
			20.60	1.00015	0.00024	18.90	1.01549	0.00027
			20.70	1.00251	0.00025	19.00	1.01791	0.00027
			20.80	1.00467	0.00024			
			20.90	1.00746	0.00024			
			21.00	1.01001	0.00025			
			21.10	1.01221	0.00024			
			21.20	1.01450	0.00025			
			21.30	1.01663	0.00025			

Table B.2.1.1.1-2. K_{eff} Values for 100% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma
14.50	0.92331	0.00030	13.90	0.91886	0.00032	13.50	0.92045	0.00031
14.60	0.92798	0.00030	14.00	0.92497	0.00031	13.60	0.92671	0.00032
14.70	0.93333	0.00030	14.10	0.93051	0.00031	13.70	0.93203	0.00033
14.80	0.93815	0.00031	14.20	0.93603	0.00031	13.80	0.93809	0.00033
14.90	0.94337	0.00030	14.30	0.94138	0.00031	13.90	0.94332	0.00032
15.00	0.94817	0.00030	14.40	0.94752	0.00031	14.00	0.94887	0.00032
15.10	0.95343	0.00030	14.50	0.95250	0.00031	14.10	0.95485	0.00032
15.20	0.95786	0.00030	14.60	0.95718	0.00031	14.20	0.96061	0.00032
15.30	0.96255	0.00030	14.70	0.96293	0.00031	14.30	0.96627	0.00032
15.40	0.96689	0.00030	14.80	0.96801	0.00031	14.40	0.97268	0.00033
15.50	0.97162	0.00030	14.90	0.97360	0.00031	14.50	0.97662	0.00032
15.60	0.97694	0.00030	15.00	0.97830	0.00031	14.60	0.98291	0.00032
15.70	0.98143	0.00030	15.10	0.98271	0.00031	14.70	0.98741	0.00032
15.80	0.98586	0.00030	15.20	0.98812	0.00031	14.80	0.99247	0.00032
15.90	0.99064	0.00030	15.30	0.99261	0.00031	14.90	0.99847	0.00032
16.00	0.99339	0.00030	15.40	0.99727	0.00031	15.00	1.00322	0.00032
16.10	0.99901	0.00030	15.50	1.00209	0.00032	15.10	1.00815	0.00032
16.20	1.00281	0.00030	15.60	1.00680	0.00031	15.20	1.01327	0.00032
16.30	1.00770	0.00031	15.70	1.01125	0.00031	15.30	1.01874	0.00031
16.40	1.01204	0.00030	15.80	1.01585	0.00031			
16.50	1.01656	0.00030	15.90	1.02155	0.00031			
16.60	1.01987	0.00029						

Table B.2.1.1.1-2. K_{eff} Values for 100% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma
13.20	0.92215	0.00033	12.90	0.92044	0.00033	12.60	0.91518	0.00034
13.25	0.92553	0.00033	12.95	0.92354	0.00034	12.65	0.91892	0.00034
13.30	0.92820	0.00032	13.00	0.92695	0.00033	12.70	0.92240	0.00034
13.35	0.93158	0.00033	13.05	0.93007	0.00034	12.75	0.92551	0.00034
13.40	0.93491	0.00033	13.10	0.93356	0.00034	12.80	0.92824	0.00033
13.45	0.93724	0.00033	13.15	0.93615	0.00033	12.85	0.93170	0.00034
13.50	0.94055	0.00033	13.20	0.93935	0.00034	12.90	0.93593	0.00034
13.55	0.94356	0.00033	13.25	0.94294	0.00033	12.95	0.93875	0.00035
13.60	0.94639	0.00033	13.30	0.94586	0.00034	13.00	0.94214	0.00034
13.65	0.95010	0.00032	13.35	0.94787	0.00034	13.05	0.94583	0.00034
13.70	0.95266	0.00032	13.40	0.95223	0.00033	13.10	0.94872	0.00034
13.75	0.95562	0.00033	13.45	0.95529	0.00034	13.15	0.95094	0.00034
13.80	0.95837	0.00033	13.50	0.95835	0.00033	13.20	0.95491	0.00034
13.85	0.96176	0.00033	13.55	0.96129	0.00033	13.25	0.95837	0.00035
13.90	0.96468	0.00033	13.60	0.96440	0.00034	13.30	0.96156	0.00034
13.95	0.96695	0.00033	13.65	0.96822	0.00034	13.35	0.96522	0.00034
14.00	0.96967	0.00033	13.70	0.97093	0.00033	13.40	0.96734	0.00035
14.05	0.97255	0.00033	13.75	0.97351	0.00033	13.45	0.97031	0.00033
14.10	0.97623	0.00033	13.80	0.97651	0.00034	13.50	0.97381	0.00034
14.15	0.97873	0.00033	13.85	0.97934	0.00033	13.55	0.97674	0.00034
14.20	0.98194	0.00033	13.90	0.98231	0.00033	13.60	0.98028	0.00034
14.25	0.98441	0.00032	13.95	0.98575	0.00033	13.65	0.98326	0.00034
14.30	0.98769	0.00033	14.00	0.98864	0.00034	13.70	0.98618	0.00034
14.35	0.98986	0.00033	14.05	0.99182	0.00033	13.75	0.98951	0.00034
14.40	0.99359	0.00033	14.10	0.99357	0.00033	13.80	0.99186	0.00034
14.45	0.99522	0.00033	14.15	0.99710	0.00033	13.85	0.99578	0.00033
14.50	0.99831	0.00033	14.20	0.99966	0.00033	13.90	0.99790	0.00034
14.55	1.00116	0.00033	14.25	1.00316	0.00034	13.95	1.00088	0.00034
14.60	1.00362	0.00032	14.30	1.00563	0.00033	14.00	1.00446	0.00034
14.65	1.00646	0.00033	14.35	1.00833	0.00033	14.05	1.00679	0.00034
14.70	1.00862	0.00033	14.40	1.01140	0.00033	14.10	1.01041	0.00034
14.75	1.01195	0.00031	14.45	1.01427	0.00034	14.15	1.01308	0.00034
14.80	1.01351	0.00033	14.50	1.01703	0.00033	14.20	1.01604	0.00034
14.85	1.01736	0.00033	14.55	1.01928	0.00034	14.25	1.01925	0.00034
14.90	1.01985	0.00032	14.60	1.02192	0.00033	14.30	1.02128	0.00034

Table B.2.1.1.1-2. K_{eff} Values for 100% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma
12.50	0.92112	0.00035	12.10	0.91437	0.00034	11.70	0.91576	0.00036
12.55	0.92550	0.00034	12.15	0.91870	0.00035	11.75	0.91967	0.00037
12.60	0.92843	0.00034	12.20	0.92199	0.00035	11.80	0.92381	0.00036
12.65	0.93171	0.00034	12.25	0.92564	0.00035	11.85	0.92785	0.00037
12.70	0.93501	0.00035	12.30	0.92914	0.00035	11.90	0.93184	0.00036
12.75	0.93885	0.00034	12.35	0.93305	0.00035	11.95	0.93521	0.00036
12.80	0.94241	0.00034	12.40	0.93625	0.00034	12.00	0.93909	0.00036
12.85	0.94580	0.00034	12.45	0.93985	0.00035	12.05	0.94225	0.00036
12.90	0.94876	0.00035	12.50	0.94341	0.00035	12.10	0.94655	0.00036
12.95	0.95204	0.00035	12.55	0.94692	0.00035	12.15	0.94988	0.00037
13.00	0.95552	0.00034	12.60	0.95109	0.00036	12.20	0.95368	0.00035
13.05	0.95831	0.00034	12.65	0.95448	0.00035	12.25	0.95711	0.00036
13.10	0.96164	0.00035	12.70	0.95753	0.00035	12.30	0.96156	0.00037
13.15	0.96640	0.00035	12.75	0.96058	0.00035	12.35	0.96516	0.00036
13.20	0.96818	0.00034	12.80	0.96433	0.00035	12.40	0.96873	0.00036
13.25	0.97098	0.00034	12.85	0.96747	0.00035	12.45	0.97178	0.00036
13.30	0.97512	0.00034	12.90	0.97029	0.00035	12.50	0.97614	0.00036
13.35	0.97776	0.00034	12.95	0.97438	0.00036	12.55	0.97954	0.00036
13.40	0.98111	0.00034	13.00	0.97801	0.00035	12.60	0.98346	0.00036
13.45	0.98456	0.00034	13.05	0.98089	0.00035	12.65	0.98650	0.00036
13.50	0.98752	0.00034	13.10	0.98468	0.00035	12.70	0.99001	0.00036
13.55	0.99098	0.00034	13.15	0.98752	0.00035	12.75	0.99415	0.00036
13.60	0.99373	0.00034	13.20	0.99112	0.00035	12.80	0.99764	0.00036
13.65	0.99720	0.00034	13.25	0.99410	0.00035	12.85	1.00044	0.00036
13.70	1.00024	0.00035	13.30	0.99787	0.00036	12.90	1.00431	0.00036
13.75	1.00309	0.00035	13.35	1.00092	0.00035	12.95	1.00761	0.00036
13.80	1.00579	0.00034	13.40	1.00428	0.00036	13.00	1.01071	0.00036
13.85	1.00950	0.00034	13.45	1.00719	0.00035	13.05	1.01441	0.00037
13.90	1.01187	0.00034	13.50	1.01039	0.00035	13.10	1.01756	0.00036
13.95	1.01457	0.00034	13.55	1.01351	0.00036	13.15	1.02090	0.00037
14.00	1.01847	0.00034	13.60	1.01644	0.00035	13.20	1.02440	0.00036
14.05	1.02077	0.00035	13.65	1.02081	0.00035			
14.10	1.02438	0.00035	13.70	1.02301	0.00036			

Table B.2.1.1.1-2. K_{eff} Values for 100% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma
11.30	0.91477	0.00037	11.20	0.91901	0.00038	11.00	0.91235	0.00037
11.35	0.91783	0.00037	11.25	0.92338	0.00037	11.05	0.91669	0.00037
11.40	0.92178	0.00037	11.30	0.92792	0.00037	11.10	0.92121	0.00038
11.45	0.92629	0.00036	11.35	0.93137	0.00038	11.15	0.92557	0.00038
11.50	0.93045	0.00037	11.40	0.93546	0.00037	11.20	0.92981	0.00039
11.55	0.93413	0.00038	11.45	0.94007	0.00038	11.25	0.93346	0.00039
11.60	0.93829	0.00037	11.50	0.94411	0.00037	11.30	0.93841	0.00038
11.65	0.94244	0.00037	11.55	0.94789	0.00037	11.35	0.94260	0.00038
11.70	0.94633	0.00037	11.60	0.95204	0.00037	11.40	0.94628	0.00038
11.75	0.95138	0.00037	11.65	0.95676	0.00037	11.45	0.95077	0.00038
11.80	0.95453	0.00037	11.70	0.96066	0.00038	11.50	0.95487	0.00038
11.85	0.95811	0.00038	11.75	0.96413	0.00037	11.55	0.95859	0.00039
11.90	0.96256	0.00036	11.80	0.96801	0.00038	11.60	0.96299	0.00039
11.95	0.96578	0.00037	11.85	0.97239	0.00037	11.65	0.96740	0.00038
12.00	0.96893	0.00038	11.90	0.97624	0.00038	11.70	0.97036	0.00038
12.05	0.97325	0.00037	11.95	0.98022	0.00039	11.75	0.97490	0.00038
12.10	0.97775	0.00037	12.00	0.98375	0.00037	11.80	0.97882	0.00037
12.15	0.98159	0.00037	12.05	0.98814	0.00037	11.85	0.98234	0.00037
12.20	0.98515	0.00037	12.10	0.99047	0.00037	11.90	0.98677	0.00037
12.25	0.98866	0.00037	12.15	0.99504	0.00038	11.95	0.99076	0.00038
12.30	0.99183	0.00037	12.20	0.99902	0.00038	12.00	0.99468	0.00038
12.35	0.99615	0.00038	12.25	1.00328	0.00037	12.05	0.99797	0.00039
12.40	1.00049	0.00037	12.30	1.00664	0.00038	12.10	1.00273	0.00038
12.45	1.00321	0.00038	12.35	1.00978	0.00037	12.15	1.00574	0.00038
12.50	1.00741	0.00037	12.40	1.01366	0.00038	12.20	1.01008	0.00037
12.55	1.01032	0.00036	12.45	1.01744	0.00039	12.25	1.01328	0.00038
12.60	1.01396	0.00037	12.50	1.02162	0.00038	12.30	1.01759	0.00037
12.65	1.01861	0.00038				12.35	1.02135	0.00038
12.70	1.02242	0.00038				12.40	1.02492	0.00038

Table B.2.1.1.1-2. K_{eff} Values for 100% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma
10.90	0.91645	0.00038	10.60	0.91710	0.00038	10.50	0.91909	0.00038
10.95	0.92063	0.00038	10.65	0.92213	0.00038	10.55	0.92387	0.00038
11.00	0.92463	0.00037	10.70	0.92683	0.00038	10.60	0.92855	0.00038
11.05	0.92939	0.00038	10.75	0.93135	0.00038	10.65	0.93275	0.00037
11.10	0.93330	0.00038	10.80	0.93517	0.00038	10.70	0.93733	0.00038
11.15	0.93793	0.00039	10.85	0.94047	0.00038	10.75	0.94036	0.00038
11.20	0.94240	0.00038	10.90	0.94462	0.00038	10.80	0.94583	0.00038
11.25	0.94643	0.00038	10.95	0.94812	0.00038	10.85	0.95001	0.00038
11.30	0.95053	0.00038	11.00	0.95282	0.00039	10.90	0.95468	0.00039
11.35	0.95374	0.00039	11.05	0.95800	0.00038	10.95	0.95840	0.00038
11.40	0.95885	0.00038	11.10	0.96214	0.00039	11.00	0.96223	0.00038
11.45	0.96209	0.00038	11.15	0.96619	0.00038	11.05	0.96606	0.00038
11.50	0.96658	0.00038	11.20	0.96984	0.00038	11.10	0.97130	0.00038
11.55	0.97170	0.00038	11.25	0.97405	0.00038	11.15	0.97552	0.00037
11.60	0.97573	0.00039	11.30	0.97881	0.00038	11.20	0.97884	0.00039
11.65	0.97910	0.00038	11.35	0.98149	0.00039	11.25	0.98321	0.00039
11.70	0.98287	0.00038	11.40	0.98658	0.00039	11.30	0.98813	0.00038
11.75	0.98715	0.00038	11.45	0.99105	0.00038	11.35	0.99196	0.00039
11.80	0.99075	0.00039	11.50	0.99469	0.00039	11.40	0.99531	0.00038
11.85	0.99510	0.00038	11.55	0.99856	0.00039	11.45	0.99935	0.00038
11.90	0.99952	0.00038	11.60	1.00283	0.00037	11.50	1.00386	0.00038
11.95	1.00272	0.00038	11.65	1.00664	0.00038	11.55	1.00749	0.00038
12.00	1.00672	0.00038	11.70	1.01101	0.00039	11.60	1.01168	0.00038
12.05	1.01058	0.00038	11.75	1.01493	0.00039	11.65	1.01598	0.00039
12.10	1.01467	0.00037	11.80	1.01847	0.00040	11.70	1.01995	0.00038
12.15	1.01855	0.00039	11.85	1.02295	0.00040	11.75	1.02352	0.00039
12.20	1.02180	0.00038	11.90	1.02700	0.00040	11.80	1.02665	0.00038

Table B.2.1.1.1-2. K_{eff} Values for 100% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma
10.40	0.91905	0.00037	10.30	0.91327	0.00036	10.30	0.92152	0.00036
10.45	0.92357	0.00037	10.35	0.91714	0.00037	10.35	0.92558	0.00036
10.50	0.92773	0.00037	10.40	0.92255	0.00036	10.40	0.92994	0.00035
10.55	0.93157	0.00038	10.45	0.92654	0.00037	10.45	0.93418	0.00035
10.60	0.93593	0.00037	10.50	0.93097	0.00037	10.50	0.93775	0.00036
10.65	0.94046	0.00037	10.55	0.93524	0.00036	10.55	0.94160	0.00036
10.70	0.94456	0.00038	10.60	0.93899	0.00036	10.60	0.94555	0.00036
10.75	0.94874	0.00038	10.65	0.94310	0.00037	10.65	0.95049	0.00036
10.80	0.95276	0.00037	10.70	0.94703	0.00036	10.70	0.95424	0.00035
10.85	0.95760	0.00037	10.75	0.95283	0.00036	10.75	0.95850	0.00036
10.90	0.96071	0.00037	10.80	0.95559	0.00037	10.80	0.96196	0.00036
10.95	0.96551	0.00037	10.85	0.95967	0.00037	10.85	0.96527	0.00036
11.00	0.96972	0.00037	10.90	0.96390	0.00037	10.90	0.96947	0.00036
11.05	0.97408	0.00038	10.95	0.96796	0.00037	10.95	0.97402	0.00036
11.10	0.97774	0.00037	11.00	0.97219	0.00037	11.00	0.97815	0.00035
11.15	0.98136	0.00038	11.05	0.97634	0.00037	11.05	0.98142	0.00036
11.20	0.98551	0.00038	11.10	0.97981	0.00037	11.10	0.98467	0.00036
11.25	0.98925	0.00037	11.15	0.98356	0.00038	11.15	0.98913	0.00036
11.30	0.99389	0.00038	11.20	0.98768	0.00037	11.20	0.99318	0.00036
11.35	0.99778	0.00038	11.25	0.99186	0.00037	11.25	0.99668	0.00035
11.40	1.00166	0.00037	11.30	0.99561	0.00037	11.30	1.00002	0.00036
11.45	1.00586	0.00037	11.35	0.99974	0.00036	11.35	1.00458	0.00036
11.50	1.00921	0.00038	11.40	1.00309	0.00037	11.40	1.00818	0.00036
11.55	1.01319	0.00038	11.45	1.00673	0.00038	11.45	1.01163	0.00036
11.60	1.01739	0.00037	11.50	1.01136	0.00037	11.50	1.01543	0.00036
11.65	1.02067	0.00038	11.55	1.01457	0.00037	11.55	1.01902	0.00036
11.70	1.02508	0.00038	11.60	1.01904	0.00037	11.60	1.02287	0.00036
			11.65	1.02243	0.00037			
			11.70	1.02583	0.00037			

Table B.2.1.1.1-2. K_{eff} Values for 100% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma
10.20	0.91646	0.00035	10.20	0.92006	0.00035	10.10	0.91411	0.00036
10.25	0.92080	0.00035	10.25	0.92461	0.00034	10.15	0.91854	0.00034
10.30	0.92518	0.00035	10.30	0.92861	0.00034	10.20	0.92253	0.00034
10.35	0.92918	0.00035	10.35	0.93294	0.00035	10.25	0.92739	0.00034
10.40	0.93301	0.00035	10.40	0.93734	0.00035	10.30	0.93038	0.00035
10.45	0.93678	0.00035	10.45	0.94068	0.00035	10.35	0.93446	0.00034
10.50	0.94130	0.00035	10.50	0.94464	0.00035	10.40	0.93766	0.00035
10.55	0.94539	0.00035	10.55	0.94870	0.00034	10.45	0.94297	0.00035
10.60	0.94930	0.00035	10.60	0.95233	0.00035	10.50	0.94639	0.00034
10.65	0.95337	0.00035	10.65	0.95668	0.00034	10.55	0.95042	0.00034
10.70	0.95701	0.00036	10.70	0.96177	0.00035	10.60	0.95521	0.00034
10.75	0.96095	0.00035	10.75	0.96503	0.00035	10.65	0.95832	0.00034
10.80	0.96564	0.00035	10.80	0.96850	0.00035	10.70	0.96222	0.00035
10.85	0.96854	0.00035	10.85	0.97235	0.00035	10.75	0.96623	0.00035
10.90	0.97262	0.00035	10.90	0.97673	0.00035	10.80	0.96982	0.00035
10.95	0.97681	0.00036	10.95	0.98005	0.00035	10.85	0.97397	0.00035
11.00	0.98138	0.00035	11.00	0.98353	0.00035	10.90	0.97754	0.00035
11.05	0.98439	0.00035	11.05	0.98743	0.00035	10.95	0.98228	0.00035
11.10	0.98818	0.00036	11.10	0.99063	0.00034	11.00	0.98532	0.00035
11.15	0.99191	0.00035	11.15	0.99572	0.00035	11.05	0.98910	0.00035
11.20	0.99605	0.00035	11.20	0.99865	0.00035	11.10	0.99294	0.00035
11.25	0.99983	0.00036	11.25	1.00257	0.00035	11.15	0.99674	0.00034
11.30	1.00267	0.00035	11.30	1.00632	0.00035	11.20	1.00079	0.00035
11.35	1.00696	0.00035	11.35	1.00994	0.00035	11.25	1.00494	0.00034
11.40	1.01032	0.00036	11.40	1.01437	0.00036	11.30	1.00813	0.00035
11.45	1.01456	0.00036	11.45	1.01680	0.00035	11.35	1.01167	0.00035
11.50	1.01882	0.00035	11.50	1.01973	0.00035	11.40	1.01470	0.00035
11.55	1.02142	0.00035				11.45	1.01829	0.00035
11.60	1.02422	0.00035				11.50	1.02265	0.00035

Table B.2.1.1.1-2. K_{eff} Values for 100% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma
10.10	0.91571	0.00035	10.00	0.91722	0.00034	9.80	0.91288	0.00032
10.15	0.92100	0.00034	10.05	0.92107	0.00034	9.85	0.91734	0.00033
10.20	0.92485	0.00034	10.10	0.92535	0.00033	9.90	0.92115	0.00032
10.25	0.92830	0.00034	10.15	0.92898	0.00034	9.95	0.92536	0.00033
10.30	0.93289	0.00034	10.20	0.93381	0.00033	10.00	0.92996	0.00033
10.35	0.93708	0.00034	10.25	0.93803	0.00034	10.05	0.93384	0.00033
10.40	0.94113	0.00035	10.30	0.94148	0.00034	10.10	0.93793	0.00033
10.45	0.94494	0.00034	10.35	0.94555	0.00033	10.15	0.94178	0.00033
10.50	0.94839	0.00034	10.40	0.94905	0.00034	10.20	0.94655	0.00033
10.55	0.95261	0.00034	10.45	0.95357	0.00034	10.25	0.94924	0.00032
10.60	0.95714	0.00034	10.50	0.95730	0.00033	10.30	0.95409	0.00033
10.65	0.96054	0.00034	10.55	0.96172	0.00034	10.35	0.95776	0.00033
10.70	0.96494	0.00035	10.60	0.96510	0.00034	10.40	0.96234	0.00033
10.75	0.96827	0.00035	10.65	0.96987	0.00034	10.45	0.96582	0.00033
10.80	0.97286	0.00035	10.70	0.97327	0.00034	10.50	0.96960	0.00033
10.85	0.97570	0.00035	10.75	0.97678	0.00034	10.55	0.97358	0.00033
10.90	0.97990	0.00034	10.80	0.98097	0.00034	10.60	0.97792	0.00033
10.95	0.98357	0.00035	10.85	0.98472	0.00034	10.65	0.98143	0.00033
11.00	0.98713	0.00035	10.90	0.98775	0.00033	10.70	0.98541	0.00033
11.05	0.99065	0.00035	10.95	0.99208	0.00033	10.75	0.98841	0.00033
11.10	0.99498	0.00034	11.00	0.99556	0.00034	10.80	0.99232	0.00033
11.15	0.99870	0.00034	11.05	0.99930	0.00033	10.85	0.99601	0.00033
11.20	1.00217	0.00035	11.10	1.00350	0.00034	10.90	0.99965	0.00033
11.25	1.00644	0.00034	11.15	1.00682	0.00034	10.95	1.00396	0.00033
11.30	1.00994	0.00035	11.20	1.01051	0.00033	11.00	1.00746	0.00033
11.35	1.01333	0.00034	11.25	1.01347	0.00034	11.05	1.01086	0.00033
11.40	1.01628	0.00034	11.30	1.01785	0.00034	11.10	1.01422	0.00033
11.45	1.02040	0.00034	11.35	1.02106	0.00034	11.15	1.01821	0.00033
11.50	1.02407	0.00035	11.40	1.02404	0.00034	11.20	1.02167	0.00034

Table B.2.1.1.1-2. K_{eff} Values for 100% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma
9.50	0.91527	0.00032	9.20	0.91768	0.00030	8.90	0.92028	0.00030
9.55	0.91914	0.00031	9.25	0.92180	0.00031	8.95	0.92498	0.00030
9.60	0.92343	0.00031	9.30	0.92649	0.00030	9.00	0.92934	0.00029
9.65	0.92894	0.00032	9.35	0.93099	0.00030	9.05	0.93376	0.00030
9.70	0.93216	0.00032	9.40	0.93540	0.00031	9.10	0.93821	0.00029
9.75	0.93606	0.00032	9.45	0.93994	0.00030	9.15	0.94290	0.00030
9.80	0.94021	0.00031	9.50	0.94344	0.00031	9.20	0.94718	0.00030
9.85	0.94447	0.00032	9.55	0.94828	0.00031	9.25	0.95093	0.00030
9.90	0.94913	0.00032	9.60	0.95279	0.00031	9.30	0.95588	0.00030
9.95	0.95288	0.00032	9.65	0.95725	0.00031	9.35	0.96063	0.00029
10.00	0.95648	0.00032	9.70	0.96054	0.00031	9.40	0.96482	0.00030
10.05	0.96112	0.00032	9.75	0.96473	0.00031	9.45	0.96979	0.00030
10.10	0.96464	0.00032	9.80	0.96926	0.00031	9.50	0.97318	0.00030
10.15	0.96878	0.00032	9.85	0.97354	0.00031	9.55	0.97777	0.00030
10.20	0.97271	0.00032	9.90	0.97770	0.00031	9.60	0.98158	0.00030
10.25	0.97682	0.00032	9.95	0.98164	0.00031	9.65	0.98629	0.00030
10.30	0.98078	0.00032	10.00	0.98579	0.00031	9.70	0.99041	0.00030
10.35	0.98469	0.00032	10.05	0.98943	0.00030	9.75	0.99393	0.00030
10.40	0.98834	0.00032	10.10	0.99348	0.00031	9.80	0.99821	0.00030
10.45	0.99215	0.00032	10.15	0.99768	0.00030	9.85	1.00289	0.00031
10.50	0.99660	0.00032	10.20	1.00179	0.00031	9.90	1.00707	0.00030
10.55	1.00055	0.00033	10.25	1.00606	0.00031	9.95	1.01108	0.00030
10.60	1.00424	0.00032	10.30	1.00992	0.00031	10.00	1.01483	0.00031
10.65	1.00768	0.00032	10.35	1.01335	0.00030	10.05	1.01905	0.00030
10.70	1.01074	0.00032	10.40	1.01764	0.00032	10.10	1.02364	0.00030
10.75	1.01503	0.00032	10.45	1.02083	0.00032			
10.80	1.01894	0.00032	10.50	1.02460	0.00031			
10.85	1.02220	0.00032						
10.90	1.02623	0.00033						

Table B.2.1.1.1-2. K_{eff} Values for 100% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma
8.60	0.92056	0.00028	8.40	0.91579	0.00028	8.30	0.91895	0.00027
8.65	0.92454	0.00029	8.45	0.92049	0.00028	8.35	0.92448	0.00028
8.70	0.93060	0.00028	8.50	0.92509	0.00029	8.40	0.92920	0.00028
8.75	0.93485	0.00029	8.55	0.92965	0.00028	8.45	0.93437	0.00028
8.80	0.93951	0.00029	8.60	0.93491	0.00028	8.50	0.93880	0.00028
8.85	0.94445	0.00029	8.65	0.93914	0.00029	8.55	0.94433	0.00028
8.90	0.94879	0.00029	8.70	0.94435	0.00029	8.60	0.94860	0.00028
8.95	0.95348	0.00029	8.75	0.94887	0.00028	8.65	0.95386	0.00028
9.00	0.95811	0.00030	8.80	0.95429	0.00028	8.70	0.95831	0.00028
9.05	0.96264	0.00030	8.85	0.95857	0.00028	8.75	0.96321	0.00028
9.10	0.96729	0.00029	8.90	0.96372	0.00028	8.80	0.96777	0.00028
9.15	0.97132	0.00029	8.95	0.96789	0.00029	8.85	0.97279	0.00029
9.20	0.97594	0.00029	9.00	0.97258	0.00029	8.90	0.97684	0.00029
9.25	0.98024	0.00029	9.05	0.97731	0.00029	8.95	0.98260	0.00029
9.30	0.98471	0.00029	9.10	0.98176	0.00029	9.00	0.98609	0.00028
9.35	0.98948	0.00030	9.15	0.98662	0.00028	9.05	0.99117	0.00028
9.40	0.99328	0.00030	9.20	0.99009	0.00029	9.10	0.99543	0.00029
9.45	0.99818	0.00029	9.25	0.99515	0.00029	9.15	0.99968	0.00028
9.50	1.00218	0.00030	9.30	0.99985	0.00029	9.20	1.00465	0.00028
9.55	1.00692	0.00029	9.35	1.00354	0.00029	9.25	1.00967	0.00029
9.60	1.01100	0.00030	9.40	1.00773	0.00029	9.30	1.01380	0.00029
9.65	1.01495	0.00030	9.45	1.01258	0.00029	9.35	1.01776	0.00029
9.70	1.01960	0.00030	9.50	1.01644	0.00029	9.40	1.02288	0.00028
			9.55	1.02096	0.00029			
			9.60	1.02533	0.00029			

Table B.2.1.1.1-2. K_{eff} Values for 100% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma
8.00	0.91634	0.00027	7.80	0.92189	0.00026	6.70	0.91748	0.00022
8.05	0.92111	0.00027	7.85	0.92679	0.00026	6.75	0.92388	0.00022
8.10	0.92656	0.00027	7.90	0.93189	0.00026	6.80	0.92970	0.00022
8.15	0.93160	0.00027	7.95	0.93775	0.00027	6.85	0.93584	0.00022
8.20	0.93694	0.00027	8.00	0.94279	0.00027	6.90	0.94168	0.00022
8.25	0.94136	0.00028	8.05	0.94833	0.00026	6.95	0.94810	0.00022
8.30	0.94629	0.00026	8.10	0.95301	0.00026	7.00	0.95411	0.00023
8.35	0.95190	0.00028	8.15	0.95802	0.00027	7.05	0.95976	0.00023
8.40	0.95626	0.00027	8.20	0.96343	0.00026	7.10	0.96598	0.00023
8.45	0.96183	0.00027	8.25	0.96868	0.00026	7.15	0.97214	0.00023
8.50	0.96581	0.00028	8.30	0.97328	0.00027	7.20	0.97730	0.00023
8.55	0.97156	0.00028	8.35	0.97884	0.00027	7.25	0.98325	0.00023
8.60	0.97644	0.00027	8.40	0.98336	0.00028	7.30	0.98924	0.00024
8.65	0.98139	0.00027	8.45	0.98905	0.00027	7.35	0.99499	0.00024
8.70	0.98564	0.00028	8.50	0.99377	0.00027	7.40	1.00070	0.00023
8.75	0.99059	0.00028	8.55	0.99860	0.00027	7.45	1.00632	0.00024
8.80	0.99563	0.00027	8.60	1.00345	0.00027	7.50	1.01186	0.00023
8.85	1.00032	0.00028	8.65	1.00852	0.00028	7.55	1.01769	0.00024
8.90	1.00476	0.00028	8.70	1.01289	0.00028	7.60	1.02334	0.00024
8.95	1.00969	0.00028	8.75	1.01821	0.00027			
9.00	1.01424	0.00028	8.80	1.02240	0.00027			
9.05	1.01919	0.00028						
9.10	1.02317	0.00028						

Table B.2.1.1.1-2. K_{eff} Values for 100% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

18900 milli-g/cc								
Diameter (inches)	Keff	Sigma						
6.00	0.91909	0.00020						
6.05	0.92528	0.00020						
6.10	0.93188	0.00020						
6.15	0.93887	0.00020						
6.20	0.94501	0.00020						
6.25	0.95168	0.00020						
6.30	0.95776	0.00020						
6.35	0.96414	0.00021						
6.40	0.97065	0.00020						
6.45	0.97696	0.00020						
6.50	0.98336	0.00020						
6.55	0.98980	0.00021						
6.60	0.99626	0.00021						
6.65	1.00235	0.00021						
6.70	1.00872	0.00022						
6.75	1.01406	0.00021						
6.80	1.02073	0.00022						

B.2.1.1.2. 1” Water Reflector

Case ID: u5-sp-1000-01

Material: Uranium metal in water

Geometry: Sphere

Isotopics: 100% ^{235}U

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.2.1.1.2-1. 100% ^{235}U Sphere – 1 Inch of Water Reflection

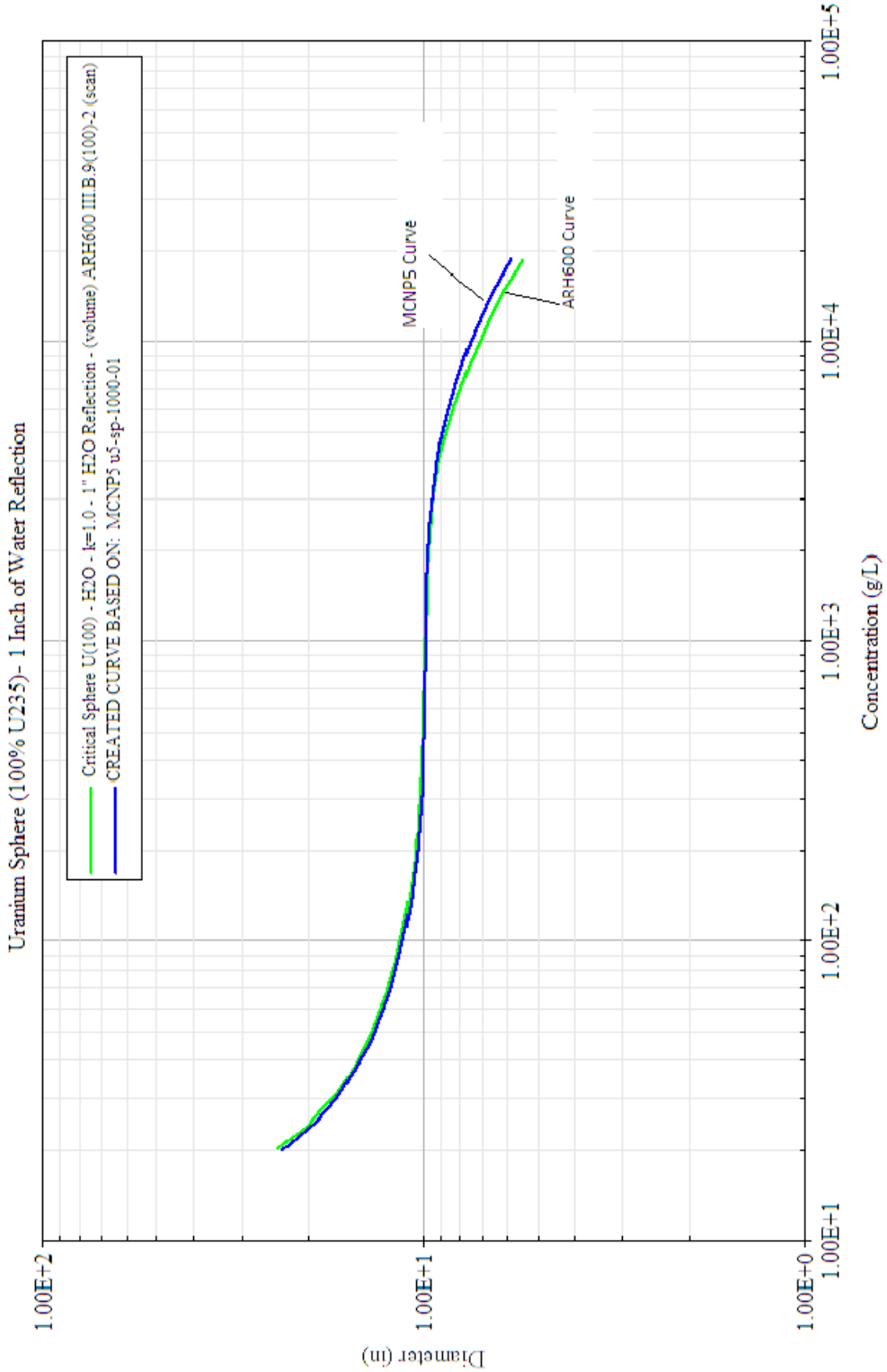

Table B.2.1.1.2-1. Critical Dimensions for 100% ^{235}U Sphere – 1 Inch of Water Reflection

100% ^{235}U Sphere – 1 Inch of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.020	19.400	24.400	0.200	23.4342
0.025	16.400	19.800	0.100	19.0875
0.030	14.700	17.400	0.100	16.8844
0.040	13.000	15.100	0.100	14.6189
0.045	12.400	14.400	0.100	13.9357
0.050	12.000	13.800	0.100	13.4229
0.055	11.700	13.400	0.050	13.0166
0.060	11.400	13.100	0.050	12.6930
0.065	11.100	12.800	0.050	12.4122
0.070	11.000	12.500	0.050	12.1845
0.080	10.700	12.100	0.050	11.8209
0.100	10.200	11.700	0.050	11.3174
0.130	9.800	11.200	0.050	10.8764
0.150	9.700	11.000	0.050	10.6899
0.170	9.500	10.900	0.050	10.5486
0.200	9.400	10.700	0.050	10.3901
0.350	9.100	10.300	0.050	10.0390
0.500	9.000	10.200	0.050	9.9356
0.800	8.900	10.200	0.050	9.8720
1.000	8.900	10.200	0.050	9.8509
1.500	8.800	10.100	0.050	9.8254
1.700	8.800	10.100	0.050	9.7948
1.900	8.700	10.100	0.050	9.7687
2.000	8.700	10.000	0.050	9.7566
2.100	8.700	10.000	0.050	9.7333
2.500	8.600	10.000	0.050	9.6423
3.000	8.500	9.800	0.050	9.5186
4.000	8.200	9.500	0.050	9.2211
5.000	8.000	9.200	0.050	8.9092
6.000	7.700	8.900	0.050	8.5942
7.000	7.400	8.600	0.050	8.3019
7.500	7.300	8.400	0.050	8.1563
8.000	7.200	8.300	0.050	8.0224
9.000	6.900	8.000	0.050	7.7593
10.000	6.700	7.800	0.050	7.5185
15.000	5.800	6.700	0.050	6.5105
18.900	5.200	6.100	0.050	5.8703

MCNP5 Sample Input File
100% ^{235}U Sphere- 1" Reflection

```
U sphere, 100.0 wt% 235U, 00100 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1040  hundreths of inches - must be integer
c radius =    13.2080 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00100 milli-g Pu/cc
c Reflector width =  1.0 inches
c Enrichment = 1.00 wt fraction 235U
c
c Density of H2O 1.00000
c Density of U 18.90000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0053 cc
c Volume of water in sample 0.9947 cc
c
c Mass of crit in sample   0.1000 g
c Mass of water in sample  0.9947 g
c
c Total mass of sample  1.0947g for a 1cc sample
c Mass Density for crit material  -1.0947, expressed as negative
c
c  sphere
20 11   -1.094709   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0

1       so    13.2080              $ Sphere
2       so    15.7480         $ Reflection

mode n
kcode 2000 1.0 100  4100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
```

```
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u/water mixture
m11    $ U/H2O Sludge, 100.0 wt% 235U, 00100 milli-g U/cc,  1.0947
1001.66c -0.101673
8016.66c -0.806979
92235.66c -0.091348
c    92238.66c -0.000000
mt11     lwtr.60t
c
c    u only
m12    $ U, 100.0 wt% 235U, 00100 milli-g U/cc,  1.0947
92235.66c -1.000000
c    92238.66c -0.000000
c
```

Critview Compatible Data File
100% ^{235}U Sphere- 1” Reflection

reset:
title: MCNP5 u5-sp-1000-01
set: MCNP5 set
source: MCNP5 primary
created: Mon 07/19/2010 11:13:38.90
geometry: sphere
modmat: H2O
critmat: uranium
isomat: U235 1.0
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.020	23.4342
0.025	19.0875
0.030	16.8844
0.040	14.6189
0.045	13.9357
0.050	13.4229
0.055	13.0166
0.060	12.6930
0.065	12.4122
0.070	12.1845
0.080	11.8209
0.100	11.3174
0.130	10.8764
0.150	10.6899
0.170	10.5486
0.200	10.3901
0.350	10.0390
0.500	9.9356
0.800	9.8720
1.000	9.8509
1.500	9.8254
1.700	9.7948
1.900	9.7687
2.000	9.7566
2.100	9.7333
2.500	9.6423
3.000	9.5186
4.000	9.2211
5.000	8.9092
6.000	8.5942
7.000	8.3019
7.500	8.1563
8.000	8.0224
9.000	7.7593
10.00	7.5185
15.00	6.5105
18.90	5.8703

Table B.2.1.1.2-2. K_{eff} Values for 100% ^{235}U Sphere – 1 Inch of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma
19.40	0.92397	0.00022	16.40	0.92372	0.00025	14.70	0.92058	0.00027
19.60	0.92846	0.00022	16.50	0.92672	0.00025	14.80	0.92470	0.00027
19.80	0.93287	0.00021	16.60	0.92983	0.00025	14.90	0.92819	0.00027
20.00	0.93729	0.00022	16.70	0.93337	0.00025	15.00	0.93236	0.00027
20.20	0.94130	0.00022	16.80	0.93608	0.00024	15.10	0.93657	0.00027
20.40	0.94504	0.00022	16.90	0.93929	0.00024	15.20	0.94117	0.00027
20.60	0.94982	0.00021	17.00	0.94205	0.00025	15.30	0.94406	0.00027
20.80	0.95388	0.00022	17.10	0.94548	0.00025	15.40	0.94796	0.00026
21.00	0.95726	0.00022	17.20	0.94835	0.00024	15.50	0.95166	0.00027
21.20	0.96156	0.00021	17.30	0.95132	0.00025	15.60	0.95566	0.00026
21.40	0.96509	0.00022	17.40	0.95455	0.00024	15.70	0.95971	0.00026
21.60	0.96881	0.00021	17.50	0.95711	0.00024	15.80	0.96288	0.00026
21.80	0.97285	0.00021	17.60	0.96016	0.00024	15.90	0.96668	0.00026
22.00	0.97672	0.00021	17.70	0.96301	0.00024	16.00	0.97015	0.00026
22.20	0.97980	0.00021	17.80	0.96528	0.00025	16.10	0.97296	0.00027
22.40	0.98330	0.00021	17.90	0.96862	0.00025	16.20	0.97724	0.00027
22.60	0.98607	0.00021	18.00	0.97098	0.00024	16.30	0.97980	0.00027
22.80	0.98959	0.00021	18.10	0.97424	0.00024	16.40	0.98413	0.00026
23.00	0.99292	0.00021	18.20	0.97701	0.00024	16.50	0.98704	0.00026
23.20	0.99668	0.00021	18.30	0.97954	0.00024	16.60	0.99030	0.00026
23.40	0.99947	0.00021	18.40	0.98232	0.00024	16.70	0.99418	0.00026
23.60	1.00257	0.00021	18.50	0.98498	0.00024	16.80	0.99696	0.00026
23.80	1.00536	0.00021	18.60	0.98751	0.00024	16.90	1.00056	0.00026
24.00	1.00842	0.00021	18.70	0.98997	0.00024	17.00	1.00374	0.00026
24.20	1.01129	0.00021	18.80	0.99201	0.00024	17.10	1.00699	0.00026
24.40	1.01389	0.00021	18.90	0.99550	0.00023	17.20	1.00991	0.00026
			19.00	0.99720	0.00024	17.30	1.01304	0.00026
			19.10	1.00040	0.00024	17.40	1.01635	0.00026
			19.20	1.00322	0.00024			
			19.30	1.00502	0.00023			
			19.40	1.00750	0.00024			
			19.50	1.00943	0.00024			
			19.60	1.01216	0.00024			
			19.70	1.01483	0.00024			
			19.80	1.01686	0.00023			

Table B.2.1.1.2-2. K_{eff} Values for 100% ^{235}U Sphere – 1 Inch of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma	Diameter (inches)	Keff	Sigma
13.00	0.92344	0.00029	12.40	0.91945	0.00030	12.00	0.92052	0.00031
13.10	0.92887	0.00029	12.50	0.92535	0.00030	12.10	0.92660	0.00031
13.20	0.93349	0.00029	12.60	0.93084	0.00030	12.20	0.93277	0.00030
13.30	0.93861	0.00029	12.70	0.93663	0.00031	12.30	0.93868	0.00031
13.40	0.94329	0.00029	12.80	0.94252	0.00030	12.40	0.94445	0.00030
13.50	0.94841	0.00029	12.90	0.94700	0.00030	12.50	0.94977	0.00031
13.60	0.95375	0.00028	13.00	0.95245	0.00029	12.60	0.95553	0.00031
13.70	0.95815	0.00029	13.10	0.95745	0.00030	12.70	0.96178	0.00031
13.80	0.96316	0.00029	13.20	0.96309	0.00030	12.80	0.96651	0.00031
13.90	0.96744	0.00029	13.30	0.96822	0.00030	12.90	0.97204	0.00030
14.00	0.97266	0.00029	13.40	0.97333	0.00030	13.00	0.97757	0.00031
14.10	0.97720	0.00029	13.50	0.97912	0.00030	13.10	0.98238	0.00031
14.20	0.98122	0.00030	13.60	0.98381	0.00030	13.20	0.98806	0.00030
14.30	0.98610	0.00029	13.70	0.98809	0.00031	13.30	0.99323	0.00031
14.40	0.99049	0.00030	13.80	0.99279	0.00031	13.40	0.99885	0.00030
14.50	0.99529	0.00028	13.90	0.99832	0.00030	13.50	1.00388	0.00030
14.60	0.99919	0.00029	14.00	1.00302	0.00030	13.60	1.00966	0.00031
14.70	1.00348	0.00029	14.10	1.00722	0.00030	13.70	1.01395	0.00030
14.80	1.00867	0.00029	14.20	1.01221	0.00030	13.80	1.01888	0.00031
14.90	1.01202	0.00029	14.30	1.01667	0.00030			
15.00	1.01597	0.00029	14.40	1.02226	0.00030			
15.10	1.02057	0.00029						

Table B.2.1.1.2-2. K_{eff} Values for 100% ^{235}U Sphere – 1 Inch of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.70	0.92242	0.00031	11.40	0.92069	0.00033	11.10	0.91542	0.00033
11.75	0.92540	0.00032	11.45	0.92345	0.00032	11.15	0.91874	0.00033
11.80	0.92925	0.00032	11.50	0.92711	0.00032	11.20	0.92307	0.00032
11.85	0.93226	0.00031	11.55	0.93076	0.00032	11.25	0.92596	0.00032
11.90	0.93555	0.00031	11.60	0.93338	0.00032	11.30	0.92924	0.00032
11.95	0.93782	0.00032	11.65	0.93673	0.00033	11.35	0.93306	0.00033
12.00	0.94186	0.00031	11.70	0.94026	0.00032	11.40	0.93605	0.00033
12.05	0.94427	0.00031	11.75	0.94346	0.00032	11.45	0.93960	0.00032
12.10	0.94777	0.00032	11.80	0.94660	0.00033	11.50	0.94237	0.00033
12.15	0.95062	0.00031	11.85	0.94992	0.00031	11.55	0.94625	0.00032
12.20	0.95366	0.00031	11.90	0.95284	0.00032	11.60	0.94951	0.00033
12.25	0.95618	0.00031	11.95	0.95577	0.00033	11.65	0.95240	0.00033
12.30	0.95903	0.00031	12.00	0.95898	0.00032	11.70	0.95525	0.00033
12.35	0.96169	0.00032	12.05	0.96201	0.00031	11.75	0.95906	0.00032
12.40	0.96461	0.00031	12.10	0.96479	0.00032	11.80	0.96251	0.00032
12.45	0.96857	0.00032	12.15	0.96874	0.00032	11.85	0.96556	0.00032
12.50	0.97158	0.00032	12.20	0.97101	0.00031	11.90	0.96873	0.00033
12.55	0.97397	0.00032	12.25	0.97379	0.00031	11.95	0.97117	0.00033
12.60	0.97695	0.00031	12.30	0.97690	0.00032	12.00	0.97460	0.00033
12.65	0.97919	0.00032	12.35	0.98034	0.00032	12.05	0.97748	0.00032
12.70	0.98209	0.00031	12.40	0.98332	0.00032	12.10	0.98067	0.00032
12.75	0.98524	0.00031	12.45	0.98620	0.00032	12.15	0.98361	0.00033
12.80	0.98827	0.00031	12.50	0.98917	0.00032	12.20	0.98679	0.00032
12.85	0.99063	0.00031	12.55	0.99217	0.00033	12.25	0.98969	0.00032
12.90	0.99380	0.00032	12.60	0.99532	0.00032	12.30	0.99305	0.00033
12.95	0.99618	0.00032	12.65	0.99772	0.00032	12.35	0.99587	0.00033
13.00	0.99896	0.00032	12.70	1.00037	0.00032	12.40	0.99919	0.00033
13.05	1.00210	0.00031	12.75	1.00323	0.00032	12.45	1.00250	0.00033
13.10	1.00448	0.00032	12.80	1.00640	0.00031	12.50	1.00493	0.00033
13.15	1.00763	0.00032	12.85	1.00911	0.00032	12.55	1.00779	0.00033
13.20	1.01006	0.00031	12.90	1.01212	0.00033	12.60	1.01167	0.00032
13.25	1.01133	0.00031	12.95	1.01505	0.00032	12.65	1.01399	0.00032
13.30	1.01571	0.00031	13.00	1.01691	0.00031	12.70	1.01582	0.00033
13.35	1.01794	0.00031	13.05	1.02036	0.00032	12.75	1.01920	0.00032
13.40	1.02063	0.00031	13.10	1.02319	0.00032	12.80	1.02207	0.00033

Table B.2.1.1.2-2. K_{eff} Values for 100% ^{235}U Sphere – 1 Inch of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.00	0.92251	0.00033	10.70	0.92279	0.00033	10.20	0.91609	0.00034
11.05	0.92625	0.00033	10.75	0.92637	0.00034	10.25	0.92060	0.00035
11.10	0.92871	0.00034	10.80	0.92972	0.00034	10.30	0.92467	0.00034
11.15	0.93256	0.00033	10.85	0.93340	0.00033	10.35	0.92837	0.00035
11.20	0.93570	0.00033	10.90	0.93657	0.00034	10.40	0.93251	0.00034
11.25	0.93949	0.00033	10.95	0.94044	0.00033	10.45	0.93642	0.00035
11.30	0.94317	0.00033	11.00	0.94429	0.00034	10.50	0.94019	0.00035
11.35	0.94594	0.00033	11.05	0.94742	0.00033	10.55	0.94390	0.00035
11.40	0.94934	0.00033	11.10	0.95098	0.00033	10.60	0.94820	0.00035
11.45	0.95326	0.00033	11.15	0.95511	0.00034	10.65	0.95193	0.00035
11.50	0.95624	0.00033	11.20	0.95834	0.00033	10.70	0.95472	0.00035
11.55	0.95976	0.00033	11.25	0.96170	0.00033	10.75	0.95894	0.00035
11.60	0.96280	0.00033	11.30	0.96523	0.00034	10.80	0.96294	0.00035
11.65	0.96575	0.00032	11.35	0.96879	0.00033	10.85	0.96620	0.00034
11.70	0.96921	0.00033	11.40	0.97204	0.00034	10.90	0.97063	0.00035
11.75	0.97250	0.00033	11.45	0.97554	0.00034	10.95	0.97372	0.00035
11.80	0.97525	0.00034	11.50	0.97899	0.00034	11.00	0.97687	0.00035
11.85	0.97826	0.00033	11.55	0.98181	0.00033	11.05	0.98072	0.00034
11.90	0.98213	0.00033	11.60	0.98555	0.00034	11.10	0.98463	0.00035
11.95	0.98596	0.00034	11.65	0.98878	0.00034	11.15	0.98820	0.00035
12.00	0.98843	0.00033	11.70	0.99228	0.00033	11.20	0.99099	0.00035
12.05	0.99201	0.00033	11.75	0.99534	0.00033	11.25	0.99503	0.00035
12.10	0.99498	0.00033	11.80	0.99870	0.00033	11.30	0.99879	0.00034
12.15	0.99820	0.00033	11.85	1.00181	0.00033	11.35	1.00226	0.00035
12.20	1.00081	0.00033	11.90	1.00518	0.00034	11.40	1.00479	0.00035
12.25	1.00414	0.00033	11.95	1.00861	0.00034	11.45	1.00818	0.00034
12.30	1.00689	0.00033	12.00	1.01211	0.00034	11.50	1.01221	0.00035
12.35	1.01053	0.00033	12.05	1.01499	0.00034	11.55	1.01606	0.00034
12.40	1.01263	0.00033	12.10	1.01838	0.00034	11.60	1.01913	0.00034
12.45	1.01639	0.00033				11.65	1.02184	0.00034
12.50	1.01926	0.00033				11.70	1.02589	0.00035

Table B.2.1.1.2-2. K_{eff} Values for 100% ^{235}U Sphere – 1 Inch of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.80	0.91474	0.00035	9.70	0.92004	0.00036	9.50	0.91418	0.00036
9.85	0.91848	0.00035	9.75	0.92522	0.00036	9.55	0.91768	0.00036
9.90	0.92345	0.00035	9.80	0.92866	0.00035	9.60	0.92281	0.00036
9.95	0.92764	0.00035	9.85	0.93254	0.00036	9.65	0.92711	0.00036
10.00	0.93097	0.00035	9.90	0.93733	0.00035	9.70	0.93140	0.00037
10.05	0.93564	0.00036	9.95	0.94092	0.00036	9.75	0.93538	0.00035
10.10	0.93971	0.00035	10.00	0.94542	0.00036	9.80	0.93986	0.00036
10.15	0.94361	0.00036	10.05	0.94998	0.00036	9.85	0.94400	0.00037
10.20	0.94744	0.00036	10.10	0.95370	0.00036	9.90	0.94753	0.00037
10.25	0.95206	0.00036	10.15	0.95800	0.00036	9.95	0.95250	0.00036
10.30	0.95603	0.00035	10.20	0.96188	0.00037	10.00	0.95621	0.00036
10.35	0.95992	0.00035	10.25	0.96615	0.00036	10.05	0.96056	0.00036
10.40	0.96401	0.00036	10.30	0.96967	0.00036	10.10	0.96499	0.00036
10.45	0.96708	0.00036	10.35	0.97409	0.00036	10.15	0.96841	0.00037
10.50	0.97103	0.00036	10.40	0.97758	0.00036	10.20	0.97278	0.00037
10.55	0.97517	0.00036	10.45	0.98192	0.00036	10.25	0.97760	0.00037
10.60	0.97900	0.00035	10.50	0.98537	0.00036	10.30	0.98017	0.00036
10.65	0.98336	0.00036	10.55	0.98958	0.00036	10.35	0.98456	0.00036
10.70	0.98619	0.00035	10.60	0.99322	0.00036	10.40	0.98845	0.00036
10.75	0.99025	0.00036	10.65	0.99714	0.00036	10.45	0.99328	0.00037
10.80	0.99449	0.00036	10.70	1.00072	0.00036	10.50	0.99612	0.00036
10.85	0.99793	0.00036	10.75	1.00436	0.00036	10.55	1.00011	0.00036
10.90	1.00185	0.00036	10.80	1.00871	0.00037	10.60	1.00416	0.00037
10.95	1.00588	0.00036	10.85	1.01241	0.00036	10.65	1.00817	0.00036
11.00	1.00865	0.00037	10.90	1.01570	0.00037	10.70	1.01237	0.00037
11.05	1.01277	0.00036	10.95	1.01997	0.00036	10.75	1.01569	0.00037
11.10	1.01650	0.00036	11.00	1.02285	0.00036	10.80	1.01999	0.00037
11.15	1.01935	0.00035				10.85	1.02350	0.00037
11.20	1.02332	0.00036				10.90	1.02697	0.00037

Table B.2.1.1.2-2. K_{eff} Values for 100% ^{235}U Sphere – 1 Inch of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.40	0.91768	0.00036	9.10	0.91887	0.00037	9.00	0.92012	0.00036
9.45	0.92176	0.00036	9.15	0.92375	0.00037	9.05	0.92542	0.00037
9.50	0.92629	0.00036	9.20	0.92850	0.00036	9.10	0.92893	0.00037
9.55	0.93078	0.00036	9.25	0.93291	0.00036	9.15	0.93363	0.00036
9.60	0.93538	0.00037	9.30	0.93752	0.00037	9.20	0.93821	0.00037
9.65	0.93903	0.00037	9.35	0.94172	0.00037	9.25	0.94214	0.00037
9.70	0.94340	0.00036	9.40	0.94614	0.00037	9.30	0.94681	0.00037
9.75	0.94795	0.00036	9.45	0.94966	0.00036	9.35	0.95110	0.00036
9.80	0.95195	0.00036	9.50	0.95497	0.00036	9.40	0.95516	0.00037
9.85	0.95598	0.00036	9.55	0.95944	0.00037	9.45	0.95989	0.00037
9.90	0.96035	0.00036	9.60	0.96372	0.00038	9.50	0.96395	0.00037
9.95	0.96443	0.00037	9.65	0.96802	0.00037	9.55	0.96836	0.00037
10.00	0.96858	0.00037	9.70	0.97261	0.00037	9.60	0.97298	0.00037
10.05	0.97196	0.00036	9.75	0.97514	0.00037	9.65	0.97711	0.00036
10.10	0.97729	0.00036	9.80	0.98008	0.00037	9.70	0.98119	0.00036
10.15	0.98088	0.00037	9.85	0.98505	0.00037	9.75	0.98518	0.00037
10.20	0.98501	0.00036	9.90	0.98854	0.00037	9.80	0.98955	0.00037
10.25	0.98897	0.00037	9.95	0.99187	0.00038	9.85	0.99293	0.00037
10.30	0.99309	0.00037	10.00	0.99740	0.00037	9.90	0.99702	0.00036
10.35	0.99729	0.00037	10.05	1.00073	0.00037	9.95	1.00121	0.00037
10.40	1.00067	0.00037	10.10	1.00425	0.00037	10.00	1.00500	0.00037
10.45	1.00503	0.00037	10.15	1.00935	0.00038	10.05	1.00964	0.00037
10.50	1.00907	0.00036	10.20	1.01313	0.00037	10.10	1.01360	0.00037
10.55	1.01233	0.00037	10.25	1.01609	0.00038	10.15	1.01745	0.00037
10.60	1.01663	0.00037	10.30	1.02026	0.00037	10.20	1.02097	0.00038
10.65	1.02072	0.00037						
10.70	1.02378	0.00037						

Table B.2.1.1.2-2. K_{eff} Values for 100% ^{235}U Sphere – 1 Inch of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.90	0.91853	0.00036	8.90	0.92075	0.00035	8.80	0.91848	0.00035
8.95	0.92309	0.00035	8.95	0.92520	0.00036	8.85	0.92250	0.00035
9.00	0.92805	0.00037	9.00	0.92959	0.00036	8.90	0.92658	0.00035
9.05	0.93198	0.00036	9.05	0.93446	0.00035	8.95	0.93110	0.00035
9.10	0.93535	0.00036	9.10	0.93860	0.00035	9.00	0.93429	0.00035
9.15	0.94065	0.00037	9.15	0.94181	0.00037	9.05	0.93901	0.00035
9.20	0.94466	0.00037	9.20	0.94644	0.00036	9.10	0.94280	0.00035
9.25	0.94869	0.00036	9.25	0.95087	0.00037	9.15	0.94731	0.00034
9.30	0.95224	0.00036	9.30	0.95485	0.00036	9.20	0.95127	0.00035
9.35	0.95773	0.00037	9.35	0.95902	0.00036	9.25	0.95551	0.00034
9.40	0.96159	0.00036	9.40	0.96323	0.00036	9.30	0.96017	0.00035
9.45	0.96536	0.00037	9.45	0.96815	0.00036	9.35	0.96302	0.00035
9.50	0.97103	0.00037	9.50	0.97156	0.00036	9.40	0.96775	0.00035
9.55	0.97410	0.00036	9.55	0.97600	0.00036	9.45	0.97131	0.00035
9.60	0.97865	0.00037	9.60	0.97953	0.00037	9.50	0.97483	0.00035
9.65	0.98218	0.00037	9.65	0.98337	0.00036	9.55	0.97909	0.00035
9.70	0.98623	0.00036	9.70	0.98755	0.00036	9.60	0.98308	0.00035
9.75	0.99004	0.00037	9.75	0.99163	0.00037	9.65	0.98667	0.00036
9.80	0.99439	0.00036	9.80	0.99499	0.00036	9.70	0.99134	0.00036
9.85	0.99839	0.00037	9.85	0.99993	0.00036	9.75	0.99453	0.00035
9.90	1.00205	0.00037	9.90	1.00369	0.00036	9.80	0.99779	0.00036
9.95	1.00595	0.00037	9.95	1.00662	0.00036	9.85	1.00214	0.00035
10.00	1.00991	0.00037	10.00	1.01069	0.00036	9.90	1.00600	0.00035
10.05	1.01359	0.00036	10.05	1.01468	0.00037	9.95	1.01019	0.00036
10.10	1.01794	0.00037	10.10	1.01874	0.00036	10.00	1.01327	0.00035
10.15	1.02174	0.00037	10.15	1.02291	0.00036	10.05	1.01667	0.00035
10.20	1.02511	0.00036	10.20	1.02668	0.00037	10.10	1.02137	0.00036

Table B.2.1.1.2-2. K_{eff} Values for 100% ^{235}U Sphere – 1 Inch of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.80	0.92058	0.00033	8.70	0.91553	0.00034	8.70	0.91629	0.00035
8.85	0.92474	0.00035	8.75	0.91937	0.00033	8.75	0.92114	0.00033
8.90	0.92904	0.00034	8.80	0.92314	0.00034	8.80	0.92540	0.00034
8.95	0.93315	0.00034	8.85	0.92739	0.00035	8.85	0.92907	0.00035
9.00	0.93725	0.00035	8.90	0.93254	0.00034	8.90	0.93300	0.00035
9.05	0.94120	0.00034	8.95	0.93590	0.00035	8.95	0.93764	0.00034
9.10	0.94528	0.00034	9.00	0.93994	0.00034	9.00	0.94184	0.00034
9.15	0.94939	0.00035	9.05	0.94436	0.00035	9.05	0.94615	0.00034
9.20	0.95403	0.00035	9.10	0.94819	0.00034	9.10	0.94963	0.00035
9.25	0.95798	0.00035	9.15	0.95171	0.00034	9.15	0.95355	0.00034
9.30	0.96199	0.00034	9.20	0.95709	0.00034	9.20	0.95758	0.00034
9.35	0.96500	0.00035	9.25	0.95977	0.00035	9.25	0.96179	0.00034
9.40	0.96983	0.00034	9.30	0.96383	0.00034	9.30	0.96563	0.00034
9.45	0.97302	0.00035	9.35	0.96822	0.00035	9.35	0.96938	0.00034
9.50	0.97709	0.00035	9.40	0.97209	0.00034	9.40	0.97343	0.00034
9.55	0.98146	0.00035	9.45	0.97552	0.00035	9.45	0.97676	0.00034
9.60	0.98521	0.00034	9.55	0.98383	0.00034	9.50	0.98128	0.00034
9.65	0.98866	0.00035	9.60	0.98675	0.00035	9.55	0.98547	0.00035
9.70	0.99225	0.00035	9.65	0.99122	0.00034	9.60	0.98868	0.00034
9.75	0.99691	0.00034	9.70	0.99471	0.00035	9.65	0.99218	0.00034
9.80	1.00036	0.00036	9.75	0.99853	0.00035	9.70	0.99626	0.00034
9.85	1.00368	0.00035	9.80	1.00246	0.00035	9.75	0.99945	0.00034
9.90	1.00790	0.00035	9.85	1.00640	0.00034	9.80	1.00359	0.00035
9.95	1.01127	0.00035	9.90	1.00934	0.00034	9.85	1.00736	0.00034
10.00	1.01512	0.00035	9.95	1.01396	0.00034	9.90	1.01211	0.00033
10.05	1.01839	0.00035	10.00	1.01774	0.00035	9.95	1.01496	0.00034
10.10	1.02248	0.00035	10.05	1.02026	0.00035	10.00	1.01810	0.00034
			10.10	1.02403	0.00035			

Table B.2.1.1.2-2. K_{eff} Values for 100% ^{235}U Sphere – 1 Inch of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.70	0.91793	0.00034	8.60	0.91678	0.00034	8.50	0.91913	0.00033
8.75	0.92195	0.00033	8.65	0.92152	0.00033	8.55	0.92298	0.00033
8.80	0.92613	0.00033	8.70	0.92522	0.00033	8.60	0.92739	0.00033
8.85	0.93089	0.00034	8.75	0.92963	0.00033	8.65	0.93091	0.00033
8.90	0.93536	0.00034	8.80	0.93339	0.00034	8.70	0.93510	0.00033
8.95	0.93888	0.00034	8.85	0.93756	0.00034	8.75	0.93946	0.00033
9.00	0.94326	0.00034	8.90	0.94149	0.00034	8.80	0.94468	0.00033
9.05	0.94687	0.00034	8.95	0.94583	0.00034	8.85	0.94776	0.00033
9.10	0.95136	0.00034	9.00	0.95012	0.00033	8.90	0.95168	0.00033
9.15	0.95597	0.00034	9.05	0.95491	0.00033	8.95	0.95583	0.00033
9.20	0.95972	0.00034	9.10	0.95766	0.00034	9.00	0.96047	0.00033
9.25	0.96287	0.00035	9.15	0.96184	0.00034	9.05	0.96367	0.00033
9.30	0.96713	0.00034	9.20	0.96582	0.00034	9.10	0.96747	0.00033
9.35	0.97089	0.00034	9.25	0.96923	0.00034	9.15	0.97168	0.00034
9.40	0.97497	0.00034	9.30	0.97372	0.00033	9.20	0.97523	0.00033
9.45	0.97858	0.00034	9.35	0.97776	0.00034	9.25	0.97992	0.00033
9.50	0.98266	0.00034	9.40	0.98127	0.00034	9.30	0.98353	0.00033
9.55	0.98570	0.00035	9.45	0.98572	0.00033	9.35	0.98745	0.00033
9.60	0.99066	0.00035	9.50	0.98894	0.00034	9.40	0.99069	0.00033
9.65	0.99396	0.00035	9.55	0.99316	0.00034	9.45	0.99476	0.00033
9.70	0.99797	0.00034	9.60	0.99639	0.00034	9.50	0.99838	0.00033
9.75	1.00102	0.00034	9.65	1.00066	0.00034	9.55	1.00274	0.00033
9.80	1.00487	0.00034	9.70	1.00433	0.00034	9.60	1.00584	0.00033
9.85	1.00865	0.00034	9.75	1.00716	0.00033	9.65	1.01004	0.00033
9.90	1.01300	0.00034	9.80	1.01083	0.00034	9.70	1.01302	0.00033
9.95	1.01607	0.00035	9.85	1.01552	0.00034	9.75	1.01713	0.00033
10.00	1.01973	0.00034	9.90	1.01865	0.00034	9.80	1.02080	0.00033
			9.95	1.02227	0.00034			
			10.00	1.02585	0.00033			

Table B.2.1.1.2-2. K_{eff} Values for 100% ^{235}U Sphere – 1 Inch of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.20	0.91593	0.00032	8.00	0.92257	0.00031	7.70	0.92033	0.00031
8.25	0.92025	0.00032	8.05	0.92663	0.00031	7.75	0.92454	0.00031
8.30	0.92456	0.00032	8.10	0.93116	0.00032	7.80	0.92926	0.00031
8.35	0.92867	0.00032	8.15	0.93588	0.00031	7.85	0.93432	0.00030
8.40	0.93321	0.00032	8.20	0.94039	0.00031	7.90	0.93903	0.00031
8.45	0.93684	0.00032	8.25	0.94504	0.00031	7.95	0.94360	0.00031
8.50	0.94098	0.00032	8.30	0.94939	0.00031	8.00	0.94814	0.00031
8.55	0.94526	0.00032	8.35	0.95353	0.00032	8.05	0.95228	0.00031
8.60	0.94985	0.00032	8.40	0.95797	0.00032	8.10	0.95653	0.00031
8.65	0.95417	0.00032	8.45	0.96163	0.00032	8.15	0.96119	0.00030
8.70	0.95804	0.00033	8.50	0.96611	0.00032	8.20	0.96535	0.00031
8.75	0.96263	0.00032	8.55	0.96970	0.00032	8.25	0.97010	0.00031
8.80	0.96662	0.00033	8.60	0.97467	0.00031	8.30	0.97463	0.00030
8.85	0.96992	0.00032	8.65	0.97847	0.00032	8.35	0.97861	0.00031
8.90	0.97401	0.00033	8.70	0.98285	0.00033	8.40	0.98274	0.00031
8.95	0.97898	0.00033	8.75	0.98691	0.00032	8.45	0.98807	0.00031
9.00	0.98277	0.00033	8.80	0.99182	0.00032	8.50	0.99152	0.00031
9.05	0.98652	0.00033	8.85	0.99482	0.00033	8.55	0.99516	0.00031
9.10	0.99077	0.00032	8.90	0.99934	0.00031	8.60	1.00064	0.00031
9.15	0.99401	0.00032	8.95	1.00292	0.00031	8.65	1.00417	0.00031
9.20	0.99820	0.00032	9.00	1.00705	0.00032	8.70	1.00903	0.00032
9.25	1.00247	0.00032	9.05	1.01180	0.00032	8.75	1.01259	0.00031
9.30	1.00599	0.00032	9.10	1.01430	0.00032	8.80	1.01733	0.00031
9.35	1.01019	0.00032	9.15	1.01863	0.00031	8.85	1.02062	0.00031
9.40	1.01349	0.00033	9.20	1.02269	0.00032	8.90	1.02535	0.00031
9.45	1.01676	0.00032						
9.50	1.02070	0.00032						

Table B.2.1.1.2-2. K_{eff} Values for 100% ^{235}U Sphere – 1 Inch of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.40	0.91649	0.00030	7.30	0.91812	0.00030	7.20	0.92057	0.00029
7.45	0.92099	0.00030	7.35	0.92348	0.00029	7.25	0.92522	0.00029
7.50	0.92565	0.00030	7.40	0.92763	0.00030	7.30	0.93007	0.00030
7.55	0.93011	0.00031	7.45	0.93281	0.00030	7.35	0.93543	0.00029
7.60	0.93531	0.00030	7.50	0.93850	0.00030	7.40	0.94003	0.00030
7.65	0.94001	0.00031	7.55	0.94295	0.00030	7.45	0.94550	0.00030
7.70	0.94491	0.00030	7.60	0.94771	0.00030	7.50	0.95036	0.00030
7.75	0.95045	0.00029	7.65	0.95206	0.00030	7.55	0.95503	0.00030
7.80	0.95418	0.00030	7.70	0.95785	0.00030	7.60	0.95987	0.00030
7.85	0.95980	0.00030	7.75	0.96241	0.00030	7.65	0.96497	0.00030
7.90	0.96369	0.00030	7.80	0.96659	0.00031	7.70	0.96946	0.00030
7.95	0.96806	0.00031	7.85	0.97113	0.00030	7.75	0.97409	0.00030
8.00	0.97305	0.00030	7.90	0.97609	0.00031	7.80	0.97891	0.00030
8.05	0.97725	0.00030	7.95	0.98097	0.00030	7.85	0.98360	0.00030
8.10	0.98191	0.00030	8.00	0.98632	0.00030	7.90	0.98884	0.00030
8.15	0.98664	0.00030	8.05	0.99002	0.00030	7.95	0.99310	0.00030
8.20	0.99150	0.00030	8.10	0.99457	0.00030	8.00	0.99778	0.00030
8.25	0.99602	0.00030	8.15	0.99951	0.00031	8.05	1.00274	0.00030
8.30	0.99982	0.00031	8.20	1.00340	0.00030	8.10	1.00717	0.00031
8.35	1.00467	0.00031	8.25	1.00784	0.00031	8.15	1.01165	0.00030
8.40	1.00850	0.00030	8.30	1.01292	0.00030	8.20	1.01646	0.00030
8.45	1.01284	0.00030	8.35	1.01711	0.00031	8.25	1.02073	0.00030
8.50	1.01762	0.00031	8.40	1.02153	0.00031	8.30	1.02533	0.00030
8.55	1.02186	0.00031						
8.60	1.02570	0.00031						

Table B.2.1.1.2-2. K_{eff} Values for 100% ^{235}U Sphere – 1 Inch of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.90	0.91220	0.00029	6.70	0.91345	0.00028	5.80	0.91218	0.00025
6.95	0.91738	0.00029	6.75	0.91941	0.00028	5.85	0.91881	0.00027
7.00	0.92285	0.00029	6.80	0.92464	0.00028	5.90	0.92443	0.00026
7.05	0.92805	0.00029	6.85	0.93002	0.00029	5.95	0.93120	0.00026
7.10	0.93351	0.00029	6.90	0.93551	0.00028	6.00	0.93708	0.00026
7.15	0.93906	0.00029	6.95	0.94104	0.00028	6.05	0.94358	0.00026
7.20	0.94392	0.00029	7.00	0.94655	0.00029	6.10	0.94932	0.00026
7.25	0.94927	0.00029	7.05	0.95115	0.00028	6.15	0.95669	0.00026
7.30	0.95436	0.00029	7.10	0.95694	0.00029	6.20	0.96229	0.00026
7.35	0.95923	0.00030	7.15	0.96201	0.00029	6.25	0.96851	0.00026
7.40	0.96425	0.00029	7.20	0.96763	0.00029	6.30	0.97493	0.00027
7.45	0.96957	0.00029	7.25	0.97276	0.00029	6.35	0.98077	0.00026
7.50	0.97438	0.00029	7.30	0.97815	0.00029	6.40	0.98655	0.00027
7.55	0.97889	0.00029	7.35	0.98268	0.00029	6.45	0.99248	0.00026
7.60	0.98391	0.00030	7.40	0.98764	0.00029	6.50	0.99882	0.00027
7.65	0.98934	0.00029	7.45	0.99334	0.00029	6.55	1.00444	0.00027
7.70	0.99408	0.00030	7.50	0.99821	0.00029	6.60	1.01058	0.00027
7.75	0.99904	0.00029	7.55	1.00305	0.00029	6.65	1.01604	0.00027
7.80	1.00418	0.00030	7.60	1.00850	0.00029	6.70	1.02202	0.00027
7.85	1.00834	0.00029	7.65	1.01300	0.00029			
7.90	1.01339	0.00029	7.70	1.01794	0.00029			
7.95	1.01824	0.00030	7.75	1.02312	0.00030			
8.00	1.02249	0.00030	7.80	1.02719	0.00029			

Table B.2.1.1.2-2. K_{eff} Values for 100% ^{235}U Sphere – 1 Inch of Water Reflection (cont)

18900 milli-g/cc								
Diameter (inches)	K_{eff}	Sigma						
5.20	0.90910	0.00023						
5.25	0.91599	0.00024						
5.30	0.92297	0.00023						
5.35	0.93022	0.00023						
5.40	0.93698	0.00024						
5.45	0.94355	0.00024						
5.50	0.95106	0.00024						
5.55	0.95766	0.00024						
5.60	0.96448	0.00025						
5.65	0.97130	0.00024						
5.70	0.97725	0.00025						
5.75	0.98464	0.00024						
5.80	0.99131	0.00024						
5.85	0.99722	0.00025						
5.90	1.00406	0.00025						
5.95	1.01062	0.00025						
6.00	1.01708	0.00025						
6.05	1.02328	0.00025						
6.10	1.03043	0.00025						

B.2.1.1.3. 10” Water Reflector

Case ID: u5-sp-1000-10

Material: Uranium metal in water

Geometry: Sphere

Isotopics: 100% ^{235}U

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.2.1.1.3-1. 100% ^{235}U Sphere - 10 Inches of Water Reflection

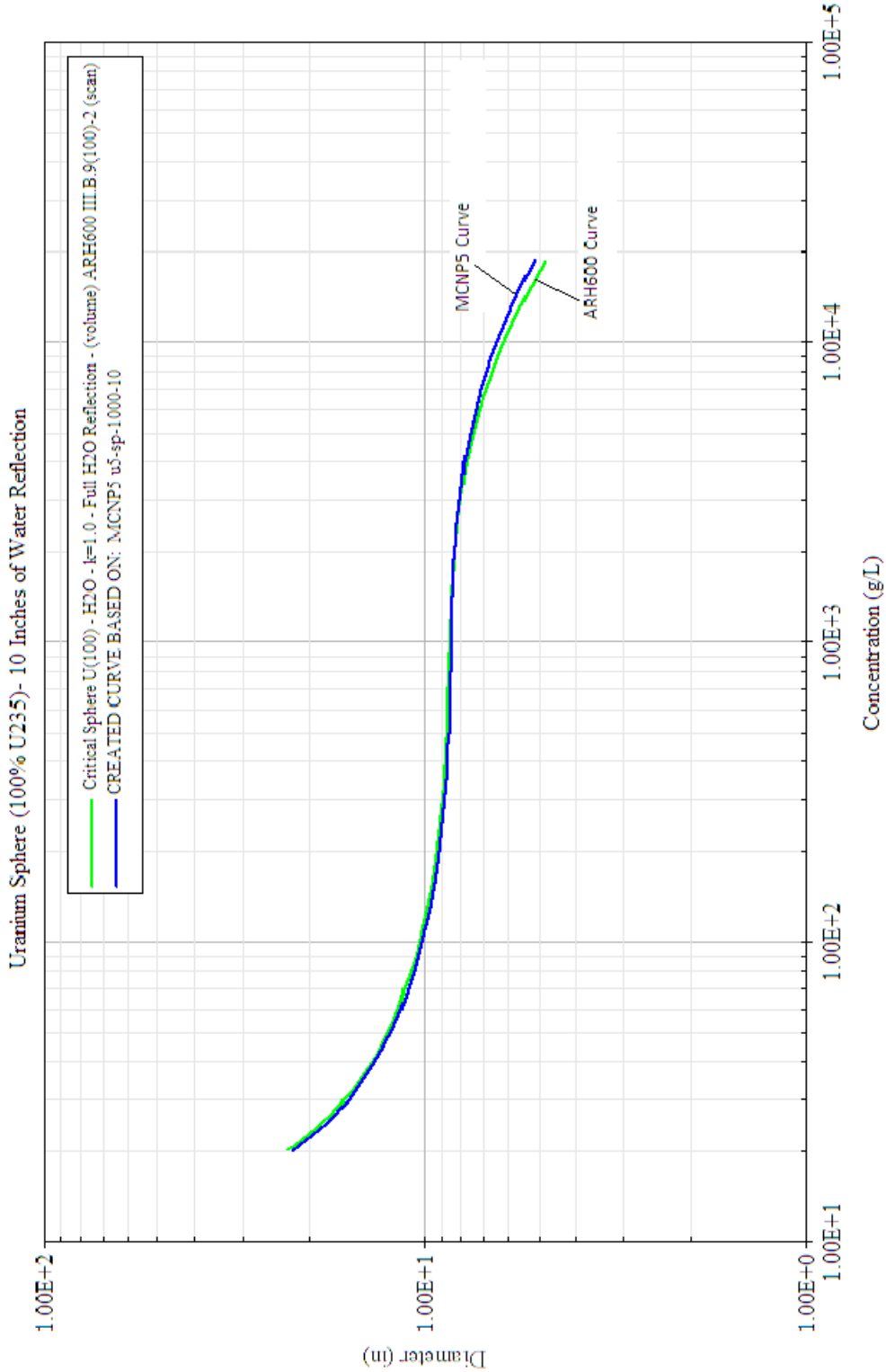

Table B.2.1.1.3-1. Critical Dimensions for 100% ^{235}U Sphere - 10 Inches of Water Reflection

100% ^{235}U Sphere- 10 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.020	18.400	23.300	0.200	22.3601
0.025	15.300	18.700	0.100	17.9978
0.030	13.700	16.300	0.100	15.7886
0.040	11.900	13.900	0.100	13.5035
0.045	11.300	13.200	0.100	12.8130
0.050	10.900	12.700	0.100	12.2957
0.055	10.500	12.300	0.100	11.8807
0.060	10.300	11.900	0.050	11.5419
0.065	10.000	11.600	0.050	11.2661
0.070	9.800	11.400	0.050	11.0359
0.080	9.500	11.000	0.050	10.6546
0.100	9.100	10.400	0.050	10.1399
0.130	8.700	10.000	0.050	9.6677
0.150	8.500	9.800	0.050	9.4691
0.170	8.300	9.600	0.050	9.3167
0.200	8.200	9.400	0.050	9.1453
0.350	7.800	9.000	0.050	8.7344
0.500	7.700	8.900	0.050	8.5875
0.800	7.500	8.800	0.050	8.4872
1.000	7.500	8.700	0.050	8.4473
1.500	7.400	8.700	0.050	8.3869
1.700	7.400	8.600	0.050	8.3637
1.900	7.400	8.600	0.050	8.3366
2.000	7.300	8.600	0.050	8.3141
2.100	7.300	8.600	0.050	8.2997
2.500	7.200	8.500	0.050	8.2237
3.000	7.100	8.400	0.050	8.1009
4.000	6.900	8.100	0.050	7.8648
5.000	6.700	7.900	0.050	7.6036
6.000	6.500	7.600	0.050	7.3524
7.000	6.300	7.300	0.050	7.1121
7.500	6.200	7.200	0.050	6.9946
8.000	6.100	7.100	0.050	6.8818
9.000	5.900	6.900	0.050	6.6689
10.000	5.700	6.700	0.050	6.4705
15.000	5.000	5.800	0.050	5.6441
18.900	4.500	5.300	0.050	5.1164

MCNP5 Sample Input File
100% ^{235}U Sphere- 10” Reflection

```
U sphere, 100.0 wt% 235U, 01000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 760   hundreths of inches - must be integer
c radius =     9.6520 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 01000 milli-g Pu/cc
c Reflector width = 10.0 inches
c Enrichment = 1.00 wt fraction 235U
c
c Density of H2O 1.00000
c Density of U 18.90000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0529 cc
c Volume of water in sample 0.9471 cc
c
c Mass of crit in sample   1.0000 g
c Mass of water in sample  0.9471 g
c
c Total mass of sample  1.9471g for a 1cc sample
c Mass Density for crit material  -1.9471, expressed as negative
c
c  sphere
20 11   -1.947090   -1        imp:n=1
21  2  -1.000    -2 1        imp:n=1    $zero importance if no reflector
22  0            2          imp:n=0

1       so     9.6520              $ Sphere
2       so    35.0520        $ Reflection

mode n
kcode 2000 1.0 100  4100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
```

```
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u/water mixture
m11    $ U/H2O Sludge, 100.0 wt% 235U, 01000 milli-g U/cc,  1.9471
1001.66c -0.054427
8016.66c -0.431986
92235.66c -0.513587
c    92238.66c -0.000000
mt11     lwtr.60t
c
c    u only
m12    $ U, 100.0 wt% 235U, 01000 milli-g U/cc,  1.9471
92235.66c -1.000000
c    92238.66c -0.000000
c
```

Critview Compatible Data File
100% ^{235}U Sphere- 10” Reflection

reset:
title: MCNP5 u5-sp-1000-10
set: MCNP5 set
source: MCNP5 primary
created: Mon 07/19/2010 12:30:39.84
geometry: sphere
modmat: H2O
critmat: uranium
isomat: U235 1.0
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.020	22.3601
0.025	17.9978
0.030	15.7886
0.040	13.5035
0.045	12.8130
0.050	12.2957
0.055	11.8807
0.060	11.5419
0.065	11.2661
0.070	11.0359
0.080	10.6546
0.100	10.1399
0.130	9.6677
0.150	9.4691
0.170	9.3167
0.200	9.1453
0.350	8.7344
0.500	8.5875
0.800	8.4872
1.000	8.4473
1.500	8.3869
1.700	8.3637
1.900	8.3366
2.000	8.3141
2.100	8.2997
2.500	8.2237
3.000	8.1009
4.000	7.8648
5.000	7.6036
6.000	7.3524
7.000	7.1121
7.500	6.9946
8.000	6.8818
9.000	6.6689
10.00	6.4705
15.00	5.6441
18.90	5.1164

Table B.2.1.1.3-2. K_{eff} Values for 100% ^{235}U Sphere - 10 Inches of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
18.40	0.92594	0.00021	15.30	0.92237	0.00023	13.70	0.92318	0.00025
18.60	0.93023	0.00021	15.40	0.92561	0.00023	13.80	0.92789	0.00025
18.80	0.93445	0.00020	15.50	0.92928	0.00023	13.90	0.93201	0.00025
19.00	0.93910	0.00020	15.60	0.93209	0.00023	14.00	0.93533	0.00026
19.20	0.94285	0.00021	15.70	0.93522	0.00023	14.10	0.93946	0.00025
19.40	0.94725	0.00020	15.80	0.93854	0.00024	14.20	0.94311	0.00025
19.60	0.95098	0.00021	15.90	0.94201	0.00023	14.30	0.94737	0.00025
19.80	0.95503	0.00021	16.00	0.94491	0.00023	14.40	0.95126	0.00025
20.00	0.95892	0.00020	16.10	0.94765	0.00023	14.50	0.95519	0.00025
20.20	0.96307	0.00020	16.20	0.95092	0.00023	14.60	0.95845	0.00025
20.40	0.96683	0.00020	16.30	0.95363	0.00023	14.70	0.96243	0.00025
20.60	0.97012	0.00020	16.40	0.95675	0.00023	14.80	0.96619	0.00025
20.80	0.97416	0.00020	16.50	0.95953	0.00023	14.90	0.96944	0.00025
21.00	0.97759	0.00020	16.60	0.96260	0.00023	15.00	0.97326	0.00025
21.20	0.98089	0.00020	16.70	0.96554	0.00023	15.10	0.97663	0.00025
21.40	0.98436	0.00020	16.80	0.96818	0.00023	15.20	0.97934	0.00025
21.60	0.98790	0.00019	16.90	0.97168	0.00023	15.30	0.98335	0.00025
21.80	0.99084	0.00020	17.00	0.97349	0.00023	15.40	0.98682	0.00025
22.00	0.99445	0.00020	17.10	0.97604	0.00023	15.50	0.99029	0.00025
22.20	0.99755	0.00019	17.20	0.97943	0.00023	15.60	0.99397	0.00025
22.40	1.00061	0.00020	17.30	0.98143	0.00023	15.70	0.99759	0.00025
22.60	1.00381	0.00020	17.40	0.98485	0.00023	15.80	1.00031	0.00024
22.80	1.00696	0.00020	17.50	0.98708	0.00023	15.90	1.00419	0.00025
23.00	1.00941	0.00020	17.60	0.98963	0.00022	16.00	1.00707	0.00025
23.20	1.01243	0.00020	17.70	0.99277	0.00023	16.10	1.01006	0.00024
23.30	1.01462	0.00019	17.80	0.99515	0.00023	16.20	1.01304	0.00024
			17.90	0.99735	0.00023	16.30	1.01624	0.00024
			18.00	1.00006	0.00023			
			18.10	1.00247	0.00023			
			18.20	1.00507	0.00022			
			18.30	1.00760	0.00023			
			18.40	1.00994	0.00022			
			18.50	1.01198	0.00022			
			18.60	1.01462	0.00022			
			18.70	1.01727	0.00022			

Table B.2.1.1.3-2. K_{eff} Values for 100% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.90	0.92281	0.00027	11.30	0.91952	0.00028	10.90	0.92128	0.00029
12.00	0.92789	0.00027	11.40	0.92524	0.00028	11.00	0.92697	0.00029
12.10	0.93289	0.00027	11.50	0.93126	0.00028	11.10	0.93311	0.00029
12.20	0.93871	0.00027	11.60	0.93683	0.00028	11.20	0.93882	0.00029
12.30	0.94306	0.00027	11.70	0.94221	0.00028	11.30	0.94471	0.00029
12.40	0.94835	0.00027	11.80	0.94689	0.00028	11.40	0.95062	0.00029
12.50	0.95312	0.00028	11.90	0.95289	0.00029	11.50	0.95609	0.00029
12.60	0.95812	0.00027	12.00	0.95845	0.00028	11.60	0.96217	0.00029
12.70	0.96283	0.00027	12.10	0.96375	0.00028	11.70	0.96765	0.00029
12.80	0.96779	0.00028	12.20	0.96904	0.00028	11.80	0.97347	0.00029
12.90	0.97273	0.00028	12.30	0.97401	0.00028	11.90	0.97875	0.00029
13.00	0.97747	0.00027	12.40	0.97951	0.00028	12.00	0.98386	0.00029
13.10	0.98152	0.00027	12.50	0.98411	0.00028	12.10	0.99020	0.00029
13.20	0.98614	0.00027	12.60	0.98912	0.00028	12.20	0.99532	0.00029
13.30	0.99127	0.00027	12.70	0.99401	0.00028	12.30	1.00021	0.00029
13.40	0.99630	0.00027	12.80	0.99938	0.00028	12.40	1.00562	0.00029
13.50	0.99983	0.00027	12.90	1.00416	0.00028	12.50	1.01099	0.00028
13.60	1.00462	0.00028	13.00	1.00841	0.00029	12.60	1.01602	0.00029
13.70	1.00882	0.00027	13.10	1.01318	0.00028	12.70	1.02080	0.00028
13.80	1.01302	0.00027	13.20	1.01806	0.00028			
13.90	1.01762	0.00028						

Table B.2.1.1.3-2. K_{eff} Values for 100% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.50	0.91635	0.00029	10.30	0.92169	0.00030	10.00	0.91700	0.00030
10.60	0.92296	0.00029	10.35	0.92484	0.00030	10.05	0.92068	0.00031
10.70	0.93051	0.00029	10.40	0.92871	0.00030	10.10	0.92448	0.00030
10.80	0.93560	0.00029	10.45	0.93195	0.00030	10.15	0.92752	0.00030
10.90	0.94159	0.00030	10.50	0.93476	0.00030	10.20	0.93152	0.00030
11.00	0.94836	0.00030	10.55	0.93871	0.00030	10.25	0.93453	0.00030
11.10	0.95483	0.00030	10.60	0.94160	0.00029	10.30	0.93798	0.00030
11.20	0.96035	0.00029	10.65	0.94548	0.00029	10.35	0.94114	0.00030
11.30	0.96627	0.00030	10.70	0.94783	0.00030	10.40	0.94459	0.00030
11.40	0.97228	0.00029	10.75	0.95140	0.00030	10.45	0.94807	0.00030
11.50	0.97861	0.00029	10.80	0.95391	0.00030	10.50	0.95093	0.00031
11.60	0.98368	0.00030	10.85	0.95716	0.00030	10.55	0.95435	0.00031
11.70	0.98959	0.00029	10.90	0.96104	0.00030	10.60	0.95772	0.00030
11.80	0.99589	0.00030	10.95	0.96408	0.00030	10.65	0.96136	0.00030
11.90	1.00098	0.00029	11.00	0.96670	0.00030	10.80	0.97107	0.00030
12.00	1.00638	0.00029	11.05	0.96948	0.00030	10.85	0.97344	0.00031
12.10	1.01172	0.00029	11.10	0.97372	0.00030	10.90	0.97695	0.00031
12.20	1.01749	0.00029	11.15	0.97594	0.00030	10.95	0.98012	0.00030
12.30	1.02201	0.00029	11.20	0.97980	0.00030	11.00	0.98306	0.00030
			11.25	0.98237	0.00029	11.05	0.98640	0.00030
			11.30	0.98550	0.00031	11.10	0.98962	0.00030
			11.35	0.98834	0.00030	11.15	0.99272	0.00030
			11.40	0.99142	0.00030	11.20	0.99596	0.00031
			11.45	0.99441	0.00029	11.25	0.99900	0.00030
			11.50	0.99778	0.00030	11.30	1.00211	0.00030
			11.55	1.00043	0.00030	11.35	1.00495	0.00031
			11.60	1.00321	0.00029	11.40	1.00730	0.00031
			11.65	1.00578	0.00030	11.45	1.01097	0.00030
			11.70	1.00906	0.00030	11.50	1.01416	0.00030
			11.75	1.01195	0.00030	11.55	1.01680	0.00030
			11.80	1.01444	0.00030	11.60	1.01992	0.00031
			11.85	1.01671	0.00030			
			11.90	1.02010	0.00029			

Table B.2.1.1.3-2. K_{eff} Values for 100% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.80	0.91696	0.00030	9.50	0.91778	0.00031	9.10	0.92082	0.00032
9.85	0.91995	0.00031	9.55	0.92216	0.00031	9.15	0.92446	0.00032
9.90	0.92457	0.00030	9.60	0.92533	0.00030	9.20	0.92881	0.00032
9.95	0.92773	0.00031	9.65	0.92859	0.00031	9.25	0.93267	0.00032
10.00	0.93080	0.00030	9.70	0.93264	0.00032	9.30	0.93696	0.00032
10.05	0.93487	0.00030	9.75	0.93692	0.00032	9.35	0.94124	0.00032
10.10	0.93891	0.00031	9.80	0.94045	0.00030	9.40	0.94521	0.00032
10.15	0.94143	0.00031	9.85	0.94398	0.00032	9.45	0.94871	0.00032
10.20	0.94523	0.00030	9.90	0.94720	0.00031	9.50	0.95282	0.00032
10.25	0.94827	0.00031	9.95	0.95142	0.00031	9.55	0.95665	0.00033
10.30	0.95203	0.00031	10.00	0.95495	0.00031	9.60	0.96030	0.00032
10.35	0.95530	0.00031	10.05	0.95870	0.00031	9.65	0.96377	0.00032
10.40	0.95893	0.00031	10.10	0.96205	0.00031	9.70	0.96783	0.00032
10.45	0.96258	0.00030	10.15	0.96554	0.00031	9.75	0.97161	0.00032
10.50	0.96514	0.00031	10.20	0.96947	0.00031	9.80	0.97537	0.00032
10.55	0.96904	0.00030	10.25	0.97226	0.00031	9.85	0.97915	0.00033
10.60	0.97217	0.00031	10.30	0.97577	0.00031	9.90	0.98268	0.00032
10.65	0.97548	0.00031	10.35	0.97931	0.00031	9.95	0.98628	0.00032
10.70	0.97876	0.00031	10.40	0.98285	0.00031	10.00	0.98998	0.00032
10.75	0.98205	0.00031	10.45	0.98677	0.00031	10.05	0.99311	0.00033
10.80	0.98493	0.00031	10.50	0.98968	0.00031	10.10	0.99682	0.00032
10.85	0.98832	0.00031	10.55	0.99269	0.00032	10.15	1.00081	0.00032
10.90	0.99119	0.00031	10.60	0.99618	0.00031	10.20	1.00433	0.00032
10.95	0.99503	0.00030	10.65	0.99969	0.00031	10.25	1.00768	0.00032
11.00	0.99750	0.00030	10.70	1.00307	0.00031	10.30	1.01164	0.00032
11.05	1.00098	0.00031	10.75	1.00619	0.00031	10.35	1.01485	0.00032
11.10	1.00419	0.00031	10.80	1.00998	0.00031	10.40	1.01815	0.00032
11.15	1.00743	0.00030	10.85	1.01251	0.00032			
11.20	1.01021	0.00031	10.90	1.01569	0.00032			
11.25	1.01383	0.00031	10.95	1.01835	0.00031			
11.30	1.01655	0.00030	11.00	1.02229	0.00031			
11.35	1.01955	0.00031						
11.40	1.02293	0.00031						

Table B.2.1.1.3-2. K_{eff} Values for 100% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.70	0.92153	0.00033	8.50	0.92025	0.00034	8.30	0.91425	0.00033
8.75	0.92599	0.00032	8.55	0.92451	0.00033	8.35	0.91904	0.00033
8.80	0.93017	0.00033	8.60	0.92861	0.00033	8.40	0.92323	0.00033
8.85	0.93414	0.00034	8.65	0.93246	0.00034	8.45	0.92757	0.00034
8.90	0.93843	0.00033	8.70	0.93707	0.00034	8.50	0.93232	0.00034
8.95	0.94245	0.00033	8.75	0.94188	0.00033	8.55	0.93647	0.00033
9.00	0.94736	0.00033	8.80	0.94576	0.00033	8.60	0.94076	0.00034
9.05	0.95061	0.00032	8.85	0.94961	0.00033	8.65	0.94518	0.00033
9.10	0.95513	0.00033	8.90	0.95378	0.00034	8.70	0.95021	0.00034
9.15	0.95865	0.00033	8.95	0.95816	0.00033	8.75	0.95373	0.00033
9.20	0.96287	0.00032	9.00	0.96229	0.00033	8.80	0.95766	0.00034
9.25	0.96653	0.00033	9.05	0.96682	0.00033	8.85	0.96230	0.00034
9.30	0.97089	0.00033	9.10	0.97056	0.00033	8.90	0.96680	0.00033
9.35	0.97521	0.00033	9.15	0.97437	0.00033	8.95	0.97053	0.00034
9.40	0.97904	0.00033	9.20	0.97916	0.00034	9.00	0.97506	0.00033
9.45	0.98317	0.00033	9.25	0.98239	0.00033	9.05	0.97893	0.00034
9.50	0.98682	0.00033	9.30	0.98736	0.00034	9.10	0.98250	0.00033
9.55	0.99036	0.00033	9.35	0.99115	0.00033	9.15	0.98713	0.00034
9.60	0.99450	0.00033	9.40	0.99478	0.00033	9.20	0.99118	0.00034
9.65	0.99894	0.00032	9.45	0.99855	0.00033	9.25	0.99561	0.00034
9.70	1.00193	0.00034	9.50	1.00235	0.00033	9.30	0.99880	0.00034
9.75	1.00638	0.00033	9.55	1.00626	0.00033	9.35	1.00239	0.00033
9.80	1.00934	0.00034	9.60	1.00999	0.00033	9.40	1.00665	0.00034
9.85	1.01331	0.00033	9.65	1.01424	0.00033	9.45	1.01088	0.00034
9.90	1.01719	0.00033	9.70	1.01779	0.00034	9.50	1.01496	0.00033
9.95	1.02101	0.00033	9.75	1.02226	0.00033	9.55	1.01879	0.00034
10.00	1.02509	0.00033	9.80	1.02489	0.00033	9.60	1.02243	0.00034

Table B.2.1.1.3-2. K_{eff} Values for 100% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.20	0.91972	0.00034	7.80	0.91720	0.00034	7.70	0.92001	0.00034
8.25	0.92384	0.00033	7.85	0.92189	0.00033	7.75	0.92560	0.00034
8.30	0.92862	0.00034	7.90	0.92656	0.00034	7.80	0.93070	0.00034
8.35	0.93305	0.00033	7.95	0.93049	0.00034	7.85	0.93516	0.00034
8.40	0.93764	0.00034	8.00	0.93460	0.00034	7.90	0.93968	0.00033
8.45	0.94224	0.00033	8.05	0.94003	0.00034	7.95	0.94402	0.00034
8.50	0.94569	0.00034	8.10	0.94485	0.00035	8.00	0.94820	0.00034
8.55	0.95010	0.00034	8.15	0.94913	0.00034	8.05	0.95297	0.00034
8.60	0.95475	0.00034	8.20	0.95357	0.00035	8.10	0.95781	0.00034
8.65	0.95909	0.00034	8.25	0.95827	0.00034	8.15	0.96176	0.00034
8.70	0.96334	0.00034	8.30	0.96239	0.00034	8.20	0.96606	0.00035
8.75	0.96724	0.00034	8.35	0.96671	0.00034	8.25	0.97043	0.00034
8.80	0.97172	0.00034	8.40	0.97086	0.00034	8.30	0.97527	0.00034
8.85	0.97570	0.00034	8.45	0.97562	0.00034	8.35	0.97976	0.00034
8.90	0.98004	0.00034	8.50	0.98045	0.00034	8.40	0.98364	0.00034
8.95	0.98441	0.00034	8.55	0.98411	0.00034	8.45	0.98883	0.00034
9.00	0.98804	0.00034	8.60	0.98834	0.00034	8.50	0.99198	0.00034
9.05	0.99268	0.00034	8.65	0.99302	0.00034	8.55	0.99704	0.00035
9.10	0.99664	0.00034	8.70	0.99706	0.00035	8.60	1.00099	0.00034
9.15	1.00035	0.00034	8.75	1.00133	0.00034	8.65	1.00557	0.00034
9.20	1.00483	0.00034	8.80	1.00565	0.00034	8.70	1.00894	0.00035
9.25	1.00917	0.00034	8.85	1.00896	0.00034	8.75	1.01343	0.00035
9.30	1.01299	0.00034	8.90	1.01324	0.00034	8.80	1.01750	0.00034
9.35	1.01680	0.00034	8.95	1.01878	0.00035	8.85	1.02203	0.00035
9.40	1.02033	0.00033	9.00	1.02207	0.00034	8.90	1.02546	0.00034

Table B.2.1.1.3-2. K_{eff} Values for 100% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.50	0.91411	0.00034	7.50	0.91782	0.00033	7.40	0.91688	0.00033
7.55	0.91884	0.00033	7.55	0.92273	0.00034	7.45	0.92121	0.00033
7.60	0.92273	0.00034	7.60	0.92702	0.00033	7.50	0.92548	0.00032
7.65	0.92797	0.00033	7.65	0.93133	0.00034	7.55	0.92953	0.00033
7.70	0.93236	0.00033	7.70	0.93655	0.00033	7.60	0.93411	0.00033
7.75	0.93632	0.00034	7.75	0.94097	0.00034	7.65	0.93893	0.00033
7.80	0.94111	0.00034	7.80	0.94457	0.00033	7.70	0.94278	0.00033
7.85	0.94586	0.00034	7.85	0.94949	0.00034	7.75	0.94740	0.00033
7.90	0.95055	0.00033	7.90	0.95354	0.00033	7.80	0.95158	0.00033
7.95	0.95408	0.00034	7.95	0.95826	0.00034	7.85	0.95608	0.00034
8.00	0.95914	0.00034	8.00	0.96248	0.00034	7.90	0.96045	0.00033
8.05	0.96326	0.00034	8.05	0.96691	0.00034	7.95	0.96411	0.00033
8.10	0.96778	0.00033	8.10	0.97071	0.00034	8.00	0.96838	0.00033
8.15	0.97236	0.00034	8.15	0.97559	0.00034	8.05	0.97303	0.00032
8.20	0.97637	0.00034	8.20	0.97921	0.00034	8.10	0.97718	0.00033
8.25	0.98069	0.00034	8.25	0.98426	0.00034	8.15	0.98056	0.00033
8.30	0.98547	0.00033	8.30	0.98744	0.00034	8.20	0.98464	0.00034
8.35	0.98860	0.00034	8.35	0.99209	0.00034	8.25	0.98869	0.00033
8.40	0.99309	0.00034	8.40	0.99521	0.00033	8.30	0.99333	0.00033
8.45	0.99690	0.00034	8.45	1.00027	0.00034	8.35	0.99714	0.00033
8.50	1.00107	0.00035	8.50	1.00387	0.00034	8.40	1.00102	0.00032
8.55	1.00538	0.00035	8.55	1.00761	0.00033	8.45	1.00466	0.00033
8.60	1.00909	0.00034	8.60	1.01207	0.00033	8.50	1.00903	0.00033
8.65	1.01337	0.00034	8.65	1.01568	0.00033	8.55	1.01278	0.00034
8.70	1.01794	0.00033	8.70	1.01972	0.00034	8.60	1.01633	0.00032
8.75	1.02112	0.00034				8.65	1.01966	0.00034
8.80	1.02580	0.00034				8.70	1.02433	0.00033

Table B.2.1.1.3-2. K_{eff} Values for 100% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.40	0.91951	0.00033	7.40	0.92289	0.00033	7.30	0.91519	0.00032
7.45	0.92405	0.00033	7.45	0.92733	0.00032	7.35	0.91985	0.00031
7.50	0.92854	0.00033	7.50	0.93116	0.00033	7.40	0.92474	0.00032
7.55	0.93314	0.00033	7.55	0.93621	0.00033	7.45	0.92912	0.00032
7.60	0.93683	0.00033	7.60	0.93937	0.00033	7.50	0.93269	0.00033
7.65	0.94115	0.00032	7.65	0.94435	0.00033	7.55	0.93725	0.00033
7.70	0.94499	0.00033	7.70	0.94830	0.00033	7.60	0.94165	0.00032
7.75	0.95053	0.00033	7.75	0.95328	0.00033	7.65	0.94549	0.00033
7.80	0.95435	0.00032	7.80	0.95707	0.00032	7.70	0.95023	0.00032
7.85	0.95859	0.00032	7.85	0.96147	0.00032	7.75	0.95437	0.00033
7.90	0.96246	0.00033	7.90	0.96538	0.00032	7.80	0.95830	0.00032
7.95	0.96644	0.00032	7.95	0.96974	0.00032	7.85	0.96305	0.00033
8.00	0.97120	0.00033	8.00	0.97347	0.00032	7.90	0.96708	0.00033
8.05	0.97543	0.00033	8.05	0.97828	0.00032	7.95	0.97122	0.00033
8.10	0.97913	0.00032	8.10	0.98200	0.00033	8.00	0.97460	0.00032
8.15	0.98284	0.00033	8.15	0.98596	0.00032	8.05	0.97905	0.00032
8.20	0.98726	0.00033	8.20	0.98931	0.00033	8.10	0.98297	0.00032
8.25	0.99139	0.00033	8.25	0.99359	0.00032	8.15	0.98689	0.00033
8.30	0.99572	0.00033	8.30	0.99715	0.00032	8.20	0.99086	0.00032
8.35	0.99895	0.00032	8.35	1.00104	0.00032	8.25	0.99473	0.00032
8.40	1.00277	0.00033	8.40	1.00538	0.00032	8.30	0.99894	0.00032
8.45	1.00704	0.00032	8.45	1.00959	0.00033	8.35	1.00269	0.00033
8.50	1.01080	0.00033	8.50	1.01326	0.00033	8.40	1.00683	0.00033
8.55	1.01457	0.00033	8.55	1.01706	0.00032	8.45	1.01081	0.00033
8.60	1.01844	0.00033	8.60	1.02116	0.00033	8.50	1.01453	0.00033
						8.55	1.01854	0.00032
						8.60	1.02167	0.00032

Table B.2.1.1.3-2. K_{eff} Values for 100% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.30	0.91744	0.00032	7.20	0.91490	0.00032	7.10	0.91504	0.00031
7.35	0.92054	0.00032	7.25	0.91853	0.00032	7.15	0.91925	0.00032
7.40	0.92494	0.00033	7.30	0.92374	0.00032	7.20	0.92407	0.00032
7.45	0.92978	0.00032	7.35	0.92832	0.00032	7.25	0.92815	0.00032
7.50	0.93443	0.00032	7.40	0.93251	0.00032	7.30	0.93232	0.00031
7.55	0.93872	0.00032	7.45	0.93674	0.00032	7.35	0.93699	0.00031
7.60	0.94308	0.00032	7.50	0.94031	0.00032	7.40	0.94155	0.00032
7.65	0.94753	0.00032	7.55	0.94516	0.00032	7.45	0.94540	0.00032
7.70	0.95182	0.00033	7.60	0.94978	0.00032	7.50	0.95002	0.00033
7.75	0.95615	0.00031	7.65	0.95400	0.00032	7.55	0.95411	0.00032
7.80	0.96013	0.00032	7.70	0.95800	0.00032	7.60	0.95914	0.00031
7.85	0.96326	0.00034	7.75	0.96174	0.00032	7.65	0.96332	0.00031
7.90	0.96864	0.00032	7.80	0.96646	0.00033	7.70	0.96685	0.00032
7.95	0.97203	0.00032	7.85	0.97062	0.00032	7.75	0.97109	0.00031
8.00	0.97661	0.00032	7.90	0.97465	0.00032	7.80	0.97505	0.00031
8.05	0.98009	0.00032	7.95	0.97936	0.00032	7.85	0.97964	0.00032
8.10	0.98500	0.00032	8.00	0.98277	0.00032	7.90	0.98298	0.00032
8.15	0.98850	0.00032	8.05	0.98650	0.00032	7.95	0.98740	0.00032
8.20	0.99164	0.00033	8.10	0.99069	0.00032	8.00	0.99143	0.00032
8.25	0.99602	0.00033	8.15	0.99512	0.00033	8.05	0.99555	0.00032
8.30	1.00002	0.00033	8.20	0.99813	0.00032	8.10	0.99994	0.00032
8.35	1.00481	0.00033	8.25	1.00208	0.00032	8.15	1.00342	0.00031
8.40	1.00842	0.00032	8.30	1.00640	0.00033	8.20	1.00697	0.00032
8.45	1.01168	0.00032	8.35	1.00976	0.00032	8.25	1.01097	0.00032
8.50	1.01520	0.00033	8.40	1.01395	0.00032	8.30	1.01472	0.00032
8.55	1.01926	0.00033	8.45	1.01750	0.00032	8.35	1.01874	0.00032
8.60	1.02306	0.00033	8.50	1.02175	0.00032	8.40	1.02222	0.00032

Table B.2.1.1.3-2. K_{eff} Values for 100% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.90	0.91656	0.00031	6.70	0.91835	0.00030	6.50	0.91974	0.00030
6.95	0.92083	0.00031	6.75	0.92339	0.00031	6.55	0.92507	0.00030
7.00	0.92552	0.00032	6.80	0.92805	0.00031	6.60	0.93039	0.00030
7.05	0.93022	0.00031	6.85	0.93313	0.00031	6.65	0.93467	0.00030
7.10	0.93508	0.00031	6.90	0.93676	0.00031	6.70	0.93972	0.00030
7.15	0.93978	0.00030	6.95	0.94233	0.00031	6.75	0.94459	0.00031
7.20	0.94344	0.00031	7.00	0.94663	0.00031	6.80	0.94916	0.00030
7.25	0.94854	0.00031	7.05	0.95107	0.00030	6.85	0.95426	0.00030
7.30	0.95182	0.00031	7.10	0.95557	0.00030	6.90	0.95916	0.00030
7.35	0.95677	0.00031	7.15	0.96058	0.00030	6.95	0.96380	0.00030
7.40	0.96149	0.00031	7.20	0.96458	0.00031	7.00	0.96791	0.00030
7.45	0.96564	0.00031	7.25	0.96994	0.00030	7.05	0.97260	0.00030
7.50	0.96990	0.00031	7.30	0.97375	0.00031	7.10	0.97743	0.00030
7.55	0.97450	0.00031	7.35	0.97791	0.00030	7.15	0.98184	0.00030
7.60	0.97863	0.00031	7.40	0.98190	0.00031	7.20	0.98613	0.00031
7.65	0.98268	0.00031	7.45	0.98642	0.00031	7.25	0.99069	0.00030
7.70	0.98664	0.00031	7.50	0.99120	0.00030	7.30	0.99532	0.00030
7.75	0.99110	0.00031	7.55	0.99579	0.00031	7.35	0.99979	0.00030
7.80	0.99476	0.00031	7.60	0.99969	0.00031	7.40	1.00416	0.00030
7.85	0.99893	0.00031	7.65	1.00400	0.00031	7.45	1.00891	0.00030
7.90	1.00255	0.00031	7.70	1.00872	0.00031	7.50	1.01298	0.00030
7.95	1.00711	0.00031	7.75	1.01218	0.00032	7.55	1.01741	0.00031
8.00	1.01058	0.00031	7.80	1.01611	0.00031	7.60	1.02171	0.00031
8.05	1.01459	0.00031	7.85	1.02030	0.00031			
8.10	1.01852	0.00031	7.90	1.02443	0.00031			

Table B.2.1.1.3-2. K_{eff} Values for 100% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.30	0.92023	0.00029	6.20	0.92067	0.00029	6.10	0.91992	0.00030
6.35	0.92586	0.00030	6.25	0.92557	0.00030	6.15	0.92572	0.00030
6.40	0.93142	0.00030	6.30	0.93083	0.00030	6.20	0.93032	0.00030
6.45	0.93615	0.00030	6.35	0.93598	0.00030	6.25	0.93571	0.00030
6.50	0.94145	0.00030	6.40	0.94107	0.00030	6.30	0.94127	0.00029
6.55	0.94597	0.00029	6.45	0.94611	0.00029	6.35	0.94600	0.00029
6.60	0.95100	0.00029	6.50	0.95200	0.00030	6.40	0.95177	0.00030
6.65	0.95585	0.00030	6.55	0.95662	0.00030	6.45	0.95673	0.00030
6.70	0.96105	0.00030	6.60	0.96181	0.00030	6.50	0.96191	0.00030
6.75	0.96583	0.00030	6.65	0.96707	0.00030	6.55	0.96705	0.00030
6.80	0.97070	0.00030	6.70	0.97143	0.00030	6.60	0.97227	0.00030
6.85	0.97540	0.00030	6.75	0.97669	0.00029	6.65	0.97680	0.00030
6.90	0.98019	0.00030	6.80	0.98145	0.00029	6.70	0.98222	0.00030
6.95	0.98538	0.00030	6.85	0.98617	0.00030	6.75	0.98756	0.00030
7.00	0.98971	0.00029	6.90	0.99086	0.00030	6.80	0.99240	0.00030
7.05	0.99490	0.00031	6.95	0.99530	0.00031	6.85	0.99698	0.00030
7.10	0.99882	0.00030	7.00	1.00057	0.00030	6.90	1.00173	0.00030
7.15	1.00371	0.00030	7.05	1.00583	0.00030	6.95	1.00683	0.00030
7.20	1.00853	0.00031	7.10	1.00994	0.00030	7.00	1.01157	0.00030
7.25	1.01310	0.00031	7.15	1.01453	0.00030	7.05	1.01564	0.00030
7.30	1.01769	0.00030	7.20	1.01909	0.00030	7.10	1.02084	0.00030

Table B.2.1.1.3-2. K_{eff} Values for 100% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.90	0.91757	0.00029	5.70	0.91415	0.00028	5.00	0.91542	0.00027
5.95	0.92325	0.00029	5.75	0.91948	0.00028	5.05	0.92229	0.00027
6.00	0.92875	0.00029	5.80	0.92503	0.00029	5.10	0.92878	0.00028
6.05	0.93422	0.00029	5.85	0.93130	0.00029	5.15	0.93558	0.00028
6.10	0.93949	0.00029	5.90	0.93703	0.00029	5.20	0.94233	0.00028
6.15	0.94518	0.00029	5.95	0.94257	0.00030	5.25	0.94885	0.00028
6.20	0.95044	0.00029	6.00	0.94859	0.00029	5.30	0.95604	0.00028
6.25	0.95574	0.00029	6.05	0.95434	0.00029	5.35	0.96218	0.00028
6.30	0.96127	0.00030	6.10	0.96014	0.00029	5.40	0.96894	0.00028
6.35	0.96678	0.00029	6.15	0.96516	0.00029	5.45	0.97565	0.00028
6.40	0.97234	0.00030	6.20	0.97085	0.00030	5.50	0.98145	0.00027
6.45	0.97730	0.00029	6.25	0.97606	0.00029	5.55	0.98814	0.00027
6.50	0.98194	0.00029	6.30	0.98177	0.00029	5.60	0.99444	0.00028
6.55	0.98779	0.00029	6.35	0.98707	0.00030	5.65	1.00074	0.00028
6.60	0.99275	0.00029	6.40	0.99228	0.00029	5.70	1.00676	0.00028
6.65	0.99805	0.00030	6.45	0.99799	0.00029	5.75	1.01290	0.00028
6.70	1.00322	0.00029	6.50	1.00290	0.00028	5.80	1.01977	0.00028
6.75	1.00830	0.00030	6.55	1.00813	0.00030			
6.80	1.01307	0.00030	6.60	1.01316	0.00030			
6.85	1.01821	0.00029	6.65	1.01899	0.00029			
6.90	1.02308	0.00029	6.70	1.02369	0.00029			

Table B.2.1.1.3-2. K_{eff} Values for 100% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

18900 milli-g/cc								
Diameter (inches)	K_{eff}	Sigma						
4.50	0.91030	0.00026						
4.55	0.91798	0.00026						
4.60	0.92526	0.00026						
4.65	0.93269	0.00026						
4.70	0.94010	0.00026						
4.75	0.94789	0.00026						
4.80	0.95487	0.00027						
4.85	0.96191	0.00026						
4.90	0.96937	0.00026						
4.95	0.97679	0.00027						
5.00	0.98355	0.00027						
5.05	0.99052	0.00027						
5.10	0.99789	0.00027						
5.15	1.00431	0.00027						
5.20	1.01122	0.00027						
5.25	1.01858	0.00028						
5.30	1.02565	0.00027						

B.2.1.2. 93.5% ^{235}U 6.5% ^{238}U

B.2.1.2.1. Unreflected

Case ID: u5-sp-0935-00

Material: Uranium metal in water

Geometry: Sphere

Isotopics: 93.5% ^{235}U 6.5% ^{238}U

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.2.1.2.1-1. 93.5% ^{235}U Sphere - 0 Inches of Water Reflection

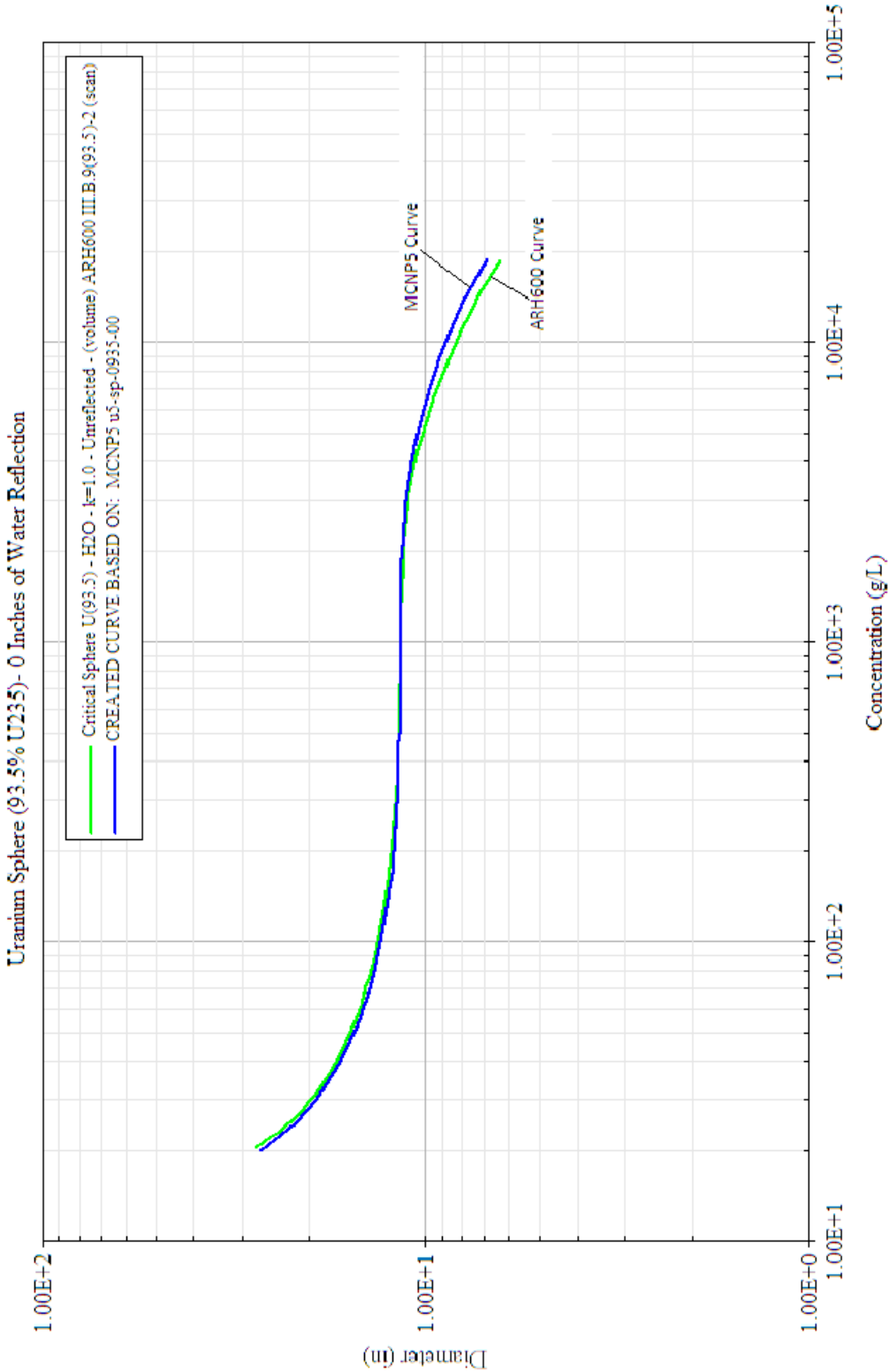

Table B.2.1.2.1-1. Critical Dimensions for 93.5% ^{235}U Sphere - 0 Inches of Water Reflection

93.5% ^{235}U Sphere- 0 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.020	22.300	28.100	0.300	26.9927
0.025	18.700	22.500	0.200	21.7039
0.030	16.800	19.800	0.100	19.1519
0.040	14.800	17.100	0.100	16.5911
0.045	14.200	16.300	0.100	15.8596
0.050	13.800	15.700	0.100	15.2812
0.055	13.400	15.200	0.100	14.8428
0.060	13.100	14.900	0.100	14.5008
0.065	12.900	14.600	0.050	14.1931
0.070	12.700	14.400	0.050	13.9613
0.080	12.300	13.900	0.050	13.5547
0.100	11.900	13.400	0.050	13.0236
0.130	11.400	12.900	0.050	12.5598
0.150	11.300	12.700	0.050	12.3544
0.170	11.100	12.500	0.050	12.2098
0.200	11.000	12.400	0.050	12.0496
0.350	10.700	12.000	0.050	11.6989
0.500	10.600	11.900	0.050	11.6086
0.800	10.500	11.900	0.050	11.5698
1.000	10.500	11.900	0.050	11.5707
1.500	10.500	11.900	0.050	11.5532
1.700	10.400	11.900	0.050	11.5217
1.900	10.400	11.800	0.050	11.4859
2.000	10.400	11.800	0.050	11.4744
2.100	10.400	11.800	0.050	11.4605
2.500	10.300	11.700	0.050	11.3584
3.000	10.100	11.500	0.050	11.2107
4.000	9.800	11.200	0.050	10.8586
5.000	9.500	10.800	0.050	10.4868
6.000	9.100	10.400	0.050	10.1105
7.000	8.800	10.100	0.050	9.7582
7.500	8.700	9.900	0.050	9.5924
8.000	8.500	9.700	0.050	9.4236
9.000	8.300	9.400	0.050	9.1209
10.000	8.000	9.100	0.050	8.8313
15.000	6.900	7.900	0.050	7.6585
18.900	6.200	7.100	0.050	6.9001

MCNP5 Sample Input File
93.5% ^{235}U Sphere- 0" Reflection

```
U sphere, 93.5 wt% 235U, 00800 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1060  hundreths of inches - must be integer
c radius =    13.4620 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00800 milli-g Pu/cc
c Reflector width =  0.0 inches
c Enrichment = 0.935 wt fraction 235U
c
c Density of H2O 1.00000
c Density of U 18.90000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0423 cc
c Volume of water in sample 0.9577 cc
c
c Mass of crit in sample   0.8000 g
c Mass of water in sample  0.9577 g
c
c Total mass of sample  1.7577g for a 1cc sample
c Mass Density for crit material  -1.7577, expressed as negative
c
c  sphere
20 11   -1.757672   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=0    $zero importance if no reflector
22  0            2           imp:n=0

1       so    13.4620              $ Sphere
2       so    13.4620         $ Reflection

mode n
kcode 2000 1.0 100  4100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
```

```
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u/water mixture
m11    $ U/H2O Sludge, 95.0 wt% 235U, 00800 milli-g U/cc,  1.7577
1001.66c -0.060966
8016.66c -0.483887
92235.66c -0.425563
92238.66c -0.029585
mt11     lwtr.60t
c
c    u only
m12    $ U, 95.0 wt% 235U, 00800 milli-g U/cc,  1.7577
92235.66c -0.935000
92238.66c -0.065000
c
```

Critview Compatible Data File
93.5% ^{235}U Sphere- 0” Reflection

reset:
title: MCNP5 u5-sp-0935-00
set: MCNP5 set
source: MCNP5 primary
created: Mon 07/19/2010 14:19:46.28
geometry: sphere
modmat: H2O
critmat: uranium
isomat: U235 0.935 ^{238}U 0.065
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.020	26.9927
0.025	21.7039
0.030	19.1519
0.040	16.5911
0.045	15.8596
0.050	15.2812
0.055	14.8428
0.060	14.5008
0.065	14.1931
0.070	13.9613
0.080	13.5547
0.100	13.0236
0.130	12.5598
0.150	12.3544
0.170	12.2098
0.200	12.0496
0.350	11.6989
0.500	11.6086
0.800	11.5698
1.000	11.5707
1.500	11.5532
1.700	11.5217
1.900	11.4859
2.000	11.4744
2.100	11.4605
2.500	11.3584
3.000	11.2107
4.000	10.8586
5.000	10.4868
6.000	10.1105
7.000	9.7582
7.500	9.5924
8.000	9.4236
9.000	9.1209
10.00	8.8313
15.00	7.6585
18.90	6.9001

Table B.2.1.2.1-2. K_{eff} Values for 93.5% ^{235}U Sphere - 0 Inches of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
22.30	0.92597	0.00021	18.70	0.92381	0.00025	16.80	0.92169	0.00027
22.60	0.93183	0.00022	18.90	0.92959	0.00025	16.90	0.92601	0.00027
22.90	0.93772	0.00022	19.10	0.93536	0.00024	17.00	0.92879	0.00027
23.50	0.94809	0.00021	19.30	0.94088	0.00025	17.10	0.93283	0.00027
23.80	0.95335	0.00021	19.50	0.94651	0.00025	17.20	0.93603	0.00027
24.10	0.95841	0.00021	19.70	0.95179	0.00024	17.30	0.94055	0.00026
24.40	0.96343	0.00021	19.90	0.95665	0.00024	17.40	0.94344	0.00027
24.70	0.96766	0.00021	20.10	0.96273	0.00024	17.50	0.94729	0.00027
25.00	0.97237	0.00020	20.30	0.96645	0.00024	17.60	0.95068	0.00026
25.60	0.98086	0.00020	20.50	0.97226	0.00024	17.70	0.95376	0.00026
25.90	0.98501	0.00020	20.70	0.97696	0.00024	17.80	0.95711	0.00027
26.20	0.98925	0.00020	20.90	0.98168	0.00024	17.90	0.96069	0.00027
26.50	0.99307	0.00020	21.10	0.98658	0.00024	18.00	0.96426	0.00027
26.80	0.99743	0.00020	21.30	0.99066	0.00024	18.10	0.96760	0.00026
27.10	1.00143	0.00020	21.50	0.99485	0.00024	18.20	0.96997	0.00027
27.40	1.00479	0.00020	21.70	0.99991	0.00024	18.30	0.97344	0.00027
27.70	1.00840	0.00019	21.90	1.00456	0.00024	18.40	0.97643	0.00026
28.00	1.01216	0.00019	22.10	1.00887	0.00023	18.50	0.97968	0.00026
28.10	1.01297	0.00020	22.30	1.01257	0.00023	18.60	0.98372	0.00027
			22.50	1.01664	0.00023	18.70	0.98580	0.00026
						18.80	0.98933	0.00026
						18.90	0.99207	0.00026
						19.00	0.99534	0.00026
						19.10	0.99838	0.00026
						19.20	1.00150	0.00026
						19.30	1.00418	0.00026
						19.40	1.00709	0.00026
						19.50	1.01015	0.00026
						19.60	1.01281	0.00026
						19.70	1.01532	0.00026
						19.80	1.01822	0.00026

Table B.2.1.2.1-2. K_{eff} Values for 93.5% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
14.80	0.91991	0.00030	14.20	0.91911	0.00030	13.80	0.92145	0.00031
14.90	0.92423	0.00030	14.30	0.92394	0.00031	13.90	0.92641	0.00031
15.00	0.92907	0.00029	14.40	0.92864	0.00030	14.00	0.93234	0.00032
15.10	0.93391	0.00030	14.50	0.93455	0.00031	14.10	0.93834	0.00032
15.20	0.93861	0.00030	14.60	0.93946	0.00031	14.20	0.94409	0.00032
15.30	0.94360	0.00030	14.70	0.94402	0.00030	14.30	0.94915	0.00031
15.40	0.94791	0.00030	14.80	0.94997	0.00030	14.40	0.95466	0.00031
15.50	0.95290	0.00029	14.90	0.95464	0.00031	14.50	0.95954	0.00031
15.60	0.95723	0.00029	15.00	0.95946	0.00031	14.60	0.96486	0.00031
15.70	0.96147	0.00029	15.10	0.96478	0.00031	14.70	0.97039	0.00032
15.80	0.96596	0.00030	15.20	0.96910	0.00030	14.80	0.97527	0.00031
15.90	0.97055	0.00029	15.30	0.97462	0.00030	14.90	0.97962	0.00031
16.00	0.97406	0.00030	15.40	0.97890	0.00030	15.00	0.98551	0.00032
16.10	0.97921	0.00029	15.50	0.98376	0.00031	15.10	0.99021	0.00032
16.20	0.98336	0.00030	15.60	0.98780	0.00030	15.20	0.99529	0.00031
16.30	0.98726	0.00029	15.70	0.99300	0.00030	15.30	1.00109	0.00031
16.40	0.99222	0.00030	15.80	0.99774	0.00030	15.40	1.00554	0.00032
16.50	0.99571	0.00030	15.90	1.00153	0.00031	15.50	1.01057	0.00031
16.60	1.00042	0.00029	16.00	1.00612	0.00030	15.60	1.01440	0.00032
16.70	1.00406	0.00029	16.10	1.01048	0.00030	15.70	1.01980	0.00031
16.80	1.00798	0.00030	16.20	1.01486	0.00031			
16.90	1.01154	0.00029	16.30	1.02006	0.00030			
17.00	1.01572	0.00030						
17.10	1.02010	0.00029						

Table B.2.1.2.1-2. K_{eff} Values for 93.5% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
13.40	0.91849	0.00032	13.10	0.91822	0.00033	12.90	0.92041	0.00033
13.50	0.92473	0.00033	13.20	0.92402	0.00033	12.95	0.92307	0.00034
13.60	0.93091	0.00032	13.30	0.93016	0.00033	13.00	0.92729	0.00033
13.70	0.93721	0.00033	13.40	0.93668	0.00033	13.05	0.93036	0.00033
13.80	0.94208	0.00032	13.50	0.94326	0.00033	13.10	0.93291	0.00033
13.90	0.94827	0.00032	13.60	0.94909	0.00033	13.15	0.93757	0.00034
14.00	0.95410	0.00032	13.70	0.95550	0.00033	13.20	0.94043	0.00033
14.10	0.95937	0.00033	13.80	0.96170	0.00033	13.25	0.94368	0.00033
14.20	0.96552	0.00032	13.90	0.96729	0.00033	13.30	0.94687	0.00033
14.30	0.97054	0.00032	14.00	0.97319	0.00033	13.35	0.94966	0.00034
14.40	0.97578	0.00033	14.10	0.97893	0.00033	13.40	0.95261	0.00033
14.50	0.98143	0.00033	14.20	0.98375	0.00033	13.45	0.95576	0.00034
14.60	0.98715	0.00032	14.30	0.98879	0.00032	13.50	0.95901	0.00034
14.70	0.99220	0.00032	14.40	0.99454	0.00033	13.55	0.96168	0.00034
14.80	0.99799	0.00032	14.50	0.99995	0.00033	13.60	0.96491	0.00033
14.90	1.00269	0.00032	14.60	1.00604	0.00033	13.65	0.96874	0.00033
15.00	1.00817	0.00032	14.70	1.01225	0.00032	13.70	0.97119	0.00033
15.10	1.01314	0.00032	14.80	1.01629	0.00032	13.75	0.97444	0.00034
15.20	1.01744	0.00032	14.90	1.02195	0.00033	13.80	0.97691	0.00034
						13.85	0.97960	0.00034
						13.90	0.98288	0.00033
						13.95	0.98634	0.00033
						14.00	0.98806	0.00033
						14.05	0.99195	0.00034
						14.10	0.99432	0.00034
						14.15	0.99701	0.00034
						14.20	1.00048	0.00034
						14.25	1.00309	0.00034
						14.30	1.00591	0.00033
						14.35	1.00865	0.00034
						14.40	1.01142	0.00033
						14.45	1.01386	0.00033
						14.50	1.01749	0.00033
						14.55	1.01994	0.00033
						14.60	1.02241	0.00034

