

BOOK58R

Notes:

"HFIR CE #5" on front

"HFIR CE 5 1970, 71" on spine

Blank pages: inside front cover sheets, 1-4, 6, 8, 10, 12, 14, 18, 24, 26, 38, 42, 44, 48, 56, 60, 66,
75-302, inside back cover sheets

-page 28 has graph glued to it

Scanned by:

Sheila Finch

RSICC /Oak Ridge National Lab.

August 17, 1999



PIONEERS SINCE 1831

Account Book

No. S 149

NO UNITS

Journal

Ledger, Single Entry . .

Ledger, Double Entry .

Record Ruled (27 Lines)

Made in 150, and 300 Pages

MADE IN U. S. A.

TO REORDER, SPECIFY NUMBER,
RULING AND THICKNESS INDICATED
ON BACKBONE OF THIS BOOK.

December 17, 1970

A.M. HFIR CE #5 Fuel Element transferred to South Assembly Area with all removable plates in core and with central target Cadmium Annulus and with Boron Poison Strips equally spaced around the core. Removable plate locations checked and found to be as specified informally. (Drawing has to be revised to reflect the as built condition)

Inner		Outer					
Slot	Plate	Slot	Plate	Slot	Plate	Slot	Plate
1	IE-14-A	1	OE-5-S	131	OE-10-H	259	OE-3-J
13	11-A	31	17-W	155	9-U	271	18-P
37	7-A	44	19-S	173	4-G	305	8-Q
72	15-A	62	24-U	185	14-U	315	11-R
97	16-A	78	15-U	207	1-W	337	6-W
121	12-A	87	1-K	218	5-H	351	20-X
146	10-H	122	17-M	231	16-J		

all but last four outer element fuel-plates to be sent to X-10.
(TM Sims.)

(EBS found no multiplication with central target Cadmium Annulus in place. Core alone $\sim +0.6$ β when flooded.)
Cadmium outside core worth $\sim 1/5$, no hazard to fill element core.
At approx 2.P.M., Fuel Element filled with H₂O for over nite leak check.

W. S. H.

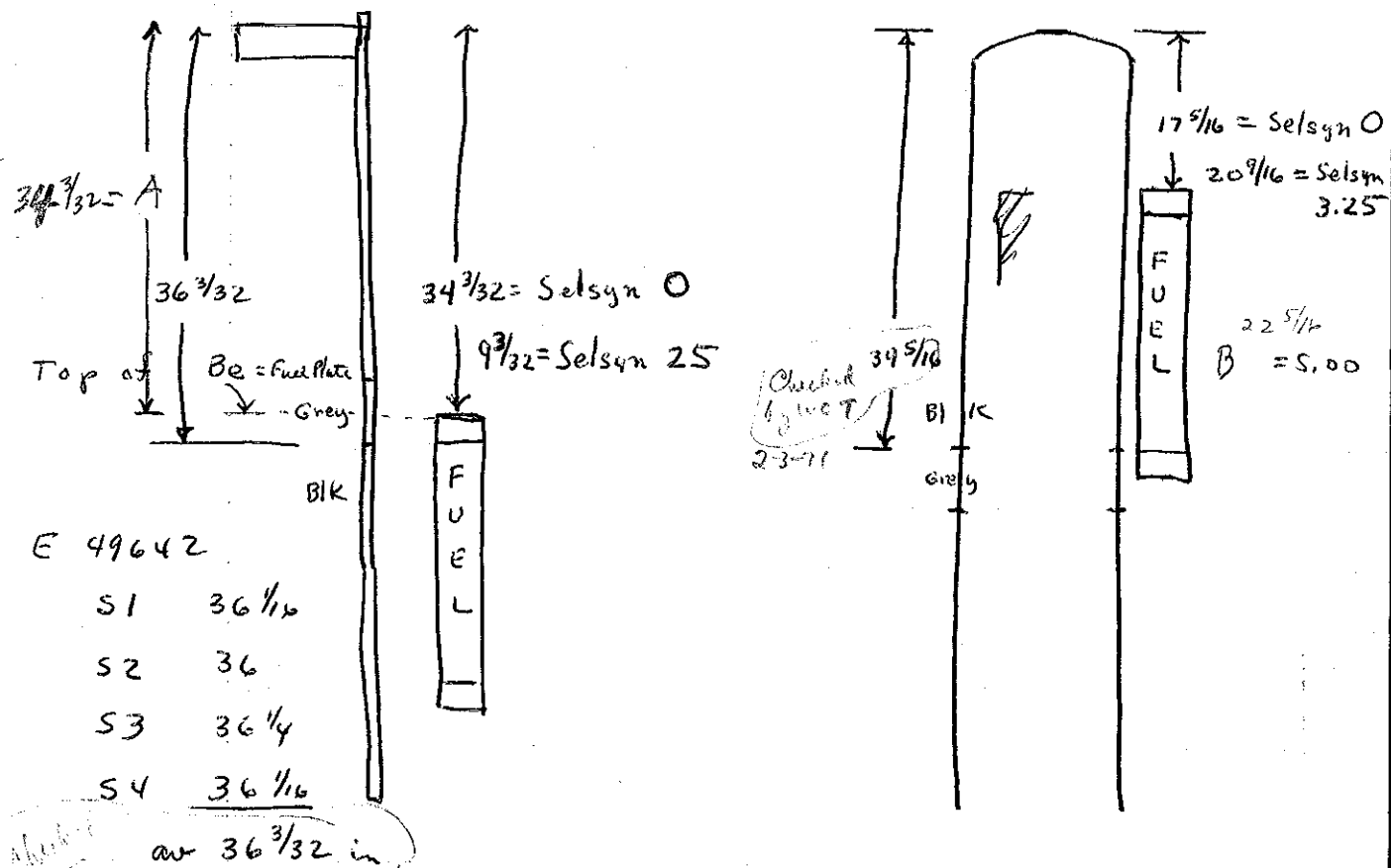
12/28/70 Final Measurements, taken between Fuel Element
and removable Beryllium Reflector Assembly. (Gap Dim.)
Vertical measurements from the top of the Removable
Beryllium Reflector Assembly.

