

DATES TO REMEMBER

- Jul 28-30 2020 Budget Execution Meeting at NATM
- Hands-On Training & Education Course Dates:
- Two-week Practitioner Course Dates:*
Aug 10–21, 2020 Jan 25-Feb 5, 2021
Aug 9-20, 2021
- One-week Manager’s Course Dates:*
Apr 5-9, 2021 Jun 7-11, 2021

Course Registration: https://ncsp.llnl.gov/trng_apply.php

LINKS TO REMEMBER

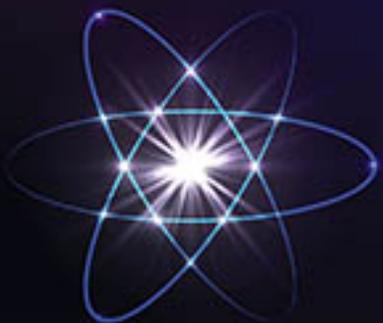
- [NCSP WEBSITE](#)
- [NCSP HISTORY & PROGRAM OVERVIEW](#)
- [NCSP ORGANIZATION CHART](#)
- [NCSP MISSION AND VISION](#)
- [NCSP FIVE-YEAR EXECUTION PLAN](#)
- [NCSP PLANNING CALENDAR](#)
- [PREVIOUS NCSP NEWSLETTERS](#)
- [CSSG TASKINGS](#)
- [NONDESTRUCTIVE ASSAY PROGRAM](#)



Dr. Angela Chambers, NCSP Manager

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A MESSAGE FROM THE NCSP MANAGER

I hope this newsletter finds you and your families safe and healthy.

The COVID-19 pandemic has thrown DOE, and the world, into an unprecedented state. I know from our NNSA daily COVID-19 briefs that the dedicated staff at each site continue to work and ensure that every site remains safe and that DOE and NNSA’s mission essential functions continue to be conducted. Many of you are also working to help keep your communities safe and providing a helping hand to others in need.

Please check our website course dates that may have been affected by the pandemic.

Please enjoy the newsletter and remain safe and healthy.

Angela

DOE O 420.1C FAQs

DOE AU recently posted a revised FAQs on the DOE directives website related to DOE O 420.1C, *Facility Safety*. The FAQs answers some questions your site might have related to implementation of the invoked ANSI/ANS 8 nuclear criticality safety standards. The FAQs can be accessed by going to the directives web site, navigating to the DOE 420.1C order and selecting the “Related” tab next to the link to the order pdf file. You can also directly access the FAQs using this link: https://www.directives.doe.gov/related-items/faqs_doe_o%29420.1C

Please contact **Lori Scott** for information or contributions: lori.scott@nnsa.doe.gov



A MESSAGE FROM THE CSSG

(Links to the CSSG Taskings can be found on the cover page under 'LINKS TO REMEMBER')

The CSSG has been busier in the last several months, and now has two Taskings in progress, just completed a third, and is drafting a fourth. Each of these will be discussed below.

The completed Tasking, 2020-02, is the annual review and prioritization of the NCSP Proposals. This will be utilized by NCSP Management to develop the FY21 NCSP Five-Year Execution Plan.

Tasking 2020-01: Update/Replace DOE-STD-1158 with a New Document. As most are aware, this Standard has been used by both the regulator and the contractor to ensure criticality safety related program and facility assessments have appropriate scopes and focus, as it provided suggested LOIs to supplement the Criteria identified in ANSI/ANS-8.19. When 8.19 was updated to the most recent version, this Standard, was cancelled vs being revised. The CSSG is working to develop an updated, more comprehensive document, to replace the Standard, with the expectation that it will be adopted by others.

The final Tasking, currently in progress, 2020-03, is a review of DOE Order 420.1C, III.3.f. This statement has caused much confusion since it came into being. The purpose of this review is to define/identify the issues and propose resolutions to the identified issues.

Finally, Tasking 2020-04 is being drafted. The purpose of this Tasking is to support the NNSA in its' review of the CD-1 submittal related to the Savannah River Plutonium Processing Facility (SRPPF). This effort may begin this summer or fall.

The Criticality Safety Coordinating Team (CSCT), made up of the DOE (non-contractor) criticality safety staff from across the complex, has been tasked with reviewing and suggesting changes to DOE O 232.2, Group 3, "Nuclear Safety Basis," Subgroup C, "Nuclear Criticality Safety Control Violations," *Occurrence Reporting and Processing of Operations Information*, has caused significant discussion between the regulator and the contractor regarding the meanings of the different criteria. The CSSG, and possibly other groups, will be involved in the review of the CSCT product. The timing of this review is not yet determined and depends on the CSCT reaching a consensus on the revision.

As always, even in this time of uncertainty caused by Covid-19, we look to additional opportunities to support the NCSP and the DOE Criticality Safety Community. Just let the NCSP Manager, or any CSSG member, know if you see something/somewhere where you think we can assist.

David Erickson, CSSG Chair

A Tribute to JEFF LEWIS - Retired (Mission Support & Test Services – NCSP)

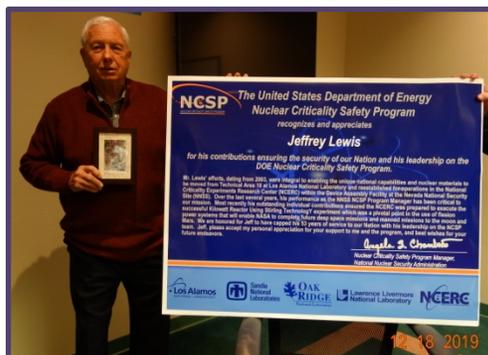
Jeff has spent more than 50 years serving his Country. He started his early career in the Army in 1968, where he served 10 years as an enlisted soldier as a squad leader, platoon sergeant and Drill Sergeant and completed two tours in Vietnam. He was selected to attend Officer Candidate School (OCS) and served as an officer for his final 10 years. As an officer, he served as a platoon leader, company commander and battalion executive officer in Korea, Central America and Turkey. His last assignment was in Istanbul, Turkey, where he was a Military Customs agent and managed port operations. He retired in 1988 after 20 years in the Army. In 1989, he was given the opportunity to work for Los Alamos National Laboratory at the Nevada Test Site (NTS). For J Division he provided security, operations and logistical support for the Lab during underground nuclear testing. During the moratorium he led a team who provided hazardous material packaging and transportation support at Los Alamos. He returned to the NTS in 1996 to support subcritical weapons experiments for several years and then supported the early move project during the time that TA-18 was transitioning to the DAF. After 19 years, he retired from LANL as the Los Alamos Resident Manager at the NTS. He then got married and moved to Los Alamos for about 4 years and was the manager for an engineering firm responsible for facility upgrade A&E work at LANL's TA-55. He missed the desert... and moved back to Nevada to work for NSTec. He supported subcritical experiments at U1a, restart activities at JASPER, and U1a, and was a project and program manager for the High Explosives Facilities (HEF), JASPER, the Off Site Source Recovery Program, the Nuclear Weapons Laboratories in Nevada, DOE Nevada Programs, Nuclear Testing Heritage and the Nuclear Criticality Safety Program (NCSP). He retired for the last time from MSTs after 9.5 years of service.



In retirement, he has stayed pretty busy, checking things off of his honey-do list and adding to it as well. He makes dinner for his wife, Donnette, every night! Jeff and Donnette have been camping at the beach a couple of times, and he is currently getting the camper ready for a longer voyage. For his retirement celebration, they went to the Bahamas for a week. It was a perfect way to start his new, less hectic, life. The most stressful day of his week is Monday, trash day, when he actually has to meet the deadline of getting the trash out BEFORE the trash man shows up. He was hoping to spend some time in Illinois this spring with friends and family, but the shelter in place has interfered with his plans for travel, shooting and fishing in his new fishing boat. He recently hired a contractor to build a man-cave, which will also keep him busy. Jeff and Donnette recently rescued a couple of dogs, and Donnette is hoping the three of them will keep each other out of trouble.