Table B.2.1.2.1-2. K_{eff} Values for 93.5% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.70	0.92114	0.00035	12.30	0.91619	0.00035	11.90	0.91938	0.00035
12.75	0.92434	0.00034	12.35	0.92094	0.00034	11.95	0.92384	0.00036
12.80	0.92779	0.00033	12.40	0.92302	0.00034	12.00	0.92668	0.00036
12.85	0.93134	0.00034	12.45	0.92691	0.00035	12.05	0.93033	0.00036
12.90	0.93434	0.00034	12.50	0.93048	0.00034	12.10	0.93386	0.00036
12.95	0.93823	0.00034	12.55	0.93379	0.00035	12.15	0.93776	0.00036
13.00	0.94062	0.00034	12.60	0.93716	0.00035	12.20	0.94153	0.00036
13.05	0.94403	0.00034	12.65	0.93987	0.00035	12.25	0.94607	0.00035
13.10	0.94745	0.00035	12.70	0.94439	0.00035	12.30	0.94896	0.00036
13.15	0.95036	0.00034	12.75	0.94797	0.00034	12.35	0.95277	0.00036
13.20	0.95365	0.00035	12.80	0.95079	0.00035	12.40	0.95695	0.00036
13.25	0.95773	0.00034	12.85	0.95434	0.00035	12.45	0.95998	0.00036
13.30	0.96028	0.00034	12.90	0.95805	0.00035	12.50	0.96375	0.00036
13.35	0.96374	0.00033	12.95	0.96110	0.00035	12.55	0.96717	0.00036
13.40	0.96687	0.00034	13.00	0.96522	0.00034	12.60	0.97106	0.00036
13.45	0.97054	0.00034	13.05	0.96856	0.00035	12.65	0.97421	0.00035
13.50	0.97275	0.00034	13.10	0.97119	0.00034	12.70	0.97791	0.00036
13.55	0.97582	0.00035	13.15	0.97451	0.00034	12.75	0.98112	0.00036
13.60	0.97943	0.00033	13.20	0.97766	0.00035	12.80	0.98430	0.00036
13.65	0.98153	0.00034	13.25	0.98134	0.00035	12.85	0.98792	0.00036
13.70	0.98459	0.00034	13.30	0.98308	0.00034	12.90	0.99090	0.00036
13.75	0.98833	0.00034	13.35	0.98637	0.00035	12.95	0.99549	0.00035
13.80	0.99092	0.00034	13.40	0.99078	0.00034	13.00	0.99835	0.00037
13.85	0.99373	0.00034	13.45	0.99347	0.00035	13.05	1.00185	0.00036
13.90	0.99662	0.00035	13.50	0.99612	0.00035	13.10	1.00520	0.00036
13.95	0.99924	0.00033	13.55	0.99972	0.00035	13.15	1.00830	0.00035
14.00	1.00261	0.00034	13.60	1.00273	0.00034	13.20	1.01167	0.00035
14.05	1.00584	0.00034	13.65	1.00644	0.00034	13.25	1.01491	0.00036
14.10	1.00855	0.00034	13.70	1.00881	0.00035	13.30	1.01821	0.00036
14.15	1.01182	0.00034	13.75	1.01210	0.00035	13.35	1.02185	0.00036
14.20	1.01496	0.00034	13.80	1.01508	0.00035	13.40	1.02539	0.00036
14.25	1.01731	0.00034	13.85	1.01824	0.00034			
14.30	1.02084	0.00034	13.90	1.02070	0.00035			
14.35	1.02253	0.00034						
14.40	1.02579	0.00034						

Table B.2.1.2.1-2. K_{eff} Values for 93.5% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.40	0.91192	0.00037	11.30	0.91763	0.00037	11.10	0.91164	0.00037
11.45	0.91570	0.00037	11.35	0.92076	0.00037	11.15	0.91667	0.00038
11.50	0.91961	0.00037	11.40	0.92612	0.00038	11.20	0.91998	0.00038
11.55	0.92321	0.00036	11.45	0.92985	0.00037	11.25	0.92415	0.00038
11.60	0.92767	0.00037	11.50	0.93276	0.00037	11.30	0.92838	0.00037
11.65	0.93181	0.00037	11.55	0.93763	0.00038	11.35	0.93241	0.00038
11.70	0.93541	0.00037	11.60	0.94155	0.00037	11.40	0.93634	0.00037
11.75	0.93952	0.00036	11.65	0.94590	0.00037	11.45	0.94008	0.00037
11.80	0.94301	0.00037	11.70	0.94899	0.00037	11.50	0.94520	0.00037
11.85	0.94595	0.00036	11.75	0.95311	0.00038	11.55	0.94856	0.00038
11.90	0.95123	0.00037	11.80	0.95791	0.00037	11.60	0.95270	0.00038
11.95	0.95547	0.00036	11.85	0.96188	0.00037	11.65	0.95721	0.00037
12.00	0.95915	0.00037	11.90	0.96476	0.00038	11.70	0.96082	0.00037
12.05	0.96307	0.00037	11.95	0.96909	0.00038	11.75	0.96459	0.00038
12.10	0.96647	0.00037	12.00	0.97277	0.00038	11.80	0.96906	0.00037
12.15	0.97053	0.00037	12.05	0.97737	0.00037	11.85	0.97228	0.00037
12.20	0.97367	0.00037	12.10	0.98078	0.00038	11.90	0.97660	0.00038
12.25	0.97744	0.00037	12.15	0.98388	0.00037	11.95	0.98025	0.00037
12.30	0.98079	0.00037	12.20	0.98882	0.00037	12.00	0.98483	0.00039
12.35	0.98510	0.00037	12.25	0.99193	0.00037	12.05	0.98838	0.00038
12.40	0.98837	0.00036	12.30	0.99588	0.00038	12.10	0.99104	0.00037
12.45	0.99227	0.00037	12.35	0.99975	0.00038	12.15	0.99568	0.00038
12.50	0.99567	0.00037	12.40	1.00259	0.00038	12.20	0.99928	0.00038
12.55	0.99913	0.00037	12.45	1.00668	0.00038	12.25	1.00296	0.00038
12.60	1.00356	0.00037	12.50	1.01043	0.00037	12.30	1.00709	0.00037
12.65	1.00625	0.00037	12.55	1.01432	0.00037	12.35	1.01057	0.00037
12.70	1.01019	0.00037	12.60	1.01754	0.00037	12.40	1.01442	0.00038
12.75	1.01306	0.00037	12.65	1.02143	0.00038	12.45	1.01795	0.00039
12.80	1.01699	0.00037	12.70	1.02488	0.00038	12.50	1.02133	0.00038
12.85	1.02096	0.00037						
12.90	1.02445	0.00036						

Table B.2.1.2.1-2. K_{eff} Values for 93.5% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.00	0.91486	0.00038	10.70	0.91623	0.00039	10.60	0.91655	0.00038
11.05	0.91936	0.00038	10.75	0.92111	0.00038	10.65	0.92050	0.00037
11.10	0.92371	0.00038	10.80	0.92489	0.00038	10.70	0.92565	0.00038
11.15	0.92774	0.00038	10.85	0.92932	0.00038	10.75	0.92966	0.00038
11.20	0.93171	0.00038	10.90	0.93441	0.00038	10.80	0.93353	0.00038
11.25	0.93569	0.00038	10.95	0.93802	0.00038	10.85	0.93865	0.00038
11.30	0.93993	0.00037	11.00	0.94325	0.00038	10.90	0.94244	0.00038
11.35	0.94469	0.00037	11.05	0.94626	0.00039	10.95	0.94711	0.00039
11.40	0.94827	0.00037	11.10	0.95135	0.00038	11.00	0.95053	0.00037
11.45	0.95330	0.00037	11.15	0.95526	0.00038	11.05	0.95569	0.00038
11.50	0.95757	0.00038	11.20	0.95928	0.00038	11.10	0.95965	0.00038
11.55	0.96104	0.00039	11.25	0.96393	0.00039	11.15	0.96356	0.00038
11.60	0.96505	0.00038	11.30	0.96764	0.00038	11.20	0.96731	0.00038
11.65	0.96910	0.00038	11.35	0.97158	0.00038	11.25	0.97205	0.00038
11.70	0.97317	0.00037	11.40	0.97560	0.00039	11.30	0.97561	0.00039
11.75	0.97634	0.00038	11.45	0.97952	0.00038	11.35	0.97971	0.00038
11.80	0.98090	0.00037	11.50	0.98391	0.00039	11.40	0.98442	0.00038
11.85	0.98483	0.00038	11.55	0.98771	0.00039	11.45	0.98749	0.00038
11.90	0.98883	0.00038	11.60	0.99246	0.00039	11.50	0.99088	0.00038
11.95	0.99318	0.00038	11.65	0.99611	0.00039	11.55	0.99502	0.00038
12.00	0.99665	0.00038	11.70	1.00009	0.00039	11.60	0.99922	0.00038
12.05	1.00003	0.00038	11.75	1.00362	0.00039	11.65	1.00377	0.00039
12.10	1.00486	0.00038	11.80	1.00758	0.00038	11.70	1.00749	0.00038
12.15	1.00828	0.00039	11.85	1.01185	0.00038	11.75	1.01030	0.00038
12.20	1.01154	0.00038	11.90	1.01532	0.00038	11.80	1.01573	0.00038
12.25	1.01567	0.00039	11.95	1.02016	0.00039	11.85	1.01882	0.00039
12.30	1.01931	0.00038	12.00	1.02370	0.00038	11.90	1.02297	0.00038
12.35	1.02286	0.00038						
12.40	1.02683	0.00038						

Table B.2.1.2.1-2. K_{eff} Values for 93.5% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.50	0.91399	0.00037	10.50	0.91542	0.00037	10.50	0.92100	0.00036
10.55	0.91778	0.00038	10.55	0.91976	0.00037	10.55	0.92407	0.00035
10.60	0.92227	0.00037	10.60	0.92379	0.00036	10.60	0.92821	0.00035
10.65	0.92619	0.00037	10.65	0.92788	0.00037	10.65	0.93298	0.00035
10.70	0.93094	0.00037	10.70	0.93207	0.00036	10.70	0.93590	0.00035
10.75	0.93472	0.00037	10.75	0.93594	0.00036	10.75	0.93964	0.00036
10.80	0.94008	0.00037	10.80	0.93990	0.00037	10.80	0.94474	0.00035
10.85	0.94317	0.00037	10.85	0.94505	0.00036	10.85	0.94798	0.00036
10.90	0.94727	0.00037	10.90	0.94727	0.00036	10.90	0.95183	0.00036
10.95	0.95155	0.00037	10.95	0.95183	0.00037	10.95	0.95589	0.00035
11.00	0.95554	0.00038	11.00	0.95532	0.00037	11.00	0.95855	0.00035
11.05	0.95943	0.00037	11.05	0.96039	0.00037	11.05	0.96364	0.00035
11.10	0.96335	0.00037	11.10	0.96432	0.00037	11.10	0.96686	0.00035
11.15	0.96635	0.00037	11.15	0.96781	0.00037	11.15	0.97139	0.00035
11.20	0.97086	0.00038	11.20	0.97132	0.00037	11.20	0.97484	0.00036
11.25	0.97572	0.00037	11.25	0.97533	0.00036	11.25	0.97869	0.00036
11.30	0.97851	0.00037	11.30	0.97965	0.00036	11.30	0.98247	0.00035
11.35	0.98377	0.00038	11.35	0.98335	0.00037	11.35	0.98628	0.00035
11.40	0.98786	0.00037	11.40	0.98789	0.00037	11.40	0.98988	0.00036
11.45	0.99053	0.00038	11.45	0.99111	0.00038	11.45	0.99322	0.00035
11.50	0.99470	0.00038	11.50	0.99437	0.00036	11.50	0.99661	0.00036
11.55	0.99822	0.00037	11.55	0.99834	0.00037	11.55	0.99978	0.00035
11.60	1.00271	0.00037	11.60	1.00235	0.00037	11.60	1.00320	0.00036
11.65	1.00618	0.00037	11.65	1.00658	0.00037	11.65	1.00732	0.00035
11.70	1.00936	0.00037	11.70	1.01006	0.00037	11.70	1.01039	0.00035
11.75	1.01367	0.00038	11.75	1.01367	0.00037	11.75	1.01431	0.00035
11.80	1.01719	0.00037	11.80	1.01660	0.00038	11.80	1.01775	0.00035
11.85	1.02059	0.00037	11.85	1.02016	0.00038	11.85	1.02090	0.00035
11.90	1.02438	0.00037	11.90	1.02458	0.00037	11.90	1.02399	0.00036

Table B.2.1.2.1-2. K_{eff} Values for 93.5% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.40	0.91442	0.00035	10.40	0.91763	0.00035	10.40	0.91975	0.00034
10.45	0.91925	0.00035	10.45	0.92169	0.00034	10.45	0.92393	0.00033
10.50	0.92266	0.00035	10.50	0.92575	0.00034	10.50	0.92730	0.00034
10.55	0.92735	0.00036	10.55	0.92929	0.00034	10.55	0.93109	0.00035
10.60	0.93063	0.00035	10.60	0.93336	0.00035	10.60	0.93520	0.00034
10.65	0.93513	0.00034	10.65	0.93753	0.00034	10.65	0.93875	0.00034
10.70	0.93923	0.00035	10.70	0.94128	0.00035	10.70	0.94346	0.00034
10.75	0.94175	0.00035	10.75	0.94491	0.00034	10.75	0.94623	0.00035
10.80	0.94587	0.00036	10.80	0.94924	0.00035	10.80	0.95069	0.00034
10.85	0.95018	0.00036	10.85	0.95325	0.00035	10.85	0.95403	0.00035
10.90	0.95453	0.00036	10.90	0.95715	0.00035	10.90	0.95780	0.00034
10.95	0.95860	0.00035	10.95	0.96039	0.00035	10.95	0.96204	0.00035
11.00	0.96202	0.00035	11.00	0.96412	0.00035	11.00	0.96617	0.00034
11.05	0.96526	0.00035	11.05	0.96782	0.00034	11.05	0.96899	0.00035
11.10	0.96962	0.00035	11.10	0.97160	0.00035	11.10	0.97309	0.00034
11.15	0.97291	0.00035	11.15	0.97554	0.00035	11.15	0.97706	0.00034
11.20	0.97689	0.00035	11.20	0.97957	0.00035	11.20	0.98042	0.00034
11.25	0.97993	0.00036	11.25	0.98279	0.00034	11.25	0.98416	0.00035
11.30	0.98304	0.00035	11.30	0.98620	0.00035	11.30	0.98744	0.00034
11.35	0.98721	0.00035	11.35	0.98967	0.00035	11.35	0.99132	0.00034
11.40	0.99041	0.00035	11.40	0.99277	0.00035	11.40	0.99547	0.00035
11.45	0.99444	0.00036	11.45	0.99710	0.00035	11.45	0.99855	0.00034
11.50	0.99848	0.00035	11.50	1.00114	0.00036	11.50	1.00152	0.00034
11.55	1.00199	0.00035	11.55	1.00423	0.00036	11.55	1.00532	0.00035
11.60	1.00593	0.00035	11.60	1.00670	0.00035	11.60	1.00879	0.00035
11.65	1.00890	0.00035	11.65	1.01125	0.00035	11.65	1.01247	0.00034
11.70	1.01177	0.00035	11.70	1.01411	0.00034	11.70	1.01628	0.00035
11.75	1.01537	0.00035	11.75	1.01751	0.00035	11.75	1.01892	0.00035
11.80	1.01934	0.00036	11.80	1.02070	0.00035	11.80	1.02199	0.00035
11.85	1.02292	0.00035						
11.90	1.02651	0.00035						

Table B.2.1.2.1-2. K_{eff} Values for 93.5% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.40	0.92119	0.00034	10.30	0.92137	0.00033	10.10	0.91653	0.00033
10.45	0.92530	0.00034	10.35	0.92521	0.00033	10.15	0.92079	0.00033
10.50	0.92925	0.00034	10.40	0.92985	0.00034	10.20	0.92467	0.00033
10.55	0.93275	0.00034	10.45	0.93296	0.00034	10.25	0.92881	0.00032
10.60	0.93644	0.00034	10.50	0.93731	0.00034	10.30	0.93285	0.00033
10.65	0.94101	0.00034	10.55	0.94021	0.00034	10.35	0.93705	0.00033
10.70	0.94520	0.00034	10.60	0.94425	0.00034	10.40	0.93998	0.00033
10.75	0.94833	0.00034	10.65	0.94837	0.00033	10.45	0.94446	0.00032
10.80	0.95266	0.00035	10.70	0.95182	0.00034	10.50	0.94790	0.00033
10.85	0.95614	0.00034	10.75	0.95614	0.00033	10.55	0.95194	0.00033
10.90	0.96005	0.00034	10.80	0.95937	0.00033	10.60	0.95582	0.00034
10.95	0.96309	0.00034	10.85	0.96298	0.00034	10.65	0.95917	0.00033
11.00	0.96711	0.00034	10.90	0.96583	0.00034	10.70	0.96332	0.00033
11.05	0.97132	0.00034	10.95	0.97088	0.00034	10.75	0.96684	0.00033
11.10	0.97449	0.00035	11.00	0.97436	0.00034	10.80	0.97091	0.00033
11.15	0.97828	0.00035	11.05	0.97799	0.00033	10.85	0.97388	0.00033
11.20	0.98196	0.00035	11.10	0.98151	0.00034	10.90	0.97742	0.00033
11.25	0.98572	0.00034	11.15	0.98505	0.00033	10.95	0.98169	0.00033
11.30	0.98938	0.00034	11.20	0.98816	0.00034	11.00	0.98459	0.00033
11.35	0.99310	0.00035	11.25	0.99284	0.00034	11.05	0.98891	0.00033
11.40	0.99680	0.00034	11.30	0.99563	0.00034	11.10	0.99244	0.00034
11.45	0.99918	0.00035	11.35	0.99940	0.00034	11.15	0.99550	0.00033
11.50	1.00307	0.00035	11.40	1.00297	0.00034	11.20	0.99925	0.00033
11.55	1.00630	0.00035	11.45	1.00641	0.00034	11.25	1.00277	0.00033
11.60	1.01009	0.00035	11.50	1.01002	0.00034	11.30	1.00677	0.00032
11.65	1.01407	0.00034	11.55	1.01388	0.00034	11.35	1.00993	0.00033
11.70	1.01672	0.00034	11.60	1.01628	0.00034	11.40	1.01289	0.00033
11.75	1.02005	0.00034	11.65	1.02024	0.00034	11.45	1.01681	0.00033
11.80	1.02404	0.00034	11.70	1.02321	0.00034	11.50	1.02062	0.00034

Table B.2.1.2.1-2. K_{eff} Values for 93.5% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.80	0.91827	0.00031	9.50	0.92162	0.00031	9.10	0.91565	0.00030
9.85	0.92197	0.00031	9.55	0.92593	0.00031	9.15	0.91941	0.00029
9.90	0.92699	0.00031	9.60	0.92948	0.00030	9.20	0.92379	0.00029
9.95	0.93103	0.00032	9.65	0.93383	0.00030	9.25	0.92844	0.00030
10.00	0.93526	0.00031	9.70	0.93811	0.00031	9.30	0.93265	0.00029
10.05	0.93925	0.00032	9.75	0.94220	0.00030	9.35	0.93709	0.00030
10.10	0.94252	0.00032	9.80	0.94641	0.00030	9.40	0.94122	0.00030
10.15	0.94646	0.00031	9.85	0.95106	0.00030	9.45	0.94548	0.00030
10.20	0.95001	0.00031	9.90	0.95457	0.00031	9.50	0.95028	0.00030
10.25	0.95432	0.00031	9.95	0.95884	0.00031	9.55	0.95427	0.00030
10.30	0.95880	0.00031	10.00	0.96267	0.00030	9.60	0.95872	0.00030
10.35	0.96157	0.00032	10.05	0.96683	0.00031	9.65	0.96314	0.00030
10.40	0.96565	0.00031	10.10	0.97021	0.00030	9.70	0.96627	0.00030
10.45	0.96929	0.00032	10.15	0.97465	0.00030	9.75	0.97083	0.00030
10.50	0.97357	0.00032	10.20	0.97805	0.00031	9.80	0.97459	0.00030
10.55	0.97692	0.00031	10.25	0.98243	0.00031	9.85	0.97955	0.00030
10.60	0.98075	0.00032	10.30	0.98640	0.00031	9.90	0.98322	0.00030
10.65	0.98375	0.00032	10.35	0.98985	0.00031	9.95	0.98728	0.00030
10.70	0.98817	0.00032	10.40	0.99434	0.00031	10.00	0.99087	0.00030
10.75	0.99199	0.00032	10.45	0.99745	0.00031	10.05	0.99506	0.00030
10.80	0.99576	0.00032	10.50	1.00091	0.00031	10.10	0.99917	0.00030
10.85	0.99938	0.00032	10.55	1.00531	0.00031	10.15	1.00311	0.00030
10.90	1.00298	0.00032	10.60	1.00868	0.00031	10.20	1.00684	0.00030
10.95	1.00654	0.00032	10.65	1.01191	0.00031	10.25	1.01094	0.00031
11.00	1.00931	0.00032	10.70	1.01617	0.00031	10.30	1.01474	0.00030
11.05	1.01386	0.00032	10.75	1.01999	0.00031	10.35	1.01837	0.00030
11.10	1.01647	0.00032	10.80	1.02369	0.00031	10.40	1.02288	0.00030
11.15	1.02065	0.00031						
11.20	1.02402	0.00032						

Table B.2.1.2.1-2. K_{eff} Values for 93.5% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.80	0.91613	0.00028	8.70	0.92080	0.00028	8.50	0.91509	0.00028
8.85	0.92071	0.00029	8.75	0.92462	0.00029	8.55	0.92013	0.00028
8.90	0.92517	0.00029	8.80	0.92944	0.00028	8.60	0.92508	0.00028
8.95	0.93047	0.00029	8.85	0.93441	0.00029	8.65	0.92942	0.00028
9.00	0.93413	0.00029	8.90	0.93915	0.00028	8.70	0.93488	0.00028
9.05	0.93860	0.00029	8.95	0.94391	0.00029	8.75	0.93915	0.00028
9.10	0.94371	0.00029	9.00	0.94853	0.00028	8.80	0.94355	0.00028
9.15	0.94731	0.00029	9.05	0.95260	0.00028	8.85	0.94813	0.00028
9.20	0.95280	0.00029	9.10	0.95723	0.00028	8.90	0.95311	0.00028
9.25	0.95658	0.00030	9.15	0.96095	0.00029	8.95	0.95758	0.00028
9.30	0.96124	0.00029	9.20	0.96583	0.00028	9.00	0.96191	0.00028
9.35	0.96541	0.00029	9.25	0.97073	0.00029	9.05	0.96691	0.00029
9.40	0.96950	0.00029	9.30	0.97508	0.00029	9.10	0.97138	0.00028
9.45	0.97381	0.00029	9.35	0.97946	0.00029	9.15	0.97541	0.00029
9.50	0.97807	0.00029	9.40	0.98319	0.00029	9.20	0.98054	0.00028
9.55	0.98217	0.00029	9.45	0.98791	0.00029	9.25	0.98486	0.00029
9.60	0.98631	0.00029	9.50	0.99221	0.00029	9.30	0.98881	0.00028
9.65	0.99116	0.00029	9.55	0.99665	0.00029	9.35	0.99316	0.00028
9.70	0.99523	0.00029	9.60	1.00060	0.00029	9.40	0.99804	0.00029
9.75	0.99933	0.00029	9.65	1.00532	0.00029	9.45	1.00220	0.00029
9.80	1.00343	0.00029	9.70	1.00904	0.00029	9.50	1.00584	0.00029
9.85	1.00715	0.00029	9.75	1.01342	0.00029	9.55	1.01025	0.00029
9.90	1.01143	0.00029	9.80	1.01764	0.00029	9.60	1.01471	0.00028
9.95	1.01576	0.00029	9.85	1.02187	0.00030	9.65	1.01915	0.00029
10.00	1.01949	0.00030	9.90	1.02508	0.00029	9.70	1.02329	0.00029
10.05	1.02390	0.00029						
10.10	1.02855	0.00029						

Table B.2.1.2.1-2. K_{eff} Values for 93.5% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.30	0.92216	0.00027	8.00	0.91767	0.00026	6.90	0.91283	0.00022
8.35	0.92691	0.00027	8.05	0.92313	0.00027	6.95	0.91920	0.00022
8.40	0.93169	0.00027	8.10	0.92739	0.00027	7.00	0.92482	0.00022
8.45	0.93685	0.00027	8.15	0.93312	0.00027	7.05	0.93075	0.00023
8.50	0.94186	0.00027	8.20	0.93824	0.00026	7.10	0.93656	0.00022
8.55	0.94635	0.00028	8.25	0.94301	0.00026	7.15	0.94206	0.00023
8.60	0.95148	0.00027	8.30	0.94821	0.00027	7.20	0.94772	0.00023
8.65	0.95640	0.00027	8.35	0.95344	0.00027	7.25	0.95403	0.00023
8.70	0.96085	0.00027	8.40	0.95785	0.00027	7.30	0.95962	0.00023
8.75	0.96538	0.00028	8.45	0.96314	0.00026	7.35	0.96494	0.00023
8.80	0.97048	0.00028	8.50	0.96783	0.00027	7.40	0.97141	0.00024
8.85	0.97480	0.00028	8.55	0.97247	0.00027	7.45	0.97695	0.00023
8.90	0.97961	0.00028	8.60	0.97731	0.00026	7.50	0.98251	0.00024
8.95	0.98476	0.00028	8.65	0.98244	0.00027	7.55	0.98790	0.00023
9.00	0.98902	0.00028	8.70	0.98737	0.00027	7.60	0.99356	0.00024
9.05	0.99386	0.00028	8.75	0.99221	0.00027	7.65	0.99914	0.00024
9.10	0.99811	0.00028	8.80	0.99709	0.00027	7.70	1.00421	0.00023
9.15	1.00263	0.00028	8.85	1.00174	0.00027	7.75	1.01023	0.00024
9.20	1.00758	0.00027	8.90	1.00684	0.00028	7.80	1.01557	0.00024
9.25	1.01173	0.00028	8.95	1.01064	0.00027	7.85	1.02103	0.00023
9.30	1.01628	0.00029	9.00	1.01562	0.00027	7.90	1.02692	0.00024
9.35	1.02060	0.00028	9.05	1.02035	0.00027			
9.40	1.02544	0.00028	9.10	1.02497	0.00027			

Table B.2.1.2.1-2. K_{eff} Values for 93.5% ^{235}U Sphere - 0 Inches of Water Reflection (cont)

18900 milli-g/cc								
Diameter (inches)	K_{eff}	Sigma						
6.20	0.91275	0.00019						
6.25	0.91968	0.00020						
6.30	0.92609	0.00020						
6.35	0.93245	0.00020						
6.40	0.93896	0.00020						
6.45	0.94519	0.00021						
6.50	0.95107	0.00020						
6.55	0.95759	0.00020						
6.60	0.96300	0.00021						
6.65	0.97003	0.00020						
6.70	0.97576	0.00021						
6.75	0.98214	0.00021						
6.80	0.98822	0.00021						
6.85	0.99458	0.00022						
6.90	0.99999	0.00021						
6.95	1.00613	0.00022						
7.00	1.01239	0.00021						
7.05	1.01879	0.00022						
7.10	1.02372	0.00021						

B.2.1.2.2. 1” Water Reflector

Case ID: u5-sp-0935-01

Material: Uranium metal in water

Geometry: Sphere

Isotopics: 93.5% ^{235}U 6.5% ^{238}U

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.2.1.2.2-1. 93.5% ^{235}U Sphere - 1 Inch of Water Reflection

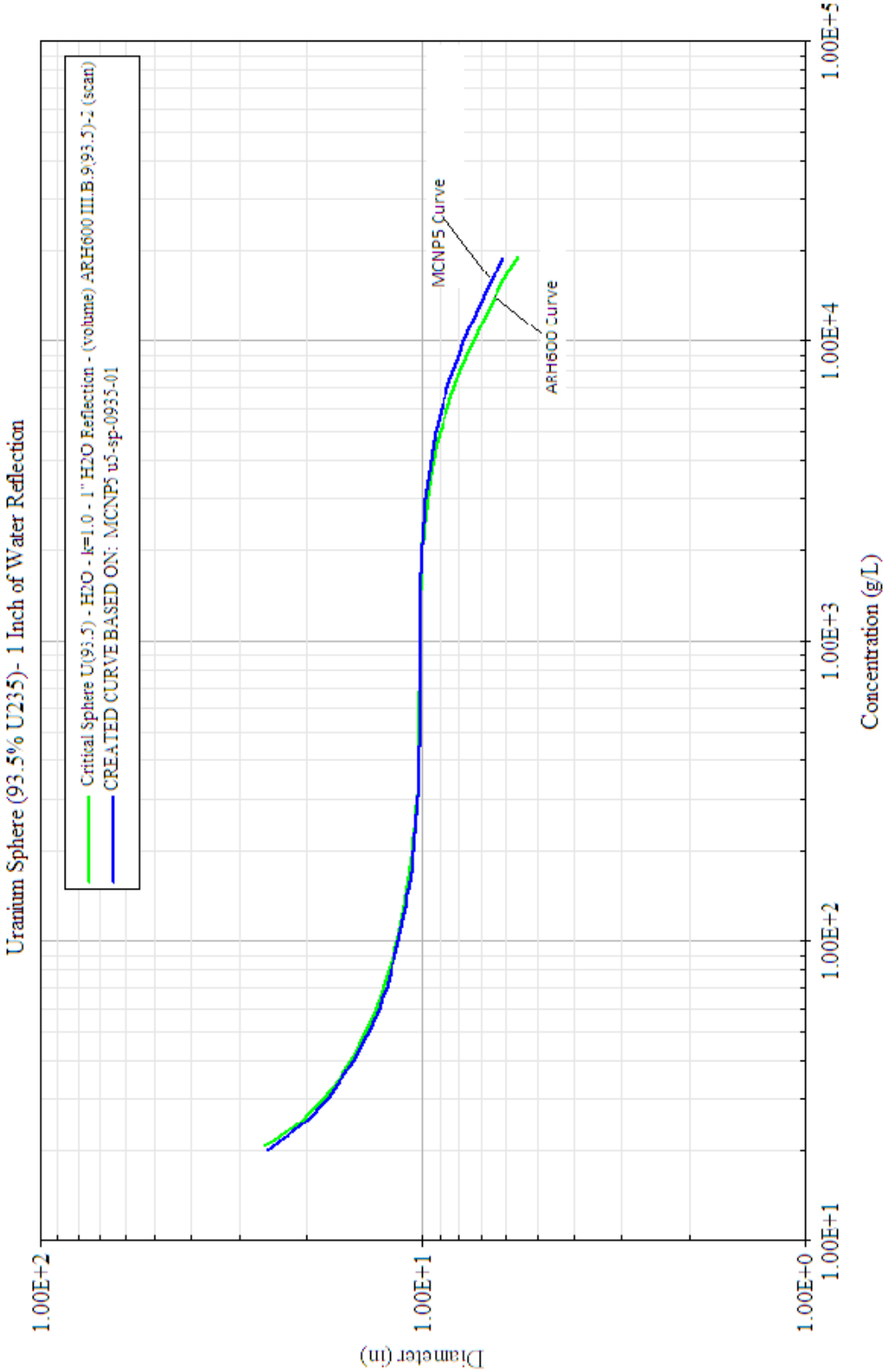

Table B.2.1.2.2-1. Critical Dimensions for 93.5% ^{235}U Sphere - 1 Inch of Water Reflection

93.5% ^{235}U Sphere- 1 Inch of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.020	20.700	27.200	0.300	25.4870
0.025	17.200	20.900	0.100	20.2071
0.030	15.300	18.200	0.100	17.6488
0.040	13.300	15.500	0.100	15.0802
0.045	12.800	14.700	0.100	14.3452
0.050	12.300	14.100	0.100	13.7765
0.055	12.000	13.800	0.100	13.3379
0.060	11.600	13.400	0.100	12.9783
0.065	11.400	13.000	0.050	12.6753
0.070	11.200	12.800	0.050	12.4277
0.080	10.800	12.400	0.050	12.0394
0.100	10.400	11.900	0.050	11.5119
0.130	10.000	11.400	0.050	11.0365
0.150	9.800	11.200	0.050	10.8335
0.170	9.700	11.000	0.050	10.6778
0.200	9.500	10.800	0.050	10.5202
0.350	9.200	10.500	0.050	10.1758
0.500	9.100	10.400	0.050	10.0784
0.800	9.000	10.300	0.050	10.0460
1.000	9.000	10.300	0.050	10.0616
1.500	9.000	10.400	0.050	10.0627
1.700	9.000	10.300	0.050	10.0472
1.900	9.000	10.400	0.050	10.0296
2.000	8.900	10.300	0.050	10.0158
2.100	8.900	10.300	0.050	9.9988
2.500	8.900	10.200	0.050	9.9281
3.000	8.800	10.100	0.050	9.8007
4.000	8.500	9.800	0.050	9.5216
5.000	8.200	9.500	0.050	9.2019
6.000	7.900	9.200	0.050	8.8799
7.000	7.700	8.900	0.050	8.5719
7.500	7.500	8.700	0.050	8.4222
8.000	7.400	8.500	0.050	8.2877
9.000	7.200	8.300	0.050	8.0197
10.000	6.900	8.000	0.050	7.7709
15.000	6.100	7.000	0.050	6.7535
18.900	5.500	6.300	0.050	6.1050

MCNP5 Sample Input File
93.5% ^{235}U Sphere- 1" Reflection

```
U sphere, 93.5 wt% 235U, 00100 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1050  hundreths of inches - must be integer
c radius =    13.3350 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00100 milli-g Pu/cc
c Reflector width =  1.0 inches
c Enrichment = 0.935 wt fraction 235U
c
c Density of H2O 1.00000
c Density of U 18.90000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0053 cc
c Volume of water in sample 0.9947 cc
c
c Mass of crit in sample   0.1000 g
c Mass of water in sample  0.9947 g
c
c Total mass of sample  1.0947g for a 1cc sample
c Mass Density for crit material  -1.0947, expressed as negative
c
c  sphere
20 11   -1.094709   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0

1       so    13.3350              $ Sphere
2       so    15.8750         $ Reflection

mode n
kcode 2000 1.0 100  4100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
```

```
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u/water mixture
m11    $ U/H2O Sludge, 95.0 wt% 235U, 00100 milli-g U/cc,  1.0947
1001.66c -0.101673
8016.66c -0.806979
92235.66c -0.085411
92238.66c -0.005938
mt11     lwtr.60t
c
c    u only
m12    $ U, 95.0 wt% 235U, 00100 milli-g U/cc,  1.0947
92235.66c -0.935000
92238.66c -0.065000
c
```

Critview Compatible Data File
93.5% ^{235}U Sphere- 1" Reflection

reset:
title: MCNP5 u5-sp-0935-01
set: MCNP5 set
source: MCNP5 primary
created: Mon 07/19/2010 14:48:12.38
geometry: sphere
modmat: H2O
critmat: uranium
isomat: U235 0.935 U238 0.065
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.020	25.4870
0.025	20.2071
0.030	17.6488
0.040	15.0802
0.045	14.3452
0.050	13.7765
0.055	13.3379
0.060	12.9783
0.065	12.6753
0.070	12.4277
0.080	12.0394
0.100	11.5119
0.130	11.0365
0.150	10.8335
0.170	10.6778
0.200	10.5202
0.350	10.1758
0.500	10.0784
0.800	10.0460
1.000	10.0616
1.500	10.0627
1.700	10.0472
1.900	10.0296
2.000	10.0158
2.100	9.9988
2.500	9.9281
3.000	9.8007
4.000	9.5216
5.000	9.2019
6.000	8.8799
7.000	8.5719
7.500	8.4222
8.000	8.2877
9.000	8.0197
10.00	7.7709
15.00	6.7535
18.90	6.1050

Table B.2.1.2.2-2. K_{eff} Values for 93.5% ^{235}U Sphere - 1 Inch of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
20.70	0.92460	0.00021	17.20	0.92370	0.00024	15.30	0.92207	0.00026
21.00	0.93044	0.00020	17.30	0.92667	0.00023	15.40	0.92570	0.00026
21.30	0.93653	0.00021	17.40	0.92975	0.00024	15.50	0.92972	0.00026
21.60	0.94099	0.00020	17.50	0.93276	0.00024	15.60	0.93333	0.00025
21.90	0.94667	0.00020	17.60	0.93562	0.00024	15.70	0.93655	0.00026
22.20	0.95209	0.00020	17.70	0.93812	0.00024	15.80	0.94022	0.00026
22.50	0.95632	0.00020	17.80	0.94116	0.00024	15.90	0.94379	0.00025
22.80	0.96172	0.00020	17.90	0.94378	0.00024	16.00	0.94726	0.00026
23.10	0.96594	0.00020	18.00	0.94680	0.00024	16.10	0.95084	0.00026
23.40	0.97138	0.00020	18.10	0.94869	0.00024	16.20	0.95424	0.00025
23.70	0.97529	0.00020	18.20	0.95208	0.00023	16.30	0.95737	0.00025
24.00	0.97983	0.00020	18.30	0.95460	0.00023	16.40	0.96079	0.00026
24.30	0.98433	0.00020	18.40	0.95731	0.00023	16.50	0.96421	0.00026
24.60	0.98840	0.00019	18.50	0.95946	0.00023	16.60	0.96762	0.00025
24.90	0.99236	0.00019	18.60	0.96265	0.00023	16.70	0.97095	0.00026
25.20	0.99646	0.00019	18.70	0.96486	0.00024	16.80	0.97425	0.00025
25.50	1.00016	0.00019	18.80	0.96716	0.00023	16.90	0.97682	0.00026
25.80	1.00409	0.00019	18.90	0.96975	0.00023	17.00	0.98093	0.00026
26.10	1.00789	0.00019	19.00	0.97271	0.00023	17.10	0.98296	0.00026
26.40	1.01141	0.00019	19.10	0.97490	0.00023	17.20	0.98640	0.00025
26.70	1.01452	0.00019	19.20	0.97729	0.00023	17.30	0.98910	0.00025
27.00	1.01786	0.00019	19.30	0.97943	0.00023	17.40	0.99265	0.00025
27.20	1.02035	0.00019	19.40	0.98174	0.00023	17.50	0.99564	0.00025
			19.50	0.98420	0.00023	17.60	0.99854	0.00025
			19.60	0.98707	0.00023	17.70	1.00153	0.00026
			19.70	0.98962	0.00023	17.80	1.00484	0.00025
			19.80	0.99099	0.00023	17.90	1.00758	0.00025
			19.90	0.99375	0.00023	18.00	1.01033	0.00025
			20.00	0.99594	0.00023	18.10	1.01286	0.00025
			20.10	0.99846	0.00023	18.20	1.01575	0.00025
			20.20	0.99982	0.00023			
			20.30	1.00236	0.00023			
			20.40	1.00496	0.00023			
			20.50	1.00643	0.00023			
			20.60	1.00873	0.00023			
			20.70	1.01082	0.00023			
			20.80	1.01279	0.00022			
			20.90	1.01482	0.00023			

Table B.2.1.2.2-2. K_{eff} Values for 93.5% ^{235}U Sphere - 1 Inch of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
13.30	0.91942	0.00029	12.80	0.92421	0.00030	12.30	0.92104	0.00030
13.40	0.92442	0.00029	12.90	0.92893	0.00030	12.40	0.92672	0.00031
13.50	0.92918	0.00029	13.00	0.93485	0.00030	12.50	0.93291	0.00031
13.60	0.93422	0.00029	13.10	0.93972	0.00030	12.60	0.93806	0.00030
13.70	0.93894	0.00029	13.20	0.94540	0.00030	12.70	0.94468	0.00030
13.80	0.94431	0.00029	13.30	0.94975	0.00029	12.80	0.94931	0.00031
13.90	0.94832	0.00028	13.40	0.95519	0.00029	12.90	0.95472	0.00030
14.00	0.95351	0.00028	13.50	0.96043	0.00029	13.00	0.96024	0.00030
14.10	0.95748	0.00028	13.60	0.96484	0.00029	13.10	0.96588	0.00030
14.20	0.96161	0.00029	13.70	0.96994	0.00029	13.20	0.97069	0.00030
14.30	0.96598	0.00028	13.80	0.97510	0.00029	13.30	0.97570	0.00030
14.40	0.97074	0.00029	13.90	0.97979	0.00030	13.40	0.98119	0.00030
14.50	0.97567	0.00029	14.00	0.98416	0.00029	13.50	0.98601	0.00030
14.60	0.97964	0.00028	14.10	0.98890	0.00029	13.60	0.99085	0.00030
14.70	0.98405	0.00028	14.20	0.99341	0.00030	13.70	0.99606	0.00031
14.80	0.98837	0.00028	14.30	0.99798	0.00030	13.80	1.00121	0.00030
14.90	0.99231	0.00028	14.40	1.00245	0.00029	13.90	1.00616	0.00031
15.00	0.99680	0.00028	14.50	1.00701	0.00030	14.00	1.01088	0.00031
15.10	1.00079	0.00028	14.60	1.01168	0.00030	14.10	1.01544	0.00030
15.20	1.00470	0.00028	14.70	1.01560	0.00030			
15.30	1.00862	0.00028						
15.40	1.01227	0.00028						
15.50	1.01607	0.00028						

Table B.2.1.2.2-2. K_{eff} Values for 93.5% ^{235}U Sphere - 1 Inch of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.00	0.92575	0.00032	11.60	0.91826	0.00031	11.40	0.92106	0.00032
12.10	0.93127	0.00031	11.70	0.92486	0.00031	11.45	0.92519	0.00032
12.20	0.93715	0.00031	11.80	0.93123	0.00032	11.50	0.92806	0.00032
12.30	0.94344	0.00031	11.90	0.93746	0.00032	11.55	0.93108	0.00032
12.40	0.94908	0.00032	12.00	0.94341	0.00032	11.60	0.93425	0.00032
12.50	0.95461	0.00030	12.10	0.94969	0.00031	11.65	0.93710	0.00032
12.60	0.96052	0.00031	12.20	0.95539	0.00031	11.70	0.94065	0.00032
12.70	0.96598	0.00031	12.30	0.96210	0.00031	11.75	0.94483	0.00032
12.80	0.97099	0.00031	12.40	0.96754	0.00032	11.80	0.94742	0.00032
12.90	0.97642	0.00031	12.50	0.97347	0.00032	11.85	0.95045	0.00032
13.00	0.98192	0.00031	12.60	0.97919	0.00032	11.90	0.95367	0.00031
13.10	0.98756	0.00032	12.70	0.98437	0.00032	11.95	0.95673	0.00033
13.20	0.99276	0.00031	12.80	0.99030	0.00032	12.00	0.95947	0.00032
13.30	0.99796	0.00031	12.90	0.99625	0.00032	12.05	0.96271	0.00032
13.40	1.00334	0.00031	13.00	1.00104	0.00032	12.10	0.96553	0.00032
13.50	1.00868	0.00031	13.10	1.00697	0.00032	12.15	0.96890	0.00032
13.60	1.01359	0.00031	13.20	1.01095	0.00032	12.20	0.97162	0.00032
13.70	1.01835	0.00031	13.30	1.01811	0.00031	12.25	0.97463	0.00032
13.80	1.02352	0.00031	13.40	1.02265	0.00032	12.30	0.97770	0.00032
						12.35	0.98122	0.00033
						12.40	0.98386	0.00032
						12.45	0.98628	0.00032
						12.50	0.98967	0.00032
						12.55	0.99260	0.00032
						12.60	0.99553	0.00032
						12.65	0.99836	0.00032
						12.70	1.00160	0.00033
						12.75	1.00364	0.00032
						12.80	1.00654	0.00033
						12.85	1.00980	0.00032
						12.90	1.01256	0.00032
						12.95	1.01509	0.00032
						13.00	1.01776	0.00032

Table B.2.1.2.2-2. K_{eff} Values for 93.5% ^{235}U Sphere - 1 Inch of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.20	0.92191	0.00032	10.80	0.91703	0.00033	10.40	0.91970	0.00034
11.25	0.92509	0.00033	10.85	0.92074	0.00034	10.45	0.92385	0.00034
11.30	0.92891	0.00033	10.90	0.92378	0.00033	10.50	0.92780	0.00035
11.35	0.93218	0.00033	10.95	0.92752	0.00034	10.55	0.93117	0.00034
11.40	0.93531	0.00032	11.00	0.93092	0.00033	10.60	0.93559	0.00034
11.45	0.93867	0.00033	11.05	0.93434	0.00033	10.65	0.93916	0.00034
11.50	0.94218	0.00033	11.10	0.93839	0.00033	10.70	0.94287	0.00035
11.55	0.94568	0.00033	11.15	0.94148	0.00033	10.75	0.94616	0.00034
11.60	0.94845	0.00033	11.20	0.94484	0.00034	10.80	0.95045	0.00034
11.65	0.95190	0.00032	11.25	0.94876	0.00033	10.85	0.95368	0.00034
11.70	0.95500	0.00034	11.30	0.95177	0.00034	10.90	0.95702	0.00035
11.75	0.95821	0.00033	11.35	0.95484	0.00033	10.95	0.96141	0.00034
11.80	0.96088	0.00032	11.40	0.95833	0.00033	11.00	0.96465	0.00035
11.85	0.96455	0.00033	11.45	0.96186	0.00034	11.05	0.96804	0.00034
11.90	0.96716	0.00032	11.50	0.96454	0.00033	11.10	0.97174	0.00035
11.95	0.97052	0.00033	11.55	0.96907	0.00033	11.15	0.97564	0.00034
12.00	0.97383	0.00033	11.60	0.97215	0.00034	11.20	0.97866	0.00033
12.05	0.97670	0.00033	11.65	0.97526	0.00033	11.25	0.98283	0.00035
12.10	0.97954	0.00033	11.70	0.97874	0.00033	11.30	0.98639	0.00035
12.15	0.98309	0.00033	11.75	0.98251	0.00034	11.35	0.98954	0.00034
12.20	0.98625	0.00032	11.80	0.98529	0.00033	11.40	0.99307	0.00035
12.25	0.98939	0.00033	11.85	0.98744	0.00033	11.45	0.99647	0.00034
12.30	0.99234	0.00032	11.90	0.99176	0.00034	11.50	0.99907	0.00035
12.35	0.99507	0.00033	11.95	0.99482	0.00034	11.55	1.00297	0.00035
12.40	0.99819	0.00033	12.00	0.99765	0.00033	11.60	1.00623	0.00034
12.45	1.00146	0.00032	12.05	1.00063	0.00034	11.65	1.01013	0.00035
12.50	1.00400	0.00033	12.10	1.00392	0.00034	11.70	1.01208	0.00035
12.55	1.00671	0.00033	12.15	1.00692	0.00033	11.75	1.01674	0.00035
12.60	1.00929	0.00033	12.20	1.01043	0.00034	11.80	1.01940	0.00034
12.65	1.01281	0.00032	12.25	1.01328	0.00033	11.85	1.02325	0.00034
12.70	1.01587	0.00033	12.30	1.01647	0.00033	11.90	1.02606	0.00035
12.75	1.01865	0.00032	12.35	1.01946	0.00033			
12.80	1.02181	0.00033	12.40	1.02304	0.00034			

Table B.2.1.2.2-2. K_{eff} Values for 93.5% ^{235}U Sphere - 1 Inch of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.00	0.92082	0.00035	9.80	0.91801	0.00036	9.70	0.92132	0.00035
10.05	0.92438	0.00035	9.85	0.92320	0.00036	9.75	0.92536	0.00035
10.10	0.92895	0.00035	9.90	0.92774	0.00035	9.80	0.92984	0.00036
10.15	0.93301	0.00035	9.95	0.93064	0.00036	9.85	0.93341	0.00037
10.20	0.93764	0.00035	10.00	0.93538	0.00035	9.90	0.93826	0.00035
10.25	0.94079	0.00035	10.05	0.93920	0.00036	9.95	0.94271	0.00036
10.30	0.94471	0.00035	10.10	0.94352	0.00036	10.00	0.94604	0.00036
10.35	0.94846	0.00035	10.15	0.94721	0.00035	10.05	0.95000	0.00037
10.40	0.95294	0.00035	10.20	0.95115	0.00036	10.10	0.95457	0.00035
10.45	0.95676	0.00035	10.25	0.95593	0.00035	10.15	0.95854	0.00036
10.50	0.96004	0.00035	10.30	0.95916	0.00036	10.20	0.96274	0.00036
10.55	0.96322	0.00036	10.35	0.96379	0.00036	10.25	0.96603	0.00036
10.60	0.96738	0.00035	10.40	0.96739	0.00035	10.30	0.97037	0.00036
10.65	0.97163	0.00036	10.45	0.97119	0.00036	10.35	0.97472	0.00037
10.70	0.97526	0.00035	10.50	0.97488	0.00036	10.40	0.97824	0.00036
10.75	0.97899	0.00035	10.55	0.97873	0.00036	10.45	0.98194	0.00036
10.80	0.98319	0.00035	10.60	0.98226	0.00036	10.50	0.98602	0.00036
10.85	0.98661	0.00036	10.65	0.98674	0.00036	10.55	0.99001	0.00037
10.90	0.99027	0.00035	10.70	0.99002	0.00035	10.60	0.99363	0.00036
10.95	0.99353	0.00036	10.75	0.99384	0.00036	10.65	0.99799	0.00036
11.00	0.99768	0.00035	10.80	0.99763	0.00036	10.70	1.00160	0.00036
11.05	1.00086	0.00036	10.85	1.00117	0.00035	10.75	1.00534	0.00036
11.10	1.00452	0.00035	10.90	1.00448	0.00036	10.80	1.00914	0.00036
11.15	1.00872	0.00036	10.95	1.00872	0.00035	10.85	1.01269	0.00036
11.20	1.01225	0.00035	11.00	1.01188	0.00036	10.90	1.01587	0.00036
11.25	1.01585	0.00036	11.05	1.01697	0.00036	10.95	1.01990	0.00036
11.30	1.01858	0.00036	11.10	1.01994	0.00036	11.00	1.02325	0.00036
11.35	1.02260	0.00035	11.15	1.02368	0.00036			
11.40	1.02626	0.00036	11.20	1.02684	0.00036			

Table B.2.1.2.2-2. K_{eff} Values for 93.5% ^{235}U Sphere - 1 Inch of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.50	0.91637	0.00037	9.20	0.91823	0.00037	9.10	0.91822	0.00037
9.55	0.92062	0.00036	9.25	0.92273	0.00037	9.15	0.92270	0.00037
9.60	0.92487	0.00036	9.30	0.92738	0.00038	9.20	0.92680	0.00036
9.65	0.92941	0.00036	9.35	0.93154	0.00037	9.25	0.93083	0.00037
9.70	0.93401	0.00036	9.40	0.93588	0.00037	9.30	0.93580	0.00037
9.75	0.93819	0.00036	9.45	0.94032	0.00037	9.35	0.94082	0.00037
9.80	0.94195	0.00036	9.50	0.94491	0.00037	9.40	0.94501	0.00036
9.85	0.94634	0.00036	9.55	0.94846	0.00038	9.45	0.94854	0.00037
9.90	0.95040	0.00036	9.60	0.95253	0.00037	9.50	0.95336	0.00036
9.95	0.95506	0.00036	9.65	0.95696	0.00037	9.55	0.95707	0.00036
10.00	0.95839	0.00036	9.70	0.96116	0.00037	9.60	0.96110	0.00037
10.05	0.96264	0.00036	9.75	0.96591	0.00037	9.65	0.96530	0.00036
10.10	0.96688	0.00036	9.80	0.96913	0.00037	9.70	0.96919	0.00038
10.15	0.97061	0.00036	9.85	0.97435	0.00037	9.75	0.97339	0.00037
10.20	0.97522	0.00037	9.90	0.97818	0.00037	9.80	0.97742	0.00037
10.25	0.97869	0.00037	9.95	0.98223	0.00037	9.85	0.98137	0.00037
10.30	0.98298	0.00036	10.00	0.98565	0.00038	9.90	0.98596	0.00037
10.35	0.98677	0.00037	10.05	0.99078	0.00037	9.95	0.98952	0.00036
10.40	0.99123	0.00036	10.10	0.99376	0.00037	10.00	0.99313	0.00037
10.45	0.99481	0.00038	10.15	0.99790	0.00037	10.05	0.99755	0.00037
10.50	0.99802	0.00037	10.20	1.00197	0.00037	10.10	1.00186	0.00037
10.55	1.00291	0.00037	10.25	1.00625	0.00037	10.15	1.00561	0.00037
10.60	1.00535	0.00037	10.30	1.01025	0.00037	10.20	1.00970	0.00037
10.65	1.00946	0.00037	10.35	1.01376	0.00037	10.25	1.01278	0.00037
10.70	1.01437	0.00036	10.40	1.01785	0.00037	10.30	1.01715	0.00037
10.75	1.01796	0.00036	10.45	1.02204	0.00037	10.35	1.02085	0.00037
10.80	1.02116	0.00036	10.50	1.02585	0.00037	10.40	1.02432	0.00037

Table B.2.1.2.2-2. K_{eff} Values for 93.5% ^{235}U Sphere - 1 Inch of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.00	0.91419	0.00036	9.00	0.91555	0.00036	9.00	0.91793	0.00034
9.05	0.91832	0.00036	9.05	0.91945	0.00035	9.05	0.92238	0.00035
9.10	0.92307	0.00035	9.10	0.92296	0.00035	9.10	0.92601	0.00035
9.15	0.92738	0.00036	9.15	0.92839	0.00035	9.15	0.93112	0.00035
9.20	0.93120	0.00037	9.20	0.93243	0.00036	9.20	0.93438	0.00034
9.25	0.93567	0.00036	9.25	0.93633	0.00036	9.25	0.93838	0.00035
9.30	0.94021	0.00036	9.30	0.94048	0.00036	9.30	0.94187	0.00034
9.35	0.94452	0.00036	9.35	0.94467	0.00036	9.35	0.94624	0.00035
9.40	0.94848	0.00036	9.40	0.94867	0.00035	9.40	0.95006	0.00034
9.45	0.95261	0.00037	9.45	0.95305	0.00036	9.45	0.95348	0.00035
9.50	0.95667	0.00037	9.50	0.95564	0.00036	9.50	0.95816	0.00035
9.55	0.96125	0.00036	9.55	0.95979	0.00036	9.55	0.96161	0.00035
9.60	0.96478	0.00037	9.60	0.96354	0.00036	9.60	0.96526	0.00035
9.65	0.96834	0.00036	9.65	0.96815	0.00036	9.65	0.96904	0.00035
9.70	0.97225	0.00036	9.70	0.97220	0.00037	9.70	0.97263	0.00035
9.75	0.97673	0.00036	9.75	0.97633	0.00036	9.75	0.97687	0.00035
9.80	0.98040	0.00036	9.80	0.98028	0.00036	9.80	0.98041	0.00035
9.85	0.98495	0.00037	9.85	0.98483	0.00037	9.85	0.98346	0.00035
9.90	0.98764	0.00037	9.90	0.98830	0.00036	9.90	0.98782	0.00035
9.95	0.99175	0.00036	9.95	0.99168	0.00036	9.95	0.99193	0.00036
10.00	0.99600	0.00036	10.00	0.99572	0.00036	10.00	0.99548	0.00035
10.05	1.00035	0.00036	10.05	0.99891	0.00037	10.05	0.99906	0.00035
10.10	1.00414	0.00036	10.10	1.00360	0.00037	10.10	1.00276	0.00035
10.15	1.00705	0.00036	10.15	1.00616	0.00036	10.15	1.00671	0.00035
10.20	1.01113	0.00036	10.20	1.01058	0.00036	10.20	1.00939	0.00035
10.25	1.01442	0.00036	10.25	1.01416	0.00035	10.25	1.01301	0.00035
10.30	1.01874	0.00037	10.30	1.01760	0.00036	10.30	1.01681	0.00035
						10.35	1.01988	0.00036
						10.40	1.02358	0.00035

Table B.2.1.2.2-2. K_{eff} Values for 93.5% ^{235}U Sphere - 1 Inch of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.00	0.91948	0.00034	9.00	0.92139	0.00035	8.90	0.91427	0.00034
9.05	0.92351	0.00035	9.05	0.92625	0.00034	8.95	0.91927	0.00035
9.10	0.92769	0.00034	9.10	0.92966	0.00034	9.00	0.92241	0.00034
9.15	0.93155	0.00035	9.15	0.93392	0.00034	9.05	0.92684	0.00034
9.20	0.93654	0.00035	9.20	0.93727	0.00035	9.10	0.93143	0.00034
9.25	0.94016	0.00034	9.25	0.94237	0.00034	9.15	0.93538	0.00034
9.30	0.94382	0.00035	9.30	0.94579	0.00035	9.20	0.93884	0.00034
9.35	0.94738	0.00035	9.35	0.94852	0.00035	9.25	0.94286	0.00035
9.40	0.95150	0.00035	9.40	0.95311	0.00034	9.30	0.94673	0.00034
9.45	0.95549	0.00035	9.45	0.95662	0.00034	9.35	0.95083	0.00034
9.50	0.95853	0.00035	9.50	0.96098	0.00034	9.40	0.95369	0.00034
9.55	0.96280	0.00034	9.55	0.96490	0.00035	9.45	0.95829	0.00034
9.60	0.96655	0.00034	9.60	0.96810	0.00034	9.50	0.96172	0.00034
9.65	0.96991	0.00034	9.65	0.97222	0.00035	9.55	0.96654	0.00034
9.70	0.97463	0.00034	9.70	0.97648	0.00034	9.60	0.96921	0.00035
9.75	0.97806	0.00035	9.75	0.97968	0.00034	9.65	0.97330	0.00033
9.80	0.98159	0.00034	9.80	0.98309	0.00035	9.70	0.97683	0.00034
9.85	0.98564	0.00035	9.85	0.98678	0.00035	9.75	0.98072	0.00035
9.90	0.98925	0.00034	9.90	0.99079	0.00034	9.80	0.98445	0.00034
9.95	0.99264	0.00035	9.95	0.99373	0.00035	9.85	0.98810	0.00034
10.00	0.99663	0.00034	10.00	0.99783	0.00035	9.90	0.99200	0.00034
10.05	1.00020	0.00035	10.05	1.00149	0.00035	9.95	0.99445	0.00035
10.10	1.00260	0.00035	10.10	1.00533	0.00035	10.00	0.99884	0.00034
10.15	1.00659	0.00035	10.15	1.00884	0.00034	10.05	1.00252	0.00035
10.20	1.01143	0.00035	10.20	1.01232	0.00035	10.10	1.00613	0.00034
10.25	1.01377	0.00034	10.25	1.01541	0.00034	10.15	1.00971	0.00034
10.30	1.01742	0.00034	10.30	1.01914	0.00035	10.20	1.01265	0.00034
			10.35	1.02223	0.00034	10.25	1.01610	0.00034
			10.40	1.02567	0.00034	10.30	1.01966	0.00034

Table B.2.1.2.2-2. K_{eff} Values for 93.5% ^{235}U Sphere - 1 Inch of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.90	0.91585	0.00034	8.90	0.92279	0.00034	8.80	0.92325	0.00033
8.95	0.92033	0.00034	8.95	0.92605	0.00033	8.85	0.92785	0.00033
9.00	0.92407	0.00034	9.00	0.93018	0.00033	8.90	0.93174	0.00033
9.05	0.92878	0.00034	9.05	0.93403	0.00033	8.95	0.93546	0.00034
9.10	0.93259	0.00034	9.10	0.93794	0.00033	9.00	0.93932	0.00033
9.15	0.93656	0.00034	9.15	0.94197	0.00033	9.05	0.94321	0.00033
9.20	0.94060	0.00034	9.20	0.94629	0.00033	9.10	0.94747	0.00033
9.25	0.94431	0.00034	9.25	0.94953	0.00034	9.15	0.95057	0.00033
9.30	0.94732	0.00034	9.30	0.95378	0.00033	9.20	0.95528	0.00032
9.35	0.95170	0.00034	9.35	0.95771	0.00034	9.25	0.95867	0.00033
9.40	0.95549	0.00034	9.40	0.96176	0.00033	9.30	0.96275	0.00033
9.45	0.95976	0.00034	9.45	0.96537	0.00034	9.35	0.96613	0.00033
9.50	0.96350	0.00034	9.50	0.96899	0.00033	9.40	0.96991	0.00032
9.55	0.96696	0.00035	9.55	0.97212	0.00033	9.45	0.97382	0.00034
9.60	0.97041	0.00034	9.60	0.97562	0.00033	9.50	0.97700	0.00033
9.65	0.97412	0.00034	9.65	0.98007	0.00034	9.55	0.98040	0.00033
9.70	0.97885	0.00034	9.70	0.98340	0.00033	9.60	0.98469	0.00032
9.75	0.98208	0.00034	9.75	0.98739	0.00035	9.65	0.98864	0.00033
9.80	0.98551	0.00034	9.80	0.99039	0.00033	9.70	0.99183	0.00033
9.85	0.98939	0.00034	9.85	0.99391	0.00033	9.75	0.99616	0.00033
9.90	0.99222	0.00034	9.90	0.99800	0.00034	9.80	0.99996	0.00033
9.95	0.99674	0.00035	9.95	1.00156	0.00034	9.85	1.00304	0.00033
10.00	1.00008	0.00034	10.00	1.00510	0.00034	9.90	1.00612	0.00033
10.05	1.00265	0.00034	10.05	1.00771	0.00034	9.95	1.01006	0.00033
10.10	1.00674	0.00034	10.10	1.01187	0.00034	10.00	1.01307	0.00033
10.15	1.01043	0.00034	10.15	1.01467	0.00033	10.05	1.01674	0.00032
10.20	1.01335	0.00035	10.20	1.01942	0.00034	10.10	1.02016	0.00033
10.25	1.01740	0.00034						
10.30	1.02058	0.00034						

Table B.2.1.2.2-2. K_{eff} Values for 93.5% ^{235}U Sphere - 1 Inch of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.50	0.92050	0.00032	8.20	0.91880	0.00032	7.90	0.91730	0.00030
8.55	0.92425	0.00032	8.25	0.92317	0.00032	7.95	0.92144	0.00031
8.60	0.92904	0.00032	8.30	0.92726	0.00031	8.00	0.92619	0.00031
8.65	0.93305	0.00032	8.35	0.93171	0.00031	8.05	0.93001	0.00031
8.70	0.93664	0.00032	8.40	0.93581	0.00031	8.10	0.93437	0.00031
8.75	0.94084	0.00032	8.45	0.94035	0.00032	8.15	0.93855	0.00031
8.80	0.94512	0.00032	8.50	0.94466	0.00031	8.20	0.94351	0.00031
8.85	0.94917	0.00032	8.55	0.94891	0.00031	8.25	0.94769	0.00030
8.90	0.95305	0.00032	8.60	0.95288	0.00031	8.30	0.95160	0.00030
8.95	0.95707	0.00032	8.65	0.95680	0.00031	8.35	0.95656	0.00031
9.00	0.96035	0.00031	8.70	0.96059	0.00031	8.40	0.96043	0.00031
9.05	0.96492	0.00032	8.75	0.96507	0.00031	8.45	0.96540	0.00031
9.10	0.96811	0.00032	8.80	0.96869	0.00031	8.50	0.96964	0.00031
9.15	0.97228	0.00032	8.85	0.97286	0.00032	8.55	0.97294	0.00031
9.20	0.97650	0.00032	8.90	0.97691	0.00032	8.60	0.97752	0.00031
9.25	0.97989	0.00032	8.95	0.98056	0.00032	8.65	0.98156	0.00031
9.30	0.98342	0.00032	9.00	0.98471	0.00031	8.70	0.98536	0.00031
9.35	0.98812	0.00032	9.05	0.98890	0.00031	8.75	0.99000	0.00031
9.40	0.99128	0.00033	9.10	0.99275	0.00030	8.80	0.99387	0.00031
9.45	0.99506	0.00032	9.15	0.99638	0.00032	8.85	0.99728	0.00031
9.50	0.99847	0.00032	9.20	0.99985	0.00031	8.90	1.00183	0.00032
9.55	1.00201	0.00032	9.25	1.00375	0.00031	8.95	1.00578	0.00031
9.60	1.00586	0.00032	9.30	1.00814	0.00032	9.00	1.00960	0.00031
9.65	1.00937	0.00033	9.35	1.01202	0.00032	9.05	1.01381	0.00031
9.70	1.01284	0.00032	9.40	1.01505	0.00032	9.10	1.01749	0.00031
9.75	1.01658	0.00032	9.45	1.01954	0.00032	9.15	1.02154	0.00031
9.80	1.02097	0.00032	9.50	1.02254	0.00032	9.20	1.02567	0.00031

Table B.2.1.2.2-2. K_{eff} Values for 93.5% ^{235}U Sphere - 1 Inch of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.70	0.92258	0.00030	7.50	0.91576	0.00029	7.40	0.91772	0.00030
7.75	0.92690	0.00030	7.55	0.92059	0.00029	7.45	0.92253	0.00030
7.80	0.93176	0.00030	7.60	0.92490	0.00030	7.50	0.92712	0.00029
7.85	0.93639	0.00030	7.65	0.92993	0.00030	7.55	0.93232	0.00030
7.90	0.94137	0.00030	7.70	0.93461	0.00030	7.60	0.93689	0.00029
7.95	0.94570	0.00031	7.75	0.93919	0.00031	7.65	0.94193	0.00029
8.00	0.94965	0.00030	7.80	0.94418	0.00030	7.70	0.94635	0.00030
8.05	0.95471	0.00030	7.85	0.94759	0.00029	7.75	0.95162	0.00030
8.10	0.95925	0.00030	7.90	0.95278	0.00030	7.80	0.95627	0.00029
8.15	0.96355	0.00031	7.95	0.95795	0.00030	7.85	0.96091	0.00030
8.20	0.96763	0.00030	8.00	0.96231	0.00030	7.90	0.96500	0.00030
8.25	0.97207	0.00030	8.05	0.96724	0.00030	7.95	0.96976	0.00030
8.30	0.97702	0.00030	8.10	0.97132	0.00030	8.00	0.97462	0.00030
8.35	0.98118	0.00030	8.15	0.97594	0.00030	8.05	0.97897	0.00029
8.40	0.98589	0.00030	8.20	0.98042	0.00030	8.10	0.98381	0.00030
8.45	0.98971	0.00030	8.25	0.98440	0.00031	8.15	0.98796	0.00030
8.50	0.99389	0.00031	8.30	0.98933	0.00030	8.20	0.99254	0.00030
8.55	0.99778	0.00030	8.35	0.99330	0.00030	8.25	0.99731	0.00030
8.60	1.00285	0.00030	8.40	0.99799	0.00031	8.30	1.00088	0.00030
8.65	1.00706	0.00031	8.45	1.00251	0.00031	8.35	1.00590	0.00030
8.70	1.01117	0.00031	8.50	1.00676	0.00031	8.40	1.01012	0.00030
8.75	1.01474	0.00031	8.55	1.01052	0.00030	8.45	1.01502	0.00030
8.80	1.01932	0.00030	8.60	1.01508	0.00030	8.50	1.01888	0.00029
8.85	1.02304	0.00031	8.65	1.01921	0.00031			
8.90	1.02690	0.00031	8.70	1.02299	0.00030			

Table B.2.1.2.2-2. K_{eff} Values for 93.5% ^{235}U Sphere - 1 Inch of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.20	0.92053	0.00029	6.90	0.91180	0.00028	6.10	0.92197	0.00026
7.25	0.92553	0.00029	6.95	0.91689	0.00028	6.15	0.92856	0.00026
7.30	0.93105	0.00028	7.00	0.92211	0.00028	6.20	0.93517	0.00025
7.35	0.93598	0.00030	7.05	0.92753	0.00028	6.25	0.94049	0.00026
7.40	0.94040	0.00029	7.10	0.93288	0.00029	6.30	0.94700	0.00026
7.45	0.94578	0.00029	7.15	0.93783	0.00028	6.35	0.95319	0.00026
7.50	0.95050	0.00029	7.20	0.94301	0.00028	6.40	0.95877	0.00026
7.55	0.95547	0.00028	7.25	0.94793	0.00028	6.45	0.96503	0.00026
7.60	0.96025	0.00029	7.30	0.95383	0.00029	6.50	0.97074	0.00027
7.65	0.96582	0.00029	7.35	0.95844	0.00028	6.55	0.97632	0.00027
7.70	0.97008	0.00030	7.40	0.96424	0.00029	6.60	0.98214	0.00026
7.75	0.97498	0.00029	7.45	0.96827	0.00029	6.65	0.98825	0.00027
7.80	0.98037	0.00030	7.50	0.97400	0.00029	6.70	0.99442	0.00027
7.85	0.98427	0.00029	7.55	0.97885	0.00029	6.75	0.99958	0.00027
7.90	0.98941	0.00030	7.60	0.98335	0.00029	6.80	1.00566	0.00027
7.95	0.99409	0.00029	7.65	0.98817	0.00029	6.85	1.01083	0.00027
8.00	0.99799	0.00030	7.70	0.99338	0.00029	6.90	1.01632	0.00027
8.05	1.00308	0.00029	7.75	0.99807	0.00029	6.95	1.02248	0.00027
8.10	1.00755	0.00029	7.80	1.00268	0.00029	7.00	1.02757	0.00027
8.15	1.01195	0.00029	7.85	1.00736	0.00030			
8.20	1.01645	0.00030	7.90	1.01236	0.00028			
8.25	1.02169	0.00030	7.95	1.01726	0.00029			
8.30	1.02565	0.00030	8.00	1.02101	0.00029			

Table B.2.1.2.2-2. K_{eff} Values for 93.5% ^{235}U Sphere - 1 Inch of Water Reflection (cont)

18900 milli-g/cc								
Diameter (inches)	K_{eff}	Sigma						
5.50	0.92101	0.00024						
5.55	0.92755	0.00024						
5.60	0.93420	0.00024						
5.65	0.94121	0.00024						
5.70	0.94754	0.00025						
5.75	0.95400	0.00024						
5.80	0.96089	0.00025						
5.85	0.96742	0.00024						
5.90	0.97357	0.00024						
5.95	0.98018	0.00024						
6.00	0.98668	0.00025						
6.05	0.99271	0.00025						
6.10	0.99935	0.00025						
6.15	1.00581	0.00025						
6.20	1.01104	0.00025						
6.25	1.01775	0.00025						
6.30	1.02430	0.00025						

B.2.1.2.3. 10” Water Reflector

Case ID: u5-sp-0935-10

Material: Uranium metal in water

Geometry: Sphere

Isotopics: 93.5% ^{235}U 6.5% ^{238}U

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Scott Finfrock

Date: 8/2010

Figure B.2.1.2.3-1. 93.5% ^{235}U Sphere - 10 Inches of Water Reflection

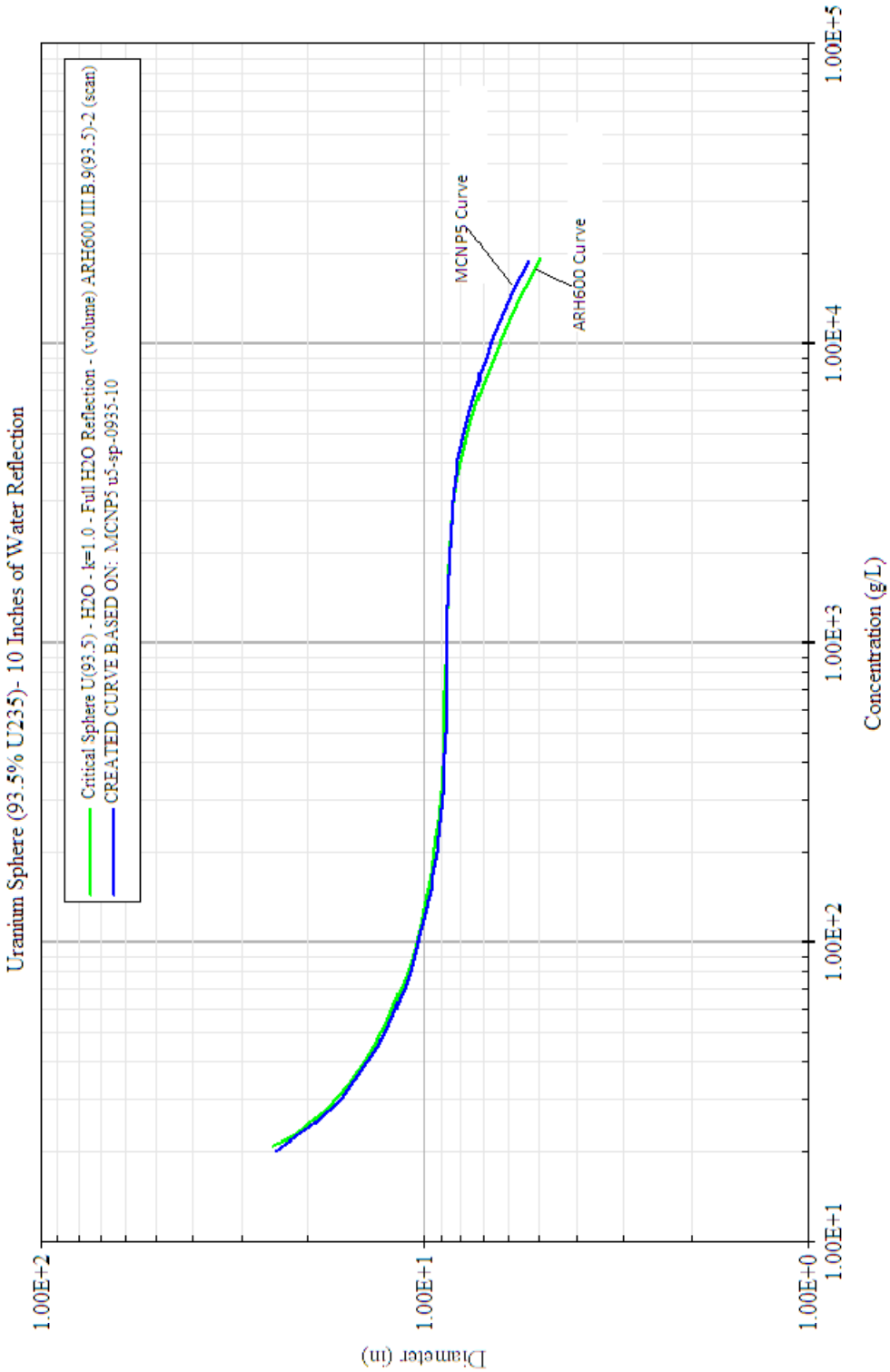

Table B.2.1.2.3-1. Critical Dimensions for 93.5% ^{235}U Sphere - 10 Inches of Water Reflection

93.5% ^{235}U Sphere- 10 Inches of Water Reflection				
Concentrations (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.020	19.600	25.300	0.200	24.3838
0.025	16.100	19.800	0.100	19.0884
0.030	14.300	17.300	0.100	16.5412
0.040	12.300	14.400	0.100	13.9784
0.045	11.600	13.600	0.100	13.2273
0.050	11.200	13.100	0.100	12.6544
0.055	10.800	12.600	0.100	12.2033
0.060	10.500	12.200	0.050	11.8326
0.065	10.300	11.900	0.050	11.5304
0.070	10.000	11.700	0.050	11.2776
0.080	9.700	11.200	0.050	10.8782
0.100	9.200	10.700	0.050	10.3203
0.130	8.800	10.100	0.050	9.8280
0.150	8.600	9.900	0.050	9.6070
0.170	8.400	9.700	0.050	9.4533
0.200	8.300	9.500	0.050	9.2642
0.350	7.900	9.100	0.050	8.8625
0.500	7.800	9.000	0.050	8.7219
0.800	7.600	8.900	0.050	8.6419
1.000	7.700	8.900	0.050	8.6335
1.500	7.600	8.900	0.050	8.5854
1.700	7.600	8.900	0.050	8.5789
1.900	7.500	8.900	0.050	8.5559
2.000	7.500	8.800	0.050	8.5452
2.100	7.500	8.800	0.050	8.5298
2.500	7.400	8.800	0.050	8.4596
3.000	7.400	8.600	0.050	8.3614
4.000	7.100	8.400	0.050	8.1179
5.000	6.900	8.100	0.050	7.8516
6.000	6.700	7.800	0.050	7.5940
7.000	6.500	7.500	0.050	7.3356
7.500	6.400	7.500	0.050	7.2190
8.000	6.200	7.300	0.050	7.1019
9.000	6.100	7.100	0.050	6.8847
10.000	5.900	6.900	0.050	6.6849
15.000	5.200	6.100	0.050	5.8523
18.900	4.700	5.500	0.050	5.3163

MCNP5 Sample Input File
93.5% ^{235}U Sphere- 10” Reflection

```
U sphere, 93.5 wt% 235U, 01000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 780   hundreths of inches - must be integer
c radius =     9.9060 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpreted as octal
c Conc = 01000 milli-g Pu/cc
c Reflector width = 10.0 inches
c Enrichment = 0.935 wt fraction 235U
c
c Density of H2O 1.00000
c Density of U 18.90000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0529 cc
c Volume of water in sample 0.9471 cc
c
c Mass of crit in sample   1.0000 g
c Mass of water in sample  0.9471 g
c
c Total mass of sample  1.9471g for a 1cc sample
c Mass Density for crit material  -1.9471, expressed as negative
c
c  sphere
20 11   -1.947090   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0

1        so     9.9060              $ Sphere
2        so    35.3060         $ Reflection

mode n
kcode 2000 1.0 100  4100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
```

```
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u/water mixture
m11    $ U/H2O Sludge, 95.0 wt% 235U, 01000 milli-g U/cc,  1.9471
1001.66c -0.054427
8016.66c -0.431986
92235.66c -0.480204
92238.66c -0.033383
mt11     lwtr.60t
c
c    u only
m12    $ U, 95.0 wt% 235U, 01000 milli-g U/cc,  1.9471
92235.66c -0.935000
92238.66c -0.065000
c
```

Critview Compatible Data File
93.5% ^{235}U Sphere- 10” Reflection

reset:
title: MCNP5 u5-sp-0935-10
set: MCNP5 set
source: MCNP5 primary
created: Mon 07/19/2010 15:26:43.34
geometry: sphere
modmat: H2O
critmat: uranium
isomat: U235 0.935 U238 0.065
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.020	24.3838
0.025	19.0884
0.030	16.5412
0.040	13.9784
0.045	13.2273
0.050	12.6544
0.055	12.2033
0.060	11.8326
0.065	11.5304
0.070	11.2776
0.080	10.8782
0.100	10.3203
0.130	9.8280
0.150	9.6070
0.170	9.4533
0.200	9.2642
0.350	8.8625
0.500	8.7219
0.800	8.6419
1.000	8.6335
1.500	8.5854
1.700	8.5789
1.900	8.5559
2.000	8.5452
2.100	8.5298
2.500	8.4596
3.000	8.3614
4.000	8.1179
5.000	7.8516
6.000	7.5940
7.000	7.3356
7.500	7.2190
8.000	7.1019
9.000	6.8847
10.00	6.6849
15.00	5.8523
18.90	5.3163

Table B.2.1.2.3-2. K_{eff} Values for 93.5% ^{235}U Sphere - 10 Inches of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
19.60	0.92398	0.00020	16.10	0.92290	0.00022	14.30	0.92480	0.00024
19.80	0.92754	0.00020	16.20	0.92639	0.00023	14.40	0.92867	0.00024
20.00	0.93123	0.00019	16.30	0.92873	0.00023	14.50	0.93211	0.00024
20.20	0.93554	0.00019	16.40	0.93202	0.00022	14.60	0.93572	0.00025
20.40	0.93954	0.00020	16.50	0.93534	0.00022	14.70	0.93961	0.00025
20.60	0.94245	0.00020	16.60	0.93785	0.00023	14.80	0.94281	0.00024
20.80	0.94551	0.00019	16.70	0.94055	0.00023	14.90	0.94640	0.00024
21.00	0.94946	0.00020	16.80	0.94302	0.00023	15.00	0.95072	0.00024
21.20	0.95336	0.00020	16.90	0.94590	0.00023	15.10	0.95336	0.00024
21.40	0.95619	0.00020	17.00	0.94837	0.00022	15.20	0.95657	0.00024
21.60	0.95998	0.00019	17.10	0.95112	0.00022	15.30	0.96028	0.00024
21.80	0.96287	0.00019	17.20	0.95366	0.00022	15.40	0.96396	0.00024
22.00	0.96621	0.00019	17.30	0.95668	0.00023	15.50	0.96702	0.00025
22.20	0.96970	0.00019	17.40	0.95935	0.00022	15.60	0.97026	0.00024
22.40	0.97250	0.00019	17.50	0.96222	0.00022	15.70	0.97379	0.00024
22.60	0.97532	0.00019	17.60	0.96424	0.00022	15.80	0.97714	0.00024
22.80	0.97826	0.00019	17.70	0.96698	0.00022	15.90	0.98004	0.00024
23.00	0.98085	0.00019	17.80	0.96962	0.00022	16.00	0.98327	0.00024
23.20	0.98390	0.00019	17.90	0.97205	0.00022	16.10	0.98643	0.00024
23.40	0.98694	0.00019	18.00	0.97461	0.00022	16.20	0.98963	0.00024
23.60	0.98932	0.00019	18.10	0.97696	0.00022	16.30	0.99250	0.00024
23.80	0.99222	0.00019	18.20	0.97958	0.00022	16.40	0.99550	0.00024
24.00	0.99485	0.00019	18.30	0.98198	0.00022	16.50	0.99890	0.00024
24.20	0.99784	0.00018	18.40	0.98395	0.00022	16.60	1.00157	0.00025
24.40	1.00019	0.00019	18.50	0.98635	0.00022	16.70	1.00456	0.00024
24.60	1.00285	0.00019	18.60	0.98874	0.00022	16.80	1.00744	0.00024
24.80	1.00477	0.00018	18.70	0.99106	0.00022	16.90	1.01026	0.00024
25.00	1.00742	0.00018	18.80	0.99355	0.00021	17.00	1.01350	0.00024
25.20	1.01017	0.00018	18.90	0.99581	0.00022	17.10	1.01654	0.00024
25.30	1.01151	0.00018	19.00	0.99771	0.00022	17.20	1.01867	0.00024
			19.10	1.00030	0.00022	17.30	1.02114	0.00024
			19.20	1.00182	0.00021			
			19.30	1.00432	0.00022			
			19.40	1.00638	0.00022			
			19.50	1.00830	0.00022			
			19.60	1.01095	0.00021			
			19.70	1.01292	0.00021			
			19.80	1.01455	0.00022			

Table B.2.1.2.3-2. K_{eff} Values for 93.5% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.30	0.92378	0.00027	11.60	0.91806	0.00028	11.20	0.92167	0.00028
12.40	0.92821	0.00027	11.70	0.92354	0.00028	11.30	0.92762	0.00029
12.50	0.93398	0.00027	11.80	0.92937	0.00027	11.40	0.93296	0.00028
12.60	0.93878	0.00027	11.90	0.93448	0.00027	11.50	0.93899	0.00028
12.70	0.94359	0.00027	12.00	0.93929	0.00028	11.60	0.94412	0.00028
12.80	0.94802	0.00027	12.10	0.94492	0.00028	11.70	0.95024	0.00028
12.90	0.95249	0.00026	12.20	0.95023	0.00028	11.80	0.95559	0.00028
13.00	0.95696	0.00027	12.30	0.95528	0.00028	11.90	0.96097	0.00029
13.10	0.96200	0.00027	12.40	0.96036	0.00027	12.00	0.96652	0.00028
13.20	0.96643	0.00027	12.50	0.96607	0.00028	12.10	0.97161	0.00029
13.30	0.97144	0.00027	12.60	0.97058	0.00028	12.20	0.97668	0.00028
13.40	0.97569	0.00026	12.70	0.97540	0.00028	12.30	0.98198	0.00028
13.50	0.97994	0.00027	12.80	0.98013	0.00028	12.40	0.98737	0.00029
13.60	0.98448	0.00027	12.90	0.98501	0.00027	12.50	0.99225	0.00028
13.70	0.98842	0.00027	13.00	0.98977	0.00028	12.60	0.99730	0.00028
13.80	0.99255	0.00026	13.10	0.99509	0.00028	12.70	1.00226	0.00028
13.90	0.99681	0.00027	13.20	0.99882	0.00028	12.80	1.00678	0.00029
14.00	1.00088	0.00027	13.30	1.00315	0.00028	12.90	1.01183	0.00028
14.10	1.00518	0.00027	13.40	1.00809	0.00027	13.00	1.01669	0.00028
14.20	1.00967	0.00026	13.50	1.01228	0.00028	13.10	1.02112	0.00029
14.30	1.01297	0.00027	13.60	1.01720	0.00028			
14.40	1.01720	0.00027						

Table B.2.1.2.3-2. K_{eff} Values for 93.5% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.80	0.91953	0.00029	10.50	0.91915	0.00029	10.30	0.92282	0.00030
10.90	0.92580	0.00029	10.55	0.92255	0.00029	10.35	0.92550	0.00030
11.00	0.93171	0.00029	10.60	0.92632	0.00029	10.40	0.92907	0.00030
11.10	0.93747	0.00029	10.65	0.92926	0.00030	10.45	0.93274	0.00030
11.20	0.94354	0.00029	10.70	0.93206	0.00029	10.50	0.93601	0.00030
11.30	0.95013	0.00029	10.75	0.93556	0.00029	10.55	0.93907	0.00030
11.40	0.95563	0.00029	10.80	0.93861	0.00030	10.60	0.94229	0.00029
11.50	0.96114	0.00028	10.85	0.94164	0.00030	10.65	0.94567	0.00030
11.60	0.96690	0.00029	10.90	0.94480	0.00029	10.70	0.94896	0.00030
11.70	0.97225	0.00029	10.95	0.94781	0.00030	10.75	0.95193	0.00030
11.80	0.97843	0.00029	11.00	0.95098	0.00029	10.80	0.95589	0.00029
11.90	0.98339	0.00029	11.05	0.95390	0.00029	10.85	0.95808	0.00030
12.00	0.98895	0.00028	11.10	0.95683	0.00029	10.90	0.96182	0.00030
12.10	0.99431	0.00029	11.15	0.96028	0.00030	10.95	0.96495	0.00030
12.20	0.99983	0.00029	11.20	0.96347	0.00030	11.00	0.96802	0.00029
12.30	1.00494	0.00029	11.25	0.96659	0.00030	11.05	0.97148	0.00030
12.40	1.01017	0.00028	11.30	0.96959	0.00029	11.10	0.97355	0.00030
12.50	1.01593	0.00028	11.35	0.97191	0.00030	11.15	0.97695	0.00030
12.60	1.02107	0.00029	11.40	0.97501	0.00030	11.20	0.97977	0.00030
			11.45	0.97882	0.00029	11.25	0.98327	0.00030
			11.50	0.98056	0.00030	11.30	0.98618	0.00030
			11.55	0.98366	0.00030	11.35	0.98906	0.00030
			11.60	0.98661	0.00029	11.40	0.99144	0.00030
			11.65	0.98917	0.00030	11.45	0.99479	0.00031
			11.70	0.99229	0.00030	11.50	0.99834	0.00030
			11.75	0.99467	0.00030	11.55	1.00107	0.00030
			11.80	0.99803	0.00029	11.60	1.00397	0.00030
			11.85	1.00105	0.00030	11.65	1.00644	0.00030
			11.90	1.00365	0.00029	11.70	1.00902	0.00029
			11.95	1.00624	0.00030	11.75	1.01244	0.00030
			12.00	1.00861	0.00029	11.80	1.01505	0.00030
			12.05	1.01220	0.00029	11.85	1.01811	0.00030
			12.10	1.01482	0.00029	11.90	1.02089	0.00030
			12.15	1.01724	0.00030			
			12.20	1.01921	0.00029			

Table B.2.1.2.3-2. K_{eff} Values for 93.5% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.00	0.91724	0.00030	9.70	0.91913	0.00031	9.20	0.91678	0.00032
10.05	0.91995	0.00030	9.75	0.92283	0.00031	9.25	0.92032	0.00032
10.10	0.92356	0.00030	9.80	0.92716	0.00031	9.30	0.92487	0.00031
10.15	0.92713	0.00030	9.85	0.93030	0.00030	9.35	0.92874	0.00032
10.20	0.93052	0.00031	9.90	0.93389	0.00031	9.40	0.93182	0.00032
10.25	0.93373	0.00030	9.95	0.93752	0.00030	9.45	0.93648	0.00031
10.30	0.93755	0.00030	10.00	0.94084	0.00031	9.50	0.93984	0.00032
10.35	0.93973	0.00030	10.05	0.94468	0.00031	9.55	0.94428	0.00032
10.40	0.94377	0.00031	10.10	0.94802	0.00031	9.60	0.94780	0.00032
10.45	0.94748	0.00030	10.15	0.95139	0.00031	9.65	0.95192	0.00032
10.50	0.95048	0.00031	10.20	0.95551	0.00031	9.70	0.95542	0.00032
10.55	0.95355	0.00031	10.25	0.95836	0.00030	9.75	0.95997	0.00032
10.60	0.95708	0.00030	10.30	0.96182	0.00031	9.80	0.96239	0.00032
10.65	0.96045	0.00031	10.35	0.96505	0.00031	9.85	0.96643	0.00031
10.70	0.96385	0.00031	10.40	0.96875	0.00031	9.90	0.96959	0.00032
10.75	0.96648	0.00030	10.45	0.97166	0.00031	9.95	0.97328	0.00032
10.80	0.97068	0.00030	10.50	0.97561	0.00031	10.00	0.97693	0.00031
10.85	0.97365	0.00030	10.55	0.97923	0.00031	10.05	0.98086	0.00032
10.90	0.97665	0.00031	10.60	0.98234	0.00031	10.10	0.98458	0.00032
10.95	0.97988	0.00030	10.65	0.98597	0.00031	10.15	0.98881	0.00032
11.00	0.98278	0.00030	10.70	0.98903	0.00031	10.20	0.99088	0.00032
11.05	0.98605	0.00031	10.75	0.99204	0.00031	10.25	0.99474	0.00032
11.10	0.98931	0.00030	10.80	0.99502	0.00031	10.30	0.99873	0.00032
11.15	0.99173	0.00030	10.85	0.99795	0.00031	10.35	1.00186	0.00032
11.20	0.99518	0.00031	10.90	1.00158	0.00032	10.40	1.00515	0.00032
11.25	0.99840	0.00030	10.95	1.00495	0.00031	10.45	1.00882	0.00032
11.30	1.00130	0.00030	11.00	1.00805	0.00031	10.50	1.01196	0.00032
11.35	1.00409	0.00030	11.05	1.01175	0.00031	10.55	1.01550	0.00032
11.40	1.00699	0.00030	11.10	1.01428	0.00031	10.60	1.01913	0.00033
11.45	1.01044	0.00031	11.15	1.01678	0.00032	10.65	1.02241	0.00032
11.50	1.01297	0.00031	11.20	1.02060	0.00031	10.70	1.02601	0.00032
11.55	1.01599	0.00030						
11.60	1.01864	0.00031						
11.65	1.02196	0.00030						
11.70	1.02463	0.00030						

Table B.2.1.2.3-2. K_{eff} Values for 93.5% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.80	0.91893	0.00032	8.60	0.91815	0.00033	8.40	0.91288	0.00033
8.85	0.92291	0.00033	8.65	0.92246	0.00033	8.45	0.91744	0.00034
8.90	0.92775	0.00033	8.70	0.92644	0.00033	8.50	0.92202	0.00033
8.95	0.93130	0.00033	8.75	0.93053	0.00033	8.55	0.92599	0.00033
9.00	0.93508	0.00033	8.80	0.93541	0.00033	8.60	0.93084	0.00033
9.05	0.93891	0.00033	8.85	0.93947	0.00033	8.65	0.93479	0.00033
9.10	0.94384	0.00033	8.90	0.94417	0.00033	8.70	0.93940	0.00033
9.15	0.94784	0.00033	8.95	0.94678	0.00033	8.75	0.94273	0.00033
9.20	0.95153	0.00034	9.00	0.95122	0.00033	8.80	0.94753	0.00033
9.25	0.95573	0.00032	9.05	0.95602	0.00033	8.85	0.95136	0.00033
9.30	0.95994	0.00033	9.10	0.95902	0.00033	8.90	0.95655	0.00034
9.35	0.96350	0.00033	9.15	0.96348	0.00033	8.95	0.95967	0.00033
9.40	0.96752	0.00033	9.20	0.96834	0.00033	9.00	0.96378	0.00033
9.45	0.97099	0.00033	9.25	0.97203	0.00033	9.05	0.96859	0.00034
9.50	0.97458	0.00032	9.30	0.97629	0.00033	9.10	0.97255	0.00033
9.55	0.97943	0.00033	9.35	0.98019	0.00033	9.15	0.97614	0.00034
9.60	0.98305	0.00033	9.40	0.98355	0.00033	9.20	0.98027	0.00033
9.65	0.98639	0.00033	9.45	0.98751	0.00033	9.25	0.98473	0.00033
9.70	0.99104	0.00033	9.50	0.99174	0.00033	9.30	0.98806	0.00033
9.75	0.99517	0.00033	9.55	0.99498	0.00033	9.35	0.99264	0.00033
9.80	0.99806	0.00034	9.60	0.99947	0.00033	9.40	0.99590	0.00034
9.85	1.00152	0.00033	9.65	1.00323	0.00033	9.45	0.99975	0.00034
9.90	1.00532	0.00033	9.70	1.00731	0.00033	9.50	1.00349	0.00033
9.95	1.00951	0.00033	9.75	1.00994	0.00034	9.55	1.00819	0.00033
10.00	1.01252	0.00033	9.80	1.01442	0.00034	9.60	1.01196	0.00033
10.05	1.01586	0.00033	9.85	1.01767	0.00033	9.65	1.01489	0.00033
10.10	1.02009	0.00033	9.90	1.02180	0.00033	9.70	1.01950	0.00034

Table B.2.1.2.3-2. K_{eff} Values for 93.5% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.30	0.91820	0.00033	7.90	0.91622	0.00034	7.80	0.91943	0.00034
8.35	0.92264	0.00033	7.95	0.92147	0.00034	7.85	0.92459	0.00034
8.40	0.92735	0.00033	8.00	0.92493	0.00034	7.90	0.92927	0.00034
8.45	0.93145	0.00033	8.05	0.93044	0.00034	7.95	0.93436	0.00033
8.50	0.93566	0.00033	8.10	0.93476	0.00034	8.00	0.93863	0.00034
8.55	0.94073	0.00033	8.15	0.93881	0.00034	8.05	0.94246	0.00034
8.60	0.94507	0.00033	8.20	0.94314	0.00034	8.10	0.94715	0.00034
8.65	0.94895	0.00033	8.25	0.94805	0.00034	8.15	0.95181	0.00034
8.70	0.95360	0.00033	8.30	0.95231	0.00034	8.20	0.95598	0.00035
8.75	0.95722	0.00034	8.35	0.95652	0.00034	8.25	0.95985	0.00034
8.80	0.96131	0.00033	8.40	0.96171	0.00034	8.30	0.96513	0.00033
8.85	0.96547	0.00034	8.45	0.96499	0.00034	8.35	0.96858	0.00034
8.90	0.96995	0.00033	8.50	0.97000	0.00034	8.40	0.97349	0.00034
8.95	0.97470	0.00034	8.55	0.97413	0.00034	8.45	0.97767	0.00034
9.00	0.97847	0.00033	8.60	0.97905	0.00034	8.50	0.98086	0.00034
9.05	0.98256	0.00034	8.65	0.98264	0.00035	8.55	0.98557	0.00034
9.10	0.98647	0.00034	8.70	0.98668	0.00035	8.60	0.98913	0.00034
9.15	0.99047	0.00034	8.75	0.99091	0.00035	8.65	0.99415	0.00034
9.20	0.99499	0.00034	8.80	0.99531	0.00035	8.70	0.99858	0.00034
9.25	0.99876	0.00034	8.85	0.99880	0.00034	8.75	1.00182	0.00034
9.30	1.00314	0.00033	8.90	1.00361	0.00034	8.80	1.00639	0.00035
9.35	1.00654	0.00034	8.95	1.00762	0.00034	8.85	1.00999	0.00034
9.40	1.01000	0.00034	9.00	1.01166	0.00035	8.90	1.01462	0.00034
9.45	1.01427	0.00034	9.05	1.01650	0.00034	8.95	1.01834	0.00034
9.50	1.01817	0.00034	9.10	1.02018	0.00035	9.00	1.02243	0.00035

Table B.2.1.2.3-2. K_{eff} Values for 93.5% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.60	0.91061	0.00034	7.70	0.92295	0.00034	7.60	0.91896	0.00033
7.65	0.91605	0.00034	7.75	0.92712	0.00032	7.65	0.92398	0.00033
7.70	0.92058	0.00033	7.80	0.93181	0.00034	7.70	0.92832	0.00033
7.75	0.92551	0.00034	7.85	0.93598	0.00034	7.75	0.93205	0.00033
7.80	0.92961	0.00033	7.90	0.94067	0.00033	7.80	0.93672	0.00033
7.85	0.93365	0.00033	7.95	0.94452	0.00033	7.85	0.94068	0.00033
7.90	0.93775	0.00033	8.00	0.94868	0.00033	7.90	0.94469	0.00033
7.95	0.94213	0.00034	8.05	0.95334	0.00033	7.95	0.94902	0.00033
8.00	0.94661	0.00034	8.10	0.95746	0.00034	8.00	0.95368	0.00033
8.05	0.95154	0.00034	8.15	0.96176	0.00034	8.05	0.95793	0.00032
8.10	0.95514	0.00034	8.20	0.96585	0.00034	8.10	0.96065	0.00033
8.15	0.95938	0.00034	8.25	0.96990	0.00034	8.15	0.96581	0.00033
8.20	0.96340	0.00035	8.30	0.97352	0.00034	8.20	0.96917	0.00033
8.25	0.96830	0.00034	8.35	0.97876	0.00033	8.25	0.97308	0.00032
8.30	0.97190	0.00034	8.40	0.98220	0.00034	8.30	0.97708	0.00033
8.35	0.97627	0.00033	8.45	0.98613	0.00034	8.35	0.98122	0.00033
8.40	0.98067	0.00034	8.50	0.99031	0.00032	8.40	0.98518	0.00033
8.45	0.98399	0.00034	8.55	0.99363	0.00033	8.45	0.98829	0.00033
8.50	0.98858	0.00034	8.60	0.99791	0.00034	8.50	0.99220	0.00033
8.55	0.99293	0.00034	8.65	1.00103	0.00034	8.55	0.99704	0.00033
8.60	0.99676	0.00034	8.70	1.00571	0.00033	8.60	1.00122	0.00034
8.65	1.00063	0.00034	8.75	1.00973	0.00034	8.65	1.00388	0.00033
8.70	1.00481	0.00033	8.80	1.01329	0.00034	8.70	1.00759	0.00033
8.75	1.00844	0.00034	8.85	1.01782	0.00035	8.75	1.01157	0.00033
8.80	1.01278	0.00034	8.90	1.02118	0.00034	8.80	1.01517	0.00033
8.85	1.01602	0.00034				8.85	1.01933	0.00033
8.90	1.02002	0.00035				8.90	1.02224	0.00032

Table B.2.1.2.3-2. K_{eff} Values for 93.5% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.60	0.92101	0.00033	7.50	0.91587	0.00032	7.50	0.91633	0.00032
7.65	0.92631	0.00032	7.55	0.91979	0.00032	7.55	0.92075	0.00033
7.70	0.92997	0.00032	7.60	0.92400	0.00032	7.60	0.92514	0.00032
7.75	0.93401	0.00033	7.65	0.92867	0.00033	7.65	0.92932	0.00032
7.80	0.93860	0.00033	7.70	0.93245	0.00033	7.70	0.93309	0.00032
7.85	0.94250	0.00032	7.75	0.93697	0.00032	7.75	0.93744	0.00033
7.90	0.94649	0.00033	7.80	0.94089	0.00033	7.80	0.94171	0.00033
7.95	0.95015	0.00033	7.85	0.94467	0.00032	7.85	0.94621	0.00033
8.00	0.95483	0.00032	7.90	0.94888	0.00033	7.90	0.95011	0.00032
8.05	0.95905	0.00033	7.95	0.95334	0.00032	7.95	0.95382	0.00032
8.10	0.96290	0.00033	8.00	0.95726	0.00032	8.00	0.95782	0.00032
8.15	0.96711	0.00033	8.05	0.96169	0.00033	8.05	0.96248	0.00033
8.20	0.97064	0.00032	8.10	0.96514	0.00033	8.10	0.96592	0.00033
8.25	0.97447	0.00033	8.15	0.96873	0.00032	8.15	0.96961	0.00032
8.30	0.97889	0.00033	8.20	0.97290	0.00032	8.20	0.97370	0.00032
8.35	0.98263	0.00033	8.25	0.97661	0.00032	8.25	0.97778	0.00033
8.40	0.98657	0.00033	8.30	0.98063	0.00032	8.30	0.98167	0.00033
8.45	0.99035	0.00033	8.35	0.98480	0.00032	8.35	0.98556	0.00033
8.50	0.99445	0.00033	8.40	0.98830	0.00033	8.40	0.98962	0.00032
8.55	0.99781	0.00033	8.45	0.99187	0.00033	8.45	0.99351	0.00032
8.60	1.00160	0.00033	8.50	0.99593	0.00033	8.50	0.99621	0.00032
8.65	1.00590	0.00033	8.55	0.99955	0.00032	8.55	1.00040	0.00032
8.70	1.00861	0.00033	8.60	1.00337	0.00033	8.60	1.00454	0.00033
8.75	1.01309	0.00033	8.65	1.00713	0.00032	8.65	1.00807	0.00032
8.80	1.01550	0.00033	8.70	1.01036	0.00032	8.70	1.01151	0.00033
8.85	1.01971	0.00033	8.75	1.01466	0.00033	8.75	1.01505	0.00033
8.90	1.02379	0.00032	8.80	1.01774	0.00033	8.80	1.01833	0.00033
			8.85	1.02143	0.00032			
			8.90	1.02493	0.00032			

Table B.2.1.2.3-2. K_{eff} Values for 93.5% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.50	0.91873	0.00032	7.40	0.91529	0.00031	7.40	0.92381	0.00031
7.55	0.92250	0.00032	7.45	0.91934	0.00032	7.45	0.92769	0.00032
7.60	0.92697	0.00032	7.50	0.92411	0.00032	7.50	0.93236	0.00031
7.65	0.93069	0.00033	7.55	0.92784	0.00033	7.55	0.93626	0.00031
7.70	0.93495	0.00032	7.60	0.93210	0.00032	7.60	0.94054	0.00032
7.75	0.93880	0.00032	7.65	0.93682	0.00032	7.65	0.94434	0.00031
7.80	0.94330	0.00032	7.70	0.94039	0.00031	7.70	0.94894	0.00031
7.85	0.94760	0.00032	7.75	0.94459	0.00032	7.75	0.95287	0.00032
7.90	0.95112	0.00032	7.80	0.94882	0.00032	7.80	0.95670	0.00032
7.95	0.95529	0.00032	7.85	0.95321	0.00032	7.85	0.96077	0.00031
8.00	0.95935	0.00032	7.90	0.95661	0.00032	7.90	0.96477	0.00032
8.05	0.96332	0.00032	7.95	0.96101	0.00032	7.95	0.96847	0.00032
8.10	0.96754	0.00032	8.00	0.96485	0.00032	8.00	0.97217	0.00031
8.15	0.97098	0.00032	8.05	0.96882	0.00031	8.05	0.97641	0.00032
8.20	0.97514	0.00033	8.10	0.97244	0.00032	8.10	0.98090	0.00032
8.25	0.97925	0.00032	8.15	0.97666	0.00032	8.15	0.98432	0.00032
8.30	0.98242	0.00032	8.20	0.97986	0.00033	8.20	0.98808	0.00031
8.35	0.98698	0.00033	8.25	0.98400	0.00032	8.25	0.99206	0.00032
8.40	0.99089	0.00033	8.30	0.98806	0.00032	8.35	0.99914	0.00032
8.45	0.99453	0.00032	8.35	0.99201	0.00032	8.40	1.00292	0.00032
8.50	0.99753	0.00032	8.40	0.99593	0.00032	8.45	1.00723	0.00032
8.55	1.00168	0.00033	8.45	0.99915	0.00032	8.55	1.01465	0.00032
8.60	1.00566	0.00032	8.50	1.00357	0.00032	8.60	1.01790	0.00032
8.65	1.00936	0.00033	8.55	1.00671	0.00032			
8.70	1.01265	0.00033	8.60	1.00997	0.00032			
8.75	1.01557	0.00033	8.65	1.01433	0.00032			
8.80	1.01947	0.00033	8.70	1.01726	0.00032			
			8.75	1.02101	0.00032			
			8.80	1.02484	0.00032			

Table B.2.1.2.3-2. K_{eff} Values for 93.5% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.10	0.91660	0.00030	6.90	0.91893	0.00030	6.70	0.92017	0.00030
7.15	0.92083	0.00031	6.95	0.92355	0.00030	6.75	0.92528	0.00030
7.20	0.92560	0.00031	7.00	0.92777	0.00030	6.80	0.92971	0.00030
7.25	0.92939	0.00031	7.05	0.93190	0.00030	6.85	0.93425	0.00029
7.30	0.93437	0.00030	7.10	0.93624	0.00030	6.90	0.93949	0.00030
7.35	0.93788	0.00031	7.15	0.94092	0.00030	6.95	0.94360	0.00030
7.40	0.94243	0.00031	7.20	0.94540	0.00030	7.00	0.94827	0.00030
7.45	0.94681	0.00031	7.25	0.95054	0.00029	7.05	0.95336	0.00030
7.50	0.95101	0.00031	7.30	0.95397	0.00031	7.10	0.95712	0.00030
7.55	0.95469	0.00031	7.35	0.95901	0.00030	7.15	0.96167	0.00030
7.60	0.95911	0.00031	7.40	0.96288	0.00031	7.20	0.96658	0.00030
7.65	0.96344	0.00031	7.45	0.96718	0.00030	7.25	0.97100	0.00030
7.70	0.96753	0.00030	7.50	0.97111	0.00030	7.30	0.97493	0.00031
7.75	0.97179	0.00031	7.55	0.97507	0.00030	7.35	0.97970	0.00030
7.80	0.97561	0.00031	7.60	0.98023	0.00030	7.40	0.98476	0.00030
7.85	0.97928	0.00031	7.65	0.98350	0.00031	7.45	0.98799	0.00030
7.90	0.98375	0.00031	7.70	0.98777	0.00030	7.50	0.99221	0.00030
7.95	0.98770	0.00031	7.75	0.99215	0.00031	7.55	0.99650	0.00030
8.00	0.99174	0.00031	7.80	0.99563	0.00031	7.60	1.00048	0.00030
8.05	0.99600	0.00031	7.85	0.99987	0.00031	7.65	1.00582	0.00030
8.10	0.99871	0.00031	7.90	1.00399	0.00031	7.70	1.00936	0.00030
8.15	1.00232	0.00031	7.95	1.00757	0.00031	7.75	1.01336	0.00031
8.20	1.00649	0.00031	8.00	1.01209	0.00030	7.80	1.01760	0.00030
8.25	1.01080	0.00031	8.05	1.01576	0.00030			
8.30	1.01387	0.00031	8.10	1.02009	0.00031			
8.35	1.01798	0.00031						
8.40	1.02147	0.00031						

Table B.2.1.2.3-2. K_{eff} Values for 93.5% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.50	0.92077	0.00029	6.40	0.92152	0.00030	6.20	0.91062	0.00029
6.55	0.92609	0.00030	6.45	0.92710	0.00029	6.25	0.91603	0.00028
6.60	0.93126	0.00030	6.50	0.93175	0.00029	6.30	0.92067	0.00030
6.65	0.93646	0.00030	6.55	0.93664	0.00029	6.35	0.92612	0.00029
6.70	0.94143	0.00030	6.60	0.94204	0.00030	6.40	0.93100	0.00030
6.75	0.94547	0.00030	6.65	0.94601	0.00029	6.45	0.93628	0.00030
6.80	0.95051	0.00030	6.70	0.95096	0.00029	6.50	0.94121	0.00030
6.85	0.95507	0.00029	6.75	0.95611	0.00030	6.55	0.94679	0.00029
6.90	0.96000	0.00030	6.80	0.96068	0.00030	6.60	0.95184	0.00029
6.95	0.96472	0.00029	6.85	0.96610	0.00030	6.65	0.95656	0.00029
7.00	0.96960	0.00030	6.90	0.97020	0.00029	6.70	0.96176	0.00029
7.05	0.97372	0.00030	6.95	0.97482	0.00030	6.75	0.96671	0.00029
7.10	0.97884	0.00030	7.00	0.97961	0.00030	6.80	0.97130	0.00029
7.15	0.98273	0.00030	7.05	0.98428	0.00029	6.85	0.97665	0.00030
7.20	0.98749	0.00030	7.10	0.98892	0.00029	6.90	0.98126	0.00029
7.25	0.99224	0.00030	7.15	0.99360	0.00030	6.95	0.98533	0.00030
7.30	0.99690	0.00031	7.20	0.99845	0.00030	7.00	0.99079	0.00030
7.35	1.00126	0.00030	7.25	1.00253	0.00030	7.05	0.99484	0.00029
7.40	1.00550	0.00030	7.30	1.00739	0.00030	7.10	0.99984	0.00030
7.45	1.00949	0.00030	7.35	1.01134	0.00030	7.15	1.00410	0.00030
7.50	1.01427	0.00030	7.40	1.01572	0.00030	7.20	1.00872	0.00030
			7.45	1.02052	0.00030	7.25	1.01328	0.00030
			7.50	1.02470	0.00030	7.30	1.01833	0.00030

Table B.2.1.2.3-2. K_{eff} Values for 93.5% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.10	0.91911	0.00029	5.90	0.91595	0.00029	5.20	0.91870	0.00027
6.15	0.92492	0.00029	5.95	0.92236	0.00028	5.25	0.92498	0.00027
6.20	0.93044	0.00030	6.00	0.92770	0.00028	5.30	0.93171	0.00027
6.25	0.93530	0.00029	6.05	0.93330	0.00029	5.35	0.93800	0.00027
6.30	0.94076	0.00030	6.10	0.93878	0.00029	5.40	0.94454	0.00027
6.35	0.94638	0.00029	6.15	0.94346	0.00029	5.45	0.95012	0.00028
6.40	0.95090	0.00029	6.20	0.95011	0.00029	5.50	0.95720	0.00027
6.45	0.95661	0.00029	6.25	0.95485	0.00029	5.55	0.96346	0.00028
6.50	0.96088	0.00029	6.30	0.96043	0.00029	5.60	0.96947	0.00028
6.55	0.96650	0.00030	6.35	0.96511	0.00029	5.65	0.97572	0.00028
6.60	0.97146	0.00029	6.40	0.97054	0.00029	5.70	0.98200	0.00028
6.65	0.97703	0.00029	6.45	0.97594	0.00029	5.75	0.98833	0.00028
6.70	0.98168	0.00029	6.50	0.98129	0.00029	5.80	0.99363	0.00028
6.75	0.98644	0.00029	6.65	0.99624	0.00029	5.85	0.99970	0.00028
6.80	0.99121	0.00029	6.70	1.00163	0.00029	5.90	1.00612	0.00028
6.85	0.99680	0.00029	6.75	1.00660	0.00029	5.95	1.01230	0.00028
6.90	1.00141	0.00030	6.80	1.01134	0.00029	6.00	1.01784	0.00028
6.95	1.00586	0.00029	6.85	1.01606	0.00029	6.05	1.02395	0.00028
7.00	1.01082	0.00030	6.90	1.02114	0.00029	6.10	1.02931	0.00028
7.05	1.01579	0.00029						
7.10	1.02071	0.00029						

Table B.2.1.2.3-2. K_{eff} Values for 93.5% ^{235}U Sphere - 10 Inches of Water Reflection (cont)

18900 milli-g/cc								
Diameter (inches)	K_{eff}	Sigma						
4.70	0.91415	0.00026						
4.75	0.92172	0.00026						
4.80	0.92898	0.00026						
4.85	0.93560	0.00027						
4.90	0.94304	0.00027						
4.95	0.95012	0.00026						
5.00	0.95683	0.00027						
5.05	0.96410	0.00026						
5.10	0.96998	0.00026						
5.15	0.97785	0.00026						
5.20	0.98461	0.00026						
5.25	0.99068	0.00026						
5.30	0.99790	0.00027						
5.35	1.00433	0.00027						
5.40	1.01106	0.00027						
5.45	1.01782	0.00027						
5.50	1.02391	0.00027						

B.2.2. Infinite Cylinder

B.2.2.1. 100% ^{235}U

B.2.2.1.1. Unreflected

Case ID: u5-cyl-1000-00

Material: Uranium metal in water

Geometry: Infinite Cylinder

Isotopics: 100% ^{235}U

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.2.2.1.1-1. Uranium Cylinder (100% ^{235}U) - 0 Inches of Water Reflection

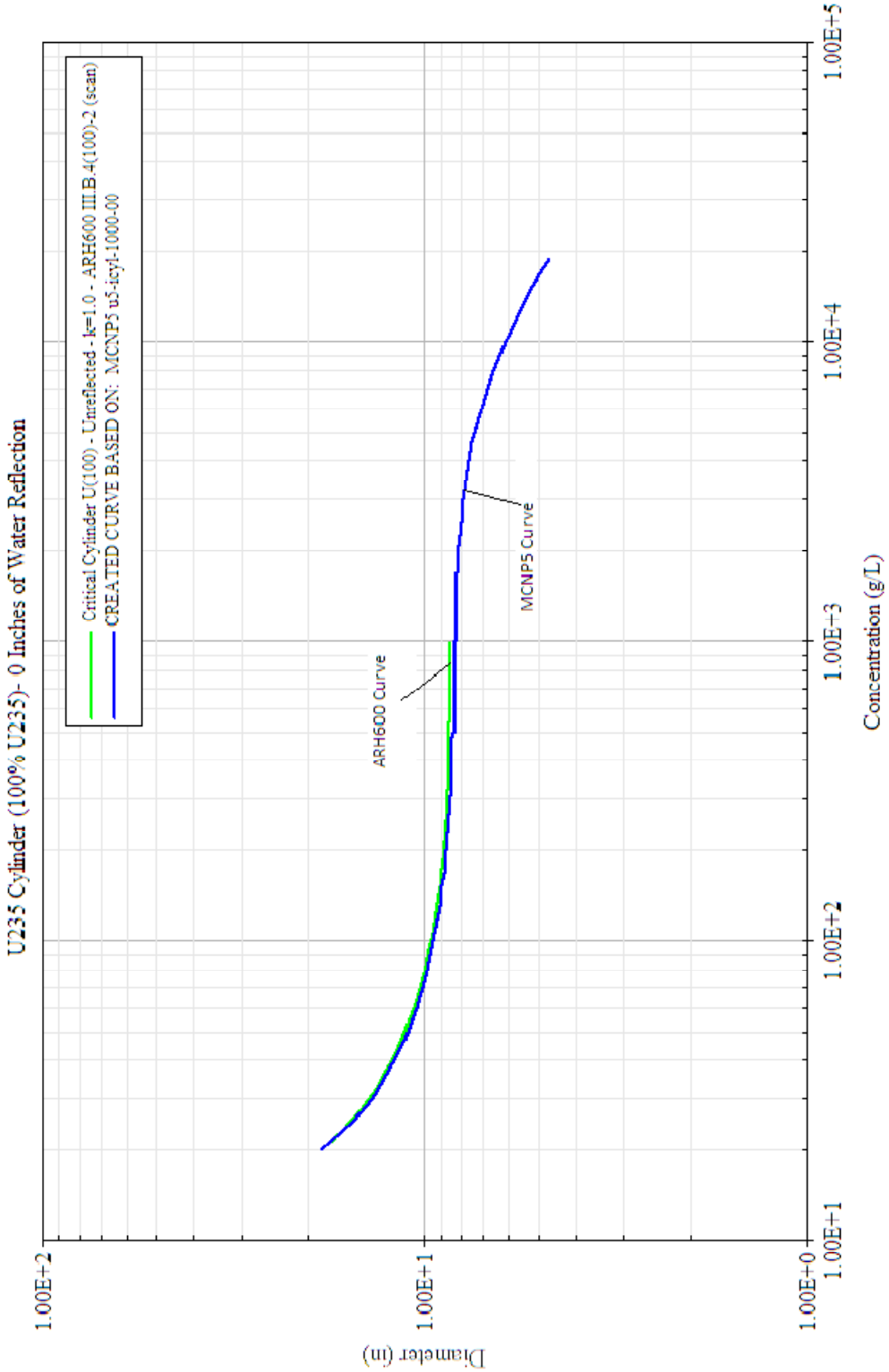

Table B.2.2.1.1-1. Critical Dimensions for Uranium Cylinder (100% ^{235}U) - 0 Inches of Water Reflection

Uranium Cylinder (100% ^{235}U)- 0 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.020	15.600	19.400	0.200	18.6498
0.025	13.300	15.900	0.100	15.3450
0.030	12.000	14.100	0.100	13.6706
0.040	10.600	12.300	0.050	11.9547
0.045	10.200	11.800	0.050	11.4276
0.050	10.000	11.300	0.050	11.0313
0.055	9.700	11.000	0.050	10.7216
0.060	9.500	10.800	0.050	10.4654
0.065	9.300	10.600	0.050	10.2559
0.070	8.800	10.400	0.050	10.0902
0.080	8.900	10.100	0.050	9.8165
0.100	8.400	9.700	0.050	9.4393
0.130	8.300	9.400	0.050	9.1045
0.150	8.200	9.200	0.050	8.9619
0.170	8.000	9.100	0.050	8.8434
0.200	8.100	9.000	0.050	8.7185
0.350	7.700	8.700	0.050	8.4530
0.500	7.500	8.600	0.050	8.3521
0.800	7.600	8.500	0.050	8.2916
1.000	7.400	8.500	0.050	8.2742
1.500	7.400	8.500	0.050	8.2163
1.700	7.500	8.400	0.050	8.1895
1.900	7.400	8.400	0.050	8.1540
2.000	7.200	8.400	0.050	8.1296
2.100	7.300	8.400	0.050	8.1165
2.500	7.300	8.300	0.050	8.0275
3.000	7.200	8.200	0.050	7.9032
4.000	6.800	7.900	0.050	7.6505
5.000	6.600	7.600	0.050	7.3667
6.000	6.400	7.300	0.050	7.0903
7.000	6.100	7.100	0.050	6.8267
7.500	6.000	6.900	0.050	6.7067
8.000	5.900	6.800	0.050	6.5915
9.000	5.700	6.600	0.050	6.3572
10.000	5.500	6.300	0.050	6.1503
15.000	4.700	5.500	0.050	5.2698
18.900	4.200	4.900	0.050	4.6942

MCNP5 Sample Input File

100% ^{235}U Cylinder- 0 Inches of Reflection

```
u icyl, 100.0 wt% 235U, 00150 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 860   hundreths of inches - must be integer
c radius =    10.9220 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00150 milli-g u/cc
c Reflector width =  0.0 inches
c Enrichment = 1.00 wt fraction 235U
c
c Density of H2O 1.00000
c Density of u 18.90000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c u238  = 238.05080
c
c Effective Uranium atomic mass 235.04390
c uranium metal
c Mass fraction of u in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0079 cc
c Volume of water in sample 0.9921 cc
c
c Mass of crit in sample   0.1500 g
c Mass of u in sample   0.1500 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9921 g
c
c Total mass of sample  1.1421g for a 1cc sample
c Mass Density for crit material  -1.1421, expressed as negative
c
c  plane
20 11   -1.142063   -1      imp:n=1
21  2  -1.000                    -2 1     imp:n=0    $zero importance if no reflector
22  0                          2       imp:n=0

1       cz    10.9220             $ plane
```

```
2       cz    10.9220        $ Reflection

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u metal / water mixture
m11    $ Uranium/H2O Sludge, 100.0 wt% 235U, 00150 milli-g u/cc,  1.1421
1001.66c -0.097198
8016.66c -0.771461      $from water
92235.66c -0.131341
c    92238.66c -0.000000
mt11     lwtr.60t
c
c    u only
m12    $ U metal, 100.0 wt% 235U, 00150 milli-g U/cc,  1.1421
92235.66c -0.131341
c    92238.66c -0.000000
c
```

Critview Compatible Data File
100% ^{235}U Cylinder- 0 Inches of Reflection

reset:
title: MCNP5 u5-icyl-1000-00
set: MCNP5 set
source: MCNP5 primary
created: Mon 07/26/2010 10:49:55.28
geometry: infcyl
modmat: H2O
critmat: uranium
isomat: U235 1.0
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.020	18.6498
0.025	15.3450
0.030	13.6706
0.040	11.9547
0.045	11.4276
0.050	11.0313
0.055	10.7216
0.060	10.4654
0.065	10.2559
0.070	10.0902
0.080	9.8165
0.100	9.4393
0.130	9.1045
0.150	8.9619
0.170	8.8434
0.200	8.7185
0.350	8.4530
0.500	8.3521
0.800	8.2916
1.000	8.2742
1.500	8.2163
1.700	8.1895
1.900	8.1540
2.000	8.1296
2.100	8.1165
2.500	8.0275
3.000	7.9032
4.000	7.6505
5.000	7.3667
6.000	7.0903
7.000	6.8267
7.500	6.7067
8.000	6.5915
9.000	6.3572
10.00	6.1503
15.00	5.2698
18.90	4.6942

Table B.2.2.1.1-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) - 0 Inches of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
15.60	0.92456	0.00037	13.30	0.92361	0.00042	12.00	0.91935	0.00046
15.80	0.93041	0.00038	13.40	0.92784	0.00042	12.10	0.92577	0.00045
16.00	0.93651	0.00036	13.50	0.93202	0.00041	12.20	0.93084	0.00047
16.20	0.94106	0.00036	13.60	0.93626	0.00041	12.30	0.93534	0.00045
16.40	0.94678	0.00036	13.70	0.94075	0.00040	12.40	0.94080	0.00046
16.60	0.95154	0.00035	13.80	0.94454	0.00040	12.50	0.94558	0.00045
16.80	0.95784	0.00035	13.90	0.94773	0.00041	12.60	0.95097	0.00045
17.00	0.96302	0.00035	14.00	0.95120	0.00040	12.70	0.95672	0.00044
17.20	0.96753	0.00035	14.10	0.95558	0.00042	12.80	0.96017	0.00043
17.40	0.97215	0.00036	14.20	0.95904	0.00040	12.90	0.96587	0.00043
17.60	0.97732	0.00035	14.30	0.96367	0.00041	13.00	0.97048	0.00044
17.80	0.98153	0.00035	14.40	0.96658	0.00042	13.10	0.97469	0.00046
18.00	0.98539	0.00035	14.50	0.97153	0.00040	13.20	0.97939	0.00044
18.20	0.99053	0.00037	14.60	0.97371	0.00042	13.30	0.98383	0.00042
18.40	0.99514	0.00034	14.70	0.97728	0.00040	13.40	0.98741	0.00045
18.60	0.99875	0.00035	14.80	0.98145	0.00041	13.50	0.99192	0.00046
18.80	1.00377	0.00034	14.90	0.98430	0.00040	13.60	0.99698	0.00043
19.00	1.00606	0.00035	15.00	0.98859	0.00041	13.70	1.00126	0.00044
19.20	1.01056	0.00034	15.10	0.99111	0.00040	13.80	1.00645	0.00044
19.40	1.01451	0.00035	15.20	0.99515	0.00040	13.90	1.00972	0.00045
			15.30	0.99848	0.00039	14.00	1.01334	0.00045
			15.40	1.00186	0.00038	14.10	1.01782	0.00045
			15.50	1.00537	0.00039			
			15.60	1.00830	0.00040			
			15.70	1.01139	0.00040			
			15.80	1.01426	0.00040			
			15.90	1.01788	0.00040			

Table B.2.2.1.1-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) - 0 Inches of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
10.60	0.91531	0.00049	10.20	0.91565	0.00053	10.00	0.92401	0.00052
10.65	0.91873	0.00049	10.25	0.91900	0.00050	10.05	0.92906	0.00053
10.70	0.92302	0.00050	10.30	0.92324	0.00050	10.10	0.93201	0.00053
10.75	0.92513	0.00050	10.35	0.92742	0.00050	10.15	0.93535	0.00052
10.80	0.92859	0.00048	10.40	0.93097	0.00050	10.20	0.93931	0.00052
10.85	0.93274	0.00049	10.45	0.93384	0.00052	10.25	0.94355	0.00052
10.90	0.93589	0.00048	10.50	0.93843	0.00050	10.30	0.94790	0.00052
10.95	0.93881	0.00049	10.55	0.94138	0.00051	10.35	0.95126	0.00053
11.00	0.94237	0.00050	10.60	0.94551	0.00051	10.40	0.95648	0.00053
11.05	0.94519	0.00050	10.65	0.94789	0.00049	10.45	0.95907	0.00052
11.10	0.94943	0.00049	10.70	0.95256	0.00050	10.50	0.96199	0.00051
11.15	0.95174	0.00050	10.75	0.95541	0.00052	10.55	0.96606	0.00052
11.20	0.95540	0.00049	10.80	0.95879	0.00050	10.60	0.96990	0.00053
11.25	0.95716	0.00049	10.85	0.96214	0.00052	10.65	0.97271	0.00053
11.30	0.96204	0.00048	10.90	0.96638	0.00051	10.70	0.97597	0.00054
11.35	0.96477	0.00050	10.95	0.96854	0.00050	10.75	0.98064	0.00052
11.40	0.96833	0.00049	11.00	0.97157	0.00051	10.80	0.98371	0.00052
11.45	0.97088	0.00048	11.05	0.97575	0.00049	10.85	0.98777	0.00053
11.50	0.97413	0.00049	11.10	0.97884	0.00049	10.90	0.99028	0.00052
11.55	0.97617	0.00049	11.15	0.98219	0.00051	10.95	0.99486	0.00053
11.60	0.97951	0.00049	11.20	0.98557	0.00051	11.00	0.99839	0.00052
11.65	0.98318	0.00049	11.25	0.98920	0.00051	11.05	1.00096	0.00053
11.70	0.98614	0.00049	11.30	0.99140	0.00050	11.10	1.00483	0.00054
11.75	0.98824	0.00048	11.35	0.99543	0.00050	11.15	1.00881	0.00053
11.80	0.99185	0.00049	11.40	0.99856	0.00052	11.20	1.01145	0.00053
11.85	0.99507	0.00049	11.45	1.00117	0.00052	11.25	1.01480	0.00053
11.90	0.99722	0.00050	11.50	1.00458	0.00050	11.30	1.01764	0.00052
11.95	0.99957	0.00048	11.55	1.00813	0.00051			
12.00	1.00418	0.00049	11.60	1.01040	0.00050			
12.05	1.00669	0.00050	11.65	1.01396	0.00051			
12.10	1.00955	0.00047	11.70	1.01675	0.00053			
12.15	1.01286	0.00049	11.75	1.02000	0.00051			
12.20	1.01458	0.00048	11.80	1.02325	0.00051			
12.25	1.01907	0.00049						
12.30	1.02180	0.00049						

Table B.2.2.1.1-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) - 0 Inches of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.70	0.92064	0.00053	9.50	0.92079	0.00054	9.30	0.91899	0.00054
9.75	0.92410	0.00054	9.55	0.92420	0.00056	9.35	0.92342	0.00057
9.80	0.92978	0.00055	9.60	0.93015	0.00054	9.40	0.92772	0.00056
9.85	0.93313	0.00053	9.65	0.93431	0.00055	9.45	0.93222	0.00054
9.90	0.93651	0.00054	9.70	0.93822	0.00053	9.50	0.93716	0.00056
9.95	0.94088	0.00052	9.75	0.94271	0.00055	9.55	0.94113	0.00055
10.00	0.94493	0.00052	9.80	0.94647	0.00056	9.60	0.94509	0.00057
10.05	0.94850	0.00051	9.85	0.95060	0.00054	9.65	0.95008	0.00054
10.10	0.95322	0.00055	9.90	0.95427	0.00055	9.70	0.95499	0.00057
10.15	0.95691	0.00053	9.95	0.95889	0.00056	9.75	0.95853	0.00057
10.20	0.96013	0.00054	10.00	0.96324	0.00054	9.80	0.96358	0.00054
10.25	0.96498	0.00053	10.05	0.96649	0.00057	9.85	0.96761	0.00054
10.30	0.96914	0.00054	10.10	0.97134	0.00056	9.90	0.97031	0.00056
10.35	0.97165	0.00054	10.15	0.97469	0.00054	9.95	0.97549	0.00055
10.40	0.97664	0.00053	10.20	0.97945	0.00055	10.00	0.97815	0.00055
10.45	0.97977	0.00053	10.25	0.98343	0.00056	10.05	0.98150	0.00055
10.50	0.98355	0.00053	10.30	0.98697	0.00053	10.10	0.98601	0.00055
10.55	0.98781	0.00054	10.35	0.99018	0.00055	10.15	0.99063	0.00054
10.60	0.99081	0.00053	10.40	0.99446	0.00055	10.20	0.99469	0.00057
10.65	0.99431	0.00053	10.45	0.99877	0.00056	10.25	0.99966	0.00056
10.70	0.99831	0.00054	10.50	1.00276	0.00056	10.30	1.00255	0.00057
10.75	1.00223	0.00053	10.55	1.00642	0.00055	10.35	1.00658	0.00056
10.80	1.00498	0.00053	10.60	1.00959	0.00054	10.40	1.00997	0.00054
10.85	1.00832	0.00051	10.65	1.01265	0.00054	10.45	1.01366	0.00056
10.90	1.01262	0.00053	10.70	1.01648	0.00053	10.50	1.01740	0.00056
10.95	1.01616	0.00054	10.75	1.02036	0.00055	10.55	1.02111	0.00054
11.00	1.01950	0.00054	10.80	1.02398	0.00056	10.60	1.02554	0.00055

Table B.2.2.1.1-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) - 0 Inches of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.80	0.88495	0.00054	8.90	0.91611	0.00056	8.40	0.89657	0.00060
8.85	0.88945	0.00057	8.95	0.92013	0.00059	8.45	0.90322	0.00058
8.90	0.89332	0.00057	9.00	0.92632	0.00057	8.50	0.90839	0.00060
8.95	0.89902	0.00057	9.05	0.93052	0.00057	8.55	0.91353	0.00060
9.00	0.90408	0.00057	9.10	0.93473	0.00058	8.60	0.91760	0.00059
9.05	0.90834	0.00058	9.15	0.93961	0.00059	8.65	0.92408	0.00059
9.10	0.91262	0.00055	9.20	0.94442	0.00059	8.70	0.92889	0.00058
9.15	0.91793	0.00054	9.25	0.94993	0.00058	8.75	0.93358	0.00058
9.20	0.92256	0.00057	9.30	0.95478	0.00056	8.80	0.93951	0.00060
9.25	0.92779	0.00057	9.35	0.95876	0.00058	8.85	0.94402	0.00058
9.30	0.93193	0.00054	9.40	0.96389	0.00058	8.90	0.94824	0.00059
9.35	0.93613	0.00057	9.45	0.96758	0.00056	8.95	0.95403	0.00058
9.40	0.94088	0.00057	9.50	0.97356	0.00057	9.00	0.95905	0.00059
9.45	0.94520	0.00053	9.55	0.97740	0.00059	9.05	0.96306	0.00059
9.50	0.94917	0.00055	9.60	0.98135	0.00060	9.10	0.96888	0.00057
9.55	0.95422	0.00056	9.65	0.98650	0.00060	9.15	0.97330	0.00061
9.60	0.95828	0.00056	9.70	0.98885	0.00058	9.20	0.97799	0.00059
9.65	0.96375	0.00057	9.75	0.99422	0.00057	9.25	0.98251	0.00059
9.70	0.96730	0.00056	9.80	0.99818	0.00057	9.30	0.98736	0.00058
9.75	0.97265	0.00058	9.85	1.00368	0.00057	9.35	0.99306	0.00058
9.80	0.97558	0.00056	9.90	1.00790	0.00058	9.40	0.99677	0.00058
9.85	0.97976	0.00057	9.95	1.01094	0.00057	9.45	1.00088	0.00060
9.90	0.98418	0.00055	10.00	1.01456	0.00060	9.50	1.00570	0.00059
9.95	0.98853	0.00056	10.05	1.01909	0.00059	9.55	1.01026	0.00058
10.00	0.99272	0.00056	10.10	1.02455	0.00059	9.60	1.01565	0.00059
10.05	0.99670	0.00056				9.65	1.02012	0.00057
10.10	1.00080	0.00058				9.70	1.02336	0.00058
10.15	1.00532	0.00057						
10.20	1.00810	0.00058						
10.25	1.01150	0.00057						
10.30	1.01640	0.00057						
10.35	1.01997	0.00057						
10.40	1.02412	0.00058						

Table B.2.2.1.1-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) - 0 Inches of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.30	0.91719	0.00062	8.20	0.92029	0.00060	8.00	0.90832	0.00063
8.35	0.92301	0.00061	8.25	0.92522	0.00061	8.05	0.91392	0.00060
8.40	0.92850	0.00063	8.30	0.93161	0.00061	8.10	0.91919	0.00061
8.45	0.93321	0.00060	8.35	0.93594	0.00061	8.15	0.92532	0.00062
8.50	0.93976	0.00059	8.40	0.94319	0.00062	8.20	0.93207	0.00061
8.55	0.94384	0.00060	8.45	0.94739	0.00061	8.25	0.93728	0.00060
8.60	0.94913	0.00060	8.50	0.95225	0.00061	8.30	0.94305	0.00063
8.65	0.95453	0.00060	8.55	0.95851	0.00061	8.35	0.94922	0.00061
8.70	0.95970	0.00061	8.60	0.96357	0.00060	8.40	0.95347	0.00064
8.75	0.96532	0.00060	8.65	0.96870	0.00058	8.45	0.95866	0.00066
8.80	0.96996	0.00063	8.70	0.97492	0.00062	8.50	0.96510	0.00061
8.85	0.97515	0.00061	8.75	0.98006	0.00062	8.55	0.97004	0.00061
8.90	0.98032	0.00061	8.80	0.98410	0.00061	8.60	0.97355	0.00063
8.95	0.98496	0.00061	8.85	0.98896	0.00061	8.65	0.98052	0.00061
9.00	0.99048	0.00062	8.90	0.99467	0.00061	8.70	0.98530	0.00062
9.05	0.99472	0.00062	8.95	0.99854	0.00061	8.75	0.99156	0.00060
9.10	0.99948	0.00065	9.00	1.00467	0.00062	8.80	0.99616	0.00061
9.15	1.00523	0.00060	9.05	1.01032	0.00061	8.85	1.00058	0.00063
9.20	1.01027	0.00059	9.10	1.01363	0.00062	8.90	1.00669	0.00063
9.25	1.01407	0.00060	9.15	1.01994	0.00062	8.95	1.01050	0.00064
9.30	1.01985	0.00060	9.20	1.02430	0.00060	9.00	1.01566	0.00062
9.35	1.02410	0.00061				9.05	1.02105	0.00062
9.40	1.02848	0.00061				9.10	1.02565	0.00064