Vertical Dist (in.)	GAP DIMENSION (IN.)			
	S	W	E	N
6	.876	.861	.866	.871
11	.877	.861	.864	.870
16	.874	.859	.862	.864
21	.870	.863	.872	.868
27	.865	.866	.870	.868
AVE.	.872	.862	.867	.868

Meas. made by C. Cross and M. Garrison
During ~~the~~ Dec 21, 22, 23.

DWJm

Jan 15, 71 Method for setting Selsyns



E 49642

S1	36 1/16
S2	36
S3	36 1/4
S4	36 1/16

Checked by WCT 2-3-71
 Meas. from DWG E-49642

Checked by WCT 2-3-71

Meas. from DWG E-49882

Inner Control set for 0 at Blk-Grey at top of fuel
 Outer Control set for 0 at Blk-Grey at bottom of fuel
 Set by DWG cc of ERR

Quadrant Ganged Rod goes Down - Sw up to increase React.
 Inner Safety Rod goes up - Sw up to increase React.
 Limiter Sw, direction of travel, selsyn readings checked
 DWG

1-15-71 Dropped Safety up to 14 in. without difficulty. Will set up testing balance - vs time by ERR WCT, DWG

January 28, 1971

to WCT & ERR

Timing tests were made on the inner cylinder, falling as a safety for distances of 6, 12, 18 and 24 in, with the water depth of 16 1/2 in. in Tank (Tap water). These tests show that the shock absorber does not decelerate the safety. Since the terminal velocity, probably due to hydraulic friction, is reached at 6 ft/sec a shock absorber is probably not necessary. (Letter WCT to D.W.M. dated Jan 28, 1971). ERR has these data in his files. ^{FPS-1006-A} Further tests will be made after the tanks are cleaned and distilled water is available to completely fill the system. SWW

On Jan 27, 71 polyethylene floats coated with blue ink were installed in manometer tubing for visual sight glasses (through the water window) for the moderator and reflector water systems. Control of the latter will be by total volume so that system cannot be overfilled. The moderator level will be indicated at the console using a liquid level device. Incorporating the float in the device should make its operation more reliable.

T. M. Sims, in response to questioning about air layers, water P.H., cleaning etc, reported back that the removable beryllium should not be subjected to any acid treatment and that the chlorine content of tap water was high.

to be tolerated. Therefore, this system will be rinsed with demineralized water and flushed out as best we can before filling with demineralized H_2O . Discussed with C. Cross the precautions necessary to prevent inadvertent filling of fuel element while connecting moderator pump system. Close Hand Valve and set air pressure to zero making feed valve and dump valve inoperative, former stays closed and latter stays open.

D.W.M.

Feb 2, 1971

Instrument Locations

10 mc Source Response

	IC-1	East Side outside Tank	$\sim 1.6 \times 10^{-9}$ a
RS-77N Detectors (in H ₂ O)	IC-2	North Side of Be inside Tank	$\sim 5 \times 10^{-10}$ a
	IC-3	South Side of Be inside Tank	$\sim 3 \times 10^{-10}$ a
	IC-4	West Side Outside Tank	$\sim 2 \times 10^{-9}$ a

	1	2	3	4	
	$.06 \times 10^{-12}$	$.61 \times 10^{-12}$	5×10^{-13}	1.5×10^{-12}	Source Out
	$\sim 1 \times 10^{-12}$	$.3 \times 10^{-12}$	1.7×10^{-12}	2×10^{-12}	Source In

2⁰⁴ Start pumping reflector water up to flood Be. Flood
OK
 (prior to running drop tests on Hede, inside ^{boots}
 to check for leaks from Reflector water to Be
 Air pressure still off feed system - hence any
 leakage will drain to top of feed moderator water vol.
 Stop after about six inches all for ERE to make
 connections for lig. level on Mod. Sys. and to make
 connections for drop tests.