Jeff working his magic.



Receiving his NCSP Leadership certificate at his retirement party in December 2019.

[Click here to see the presentation from Jeff's retirement party: Roasting Humor at its best.](#)

A Tribute to JEFF LEWIS - Retired (cont'd)

Jeff's been quite busy since retiring . Do you think he misses us?

First on the retirement bucket list was a trip to the Bahama's with his lovely wife, Donnette.



They have been camping some and went once over Christmas holiday. It was time for Donnette to go back to work in Nevada. Retired-Jeff was not quite ready to leave the beach and sent Donnette home and back to work, while he stayed solo for a few more days. He just loves the pink flamingos (lol!).

Jeff enjoying shooting with his wife, Donnette, and one of the kids he was coaching.



Jeff needed some friends to keep him company while Donnette is hard at work, so they rescued a couple of dogs. They follow him everywhere.

Good luck on your new journey, Jeff. We will miss you!

Welcome NCSP Newcomers



Marsha Henley

Oak Ridge National Laboratory

NCSP Management Team,
Program Execution Support

Marsha Henley joined the NCSP Management Team in December 2019. She has over 20 years of experience working at Oak Ridge National Laboratory (ORNL), including support of the Oak Ridge Leadership Computing Facility (OLCF), Radiation Safety Information Computational Center (RSICC) and the Nuclear Data and Criticality Safety (NDCS) group. In addition to her work on the NCSP Management Team, she will also support the ORNL SCALE modeling and simulation suite in both the Quality Assurance and User Support areas. Marsha has a B.S. in Management and Data Processing from Carson-Newman University, Jefferson City, Tennessee.



Sylvia Wright-Reeder

Mission Support & Test Services

NCSP Task Manager

Ms. Wright-Reeder, is a certified project management professional with over 25 years of extensive program/project management and technical experience. She is results-oriented, applies her extensive management experience to meet project goals and objectives within budget, on schedule, and in compliance with the strict confines of safety, regulatory, and contract requirements. She has demonstrated superior leadership and management, executing strategic requirements within the U.S. Department of Energy (DOE) complex and at Department of Defense (DOD) air bases. She possesses abundant operations and maintenance expertise with nuclear and non-nuclear facility management programs. She successfully maintained the protectiveness of human health and the environment at facilities and closure sites, while strategically realigning resources across projects to reduce overall cost and budget needs. Ms. Wright-Reeder has been a certified nuclear facility manager in accordance with DOE Order 426.2 (previously 5480.20A), and a qualified facility representative in accordance with Homeland Protection Security Directive 5. She was awarded the prime contractor Presidential Award for Leadership in project management for right-sizing projects, project management efficiency, and overall cost savings.

She currently works for Mission Support and Test Services (MSTS), in Las Vegas, Nevada as the Program Manager for the Device Assembly Facility, and Task Manager for the NCSP activities performed at the DAF.

INFORMATION PRESERVATION & DISSEMINATION

NEW NCSP WEBSITE PAGE – WORK IN PROGRESS

[DOE NNSA Nondestructive Assay Program](#)

(see details on page 18)

<https://nda.llnl.gov/>

DOE NNSA Nondestructive Assay Program

Home Nuclear Criticality Safety Program (NCSP) Website



Workshop on the Technical and Programmatic Needs for a Sustainable NDA Program for the US Department of Energy
Hosted at ORNL April 10 – 12, 2018

[Read Workshop Report](#)

Focus Areas

- Hardware/Software
- Algorithm Development
- Uncertainty Analysis
- Staffing, Personnel & Training
- Nuclear Materials
- Data Management
- Rules & Regulations
- Technical Standards & Best Practices

INFORMATION PRESERVATION & DISSEMINATION (cont'd)

NCSP Annual Technical Program Review (TPR)

This year, the 2020 NCSP annual TPR was held in Santa Fe, NM, on February 11-12, 2020.

Over 100 participants attended the review from AECOM, ANL, AWE, BECHTEL, BNL, CNS, CS Engineering, DNFSB, DOE, IRSN, LANL, LLNL, MIT, MSTs, NCSU, NNL, NNSA, OECD-NEA, ORNL, RPI, SNL, Spectra, SRS and Y-12.

This year, Task Managers were asked to provide briefings on work performed and funding utilized.

LANL, LLNL, ORNL and SNL Task Managers were invited to present their briefings at the winter ANS meeting, with travel funded by the NCSP Manager.

The full TPR agenda, with links to all presentations can be found on the NCSP website: https://ncsp.llnl.gov/TPRAgendas/2020/TPR_Agenda_FINAL.pdf

Thanks to everyone who participated and to those who made it all happen.



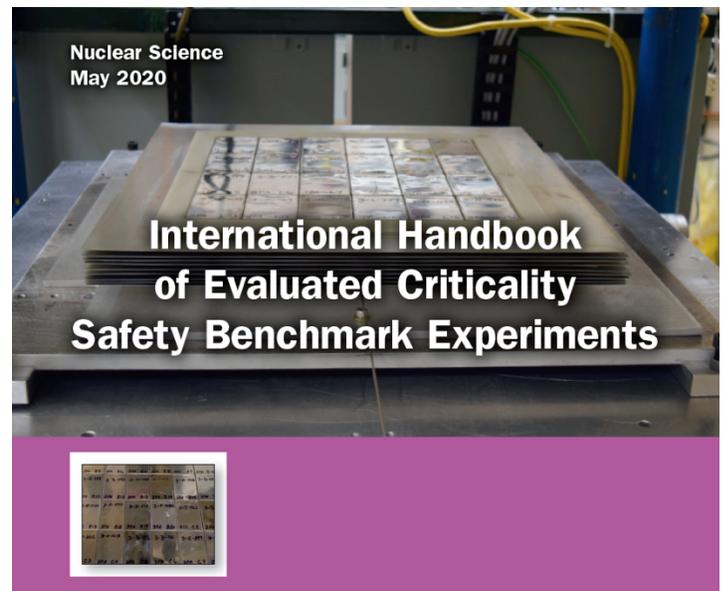
INTEGRAL EXPERIMENTS

First TEX Benchmarks to be Included in the 2020 ICSBEP Handbook

After final approval from the International Criticality Safety Benchmark Evaluation Project's (ICSBEP) review committee, the first five Thermal Epithermal eXperiments (TEX) plutonium configurations will be included as critical benchmarks in the 2020 ICSBEP Handbook. The five configurations were fueled with plutonium plates that were excessed from the Zero Power Physics Reactor (ZPPR) project and saved by the NCSP for use in critical experiments. These five configurations were designed to be clean baseline experiments and used a minimum of materials to allow examination of different parts of the plutonium cross section. In each case, the plutonium ZPPR plates were arranged in layers, with varying thicknesses of interspersed polyethylene moderator layers, which tuned the fission neutron spectrum from fast to thermal. Ultimately, the benchmark was designated Pu-Metal-Mixed-002 (PMM-002), with two fast energy configurations, two mixed energy configurations, and one thermal configuration. The experiments were designed by LLNL and conducted at NCERC by LANL.