Table B.2.2.1.1-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) - 0 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.10	0.93242	0.00063	7.70	0.91523	0.00062	7.50	0.90226	0.00061
8.15	0.93766	0.00061	7.75	0.92059	0.00062	7.55	0.90804	0.00063
8.20	0.94329	0.00062	7.80	0.92661	0.00061	7.60	0.91483	0.00063
8.25	0.94888	0.00062	7.85	0.93304	0.00064	7.65	0.92077	0.00063
8.30	0.95430	0.00062	7.90	0.93919	0.00064	7.70	0.92603	0.00063
8.35	0.95937	0.00062	7.95	0.94467	0.00064	7.75	0.93246	0.00062
8.40	0.96565	0.00061	8.00	0.95049	0.00063	7.80	0.93759	0.00061
8.45	0.97089	0.00064	8.05	0.95622	0.00063	7.85	0.94404	0.00064
8.50	0.97625	0.00062	8.10	0.96111	0.00063	7.90	0.94857	0.00065
8.55	0.98324	0.00064	8.15	0.96727	0.00063	7.95	0.95438	0.00062
8.60	0.98684	0.00063	8.20	0.97269	0.00062	8.00	0.96064	0.00061
8.65	0.99222	0.00062	8.25	0.97894	0.00064	8.05	0.96575	0.00062
8.70	0.99836	0.00061	8.30	0.98379	0.00061	8.10	0.97315	0.00064
8.75	1.00280	0.00061	8.35	0.98930	0.00062	8.15	0.97753	0.00064
8.80	1.00903	0.00062	8.40	0.99462	0.00065	8.20	0.98233	0.00063
8.85	1.01351	0.00062	8.45	0.99965	0.00063	8.25	0.98847	0.00063
8.90	1.01834	0.00062	8.50	1.00552	0.00065	8.30	0.99393	0.00063
8.95	1.02307	0.00063	8.55	1.01121	0.00064	8.35	0.99983	0.00063
9.00	1.02828	0.00064	8.60	1.01571	0.00064	8.40	1.00388	0.00065
			8.65	1.02101	0.00061	8.45	1.00904	0.00063
			8.70	1.02644	0.00062	8.50	1.01551	0.00064
						8.55	1.01992	0.00064
						8.60	1.02525	0.00062

Table B.2.2.1.1-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) - 0 Inches of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.60	0.92402	0.00060	7.40	0.90429	0.00061	7.40	0.91362	0.00060
7.65	0.92914	0.00062	7.45	0.90932	0.00061	7.45	0.91920	0.00060
7.70	0.93552	0.00061	7.50	0.91639	0.00060	7.50	0.92496	0.00059
7.75	0.94059	0.00061	7.55	0.92205	0.00061	7.55	0.92915	0.00058
7.80	0.94635	0.00062	7.60	0.92624	0.00061	7.60	0.93521	0.00061
7.85	0.95143	0.00062	7.65	0.93341	0.00061	7.65	0.94043	0.00057
7.90	0.95742	0.00064	7.70	0.93904	0.00061	7.70	0.94579	0.00058
7.95	0.96367	0.00062	7.75	0.94408	0.00059	7.75	0.95138	0.00061
8.00	0.96787	0.00062	7.80	0.95001	0.00061	7.80	0.95758	0.00058
8.05	0.97507	0.00059	7.85	0.95455	0.00061	7.85	0.96254	0.00060
8.10	0.97930	0.00061	7.90	0.96149	0.00061	7.90	0.96869	0.00058
8.15	0.98402	0.00062	7.95	0.96562	0.00062	7.95	0.97255	0.00059
8.20	0.99093	0.00063	8.00	0.97046	0.00062	8.00	0.97788	0.00059
8.25	0.99526	0.00064	8.05	0.97687	0.00062	8.05	0.98294	0.00059
8.30	1.00096	0.00059	8.10	0.98276	0.00062	8.10	0.98661	0.00058
8.35	1.00590	0.00063	8.15	0.98584	0.00064	8.15	0.99331	0.00058
8.40	1.00925	0.00061	8.20	0.99364	0.00061	8.20	0.99837	0.00060
8.45	1.01600	0.00061	8.25	0.99741	0.00061	8.25	1.00338	0.00059
8.50	1.02106	0.00063	8.30	1.00277	0.00060	8.30	1.00722	0.00058
			8.35	1.00712	0.00060	8.35	1.01249	0.00061
			8.40	1.01258	0.00062	8.40	1.01834	0.00059
			8.45	1.01758	0.00060	8.45	1.02305	0.00060
			8.50	1.02296	0.00061	8.50	1.02706	0.00058

Table B.2.2.1.1-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) - 0 Inches of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.50	0.92797	0.00059	7.40	0.92153	0.00058	7.20	0.90099	0.00057
7.55	0.93383	0.00058	7.45	0.92652	0.00057	7.25	0.90728	0.00055
7.60	0.93911	0.00057	7.50	0.93192	0.00057	7.30	0.91165	0.00055
7.65	0.94478	0.00056	7.55	0.93782	0.00057	7.35	0.91735	0.00057
7.70	0.94923	0.00056	7.60	0.94230	0.00058	7.40	0.92291	0.00057
7.75	0.95469	0.00059	7.65	0.94805	0.00056	7.45	0.92827	0.00057
7.80	0.95921	0.00059	7.70	0.95404	0.00058	7.50	0.93389	0.00056
7.85	0.96572	0.00058	7.75	0.95891	0.00058	7.55	0.94011	0.00057
7.90	0.97011	0.00056	7.80	0.96371	0.00056	7.60	0.94556	0.00059
7.95	0.97635	0.00059	7.85	0.96917	0.00058	7.65	0.95038	0.00058
8.00	0.98119	0.00058	7.90	0.97336	0.00059	7.70	0.95591	0.00059
8.05	0.98571	0.00059	7.95	0.98012	0.00060	7.75	0.96065	0.00056
8.10	0.99146	0.00059	8.00	0.98391	0.00056	7.80	0.96655	0.00058
8.15	0.99593	0.00059	8.05	0.98998	0.00056	7.85	0.97038	0.00056
8.20	1.00108	0.00057	8.10	0.99476	0.00057	7.90	0.97632	0.00058
8.25	1.00495	0.00058	8.15	0.99963	0.00060	7.95	0.98274	0.00059
8.30	1.01159	0.00058	8.20	1.00431	0.00058	8.00	0.98606	0.00057
8.35	1.01692	0.00058	8.25	1.00974	0.00058	8.05	0.99113	0.00058
8.40	1.02041	0.00059	8.30	1.01418	0.00057	8.10	0.99657	0.00056
			8.35	1.01921	0.00056	8.15	1.00236	0.00057
			8.40	1.02363	0.00057	8.20	1.00619	0.00057
						8.25	1.01098	0.00059
						8.30	1.01642	0.00058
						8.35	1.02074	0.00059
						8.40	1.02563	0.00059

Table B.2.2.1.1-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) - 0 Inches of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.30	0.91380	0.00056	7.30	0.92349	0.00055	7.20	0.92615	0.00055
7.35	0.91994	0.00056	7.35	0.92864	0.00056	7.25	0.93140	0.00054
7.40	0.92552	0.00057	7.40	0.93437	0.00054	7.30	0.93653	0.00054
7.45	0.93039	0.00056	7.45	0.93988	0.00054	7.35	0.94194	0.00055
7.50	0.93666	0.00058	7.50	0.94540	0.00055	7.40	0.94755	0.00056
7.55	0.94161	0.00057	7.55	0.95020	0.00055	7.45	0.95228	0.00054
7.60	0.94640	0.00056	7.60	0.95571	0.00056	7.50	0.95737	0.00057
7.65	0.95221	0.00055	7.65	0.96160	0.00055	7.55	0.96412	0.00055
7.70	0.95661	0.00055	7.70	0.96622	0.00055	7.60	0.96841	0.00054
7.75	0.96306	0.00058	7.75	0.97225	0.00057	7.65	0.97331	0.00056
7.80	0.96807	0.00057	7.80	0.97657	0.00057	7.70	0.97883	0.00054
7.85	0.97343	0.00056	7.85	0.98127	0.00056	7.75	0.98394	0.00055
7.90	0.97829	0.00057	7.90	0.98748	0.00058	7.80	0.98943	0.00056
7.95	0.98294	0.00056	7.95	0.99128	0.00055	7.85	0.99469	0.00056
8.00	0.98734	0.00059	8.00	0.99764	0.00056	7.90	0.99976	0.00055
8.05	0.99244	0.00057	8.05	1.00193	0.00058	7.95	1.00348	0.00054
8.10	0.99841	0.00058	8.10	1.00783	0.00057	8.00	1.00849	0.00054
8.15	1.00322	0.00059	8.15	1.01084	0.00056	8.05	1.01305	0.00054
8.20	1.00797	0.00057	8.20	1.01569	0.00055	8.10	1.01767	0.00053
8.25	1.01269	0.00056	8.25	1.02013	0.00058	8.15	1.02336	0.00055
8.30	1.01876	0.00057	8.30	1.02533	0.00056	8.20	1.02835	0.00056
8.35	1.02197	0.00056						
8.40	1.02732	0.00057						

Table B.2.2.1.1-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) - 0 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.80	0.90822	0.00051	6.60	0.91445	0.00051	6.40	0.91988	0.00051
6.85	0.91466	0.00051	6.65	0.92012	0.00051	6.45	0.92561	0.00050
6.90	0.92030	0.00052	6.70	0.92636	0.00050	6.50	0.93162	0.00049
6.95	0.92525	0.00051	6.75	0.93227	0.00051	6.55	0.93881	0.00049
7.00	0.93188	0.00052	6.80	0.93774	0.00053	6.60	0.94367	0.00050
7.05	0.93670	0.00052	6.85	0.94339	0.00050	6.65	0.95010	0.00050
7.10	0.94202	0.00051	6.90	0.95030	0.00051	6.70	0.95545	0.00051
7.15	0.94867	0.00052	6.95	0.95509	0.00050	6.75	0.96117	0.00051
7.20	0.95383	0.00052	7.00	0.96036	0.00052	6.80	0.96759	0.00050
7.25	0.95852	0.00052	7.05	0.96593	0.00051	6.85	0.97258	0.00051
7.30	0.96407	0.00053	7.10	0.97232	0.00051	6.90	0.97836	0.00050
7.35	0.96868	0.00050	7.15	0.97730	0.00053	6.95	0.98421	0.00050
7.40	0.97501	0.00052	7.20	0.98171	0.00052	7.00	0.99041	0.00050
7.45	0.97940	0.00054	7.25	0.98725	0.00052	7.05	0.99583	0.00050
7.50	0.98503	0.00052	7.30	0.99323	0.00050	7.10	1.00101	0.00048
7.55	0.99058	0.00053	7.35	0.99844	0.00052	7.15	1.00615	0.00050
7.60	0.99541	0.00052	7.40	1.00312	0.00052	7.20	1.01173	0.00049
7.65	0.99993	0.00053	7.45	1.00892	0.00053	7.25	1.01708	0.00050
7.70	1.00641	0.00054	7.50	1.01461	0.00051	7.30	1.02203	0.00050
7.75	1.01116	0.00055	7.55	1.01952	0.00050			
7.80	1.01547	0.00052	7.60	1.02478	0.00050			
7.85	1.01992	0.00052						
7.90	1.02686	0.00054						

Table B.2.2.1.1-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) - 0 Inches of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.10	0.91009	0.00046	6.00	0.91249	0.00045	5.90	0.91298	0.00047
6.15	0.91719	0.00047	6.05	0.91847	0.00047	5.95	0.91959	0.00046
6.20	0.92305	0.00046	6.10	0.92484	0.00048	6.00	0.92523	0.00047
6.25	0.93034	0.00049	6.15	0.93154	0.00048	6.05	0.93076	0.00046
6.30	0.93618	0.00048	6.20	0.93746	0.00047	6.10	0.93916	0.00047
6.35	0.94270	0.00049	6.25	0.94444	0.00047	6.15	0.94534	0.00048
6.40	0.94860	0.00048	6.30	0.95047	0.00047	6.20	0.95183	0.00047
6.45	0.95538	0.00048	6.35	0.95629	0.00048	6.25	0.95777	0.00047
6.50	0.96122	0.00050	6.40	0.96392	0.00047	6.30	0.96486	0.00047
6.55	0.96697	0.00049	6.45	0.96953	0.00047	6.35	0.97101	0.00047
6.60	0.97278	0.00049	6.50	0.97552	0.00049	6.40	0.97669	0.00047
6.65	0.97837	0.00047	6.55	0.98146	0.00048	6.45	0.98258	0.00047
6.70	0.98471	0.00049	6.60	0.98709	0.00048	6.50	0.98975	0.00048
6.75	0.99098	0.00049	6.65	0.99327	0.00049	6.55	0.99529	0.00048
6.80	0.99663	0.00049	6.70	0.99919	0.00048	6.60	1.00097	0.00048
6.85	1.00294	0.00049	6.75	1.00520	0.00049	6.65	1.00728	0.00049
6.90	1.00865	0.00048	6.80	1.01114	0.00048	6.70	1.01338	0.00049
6.95	1.01365	0.00049	6.85	1.01635	0.00049	6.75	1.01985	0.00048
7.00	1.01901	0.00050	6.90	1.02277	0.00048	6.80	1.02523	0.00048
7.05	1.02545	0.00049						
7.10	1.02969	0.00049						

Table B.2.2.1.1-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) - 0 Inches of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.70	0.91156	0.00045	5.50	0.91038	0.00044	4.70	0.91046	0.00036
5.75	0.91885	0.00044	5.55	0.91830	0.00044	4.75	0.91740	0.00038
5.80	0.92640	0.00045	5.60	0.92509	0.00045	4.80	0.92599	0.00037
5.85	0.93337	0.00045	5.65	0.93264	0.00044	4.85	0.93415	0.00037
5.90	0.93978	0.00047	5.70	0.93942	0.00045	4.90	0.94215	0.00038
5.95	0.94687	0.00046	5.75	0.94696	0.00045	4.95	0.95010	0.00038
6.00	0.95359	0.00046	5.80	0.95314	0.00044	5.00	0.95829	0.00039
6.05	0.95953	0.00045	5.85	0.95952	0.00044	5.05	0.96622	0.00040
6.10	0.96645	0.00044	5.90	0.96718	0.00044	5.10	0.97382	0.00040
6.15	0.97337	0.00045	5.95	0.97343	0.00044	5.15	0.98241	0.00039
6.20	0.97871	0.00046	6.00	0.97909	0.00045	5.20	0.99009	0.00039
6.25	0.98558	0.00047	6.05	0.98711	0.00045	5.25	0.99738	0.00039
6.30	0.99252	0.00046	6.10	0.99390	0.00047	5.30	1.00400	0.00040
6.35	0.99913	0.00046	6.15	0.99996	0.00045	5.35	1.01187	0.00041
6.40	1.00520	0.00047	6.20	1.00636	0.00045	5.40	1.01979	0.00039
6.45	1.01121	0.00047	6.25	1.01299	0.00045	5.45	1.02765	0.00041
6.50	1.01771	0.00047	6.30	1.01994	0.00046	5.50	1.03490	0.00039
6.55	1.02278	0.00047						
6.60	1.03040	0.00047						

Table B.2.2.1.1-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) - 0 Inches of Water Reflection (cont)

18900 milli-g/cc								
Diameter (inches)	Keff	Sigma						
4.20	0.91485	0.00034						
4.25	0.92377	0.00036						
4.30	0.93244	0.00034						
4.35	0.94171	0.00033						
4.40	0.95024	0.00034						
4.45	0.95899	0.00035						
4.50	0.96762	0.00035						
4.55	0.97615	0.00035						
4.60	0.98516	0.00035						
4.65	0.99224	0.00037						
4.70	1.00102	0.00037						
4.75	1.00966	0.00038						
4.80	1.01779	0.00037						
4.85	1.02636	0.00036						
4.90	1.03415	0.00037						

B.2.2.1.2. 1” Water Reflector

Case ID: u5-cyl-1000-01

Material: Uranium metal in water

Geometry: Infinite Cylinder

Isotopics: 100% ^{235}U

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.2.2.1.2-1. Uranium Cylinder (100% ^{235}U) – 1 Inch of Water Reflection

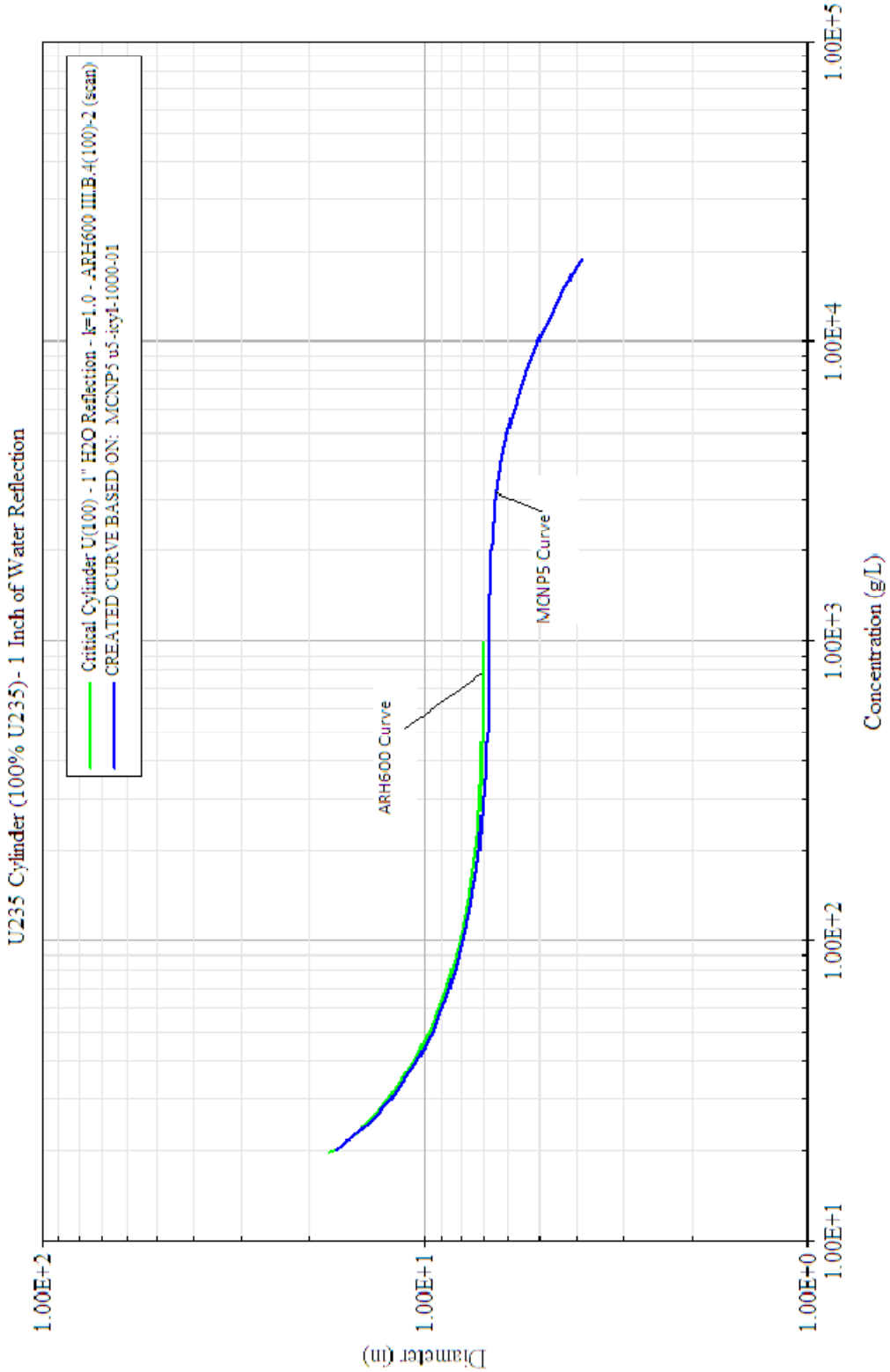

Table B.2.2.1.2-1. Critical Dimensions for Uranium Cylinder (100% ^{235}U) – 1 Inch of Water Reflection

Uranium Cylinder (100% ^{235}U) – 1 Inch of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter
0.020	14.100	17.900	0.200	17.0922
0.025	11.800	14.300	0.100	13.8438
0.030	10.500	12.600	0.100	12.1552
0.040	8.800	10.800	0.100	10.4129
0.045	8.700	10.200	0.050	9.9088
0.050	8.400	9.800	0.050	9.4991
0.055	8.100	9.500	0.050	9.1956
0.060	8.000	9.200	0.050	8.9588
0.065	7.500	9.000	0.050	8.7532
0.070	7.200	8.800	0.050	8.5681
0.080	7.500	8.500	0.050	8.2817
0.100	7.100	8.200	0.050	7.9120
0.130	6.800	7.800	0.050	7.5596
0.150	6.600	7.700	0.050	7.4207
0.170	6.600	7.500	0.050	7.3057
0.200	6.400	7.400	0.050	7.1849
0.350	6.200	7.100	0.050	6.9131
0.500	6.100	7.000	0.050	6.8225
0.800	6.000	7.000	0.050	6.7624
1.000	6.000	7.000	0.050	6.7540
1.500	5.900	7.000	0.050	6.7216
1.700	5.900	6.900	0.050	6.6996
1.900	5.900	6.900	0.050	6.6847
2.000	5.900	6.900	0.050	6.6710
2.100	5.900	6.900	0.050	6.6568
2.500	5.800	6.800	0.050	6.5960
3.000	5.700	6.700	0.050	6.4988
4.000	5.500	6.500	0.050	6.2798
5.000	5.300	6.300	0.050	6.0598
6.000	5.100	6.000	0.050	5.8314
7.000	5.000	5.800	0.050	5.6163
7.500	4.900	5.700	0.050	5.5121
8.000	4.800	5.600	0.050	5.4136
9.000	4.600	5.400	0.050	5.2292
10.000	4.500	5.200	0.050	5.0442
15.000	3.800	4.500	0.050	4.3280
18.900	3.200	4.000	0.050	3.8641

MCNP5 Sample Input File
100% ^{235}U Cylinder- 1 Inches of Reflection

```
u icyl, 100.0 wt% 235U, 00150 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 705   hundreths of inches - must be integer
c radius =     8.9535 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00150 milli-g u/cc
c Reflector width =  1.0 inches
c Enrichment = 1.00 wt fraction 235U
c
c Density of H2O 1.00000
c Density of u 18.90000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c u238  = 238.05080
c
c Effective Uranium atomic mass 235.04390
c uranium metal
c Mass fraction of u in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0079 cc
c Volume of water in sample 0.9921 cc
c
c Mass of crit in sample   0.1500 g
c Mass of u in sample   0.1500 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9921 g
c
c Total mass of sample  1.1421g for a 1cc sample
c Mass Density for crit material  -1.1421, expressed as negative
c
c  plane
20 11   -1.142063   -1      imp:n=1
21  2  -1.000                    -2 1     imp:n=1    $zero importance if no reflector
22  0                          2        imp:n=0
```

```
1       cz     8.9535              $ plane
2       cz    11.4935        $ Reflection

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u metal / water mixture
m11    $ Uranium/H2O Sludge, 100.0 wt% 235U, 00150 milli-g u/cc,  1.1421
1001.66c -0.097198
8016.66c -0.771461      $from water
92235.66c -0.131341
c    92238.66c -0.000000
mt11     lwtr.60t
c
c    u only
m12    $ U metal, 100.0 wt% 235U, 00150 milli-g U/cc,  1.1421
92235.66c -0.131341
c    92238.66c -0.000000
c
```

Critview Compatible Data File
100% ^{235}U Cylinder- 1 Inches of Reflection
reset:
title: MCNP5 u5-icyl-1000-01
set: MCNP5 set
source: MCNP5 primary
created: Mon 07/26/2010 10:50:09.46
geometry: infcyl
modmat: H2O
critmat: uranium
isomat: U235 1.0
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.020	17.0922
0.025	13.8438
0.030	12.1552
0.040	10.4129
0.045	9.9088
0.050	9.4991
0.055	9.1956
0.060	8.9588
0.065	8.7532
0.070	8.5681
0.080	8.2817
0.100	7.9120
0.130	7.5596
0.150	7.4207
0.170	7.3057
0.200	7.1849
0.350	6.9131
0.500	6.8225
0.800	6.7624
1.000	6.7540
1.500	6.7216
1.700	6.6996
1.900	6.6847
2.000	6.6710
2.100	6.6568
2.500	6.5960
3.000	6.4988
4.000	6.2798
5.000	6.0598
6.000	5.8314
7.000	5.6163
7.500	5.5121
8.000	5.4136
9.000	5.2292
10.00	5.0442
15.00	4.3280
18.90	3.8641

Table B.2.2.1.2-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 1 Inch of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
14.10	0.92456	0.00036	11.80	0.92376	0.00039	10.50	0.92005	0.00045
14.30	0.93118	0.00036	11.90	0.92803	0.00040	10.60	0.92641	0.00043
14.50	0.93605	0.00036	12.00	0.93276	0.00039	10.70	0.93211	0.00041
14.70	0.94241	0.00035	12.10	0.93658	0.00039	10.80	0.93740	0.00044
14.90	0.94769	0.00035	12.20	0.93993	0.00039	10.90	0.94131	0.00044
15.10	0.95264	0.00034	12.30	0.94456	0.00039	11.00	0.94693	0.00042
15.30	0.95706	0.00035	12.40	0.94922	0.00040	11.10	0.95124	0.00044
15.50	0.96224	0.00035	12.50	0.95233	0.00041	11.20	0.95621	0.00044
15.70	0.96718	0.00034	12.60	0.95648	0.00039	11.30	0.96158	0.00043
15.90	0.97250	0.00035	12.70	0.95995	0.00040	11.40	0.96618	0.00043
16.10	0.97756	0.00034	12.80	0.96416	0.00039	11.50	0.97132	0.00042
16.30	0.98228	0.00035	12.90	0.96764	0.00040	11.60	0.97543	0.00042
16.50	0.98614	0.00033	13.00	0.97078	0.00040	11.70	0.98117	0.00043
16.70	0.98997	0.00034	13.10	0.97468	0.00041	11.80	0.98494	0.00043
16.90	0.99485	0.00034	13.20	0.97888	0.00040	11.90	0.98887	0.00042
17.10	1.00021	0.00034	13.30	0.98228	0.00040	12.00	0.99336	0.00043
17.30	1.00303	0.00034	13.40	0.98592	0.00040	12.10	0.99768	0.00042
17.50	1.00704	0.00033	13.50	0.98943	0.00040	12.20	1.00188	0.00043
17.70	1.01116	0.00033	13.60	0.99176	0.00040	12.30	1.00563	0.00042
17.90	1.01489	0.00032	13.70	0.99616	0.00038	12.40	1.01042	0.00043
			13.80	0.99824	0.00038	12.50	1.01453	0.00041
			13.90	1.00226	0.00040	12.60	1.01857	0.00043
			14.00	1.00539	0.00039			
			14.10	1.00774	0.00038			
			14.20	1.01222	0.00039			
			14.30	1.01531	0.00039			

Table B.2.2.1.2-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 1 Inch of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.80	0.89472	0.00047	8.70	0.91584	0.00046	8.40	0.91740	0.00049
8.90	0.90159	0.00047	8.75	0.91978	0.00049	8.45	0.92162	0.00049
9.00	0.90921	0.00047	8.80	0.92392	0.00049	8.50	0.92451	0.00051
9.10	0.91588	0.00049	8.85	0.92883	0.00048	8.55	0.92961	0.00049
9.20	0.92309	0.00049	8.90	0.93187	0.00049	8.60	0.93307	0.00050
9.30	0.93057	0.00049	8.95	0.93524	0.00050	8.65	0.93761	0.00049
9.40	0.93683	0.00048	9.00	0.93880	0.00048	8.70	0.94167	0.00050
9.50	0.94396	0.00049	9.05	0.94190	0.00052	8.75	0.94477	0.00050
9.60	0.94938	0.00047	9.10	0.94549	0.00050	8.80	0.94825	0.00050
9.70	0.95629	0.00048	9.15	0.94996	0.00050	8.85	0.95289	0.00052
9.80	0.96333	0.00048	9.20	0.95292	0.00049	8.90	0.95646	0.00049
9.90	0.96952	0.00048	9.25	0.95730	0.00049	8.95	0.96011	0.00049
10.00	0.97507	0.00048	9.30	0.96055	0.00050	9.00	0.96334	0.00050
10.10	0.98144	0.00048	9.35	0.96358	0.00050	9.05	0.96716	0.00051
10.20	0.98679	0.00047	9.40	0.96597	0.00050	9.10	0.97117	0.00051
10.30	0.99331	0.00047	9.45	0.96994	0.00049	9.15	0.97491	0.00050
10.40	0.99930	0.00049	9.50	0.97271	0.00049	9.20	0.97785	0.00050
10.50	1.00474	0.00048	9.55	0.97621	0.00050	9.25	0.98212	0.00051
10.60	1.01055	0.00047	9.60	0.98014	0.00051	9.30	0.98549	0.00050
10.70	1.01612	0.00049	9.65	0.98322	0.00050	9.35	0.98915	0.00048
10.80	1.02170	0.00047	9.70	0.98706	0.00048	9.40	0.99221	0.00051
			9.75	0.98980	0.00048	9.45	0.99498	0.00050
			9.80	0.99293	0.00046	9.50	1.00009	0.00051
			9.85	0.99625	0.00047	9.55	1.00227	0.00050
			9.90	0.99930	0.00049	9.60	1.00560	0.00049
			9.95	1.00326	0.00049	9.65	1.00912	0.00047
			10.00	1.00525	0.00049	9.70	1.01238	0.00050
			10.05	1.00950	0.00049	9.75	1.01594	0.00049
			10.10	1.01148	0.00046	9.80	1.01888	0.00050
			10.15	1.01436	0.00049			
			10.20	1.01807	0.00048			

Table B.2.2.1.2-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 1 Inch of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.10	0.91345	0.00052	8.00	0.92279	0.00052	7.50	0.89252	0.00055
8.15	0.91747	0.00050	8.05	0.92706	0.00050	7.55	0.89778	0.00051
8.20	0.92179	0.00051	8.10	0.93112	0.00053	7.60	0.90176	0.00055
8.25	0.92593	0.00053	8.15	0.93520	0.00052	7.65	0.90680	0.00054
8.30	0.92954	0.00050	8.20	0.93931	0.00054	7.70	0.91041	0.00053
8.35	0.93349	0.00052	8.25	0.94437	0.00051	7.75	0.91581	0.00052
8.40	0.93896	0.00052	8.30	0.94810	0.00052	7.80	0.92047	0.00053
8.45	0.94319	0.00052	8.35	0.95126	0.00051	7.85	0.92508	0.00054
8.50	0.94602	0.00050	8.40	0.95559	0.00052	7.90	0.93048	0.00054
8.55	0.95009	0.00052	8.45	0.96018	0.00053	7.95	0.93334	0.00053
8.60	0.95495	0.00051	8.50	0.96495	0.00051	8.00	0.93826	0.00054
8.65	0.95823	0.00052	8.55	0.96929	0.00051	8.05	0.94228	0.00054
8.70	0.96192	0.00051	8.60	0.97253	0.00052	8.10	0.94647	0.00055
8.75	0.96639	0.00052	8.65	0.97559	0.00055	8.15	0.95165	0.00054
8.80	0.97047	0.00052	8.70	0.98087	0.00052	8.20	0.95563	0.00053
8.85	0.97389	0.00048	8.75	0.98408	0.00051	8.25	0.95984	0.00052
8.90	0.97810	0.00052	8.80	0.98822	0.00052	8.30	0.96314	0.00053
8.95	0.98122	0.00050	8.85	0.99185	0.00051	8.35	0.96847	0.00053
9.00	0.98667	0.00052	8.90	0.99617	0.00052	8.40	0.97262	0.00054
9.05	0.98875	0.00052	8.95	0.99935	0.00053	8.45	0.97688	0.00053
9.10	0.99356	0.00051	9.00	1.00304	0.00052	8.50	0.98030	0.00052
9.15	0.99638	0.00052	9.05	1.00745	0.00052	8.55	0.98430	0.00052
9.20	1.00035	0.00052	9.10	1.01138	0.00055	8.60	0.98861	0.00052
9.25	1.00380	0.00050	9.15	1.01520	0.00050	8.65	0.99172	0.00053
9.30	1.00702	0.00052	9.20	1.01828	0.00051	8.70	0.99689	0.00053
9.35	1.01020	0.00050				8.75	0.99966	0.00051
9.40	1.01459	0.00051				8.80	1.00491	0.00053
9.45	1.01818	0.00053				8.85	1.00855	0.00052
9.50	1.02094	0.00051				8.90	1.01213	0.00052
						8.95	1.01599	0.00053
						9.00	1.01997	0.00053

Table B.2.2.1.2-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 1 Inch of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.20	0.87548	0.00054	7.50	0.92868	0.00056	7.10	0.92113	0.00057
7.25	0.87987	0.00054	7.55	0.93282	0.00054	7.15	0.92493	0.00056
7.30	0.88730	0.00054	7.60	0.93747	0.00055	7.20	0.93114	0.00058
7.35	0.89221	0.00053	7.65	0.94220	0.00055	7.25	0.93667	0.00057
7.40	0.89660	0.00054	7.70	0.94717	0.00054	7.30	0.94110	0.00055
7.45	0.90095	0.00053	7.75	0.95142	0.00056	7.35	0.94613	0.00056
7.50	0.90572	0.00053	7.80	0.95635	0.00055	7.40	0.95046	0.00055
7.55	0.90984	0.00051	7.85	0.96165	0.00052	7.45	0.95695	0.00057
7.60	0.91352	0.00052	7.90	0.96647	0.00055	7.50	0.96102	0.00055
7.65	0.91972	0.00053	7.95	0.96970	0.00055	7.55	0.96642	0.00056
7.70	0.92446	0.00053	8.00	0.97577	0.00056	7.60	0.97044	0.00057
7.75	0.92959	0.00054	8.05	0.98027	0.00056	7.65	0.97532	0.00057
7.80	0.93369	0.00052	8.10	0.98466	0.00055	7.70	0.98101	0.00055
7.85	0.93792	0.00054	8.15	0.98886	0.00054	7.75	0.98524	0.00058
7.90	0.94322	0.00055	8.20	0.99217	0.00055	7.80	0.99018	0.00056
7.95	0.94781	0.00053	8.25	0.99742	0.00055	7.85	0.99480	0.00055
8.00	0.95175	0.00054	8.30	1.00149	0.00054	7.90	0.99882	0.00056
8.05	0.95555	0.00053	8.35	1.00451	0.00055	7.95	1.00375	0.00056
8.10	0.96110	0.00054	8.40	1.01022	0.00056	8.00	1.00940	0.00058
8.15	0.96479	0.00054	8.45	1.01328	0.00055	8.05	1.01256	0.00058
8.20	0.96930	0.00054	8.50	1.01911	0.00056	8.10	1.01765	0.00059
8.25	0.97320	0.00054				8.15	1.02243	0.00057
8.30	0.97723	0.00053				8.20	1.02707	0.00056
8.35	0.98206	0.00053						
8.40	0.98625	0.00053						
8.45	0.98993	0.00054						
8.50	0.99569	0.00054						
8.55	0.99861	0.00053						
8.60	1.00246	0.00054						
8.65	1.00579	0.00053						
8.70	1.01071	0.00055						
8.75	1.01557	0.00053						
8.80	1.01877	0.00055						

Table B.2.2.1.2-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 1 Inch of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.80	0.92036	0.00060	6.60	0.91142	0.00058	6.60	0.92322	0.00059
6.85	0.92504	0.00058	6.65	0.91764	0.00059	6.65	0.92806	0.00058
6.90	0.93056	0.00057	6.70	0.92329	0.00058	6.70	0.93399	0.00060
6.95	0.93597	0.00058	6.75	0.92826	0.00059	6.75	0.94060	0.00060
7.00	0.94202	0.00059	6.80	0.93442	0.00060	6.80	0.94598	0.00055
7.05	0.94726	0.00058	6.85	0.94014	0.00059	6.85	0.95090	0.00060
7.10	0.95193	0.00060	6.90	0.94615	0.00059	6.90	0.95592	0.00061
7.15	0.95844	0.00058	6.95	0.95152	0.00059	6.95	0.96255	0.00059
7.20	0.96292	0.00058	7.00	0.95730	0.00060	7.00	0.96875	0.00057
7.25	0.96945	0.00058	7.05	0.96254	0.00059	7.05	0.97342	0.00063
7.30	0.97370	0.00058	7.10	0.96814	0.00059	7.10	0.97850	0.00060
7.35	0.97877	0.00060	7.15	0.97260	0.00061	7.15	0.98332	0.00061
7.40	0.98366	0.00057	7.20	0.97754	0.00058	7.20	0.98912	0.00060
7.45	0.98944	0.00056	7.25	0.98227	0.00059	7.25	0.99425	0.00059
7.50	0.99381	0.00058	7.30	0.98911	0.00061	7.30	0.99947	0.00058
7.55	0.99908	0.00059	7.35	0.99249	0.00059	7.35	1.00414	0.00061
7.60	1.00388	0.00057	7.40	0.99761	0.00058	7.40	1.00987	0.00060
7.65	1.00902	0.00059	7.45	1.00338	0.00061	7.45	1.01374	0.00059
7.70	1.01413	0.00057	7.50	1.00856	0.00059	7.50	1.01965	0.00059
7.75	1.01762	0.00057	7.55	1.01282	0.00058			
7.80	1.02215	0.00058	7.60	1.01755	0.00059			
			7.65	1.02327	0.00060			
			7.70	1.02832	0.00061			

Table B.2.2.1.2-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 1 Inch of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.40	0.91182	0.00059	6.20	0.91924	0.00060	6.10	0.91811	0.00060
6.45	0.91821	0.00060	6.25	0.92383	0.00061	6.15	0.92336	0.00060
6.50	0.92413	0.00058	6.30	0.93144	0.00060	6.20	0.93079	0.00060
6.55	0.93018	0.00059	6.35	0.93623	0.00061	6.25	0.93592	0.00059
6.60	0.93642	0.00059	6.40	0.94271	0.00061	6.30	0.94155	0.00059
6.65	0.94165	0.00058	6.45	0.94882	0.00060	6.35	0.94795	0.00061
6.70	0.94724	0.00060	6.50	0.95367	0.00059	6.40	0.95259	0.00060
6.75	0.95213	0.00059	6.55	0.96027	0.00059	6.45	0.95884	0.00059
6.80	0.95878	0.00061	6.60	0.96468	0.00061	6.50	0.96467	0.00062
6.85	0.96482	0.00058	6.65	0.97169	0.00060	6.55	0.97016	0.00062
6.90	0.96925	0.00060	6.70	0.97726	0.00060	6.60	0.97544	0.00061
6.95	0.97445	0.00059	6.75	0.98307	0.00061	6.65	0.98180	0.00062
7.00	0.98080	0.00058	6.80	0.98800	0.00061	6.70	0.98746	0.00061
7.05	0.98558	0.00059	6.85	0.99308	0.00061	6.75	0.99280	0.00060
7.10	0.99125	0.00062	6.90	0.99850	0.00060	6.80	0.99744	0.00062
7.15	0.99604	0.00061	6.95	1.00423	0.00062	6.85	1.00314	0.00060
7.20	1.00172	0.00058	7.00	1.00964	0.00062	6.90	1.00912	0.00059
7.25	1.00785	0.00061	7.05	1.01481	0.00063	6.95	1.01390	0.00061
7.30	1.01259	0.00061	7.10	1.02140	0.00063	7.00	1.01899	0.00061
7.35	1.01723	0.00059						
7.40	1.02142	0.00060						

Table B.2.2.1.2-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 1 Inch of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.00	0.91483	0.00059	6.00	0.91643	0.00059	5.90	0.91156	0.00057
6.05	0.92006	0.00058	6.05	0.92204	0.00060	5.95	0.91724	0.00057
6.10	0.92595	0.00058	6.10	0.92763	0.00056	6.00	0.92223	0.00057
6.15	0.93135	0.00059	6.15	0.93459	0.00060	6.05	0.92889	0.00059
6.20	0.93765	0.00060	6.20	0.93986	0.00060	6.10	0.93328	0.00056
6.25	0.94418	0.00059	6.25	0.94587	0.00060	6.15	0.93942	0.00059
6.30	0.94871	0.00057	6.30	0.95077	0.00057	6.20	0.94582	0.00058
6.35	0.95571	0.00059	6.35	0.95723	0.00058	6.25	0.95148	0.00060
6.40	0.95989	0.00060	6.40	0.96359	0.00060	6.30	0.95614	0.00056
6.45	0.96617	0.00062	6.45	0.96699	0.00058	6.35	0.96211	0.00056
6.50	0.97080	0.00061	6.50	0.97355	0.00059	6.40	0.96670	0.00058
6.55	0.97700	0.00059	6.55	0.97869	0.00058	6.45	0.97228	0.00060
6.60	0.98327	0.00058	6.60	0.98375	0.00059	6.50	0.97788	0.00060
6.65	0.98771	0.00061	6.65	0.98886	0.00059	6.55	0.98245	0.00056
6.70	0.99262	0.00060	6.70	0.99381	0.00058	6.60	0.98736	0.00058
6.75	0.99879	0.00058	6.75	0.99968	0.00060	6.65	0.99337	0.00057
6.80	1.00366	0.00061	6.80	1.00367	0.00059	6.70	0.99807	0.00059
6.85	1.00907	0.00060	6.85	1.00945	0.00059	6.75	1.00254	0.00060
6.90	1.01398	0.00060	6.90	1.01424	0.00060	6.80	1.00796	0.00057
6.95	1.01880	0.00061	6.95	1.02109	0.00059	6.85	1.01333	0.00058
7.00	1.02419	0.00061	7.00	1.02453	0.00060	6.90	1.01798	0.00059
						6.95	1.02309	0.00057
						7.00	1.02590	0.00059

Table B.2.2.1.2-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 1 Inch of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.90	0.91551	0.00058	5.90	0.91649	0.00058	5.90	0.91833	0.00056
5.95	0.91969	0.00059	5.95	0.92336	0.00057	5.95	0.92503	0.00058
6.00	0.92626	0.00056	6.00	0.92856	0.00058	6.00	0.93033	0.00056
6.05	0.93086	0.00058	6.05	0.93321	0.00056	6.05	0.93506	0.00057
6.10	0.93629	0.00057	6.10	0.93917	0.00058	6.10	0.94077	0.00057
6.15	0.94141	0.00058	6.15	0.94440	0.00056	6.15	0.94606	0.00055
6.20	0.94721	0.00057	6.20	0.95022	0.00056	6.20	0.95089	0.00058
6.25	0.95242	0.00056	6.25	0.95615	0.00056	6.25	0.95696	0.00057
6.30	0.95811	0.00056	6.30	0.96126	0.00059	6.30	0.96284	0.00058
6.35	0.96237	0.00058	6.35	0.96656	0.00055	6.35	0.96686	0.00056
6.40	0.96831	0.00057	6.40	0.97168	0.00056	6.40	0.97270	0.00058
6.45	0.97489	0.00055	6.45	0.97681	0.00057	6.45	0.97748	0.00057
6.50	0.97962	0.00058	6.50	0.98152	0.00058	6.50	0.98222	0.00058
6.55	0.98462	0.00058	6.55	0.98641	0.00057	6.55	0.98874	0.00056
6.60	0.98911	0.00057	6.60	0.99243	0.00057	6.60	0.99390	0.00058
6.65	0.99441	0.00057	6.65	0.99697	0.00056	6.65	0.99800	0.00057
6.70	1.00005	0.00055	6.70	1.00134	0.00056	6.70	1.00277	0.00056
6.75	1.00450	0.00057	6.75	1.00685	0.00057	6.75	1.00726	0.00055
6.80	1.00927	0.00057	6.80	1.01076	0.00058	6.80	1.01301	0.00056
6.85	1.01430	0.00057	6.85	1.01596	0.00058	6.85	1.01779	0.00057
6.90	1.01951	0.00059	6.90	1.02253	0.00056	6.90	1.02266	0.00058

Table B.2.2.1.2-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 1 Inch of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.90	0.92088	0.00058	5.80	0.91605	0.00055	5.70	0.91481	0.00055
5.95	0.92558	0.00055	5.85	0.92181	0.00053	5.75	0.92161	0.00055
6.00	0.93124	0.00055	5.90	0.92789	0.00057	5.80	0.92588	0.00056
6.05	0.93687	0.00057	5.95	0.93284	0.00055	5.85	0.93093	0.00055
6.10	0.94263	0.00057	6.00	0.93883	0.00057	5.90	0.93712	0.00056
6.15	0.94950	0.00058	6.05	0.94368	0.00055	5.95	0.94270	0.00055
6.20	0.95273	0.00057	6.10	0.94872	0.00056	6.00	0.94789	0.00054
6.25	0.95859	0.00060	6.15	0.95425	0.00057	6.05	0.95326	0.00054
6.30	0.96327	0.00056	6.20	0.95973	0.00054	6.10	0.95861	0.00054
6.35	0.97007	0.00056	6.25	0.96441	0.00057	6.15	0.96464	0.00054
6.40	0.97379	0.00057	6.30	0.97008	0.00055	6.20	0.96956	0.00054
6.45	0.97875	0.00058	6.35	0.97542	0.00055	6.25	0.97524	0.00056
6.50	0.98531	0.00058	6.40	0.98096	0.00057	6.30	0.98045	0.00054
6.55	0.98995	0.00058	6.45	0.98574	0.00057	6.35	0.98493	0.00055
6.60	0.99574	0.00059	6.50	0.99083	0.00053	6.40	0.98984	0.00055
6.65	0.99920	0.00058	6.55	0.99628	0.00055	6.45	0.99556	0.00055
6.70	1.00509	0.00057	6.60	1.00032	0.00056	6.50	1.00011	0.00053
6.75	1.00884	0.00057	6.65	1.00577	0.00057	6.55	1.00596	0.00056
6.80	1.01486	0.00056	6.70	1.01105	0.00056	6.60	1.01025	0.00057
6.85	1.01896	0.00059	6.75	1.01597	0.00055	6.65	1.01592	0.00054
6.90	1.02306	0.00058	6.80	1.02004	0.00057	6.70	1.02035	0.00056

Table B.2.2.1.2-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 1 Inch of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.50	0.91435	0.00052	5.30	0.91329	0.00052	5.10	0.91361	0.00051
5.55	0.91994	0.00054	5.35	0.91946	0.00052	5.15	0.92003	0.00052
5.60	0.92620	0.00053	5.40	0.92622	0.00052	5.20	0.92568	0.00052
5.65	0.93155	0.00053	5.45	0.93164	0.00053	5.25	0.93241	0.00050
5.70	0.93701	0.00054	5.50	0.93761	0.00051	5.30	0.93750	0.00051
5.75	0.94215	0.00056	5.55	0.94406	0.00052	5.35	0.94325	0.00051
5.80	0.94798	0.00054	5.60	0.94885	0.00052	5.40	0.95044	0.00049
5.85	0.95397	0.00054	5.65	0.95603	0.00052	5.45	0.95566	0.00053
5.90	0.95938	0.00054	5.70	0.96110	0.00053	5.50	0.96186	0.00050
5.95	0.96547	0.00054	5.75	0.96602	0.00052	5.55	0.96714	0.00053
6.00	0.97044	0.00054	5.80	0.97223	0.00053	5.60	0.97364	0.00052
6.05	0.97458	0.00055	5.85	0.97723	0.00052	5.65	0.98005	0.00052
6.10	0.98085	0.00053	5.90	0.98390	0.00052	5.70	0.98480	0.00053
6.15	0.98710	0.00055	5.95	0.98772	0.00052	5.75	0.99095	0.00051
6.20	0.99136	0.00056	6.00	0.99457	0.00054	5.80	0.99629	0.00052
6.25	0.99798	0.00056	6.05	0.99898	0.00052	5.85	1.00220	0.00051
6.30	1.00137	0.00054	6.10	1.00419	0.00052	5.90	1.00757	0.00052
6.35	1.00661	0.00054	6.15	1.00933	0.00052	5.95	1.01208	0.00050
6.40	1.01172	0.00055	6.20	1.01560	0.00052	6.00	1.01886	0.00053
6.45	1.01828	0.00054	6.25	1.02136	0.00053			
6.50	1.02187	0.00054	6.30	1.02512	0.00052			

Table B.2.2.1.2-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 1 Inch of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.00	0.92310	0.00051	4.90	0.92203	0.00050	4.80	0.92049	0.00049
5.05	0.92995	0.00050	4.95	0.92851	0.00050	4.85	0.92694	0.00048
5.10	0.93666	0.00050	5.00	0.93609	0.00050	4.90	0.93423	0.00050
5.15	0.94242	0.00052	5.05	0.94238	0.00050	4.95	0.94075	0.00051
5.20	0.94909	0.00051	5.10	0.94827	0.00049	5.00	0.94629	0.00049
5.25	0.95548	0.00050	5.15	0.95562	0.00051	5.05	0.95393	0.00049
5.30	0.96312	0.00050	5.20	0.96073	0.00049	5.10	0.96015	0.00050
5.35	0.96830	0.00049	5.25	0.96730	0.00050	5.15	0.96744	0.00049
5.40	0.97344	0.00051	5.30	0.97399	0.00050	5.20	0.97307	0.00051
5.45	0.97981	0.00050	5.35	0.98052	0.00052	5.25	0.97989	0.00051
5.50	0.98740	0.00052	5.40	0.98632	0.00051	5.30	0.98607	0.00051
5.55	0.99210	0.00050	5.45	0.99235	0.00050	5.35	0.99160	0.00051
5.60	0.99766	0.00052	5.50	0.99858	0.00051	5.40	0.99828	0.00049
5.65	1.00485	0.00053	5.55	1.00443	0.00052	5.45	1.00461	0.00051
5.70	1.00973	0.00052	5.60	1.01036	0.00051	5.50	1.01106	0.00050
5.75	1.01577	0.00052	5.65	1.01590	0.00052	5.55	1.01595	0.00048
5.80	1.02282	0.00051	5.70	1.02220	0.00052	5.60	1.02233	0.00050

Table B.2.2.1.2-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 1 Inch of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.60	0.91509	0.00047	4.50	0.92281	0.00048	3.80	0.91221	0.00046
4.65	0.92238	0.00049	4.55	0.93018	0.00047	3.85	0.92147	0.00045
4.70	0.92963	0.00051	4.60	0.93706	0.00048	3.90	0.93002	0.00045
4.75	0.93635	0.00050	4.65	0.94506	0.00048	3.95	0.93860	0.00044
4.80	0.94357	0.00049	4.70	0.95184	0.00049	4.00	0.94686	0.00045
4.85	0.94907	0.00049	4.75	0.95861	0.00048	4.05	0.95528	0.00044
4.90	0.95667	0.00048	4.80	0.96529	0.00048	4.10	0.96309	0.00045
4.95	0.96392	0.00048	4.85	0.97278	0.00049	4.15	0.97132	0.00045
5.00	0.97017	0.00050	4.90	0.97993	0.00049	4.20	0.97915	0.00045
5.05	0.97613	0.00050	4.95	0.98586	0.00049	4.25	0.98773	0.00044
5.10	0.98392	0.00049	5.00	0.99348	0.00048	4.30	0.99562	0.00046
5.15	0.99063	0.00049	5.05	1.00085	0.00049	4.35	1.00344	0.00046
5.20	0.99636	0.00050	5.10	1.00673	0.00050	4.40	1.01091	0.00046
5.25	1.00260	0.00051	5.15	1.01359	0.00051	4.45	1.01898	0.00047
5.30	1.00904	0.00048	5.20	1.01972	0.00050	4.50	1.02681	0.00046
5.35	1.01557	0.00049						
5.40	1.02164	0.00050						

Table B.2.2.1.2-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 1 Inch of Water Reflection (cont)

18900 milli-g/cc								
Diameter (inches)	K_{eff}	Sigma						
3.20	0.87501	0.00042						
3.25	0.88505	0.00042						
3.30	0.89427	0.00041						
3.35	0.90422	0.00041						
3.40	0.91410	0.00040						
3.45	0.92380	0.00042						
3.50	0.93362	0.00042						
3.55	0.94263	0.00042						
3.60	0.95130	0.00041						
3.65	0.96143	0.00043						
3.70	0.97084	0.00043						
3.75	0.97891	0.00042						
3.80	0.98808	0.00042						
3.85	0.99738	0.00042						
3.90	1.00669	0.00044						
3.95	1.01482	0.00044						
4.00	1.02293	0.00044						

B.2.2.1.3. 10” Water Reflector

Case ID: u5-cyl-1000-10

Material: Uranium metal in water

Geometry: Infinite Cylinder

Isotopics: 100% ^{235}U

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.2.2.1.3-1. Uranium Cylinder (100% ^{235}U) – 10 Inches of Water Reflection

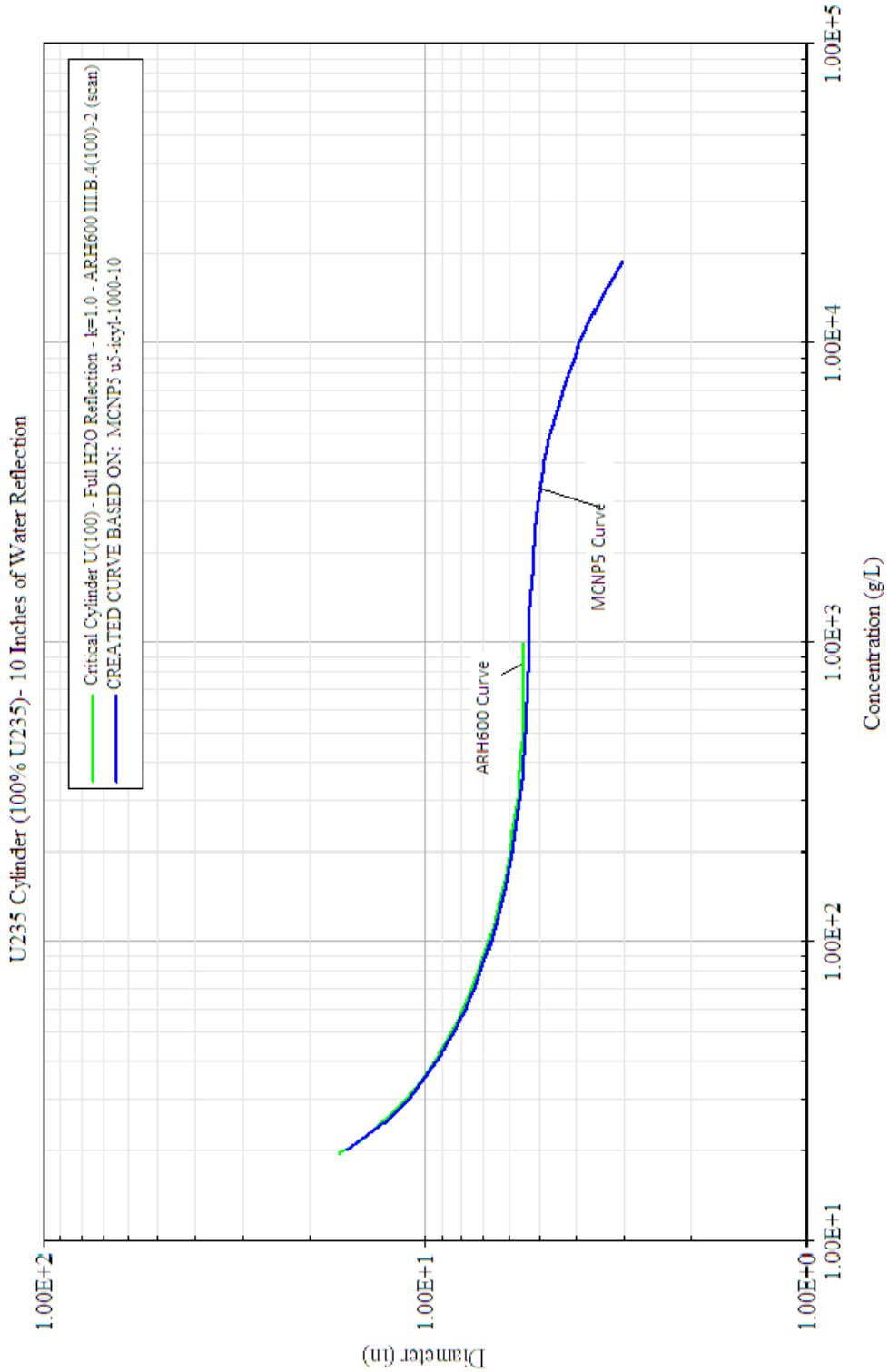

Table B.2.2.1.3-1. Critical Dimensions for Uranium Cylinder (100% ^{235}U) – 10 Inches of Water Reflection

Uranium Cylinder (100% ^{235}U) – 10 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter
0.020	13.100	16.800	0.100	16.0357
0.025	10.400	13.200	0.100	12.7386
0.030	9.400	11.400	0.100	11.0367
0.040	8.000	10.000	0.100	9.2785
0.045	7.800	9.100	0.050	8.7745
0.050	7.300	8.700	0.050	8.3636
0.055	7.100	8.300	0.050	8.0469
0.060	6.800	8.100	0.050	7.8030
0.065	6.600	7.800	0.050	7.5759
0.070	6.500	7.700	0.050	7.3972
0.080	6.300	7.400	0.050	7.1045
0.100	5.900	6.900	0.050	6.6961
0.130	5.600	6.600	0.050	6.3358
0.150	5.400	6.400	0.050	6.1697
0.170	5.300	6.300	0.050	6.0478
0.200	5.200	6.100	0.050	5.9121
0.350	4.700	5.800	0.050	5.5685
0.500	4.700	5.600	0.050	5.4437
0.800	4.600	5.600	0.050	5.3387
1.000	4.600	5.500	0.050	5.3032
1.500	4.400	5.500	0.050	5.2479
1.700	4.500	5.400	0.050	5.2159
1.900	4.500	5.400	0.050	5.1946
2.000	4.500	5.400	0.050	5.1902
2.100	4.400	5.400	0.050	5.1669
2.500	4.400	5.300	0.050	5.1104
3.000	4.200	5.200	0.050	5.0254
4.000	4.200	5.100	0.050	4.8617
5.000	4.100	4.900	0.050	4.6784
6.000	3.800	4.700	0.050	4.5045
7.000	3.500	4.500	0.050	4.3455
7.500	3.800	4.400	0.050	4.2673
8.000	3.600	4.400	0.050	4.1928
9.000	3.300	4.200	0.050	4.0464
10.000	3.300	4.100	0.050	3.9148
15.000	2.800	3.500	0.050	3.3663
18.900	2.500	3.200	0.050	3.0208

MCNP5 Sample Input File
100% ^{235}U Cylinder- 10 Inches of Reflection

```
u icyl, 100.0 wt% 235U, 00150 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 570   hundreths of inches - must be integer
c radius =     7.2390 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00150 milli-g u/cc
c Reflector width = 10.0 inches
c Enrichment = 1.00 wt fraction 235U
c
c Density of H2O 1.00000
c Density of u 18.90000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c u238  = 238.05080
c
c Effective Uranium atomic mass 235.04390
c uranium metal
c Mass fraction of u in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0079 cc
c Volume of water in sample 0.9921 cc
c
c Mass of crit in sample   0.1500 g
c Mass of u in sample   0.1500 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9921 g
c
c Total mass of sample  1.1421g for a 1cc sample
c Mass Density for crit material  -1.1421, expressed as negative
c
c  plane
20 11   -1.142063   -1      imp:n=1
21  2  -1.000                    -2 1     imp:n=1    $zero importance if no reflector
22  0                          2        imp:n=0
```

```
1       cz     7.2390              $ plane
2       cz    32.6390        $ Reflection

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u metal / water mixture
m11    $ Uranium/H2O Sludge, 100.0 wt% 235U, 00150 milli-g u/cc,  1.1421
1001.66c -0.097198
8016.66c -0.771461      $from water
92235.66c -0.131341
c    92238.66c -0.000000
mt11     lwtr.60t
c
c    u only
m12    $ U metal, 100.0 wt% 235U, 00150 milli-g U/cc,  1.1421
92235.66c -0.131341
c    92238.66c -0.000000
c
```

Critview Compatible Data File
100% ^{235}U Cylinder- 10 Inches of Reflection

reset:
title: MCNP5 u5-icyl-1000-10
set: MCNP5 set
source: MCNP5 primary
created: Mon 07/26/2010 10:50:28.26
geometry: infcyl
modmat: H2O
critmat: uranium
isomat: U235 1.0
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.020	16.0357
0.025	12.7386
0.030	11.0367
0.040	9.2785
0.045	8.7745
0.050	8.3636
0.055	8.0469
0.060	7.8030
0.065	7.5759
0.070	7.3972
0.080	7.1045
0.100	6.6961
0.130	6.3358
0.150	6.1697
0.170	6.0478
0.200	5.9121
0.350	5.5685
0.500	5.4437
0.800	5.3387
1.000	5.3032
1.500	5.2479
1.700	5.2159
1.900	5.1946
2.000	5.1902
2.100	5.1669
2.500	5.1104
3.000	5.0254
4.000	4.8617
5.000	4.6784
6.000	4.5045
7.000	4.3455
7.500	4.2673
8.000	4.1928
9.000	4.0464
10.00	3.9148
15.00	3.3663
18.90	3.0208

Table B.2.2.1.3-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 10 Inches of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
13.10	0.92671	0.00034	10.40	0.91018	0.00040	9.40	0.92042	0.00039
13.20	0.93044	0.00033	10.50	0.91421	0.00037	9.50	0.92496	0.00040
13.30	0.93320	0.00034	10.60	0.91861	0.00039	9.60	0.93191	0.00039
13.40	0.93543	0.00034	10.70	0.92367	0.00037	9.70	0.93710	0.00041
13.50	0.93825	0.00035	10.80	0.92799	0.00038	9.80	0.94158	0.00041
13.60	0.94132	0.00033	10.90	0.93208	0.00036	9.90	0.94642	0.00041
13.70	0.94382	0.00034	11.00	0.93645	0.00038	10.00	0.95200	0.00040
13.80	0.94723	0.00033	11.10	0.94011	0.00038	10.10	0.95755	0.00042
13.90	0.94959	0.00034	11.20	0.94401	0.00037	10.20	0.96124	0.00042
14.00	0.95162	0.00032	11.30	0.94794	0.00038	10.30	0.96574	0.00041
14.10	0.95541	0.00033	11.40	0.95212	0.00038	10.40	0.97110	0.00043
14.20	0.95701	0.00033	11.50	0.95600	0.00038	10.50	0.97543	0.00041
14.30	0.95935	0.00033	11.60	0.95957	0.00037	10.60	0.98038	0.00040
14.40	0.96263	0.00034	11.70	0.96365	0.00036	10.70	0.98506	0.00042
14.50	0.96500	0.00033	11.80	0.96775	0.00036	10.80	0.98900	0.00039
14.60	0.96760	0.00034	11.90	0.97179	0.00037	10.90	0.99422	0.00041
14.70	0.96986	0.00032	12.00	0.97472	0.00037	11.00	0.99854	0.00040
14.80	0.97273	0.00034	12.10	0.97958	0.00037	11.10	1.00252	0.00041
14.90	0.97474	0.00032	12.20	0.98240	0.00036	11.20	1.00640	0.00040
15.00	0.97765	0.00031	12.30	0.98495	0.00037	11.30	1.01111	0.00040
15.10	0.97976	0.00033	12.40	0.98949	0.00037	11.40	1.01478	0.00039
15.20	0.98192	0.00033	12.50	0.99241	0.00037			
15.30	0.98415	0.00032	12.60	0.99579	0.00036			
15.40	0.98562	0.00032	12.70	0.99893	0.00036			
15.50	0.98838	0.00032	12.80	1.00170	0.00036			
15.60	0.99093	0.00032	12.90	1.00559	0.00036			
15.70	0.99294	0.00032	13.00	1.00869	0.00036			
15.80	0.99429	0.00032	13.10	1.01243	0.00036			
15.90	0.99662	0.00032	13.20	1.01531	0.00036			
16.00	0.99954	0.00032						
16.10	1.00083	0.00032						
16.20	1.00272	0.00032						
16.30	1.00509	0.00032						
16.40	1.00754	0.00032						
16.50	1.00912	0.00032						
16.60	1.01076	0.00031						
16.70	1.01273	0.00032						
16.80	1.01481	0.00032						

Table B.2.2.1.3-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 10 Inches of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.00	0.91688	0.00045	7.80	0.93276	0.00044	7.30	0.91889	0.00047
8.10	0.92298	0.00044	7.85	0.93621	0.00045	7.35	0.92347	0.00046
8.20	0.93064	0.00043	7.90	0.94071	0.00045	7.40	0.92780	0.00048
8.30	0.93758	0.00044	7.95	0.94355	0.00045	7.45	0.93117	0.00048
8.40	0.94365	0.00043	8.00	0.94807	0.00046	7.50	0.93599	0.00047
8.50	0.95143	0.00045	8.05	0.95157	0.00046	7.55	0.93883	0.00048
8.60	0.95750	0.00045	8.10	0.95467	0.00047	7.60	0.94297	0.00048
8.70	0.96356	0.00044	8.15	0.95759	0.00045	7.65	0.94760	0.00047
8.80	0.97039	0.00046	8.20	0.96259	0.00047	7.70	0.95121	0.00046
8.90	0.97602	0.00043	8.25	0.96580	0.00046	7.75	0.95542	0.00047
9.00	0.98348	0.00043	8.30	0.96834	0.00046	7.80	0.95873	0.00047
9.10	0.98884	0.00043	8.35	0.97167	0.00045	7.85	0.96214	0.00049
9.20	0.99558	0.00045	8.40	0.97588	0.00046	7.90	0.96644	0.00045
9.30	1.00121	0.00043	8.45	0.97933	0.00046	7.95	0.96968	0.00047
9.40	1.00668	0.00043	8.50	0.98248	0.00046	8.00	0.97377	0.00046
9.50	1.01230	0.00043	8.55	0.98588	0.00046	8.05	0.97804	0.00047
9.60	1.01757	0.00045	8.60	0.98896	0.00046	8.10	0.98168	0.00048
9.70	1.02329	0.00045	8.65	0.99296	0.00045	8.15	0.98553	0.00046
9.80	1.02845	0.00044	8.70	0.99541	0.00046	8.20	0.98843	0.00045
9.90	1.03399	0.00043	8.75	0.99798	0.00045	8.25	0.99177	0.00046
10.00	1.03990	0.00046	8.80	1.00211	0.00044	8.30	0.99608	0.00045
			8.85	1.00488	0.00047	8.35	0.99925	0.00046
			8.90	1.00838	0.00046	8.40	1.00201	0.00046
			8.95	1.01204	0.00046	8.45	1.00604	0.00047
			9.00	1.01470	0.00045	8.50	1.00864	0.00048
			9.05	1.01716	0.00044	8.55	1.01200	0.00045
			9.10	1.02088	0.00046	8.60	1.01620	0.00048
						8.65	1.01950	0.00047
						8.70	1.02306	0.00045

Table B.2.2.1.3-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 10 Inches of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.10	0.92418	0.00047	6.80	0.91686	0.00048	6.60	0.91495	0.00048
7.15	0.92958	0.00047	6.85	0.92159	0.00049	6.65	0.91984	0.00049
7.20	0.93348	0.00048	6.90	0.92587	0.00047	6.70	0.92383	0.00048
7.25	0.93740	0.00047	6.95	0.93024	0.00047	6.75	0.92893	0.00047
7.30	0.94054	0.00047	7.00	0.93457	0.00048	6.80	0.93297	0.00050
7.35	0.94583	0.00047	7.05	0.93915	0.00047	6.85	0.93769	0.00048
7.40	0.94967	0.00049	7.10	0.94344	0.00050	6.90	0.94293	0.00049
7.45	0.95359	0.00047	7.15	0.94838	0.00048	6.95	0.94653	0.00048
7.50	0.95828	0.00047	7.20	0.95214	0.00049	7.00	0.95149	0.00050
7.55	0.96055	0.00048	7.25	0.95557	0.00048	7.05	0.95609	0.00049
7.60	0.96498	0.00049	7.30	0.96113	0.00048	7.10	0.96107	0.00052
7.65	0.97057	0.00047	7.35	0.96438	0.00047	7.15	0.96449	0.00049
7.70	0.97415	0.00048	7.40	0.96901	0.00049	7.20	0.96874	0.00048
7.75	0.97755	0.00047	7.45	0.97376	0.00049	7.25	0.97391	0.00050
7.80	0.98124	0.00048	7.50	0.97750	0.00048	7.30	0.97702	0.00048
7.85	0.98418	0.00047	7.55	0.98131	0.00050	7.35	0.98114	0.00048
7.90	0.98802	0.00049	7.60	0.98442	0.00048	7.40	0.98551	0.00050
7.95	0.99237	0.00047	7.65	0.98911	0.00050	7.45	0.98899	0.00048
8.00	0.99701	0.00048	7.70	0.99416	0.00049	7.50	0.99378	0.00049
8.05	1.00020	0.00049	7.75	0.99748	0.00048	7.55	0.99805	0.00049
8.10	1.00463	0.00047	7.80	0.99972	0.00049	7.60	1.00182	0.00049
8.15	1.00692	0.00047	7.85	1.00446	0.00049	7.65	1.00625	0.00049
8.20	1.01110	0.00048	7.90	1.00862	0.00046	7.70	1.00932	0.00049
8.25	1.01462	0.00047	7.95	1.01228	0.00050	7.75	1.01366	0.00049
8.30	1.01775	0.00048	8.00	1.01700	0.00050	7.80	1.01823	0.00050
			8.05	1.01984	0.00047			
			8.10	1.02242	0.00048			

Table B.2.2.1.3-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 10 Inches of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.50	0.91996	0.00048	6.30	0.92453	0.00051	5.90	0.91867	0.00051
6.55	0.92444	0.00051	6.35	0.92883	0.00048	5.95	0.92415	0.00051
6.60	0.92943	0.00048	6.40	0.93338	0.00051	6.00	0.92981	0.00052
6.65	0.93343	0.00050	6.45	0.93878	0.00051	6.05	0.93440	0.00052
6.70	0.93931	0.00050	6.50	0.94437	0.00052	6.10	0.94047	0.00052
6.75	0.94455	0.00051	6.55	0.94840	0.00051	6.15	0.94479	0.00051
6.80	0.94792	0.00050	6.60	0.95389	0.00052	6.20	0.95065	0.00052
6.85	0.95288	0.00050	6.65	0.95876	0.00052	6.25	0.95477	0.00052
6.90	0.95790	0.00048	6.70	0.96335	0.00051	6.30	0.96124	0.00051
6.95	0.96154	0.00050	6.75	0.96820	0.00052	6.35	0.96552	0.00051
7.00	0.96647	0.00049	6.80	0.97235	0.00051	6.40	0.97095	0.00052
7.05	0.97064	0.00049	6.85	0.97820	0.00050	6.45	0.97584	0.00052
7.10	0.97412	0.00049	6.90	0.98189	0.00051	6.50	0.98128	0.00053
7.15	0.97964	0.00050	6.95	0.98595	0.00051	6.55	0.98542	0.00053
7.20	0.98369	0.00051	7.00	0.99092	0.00050	6.60	0.98971	0.00053
7.25	0.98714	0.00051	7.05	0.99517	0.00050	6.65	0.99571	0.00054
7.30	0.99249	0.00050	7.10	0.99956	0.00051	6.70	1.00036	0.00053
7.35	0.99537	0.00050	7.15	1.00450	0.00050	6.75	1.00507	0.00053
7.40	1.00027	0.00049	7.20	1.00818	0.00051	6.80	1.00927	0.00052
7.45	1.00449	0.00051	7.25	1.01337	0.00049	6.85	1.01485	0.00054
7.50	1.00944	0.00048	7.30	1.01613	0.00051	6.90	1.01874	0.00051
7.55	1.01259	0.00050	7.35	1.02128	0.00048			
7.60	1.01677	0.00050	7.40	1.02603	0.00050			
7.65	1.02086	0.00049						
7.70	1.02447	0.00051						

Table B.2.2.1.3-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 10 Inches of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.60	0.92085	0.00052	5.40	0.91430	0.00052	5.30	0.91502	0.00055
5.65	0.92628	0.00053	5.45	0.91997	0.00055	5.35	0.92126	0.00056
5.70	0.93150	0.00052	5.50	0.92579	0.00053	5.40	0.92737	0.00053
5.75	0.93766	0.00053	5.55	0.93223	0.00054	5.45	0.93387	0.00053
5.80	0.94315	0.00054	5.60	0.93748	0.00052	5.50	0.93914	0.00055
5.85	0.94887	0.00054	5.65	0.94241	0.00054	5.55	0.94534	0.00055
5.90	0.95454	0.00052	5.70	0.94891	0.00055	5.60	0.95048	0.00054
5.95	0.96026	0.00054	5.75	0.95377	0.00055	5.65	0.95573	0.00054
6.00	0.96509	0.00052	5.80	0.96014	0.00054	5.70	0.96230	0.00054
6.05	0.97039	0.00053	5.85	0.96625	0.00051	5.75	0.96703	0.00052
6.10	0.97536	0.00054	5.90	0.96982	0.00055	5.80	0.97311	0.00054
6.15	0.98128	0.00055	5.95	0.97605	0.00053	5.85	0.97885	0.00054
6.20	0.98667	0.00053	6.00	0.98203	0.00054	5.90	0.98501	0.00053
6.25	0.99121	0.00054	6.05	0.98755	0.00056	5.95	0.98944	0.00052
6.30	0.99650	0.00053	6.10	0.99311	0.00056	6.00	0.99458	0.00055
6.35	1.00139	0.00054	6.15	0.99810	0.00055	6.05	1.00025	0.00054
6.40	1.00736	0.00054	6.20	1.00293	0.00054	6.10	1.00606	0.00057
6.45	1.01206	0.00054	6.25	1.00886	0.00053	6.15	1.01214	0.00054
6.50	1.01675	0.00054	6.30	1.01373	0.00052	6.20	1.01723	0.00056
6.55	1.02310	0.00053	6.35	1.01876	0.00054	6.25	1.02207	0.00054
6.60	1.02778	0.00054	6.40	1.02425	0.00056	6.30	1.02723	0.00054

Table B.2.2.1.3-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 10 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.20	0.91784	0.00054	4.70	0.89427	0.00058	4.70	0.91010	0.00055
5.25	0.92423	0.00054	4.75	0.90094	0.00055	4.75	0.91660	0.00055
5.30	0.93021	0.00055	4.80	0.90675	0.00053	4.80	0.92300	0.00056
5.35	0.93536	0.00053	4.85	0.91298	0.00055	4.85	0.92925	0.00056
5.40	0.94163	0.00055	4.90	0.91958	0.00055	4.90	0.93588	0.00057
5.45	0.94829	0.00056	4.95	0.92496	0.00056	4.95	0.94190	0.00057
5.50	0.95466	0.00054	5.00	0.93184	0.00056	5.00	0.94712	0.00054
5.55	0.95938	0.00054	5.05	0.93785	0.00054	5.05	0.95402	0.00055
5.60	0.96577	0.00055	5.10	0.94425	0.00054	5.10	0.96045	0.00056
5.65	0.97144	0.00055	5.15	0.95242	0.00055	5.15	0.96519	0.00056
5.70	0.97738	0.00055	5.20	0.95763	0.00056	5.20	0.97131	0.00057
5.75	0.98258	0.00055	5.25	0.96196	0.00056	5.25	0.97766	0.00057
5.80	0.98798	0.00056	5.30	0.96798	0.00054	5.30	0.98435	0.00057
5.85	0.99407	0.00056	5.35	0.97544	0.00055	5.35	0.98931	0.00056
5.90	0.99867	0.00055	5.40	0.98056	0.00054	5.40	0.99475	0.00056
5.95	1.00415	0.00054	5.45	0.98547	0.00056	5.45	1.00076	0.00056
6.00	1.01027	0.00055	5.50	0.99156	0.00057	5.50	1.00736	0.00054
6.05	1.01518	0.00055	5.55	0.99779	0.00056	5.55	1.01268	0.00056
6.10	1.01984	0.00056	5.60	1.00377	0.00057	5.60	1.01670	0.00056
			5.65	1.00950	0.00057			
			5.70	1.01480	0.00055			
			5.75	1.01915	0.00057			
			5.80	1.02601	0.00058			

Table B.2.2.1.3-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 10 Inches of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.60	0.91121	0.00055	4.60	0.91758	0.00057	4.40	0.90218	0.00052
4.65	0.91751	0.00055	4.65	0.92246	0.00054	4.45	0.90925	0.00054
4.70	0.92455	0.00055	4.70	0.92985	0.00054	4.50	0.91514	0.00056
4.75	0.93128	0.00055	4.75	0.93635	0.00058	4.55	0.92239	0.00054
4.80	0.93650	0.00053	4.80	0.94130	0.00056	4.60	0.92811	0.00055
4.85	0.94308	0.00054	4.85	0.94793	0.00056	4.65	0.93254	0.00053
4.90	0.94870	0.00056	4.90	0.95293	0.00054	4.70	0.93903	0.00052
4.95	0.95486	0.00054	4.95	0.95910	0.00053	4.75	0.94539	0.00054
5.00	0.96177	0.00057	5.00	0.96629	0.00054	4.80	0.95007	0.00054
5.05	0.96731	0.00055	5.05	0.97110	0.00056	4.85	0.95593	0.00055
5.10	0.97379	0.00055	5.10	0.97688	0.00056	4.90	0.96252	0.00054
5.15	0.97836	0.00056	5.15	0.98248	0.00054	4.95	0.96727	0.00055
5.20	0.98465	0.00055	5.20	0.98942	0.00056	5.00	0.97399	0.00055
5.25	0.98943	0.00055	5.25	0.99333	0.00055	5.05	0.97777	0.00054
5.30	0.99641	0.00056	5.30	0.99969	0.00055	5.10	0.98360	0.00054
5.35	1.00105	0.00054	5.35	1.00451	0.00056	5.15	0.99041	0.00056
5.40	1.00685	0.00056	5.40	1.01084	0.00055	5.20	0.99542	0.00056
5.45	1.01147	0.00055	5.45	1.01539	0.00056	5.25	1.00020	0.00056
5.50	1.01697	0.00056	5.50	1.02124	0.00054	5.30	1.00596	0.00055
5.55	1.02286	0.00057				5.35	1.01135	0.00053
5.60	1.02779	0.00055				5.40	1.01697	0.00054
						5.45	1.02144	0.00054
						5.50	1.02656	0.00055

Table B.2.2.1.3-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 10 Inches of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.50	0.91922	0.00055	4.50	0.92238	0.00053	4.50	0.92392	0.00054
4.55	0.92428	0.00054	4.55	0.92825	0.00054	4.55	0.92913	0.00053
4.60	0.92974	0.00053	4.60	0.93336	0.00055	4.60	0.93493	0.00054
4.65	0.93710	0.00055	4.65	0.94001	0.00052	4.65	0.94086	0.00055
4.70	0.94243	0.00055	4.70	0.94505	0.00055	4.70	0.94774	0.00055
4.75	0.94817	0.00055	4.75	0.95218	0.00054	4.75	0.95280	0.00053
4.80	0.95365	0.00056	4.80	0.95614	0.00053	4.80	0.95832	0.00053
4.85	0.96014	0.00053	4.85	0.96202	0.00051	4.85	0.96346	0.00055
4.90	0.96480	0.00054	4.90	0.96756	0.00054	4.90	0.97001	0.00053
4.95	0.97036	0.00053	4.95	0.97396	0.00054	4.95	0.97431	0.00054
5.00	0.97609	0.00052	5.00	0.97889	0.00053	5.00	0.97977	0.00054
5.05	0.98199	0.00055	5.05	0.98456	0.00054	5.05	0.98556	0.00052
5.10	0.98822	0.00056	5.10	0.99066	0.00054	5.10	0.99068	0.00057
5.15	0.99300	0.00056	5.15	0.99485	0.00053	5.15	0.99718	0.00053
5.20	0.99788	0.00055	5.20	1.00062	0.00053	5.20	1.00069	0.00054
5.25	1.00453	0.00054	5.25	1.00672	0.00054	5.25	1.00752	0.00054
5.30	1.00871	0.00053	5.30	1.01107	0.00053	5.30	1.01310	0.00054
5.35	1.01322	0.00056	5.35	1.01651	0.00053	5.35	1.01659	0.00052
5.40	1.01837	0.00053	5.40	1.02194	0.00055	5.40	1.02295	0.00052

Table B.2.2.1.3-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 10 Inches of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.40	0.91338	0.00054	4.40	0.91988	0.00053	4.20	0.90395	0.00052
4.45	0.91955	0.00053	4.45	0.92592	0.00051	4.25	0.91074	0.00050
4.50	0.92563	0.00055	4.50	0.93209	0.00053	4.30	0.91683	0.00053
4.55	0.93077	0.00054	4.55	0.93753	0.00053	4.35	0.92224	0.00052
4.60	0.93676	0.00053	4.60	0.94298	0.00052	4.40	0.92839	0.00052
4.65	0.94305	0.00053	4.65	0.94910	0.00051	4.45	0.93520	0.00053
4.70	0.94882	0.00052	4.70	0.95477	0.00053	4.50	0.94075	0.00052
4.75	0.95353	0.00052	4.75	0.96103	0.00052	4.55	0.94676	0.00053
4.80	0.96017	0.00054	4.80	0.96593	0.00053	4.60	0.95266	0.00051
4.85	0.96587	0.00052	4.85	0.97187	0.00052	4.65	0.95910	0.00053
4.90	0.97176	0.00052	4.90	0.97719	0.00053	4.70	0.96376	0.00052
4.95	0.97651	0.00054	4.95	0.98336	0.00052	4.75	0.96886	0.00052
5.00	0.98237	0.00053	5.00	0.98815	0.00053	4.80	0.97606	0.00053
5.05	0.98743	0.00054	5.05	0.99374	0.00053	4.85	0.98099	0.00051
5.10	0.99287	0.00053	5.10	0.99897	0.00054	4.90	0.98609	0.00053
5.15	0.99763	0.00053	5.15	1.00392	0.00052	4.95	0.99120	0.00053
5.20	1.00465	0.00054	5.20	1.00902	0.00054	5.00	0.99750	0.00051
5.25	1.00823	0.00053	5.25	1.01344	0.00053	5.05	1.00242	0.00053
5.30	1.01336	0.00054	5.30	1.01894	0.00054	5.10	1.00656	0.00052
5.35	1.01828	0.00054				5.15	1.01245	0.00053
5.40	1.02428	0.00054				5.20	1.01825	0.00052

Table B.2.2.1.3-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 10 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.20	0.92260	0.00052	4.10	0.93022	0.00050	3.80	0.90960	0.00050
4.25	0.92904	0.00053	4.15	0.93697	0.00050	3.85	0.91637	0.00050
4.30	0.93540	0.00051	4.20	0.94226	0.00051	3.90	0.92316	0.00050
4.35	0.94246	0.00052	4.25	0.94847	0.00051	3.95	0.92964	0.00051
4.40	0.94672	0.00053	4.30	0.95512	0.00051	4.00	0.93545	0.00049
4.45	0.95236	0.00053	4.35	0.96058	0.00051	4.05	0.94293	0.00051
4.50	0.95849	0.00051	4.40	0.96705	0.00051	4.10	0.94954	0.00050
4.55	0.96521	0.00053	4.45	0.97296	0.00052	4.15	0.95553	0.00050
4.60	0.97156	0.00052	4.50	0.97860	0.00051	4.20	0.96298	0.00049
4.65	0.97730	0.00051	4.55	0.98534	0.00050	4.25	0.96843	0.00051
4.70	0.98227	0.00053	4.60	0.99081	0.00052	4.30	0.97560	0.00051
4.75	0.98862	0.00052	4.65	0.99707	0.00051	4.35	0.98126	0.00050
4.80	0.99338	0.00051	4.70	1.00223	0.00051	4.40	0.98785	0.00050
4.85	0.99875	0.00052	4.75	1.00831	0.00051	4.45	0.99338	0.00051
4.90	1.00409	0.00050	4.80	1.01450	0.00052	4.50	0.99943	0.00051
4.95	1.01110	0.00051	4.85	1.01930	0.00050	4.55	1.00571	0.00050
5.00	1.01620	0.00052	4.90	1.02383	0.00051	4.60	1.01054	0.00050
5.05	1.02065	0.00052				4.65	1.01675	0.00050
5.10	1.02582	0.00052				4.70	1.02259	0.00050

Table B.2.2.1.3-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 10 Inches of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
3.50	0.88479	0.00051	3.80	0.93792	0.00050	3.60	0.91833	0.00048
3.55	0.89270	0.00049	3.85	0.94467	0.00049	3.65	0.92560	0.00048
3.60	0.89976	0.00050	3.90	0.95114	0.00049	3.70	0.93304	0.00050
3.65	0.90713	0.00049	3.95	0.95846	0.00050	3.75	0.94000	0.00049
3.70	0.91408	0.00049	4.00	0.96529	0.00050	3.80	0.94676	0.00047
3.75	0.92130	0.00049	4.05	0.97191	0.00049	3.85	0.95368	0.00051
3.80	0.92718	0.00051	4.10	0.97860	0.00049	3.90	0.96021	0.00049
3.85	0.93479	0.00051	4.15	0.98479	0.00050	3.95	0.96762	0.00050
3.90	0.94173	0.00048	4.20	0.99117	0.00049	4.00	0.97496	0.00049
3.95	0.94935	0.00051	4.25	0.99756	0.00049	4.05	0.98136	0.00050
4.00	0.95500	0.00050	4.30	1.00462	0.00049	4.10	0.98857	0.00049
4.05	0.96216	0.00050	4.35	1.01117	0.00051	4.15	0.99485	0.00051
4.10	0.96987	0.00049	4.40	1.01665	0.00050	4.20	1.00087	0.00049
4.15	0.97551	0.00049				4.25	1.00718	0.00048
4.20	0.98224	0.00051				4.30	1.01432	0.00050
4.25	0.98832	0.00049				4.35	1.02009	0.00049
4.30	0.99460	0.00051				4.40	1.02715	0.00050
4.35	1.00054	0.00052						
4.40	1.00733	0.00050						
4.45	1.01188	0.00050						
4.50	1.01840	0.00051						

Table B.2.2.1.3-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 10 Inches of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
3.30	0.88934	0.00048	3.30	0.90675	0.00049	2.80	0.89812	0.00048
3.35	0.89754	0.00049	3.35	0.91432	0.00048	2.85	0.90721	0.00048
3.40	0.90503	0.00047	3.40	0.92216	0.00048	2.90	0.91717	0.00045
3.45	0.91322	0.00049	3.45	0.92973	0.00047	2.95	0.92608	0.00047
3.50	0.92079	0.00048	3.50	0.93851	0.00049	3.00	0.93544	0.00045
3.55	0.92870	0.00048	3.55	0.94550	0.00048	3.05	0.94465	0.00048
3.60	0.93637	0.00050	3.60	0.95410	0.00049	3.10	0.95359	0.00047
3.65	0.94309	0.00050	3.65	0.96158	0.00049	3.15	0.96200	0.00047
3.70	0.95040	0.00050	3.70	0.96902	0.00049	3.20	0.97206	0.00047
3.75	0.95762	0.00049	3.75	0.97596	0.00049	3.25	0.97974	0.00046
3.80	0.96514	0.00049	3.80	0.98414	0.00051	3.30	0.98781	0.00048
3.85	0.97260	0.00048	3.85	0.99065	0.00048	3.35	0.99729	0.00048
3.90	0.97859	0.00049	3.90	0.99800	0.00048	3.40	1.00560	0.00047
3.95	0.98658	0.00050	3.95	1.00476	0.00047	3.45	1.01371	0.00047
4.00	0.99388	0.00050	4.00	1.01206	0.00050	3.50	1.02262	0.00050
4.05	1.00048	0.00050	4.05	1.01942	0.00050			
4.10	1.00716	0.00049	4.10	1.02565	0.00048			
4.15	1.01350	0.00051						
4.20	1.02090	0.00049						

Table B.2.2.1.3-2. K_{eff} Values for Uranium Cylinder (100% ^{235}U) – 10 Inches of Water Reflection (cont)

18900 milli-g/cc								
Diameter (inches)	K_{eff}	Sigma						
2.50	0.89413	0.00045						
2.55	0.90545	0.00044						
2.60	0.91586	0.00046						
2.65	0.92496	0.00045						
2.70	0.93693	0.00045						
2.75	0.94643	0.00047						
2.80	0.95681	0.00047						
2.85	0.96691	0.00044						
2.90	0.97669	0.00047						
2.95	0.98628	0.00047						
3.00	0.99585	0.00046						
3.05	1.00582	0.00046						
3.10	1.01569	0.00046						
3.15	1.02453	0.00047						
3.20	1.03416	0.00045						

B.2.2.2. 93.5% ^{235}U 6.5% ^{238}U

B.2.2.2.1. Unreflected

Case ID: u5-cyl-0935-00

Material: Uranium metal in water

Geometry: Infinite Cylinder

Isotopics: 93.5% ^{235}U 6.5% ^{238}U

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.2.2.2.1-1. Uranium Cylinder (93.5% ^{235}U) – 0 Inches of Water Reflection

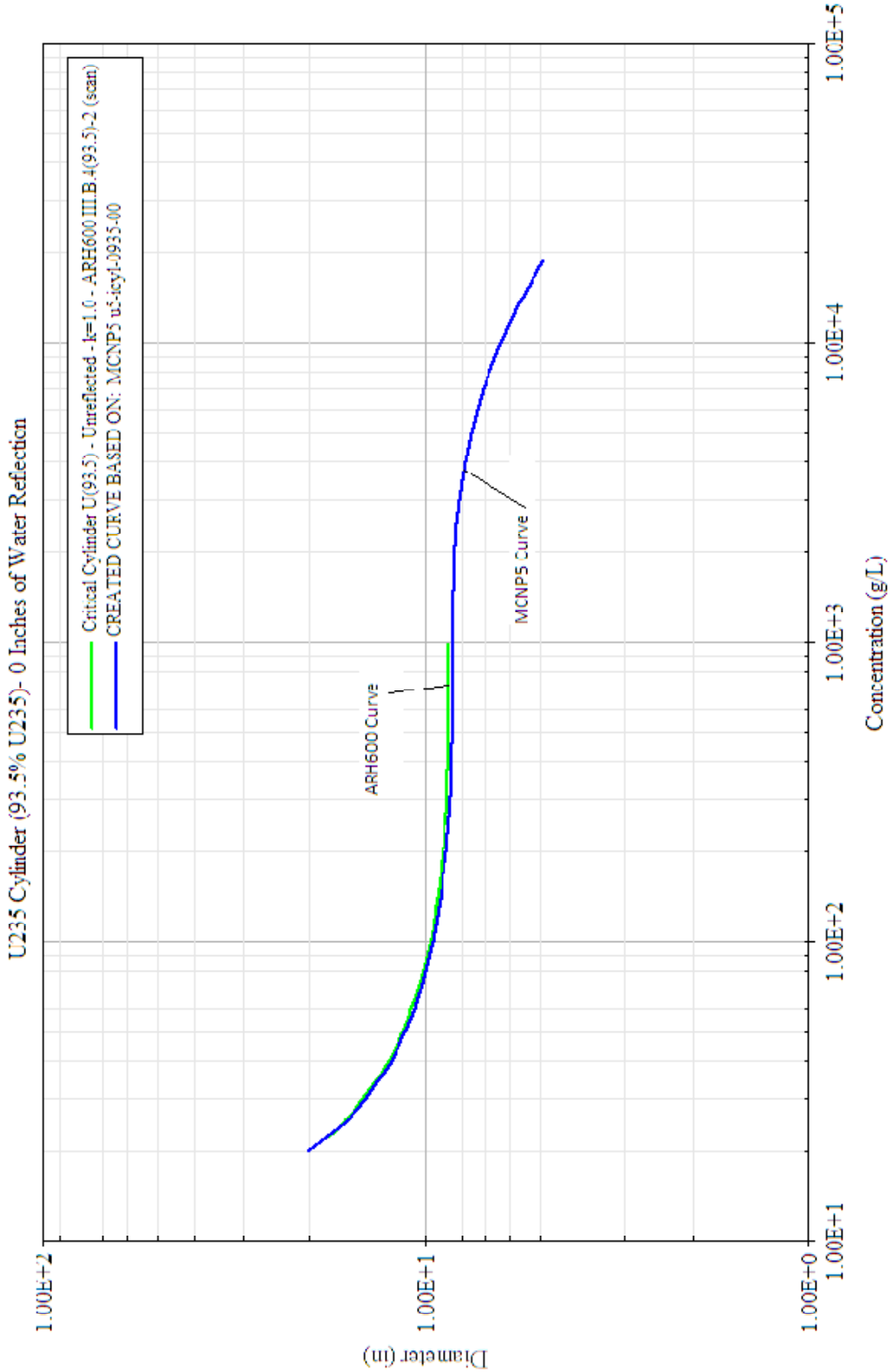

Table B.2.2.2.1-1. Critical Dimensions for Uranium Cylinder (93.5% ^{235}U) – 0 Inches of Water Reflection

Uranium Cylinder (93.5% ^{235}U) – 0 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.020	16.600	21.200	0.200	20.2472
0.025	13.900	16.700	0.100	16.1695
0.030	12.500	14.700	0.100	14.2446
0.040	11.000	12.700	0.050	12.2991
0.045	10.500	12.100	0.050	11.7324
0.050	10.200	11.600	0.050	11.2975
0.055	9.900	11.300	0.050	10.9688
0.060	9.600	11.000	0.050	10.6897
0.065	9.500	10.700	0.050	10.4731
0.070	9.300	10.600	0.050	10.2712
0.080	9.000	10.300	0.050	9.9813
0.100	8.700	9.800	0.050	9.5799
0.130	8.400	9.500	0.050	9.2199
0.150	8.200	9.300	0.050	9.0679
0.170	8.100	9.200	0.050	8.9501
0.200	8.100	9.100	0.050	8.8216
0.350	7.800	8.800	0.050	8.5559
0.500	7.700	8.700	0.050	8.4621
0.800	7.700	8.700	0.050	8.4281
1.000	7.600	8.700	0.050	8.4307
1.500	7.600	8.700	0.050	8.4169
1.700	7.600	8.600	0.050	8.3918
1.900	7.500	8.600	0.050	8.3679
2.000	7.500	8.600	0.050	8.3598
2.100	7.500	8.600	0.050	8.3419
2.500	7.400	8.500	0.050	8.2629
3.000	7.300	8.400	0.050	8.1558
4.000	7.100	8.100	0.050	7.8839
5.000	6.800	7.800	0.050	7.6009
6.000	6.600	7.500	0.050	7.3168
7.000	6.300	7.300	0.050	7.0415
7.500	6.200	7.100	0.050	6.9228
8.000	6.100	7.000	0.050	6.8024
9.000	5.900	6.800	0.050	6.5659
10.000	5.700	6.600	0.050	6.3483
15.000	4.900	5.700	0.050	5.4702
18.900	4.400	5.100	0.050	4.8926

MCNP5 Sample Input File

93.5% ^{235}U Cylinder- 0 Inches of Reflection

```
u icyl, 93.5 wt% 235U, 00150 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 880   hundreths of inches - must be integer
c radius =    11.1760 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00150 milli-g u/cc
c Reflector width =  0.0 inches
c Enrichment = 0.94 wt fraction 235U
c
c Density of H2O 1.00000
c Density of u 18.90000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c u238  = 238.05080
c
c Effective Uranium atomic mass 235.23935
c uranium metal
c Mass fraction of u in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0079 cc
c Volume of water in sample 0.9921 cc
c
c Mass of crit in sample   0.1500 g
c Mass of u in sample   0.1500 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9921 g
c
c Total mass of sample  1.1421g for a 1cc sample
c Mass Density for crit material  -1.1421, expressed as negative
c
c  plane
20 11   -1.142063   -1      imp:n=1
21  2  -1.000                    -2 1     imp:n=0    $zero importance if no reflector
22  0                          2        imp:n=0
```

```
1       cz    11.1760             $ plane
2       cz    11.1760        $ Reflection

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u metal / water mixture
m11    $ Uranium/H2O Sludge, 100.0 wt% 235U, 00150 milli-g u/cc,  1.1421
1001.66c -0.097198
8016.66c -0.771461      $from water
92235.66c -0.122804
92238.66c -0.008537
mt11     lwtr.60t
c
c    u only
m12    $ U metal, 100.0 wt% 235U, 00150 milli-g U/cc,  1.1421
92235.66c -0.122804
92238.66c -0.008537
c
```

Critview Compatible Data File
93.5% ^{235}U Cylinder- 0 Inches of Reflection
reset:
title: MCNP5 u5-icyl-0935-00
set: MCNP5 set
source: MCNP5 primary
created: Wed 07/28/2010 9:50:22.53
geometry: infcyl
modmat: H2O
critmat: Uranium
isomat: U235 0.935 U238 0.065
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.020	20.2472
0.025	16.1695
0.030	14.2446
0.040	12.2991
0.045	11.7324
0.050	11.2975
0.055	10.9688
0.060	10.6897
0.065	10.4731
0.070	10.2712
0.080	9.9813
0.100	9.5799
0.130	9.2199
0.150	9.0679
0.170	8.9501
0.200	8.8216
0.350	8.5559
0.500	8.4621
0.800	8.4281
1.000	8.4307
1.500	8.4169
1.700	8.3918
1.900	8.3679
2.000	8.3598
2.100	8.3419
2.500	8.2629
3.000	8.1558
4.000	7.8839
5.000	7.6009
6.000	7.3168
7.000	7.0415
7.500	6.9228
8.000	6.8024
9.000	6.5659
10.00	6.3483
15.00	5.4702
18.90	4.8926

Table B.2.2.2.1-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) – 0 Inches of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
16.60	0.92460	0.00035	13.90	0.92377	0.00040	12.50	0.92358	0.00043
16.80	0.93047	0.00034	14.00	0.92670	0.00038	12.60	0.92863	0.00043
17.00	0.93526	0.00035	14.10	0.93107	0.00040	12.70	0.93298	0.00043
17.20	0.94023	0.00035	14.20	0.93522	0.00041	12.80	0.93868	0.00044
17.40	0.94457	0.00034	14.30	0.93893	0.00040	12.90	0.94244	0.00044
17.60	0.94907	0.00033	14.40	0.94227	0.00041	13.00	0.94692	0.00045
17.80	0.95267	0.00035	14.50	0.94534	0.00039	13.10	0.95241	0.00043
18.00	0.95794	0.00035	14.60	0.94916	0.00041	13.20	0.95601	0.00045
18.20	0.96197	0.00034	14.70	0.95301	0.00039	13.30	0.96049	0.00043
18.40	0.96631	0.00034	14.80	0.95578	0.00039	13.40	0.96572	0.00043
18.60	0.96981	0.00033	14.90	0.96002	0.00039	13.50	0.97032	0.00044
18.80	0.97407	0.00034	15.00	0.96333	0.00040	13.60	0.97508	0.00042
19.00	0.97795	0.00035	15.10	0.96718	0.00039	13.70	0.97770	0.00043
19.20	0.98268	0.00034	15.20	0.96894	0.00040	13.80	0.98139	0.00043
19.40	0.98557	0.00034	15.30	0.97267	0.00038	13.90	0.98716	0.00043
19.60	0.98982	0.00032	15.40	0.97698	0.00039	14.00	0.99078	0.00042
19.80	0.99311	0.00033	15.50	0.97970	0.00038	14.10	0.99488	0.00043
20.00	0.99611	0.00033	15.60	0.98318	0.00039	14.20	0.99817	0.00043
20.20	0.99911	0.00033	15.70	0.98547	0.00040	14.30	1.00227	0.00041
20.40	1.00288	0.00032	15.80	0.98877	0.00039	14.40	1.00669	0.00041
20.60	1.00607	0.00033	15.90	0.99187	0.00038	14.50	1.01026	0.00043
20.80	1.00881	0.00032	16.00	0.99385	0.00038	14.60	1.01331	0.00044
21.00	1.01200	0.00032	16.10	0.99770	0.00038	14.70	1.01753	0.00042
21.20	1.01458	0.00032	16.20	1.00101	0.00038			
			16.30	1.00347	0.00038			
			16.40	1.00672	0.00038			
			16.50	1.00977	0.00038			
			16.60	1.01191	0.00039			
			16.70	1.01445	0.00039			

Table B.2.2.2.1-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) – 0 Inches of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
11.00	0.92347	0.00048	10.50	0.91960	0.00051	10.20	0.92248	0.00052
11.05	0.92618	0.00049	10.55	0.92319	0.00050	10.25	0.92592	0.00052
11.10	0.92951	0.00049	10.60	0.92636	0.00047	10.30	0.92978	0.00051
11.15	0.93281	0.00049	10.65	0.93049	0.00049	10.35	0.93458	0.00051
11.20	0.93625	0.00050	10.70	0.93375	0.00051	10.40	0.93767	0.00051
11.25	0.93946	0.00048	10.75	0.93645	0.00049	10.45	0.94131	0.00052
11.30	0.94300	0.00049	10.80	0.94016	0.00049	10.50	0.94510	0.00051
11.35	0.94580	0.00048	10.85	0.94409	0.00051	10.55	0.94854	0.00051
11.40	0.94850	0.00048	10.90	0.94726	0.00050	10.60	0.95137	0.00052
11.45	0.95197	0.00049	10.95	0.95101	0.00050	10.65	0.95704	0.00053
11.50	0.95432	0.00050	11.00	0.95331	0.00049	10.70	0.95950	0.00052
11.55	0.95644	0.00049	11.05	0.95768	0.00051	10.75	0.96316	0.00051
11.60	0.96099	0.00048	11.10	0.96062	0.00052	10.80	0.96680	0.00051
11.65	0.96352	0.00049	11.15	0.96375	0.00050	10.85	0.97089	0.00053
11.70	0.96719	0.00048	11.20	0.96762	0.00051	10.90	0.97265	0.00052
11.75	0.96893	0.00048	11.25	0.97013	0.00050	10.95	0.97677	0.00052
11.80	0.97195	0.00051	11.30	0.97302	0.00050	11.00	0.98013	0.00053
11.85	0.97458	0.00048	11.35	0.97712	0.00049	11.05	0.98357	0.00052
11.90	0.97739	0.00050	11.40	0.97990	0.00050	11.10	0.98644	0.00053
11.95	0.98109	0.00048	11.45	0.98213	0.00050	11.15	0.98909	0.00053
12.00	0.98394	0.00049	11.50	0.98530	0.00051	11.20	0.99307	0.00050
12.05	0.98563	0.00048	11.55	0.98943	0.00049	11.25	0.99566	0.00052
12.10	0.98879	0.00049	11.60	0.99128	0.00050	11.30	1.00023	0.00052
12.15	0.99152	0.00049	11.65	0.99512	0.00051	11.35	1.00291	0.00053
12.20	0.99369	0.00047	11.70	0.99880	0.00048	11.40	1.00653	0.00052
12.25	0.99739	0.00048	11.75	1.00065	0.00050	11.45	1.00953	0.00050
12.30	1.00005	0.00047	11.80	1.00366	0.00049	11.50	1.01336	0.00052
12.35	1.00244	0.00049	11.85	1.00625	0.00051	11.55	1.01594	0.00050
12.40	1.00501	0.00048	11.90	1.00971	0.00049	11.60	1.01967	0.00051
12.45	1.00844	0.00048	11.95	1.01297	0.00050			
12.50	1.01064	0.00047	12.00	1.01573	0.00049			
12.55	1.01336	0.00048	12.05	1.01899	0.00050			
12.60	1.01621	0.00048	12.10	1.02124	0.00050			
12.65	1.01879	0.00048						
12.70	1.02149	0.00047						

Table B.2.2.2.1-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) – 0 Inches of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.90	0.92155	0.00052	9.60	0.91448	0.00054	9.50	0.92115	0.00056
9.95	0.92561	0.00054	9.65	0.91844	0.00053	9.55	0.92623	0.00055
10.00	0.92971	0.00052	9.70	0.92195	0.00054	9.60	0.92988	0.00055
10.05	0.93272	0.00052	9.75	0.92687	0.00054	9.65	0.93460	0.00055
10.10	0.93716	0.00051	9.80	0.93278	0.00053	9.70	0.93898	0.00055
10.15	0.94021	0.00055	9.85	0.93495	0.00055	9.75	0.94299	0.00056
10.20	0.94342	0.00052	9.90	0.93893	0.00054	9.80	0.94678	0.00055
10.25	0.94886	0.00056	9.95	0.94385	0.00054	9.85	0.95108	0.00054
10.30	0.95199	0.00053	10.00	0.94797	0.00053	9.90	0.95484	0.00056
10.35	0.95511	0.00052	10.05	0.95128	0.00053	9.95	0.95844	0.00055
10.40	0.95932	0.00052	10.10	0.95558	0.00053	10.00	0.96334	0.00054
10.45	0.96333	0.00054	10.15	0.95949	0.00053	10.05	0.96760	0.00055
10.50	0.96687	0.00051	10.20	0.96395	0.00051	10.10	0.97063	0.00053
10.55	0.97026	0.00052	10.25	0.96716	0.00055	10.15	0.97492	0.00055
10.60	0.97505	0.00051	10.30	0.96916	0.00054	10.20	0.98073	0.00055
10.65	0.97851	0.00053	10.35	0.97466	0.00056	10.25	0.98384	0.00054
10.70	0.98079	0.00054	10.40	0.97878	0.00054	10.30	0.98695	0.00055
10.75	0.98493	0.00054	10.45	0.98159	0.00052	10.35	0.99064	0.00053
10.80	0.98862	0.00052	10.50	0.98477	0.00053	10.40	0.99546	0.00056
10.85	0.99310	0.00053	10.55	0.99017	0.00055	10.45	0.99823	0.00055
10.90	0.99634	0.00052	10.60	0.99280	0.00053	10.50	1.00206	0.00055
10.95	0.99847	0.00054	10.65	0.99672	0.00056	10.55	1.00669	0.00055
11.00	1.00255	0.00053	10.70	1.00085	0.00052	10.60	1.01028	0.00052
11.05	1.00531	0.00053	10.75	1.00379	0.00053	10.65	1.01376	0.00056
11.10	1.00951	0.00053	10.80	1.00777	0.00054	10.70	1.01678	0.00054
11.15	1.01316	0.00053	10.85	1.01144	0.00055			
11.20	1.01550	0.00052	10.90	1.01540	0.00057			
11.25	1.01934	0.00052	10.95	1.01863	0.00053			
11.30	1.02253	0.00053	11.00	1.02133	0.00055			

Table B.2.2.2.1-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) – 0 Inches of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.30	0.91829	0.00056	9.00	0.91294	0.00056	8.70	0.91747	0.00060
9.35	0.92267	0.00057	9.05	0.91778	0.00058	8.75	0.92220	0.00057
9.40	0.92693	0.00055	9.10	0.92222	0.00058	8.80	0.92761	0.00058
9.45	0.93191	0.00055	9.15	0.92718	0.00056	8.85	0.93194	0.00059
9.50	0.93520	0.00055	9.20	0.93222	0.00055	8.90	0.93531	0.00060
9.55	0.94033	0.00055	9.25	0.93624	0.00056	8.95	0.94155	0.00057
9.60	0.94431	0.00055	9.30	0.94063	0.00057	9.00	0.94712	0.00057
9.65	0.94922	0.00054	9.35	0.94475	0.00055	9.05	0.95202	0.00060
9.70	0.95298	0.00056	9.40	0.94970	0.00058	9.10	0.95730	0.00060
9.75	0.95753	0.00055	9.45	0.95479	0.00056	9.15	0.96152	0.00059
9.80	0.96082	0.00055	9.50	0.95849	0.00057	9.20	0.96583	0.00058
9.85	0.96554	0.00053	9.55	0.96420	0.00055	9.25	0.97087	0.00059
9.90	0.96991	0.00055	9.60	0.96882	0.00057	9.30	0.97594	0.00061
9.95	0.97397	0.00057	9.65	0.97170	0.00058	9.35	0.97924	0.00059
10.00	0.97788	0.00054	9.70	0.97650	0.00057	9.40	0.98375	0.00060
10.05	0.98196	0.00055	9.75	0.97971	0.00056	9.45	0.98945	0.00060
10.10	0.98483	0.00056	9.80	0.98526	0.00058	9.50	0.99404	0.00059
10.15	0.98955	0.00055	9.85	0.98839	0.00058	9.55	0.99659	0.00059
10.20	0.99424	0.00056	9.90	0.99289	0.00057	9.60	1.00229	0.00059
10.25	0.99813	0.00056	9.95	0.99745	0.00059	9.65	1.00701	0.00057
10.30	1.00254	0.00055	10.00	1.00153	0.00057	9.70	1.01081	0.00058
10.35	1.00587	0.00056	10.05	1.00637	0.00055	9.75	1.01547	0.00059
10.40	1.00962	0.00053	10.10	1.01027	0.00056	9.80	1.02042	0.00058
10.45	1.01306	0.00058	10.15	1.01460	0.00056			
10.50	1.01695	0.00056	10.20	1.01782	0.00056			
10.55	1.02105	0.00056	10.25	1.02088	0.00058			
10.60	1.02366	0.00055	10.30	1.02695	0.00058			

Table B.2.2.2.1-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) – 0 Inches of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.40	0.91680	0.00059	8.20	0.91031	0.00061	8.10	0.90983	0.00062
8.45	0.92318	0.00061	8.25	0.91421	0.00061	8.15	0.91517	0.00060
8.50	0.92762	0.00059	8.30	0.92023	0.00061	8.20	0.92186	0.00063
8.55	0.93576	0.00061	8.35	0.92627	0.00062	8.25	0.92721	0.00063
8.60	0.93811	0.00060	8.40	0.93236	0.00062	8.30	0.93237	0.00061
8.65	0.94400	0.00061	8.45	0.93695	0.00062	8.35	0.93816	0.00063
8.70	0.94837	0.00059	8.50	0.94357	0.00061	8.40	0.94282	0.00063
8.75	0.95437	0.00058	8.55	0.94650	0.00059	8.45	0.94840	0.00060
8.80	0.95859	0.00060	8.60	0.95280	0.00061	8.50	0.95360	0.00063
8.85	0.96416	0.00060	8.65	0.95873	0.00061	8.55	0.95945	0.00059
8.90	0.96891	0.00059	8.70	0.96317	0.00060	8.60	0.96426	0.00062
8.95	0.97441	0.00061	8.75	0.96811	0.00060	8.65	0.97074	0.00060
9.00	0.97962	0.00061	8.80	0.97386	0.00061	8.70	0.97571	0.00064
9.05	0.98318	0.00059	8.85	0.97891	0.00063	8.75	0.98070	0.00063
9.10	0.98884	0.00059	8.90	0.98446	0.00060	8.80	0.98391	0.00061
9.15	0.99427	0.00060	8.95	0.98839	0.00061	8.85	0.98951	0.00062
9.20	0.99744	0.00060	9.00	0.99365	0.00062	8.90	0.99573	0.00063
9.25	1.00386	0.00061	9.05	0.99855	0.00062	8.95	0.99999	0.00063
9.30	1.00860	0.00061	9.10	1.00261	0.00061	9.00	1.00485	0.00061
9.35	1.01293	0.00060	9.15	1.00894	0.00061	9.05	1.01187	0.00063
9.40	1.01769	0.00059	9.20	1.01387	0.00062	9.10	1.01581	0.00061
9.45	1.02121	0.00062	9.25	1.01816	0.00063	9.15	1.02061	0.00065
9.50	1.02733	0.00061	9.30	1.02243	0.00063	9.20	1.02512	0.00059

Table B.2.2.2.1-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) – 0 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.10	0.92181	0.00062	7.80	0.91712	0.00061	7.70	0.91531	0.00063
8.15	0.92725	0.00060	7.85	0.92219	0.00062	7.75	0.91970	0.00063
8.20	0.93315	0.00063	7.90	0.92921	0.00062	7.80	0.92677	0.00062
8.25	0.93949	0.00060	7.95	0.93416	0.00062	7.85	0.93222	0.00062
8.30	0.94556	0.00063	8.00	0.93993	0.00061	7.90	0.93650	0.00062
8.35	0.94991	0.00063	8.05	0.94526	0.00063	7.95	0.94304	0.00062
8.40	0.95562	0.00061	8.10	0.95092	0.00060	8.00	0.94880	0.00062
8.45	0.96127	0.00062	8.15	0.95668	0.00063	8.05	0.95417	0.00063
8.50	0.96510	0.00061	8.20	0.96222	0.00062	8.10	0.96047	0.00062
8.55	0.97215	0.00062	8.25	0.96776	0.00064	8.15	0.96397	0.00063
8.60	0.97769	0.00063	8.30	0.97447	0.00064	8.20	0.97159	0.00063
8.65	0.98187	0.00062	8.35	0.97835	0.00064	8.25	0.97711	0.00062
8.70	0.98788	0.00064	8.40	0.98433	0.00063	8.30	0.98162	0.00061
8.75	0.99266	0.00064	8.45	0.99002	0.00063	8.35	0.98642	0.00062
8.80	0.99774	0.00066	8.50	0.99423	0.00064	8.40	0.99146	0.00063
8.85	1.00296	0.00061	8.55	0.99943	0.00063	8.45	0.99921	0.00062
8.90	1.00698	0.00063	8.60	1.00430	0.00064	8.50	1.00248	0.00063
8.95	1.01258	0.00061	8.65	1.01063	0.00063	8.55	1.00825	0.00062
9.00	1.01849	0.00063	8.70	1.01596	0.00063	8.60	1.01393	0.00063
9.05	1.02354	0.00061	8.75	1.02186	0.00064	8.65	1.01833	0.00063
9.10	1.02843	0.00060	8.80	1.02620	0.00064	8.70	1.02373	0.00062

Table B.2.2.2.1-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) – 0 Inches of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.70	0.92097	0.00061	7.60	0.91150	0.00060	7.60	0.91768	0.00058
7.75	0.92686	0.00062	7.65	0.91843	0.00059	7.65	0.92313	0.00058
7.80	0.93327	0.00061	7.70	0.92214	0.00060	7.70	0.92820	0.00057
7.85	0.93709	0.00062	7.75	0.92841	0.00061	7.75	0.93377	0.00060
7.90	0.94341	0.00060	7.80	0.93436	0.00060	7.80	0.93930	0.00059
7.95	0.94910	0.00061	7.85	0.93945	0.00061	7.85	0.94391	0.00058
8.00	0.95364	0.00063	7.90	0.94457	0.00062	7.90	0.94978	0.00058
8.05	0.95833	0.00062	7.95	0.95058	0.00060	7.95	0.95441	0.00059
8.10	0.96457	0.00060	8.00	0.95539	0.00060	8.00	0.95873	0.00059
8.15	0.97091	0.00061	8.05	0.96106	0.00061	8.05	0.96534	0.00059
8.20	0.97608	0.00061	8.10	0.96616	0.00060	8.10	0.96932	0.00060
8.25	0.97992	0.00061	8.15	0.97066	0.00062	8.15	0.97479	0.00059
8.30	0.98571	0.00064	8.20	0.97601	0.00060	8.20	0.97963	0.00060
8.35	0.98983	0.00060	8.25	0.98216	0.00062	8.25	0.98415	0.00058
8.40	0.99690	0.00062	8.30	0.98783	0.00062	8.30	0.98894	0.00060
8.45	1.00241	0.00059	8.35	0.99185	0.00060	8.35	0.99485	0.00059
8.50	1.00491	0.00062	8.40	0.99603	0.00061	8.40	0.99836	0.00062
8.55	1.01115	0.00061	8.45	1.00249	0.00061	8.45	1.00320	0.00058
8.60	1.01596	0.00061	8.50	1.00658	0.00060	8.50	1.00825	0.00058
8.65	1.02110	0.00061	8.55	1.01137	0.00061	8.55	1.01280	0.00060
8.70	1.02615	0.00063	8.60	1.01684	0.00060	8.60	1.01730	0.00061
			8.65	1.02102	0.00061	8.65	1.02154	0.00059
			8.70	1.02515	0.00061	8.70	1.02624	0.00057

Table B.2.2.2.1-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) – 0 Inches of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.60	0.92048	0.00060	7.50	0.91347	0.00057	7.50	0.91455	0.00056
7.65	0.92493	0.00057	7.55	0.91828	0.00057	7.55	0.92061	0.00058
7.70	0.93035	0.00059	7.60	0.92293	0.00057	7.60	0.92492	0.00057
7.75	0.93648	0.00057	7.65	0.92877	0.00056	7.65	0.93048	0.00058
7.80	0.94062	0.00058	7.70	0.93410	0.00057	7.70	0.93628	0.00057
7.85	0.94617	0.00058	7.75	0.93935	0.00058	7.75	0.94132	0.00057
7.90	0.95110	0.00055	7.80	0.94471	0.00057	7.80	0.94539	0.00054
7.95	0.95598	0.00059	7.85	0.95013	0.00058	7.85	0.95111	0.00056
8.00	0.96107	0.00058	7.90	0.95606	0.00057	7.90	0.95633	0.00058
8.05	0.96534	0.00057	7.95	0.95984	0.00057	7.95	0.96170	0.00059
8.10	0.97048	0.00059	8.00	0.96328	0.00058	8.00	0.96678	0.00057
8.15	0.97620	0.00056	8.05	0.96968	0.00059	8.05	0.97168	0.00057
8.20	0.98213	0.00059	8.10	0.97401	0.00058	8.10	0.97699	0.00056
8.25	0.98675	0.00060	8.15	0.97968	0.00058	8.15	0.98046	0.00057
8.30	0.99004	0.00058	8.20	0.98397	0.00057	8.20	0.98540	0.00057
8.35	0.99554	0.00058	8.25	0.98882	0.00056	8.25	0.99126	0.00059
8.40	1.00088	0.00059	8.30	0.99402	0.00058	8.30	0.99485	0.00059
8.45	1.00549	0.00056	8.35	0.99861	0.00057	8.35	0.99908	0.00057
8.50	1.01004	0.00058	8.40	1.00249	0.00056	8.40	1.00379	0.00057
8.55	1.01406	0.00060	8.45	1.00731	0.00057	8.45	1.00905	0.00058
8.60	1.01968	0.00059	8.50	1.01210	0.00058	8.50	1.01299	0.00056
			8.55	1.01750	0.00060	8.55	1.01705	0.00057
			8.60	1.02178	0.00056	8.60	1.02118	0.00058

Table B.2.2.2.1-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) – 0 Inches of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.50	0.91663	0.00056	7.40	0.91427	0.00053	7.30	0.91585	0.00053
7.55	0.92214	0.00056	7.45	0.91996	0.00055	7.35	0.92086	0.00054
7.60	0.92757	0.00056	7.50	0.92494	0.00056	7.40	0.92550	0.00052
7.65	0.93137	0.00056	7.55	0.92997	0.00056	7.45	0.93012	0.00053
7.70	0.93688	0.00057	7.60	0.93552	0.00055	7.50	0.93533	0.00055
7.75	0.94201	0.00057	7.65	0.94013	0.00056	7.55	0.94096	0.00055
7.80	0.94775	0.00056	7.70	0.94584	0.00055	7.60	0.94549	0.00055
7.85	0.95298	0.00058	7.75	0.95007	0.00056	7.65	0.95168	0.00057
7.90	0.95809	0.00058	7.80	0.95633	0.00057	7.70	0.95623	0.00054
7.95	0.96245	0.00057	7.85	0.95992	0.00058	7.75	0.96118	0.00054
8.00	0.96771	0.00056	7.90	0.96507	0.00056	7.80	0.96652	0.00054
8.05	0.97268	0.00055	7.95	0.96912	0.00054	7.85	0.97151	0.00053
8.10	0.97764	0.00056	8.00	0.97428	0.00054	7.90	0.97607	0.00053
8.15	0.98233	0.00058	8.05	0.98062	0.00057	7.95	0.98119	0.00054
8.20	0.98753	0.00057	8.10	0.98448	0.00055	8.00	0.98502	0.00054
8.25	0.99154	0.00055	8.15	0.98879	0.00054	8.05	0.99176	0.00055
8.30	0.99609	0.00057	8.20	0.99386	0.00055	8.10	0.99498	0.00055
8.35	1.00076	0.00057	8.25	0.99863	0.00058	8.15	0.99939	0.00053
8.40	1.00545	0.00056	8.30	1.00392	0.00057	8.20	1.00467	0.00054
8.45	1.01029	0.00056	8.35	1.00695	0.00056	8.25	1.00978	0.00054
8.50	1.01475	0.00058	8.40	1.01193	0.00056	8.30	1.01485	0.00056
8.55	1.01911	0.00057	8.45	1.01808	0.00056	8.35	1.01867	0.00054
8.60	1.02451	0.00059	8.50	1.02222	0.00056	8.40	1.02354	0.00055

Table B.2.2.2.1-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) – 0 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.10	0.92072	0.00052	6.80	0.91502	0.00049	6.60	0.91956	0.00048
7.15	0.92553	0.00053	6.85	0.92078	0.00049	6.65	0.92635	0.00047
7.20	0.93015	0.00051	6.90	0.92653	0.00051	6.70	0.93144	0.00050
7.25	0.93682	0.00050	6.95	0.93197	0.00053	6.75	0.93793	0.00049
7.30	0.94181	0.00051	7.00	0.93777	0.00050	6.80	0.94299	0.00048
7.35	0.94692	0.00053	7.05	0.94302	0.00052	6.85	0.94850	0.00049
7.40	0.95120	0.00053	7.10	0.94830	0.00050	6.90	0.95507	0.00049
7.45	0.95684	0.00054	7.15	0.95407	0.00052	6.95	0.96115	0.00050
7.50	0.96239	0.00053	7.20	0.96036	0.00050	7.00	0.96631	0.00050
7.55	0.96728	0.00052	7.25	0.96423	0.00051	7.05	0.97139	0.00050
7.60	0.97327	0.00051	7.30	0.97055	0.00051	7.10	0.97753	0.00049
7.65	0.97777	0.00052	7.35	0.97529	0.00051	7.15	0.98321	0.00049
7.70	0.98248	0.00053	7.40	0.97954	0.00052	7.20	0.98862	0.00050
7.75	0.98674	0.00052	7.45	0.98460	0.00050	7.25	0.99315	0.00049
7.80	0.99154	0.00052	7.50	0.99028	0.00052	7.30	0.99838	0.00050
7.85	0.99722	0.00053	7.55	0.99490	0.00051	7.35	1.00320	0.00051
7.90	1.00132	0.00052	7.60	0.99989	0.00052	7.40	1.00859	0.00049
7.95	1.00672	0.00054	7.65	1.00573	0.00051	7.45	1.01357	0.00049
8.00	1.01187	0.00053	7.70	1.00992	0.00052	7.50	1.01992	0.00049
8.05	1.01545	0.00052	7.75	1.01658	0.00054			
8.10	1.02122	0.00054	7.80	1.01948	0.00050			

Table B.2.2.2.1-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) – 0 Inches of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.30	0.91310	0.00048	6.20	0.91328	0.00046	6.10	0.91401	0.00046
6.35	0.91830	0.00049	6.25	0.91945	0.00048	6.15	0.92105	0.00047
6.40	0.92460	0.00048	6.30	0.92546	0.00047	6.20	0.92767	0.00046
6.45	0.93093	0.00046	6.35	0.93292	0.00047	6.25	0.93367	0.00046
6.50	0.93626	0.00049	6.40	0.93924	0.00045	6.30	0.94003	0.00046
6.55	0.94286	0.00048	6.45	0.94444	0.00048	6.35	0.94633	0.00046
6.60	0.94856	0.00049	6.50	0.95064	0.00048	6.40	0.95226	0.00047
6.65	0.95527	0.00049	6.55	0.95690	0.00046	6.45	0.95859	0.00047
6.70	0.95999	0.00048	6.60	0.96281	0.00046	6.50	0.96403	0.00047
6.75	0.96663	0.00049	6.65	0.96785	0.00047	6.55	0.97042	0.00048
6.80	0.97158	0.00049	6.70	0.97466	0.00048	6.60	0.97588	0.00047
6.85	0.97787	0.00048	6.75	0.98059	0.00048	6.65	0.98229	0.00047
6.90	0.98373	0.00050	6.80	0.98538	0.00047	6.70	0.98844	0.00046
6.95	0.98908	0.00051	6.85	0.99219	0.00048	6.75	0.99442	0.00047
7.00	0.99500	0.00046	6.90	0.99771	0.00047	6.80	0.99974	0.00048
7.05	1.00103	0.00049	6.95	1.00273	0.00049	6.85	1.00524	0.00049
7.10	1.00543	0.00049	7.00	1.00921	0.00047	6.90	1.01122	0.00047
7.15	1.01064	0.00048	7.05	1.01453	0.00049	6.95	1.01687	0.00047
7.20	1.01641	0.00049	7.10	1.01908	0.00048	7.00	1.02311	0.00047
7.25	1.02211	0.00048						
7.30	1.02744	0.00049						

Table B.2.2.2.1-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) – 0 Inches of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.90	0.91550	0.00045	5.70	0.91392	0.00044	4.90	0.91257	0.00037
5.95	0.92142	0.00045	5.75	0.91972	0.00044	4.95	0.92061	0.00037
6.00	0.92887	0.00045	5.80	0.92829	0.00043	5.00	0.92842	0.00037
6.05	0.93469	0.00046	5.85	0.93395	0.00044	5.05	0.93645	0.00038
6.10	0.94096	0.00043	5.90	0.94106	0.00044	5.10	0.94418	0.00039
6.15	0.94814	0.00046	5.95	0.94799	0.00044	5.15	0.95207	0.00038
6.20	0.95497	0.00045	6.00	0.95495	0.00045	5.20	0.95969	0.00037
6.25	0.96077	0.00045	6.05	0.96150	0.00044	5.25	0.96700	0.00038
6.30	0.96689	0.00047	6.10	0.96700	0.00045	5.30	0.97493	0.00039
6.35	0.97324	0.00046	6.15	0.97448	0.00045	5.35	0.98172	0.00040
6.40	0.97965	0.00047	6.20	0.98074	0.00045	5.40	0.98944	0.00041
6.45	0.98445	0.00047	6.25	0.98686	0.00046	5.45	0.99729	0.00039
6.50	0.99105	0.00048	6.30	0.99391	0.00045	5.50	1.00400	0.00040
6.55	0.99793	0.00048	6.35	1.00022	0.00046	5.55	1.01135	0.00040
6.60	1.00444	0.00047	6.40	1.00685	0.00046	5.60	1.01946	0.00039
6.65	1.00954	0.00046	6.45	1.01164	0.00046	5.65	1.02578	0.00039
6.70	1.01608	0.00046	6.50	1.01890	0.00045	5.70	1.03346	0.00040
6.75	1.02193	0.00046	6.55	1.02445	0.00046			
6.80	1.02694	0.00046	6.60	1.03043	0.00047			

Table B.2.2.2.1-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) – 0 Inches of Water Reflection (cont)

18900 milli-g/cc								
Diameter (inches)	K_{eff}	Sigma						
4.40	0.91769	0.00034						
4.45	0.92649	0.00033						
4.50	0.93489	0.00034						
4.55	0.94353	0.00035						
4.60	0.95161	0.00035						
4.65	0.96054	0.00036						
4.70	0.96820	0.00036						
4.75	0.97737	0.00034						
4.80	0.98481	0.00036						
4.85	0.99246	0.00035						
4.90	1.00132	0.00037						
4.95	1.00947	0.00036						
5.00	1.01712	0.00035						
5.05	1.02464	0.00038						
5.10	1.03215	0.00037						

B.2.2.2.2. 1” Water Reflector

Case ID: u5-cyl-0935-01

Material: Uranium metal in water

Geometry: Infinite Cylinder

Isotopics: 93.5% ^{235}U 6.5% ^{238}U

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.2.2.2.2-1. Uranium Cylinder (93.5% ^{235}U) - 1 Inch of Water Reflection

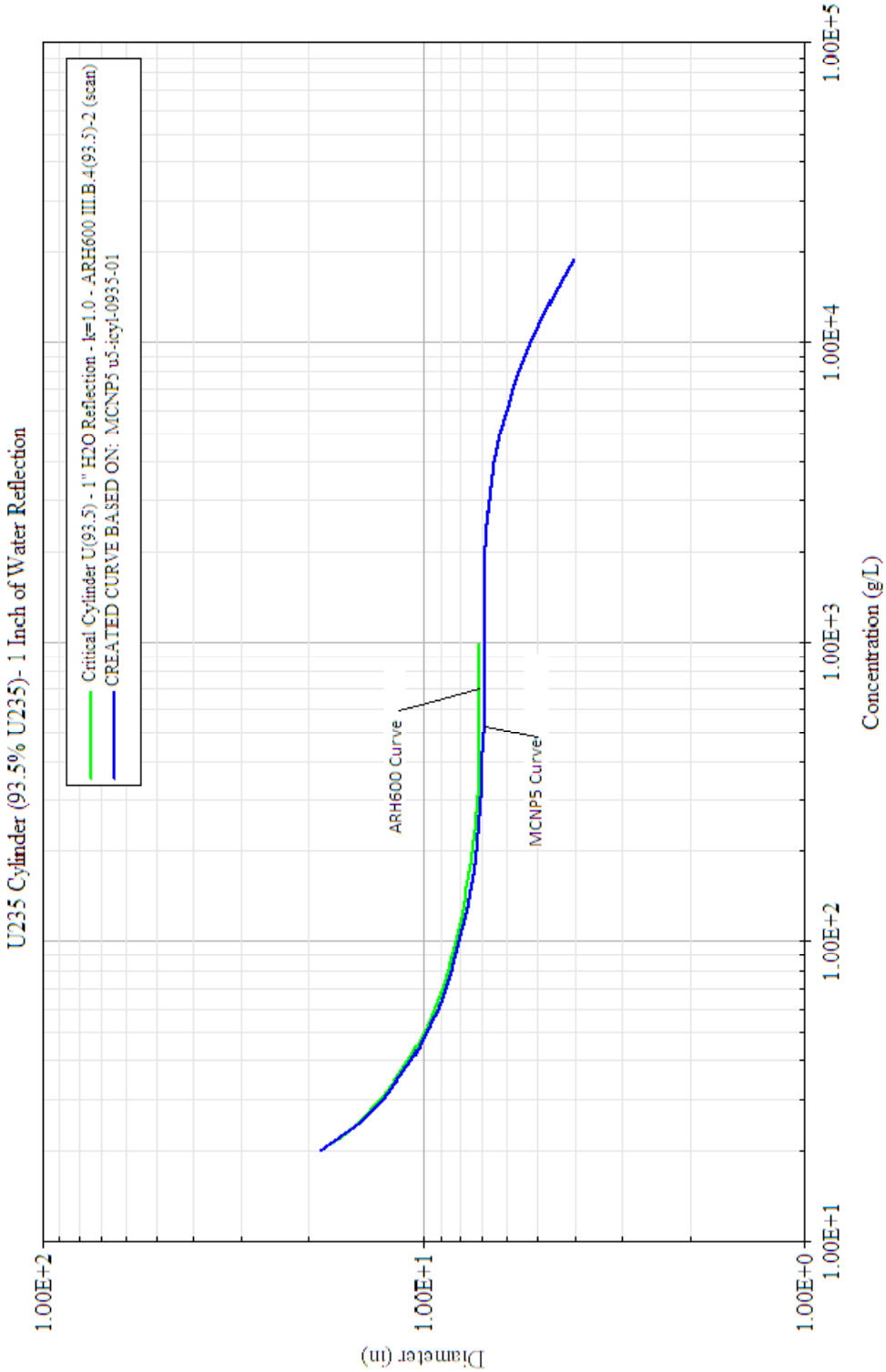

Table B.2.2.2.2-1. Critical Dimensions for Uranium Cylinder (93.5% ^{235}U) - 1 Inch of Water Reflection

Uranium Cylinder (93.5% ^{235}U) - 1 Inch of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter
0.020	15.100	19.600	0.200	20.2472
0.025	12.400	15.200	0.100	16.1695
0.030	11.000	13.200	0.100	14.2446
0.040	9.500	11.100	0.050	12.2991
0.045	9.000	10.500	0.050	11.7324
0.050	8.600	10.100	0.050	11.2975
0.055	8.400	9.700	0.050	10.9688
0.060	8.100	9.500	0.050	10.6897
0.065	7.900	9.200	0.050	10.4731
0.070	7.800	9.100	0.050	10.2712
0.080	7.500	8.700	0.050	9.9813
0.100	7.200	8.300	0.050	9.5799
0.130	6.900	7.900	0.050	9.2199
0.150	6.700	7.800	0.050	9.0679
0.170	6.600	7.600	0.050	8.9501
0.200	6.500	7.500	0.050	8.8216
0.350	6.300	7.200	0.050	8.5559
0.500	6.200	7.200	0.050	8.4621
0.800	6.100	7.100	0.050	8.4281
1.000	6.100	7.100	0.050	8.4307
1.500	6.100	7.100	0.050	8.4169
1.700	6.100	7.200	0.050	8.3918
1.900	6.100	7.100	0.050	8.3679
2.000	6.100	7.100	0.050	8.3598
2.100	6.100	7.100	0.050	8.3419
2.500	6.000	7.000	0.050	8.2629
3.000	5.900	6.900	0.050	8.1558
4.000	5.700	6.700	0.050	7.8839
5.000	5.500	6.500	0.050	7.6009
6.000	5.300	6.300	0.050	7.3168
7.000	5.100	6.000	0.050	7.0415
7.500	5.000	5.900	0.050	6.9228
8.000	4.900	5.800	0.050	6.8024
9.000	4.800	5.600	0.050	6.5659
10.000	4.600	5.400	0.050	6.3483
15.000	4.000	4.700	0.050	5.4702
18.900	3.600	4.200	0.050	4.8926