There has been considerable interest in the five benchmarks, as the evaluation shows significant (over 1% in keff) over-prediction by the radiation transport codes using the most recent ENDF/B-VIII.0 nuclear data library for the more intermediate energy baseline configurations. Overall, ENDF/B-VII.1, the older version of the American nuclear data library, gave better results for the TEX baseline configurations. Both libraries predicted the fast and thermal cases within 2 sigma of the experimental uncertainty. The TEX results were featured in the closing plenary session of the International Conference on Nuclear Data for Science and Technology, held in Beijing, China in May 2019.

An additional five TEX-Pu experiments are currently undergoing benchmark evaluation by LLNL for the 2021 ICSBEP Handbook. These five configurations were like the baseline configurations but included a tantalum layer on top of each plutonium layer, providing a test of the tantalum cross sections in different energy regimes.



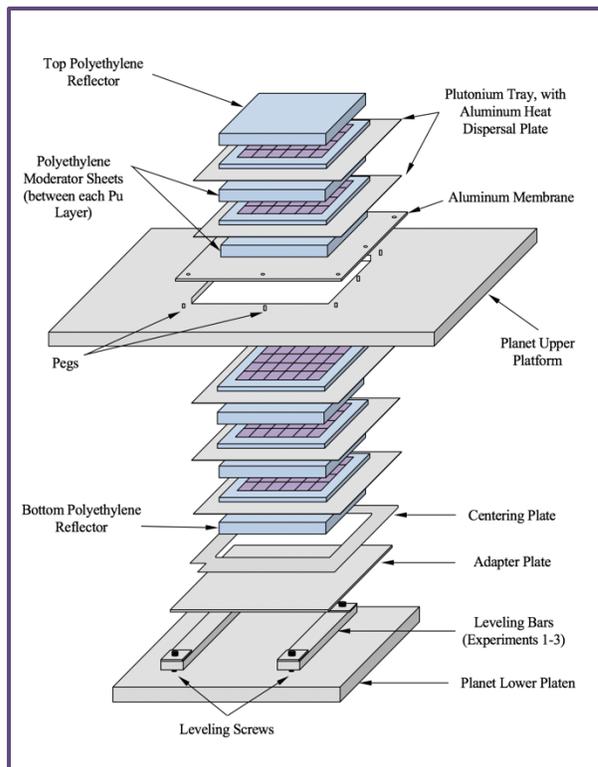
A copy of the ICSBEP Handbook can be obtained here: https://ncsp.llnl.gov/ipd_dvdform.php

INTEGRAL EXPERIMENTS (cont'd)

First TEX Benchmarks to be Included in the 2020 ICSBEP Handbook (cont'd)

Tantalum is a common material used in high temperature operations with fissile materials, and yet there are no experimental benchmarks for tantalum validation in the ICSBEP handbook. The three most intermediate experiments completed with tantalum showed large differences between prediction and experiment- an additional 2.5-7.5 kg more Pu than predicted was required to achieve criticality. This result points to an issue with the intermediate and fast underlying neutron scattering cross sections for tantalum.

Additional baseline experiments with different thicknesses of polyethylene are planned to investigate the overprediction in the intermediate energy range and to test thermal scattering laws developed by NCState with NCSP funding. Experiments with other diluents, such as iron and manganese absorbers, are also currently under design. A similar set of baseline experiments with HEU is currently being executed at NCERC, with the ICSBEP benchmark planned for 2022.



Schematic exploded view of the TEX plutonium experiments loaded on the planet machine, with all components labeled.



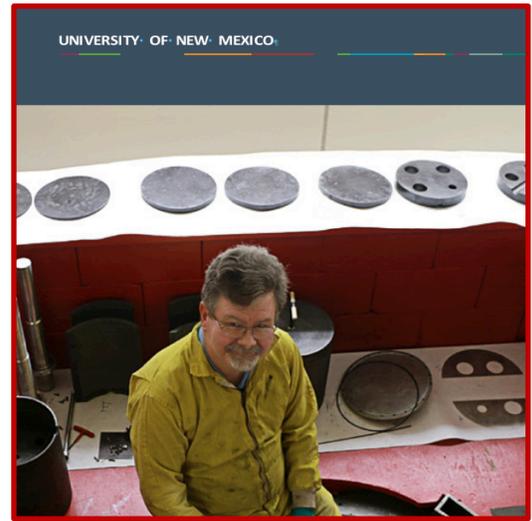
Planet machine loaded with plutonium TEX experiment, shown with the lower platen in the withdrawn position.

INTEGRAL EXPERIMENTS (cont'd)

Nuclear Criticality Benchmark Development and Safety Training

(Partnerships Annual Report • 2019)

Sandia and UNM conducted research in a number of collaboration focus areas within their Sandia Academic Alliance partnership including quantum information science, extreme environments, cyber physical security, autonomous systems, artificial intelligence/machine learning, nuclear engineering, nano/micro/optical devices, energy/water/materials, and HPC systems/algorithms.



“We wouldn’t have been able to do the radiological characterization without Sandia personnel and expertise. Without this information the benchmark would be incomplete.”

— Robert Busch
Emeritus Principal Lecturer,
Chief Reactor Supervisor
Department of Nuclear
Engineering
University of New Mexico

■
BWX Technologies
Senior Advisory Engineer
Larry Wetzel surrounded
by the disassembled
nuclear reactor parts.
Top shelf: fuel disks and
thermal fuse; Bottom
shelf: control rod guide
tubes, reflector plug
and liners, baffle plates,
core tank, and general
pieces.

Nuclear Criticality Benchmark Development and Safety Training

CHALLENGE

Current nuclear fuel uses a maximum of 5% enriched uranium. To better utilize uranium fuel and provide for smaller nuclear reactors, newer reactors are working with up to 20% enrichments, or U(20). However, there is very little documented experimental data available for the region between U(5) and U(20) to provide for the validation of computer models, so there is a need in the nuclear criticality safety (NCS) community to develop international benchmarks.

COLLABORATION

Sandia National Laboratories and the University of New Mexico (UNM) are partners in the SAA Program, an initiative Sandia has formed with five universities to promote collaborative research and attract top talent to work on tough problems. A new CRADA is allowing the partners to team up on projects to bolster national security and advance science and engineering.

For the first project under the new CRADA, Sandia and UNM worked together to characterize U(20). UNM has an AGN-201 research reactor which uses this enriched fuel. Sandia had the necessary isotopic measurement capabilities and was able to deploy this expertise to UNM. The team included individuals from UNM and Sandia, as well as from BWX Technologies, Inc, Sandia Field Office (NNSA/DOE), Oak Ridge National Laboratory (ORNL), and the [DOE Nuclear Criticality Safety Program](#).

SOLUTION

Physical measurements and radiological characterization of the U(20) fuel were done to provide information suitable for benchmarks and validation efforts with higher uranium enrichments. The work involved complete disassembly of the UNM nuclear reactor, radiation measurements of the removed nuclear fuel, and the reassembly of the reactor.

One benefit of the project was that Sandians were able to train UNM personnel on the instrumentation used to perform the measurements, and aid them in the acquisition of similar equipment for future projects.

IMPACT

Ultimately, results from the testing of UNM’s reactor will be used to support development of benchmarks for the [Nuclear Energy Agency’s International Handbook of Evaluated Criticality Safety Benchmark Experiments](#), which is used to validate nuclear data. The project results will also support a recently funded feasibility study for use of spare AGN-201 fuel plates as an NCS training tool at ORNL.

Sandia’s NCS program was also able to use this as a professional training and development activity for newly qualified and in-training individuals. Another result was that Sandia donated surplus radiation measurement equipment to UNM for future research and training activities. Looking ahead, the umbrella CRADA will be used for future collaborations between Sandia and UNM to tackle issues important to national security.

PARTNERSHIP TYPE: *Umbrella Cooperative Research and Development Agreement (CRADA) and Sandia Academic Alliance (SAA)*

GOAL: *Developing a high-fidelity benchmark experiment supporting the validation of software used in nuclear design and safety analysis*

UNIVERSITY PARTNERSHIP

The official report is entitled “Nondestructive and Supplemental Measurements of the UNM AGN-201M (ORNL/TM-2019/1410)”

NUCLEAR DATA

Workshop for Applied Nuclear Data Activities (WANDA)

The WANDA Workshop was recently held in March 2020 at the Elliott School of International Affairs at the George Washington University, in Washington, DC.



Group photo: Workshop for Applied Nuclear Data Activities, March 2020.

Dr. Mike Zerkle, Navel Nuclear Laboratory, presented an Overview of the NCSP Nuclear Data Program. His full presentation, along with the other presentations can be found at: <https://conferences.lbl.gov/event/292/>. Excerpts of Dr. Zerkle's presentation are shown below.

Overview of the NCSP Nuclear Data Program

- Objective:** Provide measured and evaluated thermal, resonance, unresolved resonance, and fast region cross section data to address the priority NCSP nuclear data needs
- Vision:** Addresses multiple Nuclear Data 5- and 10-year goals and attributes identified in the NCSP Vision
- Final product:** Rigorous ENDF/B evaluations produced from cross section measurements and analyses.
- Measurement work effort focused on NCSP priorities by NCSP Nuclear Data Advisory Group (NDAG)
- NCSP 5-year plan provides a listing of Nuclear Data measurement and evaluation priorities for the program

Milestone	Nuclear Data Measurements					
	Fast Region	Thermal	Resonance	Thermal	Thermal	Fast Region
Uranium (²³⁵ U)						
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Neutron (⁰ n)						
Thorium (²³² Th)						
Uranium (²³⁸ U)						
Plutonium (²⁴⁰ Pu)						
Neutron (⁰ n)						
Thorium (²³² Th)						
Uranium (²³⁸ U)						

NUCLEAR DATA (cont'd)

Progress on Zirconium Target Disc Processing and Resultant EDS Analyses

(ORNL, Point of Contact Klaus Guber)

In November 2019, the 5510 Isotope Material Processing Team provided an update for the R&D work done to realize a custom, zirconium target as a disc. Details are as follows:

- disc was cut out of the rolled material form using an EDM process at 7012. Photos that show the machine, machining cut in-process, finished disc, and remaining, parent material; intact are shown below. The specs. on the target disc are as follows:

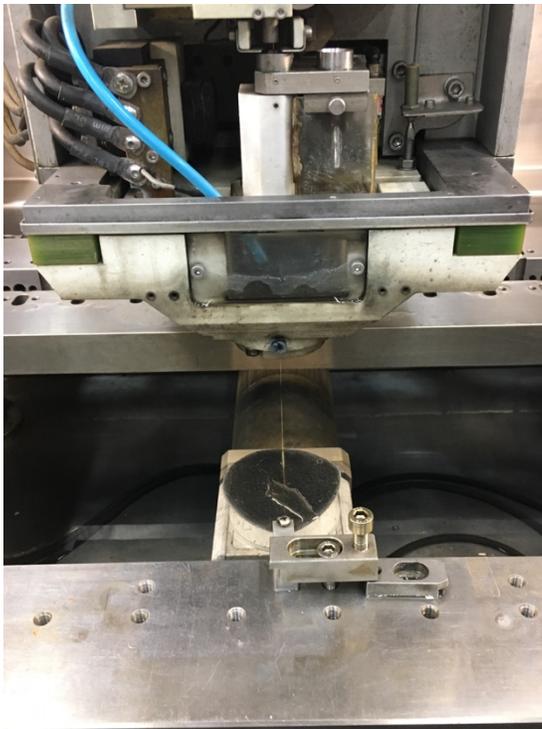
O Weight: 14.2559 gm

O Diameter: 60 mm; tolerance within 0.5 mm (-) of nominal spec. per several measurements

O Thickness profile: 0.9 mm (center zone) to 0.7 mm (perimeter zone) per several measurements

NOTE: Material loss is 0.2641 gm (264.1 mg).

- SEM/EDS analyses of the disc was performed to determine if any impurities (e.g., iron, chromium, nickel, copper, zinc) were transferred to the disc perimeter/edge cross-section profile as well as the center region on the front and back sides. Note that EDS is semi-quantitative – at best – and values reported at \leq 5% have a high level of uncertainty and, hence, typically ignored...better left for high resolution spectroscopy (e.g., ICP-MS).



EDM fabrication process.

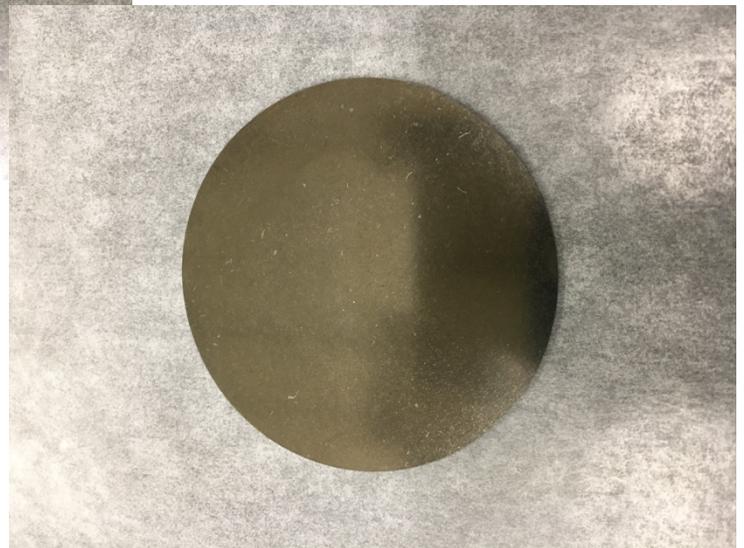
NUCLEAR DATA (cont'd)

Progress on Zirconium Target Disc Processing and Resultant EDS Analyses (cont'd)

- The results of the edge profiling indicate nickel and iron atomic percentages at approximately 15 and 5, respectively, while the cross-sectional data (obtained from analyzing the cross-section of a sample piece from the cut away zirconium mass) shows the copper concentration at ~6 percent. NOTE: The fabrication staff at 7012 cited that the discharge cutting filament ratio metrics are 63% copper and 37% zinc. At the depth of a score-mark on the cross-sectional piece (used as a referencing mark for subsequent analyses), the copper atomic concentration was significantly less; at ~3.5%.
- The source of these species would be from the S.S. rolling pack and the cathodic arc filament used in the EDM cutting process. Being that the aforementioned impurities are considered “surface contaminants” due to the limitation of EDS, they can be removed to trace (low ppm levels) through a combination of post-processing techniques such as brushing, sonification, and dissolution in a warm, diluted acid bath; that of nitric acid being a good candidate. Subsequently, the SEM/EDX analyses would be repeated to verify and document the post-purification impurity levels of the analytes of interest herein.
- Spot checks of the impurity levels at trace levels were performed on the acid dissolution treatment.
- The warm, diluted acid treatment, performed for over 1-h, reduced the final weight of the disc by 1.6 mg (to 14.2543 gm).



ZR cutout for disc.



Zr disc cut via EDM process.

TRAINING AND EDUCATION

NCSP Hands-on Training and Education Courses

Two-week Practitioner Course Dates:

Aug 10–21, 2020

Jan 25-Feb 5, 2021

Aug 9-20, 2021

The NCS Practitioners Courses were held at the National Atomic Testing Museum (NATM), the National Criticality Experiments Research Center (NCERC) and Sandia National Laboratories in Las Vegas, Nevada. The courses are designed to meet the ANSI/ANS-8.26, "Criticality Safety Engineer Training and Qualification Program," requirement for hands-on experimental training.