MCNP5 Sample Input File
93.5% ^{235}U Cylinder- 1 Inch of Reflection

```
u icyl, 93.5 wt% 235U, 00150 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 715   hundreths of inches - must be integer
c radius =     9.0805 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00150 milli-g u/cc
c Reflector width =  1.0 inches
c Enrichment = 0.94 wt fraction 235U
c
c Density of H2O 1.00000
c Density of u 18.90000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c u238  = 238.05080
c
c Effective Uranium atomic mass 235.23935
c uranium metal
c Mass fraction of u in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0079 cc
c Volume of water in sample 0.9921 cc
c
c Mass of crit in sample   0.1500 g
c Mass of u in sample   0.1500 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9921 g
c
c Total mass of sample  1.1421g for a 1cc sample
c Mass Density for crit material  -1.1421, expressed as negative
c
c  plane
20 11   -1.142063   -1      imp:n=1
21  2  -1.000                    -2 1     imp:n=1    $zero importance if no reflector
22  0                          2        imp:n=0
```

```
1       cz     9.0805              $ plane
2       cz    11.6205        $ Reflection

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u metal / water mixture
m11    $ Uranium/H2O Sludge, 100.0 wt% 235U, 00150 milli-g u/cc,  1.1421
1001.66c -0.097198
8016.66c -0.771461      $from water
92235.66c -0.122804
92238.66c -0.008537
mt11     lwtr.60t
c
c    u only
m12    $ U metal, 100.0 wt% 235U, 00150 milli-g U/cc,  1.1421
92235.66c -0.122804
92238.66c -0.008537
c
```

Critview Compatible Data File
93.5% ^{235}U Cylinder- 1 Inch of Reflection

reset:
title: MCNP5 u5-icyl-0935-01
set: MCNP5 set
source: MCNP5 primary
created: Wed 07/28/2010 9:50:51.65
geometry: infcyl
modmat: H2O
critmat: Uranium
isomat: U235 0.935 U238 0.065
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.020	18.7016
0.025	14.6815
0.030	12.7107
0.040	10.7794
0.045	10.2128
0.050	9.7816
0.055	9.4413
0.060	9.1687
0.065	8.9392
0.070	8.7489
0.080	8.4510
0.100	8.0429
0.130	7.6826
0.150	7.5273
0.170	7.3986
0.200	7.2790
0.350	7.0038
0.500	6.9251
0.800	6.9053
1.000	6.8979
1.500	6.8972
1.700	6.8824
1.900	6.8750
2.000	6.8707
2.100	6.8523
2.500	6.8036
3.000	6.7159
4.000	6.5016
5.000	6.2708
6.000	6.0433
7.000	5.8108
7.500	5.7067
8.000	5.6066
9.000	5.4130
10.00	5.2392
15.00	4.5019
18.90	4.0368

Table B.2.2.2.2-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 1 Inch of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
15.10	0.92541	0.00034	12.40	0.92398	0.00038	11.00	0.92510	0.00043
15.30	0.93094	0.00034	12.50	0.92844	0.00038	11.10	0.92949	0.00043
15.50	0.93587	0.00034	12.60	0.93217	0.00039	11.20	0.93393	0.00043
15.70	0.94038	0.00034	12.70	0.93466	0.00038	11.30	0.93876	0.00042
15.90	0.94504	0.00034	12.80	0.93955	0.00039	11.40	0.94308	0.00041
16.10	0.94997	0.00033	12.90	0.94358	0.00038	11.50	0.94784	0.00041
16.30	0.95374	0.00033	13.00	0.94610	0.00038	11.60	0.95239	0.00042
16.50	0.95843	0.00034	13.10	0.95019	0.00040	11.70	0.95726	0.00044
16.70	0.96278	0.00033	13.20	0.95399	0.00038	11.80	0.96163	0.00042
16.90	0.96684	0.00033	13.30	0.95661	0.00038	11.90	0.96605	0.00042
17.10	0.97081	0.00034	13.40	0.96070	0.00038	12.00	0.97030	0.00042
17.30	0.97465	0.00033	13.50	0.96364	0.00038	12.10	0.97471	0.00042
17.50	0.97894	0.00033	13.60	0.96650	0.00039	12.20	0.97850	0.00041
17.70	0.98314	0.00033	13.70	0.96999	0.00038	12.30	0.98240	0.00041
17.90	0.98574	0.00032	13.80	0.97405	0.00037	12.40	0.98711	0.00041
18.10	0.99005	0.00032	13.90	0.97622	0.00038	12.50	0.99082	0.00042
18.30	0.99200	0.00032	14.00	0.97977	0.00037	12.60	0.99576	0.00041
18.50	0.99675	0.00033	14.10	0.98301	0.00037	12.70	0.99952	0.00042
18.70	0.99997	0.00031	14.20	0.98660	0.00038	12.80	1.00402	0.00041
18.90	1.00365	0.00031	14.30	0.98907	0.00037	12.90	1.00673	0.00041
19.10	1.00557	0.00033	14.40	0.99222	0.00039	13.00	1.01097	0.00040
19.30	1.00953	0.00032	14.50	0.99598	0.00037	13.10	1.01407	0.00040
19.50	1.01265	0.00031	14.60	0.99802	0.00039	13.20	1.01816	0.00041
19.60	1.01399	0.00031	14.70	1.00045	0.00037			
			14.80	1.00394	0.00037			
			14.90	1.00634	0.00037			
			15.00	1.00931	0.00035			
			15.10	1.01217	0.00038			
			15.20	1.01473	0.00037			

Table B.2.2.2.2-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
9.50	0.92341	0.00047	9.00	0.92079	0.00048	8.60	0.91664	0.00051
9.55	0.92753	0.00047	9.05	0.92407	0.00047	8.65	0.92058	0.00050
9.60	0.93103	0.00046	9.10	0.92772	0.00048	8.70	0.92400	0.00047
9.65	0.93293	0.00047	9.15	0.93149	0.00048	8.75	0.92791	0.00050
9.70	0.93704	0.00046	9.20	0.93502	0.00049	8.80	0.93163	0.00049
9.75	0.94058	0.00047	9.25	0.93832	0.00049	8.85	0.93558	0.00049
9.80	0.94332	0.00046	9.30	0.94201	0.00047	8.90	0.93829	0.00050
9.85	0.94646	0.00046	9.35	0.94512	0.00048	8.95	0.94204	0.00050
9.90	0.95039	0.00046	9.40	0.94925	0.00048	9.00	0.94660	0.00050
9.95	0.95251	0.00047	9.45	0.95116	0.00048	9.05	0.95078	0.00050
10.00	0.95566	0.00046	9.50	0.95467	0.00048	9.10	0.95337	0.00048
10.05	0.95856	0.00047	9.55	0.95812	0.00048	9.15	0.95773	0.00049
10.10	0.96161	0.00047	9.60	0.96173	0.00049	9.20	0.96069	0.00050
10.15	0.96536	0.00046	9.65	0.96544	0.00047	9.25	0.96446	0.00049
10.20	0.96775	0.00047	9.70	0.96803	0.00050	9.30	0.96788	0.00051
10.25	0.97047	0.00047	9.75	0.97191	0.00048	9.35	0.97095	0.00048
10.30	0.97314	0.00045	9.80	0.97484	0.00049	9.40	0.97481	0.00050
10.35	0.97608	0.00048	9.85	0.97883	0.00049	9.45	0.97828	0.00050
10.40	0.97983	0.00046	9.90	0.98095	0.00048	9.50	0.98093	0.00049
10.45	0.98163	0.00045	9.95	0.98388	0.00048	9.55	0.98528	0.00051
10.50	0.98452	0.00047	10.00	0.98686	0.00048	9.60	0.98809	0.00049
10.55	0.98779	0.00045	10.05	0.98900	0.00048	9.65	0.99264	0.00049
10.60	0.98985	0.00046	10.10	0.99307	0.00048	9.70	0.99457	0.00049
10.65	0.99325	0.00047	10.15	0.99622	0.00049	9.75	0.99764	0.00050
10.70	0.99469	0.00047	10.20	0.99919	0.00047	9.80	1.00138	0.00049
10.75	0.99882	0.00046	10.25	1.00235	0.00046	9.85	1.00490	0.00051
10.80	1.00083	0.00044	10.30	1.00473	0.00048	9.90	1.00720	0.00052
10.85	1.00435	0.00046	10.35	1.00768	0.00049	9.95	1.01070	0.00049
10.90	1.00672	0.00048	10.40	1.01143	0.00047	10.00	1.01305	0.00048
10.95	1.00979	0.00045	10.45	1.01401	0.00048	10.05	1.01625	0.00049
11.00	1.01171	0.00045	10.50	1.01697	0.00047	10.10	1.02066	0.00049
11.05	1.01508	0.00047						
11.10	1.01677	0.00046						

Table B.2.2.2.2-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.40	0.92186	0.00051	8.10	0.91556	0.00052	7.90	0.91470	0.00052
8.45	0.92618	0.00051	8.15	0.92072	0.00051	7.95	0.91848	0.00052
8.50	0.93083	0.00050	8.20	0.92471	0.00052	8.00	0.92291	0.00052
8.55	0.93363	0.00049	8.25	0.92763	0.00051	8.05	0.92778	0.00054
8.60	0.93764	0.00049	8.30	0.93210	0.00052	8.10	0.93175	0.00052
8.65	0.94198	0.00049	8.35	0.93683	0.00052	8.15	0.93562	0.00051
8.70	0.94591	0.00052	8.40	0.94119	0.00051	8.20	0.94024	0.00052
8.75	0.95016	0.00049	8.45	0.94457	0.00053	8.25	0.94445	0.00053
8.80	0.95263	0.00051	8.50	0.94927	0.00052	8.30	0.94860	0.00052
8.85	0.95770	0.00050	8.55	0.95255	0.00051	8.35	0.95297	0.00053
8.90	0.96032	0.00051	8.60	0.95740	0.00054	8.40	0.95620	0.00052
8.95	0.96525	0.00051	8.65	0.96040	0.00053	8.45	0.96131	0.00053
9.00	0.96835	0.00049	8.70	0.96435	0.00051	8.50	0.96605	0.00055
9.05	0.97181	0.00049	8.75	0.96927	0.00051	8.55	0.96922	0.00053
9.10	0.97587	0.00051	8.80	0.97203	0.00050	8.60	0.97312	0.00051
9.15	0.97933	0.00051	8.85	0.97692	0.00050	8.65	0.97762	0.00054
9.20	0.98254	0.00050	8.90	0.97969	0.00052	8.70	0.98060	0.00053
9.25	0.98694	0.00050	8.95	0.98364	0.00051	8.75	0.98497	0.00052
9.30	0.99031	0.00050	9.00	0.98759	0.00052	8.80	0.98914	0.00052
9.35	0.99407	0.00050	9.05	0.99128	0.00052	8.85	0.99287	0.00052
9.40	0.99645	0.00051	9.10	0.99487	0.00051	8.90	0.99807	0.00053
9.45	1.00075	0.00050	9.15	0.99815	0.00052	8.95	1.00053	0.00054
9.50	1.00390	0.00051	9.20	1.00309	0.00050	9.00	1.00403	0.00052
9.55	1.00755	0.00050	9.25	1.00585	0.00051	9.05	1.00779	0.00052
9.60	1.01046	0.00051	9.30	1.00979	0.00051	9.10	1.01153	0.00050
9.65	1.01367	0.00049	9.35	1.01246	0.00051	9.15	1.01593	0.00053
9.70	1.01819	0.00051	9.40	1.01666	0.00052	9.20	1.01914	0.00052
			9.45	1.02061	0.00050			
			9.50	1.02348	0.00051			

Table B.2.2.2.2-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.80	0.91942	0.00053	7.50	0.91514	0.00053	7.20	0.91866	0.00055
7.85	0.92354	0.00054	7.55	0.91938	0.00054	7.25	0.92356	0.00056
7.90	0.92854	0.00052	7.60	0.92324	0.00055	7.30	0.92972	0.00055
7.95	0.93294	0.00055	7.65	0.92886	0.00055	7.35	0.93478	0.00057
8.00	0.93660	0.00055	7.70	0.93397	0.00053	7.40	0.93981	0.00057
8.05	0.94224	0.00052	7.75	0.93860	0.00054	7.45	0.94412	0.00057
8.10	0.94549	0.00054	7.80	0.94278	0.00054	7.50	0.94965	0.00056
8.15	0.95117	0.00052	7.85	0.94780	0.00054	7.55	0.95400	0.00056
8.20	0.95454	0.00055	7.90	0.95135	0.00055	7.60	0.95881	0.00054
8.25	0.95938	0.00053	7.95	0.95671	0.00057	7.65	0.96392	0.00054
8.30	0.96354	0.00052	8.00	0.96017	0.00055	7.70	0.96848	0.00056
8.35	0.96782	0.00052	8.05	0.96518	0.00053	7.75	0.97339	0.00055
8.40	0.97144	0.00053	8.10	0.96917	0.00053	7.80	0.97845	0.00056
8.45	0.97414	0.00053	8.15	0.97510	0.00055	7.85	0.98223	0.00054
8.50	0.97990	0.00053	8.20	0.97861	0.00054	7.90	0.98772	0.00056
8.55	0.98346	0.00053	8.25	0.98310	0.00054	7.95	0.99165	0.00056
8.60	0.98835	0.00053	8.30	0.98718	0.00055	8.00	0.99629	0.00057
8.65	0.99105	0.00052	8.35	0.99211	0.00054	8.05	1.00061	0.00056
8.70	0.99598	0.00052	8.40	0.99468	0.00054	8.10	1.00522	0.00054
8.75	1.00009	0.00052	8.45	0.99991	0.00054	8.15	1.00934	0.00055
8.80	1.00338	0.00054	8.50	1.00456	0.00056	8.20	1.01363	0.00055
8.85	1.00698	0.00052	8.55	1.00729	0.00054	8.25	1.01886	0.00059
8.90	1.01098	0.00052	8.60	1.01288	0.00053	8.30	1.02200	0.00056
8.95	1.01546	0.00053	8.65	1.01576	0.00053			
9.00	1.01868	0.00052	8.70	1.02120	0.00053			
9.05	1.02276	0.00051						
9.10	1.02708	0.00053						

Table B.2.2.2.2-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.90	0.92093	0.00057	6.70	0.91235	0.00059	6.60	0.91253	0.00056
6.95	0.92510	0.00057	6.75	0.91993	0.00057	6.65	0.91825	0.00058
7.00	0.93194	0.00058	6.80	0.92531	0.00060	6.70	0.92373	0.00059
7.05	0.93551	0.00057	6.85	0.92955	0.00057	6.75	0.93002	0.00058
7.10	0.94140	0.00057	6.90	0.93436	0.00058	6.80	0.93511	0.00059
7.15	0.94615	0.00057	6.95	0.94139	0.00058	6.85	0.94087	0.00058
7.20	0.95229	0.00058	7.00	0.94573	0.00057	6.90	0.94557	0.00059
7.25	0.95564	0.00058	7.05	0.95136	0.00060	6.95	0.95119	0.00057
7.30	0.96221	0.00057	7.10	0.95714	0.00059	7.00	0.95681	0.00058
7.35	0.96660	0.00058	7.15	0.96227	0.00058	7.05	0.96304	0.00059
7.40	0.97330	0.00057	7.20	0.96732	0.00059	7.10	0.96738	0.00059
7.45	0.97733	0.00057	7.25	0.97262	0.00059	7.15	0.97324	0.00058
7.50	0.98238	0.00057	7.30	0.97765	0.00060	7.20	0.97945	0.00058
7.55	0.98759	0.00057	7.35	0.98291	0.00057	7.25	0.98374	0.00060
7.60	0.99196	0.00058	7.40	0.98774	0.00059	7.30	0.98928	0.00059
7.65	0.99705	0.00058	7.45	0.99260	0.00058	7.35	0.99349	0.00059
7.70	1.00158	0.00057	7.50	0.99705	0.00059	7.40	1.00019	0.00059
7.75	1.00662	0.00058	7.55	1.00245	0.00059	7.45	1.00488	0.00059
7.80	1.01199	0.00057	7.60	1.00683	0.00059	7.50	1.00883	0.00060
7.85	1.01597	0.00057	7.65	1.01325	0.00059	7.55	1.01434	0.00058
7.90	1.02039	0.00056	7.70	1.01683	0.00058	7.60	1.01901	0.00059
			7.75	1.02180	0.00059			
			7.80	1.02680	0.00057			

Table B.2.2.2.2-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.50	0.91504	0.00059	6.30	0.92060	0.00063	6.20	0.91904	0.00059
6.55	0.91985	0.00060	6.35	0.92758	0.00059	6.25	0.92390	0.00061
6.60	0.92756	0.00060	6.40	0.93219	0.00060	6.30	0.93083	0.00062
6.65	0.93148	0.00059	6.45	0.93807	0.00059	6.35	0.93580	0.00061
6.70	0.93780	0.00058	6.50	0.94463	0.00061	6.40	0.94174	0.00060
6.75	0.94304	0.00057	6.55	0.94937	0.00061	6.45	0.94793	0.00060
6.80	0.94828	0.00060	6.60	0.95595	0.00061	6.50	0.95335	0.00061
6.85	0.95381	0.00059	6.65	0.96150	0.00060	6.55	0.95912	0.00061
6.90	0.96028	0.00060	6.70	0.96626	0.00060	6.60	0.96373	0.00060
6.95	0.96493	0.00060	6.75	0.97313	0.00059	6.65	0.97076	0.00059
7.00	0.97080	0.00061	6.80	0.97627	0.00061	6.70	0.97505	0.00061
7.05	0.97552	0.00059	6.85	0.98307	0.00061	6.75	0.98172	0.00060
7.10	0.98170	0.00060	6.90	0.98803	0.00061	6.80	0.98654	0.00062
7.15	0.98599	0.00059	6.95	0.99345	0.00060	6.85	0.99273	0.00062
7.20	0.99148	0.00058	7.00	0.99966	0.00061	6.90	0.99727	0.00060
7.25	0.99654	0.00061	7.05	1.00409	0.00060	6.95	1.00270	0.00060
7.30	1.00250	0.00062	7.10	1.01026	0.00062	7.00	1.00672	0.00060
7.35	1.00720	0.00059	7.15	1.01516	0.00060	7.05	1.01284	0.00061
7.40	1.01142	0.00058	7.20	1.02000	0.00059	7.10	1.01698	0.00061
7.45	1.01784	0.00059				7.15	1.02292	0.00060
7.50	1.02150	0.00058				7.20	1.02674	0.00061

Table B.2.2.2.2-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.10	0.91206	0.00058	6.10	0.91488	0.00059	6.10	0.91785	0.00058
6.15	0.91772	0.00057	6.15	0.91978	0.00060	6.15	0.92257	0.00060
6.20	0.92397	0.00058	6.20	0.92558	0.00059	6.20	0.92888	0.00058
6.25	0.92990	0.00061	6.25	0.93129	0.00058	6.25	0.93335	0.00057
6.30	0.93532	0.00061	6.30	0.93697	0.00059	6.30	0.93848	0.00056
6.35	0.94161	0.00059	6.35	0.94212	0.00059	6.35	0.94576	0.00058
6.40	0.94795	0.00059	6.40	0.94675	0.00056	6.40	0.95058	0.00058
6.45	0.95251	0.00059	6.45	0.95232	0.00059	6.45	0.95447	0.00057
6.50	0.95691	0.00061	6.50	0.95818	0.00059	6.50	0.96026	0.00059
6.55	0.96220	0.00059	6.55	0.96382	0.00060	6.55	0.96447	0.00058
6.60	0.96903	0.00061	6.60	0.96781	0.00058	6.60	0.96868	0.00058
6.65	0.97357	0.00060	6.65	0.97382	0.00059	6.65	0.97460	0.00058
6.70	0.98010	0.00060	6.70	0.97831	0.00059	6.70	0.97983	0.00057
6.75	0.98373	0.00061	6.75	0.98417	0.00059	6.75	0.98584	0.00057
6.80	0.98988	0.00059	6.80	0.98954	0.00058	6.80	0.99040	0.00059
6.85	0.99458	0.00060	6.85	0.99325	0.00059	6.85	0.99404	0.00057
6.90	0.99934	0.00058	6.90	1.00029	0.00059	6.90	1.00035	0.00058
6.95	1.00552	0.00060	6.95	1.00486	0.00058	6.95	1.00376	0.00059
7.00	1.00977	0.00058	7.00	1.00993	0.00058	7.00	1.01035	0.00060
7.05	1.01491	0.00060	7.05	1.01358	0.00058	7.05	1.01432	0.00057
7.10	1.01978	0.00059	7.10	1.02019	0.00060	7.10	1.01883	0.00059

Table B.2.2.2.2-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.10	0.91943	0.00058	6.10	0.92270	0.00057	6.10	0.92362	0.00055
6.15	0.92411	0.00057	6.15	0.92656	0.00056	6.15	0.92821	0.00057
6.20	0.93016	0.00055	6.20	0.93246	0.00056	6.20	0.93334	0.00057
6.25	0.93499	0.00058	6.25	0.93740	0.00058	6.25	0.93826	0.00057
6.30	0.94137	0.00058	6.30	0.94158	0.00058	6.30	0.94437	0.00057
6.35	0.94550	0.00056	6.35	0.94743	0.00055	6.35	0.94909	0.00057
6.40	0.95077	0.00057	6.40	0.95382	0.00058	6.40	0.95391	0.00056
6.45	0.95638	0.00057	6.45	0.95810	0.00056	6.45	0.95915	0.00055
6.50	0.96147	0.00058	6.50	0.96336	0.00056	6.50	0.96464	0.00057
6.55	0.96540	0.00057	6.55	0.96750	0.00058	6.55	0.96984	0.00056
6.60	0.97155	0.00057	6.60	0.97337	0.00057	6.60	0.97461	0.00057
6.65	0.97522	0.00057	6.65	0.97765	0.00058	6.65	0.97915	0.00058
6.70	0.98111	0.00057	6.70	0.98372	0.00055	6.70	0.98420	0.00056
6.75	0.98637	0.00058	6.75	0.98777	0.00058	6.75	0.98900	0.00056
6.80	0.99132	0.00058	6.80	0.99193	0.00057	6.80	0.99381	0.00058
6.85	0.99655	0.00056	6.85	0.99803	0.00058	6.85	0.99774	0.00058
6.90	1.00188	0.00057	6.90	1.00197	0.00057	6.90	1.00319	0.00057
6.95	1.00590	0.00057	6.95	1.00711	0.00057	6.95	1.00833	0.00059
7.00	1.01035	0.00058	7.00	1.01146	0.00058	7.00	1.01225	0.00058
7.05	1.01418	0.00059	7.05	1.01584	0.00058	7.05	1.01708	0.00058
7.10	1.01969	0.00058	7.10	1.02139	0.00057	7.10	1.02166	0.00056
7.15	1.02476	0.00056						
7.20	1.02848	0.00057						

Table B.2.2.2.2-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.10	0.92395	0.00058	6.00	0.91807	0.00057	5.90	0.91803	0.00052
6.15	0.92917	0.00055	6.05	0.92453	0.00055	5.95	0.92265	0.00053
6.20	0.93437	0.00055	6.10	0.92935	0.00054	6.00	0.92803	0.00055
6.25	0.93930	0.00055	6.15	0.93536	0.00056	6.05	0.93321	0.00055
6.30	0.94471	0.00057	6.20	0.94021	0.00054	6.10	0.93791	0.00053
6.35	0.95035	0.00057	6.25	0.94485	0.00055	6.15	0.94291	0.00054
6.40	0.95457	0.00054	6.30	0.95076	0.00057	6.20	0.94989	0.00056
6.45	0.96074	0.00057	6.35	0.95651	0.00057	6.25	0.95478	0.00054
6.50	0.96510	0.00059	6.40	0.96064	0.00055	6.30	0.95993	0.00056
6.55	0.97053	0.00054	6.45	0.96587	0.00056	6.35	0.96417	0.00056
6.60	0.97561	0.00055	6.50	0.97131	0.00057	6.40	0.96892	0.00056
6.65	0.97981	0.00055	6.55	0.97598	0.00056	6.45	0.97368	0.00053
6.70	0.98521	0.00057	6.60	0.98073	0.00058	6.50	0.97937	0.00055
6.75	0.98926	0.00056	6.65	0.98563	0.00057	6.55	0.98420	0.00054
6.80	0.99507	0.00056	6.70	0.98963	0.00056	6.60	0.98923	0.00054
6.85	0.99978	0.00056	6.75	0.99457	0.00056	6.65	0.99327	0.00055
6.90	1.00464	0.00058	6.80	0.99963	0.00055	6.70	0.99830	0.00055
6.95	1.00826	0.00056	6.85	1.00470	0.00056	6.75	1.00363	0.00054
7.00	1.01272	0.00057	6.90	1.00873	0.00055	6.80	1.00836	0.00056
7.05	1.01670	0.00056	6.95	1.01458	0.00057	6.85	1.01197	0.00056
7.10	1.02305	0.00057	7.00	1.01762	0.00057	6.90	1.01845	0.00055

Table B.2.2.2.2-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.70	0.91661	0.00052	5.50	0.91570	0.00051	5.30	0.91576	0.00050
5.75	0.92146	0.00051	5.55	0.92207	0.00053	5.35	0.92208	0.00050
5.80	0.92715	0.00052	5.60	0.92764	0.00051	5.40	0.92875	0.00052
5.85	0.93231	0.00053	5.65	0.93299	0.00053	5.45	0.93372	0.00052
5.90	0.93931	0.00052	5.70	0.93943	0.00052	5.50	0.93952	0.00052
5.95	0.94376	0.00053	5.75	0.94496	0.00052	5.55	0.94544	0.00053
6.00	0.94945	0.00053	5.80	0.94992	0.00051	5.60	0.95135	0.00051
6.05	0.95325	0.00055	5.85	0.95533	0.00051	5.65	0.95720	0.00051
6.10	0.95886	0.00053	5.90	0.96022	0.00052	5.70	0.96278	0.00050
6.15	0.96451	0.00054	5.95	0.96621	0.00053	5.75	0.96816	0.00052
6.20	0.97040	0.00055	6.00	0.97178	0.00053	5.80	0.97332	0.00052
6.25	0.97373	0.00051	6.05	0.97745	0.00051	5.85	0.97926	0.00051
6.30	0.97945	0.00053	6.10	0.98217	0.00053	5.90	0.98431	0.00051
6.35	0.98564	0.00054	6.15	0.98733	0.00052	5.95	0.98995	0.00052
6.40	0.98994	0.00053	6.20	0.99198	0.00052	6.00	0.99607	0.00052
6.45	0.99427	0.00053	6.25	0.99762	0.00053	6.05	1.00061	0.00052
6.50	0.99984	0.00052	6.30	1.00333	0.00053	6.10	1.00682	0.00052
6.55	1.00492	0.00053	6.35	1.00771	0.00051	6.15	1.01163	0.00051
6.60	1.00897	0.00053	6.40	1.01281	0.00051	6.20	1.01697	0.00053
6.65	1.01484	0.00055	6.45	1.01715	0.00052	6.25	1.02248	0.00051
6.70	1.01958	0.00054	6.50	1.02244	0.00053	6.30	1.02796	0.00051

Table B.2.2.2.2-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.10	0.91451	0.00050	5.00	0.91321	0.00050	4.90	0.91170	0.00050
5.15	0.92091	0.00050	5.05	0.92005	0.00050	4.95	0.91817	0.00049
5.20	0.92686	0.00050	5.10	0.92586	0.00050	5.00	0.92425	0.00047
5.25	0.93362	0.00051	5.15	0.93285	0.00050	5.05	0.93104	0.00051
5.30	0.93931	0.00050	5.20	0.93853	0.00051	5.10	0.93775	0.00049
5.35	0.94517	0.00050	5.25	0.94488	0.00053	5.15	0.94339	0.00050
5.40	0.95180	0.00051	5.30	0.95076	0.00050	5.20	0.95097	0.00048
5.45	0.95812	0.00052	5.35	0.95662	0.00051	5.25	0.95596	0.00050
5.50	0.96413	0.00051	5.40	0.96312	0.00050	5.30	0.96231	0.00049
5.55	0.96979	0.00049	5.45	0.96964	0.00049	5.35	0.96907	0.00049
5.60	0.97572	0.00050	5.50	0.97542	0.00051	5.40	0.97488	0.00049
5.65	0.98105	0.00051	5.55	0.98168	0.00050	5.45	0.98012	0.00050
5.70	0.98649	0.00052	5.60	0.98752	0.00050	5.50	0.98729	0.00051
5.75	0.99250	0.00051	5.65	0.99139	0.00049	5.55	0.99255	0.00052
5.80	0.99871	0.00050	5.70	0.99936	0.00051	5.60	0.99935	0.00051
5.85	1.00470	0.00051	5.75	1.00411	0.00050	5.65	1.00427	0.00051
5.90	1.00961	0.00051	5.80	1.01026	0.00050	5.70	1.00993	0.00052
5.95	1.01523	0.00052	5.85	1.01585	0.00050	5.75	1.01555	0.00052
6.00	1.02019	0.00051	5.90	1.02099	0.00049	5.80	1.02213	0.00050

Table B.2.2.2.2-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.80	0.91995	0.00047	4.60	0.91379	0.00047	4.00	0.92000	0.00043
4.85	0.92676	0.00049	4.65	0.92085	0.00049	4.05	0.92852	0.00044
4.90	0.93377	0.00047	4.70	0.92818	0.00047	4.10	0.93556	0.00043
4.95	0.94088	0.00051	4.75	0.93441	0.00047	4.15	0.94451	0.00044
5.00	0.94694	0.00049	4.80	0.94155	0.00048	4.20	0.95237	0.00045
5.05	0.95345	0.00048	4.85	0.94867	0.00047	4.25	0.96017	0.00045
5.10	0.95964	0.00050	4.90	0.95511	0.00047	4.30	0.96826	0.00045
5.15	0.96642	0.00049	4.95	0.96250	0.00048	4.35	0.97627	0.00046
5.20	0.97244	0.00049	5.00	0.96960	0.00048	4.40	0.98394	0.00045
5.25	0.97907	0.00052	5.05	0.97487	0.00050	4.45	0.99116	0.00046
5.30	0.98582	0.00048	5.10	0.98267	0.00048	4.50	0.99972	0.00046
5.35	0.99185	0.00050	5.15	0.98818	0.00048	4.55	1.00692	0.00045
5.40	0.99826	0.00050	5.20	0.99535	0.00048	4.60	1.01467	0.00044
5.45	1.00495	0.00050	5.25	1.00128	0.00048	4.65	1.02220	0.00047
5.50	1.01001	0.00050	5.30	1.00702	0.00049	4.70	1.02998	0.00047
5.55	1.01593	0.00048	5.35	1.01383	0.00049			
5.60	1.02218	0.00050	5.40	1.02016	0.00050			

Table B.2.2.2.2-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

18900 milli-g/cc								
Diameter (inches)	K_{eff}	Sigma						
3.60	0.92247	0.00042						
3.65	0.93204	0.00043						
3.70	0.94008	0.00041						
3.75	0.94909	0.00042						
3.80	0.95840	0.00043						
3.85	0.96757	0.00042						
3.90	0.97579	0.00043						
3.95	0.98523	0.00043						
4.00	0.99396	0.00043						
4.05	1.00216	0.00044						
4.10	1.01060	0.00041						
4.15	1.01931	0.00043						
4.20	1.02710	0.00044						

B.2.2.2.3. 10” Water Reflector

Case ID: u5-cyl-0935-10

Material: Uranium metal in water

Geometry: Infinite Cylinder

Isotopics: 93.5% ^{235}U 6.5% ^{238}U

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.2.2.2.3-1. Uranium Cylinder (93.5% ^{235}U) - 10 Inches of Water Reflection

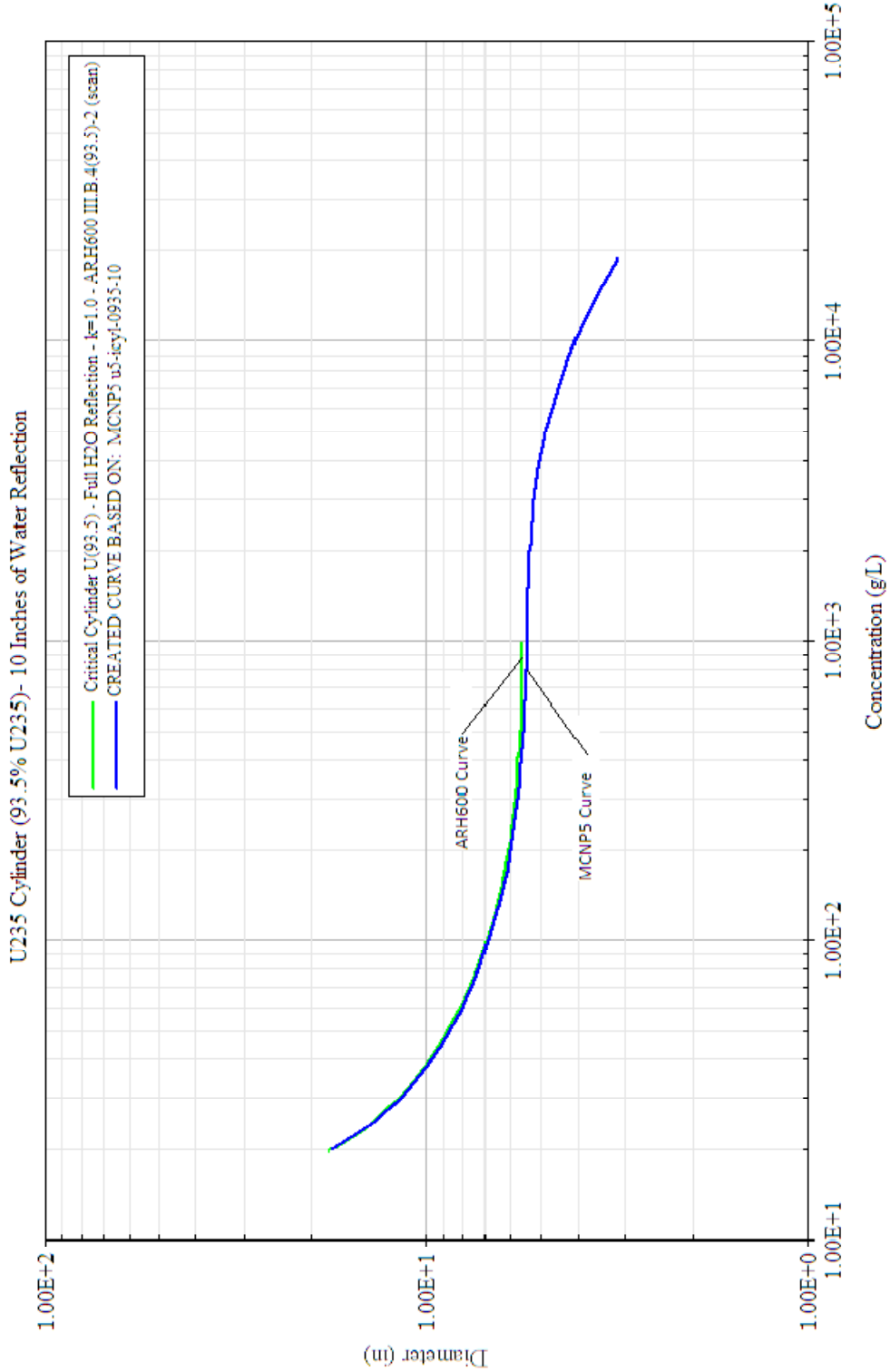

Table B.2.2.2.3-1. Critical Dimensions for Uranium Cylinder (93.5% ^{235}U) - 10 Inches of Water Reflection

Uranium Cylinder (93.5% ^{235}U)- 10 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter
0.020	14.000	18.500	0.200	17.6250
0.025	11.300	14.300	0.100	13.5604
0.030	9.900	12.100	0.100	11.6007
0.040	8.300	10.000	0.050	9.6595
0.045	7.900	9.400	0.050	9.0805
0.050	7.500	8.900	0.050	8.6363
0.055	7.200	8.600	0.050	8.2916
0.060	7.000	8.300	0.050	8.0170
0.065	6.800	8.100	0.050	7.7781
0.070	6.700	7.900	0.050	7.5836
0.080	6.400	7.500	0.050	7.2747
0.100	6.000	7.100	0.050	6.8488
0.130	5.700	6.700	0.050	6.4522
0.150	5.500	6.500	0.050	6.2776
0.170	5.400	6.400	0.050	6.1473
0.200	5.300	6.200	0.050	5.9964
0.350	4.900	5.900	0.050	5.6671
0.500	4.800	5.700	0.050	5.5466
0.800	4.700	5.700	0.050	5.4587
1.000	4.700	5.600	0.050	5.4279
1.500	4.700	5.600	0.050	5.3887
1.700	4.600	5.600	0.050	5.3680
1.900	4.600	5.600	0.050	5.3523
2.000	4.600	5.600	0.050	5.3409
2.100	4.600	5.500	0.050	5.3250
2.500	4.500	5.500	0.050	5.2753
3.000	4.500	5.400	0.050	5.2057
4.000	4.300	5.200	0.050	5.0344
5.000	4.200	5.100	0.050	4.8472
6.000	4.000	4.900	0.050	4.6635
7.000	3.900	4.700	0.050	4.5018
7.500	3.800	4.600	0.050	4.4207
8.000	3.700	4.500	0.050	4.3416
9.000	3.600	4.400	0.050	4.1980
10.000	3.500	4.200	0.050	4.0644
15.000	3.000	3.700	0.050	3.5065
18.900	2.700	3.300	0.050	3.1501

MCNP5 Sample Input File
93.5% ^{235}U Cylinder- 10 Inches of Reflection

```
u icyl, 93.5 wt% 235U, 00150 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 595   hundreths of inches - must be integer
c radius =     7.5565 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 00150 milli-g u/cc
c Reflector width = 10.0 inches
c Enrichment = 0.94 wt fraction 235U
c
c Density of H2O 1.00000
c Density of u 18.90000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c u238  = 238.05080
c
c Effective Uranium atomic mass 235.23935
c uranium metal
c Mass fraction of u in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0079 cc
c Volume of water in sample 0.9921 cc
c
c Mass of crit in sample   0.1500 g
c Mass of u in sample   0.1500 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9921 g
c
c Total mass of sample  1.1421g for a 1cc sample
c Mass Density for crit material  -1.1421, expressed as negative
c
c  plane
20 11   -1.142063   -1      imp:n=1
21  2  -1.000                    -2 1     imp:n=1    $zero importance if no reflector
22  0                          2        imp:n=0
```

```
1       cz     7.5565              $ plane
2       cz    32.9565        $ Reflection

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u metal / water mixture
m11    $ Uranium/H2O Sludge, 100.0 wt% 235U, 00150 milli-g u/cc,  1.1421
1001.66c -0.097198
8016.66c -0.771461      $from water
92235.66c -0.122804
92238.66c -0.008537
mt11     lwtr.60t
c
c    u only
m12    $ U metal, 100.0 wt% 235U, 00150 milli-g U/cc,  1.1421
92235.66c -0.122804
92238.66c -0.008537
c
```

Critview Compatible Data File
93.5% ^{235}U Cylinder- 10 Inches of Reflection

reset:
title: MCNP5 u5-icyl-0935-10
set: MCNP5 set
source: MCNP5 primary
created: Wed 07/28/2010 9:51:12.40
geometry: infcyl
modmat: H2O
critmat: Uranium
isomat: U235 0.935 U238 0.065
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.020	17.6250
0.025	13.5604
0.030	11.6007
0.040	9.6595
0.045	9.0805
0.050	8.6363
0.055	8.2916
0.060	8.0170
0.065	7.7781
0.070	7.5836
0.080	7.2747
0.100	6.8488
0.130	6.4522
0.150	6.2776
0.170	6.1473
0.200	5.9964
0.350	5.6671
0.500	5.5466
0.800	5.4587
1.000	5.4279
1.500	5.3887
1.700	5.3680
1.900	5.3523
2.000	5.3409
2.100	5.3250
2.500	5.2753
3.000	5.2057
4.000	5.0344
5.000	4.8472
6.000	4.6635
7.000	4.5018
7.500	4.4207
8.000	4.3416
9.000	4.1980
10.00	4.0644
15.00	3.5065
18.90	3.1501

Table B.2.2.2.3-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 10 Inches of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
14.00	0.92514	0.00032	11.30	0.92287	0.00037	9.90	0.92342	0.00040
14.20	0.93040	0.00032	11.40	0.92774	0.00035	10.00	0.92887	0.00041
14.40	0.93463	0.00032	11.50	0.93164	0.00036	10.10	0.93391	0.00040
14.60	0.93980	0.00033	11.60	0.93474	0.00037	10.20	0.93851	0.00039
14.80	0.94478	0.00033	11.70	0.93898	0.00037	10.30	0.94310	0.00040
15.00	0.94875	0.00031	11.80	0.94241	0.00037	10.40	0.94760	0.00039
15.20	0.95430	0.00031	11.90	0.94611	0.00036	10.50	0.95312	0.00040
15.40	0.95811	0.00033	12.00	0.95002	0.00036	10.60	0.95791	0.00039
15.60	0.96272	0.00032	12.10	0.95348	0.00036	10.70	0.96222	0.00039
15.80	0.96585	0.00032	12.20	0.95686	0.00036	10.80	0.96673	0.00039
16.00	0.97102	0.00032	12.30	0.96000	0.00035	10.90	0.97063	0.00039
16.20	0.97434	0.00031	12.40	0.96371	0.00036	11.00	0.97382	0.00038
16.40	0.97830	0.00031	12.50	0.96789	0.00036	11.10	0.97885	0.00038
16.60	0.98220	0.00030	12.60	0.96986	0.00035	11.20	0.98321	0.00039
16.80	0.98631	0.00031	12.70	0.97306	0.00037	11.30	0.98780	0.00039
17.00	0.98988	0.00031	12.80	0.97574	0.00035	11.40	0.99147	0.00039
17.20	0.99282	0.00031	12.90	0.97984	0.00036	11.50	0.99572	0.00039
17.40	0.99648	0.00030	13.00	0.98335	0.00036	11.60	0.99998	0.00039
17.60	0.99962	0.00030	13.10	0.98584	0.00035	11.70	1.00288	0.00038
17.80	1.00266	0.00030	13.20	0.98972	0.00036	11.80	1.00716	0.00040
18.00	1.00631	0.00029	13.30	0.99259	0.00036	11.90	1.01097	0.00038
18.20	1.00937	0.00031	13.40	0.99517	0.00035	12.00	1.01470	0.00038
18.40	1.01240	0.00030	13.50	0.99814	0.00036	12.10	1.01766	0.00039
18.50	1.01435	0.00030	13.60	1.00122	0.00035			
			13.70	1.00342	0.00035			
			13.80	1.00644	0.00035			
			13.90	1.00918	0.00034			
			14.00	1.01182	0.00036			
			14.10	1.01502	0.00035			
			14.20	1.01763	0.00036			
			14.30	1.02073	0.00035			

Table B.2.2.2.3-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
8.30	0.91801	0.00044	7.90	0.92199	0.00045	7.50	0.91800	
8.35	0.92071	0.00043	7.95	0.92557	0.00045	7.55	0.92157	
8.40	0.92419	0.00042	8.00	0.92864	0.00045	7.60	0.92599	
8.45	0.92819	0.00042	8.05	0.93231	0.00046	7.65	0.92892	
8.50	0.93095	0.00044	8.10	0.93573	0.00045	7.70	0.93438	
8.55	0.93379	0.00044	8.15	0.93963	0.00046	7.75	0.93727	
8.60	0.93742	0.00043	8.20	0.94249	0.00045	7.80	0.94098	
8.65	0.94032	0.00044	8.25	0.94646	0.00047	7.85	0.94498	
8.70	0.94425	0.00045	8.30	0.95047	0.00045	7.90	0.94813	
8.75	0.94740	0.00045	8.35	0.95266	0.00044	7.95	0.95223	
8.80	0.95028	0.00044	8.40	0.95623	0.00046	8.00	0.95490	
8.85	0.95211	0.00043	8.45	0.95937	0.00046	8.05	0.96029	
8.90	0.95622	0.00045	8.50	0.96367	0.00044	8.10	0.96331	
8.95	0.95974	0.00043	8.55	0.96621	0.00045	8.15	0.96667	
9.00	0.96296	0.00043	8.60	0.96960	0.00044	8.20	0.96968	
9.05	0.96512	0.00043	8.65	0.97361	0.00045	8.25	0.97383	
9.10	0.96827	0.00044	8.70	0.97621	0.00044	8.30	0.97756	
9.15	0.97177	0.00044	8.75	0.97976	0.00045	8.35	0.98040	
9.20	0.97428	0.00043	8.80	0.98299	0.00044	8.40	0.98358	
9.25	0.97731	0.00044	8.85	0.98607	0.00044	8.45	0.98687	
9.30	0.98007	0.00043	8.90	0.98887	0.00044	8.50	0.99062	
9.35	0.98430	0.00044	8.95	0.99208	0.00045	8.55	0.99506	
9.40	0.98567	0.00043	9.00	0.99550	0.00044	8.60	0.99769	
9.45	0.98908	0.00042	9.05	0.99841	0.00044	8.65	1.00087	
9.50	0.99265	0.00043	9.10	1.00102	0.00044	8.70	1.00436	
9.55	0.99419	0.00043	9.15	1.00397	0.00045	8.75	1.00688	
9.60	0.99721	0.00044	9.20	1.00756	0.00044	8.80	1.01048	
9.65	0.99958	0.00043	9.25	1.01039	0.00045	8.85	1.01436	
9.70	1.00180	0.00045	9.30	1.01354	0.00045	8.90	1.01711	
9.75	1.00533	0.00042	9.35	1.01700	0.00044			
9.80	1.00796	0.00043	9.40	1.01886	0.00045			
9.85	1.01116	0.00044						
9.90	1.01423	0.00043						
9.95	1.01650	0.00042						
10.00	1.01857	0.00043						

Table B.2.2.2.3-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
7.20	0.91612	0.00046	7.00	0.91900	0.00046	6.80	0.91866	0.00049
7.25	0.92005	0.00048	7.05	0.92302	0.00047	6.85	0.92234	0.00048
7.30	0.92407	0.00047	7.10	0.92673	0.00048	6.90	0.92728	0.00048
7.35	0.92845	0.00047	7.15	0.93110	0.00047	6.95	0.93113	0.00048
7.40	0.93297	0.00047	7.20	0.93527	0.00047	7.00	0.93626	0.00049
7.45	0.93638	0.00047	7.25	0.94017	0.00048	7.05	0.93978	0.00048
7.50	0.94135	0.00047	7.30	0.94404	0.00048	7.10	0.94554	0.00048
7.55	0.94434	0.00044	7.35	0.94832	0.00047	7.15	0.94896	0.00049
7.60	0.94885	0.00046	7.40	0.95241	0.00049	7.20	0.95256	0.00050
7.65	0.95257	0.00046	7.45	0.95650	0.00048	7.25	0.95701	0.00046
7.70	0.95680	0.00046	7.50	0.96012	0.00046	7.30	0.96081	0.00047
7.75	0.96057	0.00045	7.55	0.96533	0.00048	7.35	0.96586	0.00050
7.80	0.96369	0.00046	7.60	0.96919	0.00047	7.40	0.96976	0.00048
7.85	0.96740	0.00048	7.65	0.97203	0.00047	7.45	0.97392	0.00048
7.90	0.97171	0.00047	7.70	0.97607	0.00049	7.50	0.97798	0.00048
7.95	0.97529	0.00047	7.75	0.97989	0.00048	7.55	0.98128	0.00048
8.00	0.97899	0.00048	7.80	0.98324	0.00047	7.60	0.98553	0.00049
8.05	0.98245	0.00048	7.85	0.98718	0.00047	7.65	0.98942	0.00050
8.10	0.98663	0.00047	7.90	0.99111	0.00047	7.70	0.99424	0.00049
8.15	0.99036	0.00047	7.95	0.99562	0.00049	7.75	0.99829	0.00049
8.20	0.99346	0.00046	8.00	0.99866	0.00048	7.80	1.00133	0.00049
8.25	0.99694	0.00047	8.05	1.00260	0.00046	7.85	1.00603	0.00048
8.30	1.00062	0.00048	8.10	1.00672	0.00048	7.90	1.00910	0.00049
8.35	1.00366	0.00048	8.15	1.00964	0.00048	7.95	1.01291	0.00050
8.40	1.00761	0.00048	8.20	1.01326	0.00047	8.00	1.01670	0.00047
8.45	1.01127	0.00045	8.25	1.01716	0.00048	8.05	1.02098	0.00049
8.50	1.01486	0.00046	8.30	1.02059	0.00048	8.10	1.02375	0.00048
8.55	1.01843	0.00046						
8.60	1.02163	0.00047						

Table B.2.2.2.3-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
6.70	0.92355	0.00049	6.40	0.92130	0.00048	6.00	0.91621	0.00053
6.75	0.92875	0.00050	6.45	0.92483	0.00050	6.05	0.92324	0.00050
6.80	0.93360	0.00050	6.50	0.93095	0.00049	6.10	0.92756	0.00050
6.85	0.93779	0.00050	6.55	0.93443	0.00050	6.15	0.93285	0.00052
6.90	0.94243	0.00048	6.60	0.94047	0.00050	6.20	0.93811	0.00052
6.95	0.94734	0.00049	6.65	0.94383	0.00050	6.25	0.94269	0.00050
7.00	0.95086	0.00048	6.70	0.94901	0.00049	6.30	0.94820	0.00051
7.05	0.95465	0.00049	6.75	0.95373	0.00050	6.35	0.95308	0.00049
7.10	0.95993	0.00048	6.80	0.95866	0.00049	6.40	0.95778	0.00050
7.15	0.96411	0.00048	6.85	0.96465	0.00050	6.45	0.96244	0.00051
7.20	0.96782	0.00050	6.90	0.96757	0.00050	6.50	0.96733	0.00051
7.25	0.97268	0.00050	6.95	0.97256	0.00052	6.55	0.97233	0.00051
7.30	0.97638	0.00048	7.00	0.97658	0.00048	6.60	0.97739	0.00052
7.35	0.98096	0.00050	7.05	0.98036	0.00051	6.65	0.98218	0.00051
7.40	0.98393	0.00048	7.10	0.98580	0.00050	6.70	0.98762	0.00052
7.45	0.98956	0.00049	7.15	0.98999	0.00051	6.75	0.99135	0.00050
7.50	0.99333	0.00049	7.20	0.99448	0.00050	6.80	0.99709	0.00052
7.55	0.99723	0.00049	7.25	0.99810	0.00052	6.85	1.00007	0.00052
7.60	1.00135	0.00051	7.30	1.00194	0.00050	6.90	1.00524	0.00051
7.65	1.00509	0.00050	7.35	1.00655	0.00049	6.95	1.01049	0.00052
7.70	1.00923	0.00048	7.40	1.01198	0.00051	7.00	1.01522	0.00053
7.75	1.01375	0.00050	7.45	1.01545	0.00049	7.05	1.01949	0.00052
7.80	1.01725	0.00049	7.50	1.01886	0.00051	7.10	1.02398	0.00052
7.85	1.02165	0.00050						
7.90	1.02495	0.00047						

Table B.2.2.2.3-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.70	0.92082	0.00052	5.50	0.91505	0.00054	5.40	0.91670	0.00052
5.75	0.92657	0.00054	5.55	0.92021	0.00054	5.45	0.92264	0.00055
5.80	0.93208	0.00053	5.60	0.92717	0.00051	5.50	0.92819	0.00053
5.85	0.93624	0.00053	5.65	0.93303	0.00053	5.55	0.93371	0.00054
5.90	0.94332	0.00054	5.70	0.93778	0.00053	5.60	0.94024	0.00053
5.95	0.94847	0.00053	5.75	0.94325	0.00052	5.65	0.94587	0.00054
6.00	0.95352	0.00051	5.80	0.94973	0.00053	5.70	0.95140	0.00054
6.05	0.95886	0.00052	5.85	0.95484	0.00054	5.75	0.95716	0.00055
6.10	0.96401	0.00053	5.90	0.95898	0.00054	5.80	0.96284	0.00054
6.15	0.96971	0.00053	5.95	0.96483	0.00052	5.85	0.96781	0.00054
6.20	0.97369	0.00053	6.00	0.97066	0.00052	5.90	0.97327	0.00054
6.25	0.97910	0.00055	6.05	0.97550	0.00053	5.95	0.97866	0.00055
6.30	0.98560	0.00051	6.10	0.98053	0.00053	6.00	0.98430	0.00053
6.35	0.98943	0.00052	6.15	0.98626	0.00053	6.05	0.99009	0.00054
6.40	0.99517	0.00052	6.20	0.99172	0.00053	6.10	0.99522	0.00054
6.45	0.99982	0.00055	6.25	0.99784	0.00055	6.15	1.00027	0.00055
6.50	1.00392	0.00053	6.30	1.00175	0.00053	6.20	1.00630	0.00054
6.55	1.00948	0.00053	6.35	1.00592	0.00052	6.25	1.01050	0.00055
6.60	1.01386	0.00055	6.40	1.01251	0.00055	6.30	1.01511	0.00054
6.65	1.02010	0.00054	6.45	1.01715	0.00055	6.35	1.01975	0.00054
6.70	1.02437	0.00052	6.50	1.02194	0.00053	6.40	1.02536	0.00055

Table B.2.2.2.3-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
5.30	0.92070	0.00056	4.90	0.90976	0.00055	4.80	0.91278	0.00055
5.35	0.92705	0.00055	4.95	0.91625	0.00055	4.85	0.91945	0.00055
5.40	0.93195	0.00054	5.00	0.92240	0.00057	4.90	0.92493	0.00054
5.45	0.93834	0.00054	5.05	0.92931	0.00056	4.95	0.93150	0.00055
5.50	0.94344	0.00052	5.10	0.93439	0.00056	5.00	0.93741	0.00054
5.55	0.94960	0.00054	5.15	0.94024	0.00056	5.05	0.94332	0.00056
5.60	0.95660	0.00056	5.20	0.94700	0.00055	5.10	0.95088	0.00054
5.65	0.96093	0.00055	5.25	0.95242	0.00055	5.15	0.95618	0.00055
5.70	0.96628	0.00052	5.30	0.95895	0.00054	5.20	0.96195	0.00056
5.75	0.97188	0.00054	5.35	0.96394	0.00057	5.25	0.96717	0.00057
5.80	0.97758	0.00055	5.40	0.96899	0.00055	5.30	0.97364	0.00056
5.85	0.98419	0.00055	5.45	0.97595	0.00055	5.35	0.97735	0.00056
5.90	0.98834	0.00055	5.50	0.98186	0.00055	5.40	0.98358	0.00055
5.95	0.99427	0.00054	5.55	0.98758	0.00056	5.45	0.99028	0.00054
6.00	1.00045	0.00055	5.60	0.99305	0.00054	5.50	0.99475	0.00056
6.05	1.00418	0.00057	5.65	0.99798	0.00055	5.55	1.00038	0.00056
6.10	1.01010	0.00055	5.70	1.00390	0.00055	5.60	1.00609	0.00055
6.15	1.01458	0.00056	5.75	1.00855	0.00056	5.65	1.01233	0.00054
6.20	1.02083	0.00056	5.80	1.01454	0.00055	5.70	1.01811	0.00059
			5.85	1.01992	0.00057			
			5.90	1.02476	0.00057			

Table B.2.2.2.3-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.70	0.91366	0.00056	4.70	0.91758	0.00053	4.70	0.92500	0.00054
4.75	0.91951	0.00056	4.75	0.92298	0.00055	4.75	0.93141	0.00054
4.80	0.92509	0.00055	4.80	0.92971	0.00054	4.80	0.93611	0.00053
4.85	0.93194	0.00054	4.85	0.93494	0.00055	4.85	0.94292	0.00053
4.90	0.93755	0.00056	4.90	0.94153	0.00055	4.90	0.94737	0.00055
4.95	0.94339	0.00055	4.95	0.94689	0.00055	4.95	0.95371	0.00053
5.00	0.94939	0.00057	5.00	0.95244	0.00055	5.00	0.95875	0.00053
5.05	0.95514	0.00054	5.05	0.95947	0.00054	5.05	0.96392	0.00054
5.10	0.96168	0.00054	5.10	0.96494	0.00055	5.10	0.97002	0.00053
5.15	0.96691	0.00055	5.15	0.96925	0.00056	5.15	0.97546	0.00055
5.20	0.97168	0.00055	5.20	0.97555	0.00054	5.20	0.98116	0.00055
5.25	0.97761	0.00056	5.25	0.98150	0.00054	5.25	0.98515	0.00055
5.30	0.98305	0.00056	5.30	0.98609	0.00056	5.30	0.99020	0.00055
5.35	0.98864	0.00055	5.35	0.99197	0.00056	5.35	0.99675	0.00054
5.40	0.99354	0.00056	5.40	0.99688	0.00053	5.40	1.00095	0.00053
5.45	0.99908	0.00053	5.45	1.00248	0.00056	5.45	1.00709	0.00057
5.50	1.00438	0.00054	5.50	1.00742	0.00056	5.50	1.01135	0.00053
5.55	1.00953	0.00056	5.55	1.01262	0.00054	5.55	1.01709	0.00057
5.60	1.01570	0.00055	5.60	1.01815	0.00056	5.60	1.02204	0.00054
5.65	1.02015	0.00054						
5.70	1.02603	0.00054						

Table B.2.2.2.3-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.60	0.91524	0.00052	4.60	0.91841	0.00054	4.60	0.92016	0.00052
4.65	0.92270	0.00053	4.65	0.92425	0.00052	4.65	0.92710	0.00054
4.70	0.92661	0.00055	4.70	0.93092	0.00053	4.70	0.93249	0.00053
4.75	0.93295	0.00053	4.75	0.93646	0.00054	4.75	0.93795	0.00052
4.80	0.93954	0.00055	4.80	0.94190	0.00053	4.80	0.94380	0.00052
4.85	0.94468	0.00054	4.85	0.94707	0.00053	4.85	0.94812	0.00053
4.90	0.94969	0.00052	4.90	0.95234	0.00053	4.90	0.95429	0.00052
4.95	0.95663	0.00053	4.95	0.95930	0.00055	4.95	0.95880	0.00053
5.00	0.96064	0.00054	5.00	0.96400	0.00053	5.00	0.96451	0.00054
5.05	0.96681	0.00054	5.05	0.96854	0.00054	5.05	0.97081	0.00054
5.10	0.97254	0.00054	5.10	0.97497	0.00052	5.10	0.97529	0.00052
5.15	0.97678	0.00055	5.15	0.97889	0.00053	5.15	0.98043	0.00053
5.20	0.98305	0.00053	5.20	0.98391	0.00055	5.20	0.98536	0.00053
5.25	0.98667	0.00054	5.25	0.98999	0.00053	5.25	0.99148	0.00053
5.30	0.99255	0.00054	5.30	0.99605	0.00055	5.30	0.99510	0.00053
5.35	0.99818	0.00055	5.35	0.99975	0.00052	5.35	1.00109	0.00053
5.40	1.00324	0.00053	5.40	1.00510	0.00051	5.40	1.00526	0.00054
5.45	1.00796	0.00054	5.45	1.01011	0.00052	5.45	1.01073	0.00054
5.50	1.01310	0.00053	5.50	1.01416	0.00053	5.50	1.01571	0.00056
5.55	1.01730	0.00055	5.55	1.01964	0.00054	5.55	1.01993	0.00052
5.60	1.02188	0.00054	5.60	1.02368	0.00055	5.60	1.02516	0.00054

Table B.2.2.2.3-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.60	0.92117	0.00053	4.50	0.91674	0.00054	4.50	0.92391	0.00053
4.65	0.92679	0.00055	4.55	0.92231	0.00050	4.55	0.93013	0.00052
4.70	0.93304	0.00053	4.60	0.92738	0.00054	4.60	0.93562	0.00053
4.75	0.93764	0.00052	4.65	0.93248	0.00053	4.65	0.94142	0.00051
4.80	0.94405	0.00053	4.70	0.93874	0.00053	4.70	0.94663	0.00052
4.85	0.94858	0.00052	4.75	0.94388	0.00052	4.75	0.95221	0.00052
4.90	0.95500	0.00054	4.80	0.94955	0.00051	4.80	0.95823	0.00052
4.95	0.96146	0.00053	4.85	0.95566	0.00051	4.85	0.96293	0.00054
5.00	0.96599	0.00055	4.90	0.96102	0.00053	4.90	0.96824	0.00052
5.05	0.97107	0.00053	4.95	0.96674	0.00054	4.95	0.97419	0.00052
5.10	0.97535	0.00055	5.00	0.97210	0.00054	5.00	0.97916	0.00053
5.15	0.98185	0.00053	5.05	0.97569	0.00053	5.05	0.98453	0.00052
5.20	0.98662	0.00055	5.10	0.98184	0.00054	5.10	0.98897	0.00051
5.25	0.99165	0.00054	5.15	0.98677	0.00054	5.15	0.99439	0.00051
5.30	0.99729	0.00054	5.20	0.99218	0.00053	5.20	0.99943	0.00052
5.35	1.00270	0.00054	5.25	0.99762	0.00053	5.25	1.00444	0.00053
5.40	1.00691	0.00052	5.30	1.00233	0.00054	5.30	1.00938	0.00051
5.45	1.01197	0.00054	5.35	1.00746	0.00054	5.35	1.01484	0.00053
5.50	1.01715	0.00054	5.40	1.01213	0.00051	5.40	1.01946	0.00051
			5.45	1.01703	0.00054			
			5.50	1.02253	0.00054			

Table B.2.2.2.3-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
4.30	0.91800	0.00048	4.20	0.92550	0.00051	4.00	0.91889	0.00051
4.35	0.92429	0.00051	4.25	0.93005	0.00049	4.05	0.92504	0.00049
4.40	0.93011	0.00052	4.30	0.93741	0.00050	4.10	0.93093	0.00050
4.45	0.93533	0.00050	4.35	0.94281	0.00050	4.15	0.93782	0.00050
4.50	0.94210	0.00052	4.40	0.94931	0.00051	4.20	0.94347	0.00049
4.55	0.94796	0.00051	4.45	0.95463	0.00052	4.25	0.95053	0.00048
4.60	0.95277	0.00053	4.50	0.96091	0.00051	4.30	0.95619	0.00051
4.65	0.95750	0.00052	4.55	0.96645	0.00052	4.35	0.96247	0.00050
4.70	0.96457	0.00053	4.60	0.97148	0.00051	4.40	0.96856	0.00050
4.75	0.97068	0.00051	4.65	0.97801	0.00052	4.45	0.97435	0.00050
4.80	0.97612	0.00051	4.70	0.98307	0.00051	4.50	0.98017	0.00049
4.85	0.98125	0.00051	4.75	0.98976	0.00050	4.55	0.98622	0.00050
4.90	0.98590	0.00052	4.80	0.99458	0.00050	4.60	0.99143	0.00049
4.95	0.99083	0.00050	4.85	1.00032	0.00050	4.65	0.99842	0.00052
5.00	0.99642	0.00051	4.90	1.00538	0.00051	4.70	1.00426	0.00052
5.05	1.00163	0.00052	4.95	1.00978	0.00051	4.75	1.00841	0.00049
5.10	1.00592	0.00052	5.00	1.01585	0.00053	4.80	1.01435	0.00051
5.15	1.01242	0.00051	5.05	1.02080	0.00052	4.85	1.02003	0.00050
5.20	1.01607	0.00051	5.10	1.02603	0.00051	4.90	1.02485	0.00050

Table B.2.2.2.3-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
3.90	0.92348	0.00050	3.80	0.91879	0.00049	3.70	0.91418	0.00050
3.95	0.92997	0.00049	3.85	0.92599	0.00048	3.75	0.92168	0.00049
4.00	0.93772	0.00049	3.90	0.93233	0.00046	3.80	0.92839	0.00049
4.05	0.94406	0.00051	3.95	0.93900	0.00050	3.85	0.93413	0.00048
4.10	0.95079	0.00050	4.00	0.94598	0.00049	3.90	0.94173	0.00049
4.15	0.95659	0.00049	4.05	0.95189	0.00049	3.95	0.94835	0.00049
4.20	0.96240	0.00050	4.10	0.95904	0.00050	4.00	0.95548	0.00050
4.25	0.96924	0.00049	4.15	0.96668	0.00050	4.05	0.96179	0.00050
4.30	0.97550	0.00050	4.20	0.97147	0.00051	4.10	0.96852	0.00048
4.35	0.98123	0.00049	4.25	0.97852	0.00048	4.15	0.97514	0.00047
4.40	0.98785	0.00051	4.30	0.98363	0.00049	4.20	0.98118	0.00049
4.45	0.99383	0.00048	4.35	0.99052	0.00050	4.25	0.98686	0.00050
4.50	0.99979	0.00050	4.40	0.99724	0.00049	4.30	0.99353	0.00050
4.55	1.00555	0.00051	4.45	1.00390	0.00049	4.35	1.00130	0.00050
4.60	1.01201	0.00049	4.50	1.00883	0.00049	4.40	1.00659	0.00050
4.65	1.01758	0.00049	4.55	1.01522	0.00050	4.45	1.01259	0.00048
4.70	1.02293	0.00050	4.60	1.02146	0.00049	4.50	1.01916	0.00049

Table B.2.2.2.3-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
3.60	0.91721	0.00049	3.50	0.91843	0.00048	3.00	0.91333	0.00048
3.65	0.92440	0.00048	3.55	0.92602	0.00048	3.05	0.92293	0.00047
3.70	0.93133	0.00050	3.60	0.93328	0.00048	3.10	0.93083	0.00047
3.75	0.93885	0.00048	3.65	0.94151	0.00049	3.15	0.94043	0.00047
3.80	0.94538	0.00049	3.70	0.94847	0.00050	3.20	0.94913	0.00048
3.85	0.95278	0.00051	3.75	0.95557	0.00050	3.25	0.95730	0.00047
3.90	0.95942	0.00048	3.80	0.96323	0.00047	3.30	0.96542	0.00046
3.95	0.96688	0.00049	3.85	0.96955	0.00048	3.35	0.97426	0.00048
4.00	0.97363	0.00049	3.90	0.97861	0.00048	3.40	0.98244	0.00047
4.05	0.98026	0.00048	3.95	0.98294	0.00050	3.45	0.99158	0.00046
4.10	0.98737	0.00050	4.00	0.99033	0.00049	3.50	0.99890	0.00048
4.15	0.99386	0.00049	4.05	0.99846	0.00048	3.55	1.00742	0.00047
4.20	1.00025	0.00048	4.10	1.00379	0.00050	3.60	1.01508	0.00047
4.25	1.00670	0.00049	4.15	1.01247	0.00048	3.65	1.02321	0.00049
4.30	1.01228	0.00049	4.20	1.01831	0.00048	3.70	1.03137	0.00049
4.35	1.01894	0.00049						
4.40	1.02655	0.00049						

Table B.2.2.2.3-2. K_{eff} Values for Uranium Cylinder (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

18900 milli-g/cc								
Diameter (inches)	K_{eff}	Sigma						
2.70	0.91333	0.00045						
2.75	0.92301	0.00045						
2.80	0.93330	0.00046						
2.85	0.94320	0.00045						
2.90	0.95330	0.00044						
2.95	0.96177	0.00045						
3.00	0.97094	0.00046						
3.05	0.98106	0.00044						
3.10	0.99068	0.00046						
3.15	0.99999	0.00048						
3.20	1.00943	0.00045						
3.25	1.01718	0.00047						
3.30	1.02618	0.00047						

B.2.3. Infinite Plane (Slab)

B.2.3.1. 100% ^{235}U

B.2.3.1.1. Unreflected

Case ID: u5-pl-1000-00

Material: Uranium metal in water

Geometry: Infinite Plane

Isotopics: 100% ^{235}U

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.2.3.1.1-1. Uranium Slab (100% ^{235}U) – 0 Inches of Water Reflection

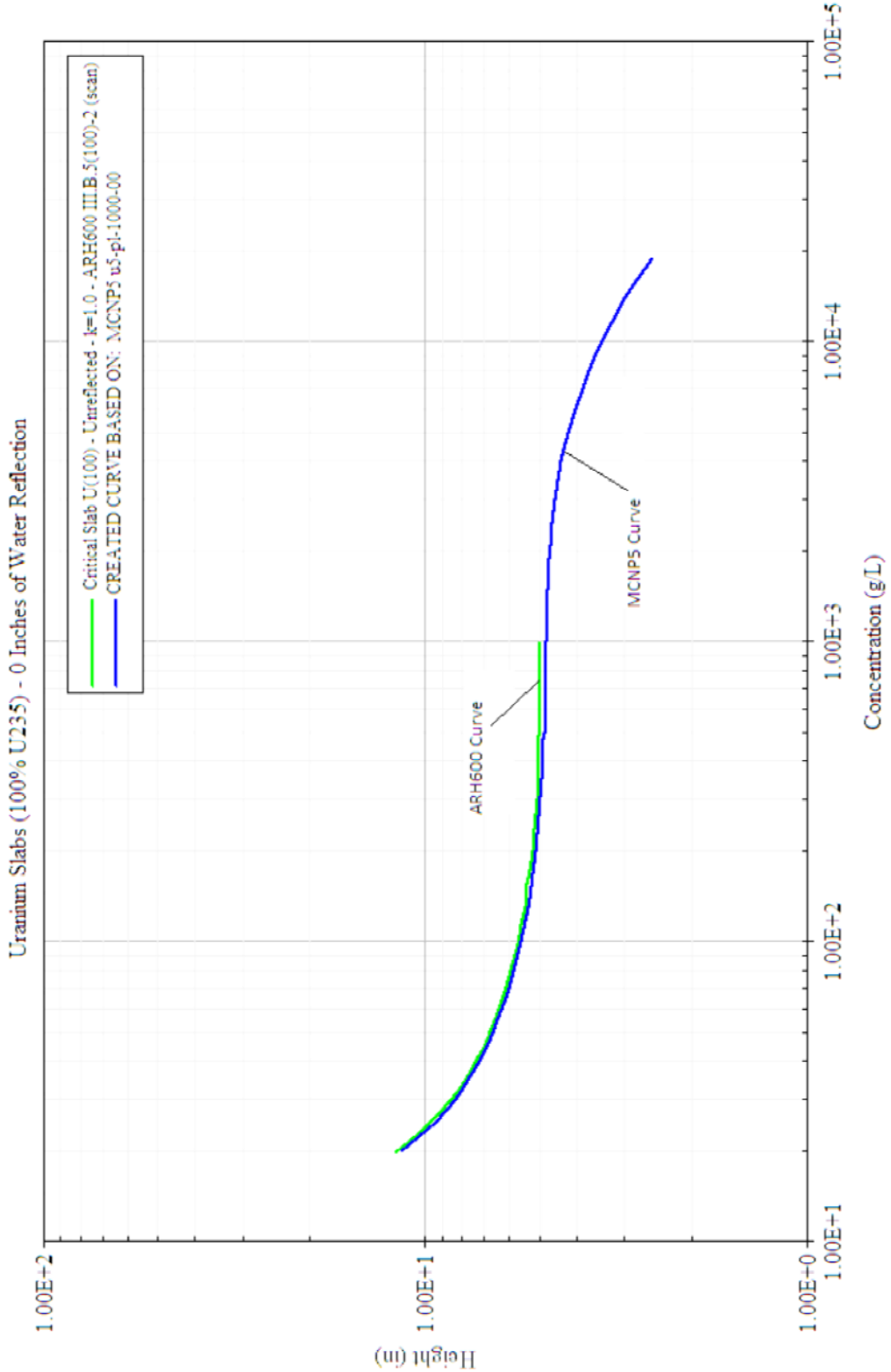

Table B.2.3.1.1-1. Critical Dimensions for Uranium Slab (100% ^{235}U) – 0 Inches of Water Reflection

Uranium Slab (100% ^{235}U) – 0 Inches of Water Reflection				
Concentration (g/cc)	First Height (Inches)	Last Height (Inches)	Delta (Inches)	Critical Height (Inches)
0.020	9.600	12.100	0.100	11.5579
0.025	8.100	9.800	0.050	9.4104
0.030	7.300	8.600	0.050	8.3291
0.040	6.400	7.500	0.050	7.2198
0.045	6.100	7.100	0.050	6.8884
0.050	5.900	6.900	0.050	6.6385
0.055	5.800	6.700	0.050	6.4381
0.060	5.600	6.500	0.050	6.2770
0.065	5.500	6.300	0.050	6.1381
0.070	5.400	6.200	0.050	6.0336
0.080	5.300	6.000	0.050	5.8442
0.100	5.000	5.800	0.050	5.6071
0.130	4.900	5.600	0.050	5.3813
0.150	4.800	5.500	0.050	5.2840
0.170	4.700	5.400	0.050	5.2098
0.200	4.600	5.300	0.050	5.1319
0.350	4.500	5.100	0.050	4.9431
0.500	4.400	5.000	0.050	4.8798
0.800	4.300	5.000	0.050	4.8331
1.000	4.300	5.000	0.050	4.8061
1.500	4.300	4.900	0.050	4.7645
1.700	4.200	4.900	0.050	4.7505
1.900	4.200	4.900	0.050	4.7226
2.000	4.200	4.900	0.050	4.7060
2.100	4.200	4.900	0.050	4.6975
2.500	4.100	4.800	0.050	4.6344
3.000	4.100	4.700	0.050	4.5629
4.000	3.900	4.600	0.050	4.3893
5.000	3.700	4.400	0.050	4.2084
6.000	3.600	4.200	0.050	4.0384
7.000	3.400	4.000	0.050	3.8675
7.500	3.400	3.900	0.020	3.7946
8.000	3.300	3.900	0.050	3.7186
9.000	3.200	3.700	0.020	3.5777
10.000	3.000	3.600	0.050	3.4444
15.000	2.500	3.000	0.020	2.8896
18.900	2.200	2.700	0.020	2.5286

```
MCNP5 Sample Input File
100% 235U Slab- 0 Inch of Reflection

u ipl, 100.0 wt% 235U, ZZZ1 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Height = <d1= QQQ1:QQQ2:QQQ3|5> hundreths of inches - must be integer
c half height = <rd=d1*2.54/100/2|5.4> cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = <c = 'ZZZ1'|5> milli-g u/cc
c Reflector width = <rw=0.0|2.1> inches
c Enrichment = <en=1.0|1.2> wt fraction 235U
c
c Density of H2O <denW=1.0|1.5>
c Density of u <denu=18.9|2.5> g/cc
c
c Atomic Masses
c H     = <H=1.0079|3.5>
c O     = <O=15.9994|3.5>
c 235U  = <235U=235.0439|3.5>
c u238  = <u238=238.0508|3.5>
c
c Effective Uranium atomic mass <ueff = en*235U + (1-en)*u238|3.5>
c uranium metal
c Mass fraction of u in crit material <ufrac = ueff/(ueff)|1.5>
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  <volC=c/denu/1000|1.4> cc
c Volume of water in sample <volW=1-volC|1.4> cc
c
c Mass of crit in sample  <massC=c/1000|2.4> g
c Mass of u in sample  <massu=massC*ufrac|2.4> g
c Mass of bound O in sample <massO=massC*(1-ufrac)|2.4> g
c Mass of water in sample <massW=volW*denW|2.4> g
c
c Total mass of sample <mass=massC+massW|2.4>g for a 1cc sample
c Mass Density for crit material <massd=-mass|3.4>, expressed as negative
c
<perl>
sub IMP
{
return 1 if( $_[0]>0 );
return 0;
}
sub GETMAT
{
return 11 if( $_[0]>1e-10 );
return 12;
```

```
}
</perl>
c  plane
20 <&GETMAT(massW)|2>  <massd|3.6>   -1 2 -7 -5 8 6      imp:n=1
21  2  -1.000    -3 4 6 8 -7 -5 ((1 -3):(-2 4))        imp:n=<&IMP(rw)|1>    $zero importance if no reflector
22  0            3:-4:7:5:-8:-6                    imp:n=0

1        py  <rd|4.4>              $ plane
2        py  <-rd|4.4>
3        py  <rd+rw*in|4.4>        $ Reflection
4        py  <-rd-rw*in|4.4>
*5        px    100
*6        px    -100
*7        pz    100
*8        pz    -100

mode n
kcode 2000 1.0 100  ZZZ0
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u metal / water mixture
m11    $ Uranium/H2O Sludge, 100.0 wt% 235U, ZZZ1 milli-g u/cc, <mass|2.4>
1001.66c -<massW/mass*(2*H/(2*H+O))|1.6>
8016.66c -<massW/mass*(O/(2*H+O))|1.6>      $from water
92235.66c -<massu*en/mass|1.6>
c    92238.66c -<massu*(1-en)/mass|1.6>
mt11     lwtr.60t
c
c    u only
m12    $ U metal, 100.0 wt% 235U, ZZZ1 milli-g U/cc, <mass|2.4>
92235.66c -<massu*en/mass|1.6>
c    92238.66c -<massu*(1-en)/mass|1.6>
c
```

Critview Compatible Data File
100% ^{235}U Slab- 0 Inch of Reflection

reset:
title: MCNP5 u5-pl-1000-00
set: MCNP5 set
source: MCNP5 primary
created: Mon 08/09/2010 8:07:52.05
geometry: infplane
modmat: H2O
critmat: uranium
isomat: U235 1.0
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: height in

0.020	11.5579
0.025	9.4104
0.030	8.3291
0.040	7.2198
0.045	6.8884
0.050	6.6385
0.055	6.4381
0.060	6.2770
0.065	6.1381
0.070	6.0336
0.080	5.8442
0.100	5.6071
0.130	5.3813
0.150	5.2840
0.170	5.2098
0.200	5.1319
0.350	4.9431
0.500	4.8798
0.800	4.8331
1.000	4.8061
1.500	4.7645
1.700	4.7505
1.900	4.7226
2.000	4.7060
2.100	4.6975
2.500	4.6344
3.000	4.5629
4.000	4.3893
5.000	4.2084
6.000	4.0384
7.000	3.8675
7.500	3.7946
8.000	3.7186
9.000	3.5777
10.00	3.4444
15.00	2.8896
18.90	2.5286

Table B.2.3.1.1-2. K_{eff} Values for Uranium Slab (100% ^{235}U) – 0 Inches of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
9.60	0.92493	0.00035	8.10	0.92225	0.00040	7.30	0.92220	0.00044
9.70	0.92983	0.00035	8.15	0.92672	0.00040	7.35	0.92621	0.00042
9.80	0.93352	0.00035	8.20	0.92922	0.00040	7.40	0.93018	0.00042
9.90	0.93818	0.00035	8.25	0.93349	0.00040	7.45	0.93434	0.00044
10.00	0.94221	0.00034	8.30	0.93605	0.00039	7.50	0.93898	0.00044
10.10	0.94737	0.00034	8.35	0.94034	0.00039	7.55	0.94289	0.00042
10.20	0.95121	0.00034	8.40	0.94255	0.00038	7.60	0.94665	0.00042
10.30	0.95506	0.00034	8.45	0.94590	0.00039	7.65	0.95053	0.00043
10.40	0.95876	0.00034	8.50	0.94934	0.00040	7.70	0.95459	0.00042
10.50	0.96276	0.00034	8.55	0.95125	0.00039	7.75	0.95798	0.00042
10.60	0.96694	0.00034	8.60	0.95465	0.00039	7.80	0.96247	0.00043
10.70	0.97046	0.00034	8.65	0.95830	0.00041	7.85	0.96542	0.00042
10.80	0.97466	0.00034	8.70	0.96010	0.00040	7.90	0.96966	0.00041
10.90	0.97703	0.00033	8.75	0.96258	0.00039	7.95	0.97288	0.00043
11.00	0.98115	0.00033	8.80	0.96659	0.00037	8.00	0.97701	0.00041
11.10	0.98477	0.00033	8.85	0.96957	0.00038	8.05	0.97987	0.00040
11.20	0.98819	0.00033	8.90	0.97258	0.00039	8.10	0.98375	0.00042
11.30	0.99164	0.00033	8.95	0.97477	0.00039	8.15	0.98740	0.00040
11.40	0.99464	0.00033	9.00	0.97791	0.00038	8.20	0.99074	0.00041
11.50	0.99821	0.00034	9.05	0.98060	0.00038	8.25	0.99424	0.00042
11.60	1.00130	0.00034	9.10	0.98310	0.00039	8.30	0.99788	0.00043
11.70	1.00403	0.00033	9.15	0.98522	0.00038	8.35	1.00152	0.00040
11.80	1.00725	0.00032	9.20	0.98821	0.00038	8.40	1.00467	0.00042
11.90	1.01013	0.00032	9.25	0.99186	0.00038	8.45	1.00773	0.00041
12.00	1.01308	0.00032	9.30	0.99390	0.00039	8.50	1.01143	0.00041
12.10	1.01654	0.00032	9.35	0.99665	0.00039	8.55	1.01412	0.00041
			9.40	0.99943	0.00038	8.60	1.01782	0.00042
			9.45	1.00217	0.00037			
			9.50	1.00359	0.00038			
			9.55	1.00628	0.00038			
			9.60	1.00913	0.00037			
			9.65	1.01143	0.00038			
			9.70	1.01364	0.00038			
			9.75	1.01642	0.00039			
			9.80	1.01888	0.00037			

Table B.2.3.1.1-2. K_{eff} Values for Uranium Slab (100% ^{235}U) – 0 Inches of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
6.40	0.91803	0.00047	6.10	0.91295	0.00048	5.90	0.91410	0.00049
6.45	0.92319	0.00046	6.15	0.91961	0.00048	5.95	0.92004	0.00050
6.50	0.92937	0.00048	6.20	0.92643	0.00048	6.00	0.92671	0.00049
6.55	0.93471	0.00045	6.25	0.93153	0.00049	6.05	0.93269	0.00049
6.60	0.93976	0.00047	6.30	0.93670	0.00050	6.10	0.93926	0.00049
6.65	0.94474	0.00047	6.35	0.94343	0.00048	6.15	0.94450	0.00050
6.70	0.94952	0.00048	6.40	0.94901	0.00049	6.20	0.94986	0.00050
6.75	0.95488	0.00046	6.45	0.95489	0.00049	6.25	0.95689	0.00050
6.80	0.96025	0.00047	6.50	0.95920	0.00049	6.30	0.96234	0.00051
6.85	0.96476	0.00047	6.55	0.96519	0.00048	6.35	0.96841	0.00050
6.90	0.97025	0.00046	6.60	0.96927	0.00049	6.40	0.97375	0.00047
6.95	0.97452	0.00046	6.65	0.97561	0.00049	6.45	0.97879	0.00049
7.00	0.97983	0.00047	6.70	0.98106	0.00048	6.50	0.98631	0.00050
7.05	0.98421	0.00047	6.75	0.98563	0.00049	6.55	0.99078	0.00050
7.10	0.98865	0.00047	6.80	0.99138	0.00046	6.60	0.99551	0.00049
7.15	0.99335	0.00047	6.85	0.99605	0.00049	6.65	1.00134	0.00050
7.20	0.99819	0.00047	6.90	1.00119	0.00047	6.70	1.00674	0.00050
7.25	1.00277	0.00047	6.95	1.00615	0.00049	6.75	1.01138	0.00052
7.30	1.00786	0.00047	7.00	1.01069	0.00048	6.80	1.01743	0.00050
7.35	1.01220	0.00045	7.05	1.01494	0.00047	6.85	1.02179	0.00049
7.40	1.01555	0.00045	7.10	1.02050	0.00048	6.90	1.02771	0.00047
7.45	1.02071	0.00046						
7.50	1.02461	0.00045						

Table B.2.3.1.1-2. K_{eff} Values for Uranium Slab (100% ^{235}U) – 0 Inches of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
5.80	0.92247	0.00050	5.60	0.91235	0.00054	5.50	0.91414	0.00053
5.85	0.92858	0.00051	5.65	0.92001	0.00053	5.55	0.92114	0.00054
5.90	0.93507	0.00051	5.70	0.92649	0.00051	5.60	0.92836	0.00053
5.95	0.94133	0.00050	5.75	0.93282	0.00052	5.65	0.93466	0.00052
6.00	0.94847	0.00052	5.80	0.93933	0.00052	5.70	0.94289	0.00051
6.05	0.95397	0.00051	5.85	0.94625	0.00052	5.75	0.94987	0.00052
6.10	0.95979	0.00053	5.90	0.95234	0.00052	5.80	0.95596	0.00052
6.15	0.96620	0.00050	5.95	0.96066	0.00052	5.85	0.96315	0.00051
6.20	0.97153	0.00051	6.00	0.96575	0.00051	5.90	0.96949	0.00052
6.25	0.97757	0.00050	6.05	0.97217	0.00051	5.95	0.97544	0.00052
6.30	0.98452	0.00049	6.10	0.97861	0.00051	6.00	0.98148	0.00053
6.35	0.98957	0.00049	6.15	0.98519	0.00051	6.05	0.98835	0.00053
6.40	0.99464	0.00050	6.20	0.99055	0.00051	6.10	0.99531	0.00054
6.45	1.00168	0.00051	6.25	0.99670	0.00053	6.15	1.00146	0.00053
6.50	1.00702	0.00051	6.30	1.00281	0.00051	6.20	1.00656	0.00053
6.55	1.01290	0.00051	6.35	1.00932	0.00050	6.25	1.01320	0.00053
6.60	1.01871	0.00050	6.40	1.01492	0.00053	6.30	1.01910	0.00053
6.65	1.02346	0.00051	6.45	1.01941	0.00053			
6.70	1.02931	0.00050	6.50	1.02623	0.00051			

Table B.2.3.1.1-2. K_{eff} Values for Uranium Slab (100% ^{235}U) – 0 Inches of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
5.40	0.91288	0.00053	5.30	0.91939	0.00055	5.00	0.90549	0.00054
5.45	0.92052	0.00051	5.35	0.92941	0.00054	5.05	0.91339	0.00057
5.50	0.92754	0.00053	5.40	0.93646	0.00053	5.10	0.92222	0.00057
5.55	0.93463	0.00054	5.45	0.94276	0.00054	5.15	0.93075	0.00056
5.60	0.94172	0.00054	5.50	0.95035	0.00056	5.20	0.93819	0.00056
5.65	0.94918	0.00052	5.55	0.95825	0.00055	5.25	0.94598	0.00055
5.70	0.95586	0.00053	5.60	0.96518	0.00055	5.30	0.95343	0.00056
5.75	0.96248	0.00053	5.65	0.97334	0.00055	5.35	0.96263	0.00055
5.80	0.96995	0.00054	5.70	0.97956	0.00055	5.40	0.96913	0.00055
5.85	0.97623	0.00053	5.75	0.98641	0.00054	5.45	0.97726	0.00056
5.90	0.98284	0.00054	5.80	0.99416	0.00055	5.50	0.98504	0.00055
5.95	0.99038	0.00053	5.85	1.00077	0.00054	5.55	0.99274	0.00055
6.00	0.99564	0.00055	5.90	1.00697	0.00054	5.60	0.99882	0.00055
6.05	1.00213	0.00054	5.95	1.01336	0.00054	5.65	1.00709	0.00059
6.10	1.00916	0.00054	6.00	1.01948	0.00056	5.70	1.01419	0.00056
6.15	1.01591	0.00053				5.75	1.02158	0.00057
6.20	1.02191	0.00051				5.80	1.02781	0.00056

Table B.2.3.1.1-2. K_{eff} Values for Uranium Slab (100% ^{235}U) – 0 Inches of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
4.90	0.92037	0.00057	4.80	0.91792	0.00057	4.70	0.91092	0.00058
4.95	0.92952	0.00058	4.85	0.92759	0.00058	4.75	0.91929	0.00057
5.00	0.93918	0.00057	4.90	0.93399	0.00057	4.80	0.92969	0.00057
5.05	0.94623	0.00058	4.95	0.94502	0.00057	4.85	0.93854	0.00058
5.10	0.95554	0.00060	5.00	0.95131	0.00059	4.90	0.94712	0.00059
5.15	0.96358	0.00058	5.05	0.96115	0.00058	4.95	0.95692	0.00060
5.20	0.97210	0.00056	5.10	0.96991	0.00058	5.00	0.96436	0.00059
5.25	0.97956	0.00058	5.15	0.97832	0.00057	5.05	0.97286	0.00058
5.30	0.98756	0.00059	5.20	0.98636	0.00058	5.10	0.98240	0.00061
5.35	0.99533	0.00057	5.25	0.99504	0.00059	5.15	0.98995	0.00059
5.40	1.00278	0.00057	5.30	1.00234	0.00059	5.20	0.99838	0.00060
5.45	1.01065	0.00057	5.35	1.01065	0.00055	5.25	1.00668	0.00058
5.50	1.01816	0.00057	5.40	1.01890	0.00057	5.30	1.01414	0.00060
5.55	1.02538	0.00059	5.45	1.02734	0.00057	5.35	1.02255	0.00061
5.60	1.03353	0.00058	5.50	1.03380	0.00057	5.40	1.02903	0.00059

Table B.2.3.1.1-2. K_{eff} Values for Uranium Slab (100% ^{235}U) – 0 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
4.60	0.90483	0.00055	4.50	0.91808	0.00059	4.40	0.91202	0.00057
4.65	0.91424	0.00057	4.55	0.92886	0.00057	4.45	0.92101	0.00058
4.70	0.92336	0.00057	4.60	0.93730	0.00061	4.50	0.93074	0.00060
4.75	0.93300	0.00058	4.65	0.94674	0.00062	4.55	0.94094	0.00058
4.80	0.94182	0.00061	4.70	0.95607	0.00060	4.60	0.94913	0.00060
4.85	0.95215	0.00058	4.75	0.96625	0.00059	4.65	0.95923	0.00059
4.90	0.95973	0.00059	4.80	0.97322	0.00061	4.70	0.96750	0.00059
4.95	0.96832	0.00061	4.85	0.98331	0.00060	4.75	0.97764	0.00060
5.00	0.97794	0.00059	4.90	0.99156	0.00060	4.80	0.98539	0.00059
5.05	0.98636	0.00060	4.95	1.00135	0.00060	4.85	0.99497	0.00059
5.10	0.99509	0.00060	5.00	1.00807	0.00061	4.90	1.00340	0.00061
5.15	1.00278	0.00059	5.05	1.01713	0.00061	4.95	1.01186	0.00062
5.20	1.01133	0.00058	5.10	1.02641	0.00060	5.00	1.01941	0.00059
5.25	1.01989	0.00062						
5.30	1.02731	0.00059						

Table B.2.3.1.1-2. K_{eff} Values for Uranium Slab (100% ^{235}U) – 0 Inches of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
4.30	0.90354	0.00058	4.30	0.91000	0.00058	4.30	0.92070	0.00057
4.35	0.91501	0.00059	4.35	0.91990	0.00057	4.35	0.92866	0.00056
4.40	0.92394	0.00058	4.40	0.92802	0.00058	4.40	0.93724	0.00058
4.45	0.93324	0.00059	4.45	0.93716	0.00057	4.45	0.94719	0.00056
4.50	0.94204	0.00059	4.50	0.94615	0.00059	4.50	0.95520	0.00057
4.55	0.95103	0.00059	4.55	0.95418	0.00059	4.55	0.96372	0.00057
4.60	0.95965	0.00059	4.60	0.96299	0.00057	4.60	0.97297	0.00055
4.65	0.96940	0.00059	4.65	0.97174	0.00057	4.65	0.98048	0.00057
4.70	0.97708	0.00057	4.70	0.98118	0.00058	4.70	0.98874	0.00058
4.75	0.98539	0.00060	4.75	0.98856	0.00057	4.75	0.99772	0.00056
4.80	0.99456	0.00059	4.80	0.99909	0.00058	4.80	1.00560	0.00058
4.85	1.00279	0.00059	4.85	1.00650	0.00058	4.85	1.01254	0.00059
4.90	1.01022	0.00058	4.90	1.01353	0.00060	4.90	1.02063	0.00056
4.95	1.01875	0.00060	4.95	1.02132	0.00059			
5.00	1.02731	0.00057	5.00	1.02907	0.00060			

Table B.2.3.1.1-2. K_{eff} Values for Uranium Slab (100% ^{235}U) – 0 Inches of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
4.20	0.90570	0.00055	4.20	0.91152	0.00056	4.20	0.91419	0.00055
4.25	0.91640	0.00057	4.25	0.92072	0.00055	4.25	0.92310	0.00054
4.30	0.92494	0.00056	4.30	0.92906	0.00056	4.30	0.93150	0.00056
4.35	0.93348	0.00055	4.35	0.93842	0.00057	4.35	0.94012	0.00054
4.40	0.94239	0.00057	4.40	0.94627	0.00056	4.40	0.95028	0.00056
4.45	0.95146	0.00055	4.45	0.95536	0.00055	4.45	0.95748	0.00056
4.50	0.95954	0.00055	4.50	0.96424	0.00058	4.50	0.96647	0.00056
4.55	0.96720	0.00058	4.55	0.97147	0.00054	4.55	0.97456	0.00054
4.60	0.97613	0.00058	4.60	0.98107	0.00055	4.60	0.98292	0.00055
4.65	0.98363	0.00055	4.65	0.98785	0.00057	4.65	0.99067	0.00052
4.70	0.99347	0.00058	4.70	0.99637	0.00054	4.70	0.99923	0.00055
4.75	0.99991	0.00056	4.75	1.00439	0.00054	4.75	1.00568	0.00056
4.80	1.00901	0.00057	4.80	1.01138	0.00056	4.80	1.01450	0.00054
4.85	1.01583	0.00059	4.85	1.01939	0.00056	4.85	1.02107	0.00056
4.90	1.02316	0.00055	4.90	1.02769	0.00053	4.90	1.02898	0.00056

Table B.2.3.1.1-2. K_{eff} Values for Uranium Slab (100% ^{235}U) – 0 Inches of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
4.20	0.91536	0.00054	4.10	0.90941	0.00055	4.10	0.92151	0.00051
4.25	0.92530	0.00054	4.15	0.91732	0.00054	4.15	0.93126	0.00054
4.30	0.93339	0.00054	4.20	0.92644	0.00056	4.20	0.93964	0.00052
4.35	0.94262	0.00055	4.25	0.93570	0.00053	4.25	0.94869	0.00054
4.40	0.95113	0.00054	4.30	0.94290	0.00054	4.30	0.95745	0.00053
4.45	0.95925	0.00057	4.35	0.95254	0.00054	4.35	0.96527	0.00055
4.50	0.96860	0.00054	4.40	0.95999	0.00055	4.40	0.97374	0.00052
4.55	0.97692	0.00054	4.45	0.96902	0.00054	4.45	0.98184	0.00053
4.60	0.98414	0.00057	4.50	0.97667	0.00053	4.50	0.98961	0.00054
4.65	0.99298	0.00055	4.55	0.98581	0.00056	4.55	0.99838	0.00055
4.70	1.00037	0.00054	4.60	0.99378	0.00054	4.60	1.00466	0.00052
4.75	1.00940	0.00057	4.65	1.00281	0.00054	4.65	1.01429	0.00053
4.80	1.01493	0.00055	4.70	1.00932	0.00053	4.70	1.02157	0.00053
4.85	1.02340	0.00054	4.75	1.01737	0.00053			
4.90	1.03077	0.00055	4.80	1.02404	0.00055			

Table B.2.3.1.1-2. K_{eff} Values for Uranium Slab (100% ^{235}U) – 0 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
3.90	0.91475	0.00050	3.70	0.90731	0.00049	3.60	0.91879	0.00049
3.95	0.92462	0.00050	3.75	0.91777	0.00050	3.65	0.92780	0.00049
4.00	0.93340	0.00051	3.80	0.92647	0.00048	3.70	0.93821	0.00049
4.05	0.94231	0.00051	3.85	0.93631	0.00049	3.75	0.94613	0.00048
4.10	0.95147	0.00052	3.90	0.94525	0.00050	3.80	0.95676	0.00048
4.15	0.95989	0.00053	3.95	0.95459	0.00050	3.85	0.96569	0.00048
4.20	0.96929	0.00051	4.00	0.96392	0.00050	3.90	0.97547	0.00049
4.25	0.97699	0.00051	4.05	0.97220	0.00051	3.95	0.98447	0.00050
4.30	0.98551	0.00051	4.10	0.98082	0.00051	4.00	0.99383	0.00048
4.35	0.99438	0.00051	4.15	0.98950	0.00049	4.05	1.00187	0.00050
4.40	1.00153	0.00051	4.20	0.99839	0.00048	4.10	1.01098	0.00048
4.45	1.01055	0.00051	4.25	1.00792	0.00051	4.15	1.01940	0.00049
4.50	1.01792	0.00050	4.30	1.01566	0.00048	4.20	1.02776	0.00050
4.55	1.02556	0.00052	4.35	1.02396	0.00052			
4.60	1.03332	0.00052	4.40	1.03175	0.00050			

Table B.2.3.1.1-2. K_{eff} Values for Uranium Slab (100% ^{235}U) – 0 Inches of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
3.40	0.90671	0.00049	3.40	0.92104	0.00048	3.30	0.91390	0.00047
3.45	0.91614	0.00047	3.42	0.92507	0.00048	3.35	0.92517	0.00046
3.50	0.92680	0.00048	3.44	0.92970	0.00047	3.40	0.93558	0.00049
3.55	0.93757	0.00047	3.46	0.93434	0.00047	3.45	0.94549	0.00046
3.60	0.94808	0.00047	3.48	0.93839	0.00047	3.50	0.95630	0.00048
3.65	0.95781	0.00047	3.50	0.94224	0.00050	3.55	0.96697	0.00046
3.70	0.96654	0.00048	3.52	0.94638	0.00047	3.60	0.97657	0.00048
3.75	0.97650	0.00048	3.54	0.95058	0.00047	3.65	0.98684	0.00047
3.80	0.98584	0.00048	3.56	0.95388	0.00047	3.70	0.99617	0.00047
3.85	0.99696	0.00048	3.58	0.95877	0.00046	3.75	1.00649	0.00048
3.90	1.00566	0.00047	3.60	0.96235	0.00046	3.80	1.01649	0.00047
3.95	1.01463	0.00049	3.62	0.96656	0.00048	3.85	1.02466	0.00048
4.00	1.02363	0.00048	3.64	0.97113	0.00047	3.90	1.03357	0.00047
			3.66	0.97485	0.00046			
			3.68	0.97768	0.00049			
			3.70	0.98169	0.00048			
			3.72	0.98553	0.00047			
			3.74	0.98962	0.00048			
			3.76	0.99410	0.00049			
			3.78	0.99699	0.00048			
			3.80	1.00112	0.00048			
			3.82	1.00586	0.00047			
			3.84	1.00880	0.00049			
			3.86	1.01164	0.00045			
			3.88	1.01708	0.00047			
			3.90	1.01984	0.00048			

Table B.2.3.1.1-2. K_{eff} Values for Uranium Slab (100% ^{235}U) – 0 Inches of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
3.20	0.91989	0.00045	3.00	0.90075	0.00042	2.50	0.89871	0.00039
3.22	0.92502	0.00045	3.05	0.91235	0.00044	2.52	0.90384	0.00038
3.24	0.92866	0.00045	3.10	0.92351	0.00043	2.54	0.90967	0.00039
3.26	0.93292	0.00045	3.15	0.93557	0.00047	2.56	0.91432	0.00038
3.28	0.93803	0.00047	3.20	0.94670	0.00043	2.58	0.91984	0.00037
3.30	0.94168	0.00044	3.25	0.95733	0.00044	2.60	0.92542	0.00038
3.32	0.94594	0.00047	3.30	0.96920	0.00045	2.62	0.93045	0.00039
3.34	0.95028	0.00046	3.35	0.97932	0.00045	2.64	0.93602	0.00039
3.36	0.95427	0.00045	3.40	0.99071	0.00044	2.66	0.94114	0.00038
3.38	0.95903	0.00044	3.45	1.00118	0.00045	2.68	0.94621	0.00039
3.40	0.96344	0.00045	3.50	1.01204	0.00046	2.70	0.95163	0.00039
3.42	0.96718	0.00046	3.55	1.02184	0.00044	2.72	0.95674	0.00039
3.44	0.97187	0.00046	3.60	1.03207	0.00045	2.74	0.96155	0.00041
3.46	0.97527	0.00045				2.76	0.96698	0.00041
3.48	0.97960	0.00046				2.78	0.97182	0.00040
3.50	0.98442	0.00046				2.80	0.97680	0.00040
3.52	0.98759	0.00046				2.82	0.98173	0.00041
3.54	0.99267	0.00046				2.84	0.98673	0.00041
3.56	0.99610	0.00045				2.86	0.99227	0.00041
3.58	1.00050	0.00045				2.88	0.99724	0.00040
3.60	1.00497	0.00047				2.90	1.00300	0.00041
3.62	1.00983	0.00047				2.92	1.00674	0.00040
3.64	1.01229	0.00046				2.94	1.01295	0.00041
3.66	1.01658	0.00045				2.96	1.01700	0.00041
3.68	1.02019	0.00046				2.98	1.02236	0.00040
3.70	1.02434	0.00046				3.00	1.02628	0.00042

Table B.2.3.1.1-2. K_{eff} Values for Uranium Slab (100% ^{235}U) – 0 Inches of Water Reflection (cont)

18900 milli-g/cc								
Height (inches)	K_{eff}	Sigma						
2.20	0.90728	0.00035						
2.22	0.91347	0.00036						
2.24	0.91989	0.00038						
2.26	0.92515	0.00036						
2.28	0.93065	0.00035						
2.30	0.93632	0.00036						
2.32	0.94201	0.00037						
2.34	0.94763	0.00037						
2.36	0.95384	0.00036						
2.38	0.95938	0.00037						
2.40	0.96526	0.00038						
2.42	0.97024	0.00038						
2.44	0.97548	0.00038						
2.46	0.98145	0.00037						
2.48	0.98717	0.00037						
2.50	0.99291	0.00038						
2.52	0.99786	0.00037						
2.54	1.00284	0.00039						
2.56	1.00889	0.00038						
2.58	1.01442	0.00039						
2.60	1.01972	0.00039						
2.62	1.02516	0.00038						
2.64	1.03057	0.00039						
2.66	1.03588	0.00039						
2.68	1.04030	0.00039						
2.70	1.04623	0.00039						

B.2.3.1.2. 1” Water Reflector

Case ID: u5-pl-1000-01

Material: Uranium metal in water

Geometry: Infinite Plane

Isotopics: 100% ^{235}U

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.2.3.1.2-1. Uranium Slab (100% ^{235}U) - 1 Inch of Water Reflection

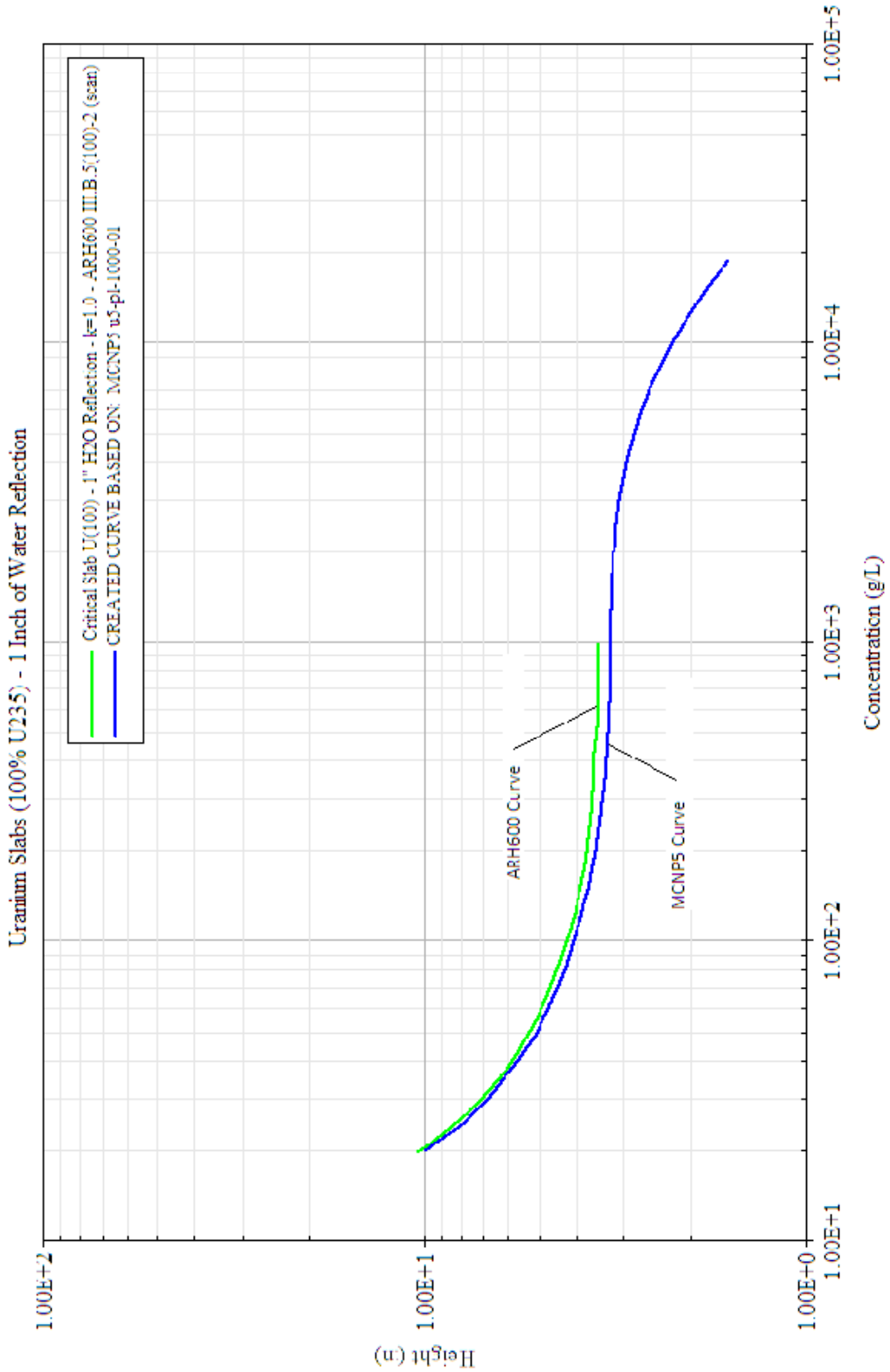

Table B.2.3.1.2-1. Critical Dimensions for Uranium Slab (100% ^{235}U) - 1 Inch of Water Reflection

Uranium Slab (100% ^{235} U) - 1 Inch of Water Reflection				
Concentration (g/cc)	First Height (Inches)	Last Height (Inches)	Delta (Inches)	Critical Height (Inches)
0.020	8.100	10.500	0.100	10.0170
0.025	6.600	8.200	0.050	7.8907
0.030	5.800	7.100	0.050	6.7945
0.040	4.900	5.900	0.050	5.6887
0.045	4.600	5.600	0.050	5.3543
0.050	4.400	5.300	0.050	5.0975
0.055	4.200	5.100	0.050	4.9005
0.060	4.100	4.900	0.050	4.7336
0.065	4.000	4.800	0.050	4.5955
0.070	3.900	4.700	0.050	4.4846
0.080	3.700	4.500	0.050	4.3010
0.100	3.500	4.200	0.050	4.0518
0.130	3.300	4.000	0.050	3.8258
0.150	3.200	3.900	0.050	3.7298
0.170	3.200	3.800	0.050	3.6559
0.200	3.100	3.700	0.050	3.5740
0.350	2.900	3.500	0.050	3.3810
0.500	2.900	3.500	0.050	3.3161
0.800	2.800	3.400	0.050	3.2650
1.000	2.800	3.400	0.050	3.2542
1.500	2.700	3.400	0.050	3.2281
1.700	2.700	3.400	0.050	3.2135
1.900	2.700	3.400	0.050	3.1961
2.000	2.700	3.300	0.050	3.1879
2.100	2.700	3.300	0.050	3.1785
2.500	2.700	3.300	0.050	3.1423
3.000	2.600	3.200	0.050	3.0834
4.000	2.500	3.100	0.050	2.9591
5.000	2.400	3.000	0.050	2.8235
6.000	2.300	2.800	0.020	2.6959
7.000	2.100	2.700	0.050	2.5708
7.500	2.100	2.700	0.050	2.5138
8.000	2.000	2.600	0.050	2.4519
9.000	2.000	2.500	0.020	2.3471
10.000	1.900	2.400	0.020	2.2485
15.000	1.500	2.000	0.020	1.8421
18.900	1.300	1.700	0.020	1.5919

MCNP5 Sample Input File
100% ^{235}U Slab- 1 Inch of Reflection

```
u ipl, 100.0 wt% 235U, 01000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Height = 310   hundreths of inches - must be integer
c half height =     3.9370 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 01000 milli-g u/cc
c Reflector width =  1.0 inches
c Enrichment = 1.00 wt fraction 235U
c
c Density of H2O 1.00000
c Density of u 18.90000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c u238  = 238.05080
c
c Effective Uranium atomic mass 235.04390
c uranium metal
c Mass fraction of u in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0529 cc
c Volume of water in sample 0.9471 cc
c
c Mass of crit in sample   1.0000 g
c Mass of u in sample   1.0000 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9471 g
c
c Total mass of sample  1.9471g for a 1cc sample
c Mass Density for crit material  -1.9471, expressed as negative
c
c  plane
20 11   -1.947090   -1 2 -7 -5 8 6      imp:n=1
21  2  -1.000    -3 4 6 8 -7 -5 ((1 -3):(-2 4))       imp:n=1    $zero importance if no reflector
22  0            3:-4:7:5:-8:-6                      imp:n=0
```

```
1       py     3.9370              $ plane
2       py    -3.9370
3       py     6.4770         $ Reflection
4       py    -6.4770
*5       px    100
*6       px    -100
*7       pz    100
*8       pz    -100

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u metal / water mixture
m11    $ Uranium/H2O Sludge, 100.0 wt% 235U, 01000 milli-g u/cc,  1.9471
1001.66c -0.054427
8016.66c -0.431986      $from water
92235.66c -0.513587
c    92238.66c -0.000000
mt11     lwtr.60t
c
c    u only
m12    $ U metal, 100.0 wt% 235U, 01000 milli-g U/cc,  1.9471
92235.66c -0.513587
c    92238.66c -0.000000
c
```

Critview Compatible Data File
100% ^{235}U Slab- 1 Inch of Reflection

reset:
title: MCNP5 u5-pl-1000-01
set: MCNP5 set
source: MCNP5 primary
created: Mon 08/09/2010 8:11:07.73
geometry: infplane
modmat: H2O
critmat: uranium
isomat: U235 1.0
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: height in

0.020	10.0170
0.025	7.8907
0.030	6.7945
0.040	5.6887
0.045	5.3543
0.050	5.0975
0.055	4.9005
0.060	4.7336
0.065	4.5955
0.070	4.4846
0.080	4.3010
0.100	4.0518
0.130	3.8258
0.150	3.7298
0.170	3.6559
0.200	3.5740
0.350	3.3810
0.500	3.3161
0.800	3.2650
1.000	3.2542
1.500	3.2281
1.700	3.2135
1.900	3.1961
2.000	3.1879
2.100	3.1785
2.500	3.1423
3.000	3.0834
4.000	2.9591
5.000	2.8235
6.000	2.6959
7.000	2.5708
7.500	2.5138
8.000	2.4519
9.000	2.3471
10.00	2.2485
15.00	1.8421
18.90	1.5919

Table B.2.3.1.2-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 1 Inch of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
8.10	0.92644	0.00033	6.60	0.92428	0.00038	5.80	0.92483	0.00040
8.20	0.93001	0.00033	6.65	0.92778	0.00039	5.85	0.92923	0.00040
8.30	0.93542	0.00033	6.70	0.93109	0.00037	5.90	0.93228	0.00039
8.40	0.93919	0.00033	6.75	0.93423	0.00038	5.95	0.93651	0.00040
8.50	0.94405	0.00033	6.80	0.93806	0.00039	6.00	0.94037	0.00040
8.60	0.94792	0.00034	6.85	0.94023	0.00039	6.05	0.94543	0.00041
8.70	0.95246	0.00033	6.90	0.94397	0.00038	6.10	0.94902	0.00041
8.80	0.95604	0.00032	6.95	0.94728	0.00038	6.15	0.95173	0.00041
8.90	0.96029	0.00033	7.00	0.94978	0.00038	6.20	0.95598	0.00041
9.00	0.96357	0.00033	7.05	0.95320	0.00037	6.25	0.96043	0.00041
9.10	0.96782	0.00034	7.10	0.95610	0.00038	6.30	0.96432	0.00040
9.20	0.97197	0.00033	7.15	0.95902	0.00037	6.35	0.96741	0.00041
9.30	0.97530	0.00032	7.20	0.96195	0.00038	6.40	0.97113	0.00040
9.40	0.97870	0.00032	7.25	0.96500	0.00038	6.45	0.97520	0.00041
9.50	0.98228	0.00032	7.30	0.96786	0.00037	6.50	0.97863	0.00041
9.60	0.98563	0.00031	7.35	0.97026	0.00038	6.55	0.98224	0.00041
9.70	0.98869	0.00033	7.40	0.97323	0.00037	6.60	0.98502	0.00040
9.80	0.99302	0.00032	7.45	0.97666	0.00037	6.65	0.98891	0.00041
9.90	0.99549	0.00031	7.50	0.97844	0.00037	6.70	0.99337	0.00040
10.00	0.99953	0.00032	7.55	0.98217	0.00036	6.75	0.99639	0.00040
10.10	1.00230	0.00032	7.60	0.98454	0.00037	6.80	1.00045	0.00041
10.20	1.00542	0.00030	7.65	0.98723	0.00037	6.85	1.00269	0.00040
10.30	1.00808	0.00032	7.70	0.98985	0.00038	6.90	1.00632	0.00041
10.40	1.01138	0.00032	7.75	0.99310	0.00036	6.95	1.00887	0.00040
10.50	1.01422	0.00032	7.80	0.99546	0.00037	7.00	1.01262	0.00040
			7.85	0.99769	0.00036	7.05	1.01600	0.00039
			7.90	1.00053	0.00037	7.10	1.01895	0.00039
			7.95	1.00285	0.00036			
			8.00	1.00551	0.00036			
			8.05	1.00790	0.00038			
			8.10	1.01086	0.00037			
			8.15	1.01278	0.00035			
			8.20	1.01551	0.00037			

Table B.2.3.1.2-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 1 Inch of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
4.90	0.92187	0.00046	4.60	0.91652	0.00047	4.40	0.91739	0.00048
4.95	0.92636	0.00046	4.65	0.92326	0.00047	4.45	0.92448	0.00047
5.00	0.93249	0.00045	4.70	0.92894	0.00046	4.50	0.93011	0.00048
5.05	0.93744	0.00045	4.75	0.93450	0.00047	4.55	0.93623	0.00048
5.10	0.94272	0.00046	4.80	0.94060	0.00046	4.60	0.94327	0.00049
5.15	0.94839	0.00044	4.85	0.94619	0.00047	4.65	0.94841	0.00048
5.20	0.95320	0.00045	4.90	0.95137	0.00046	4.70	0.95484	0.00048
5.25	0.95734	0.00045	4.95	0.95614	0.00046	4.75	0.96090	0.00047
5.30	0.96337	0.00044	5.00	0.96289	0.00046	4.80	0.96566	0.00047
5.35	0.96828	0.00045	5.05	0.96763	0.00047	4.85	0.97275	0.00047
5.40	0.97322	0.00044	5.10	0.97386	0.00047	4.90	0.97818	0.00047
5.45	0.97786	0.00047	5.15	0.97943	0.00046	4.95	0.98374	0.00048
5.50	0.98283	0.00046	5.20	0.98455	0.00047	5.00	0.98904	0.00047
5.55	0.98731	0.00045	5.25	0.98911	0.00047	5.05	0.99499	0.00047
5.60	0.99194	0.00045	5.30	0.99536	0.00045	5.10	1.00026	0.00048
5.65	0.99690	0.00045	5.35	0.99952	0.00046	5.15	1.00575	0.00047
5.70	1.00090	0.00044	5.40	1.00504	0.00045	5.20	1.01071	0.00046
5.75	1.00544	0.00045	5.45	1.01029	0.00047	5.25	1.01514	0.00047
5.80	1.01018	0.00045	5.50	1.01446	0.00047	5.30	1.02027	0.00046
5.85	1.01534	0.00045	5.55	1.01942	0.00046			
5.90	1.01995	0.00045	5.60	1.02442	0.00048			

Table B.2.3.1.2-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 1 Inch of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
4.20	0.91307	0.00048	4.10	0.91657	0.00051	4.00	0.91849	0.00049
4.25	0.91898	0.00049	4.15	0.92369	0.00050	4.05	0.92661	0.00050
4.30	0.92662	0.00050	4.20	0.93115	0.00051	4.10	0.93380	0.00049
4.35	0.93239	0.00048	4.25	0.93700	0.00049	4.15	0.94111	0.00049
4.40	0.93879	0.00050	4.30	0.94506	0.00049	4.20	0.94705	0.00049
4.45	0.94579	0.00049	4.35	0.95143	0.00050	4.25	0.95360	0.00049
4.50	0.95152	0.00049	4.40	0.95779	0.00050	4.30	0.96080	0.00049
4.55	0.95773	0.00052	4.45	0.96481	0.00050	4.35	0.96735	0.00049
4.60	0.96409	0.00048	4.50	0.97099	0.00049	4.40	0.97408	0.00050
4.65	0.96978	0.00051	4.55	0.97727	0.00050	4.45	0.98136	0.00050
4.70	0.97651	0.00047	4.60	0.98361	0.00050	4.50	0.98700	0.00050
4.75	0.98138	0.00047	4.65	0.98924	0.00049	4.55	0.99456	0.00051
4.80	0.98798	0.00049	4.70	0.99549	0.00049	4.60	1.00054	0.00051
4.85	0.99426	0.00049	4.75	1.00220	0.00052	4.65	1.00646	0.00049
4.90	0.99994	0.00049	4.80	1.00722	0.00051	4.70	1.01162	0.00051
4.95	1.00585	0.00047	4.85	1.01322	0.00051	4.75	1.01836	0.00053
5.00	1.01064	0.00049	4.90	1.01961	0.00050	4.80	1.02363	0.00051
5.05	1.01643	0.00049						
5.10	1.02275	0.00049						

Table B.2.3.1.2-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 1 Inch of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
3.90	0.91844	0.00050	3.70	0.91140	0.00053	3.50	0.91290	0.00054
3.95	0.92593	0.00049	3.75	0.91893	0.00054	3.55	0.92037	0.00054
4.00	0.93342	0.00051	3.80	0.92547	0.00052	3.60	0.92979	0.00054
4.05	0.94045	0.00051	3.85	0.93482	0.00053	3.65	0.93619	0.00053
4.10	0.94739	0.00049	3.90	0.94126	0.00053	3.70	0.94492	0.00053
4.15	0.95442	0.00052	3.95	0.94901	0.00051	3.75	0.95397	0.00055
4.20	0.96021	0.00052	4.00	0.95669	0.00052	3.80	0.96128	0.00053
4.25	0.96840	0.00052	4.05	0.96380	0.00053	3.85	0.96911	0.00052
4.30	0.97583	0.00050	4.10	0.97108	0.00053	3.90	0.97690	0.00055
4.35	0.98202	0.00051	4.15	0.97870	0.00054	3.95	0.98360	0.00055
4.40	0.98832	0.00052	4.20	0.98487	0.00051	4.00	0.99267	0.00054
4.45	0.99538	0.00051	4.25	0.99212	0.00052	4.05	0.99978	0.00055
4.50	1.00205	0.00050	4.30	0.99987	0.00052	4.10	1.00584	0.00054
4.55	1.00851	0.00051	4.35	1.00633	0.00052	4.15	1.01473	0.00055
4.60	1.01477	0.00052	4.40	1.01285	0.00052	4.20	1.02102	0.00056
4.65	1.02005	0.00050	4.45	1.01965	0.00052			
4.70	1.02732	0.00051	4.50	1.02743	0.00052			

Table B.2.3.1.2-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 1 Inch of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
3.30	0.91148	0.00056	3.20	0.90925	0.00056	3.20	0.92020	0.00056
3.35	0.92023	0.00055	3.25	0.91727	0.00056	3.25	0.92962	0.00055
3.40	0.92755	0.00053	3.30	0.92831	0.00057	3.30	0.93844	0.00056
3.45	0.93810	0.00056	3.35	0.93587	0.00055	3.35	0.94717	0.00058
3.50	0.94654	0.00055	3.40	0.94390	0.00057	3.40	0.95641	0.00056
3.55	0.95513	0.00055	3.45	0.95358	0.00056	3.45	0.96490	0.00058
3.60	0.96342	0.00055	3.50	0.96203	0.00056	3.50	0.97366	0.00056
3.65	0.97039	0.00055	3.55	0.96967	0.00056	3.55	0.98284	0.00057
3.70	0.97973	0.00055	3.60	0.97840	0.00055	3.60	0.99018	0.00055
3.75	0.98752	0.00056	3.65	0.98736	0.00056	3.65	0.99911	0.00056
3.80	0.99660	0.00056	3.70	0.99499	0.00054	3.70	1.00665	0.00055
3.85	1.00318	0.00054	3.75	1.00340	0.00055	3.75	1.01496	0.00056
3.90	1.01041	0.00057	3.80	1.01185	0.00055	3.80	1.02370	0.00057
3.95	1.01920	0.00057	3.85	1.01899	0.00055			
4.00	1.02635	0.00055	3.90	1.02671	0.00054			

Table B.2.3.1.2-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 1 Inch of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
3.10	0.91494	0.00056	2.90	0.91077	0.00057	2.90	0.92511	0.00057
3.15	0.92474	0.00057	2.95	0.92145	0.00057	2.95	0.93356	0.00057
3.20	0.93395	0.00055	3.00	0.92967	0.00058	3.00	0.94322	0.00058
3.25	0.94335	0.00058	3.05	0.94008	0.00059	3.05	0.95259	0.00059
3.30	0.95369	0.00058	3.10	0.95038	0.00058	3.10	0.96151	0.00057
3.35	0.96228	0.00057	3.15	0.95889	0.00059	3.15	0.97060	0.00059
3.40	0.97059	0.00057	3.20	0.96772	0.00060	3.20	0.97941	0.00059
3.45	0.97906	0.00057	3.25	0.97670	0.00056	3.25	0.98884	0.00058
3.50	0.98760	0.00056	3.30	0.98633	0.00060	3.30	0.99709	0.00059
3.55	0.99569	0.00056	3.35	0.99407	0.00058	3.35	1.00612	0.00060
3.60	1.00468	0.00058	3.40	1.00364	0.00058	3.40	1.01507	0.00059
3.65	1.01295	0.00058	3.45	1.01246	0.00057	3.45	1.02393	0.00056
3.70	1.02114	0.00059	3.50	1.02071	0.00059	3.50	1.03171	0.00059

Table B.2.3.1.2-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 1 Inch of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
2.80	0.91666	0.00056	2.80	0.91954	0.00059	2.70	0.90895	0.00057
2.85	0.92551	0.00058	2.85	0.92950	0.00058	2.75	0.91757	0.00057
2.90	0.93506	0.00056	2.90	0.93797	0.00058	2.80	0.92640	0.00057
2.95	0.94429	0.00058	2.95	0.94754	0.00059	2.85	0.93665	0.00057
3.00	0.95326	0.00057	3.00	0.95596	0.00058	2.90	0.94430	0.00058
3.05	0.96285	0.00057	3.05	0.96635	0.00056	2.95	0.95386	0.00056
3.10	0.97069	0.00059	3.10	0.97450	0.00057	3.00	0.96246	0.00057
3.15	0.98047	0.00057	3.15	0.98369	0.00057	3.05	0.97160	0.00057
3.20	0.98896	0.00057	3.20	0.99008	0.00058	3.10	0.97947	0.00057
3.25	0.99756	0.00058	3.25	0.99921	0.00055	3.15	0.98706	0.00055
3.30	1.00571	0.00060	3.30	1.00860	0.00057	3.20	0.99561	0.00056
3.35	1.01360	0.00061	3.35	1.01707	0.00056	3.25	1.00342	0.00055
3.40	1.02257	0.00057	3.40	1.02439	0.00056	3.30	1.01249	0.00058
						3.35	1.01980	0.00056
						3.40	1.02785	0.00056

Table B.2.3.1.2-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 1 Inch of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
2.70	0.91239	0.00056	2.70	0.91455	0.00054	2.70	0.91641	0.00055
2.75	0.92076	0.00054	2.75	0.92377	0.00055	2.75	0.92575	0.00054
2.80	0.92935	0.00055	2.80	0.93352	0.00055	2.80	0.93529	0.00055
2.85	0.93926	0.00055	2.85	0.94167	0.00054	2.85	0.94380	0.00055
2.90	0.94830	0.00055	2.90	0.94958	0.00055	2.90	0.95203	0.00056
2.95	0.95644	0.00056	2.95	0.95883	0.00055	2.95	0.96093	0.00054
3.00	0.96487	0.00057	3.00	0.96787	0.00057	3.00	0.96993	0.00055
3.05	0.97330	0.00057	3.05	0.97681	0.00054	3.05	0.97826	0.00056
3.10	0.98224	0.00055	3.10	0.98439	0.00056	3.10	0.98610	0.00056
3.15	0.98992	0.00055	3.15	0.99270	0.00056	3.15	0.99467	0.00056
3.20	0.99790	0.00054	3.20	1.00062	0.00056	3.20	1.00170	0.00057
3.25	1.00565	0.00055	3.25	1.00779	0.00058	3.25	1.01120	0.00056
3.30	1.01471	0.00056	3.30	1.01663	0.00053	3.30	1.01760	0.00055
3.35	1.02248	0.00054	3.35	1.02503	0.00055			
3.40	1.02931	0.00056	3.40	1.03222	0.00055			

Table B.2.3.1.2-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 1 Inch of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
2.70	0.91789	0.00056	2.70	0.92488	0.00053	2.60	0.91747	0.00054
2.75	0.92775	0.00052	2.75	0.93377	0.00054	2.65	0.92589	0.00055
2.80	0.93608	0.00054	2.80	0.94373	0.00056	2.70	0.93414	0.00053
2.85	0.94435	0.00056	2.85	0.95241	0.00054	2.75	0.94383	0.00054
2.90	0.95401	0.00055	2.90	0.96071	0.00054	2.80	0.95291	0.00053
2.95	0.96148	0.00055	2.95	0.96876	0.00057	2.85	0.96162	0.00053
3.00	0.97083	0.00055	3.00	0.97759	0.00052	2.90	0.97030	0.00054
3.05	0.97922	0.00056	3.05	0.98543	0.00054	2.95	0.97877	0.00055
3.10	0.98736	0.00054	3.10	0.99342	0.00056	3.00	0.98650	0.00054
3.15	0.99552	0.00054	3.15	1.00119	0.00055	3.05	0.99407	0.00053
3.20	1.00337	0.00055	3.20	1.00916	0.00055	3.10	1.00296	0.00053
3.25	1.01206	0.00054	3.25	1.01692	0.00053	3.15	1.01143	0.00055
3.30	1.02008	0.00056	3.30	1.02462	0.00057	3.20	1.01826	0.00056

Table B.2.3.1.2-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 1 Inch of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
2.50	0.91913	0.00054	2.40	0.92250	0.00051	2.30	0.92436	0.00052
2.55	0.92952	0.00054	2.45	0.93244	0.00052	2.32	0.92842	0.00051
2.60	0.93865	0.00054	2.50	0.94065	0.00051	2.34	0.93257	0.00050
2.65	0.94693	0.00053	2.55	0.95091	0.00051	2.36	0.93722	0.00052
2.70	0.95560	0.00051	2.60	0.95949	0.00050	2.38	0.94003	0.00050
2.75	0.96475	0.00052	2.65	0.96946	0.00052	2.40	0.94511	0.00052
2.80	0.97336	0.00051	2.70	0.97831	0.00051	2.42	0.94944	0.00050
2.85	0.98200	0.00051	2.75	0.98713	0.00052	2.44	0.95281	0.00051
2.90	0.99057	0.00054	2.80	0.99607	0.00053	2.46	0.95691	0.00051
2.95	0.99866	0.00052	2.85	1.00444	0.00053	2.48	0.95969	0.00052
3.00	1.00600	0.00053	2.90	1.01360	0.00052	2.50	0.96386	0.00050
3.05	1.01529	0.00054	2.95	1.02156	0.00051	2.52	0.96850	0.00051
3.10	1.02303	0.00052	3.00	1.02937	0.00052	2.54	0.97155	0.00052
						2.56	0.97565	0.00053
						2.58	0.97936	0.00051
						2.60	0.98336	0.00050
						2.62	0.98665	0.00053
						2.64	0.99062	0.00053
						2.66	0.99391	0.00051
						2.68	0.99767	0.00051
						2.70	1.00061	0.00050
						2.72	1.00476	0.00050
						2.74	1.00789	0.00052
						2.76	1.01154	0.00053
						2.78	1.01612	0.00050
						2.80	1.01935	0.00051

Table B.2.3.1.2-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 1 Inch of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
2.10	0.90448	0.00050	2.10	0.91557	0.00048	2.00	0.90386	0.00049
2.15	0.91553	0.00051	2.15	0.92601	0.00048	2.05	0.91546	0.00049
2.20	0.92591	0.00050	2.20	0.93629	0.00050	2.10	0.92552	0.00049
2.25	0.93586	0.00051	2.25	0.94611	0.00052	2.15	0.93625	0.00048
2.30	0.94695	0.00052	2.30	0.95721	0.00049	2.20	0.94745	0.00049
2.35	0.95683	0.00050	2.35	0.96733	0.00051	2.25	0.95728	0.00051
2.40	0.96617	0.00051	2.40	0.97811	0.00053	2.30	0.96880	0.00050
2.45	0.97710	0.00051	2.45	0.98850	0.00050	2.35	0.97832	0.00050
2.50	0.98642	0.00050	2.50	0.99714	0.00049	2.40	0.98878	0.00051
2.55	0.99631	0.00052	2.55	1.00753	0.00050	2.45	0.99966	0.00050
2.60	1.00520	0.00051	2.60	1.01690	0.00052	2.50	1.00884	0.00050
2.65	1.01449	0.00050	2.65	1.02656	0.00050	2.55	1.01829	0.00050
2.70	1.02475	0.00052	2.70	1.03498	0.00051	2.60	1.02785	0.00052

Table B.2.3.1.2-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 1 Inch of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
2.00	0.92388	0.00049	1.90	0.91988	0.00049	1.50	0.90582	0.00046
2.02	0.92907	0.00048	1.92	0.92549	0.00048	1.52	0.91219	0.00048
2.04	0.93292	0.00048	1.94	0.92983	0.00047	1.54	0.91799	0.00046
2.06	0.93758	0.00050	1.96	0.93432	0.00049	1.56	0.92252	0.00047
2.08	0.94249	0.00048	1.98	0.93947	0.00050	1.58	0.92905	0.00046
2.10	0.94619	0.00048	2.00	0.94429	0.00050	1.60	0.93419	0.00047
2.12	0.95092	0.00049	2.02	0.94979	0.00049	1.62	0.93981	0.00046
2.14	0.95591	0.00050	2.04	0.95337	0.00049	1.64	0.94602	0.00046
2.16	0.95998	0.00050	2.06	0.95726	0.00050	1.66	0.95134	0.00047
2.18	0.96353	0.00049	2.08	0.96246	0.00048	1.68	0.95625	0.00047
2.20	0.96855	0.00049	2.10	0.96657	0.00048	1.70	0.96274	0.00046
2.22	0.97450	0.00049	2.12	0.97199	0.00050	1.72	0.96784	0.00046
2.24	0.97732	0.00049	2.14	0.97632	0.00047	1.74	0.97271	0.00045
2.26	0.98144	0.00050	2.16	0.98038	0.00050	1.76	0.97847	0.00047
2.28	0.98580	0.00050	2.18	0.98424	0.00050	1.78	0.98306	0.00046
2.30	0.99013	0.00050	2.20	0.98964	0.00050	1.80	0.98941	0.00048
2.32	0.99476	0.00051	2.22	0.99343	0.00049	1.82	0.99416	0.00046
2.34	0.99878	0.00047	2.24	0.99811	0.00049	1.84	0.99944	0.00048
2.36	1.00221	0.00050	2.26	1.00254	0.00049	1.86	1.00475	0.00047
2.38	1.00646	0.00049	2.28	1.00687	0.00049	1.88	1.00946	0.00047
2.40	1.01070	0.00051	2.30	1.01196	0.00048	1.90	1.01462	0.00048
2.42	1.01451	0.00050	2.32	1.01477	0.00048	1.92	1.01936	0.00047
2.44	1.01889	0.00050	2.34	1.01935	0.00049	1.94	1.02532	0.00048
2.46	1.02292	0.00050	2.36	1.02380	0.00049	1.96	1.03002	0.00047
2.48	1.02651	0.00050	2.38	1.02788	0.00048	1.98	1.03457	0.00046
2.50	1.03046	0.00049	2.40	1.03177	0.00049	2.00	1.04051	0.00046

Table B.2.3.1.2-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 1 Inch of Water Reflection (cont)

18900 milli-g/cc								
Height (inches)	K_{eff}	Sigma						
1.30	0.90842	0.00044						
1.32	0.91595	0.00044						
1.34	0.92223	0.00045						
1.36	0.92868	0.00045						
1.38	0.93425	0.00045						
1.40	0.94027	0.00045						
1.42	0.94735	0.00045						
1.44	0.95444	0.00045						
1.46	0.95939	0.00045						
1.48	0.96637	0.00046						
1.50	0.97188	0.00045						
1.52	0.97841	0.00047						
1.54	0.98423	0.00044						
1.56	0.99071	0.00043						
1.58	0.99619	0.00045						
1.60	1.00259	0.00046						
1.62	1.00764	0.00044						
1.64	1.01438	0.00044						
1.66	1.01957	0.00044						
1.68	1.02572	0.00045						
1.70	1.03050	0.00046						

B.2.3.1.3. 10” Water Reflector

Case ID: u5-pl-1000-10

Material: Uranium metal in water

Geometry: Infinite Plane

Isotopics: 100% ^{235}U

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.2.3.1.3-1. Uranium Slab (100% ^{235}U) - 10 Inches of Water Reflection