Then NATM portion of the course involves classroom lectures and workshops for NCS Evaluation development and the NCERC and SNL portions of the course involve experiments with the critical assemblies.

MSTS, LANL, ORNL, LLNL, SNL, Y12 and NFO staff participated in the course execution.

One-week Manager's Course Dates:

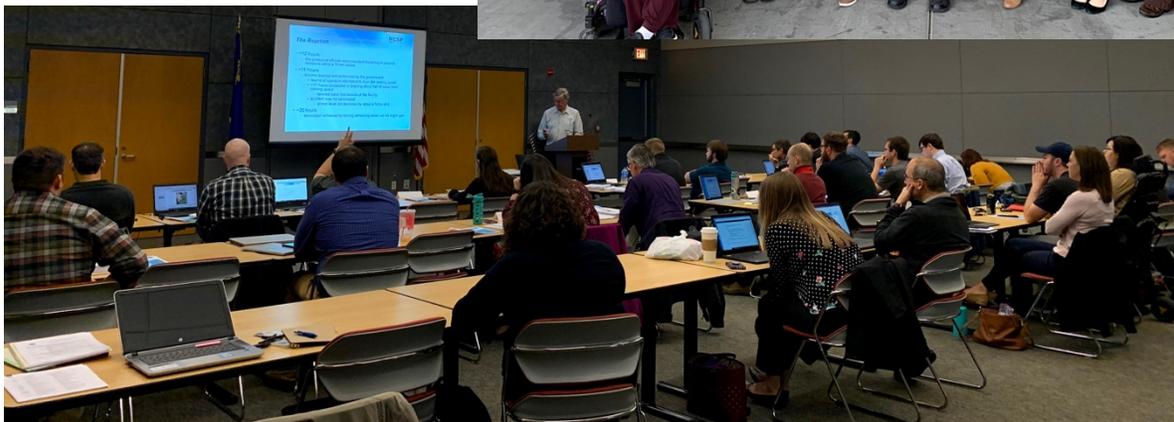
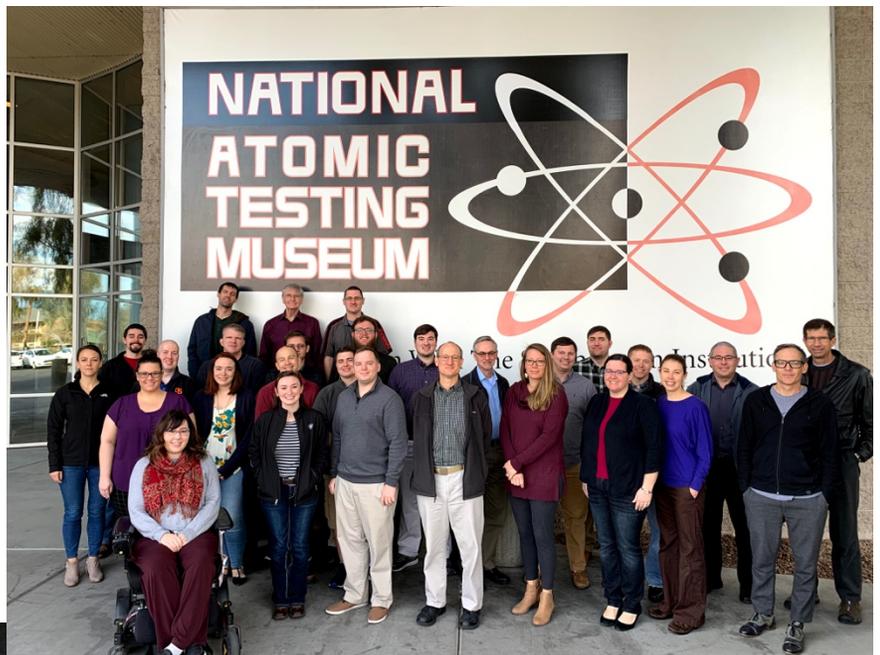
Apr 5-9, 2021

Jun 7-11, 2021

The Managers courses were held at both NCERC and SNL. THE courses are designed for fissile material handlers, process supervisors, line managers and regulators with criticality safety responsibilities.

MSTS, LANL, ORNL, LLNL, SNL, Y12 and NFO staff participated in the course execution.

Photos from the January 2020 2-week Hands-on Course at the National Atomic Testing Museum.



TRAINING AND EDUCATION (cont'd)



Class Information:

<https://mcnp.lanl.gov/classes/classinformation.shtml>

Fees and Registration Information:

<https://laws.lanl.gov/vhosts/mcnp.lanl.gov/classes/CostsRegistrationInfo.shtml>

MCNP6 Class Schedule for 2020

June 1-5, 2020 Los Alamos, NM	Introduction to MCNP6 *** CANCELLED *** Non-US citizens must register by 2020-03-05 Mon 10:00 - Fri 12:00
June 16-18, 2020 Los Alamos, NM	Using NJOY to Create MCNP ACE Files & Visualize Nuclear Data *** CANCELLED*** Non-US citizens must register by 2020-03-20 Tues 10:00 - Thurs 5:00
July 6-10, 2020 Los Alamos, NM	Introduction to MCNP6 Non-US citizens must register by 2020-04-10 Mon 10:00 - Fri 12:00
July 13-17, 2020 Los Alamos, NM	Unstructured Mesh with Attila4MC Non-US citizens must register by 2020-04-17 Mon 10:00 - Fri 4:30
July 20-24, 2020 Los Alamos, NM	Intermediate MCNP6 Non-US citizens must register by 2020-04-24 Mon 10:00 - Fri 12:00
July 27-31, 2020 Los Alamos, NM	Variance Reduction with MCNP6 Non-US citizens must register by 2020-05-01 Mon 10:00 - Fri 12:00
Aug 3-7, 2020 Los Alamos, NM	Criticality Calculations with MCNP6 Non-US citizens must register by 2020-05-08 Mon 10:00 - Fri 12:00
Sept 28 - Oct 2, 2020 Los Alamos, NM	Intermediate MCNP6 Non-US citizens must register by 2020-07-06 Mon 10:00 - Fri 12:00
Oct 5-9, 2020 Los Alamos, NM	Introduction to MCNP6 Non-US citizens must register by 2020-07-10 Mon 10:00 - Fri 12:00
Oct 26-30, 2020 Los Alamos, NM	Introduction to MCNP6 Non-US citizens must register by 2020-07-31 Mon 10:00 - Fri 12:00
Nov 2-6, 2020 Los Alamos, NM	Unstructured Mesh with Attila4MC Non-US citizens must register by 2020-08-07 Mon 10:00 - Fri 4:30

TRAINING AND EDUCATION (cont'd)



SCALE Users' Group Workshop

July 27 – 29, 2020

Presented Virtually from Oak Ridge National Laboratory

<https://scalemeetings.ornl.gov/>

Tentative Agenda

Day 1

- Morning Plenary
- Afternoon (concurrent tutorial and presentation sessions)
 - Introduction to SCALE Methodologies (2h)
 - Best SCALE model contest (2h)
 - Tutorials (2h each):
 - Frequent Fulcrum Functions: The Basics of SCALE's Graphical User Interface
 - Generation of SCALE Multigroup Libraries for Advanced Reactors using AMPX

Day 2

- Morning (concurrent tutorial and presentation sessions)
 - Best Practices for SCALE M&S (2h)
 - Tutorials (2h each):
 - LWR Depletion Analysis with Polaris
 - Advanced User Interface for Advanced Reactors
- Afternoon (concurrent tutorial and presentation sessions)
 - How I use SCALE for my work? (SCALE Open Mic) (2h)
 - Tutorials (2h each):
 - Crossing the Streams – Sampler and the Template Engine
 - Activation Analysis with ORIGEN/MAVRIC for Advanced Reactors

Day 3

- Morning (tutorials only)
 - Tutorials (2h each):
 - SCALE Utilities for Nuclear Data Interrogation, Comparison, and Visualization
 - Advanced Reactor Source Terms for Safeguards Application
- Afternoon
 - Closing session (2h)

TRAINING AND EDUCATION (cont'd)



SCALE Course Information:

<https://www.ornl.gov/scale/scale-training>

Registration will open soon.