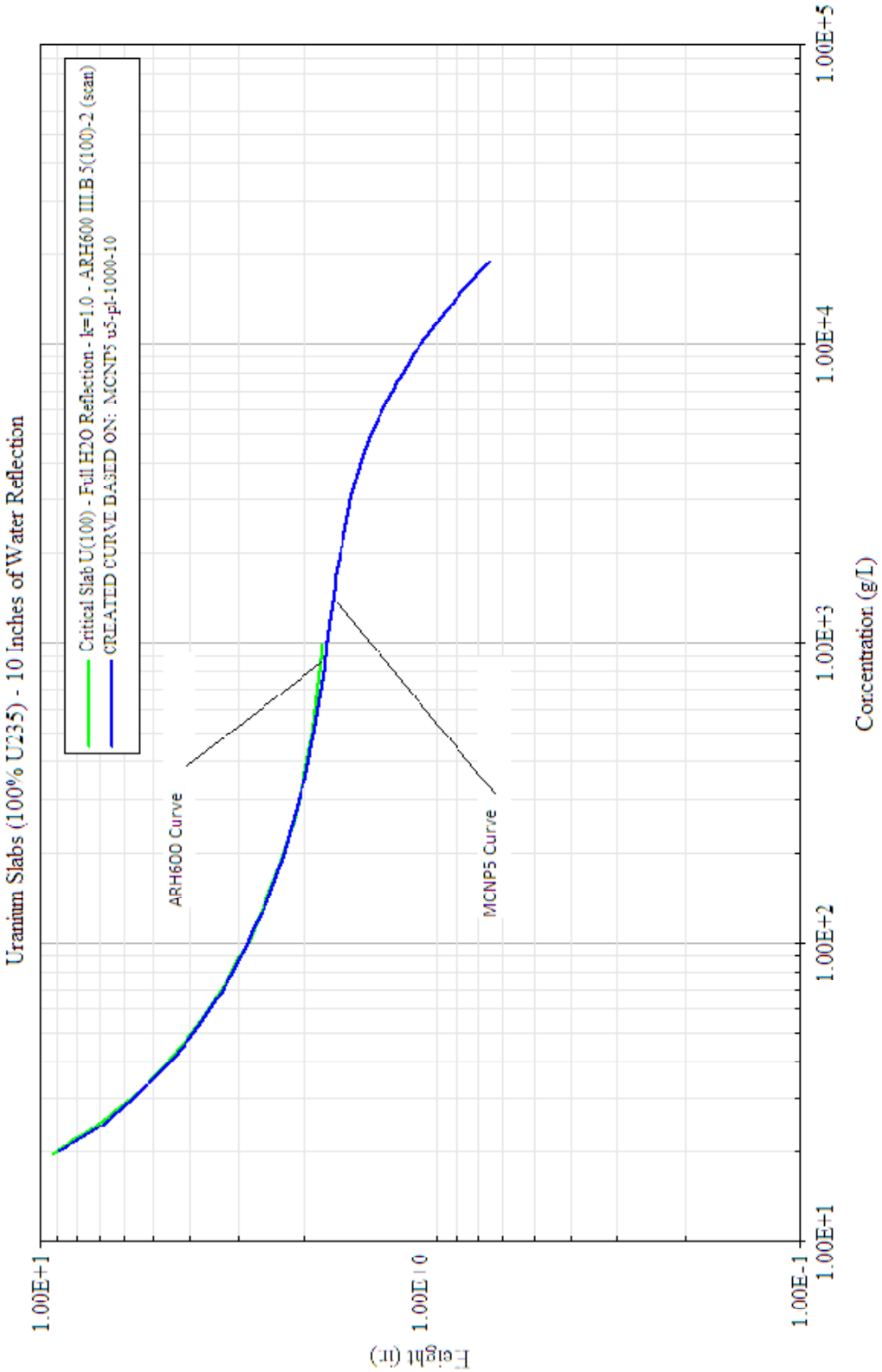

Table B.2.3.1.3-1. Critical Dimensions for Uranium Slab (100% ^{235}U) - 10 Inches of Water Reflection

Uranium Slab (100% ^{235}U)- 10 Inches of Water Reflection				
Concentration (g/cc)	First Height (Inches)	Last Height (Inches)	Delta (Inches)	Critical Height (Inches)
0.020	7.000	9.400	0.100	8.9213
0.025	5.500	7.100	0.050	6.7771
0.030	4.700	5.900	0.050	5.6844
0.040	3.800	4.800	0.050	4.5426
0.045	3.500	4.400	0.050	4.2100
0.050	3.300	4.100	0.050	3.9442
0.055	3.100	3.900	0.050	3.7318
0.060	3.000	3.700	0.050	3.5596
0.065	2.800	3.600	0.050	3.4184
0.070	2.700	3.500	0.050	3.2923
0.080	2.600	3.300	0.050	3.1031
0.100	2.300	3.000	0.050	2.8264
0.130	2.100	2.700	0.050	2.5745
0.150	2.000	2.600	0.050	2.4591
0.170	1.900	2.500	0.050	2.3730
0.200	1.800	2.400	0.050	2.2708
0.350	1.600	2.100	0.020	2.0062
0.500	1.500	2.000	0.020	1.8935
0.800	1.400	1.900	0.020	1.7835
1.000	1.300	1.900	0.050	1.7494
1.500	1.200	1.800	0.050	1.6746
1.700	1.300	1.800	0.020	1.6548
1.900	1.200	1.800	0.050	1.6327
2.000	1.200	1.800	0.050	1.6177
2.100	1.200	1.700	0.020	1.6041
2.500	1.100	1.700	0.050	1.5644
3.000	1.100	1.700	0.050	1.5210
4.000	1.000	1.600	0.050	1.4229
5.000	0.900	1.500	0.050	1.3365
6.000	0.900	1.400	0.020	1.2523
7.000	0.800	1.300	0.020	1.1791
7.500	0.800	1.300	0.020	1.1433
8.000	0.800	1.200	0.020	1.1078
9.000	0.700	1.200	0.020	1.0480
10.000	0.700	1.100	0.020	0.9911
15.000	0.500	0.900	0.020	0.7702
18.900	0.400	0.700	0.020	0.6516

MCNP5 Sample Input File
100% ^{235}U Slab- 10 Inch of Reflection

```
u ipl, 100.0 wt% 235U, 01000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Height = 160   hundreths of inches - must be integer
c half height =     2.0320 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 01000 milli-g u/cc
c Reflector width = 10.0 inches
c Enrichment = 1.00 wt fraction 235U
c
c Density of H2O 1.00000
c Density of u 18.90000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c u238  = 238.05080
c
c Effective Uranium atomic mass 235.04390
c uranium metal
c Mass fraction of u in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0529 cc
c Volume of water in sample 0.9471 cc
c
c Mass of crit in sample   1.0000 g
c Mass of u in sample   1.0000 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9471 g
c
c Total mass of sample  1.9471g for a 1cc sample
c Mass Density for crit material  -1.9471, expressed as negative
c
c  plane
20 11   -1.947090   -1 2 -7 -5 8 6      imp:n=1
21  2  -1.000    -3 4 6 8 -7 -5 ((1 -3):(-2 4))       imp:n=1    $zero importance if no reflector
22  0            3:-4:7:5:-8:-6                      imp:n=0
```

```
1       py     2.0320              $ plane
2       py    -2.0320
3       py    27.4320         $ Reflection
4       py   -27.4320
*5       px    100
*6       px    -100
*7       pz    100
*8       pz    -100

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u metal / water mixture
m11    $ Uranium/H2O Sludge, 100.0 wt% 235U, 01000 milli-g u/cc,  1.9471
1001.66c -0.054427
8016.66c -0.431986      $from water
92235.66c -0.513587
c    92238.66c -0.000000
mt11     lwtr.60t
c
c    u only
m12    $ U metal, 100.0 wt% 235U, 01000 milli-g U/cc,  1.9471
92235.66c -0.513587
c    92238.66c -0.000000
c
```

Critview Compatible Data File
100% ^{235}U Slab- 10 Inch of Reflection

reset:
title: MCNP5 u5-pl-1000-10
set: MCNP5 set
source: MCNP5 primary
created: Mon 08/09/2010 8:11:23.09
geometry: infplane
modmat: H2O
critmat: uranium
isomat: U235 1.0
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: height in

0.020	8.9213
0.025	6.7771
0.030	5.6844
0.040	4.5426
0.045	4.2100
0.050	3.9442
0.055	3.7318
0.060	3.5596
0.065	3.4184
0.070	3.2923
0.080	3.1031
0.100	2.8264
0.130	2.5745
0.150	2.4591
0.170	2.3730
0.200	2.2708
0.350	2.0062
0.500	1.8935
0.800	1.7835
1.000	1.7494
1.500	1.6746
1.700	1.6548
1.900	1.6327
2.000	1.6177
2.100	1.6041
2.500	1.5644
3.000	1.5210
4.000	1.4229
5.000	1.3365
6.000	1.2523
7.000	1.1791
7.500	1.1433
8.000	1.1078
9.000	1.0480
10.00	0.9911
15.00	0.7702
18.90	0.6516

Table B.2.3.1.3-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 10 Inches of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
7.00	0.92509	0.00032	5.50	0.92346	0.00035	4.70	0.92457	0.00038
7.10	0.93032	0.00031	5.55	0.92739	0.00035	4.75	0.92906	0.00039
7.20	0.93508	0.00031	5.60	0.93008	0.00036	4.80	0.93316	0.00039
7.30	0.93930	0.00031	5.65	0.93362	0.00036	4.85	0.93720	0.00039
7.40	0.94363	0.00031	5.70	0.93769	0.00034	4.90	0.94120	0.00038
7.50	0.94754	0.00031	5.75	0.94098	0.00034	4.95	0.94542	0.00038
7.60	0.95164	0.00030	5.80	0.94387	0.00035	5.00	0.95003	0.00039
7.70	0.95613	0.00032	5.85	0.94713	0.00035	5.05	0.95367	0.00038
7.80	0.95996	0.00031	5.90	0.94992	0.00035	5.10	0.95717	0.00038
7.90	0.96399	0.00032	5.95	0.95342	0.00036	5.15	0.96088	0.00039
8.00	0.96758	0.00031	6.00	0.95627	0.00034	5.20	0.96561	0.00038
8.10	0.97133	0.00031	6.05	0.95865	0.00034	5.25	0.96952	0.00038
8.20	0.97545	0.00031	6.10	0.96296	0.00035	5.30	0.97253	0.00037
8.30	0.97880	0.00031	6.15	0.96522	0.00035	5.35	0.97659	0.00037
8.40	0.98313	0.00032	6.20	0.96878	0.00035	5.40	0.97982	0.00037
8.50	0.98583	0.00030	6.25	0.97131	0.00035	5.45	0.98358	0.00038
8.60	0.98944	0.00030	6.30	0.97435	0.00035	5.50	0.98753	0.00037
8.70	0.99255	0.00031	6.35	0.97719	0.00035	5.55	0.99084	0.00037
8.80	0.99592	0.00029	6.40	0.97986	0.00034	5.60	0.99462	0.00037
8.90	0.99924	0.00031	6.45	0.98264	0.00034	5.65	0.99824	0.00037
9.00	1.00280	0.00031	6.50	0.98588	0.00034	5.70	1.00080	0.00038
9.10	1.00523	0.00031	6.55	0.98820	0.00034	5.75	1.00529	0.00037
9.20	1.00834	0.00030	6.60	0.99071	0.00034	5.80	1.00755	0.00037
9.30	1.01155	0.00029	6.65	0.99445	0.00034	5.85	1.01134	0.00037
9.40	1.01476	0.00030	6.70	0.99610	0.00034	5.90	1.01485	0.00036
			6.75	0.99829	0.00034			
			6.80	1.00144	0.00034			
			6.85	1.00378	0.00034			
			6.90	1.00552	0.00033			
			6.95	1.00868	0.00034			
			7.00	1.01117	0.00034			
			7.05	1.01429	0.00035			
			7.10	1.01603	0.00034			

Table B.2.3.1.3-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 10 Inches of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
3.80	0.92377	0.00043	3.50	0.92054	0.00042	3.30	0.92168	0.00044
3.85	0.92923	0.00041	3.55	0.92670	0.00042	3.35	0.92898	0.00043
3.90	0.93452	0.00043	3.60	0.93244	0.00042	3.40	0.93574	0.00044
3.95	0.93976	0.00041	3.65	0.93893	0.00042	3.45	0.94151	0.00044
4.00	0.94539	0.00042	3.70	0.94429	0.00043	3.50	0.94820	0.00044
4.05	0.95092	0.00041	3.75	0.95053	0.00042	3.55	0.95393	0.00045
4.10	0.95633	0.00042	3.80	0.95643	0.00043	3.60	0.96003	0.00044
4.15	0.96093	0.00043	3.85	0.96223	0.00043	3.65	0.96566	0.00044
4.20	0.96602	0.00042	3.90	0.96809	0.00042	3.70	0.97285	0.00043
4.25	0.97111	0.00040	3.95	0.97256	0.00043	3.75	0.97805	0.00044
4.30	0.97692	0.00042	4.00	0.97781	0.00043	3.80	0.98450	0.00044
4.35	0.98111	0.00040	4.05	0.98410	0.00042	3.85	0.98996	0.00043
4.40	0.98608	0.00039	4.10	0.98871	0.00043	3.90	0.99475	0.00043
4.45	0.99092	0.00041	4.15	0.99432	0.00043	3.95	1.00069	0.00045
4.50	0.99610	0.00041	4.20	0.99896	0.00042	4.00	1.00593	0.00043
4.55	1.00068	0.00041	4.25	1.00414	0.00042	4.05	1.01206	0.00044
4.60	1.00527	0.00042	4.30	1.00898	0.00044	4.10	1.01697	0.00043
4.65	1.00907	0.00042	4.35	1.01467	0.00042			
4.70	1.01434	0.00041	4.40	1.01978	0.00043			
4.75	1.01901	0.00041						
4.80	1.02278	0.00042						

Table B.2.3.1.3-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 10 Inches of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
3.10	0.91883	0.00044	3.00	0.92445	0.00044	2.80	0.91267	0.00047
3.15	0.92512	0.00045	3.05	0.93153	0.00044	2.85	0.91964	0.00046
3.20	0.93164	0.00044	3.10	0.93845	0.00045	2.90	0.92786	0.00046
3.25	0.93977	0.00044	3.15	0.94527	0.00046	2.95	0.93486	0.00044
3.30	0.94558	0.00046	3.20	0.95308	0.00046	3.00	0.94198	0.00047
3.35	0.95269	0.00044	3.25	0.95919	0.00045	3.05	0.94959	0.00045
3.40	0.95860	0.00046	3.30	0.96590	0.00045	3.10	0.95655	0.00046
3.45	0.96463	0.00044	3.35	0.97241	0.00046	3.15	0.96303	0.00045
3.50	0.97108	0.00045	3.40	0.97900	0.00047	3.20	0.97103	0.00045
3.55	0.97690	0.00045	3.45	0.98553	0.00047	3.25	0.97705	0.00047
3.60	0.98409	0.00045	3.50	0.99280	0.00046	3.30	0.98346	0.00047
3.65	0.99057	0.00045	3.55	0.99886	0.00046	3.35	0.99051	0.00046
3.70	0.99669	0.00044	3.60	1.00479	0.00046	3.40	0.99794	0.00046
3.75	1.00189	0.00046	3.65	1.01071	0.00045	3.45	1.00355	0.00045
3.80	1.00783	0.00044	3.70	1.01696	0.00044	3.50	1.00914	0.00047
3.85	1.01334	0.00045				3.55	1.01666	0.00047
3.90	1.01852	0.00045				3.60	1.02257	0.00044

Table B.2.3.1.3-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 10 Inches of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
2.70	0.91178	0.00047	2.60	0.92390	0.00049	2.30	0.91169	0.00048
2.75	0.92017	0.00045	2.65	0.93137	0.00047	2.35	0.92079	0.00049
2.80	0.92861	0.00047	2.70	0.93935	0.00047	2.40	0.92929	0.00049
2.85	0.93537	0.00047	2.75	0.94819	0.00046	2.45	0.93887	0.00049
2.90	0.94382	0.00048	2.80	0.95478	0.00047	2.50	0.94723	0.00049
2.95	0.95090	0.00047	2.85	0.96271	0.00048	2.55	0.95576	0.00050
3.00	0.95809	0.00046	2.90	0.97026	0.00047	2.60	0.96366	0.00048
3.05	0.96518	0.00047	2.95	0.97851	0.00047	2.65	0.97090	0.00048
3.10	0.97238	0.00046	3.00	0.98519	0.00049	2.70	0.97964	0.00049
3.15	0.97941	0.00045	3.05	0.99285	0.00048	2.75	0.98767	0.00049
3.20	0.98662	0.00046	3.10	0.99955	0.00047	2.80	0.99574	0.00049
3.25	0.99411	0.00046	3.15	1.00676	0.00048	2.85	1.00381	0.00050
3.30	1.00107	0.00047	3.20	1.01408	0.00047	2.90	1.01071	0.00050
3.35	1.00648	0.00047	3.25	1.02050	0.00047	2.95	1.01811	0.00049
3.40	1.01280	0.00046	3.30	1.02865	0.00049	3.00	1.02646	0.00050
3.45	1.02030	0.00049						
3.50	1.02664	0.00047						

Table B.2.3.1.3-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 10 Inches of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
2.10	0.91643	0.00050	2.00	0.91578	0.00049	1.90	0.91302	0.00053
2.15	0.92521	0.00049	2.05	0.92573	0.00048	1.95	0.92240	0.00050
2.20	0.93478	0.00050	2.10	0.93589	0.00051	2.00	0.93151	0.00049
2.25	0.94318	0.00048	2.15	0.94469	0.00050	2.05	0.94132	0.00051
2.30	0.95336	0.00051	2.20	0.95410	0.00050	2.10	0.95051	0.00051
2.35	0.96136	0.00051	2.25	0.96246	0.00052	2.15	0.95938	0.00050
2.40	0.97074	0.00049	2.30	0.97256	0.00049	2.20	0.97014	0.00052
2.45	0.97905	0.00052	2.35	0.98113	0.00049	2.25	0.97797	0.00051
2.50	0.98776	0.00050	2.40	0.98888	0.00051	2.30	0.98770	0.00052
2.55	0.99589	0.00050	2.45	0.99843	0.00054	2.35	0.99591	0.00052
2.60	1.00427	0.00050	2.50	1.00702	0.00052	2.40	1.00481	0.00051
2.65	1.01233	0.00051	2.55	1.01549	0.00051	2.45	1.01349	0.00051
2.70	1.02039	0.00049	2.60	1.02356	0.00052	2.50	1.02124	0.00050

Table B.2.3.1.3-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 10 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
1.80	0.91114	0.00052	1.60	0.91915	0.00051	1.50	0.92223	0.00053
1.85	0.92052	0.00052	1.62	0.92327	0.00053	1.52	0.92624	0.00053
1.90	0.93092	0.00051	1.64	0.92855	0.00053	1.54	0.92983	0.00052
1.95	0.94147	0.00052	1.66	0.93157	0.00052	1.56	0.93393	0.00050
2.00	0.95011	0.00051	1.68	0.93628	0.00052	1.58	0.93895	0.00052
2.05	0.95941	0.00051	1.70	0.94036	0.00053	1.60	0.94333	0.00052
2.10	0.96938	0.00051	1.72	0.94450	0.00051	1.62	0.94769	0.00052
2.15	0.97773	0.00052	1.74	0.94839	0.00054	1.64	0.95041	0.00052
2.20	0.98745	0.00052	1.76	0.95309	0.00054	1.66	0.95461	0.00052
2.25	0.99625	0.00055	1.78	0.95708	0.00053	1.68	0.95843	0.00053
2.30	1.00527	0.00051	1.80	0.95996	0.00053	1.70	0.96319	0.00051
2.35	1.01423	0.00051	1.82	0.96330	0.00053	1.72	0.96658	0.00051
2.40	1.02285	0.00053	1.84	0.96734	0.00053	1.74	0.97026	0.00052
			1.86	0.97172	0.00052	1.76	0.97475	0.00053
			1.88	0.97580	0.00053	1.78	0.97810	0.00053
			1.90	0.97981	0.00054	1.80	0.98266	0.00053
			1.92	0.98357	0.00053	1.82	0.98528	0.00054
			1.94	0.98685	0.00054	1.84	0.98930	0.00053
			1.96	0.99120	0.00051	1.86	0.99312	0.00053
			1.98	0.99442	0.00052	1.88	0.99674	0.00051
			2.00	0.99896	0.00052	1.90	1.00158	0.00053
			2.02	1.00234	0.00053	1.92	1.00396	0.00054
			2.04	1.00571	0.00052	1.94	1.00912	0.00052
			2.06	1.00904	0.00051	1.96	1.01190	0.00051
			2.08	1.01375	0.00053	1.98	1.01553	0.00052
			2.10	1.01624	0.00051	2.00	1.01776	0.00052

Table B.2.3.1.3-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 10 Inches of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
1.40	0.92453	0.00055	1.30	0.91393	0.00050	1.20	0.90980	0.00052
1.42	0.92944	0.00054	1.35	0.92434	0.00052	1.25	0.91999	0.00051
1.44	0.93326	0.00052	1.40	0.93366	0.00054	1.30	0.92937	0.00051
1.46	0.93667	0.00051	1.45	0.94426	0.00053	1.35	0.93865	0.00052
1.48	0.94083	0.00052	1.50	0.95419	0.00052	1.40	0.94895	0.00053
1.50	0.94496	0.00053	1.55	0.96452	0.00053	1.45	0.95921	0.00051
1.52	0.95020	0.00052	1.60	0.97335	0.00055	1.50	0.96898	0.00053
1.54	0.95308	0.00052	1.65	0.98279	0.00053	1.55	0.97762	0.00050
1.56	0.95672	0.00053	1.70	0.99232	0.00053	1.60	0.98713	0.00052
1.58	0.96124	0.00051	1.75	1.00009	0.00051	1.65	0.99468	0.00054
1.60	0.96498	0.00053	1.80	1.01006	0.00053	1.70	1.00548	0.00051
1.62	0.96861	0.00054	1.85	1.01801	0.00054	1.75	1.01344	0.00052
1.64	0.97257	0.00052	1.90	1.02744	0.00054	1.80	1.02200	0.00053
1.66	0.97644	0.00053						
1.68	0.98057	0.00054						
1.70	0.98399	0.00052						
1.72	0.98727	0.00053						
1.74	0.99192	0.00054						
1.76	0.99484	0.00053						
1.78	0.99952	0.00053						
1.80	1.00228	0.00054						
1.82	1.00694	0.00052						
1.84	1.00961	0.00053						
1.86	1.01312	0.00055						
1.88	1.01658	0.00052						
1.90	1.02010	0.00054						

Table B.2.3.1.3-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 10 Inches of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
1.30	0.93535	0.00052	1.20	0.91856	0.00052	1.20	0.92160	0.00053
1.32	0.93863	0.00054	1.25	0.92940	0.00051	1.25	0.93060	0.00052
1.34	0.94197	0.00049	1.30	0.93897	0.00053	1.30	0.94151	0.00053
1.36	0.94582	0.00053	1.35	0.94900	0.00051	1.35	0.95087	0.00051
1.38	0.94944	0.00053	1.40	0.95763	0.00050	1.40	0.96004	0.00050
1.40	0.95479	0.00051	1.45	0.96733	0.00050	1.45	0.97080	0.00053
1.42	0.95796	0.00051	1.50	0.97714	0.00051	1.50	0.97806	0.00050
1.44	0.96188	0.00053	1.55	0.98576	0.00052	1.55	0.98757	0.00053
1.46	0.96513	0.00051	1.60	0.99449	0.00053	1.60	0.99671	0.00052
1.48	0.96998	0.00052	1.65	1.00292	0.00051	1.65	1.00600	0.00052
1.50	0.97212	0.00050	1.70	1.01173	0.00054	1.70	1.01456	0.00054
1.52	0.97623	0.00052	1.75	1.01991	0.00052	1.75	1.02229	0.00052
1.54	0.97980	0.00053	1.80	1.02966	0.00053	1.80	1.03098	0.00052
1.56	0.98400	0.00051						
1.58	0.98690	0.00053						
1.60	0.99127	0.00052						
1.62	0.99538	0.00051						
1.64	0.99694	0.00051						
1.66	1.00108	0.00052						
1.68	1.00539	0.00052						
1.70	1.00873	0.00052						
1.72	1.01134	0.00052						
1.74	1.01538	0.00052						
1.76	1.01841	0.00052						
1.78	1.02193	0.00053						
1.80	1.02539	0.00052						

Table B.2.3.1.3-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 10 Inches of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
1.20	0.92343	0.00051	1.10	0.91035	0.00050	1.10	0.91942	0.00051
1.22	0.92759	0.00053	1.15	0.92062	0.00053	1.15	0.92994	0.00052
1.24	0.93183	0.00053	1.20	0.93076	0.00052	1.20	0.94010	0.00052
1.26	0.93557	0.00052	1.25	0.94136	0.00052	1.25	0.94950	0.00050
1.28	0.93909	0.00051	1.30	0.95065	0.00051	1.30	0.95980	0.00049
1.30	0.94247	0.00052	1.35	0.96011	0.00051	1.35	0.96963	0.00050
1.32	0.94620	0.00050	1.40	0.96947	0.00052	1.40	0.97907	0.00049
1.34	0.95028	0.00053	1.45	0.97894	0.00053	1.45	0.98836	0.00051
1.36	0.95408	0.00052	1.50	0.98784	0.00051	1.50	0.99580	0.00049
1.38	0.95829	0.00050	1.55	0.99757	0.00050	1.55	1.00581	0.00051
1.40	0.96277	0.00051	1.60	1.00603	0.00053	1.60	1.01341	0.00050
1.42	0.96584	0.00052	1.65	1.01448	0.00051	1.65	1.02263	0.00051
1.44	0.96980	0.00051	1.70	1.02284	0.00052	1.70	1.03103	0.00052
1.46	0.97409	0.00053						
1.48	0.97678	0.00053						
1.50	0.98026	0.00053						
1.52	0.98466	0.00052						
1.54	0.98789	0.00050						
1.56	0.99163	0.00052						
1.58	0.99507	0.00053						
1.60	0.99968	0.00052						
1.62	1.00124	0.00050						
1.64	1.00623	0.00053						
1.66	1.00893	0.00051						
1.68	1.01177	0.00052						
1.70	1.01640	0.00054						

Table B.2.3.1.3-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 10 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
1.00	0.91561	0.00052	0.90	0.90891	0.00049	0.90	0.92343	0.00049
1.05	0.92580	0.00051	0.95	0.92022	0.00050	0.92	0.92841	0.00049
1.10	0.93687	0.00049	1.00	0.93095	0.00049	0.94	0.93194	0.00049
1.15	0.94857	0.00053	1.05	0.94261	0.00051	0.96	0.93769	0.00051
1.20	0.95693	0.00050	1.10	0.95339	0.00050	0.98	0.94128	0.00050
1.25	0.96720	0.00052	1.15	0.96403	0.00050	1.00	0.94700	0.00048
1.30	0.97640	0.00052	1.20	0.97311	0.00050	1.02	0.95123	0.00050
1.35	0.98619	0.00051	1.25	0.98305	0.00051	1.04	0.95551	0.00048
1.40	0.99605	0.00049	1.30	0.99444	0.00049	1.06	0.96038	0.00050
1.45	1.00466	0.00050	1.35	1.00205	0.00050	1.08	0.96352	0.00048
1.50	1.01316	0.00051	1.40	1.01199	0.00049	1.10	0.96862	0.00049
1.55	1.02287	0.00050	1.45	1.02154	0.00049	1.12	0.97260	0.00049
1.60	1.03122	0.00051	1.50	1.03054	0.00051	1.14	0.97651	0.00050
						1.16	0.98111	0.00050
						1.18	0.98531	0.00050
						1.20	0.98942	0.00049
						1.22	0.99338	0.00049
						1.24	0.99692	0.00049
						1.26	1.00191	0.00049
						1.28	1.00532	0.00049
						1.30	1.00869	0.00050
						1.32	1.01273	0.00050
						1.34	1.01781	0.00050
						1.36	1.02128	0.00051
						1.38	1.02492	0.00050
						1.40	1.02878	0.00049

Table B.2.3.1.3-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 10 Inches of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
0.80	0.91270	0.00050	0.80	0.91923	0.00047	0.80	0.92509	0.00049
0.82	0.91765	0.00048	0.82	0.92515	0.00047	0.82	0.93096	0.00050
0.84	0.92265	0.00050	0.84	0.92972	0.00049	0.84	0.93612	0.00049
0.86	0.92790	0.00049	0.86	0.93420	0.00049	0.86	0.94065	0.00048
0.88	0.93352	0.00050	0.88	0.93851	0.00049	0.88	0.94658	0.00049
0.90	0.93731	0.00048	0.90	0.94400	0.00050	0.90	0.95093	0.00048
0.92	0.94206	0.00049	0.92	0.94887	0.00049	0.92	0.95567	0.00049
0.94	0.94732	0.00048	0.94	0.95366	0.00050	0.94	0.96031	0.00049
0.96	0.95231	0.00051	0.96	0.95809	0.00048	0.96	0.96543	0.00047
0.98	0.95663	0.00049	0.98	0.96322	0.00048	0.98	0.97082	0.00049
1.00	0.96091	0.00048	1.00	0.96693	0.00050	1.00	0.97463	0.00049
1.02	0.96574	0.00049	1.02	0.97351	0.00049	1.02	0.97994	0.00048
1.04	0.97072	0.00049	1.04	0.97711	0.00048	1.04	0.98353	0.00049
1.06	0.97500	0.00049	1.06	0.98231	0.00048	1.06	0.98900	0.00049
1.08	0.97809	0.00048	1.08	0.98577	0.00051	1.08	0.99262	0.00048
1.10	0.98328	0.00047	1.10	0.99057	0.00050	1.10	0.99778	0.00048
1.12	0.98766	0.00051	1.12	0.99502	0.00050	1.12	1.00345	0.00050
1.14	0.99197	0.00049	1.14	0.99930	0.00050	1.14	1.00670	0.00049
1.16	0.99564	0.00048	1.16	1.00350	0.00050	1.16	1.01135	0.00050
1.18	1.00020	0.00050	1.18	1.00768	0.00050	1.18	1.01526	0.00048
1.20	1.00455	0.00050	1.20	1.01258	0.00048	1.20	1.01921	0.00048
1.22	1.00867	0.00049	1.22	1.01573	0.00050			
1.24	1.01292	0.00048	1.24	1.02076	0.00048			
1.26	1.01728	0.00048	1.26	1.02393	0.00048			
1.28	1.02080	0.00049	1.28	1.02919	0.00049			
1.30	1.02506	0.00050	1.30	1.03331	0.00048			

Table B.2.3.1.3-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 10 Inches of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
0.70	0.91067	0.00048	0.70	0.92198	0.00048	0.50	0.90687	0.00047
0.72	0.91676	0.00049	0.72	0.92843	0.00047	0.52	0.91442	0.00048
0.74	0.92276	0.00049	0.74	0.93407	0.00049	0.54	0.92246	0.00048
0.76	0.92710	0.00050	0.76	0.93961	0.00047	0.56	0.92984	0.00049
0.78	0.93357	0.00048	0.78	0.94538	0.00049	0.58	0.93590	0.00048
0.80	0.93871	0.00050	0.80	0.95054	0.00049	0.60	0.94340	0.00046
0.82	0.94363	0.00049	0.82	0.95647	0.00050	0.62	0.95058	0.00049
0.84	0.94859	0.00048	0.84	0.96048	0.00048	0.64	0.95798	0.00049
0.86	0.95375	0.00050	0.86	0.96642	0.00049	0.66	0.96357	0.00047
0.88	0.95918	0.00048	0.88	0.97108	0.00049	0.68	0.97067	0.00048
0.90	0.96409	0.00048	0.90	0.97679	0.00049	0.70	0.97714	0.00049
0.92	0.96891	0.00048	0.92	0.98249	0.00049	0.72	0.98332	0.00048
0.94	0.97394	0.00049	0.94	0.98879	0.00051	0.74	0.99029	0.00049
0.96	0.97938	0.00048	0.96	0.99264	0.00047	0.76	0.99616	0.00050
0.98	0.98418	0.00050	0.98	0.99731	0.00049	0.78	1.00369	0.00047
1.00	0.98962	0.00048	1.00	1.00216	0.00048	0.80	1.00835	0.00048
1.02	0.99304	0.00050	1.02	1.00708	0.00050	0.82	1.01443	0.00047
1.04	0.99778	0.00047	1.04	1.01218	0.00048	0.84	1.02089	0.00048
1.06	1.00334	0.00049	1.06	1.01686	0.00048	0.86	1.02674	0.00049
1.08	1.00724	0.00050	1.08	1.02142	0.00050	0.88	1.03224	0.00048
1.10	1.01180	0.00051	1.10	1.02580	0.00050	0.90	1.03752	0.00047
1.12	1.01681	0.00048						
1.14	1.02043	0.00050						
1.16	1.02563	0.00048						
1.18	1.03032	0.00049						
1.20	1.03502	0.00050						

Table B.2.3.1.3-2. K_{eff} Values for Uranium Slab (100% ^{235}U) - 10 Inches of Water Reflection (cont)

18900 milli-g/cc								
Height (inches)	K_{eff}	Sigma						
0.40	0.89786	0.00049						
0.42	0.90670	0.00048						
0.44	0.91570	0.00046						
0.46	0.92437	0.00047						
0.48	0.93244	0.00048						
0.50	0.94132	0.00047						
0.52	0.95000	0.00047						
0.54	0.95852	0.00046						
0.56	0.96550	0.00049						
0.58	0.97267	0.00049						
0.60	0.98129	0.00047						
0.62	0.98841	0.00047						
0.64	0.99576	0.00048						
0.66	1.00305	0.00048						
0.68	1.00942	0.00047						
0.70	1.01671	0.00047						

B.2.3.2. 93.5% ^{235}U 6.5% ^{238}U

B.2.3.2.1. Unreflected

Case ID: u5-pl-0935-00

Material: Uranium metal in water

Geometry: Infinite Plane

Isotopics: 93.5% ^{235}U 6.5% ^{238}U

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.2.3.2.1-1. ^{235}U Slab (93.5% ^{235}U) - 0 Inches of Water Reflection

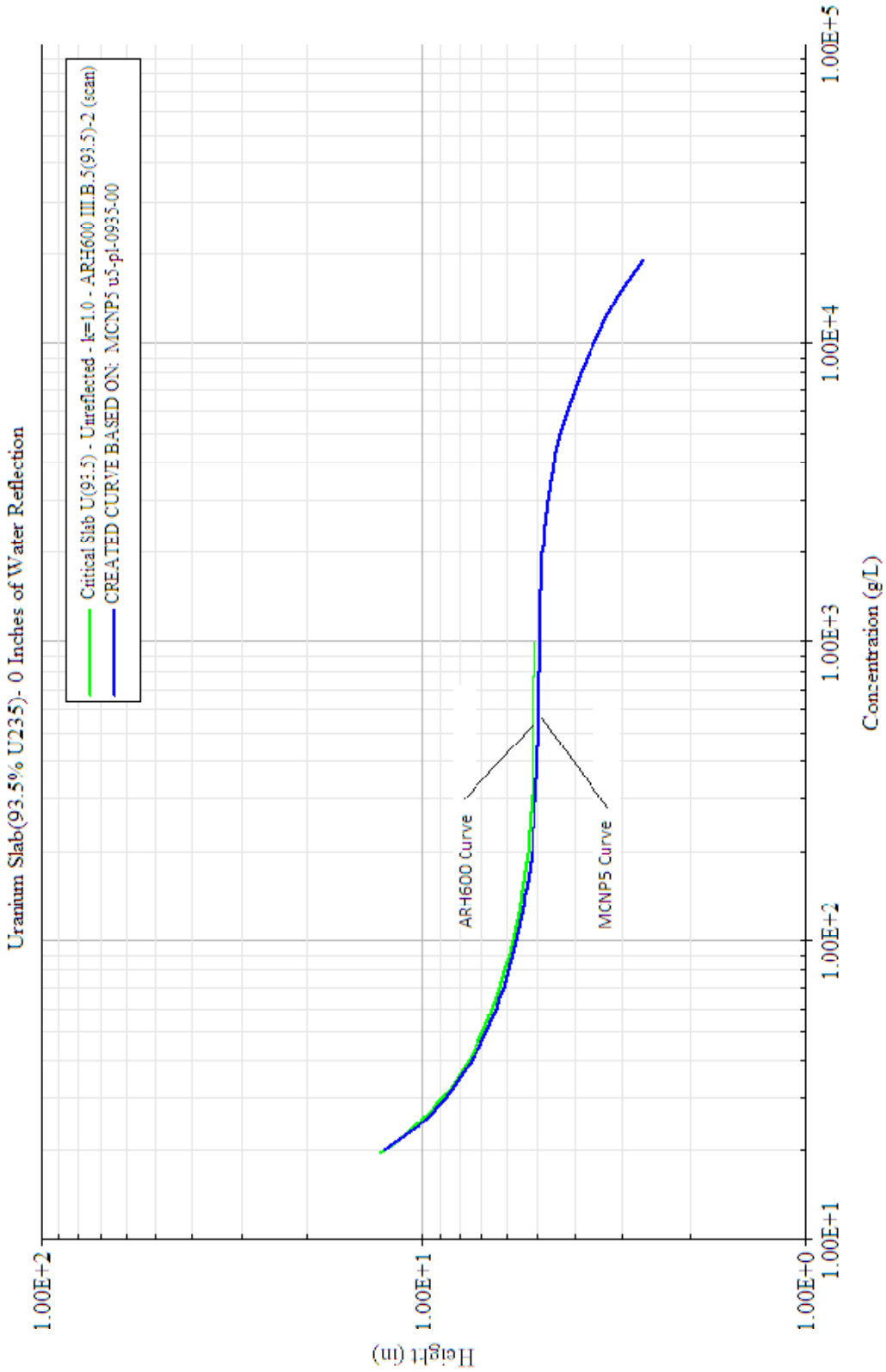

Table B.2.3.2.1-1. Critical Dimensions for ^{235}U Slab (93.5% ^{235}U) - 0 Inches of Water Reflection

^{235}U Slab (93.5% ^{235}U) - 0 Inches of Water Reflection				
Concentration (g/cc)	First Height (Inches)	Last Height (Inches)	Delta (Inches)	Critical Height (Inches)
0.020	10.200	13.200	0.100	12.5874
0.025	8.500	10.300	0.100	9.9538
0.030	7.500	9.000	0.050	8.7033
0.040	6.600	7.700	0.050	7.4476
0.045	6.300	7.300	0.050	7.0821
0.050	6.100	7.000	0.050	6.8078
0.055	5.900	6.800	0.050	6.5902
0.060	5.700	6.600	0.050	6.4102
0.065	5.600	6.500	0.050	6.2664
0.070	5.500	6.400	0.050	6.1500
0.080	5.400	6.200	0.050	5.9545
0.100	5.100	5.900	0.050	5.6871
0.130	4.900	5.700	0.050	5.4642
0.150	4.800	5.500	0.050	5.3584
0.170	4.800	5.500	0.050	5.2810
0.200	4.700	5.400	0.050	5.1948
0.350	4.500	5.200	0.050	5.0207
0.500	4.500	5.100	0.050	4.9589
0.800	4.400	5.100	0.050	4.9267
1.000	4.400	5.100	0.050	4.9123
1.500	4.400	5.100	0.050	4.8871
1.700	4.300	5.100	0.050	4.8807
1.900	4.300	5.000	0.050	4.8514
2.000	4.300	5.000	0.050	4.8424
2.100	4.300	5.000	0.050	4.8328
2.500	4.200	5.000	0.050	4.7832
3.000	4.200	4.900	0.050	4.7073
4.000	4.000	4.700	0.050	4.5365
5.000	3.900	4.500	0.050	4.3554
6.000	3.700	4.300	0.050	4.1779
7.000	3.500	4.200	0.050	4.0115
7.500	3.500	4.100	0.050	3.9290
8.000	3.400	4.000	0.050	3.8536
9.000	3.300	3.900	0.050	3.7056
10.000	3.200	3.700	0.020	3.5728
15.000	2.700	3.100	0.020	3.0201
18.900	2.300	2.800	0.020	2.6509

MCNP5 Sample Input File
93.5% ^{235}U Slab- 0 Inches of Reflection

```
u ipl, 93.5 wt% 235U, 01000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Height = 470   hundreths of inches - must be integer
c half height =     5.9690 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 01000 milli-g u/cc
c Reflector width =  0.0 inches
c Enrichment = 0.94 wt fraction 235U
c
c Density of H2O 1.00000
c Density of u 18.90000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c u238  = 238.05080
c
c Effective Uranium atomic mass 235.23935
c uranium metal
c Mass fraction of u in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0529 cc
c Volume of water in sample 0.9471 cc
c
c Mass of crit in sample   1.0000 g
c Mass of u in sample   1.0000 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9471 g
c
c Total mass of sample  1.9471g for a 1cc sample
c Mass Density for crit material  -1.9471, expressed as negative
c
c  plane
20 11   -1.947090   -1 2 -7 -5 8 6      imp:n=1
21  2  -1.000    -3 4 6 8 -7 -5 ((1 -3):(-2 4))       imp:n=0    $zero importance if no reflector
22  0            3:-4:7:5:-8:-6                       imp:n=0
```

```
1       py     5.9690              $ plane
2       py    -5.9690
3       py     5.9690         $ Reflection
4       py    -5.9690
*5       px    100
*6       px    -100
*7       pz    100
*8       pz    -100

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u metal / water mixture
m11    $ Uranium/H2O Sludge, 100.0 wt% 235U, 01000 milli-g u/cc,  1.9471
1001.66c -0.054427
8016.66c -0.431986      $from water
92235.66c -0.480204
92238.66c -0.033383
mt11     lwtr.60t
c
c    u only
m12    $ U metal, 100.0 wt% 235U, 01000 milli-g U/cc,  1.9471
92235.66c -0.480204
92238.66c -0.033383
c
```

Critview Compatible Data File
93.5% ^{235}U Slab- 0 Inches of Reflection

reset:
title: MCNP5 u5-pl-0935-00
set: MCNP5 set
source: MCNP5 primary
created: Mon 08/09/2010 10:19:39.95
geometry: infplane
modmat: H2O
critmat: uranium
isomat: U235 0.935 U238 0.065
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: height in

0.020	12.5874
0.025	9.9538
0.030	8.7033
0.040	7.4476
0.045	7.0821
0.050	6.8078
0.055	6.5902
0.060	6.4102
0.065	6.2664
0.070	6.1500
0.080	5.9545
0.100	5.6871
0.130	5.4642
0.150	5.3584
0.170	5.2810
0.200	5.1948
0.350	5.0207
0.500	4.9589
0.800	4.9267
1.000	4.9123
1.500	4.8871
1.700	4.8807
1.900	4.8514
2.000	4.8424
2.100	4.8328
2.500	4.7832
3.000	4.7073
4.000	4.5365
5.000	4.3554
6.000	4.1779
7.000	4.0115
7.500	3.9290
8.000	3.8536
9.000	3.7056
10.00	3.5728
15.00	3.0201
18.90	2.6509

Table B.2.3.2.1-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 0 Inches of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
10.20	0.92341	0.00034	8.50	0.92385	0.00039	7.50	0.91623	0.00042
10.30	0.92768	0.00033	8.60	0.92948	0.00038	7.55	0.92041	0.00042
10.40	0.93184	0.00033	8.70	0.93551	0.00038	7.60	0.92456	0.00042
10.50	0.93556	0.00033	8.80	0.94152	0.00038	7.65	0.92801	0.00041
10.60	0.93887	0.00035	8.90	0.94645	0.00037	7.70	0.93218	0.00041
10.70	0.94317	0.00033	9.00	0.95285	0.00036	7.75	0.93631	0.00041
10.80	0.94575	0.00033	9.10	0.95784	0.00037	7.80	0.93942	0.00042
10.90	0.95010	0.00033	9.20	0.96353	0.00038	7.85	0.94312	0.00042
11.00	0.95386	0.00033	9.30	0.96899	0.00037	7.90	0.94601	0.00040
11.10	0.95607	0.00032	9.40	0.97381	0.00039	7.95	0.94932	0.00041
11.20	0.96007	0.00033	9.50	0.97866	0.00038	8.00	0.95409	0.00041
11.30	0.96309	0.00033	9.60	0.98275	0.00037	8.05	0.95659	0.00042
11.40	0.96631	0.00033	9.70	0.98892	0.00037	8.10	0.96096	0.00042
11.50	0.97032	0.00032	9.80	0.99240	0.00037	8.15	0.96410	0.00042
11.60	0.97301	0.00032	9.90	0.99755	0.00038	8.20	0.96814	0.00041
11.70	0.97580	0.00032	10.00	1.00210	0.00035	8.25	0.97125	0.00041
11.80	0.97884	0.00032	10.10	1.00645	0.00036	8.30	0.97437	0.00041
11.90	0.98157	0.00031	10.20	1.01057	0.00036	8.35	0.97756	0.00040
12.00	0.98407	0.00032	10.30	1.01423	0.00036	8.40	0.98093	0.00041
12.10	0.98763	0.00031				8.45	0.98419	0.00041
12.20	0.99075	0.00031				8.50	0.98751	0.00040
12.30	0.99285	0.00032				8.55	0.99074	0.00040
12.40	0.99535	0.00032				8.60	0.99331	0.00041
12.50	0.99798	0.00032				8.65	0.99664	0.00041
12.60	1.00029	0.00030				8.70	0.99980	0.00041
12.70	1.00309	0.00031				8.75	1.00283	0.00039
12.80	1.00610	0.00032				8.80	1.00491	0.00040
12.90	1.00869	0.00031				8.85	1.00846	0.00041
13.00	1.01094	0.00030				8.90	1.01194	0.00039
13.10	1.01299	0.00030				8.95	1.01457	0.00041
13.20	1.01545	0.00031				9.00	1.01610	0.00040

Table B.2.3.2.1-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 0 Inches of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
6.60	0.92019	0.00047	6.30	0.91955	0.00048	6.10	0.92148	0.00050
6.65	0.92539	0.00047	6.35	0.92458	0.00047	6.15	0.92683	0.00049
6.70	0.93036	0.00046	6.40	0.92966	0.00048	6.20	0.93275	0.00049
6.75	0.93552	0.00045	6.45	0.93554	0.00048	6.25	0.93894	0.00049
6.80	0.94027	0.00046	6.50	0.94103	0.00049	6.30	0.94494	0.00048
6.85	0.94638	0.00046	6.55	0.94633	0.00049	6.35	0.95119	0.00049
6.90	0.94970	0.00046	6.60	0.95149	0.00048	6.40	0.95594	0.00050
6.95	0.95493	0.00045	6.65	0.95656	0.00046	6.45	0.96182	0.00049
7.00	0.95963	0.00048	6.70	0.96230	0.00047	6.50	0.96788	0.00049
7.05	0.96434	0.00048	6.75	0.96653	0.00047	6.55	0.97319	0.00048
7.10	0.96942	0.00046	6.80	0.97256	0.00047	6.60	0.97951	0.00049
7.15	0.97381	0.00046	6.85	0.97676	0.00049	6.65	0.98408	0.00049
7.20	0.97803	0.00047	6.90	0.98172	0.00048	6.70	0.98878	0.00047
7.25	0.98298	0.00046	6.95	0.98657	0.00049	6.75	0.99334	0.00048
7.30	0.98756	0.00046	7.00	0.99222	0.00048	6.80	0.99923	0.00050
7.35	0.99166	0.00046	7.05	0.99614	0.00047	6.85	1.00415	0.00048
7.40	0.99558	0.00045	7.10	1.00215	0.00048	6.90	1.00864	0.00048
7.45	1.00022	0.00046	7.15	1.00583	0.00048	6.95	1.01338	0.00049
7.50	1.00445	0.00046	7.20	1.01033	0.00048	7.00	1.01863	0.00048
7.55	1.00820	0.00045	7.25	1.01537	0.00047			
7.60	1.01238	0.00046	7.30	1.01846	0.00047			
7.65	1.01639	0.00045						
7.70	1.02060	0.00044						

Table B.2.3.2.1-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 0 Inches of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
5.90	0.91797	0.00051	5.70	0.90994	0.00052	5.60	0.91323	0.00052
5.95	0.92410	0.00049	5.75	0.91840	0.00051	5.65	0.91938	0.00051
6.00	0.93092	0.00050	5.80	0.92409	0.00050	5.70	0.92667	0.00051
6.05	0.93769	0.00050	5.85	0.93107	0.00052	5.75	0.93446	0.00052
6.10	0.94284	0.00051	5.90	0.93745	0.00051	5.80	0.94097	0.00051
6.15	0.94966	0.00052	5.95	0.94329	0.00050	5.85	0.94675	0.00052
6.20	0.95482	0.00051	6.00	0.95022	0.00051	5.90	0.95406	0.00053
6.25	0.96099	0.00051	6.05	0.95612	0.00051	5.95	0.95999	0.00053
6.30	0.96737	0.00048	6.10	0.96138	0.00052	6.00	0.96711	0.00052
6.35	0.97289	0.00048	6.15	0.96783	0.00050	6.05	0.97216	0.00051
6.40	0.97883	0.00049	6.20	0.97464	0.00050	6.10	0.97971	0.00053
6.45	0.98495	0.00051	6.25	0.98051	0.00049	6.15	0.98480	0.00052
6.50	0.98998	0.00052	6.30	0.98665	0.00052	6.20	0.99095	0.00052
6.55	0.99553	0.00049	6.35	0.99292	0.00051	6.25	0.99827	0.00053
6.60	1.00109	0.00049	6.40	0.99885	0.00050	6.30	1.00356	0.00053
6.65	1.00621	0.00050	6.45	1.00450	0.00051	6.35	1.01029	0.00051
6.70	1.01182	0.00049	6.50	1.00968	0.00052	6.40	1.01512	0.00053
6.75	1.01741	0.00049	6.55	1.01520	0.00052	6.45	1.02125	0.00053
6.80	1.02142	0.00049	6.60	1.02039	0.00051	6.50	1.02582	0.00053

Table B.2.3.2.1-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 0 Inches of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
5.50	0.91315	0.00053	5.40	0.92207	0.00054	5.10	0.90924	0.00056
5.55	0.91997	0.00054	5.45	0.92950	0.00052	5.15	0.91794	0.00054
5.60	0.92789	0.00052	5.50	0.93721	0.00053	5.20	0.92543	0.00056
5.65	0.93436	0.00053	5.55	0.94502	0.00054	5.25	0.93349	0.00055
5.70	0.94145	0.00052	5.60	0.95259	0.00053	5.30	0.94161	0.00054
5.75	0.94819	0.00052	5.65	0.95869	0.00053	5.35	0.94997	0.00055
5.80	0.95588	0.00052	5.70	0.96634	0.00054	5.40	0.95732	0.00056
5.85	0.96135	0.00052	5.75	0.97306	0.00054	5.45	0.96520	0.00056
5.90	0.96890	0.00053	5.80	0.97946	0.00052	5.50	0.97262	0.00057
5.95	0.97540	0.00054	5.85	0.98675	0.00053	5.55	0.97921	0.00055
6.00	0.98183	0.00052	5.90	0.99284	0.00056	5.60	0.98752	0.00054
6.05	0.98807	0.00053	5.95	0.99950	0.00053	5.65	0.99460	0.00057
6.10	0.99293	0.00052	6.00	1.00502	0.00054	5.70	1.00188	0.00056
6.15	1.00000	0.00053	6.05	1.01273	0.00052	5.75	1.00810	0.00056
6.20	1.00643	0.00052	6.10	1.01889	0.00054	5.80	1.01540	0.00056
6.25	1.01273	0.00054	6.15	1.02516	0.00052	5.85	1.02119	0.00056
6.30	1.01895	0.00053	6.20	1.03189	0.00055	5.90	1.02905	0.00055
6.35	1.02379	0.00052						
6.40	1.03086	0.00052						

Table B.2.3.2.1-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 0 Inches of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
4.90	0.90921	0.00055	4.80	0.90650	0.00059	4.80	0.91817	0.00059
4.95	0.91806	0.00057	4.85	0.91497	0.00056	4.85	0.92712	0.00058
5.00	0.92671	0.00056	4.90	0.92433	0.00056	4.90	0.93556	0.00057
5.05	0.93438	0.00058	4.95	0.93351	0.00059	4.95	0.94571	0.00057
5.10	0.94229	0.00059	5.00	0.94098	0.00056	5.00	0.95438	0.00060
5.15	0.95053	0.00056	5.05	0.95012	0.00057	5.05	0.96320	0.00060
5.20	0.95930	0.00056	5.10	0.95885	0.00058	5.10	0.97063	0.00058
5.25	0.96769	0.00057	5.15	0.96725	0.00058	5.15	0.97866	0.00059
5.30	0.97455	0.00056	5.20	0.97495	0.00059	5.20	0.98611	0.00059
5.35	0.98516	0.00057	5.25	0.98249	0.00058	5.25	0.99528	0.00059
5.40	0.99107	0.00058	5.30	0.99162	0.00058	5.30	1.00290	0.00058
5.45	0.99769	0.00058	5.35	0.99869	0.00058	5.35	1.01147	0.00061
5.50	1.00580	0.00059	5.40	1.00653	0.00056	5.40	1.01887	0.00060
5.55	1.01416	0.00059	5.45	1.01506	0.00060	5.45	1.02670	0.00059
5.60	1.02200	0.00057	5.50	1.02163	0.00059	5.50	1.03449	0.00060
5.65	1.02922	0.00058						
5.70	1.03599	0.00057						

Table B.2.3.2.1-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 0 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
4.70	0.91329	0.00060	4.50	0.90848	0.00060	4.50	0.91960	0.00059
4.75	0.92222	0.00061	4.55	0.91763	0.00061	4.55	0.92867	0.00059
4.80	0.93236	0.00060	4.60	0.92641	0.00058	4.60	0.93722	0.00060
4.85	0.94248	0.00060	4.65	0.93617	0.00060	4.65	0.94672	0.00060
4.90	0.95000	0.00058	4.70	0.94581	0.00061	4.70	0.95535	0.00060
4.95	0.95810	0.00057	4.75	0.95478	0.00059	4.75	0.96519	0.00059
5.00	0.96759	0.00059	4.80	0.96433	0.00059	4.80	0.97351	0.00061
5.05	0.97582	0.00059	4.85	0.97273	0.00059	4.85	0.98205	0.00059
5.10	0.98399	0.00058	4.90	0.98013	0.00061	4.90	0.98983	0.00059
5.15	0.99185	0.00060	4.95	0.98946	0.00061	4.95	0.99848	0.00060
5.20	1.00094	0.00060	5.00	0.99739	0.00059	5.00	1.00698	0.00061
5.25	1.00865	0.00058	5.05	1.00368	0.00061	5.05	1.01484	0.00059
5.30	1.01681	0.00061	5.10	1.01402	0.00059	5.10	1.02276	0.00062
5.35	1.02376	0.00058	5.15	1.02313	0.00060			
5.40	1.03196	0.00060	5.20	1.03043	0.00060			

Table B.2.3.2.1-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 0 Inches of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
4.40	0.90968	0.00059	4.40	0.91312	0.00056	4.40	0.92042	0.00055
4.45	0.91878	0.00058	4.45	0.92227	0.00059	4.45	0.92862	0.00057
4.50	0.92863	0.00058	4.50	0.92982	0.00060	4.50	0.93761	0.00059
4.55	0.93688	0.00060	4.55	0.93943	0.00055	4.55	0.94571	0.00054
4.60	0.94613	0.00059	4.60	0.94795	0.00060	4.60	0.95364	0.00055
4.65	0.95388	0.00058	4.65	0.95667	0.00058	4.65	0.96301	0.00058
4.70	0.96305	0.00060	4.70	0.96525	0.00058	4.70	0.96995	0.00057
4.75	0.97180	0.00059	4.75	0.97244	0.00059	4.75	0.97769	0.00058
4.80	0.97998	0.00058	4.80	0.98094	0.00057	4.80	0.98606	0.00058
4.85	0.98869	0.00058	4.85	0.98977	0.00058	4.85	0.99483	0.00055
4.90	0.99561	0.00060	4.90	0.99835	0.00059	4.90	1.00180	0.00058
4.95	1.00384	0.00059	4.95	1.00504	0.00057	4.95	1.00879	0.00056
5.00	1.01260	0.00059	5.00	1.01390	0.00057	5.00	1.01627	0.00055
5.05	1.02148	0.00060	5.05	1.02119	0.00058	5.05	1.02427	0.00059
5.10	1.02802	0.00060	5.10	1.02875	0.00058	5.10	1.03051	0.00057

Table B.2.3.2.1-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 0 Inches of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
4.30	0.90486	0.00058	4.30	0.90980	0.00054	4.30	0.91235	0.00055
4.35	0.91522	0.00055	4.35	0.91908	0.00055	4.35	0.92063	0.00054
4.40	0.92310	0.00055	4.40	0.92718	0.00055	4.40	0.92952	0.00056
4.45	0.93091	0.00057	4.45	0.93532	0.00054	4.45	0.93763	0.00055
4.50	0.94040	0.00059	4.50	0.94290	0.00056	4.50	0.94645	0.00053
4.55	0.94775	0.00056	4.55	0.95134	0.00057	4.55	0.95415	0.00055
4.60	0.95661	0.00057	4.60	0.95984	0.00054	4.60	0.96132	0.00056
4.65	0.96479	0.00056	4.65	0.96762	0.00055	4.65	0.96963	0.00055
4.70	0.97243	0.00055	4.70	0.97686	0.00054	4.70	0.97736	0.00057
4.75	0.98148	0.00056	4.75	0.98375	0.00056	4.75	0.98537	0.00056
4.80	0.98794	0.00056	4.80	0.99132	0.00054	4.80	0.99373	0.00056
4.85	0.99611	0.00059	4.85	0.99981	0.00056	4.85	1.00112	0.00054
4.90	1.00244	0.00055	4.90	1.00669	0.00054	4.90	1.00815	0.00054
4.95	1.01154	0.00057	4.95	1.01326	0.00055	4.95	1.01548	0.00055
5.00	1.01865	0.00057	5.00	1.02089	0.00056	5.00	1.02383	0.00056
5.05	1.02599	0.00057						
5.10	1.03262	0.00057						

Table B.2.3.2.1-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 0 Inches of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
4.30	0.91440	0.00056	4.20	0.90572	0.00054	4.20	0.91875	0.00053
4.35	0.92274	0.00053	4.25	0.91425	0.00055	4.25	0.92693	0.00054
4.40	0.93131	0.00055	4.30	0.92390	0.00055	4.30	0.93591	0.00053
4.45	0.93904	0.00055	4.35	0.93179	0.00053	4.35	0.94405	0.00053
4.50	0.94683	0.00053	4.40	0.93940	0.00054	4.40	0.95124	0.00053
4.55	0.95565	0.00054	4.45	0.94751	0.00052	4.45	0.95970	0.00055
4.60	0.96270	0.00055	4.50	0.95594	0.00054	4.50	0.96766	0.00053
4.65	0.97141	0.00055	4.55	0.96397	0.00054	4.55	0.97531	0.00051
4.70	0.97971	0.00055	4.60	0.97260	0.00055	4.60	0.98271	0.00053
4.75	0.98718	0.00053	4.65	0.97936	0.00055	4.65	0.99137	0.00052
4.80	0.99480	0.00056	4.70	0.98661	0.00054	4.70	0.99895	0.00052
4.85	1.00273	0.00055	4.75	0.99551	0.00054	4.75	1.00617	0.00053
4.90	1.00936	0.00056	4.80	1.00227	0.00054	4.80	1.01404	0.00053
4.95	1.01697	0.00055	4.85	1.01019	0.00055	4.85	1.02083	0.00053
5.00	1.02336	0.00056	4.90	1.01698	0.00053	4.90	1.02783	0.00053
			4.95	1.02377	0.00054			
			5.00	1.03019	0.00053			

Table B.2.3.2.1-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 0 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
4.00	0.91136	0.00050	3.90	0.92224	0.00049	3.70	0.91376	0.00047
4.05	0.92038	0.00053	3.95	0.93119	0.00050	3.75	0.92453	0.00048
4.10	0.92991	0.00051	4.00	0.94045	0.00048	3.80	0.93295	0.00048
4.15	0.93753	0.00052	4.05	0.94846	0.00049	3.85	0.94340	0.00047
4.20	0.94602	0.00051	4.10	0.95714	0.00048	3.90	0.95169	0.00049
4.25	0.95374	0.00052	4.15	0.96652	0.00049	3.95	0.96029	0.00048
4.30	0.96265	0.00052	4.20	0.97349	0.00048	4.00	0.96998	0.00049
4.35	0.97123	0.00051	4.25	0.98291	0.00051	4.05	0.97871	0.00048
4.40	0.97872	0.00052	4.30	0.99084	0.00050	4.10	0.98725	0.00048
4.45	0.98687	0.00049	4.35	0.99906	0.00049	4.15	0.99493	0.00050
4.50	0.99405	0.00052	4.40	1.00773	0.00050	4.20	1.00401	0.00049
4.55	1.00221	0.00052	4.45	1.01464	0.00051	4.25	1.01212	0.00047
4.60	1.00881	0.00051	4.50	1.02284	0.00051	4.30	1.02050	0.00049
4.65	1.01734	0.00051						
4.70	1.02537	0.00051						

Table B.2.3.2.1-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 0 Inches of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
3.50	0.90334	0.00045	3.50	0.91715	0.00046	3.40	0.91165	0.00045
3.55	0.91318	0.00047	3.55	0.92758	0.00045	3.45	0.92115	0.00045
3.60	0.92243	0.00047	3.60	0.93662	0.00046	3.50	0.93107	0.00044
3.65	0.93456	0.00047	3.65	0.94681	0.00047	3.55	0.94153	0.00045
3.70	0.94336	0.00047	3.70	0.95611	0.00046	3.60	0.95045	0.00046
3.75	0.95246	0.00048	3.75	0.96699	0.00046	3.65	0.96092	0.00046
3.80	0.96248	0.00047	3.80	0.97567	0.00047	3.70	0.97084	0.00046
3.85	0.97086	0.00048	3.85	0.98522	0.00046	3.75	0.98040	0.00046
3.90	0.97970	0.00048	3.90	0.99555	0.00048	3.80	0.99065	0.00048
3.95	0.98981	0.00048	3.95	1.00323	0.00048	3.85	0.99932	0.00047
4.00	0.99797	0.00047	4.00	1.01243	0.00046	3.90	1.00885	0.00046
4.05	1.00676	0.00048	4.05	1.02136	0.00048	3.95	1.01820	0.00049
4.10	1.01563	0.00049	4.10	1.03032	0.00047	4.00	1.02615	0.00047
4.15	1.02415	0.00049						
4.20	1.03268	0.00048						

Table B.2.3.2.1-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 0 Inches of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
3.30	0.91623	0.00043	3.20	0.92077	0.00043	2.70	0.92155	0.00038
3.35	0.92735	0.00045	3.22	0.92508	0.00043	2.72	0.92629	0.00038
3.40	0.93815	0.00045	3.24	0.92875	0.00043	2.74	0.93248	0.00039
3.45	0.94824	0.00044	3.26	0.93409	0.00044	2.76	0.93721	0.00039
3.50	0.95803	0.00045	3.28	0.93796	0.00044	2.78	0.94213	0.00039
3.55	0.96796	0.00047	3.30	0.94247	0.00044	2.80	0.94679	0.00039
3.60	0.97881	0.00046	3.32	0.94651	0.00042	2.82	0.95164	0.00038
3.65	0.98894	0.00045	3.34	0.95147	0.00043	2.84	0.95677	0.00039
3.70	0.99898	0.00046	3.36	0.95582	0.00045	2.86	0.96104	0.00040
3.75	1.00801	0.00047	3.38	0.95933	0.00044	2.88	0.96679	0.00040
3.80	1.01811	0.00045	3.40	0.96388	0.00043	2.90	0.97165	0.00040
3.85	1.02679	0.00046	3.42	0.96827	0.00045	2.92	0.97624	0.00040
3.90	1.03631	0.00045	3.44	0.97241	0.00044	2.94	0.98051	0.00041
			3.46	0.97622	0.00046	2.96	0.98666	0.00040
			3.48	0.98156	0.00044	2.98	0.99081	0.00040
			3.50	0.98529	0.00043	3.00	0.99593	0.00041
			3.52	0.98937	0.00046	3.02	0.99998	0.00040
			3.54	0.99376	0.00043	3.04	1.00490	0.00041
			3.56	0.99741	0.00045	3.06	1.00977	0.00041
			3.58	1.00146	0.00045	3.08	1.01436	0.00040
			3.60	1.00581	0.00045	3.10	1.01975	0.00041
			3.62	1.00955	0.00045			
			3.64	1.01269	0.00044			
			3.66	1.01665	0.00044			
			3.68	1.02172	0.00046			
			3.70	1.02441	0.00046			

Table B.2.3.2.1-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 0 Inches of Water Reflection (cont)

18900 milli-g/cc								
Height (inches)	K_{eff}	Sigma						
2.30	0.90405	0.00035						
2.32	0.90979	0.00035						
2.34	0.91602	0.00036						
2.36	0.92100	0.00036						
2.38	0.92714	0.00038						
2.40	0.93225	0.00036						
2.42	0.93778	0.00036						
2.44	0.94363	0.00036						
2.46	0.94965	0.00036						
2.48	0.95450	0.00036						
2.50	0.95997	0.00037						
2.52	0.96539	0.00037						
2.54	0.97025	0.00037						
2.56	0.97606	0.00037						
2.58	0.98143	0.00038						
2.60	0.98629	0.00038						
2.62	0.99243	0.00037						
2.64	0.99667	0.00038						
2.66	1.00280	0.00038						
2.68	1.00748	0.00039						
2.70	1.01238	0.00038						
2.72	1.01750	0.00038						
2.74	1.02269	0.00038						
2.76	1.02818	0.00039						
2.78	1.03265	0.00038						
2.80	1.03809	0.00038						

B.2.3.2.2. 1” Water Reflector

Case ID: u5-pl-0935-01

Material: Uranium metal in water

Geometry: Infinite Plane

Isotopics: 93.5% ^{235}U 6.5% ^{238}U

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.2.3.2.2-1. ^{235}U Slab (93.5% ^{235}U) - 1 Inch of Water Reflection

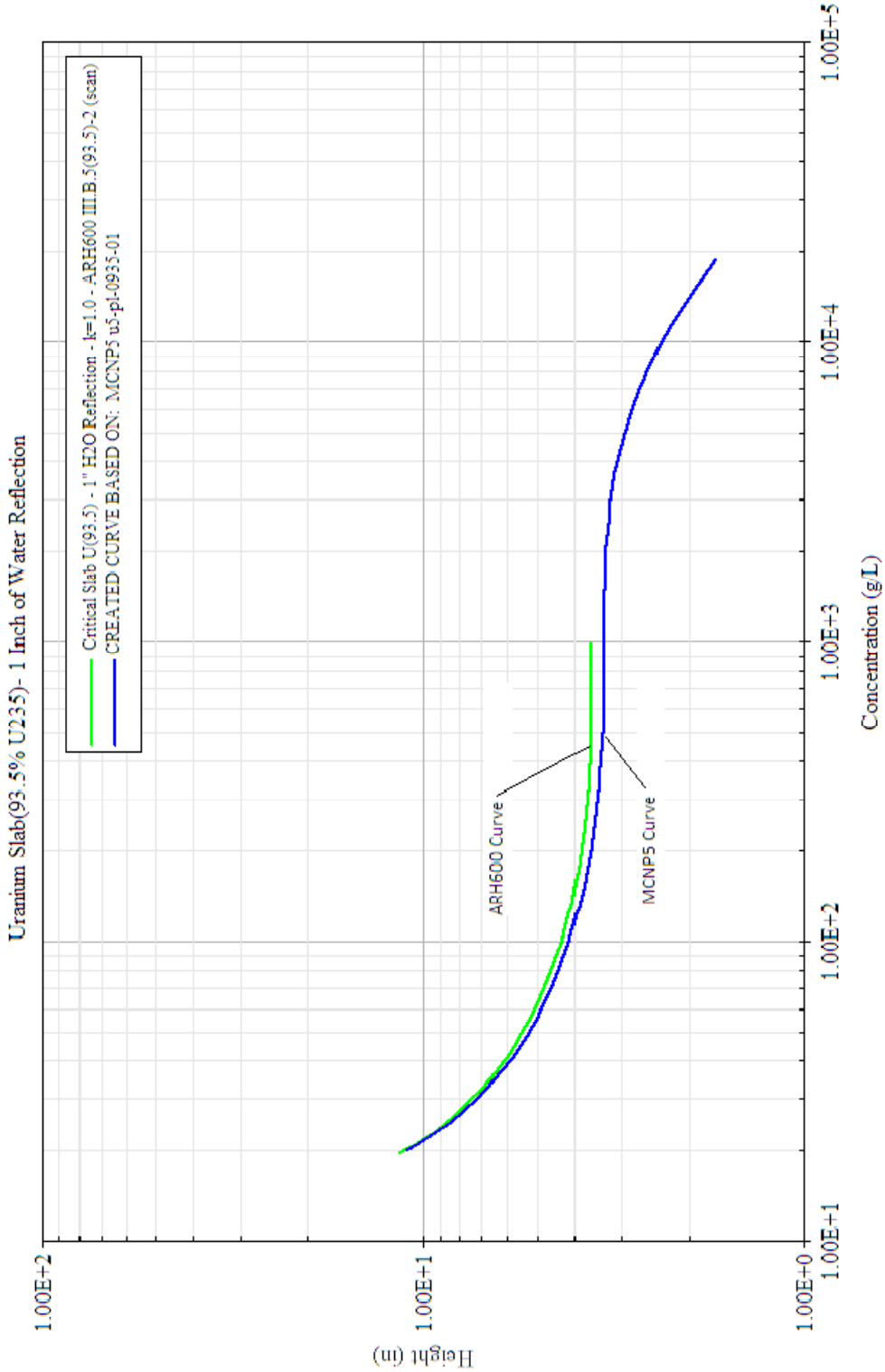

Table B.2.3.2.2-1. Critical Dimensions for ^{235}U Slab (93.5% ^{235}U) - 1 Inch of Water Reflection

^{235}U Slab (93.5% ^{235}U) - 1 Inch of Water Reflection				
Concentration (g/cc)	First Height (Inches)	Last Height (Inches)	Delta (Inches)	Critical Height (Inches)
0.020	8.700	11.600	0.100	11.0388
0.025	7.000	8.800	0.100	8.4324
0.030	6.000	7.500	0.050	7.1719
0.040	5.100	6.200	0.050	5.9227
0.045	4.800	5.800	0.050	5.5578
0.050	4.500	5.500	0.050	5.2769
0.055	4.400	5.300	0.050	5.0560
0.060	4.200	5.100	0.050	4.8851
0.065	4.100	4.900	0.050	4.7318
0.070	4.000	4.800	0.050	4.6012
0.080	3.800	4.600	0.050	4.4092
0.100	3.600	4.300	0.050	4.1417
0.130	3.400	4.100	0.050	3.9029
0.150	3.300	4.000	0.050	3.7995
0.170	3.200	3.900	0.050	3.7220
0.200	3.200	3.800	0.050	3.6326
0.350	3.000	3.600	0.050	3.4419
0.500	2.900	3.500	0.050	3.3841
0.800	2.900	3.500	0.050	3.3502
1.000	2.800	3.500	0.050	3.3463
1.500	2.800	3.500	0.050	3.3340
1.700	2.800	3.500	0.050	3.3235
1.900	2.800	3.500	0.050	3.3205
2.000	2.800	3.500	0.050	3.3103
2.100	2.800	3.500	0.050	3.3052
2.500	2.800	3.400	0.050	3.2660
3.000	2.700	3.400	0.050	3.2186
4.000	2.600	3.200	0.050	3.0879
5.000	2.500	3.100	0.050	2.9519
6.000	2.400	3.000	0.050	2.8217
7.000	2.300	2.800	0.020	2.6959
7.500	2.200	2.800	0.050	2.6354
8.000	2.100	2.700	0.050	2.5739
9.000	2.100	2.600	0.020	2.4662
10.000	2.000	2.500	0.020	2.3578
15.000	1.600	2.100	0.020	1.9459
18.900	1.400	1.800	0.020	1.6916

MCNP5 Sample Input File
93.5% ^{235}U Slab- 1 Inch of Reflection

```
u ipl, 93.5 wt% 235U, 01000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Height = 310   hundreths of inches - must be integer
c half height =     3.9370 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 01000 milli-g u/cc
c Reflector width =  1.0 inches
c Enrichment = 0.94 wt fraction 235U
c
c Density of H2O 1.00000
c Density of u 18.90000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c u238  = 238.05080
c
c Effective Uranium atomic mass 235.23935
c uranium metal
c Mass fraction of u in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0529 cc
c Volume of water in sample 0.9471 cc
c
c Mass of crit in sample   1.0000 g
c Mass of u in sample   1.0000 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9471 g
c
c Total mass of sample  1.9471g for a 1cc sample
c Mass Density for crit material  -1.9471, expressed as negative
c
c  plane
20 11   -1.947090   -1 2 -7 -5 8 6      imp:n=1
21  2  -1.000    -3 4 6 8 -7 -5 ((1 -3):(-2 4))       imp:n=1    $zero importance if no reflector
22  0            3:-4:7:5:-8:-6                    imp:n=0
```

```
1       py     3.9370              $ plane
2       py    -3.9370
3       py     6.4770         $ Reflection
4       py    -6.4770
*5       px    100
*6       px    -100
*7       pz    100
*8       pz    -100

mode n
kcode 2000 1.0 100  1500
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u metal / water mixture
m11    $ Uranium/H2O Sludge, 100.0 wt% 235U, 01000 milli-g u/cc,  1.9471
1001.66c -0.054427
8016.66c -0.431986      $from water
92235.66c -0.480204
92238.66c -0.033383
mt11     lwtr.60t
c
c    u only
m12    $ U metal, 100.0 wt% 235U, 01000 milli-g U/cc,  1.9471
92235.66c -0.480204
92238.66c -0.033383
c
```

Critview Compatible Data File
93.5% ^{235}U Slab- 1 Inch of Reflection

reset:
title: MCNP5 u5-pl-0935-01
set: MCNP5 set
source: MCNP5 primary
created: Mon 08/09/2010 10:20:36.98
geometry: infplane
modmat: H2O
critmat: uranium
isomat: U235 0.935 U238 0.065
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: height in

0.020	11.0388
0.025	8.4324
0.030	7.1719
0.040	5.9227
0.045	5.5578
0.050	5.2769
0.055	5.0560
0.060	4.8851
0.065	4.7318
0.070	4.6012
0.080	4.4092
0.100	4.1417
0.130	3.9029
0.150	3.7995
0.170	3.7220
0.200	3.6326
0.350	3.4419
0.500	3.3841
0.800	3.3502
1.000	3.3463
1.500	3.3340
1.700	3.3235
1.900	3.3205
2.000	3.3103
2.100	3.3052
2.500	3.2660
3.000	3.2186
4.000	3.0879
5.000	2.9519
6.000	2.8217
7.000	2.6959
7.500	2.6354
8.000	2.5739
9.000	2.4662
10.00	2.3578
15.00	1.9459
18.90	1.6916

Table B.2.3.2.2-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 1 Inch of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
8.70	0.92520	0.00032	7.00	0.92538	0.00037	6.00	0.91860	0.00041
8.80	0.92843	0.00033	7.10	0.93166	0.00037	6.05	0.92227	0.00040
8.90	0.93251	0.00031	7.20	0.93761	0.00036	6.10	0.92604	0.00039
9.00	0.93609	0.00032	7.30	0.94336	0.00037	6.15	0.92986	0.00042
9.10	0.94032	0.00032	7.40	0.94851	0.00036	6.20	0.93317	0.00040
9.20	0.94381	0.00032	7.50	0.95365	0.00036	6.25	0.93693	0.00039
9.30	0.94693	0.00032	7.60	0.95984	0.00037	6.30	0.94080	0.00040
9.40	0.95082	0.00032	7.70	0.96459	0.00036	6.35	0.94435	0.00040
9.50	0.95411	0.00031	7.80	0.96975	0.00035	6.40	0.94801	0.00040
9.60	0.95687	0.00031	7.90	0.97595	0.00035	6.45	0.95212	0.00039
9.70	0.96149	0.00032	8.00	0.97969	0.00037	6.50	0.95553	0.00040
9.80	0.96431	0.00031	8.10	0.98415	0.00037	6.55	0.95980	0.00039
9.90	0.96730	0.00032	8.20	0.99007	0.00036	6.60	0.96219	0.00040
10.00	0.97079	0.00031	8.30	0.99449	0.00036	6.65	0.96581	0.00040
10.10	0.97381	0.00031	8.40	0.99855	0.00036	6.70	0.96957	0.00040
10.20	0.97685	0.00031	8.50	1.00302	0.00036	6.75	0.97313	0.00039
10.30	0.97956	0.00031	8.60	1.00738	0.00036	6.80	0.97585	0.00040
10.40	0.98261	0.00031	8.70	1.01179	0.00035	6.85	0.97971	0.00041
10.50	0.98586	0.00031	8.80	1.01638	0.00034	6.90	0.98305	0.00040
10.60	0.98884	0.00031				6.95	0.98541	0.00038
10.70	0.99075	0.00032				7.00	0.98894	0.00039
10.80	0.99417	0.00031				7.05	0.99178	0.00039
10.90	0.99656	0.00030				7.10	0.99494	0.00038
11.00	0.99887	0.00031				7.15	0.99897	0.00039
11.10	1.00178	0.00030				7.20	1.00132	0.00039
11.20	1.00443	0.00029				7.25	1.00422	0.00040
11.30	1.00649	0.00030				7.30	1.00721	0.00039
11.40	1.00902	0.00029				7.35	1.01073	0.00039
11.50	1.01146	0.00030				7.40	1.01265	0.00039
11.60	1.01394	0.00030				7.45	1.01626	0.00039
						7.50	1.01928	0.00038

Table B.2.3.2.2-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
5.10	0.92312	0.00044	4.80	0.92208	0.00046	4.50	0.91321	0.00048
5.15	0.92752	0.00044	4.85	0.92760	0.00046	4.55	0.91896	0.00046
5.20	0.93348	0.00045	4.90	0.93280	0.00046	4.60	0.92446	0.00048
5.25	0.93747	0.00043	4.95	0.93901	0.00045	4.65	0.93051	0.00047
5.30	0.94386	0.00044	5.00	0.94438	0.00047	4.70	0.93707	0.00047
5.35	0.94818	0.00043	5.05	0.94954	0.00044	4.75	0.94307	0.00048
5.40	0.95323	0.00044	5.10	0.95379	0.00046	4.80	0.94980	0.00046
5.45	0.95791	0.00042	5.15	0.96061	0.00045	4.85	0.95405	0.00047
5.50	0.96196	0.00045	5.20	0.96551	0.00045	4.90	0.95991	0.00045
5.55	0.96733	0.00044	5.25	0.97026	0.00047	4.95	0.96600	0.00046
5.60	0.97174	0.00045	5.30	0.97547	0.00046	5.00	0.97071	0.00045
5.65	0.97628	0.00045	5.35	0.98080	0.00045	5.05	0.97651	0.00047
5.70	0.98157	0.00044	5.40	0.98557	0.00046	5.10	0.98227	0.00045
5.75	0.98509	0.00045	5.45	0.98987	0.00045	5.15	0.98703	0.00048
5.80	0.98924	0.00043	5.50	0.99477	0.00045	5.20	0.99314	0.00047
5.85	0.99352	0.00045	5.55	0.99912	0.00046	5.25	0.99708	0.00047
5.90	0.99798	0.00044	5.60	1.00473	0.00046	5.30	1.00251	0.00047
5.95	1.00242	0.00043	5.65	1.00909	0.00044	5.35	1.00743	0.00048
6.00	1.00603	0.00043	5.70	1.01384	0.00046	5.40	1.01284	0.00046
6.05	1.01067	0.00044	5.75	1.01835	0.00045	5.45	1.01803	0.00047
6.10	1.01472	0.00043	5.80	1.02279	0.00045	5.50	1.02281	0.00045
6.15	1.01904	0.00043						
6.20	1.02242	0.00044						

Table B.2.3.2.2-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
4.40	0.92223	0.00048	4.20	0.91472	0.00049	4.10	0.91806	0.00050
4.45	0.92910	0.00049	4.25	0.92200	0.00047	4.15	0.92419	0.00049
4.50	0.93435	0.00047	4.30	0.92803	0.00048	4.20	0.93149	0.00050
4.55	0.94130	0.00049	4.35	0.93410	0.00049	4.25	0.93812	0.00050
4.60	0.94738	0.00050	4.40	0.94123	0.00048	4.30	0.94524	0.00051
4.65	0.95396	0.00048	4.45	0.94872	0.00048	4.35	0.95218	0.00051
4.70	0.95973	0.00049	4.50	0.95449	0.00048	4.40	0.95766	0.00052
4.75	0.96586	0.00049	4.55	0.96145	0.00049	4.45	0.96405	0.00049
4.80	0.97121	0.00047	4.60	0.96700	0.00050	4.50	0.97084	0.00049
4.85	0.97712	0.00048	4.65	0.97317	0.00048	4.55	0.97727	0.00050
4.90	0.98260	0.00049	4.70	0.98060	0.00051	4.60	0.98477	0.00051
4.95	0.98823	0.00049	4.75	0.98546	0.00049	4.65	0.99124	0.00050
5.00	0.99414	0.00048	4.80	0.99111	0.00048	4.70	0.99521	0.00048
5.05	0.99939	0.00047	4.85	0.99550	0.00050	4.75	1.00275	0.00050
5.10	1.00444	0.00048	4.90	1.00191	0.00049	4.80	1.00823	0.00051
5.15	1.00963	0.00048	4.95	1.00784	0.00048	4.85	1.01495	0.00049
5.20	1.01462	0.00047	5.00	1.01330	0.00048	4.90	1.02009	0.00049
5.25	1.02082	0.00048	5.05	1.01866	0.00050			
5.30	1.02548	0.00047	5.10	1.02504	0.00049			

Table B.2.3.2.2-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
4.00	0.91785	0.00052	3.80	0.91275	0.00052	3.60	0.91564	0.00056
4.05	0.92591	0.00052	3.85	0.92034	0.00052	3.65	0.92483	0.00055
4.10	0.93262	0.00051	3.90	0.92786	0.00050	3.70	0.93268	0.00053
4.15	0.93968	0.00050	3.95	0.93466	0.00051	3.75	0.94084	0.00052
4.20	0.94666	0.00050	4.00	0.94314	0.00053	3.80	0.94855	0.00053
4.25	0.95390	0.00051	4.05	0.95052	0.00053	3.85	0.95655	0.00053
4.30	0.96046	0.00051	4.10	0.95780	0.00051	3.90	0.96434	0.00054
4.35	0.96712	0.00050	4.15	0.96481	0.00051	3.95	0.97161	0.00052
4.40	0.97395	0.00051	4.20	0.97227	0.00053	4.00	0.97900	0.00053
4.45	0.98059	0.00049	4.25	0.97886	0.00052	4.05	0.98615	0.00054
4.50	0.98578	0.00051	4.30	0.98489	0.00051	4.10	0.99440	0.00053
4.55	0.99286	0.00050	4.35	0.99201	0.00050	4.15	1.00112	0.00054
4.60	0.99985	0.00051	4.40	0.99897	0.00050	4.20	1.00786	0.00053
4.65	1.00615	0.00050	4.45	1.00457	0.00051	4.25	1.01543	0.00053
4.70	1.01099	0.00050	4.50	1.01160	0.00051	4.30	1.02300	0.00054
4.75	1.01709	0.00051	4.55	1.01741	0.00052			
4.80	1.02356	0.00051	4.60	1.02450	0.00052			

Table B.2.3.2.2-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
3.40	0.91681	0.00054	3.30	0.91515	0.00056	3.20	0.91026	0.00055
3.45	0.92555	0.00056	3.35	0.92531	0.00056	3.25	0.91924	0.00056
3.50	0.93388	0.00055	3.40	0.93457	0.00054	3.30	0.92798	0.00057
3.55	0.94301	0.00055	3.45	0.94228	0.00056	3.35	0.93630	0.00058
3.60	0.95133	0.00054	3.50	0.95141	0.00054	3.40	0.94585	0.00057
3.65	0.95929	0.00056	3.55	0.95947	0.00053	3.45	0.95396	0.00055
3.70	0.96736	0.00055	3.60	0.96747	0.00055	3.50	0.96329	0.00057
3.75	0.97582	0.00055	3.65	0.97639	0.00055	3.55	0.97131	0.00059
3.80	0.98391	0.00056	3.70	0.98331	0.00056	3.60	0.98008	0.00056
3.85	0.99085	0.00056	3.75	0.99097	0.00055	3.65	0.98890	0.00055
3.90	0.99954	0.00054	3.80	1.00010	0.00057	3.70	0.99639	0.00055
3.95	1.00740	0.00055	3.85	1.00761	0.00055	3.75	1.00461	0.00056
4.00	1.01515	0.00054	3.90	1.01557	0.00057	3.80	1.01202	0.00056
4.05	1.02276	0.00055	3.95	1.02294	0.00057	3.85	1.01967	0.00057
4.10	1.02892	0.00054	4.00	1.02991	0.00056	3.90	1.02809	0.00056

Table B.2.3.2.2-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
3.20	0.92368	0.00056	3.00	0.92053	0.00058	2.90	0.91305	0.00056
3.25	0.93321	0.00056	3.05	0.93017	0.00059	2.95	0.92328	0.00058
3.30	0.94216	0.00055	3.10	0.93883	0.00058	3.00	0.93266	0.00058
3.35	0.95117	0.00057	3.15	0.94813	0.00057	3.05	0.94106	0.00059
3.40	0.95937	0.00057	3.20	0.95671	0.00058	3.10	0.95080	0.00057
3.45	0.96843	0.00057	3.25	0.96644	0.00058	3.15	0.95971	0.00059
3.50	0.97791	0.00057	3.30	0.97520	0.00060	3.20	0.96861	0.00061
3.55	0.98709	0.00056	3.35	0.98411	0.00059	3.25	0.97872	0.00059
3.60	0.99446	0.00057	3.40	0.99286	0.00056	3.30	0.98521	0.00058
3.65	1.00297	0.00056	3.45	1.00138	0.00057	3.35	0.99451	0.00059
3.70	1.01038	0.00057	3.50	1.00982	0.00059	3.40	1.00255	0.00059
3.75	1.01851	0.00057	3.55	1.01833	0.00057	3.45	1.01159	0.00058
3.80	1.02685	0.00057	3.60	1.02584	0.00060	3.50	1.01922	0.00060

Table B.2.3.2.2-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
2.90	0.92213	0.00057	2.80	0.90628	0.00058	2.80	0.91049	0.00056
2.95	0.93181	0.00056	2.85	0.91544	0.00057	2.85	0.92104	0.00055
3.00	0.93973	0.00060	2.90	0.92486	0.00056	2.90	0.92921	0.00055
3.05	0.94909	0.00056	2.95	0.93457	0.00059	2.95	0.93658	0.00056
3.10	0.95738	0.00059	3.00	0.94190	0.00058	3.00	0.94582	0.00058
3.15	0.96624	0.00057	3.05	0.95130	0.00057	3.05	0.95491	0.00055
3.20	0.97464	0.00058	3.10	0.95910	0.00058	3.10	0.96259	0.00056
3.25	0.98369	0.00057	3.15	0.96754	0.00056	3.15	0.97127	0.00055
3.30	0.99192	0.00057	3.20	0.97674	0.00057	3.20	0.97946	0.00056
3.35	0.99997	0.00056	3.25	0.98479	0.00057	3.25	0.98733	0.00057
3.40	1.00834	0.00056	3.30	0.99321	0.00056	3.30	0.99460	0.00055
3.45	1.01590	0.00059	3.35	1.00054	0.00060	3.35	1.00255	0.00056
3.50	1.02387	0.00057	3.40	1.00822	0.00057	3.40	1.01013	0.00057
			3.45	1.01729	0.00057	3.45	1.01654	0.00054
			3.50	1.02437	0.00059	3.50	1.02462	0.00058

Table B.2.3.2.2-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
2.80	0.91372	0.00055	2.80	0.91519	0.00055	2.80	0.91675	0.00054
2.85	0.92236	0.00053	2.85	0.92465	0.00054	2.85	0.92573	0.00056
2.90	0.93103	0.00056	2.90	0.93410	0.00056	2.90	0.93340	0.00054
2.95	0.94037	0.00056	2.95	0.94113	0.00055	2.95	0.94362	0.00055
3.00	0.94760	0.00055	3.00	0.95013	0.00055	3.00	0.95150	0.00054
3.05	0.95673	0.00055	3.05	0.95898	0.00056	3.05	0.95938	0.00056
3.10	0.96429	0.00056	3.10	0.96623	0.00055	3.10	0.96740	0.00056
3.15	0.97227	0.00056	3.15	0.97461	0.00055	3.15	0.97502	0.00054
3.20	0.98024	0.00057	3.20	0.98234	0.00057	3.20	0.98367	0.00057
3.25	0.98791	0.00057	3.25	0.99048	0.00055	3.25	0.99106	0.00055
3.30	0.99662	0.00055	3.30	0.99606	0.00055	3.30	0.99820	0.00054
3.35	1.00381	0.00056	3.35	1.00568	0.00055	3.35	1.00696	0.00054
3.40	1.01158	0.00055	3.40	1.01378	0.00056	3.40	1.01298	0.00055
3.45	1.01891	0.00056	3.45	1.02036	0.00053	3.45	1.02076	0.00055
3.50	1.02626	0.00057	3.50	1.02698	0.00056	3.50	1.02792	0.00056

Table B.2.3.2.2-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
2.80	0.91879	0.00052	2.80	0.92403	0.00054	2.70	0.91546	0.00053
2.85	0.92785	0.00055	2.85	0.93339	0.00054	2.75	0.92483	0.00055
2.90	0.93566	0.00052	2.90	0.94108	0.00053	2.80	0.93369	0.00053
2.95	0.94523	0.00052	2.95	0.94996	0.00054	2.85	0.94043	0.00053
3.00	0.95185	0.00055	3.00	0.95758	0.00055	2.90	0.94984	0.00053
3.05	0.96081	0.00055	3.05	0.96598	0.00054	2.95	0.95876	0.00054
3.10	0.96849	0.00055	3.10	0.97420	0.00055	3.00	0.96666	0.00053
3.15	0.97692	0.00055	3.15	0.98146	0.00055	3.05	0.97459	0.00055
3.20	0.98472	0.00055	3.20	0.98938	0.00055	3.10	0.98066	0.00052
3.25	0.99208	0.00056	3.25	0.99736	0.00053	3.15	0.98955	0.00054
3.30	0.99914	0.00054	3.30	1.00562	0.00053	3.20	0.99711	0.00053
3.35	1.00744	0.00057	3.35	1.01104	0.00055	3.25	1.00486	0.00053
3.40	1.01517	0.00056	3.40	1.01941	0.00053	3.30	1.01227	0.00054
3.45	1.02177	0.00057				3.35	1.01992	0.00054
3.50	1.02835	0.00054				3.40	1.02715	0.00053

Table B.2.3.2.2-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
2.60	0.91719	0.00053	2.50	0.92048	0.00052	2.40	0.92283	0.00052
2.65	0.92634	0.00052	2.55	0.93011	0.00052	2.45	0.93331	0.00051
2.70	0.93598	0.00052	2.60	0.93948	0.00052	2.50	0.94280	0.00050
2.75	0.94385	0.00051	2.65	0.94898	0.00052	2.55	0.95050	0.00049
2.80	0.95295	0.00054	2.70	0.95655	0.00051	2.60	0.96089	0.00053
2.85	0.96177	0.00052	2.75	0.96525	0.00052	2.65	0.97085	0.00051
2.90	0.96854	0.00052	2.80	0.97370	0.00051	2.70	0.97821	0.00050
2.95	0.97805	0.00051	2.85	0.98295	0.00052	2.75	0.98709	0.00050
3.00	0.98527	0.00054	2.90	0.99160	0.00051	2.80	0.99545	0.00051
3.05	0.99324	0.00054	2.95	0.99973	0.00053	2.85	1.00595	0.00051
3.10	1.00215	0.00052	3.00	1.00673	0.00051	2.90	1.01338	0.00049
3.15	1.00963	0.00053	3.05	1.01484	0.00053	2.95	1.02193	0.00051
3.20	1.01738	0.00052	3.10	1.02283	0.00050	3.00	1.02960	0.00048

Table B.2.3.2.2-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
2.30	0.92520	0.00050	2.20	0.91491	0.00049	2.10	0.90431	0.00049
2.32	0.92852	0.00049	2.25	0.92561	0.00050	2.15	0.91466	0.00049
2.34	0.93334	0.00049	2.30	0.93498	0.00050	2.20	0.92543	0.00048
2.36	0.93745	0.00050	2.35	0.94535	0.00049	2.25	0.93615	0.00049
2.38	0.94082	0.00051	2.40	0.95548	0.00052	2.30	0.94632	0.00050
2.40	0.94502	0.00052	2.45	0.96552	0.00049	2.35	0.95600	0.00050
2.42	0.94914	0.00051	2.50	0.97481	0.00052	2.40	0.96599	0.00051
2.44	0.95262	0.00051	2.55	0.98383	0.00050	2.45	0.97691	0.00049
2.46	0.95637	0.00050	2.60	0.99397	0.00051	2.50	0.98571	0.00050
2.48	0.96031	0.00051	2.65	1.00248	0.00051	2.55	0.99516	0.00049
2.50	0.96486	0.00051	2.70	1.01164	0.00051	2.60	1.00529	0.00050
2.52	0.96815	0.00049	2.75	1.02055	0.00050	2.65	1.01313	0.00049
2.54	0.97261	0.00048	2.80	1.02975	0.00049	2.70	1.02274	0.00051
2.56	0.97523	0.00050						
2.58	0.97984	0.00051						
2.60	0.98268	0.00051						
2.62	0.98730	0.00050						
2.64	0.98948	0.00052						
2.66	0.99397	0.00049						
2.68	0.99687	0.00051						
2.70	1.00080	0.00049						
2.72	1.00455	0.00050						
2.74	1.00849	0.00051						
2.76	1.01195	0.00049						
2.78	1.01470	0.00052						
2.80	1.01825	0.00051						

Table B.2.3.2.2-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
2.10	0.92417	0.00049	2.00	0.92163	0.00047	1.60	0.90931	0.00047
2.12	0.92847	0.00049	2.02	0.92590	0.00047	1.62	0.91477	0.00045
2.14	0.93243	0.00048	2.04	0.93049	0.00049	1.64	0.91987	0.00045
2.16	0.93651	0.00048	2.06	0.93451	0.00048	1.66	0.92560	0.00047
2.18	0.94082	0.00049	2.08	0.93873	0.00048	1.68	0.92970	0.00046
2.20	0.94578	0.00048	2.10	0.94384	0.00050	1.70	0.93596	0.00047
2.22	0.94995	0.00049	2.12	0.94828	0.00048	1.72	0.94123	0.00049
2.24	0.95408	0.00050	2.14	0.95226	0.00049	1.74	0.94661	0.00046
2.26	0.95841	0.00051	2.16	0.95684	0.00048	1.76	0.95238	0.00046
2.28	0.96175	0.00047	2.18	0.96106	0.00049	1.78	0.95697	0.00046
2.30	0.96710	0.00047	2.20	0.96607	0.00050	1.80	0.96281	0.00047
2.32	0.97040	0.00048	2.22	0.97026	0.00048	1.82	0.96800	0.00048
2.34	0.97468	0.00050	2.24	0.97489	0.00048	1.84	0.97256	0.00047
2.36	0.97825	0.00048	2.26	0.97893	0.00048	1.86	0.97804	0.00046
2.38	0.98301	0.00048	2.28	0.98206	0.00049	1.88	0.98326	0.00046
2.40	0.98748	0.00050	2.30	0.98670	0.00049	1.90	0.98850	0.00046
2.42	0.99153	0.00048	2.32	0.99124	0.00048	1.92	0.99361	0.00048
2.44	0.99467	0.00048	2.34	0.99494	0.00048	1.94	0.99876	0.00046
2.46	0.99872	0.00050	2.36	1.00063	0.00049	1.96	1.00294	0.00047
2.48	1.00283	0.00048	2.38	1.00288	0.00049	1.98	1.00753	0.00046
2.50	1.00620	0.00050	2.40	1.00716	0.00050	2.00	1.01277	0.00048
2.52	1.01115	0.00050	2.42	1.01163	0.00050	2.02	1.01769	0.00045
2.54	1.01469	0.00049	2.44	1.01647	0.00049	2.04	1.02219	0.00047
2.56	1.01844	0.00049	2.46	1.02003	0.00049	2.06	1.02770	0.00048
2.58	1.02193	0.00048	2.48	1.02385	0.00050	2.08	1.03213	0.00048
2.60	1.02570	0.00049	2.50	1.02752	0.00049	2.10	1.03673	0.00047

Table B.2.3.2.2-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 1 Inch of Water Reflection (cont)

18900 milli-g/cc								
Height (inches)	K_{eff}	Sigma						
1.40	0.91440	0.00044						
1.42	0.92057	0.00044						
1.44	0.92589	0.00044						
1.46	0.93282	0.00042						
1.48	0.93844	0.00044						
1.50	0.94391	0.00044						
1.52	0.95055	0.00046						
1.54	0.95692	0.00045						
1.56	0.96258	0.00043						
1.58	0.96739	0.00045						
1.60	0.97375	0.00044						
1.62	0.97956	0.00046						
1.64	0.98491	0.00045						
1.66	0.99084	0.00045						
1.68	0.99703	0.00045						
1.70	1.00214	0.00046						
1.72	1.00838	0.00045						
1.74	1.01415	0.00047						
1.76	1.01862	0.00045						
1.78	1.02408	0.00046						
1.80	1.03023	0.00046						

B.2.3.2.3. 10” Water Reflector

Case ID: u5-pl-0935-10

Material: Uranium metal in water

Geometry: Infinite Plane

Isotopics: 93.5% ^{235}U 6.5% ^{238}U

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.2.3.2.3-1. ^{235}U Slab (93.5% ^{235}U) - 10 Inches of Water Reflection

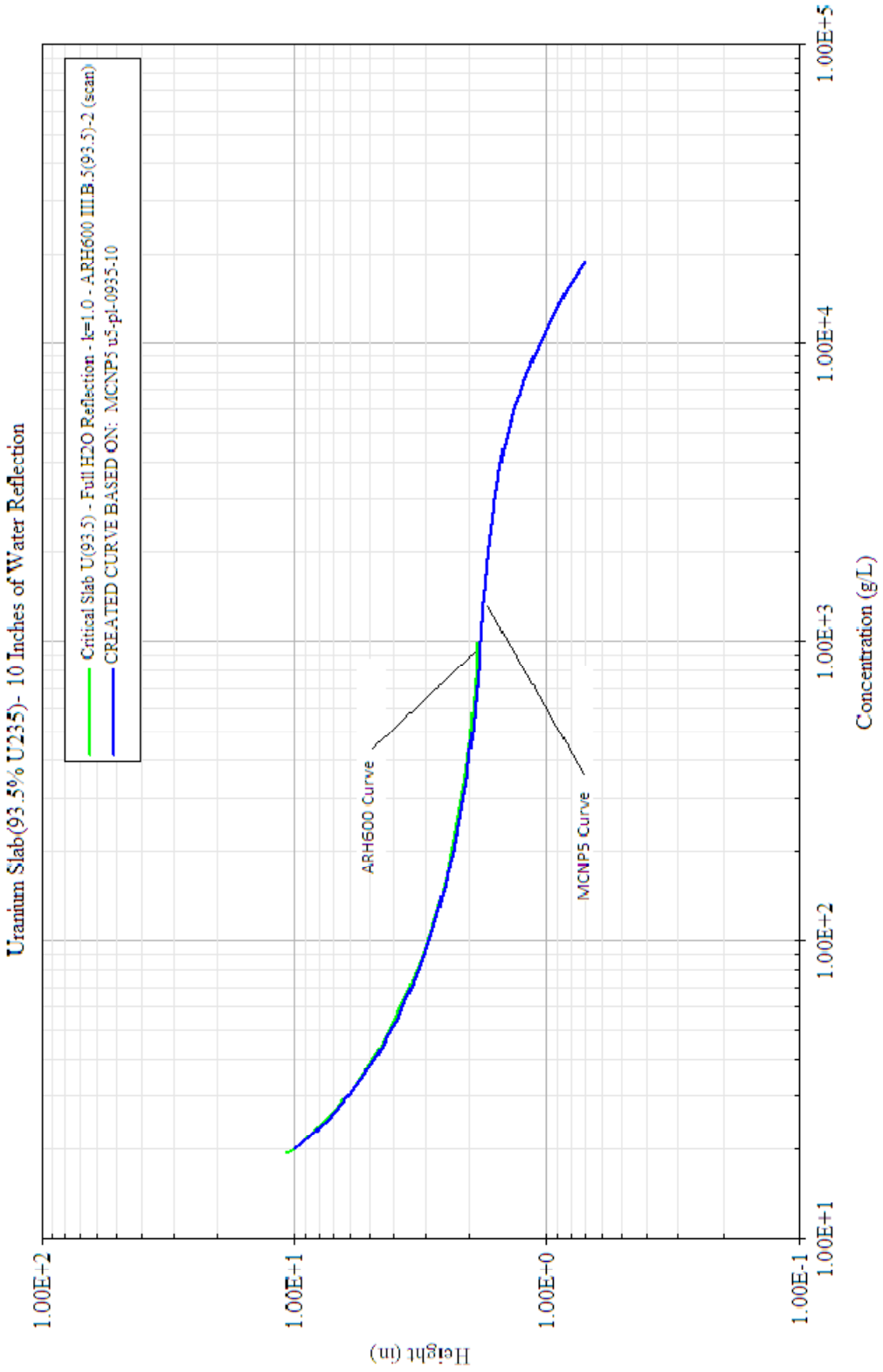

Table B.2.3.2.3-1. Critical Dimensions for ^{235}U Slab (93.5% ^{235}U) - 10 Inches of Water Reflection

^{235}U Slab (93.5% ^{235}U) - 10 Inches of Water Reflection				
Concentration (g/cc)	First Height (Inches)	Last Height (Inches)	Delta (Inches)	Critical Height (Inches)
0.020	7.600	10.500	0.100	9.9448
0.025	5.900	7.700	0.100	7.3104
0.030	5.000	6.300	0.050	6.0508
0.040	4.000	5.000	0.050	4.7788
0.045	3.700	4.600	0.050	4.4092
0.050	3.400	4.300	0.050	4.1158
0.055	3.200	4.100	0.050	3.8870
0.060	3.100	3.900	0.050	3.7069
0.065	2.900	3.700	0.050	3.5535
0.070	2.800	3.600	0.050	3.4228
0.080	2.700	3.400	0.050	3.2162
0.100	2.400	3.100	0.050	2.9187
0.130	2.200	2.800	0.050	2.6568
0.150	2.100	2.700	0.050	2.5315
0.170	2.000	2.600	0.050	2.4406
0.200	1.900	2.500	0.050	2.3311
0.350	1.600	2.200	0.050	2.0617
0.500	1.500	2.100	0.050	1.9541
0.800	1.400	2.000	0.050	1.8506
1.000	1.400	1.900	0.020	1.8220
1.500	1.300	1.900	0.050	1.7501
1.700	1.300	1.900	0.050	1.7304
1.900	1.300	1.900	0.050	1.7114
2.000	1.200	1.800	0.050	1.6980
2.100	1.200	1.800	0.050	1.6864
2.500	1.200	1.800	0.050	1.6525
3.000	1.200	1.700	0.020	1.6058
4.000	1.100	1.600	0.020	1.5124
5.000	1.000	1.600	0.050	1.4227
6.000	0.900	1.500	0.050	1.3379
7.000	0.900	1.400	0.020	1.2543
7.500	0.800	1.300	0.020	1.2240
8.000	0.800	1.300	0.020	1.1845
9.000	0.800	1.200	0.020	1.1198
10.000	0.700	1.200	0.020	1.0620
15.000	0.500	0.900	0.020	0.8312
18.900	0.500	0.800	0.020	0.7016

MCNP5 Sample Input File
93.5% ^{235}U Slab- 10 Inches of Reflection

```
u ipl, 93.5 wt% 235U, 01000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Height = 158   hundreths of inches - must be integer
c half height =     2.0066 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 01000 milli-g u/cc
c Reflector width = 10.0 inches
c Enrichment = 0.94 wt fraction 235U
c
c Density of H2O 1.00000
c Density of u 18.90000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c u238  = 238.05080
c
c Effective Uranium atomic mass 235.23935
c uranium metal
c Mass fraction of u in crit material 1.00000
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.0529 cc
c Volume of water in sample 0.9471 cc
c
c Mass of crit in sample   1.0000 g
c Mass of u in sample   1.0000 g
c Mass of bound O in sample  0.0000 g
c Mass of water in sample  0.9471 g
c
c Total mass of sample  1.9471g for a 1cc sample
c Mass Density for crit material  -1.9471, expressed as negative
c
c  plane
20 11   -1.947090   -1 2 -7 -5 8 6      imp:n=1
21  2  -1.000    -3 4 6 8 -7 -5 ((1 -3):(-2 4))       imp:n=1    $zero importance if no reflector
22  0            3:-4:7:5:-8:-6                    imp:n=0
```

```
1       py     2.0066              $ plane
2       py    -2.0066
3       py    27.4066        $ Reflection
4       py   -27.4066
*5       px    100
*6       px    -100
*7       pz    100
*8       pz    -100

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u metal / water mixture
m11    $ Uranium/H2O Sludge, 100.0 wt% 235U, 01000 milli-g u/cc,  1.9471
1001.66c -0.054427
8016.66c -0.431986      $from water
92235.66c -0.480204
92238.66c -0.033383
mt11     lwtr.60t
c
c    u only
m12    $ U metal, 100.0 wt% 235U, 01000 milli-g U/cc,  1.9471
92235.66c -0.480204
92238.66c -0.033383
c
```

Critview Compatible Data File
93.5% ^{235}U Slab- 10 Inches of Reflection

reset:
title: MCNP5 u5-pl-0935-10
set: MCNP5 set
source: MCNP5 primary
created: Mon 08/09/2010 10:20:55.62
geometry: infplane
modmat: H2O
critmat: uranium
isomat: U235 0.935 U238 0.065
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: height in

0.020	9.9448
0.025	7.3104
0.030	6.0508
0.040	4.7788
0.045	4.4092
0.050	4.1158
0.055	3.8870
0.060	3.7069
0.065	3.5535
0.070	3.4228
0.080	3.2162
0.100	2.9187
0.130	2.6568
0.150	2.5315
0.170	2.4406
0.200	2.3311
0.350	2.0617
0.500	1.9541
0.800	1.8506
1.000	1.8220
1.500	1.7501
1.700	1.7304
1.900	1.7114
2.000	1.6980
2.100	1.6864
2.500	1.6525
3.000	1.6058
4.000	1.5124
5.000	1.4227
6.000	1.3379
7.000	1.2543
7.500	1.2240
8.000	1.1845
9.000	1.1198
10.00	1.0620
15.00	0.8312
18.90	0.7016

Table B.2.3.2.3-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 10 Inches of Water Reflection

20 milli-g/cc			25 milli-g/cc			30 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
7.60	0.92367	0.00036	5.90	0.92464	0.00041	5.00	0.92611	0.00042
7.70	0.92777	0.00036	6.00	0.93124	0.00041	5.05	0.93034	0.00047
7.80	0.93256	0.00035	6.10	0.93752	0.00041	5.10	0.93322	0.00043
7.90	0.93611	0.00034	6.20	0.94253	0.00040	5.15	0.93806	0.00044
8.00	0.94012	0.00035	6.30	0.94866	0.00040	5.20	0.94181	0.00042
8.10	0.94291	0.00036	6.40	0.95374	0.00041	5.25	0.94556	0.00044
8.20	0.94698	0.00035	6.50	0.95938	0.00041	5.30	0.94955	0.00044
8.30	0.95011	0.00035	6.60	0.96545	0.00040	5.35	0.95229	0.00043
8.40	0.95465	0.00036	6.70	0.97021	0.00040	5.40	0.95592	0.00044
8.50	0.95711	0.00034	6.80	0.97569	0.00040	5.45	0.96030	0.00042
8.60	0.96096	0.00036	6.90	0.98041	0.00039	5.50	0.96339	0.00043
8.70	0.96421	0.00035	7.00	0.98576	0.00039	5.55	0.96748	0.00043
8.80	0.96733	0.00034	7.10	0.98950	0.00040	5.60	0.96997	0.00044
8.90	0.97025	0.00034	7.20	0.99441	0.00039	5.65	0.97393	0.00044
9.00	0.97419	0.00035	7.30	0.99961	0.00039	5.70	0.97692	0.00044
9.10	0.97705	0.00034	7.40	1.00336	0.00040	5.75	0.98008	0.00043
9.20	0.97959	0.00034	7.50	1.00838	0.00039	5.80	0.98401	0.00044
9.30	0.98292	0.00034	7.60	1.01240	0.00039	5.85	0.98678	0.00043
9.40	0.98487	0.00034	7.70	1.01612	0.00039	5.90	0.98984	0.00042
9.50	0.98819	0.00034				5.95	0.99225	0.00043
9.60	0.99115	0.00035				6.00	0.99655	0.00044
9.70	0.99356	0.00033				6.05	0.99995	0.00043
9.80	0.99673	0.00033				6.10	1.00290	0.00042
9.90	0.99914	0.00033				6.15	1.00568	0.00043
10.00	1.00106	0.00033				6.20	1.00979	0.00041
10.10	1.00488	0.00033				6.25	1.01185	0.00044
10.20	1.00705	0.00034				6.30	1.01502	0.00044
10.30	1.00940	0.00033						
10.40	1.01154	0.00034						
10.50	1.01374	0.00032						

Table B.2.3.2.3-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

40 milli-g/cc			45 milli-g/cc			50 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
4.00	0.92465	0.00047	3.70	0.92485	0.00050	3.40	0.91647	0.00052
4.05	0.93012	0.00048	3.75	0.93088	0.00050	3.45	0.92188	0.00050
4.10	0.93475	0.00049	3.80	0.93598	0.00051	3.50	0.92893	0.00053
4.15	0.93966	0.00048	3.85	0.94165	0.00051	3.55	0.93473	0.00051
4.20	0.94555	0.00048	3.90	0.94783	0.00050	3.60	0.94168	0.00051
4.25	0.95049	0.00049	3.95	0.95267	0.00048	3.65	0.94717	0.00050
4.30	0.95582	0.00049	4.00	0.95912	0.00051	3.70	0.95349	0.00053
4.35	0.95986	0.00047	4.05	0.96406	0.00051	3.75	0.95990	0.00052
4.40	0.96596	0.00048	4.10	0.96843	0.00049	3.80	0.96553	0.00054
4.45	0.96989	0.00050	4.15	0.97415	0.00048	3.85	0.97069	0.00052
4.50	0.97476	0.00047	4.20	0.97982	0.00049	3.90	0.97629	0.00052
4.55	0.97954	0.00047	4.25	0.98484	0.00049	3.95	0.98144	0.00051
4.60	0.98383	0.00048	4.30	0.99012	0.00047	4.00	0.98730	0.00049
4.65	0.98864	0.00048	4.35	0.99447	0.00050	4.05	0.99176	0.00052
4.70	0.99214	0.00048	4.40	0.99927	0.00049	4.10	0.99826	0.00051
4.75	0.99775	0.00047	4.45	1.00325	0.00050	4.15	1.00377	0.00051
4.80	1.00165	0.00046	4.50	1.00825	0.00051	4.20	1.00862	0.00051
4.85	1.00630	0.00048	4.55	1.01434	0.00052	4.25	1.01336	0.00051
4.90	1.01057	0.00046	4.60	1.01946	0.00048	4.30	1.01904	0.00050
4.95	1.01408	0.00048						
5.00	1.01923	0.00048						

Table B.2.3.2.3-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

55 milli-g/cc			60 milli-g/cc			65 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
3.20	0.91506	0.00053	3.10	0.92110	0.00053	2.90	0.91130	0.00054
3.25	0.91995	0.00052	3.15	0.92785	0.00053	2.95	0.91857	0.00055
3.30	0.92779	0.00052	3.20	0.93579	0.00055	3.00	0.92675	0.00055
3.35	0.93472	0.00051	3.25	0.94218	0.00055	3.05	0.93336	0.00054
3.40	0.94076	0.00051	3.30	0.94910	0.00054	3.10	0.93968	0.00055
3.45	0.94747	0.00052	3.35	0.95482	0.00053	3.15	0.94806	0.00055
3.50	0.95246	0.00052	3.40	0.96221	0.00053	3.20	0.95389	0.00055
3.55	0.95964	0.00051	3.45	0.96861	0.00053	3.25	0.96181	0.00052
3.60	0.96583	0.00051	3.50	0.97354	0.00051	3.30	0.96628	0.00055
3.65	0.97138	0.00053	3.55	0.98034	0.00052	3.35	0.97388	0.00054
3.70	0.97788	0.00052	3.60	0.98712	0.00054	3.40	0.98026	0.00054
3.75	0.98371	0.00051	3.65	0.99336	0.00052	3.45	0.98678	0.00054
3.80	0.98985	0.00054	3.70	0.99906	0.00053	3.50	0.99414	0.00052
3.85	0.99526	0.00055	3.75	1.00592	0.00057	3.55	0.99958	0.00051
3.90	1.00167	0.00053	3.80	1.01150	0.00053	3.60	1.00559	0.00054
3.95	1.00650	0.00053	3.85	1.01635	0.00055	3.65	1.01151	0.00053
4.00	1.01226	0.00055	3.90	1.02226	0.00051	3.70	1.01782	0.00055
4.05	1.01763	0.00053						
4.10	1.02208	0.00052						

Table B.2.3.2.3-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

70 milli-g/cc			80 milli-g/cc			100 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
2.80	0.91238	0.00052	2.70	0.92481	0.00055	2.40	0.91600	0.00055
2.85	0.92055	0.00054	2.75	0.93303	0.00060	2.45	0.92501	0.00059
2.90	0.92756	0.00053	2.80	0.94015	0.00054	2.50	0.93307	0.00055
2.95	0.93567	0.00053	2.85	0.94758	0.00054	2.55	0.94140	0.00058
3.00	0.94177	0.00054	2.90	0.95491	0.00055	2.60	0.94941	0.00058
3.05	0.94881	0.00054	2.95	0.96281	0.00055	2.65	0.95777	0.00058
3.10	0.95632	0.00056	3.00	0.97021	0.00056	2.70	0.96626	0.00058
3.15	0.96262	0.00055	3.05	0.97704	0.00054	2.75	0.97372	0.00056
3.20	0.97033	0.00054	3.10	0.98481	0.00057	2.80	0.98176	0.00056
3.25	0.97754	0.00052	3.15	0.99047	0.00057	2.85	0.98988	0.00057
3.30	0.98406	0.00055	3.20	0.99763	0.00057	2.90	0.99743	0.00059
3.35	0.99084	0.00055	3.25	1.00496	0.00056	2.95	1.00429	0.00058
3.40	0.99669	0.00055	3.30	1.01291	0.00054	3.00	1.01164	0.00058
3.45	1.00394	0.00054	3.35	1.01851	0.00057	3.05	1.01817	0.00057
3.50	1.00937	0.00053	3.40	1.02481	0.00056	3.10	1.02605	0.00057
3.55	1.01547	0.00055						
3.60	1.02217	0.00054						

Table B.2.3.2.3-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

130 milli-g/cc			150 milli-g/cc			170 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
2.20	0.92271	0.00059	2.10	0.92289	0.00061	2.00	0.91991	0.00060
2.25	0.93209	0.00061	2.15	0.93238	0.00061	2.05	0.93049	0.00059
2.30	0.94107	0.00061	2.20	0.94236	0.00059	2.10	0.93972	0.00060
2.35	0.94880	0.00059	2.25	0.95133	0.00058	2.15	0.94841	0.00060
2.40	0.95820	0.00058	2.30	0.95979	0.00057	2.20	0.95838	0.00061
2.45	0.96713	0.00059	2.35	0.96898	0.00062	2.25	0.96668	0.00061
2.50	0.97472	0.00058	2.40	0.97762	0.00059	2.30	0.97584	0.00061
2.55	0.98440	0.00059	2.45	0.98611	0.00060	2.35	0.98496	0.00057
2.60	0.99212	0.00060	2.50	0.99563	0.00061	2.40	0.99315	0.00061
2.65	0.99868	0.00058	2.55	1.00257	0.00060	2.45	1.00158	0.00063
2.70	1.00832	0.00057	2.60	1.01111	0.00060	2.50	1.01002	0.00061
2.75	1.01552	0.00059	2.65	1.02003	0.00060	2.55	1.01919	0.00061
2.80	1.02376	0.00063	2.70	1.02720	0.00059	2.60	1.02705	0.00061

Table B.2.3.2.3-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

200 milli-g/cc			350 milli-g/cc			500 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
1.90	0.91955	0.00062	1.60	0.91086	0.00060	1.50	0.91278	0.00063
1.95	0.92947	0.00061	1.65	0.92053	0.00062	1.55	0.92311	0.00062
2.00	0.93871	0.00060	1.70	0.92948	0.00064	1.60	0.93210	0.00063
2.05	0.94926	0.00061	1.75	0.94010	0.00062	1.65	0.94407	0.00065
2.10	0.95786	0.00062	1.80	0.95104	0.00064	1.70	0.95367	0.00061
2.15	0.96823	0.00061	1.85	0.95921	0.00060	1.75	0.96276	0.00063
2.20	0.97585	0.00063	1.90	0.96986	0.00063	1.80	0.97179	0.00062
2.25	0.98704	0.00060	1.95	0.97915	0.00060	1.85	0.98035	0.00061
2.30	0.99472	0.00059	2.00	0.98927	0.00062	1.90	0.99098	0.00062
2.35	1.00320	0.00062	2.05	0.99781	0.00064	1.95	0.99923	0.00063
2.40	1.01152	0.00058	2.10	1.00713	0.00062	2.00	1.00863	0.00064
2.45	1.02036	0.00059	2.15	1.01492	0.00062	2.05	1.01772	0.00061
2.50	1.02758	0.00063	2.20	1.02308	0.00061	2.10	1.02624	0.00063

Table B.2.3.2.3-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

800 milli-g/cc			1000 milli-g/cc			1500 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
1.40	0.91441	0.00059	1.40	0.92405	0.00061	1.30	0.91785	0.00060
1.45	0.92463	0.00061	1.42	0.92736	0.00062	1.35	0.92781	0.00060
1.50	0.93499	0.00063	1.44	0.93216	0.00063	1.40	0.93771	0.00062
1.55	0.94497	0.00063	1.46	0.93525	0.00064	1.45	0.94649	0.00060
1.60	0.95440	0.00064	1.48	0.93962	0.00060	1.50	0.95637	0.00063
1.65	0.96358	0.00065	1.50	0.94393	0.00063	1.55	0.96528	0.00060
1.70	0.97196	0.00063	1.52	0.94685	0.00060	1.60	0.97452	0.00060
1.75	0.98195	0.00062	1.54	0.94879	0.00061	1.65	0.98320	0.00062
1.80	0.99080	0.00061	1.56	0.95452	0.00062	1.70	0.99205	0.00062
1.85	0.99989	0.00061	1.58	0.95818	0.00062	1.75	0.99999	0.00061
1.90	1.00946	0.00064	1.60	0.96191	0.00061	1.80	1.00884	0.00063
1.95	1.01799	0.00062	1.62	0.96490	0.00062	1.85	1.01646	0.00062
2.00	1.02594	0.00064	1.64	0.96964	0.00063	1.90	1.02432	0.00063
			1.66	0.97308	0.00063			
			1.68	0.97678	0.00064			
			1.70	0.98084	0.00066			
			1.72	0.98424	0.00062			
			1.74	0.98738	0.00063			
			1.76	0.99045	0.00062			
			1.78	0.99496	0.00063			
			1.80	0.99846	0.00062			
			1.82	0.99952	0.00062			
			1.84	1.00430	0.00061			
			1.86	1.00854	0.00063			
			1.88	1.01137	0.00062			
			1.90	1.01549	0.00064			

Table B.2.3.2.3-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
1.30	0.92284	0.00060	1.30	0.92657	0.00062	1.20	0.90958	0.00058
1.35	0.93273	0.00059	1.35	0.93619	0.00059	1.25	0.91814	0.00059
1.40	0.94249	0.00062	1.40	0.94598	0.00060	1.30	0.92940	0.00060
1.45	0.95160	0.00059	1.45	0.95464	0.00062	1.35	0.93837	0.00063
1.50	0.96006	0.00061	1.50	0.96368	0.00062	1.40	0.94669	0.00061
1.55	0.97005	0.00058	1.55	0.97268	0.00062	1.45	0.95666	0.00060
1.60	0.97839	0.00061	1.60	0.98091	0.00060	1.50	0.96444	0.00059
1.65	0.98669	0.00060	1.65	0.98942	0.00060	1.55	0.97493	0.00061
1.70	0.99507	0.00063	1.70	0.99842	0.00059	1.60	0.98234	0.00062
1.75	1.00317	0.00060	1.75	1.00538	0.00063	1.65	0.99104	0.00061
1.80	1.01112	0.00062	1.80	1.01376	0.00062	1.70	1.00037	0.00060
1.85	1.02000	0.00061	1.85	1.02321	0.00061	1.75	1.00689	0.00063
1.90	1.02851	0.00063	1.90	1.03020	0.00059	1.80	1.01606	0.00059

Table B.2.3.2.3-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
1.20	0.91085	0.00063	1.20	0.91865	0.00061	1.20	0.92722	0.00058
1.25	0.92075	0.00062	1.25	0.92823	0.00059	1.22	0.93016	0.00059
1.30	0.93142	0.00062	1.30	0.93840	0.00060	1.24	0.93470	0.00060
1.35	0.93844	0.00060	1.35	0.94832	0.00060	1.26	0.93889	0.00058
1.40	0.94881	0.00060	1.40	0.95591	0.00062	1.28	0.94196	0.00059
1.45	0.95888	0.00062	1.45	0.96396	0.00059	1.30	0.94599	0.00060
1.50	0.96818	0.00062	1.50	0.97434	0.00061	1.32	0.95076	0.00058
1.55	0.97717	0.00062	1.55	0.98278	0.00061	1.34	0.95330	0.00062
1.60	0.98520	0.00063	1.60	0.99136	0.00060	1.36	0.95650	0.00057
1.65	0.99384	0.00061	1.65	0.99955	0.00062	1.38	0.96068	0.00060
1.70	1.00230	0.00059	1.70	1.00848	0.00059	1.40	0.96431	0.00060
1.75	1.00843	0.00063	1.75	1.01605	0.00060	1.42	0.96895	0.00059
1.80	1.01696	0.00063	1.80	1.02358	0.00061	1.44	0.97170	0.00061
						1.46	0.97433	0.00060
						1.48	0.97852	0.00060
						1.50	0.98201	0.00060
						1.52	0.98500	0.00061
						1.54	0.98827	0.00063
						1.56	0.99250	0.00060
						1.58	0.99455	0.00058
						1.60	0.99915	0.00061
						1.62	1.00208	0.00058
						1.64	1.00625	0.00064
						1.66	1.00880	0.00061
						1.68	1.01224	0.00060
						1.70	1.01426	0.00061

Table B.2.3.2.3-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
1.10	0.92288	0.00055	1.00	0.91748	0.00058	0.90	0.90987	0.00058
1.12	0.92705	0.00060	1.05	0.92866	0.00061	0.95	0.92075	0.00057
1.14	0.93048	0.00060	1.10	0.93841	0.00057	1.00	0.93101	0.00057
1.16	0.93491	0.00060	1.15	0.94903	0.00057	1.05	0.94302	0.00055
1.18	0.93961	0.00060	1.20	0.95827	0.00058	1.10	0.95292	0.00055
1.20	0.94302	0.00059	1.25	0.96809	0.00061	1.15	0.96426	0.00059
1.22	0.94786	0.00058	1.30	0.97739	0.00060	1.20	0.97433	0.00059
1.24	0.95159	0.00058	1.35	0.98705	0.00056	1.25	0.98366	0.00061
1.26	0.95623	0.00060	1.40	0.99636	0.00059	1.30	0.99325	0.00059
1.28	0.95801	0.00060	1.45	1.00438	0.00058	1.35	1.00215	0.00059
1.30	0.96187	0.00060	1.50	1.01547	0.00058	1.40	1.01129	0.00059
1.32	0.96438	0.00060	1.55	1.02210	0.00060	1.45	1.02024	0.00057
1.34	0.96927	0.00057	1.60	1.03091	0.00060	1.50	1.02971	0.00060
1.36	0.97259	0.00057						
1.38	0.97633	0.00058						
1.40	0.98002	0.00056						
1.42	0.98237	0.00061						
1.44	0.98782	0.00060						
1.46	0.99173	0.00062						
1.48	0.99447	0.00058						
1.50	0.99785	0.00061						
1.52	1.00133	0.00059						
1.54	1.00537	0.00059						
1.56	1.00776	0.00059						
1.58	1.01133	0.00059						
1.60	1.01479	0.00061						

Table B.2.3.2.3-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
0.90	0.92285	0.00060	0.80	0.90671	0.00059	0.80	0.91244	0.00059
0.92	0.92750	0.00059	0.82	0.91012	0.00058	0.82	0.91587	0.00058
0.94	0.93317	0.00057	0.84	0.91544	0.00059	0.84	0.92145	0.00056
0.96	0.93637	0.00057	0.86	0.91992	0.00057	0.86	0.92648	0.00057
0.98	0.94213	0.00058	0.88	0.92454	0.00061	0.88	0.93162	0.00058
1.00	0.94550	0.00058	0.90	0.92942	0.00057	0.90	0.93614	0.00059
1.02	0.94935	0.00059	0.92	0.93497	0.00055	0.92	0.94075	0.00059
1.04	0.95415	0.00059	0.94	0.93861	0.00060	0.94	0.94571	0.00058
1.06	0.95920	0.00056	0.96	0.94421	0.00057	0.96	0.95040	0.00058
1.08	0.96291	0.00058	0.98	0.94880	0.00056	0.98	0.95546	0.00060
1.10	0.96751	0.00059	1.00	0.95258	0.00056	1.00	0.95966	0.00060
1.12	0.97118	0.00056	1.02	0.95702	0.00054	1.02	0.96395	0.00060
1.14	0.97662	0.00058	1.04	0.96198	0.00057	1.04	0.96873	0.00055
1.16	0.98080	0.00058	1.06	0.96685	0.00059	1.06	0.97208	0.00057
1.18	0.98431	0.00057	1.08	0.96965	0.00060	1.08	0.97807	0.00058
1.20	0.98884	0.00057	1.10	0.97456	0.00060	1.10	0.98079	0.00060
1.22	0.99255	0.00058	1.12	0.97857	0.00057	1.12	0.98632	0.00059
1.24	0.99699	0.00058	1.14	0.98368	0.00060	1.14	0.99104	0.00060
1.26	1.00121	0.00058	1.16	0.98755	0.00059	1.16	0.99516	0.00057
1.28	1.00529	0.00057	1.18	0.99182	0.00058	1.18	0.99903	0.00055
1.30	1.00886	0.00057	1.20	0.99514	0.00059	1.20	1.00337	0.00058
1.32	1.01244	0.00058	1.22	0.99903	0.00060	1.22	1.00660	0.00057
1.34	1.01699	0.00057	1.24	1.00384	0.00059	1.24	1.01069	0.00059
1.36	1.02003	0.00059	1.26	1.00804	0.00059	1.26	1.01432	0.00057
1.38	1.02435	0.00059	1.28	1.01168	0.00058	1.28	1.01906	0.00056
1.40	1.02836	0.00058	1.30	1.01596	0.00056	1.30	1.02379	0.00058

Table B.2.3.2.3-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

9000 milli-g/cc			10000 milli-g/cc			15000 milli-g/cc		
Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma	Height (inches)	K_{eff}	Sigma
0.80	0.92379	0.00058	0.70	0.90869	0.00057	0.50	0.89303	0.00057
0.82	0.92836	0.00058	0.72	0.91441	0.00057	0.52	0.90035	0.00056
0.84	0.93415	0.00058	0.74	0.91966	0.00059	0.54	0.90657	0.00058
0.86	0.93887	0.00056	0.76	0.92469	0.00057	0.56	0.91438	0.00056
0.88	0.94512	0.00059	0.78	0.93057	0.00057	0.58	0.92206	0.00056
0.90	0.94791	0.00056	0.80	0.93574	0.00056	0.60	0.92880	0.00057
0.92	0.95394	0.00056	0.82	0.94142	0.00057	0.62	0.93429	0.00055
0.94	0.95786	0.00056	0.84	0.94573	0.00057	0.64	0.94148	0.00057
0.96	0.96338	0.00057	0.86	0.95097	0.00056	0.66	0.94884	0.00056
0.98	0.96756	0.00057	0.88	0.95639	0.00055	0.68	0.95468	0.00056
1.00	0.97182	0.00055	0.90	0.95992	0.00057	0.70	0.96056	0.00056
1.02	0.97756	0.00056	0.92	0.96697	0.00057	0.72	0.96666	0.00058
1.04	0.98198	0.00057	0.94	0.97099	0.00058	0.74	0.97350	0.00057
1.06	0.98635	0.00057	0.96	0.97665	0.00059	0.76	0.97916	0.00057
1.08	0.99039	0.00058	0.98	0.98108	0.00059	0.78	0.98568	0.00057
1.10	0.99478	0.00062	1.00	0.98643	0.00058	0.80	0.99165	0.00059
1.12	1.00005	0.00057	1.02	0.99001	0.00057	0.82	0.99688	0.00056
1.14	1.00491	0.00055	1.04	0.99535	0.00056	0.84	1.00244	0.00056
1.16	1.00880	0.00059	1.06	0.99942	0.00056	0.86	1.00837	0.00055
1.18	1.01285	0.00058	1.08	1.00521	0.00056	0.88	1.01365	0.00057
1.20	1.01653	0.00058	1.10	1.00886	0.00056	0.90	1.02033	0.00057
			1.12	1.01268	0.00058			
			1.14	1.01754	0.00057			
			1.16	1.02316	0.00056			
			1.18	1.02640	0.00057			
			1.20	1.03077	0.00057			

Table B.2.3.2.3-2. K_{eff} Values for ^{235}U Slab (93.5% ^{235}U) - 10 Inches of Water Reflection (cont)

18900 milli-g/cc								
Height (inches)	K_{eff}	Sigma						
0.50	0.92526	0.00056						
0.52	0.93281	0.00054						
0.54	0.94021	0.00056						
0.56	0.94962	0.00056						
0.58	0.95640	0.00056						
0.60	0.96387	0.00055						
0.62	0.97035	0.00053						
0.64	0.97826	0.00057						
0.66	0.98490	0.00055						
0.68	0.99170	0.00056						
0.70	0.99951	0.00057						
0.72	1.00577	0.00056						
0.74	1.01231	0.00056						
0.76	1.01938	0.00057						
0.78	1.02610	0.00056						
0.80	1.03078	0.00056						

B.3. Uranium Oxides in Water

B.3.1. Sphere

B.3.1.1. 6% ^{235}U 94% ^{238}U

B.3.1.1.1. Unreflected

Case ID: u5o2-sp-0060-00

Material: Uranium dioxide in water

Geometry: Sphere

Isotopics: 6% ^{235}U 94% ^{238}U

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.3.1.1.1-1. Uranium Dioxide Sphere (6.0% ^{235}U) - 0 Inches of Water Reflection

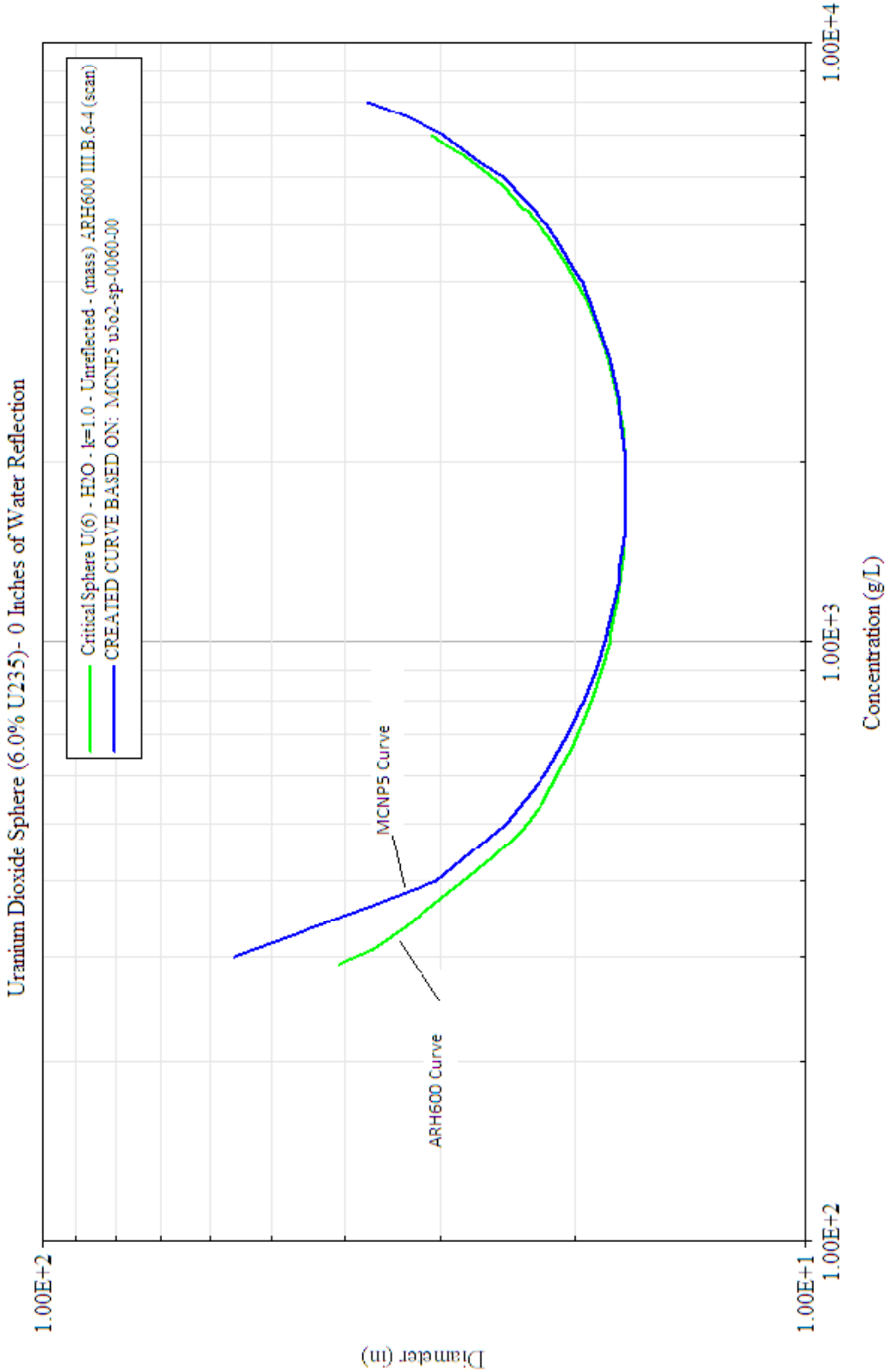

Table B.3.1.1.1-1. Critical Dimensions for Uranium Dioxide Sphere (6.0% ^{235}U) - 0 Inches of Water Reflection

Uranium Dioxide Sphere (6.0% ^{235}U) - 0 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.300	34.900	63.100	1.400	56.0097
0.400	24.300	32.200	0.400	30.3684
0.500	20.800	25.700	0.200	24.6538
0.600	19.100	23.100	0.200	21.9838
0.700	18.100	21.400	0.100	20.4572
0.800	17.300	20.100	0.100	19.4497
0.850	17.100	19.800	0.100	19.0780
0.900	16.800	19.500	0.100	18.8038
1.000	16.400	19.100	0.100	18.3052
1.250	15.800	18.400	0.100	17.5946
1.500	15.600	18.200	0.100	17.2816
1.700	15.400	18.000	0.100	17.2101
1.900	15.400	18.000	0.100	17.1752
2.000	15.400	18.000	0.100	17.1985
2.100	15.500	18.100	0.100	17.2334
2.500	15.800	18.300	0.100	17.5227
3.000	16.200	18.800	0.100	18.0506
4.000	17.500	20.200	0.100	19.5750
5.000	19.200	22.800	0.100	21.7874
6.000	21.600	25.800	0.200	24.8976
7.000	24.700	30.600	0.300	29.6771
7.500	27.300	34.400	0.300	32.8889
8.000	29.700	39.500	0.500	37.4344

MCNP5 Sample Input File
6% ^{235}U uranium dioxide sphere - 0 Inch of Reflection

```
UO2 sphere, 6.0 wt% 235U, 02500 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1700  hundreths of inches - must be integer
c radius =    21.5900 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 02500 milli-g Pu/cc
c Reflector width =  0.0 inches
c Enrichment = 0.06 wt fraction 235U
c
c Density of H2O 1.00000
c Density of UO2 11.00000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c U238  = 238.05080
c
c Effective uranium atomic mass 237.87039
c UO2
c Mass fraction of U in crit material 0.88143
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.2273 cc
c Volume of water in sample 0.7727 cc
c
c Mass of crit in sample   2.5000 g
c Mass of U in sample   2.2036 g
c Mass of bound O in sample  0.2964 g
c Mass of water in sample  0.7727 g
c
c Total mass of sample  3.2727g for a 1cc sample
c Mass Density for crit material  -3.2727, expressed as negative
c
c  sphere
20 11   -3.272727   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=0    $zero importance if no reflector
22  0            2           imp:n=0
```

```
1       so    21.5900              $ Sphere
2       so    21.5900         $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u oxide / water mixture
m11    $ UO2/H2O Sludge, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
1001.66c -0.026420
8016.66c -0.209692      $from water
8016.66c -0.090575      $from oxide
92235.66c -0.040399
92238.66c -0.632915
mt11     lwtr.60t
c
c    u oxide only
m12    $ U oxide, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
8016.66c -0.090575      $from oxide
92235.66c -0.040399
92238.66c -0.632915
c
```

reset:
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source: MCNP5 primary
created: Wed 08/11/2010 17:29:57.29
geometry: sphere
modmat: H2O
critmat: uranium dioxide
isomat: U235 0.060 U238 0.940
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.300	56.0097
0.400	30.3684
0.500	24.6538
0.600	21.9838
0.700	20.4572
0.800	19.4497
0.850	19.0780
0.900	18.8038
1.000	18.3052
1.250	17.5946
1.500	17.2816
1.700	17.2101
1.900	17.1752
2.000	17.1985
2.100	17.2334
2.500	17.5227
3.000	18.0506
4.000	19.5750
5.000	21.7874
6.000	24.8976
7.000	29.6771
7.500	32.8889
8.000	37.4344

Table B.3.1.1.1-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 0 Inches of Water Reflection

300 milli-g/cc			400 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
34.90	0.92906	0.00033	24.30	0.92660	0.00042	20.80	0.92745	0.00049
36.30	0.93743	0.00034	24.70	0.93135	0.00043	21.00	0.93126	0.00047
37.70	0.94395	0.00034	25.10	0.93883	0.00045	21.20	0.93546	0.00047
39.10	0.95142	0.00033	25.50	0.94458	0.00043	21.40	0.93796	0.00047
40.50	0.95774	0.00032	25.90	0.94875	0.00041	21.60	0.94395	0.00048
41.90	0.96354	0.00031	26.30	0.95407	0.00041	21.80	0.94816	0.00050
43.30	0.96845	0.00031	26.70	0.96004	0.00040	22.00	0.95272	0.00049
44.70	0.97311	0.00031	27.10	0.96464	0.00043	22.20	0.95609	0.00048
46.10	0.97692	0.00030	27.50	0.96950	0.00042	22.40	0.96093	0.00050
47.50	0.98195	0.00031	27.90	0.97329	0.00042	22.60	0.96325	0.00048
48.90	0.98464	0.00031	28.30	0.97820	0.00041	22.80	0.96792	0.00050
50.30	0.98875	0.00031	28.70	0.98150	0.00043	23.00	0.97174	0.00048
51.70	0.99231	0.00029	29.10	0.98700	0.00040	23.20	0.97461	0.00047
53.10	0.99337	0.00029	29.50	0.99126	0.00041	23.40	0.97979	0.00048
54.50	0.99738	0.00028	29.90	0.99502	0.00040	23.60	0.98133	0.00048
55.90	0.99979	0.00028	30.30	0.99940	0.00042	23.80	0.98608	0.00049
57.30	1.00247	0.00028	30.70	1.00291	0.00040	24.00	0.98977	0.00048
58.70	1.00497	0.00028	31.10	1.00562	0.00042	24.20	0.99262	0.00048
60.10	1.00672	0.00028	31.50	1.00973	0.00040	24.40	0.99647	0.00047
61.50	1.00912	0.00028	31.90	1.01204	0.00041	24.60	0.99943	0.00046
62.90	1.00986	0.00028	32.20	1.01510	0.00040	24.80	1.00155	0.00048
63.10	1.01111	0.00028				25.00	1.00498	0.00048
						25.20	1.00834	0.00046
						25.40	1.01132	0.00049
						25.60	1.01500	0.00047
						25.70	1.01595	0.00048

Table B.3.1.1.1-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 0 Inches of Water Reflection (cont)

600 milli-g/cc			700 milli-g/cc			800 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
19.10	0.92969	0.00054	18.10	0.93353	0.00055	17.30	0.93267	0.00058
19.30	0.93532	0.00055	18.20	0.93698	0.00057	17.40	0.93473	0.00058
19.50	0.94083	0.00054	18.30	0.93875	0.00056	17.50	0.93799	0.00057
19.70	0.94662	0.00052	18.40	0.94352	0.00056	17.60	0.94155	0.00057
19.90	0.94902	0.00054	18.50	0.94612	0.00055	17.70	0.94554	0.00060
20.10	0.95558	0.00053	18.60	0.94951	0.00057	17.80	0.94852	0.00061
20.30	0.96122	0.00053	18.70	0.95175	0.00056	17.90	0.95263	0.00057
20.50	0.96635	0.00054	18.80	0.95379	0.00053	18.00	0.95567	0.00057
20.70	0.97078	0.00053	18.90	0.95769	0.00057	18.10	0.95866	0.00059
20.90	0.97462	0.00053	19.00	0.96184	0.00056	18.20	0.96151	0.00058
21.10	0.98002	0.00053	19.10	0.96347	0.00054	18.30	0.96493	0.00059
21.30	0.98456	0.00052	19.20	0.96686	0.00056	18.40	0.96903	0.00060
21.50	0.98887	0.00052	19.30	0.96917	0.00057	18.50	0.97090	0.00058
21.70	0.99344	0.00053	19.40	0.97271	0.00055	18.60	0.97501	0.00058
21.90	0.99855	0.00051	19.50	0.97496	0.00057	18.70	0.97735	0.00059
22.10	1.00201	0.00052	19.60	0.97761	0.00054	18.80	0.97984	0.00058
22.30	1.00669	0.00050	19.70	0.97966	0.00056	18.90	0.98313	0.00056
22.50	1.00962	0.00051	19.80	0.98334	0.00056	19.00	0.98467	0.00058
22.70	1.01391	0.00053	19.90	0.98558	0.00056	19.10	0.98978	0.00058
22.90	1.01820	0.00050	20.00	0.98829	0.00054	19.20	0.99252	0.00057
23.10	1.02121	0.00052	20.10	0.99111	0.00055	19.30	0.99524	0.00058
			20.20	0.99277	0.00054	19.40	0.99768	0.00057
			20.30	0.99676	0.00054	19.50	1.00235	0.00056
			20.40	0.99793	0.00055	19.60	1.00473	0.00057
			20.50	1.00155	0.00056	19.70	1.00753	0.00057
			20.60	1.00233	0.00055	19.80	1.01011	0.00057
			20.70	1.00597	0.00056	19.90	1.01183	0.00055
			20.80	1.00888	0.00055	20.00	1.01437	0.00057
			20.90	1.01146	0.00055	20.10	1.01747	0.00059
			21.00	1.01353	0.00055			
			21.10	1.01434	0.00054			
			21.20	1.01780	0.00052			
			21.30	1.02026	0.00054			
			21.40	1.02226	0.00055			

Table B.3.1.1.1-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 0 Inches of Water Reflection (cont)

850 milli-g/cc			900 milli-g/cc			1000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.10	0.93411	0.00059	16.80	0.93269	0.00059	16.40	0.93204	0.00060
17.20	0.93919	0.00061	16.90	0.93560	0.00059	16.50	0.93574	0.00062
17.30	0.94160	0.00060	17.00	0.93964	0.00061	16.60	0.93930	0.00061
17.40	0.94444	0.00059	17.10	0.94426	0.00060	16.70	0.94317	0.00059
17.50	0.95022	0.00058	17.20	0.94823	0.00060	16.80	0.94689	0.00064
17.60	0.95066	0.00060	17.30	0.95011	0.00063	16.90	0.95101	0.00060
17.70	0.95462	0.00058	17.40	0.95452	0.00061	17.00	0.95593	0.00059
17.80	0.96067	0.00061	17.50	0.95821	0.00059	17.10	0.95788	0.00061
17.90	0.96288	0.00058	17.60	0.96163	0.00059	17.20	0.96188	0.00059
18.00	0.96624	0.00058	17.70	0.96338	0.00059	17.30	0.96545	0.00060
18.10	0.96940	0.00059	17.80	0.96774	0.00062	17.40	0.96816	0.00063
18.20	0.97183	0.00058	17.90	0.97034	0.00061	17.50	0.97291	0.00062
18.30	0.97650	0.00058	18.00	0.97469	0.00058	17.60	0.97578	0.00059
18.40	0.97824	0.00059	18.10	0.97884	0.00062	17.70	0.97967	0.00061
18.50	0.98346	0.00058	18.20	0.98146	0.00059	17.80	0.98226	0.00063
18.60	0.98530	0.00059	18.30	0.98442	0.00061	17.90	0.98762	0.00061
18.70	0.98652	0.00057	18.40	0.98684	0.00061	18.00	0.98988	0.00061
18.80	0.99112	0.00059	18.50	0.99106	0.00056	18.10	0.99182	0.00059
18.90	0.99408	0.00058	18.60	0.99467	0.00059	18.20	0.99608	0.00061
19.00	0.99670	0.00057	18.70	0.99737	0.00060	18.30	0.99980	0.00061
19.10	1.00093	0.00060	18.80	0.99988	0.00059	18.40	1.00368	0.00059
19.20	1.00293	0.00058	18.90	1.00305	0.00057	18.50	1.00610	0.00060
19.30	1.00577	0.00058	19.00	1.00549	0.00058	18.60	1.01004	0.00061
19.40	1.00906	0.00056	19.10	1.01014	0.00057	18.70	1.01297	0.00059
19.50	1.01154	0.00057	19.20	1.01228	0.00058	18.80	1.01466	0.00061
19.60	1.01458	0.00059	19.30	1.01537	0.00058	18.90	1.01939	0.00060
19.70	1.01688	0.00058	19.40	1.01752	0.00057	19.00	1.02229	0.00060
19.80	1.02009	0.00061	19.50	1.02041	0.00060	19.10	1.02484	0.00062

Table B.3.1.1.1-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 0 Inches of Water Reflection (cont)

1250 milli-g/cc			1500 milli-g/cc			1700 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
15.80	0.93052	0.00063	15.60	0.93182	0.00065	15.40	0.92620	0.00066
15.90	0.93344	0.00062	15.70	0.93658	0.00065	15.50	0.93028	0.00064
16.00	0.93713	0.00066	15.80	0.94019	0.00065	15.60	0.93385	0.00066
16.10	0.94236	0.00062	15.90	0.94491	0.00064	15.70	0.93918	0.00064
16.20	0.94558	0.00063	16.00	0.94907	0.00065	15.80	0.94401	0.00065
16.30	0.95078	0.00064	16.10	0.95396	0.00066	15.90	0.94726	0.00067
16.40	0.95455	0.00064	16.20	0.95689	0.00063	16.00	0.95089	0.00064
16.50	0.95775	0.00065	16.30	0.96245	0.00066	16.10	0.95523	0.00065
16.60	0.96213	0.00061	16.40	0.96597	0.00065	16.20	0.96094	0.00066
16.70	0.96675	0.00062	16.50	0.97111	0.00066	16.30	0.96562	0.00063
16.80	0.97140	0.00065	16.60	0.97410	0.00063	16.40	0.96947	0.00067
16.90	0.97481	0.00064	16.70	0.97783	0.00062	16.50	0.97303	0.00066
17.00	0.97881	0.00063	16.80	0.98192	0.00066	16.60	0.97766	0.00064
17.10	0.98290	0.00064	16.90	0.98632	0.00065	16.70	0.98128	0.00065
17.20	0.98549	0.00064	17.00	0.99022	0.00066	16.80	0.98644	0.00064
17.30	0.99030	0.00063	17.10	0.99217	0.00064	16.90	0.98924	0.00064
17.40	0.99218	0.00064	17.20	0.99604	0.00066	17.00	0.99407	0.00063
17.50	0.99666	0.00061	17.30	1.00089	0.00063	17.10	0.99830	0.00067
17.60	1.00019	0.00065	17.40	1.00383	0.00066	17.20	0.99952	0.00066
17.70	1.00324	0.00060	17.50	1.00779	0.00067	17.30	1.00428	0.00067
17.80	1.00575	0.00066	17.60	1.01208	0.00064	17.40	1.00732	0.00064
17.90	1.01002	0.00062	17.70	1.01498	0.00061	17.50	1.01154	0.00064
18.00	1.01354	0.00062	17.80	1.01840	0.00069	17.60	1.01586	0.00066
18.10	1.01647	0.00062	17.90	1.02306	0.00065	17.70	1.01831	0.00067
18.20	1.02072	0.00063	18.00	1.02600	0.00066	17.80	1.02154	0.00067
18.30	1.02311	0.00062	18.10	1.02871	0.00065	17.90	1.02735	0.00066
18.40	1.02677	0.00063	18.20	1.03261	0.00063	18.00	1.02925	0.00065

Table B.3.1.1.1-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 0 Inches of Water Reflection (cont)

1900 milli-g/cc			2000 milli-g/cc			2100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
15.40	0.92592	0.00067	15.40	0.92555	0.00066	15.50	0.92757	0.00071
15.50	0.93115	0.00065	15.50	0.92994	0.00067	15.60	0.93093	0.00067
15.60	0.93402	0.00067	15.60	0.93388	0.00064	15.70	0.93648	0.00067
15.70	0.93999	0.00068	15.70	0.93774	0.00065	15.80	0.94241	0.00067
15.80	0.94356	0.00065	15.80	0.94364	0.00067	15.90	0.94541	0.00064
15.90	0.94843	0.00067	15.90	0.94868	0.00066	16.00	0.94904	0.00067
16.00	0.95361	0.00070	16.00	0.95024	0.00066	16.10	0.95527	0.00065
16.10	0.95606	0.00066	16.10	0.95636	0.00065	16.20	0.95908	0.00069
16.20	0.95919	0.00067	16.20	0.95914	0.00067	16.30	0.96343	0.00066
16.30	0.96509	0.00064	16.30	0.96441	0.00067	16.40	0.96695	0.00064
16.40	0.96853	0.00066	16.40	0.96808	0.00066	16.50	0.97053	0.00066
16.50	0.97355	0.00066	16.50	0.97194	0.00067	16.60	0.97488	0.00065
16.60	0.97694	0.00066	16.60	0.97702	0.00066	16.70	0.97869	0.00067
16.70	0.97963	0.00066	16.70	0.98068	0.00065	16.80	0.98295	0.00065
16.80	0.98532	0.00066	16.80	0.98485	0.00065	16.90	0.98587	0.00067
16.90	0.98966	0.00067	16.90	0.98742	0.00069	17.00	0.99102	0.00066
17.00	0.99353	0.00066	17.00	0.99202	0.00066	17.10	0.99448	0.00065
17.10	0.99660	0.00067	17.10	0.99539	0.00064	17.20	0.99902	0.00065
17.20	1.00112	0.00066	17.20	1.00007	0.00067	17.30	1.00195	0.00067
17.30	1.00382	0.00065	17.30	1.00378	0.00067	17.40	1.00593	0.00066
17.40	1.00834	0.00068	17.40	1.00651	0.00065	17.50	1.01057	0.00066
17.50	1.01241	0.00067	17.50	1.01048	0.00067	17.60	1.01248	0.00066
17.60	1.01469	0.00065	17.60	1.01464	0.00064	17.70	1.01793	0.00066
17.70	1.01967	0.00066	17.70	1.01839	0.00066	17.80	1.02031	0.00066
17.80	1.02315	0.00067	17.80	1.02331	0.00066	17.90	1.02486	0.00068
17.90	1.02513	0.00067	17.90	1.02468	0.00065	18.00	1.02824	0.00066
18.00	1.02970	0.00065	18.00	1.02940	0.00068	18.10	1.03113	0.00066

Table B.3.1.1.1-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 0 Inches of Water Reflection (cont)

2500 milli-g/cc			3000 milli-g/cc			4000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
15.80	0.93100	0.00067	16.20	0.93100	0.00068	17.50	0.93127	0.00066
15.90	0.93563	0.00066	16.30	0.93427	0.00064	17.60	0.93422	0.00066
16.00	0.94019	0.00065	16.40	0.94053	0.00067	17.70	0.93879	0.00064
16.10	0.94321	0.00068	16.50	0.94437	0.00067	17.80	0.94318	0.00067
16.20	0.94774	0.00066	16.60	0.94725	0.00069	17.90	0.94582	0.00064
16.30	0.95250	0.00067	16.70	0.95058	0.00066	18.00	0.95029	0.00063
16.40	0.95716	0.00067	16.80	0.95451	0.00067	18.10	0.95319	0.00065
16.50	0.96198	0.00067	16.90	0.95972	0.00065	18.20	0.95659	0.00064
16.60	0.96674	0.00064	17.00	0.96313	0.00068	18.30	0.95999	0.00064
16.70	0.96868	0.00067	17.10	0.96671	0.00068	18.40	0.96425	0.00065
16.80	0.97340	0.00067	17.20	0.97058	0.00065	18.50	0.96674	0.00068
16.90	0.97859	0.00065	17.30	0.97357	0.00067	18.60	0.97027	0.00067
17.00	0.98095	0.00067	17.40	0.97709	0.00068	18.70	0.97414	0.00064
17.10	0.98438	0.00065	17.50	0.98121	0.00067	18.80	0.97740	0.00066
17.20	0.98851	0.00066	17.60	0.98536	0.00067	18.90	0.97972	0.00066
17.30	0.99280	0.00066	17.70	0.98881	0.00066	19.00	0.98329	0.00066
17.40	0.99662	0.00063	17.80	0.99357	0.00066	19.10	0.98518	0.00065
17.50	0.99907	0.00066	17.90	0.99654	0.00066	19.20	0.98955	0.00065
17.60	1.00317	0.00066	18.00	0.99782	0.00068	19.30	0.99272	0.00067
17.70	1.00756	0.00066	18.10	1.00213	0.00068	19.40	0.99699	0.00067
17.80	1.01040	0.00066	18.20	1.00622	0.00067	19.50	0.99841	0.00067
17.90	1.01416	0.00067	18.30	1.01059	0.00066	19.60	1.00053	0.00066
18.00	1.01825	0.00065	18.40	1.01430	0.00064	19.70	1.00540	0.00064
18.10	1.02021	0.00069	18.50	1.01489	0.00067	19.80	1.00761	0.00063
18.20	1.02382	0.00065	18.60	1.01983	0.00068	19.90	1.00980	0.00064
18.30	1.02854	0.00066	18.70	1.02176	0.00068	20.00	1.01349	0.00066
			18.80	1.02517	0.00067	20.10	1.01627	0.00066
						20.20	1.01727	0.00064

Table B.3.1.1.1-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 0 Inches of Water Reflection (cont)

5000 milli-g/cc			6000 milli-g/cc			7000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
19.20	0.93078	0.00060	21.60	0.92956	0.00061	24.70	0.92515	0.00057
19.30	0.93336	0.00062	21.80	0.93396	0.00061	25.00	0.92859	0.00056
19.40	0.93525	0.00065	22.00	0.93944	0.00059	25.30	0.93636	0.00054
19.50	0.93882	0.00064	22.20	0.94449	0.00059	25.60	0.94102	0.00056
19.60	0.94202	0.00063	22.40	0.94876	0.00058	25.90	0.94458	0.00054
19.70	0.94546	0.00062	22.60	0.95278	0.00057	26.20	0.95033	0.00054
19.80	0.94936	0.00065	22.80	0.95837	0.00061	26.50	0.95648	0.00057
19.90	0.94936	0.00060	23.00	0.96208	0.00059	26.80	0.95972	0.00057
20.00	0.95324	0.00062	23.20	0.96513	0.00060	27.10	0.96471	0.00055
20.10	0.95700	0.00061	23.40	0.97047	0.00058	27.40	0.96898	0.00052
20.20	0.95803	0.00062	23.60	0.97403	0.00060	27.70	0.97314	0.00055
20.30	0.96187	0.00061	23.80	0.97978	0.00060	28.00	0.97768	0.00055
20.40	0.96503	0.00063	24.00	0.98253	0.00061	28.30	0.98210	0.00053
20.50	0.96708	0.00063	24.20	0.98670	0.00058	28.60	0.98615	0.00054
20.60	0.97015	0.00059	24.40	0.99085	0.00057	28.90	0.98984	0.00056
20.70	0.97236	0.00062	24.60	0.99581	0.00060	29.20	0.99462	0.00056
20.80	0.97550	0.00064	24.80	0.99800	0.00060	29.50	0.99879	0.00053
20.90	0.97797	0.00062	25.00	1.00210	0.00061	29.80	1.00084	0.00056
21.00	0.98076	0.00062	25.20	1.00545	0.00057	30.10	1.00667	0.00057
21.10	0.98531	0.00066	25.40	1.00784	0.00058	30.40	1.01084	0.00054
21.20	0.98584	0.00061	25.60	1.01284	0.00060	30.60	1.01151	0.00054
21.30	0.98821	0.00064	25.80	1.01506	0.00058			
21.40	0.99122	0.00062						
21.50	0.99346	0.00062						
21.60	0.99508	0.00063						
21.70	0.99813	0.00063						
21.80	1.00027	0.00060						
21.90	1.00380	0.00062						
22.00	1.00632	0.00062						
22.10	1.00649	0.00062						
22.20	1.01033	0.00064						
22.30	1.01228	0.00063						
22.40	1.01553	0.00063						
22.50	1.01599	0.00062						
22.60	1.02131	0.00062						
22.70	1.02138	0.00061						
22.80	1.02450	0.00062						

Table B.3.1.1.1-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 0 Inches of Water Reflection (cont)

7500 milli-g/cc			8000 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma			
27.30	0.93063	0.00054	29.70	0.92417	0.00050			
27.60	0.93435	0.00053	30.20	0.93070	0.00049			
27.90	0.93850	0.00055	30.70	0.93624	0.00051			
28.20	0.94227	0.00053	31.20	0.94192	0.00051			
28.50	0.94688	0.00053	31.70	0.94917	0.00052			
28.80	0.95098	0.00053	32.20	0.95340	0.00052			
29.10	0.95546	0.00051	32.70	0.95798	0.00051			
29.40	0.95974	0.00051	33.20	0.96353	0.00050			
29.70	0.96258	0.00054	33.70	0.96965	0.00050			
30.00	0.96697	0.00051	34.20	0.97373	0.00050			
30.30	0.96915	0.00052	34.70	0.97772	0.00052			
30.60	0.97459	0.00053	35.20	0.98312	0.00050			
30.90	0.97785	0.00053	35.70	0.98676	0.00050			
31.20	0.97985	0.00052	36.20	0.98886	0.00051			
31.50	0.98422	0.00052	36.70	0.99429	0.00050			
31.80	0.98829	0.00054	37.20	0.99857	0.00050			
32.10	0.99159	0.00051	37.70	1.00162	0.00050			
32.40	0.99375	0.00052	38.20	1.00599	0.00048			
32.70	0.99835	0.00053	38.70	1.00841	0.00052			
33.00	1.00097	0.00054	39.20	1.01295	0.00050			
33.30	1.00295	0.00052	39.50	1.01401	0.00051			
33.60	1.00650	0.00053						
33.90	1.00891	0.00053						
34.20	1.01173	0.00052						
34.40	1.01339	0.00051						

B.3.1.1.2. 1” Water Reflector

Case ID: u5o2-sp-0060-01

Material: Uranium dioxide in water

Geometry: Sphere

Isotopics: 6% ^{235}U 94% ^{238}U

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.3.1.1.2-1. Uranium Dioxide Sphere (6.0% ^{235}U) - 1 Inch of Water Reflection

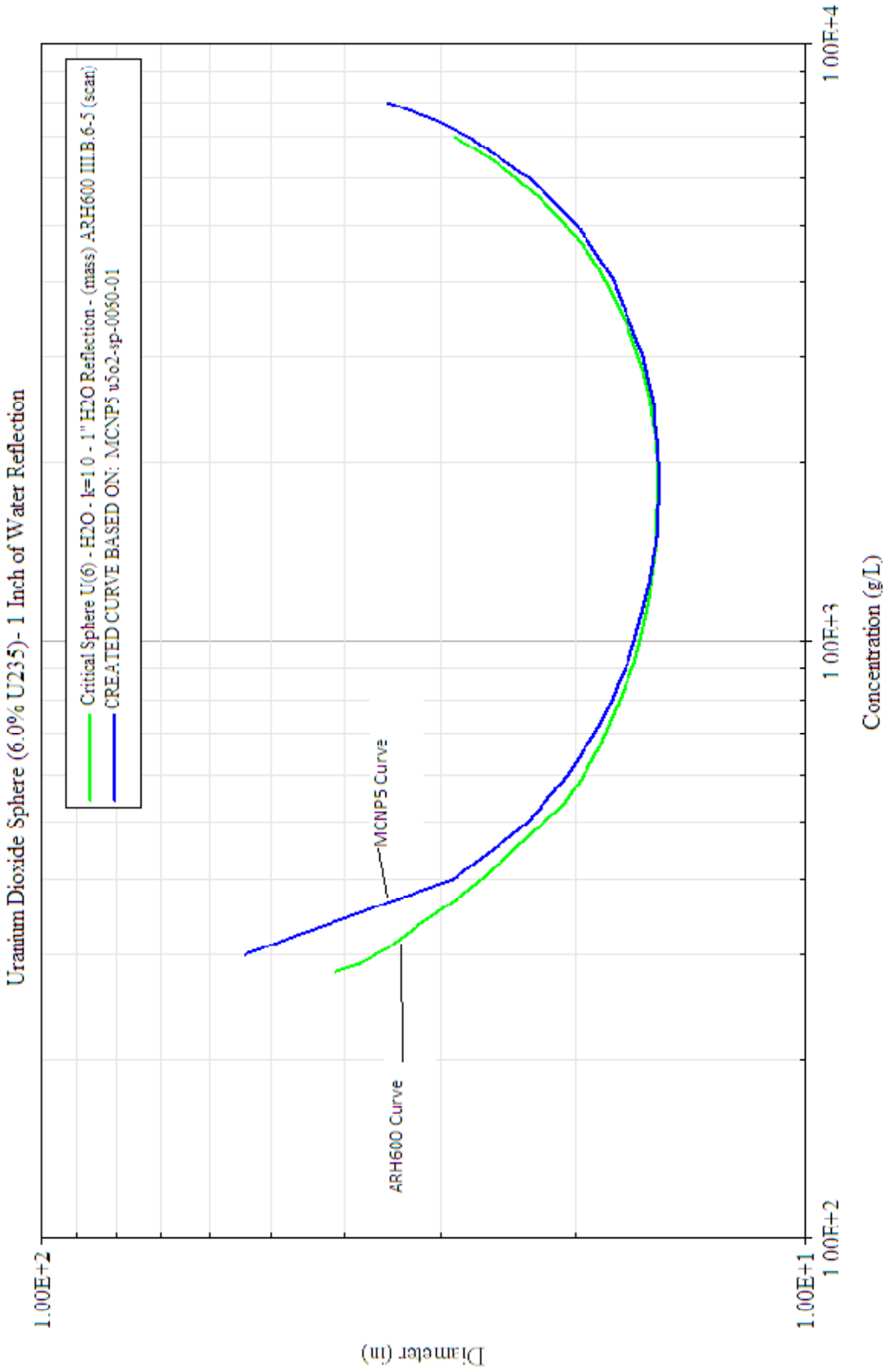

Table B.3.1.1.2-1. Critical Dimensions for Uranium Dioxide Sphere (6.0% ^{235}U) - 1 Inch of Water Reflection

Uranium Dioxide Sphere (6.0% ^{235}U) - 1 Inch of Water Reflection				
Concentrations (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.300	33.300	61.400	1.400	54.2574
0.400	23.000	30.300	0.300	28.8850
0.500	19.300	24.200	0.200	23.0921
0.600	17.600	21.300	0.100	20.4177
0.700	16.400	19.700	0.100	18.9050
0.800	15.600	18.800	0.100	17.8909
0.850	15.200	18.500	0.100	17.5373
0.900	14.900	18.000	0.100	17.1770
1.000	14.600	17.500	0.100	16.7144
1.250	14.100	16.700	0.100	15.9858
1.500	13.900	16.300	0.100	15.6638
1.700	13.800	16.200	0.100	15.5436
1.900	13.900	16.200	0.100	15.5280
2.000	13.900	16.200	0.100	15.5459
2.100	13.900	16.300	0.100	15.5589
2.500	14.100	16.600	0.100	15.8082
3.000	14.400	17.100	0.100	16.2785
4.000	15.500	18.600	0.100	17.7622
5.000	17.400	20.700	0.100	19.8833
6.000	19.400	24.000	0.200	22.9958
7.000	22.900	29.100	0.300	27.5557
7.500	25.100	32.500	0.300	30.7792
8.000	27.700	37.100	0.400	35.1860

MCNP5 Sample Input File
6% ^{235}U uranium dioxide sphere - 1 Inch of Reflection

```
UO2 sphere, 6.0 wt% 235U, 02500 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1560  hundreths of inches - must be integer
c radius =    19.8120 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 02500 milli-g Pu/cc
c Reflector width =  1.0 inches
c Enrichment = 0.06 wt fraction 235U
c
c Density of H2O 1.00000
c Density of UO2 11.00000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c U238  = 238.05080
c
c Effective uranium atomic mass 237.87039
c UO2
c Mass fraction of U in crit material 0.88143
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.2273 cc
c Volume of water in sample 0.7727 cc
c
c Mass of crit in sample   2.5000 g
c Mass of U in sample   2.2036 g
c Mass of bound O in sample  0.2964 g
c Mass of water in sample  0.7727 g
c
c Total mass of sample  3.2727g for a 1cc sample
c Mass Density for crit material  -3.2727, expressed as negative
c
c  sphere
20 11   -3.272727   -1        imp:n=1
21  2  -1.000    -2 1        imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0
```

```
1       so    19.8120            $ Sphere
2       so    22.3520        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u oxide / water mixture
m11    $ UO2/H2O Sludge, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
1001.66c -0.026420
8016.66c -0.209692      $from water
8016.66c -0.090575      $from oxide
92235.66c -0.040399
92238.66c -0.632915
mt11     lwtr.60t
c
c    u oxide only
m12    $ U oxide, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
8016.66c -0.090575      $from oxide
92235.66c -0.040399
92238.66c -0.632915
c
```

reset:
title: MCNP5 u5o2-sp-0060-01
set: MCNP5 set
source: MCNP5 primary
created: Wed 08/11/2010 17:30:18.40
geometry: sphere
modmat: H2O
critmat: uranium dioxide
isomat: U235 0.060 U238 0.940
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.300	54.2574
0.400	28.8850
0.500	23.0921
0.600	20.4177
0.700	18.9050
0.800	17.8909
0.850	17.5373
0.900	17.1770
1.000	16.7144
1.250	15.9858
1.500	15.6638
1.700	15.5436
1.900	15.5280
2.000	15.5459
2.100	15.5589
2.500	15.8082
3.000	16.2785
4.000	17.7622
5.000	19.8833
6.000	22.9958
7.000	27.5557
7.500	30.7792
8.000	35.1860

Table B.3.1.1.2-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 1 Inch of Water Reflection

300 milli-g/cc			400 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
33.30	0.92939	0.00034	23.00	0.92917	0.00044	19.30	0.92898	0.00049
34.70	0.93651	0.00034	23.30	0.93429	0.00044	19.50	0.93232	0.00047
36.10	0.94371	0.00034	23.60	0.93874	0.00043	19.70	0.93599	0.00048
37.50	0.95132	0.00033	23.90	0.94169	0.00043	19.90	0.94126	0.00049
38.90	0.95645	0.00032	24.20	0.94655	0.00042	20.10	0.94468	0.00048
40.30	0.96282	0.00032	24.50	0.95106	0.00042	20.30	0.94986	0.00047
41.70	0.96848	0.00030	24.80	0.95501	0.00042	20.50	0.95329	0.00048
43.10	0.97243	0.00033	25.10	0.95931	0.00041	20.70	0.95663	0.00046
44.50	0.97709	0.00032	25.40	0.96192	0.00042	20.90	0.95991	0.00048
45.90	0.98159	0.00030	25.70	0.96584	0.00040	21.10	0.96482	0.00048
47.30	0.98434	0.00030	26.00	0.96929	0.00042	21.30	0.96872	0.00048
48.70	0.98844	0.00030	26.30	0.97322	0.00041	21.50	0.97149	0.00047
50.10	0.99109	0.00030	26.60	0.97643	0.00040	21.70	0.97647	0.00046
51.50	0.99417	0.00029	26.90	0.97972	0.00042	21.90	0.98017	0.00047
52.90	0.99745	0.00029	27.20	0.98311	0.00041	22.10	0.98373	0.00046
54.30	1.00008	0.00028	27.50	0.98631	0.00043	22.30	0.98700	0.00046
55.70	1.00216	0.00028	27.80	0.99007	0.00040	22.50	0.98898	0.00047
57.10	1.00465	0.00028	28.10	0.99266	0.00042	22.70	0.99355	0.00046
58.50	1.00629	0.00028	28.40	0.99555	0.00039	22.90	0.99732	0.00047
59.90	1.00890	0.00027	28.70	0.99791	0.00041	23.10	1.00011	0.00045
61.30	1.00990	0.00028	29.00	1.00130	0.00039	23.30	1.00408	0.00045
61.40	1.00973	0.00028	29.30	1.00378	0.00040	23.50	1.00612	0.00045
			29.60	1.00646	0.00040	23.70	1.00826	0.00045
			29.90	1.00911	0.00039	23.90	1.01253	0.00046
			30.20	1.01117	0.00039	24.10	1.01467	0.00044
			30.30	1.01118	0.00039	24.20	1.01616	0.00047

Table B.3.1.1.2-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 1 Inch of Water Reflection (cont)

600 milli-g/cc			700 milli-g/cc			800 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.60	0.93216	0.00054	16.40	0.92929	0.00053	15.60	0.92853	0.00057
17.70	0.93427	0.00052	16.50	0.93194	0.00054	15.70	0.93181	0.00055
17.80	0.93732	0.00051	16.60	0.93624	0.00056	15.80	0.93433	0.00057
17.90	0.94016	0.00054	16.70	0.93924	0.00056	15.90	0.93766	0.00055
18.00	0.94325	0.00052	16.80	0.94139	0.00056	16.00	0.94100	0.00057
18.10	0.94569	0.00053	16.90	0.94531	0.00054	16.10	0.94478	0.00056
18.20	0.94770	0.00051	17.00	0.94764	0.00056	16.20	0.94850	0.00055
18.30	0.95060	0.00049	17.10	0.95121	0.00054	16.30	0.95154	0.00056
18.40	0.95307	0.00053	17.20	0.95503	0.00056	16.40	0.95453	0.00057
18.50	0.95579	0.00051	17.30	0.95643	0.00052	16.50	0.95796	0.00057
18.60	0.95779	0.00049	17.40	0.96003	0.00055	16.60	0.96197	0.00056
18.70	0.96045	0.00050	17.50	0.96305	0.00055	16.70	0.96311	0.00056
18.80	0.96314	0.00050	17.60	0.96636	0.00052	16.80	0.96791	0.00057
18.90	0.96566	0.00051	17.70	0.96793	0.00055	16.90	0.97075	0.00055
19.00	0.96855	0.00049	17.80	0.97192	0.00054	17.00	0.97405	0.00057
19.10	0.97010	0.00051	17.90	0.97417	0.00055	17.10	0.97755	0.00058
19.20	0.97285	0.00049	18.00	0.97701	0.00052	17.20	0.98009	0.00055
19.30	0.97472	0.00053	18.10	0.98033	0.00057	17.30	0.98274	0.00054
19.40	0.97694	0.00050	18.20	0.98235	0.00054	17.40	0.98543	0.00057
19.50	0.97936	0.00052	18.30	0.98511	0.00053	17.50	0.98845	0.00055
19.60	0.98086	0.00050	18.40	0.98705	0.00054	17.60	0.99179	0.00054
19.70	0.98334	0.00050	18.50	0.99034	0.00055	17.70	0.99257	0.00054
19.80	0.98630	0.00049	18.60	0.99212	0.00054	17.80	0.99771	0.00056
19.90	0.98748	0.00051	18.70	0.99535	0.00053	17.90	1.00023	0.00054
20.00	0.99021	0.00051	18.80	0.99711	0.00054	18.00	1.00312	0.00055
20.10	0.99293	0.00050	18.90	0.99987	0.00054	18.10	1.00570	0.00054
20.20	0.99565	0.00049	19.00	1.00245	0.00055	18.20	1.00926	0.00055
20.30	0.99699	0.00050	19.10	1.00562	0.00052	18.30	1.01235	0.00055
20.40	0.99994	0.00052	19.20	1.00658	0.00053	18.40	1.01333	0.00055
20.50	1.00028	0.00050	19.30	1.00953	0.00053	18.50	1.01707	0.00055
20.60	1.00321	0.00050	19.40	1.01355	0.00051	18.60	1.01921	0.00054
20.70	1.00687	0.00053	19.50	1.01560	0.00054	18.70	1.02273	0.00055
20.80	1.00783	0.00050	19.60	1.01775	0.00055	18.80	1.02513	0.00056
20.90	1.01023	0.00054	19.70	1.02002	0.00054			
21.00	1.01221	0.00051						
21.10	1.01403	0.00050						
21.20	1.01589	0.00050						
21.30	1.01733	0.00048						

Table B.3.1.1.2-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 1 Inch of Water Reflection (cont)

850 milli-g/cc			900 milli-g/cc			1000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
15.20	0.92269	0.00057	14.90	0.92062	0.00057	14.60	0.92490	0.00058
15.30	0.92623	0.00056	15.00	0.92442	0.00057	14.70	0.92698	0.00059
15.40	0.93004	0.00056	15.10	0.92705	0.00059	14.80	0.93022	0.00059
15.50	0.93365	0.00056	15.20	0.93185	0.00057	14.90	0.93396	0.00058
15.60	0.93752	0.00057	15.30	0.93554	0.00057	15.00	0.93978	0.00059
15.70	0.94111	0.00055	15.40	0.94007	0.00057	15.10	0.94284	0.00060
15.80	0.94491	0.00057	15.50	0.94398	0.00056	15.20	0.94783	0.00059
15.90	0.94926	0.00057	15.60	0.94639	0.00058	15.30	0.95108	0.00058
16.00	0.95181	0.00057	15.70	0.95015	0.00057	15.40	0.95413	0.00058
16.10	0.95462	0.00058	15.80	0.95387	0.00057	15.50	0.95811	0.00059
16.20	0.95878	0.00058	15.90	0.95740	0.00058	15.60	0.96139	0.00057
16.30	0.96278	0.00059	16.00	0.96027	0.00059	15.70	0.96428	0.00058
16.40	0.96577	0.00058	16.10	0.96426	0.00059	15.80	0.96947	0.00059
16.50	0.96908	0.00056	16.20	0.96622	0.00058	15.90	0.97179	0.00062
16.60	0.97211	0.00058	16.30	0.97074	0.00056	16.00	0.97553	0.00061
16.70	0.97646	0.00056	16.40	0.97456	0.00059	16.10	0.98026	0.00058
16.80	0.97845	0.00061	16.50	0.97695	0.00059	16.20	0.98354	0.00061
16.90	0.98098	0.00056	16.60	0.98080	0.00059	16.30	0.98718	0.00059
17.00	0.98382	0.00059	16.70	0.98421	0.00057	16.40	0.98905	0.00060
17.10	0.98854	0.00056	16.80	0.98830	0.00059	16.50	0.99360	0.00059
17.20	0.99063	0.00055	16.90	0.99089	0.00058	16.60	0.99564	0.00058
17.30	0.99269	0.00056	17.00	0.99321	0.00059	16.70	0.99957	0.00062
17.40	0.99702	0.00057	17.10	0.99698	0.00058	16.80	1.00255	0.00059
17.50	0.99850	0.00058	17.20	1.00090	0.00058	16.90	1.00596	0.00058
17.60	1.00252	0.00055	17.30	1.00338	0.00057	17.00	1.00836	0.00059
17.70	1.00533	0.00057	17.40	1.00647	0.00058	17.10	1.01333	0.00057
17.80	1.00728	0.00058	17.50	1.00910	0.00058	17.20	1.01563	0.00058
17.90	1.00991	0.00056	17.60	1.01085	0.00060	17.30	1.02014	0.00059
18.00	1.01405	0.00056	17.70	1.01550	0.00058	17.40	1.02220	0.00057
18.10	1.01621	0.00057	17.80	1.01695	0.00055	17.50	1.02425	0.00059
18.20	1.02052	0.00059	17.90	1.02102	0.00056			
18.30	1.02197	0.00056	18.00	1.02401	0.00055			
18.40	1.02455	0.00055						
18.50	1.02750	0.00056						

Table B.3.1.1.2-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 1 Inch of Water Reflection (cont)

1250 milli-g/cc			1500 milli-g/cc			1700 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
14.10	0.92583	0.00061	13.90	0.92805	0.00063	13.80	0.92733	0.00063
14.20	0.92962	0.00060	14.00	0.93398	0.00066	13.90	0.93236	0.00063
14.30	0.93465	0.00062	14.10	0.93802	0.00062	14.00	0.93754	0.00064
14.40	0.93893	0.00063	14.20	0.94130	0.00063	14.10	0.94057	0.00065
14.50	0.94356	0.00063	14.30	0.94600	0.00063	14.20	0.94622	0.00066
14.60	0.94635	0.00059	14.40	0.94977	0.00063	14.30	0.94914	0.00067
14.70	0.95051	0.00061	14.50	0.95497	0.00064	14.40	0.95459	0.00065
14.80	0.95461	0.00061	14.60	0.95907	0.00061	14.50	0.95828	0.00065
14.90	0.96026	0.00062	14.70	0.96298	0.00062	14.60	0.96191	0.00063
15.00	0.96397	0.00065	14.80	0.96675	0.00064	14.70	0.96683	0.00062
15.10	0.96684	0.00062	14.90	0.97135	0.00064	14.80	0.97143	0.00064
15.20	0.97165	0.00061	15.00	0.97568	0.00062	14.90	0.97464	0.00066
15.30	0.97431	0.00062	15.10	0.97952	0.00063	15.00	0.97994	0.00066
15.40	0.97835	0.00060	15.20	0.98351	0.00062	15.10	0.98342	0.00063
15.50	0.98295	0.00060	15.30	0.98817	0.00065	15.20	0.98613	0.00064
15.60	0.98671	0.00062	15.40	0.99180	0.00065	15.30	0.99026	0.00063
15.70	0.98989	0.00061	15.50	0.99386	0.00064	15.40	0.99455	0.00063
15.80	0.99375	0.00060	15.60	0.99668	0.00061	15.50	0.99897	0.00064
15.90	0.99630	0.00062	15.70	1.00188	0.00063	15.60	1.00133	0.00063
16.00	1.00061	0.00060	15.80	1.00489	0.00060	15.70	1.00539	0.00063
16.10	1.00392	0.00062	15.90	1.00917	0.00063	15.80	1.01011	0.00063
16.20	1.00753	0.00062	16.00	1.01207	0.00064	15.90	1.01214	0.00065
16.30	1.01074	0.00061	16.10	1.01527	0.00062	16.00	1.01772	0.00064
16.40	1.01333	0.00063	16.20	1.01983	0.00063	16.10	1.02112	0.00061
16.50	1.01638	0.00062	16.30	1.02399	0.00060	16.20	1.02531	0.00063
16.60	1.02123	0.00061						
16.70	1.02463	0.00060						

Table B.3.1.1.2-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 1 Inch of Water Reflection (cont)

1900 milli-g/cc			2000 milli-g/cc			2100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
13.90	0.93389	0.00061	13.90	0.93250	0.00065	13.90	0.93028	0.00062
14.00	0.93668	0.00061	14.00	0.93626	0.00064	14.00	0.93681	0.00064
14.10	0.94136	0.00064	14.10	0.94168	0.00068	14.10	0.94078	0.00064
14.20	0.94617	0.00062	14.20	0.94499	0.00067	14.20	0.94455	0.00064
14.30	0.95051	0.00064	14.30	0.94868	0.00064	14.30	0.94881	0.00064
14.40	0.95465	0.00065	14.40	0.95525	0.00065	14.40	0.95412	0.00068
14.50	0.96018	0.00065	14.50	0.95777	0.00066	14.50	0.95693	0.00063
14.60	0.96191	0.00064	14.60	0.96367	0.00064	14.60	0.96226	0.00062
14.70	0.96722	0.00066	14.70	0.96687	0.00065	14.70	0.96535	0.00067
14.80	0.97106	0.00064	14.80	0.96965	0.00065	14.80	0.97070	0.00067
14.90	0.97600	0.00066	14.90	0.97493	0.00063	14.90	0.97370	0.00064
15.00	0.97824	0.00062	15.00	0.97941	0.00067	15.00	0.97766	0.00066
15.10	0.98302	0.00063	15.10	0.98242	0.00064	15.10	0.98201	0.00063
15.20	0.98750	0.00065	15.20	0.98716	0.00063	15.20	0.98717	0.00064
15.30	0.99210	0.00065	15.30	0.99066	0.00063	15.30	0.98998	0.00067
15.40	0.99510	0.00064	15.40	0.99517	0.00064	15.40	0.99438	0.00066
15.50	0.99916	0.00063	15.50	0.99845	0.00066	15.50	0.99784	0.00066
15.60	1.00216	0.00066	15.60	1.00183	0.00062	15.60	1.00151	0.00065
15.70	1.00695	0.00063	15.70	1.00715	0.00067	15.70	1.00437	0.00066
15.80	1.01054	0.00064	15.80	1.00991	0.00062	15.80	1.01023	0.00064
15.90	1.01424	0.00063	15.90	1.01464	0.00066	15.90	1.01269	0.00065
16.00	1.01692	0.00065	16.00	1.01894	0.00063	16.00	1.01737	0.00066
16.10	1.02245	0.00063	16.10	1.02060	0.00065	16.10	1.01986	0.00065
16.20	1.02501	0.00065	16.20	1.02426	0.00066	16.20	1.02371	0.00065
						16.30	1.02587	0.00067

Table B.3.1.1.2-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 1 Inch of Water Reflection (cont)

2500 milli-g/cc			3000 milli-g/cc			4000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
14.10	0.93073	0.00067	14.40	0.92769	0.00065	15.50	0.92471	0.00063
14.20	0.93756	0.00067	14.50	0.93238	0.00064	15.60	0.92853	0.00068
14.30	0.93939	0.00065	14.60	0.93574	0.00066	15.70	0.93163	0.00065
14.40	0.94446	0.00068	14.70	0.94153	0.00066	15.80	0.93581	0.00063
14.50	0.94830	0.00062	14.80	0.94429	0.00064	15.90	0.94002	0.00066
14.60	0.95298	0.00065	14.90	0.94676	0.00064	16.00	0.94328	0.00065
14.70	0.95815	0.00067	15.00	0.95307	0.00066	16.10	0.94755	0.00066
14.80	0.96121	0.00065	15.10	0.95492	0.00068	16.20	0.94971	0.00063
14.90	0.96462	0.00064	15.20	0.95986	0.00064	16.30	0.95365	0.00065
15.00	0.96769	0.00065	15.30	0.96397	0.00067	16.40	0.95752	0.00065
15.10	0.97285	0.00067	15.40	0.96758	0.00065	16.50	0.95911	0.00063
15.20	0.97720	0.00068	15.50	0.97307	0.00065	16.60	0.96218	0.00062
15.30	0.98114	0.00067	15.60	0.97567	0.00066	16.70	0.96604	0.00063
15.40	0.98516	0.00067	15.70	0.97917	0.00068	16.80	0.97108	0.00065
15.50	0.98990	0.00066	15.80	0.98407	0.00067	16.90	0.97183	0.00065
15.60	0.99305	0.00064	15.90	0.98629	0.00065	17.00	0.97718	0.00064
15.70	0.99619	0.00066	16.00	0.99007	0.00064	17.10	0.98000	0.00064
15.80	0.99963	0.00063	16.10	0.99351	0.00066	17.20	0.98258	0.00063
15.90	1.00416	0.00066	16.20	0.99650	0.00064	17.30	0.98670	0.00064
16.00	1.00770	0.00068	16.30	1.00096	0.00066	17.40	0.98953	0.00062
16.10	1.01058	0.00063	16.40	1.00523	0.00063	17.50	0.99205	0.00064
16.20	1.01429	0.00064	16.50	1.00770	0.00066	17.60	0.99569	0.00064
16.30	1.01629	0.00065	16.60	1.01060	0.00064	17.70	0.99745	0.00067
16.40	1.02084	0.00065	16.70	1.01478	0.00066	17.80	1.00155	0.00063
16.50	1.02390	0.00064	16.80	1.01718	0.00065	17.90	1.00512	0.00062
16.60	1.02834	0.00064	16.90	1.02068	0.00064	18.00	1.00842	0.00062
			17.00	1.02243	0.00064	18.10	1.00901	0.00064
			17.10	1.02734	0.00065	18.20	1.01258	0.00062
						18.30	1.01597	0.00063
						18.40	1.01856	0.00062
						18.50	1.02135	0.00063
						18.60	1.02380	0.00061

Table B.3.1.1.2-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 1 Inch of Water Reflection (cont)

5000 milli-g/cc			6000 milli-g/cc			7000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.40	0.93253	0.00061	19.40	0.92357	0.00058	22.90	0.92971	0.00055
17.50	0.93576	0.00060	19.60	0.92842	0.00060	23.20	0.93425	0.00057
17.60	0.93844	0.00062	19.80	0.93312	0.00060	23.50	0.94056	0.00056
17.70	0.94134	0.00060	20.00	0.93856	0.00058	23.80	0.94467	0.00055
17.80	0.94472	0.00062	20.20	0.94361	0.00058	24.10	0.94962	0.00056
17.90	0.94672	0.00062	20.40	0.94810	0.00058	24.40	0.95492	0.00055
18.00	0.94977	0.00061	20.60	0.95300	0.00061	24.70	0.95974	0.00055
18.10	0.95432	0.00065	20.80	0.95651	0.00061	25.00	0.96363	0.00053
18.20	0.95511	0.00063	21.00	0.96103	0.00061	25.30	0.96910	0.00055
18.30	0.95770	0.00064	21.20	0.96527	0.00059	25.60	0.97307	0.00056
18.40	0.96229	0.00062	21.40	0.96912	0.00058	25.90	0.97819	0.00058
18.50	0.96422	0.00064	21.60	0.97294	0.00060	26.20	0.98125	0.00058
18.60	0.96720	0.00060	21.80	0.97786	0.00060	26.50	0.98620	0.00057
18.70	0.96964	0.00060	22.00	0.98142	0.00061	26.80	0.98963	0.00059
18.80	0.97178	0.00062	22.20	0.98577	0.00061	27.70	1.00198	0.00054
18.90	0.97484	0.00061	22.40	0.99007	0.00061	28.00	1.00519	0.00056
19.00	0.97845	0.00063	22.60	0.99425	0.00059	28.30	1.00856	0.00056
19.10	0.97937	0.00061	22.80	0.99719	0.00058	28.60	1.01245	0.00056
19.20	0.98138	0.00062	23.00	1.00006	0.00061	28.90	1.01636	0.00055
19.30	0.98559	0.00063	23.20	1.00477	0.00060	29.10	1.01828	0.00056
19.40	0.98757	0.00062	23.40	1.00725	0.00059			
19.50	0.99007	0.00063	23.60	1.01178	0.00058			
19.60	0.99284	0.00062	23.80	1.01464	0.00058			
19.70	0.99559	0.00063	24.00	1.01772	0.00061			
19.80	0.99785	0.00061						
19.90	1.00043	0.00062						
20.00	1.00224	0.00063						
20.10	1.00578	0.00061						
20.20	1.00560	0.00063						
20.30	1.00914	0.00063						
20.40	1.01170	0.00062						
20.50	1.01466	0.00061						
20.60	1.01792	0.00063						
20.70	1.01955	0.00061						

Table B.3.1.1.2-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 1 Inch of Water Reflection (cont)

7500 milli-g/cc			8000 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma			
25.10	0.92968	0.00054	27.70	0.92644	0.00050			
25.40	0.93256	0.00054	28.10	0.93153	0.00053			
25.70	0.93792	0.00055	28.50	0.93759	0.00051			
26.00	0.94312	0.00055	28.90	0.94199	0.00052			
26.30	0.94561	0.00055	29.30	0.94669	0.00052			
26.60	0.94943	0.00054	29.70	0.95114	0.00053			
26.90	0.95494	0.00054	30.10	0.95399	0.00051			
27.20	0.95845	0.00055	30.50	0.95862	0.00052			
27.50	0.96243	0.00054	30.90	0.96389	0.00051			
27.80	0.96638	0.00054	31.30	0.96622	0.00053			
28.10	0.97022	0.00053	31.70	0.97044	0.00051			
28.40	0.97347	0.00055	32.10	0.97358	0.00053			
28.70	0.97578	0.00054	32.50	0.97817	0.00050			
29.00	0.98115	0.00055	32.90	0.98088	0.00053			
29.30	0.98315	0.00052	33.30	0.98509	0.00052			
29.60	0.98646	0.00055	33.70	0.98794	0.00050			
29.90	0.99086	0.00052	34.10	0.99098	0.00051			
30.20	0.99454	0.00053	34.50	0.99281	0.00053			
30.50	0.99598	0.00054	34.90	0.99729	0.00050			
30.80	1.00030	0.00052	35.30	1.00108	0.00050			
31.10	1.00273	0.00054	35.70	1.00309	0.00051			
31.40	1.00586	0.00052	36.10	1.00736	0.00050			
31.70	1.00771	0.00054	36.50	1.00920	0.00050			
32.00	1.01121	0.00053	36.90	1.01050	0.00049			
32.30	1.01392	0.00051	37.10	1.01272	0.00050			
32.50	1.01427	0.00053						

B.3.1.1.3. 10” Water Reflector

Case ID: u5o2-sp-0060-10

Material: Uranium dioxide in water

Geometry: Sphere

Isotopics: 6% ^{235}U 94% ^{238}U

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.3.1.1.3-1. Uranium Dioxide Sphere (6.0% ^{235}U) - 10 Inches of Water Reflection

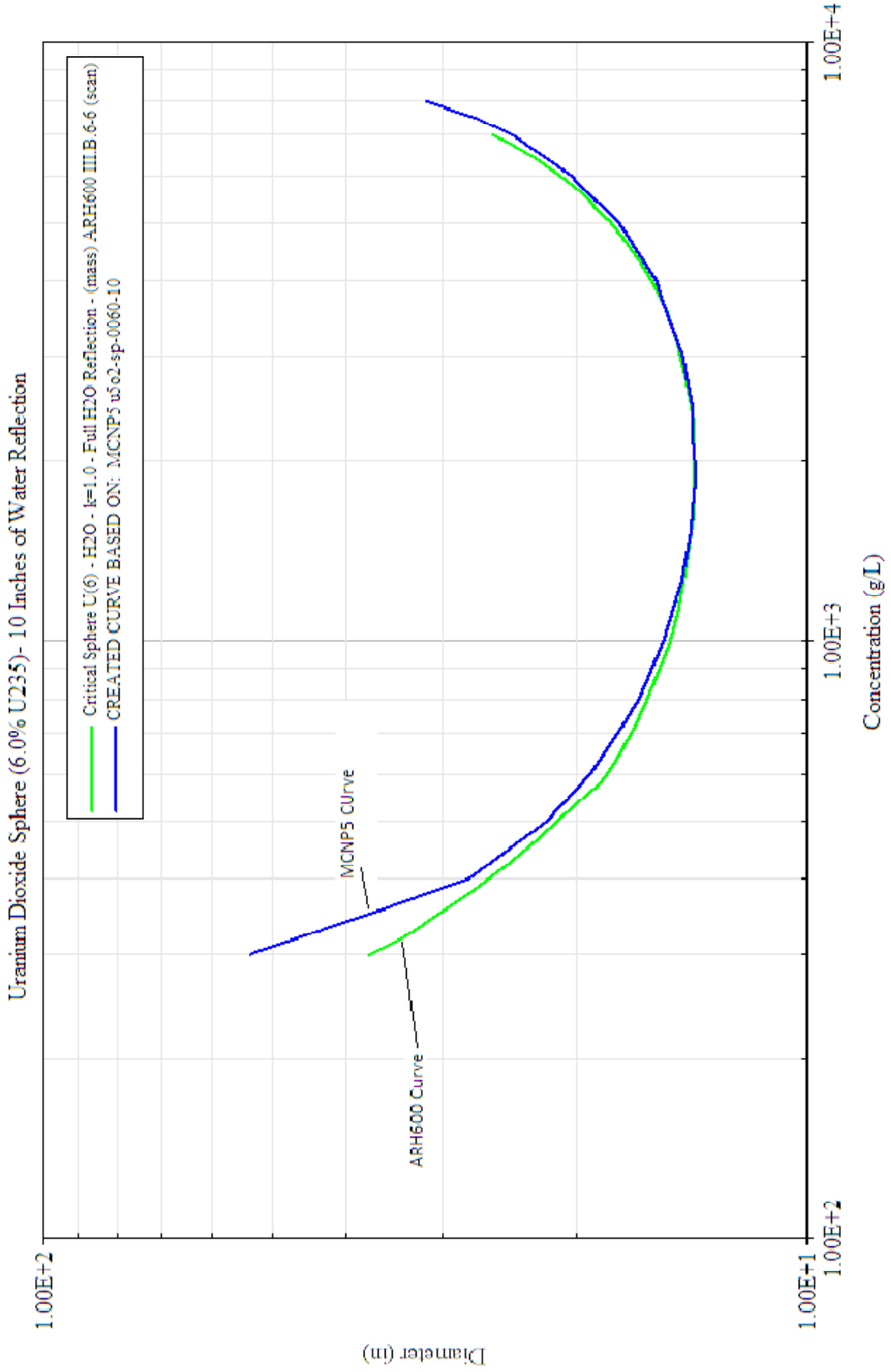

Table B.3.1.1.3-1. Critical Dimensions for Uranium Dioxide Sphere (6.0% ^{235}U) - 10 Inches of Water Reflection

Uranium Dioxide Sphere (6.0% ^{235}U) - 10 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.300	32.300	62.000	1.400	53.3757
0.400	21.800	29.300	0.300	27.6951
0.500	18.200	23.100	0.200	21.8958
0.600	16.400	20.000	0.100	19.1751
0.700	15.000	18.500	0.100	17.6393
0.800	14.300	17.500	0.100	16.5924
0.850	14.100	17.100	0.100	16.2237
0.900	13.900	16.700	0.100	15.8951
1.000	13.500	16.000	0.100	15.3917
1.250	13.000	15.100	0.100	14.6005
1.500	12.700	14.800	0.100	14.1975
1.700	12.500	14.700	0.100	14.0402
1.900	12.500	14.600	0.100	13.9585
2.000	12.500	14.600	0.100	13.9754
2.100	12.500	14.600	0.100	13.9886
2.500	12.600	14.800	0.100	14.1170
3.000	12.800	15.000	0.100	14.4988
4.000	13.600	16.400	0.100	15.7051
5.000	14.800	18.600	0.200	17.5576
6.000	17.000	21.100	0.200	20.2469
7.000	19.400	25.500	0.300	24.3465
7.500	21.500	28.900	0.300	27.3343
8.000	23.900	33.300	0.400	31.4539

MCNP5 Sample Input File
6% ^{235}U uranium dioxide sphere - 10 Inch of Reflection

```
UO2 sphere, 6.0 wt% 235U, 02500 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1350  hundreths of inches - must be integer
c radius =    17.1450 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 02500 milli-g Pu/cc
c Reflector width = 10.0 inches
c Enrichment = 0.06 wt fraction 235U
c
c Density of H2O 1.00000
c Density of UO2 11.00000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c U238  = 238.05080
c
c Effective uranium atomic mass 237.87039
c UO2
c Mass fraction of U in crit material 0.88143
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.2273 cc
c Volume of water in sample 0.7727 cc
c
c Mass of crit in sample   2.5000 g
c Mass of U in sample   2.2036 g
c Mass of bound O in sample  0.2964 g
c Mass of water in sample  0.7727 g
c
c Total mass of sample  3.2727g for a 1cc sample
c Mass Density for crit material  -3.2727, expressed as negative
c
c  sphere
20 11   -3.272727   -1        imp:n=1
21  2  -1.000    -2 1        imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0
```

```
1       so    17.1450            $ Sphere
2       so    42.5450        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u oxide / water mixture
m11    $ UO2/H2O Sludge, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
1001.66c -0.026420
8016.66c -0.209692      $from water
8016.66c -0.090575      $from oxide
92235.66c -0.040399
92238.66c -0.632915
mt11     lwtr.60t
c
c    u oxide only
m12    $ U oxide, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
8016.66c -0.090575      $from oxide
92235.66c -0.040399
92238.66c -0.632915
c
```

reset:
title: MCNP5 u5o2-sp-0060-10
set: MCNP5 set
source: MCNP5 primary
created: Wed 08/11/2010 17:30:41.13
geometry: sphere
modmat: H2O
critmat: uranium dioxide
isomat: U235 0.060 U238 0.940
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.300	53.3757
0.400	27.6951
0.500	21.8958
0.600	19.1751
0.700	17.6393
0.800	16.5924
0.850	16.2237
0.900	15.8951
1.000	15.3917
1.250	14.6005
1.500	14.1975
1.700	14.0402
1.900	13.9585
2.000	13.9754
2.100	13.9886
2.500	14.1170
3.000	14.4988
4.000	15.7051
5.000	17.5576
6.000	20.2469
7.000	24.3465
7.500	27.3343
8.000	31.4539

Table B.3.1.1.3-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 10 Inches of Water Reflection

300 milli-g/cc			400 milli-g/cc			500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
32.30	0.92840	0.00034	21.80	0.92909	0.00042	18.20	0.93059	0.00044
33.70	0.93748	0.00032	22.10	0.93441	0.00042	18.40	0.93399	0.00046
35.10	0.94575	0.00031	22.40	0.93781	0.00040	18.60	0.93899	0.00044
36.50	0.95117	0.00030	22.70	0.94313	0.00041	18.80	0.94207	0.00044
37.90	0.95756	0.00031	23.00	0.94702	0.00040	19.00	0.94805	0.00045
39.30	0.96390	0.00030	23.30	0.95130	0.00039	19.20	0.95149	0.00045
40.70	0.96867	0.00030	23.60	0.95559	0.00039	19.40	0.95497	0.00044
42.10	0.97279	0.00030	23.90	0.95894	0.00038	19.60	0.95877	0.00047
43.50	0.97744	0.00029	24.20	0.96239	0.00039	19.80	0.96405	0.00045
44.90	0.98180	0.00030	24.50	0.96567	0.00039	20.00	0.96742	0.00047
46.30	0.98585	0.00030	24.80	0.97082	0.00040	20.20	0.96986	0.00045
47.70	0.98960	0.00028	25.10	0.97299	0.00038	20.40	0.97550	0.00045
49.10	0.99160	0.00028	25.40	0.97677	0.00040	20.60	0.97867	0.00045
50.50	0.99488	0.00028	25.70	0.98011	0.00040	20.80	0.98140	0.00045
51.90	0.99731	0.00027	26.00	0.98298	0.00040	21.00	0.98490	0.00045
53.30	0.99984	0.00028	26.30	0.98661	0.00039	21.20	0.98890	0.00045
54.70	1.00280	0.00027	26.60	0.98880	0.00039	21.40	0.99210	0.00043
56.10	1.00461	0.00027	26.90	0.99208	0.00039	21.60	0.99585	0.00044
57.50	1.00677	0.00027	27.20	0.99614	0.00039	21.80	0.99874	0.00043
58.90	1.00841	0.00028	27.50	0.99788	0.00038	22.00	1.00137	0.00046
60.30	1.01061	0.00027	27.80	1.00114	0.00039	22.20	1.00503	0.00045
61.70	1.01289	0.00027	28.10	1.00364	0.00038	22.40	1.00777	0.00044
62.00	1.01275	0.00027	28.40	1.00566	0.00038	22.60	1.01089	0.00042
			28.70	1.00833	0.00037	22.80	1.01416	0.00045
			29.00	1.01100	0.00039	23.00	1.01666	0.00042
			29.30	1.01451	0.00037	23.10	1.01908	0.00044

Table B.3.1.1.3-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 10 Inches of Water Reflection (cont)

600 milli-g/cc			700 milli-g/cc			800 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
16.40	0.93138	0.00047	15.00	0.92474	0.00049	14.30	0.92554	0.00052
16.50	0.93459	0.00048	15.10	0.92797	0.00052	14.40	0.93083	0.00052
16.60	0.93771	0.00047	15.20	0.93065	0.00052	14.50	0.93359	0.00053
16.70	0.93971	0.00049	15.30	0.93399	0.00048	14.60	0.93729	0.00052
16.80	0.94280	0.00047	15.40	0.93649	0.00051	14.70	0.94047	0.00053
16.90	0.94583	0.00049	15.50	0.94063	0.00051	14.80	0.94376	0.00054
17.00	0.94857	0.00049	15.60	0.94264	0.00051	14.90	0.94643	0.00053
17.10	0.95007	0.00049	15.70	0.94647	0.00052	15.00	0.95091	0.00051
17.20	0.95364	0.00049	15.80	0.94999	0.00048	15.10	0.95416	0.00053
17.30	0.95661	0.00047	15.90	0.95328	0.00052	15.20	0.95670	0.00052
17.40	0.95772	0.00047	16.00	0.95553	0.00050	15.30	0.96069	0.00051
17.50	0.96019	0.00049	16.10	0.95862	0.00050	15.40	0.96330	0.00054
17.60	0.96418	0.00048	16.20	0.96128	0.00052	15.50	0.96738	0.00054
17.70	0.96633	0.00048	16.30	0.96492	0.00049	15.60	0.97048	0.00055
17.80	0.96855	0.00048	16.40	0.96697	0.00050	15.70	0.97338	0.00052
17.90	0.97172	0.00048	16.50	0.97028	0.00051	15.80	0.97639	0.00052
18.00	0.97330	0.00047	16.60	0.97187	0.00051	15.90	0.97926	0.00052
18.10	0.97626	0.00048	16.70	0.97590	0.00052	16.00	0.98223	0.00051
18.20	0.97794	0.00050	16.80	0.97874	0.00052	16.10	0.98559	0.00053
18.30	0.98027	0.00048	16.90	0.98174	0.00050	16.20	0.98824	0.00053
18.40	0.98224	0.00049	17.00	0.98324	0.00049	16.30	0.99244	0.00055
18.50	0.98410	0.00047	17.10	0.98626	0.00051	16.40	0.99561	0.00054
18.60	0.98743	0.00048	17.20	0.98945	0.00050	16.50	0.99780	0.00052
18.70	0.98935	0.00047	17.30	0.99126	0.00049	16.60	1.00018	0.00052
18.80	0.99162	0.00048	17.40	0.99403	0.00051	16.70	1.00301	0.00053
18.90	0.99299	0.00051	17.50	0.99730	0.00052	16.80	1.00574	0.00053
19.00	0.99529	0.00050	17.60	0.99866	0.00051	16.90	1.00838	0.00055
19.10	0.99756	0.00047	17.70	1.00207	0.00052	17.00	1.01082	0.00051
19.20	1.00081	0.00047	17.80	1.00481	0.00050	17.10	1.01353	0.00051
19.30	1.00176	0.00047	17.90	1.00563	0.00048	17.20	1.01757	0.00052
19.40	1.00535	0.00048	18.00	1.00915	0.00051	17.30	1.02033	0.00051
19.50	1.00641	0.00048	18.10	1.01254	0.00050	17.40	1.02138	0.00053
19.60	1.00905	0.00050	18.20	1.01379	0.00051	17.50	1.02379	0.00052
19.70	1.01009	0.00049	18.30	1.01642	0.00049			
19.80	1.01233	0.00048	18.40	1.01805	0.00051			
19.90	1.01397	0.00046	18.50	1.02051	0.00049			
20.00	1.01564	0.00049						

Table B.3.1.1.3-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 10 Inches of Water Reflection (cont)

850 milli-g/cc			900 milli-g/cc			1000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
14.10	0.93033	0.00053	13.90	0.93217	0.00055	13.50	0.93219	0.00055
14.20	0.93347	0.00053	14.00	0.93504	0.00055	13.60	0.93572	0.00056
14.30	0.93655	0.00053	14.10	0.93931	0.00056	13.70	0.94028	0.00054
14.40	0.93986	0.00056	14.20	0.94423	0.00053	13.80	0.94395	0.00054
14.50	0.94473	0.00052	14.30	0.94617	0.00054	13.90	0.94719	0.00055
14.60	0.94773	0.00054	14.40	0.95102	0.00053	14.00	0.95060	0.00055
14.70	0.95118	0.00056	14.50	0.95364	0.00055	14.10	0.95527	0.00054
14.80	0.95497	0.00055	14.60	0.95661	0.00053	14.20	0.95921	0.00055
14.90	0.95774	0.00054	14.70	0.95989	0.00054	14.30	0.96470	0.00057
15.00	0.96080	0.00052	14.80	0.96473	0.00053	14.40	0.96567	0.00057
15.10	0.96428	0.00052	14.90	0.96990	0.00054	14.50	0.97037	0.00056
15.20	0.96757	0.00053	15.00	0.97019	0.00057	14.60	0.97300	0.00055
15.30	0.97081	0.00052	15.10	0.97377	0.00053	14.70	0.97612	0.00054
15.40	0.97573	0.00053	15.20	0.97773	0.00054	14.80	0.98096	0.00055
15.50	0.97692	0.00053	15.30	0.98082	0.00054	14.90	0.98462	0.00055
15.60	0.98173	0.00053	15.40	0.98479	0.00052	15.00	0.98771	0.00055
15.70	0.98528	0.00053	15.50	0.98883	0.00054	15.10	0.99053	0.00057
15.80	0.98775	0.00054	15.60	0.99200	0.00055	15.20	0.99496	0.00055
15.90	0.99027	0.00055	15.70	0.99491	0.00053	15.30	0.99834	0.00059
16.00	0.99385	0.00053	15.80	0.99649	0.00052	15.40	1.00015	0.00055
16.10	0.99635	0.00052	15.90	1.00018	0.00054	15.50	1.00373	0.00057
16.20	0.99902	0.00053	16.00	1.00165	0.00052	15.60	1.00640	0.00056
16.30	1.00316	0.00054	16.10	1.00581	0.00052	15.70	1.01033	0.00056
16.40	1.00654	0.00055	16.20	1.00921	0.00053	15.80	1.01421	0.00054
16.50	1.00802	0.00058	16.30	1.01225	0.00057	15.90	1.01544	0.00057
16.60	1.01120	0.00053	16.40	1.01630	0.00052	16.00	1.02026	0.00054
16.70	1.01445	0.00051	16.50	1.01793	0.00052			
16.80	1.01709	0.00054	16.60	1.02061	0.00054			
16.90	1.02048	0.00053	16.70	1.02401	0.00053			
17.00	1.02217	0.00055						
17.10	1.02422	0.00052						

Table B.3.1.1.3-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 10 Inches of Water Reflection (cont)

1250 milli-g/cc			1500 milli-g/cc			1700 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
13.00	0.93756	0.00060	12.70	0.93934	0.00059	12.50	0.93587	0.00061
13.10	0.94162	0.00057	12.80	0.94358	0.00059	12.60	0.94044	0.00058
13.20	0.94447	0.00058	12.90	0.94793	0.00059	12.70	0.94496	0.00059
13.30	0.95030	0.00057	13.00	0.95255	0.00057	12.80	0.94993	0.00058
13.40	0.95587	0.00059	13.10	0.95622	0.00058	12.90	0.95240	0.00055
13.50	0.95698	0.00056	13.20	0.96006	0.00060	13.00	0.95804	0.00058
13.60	0.96226	0.00056	13.30	0.96502	0.00059	13.10	0.96260	0.00063
13.70	0.96645	0.00058	13.40	0.96733	0.00057	13.20	0.96587	0.00062
13.80	0.96960	0.00058	13.50	0.97245	0.00059	13.30	0.97050	0.00059
13.90	0.97324	0.00058	13.60	0.97797	0.00058	13.40	0.97418	0.00060
14.00	0.97712	0.00060	13.70	0.98102	0.00058	13.50	0.97970	0.00059
14.10	0.98242	0.00058	13.80	0.98510	0.00058	13.60	0.98289	0.00059
14.20	0.98544	0.00059	13.90	0.98883	0.00059	13.70	0.98639	0.00059
14.30	0.98911	0.00056	14.00	0.99252	0.00061	13.80	0.98951	0.00057
14.40	0.99254	0.00057	14.10	0.99568	0.00058	13.90	0.99472	0.00060
14.50	0.99619	0.00056	14.20	1.00011	0.00060	14.00	0.99916	0.00059
14.60	0.99998	0.00057	14.30	1.00333	0.00058	14.10	1.00125	0.00060
14.70	1.00391	0.00056	14.40	1.00793	0.00059	14.20	1.00449	0.00060
14.80	1.00645	0.00058	14.50	1.01092	0.00060	14.30	1.00943	0.00062
14.90	1.01071	0.00059	14.60	1.01536	0.00059	14.40	1.01325	0.00058
15.00	1.01518	0.00056	14.70	1.01840	0.00058	14.50	1.01656	0.00062
15.10	1.01797	0.00056	14.80	1.02251	0.00058	14.60	1.02046	0.00060
						14.70	1.02378	0.00061

Table B.3.1.1.3-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 10 Inches of Water Reflection (cont)

1900 milli-g/cc			2000 milli-g/cc			2100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.50	0.93853	0.00062	12.50	0.94005	0.00061	12.50	0.93848	0.00060
12.60	0.94334	0.00060	12.60	0.94270	0.00058	12.60	0.94404	0.00061
12.70	0.94633	0.00057	12.70	0.94802	0.00061	12.70	0.94920	0.00059
12.80	0.95175	0.00060	12.80	0.95250	0.00060	12.80	0.95285	0.00062
12.90	0.95633	0.00060	12.90	0.95723	0.00062	12.90	0.95593	0.00061
13.00	0.96054	0.00060	13.00	0.96221	0.00060	13.00	0.96056	0.00061
13.10	0.96390	0.00061	13.10	0.96397	0.00062	13.10	0.96419	0.00058
13.20	0.96913	0.00059	13.20	0.96774	0.00061	13.20	0.96811	0.00059
13.30	0.97241	0.00061	13.30	0.97263	0.00059	13.30	0.97311	0.00059
13.40	0.97635	0.00059	13.40	0.97798	0.00059	13.40	0.97749	0.00060
13.50	0.98230	0.00062	13.50	0.98160	0.00057	13.50	0.98190	0.00064
13.60	0.98435	0.00060	13.60	0.98648	0.00059	13.60	0.98575	0.00062
13.70	0.98987	0.00062	13.70	0.98964	0.00063	13.70	0.98910	0.00060
13.80	0.99449	0.00059	13.80	0.99303	0.00060	13.80	0.99287	0.00060
13.90	0.99801	0.00058	13.90	0.99706	0.00060	13.90	0.99751	0.00061
14.00	1.00141	0.00061	14.00	1.00096	0.00061	14.00	1.00032	0.00062
14.10	1.00490	0.00061	14.10	1.00532	0.00060	14.10	1.00403	0.00059
14.20	1.00905	0.00058	14.20	1.00930	0.00062	14.20	1.00945	0.00061
14.30	1.01211	0.00061	14.30	1.01339	0.00062	14.30	1.01297	0.00062
14.40	1.01622	0.00061	14.40	1.01655	0.00061	14.40	1.01650	0.00060
14.50	1.01900	0.00060	14.50	1.01947	0.00061	14.50	1.01901	0.00058
14.60	1.02404	0.00061	14.60	1.02380	0.00058	14.60	1.02204	0.00059

Table B.3.1.1.3-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 10 Inches of Water Reflection (cont)

2500 milli-g/cc			3000 milli-g/cc			4000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.60	0.93916	0.00061	12.80	0.93395	0.00062	13.60	0.92992	0.00060
12.70	0.94436	0.00061	12.90	0.93886	0.00061	13.70	0.93405	0.00063
12.80	0.94811	0.00061	13.00	0.94295	0.00059	13.80	0.93736	0.00061
12.90	0.95002	0.00061	13.10	0.94787	0.00063	13.90	0.94066	0.00058
13.00	0.95526	0.00062	13.20	0.95064	0.00059	14.00	0.94529	0.00062
13.10	0.96014	0.00060	13.30	0.95614	0.00060	14.10	0.94777	0.00059
13.20	0.96307	0.00060	13.40	0.96010	0.00058	14.20	0.95136	0.00062
13.30	0.96669	0.00059	13.50	0.96389	0.00059	14.30	0.95589	0.00061
13.40	0.97256	0.00062	13.60	0.96742	0.00063	14.40	0.95876	0.00062
13.50	0.97562	0.00063	13.70	0.97156	0.00062	14.50	0.96175	0.00060
13.60	0.97892	0.00059	13.80	0.97428	0.00062	14.60	0.96551	0.00060
13.70	0.98445	0.00059	13.90	0.97899	0.00060	14.70	0.96883	0.00058
13.80	0.98740	0.00059	14.00	0.98277	0.00059	14.80	0.97196	0.00060
13.90	0.99076	0.00061	14.10	0.98616	0.00062	14.90	0.97596	0.00059
14.00	0.99557	0.00060	14.20	0.98921	0.00064	15.00	0.97869	0.00060
14.10	0.99943	0.00061	14.30	0.99340	0.00063	15.10	0.98274	0.00062
14.20	1.00279	0.00062	14.40	0.99658	0.00062	15.20	0.98403	0.00061
14.30	1.00755	0.00062	14.50	1.00004	0.00061	15.30	0.98702	0.00062
14.40	1.01058	0.00064	14.60	1.00396	0.00058	15.40	0.99083	0.00061
14.50	1.01479	0.00061	14.70	1.00822	0.00062	15.50	0.99404	0.00059
14.60	1.01815	0.00061	14.80	1.01070	0.00062	15.60	0.99760	0.00060
14.70	1.02041	0.00059	14.90	1.01408	0.00060	15.70	0.99984	0.00058
14.80	1.02680	0.00062	15.00	1.01916	0.00062	15.80	1.00300	0.00063
						15.90	1.00572	0.00060
						16.00	1.00789	0.00059
						16.10	1.01173	0.00064
						16.20	1.01467	0.00059
						16.30	1.01782	0.00059
						16.40	1.02061	0.00059

Table B.3.1.1.3-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 10 Inches of Water Reflection (cont)

5000 milli-g/cc			6000 milli-g/cc			7000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
14.80	0.92549	0.00059	17.00	0.93193	0.00057	19.40	0.92423	0.00056
15.00	0.93017	0.00057	17.20	0.93569	0.00056	19.70	0.92926	0.00054
15.20	0.93755	0.00059	17.40	0.94214	0.00057	20.00	0.93603	0.00053
15.40	0.94263	0.00060	17.60	0.94630	0.00057	20.30	0.94062	0.00052
15.60	0.94782	0.00060	17.80	0.95057	0.00059	20.60	0.94494	0.00055
15.80	0.95348	0.00060	18.00	0.95571	0.00057	20.90	0.95051	0.00056
16.00	0.95996	0.00056	18.20	0.95946	0.00056	21.20	0.95420	0.00056
16.20	0.96657	0.00058	18.40	0.96374	0.00056	21.50	0.95989	0.00054
16.40	0.97188	0.00058	18.60	0.96857	0.00056	21.80	0.96498	0.00053
16.60	0.97726	0.00061	18.80	0.97381	0.00054	22.10	0.96930	0.00053
16.80	0.98158	0.00060	19.00	0.97524	0.00056	22.40	0.97374	0.00053
17.00	0.98621	0.00058	19.20	0.98018	0.00057	22.70	0.97831	0.00053
17.20	0.99218	0.00058	19.40	0.98556	0.00057	23.00	0.98263	0.00053
17.40	0.99614	0.00057	19.60	0.98837	0.00057	23.30	0.98585	0.00055
17.60	1.00104	0.00060	19.80	0.99170	0.00055	23.60	0.98927	0.00053
17.80	1.00645	0.00059	20.00	0.99542	0.00056	23.90	0.99397	0.00056
18.00	1.01167	0.00058	20.20	0.99897	0.00058	24.20	0.99751	0.00055
18.20	1.01674	0.00059	20.40	1.00336	0.00056	24.50	1.00261	0.00051
18.40	1.01996	0.00058	20.60	1.00679	0.00057	24.80	1.00507	0.00054
18.60	1.02474	0.00059	20.80	1.00974	0.00055	25.10	1.00928	0.00053
			21.00	1.01295	0.00059	25.40	1.01226	0.00053
			21.10	1.01326	0.00058	25.50	1.01308	0.00051

Table B.3.1.1.3-2. K_{eff} Values for Uranium Dioxide Sphere (6.0% ^{235}U) - 10 Inches of Water Reflection (cont)

7500 milli-g/cc			8000 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma			
21.50	0.92762	0.00052	23.90	0.92806	0.00051			
21.80	0.93254	0.00054	24.30	0.93218	0.00052			
22.10	0.93665	0.00053	24.70	0.93752	0.00051			
22.40	0.94177	0.00052	25.10	0.94165	0.00049			
22.70	0.94623	0.00052	25.50	0.94741	0.00048			
23.00	0.95008	0.00052	25.90	0.95177	0.00050			
23.30	0.95313	0.00054	26.30	0.95596	0.00050			
23.60	0.95658	0.00051	26.70	0.95865	0.00051			
23.90	0.96119	0.00053	27.10	0.96247	0.00051			
24.20	0.96447	0.00054	27.50	0.96771	0.00050			
24.50	0.96934	0.00053	27.90	0.97030	0.00050			
24.80	0.97281	0.00052	28.30	0.97432	0.00049			
25.10	0.97499	0.00053	28.70	0.97892	0.00052			
25.40	0.97929	0.00051	29.10	0.98273	0.00051			
25.70	0.98308	0.00052	29.50	0.98490	0.00049			
26.00	0.98499	0.00053	29.90	0.98893	0.00050			
26.30	0.98845	0.00053	30.30	0.99147	0.00050			
26.60	0.99273	0.00052	30.70	0.99584	0.00050			
26.90	0.99574	0.00051	31.10	0.99747	0.00049			
27.20	0.99807	0.00052	31.50	1.00033	0.00051			
27.50	1.00238	0.00050	31.90	1.00291	0.00049			
27.80	1.00465	0.00053	32.30	1.00735	0.00049			
28.10	1.00674	0.00053	32.70	1.00979	0.00050			
28.40	1.00916	0.00052	33.10	1.01272	0.00052			
28.70	1.01301	0.00052	33.30	1.01311	0.00049			
28.90	1.01359	0.00051						

B.3.1.2. 5% ^{235}U 95% ^{238}U

B.3.1.2.1. Unreflected

Case ID: u5o2-sp-0050-00

Material: Uranium dioxide in water

Geometry: Sphere

Isotopics: 5% ^{235}U 95% ^{238}U

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.3.1.2.1-1. Uranium Dioxide Sphere (5.0% ^{235}U) - 0 Inches of Water Reflection

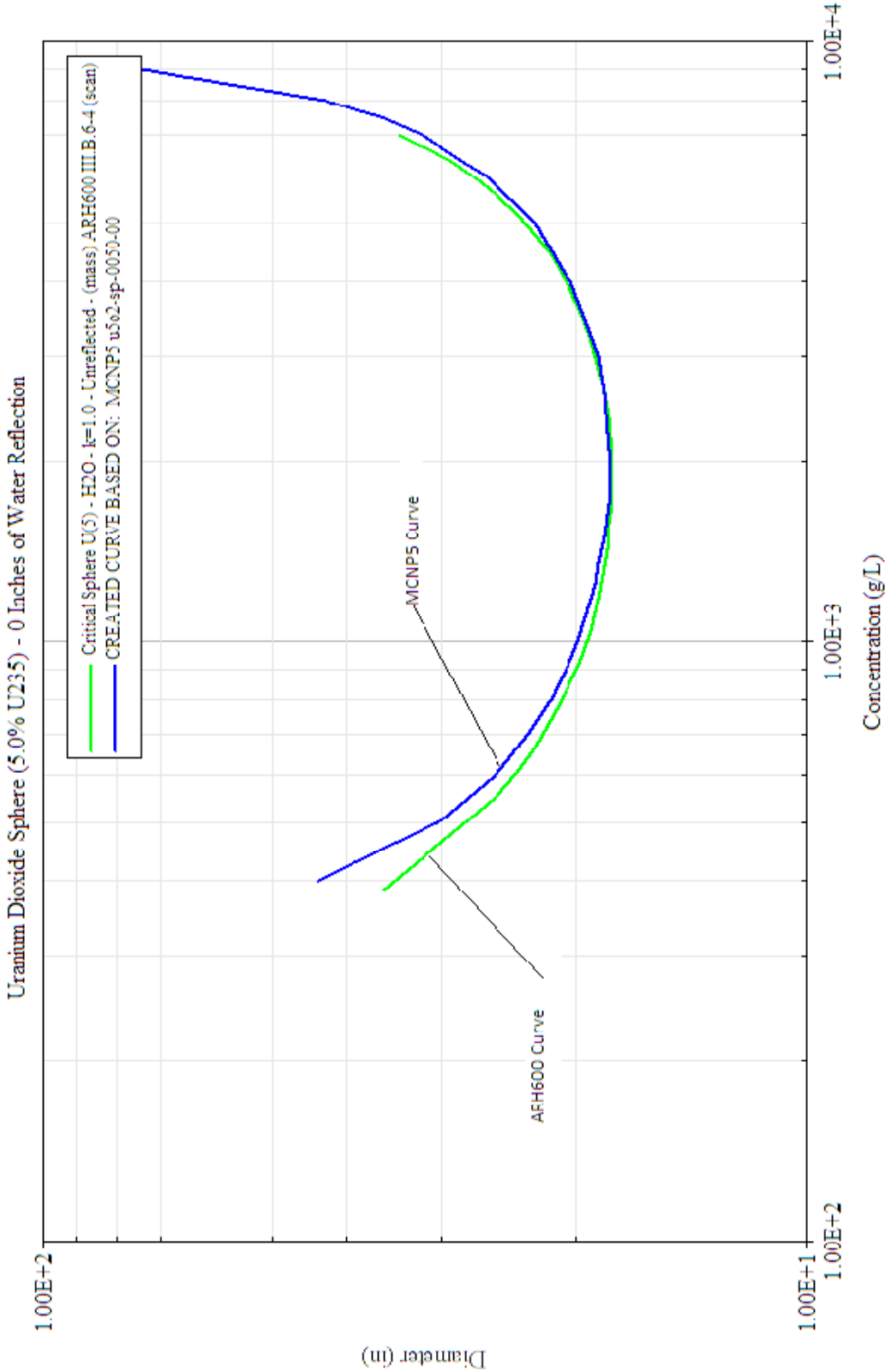

Table B.3.1.2.1-1. Critical Dimensions for Uranium Dioxide Sphere (5.0% ^{235}U) - 0 Inches of Water Reflection

Uranium Dioxide Sphere (5.0% ^{235}U) - 0 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.400	30.800	47.600	0.800	43.5278
0.500	24.100	31.700	0.300	30.3826
0.600	21.500	26.900	0.200	25.5441
0.700	19.800	24.200	0.200	23.1142
0.800	18.000	22.300	0.200	21.5912
0.850	18.200	21.800	0.100	21.0585
0.900	17.800	21.300	0.100	20.6061
1.000	17.300	20.400	0.100	19.8813
1.250	16.600	19.500	0.100	18.8356
1.500	16.200	18.900	0.100	18.3263
1.700	15.900	18.800	0.100	18.1413
1.900	16.000	18.600	0.100	18.0455
2.000	16.000	18.600	0.100	18.0532
2.100	16.000	18.600	0.100	18.0866
2.500	16.200	18.800	0.100	18.2772
3.000	16.600	19.300	0.100	18.7022
4.000	17.500	21.000	0.100	20.3275
5.000	19.700	23.500	0.200	22.6730
6.000	22.200	27.200	0.200	26.2149
7.000	26.000	33.100	0.300	31.7680
7.500	28.900	37.800	0.400	36.0133
8.000	32.500	44.800	0.600	42.3760
9.000	45.100	83.700	1.900	73.7030

MCNP5 Sample Input File
5.0% U02 Sphere- 0 Inches of Reflection

```
UO2 sphere, 5.0 wt% 235U, 02500 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1640  hundreths of inches - must be integer
c radius =    20.8280 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 02500 milli-g Pu/cc
c Reflector width =  0.0 inches
c Enrichment = 0.05 wt fraction 235U
c
c Density of H2O 1.00000
c Density of UO2 11.00000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c U238  = 238.05080
c
c Effective uranium atomic mass 237.90045
c UO2
c Mass fraction of U in crit material 0.88144
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.2273 cc
c Volume of water in sample 0.7727 cc
c
c Mass of crit in sample   2.5000 g
c Mass of U in sample   2.2036 g
c Mass of bound O in sample  0.2964 g
c Mass of water in sample  0.7727 g
c
c Total mass of sample  3.2727g for a 1cc sample
c Mass Density for crit material  -3.2727, expressed as negative
c
c  sphere
20 11   -3.272727   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=0    $zero importance if no reflector
22  0            2           imp:n=0
```

```
1       so    20.8280              $ Sphere
2       so    20.8280        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u oxide / water mixture
m11    $ UO2/H2O Sludge, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
1001.66c -0.026420
8016.66c -0.209692      $from water
8016.66c -0.090565      $from oxide
92235.66c -0.033666
92238.66c -0.639657
mt11     lwtr.60t
c
c    u oxide only
m12    $ U oxide, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
8016.66c -0.090565      $from oxide
92235.66c -0.033666
92238.66c -0.639657
c
```

Critview Compatible Data File
5.0% U02 Sphere- 0 Inches of Reflection

reset:
title: MCNP5 u5o2-sp-0050-00
set: MCNP5 set
source: MCNP5 primary
created: Wed 08/11/2010 16:11:32.71
geometry: sphere
modmat: H2O
critmat: uranium dioxide
isomat: U235 0.050 U238 0.950
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.400	43.5278
0.500	30.3826
0.600	25.5441
0.700	23.1142
0.800	21.5912
0.850	21.0585
0.900	20.6061
1.000	19.8813
1.250	18.8356
1.500	18.3263
1.700	18.1413
1.900	18.0455
2.000	18.0532
2.100	18.0866
2.500	18.2772
3.000	18.7022
4.000	20.3275
5.000	22.6730
6.000	26.2149
7.000	31.7680
7.500	36.0133
8.000	42.3760
9.000	73.7030

Table B.3.1.2.1-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 0 Inches of Water Reflection

400 milli-g/cc			500 milli-g/cc			600 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
30.80	0.92893	0.00036	24.10	0.92330	0.00042	21.50	0.92839	0.00051
31.60	0.93464	0.00038	24.40	0.92878	0.00045	21.70	0.93320	0.00048
32.40	0.94148	0.00038	24.70	0.93393	0.00045	21.90	0.93646	0.00048
33.20	0.94625	0.00037	25.00	0.93714	0.00042	22.10	0.94167	0.00047
34.00	0.95180	0.00037	25.30	0.94136	0.00044	22.30	0.94401	0.00048
34.80	0.95748	0.00035	25.60	0.94585	0.00042	22.50	0.94933	0.00048
35.60	0.96233	0.00036	25.90	0.95014	0.00043	22.70	0.95289	0.00050
36.40	0.96725	0.00035	26.20	0.95449	0.00044	22.90	0.95584	0.00049
37.20	0.97179	0.00035	26.50	0.95811	0.00044	23.10	0.95972	0.00047
38.00	0.97526	0.00034	26.80	0.96229	0.00042	23.30	0.96256	0.00049
38.80	0.97926	0.00036	27.10	0.96619	0.00045	23.50	0.96666	0.00047
39.60	0.98334	0.00034	27.40	0.96941	0.00042	23.70	0.97083	0.00050
40.40	0.98662	0.00034	27.70	0.97289	0.00043	23.90	0.97368	0.00049
41.20	0.98908	0.00033	28.00	0.97554	0.00042	24.10	0.97723	0.00048
42.00	0.99307	0.00034	28.30	0.97930	0.00045	24.30	0.98005	0.00048
42.80	0.99647	0.00033	28.60	0.98252	0.00045	24.50	0.98331	0.00048
43.60	1.00035	0.00032	28.90	0.98464	0.00042	24.70	0.98672	0.00048
44.40	1.00252	0.00032	29.20	0.98927	0.00045	24.90	0.98938	0.00048
45.20	1.00562	0.00033	29.50	0.99218	0.00042	25.10	0.99403	0.00047
46.00	1.00654	0.00035	29.80	0.99402	0.00042	25.30	0.99462	0.00047
46.80	1.01038	0.00033	30.10	0.99838	0.00041	25.50	0.99961	0.00046
47.60	1.01244	0.00031	30.40	1.00010	0.00042	25.70	1.00138	0.00046
			30.70	1.00484	0.00041	25.90	1.00536	0.00046
			31.00	1.00506	0.00040	26.10	1.00736	0.00046
			31.30	1.00762	0.00040	26.30	1.00857	0.00047
			31.60	1.01155	0.00039	26.50	1.01244	0.00046
			31.70	1.01192	0.00041	26.70	1.01554	0.00047
						26.90	1.01778	0.00045

Table B.3.1.2.1-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 0 Inches of Water Reflection (cont)

700 milli-g/cc			800 milli-g/cc			850 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
19.80	0.92696	0.00052	18.00	0.90429	0.00055	18.20	0.92283	0.00054
20.00	0.93222	0.00050	18.20	0.91173	0.00057	18.30	0.92561	0.00055
20.20	0.93619	0.00050	18.40	0.91626	0.00055	18.40	0.92883	0.00057
20.40	0.94142	0.00052	18.60	0.92233	0.00054	18.50	0.93113	0.00054
20.60	0.94747	0.00053	18.80	0.92929	0.00056	18.60	0.93483	0.00056
20.80	0.95131	0.00050	19.00	0.93524	0.00053	18.70	0.93738	0.00055
21.00	0.95686	0.00052	19.20	0.94068	0.00056	18.80	0.94086	0.00059
21.20	0.96101	0.00051	19.40	0.94550	0.00053	18.90	0.94352	0.00054
21.40	0.96535	0.00050	19.60	0.95111	0.00055	19.00	0.94557	0.00055
21.60	0.96892	0.00050	19.80	0.95695	0.00054	19.10	0.94916	0.00056
21.80	0.97504	0.00050	20.00	0.95995	0.00053	19.20	0.95285	0.00056
22.00	0.97722	0.00050	20.20	0.96668	0.00055	19.30	0.95481	0.00054
22.20	0.98150	0.00050	20.40	0.97205	0.00055	19.40	0.95779	0.00054
22.40	0.98690	0.00049	20.60	0.97733	0.00056	19.50	0.95916	0.00055
22.60	0.98954	0.00051	20.80	0.98230	0.00054	19.60	0.96278	0.00057
22.80	0.99373	0.00049	21.00	0.98589	0.00054	19.70	0.96610	0.00056
23.00	0.99695	0.00048	21.20	0.99042	0.00052	19.80	0.96853	0.00057
23.20	1.00229	0.00051	21.40	0.99500	0.00054	19.90	0.97159	0.00055
23.40	1.00558	0.00048	21.60	1.00023	0.00054	20.00	0.97372	0.00054
23.60	1.00860	0.00051	21.80	1.00365	0.00051	20.10	0.97706	0.00054
23.80	1.01272	0.00050	22.00	1.00856	0.00054	20.20	0.97792	0.00053
24.00	1.01506	0.00050	22.20	1.01363	0.00053	20.30	0.98077	0.00056
24.20	1.01811	0.00047	22.30	1.01518	0.00052	20.40	0.98426	0.00054
						20.50	0.98654	0.00055
						20.60	0.98817	0.00054
						20.70	0.99082	0.00054
						20.80	0.99407	0.00056
						20.90	0.99692	0.00053
						21.00	0.99831	0.00054
						21.10	1.00120	0.00054
						21.20	1.00263	0.00055
						21.30	1.00479	0.00055
						21.40	1.00699	0.00052
						21.50	1.00875	0.00055
						21.60	1.01251	0.00054
						21.70	1.01478	0.00055
						21.80	1.01559	0.00055

Table B.3.1.2.1-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 0 Inches of Water Reflection (cont)

900 milli-g/cc			1000 milli-g/cc			1250 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.80	0.92005	0.00056	17.30	0.92094	0.00060	16.60	0.92265	0.00062
17.90	0.92496	0.00056	17.40	0.92400	0.00058	16.70	0.92697	0.00058
18.00	0.92713	0.00057	17.50	0.92478	0.00058	16.80	0.93082	0.00060
18.10	0.93065	0.00056	17.60	0.93103	0.00059	16.90	0.93436	0.00061
18.20	0.93138	0.00055	17.70	0.93392	0.00058	17.00	0.93749	0.00060
18.30	0.93500	0.00057	17.80	0.93694	0.00057	17.10	0.94151	0.00060
18.40	0.93890	0.00055	17.90	0.94162	0.00058	17.20	0.94489	0.00061
18.50	0.94353	0.00056	18.00	0.94474	0.00056	17.30	0.94970	0.00062
18.60	0.94557	0.00055	18.10	0.94826	0.00057	17.40	0.95315	0.00061
18.70	0.94772	0.00057	18.20	0.95136	0.00058	17.50	0.95645	0.00062
18.80	0.95135	0.00055	18.30	0.95323	0.00058	17.60	0.95950	0.00061
18.90	0.95365	0.00056	18.40	0.95609	0.00055	17.70	0.96243	0.00063
19.00	0.95622	0.00057	18.50	0.96000	0.00057	17.80	0.96638	0.00060
19.10	0.96000	0.00056	18.60	0.96289	0.00057	17.90	0.96948	0.00060
19.20	0.96342	0.00056	18.70	0.96669	0.00059	18.00	0.97407	0.00061
19.30	0.96475	0.00055	18.80	0.96922	0.00056	18.10	0.97680	0.00061
19.40	0.96869	0.00056	18.90	0.97283	0.00057	18.20	0.97974	0.00060
19.50	0.97249	0.00055	19.00	0.97500	0.00060	18.30	0.98176	0.00061
19.60	0.97503	0.00056	19.10	0.97737	0.00056	18.40	0.98583	0.00060
19.70	0.97532	0.00056	19.20	0.98089	0.00061	18.50	0.98846	0.00059
19.80	0.98001	0.00057	19.30	0.98288	0.00058	18.60	0.99237	0.00061
19.90	0.98162	0.00055	19.40	0.98706	0.00056	18.70	0.99500	0.00059
20.00	0.98467	0.00054	19.50	0.98922	0.00058	18.80	0.99904	0.00059
20.10	0.98810	0.00058	19.60	0.99092	0.00059	18.90	1.00174	0.00060
20.20	0.99025	0.00055	19.70	0.99539	0.00058	19.00	1.00407	0.00061
20.30	0.99338	0.00057	19.80	0.99700	0.00057	19.10	1.00744	0.00060
20.40	0.99630	0.00056	19.90	1.00069	0.00059	19.20	1.01137	0.00060
20.50	0.99760	0.00055	20.00	1.00332	0.00054	19.30	1.01393	0.00060
20.60	0.99985	0.00055	20.10	1.00623	0.00057	19.40	1.01614	0.00059
20.70	1.00233	0.00054	20.20	1.00962	0.00056	19.50	1.01926	0.00058
20.80	1.00499	0.00056	20.30	1.00991	0.00060			
20.90	1.00692	0.00056	20.40	1.01389	0.00055			
21.00	1.01004	0.00056						
21.10	1.01140	0.00056						
21.20	1.01441	0.00055						
21.30	1.01678	0.00055						

Table B.3.1.2.1-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 0 Inches of Water Reflection (cont)

1500 milli-g/cc			1700 milli-g/cc			1900 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
16.20	0.92170	0.00062	15.90	0.91672	0.00065	16.00	0.92178	0.00063
16.30	0.92640	0.00064	16.00	0.91909	0.00065	16.10	0.92558	0.00064
16.40	0.93079	0.00063	16.10	0.92452	0.00063	16.20	0.92995	0.00064
16.50	0.93395	0.00060	16.20	0.92800	0.00065	16.30	0.93586	0.00064
16.60	0.93768	0.00062	16.30	0.93161	0.00063	16.40	0.93970	0.00066
16.70	0.94212	0.00064	16.40	0.93660	0.00064	16.50	0.94114	0.00063
16.80	0.94637	0.00063	16.50	0.94059	0.00065	16.60	0.94559	0.00063
16.90	0.94931	0.00064	16.60	0.94408	0.00063	16.70	0.94959	0.00063
17.00	0.95334	0.00063	16.70	0.94755	0.00064	16.80	0.95434	0.00064
17.10	0.95782	0.00060	16.80	0.95289	0.00063	16.90	0.95758	0.00066
17.20	0.96081	0.00063	16.90	0.95643	0.00062	17.00	0.96269	0.00066
17.30	0.96573	0.00061	17.00	0.95873	0.00065	17.10	0.96584	0.00066
17.40	0.96778	0.00062	17.10	0.96304	0.00064	17.20	0.96980	0.00062
17.50	0.97104	0.00060	17.20	0.96664	0.00065	17.30	0.97385	0.00063
17.60	0.97566	0.00064	17.30	0.97051	0.00063	17.40	0.97547	0.00064
17.70	0.97693	0.00061	17.40	0.97454	0.00062	17.50	0.98123	0.00066
17.80	0.98176	0.00063	17.50	0.97765	0.00064	17.60	0.98474	0.00063
17.90	0.98704	0.00062	17.60	0.98090	0.00064	17.70	0.98739	0.00065
18.00	0.98917	0.00063	17.70	0.98349	0.00064	17.80	0.99015	0.00063
18.10	0.99251	0.00062	17.80	0.98740	0.00062	17.90	0.99371	0.00064
18.20	0.99505	0.00063	17.90	0.99102	0.00065	18.00	0.99844	0.00063
18.30	0.99916	0.00060	18.00	0.99550	0.00062	18.10	1.00187	0.00066
18.40	1.00235	0.00062	18.10	0.99829	0.00065	18.20	1.00562	0.00062
18.50	1.00439	0.00060	18.20	1.00243	0.00061	18.30	1.00700	0.00063
18.60	1.00834	0.00062	18.30	1.00552	0.00062	18.40	1.01244	0.00063
18.70	1.01188	0.00062	18.40	1.00956	0.00063	18.50	1.01466	0.00063
18.80	1.01540	0.00060	18.50	1.01177	0.00064	18.60	1.02008	0.00064
18.90	1.01887	0.00059	18.60	1.01626	0.00063			
			18.70	1.01944	0.00062			
			18.80	1.02210	0.00063			

Table B.3.1.2.1-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 0 Inches of Water Reflection (cont)

2000 milli-g/cc			2100 milli-g/cc			2500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
16.00	0.92341	0.00066	16.00	0.92141	0.00064	16.20	0.92322	0.00064
16.10	0.92634	0.00065	16.10	0.92447	0.00066	16.30	0.92607	0.00064
16.20	0.92987	0.00063	16.20	0.93052	0.00065	16.40	0.93045	0.00065
16.30	0.93419	0.00064	16.30	0.93190	0.00067	16.50	0.93566	0.00063
16.40	0.93958	0.00063	16.40	0.93826	0.00065	16.60	0.93866	0.00067
16.50	0.94158	0.00064	16.50	0.94166	0.00067	16.70	0.94292	0.00065
16.60	0.94539	0.00064	16.60	0.94616	0.00067	16.80	0.94643	0.00064
16.70	0.95094	0.00066	16.70	0.94986	0.00066	16.90	0.94997	0.00066
16.80	0.95407	0.00063	16.80	0.95458	0.00067	17.00	0.95524	0.00062
16.90	0.95842	0.00064	16.90	0.95699	0.00064	17.10	0.95914	0.00066
17.00	0.96194	0.00064	17.00	0.96173	0.00064	17.20	0.96226	0.00067
17.10	0.96612	0.00064	17.10	0.96540	0.00064	17.30	0.96531	0.00063
17.20	0.96893	0.00062	17.20	0.96947	0.00064	17.40	0.96946	0.00064
17.30	0.97304	0.00066	17.30	0.97318	0.00064	17.50	0.97350	0.00064
17.40	0.97601	0.00063	17.40	0.97650	0.00064	17.60	0.97696	0.00064
17.50	0.98105	0.00063	17.50	0.97966	0.00062	17.70	0.98018	0.00066
17.60	0.98423	0.00063	17.60	0.98209	0.00065	17.80	0.98462	0.00066
17.70	0.98772	0.00066	17.70	0.98743	0.00064	17.90	0.98714	0.00064
17.80	0.99032	0.00065	17.80	0.99040	0.00065	18.00	0.99014	0.00066
17.90	0.99389	0.00064	17.90	0.99350	0.00066	18.10	0.99480	0.00067
18.00	0.99774	0.00065	18.00	0.99710	0.00063	18.20	0.99651	0.00063
18.10	1.00199	0.00064	18.10	1.00045	0.00066	18.30	1.00103	0.00067
18.20	1.00667	0.00064	18.20	1.00366	0.00063	18.40	1.00366	0.00064
18.30	1.00952	0.00062	18.30	1.00773	0.00062	18.50	1.00851	0.00066
18.40	1.01227	0.00064	18.40	1.01100	0.00064	18.60	1.01062	0.00066
18.50	1.01546	0.00062	18.50	1.01459	0.00064	18.70	1.01455	0.00062
18.60	1.01880	0.00066	18.60	1.01652	0.00065	18.80	1.01776	0.00066

Table B.3.1.2.1-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 0 Inches of Water Reflection (cont)

3000 milli-g/cc			4000 milli-g/cc			5000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
16.60	0.92285	0.00066	17.50	0.91060	0.00064	19.70	0.92519	0.00063
16.70	0.92655	0.00064	17.60	0.91491	0.00066	19.90	0.92920	0.00061
16.80	0.93105	0.00065	17.70	0.91879	0.00066	20.10	0.93756	0.00063
16.90	0.93567	0.00065	17.80	0.92213	0.00066	20.30	0.94147	0.00060
17.00	0.93839	0.00065	17.90	0.92619	0.00064	20.50	0.94604	0.00062
17.10	0.94308	0.00067	18.00	0.92862	0.00065	20.70	0.95316	0.00062
17.20	0.94796	0.00065	18.10	0.93214	0.00065	20.90	0.95865	0.00061
17.30	0.95028	0.00065	18.20	0.93589	0.00065	21.10	0.96193	0.00059
17.40	0.95357	0.00065	18.30	0.93854	0.00065	21.30	0.96822	0.00062
17.50	0.95684	0.00063	18.40	0.94097	0.00065	21.50	0.97308	0.00061
17.60	0.96014	0.00065	18.50	0.94710	0.00065	21.70	0.97734	0.00063
17.70	0.96362	0.00065	18.60	0.94981	0.00064	21.90	0.98351	0.00061
17.80	0.96808	0.00067	18.70	0.95255	0.00063	22.10	0.98610	0.00059
17.90	0.97219	0.00062	18.80	0.95526	0.00065	22.30	0.99221	0.00060
18.00	0.97613	0.00063	18.90	0.95763	0.00066	22.50	0.99570	0.00061
18.10	0.97845	0.00063	19.00	0.96295	0.00063	22.70	1.00067	0.00063
18.20	0.98050	0.00067	19.10	0.96522	0.00064	22.90	1.00402	0.00062
18.30	0.98563	0.00064	19.20	0.96845	0.00066	23.10	1.01092	0.00063
18.40	0.98867	0.00063	19.30	0.97171	0.00064	23.30	1.01396	0.00057
18.50	0.99260	0.00064	19.40	0.97331	0.00063	23.50	1.01797	0.00061
18.60	0.99666	0.00067	19.50	0.97732	0.00064			
18.70	0.99995	0.00064	19.60	0.98038	0.00066			
18.80	1.00218	0.00065	19.70	0.98200	0.00063			
18.90	1.00427	0.00065	19.80	0.98527	0.00063			
19.00	1.00721	0.00061	19.90	0.98769	0.00063			
19.10	1.01223	0.00064	20.00	0.99104	0.00066			
19.20	1.01479	0.00065	20.10	0.99443	0.00063			
19.30	1.01754	0.00064	20.20	0.99730	0.00064			
			20.30	0.99916	0.00064			
			20.40	1.00221	0.00062			
			20.50	1.00515	0.00061			
			20.60	1.00879	0.00064			
			20.70	1.01067	0.00062			
			20.80	1.01334	0.00063			
			20.90	1.01407	0.00065			
			21.00	1.01910	0.00066			

Table B.3.1.2.1-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 0 Inches of Water Reflection (cont)

6000 milli-g/cc			7000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
22.20	0.92198	0.00057	26.00	0.92309	0.00054	28.90	0.92593	0.00054
22.40	0.92623	0.00059	26.30	0.92621	0.00055	29.30	0.93068	0.00055
22.60	0.93272	0.00060	26.60	0.93196	0.00054	29.70	0.93576	0.00052
22.80	0.93706	0.00057	26.90	0.93762	0.00053	30.10	0.94118	0.00054
23.00	0.93957	0.00057	27.20	0.94241	0.00058	30.50	0.94576	0.00054
23.20	0.94397	0.00059	27.50	0.94508	0.00057	30.90	0.95124	0.00051
23.40	0.94846	0.00057	27.80	0.94963	0.00056	31.30	0.95525	0.00051
23.60	0.95117	0.00058	28.10	0.95486	0.00056	31.70	0.95970	0.00053
23.80	0.95673	0.00057	28.40	0.95837	0.00053	32.10	0.96446	0.00054
24.00	0.95909	0.00062	28.70	0.96341	0.00055	32.50	0.96704	0.00050
24.20	0.96459	0.00059	29.00	0.96583	0.00052	32.90	0.97131	0.00053
24.40	0.96965	0.00057	29.30	0.97155	0.00054	33.30	0.97594	0.00051
24.60	0.97289	0.00059	29.60	0.97396	0.00056	33.70	0.97871	0.00049
24.80	0.97572	0.00057	29.90	0.97843	0.00055	34.10	0.98272	0.00051
25.00	0.98013	0.00058	30.20	0.98161	0.00054	34.50	0.98667	0.00051
25.20	0.98245	0.00061	30.50	0.98500	0.00055	34.90	0.98895	0.00052
25.40	0.98667	0.00060	30.80	0.98926	0.00053	35.30	0.99367	0.00052
25.60	0.99165	0.00059	31.10	0.99279	0.00056	35.70	0.99671	0.00054
25.80	0.99385	0.00059	31.40	0.99563	0.00056	36.10	1.00091	0.00052
26.00	0.99691	0.00061	31.70	0.99934	0.00053	36.50	1.00420	0.00050
26.20	0.99978	0.00057	32.00	1.00225	0.00056	36.90	1.00606	0.00049
26.40	1.00274	0.00056	32.30	1.00526	0.00053	37.30	1.00949	0.00052
26.60	1.00778	0.00058	32.60	1.00714	0.00053	37.70	1.01151	0.00051
26.80	1.01048	0.00059	32.90	1.01075	0.00053	37.80	1.01182	0.00051
27.00	1.01277	0.00057	33.10	1.01340	0.00054			
27.20	1.01582	0.00058						

Table B.3.1.2.1-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 0 Inches of Water Reflection (cont)

8000 milli-g/cc			9000 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma			
32.50	0.92657	0.00047	45.10	0.92788	0.00044			
33.10	0.93141	0.00051	47.00	0.93631	0.00045			
33.70	0.93793	0.00050	48.90	0.94501	0.00043			
34.30	0.94362	0.00052	50.80	0.95043	0.00043			
34.90	0.94765	0.00049	52.70	0.95762	0.00043			
35.50	0.95371	0.00051	54.60	0.96317	0.00045			
36.10	0.95864	0.00051	56.50	0.96783	0.00043			
36.70	0.96502	0.00049	58.40	0.97328	0.00045			
37.30	0.96843	0.00050	60.30	0.97744	0.00043			
37.90	0.97299	0.00051	62.20	0.98109	0.00043			
38.50	0.97641	0.00050	64.10	0.98459	0.00042			
39.10	0.98149	0.00049	66.00	0.98977	0.00043			
39.70	0.98518	0.00051	67.90	0.99254	0.00042			
40.30	0.98835	0.00049	69.80	0.99460	0.00042			
40.90	0.99307	0.00051	71.70	0.99826	0.00042			
41.50	0.99502	0.00049	73.60	0.99984	0.00042			
42.10	0.99891	0.00047	75.50	1.00279	0.00041			
42.70	1.00128	0.00047	77.40	1.00563	0.00041			
43.30	1.00515	0.00047	79.30	1.00647	0.00041			
43.90	1.00837	0.00047	81.20	1.00857	0.00042			
44.50	1.01054	0.00048	83.10	1.01064	0.00043			
44.80	1.01190	0.00047	83.70	1.01159	0.00041			

B.3.1.2.2. 1” Water Reflector

Case ID: u5o2-sp-0050-01

Material: Uranium dioxide in water

Geometry: Sphere

Isotopics: 5% ^{235}U 95% ^{238}U

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.3.1.2.2-1. Uranium Dioxide Sphere (5.0% ^{235}U) - 1 Inch of Water Reflection

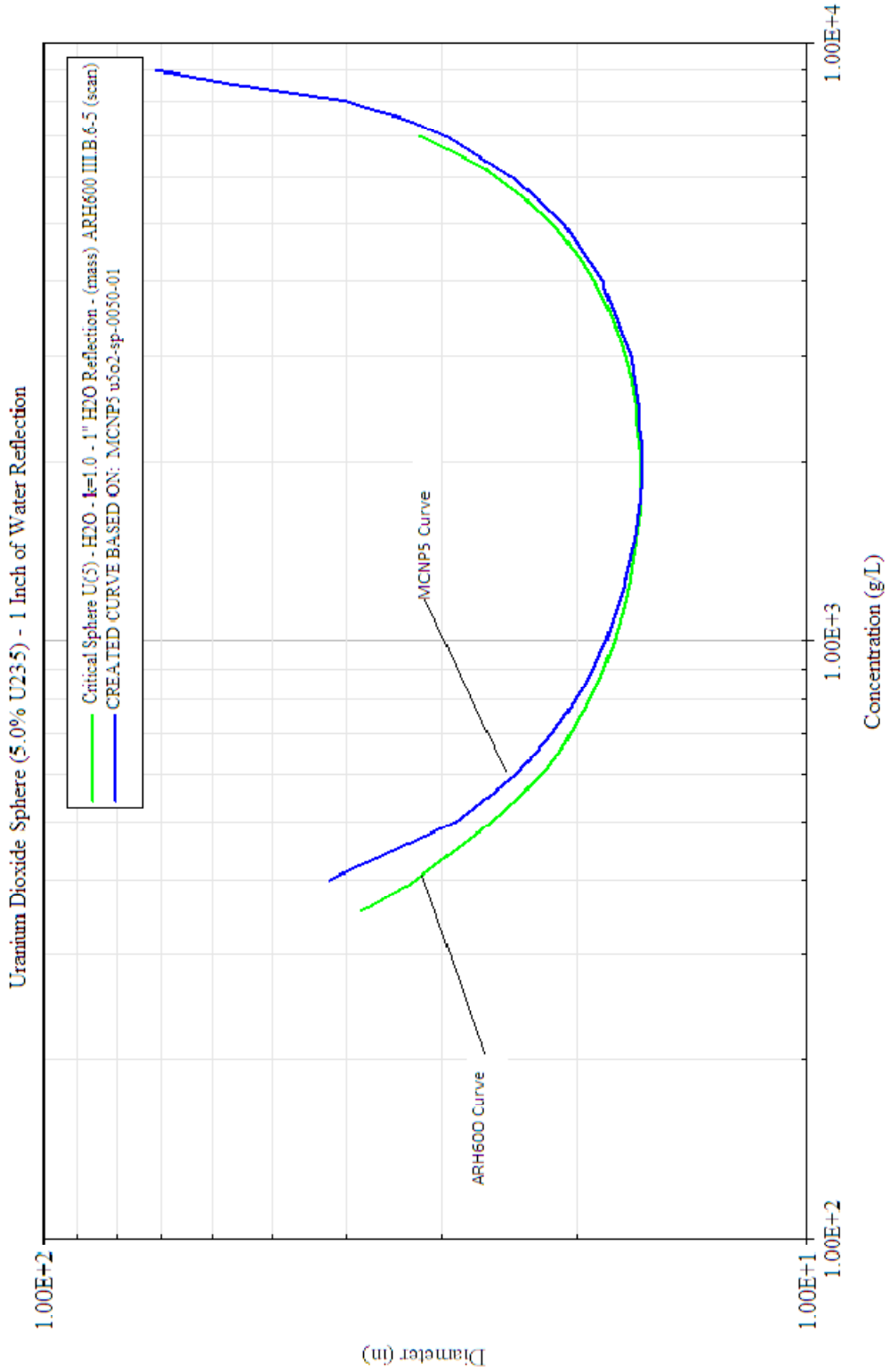

Table B.3.1.2.2-1. Critical Dimensions for Uranium Dioxide Sphere (5.0% ^{235}U) - 1 Inch of Water Reflection

Uranium Dioxide Sphere (5.0% ^{235}U) - 1 Inch of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.400	29.100	45.600	0.800	42.3210
0.500	22.700	30.200	0.300	28.7786
0.600	19.900	25.200	0.200	24.0192
0.700	18.400	22.600	0.200	21.6005
0.800	17.000	20.700	0.100	20.0619
0.850	16.600	20.200	0.100	19.4750
0.900	16.400	19.600	0.100	19.0216
1.000	15.800	19.000	0.100	18.3192
1.250	15.000	17.800	0.100	17.2319
1.500	14.600	17.300	0.100	16.6978
1.700	14.100	17.000	0.100	16.5169
1.900	14.400	17.000	0.100	16.3923
2.000	14.300	16.900	0.100	16.3930
2.100	14.400	16.900	0.100	16.3715
2.500	14.500	17.100	0.100	16.5513
3.000	14.900	17.600	0.100	16.9776
4.000	16.000	19.100	0.100	18.4834
5.000	17.900	21.500	0.100	20.7768
6.000	20.400	25.100	0.200	24.2549
7.000	24.000	30.900	0.300	29.7174
7.500	26.800	35.500	0.400	33.8474
8.000	30.300	42.900	0.600	39.8570
9.000	43.000	80.500	1.800	71.0312

MCNP5 Sample Input File
5.0% U02 Sphere- 1 Inches of Reflection

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UO2 sphere, 5.0 wt% 235U, 02500 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1540  hundreths of inches - must be integer
c radius =    19.5580 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 02500 milli-g Pu/cc
c Reflector width =  1.0 inches
c Enrichment = 0.05 wt fraction 235U
c
c Density of H2O 1.00000
c Density of UO2 11.00000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c U238  = 238.05080
c
c Effective uranium atomic mass 237.90045
c UO2
c Mass fraction of U in crit material 0.88144
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.2273 cc
c Volume of water in sample 0.7727 cc
c
c Mass of crit in sample   2.5000 g
c Mass of U in sample   2.2036 g
c Mass of bound O in sample  0.2964 g
c Mass of water in sample  0.7727 g
c
c Total mass of sample  3.2727g for a 1cc sample
c Mass Density for crit material  -3.2727, expressed as negative
c
c  sphere
20 11   -3.272727   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0
```