Course Dates and Descriptions

The next training block at Oak Ridge National Laboratory will be held October 5 - 30, 2020. Registration will open soon. Registration fee information is found [here](#).

October 5 - 9, 2020 (Mon - Thurs: 9am-6pm; Fri: 9am-1pm)

SCALE Criticality Safety Calculations

October 12 - 16, 2020 (Mon - Thurs: 9am-6pm; Fri: 9am-1pm)

TRITON Lattice Physics and Depletion

October 19 - 23, 2020 (Mon - Thurs: 9am-6pm; Fri: 9am-1pm)

ORIGEN Standalone Fuel Depletion, Activation, and Source Term Analysis

October 26 - 30, 2020 (Mon - Thurs: 9am-6pm; Fri: 9am-1pm)

Nuclear Data Fundamentals and AMPX Libraries Generation

TRAINING AND EDUCATION (cont'd)



NCS Manager's Workshop

The information presented at the Manager's workshop is designed for those people with oversight responsibility for criticality safety but not direct supervision of the criticality safety process. These may be managers who are in charge of all safety (fire, OSHA, crit, etc.) for a plant, or the plant manager. Anyone who needs to know what is involved in criticality safety and how it will affect their responsibilities should take this course. It is expected that they will leave the course with a better understanding of the criticality engineer's perspective of k-effective, validation, uncertainty, double contingency, rules, standards, and regulations. They will also understand the risks and the probability of a criticality accident; what is contained in a process analysis, and what is expected of management and supervisors in formulating and implementing a criticality safety program.

Offered: July 07-09, 2020

Enrollment: 12 attendees

Registration Deadline: June 12, 2020

Course Fee: \$1,400.00 includes lunches

Course location: Farris Engineering Center • Conference Room • UNM

[View tentative schedule](#)

Course Cancellation Policy:

Prior to the course deadline: registration fee less \$50 will be refunded

After the course deadline: registration fee less \$250 will be refunded

NCS Short Course

The purpose of the short course is to provide an overview of the theory and practice of nuclear criticality safety. The course content is directed toward the individual with less than two years experience in the field. However, one who is experienced in a particular aspect of the field may find the overview to be of value. Topics include, but are not limited to: Fundamentals of NCS, Nuclear Physics, Neutron Chain Physics, Administrative Controls, Double Contingency and Elements of a Criticality Safety Evaluation. Workshops on various topics scheduled throughout the week provide the attendee with practical applications for the subject matter. The program will be conducted by faculty drawn from universities, government, national laboratories, and industry.

Offered: July 13-17, 2020

Enrollment: 28 attendees

Registration Deadline: June 12, 2020

Course Fee: \$2,000.00 includes lunches & course dinner

Course Location: Farris Engineering Center • UNM

[View tentative schedule](#)

Course Cancellation Policy:

Prior to the course deadline: registration fee less \$50 will be refunded

After the course deadline: registration fee less \$250 will be refunded

Assessments & Crit Safety Eval Workshop

A three day workshop designed for criticality safety personnel with some experience doing assessments (evaluations) and some computer code experience (KENO, MCNP, MONK, DANTSYS). The participants will be divided into groups of three to four. Each group will be given an operation/process which is to be evaluated and for which limits and controls are to be determined. Each group will have a faculty observer/facilitator who will act as the "operations" representative. The group will be responsible for interviewing operations, identifying normal and off-normal conditions, parameters to be controlled, how the parameters will be controlled, limits, estimates of the k-effectives of different configurations, a summary of the assessment, and example postings and procedures. Each group will present their assessment to the faculty who will provide a critique of the results. The participants will have a chance to use handbooks, reports, manuals, and computer codes to evaluate the neutronics of the process and determine the sensitivity of k-effective to various parameters such as mass, concentration, reflection, etc. It would be helpful if attendees would bring a laptop with the software they want to run, i.e. SCALE, MCNP etc.

Offered: July 20-22, 2020

Enrollment: 9 attendees

Registration Deadline: June 22, 2020

Course Fee: \$1,400.00 includes lunches

Course location: Farris Engineering Center • Conference Room • UNM

[View tentative schedule](#)

Course Cancellation Policy:

Prior to the course deadline: registration fee less \$50 will be refunded

After the course deadline: registration fee less \$250 will be refunded

Additional details about the courses can be found here:

<https://ne.unm.edu/events/nuclear-criticality-safety/ncs-workshops%20and%20courses.html>

DOE NNSA Nondestructive Assay Program

New DOE NNSA NDA Program Managed and Funded by the NCSP

<https://nda.llnl.gov/>

In 2007, the DNSFB published recommendation 2007-1, *Safety-Related In Situ Nondestructive Assay of Radioactive Materials*. This spawned a DOE implementation plan in October 2007 to address the DNFSB concerns regarding holdup measurements of fissionable materials in stalled process equipment, ancillary equipment, and supporting facility infrastructure using *in situ* Nondestructive assay techniques. For the last several years, the Nuclear Safety Research and Development program championed and funded efforts to start on a DOE standard for administrative guidance on effective in situ nondestructive assay holdup measurements in support of Nuclear Criticality Safety (NCS). This standard is intended to provide guidance for sites implementing an NDA program to conduct holdup measurements to locate fissionable materials in process facilities to ensure NCS. This standard provides guidance until an administrative consensus standard NDA

practices for NCS can be developed (now in ballot with the ANS-8 Subcommittee). The new consensus ANSI standard, ANSI/ANS-8.28, Administrative Practices for the Use of Nondestructive Assay Measurements for Nuclear Criticality Safety, will be implemented in the DOE standard for use by DOE sites implementing the NDA programs to support NCS. Starting in fiscal year 2020, the NCSP took over the NDA program work from the NSRD program. The NCSP will now lead the development of a new NDA program for NCS and will finalize work on the DOE standard, NDA mission and vision, and a 5-year plan. Ultimately, the NDA program should stand on its own as an DOE program to ensure NDA practices, technologies, and capabilities are preserved to ensure NCS at DOE/NNSA sites. The NDA website will be used to share program information as it is developed.