```
1       so    19.5580            $ Sphere
2       so    22.0980        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u oxide / water mixture
m11    $ UO2/H2O Sludge, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
1001.66c -0.026420
8016.66c -0.209692      $from water
8016.66c -0.090565      $from oxide
92235.66c -0.033666
92238.66c -0.639657
mt11     lwtr.60t
c
c    u oxide only
m12    $ U oxide, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
8016.66c -0.090565      $from oxide
92235.66c -0.033666
92238.66c -0.639657
c
```

Critview Compatible Data File
5.0% U02 Sphere- 1 Inches of Reflection

reset:
title: MCNP5 u5o2-sp-0050-01
set: MCNP5 set
source: MCNP5 primary
created: Wed 08/11/2010 16:11:51.46
geometry: sphere
modmat: H2O
critmat: uranium dioxide
isomat: U235 0.050 U238 0.950
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.400	42.3210
0.500	28.7786
0.600	24.0192
0.700	21.6005
0.800	20.0619
0.850	19.4750
0.900	19.0216
1.000	18.3192
1.250	17.2319
1.500	16.6978
1.700	16.5169
1.900	16.3923
2.000	16.3930
2.100	16.3715
2.500	16.5513
3.000	16.9776
4.000	18.4834
5.000	20.7768
6.000	24.2549
7.000	29.7174
7.500	33.8474
8.000	39.8570
9.000	71.0312

Table B.3.1.2.2-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 1 Inch of Water Reflection

400 milli-g/cc			500 milli-g/cc			600 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
29.10	0.92665	0.00037	22.70	0.92573	0.00043	19.90	0.92880	0.00047
29.90	0.93256	0.00036	23.00	0.93059	0.00043	20.10	0.93215	0.00048
30.70	0.94024	0.00037	23.30	0.93522	0.00045	20.30	0.93664	0.00047
31.50	0.94595	0.00035	23.60	0.93980	0.00043	20.50	0.94020	0.00047
32.30	0.95116	0.00035	23.90	0.94450	0.00042	20.70	0.94449	0.00048
33.10	0.95671	0.00036	24.20	0.94806	0.00042	20.90	0.94745	0.00049
33.90	0.96198	0.00034	24.50	0.95290	0.00042	21.10	0.95094	0.00046
34.70	0.96583	0.00035	24.80	0.95669	0.00043	21.30	0.95473	0.00047
35.50	0.97114	0.00034	25.10	0.95985	0.00044	21.50	0.95891	0.00046
36.30	0.97505	0.00034	25.40	0.96394	0.00041	21.70	0.96416	0.00046
37.10	0.97905	0.00035	25.70	0.96667	0.00042	21.90	0.96686	0.00046
37.90	0.98227	0.00034	26.00	0.97056	0.00043	22.10	0.96963	0.00046
38.70	0.98588	0.00032	26.30	0.97436	0.00042	22.30	0.97274	0.00047
39.50	0.98960	0.00034	26.60	0.97847	0.00041	22.50	0.97653	0.00045
40.30	0.99296	0.00033	26.90	0.98077	0.00041	22.70	0.97949	0.00046
41.10	0.99544	0.00033	27.20	0.98363	0.00042	22.90	0.98291	0.00044
41.90	0.99870	0.00032	27.50	0.98697	0.00041	23.10	0.98600	0.00046
42.70	1.00117	0.00033	27.80	0.99089	0.00040	23.30	0.98908	0.00044
43.50	1.00409	0.00033	28.10	0.99445	0.00041	23.50	0.99186	0.00046
44.30	1.00669	0.00032	28.40	0.99673	0.00040	23.70	0.99414	0.00046
45.10	1.00898	0.00033	28.70	0.99891	0.00040	23.90	0.99823	0.00046
45.60	1.01104	0.00032	29.00	1.00307	0.00042	24.10	1.00120	0.00047
			29.30	1.00496	0.00041	24.30	1.00404	0.00047
			29.60	1.00679	0.00041	24.50	1.00663	0.00043
			29.90	1.00934	0.00042	24.70	1.00913	0.00045
			30.20	1.01199	0.00041	24.90	1.01186	0.00045
						25.10	1.01451	0.00047
						25.20	1.01585	0.00044

Table B.3.1.2.2-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 1 Inch of Water Reflection (cont)

700 milli-g/cc			800 milli-g/cc			850 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
18.40	0.93153	0.00049	17.00	0.92259	0.00052	16.60	0.92212	0.00055
18.60	0.93538	0.00050	17.10	0.92630	0.00053	16.70	0.92510	0.00054
18.80	0.94152	0.00051	17.20	0.92773	0.00053	16.80	0.92835	0.00054
19.00	0.94586	0.00052	17.30	0.93089	0.00054	16.90	0.93102	0.00057
19.20	0.95108	0.00052	17.40	0.93432	0.00053	17.00	0.93386	0.00055
19.40	0.95540	0.00050	17.50	0.93635	0.00053	17.10	0.93758	0.00054
19.60	0.95950	0.00048	17.60	0.93900	0.00052	17.20	0.93920	0.00054
19.80	0.96511	0.00050	17.70	0.94301	0.00054	17.30	0.94239	0.00055
20.00	0.96790	0.00049	17.80	0.94454	0.00054	17.40	0.94533	0.00053
20.20	0.97333	0.00049	17.90	0.94819	0.00055	17.50	0.95006	0.00055
20.40	0.97773	0.00051	18.00	0.95036	0.00055	17.60	0.95175	0.00053
20.60	0.98159	0.00051	18.10	0.95285	0.00052	17.70	0.95533	0.00055
20.80	0.98536	0.00050	18.20	0.95548	0.00051	17.80	0.95709	0.00053
21.00	0.98988	0.00050	18.30	0.96022	0.00054	17.90	0.96030	0.00057
21.20	0.99275	0.00049	18.40	0.96007	0.00055	18.00	0.96233	0.00053
21.40	0.99713	0.00049	18.50	0.96394	0.00052	18.10	0.96539	0.00055
21.60	0.99999	0.00051	18.60	0.96655	0.00052	18.20	0.96900	0.00053
21.80	1.00390	0.00050	18.70	0.96926	0.00050	18.30	0.97035	0.00053
22.00	1.00797	0.00049	18.80	0.97062	0.00053	18.40	0.97219	0.00052
22.20	1.01289	0.00049	18.90	0.97341	0.00052	18.50	0.97553	0.00051
22.40	1.01482	0.00050	19.00	0.97571	0.00052	18.60	0.97893	0.00052
22.60	1.01888	0.00050	19.10	0.97879	0.00053	18.70	0.98142	0.00052
			19.20	0.98010	0.00054	18.80	0.98254	0.00054
			19.30	0.98330	0.00053	18.90	0.98635	0.00053
			19.40	0.98628	0.00053	19.00	0.98813	0.00052
			19.50	0.98900	0.00053	19.10	0.99033	0.00053
			19.60	0.98965	0.00054	19.20	0.99435	0.00053
			19.70	0.99319	0.00052	19.30	0.99554	0.00051
			19.80	0.99402	0.00056	19.40	0.99808	0.00051
			19.90	0.99674	0.00050	19.50	1.00064	0.00052
			20.00	0.99870	0.00051	19.60	1.00264	0.00053
			20.10	1.00080	0.00051	19.70	1.00440	0.00053
			20.20	1.00450	0.00054	19.80	1.00706	0.00051
			20.30	1.00634	0.00050	19.90	1.01032	0.00052
			20.40	1.00725	0.00049	20.00	1.01181	0.00052
			20.50	1.01092	0.00051	20.10	1.01463	0.00051
			20.60	1.01194	0.00054	20.20	1.01547	0.00050
			20.70	1.01339	0.00049			

Table B.3.1.2.2-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 1 Inch of Water Reflection (cont)

900 milli-g/cc			1000 milli-g/cc			1250 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
16.40	0.92588	0.00055	15.80	0.92383	0.00056	15.00	0.92570	0.00058
16.50	0.92879	0.00052	15.90	0.92695	0.00057	15.10	0.92723	0.00060
16.60	0.93229	0.00058	16.00	0.93104	0.00057	15.20	0.93154	0.00059
16.70	0.93561	0.00055	16.10	0.93399	0.00053	15.30	0.93430	0.00058
16.80	0.93886	0.00055	16.20	0.93744	0.00053	15.40	0.93897	0.00061
16.90	0.94111	0.00055	16.30	0.94085	0.00057	15.50	0.94148	0.00059
17.00	0.94424	0.00057	16.40	0.94362	0.00053	15.60	0.94706	0.00058
17.10	0.94789	0.00056	16.50	0.94718	0.00059	15.70	0.94911	0.00058
17.20	0.95154	0.00057	16.60	0.94958	0.00056	15.80	0.95395	0.00057
17.30	0.95440	0.00054	16.70	0.95285	0.00059	15.90	0.95626	0.00058
17.40	0.95711	0.00053	16.80	0.95651	0.00058	16.00	0.95907	0.00060
17.50	0.95966	0.00052	16.90	0.95950	0.00056	16.10	0.96398	0.00061
17.60	0.96268	0.00056	17.00	0.96314	0.00057	16.20	0.96582	0.00058
17.70	0.96571	0.00055	17.10	0.96546	0.00056	16.30	0.96956	0.00059
17.80	0.96842	0.00055	17.20	0.96959	0.00055	16.40	0.97352	0.00059
17.90	0.97054	0.00053	17.30	0.97148	0.00054	16.50	0.97629	0.00058
18.00	0.97343	0.00052	17.40	0.97424	0.00057	16.60	0.98030	0.00059
18.10	0.97547	0.00055	17.50	0.97759	0.00056	16.70	0.98333	0.00061
18.20	0.97894	0.00054	17.60	0.98081	0.00057	16.80	0.98732	0.00060
18.30	0.98162	0.00055	17.70	0.98404	0.00058	16.90	0.98830	0.00060
18.40	0.98401	0.00053	17.80	0.98519	0.00055	17.00	0.99231	0.00060
18.50	0.98767	0.00055	17.90	0.98948	0.00054	17.10	0.99601	0.00060
18.60	0.99051	0.00054	18.00	0.99293	0.00055	17.20	0.99935	0.00057
18.70	0.99194	0.00055	18.10	0.99423	0.00055	17.30	1.00139	0.00058
18.80	0.99433	0.00053	18.20	0.99661	0.00057	17.40	1.00406	0.00059
18.90	0.99842	0.00053	18.30	0.99945	0.00056	17.50	1.00913	0.00059
19.00	0.99927	0.00055	18.40	1.00231	0.00060	17.60	1.01142	0.00057
19.10	1.00265	0.00053	18.50	1.00591	0.00056	17.70	1.01343	0.00059
19.20	1.00357	0.00055	18.60	1.00736	0.00055	17.80	1.01731	0.00057
19.30	1.00674	0.00055	18.70	1.01044	0.00056			
19.40	1.00970	0.00054	18.80	1.01328	0.00056			
19.50	1.01121	0.00052	18.90	1.01549	0.00054			
19.60	1.01441	0.00054	19.00	1.01809	0.00056			

Table B.3.1.2.2-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 1 Inch of Water Reflection (cont)

1500 milli-g/cc			1700 milli-g/cc			1900 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
14.60	0.92350	0.00060	14.10	0.90959	0.00061	14.40	0.92483	0.00064
14.70	0.92648	0.00059	14.20	0.91393	0.00061	14.50	0.92912	0.00063
14.80	0.93122	0.00061	14.30	0.91651	0.00060	14.60	0.93346	0.00065
14.90	0.93598	0.00061	14.40	0.92142	0.00062	14.70	0.93713	0.00061
15.00	0.93829	0.00063	14.50	0.92568	0.00063	14.80	0.94087	0.00062
15.10	0.94450	0.00060	14.60	0.92932	0.00063	14.90	0.94522	0.00065
15.20	0.94761	0.00061	14.70	0.93505	0.00057	15.00	0.94807	0.00062
15.30	0.95120	0.00063	14.80	0.93799	0.00061	15.10	0.95237	0.00063
15.40	0.95405	0.00061	14.90	0.94283	0.00063	15.20	0.95701	0.00063
15.50	0.95824	0.00060	15.00	0.94765	0.00061	15.30	0.96030	0.00064
15.60	0.96195	0.00062	15.10	0.94830	0.00063	15.40	0.96424	0.00061
15.70	0.96483	0.00061	15.20	0.95451	0.00062	15.50	0.96826	0.00063
15.80	0.96905	0.00062	15.30	0.95711	0.00061	15.60	0.97201	0.00061
15.90	0.97241	0.00060	15.40	0.96177	0.00062	15.70	0.97608	0.00062
16.00	0.97575	0.00059	15.50	0.96547	0.00064	15.80	0.97864	0.00064
16.10	0.97962	0.00059	15.60	0.97062	0.00060	15.90	0.98190	0.00062
16.20	0.98326	0.00060	15.70	0.97272	0.00060	16.00	0.98559	0.00060
16.30	0.98642	0.00060	15.80	0.97662	0.00061	16.10	0.98981	0.00064
16.40	0.98990	0.00060	15.90	0.97908	0.00063	16.20	0.99373	0.00059
16.50	0.99297	0.00059	16.00	0.98484	0.00063	16.30	0.99724	0.00063
16.60	0.99559	0.00062	16.10	0.98761	0.00063	16.40	1.00023	0.00063
16.70	1.00010	0.00062	16.20	0.98865	0.00060	16.50	1.00390	0.00060
16.80	1.00275	0.00061	16.30	0.99232	0.00059	16.60	1.00682	0.00061
16.90	1.00633	0.00059	16.40	0.99735	0.00062	16.70	1.01016	0.00063
17.00	1.01015	0.00058	16.50	0.99920	0.00060	16.80	1.01353	0.00061
17.10	1.01386	0.00061	16.60	1.00393	0.00063	16.90	1.01765	0.00063
17.20	1.01649	0.00059	16.70	1.00585	0.00061	17.00	1.02011	0.00062
17.30	1.01972	0.00064	16.80	1.01051	0.00061			
			16.90	1.01442	0.00060			
			17.00	1.01823	0.00060			

Table B.3.1.2.2-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 1 Inch of Water Reflection (cont)

2000 milli-g/cc			2100 milli-g/cc			2500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
14.30	0.92005	0.00062	14.40	0.92464	0.00061	14.50	0.92309	0.00065
14.40	0.92412	0.00065	14.50	0.92899	0.00065	14.60	0.92724	0.00062
14.50	0.92953	0.00062	14.60	0.93300	0.00063	14.70	0.93113	0.00062
14.60	0.93243	0.00065	14.70	0.93803	0.00063	14.80	0.93682	0.00062
14.70	0.93734	0.00060	14.80	0.94109	0.00066	14.90	0.93936	0.00064
14.80	0.94209	0.00061	14.90	0.94411	0.00064	15.00	0.94303	0.00063
14.90	0.94479	0.00063	15.00	0.94919	0.00060	15.10	0.94779	0.00063
15.00	0.94824	0.00062	15.10	0.95169	0.00064	15.20	0.95240	0.00061
15.10	0.95235	0.00059	15.20	0.95756	0.00062	15.30	0.95534	0.00064
15.20	0.95660	0.00062	15.30	0.96012	0.00061	15.40	0.95889	0.00064
15.30	0.95926	0.00063	15.40	0.96386	0.00062	15.50	0.96310	0.00065
15.40	0.96337	0.00064	15.50	0.96754	0.00063	15.60	0.96565	0.00061
15.50	0.96826	0.00061	15.60	0.97318	0.00065	15.70	0.96862	0.00061
15.60	0.97288	0.00063	15.70	0.97696	0.00064	15.80	0.97288	0.00061
15.70	0.97554	0.00065	15.80	0.97965	0.00061	15.90	0.97609	0.00063
15.80	0.97967	0.00061	15.90	0.98263	0.00060	16.00	0.98003	0.00063
15.90	0.98149	0.00061	16.00	0.98707	0.00061	16.10	0.98424	0.00064
16.00	0.98728	0.00065	16.10	0.98870	0.00062	16.20	0.98749	0.00064
16.10	0.99004	0.00062	16.20	0.99329	0.00063	16.30	0.99083	0.00068
16.20	0.99457	0.00062	16.30	0.99726	0.00061	16.40	0.99411	0.00066
16.30	0.99572	0.00063	16.40	1.00109	0.00061	16.50	0.99821	0.00063
16.40	1.00032	0.00062	16.50	1.00383	0.00062	16.60	1.00170	0.00066
16.50	1.00387	0.00062	16.60	1.00765	0.00061	16.70	1.00369	0.00064
16.60	1.00775	0.00064	16.70	1.01082	0.00063	16.80	1.00881	0.00061
16.70	1.01144	0.00064	16.80	1.01350	0.00064	16.90	1.01089	0.00064
16.80	1.01324	0.00065	16.90	1.01701	0.00062	17.00	1.01527	0.00065
16.90	1.01729	0.00061				17.10	1.01743	0.00063

Table B.3.1.2.2-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 1 Inch of Water Reflection (cont)

3000 milli-g/cc			4000 milli-g/cc			5000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
14.90	0.92520	0.00063	16.00	0.92310	0.00062	17.90	0.92814	0.00060
15.00	0.92781	0.00064	16.10	0.92628	0.00062	18.00	0.92895	0.00064
15.10	0.93198	0.00063	16.20	0.92923	0.00063	18.10	0.93195	0.00059
15.20	0.93674	0.00063	16.30	0.93265	0.00062	18.20	0.93546	0.00064
15.30	0.93981	0.00063	16.40	0.93622	0.00064	18.30	0.93870	0.00062
15.40	0.94516	0.00063	16.50	0.93939	0.00064	18.40	0.94148	0.00061
15.50	0.94763	0.00063	16.60	0.94196	0.00064	18.50	0.94273	0.00063
15.60	0.95183	0.00064	16.70	0.94518	0.00060	18.60	0.94609	0.00063
15.70	0.95510	0.00063	16.80	0.94936	0.00063	18.70	0.94956	0.00061
15.80	0.95896	0.00063	16.90	0.95332	0.00060	18.80	0.95306	0.00059
15.90	0.96309	0.00067	17.00	0.95686	0.00063	18.90	0.95449	0.00060
16.00	0.96632	0.00065	17.10	0.95791	0.00062	19.00	0.95611	0.00061
16.10	0.96883	0.00064	17.20	0.96231	0.00064	19.10	0.95996	0.00060
16.20	0.97198	0.00063	17.30	0.96640	0.00063	19.20	0.96247	0.00063
16.30	0.97667	0.00063	17.40	0.96821	0.00062	19.30	0.96586	0.00063
16.40	0.97851	0.00064	17.50	0.97176	0.00063	19.40	0.96697	0.00061
16.50	0.98333	0.00063	17.60	0.97361	0.00065	19.50	0.97052	0.00061
16.60	0.98621	0.00064	17.70	0.97729	0.00063	19.60	0.97178	0.00061
16.70	0.99103	0.00065	17.80	0.97979	0.00065	19.70	0.97397	0.00060
16.80	0.99416	0.00062	17.90	0.98401	0.00063	19.80	0.97749	0.00062
16.90	0.99633	0.00064	18.00	0.98529	0.00064	19.90	0.97978	0.00061
17.00	1.00106	0.00066	18.10	0.98865	0.00062	20.00	0.98185	0.00062
17.10	1.00260	0.00064	18.20	0.99053	0.00064	20.10	0.98355	0.00061
17.20	1.00673	0.00065	18.30	0.99433	0.00063	20.20	0.98616	0.00063
17.30	1.00807	0.00064	18.40	0.99749	0.00064	20.30	0.98889	0.00062
17.40	1.01228	0.00062	18.50	1.00050	0.00061	20.40	0.99132	0.00060
17.50	1.01608	0.00063	18.60	1.00374	0.00061	20.50	0.99403	0.00063
17.60	1.01881	0.00064	18.70	1.00514	0.00063	20.60	0.99520	0.00062
			18.80	1.00844	0.00064	20.70	0.99864	0.00063
			18.90	1.01095	0.00064	20.80	1.00041	0.00064
			19.00	1.01476	0.00061	20.90	1.00158	0.00061
			19.10	1.01648	0.00064	21.00	1.00466	0.00060
						21.10	1.00648	0.00060
						21.20	1.00954	0.00063
						21.30	1.00972	0.00061
						21.40	1.01295	0.00063
						21.50	1.01458	0.00061

Table B.3.1.2.2-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 1 Inch of Water Reflection (cont)

6000 milli-g/cc			7000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
20.40	0.92741	0.00059	24.00	0.92512	0.00058	26.80	0.92638	0.00051
20.60	0.93105	0.00058	24.30	0.92830	0.00059	27.20	0.93275	0.00053
20.80	0.93595	0.00058	24.60	0.93393	0.00056	27.60	0.93761	0.00055
21.00	0.94006	0.00060	24.90	0.93895	0.00059	28.00	0.94239	0.00053
21.20	0.94449	0.00060	25.20	0.94325	0.00057	28.40	0.94700	0.00052
21.40	0.94953	0.00057	25.50	0.94805	0.00053	28.80	0.95188	0.00051
21.60	0.95108	0.00058	25.80	0.95092	0.00055	29.20	0.95544	0.00056
21.80	0.95613	0.00061	26.10	0.95529	0.00055	29.60	0.95908	0.00053
22.00	0.96153	0.00059	26.40	0.95967	0.00055	30.00	0.96341	0.00052
22.20	0.96503	0.00058	26.70	0.96436	0.00056	30.40	0.96824	0.00053
22.40	0.96896	0.00061	27.00	0.96736	0.00054	30.80	0.97181	0.00055
22.60	0.97210	0.00057	27.30	0.97105	0.00053	31.20	0.97551	0.00052
22.80	0.97578	0.00059	27.60	0.97538	0.00055	31.60	0.98009	0.00051
23.00	0.97992	0.00059	27.90	0.97981	0.00056	32.00	0.98241	0.00054
23.20	0.98229	0.00058	28.20	0.98286	0.00056	32.40	0.98702	0.00052
23.40	0.98574	0.00060	28.50	0.98534	0.00055	32.80	0.98948	0.00053
23.60	0.99076	0.00060	28.80	0.99041	0.00055	33.20	0.99380	0.00053
23.80	0.99230	0.00059	29.10	0.99264	0.00053	33.60	0.99760	0.00052
24.00	0.99720	0.00058	29.40	0.99696	0.00054	34.00	1.00148	0.00053
24.20	0.99907	0.00057	29.70	0.99985	0.00055	34.40	1.00338	0.00053
24.40	1.00246	0.00058	30.00	1.00244	0.00055	34.80	1.00620	0.00055
24.60	1.00661	0.00058	30.30	1.00663	0.00056	35.20	1.00954	0.00051
24.80	1.00929	0.00059	30.60	1.00836	0.00055	35.50	1.01124	0.00053
25.00	1.01073	0.00058	30.90	1.01226	0.00057			
25.10	1.01500	0.00055						

Table B.3.1.2.2-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 1 Inch of Water Reflection (cont)

8000 milli-g/cc			9000 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma			
30.30	0.92578	0.00051	43.00	0.92941	0.00045			
30.90	0.93231	0.00050	44.80	0.93639	0.00044			
31.50	0.93721	0.00054	46.60	0.94448	0.00044			
32.10	0.94299	0.00051	48.40	0.95100	0.00043			
32.70	0.94929	0.00052	50.20	0.95730	0.00044			
33.30	0.95548	0.00051	52.00	0.96210	0.00043			
33.90	0.95902	0.00051	53.80	0.96794	0.00043			
34.50	0.96332	0.00050	55.60	0.97198	0.00045			
35.10	0.96833	0.00049	57.40	0.97533	0.00043			
35.70	0.97305	0.00051	59.20	0.98143	0.00043			
36.30	0.97670	0.00051	61.00	0.98402	0.00045			
36.90	0.98136	0.00050	62.80	0.98678	0.00042			
37.50	0.98475	0.00050	64.60	0.98996	0.00043			
38.10	0.98844	0.00050	66.40	0.99298	0.00043			
38.70	0.99183	0.00049	68.20	0.99621	0.00043			
39.30	0.99482	0.00053	70.00	0.99890	0.00044			
39.90	1.00040	0.00050	71.80	1.00082	0.00041			
40.50	0.99982	0.00050	73.60	1.00298	0.00044			
41.10	1.00474	0.00049	75.40	1.00500	0.00045			
41.70	1.00884	0.00050	77.20	1.00772	0.00043			
42.30	1.00952	0.00050	79.00	1.00886	0.00042			
42.90	1.01415	0.00051	80.50	1.01021	0.00043			

B.3.1.2.3. 10” Water Reflector

Case ID: u5o2-sp-0050-10

Material: Uranium dioxide in water

Geometry: Sphere

Isotopics: 5% ^{235}U 95% ^{238}U

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.3.1.2.3-1. Uranium Dioxide Sphere (5.0% ^{235}U) - 10 Inches of Water Reflection

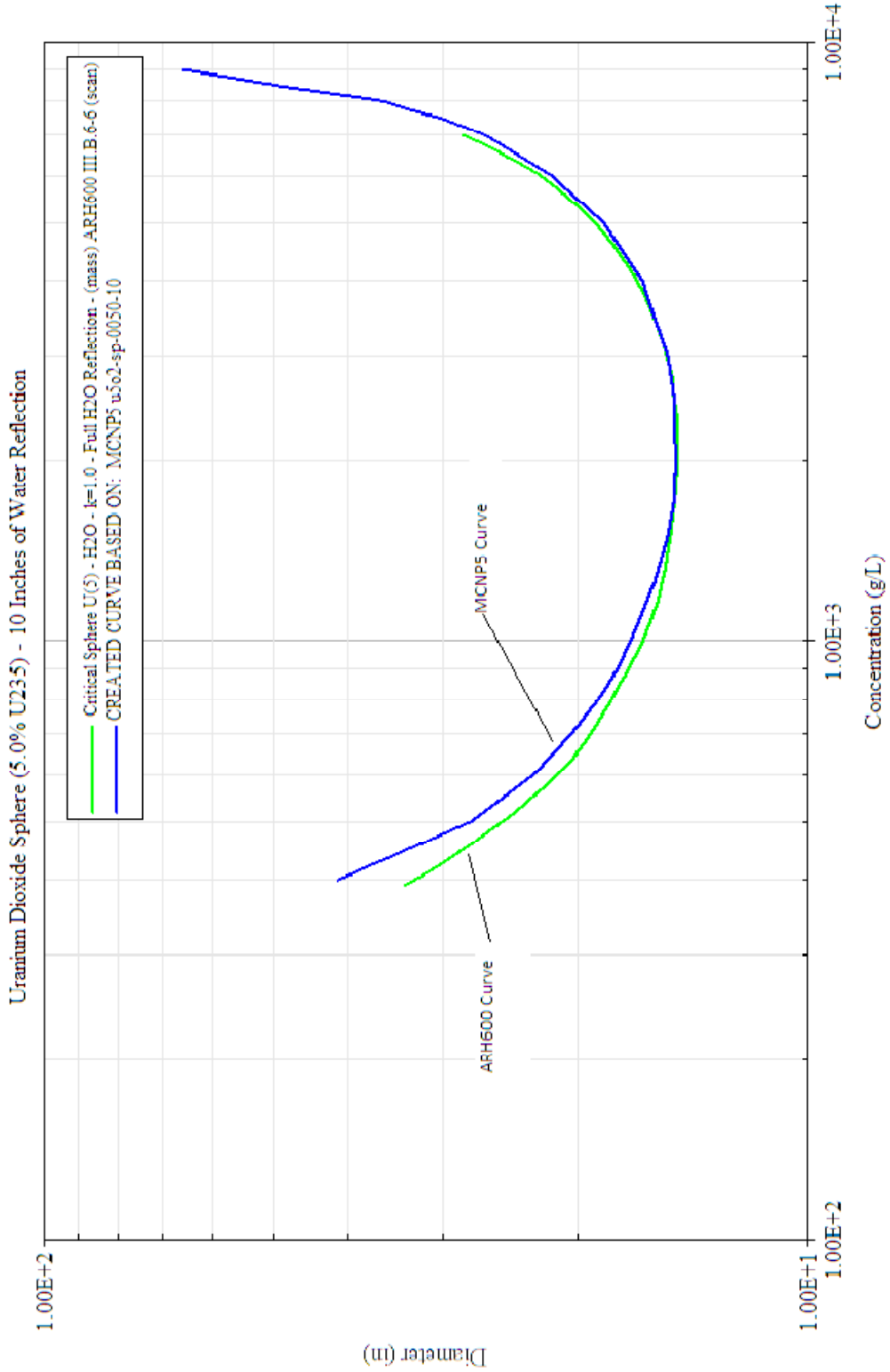

Table B.3.1.2.3-1. Critical Dimensions for Uranium Dioxide Sphere (5.0% ^{235}U) - 10 Inches of Water Reflection

Uranium Dioxide Sphere (5.0% ^{235}U) - 10 Inches of Water Reflection				
Concentrations (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.400	28.000	44.800	0.800	41.1089
0.500	21.500	28.900	0.300	27.6091
0.600	18.800	24.100	0.200	22.8000
0.700	17.200	21.100	0.200	20.3023
0.800	15.800	19.500	0.100	18.7704
0.850	15.400	18.900	0.100	18.2031
0.900	15.000	18.400	0.100	17.7128
1.000	14.500	17.600	0.100	17.0136
1.250	13.600	16.400	0.100	15.8512
1.500	13.200	15.800	0.100	15.2650
1.700	12.900	15.500	0.100	14.9876
1.900	12.800	15.400	0.100	14.9012
2.000	12.600	15.400	0.100	14.8438
2.100	12.600	15.300	0.100	14.8273
2.500	12.900	15.400	0.100	14.8977
3.000	13.100	15.800	0.100	15.2053
4.000	13.900	17.100	0.100	16.4557
5.000	15.500	19.100	0.100	18.4241
6.000	17.400	22.400	0.200	21.5392
7.000	20.800	27.800	0.300	26.4681
7.500	23.200	32.100	0.400	30.3589
8.000	26.300	38.900	0.600	36.1578
9.000	37.200	76.300	1.900	65.7722

MCNP5 Sample Input File
5.0% U02 Sphere- 10 Inches of Reflection

```
UO2 sphere, 5.0 wt% 235U, 02500 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1350  hundreths of inches - must be integer
c radius =    17.1450 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 02500 milli-g Pu/cc
c Reflector width = 10.0 inches
c Enrichment = 0.05 wt fraction 235U
c
c Density of H2O 1.00000
c Density of UO2 11.00000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c U238  = 238.05080
c
c Effective uranium atomic mass 237.90045
c UO2
c Mass fraction of U in crit material 0.88144
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.2273 cc
c Volume of water in sample 0.7727 cc
c
c Mass of crit in sample   2.5000 g
c Mass of U in sample   2.2036 g
c Mass of bound O in sample  0.2964 g
c Mass of water in sample  0.7727 g
c
c Total mass of sample  3.2727g for a 1cc sample
c Mass Density for crit material  -3.2727, expressed as negative
c
c  sphere
20 11   -3.272727   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0
```

```
1       so    17.1450            $ Sphere
2       so    42.5450        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u oxide / water mixture
m11    $ UO2/H2O Sludge, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
1001.66c -0.026420
8016.66c -0.209692      $from water
8016.66c -0.090565      $from oxide
92235.66c -0.033666
92238.66c -0.639657
mt11     lwtr.60t
c
c    u oxide only
m12    $ U oxide, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
8016.66c -0.090565      $from oxide
92235.66c -0.033666
92238.66c -0.639657
c
```

Critview Compatible Data File
5.0% U02 Sphere- 10 Inches of Reflection

reset:
title: MCNP5 u5o2-sp-0050-10
set: MCNP5 set
source: MCNP5 primary
created: Wed 08/11/2010 16:12:11.20
geometry: sphere
modmat: H2O
critmat: uranium dioxide
isomat: U235 0.050 U238 0.950
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.400	41.1089
0.500	27.6091
0.600	22.8000
0.700	20.3023
0.800	18.7704
0.850	18.2031
0.900	17.7128
1.000	17.0136
1.250	15.8512
1.500	15.2650
1.700	14.9876
1.900	14.9012
2.000	14.8438
2.100	14.8273
2.500	14.8977
3.000	15.2053
4.000	16.4557
5.000	18.4241
6.000	21.5392
7.000	26.4681
7.500	30.3589
8.000	36.1578
9.000	65.7722

Table B.3.1.2.3-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 10 Inches of Water Reflection

400 milli-g/cc			500 milli-g/cc			600 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
28.00	0.92716	0.00037	21.50	0.92615	0.00041	18.80	0.92957	0.00045
28.80	0.93370	0.00037	21.80	0.93110	0.00042	19.00	0.93412	0.00043
29.60	0.93978	0.00035	22.10	0.93583	0.00041	19.20	0.93889	0.00045
30.40	0.94662	0.00035	22.40	0.93944	0.00040	19.40	0.94205	0.00045
31.20	0.95255	0.00035	22.70	0.94350	0.00041	19.60	0.94574	0.00045
32.00	0.95698	0.00033	23.00	0.94646	0.00041	19.80	0.94915	0.00044
32.80	0.96229	0.00034	23.30	0.95251	0.00040	20.00	0.95421	0.00045
33.60	0.96719	0.00034	23.60	0.95624	0.00041	20.20	0.95660	0.00046
34.40	0.97116	0.00035	23.90	0.95987	0.00040	20.40	0.96159	0.00045
35.20	0.97516	0.00033	24.20	0.96350	0.00043	20.60	0.96433	0.00044
36.00	0.97994	0.00033	24.50	0.96738	0.00040	20.80	0.96900	0.00046
36.80	0.98346	0.00035	24.80	0.97095	0.00039	21.00	0.97164	0.00045
37.60	0.98622	0.00033	25.10	0.97440	0.00040	21.20	0.97540	0.00044
38.40	0.99028	0.00032	25.40	0.97737	0.00040	21.40	0.97859	0.00045
39.20	0.99366	0.00033	25.70	0.98173	0.00041	21.60	0.98138	0.00044
40.00	0.99581	0.00031	26.00	0.98434	0.00039	21.80	0.98449	0.00045
40.80	0.99861	0.00032	26.30	0.98807	0.00040	22.00	0.98743	0.00044
41.60	1.00221	0.00032	26.60	0.99072	0.00038	22.20	0.99042	0.00043
42.40	1.00491	0.00032	26.90	0.99393	0.00040	22.40	0.99385	0.00044
43.20	1.00780	0.00032	27.20	0.99558	0.00039	22.60	0.99659	0.00044
44.00	1.00951	0.00031	27.50	0.99860	0.00039	22.80	1.00000	0.00042
44.80	1.01200	0.00031	27.80	1.00245	0.00038	23.00	1.00337	0.00044
			28.10	1.00519	0.00039	23.20	1.00529	0.00045
			28.40	1.00737	0.00039	23.40	1.00857	0.00044
			28.70	1.01086	0.00039	23.60	1.01164	0.00041
			28.90	1.01120	0.00039	23.80	1.01273	0.00043
						24.00	1.01645	0.00043
						24.10	1.01806	0.00042

Table B.3.1.2.3-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 10 Inches of Water Reflection (cont)

700 milli-g/cc			800 milli-g/cc			850 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.20	0.93345	0.00050	15.80	0.92358	0.00051	15.40	0.92356	0.00050
17.40	0.93637	0.00046	15.90	0.92694	0.00050	15.50	0.92783	0.00051
17.60	0.94222	0.00048	16.00	0.93118	0.00053	15.60	0.93026	0.00052
17.80	0.94703	0.00048	16.10	0.93391	0.00049	15.70	0.93373	0.00049
18.00	0.95139	0.00050	16.20	0.93407	0.00048	15.80	0.93648	0.00049
18.20	0.95650	0.00048	16.30	0.93754	0.00050	15.90	0.94029	0.00051
18.40	0.95990	0.00047	16.40	0.94091	0.00051	16.00	0.94185	0.00052
18.60	0.96561	0.00048	16.50	0.94327	0.00051	16.10	0.94467	0.00050
18.80	0.96917	0.00048	16.60	0.94720	0.00051	16.20	0.94717	0.00051
19.00	0.97414	0.00046	16.70	0.94932	0.00050	16.30	0.95194	0.00051
19.20	0.97779	0.00047	16.80	0.95149	0.00050	16.40	0.95399	0.00051
19.40	0.98207	0.00045	16.90	0.95418	0.00051	16.50	0.95719	0.00049
19.60	0.98553	0.00047	17.00	0.95730	0.00048	16.60	0.95841	0.00049
19.80	0.99002	0.00048	17.10	0.95948	0.00050	16.70	0.96111	0.00051
20.00	0.99197	0.00047	17.20	0.96350	0.00050	16.80	0.96566	0.00051
20.20	0.99729	0.00046	17.30	0.96471	0.00050	16.90	0.96742	0.00052
20.40	1.00259	0.00045	17.40	0.96678	0.00052	17.00	0.97048	0.00051
20.60	1.00558	0.00047	17.50	0.97035	0.00049	17.10	0.97385	0.00050
20.80	1.00955	0.00046	17.60	0.97348	0.00053	17.20	0.97475	0.00052
21.00	1.01283	0.00046	17.70	0.97538	0.00050	17.30	0.97793	0.00050
21.10	1.01329	0.00046	17.80	0.97903	0.00051	17.40	0.98053	0.00052
			17.90	0.98124	0.00047	17.50	0.98288	0.00050
			18.00	0.98367	0.00048	17.60	0.98650	0.00051
			18.10	0.98482	0.00051	17.70	0.98785	0.00049
			18.20	0.98729	0.00050	17.80	0.99012	0.00051
			18.30	0.99040	0.00049	17.90	0.99312	0.00052
			18.40	0.99231	0.00049	18.00	0.99519	0.00050
			18.50	0.99396	0.00048	18.10	0.99609	0.00051
			18.60	0.99728	0.00049	18.20	0.99989	0.00048
			18.70	0.99817	0.00049	18.30	1.00346	0.00052
			18.80	1.00077	0.00049	18.40	1.00397	0.00051
			18.90	1.00401	0.00050	18.50	1.00781	0.00051
			19.00	1.00553	0.00049	18.60	1.00798	0.00050
			19.10	1.00789	0.00049	18.70	1.01205	0.00048
			19.20	1.00989	0.00050	18.80	1.01403	0.00051
			19.30	1.01197	0.00047	18.90	1.01460	0.00049
			19.40	1.01339	0.00050			
			19.50	1.01458	0.00047			

Table B.3.1.2.3-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 10 Inches of Water Reflection (cont)

900 milli-g/cc			1000 milli-g/cc			1250 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
15.00	0.92226	0.00051	14.50	0.92346	0.00056	13.60	0.92250	0.00057
15.10	0.92539	0.00052	14.60	0.92676	0.00053	13.70	0.92665	0.00055
15.20	0.92746	0.00053	14.70	0.93148	0.00053	13.80	0.92993	0.00057
15.30	0.93295	0.00052	14.80	0.93469	0.00052	13.90	0.93297	0.00055
15.40	0.93481	0.00050	14.90	0.93722	0.00053	14.00	0.93670	0.00055
15.50	0.93642	0.00053	15.00	0.94074	0.00053	14.10	0.94080	0.00057
15.60	0.93957	0.00050	15.10	0.94275	0.00052	14.20	0.94549	0.00055
15.70	0.94429	0.00051	15.20	0.94738	0.00054	14.30	0.94912	0.00055
15.80	0.94675	0.00052	15.30	0.94902	0.00053	14.40	0.95183	0.00056
15.90	0.95033	0.00051	15.40	0.95445	0.00054	14.50	0.95503	0.00054
16.00	0.95405	0.00052	15.50	0.95665	0.00053	14.60	0.95811	0.00055
16.10	0.95605	0.00053	15.60	0.95926	0.00052	14.70	0.96193	0.00056
16.20	0.95892	0.00052	15.70	0.96317	0.00052	14.80	0.96706	0.00057
16.30	0.96277	0.00053	15.80	0.96563	0.00054	14.90	0.96832	0.00055
16.40	0.96385	0.00051	15.90	0.96909	0.00052	15.00	0.97297	0.00056
16.50	0.96718	0.00053	16.00	0.97206	0.00052	15.10	0.97630	0.00054
16.60	0.97015	0.00051	16.10	0.97458	0.00052	15.20	0.98017	0.00053
16.70	0.97314	0.00051	16.20	0.97817	0.00052	15.30	0.98264	0.00056
16.80	0.97609	0.00051	16.30	0.98068	0.00053	15.40	0.98582	0.00056
16.90	0.97889	0.00051	16.40	0.98368	0.00051	15.50	0.98935	0.00054
17.00	0.98034	0.00051	16.50	0.98583	0.00050	15.60	0.99333	0.00056
17.10	0.98363	0.00051	16.60	0.98960	0.00055	15.70	0.99633	0.00055
17.20	0.98577	0.00052	16.70	0.99226	0.00052	15.80	0.99793	0.00054
17.30	0.99031	0.00049	16.80	0.99417	0.00052	15.90	1.00197	0.00055
17.40	0.99166	0.00049	16.90	0.99688	0.00050	16.00	1.00453	0.00055
17.50	0.99426	0.00053	17.00	0.99955	0.00051	16.10	1.00762	0.00055
17.60	0.99620	0.00052	17.10	1.00287	0.00052	16.20	1.01073	0.00055
17.70	0.99965	0.00051	17.20	1.00698	0.00053	16.30	1.01320	0.00057
17.80	1.00239	0.00048	17.30	1.00896	0.00051	16.40	1.01568	0.00055
17.90	1.00414	0.00050	17.40	1.01193	0.00053			
18.00	1.00755	0.00050	17.50	1.01297	0.00053			
18.10	1.00989	0.00050	17.60	1.01623	0.00053			
18.20	1.01128	0.00050						
18.30	1.01418	0.00052						
18.40	1.01638	0.00052						

Table B.3.1.2.3-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 10 Inches of Water Reflection (cont)

1500 milli-g/cc			1700 milli-g/cc			1900 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
13.20	0.92314	0.00058	12.90	0.91969	0.00058	12.80	0.91932	0.00059
13.30	0.92788	0.00056	13.00	0.92447	0.00058	12.90	0.92398	0.00057
13.40	0.93265	0.00056	13.10	0.92917	0.00057	13.00	0.92859	0.00058
13.50	0.93564	0.00057	13.20	0.93125	0.00059	13.10	0.93200	0.00058
13.60	0.94022	0.00056	13.30	0.93644	0.00058	13.20	0.93689	0.00056
13.70	0.94392	0.00059	13.40	0.93942	0.00059	13.30	0.94195	0.00057
13.80	0.94740	0.00057	13.50	0.94495	0.00058	13.40	0.94571	0.00060
13.90	0.95209	0.00056	13.60	0.94903	0.00058	13.50	0.94982	0.00058
14.00	0.95428	0.00059	13.70	0.95290	0.00055	13.60	0.95370	0.00059
14.10	0.95888	0.00056	13.80	0.95663	0.00057	13.70	0.95800	0.00056
14.20	0.96268	0.00057	13.90	0.96036	0.00057	13.80	0.96089	0.00060
14.30	0.96638	0.00057	14.00	0.96366	0.00058	13.90	0.96472	0.00058
14.40	0.97032	0.00057	14.10	0.96776	0.00058	14.00	0.96801	0.00056
14.50	0.97400	0.00055	14.20	0.97141	0.00058	14.10	0.97170	0.00058
14.60	0.97765	0.00055	14.30	0.97451	0.00057	14.20	0.97621	0.00060
14.70	0.98130	0.00055	14.40	0.97959	0.00057	14.30	0.97970	0.00059
14.80	0.98426	0.00056	14.50	0.98229	0.00059	14.40	0.98341	0.00059
14.90	0.98723	0.00056	14.60	0.98584	0.00058	14.50	0.98847	0.00056
15.00	0.99114	0.00057	14.70	0.98989	0.00057	14.60	0.98985	0.00056
15.10	0.99380	0.00057	14.80	0.99367	0.00058	14.70	0.99466	0.00058
15.20	0.99818	0.00057	14.90	0.99534	0.00057	14.80	0.99847	0.00059
15.30	1.00098	0.00054	15.00	1.00066	0.00057	14.90	0.99993	0.00059
15.40	1.00413	0.00059	15.10	1.00256	0.00058	15.00	1.00597	0.00061
15.50	1.00692	0.00055	15.20	1.00582	0.00057	15.10	1.00706	0.00057
15.60	1.01129	0.00057	15.30	1.00985	0.00057	15.20	1.01103	0.00059
15.70	1.01361	0.00057	15.40	1.01343	0.00056	15.30	1.01537	0.00058
15.80	1.01702	0.00055	15.50	1.01463	0.00059	15.40	1.01816	0.00061

Table B.3.1.2.3-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 10 Inches of Water Reflection (cont)

2000 milli-g/cc			2100 milli-g/cc			2500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
12.60	0.91417	0.00056	12.60	0.91457	0.00060	12.90	0.92462	0.00060
12.70	0.91858	0.00060	12.70	0.91806	0.00058	13.00	0.92902	0.00059
12.80	0.92068	0.00058	12.80	0.92301	0.00059	13.10	0.93148	0.00061
12.90	0.92611	0.00056	12.90	0.92659	0.00057	13.20	0.93693	0.00061
13.00	0.92985	0.00059	13.00	0.93065	0.00058	13.30	0.93993	0.00060
13.10	0.93373	0.00058	13.10	0.93532	0.00058	13.40	0.94527	0.00060
13.20	0.93792	0.00056	13.20	0.93855	0.00059	13.50	0.94958	0.00059
13.30	0.94175	0.00058	13.30	0.94269	0.00058	13.60	0.95217	0.00060
13.40	0.94629	0.00059	13.40	0.94842	0.00058	13.70	0.95705	0.00060
13.50	0.94939	0.00057	13.50	0.94994	0.00058	13.80	0.96092	0.00060
13.60	0.95346	0.00058	13.60	0.95460	0.00056	13.90	0.96418	0.00059
13.70	0.95861	0.00058	13.70	0.95918	0.00061	14.00	0.96774	0.00058
13.80	0.96127	0.00058	13.80	0.96351	0.00058	14.10	0.97056	0.00058
13.90	0.96644	0.00059	13.90	0.96741	0.00056	14.20	0.97599	0.00059
14.00	0.97006	0.00062	14.00	0.96998	0.00058	14.30	0.97949	0.00058
14.10	0.97427	0.00060	14.10	0.97377	0.00058	14.40	0.98234	0.00061
14.20	0.97810	0.00058	14.20	0.97757	0.00059	14.50	0.98618	0.00058
14.30	0.98165	0.00056	14.30	0.98223	0.00058	14.60	0.99026	0.00057
14.40	0.98451	0.00059	14.40	0.98524	0.00055	14.70	0.99287	0.00060
14.50	0.98907	0.00060	14.50	0.98814	0.00056	14.80	0.99749	0.00059
14.60	0.99251	0.00062	14.60	0.99258	0.00058	14.90	1.00006	0.00060
14.70	0.99565	0.00058	14.70	0.99465	0.00058	15.00	1.00395	0.00060
14.80	0.99779	0.00060	14.80	0.99900	0.00060	15.10	1.00623	0.00058
14.90	1.00284	0.00058	14.90	1.00266	0.00060	15.20	1.01056	0.00060
15.00	1.00621	0.00058	15.00	1.00564	0.00058	15.30	1.01494	0.00058
15.10	1.00962	0.00057	15.10	1.00940	0.00059	15.40	1.01810	0.00059
15.20	1.01234	0.00059	15.20	1.01280	0.00059			
15.30	1.01587	0.00058	15.30	1.01652	0.00059			
15.40	1.01915	0.00061						

Table B.3.1.2.3-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 10 Inches of Water Reflection (cont)

3000 milli-g/cc			4000 milli-g/cc			5000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
13.10	0.92258	0.00062	13.90	0.91951	0.00059	15.50	0.92375	0.00057
13.20	0.92570	0.00059	14.00	0.92440	0.00060	15.60	0.92756	0.00058
13.30	0.93128	0.00063	14.10	0.92519	0.00059	15.70	0.92999	0.00057
13.40	0.93461	0.00059	14.20	0.92971	0.00058	15.80	0.93351	0.00058
13.50	0.93974	0.00057	14.30	0.93342	0.00060	15.90	0.93658	0.00056
13.60	0.94257	0.00060	14.40	0.93762	0.00061	16.00	0.93929	0.00058
13.70	0.94617	0.00060	14.50	0.94116	0.00058	16.10	0.94225	0.00057
13.80	0.94974	0.00063	14.60	0.94428	0.00058	16.20	0.94472	0.00057
13.90	0.95445	0.00060	14.70	0.94712	0.00061	16.30	0.94709	0.00059
14.00	0.95732	0.00059	14.80	0.95044	0.00059	16.40	0.95028	0.00058
14.10	0.95994	0.00061	14.90	0.95467	0.00060	16.50	0.95260	0.00057
14.20	0.96388	0.00060	15.00	0.95700	0.00058	16.60	0.95547	0.00057
14.30	0.96797	0.00059	15.10	0.96136	0.00059	16.70	0.95798	0.00058
14.40	0.97202	0.00059	15.20	0.96240	0.00060	16.80	0.96095	0.00058
14.50	0.97544	0.00061	15.30	0.96575	0.00060	16.90	0.96233	0.00057
14.60	0.97941	0.00058	15.40	0.96935	0.00060	17.00	0.96452	0.00058
14.70	0.98347	0.00060	15.50	0.97309	0.00058	17.10	0.96826	0.00060
14.80	0.98528	0.00061	15.60	0.97661	0.00059	17.20	0.97115	0.00057
14.90	0.98921	0.00060	15.70	0.97853	0.00059	17.30	0.97311	0.00058
15.00	0.99239	0.00060	15.80	0.98151	0.00058	17.40	0.97641	0.00056
15.10	0.99502	0.00062	15.90	0.98488	0.00060	17.50	0.97843	0.00059
15.20	0.99987	0.00061	16.00	0.98704	0.00060	17.60	0.98099	0.00060
15.30	1.00234	0.00059	16.10	0.99001	0.00058	17.70	0.98365	0.00058
15.40	1.00512	0.00058	16.20	0.99324	0.00058	17.80	0.98497	0.00058
15.50	1.00916	0.00058	16.30	0.99652	0.00059	17.90	0.98806	0.00059
15.60	1.01167	0.00058	16.40	0.99843	0.00061	18.00	0.99015	0.00058
15.70	1.01478	0.00060	16.50	1.00125	0.00060	18.10	0.99239	0.00058
15.80	1.01820	0.00061	16.60	1.00444	0.00059	18.20	0.99475	0.00059
			16.70	1.00737	0.00059	18.30	0.99754	0.00057
			16.80	1.00872	0.00059	18.40	0.99947	0.00056
			16.90	1.01170	0.00058	18.50	1.00167	0.00058
			17.00	1.01465	0.00059	18.60	1.00338	0.00058
			17.10	1.01661	0.00058	18.70	1.00544	0.00058
						18.80	1.00840	0.00058
						18.90	1.01014	0.00059
						19.00	1.01158	0.00057
						19.10	1.01404	0.00059

Table B.3.1.2.3-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 10 Inches of Water Reflection (cont)

6000 milli-g/cc			7000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.40	0.92159	0.00053	20.80	0.92489	0.00055	23.20	0.92613	0.00054
17.60	0.92468	0.00055	21.10	0.93079	0.00054	23.60	0.93219	0.00051
17.80	0.93021	0.00058	21.40	0.93446	0.00052	24.00	0.93576	0.00052
18.00	0.93399	0.00055	21.70	0.93900	0.00054	24.40	0.94108	0.00054
18.20	0.93860	0.00056	22.00	0.94465	0.00050	24.80	0.94613	0.00052
18.40	0.94304	0.00056	22.30	0.94794	0.00054	25.20	0.95167	0.00052
18.60	0.94626	0.00056	22.60	0.95320	0.00053	25.60	0.95598	0.00055
18.80	0.95119	0.00056	22.90	0.95696	0.00054	26.00	0.95991	0.00051
19.00	0.95512	0.00055	23.20	0.96105	0.00055	26.40	0.96273	0.00050
19.20	0.95874	0.00054	23.50	0.96466	0.00052	26.80	0.96812	0.00050
19.40	0.96241	0.00055	23.80	0.96918	0.00054	27.20	0.97219	0.00051
19.60	0.96697	0.00056	24.10	0.97184	0.00054	27.60	0.97616	0.00052
19.80	0.97101	0.00056	24.40	0.97705	0.00053	28.00	0.97999	0.00050
20.00	0.97384	0.00056	24.70	0.97969	0.00054	28.40	0.98232	0.00052
20.20	0.97760	0.00055	25.00	0.98394	0.00055	28.80	0.98626	0.00051
20.40	0.98028	0.00057	25.30	0.98785	0.00054	29.20	0.99084	0.00053
20.60	0.98475	0.00057	25.60	0.99054	0.00054	29.60	0.99332	0.00051
20.80	0.98850	0.00057	25.90	0.99380	0.00055	30.00	0.99659	0.00051
21.00	0.99176	0.00056	26.20	0.99597	0.00055	30.40	1.00039	0.00052
21.20	0.99444	0.00056	26.50	1.00048	0.00054	30.80	1.00369	0.00051
21.40	0.99780	0.00057	26.80	1.00326	0.00054	31.20	1.00612	0.00051
21.60	1.00096	0.00057	27.10	1.00604	0.00054	31.60	1.00997	0.00053
21.80	1.00547	0.00058	27.40	1.00924	0.00053	32.00	1.01156	0.00049
22.00	1.00884	0.00055	27.70	1.01242	0.00051	32.10	1.01260	0.00052
22.20	1.01154	0.00056	27.80	1.01451	0.00051			
22.40	1.01428	0.00056						

Table B.3.1.2.3-2. K_{eff} Values for Uranium Dioxide Sphere (5.0% ^{235}U) - 10 Inches of Water Reflection (cont)

8000 milli-g/cc			9000 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma			
26.30	0.92761	0.00050	37.20	0.92652	0.00046			
26.90	0.93241	0.00049	39.10	0.93496	0.00045			
27.50	0.93821	0.00051	41.00	0.94332	0.00045			
28.10	0.94331	0.00049	42.90	0.94979	0.00044			
28.70	0.94855	0.00051	44.80	0.95638	0.00044			
29.30	0.95448	0.00049	46.70	0.96348	0.00044			
29.90	0.95952	0.00051	48.60	0.96789	0.00045			
30.50	0.96399	0.00050	50.50	0.97235	0.00044			
31.10	0.96828	0.00050	52.40	0.97636	0.00045			
31.70	0.97296	0.00049	54.30	0.98133	0.00044			
32.30	0.97674	0.00051	56.20	0.98388	0.00046			
32.90	0.98006	0.00050	58.10	0.98759	0.00044			
33.50	0.98543	0.00050	60.00	0.99091	0.00046			
34.10	0.98743	0.00051	61.90	0.99383	0.00042			
34.70	0.99239	0.00049	63.80	0.99753	0.00042			
35.30	0.99441	0.00048	65.70	0.99994	0.00042			
35.90	0.99823	0.00048	67.60	1.00152	0.00042			
36.50	1.00235	0.00050	69.50	1.00401	0.00044			
37.10	1.00425	0.00049	71.40	1.00639	0.00044			
37.70	1.00817	0.00049	73.30	1.00856	0.00042			
38.30	1.01012	0.00051	75.20	1.00997	0.00042			
38.90	1.01411	0.00047	76.30	1.01110	0.00042			

B.3.1.3. 4% ^{235}U 96% ^{238}U

B.3.1.3.1. Unreflected

Case ID: u5o2-sp-0040-00

Material: Uranium dioxide in water

Geometry: Sphere

Isotopics: 4% ^{235}U 96% ^{238}U

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.3.1.3.1-1. Uranium Dioxide Sphere (4.0% ^{235}U) - 0 Inches of Water Reflection

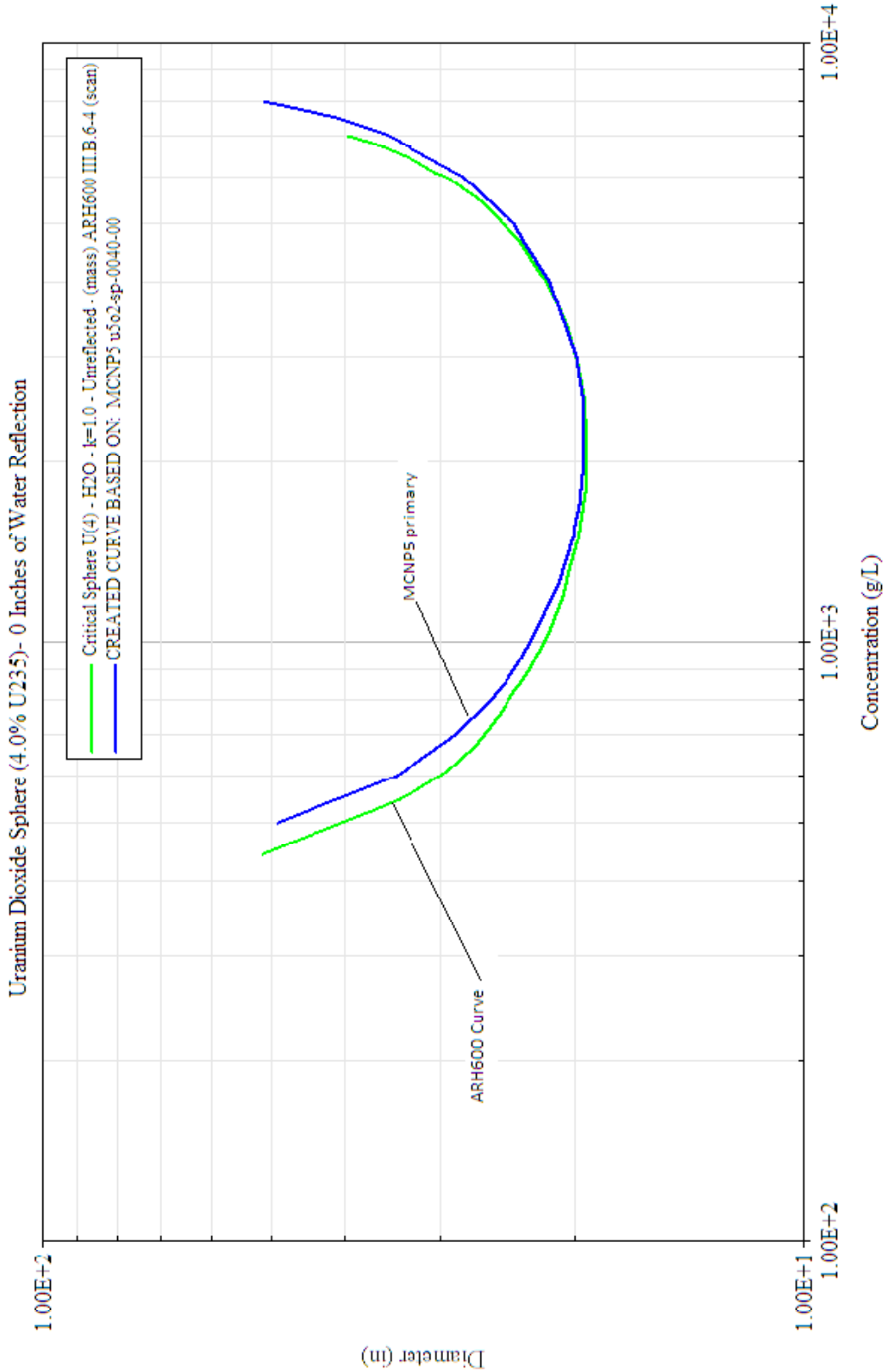

Table B.3.1.3.1-1. Critical Dimensions for Uranium Dioxide Sphere (4.0% ^{235}U) - 0 Inches of Water Reflection

Uranium Dioxide Sphere (4.0% ^{235}U) - 0 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.500	32.500	54.200	1.000	49.1277
0.600	26.400	36.300	0.500	34.2007
0.700	23.500	30.300	0.300	28.7186
0.800	21.400	26.800	0.200	25.8198
0.850	20.700	25.800	0.200	24.8047
0.900	20.300	25.000	0.200	24.0072
1.000	19.400	23.500	0.200	22.8014
1.250	18.500	21.800	0.100	20.9791
1.500	17.600	20.700	0.100	20.0788
1.700	17.200	20.300	0.100	19.7039
1.900	17.100	20.100	0.100	19.5213
2.000	16.800	20.000	0.100	19.4184
2.100	17.000	20.000	0.100	19.4339
2.500	17.100	20.100	0.100	19.4872
3.000	12.100	20.500	0.400	19.8806
4.000	18.600	22.200	0.100	21.5137
5.000	20.600	24.900	0.200	24.0384
6.000	23.500	29.100	0.200	28.0916
7.000	28.100	36.700	0.400	35.0333
7.500	31.800	43.300	0.500	40.9994
8.000	36.600	54.800	0.900	51.2461

MCNP5 Sample Input File
4.0% U02 Sphere- 0 Inches of Reflection

```
UO2 sphere, 4.0 wt% 235U, 02500 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1800  hundreths of inches - must be integer
c radius =    22.8600 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 02500 milli-g Pu/cc
c Reflector width =  0.0 inches
c Enrichment = 0.04 wt fraction 235U
c
c Density of H2O 1.00000
c Density of UO2 11.00000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c U238  = 238.05080
c
c Effective uranium atomic mass 237.93052
c UO2
c Mass fraction of U in crit material 0.88145
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.2273 cc
c Volume of water in sample 0.7727 cc
c
c Mass of crit in sample   2.5000 g
c Mass of U in sample   2.2036 g
c Mass of bound O in sample  0.2964 g
c Mass of water in sample  0.7727 g
c
c Total mass of sample  3.2727g for a 1cc sample
c Mass Density for crit material  -3.2727, expressed as negative
c
c  sphere
20 11   -3.272727   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=0    $zero importance if no reflector
22  0            2           imp:n=0
```

```
1       so    22.8600              $ Sphere
2       so    22.8600        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u oxide / water mixture
m11    $ UO2/H2O Sludge, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
1001.66c -0.026420
8016.66c -0.209692      $from water
8016.66c -0.090555      $from oxide
92235.66c -0.026933
92238.66c -0.646400
mt11     lwtr.60t
c
c    u oxide only
m12    $ U oxide, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
8016.66c -0.090555      $from oxide
92235.66c -0.026933
92238.66c -0.646400
c
```

Critview Compatible Data File
4.0% U02 Sphere- 0 Inches of Reflection

reset:
title: MCNP5 u5o2-sp-0040-00
set: MCNP5 set
source: MCNP5 primary
created: Wed 08/11/2010 9:01:00.70
geometry: sphere
modmat: H2O
critmat: uranium dioxide
isomat: U235 0.040 U238 0.960
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.500	49.1277
0.600	34.2007
0.700	28.7186
0.800	25.8198
0.850	24.8047
0.900	24.0072
1.000	22.8014
1.250	20.9791
1.500	20.0788
1.700	19.7039
1.900	19.5213
2.000	19.4184
2.100	19.4339
2.500	19.4872
3.000	19.8806
4.000	21.5137
5.000	24.0384
6.000	28.0916
7.000	35.0333
7.500	40.9994
8.000	51.2461

Table B.3.1.3.1-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 0 Inches of Water Reflection

500 milli-g/cc			600 milli-g/cc			700 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
32.50	0.92649	0.00037	26.40	0.92720	0.00045	23.50	0.92938	0.00045
33.50	0.93432	0.00035	26.90	0.93349	0.00041	23.80	0.93343	0.00047
34.50	0.93896	0.00037	27.40	0.93904	0.00044	24.10	0.93857	0.00046
35.50	0.94727	0.00035	27.90	0.94448	0.00039	24.40	0.94289	0.00046
36.50	0.95329	0.00036	28.40	0.95061	0.00041	24.70	0.94872	0.00047
37.50	0.95771	0.00035	28.90	0.95561	0.00041	25.00	0.95275	0.00046
38.50	0.96204	0.00035	29.40	0.96065	0.00041	25.30	0.95841	0.00046
39.50	0.96718	0.00035	29.90	0.96645	0.00043	25.60	0.96018	0.00046
40.50	0.97090	0.00035	30.40	0.97049	0.00040	25.90	0.96544	0.00045
41.50	0.97571	0.00032	30.90	0.97410	0.00040	26.20	0.96984	0.00046
42.50	0.97885	0.00034	31.40	0.97992	0.00039	26.50	0.97478	0.00044
43.50	0.98326	0.00032	31.90	0.98271	0.00040	26.80	0.97755	0.00045
44.50	0.98629	0.00034	32.40	0.98734	0.00040	27.10	0.98168	0.00044
45.50	0.99036	0.00033	32.90	0.99074	0.00041	27.40	0.98477	0.00044
46.50	0.99305	0.00034	33.40	0.99519	0.00040	27.70	0.98872	0.00043
47.50	0.99579	0.00032	33.90	0.99754	0.00039	28.00	0.99130	0.00046
48.50	0.99769	0.00033	34.40	1.00163	0.00039	28.30	0.99549	0.00044
49.50	1.00137	0.00033	34.90	1.00362	0.00039	28.60	0.99896	0.00044
50.50	1.00411	0.00033	35.40	1.00726	0.00038	28.90	1.00159	0.00042
51.50	1.00637	0.00031	35.90	1.01220	0.00038	29.20	1.00550	0.00044
52.50	1.00897	0.00030	36.30	1.01407	0.00040	29.50	1.00808	0.00044
53.50	1.01129	0.00030				29.80	1.01205	0.00042
54.20	1.01243	0.00032				30.10	1.01467	0.00042
						30.30	1.01610	0.00041

Table B.3.1.3.1-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 0 Inches of Water Reflection (cont)

800 milli-g/cc			850 milli-g/cc			900 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
21.40	0.92336	0.00048	20.70	0.92217	0.00053	20.30	0.92585	0.00051
21.60	0.92916	0.00049	20.90	0.92635	0.00051	20.50	0.92979	0.00050
21.80	0.93122	0.00051	21.10	0.93144	0.00050	20.70	0.93405	0.00051
22.00	0.93661	0.00050	21.30	0.93498	0.00050	20.90	0.93960	0.00052
22.20	0.93936	0.00048	21.50	0.93937	0.00051	21.10	0.94377	0.00052
22.40	0.94406	0.00049	21.70	0.94354	0.00050	21.30	0.94703	0.00051
22.60	0.94768	0.00047	21.90	0.94718	0.00049	21.50	0.95296	0.00049
22.80	0.95181	0.00049	22.10	0.95253	0.00050	21.70	0.95623	0.00052
23.00	0.95516	0.00051	22.30	0.95520	0.00049	21.90	0.96168	0.00050
23.20	0.95839	0.00048	22.50	0.95968	0.00048	22.10	0.96431	0.00048
23.40	0.96229	0.00048	22.70	0.96342	0.00051	22.30	0.96909	0.00051
23.60	0.96615	0.00048	22.90	0.96834	0.00047	22.50	0.97216	0.00050
23.80	0.96937	0.00047	23.10	0.97107	0.00051	22.70	0.97800	0.00052
24.00	0.97237	0.00049	23.30	0.97517	0.00049	22.90	0.98086	0.00052
24.20	0.97626	0.00049	23.50	0.97922	0.00049	23.10	0.98410	0.00052
24.40	0.97886	0.00048	23.70	0.98238	0.00049	23.30	0.98682	0.00050
24.60	0.98272	0.00046	23.90	0.98608	0.00048	23.50	0.99127	0.00051
24.80	0.98538	0.00047	24.10	0.98977	0.00048	23.70	0.99444	0.00051
25.00	0.98826	0.00047	24.30	0.99240	0.00049	23.90	0.99746	0.00050
25.20	0.99182	0.00048	24.50	0.99539	0.00048	24.10	1.00220	0.00051
25.40	0.99417	0.00048	24.70	0.99877	0.00051	24.30	1.00649	0.00050
25.60	0.99745	0.00046	24.90	1.00112	0.00047	24.50	1.00961	0.00049
25.80	0.99971	0.00049	25.10	1.00485	0.00048	24.70	1.01132	0.00049
26.00	1.00264	0.00047	25.30	1.00745	0.00047	24.90	1.01482	0.00049
26.20	1.00598	0.00048	25.50	1.01113	0.00050	25.00	1.01703	0.00048
26.40	1.00765	0.00048	25.70	1.01425	0.00048			
26.60	1.01086	0.00046	25.80	1.01468	0.00047			
26.80	1.01285	0.00045						

Table B.3.1.3.1-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 0 Inches of Water Reflection (cont)

1000 milli-g/cc			1250 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
19.40	0.92166	0.00053	18.50	0.93359	0.00057	17.60	0.92539	0.00061
19.60	0.92846	0.00052	18.60	0.93651	0.00058	17.70	0.92747	0.00059
19.80	0.93403	0.00053	18.70	0.93967	0.00056	17.80	0.93127	0.00057
20.00	0.93881	0.00052	18.80	0.94311	0.00058	17.90	0.93582	0.00057
20.20	0.94388	0.00054	18.90	0.94528	0.00060	18.00	0.93893	0.00060
20.40	0.94954	0.00055	19.00	0.94779	0.00059	18.10	0.94099	0.00057
20.60	0.95350	0.00054	19.10	0.94990	0.00058	18.20	0.94563	0.00059
20.80	0.95797	0.00050	19.20	0.95501	0.00057	18.30	0.94761	0.00059
21.00	0.96363	0.00054	19.30	0.95544	0.00057	18.40	0.95174	0.00061
21.20	0.96790	0.00053	19.40	0.95934	0.00057	18.50	0.95446	0.00058
21.40	0.97138	0.00055	19.50	0.96217	0.00058	18.60	0.95753	0.00059
21.60	0.97507	0.00053	19.60	0.96496	0.00058	18.70	0.96024	0.00058
21.80	0.98143	0.00052	19.70	0.96768	0.00059	18.80	0.96388	0.00060
22.00	0.98435	0.00053	19.80	0.96990	0.00057	18.90	0.96671	0.00058
22.20	0.98849	0.00050	19.90	0.97300	0.00057	19.00	0.96949	0.00060
22.40	0.99279	0.00054	20.00	0.97509	0.00057	19.10	0.97219	0.00061
22.60	0.99701	0.00050	20.10	0.97846	0.00055	19.20	0.97507	0.00060
22.80	0.99996	0.00049	20.20	0.98220	0.00056	19.30	0.97777	0.00059
23.00	1.00552	0.00051	20.30	0.98347	0.00057	19.40	0.98252	0.00057
23.20	1.00906	0.00052	20.40	0.98535	0.00057	19.50	0.98382	0.00061
23.40	1.01275	0.00050	20.50	0.98935	0.00054	19.60	0.98611	0.00061
23.50	1.01360	0.00050	20.60	0.99132	0.00057	19.70	0.98943	0.00061
			20.70	0.99184	0.00054	19.80	0.99290	0.00059
			20.80	0.99566	0.00057	19.90	0.99483	0.00059
			20.90	0.99781	0.00058	20.00	0.99665	0.00056
			21.00	1.00058	0.00056	20.10	1.00090	0.00059
			21.10	1.00161	0.00053	20.20	1.00477	0.00059
			21.20	1.00568	0.00055	20.30	1.00596	0.00060
			21.30	1.00681	0.00056	20.40	1.00841	0.00058
			21.40	1.00918	0.00053	20.50	1.01029	0.00056
			21.50	1.01190	0.00056	20.60	1.01204	0.00061
			21.60	1.01538	0.00055	20.70	1.01450	0.00057
			21.70	1.01658	0.00055			
			21.80	1.01869	0.00056			

Table B.3.1.3.1-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 0 Inches of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.20	0.91959	0.00061	17.10	0.92173	0.00060	16.80	0.91249	0.00061
17.30	0.92483	0.00058	17.20	0.92698	0.00062	16.90	0.91679	0.00062
17.40	0.92868	0.00062	17.30	0.92988	0.00062	17.00	0.92133	0.00061
17.50	0.93134	0.00060	17.40	0.93260	0.00062	17.10	0.92369	0.00060
17.60	0.93409	0.00061	17.50	0.93653	0.00061	17.20	0.92990	0.00061
17.70	0.93791	0.00058	17.60	0.93901	0.00062	17.30	0.93143	0.00061
17.80	0.94109	0.00061	17.70	0.94419	0.00064	17.40	0.93538	0.00064
17.90	0.94552	0.00060	17.80	0.94707	0.00059	17.50	0.93761	0.00060
18.00	0.94728	0.00059	17.90	0.95019	0.00061	17.60	0.94206	0.00061
18.10	0.95086	0.00060	18.00	0.95306	0.00062	17.80	0.94781	0.00060
18.20	0.95551	0.00062	18.10	0.95643	0.00062	17.90	0.95207	0.00064
18.30	0.95674	0.00063	18.20	0.96072	0.00060	18.00	0.95585	0.00064
18.40	0.96148	0.00059	18.30	0.96365	0.00061	18.10	0.95872	0.00061
18.50	0.96405	0.00058	18.40	0.96822	0.00061	18.20	0.96171	0.00061
18.60	0.96751	0.00061	18.50	0.96981	0.00059	18.30	0.96514	0.00062
18.70	0.97092	0.00062	18.60	0.97384	0.00062	18.40	0.96805	0.00062
18.80	0.97402	0.00062	18.70	0.97628	0.00061	18.50	0.97158	0.00062
18.90	0.97688	0.00061	18.80	0.98037	0.00064	18.60	0.97445	0.00061
19.00	0.97898	0.00060	18.90	0.98164	0.00058	18.70	0.97921	0.00064
19.10	0.98284	0.00060	19.00	0.98506	0.00061	18.80	0.98050	0.00061
19.20	0.98509	0.00064	19.10	0.98842	0.00063	18.90	0.98441	0.00060
19.30	0.98915	0.00060	19.20	0.99094	0.00059	19.00	0.98708	0.00062
19.40	0.99079	0.00058	19.30	0.99593	0.00060	19.10	0.99121	0.00063
19.50	0.99445	0.00061	19.40	0.99673	0.00061	19.20	0.99212	0.00060
19.60	0.99695	0.00061	19.50	0.99922	0.00059	19.30	0.99595	0.00061
19.70	0.99991	0.00061	19.60	1.00288	0.00061	19.40	0.99952	0.00060
19.80	1.00224	0.00061	19.70	1.00549	0.00061	19.50	1.00213	0.00058
19.90	1.00621	0.00058	19.80	1.00922	0.00061	19.60	1.00555	0.00060
20.00	1.00813	0.00059	19.90	1.01033	0.00058	19.70	1.00751	0.00060
20.10	1.01105	0.00060	20.00	1.01408	0.00060	19.80	1.01103	0.00062
20.20	1.01473	0.00060	20.10	1.01657	0.00059	19.90	1.01275	0.00061
20.30	1.01599	0.00060				20.00	1.01524	0.00061

Table B.3.1.3.1-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 0 Inches of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.00	0.92093	0.00063	17.10	0.92224	0.00062	12.10	0.66813	0.00061
17.10	0.92470	0.00062	17.20	0.92711	0.00065	12.50	0.69259	0.00059
17.20	0.92725	0.00060	17.30	0.92909	0.00062	12.90	0.71721	0.00062
17.30	0.93221	0.00062	17.40	0.93382	0.00064	13.30	0.73774	0.00062
17.40	0.93613	0.00064	17.50	0.93695	0.00061	13.70	0.75913	0.00064
17.50	0.93913	0.00062	17.60	0.93842	0.00064	14.10	0.78002	0.00061
17.60	0.94276	0.00059	17.70	0.94536	0.00065	14.50	0.79981	0.00065
17.70	0.94611	0.00063	17.80	0.94760	0.00065	14.90	0.81997	0.00066
17.80	0.94840	0.00063	17.90	0.95036	0.00064	15.30	0.83669	0.00061
17.90	0.95226	0.00061	18.00	0.95440	0.00061	15.70	0.85359	0.00062
18.00	0.95607	0.00062	18.10	0.95642	0.00065	16.10	0.87075	0.00065
18.10	0.95937	0.00063	18.20	0.96067	0.00064	16.50	0.88676	0.00062
18.20	0.96239	0.00064	18.30	0.96360	0.00062	16.90	0.90258	0.00063
18.30	0.96572	0.00059	18.40	0.96721	0.00058	17.30	0.91599	0.00063
18.40	0.97036	0.00061	18.50	0.97060	0.00063	17.70	0.93202	0.00064
18.50	0.97154	0.00060	18.60	0.97216	0.00065	18.10	0.94556	0.00064
18.60	0.97624	0.00061	18.70	0.97705	0.00063	18.50	0.95801	0.00060
18.70	0.97895	0.00062	18.80	0.97970	0.00064	18.90	0.97030	0.00066
18.80	0.98297	0.00062	18.90	0.98322	0.00060	19.30	0.98408	0.00060
18.90	0.98619	0.00061	19.00	0.98558	0.00062	19.70	0.99540	0.00064
19.00	0.98834	0.00060	19.10	0.98848	0.00063	20.10	1.00559	0.00063
19.10	0.99129	0.00064	19.20	0.99187	0.00059	20.50	1.01753	0.00063
19.20	0.99326	0.00060	19.30	0.99437	0.00061			
19.30	0.99730	0.00060	19.40	0.99612	0.00062			
19.40	0.99851	0.00063	19.50	1.00057	0.00064			
19.50	1.00291	0.00064	19.60	1.00491	0.00063			
19.60	1.00412	0.00061	19.70	1.00726	0.00063			
19.70	1.00784	0.00061	19.80	1.00877	0.00065			
19.80	1.01073	0.00061	19.90	1.01296	0.00063			
19.90	1.01452	0.00064	20.00	1.01495	0.00061			
20.00	1.01669	0.00059	20.10	1.01857	0.00064			

Table B.3.1.3.1-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 0 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
18.60	0.91985	0.00063	20.60	0.92176	0.00063	23.50	0.92281	0.00057
18.70	0.92390	0.00060	20.80	0.92791	0.00056	23.70	0.92603	0.00059
18.80	0.92635	0.00062	21.00	0.93296	0.00062	23.90	0.93173	0.00058
18.90	0.92940	0.00061	21.20	0.93851	0.00062	24.10	0.93448	0.00056
19.00	0.93255	0.00061	21.40	0.94315	0.00061	24.30	0.93866	0.00060
19.10	0.93602	0.00062	21.60	0.94770	0.00060	24.50	0.94189	0.00057
19.20	0.93943	0.00063	21.80	0.95316	0.00060	24.70	0.94696	0.00057
19.30	0.94091	0.00064	22.00	0.95801	0.00060	24.90	0.95025	0.00057
19.40	0.94487	0.00061	22.20	0.96238	0.00059	25.10	0.95367	0.00058
19.50	0.94852	0.00063	22.40	0.96586	0.00060	25.30	0.95624	0.00056
19.60	0.95217	0.00065	22.60	0.97057	0.00059	25.50	0.96056	0.00059
19.70	0.95356	0.00064	22.80	0.97480	0.00059	25.70	0.96400	0.00057
19.80	0.95667	0.00063	23.00	0.97914	0.00062	25.90	0.96733	0.00058
19.90	0.95918	0.00061	23.20	0.98385	0.00062	26.10	0.96976	0.00060
20.00	0.96235	0.00061	23.40	0.98598	0.00059	26.30	0.97296	0.00058
20.10	0.96467	0.00063	23.60	0.99054	0.00060	26.50	0.97764	0.00058
20.20	0.96829	0.00059	23.80	0.99615	0.00060	26.70	0.97943	0.00060
20.30	0.97077	0.00063	24.00	0.99916	0.00060	26.90	0.98226	0.00059
20.40	0.97212	0.00061	24.20	1.00354	0.00060	27.10	0.98593	0.00057
20.50	0.97718	0.00062	24.40	1.00748	0.00059	27.30	0.98812	0.00059
20.60	0.97817	0.00062	24.60	1.01080	0.00059	27.50	0.99059	0.00055
20.70	0.98131	0.00060	24.80	1.01458	0.00059	27.70	0.99528	0.00057
20.80	0.98359	0.00063	24.90	1.01645	0.00062	27.90	0.99795	0.00056
20.90	0.98476	0.00064				28.10	1.00009	0.00056
21.00	0.98800	0.00061				28.30	1.00364	0.00058
21.10	0.99139	0.00062				28.50	1.00673	0.00057
21.20	0.99248	0.00061				28.70	1.00880	0.00058
21.30	0.99574	0.00063				28.90	1.01164	0.00056
21.40	0.99842	0.00063				29.10	1.01406	0.00057
21.50	0.99957	0.00062						
21.60	1.00270	0.00063						
21.70	1.00651	0.00062						
21.80	1.00932	0.00061						
21.90	1.01160	0.00062						
22.00	1.01328	0.00063						
22.10	1.01525	0.00063						
22.20	1.01697	0.00063						

Table B.3.1.3.1-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 0 Inches of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
28.10	0.92330	0.00055	31.80	0.92787	0.00051	36.60	0.92571	0.00051
28.50	0.93060	0.00053	32.30	0.93202	0.00051	37.50	0.93190	0.00051
28.90	0.93507	0.00055	32.80	0.93719	0.00052	38.40	0.93882	0.00048
29.30	0.93916	0.00053	33.30	0.94230	0.00052	39.30	0.94581	0.00050
29.70	0.94531	0.00053	33.80	0.94725	0.00053	40.20	0.95031	0.00049
30.10	0.95016	0.00054	34.30	0.95204	0.00051	41.10	0.95654	0.00050
30.50	0.95438	0.00056	34.80	0.95605	0.00051	42.00	0.96102	0.00048
30.90	0.95861	0.00054	35.30	0.95937	0.00053	42.90	0.96559	0.00049
31.30	0.96350	0.00053	35.80	0.96462	0.00052	43.80	0.97062	0.00048
31.70	0.96855	0.00053	36.30	0.96710	0.00053	44.70	0.97425	0.00048
32.10	0.97271	0.00052	36.80	0.97233	0.00051	45.60	0.97944	0.00049
32.50	0.97577	0.00054	37.30	0.97554	0.00050	46.50	0.98265	0.00049
32.90	0.98038	0.00052	37.80	0.97817	0.00052	47.40	0.98591	0.00050
33.30	0.98467	0.00054	38.30	0.98261	0.00051	48.30	0.98961	0.00048
33.70	0.98937	0.00054	38.80	0.98606	0.00052	49.20	0.99358	0.00049
34.10	0.99171	0.00049	39.30	0.98768	0.00050	50.10	0.99675	0.00047
34.50	0.99539	0.00054	39.80	0.99125	0.00052	51.00	0.99898	0.00049
34.90	0.99887	0.00053	40.30	0.99537	0.00049	51.90	1.00271	0.00048
35.30	1.00226	0.00052	40.80	0.99874	0.00053	52.80	1.00490	0.00048
35.70	1.00409	0.00053	41.30	1.00190	0.00050	53.70	1.00812	0.00047
36.10	1.00782	0.00054	41.80	1.00321	0.00048	54.60	1.00925	0.00046
36.50	1.01242	0.00050	42.30	1.00637	0.00052	54.80	1.01128	0.00049
36.70	1.01147	0.00052	42.80	1.00943	0.00049			
			43.30	1.01129	0.00051			

B.3.1.3.2. 1” Water Reflector

Case ID: u5o2-sp-0040-01

Material: Uranium dioxide in water

Geometry: Sphere

Isotopics: 4% ^{235}U 96% ^{238}U

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.3.1.3.2-1. Uranium Dioxide Sphere (4.0% ^{235}U) - 1 Inch of Water Reflection

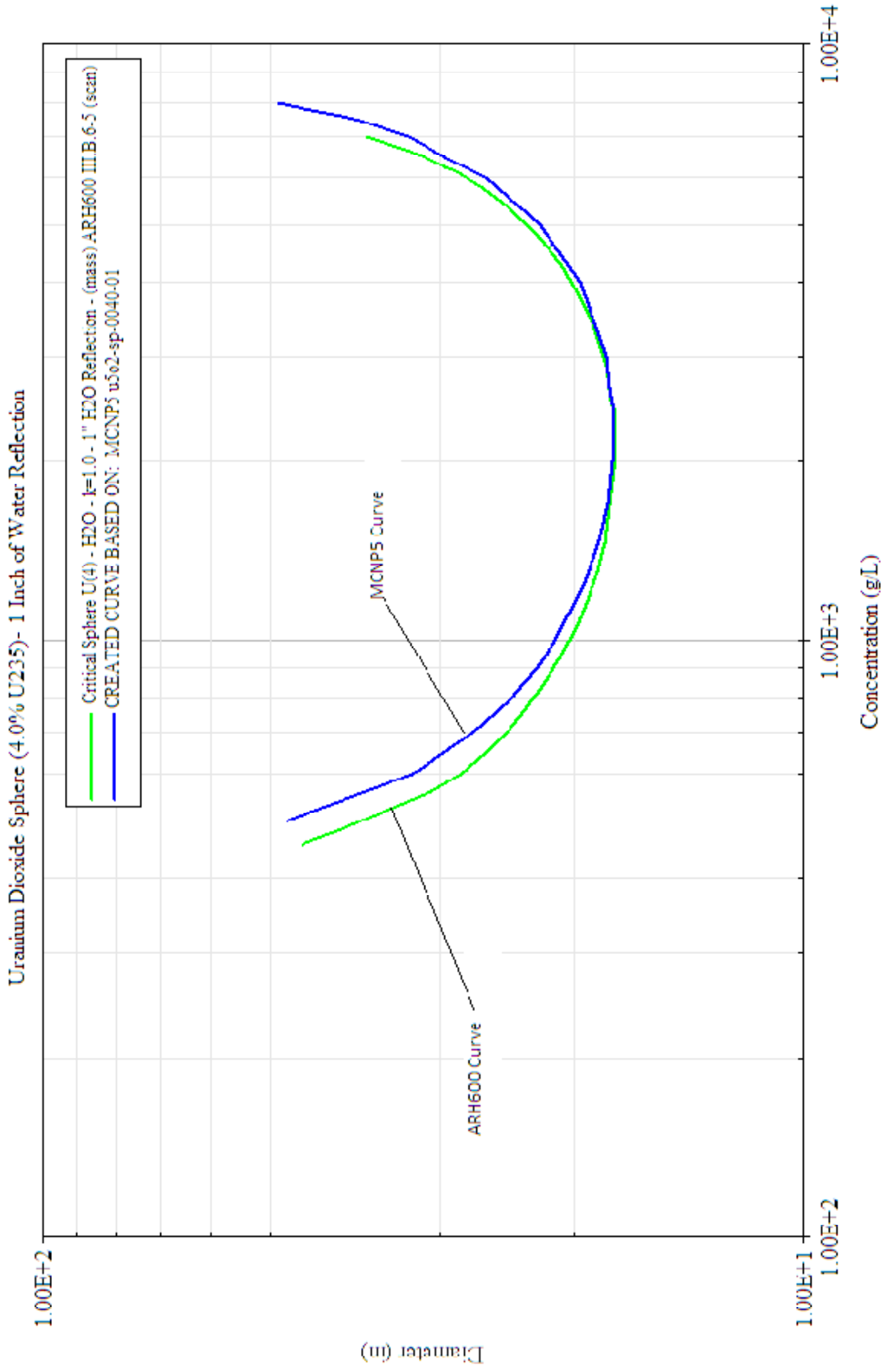

Table B.3.1.3.2-1. Critical Dimensions for Uranium Dioxide Sphere (4.0% ^{235}U) - 1 Inch of Water Reflection

Uranium Dioxide (4.0% ^{235}U) - 1 Inch of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.500	31.000	52.300	1.000	47.5323
0.600	25.000	34.700	0.400	32.5773
0.700	21.900	28.700	0.300	27.1408
0.800	19.700	25.300	0.200	24.2209
0.850	19.500	24.500	0.200	23.2269
0.900	19.000	23.600	0.200	22.3717
1.000	17.800	21.900	0.200	21.1469
1.250	16.800	20.300	0.100	19.3671
1.500	15.900	19.000	0.100	18.4618
1.700	15.600	18.600	0.100	18.0614
1.900	15.500	18.400	0.100	17.8452
2.000	15.400	18.400	0.100	17.7715
2.100	15.400	18.300	0.100	17.7331
2.500	15.500	18.400	0.100	17.7632
3.000	15.700	18.700	0.100	18.1364
4.000	16.900	20.400	0.100	19.6415
5.000	18.700	23.000	0.200	22.1142
6.000	21.600	27.200	0.200	26.0827
7.000	26.200	34.700	0.400	32.8930
7.500	29.400	41.000	0.500	38.8463
8.000	34.500	56.300	1.100	48.9588

MCNP5 Sample Input File
4.0% U02 Sphere- 1 Inches of Reflection

```
UO2 sphere, 4.0 wt% 235U, 02500 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1610  hundreths of inches - must be integer
c radius =    20.4470 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 02500 milli-g Pu/cc
c Reflector width =  1.0 inches
c Enrichment = 0.04 wt fraction 235U
c
c Density of H2O 1.00000
c Density of UO2 11.00000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c U238  = 238.05080
c
c Effective uranium atomic mass 237.93052
c UO2
c Mass fraction of U in crit material 0.88145
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.2273 cc
c Volume of water in sample 0.7727 cc
c
c Mass of crit in sample   2.5000 g
c Mass of U in sample   2.2036 g
c Mass of bound O in sample  0.2964 g
c Mass of water in sample  0.7727 g
c
c Total mass of sample  3.2727g for a 1cc sample
c Mass Density for crit material  -3.2727, expressed as negative
c
c  sphere
20 11   -3.272727   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0
```

```
1       so    20.4470            $ Sphere
2       so    22.9870        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u oxide / water mixture
m11    $ UO2/H2O Sludge, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
1001.66c -0.026420
8016.66c -0.209692      $from water
8016.66c -0.090555      $from oxide
92235.66c -0.026933
92238.66c -0.646400
mt11     lwtr.60t
c
c    u oxide only
m12    $ U oxide, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
8016.66c -0.090555      $from oxide
92235.66c -0.026933
92238.66c -0.646400
c
```

Critview Compatible Data File
4.0% U02 Sphere- 1 Inches of Reflection

reset:
title: MCNP5 u5o2-sp-0040-01
set: MCNP5 set
source: MCNP5 primary
created: Wed 08/11/2010 9:01:24.92
geometry: sphere
modmat: H2O
critmat: uranium dioxide
isomat: U235 0.040 U238 0.960
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.500	47.5323
0.600	32.5773
0.700	27.1408
0.800	24.2209
0.850	23.2269
0.900	22.3717
1.000	21.1469
1.250	19.3671
1.500	18.4618
1.700	18.0614
1.900	17.8452
2.000	17.7715
2.100	17.7331
2.500	17.7632
3.000	18.1364
4.000	19.6415
5.000	22.1142
6.000	26.0827
7.000	32.8930
7.500	38.8463
8.000	48.9588

Table B.3.1.3.2-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 1 Inch of Water Reflection

500 milli-g/cc			600 milli-g/cc			700 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
31.00	0.92692	0.00036	25.00	0.92923	0.00041	21.90	0.92786	0.00044
32.00	0.93342	0.00036	25.40	0.93407	0.00042	22.20	0.93405	0.00045
33.00	0.94059	0.00035	25.80	0.93816	0.00040	22.50	0.93908	0.00046
34.00	0.94609	0.00036	26.20	0.94427	0.00042	22.80	0.94288	0.00045
35.00	0.95236	0.00035	26.60	0.94842	0.00041	23.10	0.94849	0.00046
36.00	0.95798	0.00035	27.00	0.95175	0.00041	23.40	0.95175	0.00045
37.00	0.96368	0.00034	27.40	0.95594	0.00041	23.70	0.95701	0.00045
38.00	0.96663	0.00033	27.80	0.96074	0.00041	24.00	0.96160	0.00044
39.00	0.97099	0.00033	28.20	0.96347	0.00041	24.30	0.96566	0.00046
40.00	0.97591	0.00033	28.60	0.96862	0.00040	24.60	0.96886	0.00043
41.00	0.97900	0.00034	29.00	0.97154	0.00042	24.90	0.97379	0.00044
42.00	0.98373	0.00033	29.40	0.97457	0.00041	25.20	0.97694	0.00045
43.00	0.98728	0.00031	29.80	0.97904	0.00038	25.50	0.98157	0.00043
44.00	0.99039	0.00032	30.20	0.98265	0.00039	25.80	0.98445	0.00043
45.00	0.99326	0.00033	30.60	0.98454	0.00041	26.10	0.98893	0.00042
46.00	0.99612	0.00031	31.00	0.98825	0.00040	26.40	0.99207	0.00044
47.00	0.99901	0.00032	31.40	0.99093	0.00039	26.70	0.99495	0.00045
48.00	1.00087	0.00031	31.80	0.99437	0.00038	27.00	0.99862	0.00044
49.00	1.00481	0.00031	32.20	0.99684	0.00038	27.30	1.00156	0.00042
50.00	1.00677	0.00032	32.60	1.00019	0.00039	27.60	1.00500	0.00042
51.00	1.00806	0.00030	33.00	1.00242	0.00038	27.90	1.00714	0.00043
52.00	1.00994	0.00031	33.40	1.00469	0.00040	28.20	1.01125	0.00042
52.30	1.01156	0.00031	33.80	1.00712	0.00038	28.50	1.01436	0.00044
			34.20	1.01046	0.00038	28.70	1.01607	0.00043
			34.60	1.01174	0.00039			
			34.70	1.01328	0.00038			

Table B.3.1.3.2-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 1 Inch of Water Reflection (cont)

800 milli-g/cc			850 milli-g/cc			900 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
19.70	0.92088	0.00048	19.50	0.93049	0.00048	19.00	0.93259	0.00050
19.90	0.92461	0.00047	19.70	0.93518	0.00049	19.20	0.93735	0.00049
20.10	0.92960	0.00047	19.90	0.93909	0.00051	19.40	0.94035	0.00050
20.30	0.93307	0.00047	20.10	0.94326	0.00049	19.60	0.94573	0.00051
20.50	0.93733	0.00047	20.30	0.94711	0.00051	19.80	0.95094	0.00049
20.70	0.94118	0.00050	20.50	0.95211	0.00049	20.00	0.95398	0.00050
20.90	0.94507	0.00048	20.70	0.95512	0.00048	20.20	0.95878	0.00051
21.10	0.94910	0.00047	20.90	0.95897	0.00048	20.40	0.96233	0.00050
21.30	0.95214	0.00047	21.10	0.96285	0.00050	20.60	0.96698	0.00050
21.50	0.95739	0.00047	21.30	0.96710	0.00050	20.80	0.96988	0.00048
21.70	0.95926	0.00049	21.50	0.97055	0.00048	21.00	0.97351	0.00049
21.90	0.96370	0.00048	21.70	0.97495	0.00049	21.20	0.97734	0.00051
22.10	0.96611	0.00047	21.90	0.97787	0.00049	21.40	0.98308	0.00049
22.30	0.97108	0.00047	22.10	0.98128	0.00047	21.60	0.98604	0.00048
22.50	0.97401	0.00046	22.30	0.98468	0.00050	21.80	0.98970	0.00049
22.70	0.97622	0.00048	22.50	0.98881	0.00049	22.00	0.99290	0.00049
22.90	0.97983	0.00046	22.70	0.99108	0.00048	22.20	0.99721	0.00049
23.10	0.98299	0.00048	22.90	0.99455	0.00046	22.40	1.00046	0.00048
23.30	0.98675	0.00047	23.10	0.99778	0.00049	22.60	1.00263	0.00049
23.50	0.98987	0.00047	23.30	1.00128	0.00048	22.80	1.00628	0.00049
23.70	0.99256	0.00045	23.50	1.00438	0.00047	23.00	1.01083	0.00050
23.90	0.99581	0.00046	23.70	1.00754	0.00046	23.20	1.01431	0.00048
24.10	0.99740	0.00048	23.90	1.01047	0.00049	23.40	1.01604	0.00047
24.30	1.00170	0.00045	24.10	1.01316	0.00047	23.60	1.01983	0.00049
24.50	1.00480	0.00047	24.30	1.01548	0.00047			
24.70	1.00559	0.00046	24.50	1.01907	0.00047			
24.90	1.00895	0.00044						
25.10	1.01136	0.00046						
25.30	1.01392	0.00047						

Table B.3.1.3.2-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 1 Inch of Water Reflection (cont)

1000 milli-g/cc			1250 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.80	0.92229	0.00050	16.80	0.93025	0.00055	15.90	0.92330	0.00057
18.00	0.92920	0.00055	16.90	0.93485	0.00056	16.00	0.92650	0.00057
18.20	0.93263	0.00054	17.00	0.93672	0.00055	16.10	0.93013	0.00057
18.40	0.93842	0.00053	17.10	0.93953	0.00053	16.20	0.93335	0.00057
18.60	0.94307	0.00053	17.20	0.94248	0.00058	16.30	0.93624	0.00059
18.80	0.94862	0.00050	17.30	0.94733	0.00055	16.40	0.93980	0.00058
19.00	0.95250	0.00051	17.40	0.94848	0.00057	16.50	0.94228	0.00056
19.20	0.95857	0.00050	17.50	0.95127	0.00056	16.60	0.94515	0.00058
19.40	0.96326	0.00053	17.60	0.95404	0.00054	16.70	0.94923	0.00056
19.60	0.96682	0.00050	17.70	0.95683	0.00055	16.80	0.95184	0.00055
19.80	0.97254	0.00053	17.80	0.95973	0.00055	16.90	0.95572	0.00056
20.00	0.97654	0.00052	17.90	0.96048	0.00055	17.00	0.95743	0.00058
20.20	0.98159	0.00052	18.00	0.96575	0.00055	17.10	0.96157	0.00057
20.40	0.98469	0.00052	18.10	0.96833	0.00054	17.20	0.96489	0.00058
20.60	0.98879	0.00050	18.20	0.97071	0.00054	17.30	0.96735	0.00057
20.80	0.99287	0.00051	18.30	0.97363	0.00055	17.40	0.96990	0.00058
21.00	0.99790	0.00051	18.40	0.97604	0.00053	17.50	0.97320	0.00057
21.20	1.00076	0.00051	18.50	0.97821	0.00057	17.60	0.97649	0.00057
21.40	1.00497	0.00051	18.60	0.98063	0.00056	17.70	0.97749	0.00058
21.60	1.00880	0.00049	18.70	0.98425	0.00054	17.80	0.98163	0.00058
21.80	1.01213	0.00051	18.80	0.98755	0.00054	17.90	0.98462	0.00055
21.90	1.01420	0.00049	18.90	0.98725	0.00058	18.00	0.98739	0.00057
			19.00	0.99049	0.00054	18.10	0.99044	0.00057
			19.10	0.99290	0.00055	18.20	0.99164	0.00058
			19.20	0.99547	0.00055	18.30	0.99487	0.00058
			19.30	0.99886	0.00053	18.40	0.99788	0.00058
			19.40	1.00056	0.00054	18.50	1.00131	0.00057
			19.50	1.00354	0.00055	18.60	1.00317	0.00059
			19.60	1.00475	0.00051	18.70	1.00639	0.00056
			19.70	1.00791	0.00056	18.80	1.01014	0.00057
			19.80	1.01049	0.00054	18.90	1.01163	0.00055
			19.90	1.01320	0.00054	19.00	1.01415	0.00057
			20.00	1.01448	0.00055			
			20.10	1.01698	0.00054			
			20.20	1.01854	0.00054			
			20.30	1.02141	0.00055			

Table B.3.1.3.2-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 1 Inch of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
15.60	0.92321	0.00059	15.50	0.92343	0.00062	15.40	0.92384	0.00061
15.70	0.92580	0.00062	15.60	0.92822	0.00059	15.50	0.92553	0.00060
15.80	0.92977	0.00058	15.70	0.93106	0.00061	15.60	0.93162	0.00058
15.90	0.93215	0.00060	15.80	0.93554	0.00061	15.70	0.93318	0.00061
16.00	0.93592	0.00058	15.90	0.93980	0.00061	15.80	0.93778	0.00060
16.10	0.93984	0.00058	16.00	0.94229	0.00062	15.90	0.93990	0.00058
16.20	0.94378	0.00060	16.10	0.94680	0.00059	16.00	0.94480	0.00061
16.30	0.94653	0.00058	16.20	0.94819	0.00058	16.10	0.94708	0.00059
16.40	0.95006	0.00060	16.30	0.95209	0.00059	16.20	0.95185	0.00060
16.50	0.95383	0.00062	16.40	0.95622	0.00060	16.30	0.95501	0.00062
16.60	0.95564	0.00060	16.50	0.95982	0.00061	16.40	0.95768	0.00061
16.70	0.96112	0.00059	16.60	0.96225	0.00059	16.50	0.96077	0.00059
16.80	0.96336	0.00060	16.70	0.96687	0.00062	16.60	0.96408	0.00061
16.90	0.96613	0.00058	16.80	0.96810	0.00059	16.70	0.96687	0.00061
17.00	0.96919	0.00058	16.90	0.97289	0.00059	16.80	0.96991	0.00059
17.10	0.97145	0.00057	17.00	0.97447	0.00059	16.90	0.97451	0.00057
17.20	0.97565	0.00058	17.10	0.97792	0.00059	17.00	0.97733	0.00061
17.30	0.97781	0.00056	17.20	0.98142	0.00059	17.10	0.98009	0.00059
17.40	0.98126	0.00058	17.30	0.98426	0.00059	17.20	0.98392	0.00059
17.50	0.98485	0.00059	17.40	0.98771	0.00060	17.30	0.98494	0.00060
17.60	0.98616	0.00058	17.50	0.99091	0.00058	17.40	0.98977	0.00059
17.70	0.98941	0.00058	17.60	0.99346	0.00060	17.50	0.99239	0.00059
17.80	0.99233	0.00059	17.70	0.99651	0.00061	17.60	0.99477	0.00059
17.90	0.99545	0.00057	17.80	0.99851	0.00060	17.70	0.99779	0.00059
18.00	0.99822	0.00061	17.90	1.00181	0.00059	17.80	1.00088	0.00063
18.10	1.00112	0.00059	18.00	1.00467	0.00058	17.90	1.00414	0.00060
18.20	1.00358	0.00058	18.10	1.00693	0.00060	18.00	1.00675	0.00059
18.30	1.00789	0.00059	18.20	1.01016	0.00060	18.10	1.00819	0.00059
18.40	1.00922	0.00058	18.30	1.01340	0.00058	18.20	1.01082	0.00060
18.50	1.01167	0.00057	18.40	1.01625	0.00057	18.30	1.01431	0.00060
18.60	1.01369	0.00060				18.40	1.01665	0.00054

Table B.3.1.3.2-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 1 Inch of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
15.40	0.92462	0.00061	15.50	0.92566	0.00060	15.70	0.92263	0.00064
15.50	0.92766	0.00061	15.60	0.92836	0.00061	15.80	0.92541	0.00063
15.60	0.93156	0.00060	15.70	0.93278	0.00061	15.90	0.92976	0.00062
15.70	0.93377	0.00062	15.80	0.93649	0.00063	16.00	0.93359	0.00060
15.80	0.93982	0.00061	15.90	0.93987	0.00063	16.10	0.93674	0.00063
15.90	0.94136	0.00061	16.00	0.94291	0.00060	16.20	0.93854	0.00062
16.00	0.94523	0.00061	16.10	0.94662	0.00061	16.30	0.94250	0.00061
16.10	0.94816	0.00061	16.20	0.95102	0.00061	16.40	0.94564	0.00062
16.20	0.95173	0.00060	16.30	0.95468	0.00061	16.50	0.95025	0.00063
16.30	0.95502	0.00060	16.40	0.95710	0.00060	16.60	0.95269	0.00062
16.40	0.95890	0.00060	16.50	0.96011	0.00062	16.70	0.95590	0.00063
16.50	0.96283	0.00060	16.60	0.96347	0.00061	16.80	0.95952	0.00062
16.60	0.96557	0.00060	16.70	0.96692	0.00060	16.90	0.96274	0.00061
16.70	0.96888	0.00059	16.80	0.96955	0.00061	17.00	0.96539	0.00061
16.80	0.97201	0.00060	16.90	0.97292	0.00063	17.10	0.96947	0.00066
16.90	0.97381	0.00060	17.00	0.97704	0.00061	17.20	0.97219	0.00062
17.00	0.97680	0.00060	17.10	0.98121	0.00061	17.30	0.97474	0.00062
17.10	0.98074	0.00059	17.20	0.98214	0.00062	17.40	0.97853	0.00062
17.20	0.98468	0.00059	17.30	0.98529	0.00062	17.50	0.98169	0.00061
17.30	0.98765	0.00061	17.40	0.98936	0.00064	17.60	0.98400	0.00061
17.40	0.98966	0.00062	17.50	0.99235	0.00061	17.70	0.98615	0.00062
17.50	0.99378	0.00059	17.60	0.99424	0.00060	17.80	0.98861	0.00063
17.60	0.99620	0.00060	17.70	0.99808	0.00061	17.90	0.99235	0.00061
17.70	0.99915	0.00060	17.80	1.00112	0.00060	18.00	0.99651	0.00058
17.80	1.00172	0.00059	17.90	1.00430	0.00060	18.10	0.99898	0.00062
17.90	1.00406	0.00057	18.00	1.00635	0.00060	18.20	1.00178	0.00060
18.00	1.00762	0.00058	18.10	1.00898	0.00060	18.30	1.00363	0.00061
18.10	1.00972	0.00059	18.20	1.01287	0.00060	18.40	1.00696	0.00062
18.20	1.01469	0.00057	18.30	1.01403	0.00060	18.50	1.00918	0.00061
18.30	1.01500	0.00062	18.40	1.01693	0.00060	18.60	1.01166	0.00061
						18.70	1.01421	0.00060

Table B.3.1.3.2-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 1 Inch of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
16.90	0.92395	0.00062	18.70	0.92224	0.00060	21.60	0.92488	0.00060
17.00	0.92651	0.00063	18.90	0.92840	0.00061	21.80	0.92791	0.00058
17.10	0.92897	0.00063	19.10	0.93245	0.00062	22.00	0.93421	0.00059
17.20	0.93237	0.00060	19.30	0.93885	0.00062	22.20	0.93631	0.00059
17.30	0.93624	0.00061	19.50	0.94317	0.00059	22.40	0.94025	0.00058
17.40	0.93860	0.00059	19.70	0.94788	0.00060	22.60	0.94473	0.00058
17.50	0.94224	0.00062	19.90	0.95267	0.00061	22.80	0.94693	0.00058
17.60	0.94593	0.00062	20.10	0.95571	0.00058	23.00	0.95015	0.00056
17.70	0.94787	0.00061	20.30	0.96127	0.00059	23.20	0.95507	0.00058
17.80	0.95077	0.00060	20.50	0.96692	0.00061	23.40	0.95902	0.00056
17.90	0.95384	0.00063	20.70	0.97080	0.00062	23.60	0.96150	0.00060
18.00	0.95751	0.00061	20.90	0.97390	0.00060	23.80	0.96527	0.00058
18.10	0.95985	0.00063	21.10	0.97779	0.00059	24.00	0.96780	0.00057
18.20	0.96074	0.00061	21.30	0.98237	0.00059	24.20	0.97236	0.00057
18.30	0.96669	0.00063	21.50	0.98618	0.00063	24.40	0.97631	0.00060
18.40	0.96823	0.00062	21.70	0.99235	0.00061	24.60	0.97784	0.00055
18.50	0.97126	0.00062	21.90	0.99507	0.00061	24.80	0.98078	0.00058
18.60	0.97378	0.00061	22.10	0.99973	0.00059	25.00	0.98411	0.00058
18.70	0.97535	0.00062	22.30	1.00352	0.00061	25.20	0.98731	0.00059
18.80	0.97795	0.00059	22.50	1.00674	0.00056	25.40	0.98987	0.00058
18.90	0.98115	0.00060	22.70	1.01039	0.00059	25.60	0.99383	0.00059
19.00	0.98409	0.00062	22.90	1.01477	0.00060	25.80	0.99669	0.00058
19.10	0.98636	0.00063	23.00	1.01514	0.00059	26.00	0.99826	0.00057
19.20	0.98886	0.00064				26.20	1.00247	0.00058
19.30	0.99208	0.00064				26.40	1.00453	0.00059
19.40	0.99337	0.00061				26.60	1.00746	0.00056
19.50	0.99614	0.00062				26.80	1.01025	0.00056
19.60	0.99873	0.00062				27.00	1.01273	0.00059
19.70	1.00179	0.00062				27.20	1.01462	0.00056
19.80	1.00412	0.00064						
19.90	1.00526	0.00059						
20.00	1.00832	0.00059						
20.10	1.01113	0.00060						
20.20	1.01227	0.00059						
20.30	1.01524	0.00062						
20.40	1.01831	0.00063						

Table B.3.1.3.2-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 1 Inch of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
26.20	0.92779	0.00054	29.40	0.92484	0.00055	34.50	0.92633	0.00050
26.60	0.93319	0.00056	29.90	0.92976	0.00053	35.60	0.93572	0.00051
27.00	0.93810	0.00054	30.40	0.93577	0.00053	36.70	0.94301	0.00050
27.40	0.94305	0.00056	30.90	0.94159	0.00053	37.80	0.94994	0.00050
27.80	0.94792	0.00053	31.40	0.94413	0.00053	38.90	0.95582	0.00050
28.20	0.95308	0.00055	31.90	0.94911	0.00054	40.00	0.96311	0.00049
28.60	0.95801	0.00055	32.40	0.95386	0.00053	41.10	0.96826	0.00049
29.00	0.96155	0.00053	32.90	0.95916	0.00051	42.20	0.97418	0.00048
29.40	0.96551	0.00053	33.40	0.96226	0.00053	43.30	0.97865	0.00049
29.80	0.97030	0.00054	33.90	0.96668	0.00049	44.40	0.98290	0.00051
30.20	0.97450	0.00054	34.40	0.97074	0.00052	45.50	0.98645	0.00048
30.60	0.97870	0.00052	34.90	0.97353	0.00053	46.60	0.99174	0.00047
31.00	0.98252	0.00054	35.40	0.97763	0.00052	47.70	0.99600	0.00049
31.40	0.98589	0.00054	35.90	0.98129	0.00052	48.80	0.99958	0.00049
31.80	0.98861	0.00054	36.40	0.98451	0.00051	49.90	1.00249	0.00048
32.20	0.99413	0.00054	36.90	0.98736	0.00051	51.00	1.00657	0.00050
32.60	0.99655	0.00054	37.40	0.99111	0.00050	52.10	1.00817	0.00048
33.00	1.00126	0.00055	37.90	0.99441	0.00051	53.20	1.01229	0.00048
33.40	1.00431	0.00054	38.40	0.99651	0.00052	54.30	1.01520	0.00047
33.80	1.00593	0.00054	38.90	1.00042	0.00052	55.40	1.01812	0.00048
34.20	1.01006	0.00053	39.40	1.00265	0.00051	56.30	1.01877	0.00047
34.60	1.01336	0.00054	39.90	1.00521	0.00051			
34.70	1.01344	0.00053	40.40	1.00804	0.00051			
			40.90	1.01102	0.00050			
			41.00	1.01160	0.00053			

B.3.1.3.3. 10” Water Reflector

Case ID: u5o2-sp-0040-10

Material: Uranium dioxide in water

Geometry: Sphere

Isotopics: 4% ^{235}U 96% ^{238}U

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.3.1.3.3-1. Uranium Dioxide Sphere (4.0% ^{235}U) - 10 Inches of Water Reflection

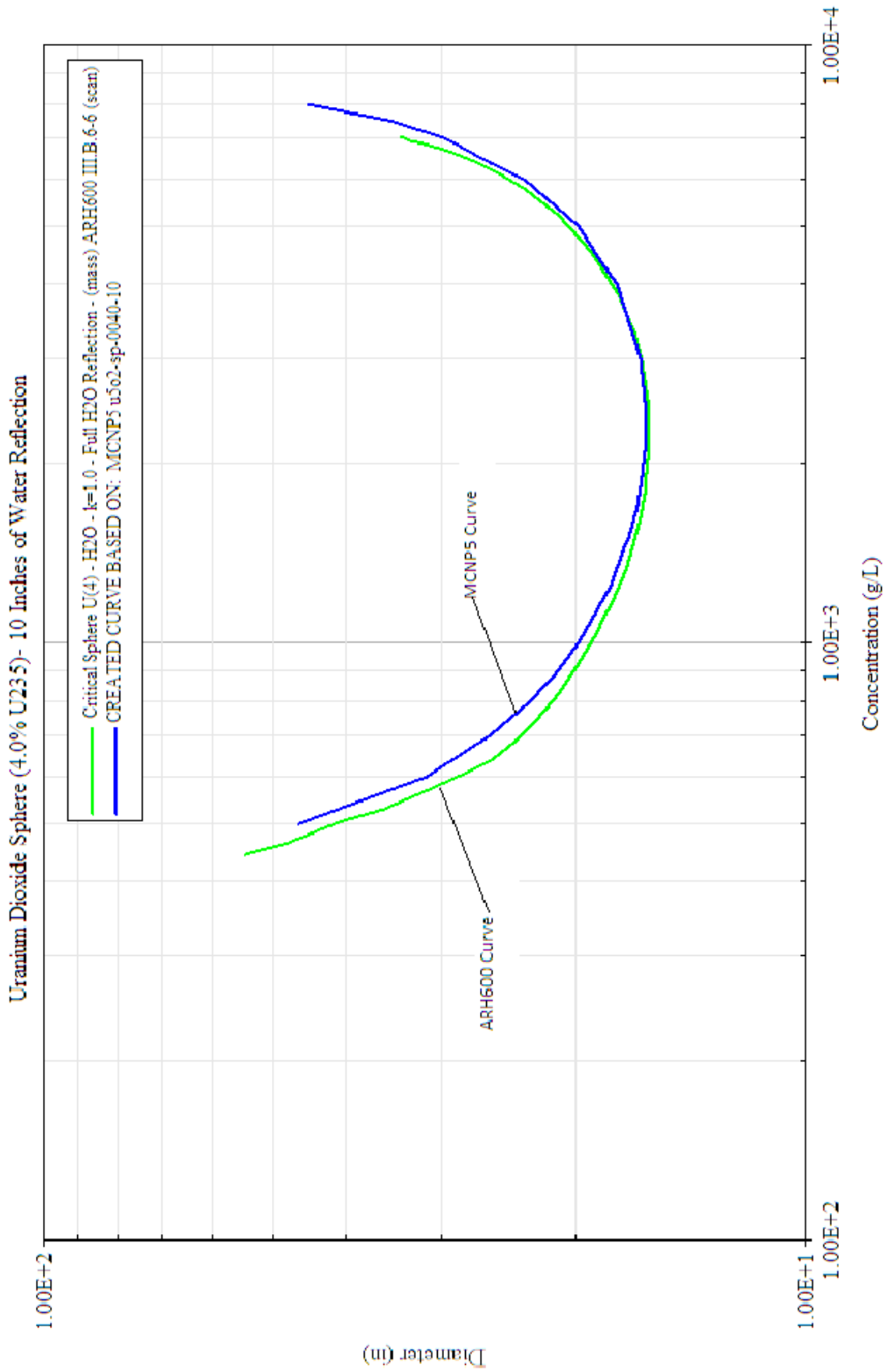

Table B.3.1.3.3-1. Critical Dimensions for Uranium Dioxide Sphere (4.0% ^{235}U) - 10 Inches of Water Reflection

Uranium Dioxide Sphere (4/0% ^{235}U) - 10 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.500	30.000	51.600	1.000	46.1058
0.600	23.900	33.200	0.400	31.2781
0.700	20.500	27.300	0.300	25.9286
0.800	18.700	24.000	0.200	22.9447
0.850	18.300	23.100	0.200	21.9164
0.900	17.700	22.200	0.200	21.1197
1.000	16.500	20.600	0.200	19.8303
1.250	15.400	19.000	0.100	17.9729
1.500	14.500	17.700	0.100	17.0406
1.700	14.200	17.200	0.100	16.5887
1.900	13.900	16.900	0.100	16.3285
2.000	14.000	16.700	0.100	16.2811
2.100	13.900	16.700	0.100	16.1890
2.500	13.800	16.700	0.100	16.1396
3.000	14.000	17.000	0.100	16.4309
4.000	14.900	18.300	0.100	17.6620
5.000	16.400	20.600	0.200	19.7715
6.000	18.900	24.500	0.200	23.3289
7.000	22.800	31.300	0.400	29.7023
7.500	25.900	37.800	0.600	35.2545
8.000	30.300	48.800	0.900	44.8701

MCNP5 Sample Input File
4.0% U02 Sphere- 10 Inches of Reflection

```
UO2 sphere, 4.0 wt% 235U, 02500 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1500  hundreths of inches - must be integer
c radius =    19.0500 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 02500 milli-g Pu/cc
c Reflector width = 10.0 inches
c Enrichment = 0.04 wt fraction 235U
c
c Density of H2O 1.00000
c Density of UO2 11.00000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c U238  = 238.05080
c
c Effective uranium atomic mass 237.93052
c UO2
c Mass fraction of U in crit material 0.88145
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.2273 cc
c Volume of water in sample 0.7727 cc
c
c Mass of crit in sample   2.5000 g
c Mass of U in sample   2.2036 g
c Mass of bound O in sample  0.2964 g
c Mass of water in sample  0.7727 g
c
c Total mass of sample  3.2727g for a 1cc sample
c Mass Density for crit material  -3.2727, expressed as negative
c
c  sphere
20 11   -3.272727   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0
```

```
1       so    19.0500              $ Sphere
2       so    44.4500        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u oxide / water mixture
m11    $ UO2/H2O Sludge, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
1001.66c -0.026420
8016.66c -0.209692      $from water
8016.66c -0.090555      $from oxide
92235.66c -0.026933
92238.66c -0.646400
mt11     lwtr.60t
c
c    u oxide only
m12    $ U oxide, 100.0 wt% 235U, 02500 milli-g U/cc,  3.2727
8016.66c -0.090555      $from oxide
92235.66c -0.026933
92238.66c -0.646400
c
```

Critview Compatible Data File
4.0% U02 Sphere- 10 Inches of Reflection

reset:
title: MCNP5 u5o2-sp-0040-10
set: MCNP5 set
source: MCNP5 primary
created: Wed 08/11/2010 9:01:48.21
geometry: sphere
modmat: H2O
critmat: uranium dioxide
isomat: U235 0.040 U238 0.960
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.500	46.1058
0.600	31.2781
0.700	25.9286
0.800	22.9447
0.850	21.9164
0.900	21.1197
1.000	19.8303
1.250	17.9729
1.500	17.0406
1.700	16.5887
1.900	16.3285
2.000	16.2811
2.100	16.1890
2.500	16.1396
3.000	16.4309
4.000	17.6620
5.000	19.7715
6.000	23.3289
7.000	29.7023
7.500	35.2545
8.000	44.8701

Table B.3.1.3.3-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 10 Inches of Water Reflection

500 milli-g/cc			600 milli-g/cc			700 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
30.00	0.92860	0.00035	23.90	0.93029	0.00040	20.50	0.92643	0.00045
31.00	0.93573	0.00037	24.30	0.93580	0.00041	20.80	0.93066	0.00044
32.00	0.94228	0.00034	24.70	0.93975	0.00040	21.10	0.93641	0.00044
33.00	0.94817	0.00034	25.10	0.94457	0.00039	21.40	0.94054	0.00042
34.00	0.95383	0.00034	25.50	0.94820	0.00039	21.70	0.94660	0.00042
35.00	0.95869	0.00034	25.90	0.95298	0.00040	22.00	0.94994	0.00043
36.00	0.96378	0.00033	26.30	0.95743	0.00039	22.30	0.95399	0.00042
37.00	0.96848	0.00034	26.70	0.96038	0.00040	22.60	0.95822	0.00044
38.00	0.97285	0.00032	27.10	0.96544	0.00039	22.90	0.96236	0.00043
39.00	0.97653	0.00032	27.50	0.96834	0.00037	23.20	0.96684	0.00042
40.00	0.98082	0.00032	27.90	0.97346	0.00040	23.50	0.97138	0.00042
41.00	0.98383	0.00032	28.30	0.97536	0.00039	23.80	0.97543	0.00042
42.00	0.98753	0.00032	28.70	0.97988	0.00038	24.10	0.97902	0.00042
43.00	0.99073	0.00033	29.10	0.98283	0.00039	24.40	0.98281	0.00043
44.00	0.99357	0.00032	29.50	0.98538	0.00039	24.70	0.98712	0.00040
45.00	0.99627	0.00032	29.90	0.98864	0.00038	25.00	0.98934	0.00042
46.00	0.99978	0.00031	30.30	0.99267	0.00038	25.30	0.99355	0.00043
47.00	1.00186	0.00030	30.70	0.99502	0.00037	25.60	0.99635	0.00042
48.00	1.00404	0.00031	31.10	0.99870	0.00038	25.90	0.99967	0.00041
49.00	1.00637	0.00033	31.50	1.00162	0.00037	26.20	1.00313	0.00042
50.00	1.00831	0.00032	31.90	1.00363	0.00036	26.50	1.00589	0.00040
51.00	1.01128	0.00029	32.30	1.00597	0.00036	26.80	1.00911	0.00042
51.60	1.01228	0.00029	32.70	1.00838	0.00037	27.10	1.01383	0.00041
			33.10	1.01114	0.00038	27.30	1.01383	0.00041
			33.20	1.01192	0.00037			

Table B.3.1.3.3-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 10 Inches of Water Reflection (cont)

800 milli-g/cc			850 milli-g/cc			900 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
18.70	0.92565	0.00046	18.30	0.93114	0.00046	17.70	0.93167	0.00049
18.90	0.92896	0.00046	18.50	0.93576	0.00047	17.90	0.93539	0.00048
19.10	0.93441	0.00044	18.70	0.94052	0.00046	18.10	0.94059	0.00047
19.30	0.93817	0.00046	18.90	0.94486	0.00048	18.30	0.94435	0.00047
19.50	0.94248	0.00045	19.10	0.94853	0.00048	18.50	0.94907	0.00046
19.70	0.94556	0.00045	19.30	0.95267	0.00048	18.70	0.95343	0.00048
19.90	0.95021	0.00047	19.50	0.95689	0.00047	18.90	0.95730	0.00048
20.10	0.95387	0.00046	19.70	0.95960	0.00048	19.10	0.96299	0.00049
20.30	0.95693	0.00044	19.90	0.96473	0.00045	19.30	0.96584	0.00047
20.50	0.96109	0.00046	20.10	0.96793	0.00047	19.50	0.97011	0.00048
20.70	0.96384	0.00044	20.30	0.97184	0.00047	19.70	0.97390	0.00045
20.90	0.96811	0.00043	20.50	0.97568	0.00046	19.90	0.97897	0.00046
21.10	0.97170	0.00044	20.70	0.97867	0.00045	20.10	0.98103	0.00044
21.30	0.97377	0.00046	20.90	0.98239	0.00047	20.30	0.98558	0.00047
21.50	0.97766	0.00045	21.10	0.98563	0.00048	20.50	0.98911	0.00049
21.70	0.98244	0.00046	21.30	0.98938	0.00049	20.70	0.99292	0.00048
21.90	0.98374	0.00045	21.50	0.99332	0.00046	20.90	0.99568	0.00044
22.10	0.98598	0.00045	21.70	0.99595	0.00046	21.10	0.99964	0.00046
22.30	0.98941	0.00046	21.90	0.99976	0.00047	21.30	1.00330	0.00045
22.50	0.99359	0.00045	22.10	1.00269	0.00043	21.50	1.00617	0.00048
22.70	0.99685	0.00045	22.30	1.00467	0.00045	21.70	1.00945	0.00045
22.90	0.99930	0.00045	22.50	1.00909	0.00046	21.90	1.01226	0.00046
23.10	1.00243	0.00045	22.70	1.01191	0.00047	22.10	1.01596	0.00046
23.30	1.00538	0.00042	22.90	1.01392	0.00045	22.20	1.01724	0.00048
23.50	1.00788	0.00045	23.10	1.01648	0.00044			
23.70	1.00985	0.00044						
23.90	1.01319	0.00043						
24.00	1.01386	0.00044						

Table B.3.1.3.3-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 10 Inches of Water Reflection (cont)

1000 milli-g/cc			1250 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
16.50	0.92181	0.00048	15.40	0.93002	0.00052	14.50	0.92282	0.00056
16.70	0.92810	0.00050	15.50	0.93200	0.00053	14.60	0.92610	0.00054
16.90	0.93403	0.00052	15.60	0.93545	0.00054	14.70	0.92866	0.00054
17.10	0.93751	0.00049	15.70	0.93694	0.00052	14.80	0.93285	0.00053
17.30	0.94385	0.00050	15.80	0.94196	0.00053	14.90	0.93621	0.00052
17.50	0.94752	0.00048	15.90	0.94334	0.00052	15.00	0.94027	0.00054
17.70	0.95353	0.00048	16.00	0.94724	0.00052	15.10	0.94319	0.00055
17.90	0.95647	0.00050	16.10	0.94918	0.00052	15.20	0.94614	0.00055
18.10	0.96331	0.00049	16.20	0.95210	0.00052	15.30	0.94993	0.00055
18.30	0.96656	0.00052	16.30	0.95611	0.00050	15.40	0.95300	0.00054
18.50	0.97166	0.00051	16.40	0.95940	0.00050	15.50	0.95467	0.00053
18.70	0.97679	0.00050	16.50	0.96201	0.00050	15.60	0.95890	0.00052
18.90	0.98173	0.00049	16.60	0.96380	0.00054	15.70	0.96105	0.00057
19.10	0.98439	0.00049	16.70	0.96632	0.00054	15.80	0.96534	0.00054
19.30	0.98970	0.00048	16.80	0.97004	0.00051	15.90	0.96829	0.00052
19.50	0.99419	0.00049	16.90	0.97202	0.00053	16.00	0.97075	0.00053
19.70	0.99746	0.00049	17.00	0.97442	0.00051	16.10	0.97304	0.00055
19.90	1.00136	0.00048	17.10	0.97680	0.00052	16.20	0.97695	0.00055
20.10	1.00502	0.00050	17.20	0.98052	0.00053	16.30	0.97917	0.00053
20.30	1.00836	0.00048	17.30	0.98286	0.00052	16.40	0.98250	0.00053
20.50	1.01199	0.00050	17.40	0.98488	0.00053	16.50	0.98372	0.00054
20.60	1.01485	0.00050	17.50	0.98730	0.00054	16.60	0.98761	0.00052
			17.60	0.99071	0.00050	16.70	0.99089	0.00054
			17.70	0.99275	0.00052	16.80	0.99261	0.00054
			17.80	0.99485	0.00051	16.90	0.99542	0.00053
			17.90	0.99739	0.00052	17.00	0.99901	0.00052
			18.00	1.00097	0.00049	17.10	1.00145	0.00054
			18.10	1.00246	0.00053	17.20	1.00399	0.00054
			18.20	1.00473	0.00052	17.30	1.00715	0.00054
			18.30	1.00876	0.00051	17.40	1.00862	0.00054
			18.40	1.01018	0.00049	17.50	1.01224	0.00054
			18.50	1.01071	0.00052	17.60	1.01477	0.00055
			18.60	1.01357	0.00052	17.70	1.01764	0.00054
			18.70	1.01608	0.00052			
			18.80	1.01742	0.00051			
			18.90	1.02190	0.00051			
			19.00	1.02383	0.00052			

Table B.3.1.3.3-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 10 Inches of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
14.20	0.92364	0.00056	13.90	0.92093	0.00058	14.00	0.92673	0.00055
14.30	0.92783	0.00055	14.00	0.92410	0.00058	14.10	0.93064	0.00054
14.40	0.93066	0.00055	14.10	0.92782	0.00054	14.20	0.93443	0.00057
14.50	0.93574	0.00057	14.20	0.93107	0.00058	14.30	0.93824	0.00055
14.60	0.93862	0.00056	14.30	0.93635	0.00054	14.40	0.94131	0.00056
14.70	0.94241	0.00055	14.40	0.93826	0.00057	14.50	0.94281	0.00055
14.80	0.94525	0.00055	14.50	0.94108	0.00055	14.60	0.94822	0.00057
14.90	0.94792	0.00058	14.60	0.94482	0.00056	14.70	0.95108	0.00056
15.00	0.95230	0.00054	14.70	0.94831	0.00056	14.80	0.95463	0.00057
15.10	0.95447	0.00055	14.80	0.95196	0.00056	14.90	0.95751	0.00056
15.20	0.95873	0.00055	14.90	0.95545	0.00054	15.00	0.96161	0.00057
15.30	0.96194	0.00056	15.00	0.95852	0.00056	15.10	0.96592	0.00057
15.40	0.96462	0.00055	15.10	0.96316	0.00056	15.20	0.96735	0.00057
15.50	0.96803	0.00055	15.20	0.96412	0.00058	15.30	0.97102	0.00057
15.60	0.97208	0.00057	15.30	0.96785	0.00058	15.40	0.97354	0.00057
15.70	0.97453	0.00056	15.40	0.97204	0.00056	15.50	0.97622	0.00060
15.80	0.97633	0.00056	15.50	0.97581	0.00056	15.60	0.98054	0.00057
15.90	0.97964	0.00054	15.60	0.97804	0.00056	15.70	0.98375	0.00057
16.00	0.98450	0.00056	15.70	0.98123	0.00056	15.80	0.98687	0.00056
16.10	0.98559	0.00054	15.80	0.98503	0.00059	15.90	0.99005	0.00057
16.20	0.98932	0.00053	15.90	0.98846	0.00055	16.00	0.99300	0.00057
16.30	0.99120	0.00057	16.00	0.98999	0.00057	16.10	0.99559	0.00057
16.40	0.99469	0.00055	16.10	0.99186	0.00056	16.20	0.99837	0.00057
16.50	0.99655	0.00054	16.20	0.99581	0.00057	16.30	1.00038	0.00057
16.60	1.00044	0.00055	16.30	0.99902	0.00055	16.40	1.00401	0.00057
16.70	1.00291	0.00053	16.40	1.00246	0.00058	16.50	1.00670	0.00057
16.80	1.00629	0.00056	16.50	1.00475	0.00055	16.60	1.01050	0.00059
16.90	1.00872	0.00053	16.60	1.00717	0.00055	16.70	1.01363	0.00055
17.00	1.01070	0.00054	16.70	1.01125	0.00056			
17.10	1.01353	0.00054	16.80	1.01393	0.00057			
17.20	1.01694	0.00053	16.90	1.01671	0.00056			

Table B.3.1.3.3-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 10 Inches of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
13.90	0.92446	0.00056	13.80	0.92252	0.00056	14.00	0.92412	0.00058
14.00	0.92763	0.00058	13.90	0.92555	0.00059	14.10	0.92754	0.00057
14.10	0.93259	0.00057	14.00	0.93080	0.00058	14.20	0.93034	0.00056
14.20	0.93506	0.00056	14.10	0.93273	0.00059	14.30	0.93325	0.00058
14.30	0.93888	0.00056	14.20	0.93712	0.00060	14.40	0.93796	0.00057
14.40	0.94376	0.00058	14.30	0.94101	0.00055	14.50	0.94120	0.00057
14.50	0.94628	0.00058	14.40	0.94558	0.00057	14.60	0.94411	0.00055
14.60	0.95035	0.00056	14.50	0.94830	0.00058	14.70	0.94741	0.00059
14.70	0.95319	0.00060	14.60	0.95036	0.00057	14.80	0.95069	0.00058
14.80	0.95632	0.00057	14.70	0.95441	0.00057	14.90	0.95409	0.00057
14.90	0.95947	0.00056	14.80	0.95802	0.00057	15.00	0.95800	0.00055
15.00	0.96381	0.00055	14.90	0.96164	0.00058	15.10	0.96104	0.00061
15.10	0.96672	0.00057	15.00	0.96455	0.00057	15.20	0.96459	0.00058
15.20	0.96986	0.00059	15.10	0.96927	0.00057	15.30	0.96642	0.00056
15.30	0.97310	0.00058	15.20	0.97239	0.00057	15.40	0.97003	0.00060
15.40	0.97546	0.00057	15.30	0.97460	0.00058	15.50	0.97317	0.00057
15.50	0.97985	0.00057	15.40	0.97798	0.00055	15.60	0.97516	0.00058
15.60	0.98387	0.00056	15.50	0.98141	0.00059	15.70	0.97987	0.00059
15.70	0.98574	0.00059	15.60	0.98446	0.00055	15.80	0.98295	0.00059
15.80	0.99025	0.00054	15.70	0.98684	0.00059	15.90	0.98466	0.00058
15.90	0.99111	0.00057	15.80	0.98997	0.00058	16.00	0.98978	0.00055
16.00	0.99434	0.00056	15.90	0.99358	0.00058	16.10	0.99008	0.00055
16.10	0.99797	0.00055	16.00	0.99672	0.00059	16.20	0.99405	0.00060
16.20	1.00025	0.00057	16.10	0.99889	0.00057	16.30	0.99809	0.00059
16.30	1.00335	0.00056	16.20	1.00169	0.00058	16.40	0.99874	0.00057
16.40	1.00646	0.00059	16.30	1.00437	0.00058	16.50	1.00282	0.00056
16.50	1.00905	0.00055	16.40	1.00876	0.00060	16.60	1.00574	0.00060
16.60	1.01301	0.00057	16.50	1.01020	0.00059	16.70	1.00932	0.00058
16.70	1.01536	0.00057	16.60	1.01270	0.00055	16.80	1.01122	0.00058
			16.70	1.01615	0.00057	16.90	1.01481	0.00058
						17.00	1.01673	0.00058

Table B.3.1.3.3-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 10 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
14.90	0.92372	0.00059	16.40	0.92235	0.00058	18.90	0.92549	0.00052
15.00	0.92730	0.00056	16.60	0.92818	0.00059	19.10	0.92945	0.00054
15.10	0.92988	0.00059	16.80	0.93304	0.00057	19.30	0.93218	0.00057
15.20	0.93197	0.00059	17.00	0.93698	0.00056	19.50	0.93733	0.00055
15.30	0.93591	0.00057	17.20	0.94261	0.00057	19.70	0.94153	0.00056
15.70	0.94819	0.00059	17.40	0.94682	0.00058	19.90	0.94523	0.00055
15.80	0.95152	0.00058	17.60	0.95372	0.00058	20.10	0.94743	0.00056
15.90	0.95333	0.00059	17.80	0.95743	0.00056	20.30	0.95251	0.00056
16.00	0.95625	0.00058	18.00	0.96117	0.00058	20.50	0.95349	0.00057
16.10	0.95948	0.00057	18.20	0.96521	0.00057	20.70	0.95918	0.00056
16.20	0.96320	0.00059	18.40	0.97038	0.00058	20.90	0.96263	0.00055
16.30	0.96486	0.00059	18.60	0.97491	0.00054	21.10	0.96553	0.00054
16.40	0.96815	0.00058	18.80	0.97947	0.00058	21.30	0.96895	0.00055
16.50	0.97073	0.00057	19.00	0.98487	0.00059	21.50	0.97179	0.00055
16.60	0.97312	0.00056	19.20	0.98739	0.00054	21.70	0.97495	0.00053
16.70	0.97538	0.00057	19.40	0.99199	0.00055	21.90	0.97774	0.00055
16.80	0.97782	0.00056	19.60	0.99555	0.00058	22.10	0.98024	0.00057
16.90	0.98155	0.00057	19.80	1.00074	0.00060	22.30	0.98410	0.00054
17.00	0.98461	0.00059	20.00	1.00407	0.00058	22.50	0.98784	0.00053
17.10	0.98678	0.00059	20.20	1.00719	0.00058	22.70	0.99003	0.00054
17.20	0.98982	0.00057	20.40	1.01154	0.00056	22.90	0.99461	0.00056
17.30	0.99177	0.00057	20.60	1.01372	0.00058	23.10	0.99585	0.00054
17.40	0.99430	0.00058				23.30	0.99978	0.00056
17.50	0.99620	0.00058				23.50	1.00130	0.00054
17.60	0.99897	0.00058				23.70	1.00452	0.00057
17.70	1.00063	0.00057				23.90	1.00759	0.00056
17.80	1.00366	0.00055				24.10	1.00963	0.00054
17.90	1.00582	0.00058				24.30	1.01218	0.00055
18.00	1.00869	0.00060				24.50	1.01446	0.00054
18.10	1.01033	0.00061						
18.20	1.01358	0.00058						
18.30	1.01716	0.00057						

Table B.3.1.3.3-2. K_{eff} Values for Uranium Dioxide Sphere (4.0% ^{235}U) - 10 Inches of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
22.80	0.92606	0.00054	25.90	0.92688	0.00049	30.30	0.92708	0.00047
23.20	0.93178	0.00052	26.50	0.93435	0.00050	31.20	0.93347	0.00049
23.60	0.93560	0.00054	27.10	0.93748	0.00052	32.10	0.94020	0.00049
24.00	0.94145	0.00052	27.70	0.94409	0.00052	33.00	0.94515	0.00050
24.40	0.94646	0.00052	28.30	0.95066	0.00051	33.90	0.95084	0.00048
24.80	0.95129	0.00053	28.90	0.95503	0.00051	34.80	0.95617	0.00049
25.20	0.95529	0.00054	29.50	0.95994	0.00050	35.70	0.96134	0.00049
25.60	0.96146	0.00054	30.10	0.96515	0.00049	36.60	0.96602	0.00048
26.00	0.96550	0.00052	30.70	0.97015	0.00053	37.50	0.97093	0.00047
26.40	0.96895	0.00053	31.30	0.97477	0.00050	38.40	0.97515	0.00049
26.80	0.97382	0.00050	31.90	0.97817	0.00050	39.30	0.97969	0.00047
27.20	0.97740	0.00052	32.50	0.98285	0.00052	40.20	0.98174	0.00046
27.60	0.98170	0.00051	33.10	0.98588	0.00050	41.10	0.98586	0.00050
28.00	0.98542	0.00051	33.70	0.99100	0.00050	42.00	0.98990	0.00049
28.40	0.98955	0.00053	34.30	0.99343	0.00051	42.90	0.99433	0.00047
28.80	0.99272	0.00053	34.90	0.99808	0.00049	43.80	0.99715	0.00048
29.20	0.99583	0.00052	35.50	1.00133	0.00049	44.70	0.99959	0.00048
29.60	0.99911	0.00052	36.10	1.00456	0.00048	45.60	1.00176	0.00047
30.00	1.00259	0.00054	36.70	1.00792	0.00049	46.50	1.00422	0.00046
30.40	1.00512	0.00052	37.30	1.01025	0.00049	47.40	1.00703	0.00045
30.80	1.00971	0.00052	37.80	1.01355	0.00051	48.30	1.01061	0.00047
31.20	1.01280	0.00053				48.80	1.01220	0.00048
31.30	1.01260	0.00053						

B.3.1.4. 3% ^{235}U 97% ^{238}U

B.3.1.4.1. Unreflected

Case ID: u5o2-sp-0030-00

Material: Uranium dioxide in water

Geometry: Sphere

Isotopics: 3% ^{235}U 97% ^{238}U

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.3.1.4.1-1. Uranium Dioxide Sphere (3.0% ^{235}U) - 0 Inches of Water Reflection

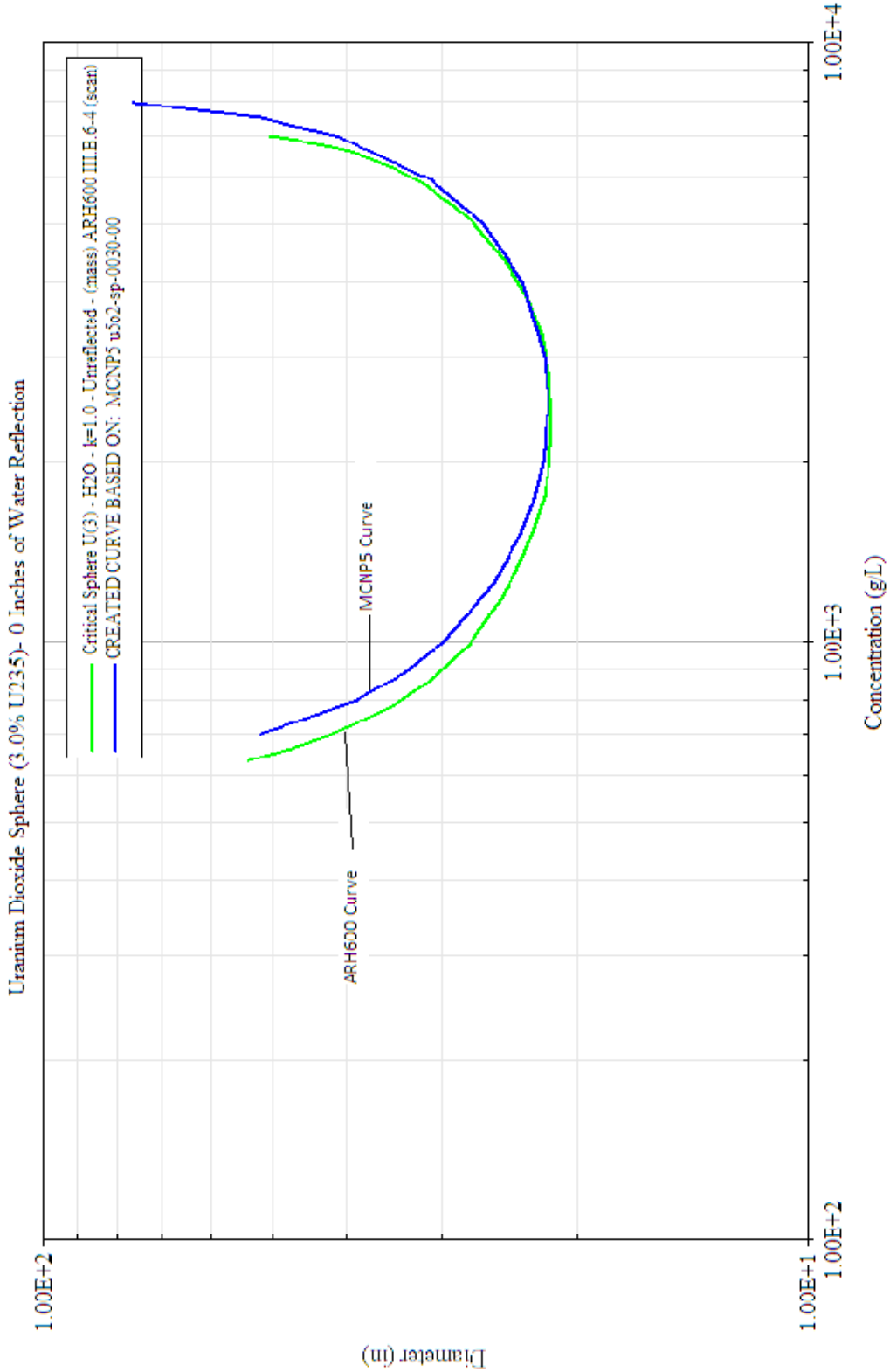

Table B.3.1.4.1-1. Critical Dimensions for Uranium Dioxide Sphere (3.0% ^{235}U) - 0 Inches of Water Reflection

Uranium Dioxide Sphere (3.0% ^{235}U) - 0 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.700	33.700	57.400	1.100	51.9330
0.800	28.700	41.400	0.600	38.7647
0.850	27.200	37.700	0.500	35.5878
0.900	25.700	35.100	0.400	33.1282
1.000	24.000	31.300	0.300	29.7822
1.250	21.600	26.700	0.200	25.6792
1.500	20.100	24.600	0.200	23.7385
1.700	19.500	23.500	0.200	22.8488
1.900	19.200	23.100	0.200	22.3223
2.000	19.000	22.900	0.200	22.1419
2.100	18.800	22.800	0.200	22.0007
2.500	18.700	22.600	0.200	21.7903
3.000	19.100	22.700	0.100	22.0223
4.000	20.200	24.400	0.200	23.5949
5.000	22.400	27.400	0.200	26.4058
6.000	25.700	32.900	0.300	31.4929
7.000	31.600	43.900	0.600	41.2447
7.500	35.900	55.400	0.900	51.6667
8.000	44.600	77.200	1.600	76.5035

MCNP5 Sample Input File
3.0% U02 Sphere- 0 Inches of Reflection

```
UO2 sphere, 3.0 wt% 235U, 03000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 2020  hundreths of inches - must be integer
c radius =    25.6540 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 03000 milli-g Pu/cc
c Reflector width =  0.0 inches
c Enrichment = 0.03 wt fraction 235U
c
c Density of H2O 1.00000
c Density of UO2 11.00000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c U238  = 238.05080
c
c Effective uranium atomic mass 237.96059
c UO2
c Mass fraction of U in crit material 0.88147
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.2727 cc
c Volume of water in sample 0.7273 cc
c
c Mass of crit in sample   3.0000 g
c Mass of U in sample   2.6444 g
c Mass of bound O in sample  0.3556 g
c Mass of water in sample  0.7273 g
c
c Total mass of sample  3.7273g for a 1cc sample
c Mass Density for crit material  -3.7273, expressed as negative
c
c  sphere
20 11   -3.727273   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=0    $zero importance if no reflector
22  0            2           imp:n=0
```