DOE NNSA Nondestructive Assay Program

Home Nuclear Criticality Safety Program (NCSP) Website

Workshop on the Technical and Programmatic Needs for a Sustainable NDA Program for the US Department of Energy

Hosted at ORNL April 10 - 12, 2018

[Read Workshop Report](#)

Focus Areas

- Hardware/Software
- Algorithm Development
- Uncertainty Analysis
- Staffing, Personnel & Training
- Nuclear Materials
- Data Management
- Rules & Regulations
- Technical Standards & Best Practices

Latest News

- Workshop Presentation Files
- NDA Mission & Vision (coming soon)
- Five-year Plan (coming soon)
- NDA DOE Standard (coming soon)

Our Services

- Safety-Related In Situ Nondestructive Assay of Radioactive Materials - Recommendation 2007-1

Our Groups

- NDA Organization Chart (coming soon)
- Technical Support Group
 - Charter
 - Current Membership
 - Current Work (coming soon)

PUBLICATIONS - FY2020

INTERNAL REPORTS AND JOURNALS

Dave Heinrichs, Soon Kim, Ed Lent, David Griesheimer, Mike Zerkle, "Beff Benchmarks," LLNL-PRES-796197, November 4, 2019

Dorothea Wiarda, Andrew Holcomb, Friederike Bostelmann, "Current Status of AMPX", November 2019

William Wieselquist, Brad Rearden, "Recent Developments in SCALE", November 2019

W.J. Marshall, "Bias between ENDF/B-VIII.0 and ENDF/B-VII.1 for LEU Pin Array System"

Catherine Percher, Jesse Norris, "PU-MET-MIX-002: TEX Plutonium Baseline Assemblies: Plutonium/ Aluminum Metal Alloy Plates with Varying Thicknesses of Polyethylene Moderator and a Thin Polyethylene Reflector", LLNL-TR-785164-DRAFT, October 19, 2019

Dorothea Wiarda, "Issues in ENDF/B-VIII.0 GNDS Covariances", November, 2019

Dorothea Wiarda, Goran Arbanas, Andrew Holcomb, Marco Pigni, "Current Status of SAMMY", November 2019

Marco Pigni, "Updates to R-matrix Evaluations for Fissile Actinides: 233,235U, 239Pu", November 2019

Marco Pigni, "Status of the n+35Cl cross sections", November 2019 Updates to R-matrix Evaluations of Fissile Actinides: 233,235U, 239Pu"

Klaus Guber, ORNL, C. Paradela, S. Kopecky, J. Heyse, P. Schillebeeckx, ECJRC, "ORNL Neutron Cross Section Measurements for the US Nuclear Criticality Safety Program", November 2019

Jesse Brown, Y. Danon RPI, D. Barry, B. Epping, M. Rapp, Naval Nuclear Laboratory, "Differential Transmission Benchmark Method to Validate Resolved and Unresolved Resonance Parameter Evaluations", November 2019

Jesse Brown, Dorothea Wiarda, "Format proposal: R-external function", November 2019

Hands-On Training – Water Moderated Critical Experiments – Sandia National Laboratories, SAND2019-14993 TR, Sandia National Laboratories, 2019

DOE NNSA Nondestructive Assay Program, LLNL-WEB-765077, January 3, 2019.

D. E. Ames, Titanium and Aluminum Sleeve Experiments in fully Reflected Water-Moderated U(4.31)O₂ Fuel Rod Lattices With 2.8 cm Pitch, LEU-COMP-THERM-099, International Handbook of Evaluated Criticality Safety Benchmark Experiments, NEA/NSC/DOC(95)3, September, 2019

CONFERENCES AND JOURNALS

ANS Winter Meeting, Washington, DC

Isabelle Duhamel et al., "International Criticality Benchmark Comparison for Nuclear Data Validation," Transactions of the American Nuclear Society: 121, 873-876, November 2019

B.J. Marshall, "Energy-dependent Bias between ENDF/B-VII.1 and ENDF/BVIII.0 for LCT Benchmarks, ANS, November 2019

C. A. Manning, A. I. Hawari, "Development of Neural Thermal Scattering (NeTS) Modules for Reactor Physics Applications," Transactions of the American Nuclear Society: 121, 1351-1353, November 2019

D. E. Ames, "Sandia BUCCX Titanium and Aluminum Sleeve Experiments," ANS Winter Meeting and Expo, Washington DC, Nov. 2019

D. G. Bowen, N. W. Brown, "Verification of the ²³⁹Pu(NO₃)₄ Solution Fissile Concentration Subcritical Limit in ANSI/ANS-8.1-2014," Transactions of the American Nuclear Society, November 2019

PHYSOR-2020 Cambridge, UK

M. L. Zerkle, J. C. Holmes, and J. L. Wormald, " Re-evaluation of the TSL for Yttrium Hydride," PHYSOR-2020, Cambridge, UK, March 29-April 2, 2020

J. L. Wormald, M. L. Zerkle, and J. C. Holmes, " Generation of the TSL for Zirconium Hydrides from Ab Initio Methods," PHYSOR-2020, Cambridge, UK, March 29-April 2, 2020

J. C. Holmes, M. L. Zerkle, and A. I. Hawari, "Validation of Thermal Scattering Laws for Light Water at Elevated Temperatures with Diffusion Experiments," PHYSOR-2020, Cambridge, UK, March 29-April 2, 2020

D. G. Bowen and T. M. Greene, "Verification of Subcritical Limits in ANSI/ANS-8.1-2014," PHYSOR-2020, Cambridge, UK, March 29-April 2, 2020.

Shaw, F. Rahnama, A. Holcomb, D. G. Bowen, "ENDF/B-VIII.0 Cross Section Testing for Copper Nuclear Criticality Safety Applications", PHYSOR-2020, Cambridge, UK, March 29-April 2, 2020.

OTHER

B.J. Marshall, "Energy-dependent Bias between ENDF/B-VII.1 and ENDF/BVIII.0 for LCT Benchmarks, CSEWG, November 2019

M. T. Pigni et al, "ORNL Contribution to the Cross Section Evaluation Working Group," CSEWG, November 2019.

D. Wiards, W. J. Marshall, V. Sobes, F. Bostelmann, A. Holcomb, B. T. Rearden, "ENDF/B-VIII.0 Covariance Testing at Oak Ridge National Laboratory," CSEWG, November 2019.

D. Wiarda, A. M. Holcomb, G. Arbanas, F. Bostelmann, "AMPX Status," CSEWG, November 2019.

PUBLICATIONS - FY2019

INTERNAL REPORTS AND JOURNALS

J.L. Alwin, F.B. Brown, M.E. Rising, "Excluding Benchmark Statistical Outliers in Nuclear Criticality Safety Validation: A Comparison Study of Upper Subcritical Limits for Plutonium Systems using Whisper-1.1", LA-UR-18-27731

M.E. Rising, "MCNP6 Code Developments and CGMF/FREYA Integration and Validation", LA-UR-18-26533

C.J. Solomon, M.E. Rising, "(U) Modernization of the Monte Carlo N-Particle Transport Code", LA-CP-18-00110

S.R. Bolding, C.J. Josey, M.E. Rising, C.J. Solomon, J.S. Bull, "Release Testing for MCNP 6.2.1", LA-UR-18-30577

Jeremy Lloyd Conlin, "Development and Maintenance of NJOY (2018 Revision)

B. Merryman, F.B. Brown, J.L. Alwin, "Investigating Region-wise Sensitivities for Nuclear Criticality Safety Validation", LA-UR-18-31601

J.L. Alwin, F.B. Brown, M.E. Rising, "Verification of MCNP6.2 with ENDF/B-VIII.0 Nuclear Data for Nuclear Criticality Safety Applications", LA-UR-19-23348

F.B. Brown, "Doppler Broadening Resonance Correction for Free-gas Scattering in MCNP6.2", LA-UR-19-24824

J.L. Alwin, J.B. Spencer, "Critical Experiment Benchmark Results using UM and Mesh Quality Recommendations", LA-UR-19-26393

J.L. Alwin, J.B. Spencer, G. Failla, "Criticality Accident Alarm System (CAAS) CSG-UM Hybrid Example", LA-UR-19-27007

J.B. Spencer, J.L. Alwin, "Big Ten MCNP6 Unstructured Mesh Benchmark", LA-UR-19-25731

A. Sood, M.E. Rising, "MCNP Modernization Execution Plan for 2019", LA-CP-19-20317

A. Sood, M.E. Rising, "MCNP Modernization Plan", LA-CP-19-20318

CONFERENCES AND JOURNALS

ANS Winter Meeting, Orlando, FL

F.B. Brown, M.E. Rising, J.L. Alwin, "Verification of MCNP6.2 for Nuclear Criticality Safety Applications", presentation at 2018 ANS Winter Meeting, Orlando FL, LA-UR-18-30510

C.J. Josey, F.B. Brown, "Fitting Nuclear Data with Chebyshev Polynomials", presentation at 2018 ANS Winter Meeting, Orlando FL, LA-UR-18-30509

C.J. Josey, F.B. Brown, "Bias in Monte Carlo Alpha-Eigenvalue Calculations", presentation at 2018 ANS Winter Meeting, Orlando FL, LA-UR-18-30508

T.P. Burke, F.B. Brown, "Development of a Library for Computing Monte Carlo Tallies on Heterogeneous Systems", presentation at 2018 ANS Winter Meeting, Orlando FL, LA-UR-18-30498

D.H. Timmons, M.E. Rising, A.K. Prinja, "Evaluating the MCNP6.2 Correlated Fission Multiplicity Models for Criticality Calculations", presentation at 2018 ANS Winter Meeting, Orlando FL, LA-UR-18-30763

ANS Summer Meeting, Minneapolis MN

J.L. Alwin, F.B. Brown, "Excluding Benchmark Statistical Outliers in Nuclear Criticality Safety Validation: A Comparison Study of Upper Subcritical Limits for Highly Enriched Uranium Systems", submitted to ANS Annual Meeting 2019, Minneapolis MN, LA-UR-19-20048

B. Merryman, F.B. Brown, J.L. Alwin, C. Perfetti, "Investigating Region-wise Sensitivities for Nuclear Criticality Safety Validation", ANS 2019 Summer meeting, LA-UR-19-20297

J.L. Alwin, F.B. Brown, "Excluding Benchmark Statistical Outliers in Nuclear Criticality Safety Validation", for ANS Minneapolis, LA-UR-19-25267

J.L. Alwin, "Sharing of Good Industry Practices and/or Lessons Learned in Nuclear Criticality Safety: Using Sensitivity-Uncertainty Methods to Improve Traditional Validation", ANS Minneapolis, LA-UR-19-25296

J.A. Alwin, F.B. Brown, "Excluding Statistical Outliers in Nuclear Criticality Safety", submitted to ANS Annual Meeting 2019, Minneapolis MN, LA-UR-19-20084

ANS Winter Meeting, Washington, DC

F.B. Brown, "Automated Acceleration and Convergence Testing for Monte Carlo Nuclear Criticality Safety Calculations", for ANS Winter 2019, LA-UR-19-25527

Nuclear Data 2019, Beijing, China

P.A. Grechanuk, M.J. Grosskopf, W. Haeck, et al., "Can machine learning techniques help us to solve nuclear data problems?", Prepared for Nuclear Data 2019, Beijing, China LA-UR-18-30087

P.A. Grechanuk, M.J. Grosskopf, W. Haeck, et al., "Finding Outliers in Differential and Integral experiments using Machine Learning Techniques", Prepared for Nuclear Data 2019, Beijing, China LA-UR-18-30086

ORNL - Modernization of SAMMY: An R-matrix Bayesian Nuclear Data Evaluation Code, for the 2019 International Conference on Nuclear Data for Science and Technology, Beijing, China

PUBLICATIONS - FY2019 (cont'd)

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ICNC 2019 - 11th International conference on Nuclear Criticality Safety

J.L. Alwin, J.B. Spencer, G. Failla, "Criticality Accident Alarm System Analysis Using MCNP6.2 Constructive Solid Geometry/Unstructured Mesh Hybrid", LANL, ICNC 2019 - 11th International conference on Nuclear Criticality Safety, Sept. 15-19, 2019.

D. G. Bowen, "Current Status of the DOE/NNSA Nuclear Criticality Safety Program Hands-on Criticality Safety Training Courses," ORNL, ICNC 2019 - 11th International conference on Nuclear Criticality Safety, Sept. 15-19, 2019.

D. G. Bowen, "An Overview of the United States Department of Energy's Nuclear Criticality Safety Program and Future Challenges," ORNL, ICNC 2019 - 11th International conference on Nuclear Criticality Safety, Sept. 15-19, 2019.

D. G. Bowen, "Overview and Status of Domestic and International Standards for Nuclear Criticality Safety," ORNL, ICNC 2019 - 11th International conference on Nuclear Criticality Safety, Sept. 15-19, 2019.

F.B. Brown, C.J. Josey, S.Henderson, W.R. Martin, "Automated Acceleration and Convergence Testing for Monte Carlo NCS Calculations", LANL, ICNC 2019 - 11th International conference on Nuclear Criticality Safety, Sept. 15-19, 2019.

F.B. Brown, C.J. Josey, S. Henderson, W.R. Martin, "Automated Acceleration and Convergence Testing for Monte Carlo Nuclear Criticality Safety Calculations", LANL, ICNC 2019 - 11th International conference on Nuclear Criticality Safety, Sept. 15-19, 2019.

C.W. Chapman, M.T. Pigni, K. Guber, "Progress on ^{140,142}Ce Neutron Cross Section Resolved Resonance Region Evaluations," ORNL, ICNC 2019 - 11th International conference on Nuclear Criticality Safety, Sept. 15-19, 2019.

J. Clarity, T. Miller, W. Marshall, D. Mueller, "Detailed Design of an Epithermal/Intermediate Critical Experiment Using the Sandia National Laboratories Critical Facility," ORNL, ICNC 2019 - 11th International conference on Nuclear Criticality Safety, Sept. 15-19, 2019.

T. Cutler, J. Hutchinson, W. Meyers, R. Bahrn, "CURIE Experiment: An Experiment to Validate and Test Updated URR Information", LANL, ICNC 2019 - 11th International conference on Nuclear Criticality Safety, Sept. 15-19, 2019.

G.A. Harms, D. E. Ames, J. T. Ford, R. D. Campbell, "The Sandia Critical Experiments Program – What Are We Doing for You Now?," SNL, ICNC 2019 - 11th International conference on Nuclear Criticality Safety, Sept. 15-19, 2019.

D.K. Hayes, "Nuclear Criticality Safety Training at the National Criticality Experiment Research Center," LANL, ICNC 2019 - 11th International conference on Nuclear Criticality Safety, Sept. 15-19, 2019.

D.K. Hayes, "Nuclear Criticality Safety Beyond 2019 ," LANL, ICNC 2019 - 11th International conference on Nuclear Criticality Safety, Sept. 15-19, 2019.

C. A. Manring, A. I. Hawari, "Development and Implementation of an Improved Liquid TSL Treatment in the FLASSH Code", NCSU, ICNC 2019 - 11th International conference on Nuclear Criticality Safety, Sept. 15-19, 2019.

D. P. Heinrichs and S. S. Kim, "Results of a Newly Expanded COG Criticality Validation Suite", LLNL, ICNC 2019 - 11th International conference on Nuclear Criticality Safety, Sept. 15-19, 2019.

C.M. Percher, A.J. Nelson, W.J. Zywiec, S.S. Kim, D. P. Heinrichs, LLNL, "Thermal Epithermal Experiments (TEX): Test Bed Assemblies for Efficient Generation of Integral Benchmarks," ICNC 2019 - 11th International conference on Nuclear Criticality Safety, Sept. 15-19, 2019.

C. M. Percher, D. P. Heinrichs, S. Bates, D. Biswas, "Future Challenges in Re-Establishing a Solution Critical Capability in the United States", LLNL, ICNC 2019 - 11th International conference on Nuclear Criticality Safety, Sept. 15-19, 2019.

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