```
1       so    25.6540              $ Sphere
2       so    25.6540        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u oxide / water mixture
m11    $ UO2/H2O Sludge, 100.0 wt% 235U, 03000 milli-g U/cc,  3.7273
1001.66c -0.021833
8016.66c -0.173289      $from water
8016.66c -0.095404      $from oxide
92235.66c -0.021284
92238.66c -0.688190
mt11     lwtr.60t
c
c    u oxide only
m12    $ U oxide, 100.0 wt% 235U, 03000 milli-g U/cc,  3.7273
8016.66c -0.095404      $from oxide
92235.66c -0.021284
92238.66c -0.688190
c
```

Critview Compatible Data File
3.0% U02 Sphere- 0 Inches of Reflection

reset:
title: MCNP5 u5o2-sp-0030-00
set: MCNP5 set
source: MCNP5 primary
created: Tue 08/10/2010 12:34:25.83
geometry: sphere
modmat: H2O
critmat: uranium dioxide
isomat: U235 0.030 U238 0.970
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.700	51.9330
0.800	38.7647
0.850	35.5878
0.900	33.1282
1.000	29.7822
1.250	25.6792
1.500	23.7385
1.700	22.8488
1.900	22.3223
2.000	22.1419
2.100	22.0007
2.500	21.7903
3.000	22.0223
4.000	23.5949
5.000	26.4058
6.000	31.4929
7.000	41.2447
7.500	51.6667
8.000	76.5035

Table B.3.1.4.1-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 0 Inches of Water Reflection

700 milli-g/cc			800 milli-g/cc			850 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
33.70	0.92855	0.00038	28.70	0.92782	0.00041	27.20	0.92965	0.00041
34.80	0.93605	0.00036	29.30	0.93299	0.00042	27.70	0.93342	0.00043
35.90	0.94185	0.00036	29.90	0.93973	0.00040	28.20	0.93886	0.00042
37.00	0.94784	0.00036	30.50	0.94537	0.00039	28.70	0.94582	0.00041
38.10	0.95375	0.00036	31.10	0.94916	0.00043	29.20	0.95091	0.00041
39.20	0.95832	0.00035	31.70	0.95451	0.00041	29.70	0.95546	0.00041
40.30	0.96309	0.00035	32.30	0.95971	0.00041	30.20	0.95858	0.00040
41.40	0.96845	0.00035	32.90	0.96499	0.00040	30.70	0.96398	0.00039
42.50	0.97316	0.00035	33.50	0.96791	0.00041	31.20	0.96886	0.00041
43.60	0.97656	0.00035	34.10	0.97312	0.00038	31.70	0.97289	0.00041
44.70	0.98012	0.00033	34.70	0.97623	0.00039	32.20	0.97678	0.00040
45.80	0.98394	0.00034	35.30	0.98059	0.00038	32.70	0.98125	0.00040
46.90	0.98760	0.00034	35.90	0.98481	0.00038	33.20	0.98391	0.00039
48.00	0.98995	0.00032	36.50	0.98748	0.00037	33.70	0.98747	0.00041
49.10	0.99232	0.00034	37.10	0.98998	0.00037	34.20	0.99123	0.00039
50.20	0.99635	0.00033	37.70	0.99420	0.00039	34.70	0.99527	0.00040
51.30	0.99825	0.00032	38.30	0.99811	0.00037	35.20	0.99772	0.00040
52.40	1.00129	0.00031	38.90	1.00055	0.00037	35.70	1.00066	0.00041
53.50	1.00332	0.00032	39.50	1.00300	0.00037	36.20	1.00410	0.00041
54.60	1.00508	0.00032	40.10	1.00474	0.00036	36.70	1.00745	0.00041
55.70	1.00741	0.00032	40.70	1.00866	0.00036	37.20	1.01041	0.00039
56.80	1.00946	0.00032	41.30	1.01182	0.00037	37.70	1.01250	0.00039
57.40	1.00917	0.00031	41.40	1.01142	0.00038			

Table B.3.1.4.1-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 0 Inches of Water Reflection (cont)

900 milli-g/cc			1000 milli-g/cc			1250 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
25.70	0.92520	0.00046	24.00	0.92611	0.00047	21.60	0.92953	0.00051
26.10	0.93177	0.00043	24.30	0.93163	0.00047	21.80	0.93331	0.00051
26.50	0.93471	0.00041	24.60	0.93491	0.00046	22.00	0.93795	0.00050
26.90	0.94071	0.00046	24.90	0.94069	0.00045	22.20	0.94153	0.00050
27.30	0.94479	0.00044	25.20	0.94495	0.00047	22.40	0.94547	0.00049
27.70	0.95023	0.00044	25.50	0.94835	0.00046	22.60	0.94945	0.00048
28.10	0.95509	0.00043	25.80	0.95270	0.00045	22.80	0.95239	0.00051
28.50	0.95825	0.00044	26.10	0.95734	0.00046	23.00	0.95646	0.00049
28.90	0.96314	0.00043	26.40	0.96186	0.00046	23.20	0.96086	0.00048
29.30	0.96711	0.00044	26.70	0.96541	0.00046	23.40	0.96303	0.00050
29.70	0.97016	0.00042	27.00	0.96834	0.00044	23.60	0.96670	0.00047
30.10	0.97471	0.00042	27.30	0.97220	0.00044	23.80	0.97038	0.00051
30.50	0.97898	0.00042	27.60	0.97706	0.00044	24.00	0.97368	0.00051
30.90	0.98175	0.00041	27.90	0.97952	0.00046	24.20	0.97738	0.00051
31.30	0.98613	0.00043	28.20	0.98231	0.00045	24.40	0.98130	0.00050
31.70	0.98876	0.00041	28.50	0.98520	0.00046	24.60	0.98373	0.00050
32.10	0.99164	0.00042	28.80	0.98937	0.00046	24.80	0.98702	0.00050
32.50	0.99529	0.00041	29.10	0.99262	0.00044	25.00	0.99061	0.00049
32.90	0.99802	0.00042	29.40	0.99563	0.00045	25.20	0.99250	0.00050
33.30	1.00149	0.00044	29.70	0.99940	0.00043	25.40	0.99623	0.00050
33.70	1.00414	0.00041	30.00	1.00159	0.00043	25.60	0.99855	0.00048
34.10	1.00697	0.00041	30.30	1.00485	0.00043	25.80	1.00221	0.00050
34.50	1.01039	0.00040	30.60	1.00781	0.00045	26.00	1.00492	0.00050
34.90	1.01188	0.00040	30.90	1.00836	0.00045	26.20	1.00696	0.00048
35.10	1.01397	0.00042	31.20	1.01186	0.00044	26.40	1.01158	0.00049
			31.30	1.01341	0.00044	26.60	1.01360	0.00049
						26.70	1.01511	0.00047

Table B.3.1.4.1-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 0 Inches of Water Reflection (cont)

1500 milli-g/cc			1700 milli-g/cc			1900 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
20.10	0.92451	0.00055	19.50	0.92319	0.00058	19.20	0.92336	0.00055
20.30	0.92851	0.00054	19.70	0.92801	0.00055	19.40	0.92943	0.00054
20.50	0.93359	0.00055	19.90	0.93299	0.00057	19.60	0.93510	0.00059
20.70	0.93844	0.00056	20.10	0.93907	0.00054	19.80	0.94125	0.00058
20.90	0.94200	0.00052	20.30	0.94398	0.00054	20.00	0.94561	0.00054
21.10	0.94658	0.00053	20.50	0.94807	0.00054	20.20	0.95151	0.00056
21.30	0.95162	0.00054	20.70	0.95338	0.00054	20.40	0.95566	0.00058
21.50	0.95663	0.00053	20.90	0.95788	0.00058	20.60	0.96058	0.00057
21.70	0.96123	0.00052	21.10	0.96220	0.00055	20.80	0.96580	0.00059
21.90	0.96520	0.00053	21.30	0.96793	0.00058	21.00	0.96959	0.00058
22.10	0.96895	0.00054	21.50	0.97254	0.00056	21.20	0.97503	0.00057
22.30	0.97255	0.00056	21.70	0.97688	0.00053	21.40	0.98046	0.00056
22.50	0.97702	0.00053	21.90	0.98012	0.00052	21.60	0.98521	0.00055
22.70	0.98044	0.00052	22.10	0.98483	0.00055	21.80	0.98789	0.00054
22.90	0.98471	0.00052	22.30	0.98874	0.00056	22.00	0.99171	0.00055
23.10	0.98826	0.00051	22.50	0.99253	0.00056	22.20	0.99833	0.00056
23.30	0.99078	0.00054	22.70	0.99550	0.00054	22.40	1.00106	0.00057
23.50	0.99557	0.00051	22.90	1.00155	0.00055	22.60	1.00585	0.00055
23.70	0.99920	0.00051	23.10	1.00553	0.00053	22.80	1.00918	0.00055
23.90	1.00336	0.00053	23.30	1.00956	0.00054	23.00	1.01374	0.00056
24.10	1.00637	0.00053	23.50	1.01201	0.00055	23.10	1.01499	0.00054
24.30	1.01054	0.00050						
24.50	1.01251	0.00054						
24.60	1.01409	0.00053						

Table B.3.1.4.1-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 0 Inches of Water Reflection (cont)

2000 milli-g/cc			2100 milli-g/cc			2500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
19.00	0.92151	0.00056	18.80	0.91875	0.00060	18.70	0.91928	0.00060
19.20	0.92852	0.00056	19.00	0.92588	0.00057	18.90	0.92530	0.00060
19.40	0.93369	0.00057	19.20	0.93176	0.00060	19.10	0.93184	0.00057
19.60	0.93918	0.00059	19.40	0.93661	0.00058	19.30	0.93801	0.00058
19.80	0.94537	0.00055	19.60	0.94063	0.00059	19.50	0.94285	0.00062
20.00	0.94980	0.00056	19.80	0.94671	0.00058	19.70	0.94933	0.00056
20.20	0.95516	0.00058	20.00	0.95160	0.00058	19.90	0.95546	0.00059
20.40	0.95881	0.00059	20.20	0.95827	0.00057	20.10	0.95924	0.00059
20.60	0.96486	0.00058	20.40	0.96250	0.00058	20.30	0.96392	0.00057
20.80	0.96982	0.00057	20.60	0.96759	0.00059	20.50	0.96919	0.00059
21.00	0.97458	0.00057	20.80	0.97228	0.00059	20.70	0.97555	0.00059
21.20	0.97815	0.00056	21.00	0.97699	0.00058	20.90	0.97993	0.00060
21.40	0.98409	0.00058	21.20	0.98252	0.00059	21.10	0.98507	0.00058
21.60	0.98832	0.00059	21.40	0.98688	0.00055	21.30	0.98885	0.00058
21.80	0.99150	0.00057	21.60	0.99217	0.00056	21.50	0.99452	0.00057
22.00	0.99582	0.00058	21.80	0.99549	0.00054	21.70	0.99860	0.00058
22.20	1.00171	0.00053	22.00	0.99998	0.00056	21.90	1.00170	0.00062
22.40	1.00595	0.00055	22.20	1.00575	0.00056	22.10	1.00759	0.00058
22.60	1.01018	0.00056	22.40	1.00863	0.00059	22.30	1.01093	0.00056
22.80	1.01341	0.00056	22.60	1.01306	0.00058	22.50	1.01610	0.00058
22.90	1.01569	0.00055	22.80	1.01829	0.00056	22.60	1.01779	0.00058

Table B.3.1.4.1-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 0 Inches of Water Reflection (cont)

3000 milli-g/cc			4000 milli-g/cc			5000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
19.10	0.92659	0.00060	20.20	0.92212	0.00060	22.40	0.92445	0.00061
19.20	0.92701	0.00058	20.40	0.92927	0.00060	22.60	0.93083	0.00058
19.30	0.93007	0.00062	20.60	0.93320	0.00061	22.80	0.93230	0.00059
19.40	0.93466	0.00057	20.80	0.93900	0.00061	23.00	0.93718	0.00059
19.50	0.93721	0.00058	21.00	0.94556	0.00061	23.20	0.94173	0.00057
19.60	0.94067	0.00060	21.20	0.94920	0.00058	23.40	0.94590	0.00058
19.70	0.94218	0.00062	21.40	0.95391	0.00058	23.60	0.94936	0.00060
19.80	0.94443	0.00062	21.60	0.95763	0.00060	23.80	0.95279	0.00059
19.90	0.94792	0.00059	21.80	0.96281	0.00060	24.00	0.95871	0.00057
20.00	0.95133	0.00062	22.00	0.96695	0.00059	24.20	0.96071	0.00059
20.10	0.95398	0.00060	22.20	0.97141	0.00058	24.40	0.96442	0.00060
20.20	0.95525	0.00060	22.40	0.97478	0.00060	24.60	0.96893	0.00055
20.30	0.95863	0.00058	22.60	0.97971	0.00062	24.80	0.97176	0.00058
20.40	0.96134	0.00060	22.80	0.98401	0.00059	25.00	0.97710	0.00057
20.50	0.96276	0.00061	23.00	0.98804	0.00061	25.20	0.97928	0.00058
20.60	0.96656	0.00059	23.20	0.99306	0.00059	25.40	0.98305	0.00058
20.70	0.96904	0.00058	23.40	0.99502	0.00059	25.60	0.98676	0.00056
20.80	0.97132	0.00058	23.60	1.00013	0.00058	25.80	0.98947	0.00059
20.90	0.97504	0.00060	23.80	1.00471	0.00058	26.00	0.99332	0.00057
21.00	0.97559	0.00059	24.00	1.00746	0.00058	26.20	0.99637	0.00059
21.10	0.97876	0.00060	24.20	1.01292	0.00059	26.40	0.99993	0.00056
21.20	0.98129	0.00058	24.40	1.01635	0.00059	26.60	1.00233	0.00060
21.30	0.98359	0.00061				26.80	1.00535	0.00056
21.40	0.98594	0.00060				27.00	1.00708	0.00058
21.50	0.98806	0.00061				27.20	1.01012	0.00058
21.60	0.98940	0.00059				27.40	1.01327	0.00056
21.70	0.99205	0.00058						
21.80	0.99498	0.00059						
21.90	0.99800	0.00058						
22.00	0.99921	0.00059						
22.10	1.00275	0.00058						
22.20	1.00436	0.00058						
22.30	1.00577	0.00061						
22.40	1.00920	0.00059						
22.50	1.01093	0.00059						
22.60	1.01186	0.00059						
22.70	1.01298	0.00058						

Table B.3.1.4.1-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 0 Inches of Water Reflection (cont)

6000 milli-g/cc			7000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
25.70	0.92259	0.00057	31.60	0.92512	0.00054	35.90	0.92123	0.00052
26.00	0.92799	0.00054	32.20	0.93169	0.00053	36.80	0.92810	0.00049
26.30	0.93402	0.00057	32.80	0.93818	0.00053	37.70	0.93435	0.00049
26.60	0.93742	0.00055	33.40	0.94362	0.00051	38.60	0.93899	0.00051
26.90	0.94189	0.00054	34.00	0.94835	0.00054	39.50	0.94670	0.00049
27.20	0.94709	0.00055	34.60	0.95260	0.00052	40.40	0.95200	0.00050
27.50	0.95132	0.00054	35.20	0.95859	0.00052	41.30	0.95576	0.00050
27.80	0.95626	0.00056	35.80	0.96371	0.00053	42.20	0.96121	0.00049
28.10	0.95906	0.00054	36.40	0.96884	0.00052	43.10	0.96562	0.00050
28.40	0.96390	0.00057	37.00	0.97274	0.00050	44.00	0.96991	0.00048
28.70	0.96778	0.00056	37.60	0.97639	0.00055	44.90	0.97406	0.00049
29.00	0.97126	0.00055	38.20	0.98004	0.00052	45.80	0.97842	0.00051
29.30	0.97479	0.00054	38.80	0.98515	0.00050	46.70	0.98171	0.00048
29.60	0.97976	0.00055	39.40	0.98929	0.00052	47.60	0.98603	0.00050
29.90	0.98245	0.00055	40.00	0.99124	0.00050	48.50	0.98920	0.00049
30.20	0.98686	0.00053	40.60	0.99482	0.00052	49.40	0.99231	0.00047
30.50	0.98895	0.00054	41.20	0.99977	0.00049	50.30	0.99656	0.00049
30.80	0.99182	0.00054	41.80	1.00286	0.00052	51.20	0.99749	0.00049
31.10	0.99578	0.00056	42.40	1.00513	0.00051	52.10	1.00233	0.00047
31.40	0.99861	0.00056	43.00	1.00821	0.00051	53.00	1.00337	0.00048
31.70	1.00310	0.00055	43.60	1.01164	0.00050	53.90	1.00661	0.00048
32.00	1.00531	0.00053	43.90	1.01278	0.00051	54.80	1.00777	0.00048
32.30	1.00802	0.00057				55.40	1.00962	0.00048
32.60	1.01184	0.00053						
32.90	1.01455	0.00056						

Table B.3.1.4.1-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 0 Inches of Water Reflection (cont)

8000 milli-g/cc								
Diameter (inches)	K_{eff}	Sigma						
44.60	0.92619	0.00049						
46.20	0.93401	0.00047						
47.80	0.94077	0.00045						
49.40	0.94629	0.00046						
51.00	0.95087	0.00046						
52.60	0.95709	0.00048						
54.20	0.96228	0.00047						
55.80	0.96488	0.00047						
57.40	0.96893	0.00046						
59.00	0.97200	0.00048						
60.60	0.97609	0.00047						
62.20	0.98017	0.00047						
63.80	0.98300	0.00048						
65.40	0.98654	0.00046						
67.00	0.98706	0.00046						
68.60	0.99050	0.00048						
70.20	0.99201	0.00046						
71.80	0.99309	0.00047						
73.40	0.99663	0.00045						
75.00	0.99782	0.00045						
76.60	1.00014	0.00045						
77.20	1.00028	0.00045						

B.3.1.4.2. 1” Water Reflector

Case ID: u5o2-sp-0030-01

Material: Uranium dioxide in water

Geometry: Sphere

Isotopics: 3% ^{235}U 97% ^{238}U

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.3.1.4.2-1. Uranium Dioxide Sphere (3.0% ^{235}U) - 1 Inch of Water Reflection

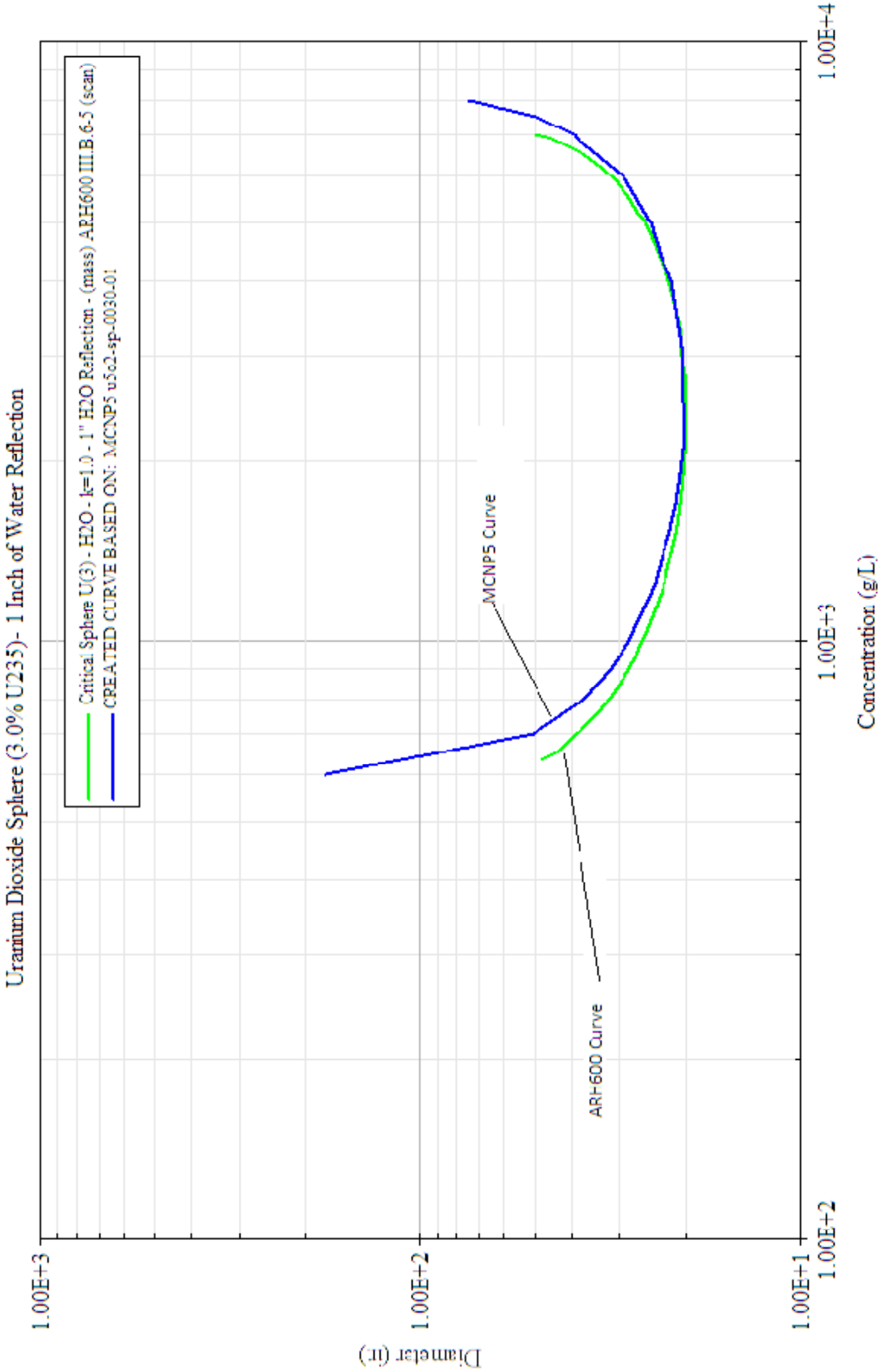

Table B.3.1.4.2-1. Critical Dimensions for Uranium Dioxide Sphere (3.0% ^{235}U) - 1 Inch of Water Reflection

Uranium Dioxide Sphere (3.0% ^{235}U) - 1 Inch of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.600	44.000	572.000	26.400	178.6940
0.700	32.100	56.100	1.200	50.4410
0.800	27.000	39.800	0.600	37.1357
0.850	25.500	36.000	0.500	33.9284
0.900	24.400	33.500	0.400	31.4574
1.000	22.300	29.700	0.300	28.1819
1.250	20.000	25.300	0.200	24.0884
1.500	18.400	22.900	0.200	22.0965
1.700	17.200	22.000	0.200	21.1916
1.900	17.500	21.500	0.200	20.6227
2.000	17.400	21.300	0.200	20.4540
2.100	17.300	21.100	0.200	20.3314
2.500	17.100	20.800	0.100	20.0731
3.000	17.200	21.000	0.200	20.2967
4.000	18.000	22.500	0.200	21.7730
5.000	20.400	25.600	0.200	24.5952
6.000	23.100	30.800	0.300	29.3692
7.000	29.500	41.800	0.600	39.0869
7.500	34.500	54.100	0.900	49.4490
8.000	42.900	76.000	1.600	74.7770

MCNP5 Sample Input File
3.0% U02 Sphere- 1 Inch of Reflection

```
UO2 sphere, 3.0 wt% 235U, 03000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1900  hundreths of inches - must be integer
c radius =    24.1300 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 03000 milli-g Pu/cc
c Reflector width =  1.0 inches
c Enrichment = 0.03 wt fraction 235U
c
c Density of H2O 1.00000
c Density of UO2 11.00000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c U238  = 238.05080
c
c Effective uranium atomic mass 237.96059
c UO2
c Mass fraction of U in crit material 0.88147
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.2727 cc
c Volume of water in sample 0.7273 cc
c
c Mass of crit in sample   3.0000 g
c Mass of U in sample   2.6444 g
c Mass of bound O in sample  0.3556 g
c Mass of water in sample  0.7273 g
c
c Total mass of sample  3.7273g for a 1cc sample
c Mass Density for crit material  -3.7273, expressed as negative
c
c  sphere
20 11   -3.727273   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0
```

```
1       so    24.1300            $ Sphere
2       so    26.6700        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u oxide / water mixture
m11    $ UO2/H2O Sludge, 100.0 wt% 235U, 03000 milli-g U/cc,  3.7273
1001.66c -0.021833
8016.66c -0.173289      $from water
8016.66c -0.095404      $from oxide
92235.66c -0.021284
92238.66c -0.688190
mt11     lwtr.60t
c
c    u oxide only
m12    $ U oxide, 100.0 wt% 235U, 03000 milli-g U/cc,  3.7273
8016.66c -0.095404      $from oxide
92235.66c -0.021284
92238.66c -0.688190
c
```

Critview Compatible Data File
3.0% U02 Sphere- 1 Inch of Reflection

reset:
title: MCNP5 u5o2-sp-0030-01
set: MCNP5 set
source: MCNP5 primary
created: Tue 08/10/2010 12:34:47.11
geometry: sphere
modmat: H2O
critmat: uranium dioxide
isomat: U235 0.030 U238 0.970
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.600	178.694
0.700	50.441
0.800	37.1357
0.850	33.9284
0.900	31.4574
1.000	28.1819
1.250	24.0884
1.500	22.0965
1.700	21.1916
1.900	20.6227
2.000	20.4540
2.100	20.3314
2.500	20.0731
3.000	20.2967
4.000	21.7730
5.000	24.5952
6.000	29.3692
7.000	39.0869
7.500	49.4490
8.000	74.7770

Table B.3.1.4.2-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 1 Inch of Water Reflection

600 milli-g/cc			700 milli-g/cc			800 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
44.00	0.92888	0.00030	32.10	0.92773	0.00039	27.00	0.92550	0.00040
70.40	0.97239	0.00027	33.30	0.93503	0.00037	27.60	0.93231	0.00040
96.80	0.98671	0.00025	34.50	0.94349	0.00037	28.20	0.93761	0.00040
123.20	0.99340	0.00025	35.70	0.94984	0.00036	28.80	0.94303	0.00040
149.60	0.99744	0.00023	36.90	0.95493	0.00035	29.40	0.94935	0.00039
176.00	0.99990	0.00024	38.10	0.96199	0.00036	30.00	0.95434	0.00041
202.40	1.00088	0.00023	39.30	0.96589	0.00032	30.60	0.95892	0.00039
228.80	1.00251	0.00023	40.50	0.97097	0.00035	31.20	0.96410	0.00039
255.20	1.00316	0.00023	41.70	0.97451	0.00035	31.80	0.96721	0.00038
281.60	1.00318	0.00023	42.90	0.97912	0.00035	32.40	0.97205	0.00038
308.00	1.00383	0.00023	44.10	0.98400	0.00035	33.00	0.97562	0.00039
334.40	1.00387	0.00024	45.30	0.98647	0.00033	33.60	0.97957	0.00038
360.80	1.00419	0.00023	46.50	0.99045	0.00034	34.20	0.98417	0.00037
387.20	1.00458	0.00022	47.70	0.99381	0.00033	34.80	0.98693	0.00039
413.60	1.00504	0.00023	48.90	0.99781	0.00032	35.40	0.99021	0.00038
440.00	1.00454	0.00023	50.10	0.99936	0.00032	36.00	0.99393	0.00037
466.40	1.00492	0.00022	51.30	1.00161	0.00031	36.60	0.99650	0.00036
492.80	1.00468	0.00023	52.50	1.00378	0.00031	37.20	1.00042	0.00037
519.20	1.00538	0.00023	53.70	1.00643	0.00031	37.80	1.00294	0.00036
545.60	1.00520	0.00023	54.90	1.00858	0.00031	38.40	1.00451	0.00036
572.00	1.00520	0.00023	56.10	1.01193	0.00031	39.00	1.00800	0.00036
						39.60	1.01060	0.00036
						39.80	1.01135	0.00036

Table B.3.1.4.2-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 1 Inch of Water Reflection (cont)

850 milli-g/cc			900 milli-g/cc			1000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
25.50	0.92699	0.00042	24.40	0.92862	0.00042	23.50	0.94295	0.00044
26.00	0.93366	0.00041	24.80	0.93449	0.00042	23.80	0.94812	0.00045
26.50	0.93881	0.00041	25.20	0.93869	0.00043	24.10	0.95199	0.00046
27.00	0.94410	0.00042	25.60	0.94389	0.00044	24.40	0.95503	0.00045
27.50	0.94955	0.00041	26.00	0.94846	0.00043	24.70	0.96024	0.00045
28.00	0.95401	0.00041	26.40	0.95301	0.00042	25.00	0.96385	0.00045
28.50	0.95840	0.00042	26.80	0.95815	0.00043	25.30	0.96738	0.00044
29.00	0.96353	0.00042	27.20	0.96196	0.00042	25.60	0.97120	0.00044
29.50	0.96828	0.00041	27.60	0.96546	0.00042	25.90	0.97480	0.00045
30.00	0.97249	0.00042	28.00	0.96972	0.00041	26.20	0.97872	0.00045
30.50	0.97585	0.00039	28.40	0.97348	0.00043	26.50	0.98176	0.00044
31.00	0.98064	0.00038	28.80	0.97743	0.00039	26.80	0.98520	0.00045
31.50	0.98213	0.00039	29.20	0.98128	0.00043	27.10	0.98735	0.00044
32.00	0.98780	0.00040	29.60	0.98542	0.00041	27.40	0.99058	0.00044
32.50	0.99065	0.00038	30.00	0.98830	0.00040	27.70	0.99460	0.00043
33.00	0.99425	0.00039	30.40	0.99216	0.00041	28.00	0.99843	0.00044
33.50	0.99689	0.00040	30.80	0.99466	0.00042	28.30	1.00102	0.00044
34.00	1.00052	0.00041	31.20	0.99769	0.00042	28.60	1.00366	0.00044
34.50	1.00351	0.00039	31.60	1.00128	0.00041	28.90	1.00673	0.00042
35.00	1.00685	0.00040	32.00	1.00395	0.00043	29.20	1.00913	0.00043
35.50	1.00890	0.00038	32.40	1.00687	0.00041	29.50	1.01233	0.00043
36.00	1.01250	0.00038	32.80	1.01013	0.00041	29.70	1.01417	0.00042
			33.20	1.01136	0.00040			
			33.50	1.01384	0.00042			

Table B.3.1.4.2-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 1 Inch of Water Reflection (cont)

1250 milli-g/cc			1500 milli-g/cc			1700 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
20.00	0.92891	0.00049	18.40	0.92205	0.00053	17.20	0.90554	0.00056
20.20	0.93335	0.00050	18.60	0.92599	0.00053	17.40	0.91135	0.00054
20.40	0.93800	0.00051	18.80	0.93184	0.00053	17.60	0.91623	0.00055
20.60	0.94209	0.00050	19.00	0.93720	0.00051	17.80	0.92084	0.00052
20.80	0.94535	0.00049	19.20	0.94119	0.00053	18.00	0.92651	0.00055
21.00	0.94914	0.00050	19.40	0.94545	0.00050	18.20	0.93163	0.00055
21.20	0.95254	0.00051	19.60	0.95048	0.00055	18.40	0.93652	0.00055
21.40	0.95674	0.00049	19.80	0.95333	0.00051	18.60	0.94173	0.00055
21.60	0.96000	0.00049	20.00	0.95849	0.00053	18.80	0.94739	0.00056
21.80	0.96394	0.00048	20.20	0.96243	0.00052	19.00	0.95121	0.00054
22.00	0.96764	0.00051	20.40	0.96646	0.00052	19.20	0.95596	0.00055
22.20	0.97030	0.00050	20.60	0.97160	0.00054	19.40	0.96064	0.00052
22.40	0.97407	0.00048	20.80	0.97435	0.00052	19.60	0.96560	0.00054
22.60	0.97730	0.00048	21.00	0.97927	0.00052	19.80	0.97029	0.00055
22.80	0.98161	0.00050	21.20	0.98313	0.00052	20.00	0.97659	0.00053
23.00	0.98412	0.00047	21.40	0.98651	0.00053	20.20	0.97916	0.00052
23.20	0.98687	0.00049	21.60	0.99098	0.00049	20.40	0.98314	0.00055
23.40	0.98978	0.00047	21.80	0.99416	0.00050	20.60	0.98866	0.00053
23.60	0.99328	0.00048	22.00	0.99834	0.00051	20.80	0.99240	0.00055
23.80	0.99620	0.00048	22.20	1.00178	0.00053	21.00	0.99613	0.00053
24.00	0.99825	0.00048	22.40	1.00460	0.00051	21.20	1.00017	0.00052
24.20	1.00221	0.00046	22.60	1.00910	0.00049	21.40	1.00320	0.00054
24.40	1.00417	0.00048	22.80	1.01174	0.00053	21.60	1.00740	0.00053
24.60	1.00814	0.00047	22.90	1.01365	0.00051	21.80	1.01184	0.00053
24.80	1.01114	0.00047				22.00	1.01402	0.00053
25.00	1.01344	0.00047						
25.20	1.01645	0.00048						
25.30	1.01787	0.00047						

Table B.3.1.4.2-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 1 Inch of Water Reflection (cont)

1900 milli-g/cc			2000 milli-g/cc			2100 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.50	0.92287	0.00058	17.40	0.92469	0.00058	17.30	0.92403	0.00056
17.70	0.92822	0.00053	17.60	0.92960	0.00055	17.50	0.92996	0.00057
17.90	0.93286	0.00054	17.80	0.93468	0.00056	17.70	0.93491	0.00055
18.10	0.94000	0.00056	18.00	0.94034	0.00055	17.90	0.94189	0.00056
18.30	0.94586	0.00056	18.20	0.94714	0.00056	18.10	0.94613	0.00057
18.50	0.94961	0.00056	18.40	0.95117	0.00056	18.30	0.95238	0.00054
18.70	0.95521	0.00057	18.60	0.95623	0.00056	18.50	0.95769	0.00054
18.90	0.95922	0.00055	18.80	0.96100	0.00054	18.70	0.96195	0.00055
19.10	0.96501	0.00057	19.00	0.96670	0.00056	18.90	0.96637	0.00056
19.30	0.96970	0.00056	19.20	0.97204	0.00056	19.10	0.97265	0.00054
19.50	0.97433	0.00055	19.40	0.97654	0.00054	19.30	0.97679	0.00058
19.70	0.97845	0.00054	19.60	0.97990	0.00055	19.50	0.98070	0.00057
19.90	0.98256	0.00053	19.80	0.98479	0.00054	19.70	0.98591	0.00056
20.10	0.98862	0.00055	20.00	0.99005	0.00053	19.90	0.99128	0.00053
20.30	0.99235	0.00056	20.20	0.99342	0.00056	20.10	0.99572	0.00056
20.50	0.99649	0.00054	20.40	0.99899	0.00057	20.30	0.99973	0.00055
20.70	1.00221	0.00054	20.60	1.00273	0.00057	20.50	1.00145	0.00056
20.90	1.00435	0.00056	20.80	1.00755	0.00055	20.70	1.00748	0.00055
21.10	1.00967	0.00055	21.00	1.01229	0.00056	20.90	1.01242	0.00057
21.30	1.01155	0.00056	21.20	1.01392	0.00059	21.10	1.01635	0.00054
21.50	1.01721	0.00055	21.30	1.01663	0.00055			

Table B.3.1.4.2-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 1 Inch of Water Reflection (cont)

2500 milli-g/cc			3000 milli-g/cc			4000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.10	0.92268	0.00059	17.20	0.91955	0.00062	18.00	0.91219	0.00058
17.20	0.92485	0.00055	17.40	0.92703	0.00059	18.20	0.91848	0.00059
17.30	0.92814	0.00058	17.60	0.93182	0.00059	18.40	0.92384	0.00056
17.40	0.93175	0.00057	17.80	0.93785	0.00058	18.60	0.92860	0.00059
17.50	0.93530	0.00056	18.00	0.94433	0.00058	18.80	0.93373	0.00057
17.60	0.93881	0.00058	18.20	0.94862	0.00059	19.00	0.93940	0.00060
17.70	0.94002	0.00057	18.40	0.95474	0.00059	19.20	0.94242	0.00060
17.80	0.94237	0.00058	18.60	0.95940	0.00059	19.40	0.94930	0.00059
17.90	0.94562	0.00057	18.80	0.96416	0.00058	19.60	0.95370	0.00059
18.00	0.94978	0.00058	19.00	0.96955	0.00058	19.80	0.95968	0.00060
18.10	0.94988	0.00059	19.20	0.97459	0.00058	20.00	0.96177	0.00059
18.20	0.95349	0.00058	19.40	0.97944	0.00056	20.20	0.96805	0.00058
18.30	0.95616	0.00057	19.60	0.98333	0.00056	20.40	0.97273	0.00060
18.40	0.95852	0.00059	19.80	0.98911	0.00058	20.60	0.97671	0.00058
18.50	0.96045	0.00056	20.00	0.99341	0.00057	20.80	0.98011	0.00059
18.60	0.96484	0.00058	20.20	0.99798	0.00057	21.00	0.98561	0.00058
18.70	0.96733	0.00055	20.40	1.00216	0.00055	21.20	0.98893	0.00057
18.80	0.96837	0.00058	20.60	1.00536	0.00058	21.40	0.99255	0.00060
18.90	0.97295	0.00057	20.80	1.01120	0.00059	21.60	0.99731	0.00058
19.00	0.97341	0.00060	21.00	1.01669	0.00058	21.80	1.00042	0.00057
19.10	0.97643	0.00057				22.00	1.00451	0.00058
19.20	0.97959	0.00057				22.20	1.00827	0.00062
19.30	0.98126	0.00056				22.40	1.01080	0.00056
19.40	0.98510	0.00058				22.50	1.01315	0.00060
19.50	0.98533	0.00057						
19.60	0.98930	0.00058						
19.70	0.99190	0.00058						
19.80	0.99394	0.00056						
19.90	0.99639	0.00059						
20.00	0.99766	0.00058						
20.10	1.00086	0.00058						
20.20	1.00220	0.00057						
20.30	1.00515	0.00056						
20.40	1.00594	0.00056						
20.50	1.00832	0.00058						
20.60	1.01091	0.00058						
20.70	1.01389	0.00053						
20.80	1.01542	0.00056						

Table B.3.1.4.2-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 1 Inch of Water Reflection (cont)

5000 milli-g/cc			6000 milli-g/cc			7000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
20.40	0.92338	0.00058	23.10	0.91397	0.00055	29.50	0.92611	0.00054
20.60	0.92753	0.00056	23.40	0.91957	0.00055	30.10	0.93322	0.00052
20.80	0.93216	0.00059	23.70	0.92331	0.00057	30.70	0.93827	0.00054
21.00	0.93565	0.00059	24.00	0.92980	0.00056	31.30	0.94340	0.00052
21.20	0.94271	0.00059	24.30	0.93377	0.00057	31.90	0.94900	0.00053
21.40	0.94482	0.00058	24.60	0.93878	0.00055	32.50	0.95300	0.00051
21.60	0.94759	0.00058	24.90	0.94190	0.00056	33.10	0.95897	0.00052
21.80	0.95189	0.00059	25.20	0.94806	0.00058	33.70	0.96335	0.00050
22.00	0.95779	0.00058	25.50	0.95200	0.00057	34.30	0.96888	0.00054
22.20	0.95997	0.00056	25.80	0.95686	0.00057	34.90	0.97212	0.00053
22.40	0.96352	0.00058	26.10	0.96016	0.00058	35.50	0.97646	0.00054
22.60	0.96597	0.00059	26.40	0.96377	0.00056	36.10	0.98044	0.00052
22.80	0.96953	0.00059	26.70	0.96672	0.00053	36.70	0.98519	0.00054
23.00	0.97323	0.00060	27.00	0.97183	0.00054	37.30	0.99021	0.00052
23.20	0.97767	0.00060	27.30	0.97447	0.00057	37.90	0.99195	0.00051
23.40	0.98052	0.00059	27.60	0.97968	0.00055	38.50	0.99596	0.00052
23.60	0.98385	0.00056	27.90	0.98291	0.00055	39.10	1.00009	0.00049
23.80	0.98733	0.00061	28.20	0.98607	0.00052	39.70	1.00189	0.00051
24.00	0.99126	0.00056	28.50	0.98947	0.00053	40.30	1.00538	0.00052
24.20	0.99402	0.00057	28.80	0.99380	0.00055	40.90	1.00953	0.00050
24.40	0.99717	0.00056	29.10	0.99659	0.00056	41.50	1.01232	0.00051
24.60	1.00007	0.00056	29.40	1.00039	0.00056	41.80	1.01155	0.00054
24.80	1.00346	0.00058	29.70	1.00281	0.00052			
25.00	1.00589	0.00058	30.00	1.00606	0.00055			
25.20	1.00853	0.00058	30.30	1.00864	0.00055			
25.40	1.01335	0.00056	30.60	1.01208	0.00057			
25.60	1.01488	0.00056	30.80	1.01310	0.00055			

Table B.3.1.4.2-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 1 Inch of Water Reflection (cont)

7500 milli-g/cc			8000 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma			
34.50	0.92732	0.00050	42.90	0.92852	0.00050			
35.40	0.93495	0.00052	44.50	0.93503	0.00049			
36.30	0.94104	0.00050	46.10	0.94263	0.00048			
37.20	0.94536	0.00050	47.70	0.94845	0.00048			
38.10	0.95142	0.00050	49.30	0.95319	0.00049			
39.00	0.95701	0.00051	50.90	0.95786	0.00047			
39.90	0.96065	0.00052	52.50	0.96155	0.00048			
40.80	0.96546	0.00053	54.10	0.96683	0.00050			
41.70	0.97032	0.00050	55.70	0.97046	0.00047			
42.60	0.97419	0.00049	57.30	0.97389	0.00048			
43.50	0.97816	0.00050	58.90	0.97855	0.00047			
44.40	0.98136	0.00049	60.50	0.98053	0.00046			
45.30	0.98476	0.00048	62.10	0.98238	0.00047			
46.20	0.98944	0.00051	63.70	0.98447	0.00045			
47.10	0.99190	0.00048	65.30	0.98828	0.00047			
48.00	0.99404	0.00049	66.90	0.99049	0.00045			
48.90	0.99706	0.00050	68.50	0.99079	0.00046			
49.80	1.00188	0.00051	70.10	0.99489	0.00046			
50.70	1.00368	0.00052	71.70	0.99705	0.00046			
51.60	1.00572	0.00050	73.30	0.99832	0.00047			
52.50	1.00812	0.00049	74.90	1.00014	0.00047			
53.40	1.01060	0.00047	76.00	1.00057	0.00047			
54.10	1.01270	0.00051						

B.3.1.4.3. 10” Water Reflector

Case ID: u5o2-sp-0030-10

Material: Uranium dioxide in water

Geometry: Sphere

Isotopics: 3% ^{235}U 97% ^{238}U

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.3.1.4.3-1. Uranium Dioxide Sphere (3.0% ^{235}U) - 10 Inches of Water Reflection

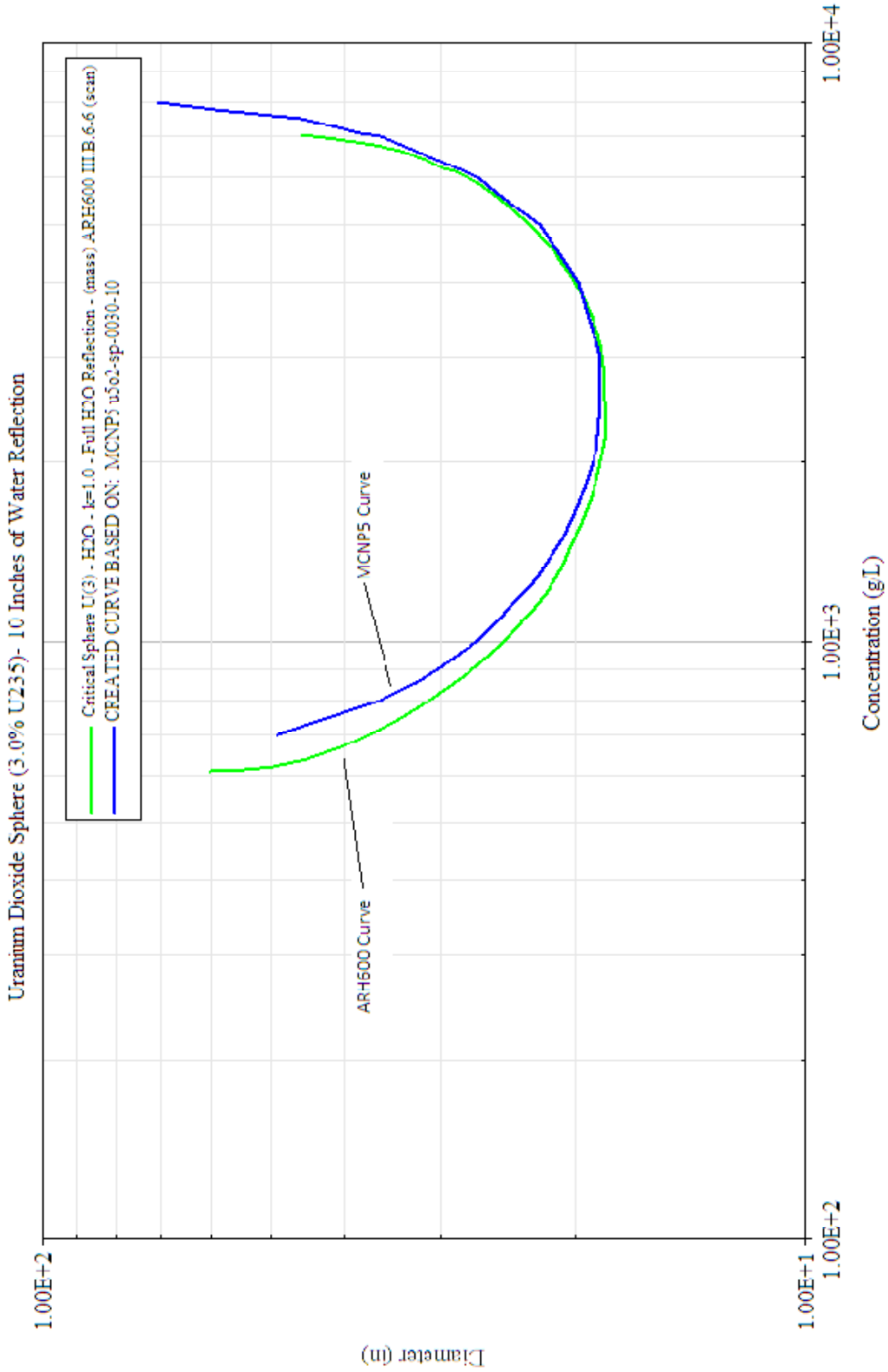

Table B.3.1.4.3-1. Critical Dimensions for Uranium Dioxide Sphere (3.0% ^{235}U) - 10 Inches of Water Reflection

Uranium Dioxide Sphere (3.0% ^{235}U) – 10 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.700	30.800	55.500	1.200	49.1430
0.800	25.800	38.700	0.600	36.0187
0.850	24.400	34.800	0.500	32.7075
0.900	23.200	32.100	0.400	30.2000
1.000	21.100	28.400	0.300	26.9426
1.250	18.800	24.000	0.200	22.7013
1.500	17.200	21.500	0.200	20.7054
1.700	16.500	20.500	0.200	19.8062
1.900	16.000	20.000	0.200	19.2145
2.000	15.900	19.700	0.200	18.9583
2.100	15.800	19.500	0.100	18.8144
2.500	15.500	19.100	0.100	18.5192
3.000	15.600	19.300	0.100	18.5715
4.000	16.500	20.600	0.200	19.8233
5.000	18.300	23.300	0.200	22.2705
6.000	21.100	28.100	0.300	26.8539
7.000	26.400	38.600	0.600	35.9869
7.500	30.800	50.100	0.900	45.8076
8.000	38.400	82.100	2.100	70.3537

MCNP5 Sample Input File
3.0% U02 Sphere- 10 Inches of Reflection

```
UO2 sphere, 3.0 wt% 235U, 03000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1650  hundreths of inches - must be integer
c radius =    20.9550 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 03000 milli-g Pu/cc
c Reflector width = 10.0 inches
c Enrichment = 0.03 wt fraction 235U
c
c Density of H2O 1.00000
c Density of UO2 11.00000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c U238  = 238.05080
c
c Effective uranium atomic mass 237.96059
c UO2
c Mass fraction of U in crit material 0.88147
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.2727 cc
c Volume of water in sample 0.7273 cc
c
c Mass of crit in sample   3.0000 g
c Mass of U in sample   2.6444 g
c Mass of bound O in sample  0.3556 g
c Mass of water in sample  0.7273 g
c
c Total mass of sample  3.7273g for a 1cc sample
c Mass Density for crit material  -3.7273, expressed as negative
c
c  sphere
20 11   -3.727273   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0
```

```
1       so    20.9550            $ Sphere
2       so    46.3550        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u oxide / water mixture
m11    $ UO2/H2O Sludge, 100.0 wt% 235U, 03000 milli-g U/cc,  3.7273
1001.66c -0.021833
8016.66c -0.173289      $from water
8016.66c -0.095404      $from oxide
92235.66c -0.021284
92238.66c -0.688190
mt11     lwtr.60t
c
c    u oxide only
m12    $ U oxide, 100.0 wt% 235U, 03000 milli-g U/cc,  3.7273
8016.66c -0.095404      $from oxide
92235.66c -0.021284
92238.66c -0.688190
c
```

Critview Compatible Data File
3.0% U02 Sphere- 10 Inches of Reflection

reset:
title: MCNP5 u5o2-sp-0030-10
set: MCNP5 set
source: MCNP5 primary
created: Tue 08/10/2010 12:35:13.41
geometry: sphere
modmat: H2O
critmat: uranium dioxide
isomat: U235 0.030 U238 0.970
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.700	49.143
0.800	36.0187
0.850	32.7075
0.900	30.2000
1.000	26.9426
1.250	22.7013
1.500	20.7054
1.700	19.8062
1.900	19.2145
2.000	18.9583
2.100	18.8144
2.500	18.5192
3.000	18.5715
4.000	19.8233
5.000	22.2705
6.000	26.8539
7.000	35.9869
7.500	45.8076
8.000	70.3537

Table B.3.1.4.3-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 10 Inches of Water Reflection

700 milli-g/cc			800 milli-g/cc			850 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
30.80	0.92740	0.00035	25.80	0.92714	0.00039	24.40	0.92908	0.00041
32.00	0.93554	0.00035	26.40	0.93238	0.00039	24.90	0.93488	0.00039
33.20	0.94193	0.00036	27.00	0.93880	0.00039	25.40	0.93997	0.00043
34.40	0.94945	0.00034	27.60	0.94398	0.00038	25.90	0.94534	0.00041
35.60	0.95533	0.00035	28.20	0.94949	0.00037	26.40	0.95124	0.00042
36.80	0.96057	0.00034	28.80	0.95427	0.00038	26.90	0.95528	0.00040
38.00	0.96628	0.00035	29.40	0.95978	0.00037	27.40	0.96005	0.00041
39.20	0.97007	0.00035	30.00	0.96357	0.00038	27.90	0.96409	0.00039
40.40	0.97465	0.00033	30.60	0.96808	0.00038	28.40	0.96918	0.00040
41.60	0.97993	0.00033	31.20	0.97216	0.00038	28.90	0.97323	0.00039
42.80	0.98310	0.00032	31.80	0.97667	0.00038	29.40	0.97742	0.00040
44.00	0.98704	0.00032	32.40	0.98033	0.00037	29.90	0.98103	0.00039
45.20	0.98963	0.00032	33.00	0.98362	0.00037	30.40	0.98488	0.00039
46.40	0.99402	0.00032	33.60	0.98745	0.00037	30.90	0.98777	0.00039
47.60	0.99661	0.00031	34.20	0.99013	0.00035	31.40	0.99290	0.00037
48.80	0.99914	0.00032	34.80	0.99407	0.00038	31.90	0.99515	0.00037
50.00	1.00215	0.00031	35.40	0.99739	0.00037	32.40	0.99794	0.00039
51.20	1.00498	0.00030	36.00	0.99991	0.00036	32.90	1.00129	0.00038
52.40	1.00681	0.00032	36.60	1.00280	0.00037	33.40	1.00529	0.00037
53.60	1.00854	0.00032	37.20	1.00598	0.00036	33.90	1.00800	0.00039
54.80	1.01087	0.00030	37.80	1.00764	0.00035	34.40	1.01047	0.00037
55.50	1.01147	0.00030	38.40	1.01112	0.00036	34.80	1.01198	0.00037
			38.70	1.01207	0.00036			

Table B.3.1.4.3-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 10 Inches of Water Reflection (cont)

900 milli-g/cc			1000 milli-g/cc			1250 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
23.20	0.92945	0.00042	21.10	0.92605	0.00044	18.80	0.93185	0.00048
23.60	0.93492	0.00042	21.40	0.93009	0.00044	19.00	0.93499	0.00048
24.00	0.94091	0.00042	21.70	0.93628	0.00043	19.20	0.93956	0.00046
24.40	0.94450	0.00040	22.00	0.93879	0.00042	19.40	0.94358	0.00045
24.80	0.94913	0.00040	22.30	0.94388	0.00045	19.60	0.94699	0.00047
25.20	0.95388	0.00042	22.60	0.94945	0.00044	19.80	0.95131	0.00048
25.60	0.95864	0.00040	22.90	0.95257	0.00043	20.00	0.95430	0.00047
26.00	0.96215	0.00040	23.20	0.95720	0.00045	20.20	0.95844	0.00047
26.40	0.96669	0.00042	23.50	0.95962	0.00043	20.40	0.96319	0.00048
26.80	0.97125	0.00040	23.80	0.96479	0.00043	20.60	0.96583	0.00048
27.20	0.97459	0.00040	24.10	0.96867	0.00041	20.80	0.97028	0.00047
27.60	0.97790	0.00041	24.40	0.97198	0.00043	21.00	0.97272	0.00047
28.00	0.98162	0.00039	24.70	0.97570	0.00041	21.20	0.97617	0.00045
28.40	0.98530	0.00041	25.00	0.97882	0.00043	21.40	0.97958	0.00047
28.80	0.98812	0.00038	25.30	0.98273	0.00043	21.60	0.98267	0.00046
29.20	0.99225	0.00038	25.60	0.98560	0.00044	21.80	0.98556	0.00047
29.60	0.99475	0.00040	25.90	0.98899	0.00044	22.00	0.98994	0.00045
30.00	0.99819	0.00041	26.20	0.99251	0.00043	22.20	0.99263	0.00047
30.40	1.00181	0.00039	26.50	0.99539	0.00043	22.40	0.99558	0.00047
30.80	1.00434	0.00039	26.80	0.99845	0.00043	22.60	0.99887	0.00048
31.20	1.00712	0.00041	27.10	1.00171	0.00041	22.80	1.00110	0.00046
31.60	1.00985	0.00039	27.40	1.00457	0.00042	23.00	1.00343	0.00046
32.00	1.01345	0.00038	27.70	1.00816	0.00041	23.20	1.00672	0.00046
32.10	1.01372	0.00039	28.00	1.00962	0.00042	23.40	1.00976	0.00047
			28.30	1.01367	0.00040	23.60	1.01232	0.00044
			28.40	1.01415	0.00041	23.80	1.01478	0.00045
						24.00	1.01691	0.00047

Table B.3.1.4.3-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 10 Inches of Water Reflection (cont)

1500 milli-g/cc			1700 milli-g/cc			1900 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.20	0.92609	0.00051	16.50	0.92351	0.00052	16.00	0.92166	0.00052
17.40	0.92968	0.00049	16.70	0.93016	0.00049	16.20	0.92812	0.00054
17.60	0.93519	0.00051	16.90	0.93609	0.00051	16.40	0.93466	0.00052
17.80	0.94020	0.00049	17.10	0.93922	0.00052	16.60	0.93850	0.00052
18.00	0.94457	0.00049	17.30	0.94512	0.00051	16.80	0.94255	0.00051
18.20	0.94934	0.00048	17.50	0.95039	0.00052	17.00	0.94945	0.00053
18.40	0.95406	0.00050	17.70	0.95614	0.00050	17.20	0.95466	0.00053
18.60	0.95803	0.00050	17.90	0.95980	0.00052	17.40	0.95955	0.00052
18.80	0.96280	0.00051	18.10	0.96368	0.00052	17.60	0.96363	0.00053
19.00	0.96706	0.00049	18.30	0.96821	0.00051	17.80	0.96865	0.00053
19.20	0.97105	0.00050	18.50	0.97302	0.00052	18.00	0.97355	0.00052
19.40	0.97585	0.00050	18.70	0.97718	0.00050	18.20	0.97825	0.00050
19.60	0.97995	0.00050	18.90	0.98282	0.00051	18.40	0.98211	0.00049
19.80	0.98300	0.00051	19.10	0.98572	0.00051	18.60	0.98780	0.00053
20.00	0.98748	0.00049	19.30	0.99009	0.00050	18.80	0.99161	0.00052
20.20	0.99028	0.00048	19.50	0.99487	0.00051	19.00	0.99568	0.00052
20.40	0.99457	0.00048	19.70	0.99751	0.00050	19.20	0.99974	0.00053
20.60	0.99765	0.00051	19.90	1.00220	0.00052	19.40	1.00332	0.00053
20.80	1.00211	0.00049	20.10	1.00631	0.00048	19.60	1.00899	0.00051
21.00	1.00548	0.00048	20.30	1.01069	0.00051	19.80	1.01157	0.00053
21.20	1.00818	0.00049	20.50	1.01296	0.00049	20.00	1.01553	0.00053
21.40	1.01159	0.00050						
21.50	1.01347	0.00051						

Table B.3.1.4.3-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 10 Inches of Water Reflection (cont)

2000 milli-g/cc			2100 milli-g/cc			2500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
15.90	0.92341	0.00053	15.80	0.92415	0.00053	15.50	0.92271	0.00055
16.10	0.92887	0.00055	15.90	0.92641	0.00053	15.60	0.92551	0.00054
16.30	0.93462	0.00054	16.00	0.92977	0.00052	15.70	0.92906	0.00055
16.50	0.94070	0.00056	16.10	0.93288	0.00053	15.80	0.93066	0.00054
16.70	0.94637	0.00050	16.20	0.93505	0.00052	15.90	0.93456	0.00055
16.90	0.95215	0.00052	16.30	0.93889	0.00054	16.00	0.93697	0.00055
17.10	0.95662	0.00054	16.40	0.94163	0.00052	16.10	0.93977	0.00054
17.30	0.96106	0.00052	16.50	0.94314	0.00057	16.20	0.94290	0.00054
17.50	0.96652	0.00052	16.60	0.94661	0.00052	16.30	0.94640	0.00054
17.70	0.97069	0.00053	16.70	0.94832	0.00052	16.40	0.94760	0.00054
17.90	0.97585	0.00052	16.80	0.95203	0.00053	16.50	0.95101	0.00053
18.10	0.98007	0.00053	16.90	0.95319	0.00054	16.60	0.95426	0.00056
18.30	0.98482	0.00053	17.00	0.95693	0.00056	16.70	0.95623	0.00056
18.50	0.98958	0.00054	17.10	0.96048	0.00053	16.80	0.96000	0.00054
18.70	0.99253	0.00053	17.20	0.96217	0.00055	16.90	0.96222	0.00055
18.90	0.99898	0.00054	17.30	0.96459	0.00052	17.00	0.96451	0.00054
19.10	1.00248	0.00053	17.40	0.96656	0.00052	17.10	0.96658	0.00055
19.30	1.00613	0.00053	17.50	0.97018	0.00054	17.20	0.96916	0.00054
19.50	1.01148	0.00052	17.60	0.97206	0.00055	17.30	0.97264	0.00055
19.70	1.01628	0.00053	17.70	0.97493	0.00052	17.40	0.97355	0.00054
			17.80	0.97698	0.00053	17.50	0.97752	0.00052
			17.90	0.97809	0.00054	17.60	0.97989	0.00056
			18.00	0.98207	0.00054	17.70	0.98154	0.00054
			18.10	0.98322	0.00053	17.80	0.98366	0.00055
			18.20	0.98701	0.00052	17.90	0.98643	0.00054
			18.30	0.98925	0.00053	18.00	0.98840	0.00052
			18.40	0.99157	0.00052	18.10	0.99050	0.00053
			18.50	0.99314	0.00052	18.20	0.99370	0.00054
			18.60	0.99556	0.00054	18.30	0.99565	0.00055
			18.70	0.99702	0.00050	18.40	0.99813	0.00053
			18.80	0.99960	0.00052	18.50	0.99964	0.00055
			18.90	1.00238	0.00052	18.60	1.00152	0.00053
			19.00	1.00453	0.00052	18.70	1.00518	0.00054
			19.10	1.00662	0.00052	18.80	1.00789	0.00053
			19.20	1.00821	0.00054	18.90	1.00864	0.00054
			19.30	1.01008	0.00052	19.00	1.01262	0.00053
			19.40	1.01316	0.00056	19.10	1.01360	0.00053
			19.50	1.01409	0.00053			

Table B.3.1.4.3-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 10 Inches of Water Reflection (cont)

3000 milli-g/cc			4000 milli-g/cc			5000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
15.60	0.92383	0.00056	16.50	0.92419	0.00055	18.30	0.92714	0.00052
15.70	0.92604	0.00056	16.70	0.93031	0.00056	18.50	0.93081	0.00054
15.80	0.92883	0.00056	16.90	0.93434	0.00057	18.70	0.93618	0.00056
15.90	0.93133	0.00056	17.10	0.94024	0.00055	18.90	0.93965	0.00056
16.00	0.93527	0.00056	17.30	0.94516	0.00056	19.10	0.94405	0.00054
16.10	0.93746	0.00056	17.50	0.95017	0.00057	19.30	0.94690	0.00056
16.20	0.94071	0.00055	17.70	0.95472	0.00054	19.50	0.95071	0.00055
16.30	0.94450	0.00054	17.90	0.96119	0.00056	19.70	0.95680	0.00057
16.40	0.94677	0.00056	18.10	0.96442	0.00055	19.90	0.95924	0.00056
16.50	0.94965	0.00057	18.30	0.96963	0.00057	20.10	0.96362	0.00056
16.60	0.95117	0.00054	18.50	0.97329	0.00054	20.30	0.96607	0.00055
16.70	0.95451	0.00057	18.70	0.97701	0.00055	20.50	0.97034	0.00053
16.80	0.95744	0.00054	18.90	0.98127	0.00055	20.70	0.97355	0.00056
16.90	0.95947	0.00055	19.10	0.98614	0.00058	20.90	0.97609	0.00053
17.00	0.96328	0.00055	19.30	0.98995	0.00056	21.30	0.98478	0.00054
17.10	0.96507	0.00054	19.50	0.99498	0.00055	21.50	0.98671	0.00054
17.20	0.96684	0.00056	19.70	0.99741	0.00054	21.70	0.99052	0.00057
17.30	0.97059	0.00056	19.90	1.00161	0.00056	21.90	0.99331	0.00054
17.40	0.97255	0.00057	20.10	1.00541	0.00058	22.10	0.99670	0.00056
17.50	0.97562	0.00055	20.30	1.01004	0.00054	22.30	1.00057	0.00055
17.60	0.97710	0.00053	20.50	1.01252	0.00057	22.50	1.00407	0.00055
17.70	0.97985	0.00056	20.60	1.01549	0.00052	22.70	1.00506	0.00053
17.80	0.98220	0.00057				22.90	1.00919	0.00054
17.90	0.98559	0.00055				23.10	1.01234	0.00053
18.00	0.98690	0.00054				23.30	1.01380	0.00056
18.10	0.98932	0.00056						
18.20	0.99240	0.00054						
18.30	0.99366	0.00056						
18.40	0.99636	0.00057						
18.50	0.99804	0.00054						
18.60	1.00078	0.00053						
18.70	1.00342	0.00055						
18.80	1.00511	0.00056						
18.90	1.00795	0.00054						
19.00	1.00895	0.00056						
19.10	1.01218	0.00055						
19.20	1.01341	0.00055						
19.30	1.01599	0.00054						

Table B.3.1.4.3-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 10 Inches of Water Reflection (cont)

6000 milli-g/cc			7000 milli-g/cc			7500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
21.10	0.92600	0.00054	26.40	0.92723	0.00052	30.80	0.92654	0.00047
21.40	0.93094	0.00055	27.00	0.93340	0.00050	31.70	0.93402	0.00049
21.70	0.93583	0.00052	27.60	0.94030	0.00051	32.60	0.94011	0.00049
22.00	0.93828	0.00051	28.20	0.94565	0.00050	33.50	0.94521	0.00048
22.30	0.94370	0.00053	28.80	0.95062	0.00053	34.40	0.95277	0.00049
22.60	0.94795	0.00052	29.40	0.95443	0.00052	35.30	0.95455	0.00051
22.90	0.95254	0.00053	30.00	0.95959	0.00049	36.20	0.96039	0.00048
23.20	0.95676	0.00052	30.60	0.96519	0.00048	37.10	0.96663	0.00049
23.50	0.96089	0.00053	31.20	0.96873	0.00050	38.00	0.97010	0.00046
23.80	0.96545	0.00054	31.80	0.97358	0.00051	38.90	0.97480	0.00050
24.10	0.96907	0.00053	32.40	0.97772	0.00050	39.80	0.97852	0.00050
24.40	0.97291	0.00053	33.00	0.98258	0.00049	40.70	0.98073	0.00049
24.70	0.97688	0.00055	33.60	0.98583	0.00049	41.60	0.98538	0.00050
25.00	0.97997	0.00051	34.20	0.98981	0.00051	42.50	0.98888	0.00048
25.30	0.98435	0.00056	34.80	0.99244	0.00048	43.40	0.99235	0.00049
25.60	0.98766	0.00053	35.40	0.99642	0.00051	44.30	0.99546	0.00047
25.90	0.99154	0.00053	36.00	1.00008	0.00049	45.20	0.99707	0.00050
26.20	0.99442	0.00054	36.60	1.00190	0.00049	46.10	1.00141	0.00046
26.50	0.99672	0.00054	37.20	1.00706	0.00051	47.00	1.00244	0.00049
26.80	0.99920	0.00055	37.80	1.00709	0.00050	47.90	1.00467	0.00049
27.10	1.00365	0.00052	38.40	1.01252	0.00050	48.80	1.00868	0.00050
27.40	1.00607	0.00053	38.60	1.01314	0.00050	49.70	1.01021	0.00049
27.70	1.01000	0.00053				50.10	1.01101	0.00049
28.00	1.01196	0.00051						
28.10	1.01346	0.00056						

Table B.3.1.4.3-2. K_{eff} Values for Uranium Dioxide Sphere (3.0% ^{235}U) - 10 Inches of Water Reflection (cont)

8000 milli-g/cc								
Diameter (inches)	K_{eff}	Sigma						
38.40	0.92813	0.00048						
40.50	0.93749	0.00046						
42.60	0.94553	0.00047						
44.70	0.95205	0.00046						
46.80	0.95876	0.00046						
48.90	0.96356	0.00047						
51.00	0.97029	0.00047						
53.10	0.97364	0.00046						
55.20	0.97878	0.00046						
57.30	0.98295	0.00045						
59.40	0.98551	0.00046						
61.50	0.98848	0.00047						
63.60	0.99185	0.00044						
65.70	0.99416	0.00046						
67.80	0.99752	0.00046						
69.90	0.99930	0.00045						
72.00	1.00254	0.00045						
74.10	1.00306	0.00042						
76.20	1.00473	0.00044						
78.30	1.00695	0.00044						
80.40	1.00929	0.00044						
82.10	1.00887	0.00045						

B.3.1.5. 2.5% ^{235}U 97.5% ^{238}U

B.3.1.5.1. Unreflected

Case ID: u5o2-sp-0025-00

Material: Uranium dioxide in water

Geometry: Sphere

Isotopics: 2.5% ^{235}U 97.5% ^{238}U

Reflector: Unreflected

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.3.1.5.1-1. Uranium Dioxide Sphere (2.5% ^{235}U) - 0 Inches of Water Reflection

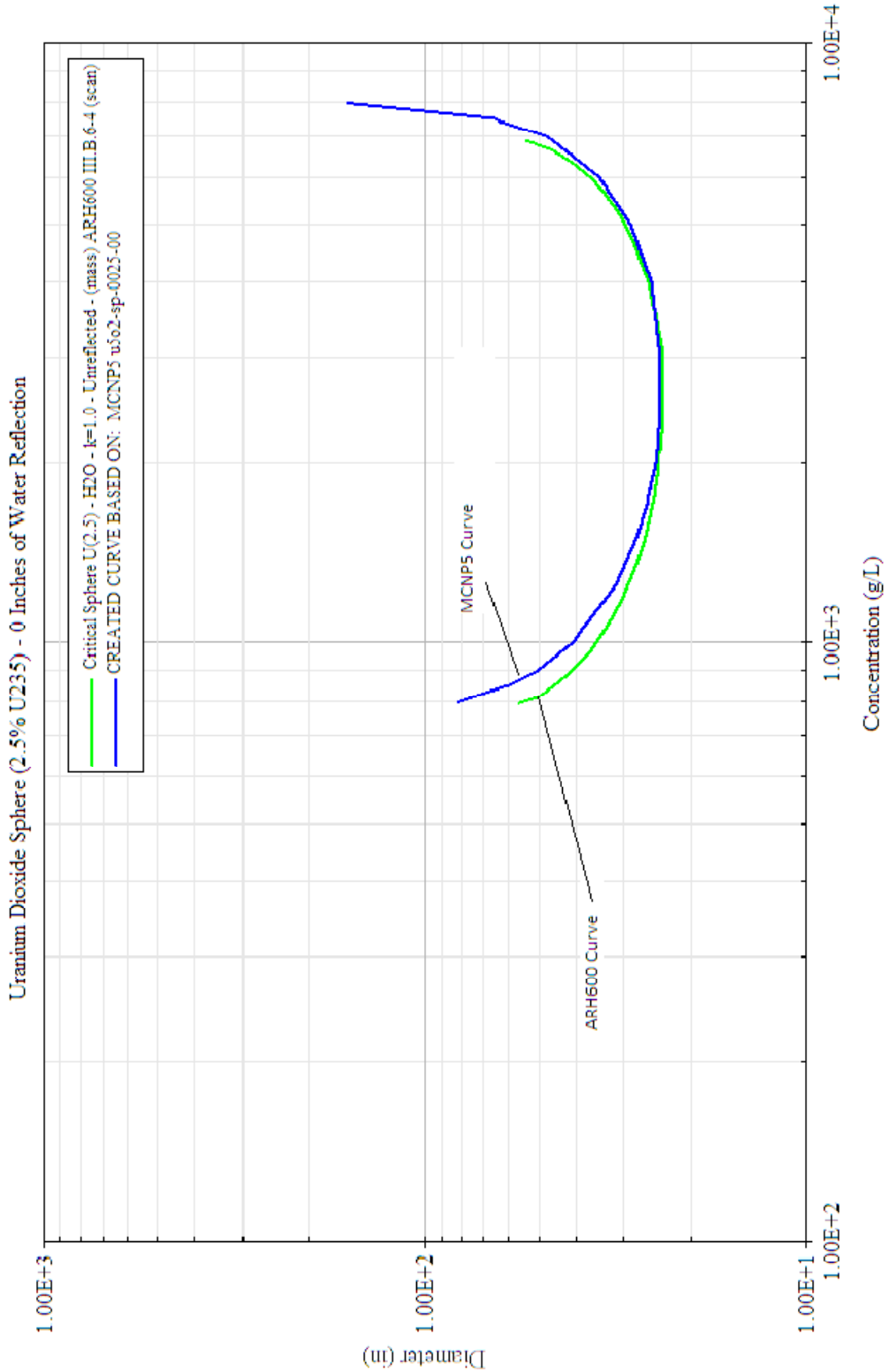

Table B.3.1.5.1-1. Critical Dimensions for Uranium Dioxide Sphere (2.5% ^{235}U) - 0 Inches of Water Reflection

Uranium Dioxide Sphere (2.5% ^{235}U) – 0 Inches of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.800	39.800	103.200	3.100	81.7975
0.850	36.100	69.500	1.600	60.1716
0.900	33.100	55.300	1.100	50.3071
1.000	29.400	43.600	0.700	40.6764
1.250	24.800	32.900	0.400	31.3510
1.500	22.700	28.900	0.300	27.6826
1.700	21.700	27.200	0.200	26.0955
1.900	21.100	26.000	0.200	25.1087
2.000	20.900	25.800	0.200	24.7940
2.100	20.800	25.400	0.200	24.5139
2.500	20.400	24.800	0.200	24.0053
3.000	20.400	24.800	0.200	24.0040
4.000	21.600	26.500	0.200	25.4788
5.000	23.900	29.900	0.300	28.7022
6.000	27.600	36.300	0.400	34.5964
7.000	34.700	51.400	0.800	47.8965
7.500	41.100	73.300	1.600	65.4529
8.000	52.900	206.800	7.700	159.5560

MCNP5 Sample Input File
2.5% U02 Sphere- 0 Inches of Reflection

```
UO2 sphere, 2.5 wt% 235U, 03000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 2220  hundreths of inches - must be integer
c radius =    28.1940 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 03000 milli-g Pu/cc
c Reflector width =  0.0 inches
c Enrichment = 0.03 wt fraction 235U
c
c Density of H2O 1.00000
c Density of UO2 11.00000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c U238  = 238.05080
c
c Effective uranium atomic mass 237.97563
c UO2
c Mass fraction of U in crit material 0.88147
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.2727 cc
c Volume of water in sample 0.7273 cc
c
c Mass of crit in sample   3.0000 g
c Mass of U in sample   2.6444 g
c Mass of bound O in sample  0.3556 g
c Mass of water in sample  0.7273 g
c
c Total mass of sample  3.7273g for a 1cc sample
c Mass Density for crit material  -3.7273, expressed as negative
c
c  sphere
20 11   -3.727273   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=0    $zero importance if no reflector
22  0            2           imp:n=0
```

```
1       so    28.1940              $ Sphere
2       so    28.1940        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u oxide / water mixture
m11    $ UO2/H2O Sludge, 100.0 wt% 235U, 03000 milli-g U/cc,  3.7273
1001.66c -0.021833
8016.66c -0.173289      $from water
8016.66c -0.095398      $from oxide
92235.66c -0.017737
92238.66c -0.691743
mt11     lwtr.60t
c
c    u oxide only
m12    $ U oxide, 100.0 wt% 235U, 03000 milli-g U/cc,  3.7273
8016.66c -0.095398      $from oxide
92235.66c -0.017737
92238.66c -0.691743
c
```

Critview Compatible Data File
2.5% U02 Sphere- 0 Inches of Reflection

reset:
title: MCNP5 u5o2-sp-0025-00
set: MCNP5 set
source: MCNP5 primary
created: Tue 08/10/2010 10:38:18.58
geometry: sphere
modmat: H2O
critmat: uranium dioxide
isomat: U235 0.025 U238 0.975
reflmat: none
reflthick: 0 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.800	81.7975
0.850	60.1716
0.900	50.3071
1.000	40.6764
1.250	31.3510
1.500	27.6826
1.700	26.0955
1.900	25.1087
2.000	24.7940
2.100	24.5139
2.500	24.0053
3.000	24.0040
4.000	25.4788
5.000	28.7022
6.000	34.5964
7.000	47.8965
7.500	65.4529
8.000	159.5560

Table B.3.1.5.1-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 0 Inches of Water Reflection

800 milli-g/cc			850 milli-g/cc			900 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
39.80	0.92857	0.00036	36.10	0.92853	0.00036	33.10	0.92810	0.00040
42.90	0.94036	0.00033	37.70	0.93660	0.00037	34.20	0.93491	0.00038
46.00	0.95075	0.00034	39.30	0.94510	0.00035	35.30	0.94129	0.00038
49.10	0.95954	0.00033	40.90	0.95276	0.00035	36.40	0.94835	0.00037
52.20	0.96657	0.00033	42.50	0.95836	0.00035	37.50	0.95506	0.00038
55.30	0.97150	0.00032	44.10	0.96304	0.00034	38.60	0.95940	0.00037
58.40	0.97671	0.00032	45.70	0.96930	0.00032	39.70	0.96491	0.00037
61.50	0.98098	0.00031	47.30	0.97317	0.00034	40.80	0.96910	0.00036
64.60	0.98534	0.00032	48.90	0.97840	0.00034	41.90	0.97464	0.00035
67.70	0.98953	0.00030	50.50	0.98259	0.00034	43.00	0.97826	0.00035
70.80	0.99265	0.00031	52.10	0.98608	0.00034	44.10	0.98219	0.00036
73.90	0.99476	0.00030	53.70	0.98969	0.00032	45.20	0.98548	0.00037
77.00	0.99728	0.00029	55.30	0.99195	0.00033	46.30	0.98870	0.00033
80.10	0.99931	0.00028	56.90	0.99505	0.00031	47.40	0.99244	0.00035
83.20	1.00057	0.00028	58.50	0.99693	0.00032	48.50	0.99542	0.00035
86.30	1.00172	0.00029	60.10	0.99991	0.00032	49.60	0.99829	0.00034
89.40	1.00402	0.00028	61.70	1.00192	0.00031	50.70	1.00095	0.00033
92.50	1.00612	0.00027	63.30	1.00376	0.00030	51.80	1.00339	0.00033
95.60	1.00639	0.00028	64.90	1.00598	0.00030	52.90	1.00616	0.00033
98.70	1.00815	0.00028	66.50	1.00774	0.00030	54.00	1.00841	0.00033
101.80	1.00929	0.00028	68.10	1.00946	0.00032	55.10	1.00951	0.00033
103.20	1.00994	0.00027	69.50	1.01021	0.00032	55.30	1.01097	0.00034

Table B.3.1.5.1-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 0 Inches of Water Reflection (cont)

1000 milli-g/cc			1250 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
29.40	0.92667	0.00043	24.80	0.92468	0.00046	22.70	0.92496	0.00051
30.10	0.93367	0.00041	25.20	0.93085	0.00048	23.00	0.93015	0.00050
30.80	0.93982	0.00040	25.60	0.93694	0.00045	23.30	0.93609	0.00050
31.50	0.94439	0.00039	26.00	0.94331	0.00048	23.60	0.94058	0.00049
32.20	0.94997	0.00040	26.40	0.94772	0.00046	23.90	0.94595	0.00050
32.90	0.95612	0.00040	26.80	0.95269	0.00046	24.20	0.95097	0.00049
33.60	0.96249	0.00042	27.20	0.95802	0.00045	24.50	0.95589	0.00050
34.30	0.96585	0.00040	27.60	0.96273	0.00046	24.80	0.96051	0.00049
35.00	0.97103	0.00039	28.00	0.96713	0.00045	25.10	0.96555	0.00049
35.70	0.97378	0.00040	28.40	0.97202	0.00044	25.40	0.97059	0.00048
36.40	0.97949	0.00039	28.80	0.97672	0.00045	25.70	0.97478	0.00048
37.10	0.98264	0.00038	29.20	0.98054	0.00045	26.00	0.97769	0.00049
37.80	0.98719	0.00038	29.60	0.98387	0.00045	26.30	0.98246	0.00047
38.50	0.99019	0.00040	30.00	0.98921	0.00045	26.60	0.98605	0.00049
39.20	0.99405	0.00038	30.40	0.99229	0.00047	26.90	0.98972	0.00047
39.90	0.99763	0.00038	30.80	0.99552	0.00043	27.20	0.99303	0.00047
40.60	0.99963	0.00038	31.20	0.99906	0.00042	27.50	0.99787	0.00049
41.30	1.00302	0.00037	31.60	1.00155	0.00043	27.80	1.00137	0.00047
42.00	1.00619	0.00038	32.00	1.00565	0.00043	28.10	1.00545	0.00047
42.70	1.00807	0.00037	32.40	1.00967	0.00042	28.40	1.00890	0.00049
43.40	1.01107	0.00037	32.80	1.01142	0.00043	28.70	1.01219	0.00047
43.60	1.01206	0.00037	32.90	1.01285	0.00042	28.90	1.01566	0.00047

Table B.3.1.5.1-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 0 Inches of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
21.70	0.92387	0.00051	21.10	0.92348	0.00056	20.90	0.92428	0.00053
21.90	0.92812	0.00050	21.30	0.92792	0.00055	21.10	0.92867	0.00054
22.10	0.93288	0.00052	21.50	0.93251	0.00053	21.30	0.93334	0.00052
22.30	0.93588	0.00054	21.70	0.93663	0.00054	21.50	0.93748	0.00053
22.50	0.93984	0.00052	21.90	0.94180	0.00055	21.70	0.94201	0.00054
22.70	0.94329	0.00052	22.10	0.94544	0.00052	21.90	0.94624	0.00056
22.90	0.94796	0.00052	22.30	0.94949	0.00055	22.10	0.95089	0.00054
23.10	0.95192	0.00051	22.50	0.95489	0.00051	22.30	0.95389	0.00055
23.30	0.95515	0.00051	22.70	0.95641	0.00054	22.50	0.95910	0.00054
23.50	0.95799	0.00053	22.90	0.96132	0.00053	22.70	0.96321	0.00054
23.70	0.96238	0.00050	23.10	0.96525	0.00051	22.90	0.96532	0.00054
23.90	0.96556	0.00051	23.30	0.96835	0.00053	23.10	0.97060	0.00054
24.10	0.96901	0.00051	23.50	0.97208	0.00052	23.30	0.97355	0.00052
24.30	0.97164	0.00053	23.70	0.97544	0.00055	23.50	0.97696	0.00053
24.50	0.97682	0.00051	23.90	0.97933	0.00053	23.70	0.98131	0.00054
24.70	0.97831	0.00049	24.10	0.98287	0.00052	23.90	0.98397	0.00053
24.90	0.98096	0.00051	24.30	0.98619	0.00052	24.10	0.98865	0.00051
25.10	0.98508	0.00051	24.50	0.98883	0.00053	24.30	0.99140	0.00052
25.30	0.98828	0.00048	24.70	0.99268	0.00051	24.50	0.99388	0.00051
25.50	0.98989	0.00052	24.90	0.99506	0.00052	24.70	0.99859	0.00053
25.70	0.99440	0.00051	25.10	0.99989	0.00053	24.90	1.00159	0.00053
25.90	0.99610	0.00049	25.30	1.00243	0.00053	25.10	1.00544	0.00052
26.10	1.00009	0.00050	25.50	1.00535	0.00053	25.30	1.00728	0.00055
26.30	1.00176	0.00050	25.70	1.00873	0.00051	25.50	1.00989	0.00051
26.50	1.00439	0.00049	25.90	1.01069	0.00050	25.70	1.01445	0.00051
26.70	1.00765	0.00049	26.00	1.01158	0.00049	25.80	1.01515	0.00052
26.90	1.00953	0.00052						
27.10	1.01375	0.00050						
27.20	1.01331	0.00052						

Table B.3.1.5.1-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 0 Inches of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
20.80	0.92661	0.00057	20.40	0.92604	0.00057	20.40	0.92321	0.00056
21.00	0.92974	0.00051	20.60	0.92912	0.00055	20.60	0.92769	0.00055
21.20	0.93560	0.00057	20.80	0.93347	0.00055	20.80	0.93334	0.00058
21.40	0.93935	0.00055	21.00	0.93892	0.00056	21.00	0.93754	0.00056
21.60	0.94426	0.00055	21.20	0.94313	0.00055	21.20	0.94182	0.00056
21.80	0.94811	0.00055	21.40	0.94834	0.00056	21.40	0.94708	0.00057
22.00	0.95263	0.00054	21.60	0.95342	0.00055	21.60	0.95124	0.00059
22.20	0.95672	0.00054	21.80	0.95741	0.00055	21.80	0.95551	0.00057
22.40	0.95938	0.00053	22.00	0.96139	0.00053	22.00	0.96015	0.00056
22.60	0.96532	0.00054	22.20	0.96605	0.00056	22.20	0.96400	0.00057
22.80	0.96773	0.00054	22.40	0.97061	0.00054	22.40	0.96862	0.00057
23.00	0.97219	0.00053	22.60	0.97382	0.00056	22.60	0.97250	0.00059
23.20	0.97641	0.00053	22.80	0.97801	0.00055	22.80	0.97821	0.00053
23.40	0.98008	0.00055	23.00	0.98245	0.00052	23.00	0.98082	0.00056
23.60	0.98379	0.00055	23.20	0.98441	0.00056	23.20	0.98442	0.00059
23.80	0.98674	0.00051	23.40	0.98980	0.00055	23.40	0.98866	0.00057
24.00	0.99082	0.00053	23.60	0.99184	0.00054	23.60	0.99222	0.00056
24.20	0.99410	0.00052	23.80	0.99659	0.00056	23.80	0.99628	0.00055
24.40	0.99787	0.00053	24.00	0.99986	0.00051	24.00	0.99992	0.00058
24.60	1.00161	0.00054	24.20	1.00513	0.00056	24.20	1.00389	0.00054
24.80	1.00382	0.00052	24.40	1.00728	0.00056	24.40	1.00896	0.00054
25.00	1.00724	0.00053	24.60	1.01082	0.00056	24.60	1.01047	0.00055
25.20	1.01120	0.00053	24.80	1.01358	0.00057	24.80	1.01346	0.00056
25.40	1.01288	0.00053						

Table B.3.1.5.1-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 0 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
21.60	0.92664	0.00058	23.90	0.92535	0.00054	27.60	0.92506	0.00055
21.80	0.92885	0.00059	24.20	0.93079	0.00056	28.00	0.93162	0.00056
22.00	0.93270	0.00056	24.50	0.93667	0.00057	28.40	0.93507	0.00055
22.20	0.93843	0.00057	24.80	0.94138	0.00056	28.80	0.93933	0.00056
22.40	0.94318	0.00058	25.10	0.94734	0.00056	29.20	0.94630	0.00053
22.60	0.94769	0.00057	25.40	0.95340	0.00057	29.60	0.95010	0.00055
22.80	0.95006	0.00056	25.70	0.95820	0.00056	30.00	0.95519	0.00055
23.00	0.95488	0.00059	26.00	0.96196	0.00057	30.40	0.95920	0.00051
23.20	0.95958	0.00057	26.30	0.96586	0.00057	30.80	0.96387	0.00053
23.40	0.96365	0.00054	26.60	0.97057	0.00056	31.20	0.96830	0.00055
23.60	0.96719	0.00058	26.90	0.97627	0.00056	31.60	0.97210	0.00055
23.80	0.97073	0.00060	27.20	0.98018	0.00057	32.00	0.97640	0.00051
24.00	0.97434	0.00057	27.50	0.98509	0.00056	32.40	0.98135	0.00053
24.20	0.97773	0.00057	27.80	0.98805	0.00055	32.80	0.98400	0.00052
24.40	0.98217	0.00055	28.10	0.99235	0.00055	33.20	0.98844	0.00053
24.60	0.98599	0.00056	28.40	0.99528	0.00057	33.60	0.99038	0.00055
24.80	0.98901	0.00056	28.70	0.99997	0.00057	34.00	0.99628	0.00055
25.00	0.99144	0.00056	29.00	1.00402	0.00056	34.40	0.99890	0.00052
25.20	0.99550	0.00057	29.30	1.00778	0.00054	34.80	1.00114	0.00054
25.40	0.99881	0.00056	29.60	1.01083	0.00055	35.20	1.00494	0.00052
25.60	1.00183	0.00058	29.90	1.01445	0.00053	35.60	1.00826	0.00051
25.80	1.00544	0.00056				36.00	1.01106	0.00053
26.00	1.00847	0.00057				36.30	1.01273	0.00051
26.20	1.01066	0.00056						
26.40	1.01520	0.00056						
26.50	1.01583	0.00057						

Table B.3.1.5.1-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 0 Inches of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
34.70	0.92452	0.00053	41.10	0.92655	0.00050	52.90	0.92617	0.00045
35.50	0.93408	0.00050	42.70	0.93442	0.00048	60.60	0.94480	0.00043
36.30	0.93918	0.00052	44.30	0.94200	0.00047	68.30	0.95788	0.00045
37.10	0.94433	0.00053	45.90	0.94877	0.00047	76.00	0.96683	0.00045
37.90	0.95119	0.00051	47.50	0.95584	0.00048	83.70	0.97435	0.00044
38.70	0.95459	0.00051	49.10	0.96132	0.00046	91.40	0.97920	0.00044
39.50	0.96131	0.00050	50.70	0.96610	0.00045	99.10	0.98428	0.00044
40.30	0.96439	0.00052	52.30	0.97152	0.00046	106.80	0.98837	0.00045
41.10	0.96918	0.00049	53.90	0.97542	0.00047	114.50	0.99084	0.00044
41.90	0.97417	0.00050	55.50	0.98056	0.00047	122.20	0.99332	0.00043
42.70	0.97650	0.00051	57.10	0.98463	0.00046	129.90	0.99582	0.00043
43.50	0.98199	0.00049	58.70	0.98672	0.00047	137.60	0.99780	0.00043
44.30	0.98613	0.00048	60.30	0.99125	0.00046	145.30	0.99901	0.00043
45.10	0.98845	0.00049	61.90	0.99337	0.00047	153.00	0.99851	0.00042
45.90	0.99190	0.00050	63.50	0.99681	0.00048	160.70	1.00026	0.00042
46.70	0.99577	0.00049	65.10	0.99927	0.00047	168.40	1.00157	0.00042
47.50	0.99832	0.00051	66.70	1.00258	0.00047	176.10	1.00280	0.00043
48.30	1.00171	0.00049	68.30	1.00527	0.00046	183.80	1.00367	0.00043
49.10	1.00471	0.00049	69.90	1.00575	0.00045	191.50	1.00390	0.00043
49.90	1.00770	0.00049	71.50	1.00805	0.00047	199.20	1.00484	0.00041
50.70	1.00982	0.00049	73.10	1.01166	0.00047	206.80	1.00375	0.00043
51.40	1.01257	0.00049	73.30	1.01189	0.00044			

B.3.1.5.2. 1” Water Reflector

Case ID: u5o2-sp-0025-01

Material: Uranium dioxide in water

Geometry: Sphere

Isotopics: 2.5% ^{235}U 97.5% ^{238}U

Reflector: 1” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.3.1.5.2-1. Uranium Dioxide Sphere (2.5% ^{235}U) - 1 Inch of Water Reflection

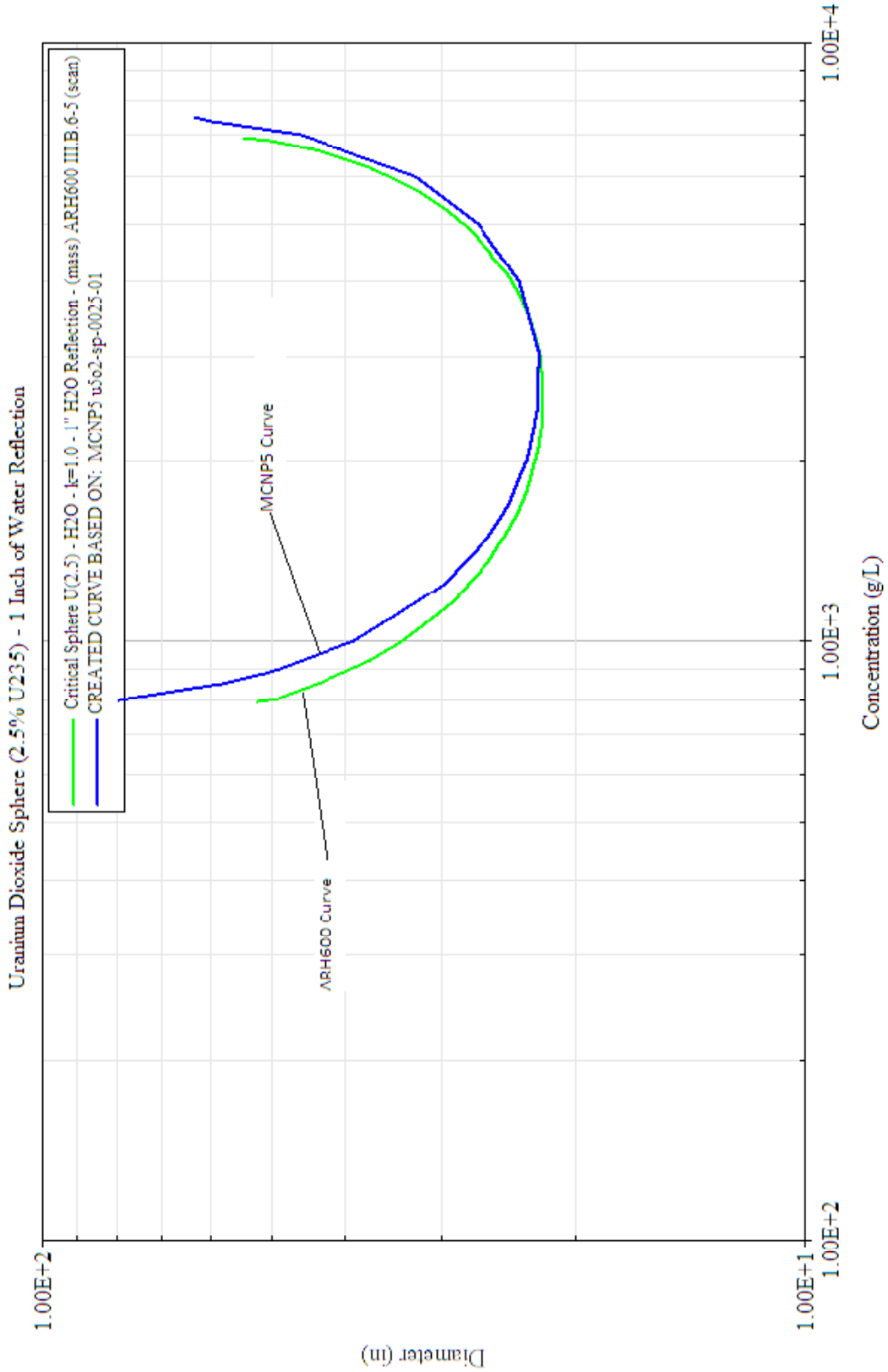

Table B.3.1.5.2-1. Critical Dimensions for Uranium Dioxide Sphere (2.5% ^{235}U) - 1 Inch of Water Reflection

Uranium Dioxide Sphere (2.5% ^{235}U)- 1 Inch of Water Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.800	38.500	101.900	3.100	79.6431
0.850	34.400	67.700	1.600	58.2604
0.900	31.700	54.500	1.100	49.0057
1.000	28.000	41.500	0.600	39.0552
1.250	23.300	31.300	0.400	29.7744
1.500	21.000	27.100	0.300	26.0362
1.700	20.100	25.600	0.200	24.4703
1.900	19.500	24.400	0.200	23.5449
2.000	19.300	24.200	0.200	23.1853
2.100	19.000	23.700	0.200	22.9069
2.500	18.700	23.200	0.200	22.3168
3.000	18.700	23.100	0.200	22.2711
4.000	19.700	24.700	0.200	23.6648
5.000	22.000	28.000	0.300	26.7925
6.000	25.700	34.300	0.400	32.5463
7.000	32.800	49.400	0.800	45.6849
7.500	39.200	77.300	1.900	62.9806

MCNP5 Sample Input File
2.5% U02 Sphere- 1 Inch of Reflection

```
UO2 sphere, 2.5 wt% 235U, 03000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 2050  hundreths of inches - must be integer
c radius =    26.0350 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 03000 milli-g Pu/cc
c Reflector width =  1.0 inches
c Enrichment = 0.03 wt fraction 235U
c
c Density of H2O 1.00000
c Density of UO2 11.00000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c U238  = 238.05080
c
c Effective uranium atomic mass 237.97563
c UO2
c Mass fraction of U in crit material 0.88147
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.2727 cc
c Volume of water in sample 0.7273 cc
c
c Mass of crit in sample   3.0000 g
c Mass of U in sample   2.6444 g
c Mass of bound O in sample  0.3556 g
c Mass of water in sample  0.7273 g
c
c Total mass of sample  3.7273g for a 1cc sample
c Mass Density for crit material  -3.7273, expressed as negative
c
c  sphere
20 11   -3.727273   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0
```

```
1       so    26.0350              $ Sphere
2       so    28.5750        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u oxide / water mixture
m11    $ UO2/H2O Sludge, 100.0 wt% 235U, 03000 milli-g U/cc,  3.7273
1001.66c -0.021833
8016.66c -0.173289      $from water
8016.66c -0.095398      $from oxide
92235.66c -0.017737
92238.66c -0.691743
mt11     lwtr.60t
c
c    u oxide only
m12    $ U oxide, 100.0 wt% 235U, 03000 milli-g U/cc,  3.7273
8016.66c -0.095398      $from oxide
92235.66c -0.017737
92238.66c -0.691743
c
```

Critview Compatible Data File
2.5% U02 Sphere- 1 Inch of Reflection

reset:
title: MCNP5 u5o2-sp-0025-01
set: MCNP5 set
source: MCNP5 primary
created: Tue 08/10/2010 10:39:04.29
geometry: sphere
modmat: H2O
critmat: uranium dioxide
isomat: U235 0.025 U238 0.975
reflmat: H2O
reflthick: 1 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.800	79.6431
0.850	58.2604
0.900	49.0057
1.000	39.0552
1.250	29.7744
1.500	26.0362
1.700	24.4703
1.900	23.5449
2.000	23.1853
2.100	22.9069
2.500	22.3168
3.000	22.2711
4.000	23.6648
5.000	26.7925
6.000	32.5463
7.000	45.6849
7.500	62.9806

Table B.3.1.5.2-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 1 Inch of Water Reflection

800 milli-g/cc			850 milli-g/cc			900 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
38.50	0.92904	0.00034	34.40	0.92894	0.00035	31.70	0.92915	0.00037
41.60	0.94155	0.00032	36.00	0.93660	0.00035	32.80	0.93649	0.00037
44.70	0.95087	0.00033	37.60	0.94486	0.00036	33.90	0.94268	0.00039
47.80	0.95878	0.00032	39.20	0.95130	0.00035	35.00	0.94998	0.00037
50.90	0.96564	0.00032	40.80	0.95739	0.00034	36.10	0.95525	0.00037
54.00	0.97265	0.00031	42.40	0.96355	0.00034	37.20	0.96010	0.00036
57.10	0.97754	0.00031	44.00	0.96862	0.00034	38.30	0.96524	0.00036
60.20	0.98214	0.00031	45.60	0.97429	0.00032	39.40	0.97049	0.00035
63.30	0.98520	0.00030	47.20	0.97797	0.00032	40.50	0.97479	0.00037
66.40	0.98905	0.00030	48.80	0.98227	0.00032	41.60	0.97830	0.00034
69.50	0.99279	0.00030	50.40	0.98521	0.00032	42.70	0.98293	0.00035
72.60	0.99454	0.00029	52.00	0.98786	0.00034	43.80	0.98701	0.00034
75.70	0.99704	0.00029	53.60	0.99170	0.00033	44.90	0.98988	0.00035
78.80	0.99966	0.00028	55.20	0.99441	0.00032	46.00	0.99296	0.00034
81.90	1.00091	0.00029	56.80	0.99749	0.00032	47.10	0.99496	0.00034
85.00	1.00332	0.00029	58.40	1.00024	0.00032	48.20	0.99781	0.00033
88.10	1.00436	0.00027	60.00	1.00156	0.00031	49.30	1.00080	0.00033
91.20	1.00571	0.00028	61.60	1.00386	0.00031	50.40	1.00410	0.00034
94.30	1.00736	0.00027	63.20	1.00657	0.00031	51.50	1.00680	0.00032
97.40	1.00815	0.00026	64.80	1.00791	0.00032	52.60	1.00790	0.00033
100.50	1.00905	0.00027	66.40	1.00985	0.00030	53.70	1.01006	0.00032
101.90	1.00956	0.00028	67.70	1.01049	0.00031	54.50	1.01174	0.00034

Table B.3.1.5.2-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 1 Inch of Water Reflection (cont)

1000 milli-g/cc			1250 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
28.00	0.92893	0.00041	23.30	0.92586	0.00047	21.00	0.92315	0.00049
28.60	0.93382	0.00042	23.70	0.93297	0.00045	21.30	0.93047	0.00048
29.20	0.94012	0.00041	24.10	0.93973	0.00046	21.60	0.93477	0.00047
29.80	0.94429	0.00038	24.50	0.94409	0.00045	21.90	0.94019	0.00047
30.40	0.94997	0.00039	24.90	0.95057	0.00044	22.20	0.94457	0.00048
31.00	0.95512	0.00041	25.30	0.95424	0.00045	22.50	0.94998	0.00048
31.60	0.95811	0.00039	25.70	0.95814	0.00045	22.80	0.95452	0.00048
32.20	0.96358	0.00040	26.10	0.96337	0.00044	23.10	0.95857	0.00048
32.80	0.96552	0.00038	26.50	0.96751	0.00044	23.40	0.96501	0.00048
33.40	0.97058	0.00039	26.90	0.97279	0.00045	23.70	0.96785	0.00045
34.00	0.97315	0.00038	27.30	0.97768	0.00045	24.00	0.97373	0.00048
34.60	0.97768	0.00038	27.70	0.98192	0.00044	24.30	0.97707	0.00047
35.20	0.98194	0.00039	28.10	0.98595	0.00043	24.60	0.98110	0.00047
35.80	0.98447	0.00038	28.50	0.98923	0.00045	24.90	0.98428	0.00049
36.40	0.98800	0.00039	28.90	0.99311	0.00044	25.20	0.98919	0.00046
37.00	0.99045	0.00036	29.30	0.99733	0.00045	25.50	0.99315	0.00045
37.60	0.99387	0.00038	29.70	0.99920	0.00042	25.80	0.99652	0.00046
38.20	0.99660	0.00037	30.10	1.00350	0.00042	26.10	1.00094	0.00046
38.80	0.99906	0.00038	30.50	1.00607	0.00043	26.40	1.00316	0.00046
39.40	1.00127	0.00036	30.90	1.01085	0.00043	26.70	1.00689	0.00046
40.00	1.00476	0.00037	31.30	1.01262	0.00043	27.00	1.01032	0.00048
40.60	1.00665	0.00036				27.10	1.01208	0.00047
41.20	1.00965	0.00037						
41.50	1.01018	0.00039						

Table B.3.1.5.2-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 1 Inch of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
20.10	0.92473	0.00052	19.50	0.92384	0.00050	19.30	0.92494	0.00052
20.30	0.92982	0.00050	19.70	0.92941	0.00052	19.50	0.93023	0.00051
20.50	0.93317	0.00050	19.90	0.93369	0.00053	19.70	0.93441	0.00053
20.70	0.93716	0.00050	20.10	0.93823	0.00051	19.90	0.93807	0.00053
20.90	0.93970	0.00051	20.30	0.94209	0.00052	20.10	0.94260	0.00053
21.10	0.94432	0.00051	20.50	0.94693	0.00052	20.30	0.94775	0.00051
21.30	0.94675	0.00052	20.70	0.95096	0.00052	20.50	0.95225	0.00053
21.50	0.95127	0.00050	20.90	0.95362	0.00051	20.70	0.95619	0.00053
21.70	0.95600	0.00050	21.10	0.95751	0.00052	20.90	0.95915	0.00052
21.90	0.95861	0.00051	21.30	0.96278	0.00050	21.10	0.96333	0.00052
22.10	0.96312	0.00049	21.50	0.96598	0.00051	21.30	0.96721	0.00052
22.30	0.96647	0.00049	21.70	0.96935	0.00052	21.50	0.97139	0.00052
22.50	0.96939	0.00050	21.90	0.97203	0.00052	21.70	0.97397	0.00053
22.70	0.97245	0.00050	22.10	0.97645	0.00050	21.90	0.97942	0.00054
22.90	0.97556	0.00049	22.30	0.98104	0.00050	22.10	0.98205	0.00054
23.10	0.97994	0.00051	22.50	0.98345	0.00051	22.30	0.98452	0.00053
23.30	0.98142	0.00050	22.70	0.98657	0.00051	22.50	0.98870	0.00053
23.50	0.98549	0.00048	22.90	0.98989	0.00050	22.70	0.99277	0.00052
23.70	0.98763	0.00051	23.10	0.99406	0.00051	22.90	0.99489	0.00055
23.90	0.99196	0.00048	23.30	0.99550	0.00051	23.10	0.99841	0.00051
24.10	0.99430	0.00050	23.50	0.99918	0.00050	23.30	1.00214	0.00052
24.30	0.99782	0.00049	23.70	1.00283	0.00053	23.50	1.00434	0.00052
24.50	1.00038	0.00051	23.90	1.00712	0.00050	23.70	1.00881	0.00051
24.70	1.00331	0.00049	24.10	1.01023	0.00051	23.90	1.01111	0.00050
24.90	1.00515	0.00049	24.30	1.01140	0.00049	24.10	1.01609	0.00052
25.10	1.00874	0.00051	24.40	1.01271	0.00050	24.20	1.01597	0.00049
25.30	1.01043	0.00051						
25.50	1.01358	0.00050						
25.60	1.01469	0.00048						

Table B.3.1.5.2-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 1 Inch of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
19.00	0.92276	0.00054	18.70	0.92476	0.00056	18.70	0.92457	0.00054
19.20	0.92734	0.00052	18.90	0.92947	0.00056	18.90	0.92773	0.00054
19.40	0.93240	0.00053	19.10	0.93469	0.00056	19.10	0.93429	0.00056
19.60	0.93711	0.00053	19.30	0.93915	0.00053	19.30	0.93836	0.00057
19.80	0.94183	0.00052	19.50	0.94427	0.00054	19.50	0.94271	0.00055
20.00	0.94524	0.00054	19.70	0.94780	0.00053	19.70	0.94847	0.00056
20.20	0.94850	0.00053	19.90	0.95211	0.00057	19.90	0.95174	0.00055
20.40	0.95454	0.00054	20.10	0.95662	0.00054	20.10	0.95613	0.00058
20.60	0.95891	0.00054	20.30	0.96146	0.00053	20.30	0.96008	0.00057
20.80	0.96261	0.00055	20.50	0.96547	0.00056	20.50	0.96545	0.00056
21.00	0.96515	0.00054	20.70	0.97083	0.00055	20.70	0.97101	0.00055
21.20	0.96942	0.00052	20.90	0.97365	0.00056	20.90	0.97394	0.00055
21.40	0.97403	0.00053	21.10	0.97716	0.00053	21.10	0.97747	0.00057
21.60	0.97747	0.00051	21.30	0.98177	0.00057	21.30	0.98245	0.00054
21.80	0.98023	0.00052	21.50	0.98537	0.00055	21.50	0.98527	0.00055
22.00	0.98505	0.00053	21.70	0.99048	0.00056	21.70	0.98908	0.00057
22.20	0.98883	0.00052	21.90	0.99222	0.00055	21.90	0.99454	0.00055
22.40	0.99184	0.00051	22.10	0.99715	0.00052	22.10	0.99627	0.00054
22.60	0.99577	0.00054	22.30	0.99965	0.00053	22.30	1.00063	0.00055
22.80	0.99782	0.00052	22.50	1.00381	0.00054	22.50	1.00358	0.00055
23.00	1.00190	0.00050	22.70	1.00790	0.00053	22.70	1.00841	0.00052
23.20	1.00472	0.00052	22.90	1.00979	0.00053	22.90	1.01214	0.00057
23.40	1.00800	0.00051	23.10	1.01356	0.00053	23.10	1.01419	0.00056
23.60	1.01237	0.00051	23.20	1.01588	0.00053			
23.70	1.01310	0.00052						

Table B.3.1.5.2-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 1 Inch of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
19.70	0.92306	0.00057	22.00	0.92570	0.00056	25.70	0.92608	0.00056
19.90	0.92778	0.00057	22.30	0.93158	0.00056	26.10	0.93191	0.00055
20.10	0.93201	0.00056	22.60	0.93666	0.00054	26.50	0.93724	0.00052
20.30	0.93693	0.00056	22.90	0.94226	0.00056	26.90	0.94271	0.00053
20.50	0.93979	0.00055	23.20	0.94687	0.00054	27.30	0.94714	0.00055
20.70	0.94505	0.00057	23.50	0.95334	0.00057	27.70	0.95233	0.00054
20.90	0.94818	0.00057	23.80	0.95749	0.00058	28.10	0.95639	0.00053
21.10	0.95328	0.00057	24.10	0.96232	0.00057	28.50	0.95972	0.00057
21.30	0.95705	0.00058	24.40	0.96671	0.00055	28.90	0.96608	0.00054
21.50	0.96106	0.00055	24.70	0.97159	0.00055	29.30	0.96938	0.00055
21.70	0.96422	0.00056	25.00	0.97583	0.00055	29.70	0.97311	0.00057
21.90	0.96799	0.00058	25.30	0.97925	0.00056	30.10	0.97605	0.00052
22.10	0.97283	0.00057	25.60	0.98397	0.00053	30.50	0.98168	0.00055
22.30	0.97606	0.00056	25.90	0.98810	0.00054	30.90	0.98499	0.00054
22.50	0.97980	0.00054	26.20	0.99283	0.00054	31.30	0.98836	0.00056
22.70	0.98334	0.00054	26.50	0.99651	0.00056	31.70	0.99162	0.00054
22.90	0.98682	0.00056	26.80	1.00009	0.00056	32.10	0.99460	0.00054
23.10	0.99010	0.00056	27.10	1.00291	0.00057	32.50	0.99959	0.00054
23.30	0.99371	0.00057	27.40	1.00685	0.00056	32.90	1.00313	0.00054
23.50	0.99705	0.00054	27.70	1.01021	0.00058	33.30	1.00576	0.00052
23.70	1.00063	0.00056	28.00	1.01502	0.00057	33.70	1.00825	0.00052
23.90	1.00277	0.00057				34.10	1.01232	0.00052
24.10	1.00598	0.00058				34.30	1.01381	0.00053
24.30	1.01027	0.00053						
24.50	1.01337	0.00056						
24.70	1.01656	0.00057						

Table B.3.1.5.2-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 1 Inch of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc					
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma			
32.80	0.92888	0.00051	39.20	0.92750	0.00050			
33.60	0.93260	0.00051	41.10	0.93740	0.00050			
34.40	0.93940	0.00051	43.00	0.94617	0.00048			
35.20	0.94529	0.00052	44.90	0.95439	0.00048			
36.00	0.95225	0.00050	46.80	0.96095	0.00047			
36.80	0.95693	0.00053	48.70	0.96696	0.00049			
37.60	0.96273	0.00049	50.60	0.97190	0.00048			
38.40	0.96622	0.00049	52.50	0.97759	0.00048			
39.20	0.97084	0.00052	54.40	0.98299	0.00046			
40.00	0.97447	0.00053	56.30	0.98726	0.00048			
40.80	0.97826	0.00050	58.20	0.99145	0.00047			
41.60	0.98254	0.00051	60.10	0.99533	0.00049			
42.40	0.98561	0.00051	62.00	0.99744	0.00049			
43.20	0.99008	0.00051	63.90	1.00240	0.00046			
44.00	0.99266	0.00049	65.80	1.00416	0.00045			
44.80	0.99706	0.00049	67.70	1.00683	0.00046			
45.60	0.99974	0.00048	69.60	1.00969	0.00045			
46.40	1.00219	0.00050	71.50	1.01227	0.00049			
47.20	1.00578	0.00048	73.40	1.01484	0.00045			
48.00	1.00731	0.00049	75.30	1.01612	0.00045			
48.80	1.00935	0.00047	77.20	1.01860	0.00045			
49.40	1.01180	0.00050	77.30	1.01639	0.00046			

B.3.1.5.3. 10” Water Reflector

Case ID: u5o2-sp-0025-10

Material: Uranium dioxide in water

Geometry: Sphere

Isotopics: 2.5% ^{235}U 97.5% ^{238}U

Reflector: 10” water

Code: MCNP5 v1.40

Analyst: Mark Murphy

Date: 8/2010

Figure B.3.1.5.3-1. Uranium Dioxide Sphere (2.5% ^{235}U) - 10 Inches of Water Reflection

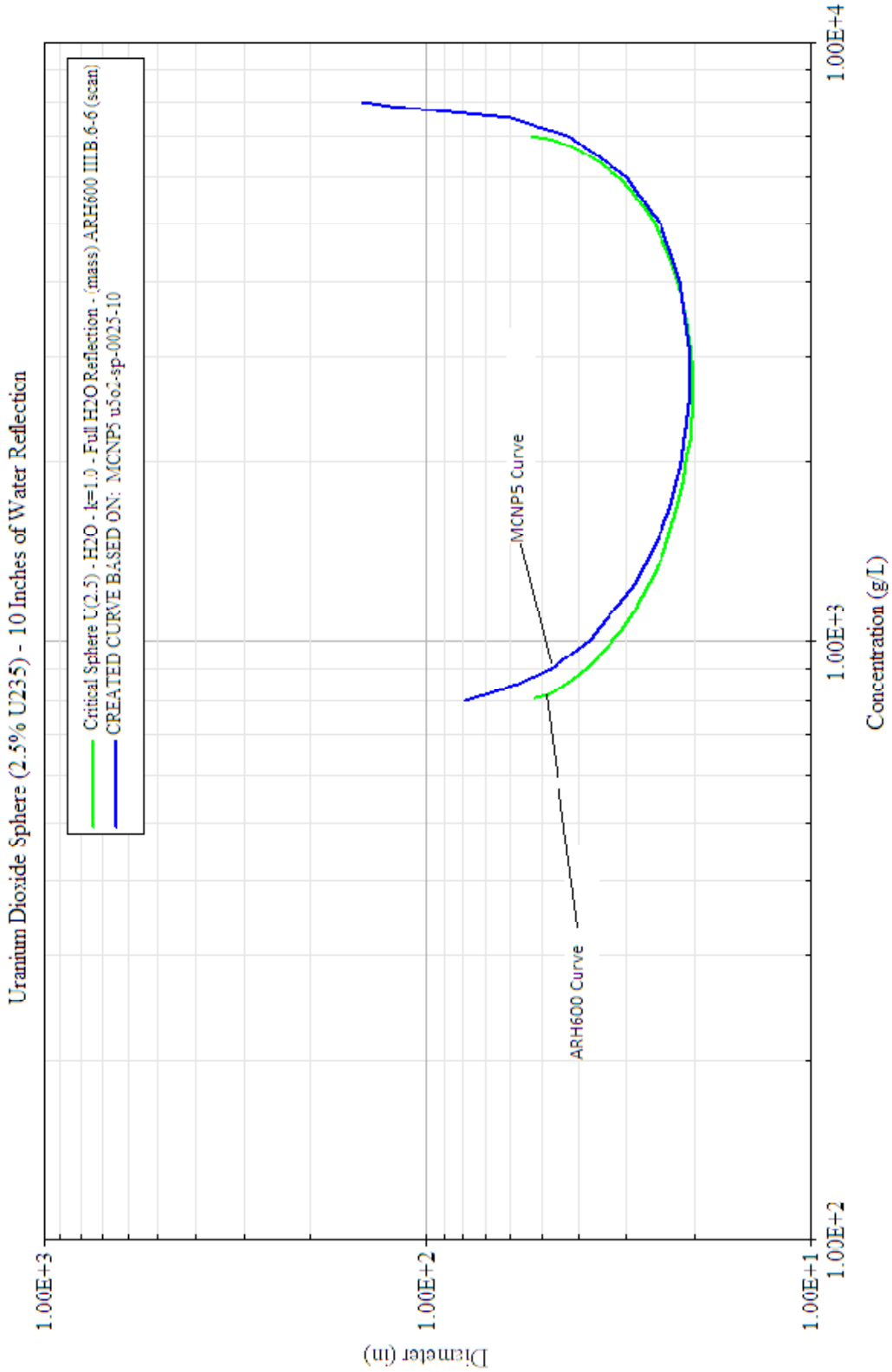

Table B.3.1.5.3-1. Critical Dimensions for Uranium Dioxide Sphere (2.5% ^{235}U) - 10 Inches of Water Reflection

Uranium Dioxide Sphere (2.5% ^{235}U)- 10 Inches of Reflection				
Concentration (g/cc)	First Diameter (Inches)	Last Diameter (Inches)	Delta (Inches)	Critical Diameter (Inches)
0.800	36.400	111.100	3.700	79.0786
0.850	33.300	66.900	1.600	57.5155
0.900	30.200	53.100	1.100	47.1113
1.000	26.500	40.500	0.700	37.4614
1.250	22.100	30.000	0.400	28.3616
1.500	19.700	25.700	0.300	24.6672
1.700	18.600	24.100	0.200	23.0952
1.900	18.100	23.000	0.200	22.0215
2.000	17.900	22.500	0.200	21.6370
2.100	17.600	22.300	0.200	21.4170
2.500	17.200	21.600	0.200	20.6614
3.000	17.000	21.400	0.200	20.5740
4.000	17.800	22.600	0.200	21.7183
5.000	19.700	25.600	0.300	24.5391
6.000	23.200	31.500	0.400	29.9661
7.000	29.400	46.400	0.800	42.5312
7.500	35.600	67.200	1.500	59.6060
8.000	47.300	182.900	6.700	147.1108

MCNP5 Sample Input File
2.5% U02 Sphere- 10 Inches of Reflection

```
UO2 sphere, 2.5 wt% 235U, 03000 milli-g/cc,
c
c worm notes: format of the form |n.m for floating point, |n for integers
c       zzz0 (in upper case) is replaced with the number of cyles
c       zzz1 = the actual concentration in units of milli-g/cc
c       qqq1 = the minimum dimensions (in hundreths of inches)
c       qqq2 = the maximum dimensions (in hundreths of inches)
c       qqq3 = the delta (in hundreths of inches)
c
c Diameter = 1880  hundreths of inches - must be integer
c radius =    23.8760 cm
c  note for perl, numbers with leading zeros must be enclosed in single quotes or else
c  they will be interpretted as octal
c Conc = 03000 milli-g Pu/cc
c Reflector width = 10.0 inches
c Enrichment = 0.03 wt fraction 235U
c
c Density of H2O 1.00000
c Density of UO2 11.00000 g/cc
c
c Atomic Masses
c H     =   1.00790
c O     =  15.99940
c 235U  = 235.04390
c U238  = 238.05080
c
c Effective uranium atomic mass 237.97563
c UO2
c Mass fraction of U in crit material 0.88147
c
c Assume a sample size of 1cc
c
c Volume of crit in sample  0.2727 cc
c Volume of water in sample 0.7273 cc
c
c Mass of crit in sample   3.0000 g
c Mass of U in sample   2.6444 g
c Mass of bound O in sample  0.3556 g
c Mass of water in sample  0.7273 g
c
c Total mass of sample  3.7273g for a 1cc sample
c Mass Density for crit material  -3.7273, expressed as negative
c
c  sphere
20 11   -3.727273   -1         imp:n=1
21  2  -1.000    -2 1         imp:n=1    $zero importance if no reflector
22  0            2           imp:n=0
```

```
1       so    23.8760            $ Sphere
2       so    49.2760        $ Reflection

mode n
kcode 2000 1.0 100  1100
ksrc  0.00    0.00    0.00
0.00    0.00    0.10
0.00    0.00    0.50
0.00    0.00    1.00
0.00    0.00    2.00
0.00    0.00    3.00
1.00    1.00    1.00
1.00    1.00    2.00
1.00    1.00    3.00
2.00    2.00    1.00
2.00    2.00    2.00
2.00    2.00    3.00
-1.00   -1.00   -1.00
-10.00   -10.00   -20.00
-10.00   -10.00   -30.00
c
m2    $ water
1001.66c      2
8016.66c      1
mt2   lwtr.60t
c    u oxide / water mixture
m11    $ UO2/H2O Sludge, 100.0 wt% 235U, 03000 milli-g U/cc,  3.7273
1001.66c -0.021833
8016.66c -0.173289      $from water
8016.66c -0.095398      $from oxide
92235.66c -0.017737
92238.66c -0.691743
mt11     lwtr.60t
c
c    u oxide only
m12    $ U oxide, 100.0 wt% 235U, 03000 milli-g U/cc,  3.7273
8016.66c -0.095398      $from oxide
92235.66c -0.017737
92238.66c -0.691743
c
```

Critview Compatible Data File
2.5% U02 Sphere- 10 Inches of Reflection

reset:
title: MCNP5 u5o2-sp-0025-10
set: MCNP5 set
source: MCNP5 primary
created: Tue 08/10/2010 10:39:30.86
geometry: sphere
modmat: H2O
critmat: uranium dioxide
isomat: U235 0.025 U238 0.975
reflmat: H2O
reflthick: 10 in
keff: 1.0
var: critconc g/cc
var: diameter in

0.800	79.0786
0.850	57.5155
0.900	47.1113
1.000	37.4614
1.250	28.3616
1.500	24.6672
1.700	23.0952
1.900	22.0215
2.000	21.6370
2.100	21.4170
2.500	20.6614
3.000	20.5740
4.000	21.7183
5.000	24.5391
6.000	29.9661
7.000	42.5312
7.500	59.6060
8.000	147.1108

Table B.3.1.5.3-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 10 Inches of Water Reflection

800 milli-g/cc			850 milli-g/cc			900 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
36.40	0.92513	0.00034	33.30	0.92916	0.00033	30.20	0.92708	0.00036
40.10	0.94001	0.00032	34.90	0.93727	0.00037	31.30	0.93509	0.00036
43.80	0.95306	0.00032	36.50	0.94526	0.00035	32.40	0.94178	0.00037
47.50	0.96139	0.00031	38.10	0.95221	0.00034	33.50	0.94761	0.00036
51.20	0.97056	0.00031	39.70	0.95852	0.00033	34.60	0.95413	0.00035
54.90	0.97628	0.00031	41.30	0.96355	0.00033	35.70	0.95970	0.00035
58.60	0.98098	0.00029	42.90	0.96952	0.00034	36.80	0.96446	0.00036
62.30	0.98562	0.00030	44.50	0.97383	0.00032	37.90	0.96981	0.00035
66.00	0.99096	0.00029	46.10	0.97812	0.00033	39.00	0.97431	0.00035
69.70	0.99281	0.00028	47.70	0.98159	0.00031	40.10	0.97852	0.00033
73.40	0.99644	0.00027	49.30	0.98597	0.00033	41.20	0.98221	0.00035
77.10	0.99900	0.00028	50.90	0.98884	0.00030	42.30	0.98542	0.00033
80.80	1.00087	0.00029	52.50	0.99230	0.00031	43.40	0.98958	0.00033
84.50	1.00277	0.00029	54.10	0.99488	0.00032	44.50	0.99189	0.00034
88.20	1.00418	0.00028	55.70	0.99846	0.00031	45.60	0.99589	0.00033
91.90	1.00652	0.00028	57.30	0.99974	0.00031	46.70	0.99874	0.00033
95.60	1.00779	0.00026	58.90	1.00167	0.00030	47.80	1.00211	0.00033
99.30	1.00890	0.00028	60.50	1.00436	0.00030	48.90	1.00355	0.00033
103.00	1.01099	0.00027	62.10	1.00595	0.00031	50.00	1.00501	0.00032
106.70	1.01246	0.00027	63.70	1.00872	0.00030	51.10	1.00841	0.00031
110.40	1.01179	0.00027	65.30	1.00952	0.00029	52.20	1.00936	0.00033
111.10	1.01215	0.00027	66.90	1.01186	0.00031	53.10	1.01148	0.00032

Table B.3.1.5.3-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 10 Inches of Water Reflection (cont)

1000 milli-g/cc			1250 milli-g/cc			1500 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
26.50	0.92714	0.00040	22.10	0.92889	0.00043	19.70	0.92448	0.00046
27.20	0.93334	0.00039	22.50	0.93386	0.00044	20.00	0.93024	0.00045
27.90	0.94001	0.00039	22.90	0.94018	0.00043	20.30	0.93594	0.00047
28.60	0.94397	0.00039	23.30	0.94437	0.00045	20.60	0.94174	0.00045
29.30	0.95153	0.00038	23.70	0.95129	0.00043	20.90	0.94581	0.00047
30.00	0.95605	0.00038	24.10	0.95487	0.00043	21.20	0.95105	0.00047
30.70	0.96167	0.00037	24.50	0.96106	0.00044	21.50	0.95560	0.00045
31.40	0.96619	0.00038	24.90	0.96539	0.00041	21.80	0.96038	0.00044
32.10	0.97009	0.00039	25.30	0.96922	0.00044	22.10	0.96645	0.00046
32.80	0.97506	0.00036	25.70	0.97479	0.00042	22.40	0.96919	0.00046
33.50	0.97851	0.00037	26.10	0.97767	0.00041	22.70	0.97503	0.00047
34.20	0.98316	0.00036	26.50	0.98309	0.00041	23.00	0.97915	0.00046
34.90	0.98636	0.00035	26.90	0.98673	0.00042	23.30	0.98181	0.00046
35.60	0.99054	0.00038	27.30	0.99029	0.00040	23.60	0.98634	0.00044
36.30	0.99303	0.00037	27.70	0.99475	0.00041	23.90	0.98951	0.00044
37.00	0.99739	0.00036	28.10	0.99705	0.00042	24.20	0.99340	0.00046
37.70	1.00135	0.00036	28.50	1.00156	0.00040	24.50	0.99796	0.00045
38.40	1.00307	0.00036	28.90	1.00560	0.00041	24.80	1.00162	0.00044
39.10	1.00676	0.00035	29.30	1.00837	0.00042	25.10	1.00526	0.00045
39.80	1.00776	0.00036	29.70	1.01075	0.00041	25.40	1.00903	0.00045
40.50	1.01187	0.00035	30.00	1.01343	0.00043	25.70	1.01327	0.00045

Table B.3.1.5.3-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 10 Inches of Water Reflection (cont)

1700 milli-g/cc			1900 milli-g/cc			2000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
18.60	0.92297	0.00047	18.10	0.92666	0.00049	17.90	0.92677	0.00052
18.80	0.92708	0.00047	18.30	0.92972	0.00050	18.10	0.93161	0.00051
19.00	0.93124	0.00048	18.50	0.93515	0.00050	18.30	0.93576	0.00049
19.20	0.93476	0.00051	18.70	0.93886	0.00048	18.50	0.94065	0.00050
19.40	0.93808	0.00047	18.90	0.94322	0.00048	18.70	0.94547	0.00050
19.60	0.94181	0.00046	19.10	0.94694	0.00050	18.90	0.94864	0.00049
19.80	0.94605	0.00047	19.30	0.95229	0.00049	19.10	0.95259	0.00049
20.00	0.94992	0.00048	19.50	0.95558	0.00052	19.30	0.95588	0.00049
20.20	0.95375	0.00048	19.70	0.95983	0.00053	19.50	0.96101	0.00051
20.40	0.95759	0.00048	19.90	0.96332	0.00047	19.70	0.96498	0.00050
20.60	0.96132	0.00047	20.10	0.96758	0.00050	19.90	0.96840	0.00049
20.80	0.96469	0.00046	20.30	0.97017	0.00050	20.10	0.97316	0.00050
21.00	0.96728	0.00049	20.50	0.97411	0.00049	20.30	0.97577	0.00050
21.20	0.97192	0.00048	20.70	0.97769	0.00046	20.50	0.97893	0.00048
21.40	0.97467	0.00049	20.90	0.98115	0.00049	20.70	0.98324	0.00051
21.60	0.97691	0.00049	21.10	0.98406	0.00048	20.90	0.98701	0.00049
21.80	0.98141	0.00050	21.30	0.98832	0.00051	21.10	0.99017	0.00050
22.00	0.98372	0.00049	21.50	0.99112	0.00050	21.30	0.99244	0.00050
22.20	0.98713	0.00047	21.70	0.99390	0.00050	21.50	0.99728	0.00049
22.40	0.99033	0.00048	21.90	0.99780	0.00050	21.70	1.00125	0.00048
22.60	0.99331	0.00047	22.10	1.00142	0.00051	21.90	1.00300	0.00050
22.80	0.99640	0.00047	22.30	1.00380	0.00050	22.10	1.00582	0.00049
23.00	0.99832	0.00046	22.50	1.00547	0.00048	22.30	1.01011	0.00047
23.20	1.00185	0.00046	22.70	1.00948	0.00047	22.50	1.01246	0.00050
23.40	1.00488	0.00048	22.90	1.01087	0.00049			
23.60	1.00838	0.00047	23.00	1.01347	0.00048			
23.80	1.00990	0.00049						
24.00	1.01255	0.00048						
24.10	1.01366	0.00047						

Table B.3.1.5.3-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 10 Inches of Water Reflection (cont)

2100 milli-g/cc			2500 milli-g/cc			3000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.60	0.92493	0.00051	17.20	0.92673	0.00052	17.00	0.92314	0.00053
17.80	0.92879	0.00049	17.40	0.93054	0.00053	17.20	0.92878	0.00053
18.00	0.93534	0.00051	17.60	0.93575	0.00052	17.40	0.93271	0.00053
18.20	0.93808	0.00051	17.80	0.94115	0.00053	17.60	0.93771	0.00056
18.40	0.94355	0.00051	18.00	0.94509	0.00053	17.80	0.94241	0.00053
18.60	0.94702	0.00051	18.20	0.95013	0.00051	18.00	0.94788	0.00053
18.80	0.95195	0.00049	18.40	0.95457	0.00054	18.20	0.95155	0.00053
19.00	0.95613	0.00049	18.60	0.95790	0.00052	18.40	0.95654	0.00054
19.20	0.95996	0.00052	18.80	0.96321	0.00052	18.60	0.96017	0.00053
19.40	0.96415	0.00051	19.00	0.96730	0.00053	18.80	0.96519	0.00054
19.60	0.96806	0.00050	19.20	0.97153	0.00051	19.00	0.96921	0.00054
19.80	0.97220	0.00050	19.40	0.97555	0.00052	19.20	0.97327	0.00052
20.00	0.97572	0.00050	19.60	0.97962	0.00051	19.40	0.97744	0.00051
20.20	0.97920	0.00049	19.80	0.98399	0.00052	19.60	0.98117	0.00053
20.40	0.98371	0.00051	20.00	0.98597	0.00052	19.80	0.98454	0.00052
20.60	0.98690	0.00049	20.20	0.99002	0.00051	20.00	0.98918	0.00054
20.80	0.99106	0.00049	20.40	0.99433	0.00052	20.20	0.99420	0.00053
21.00	0.99244	0.00048	20.60	0.99880	0.00052	20.40	0.99632	0.00053
21.20	0.99643	0.00050	20.80	1.00271	0.00049	20.60	1.00055	0.00055
21.40	0.99965	0.00050	21.00	1.00481	0.00052	20.80	1.00497	0.00053
21.60	1.00377	0.00052	21.20	1.00831	0.00051	21.00	1.00859	0.00052
21.80	1.00647	0.00049	21.40	1.01094	0.00050	21.20	1.01097	0.00054
22.00	1.00991	0.00049	21.60	1.01572	0.00052	21.40	1.01470	0.00051
22.20	1.01287	0.00049						
22.30	1.01552	0.00049						

Table B.3.1.5.3-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 10 Inches of Water Reflection (cont)

4000 milli-g/cc			5000 milli-g/cc			6000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
17.80	0.92369	0.00055	19.70	0.92474	0.00053	23.20	0.92802	0.00051
18.00	0.92744	0.00054	20.00	0.93056	0.00054	23.60	0.93333	0.00054
18.20	0.93342	0.00052	20.30	0.93634	0.00053	24.00	0.93830	0.00053
18.40	0.93670	0.00058	20.60	0.94205	0.00054	24.40	0.94448	0.00052
18.60	0.94173	0.00054	20.90	0.94690	0.00053	24.80	0.94826	0.00050
18.80	0.94647	0.00053	21.20	0.95229	0.00054	25.20	0.95282	0.00051
19.00	0.95024	0.00053	21.50	0.95585	0.00054	25.60	0.95742	0.00053
19.20	0.95288	0.00055	21.80	0.96045	0.00050	26.00	0.96204	0.00051
19.40	0.95813	0.00051	22.10	0.96584	0.00053	26.40	0.96635	0.00054
19.60	0.96208	0.00053	22.40	0.97056	0.00052	26.80	0.97070	0.00053
19.80	0.96666	0.00053	22.70	0.97533	0.00053	27.20	0.97482	0.00053
20.00	0.96861	0.00054	23.00	0.98073	0.00053	27.60	0.97804	0.00052
20.20	0.97392	0.00053	23.30	0.98396	0.00055	28.00	0.98157	0.00052
20.40	0.97694	0.00053	23.60	0.98902	0.00053	28.40	0.98578	0.00052
20.60	0.98064	0.00052	23.90	0.99209	0.00054	28.80	0.99053	0.00055
20.80	0.98341	0.00055	24.20	0.99587	0.00052	29.20	0.99449	0.00051
21.00	0.98667	0.00055	24.50	0.99967	0.00053	29.60	0.99601	0.00050
21.20	0.99227	0.00052	24.80	1.00220	0.00052	30.00	1.00037	0.00052
21.40	0.99355	0.00052	25.10	1.00639	0.00050	30.40	1.00315	0.00052
21.60	0.99767	0.00054	25.40	1.01142	0.00051	30.80	1.00703	0.00051
21.80	1.00161	0.00055	25.60	1.01329	0.00056	31.20	1.01057	0.00054
22.00	1.00376	0.00056				31.50	1.01258	0.00050
22.20	1.00810	0.00053						
22.40	1.00884	0.00056						
22.60	1.01331	0.00053						

Table B.3.1.5.3-2. K_{eff} Values for Uranium Dioxide Sphere (2.5% ^{235}U) - 10 Inches of Water Reflection (cont)

7000 milli-g/cc			7500 milli-g/cc			8000 milli-g/cc		
Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma	Diameter (inches)	K_{eff}	Sigma
29.40	0.92563	0.00051						
30.20	0.93272	0.00049						
31.00	0.93966	0.00049						
31.80	0.94521	0.00049						
32.60	0.94997	0.00050						
33.40	0.95591	0.00048						
34.20	0.96182	0.00050						
35.00	0.96478	0.00048						
35.80	0.96966	0.00049						
36.60	0.97499	0.00048						
37.40	0.97790	0.00048						
38.20	0.98188	0.00050						
39.00	0.98540	0.00049						
39.80	0.98834	0.00047						
40.60	0.99246	0.00049						
41.40	0.99581	0.00048						
42.20	0.99882	0.00049						
43.00	1.00167	0.00047						
43.80	1.00489	0.00049						
44.60	1.00631	0.00049						
45.40	1.01022	0.00050						
46.20	1.01218	0.00048						
46.40	1.01403	0.00047						