2^{36 1/2} start pumping - again source inserted. -
 Inspected at midplane and at top of Be
 added a boot 6 in above Be. Safety was
 at ~ 15 in, ran to ~ 26 , (positioned at adj
 to core) Source Mult increased a bit.
 $12 \rightarrow 16 \times (3 \times 10^{-11})$ on IC-2 Beckman.
 Insert Control - Mult. decrease Safety OK
 OK for Drop Tests to proceed
 No leaks and no safety problems. NWM CC

Feb 3, 1971

ERR, WCT, DWM, CC, MG

With Reflector water up 6 in above 30

12, 18 and 24 in drop tests were made

With 3 quadrants raised full up, & Refl. water

12, 18 and 24 in drop tests were made

DWM

Feb 3, 1971

Check selwyn setting for outer control.

Dim A = 14.094 = 20.67

Changed selwyn to 20.00.

checked with Rule
 to top of inner = $28\frac{1}{2}$
 14.1
 8.916
 22.916 ± .1

Check inner selwyn setting for inner

DIM B = 22-5/16 @ 5.52

Change to 5.000

checked with Rule to top of fuel plate!

Vert Vernier was set on top of Beryllium, East side!

Double checked vernier with scale rule and double checked setting of vernier to the control rule

Inner Selwyn	Outer Selwyn	
0	0	Black section inserted
		Blk-Grey Interface at fuel edge
10	10	Black sections half withdrawn
		No window
15	15	Full Grey window in core
20	20	5 in grey 10 in wh. Window 5 in grey
25	25	20 in white window

WDM

Feb 3

OE-6W,

OE-4N

OE-2M

OE-11M

OE-9A

Plates added to core

4

Plates OE-8Q

OE-11R

OE-6W

OE-20X

were in core

Now 6 INNER SLOTS are empty

12 OUTER SLOTS are empty

Air lines reconnected to fuel system. CC.

Drain on Mod system to fill installed CC.

all systems go!

Feb 10, 1971

Summary of Drop Tests

A. 1-25-71 and 1-26-71

Reflector Water within 2 1/2 in of Fuel Element and Beryllium (Top of Stand Pipe)

1. Magnet Release Times

14-30 millisecc

2. Slowest Drop.

1 in in 0.147 sec

$$a = \frac{2s}{t^2} = 7.7 \text{ ft/sec}^2 \text{ or } 0.24 \text{ g}$$

3. 8 of the many drops were recorded

4 with Outer quadrants lowered for 6, 12, 18 and 24 in drops.

4 with 3 of the outer quadrants raised for 6, 12, 18 and 24 in drops.

B. 2-3-71 Reflector Water 6 in above Be.

1. Magnet Release time 14-21 millisecc.

2. Slowest Drop 1 in. in 0.162 sec

$$a = 6.35 \text{ ft/sec}^2 \text{ or } 0.20 \text{ g}$$

3. Six Drops were Recorded @ 12, 18, and 24 in.

C. Detail in Inst. File, South Control Rm 112

Quadr

Test/Check on Feb 3 Source 10mc ⁶⁰Co

HV.

Set = 7.25
Meter X 2.5

PM-1 1.5 ma 10 ma low Trip ~1.2 ma

Hi Alarm Trip

IC-1	3 x 10 ⁻¹⁰	Outer Trip	OK	Drop Test Trip	OK
IC-2	3 x 10 ⁻¹⁰	Outer Trip	OK		
IC-3		Calibration	OK	swgn	M 1
IC-4		Calibration	OK	swgn	N 2
IC-5		Outer Trip			T 3
					R O N

2:15 IC-1 fast trip not working, ERR repairing

ELAPSED TIME
 Clock 4720 hrs

Instrument Check on Feb 4 Source $10 \text{mc } ^{60}\text{Co}$

HV = 950	PM-1	Low Trip	OK	Hi Trip	OK	Trigger Safety
LO 1.3 ma	PM-2					
Hi 10 ma	IC-1	10×10^{-10}	Motor Trip	OK	Fast Trip	OK
Bat 8.05	IC-2	3×10^{-10}	Motor Trip	OK	M ①	OK
	IC-3	5×10^{-10}	Calibration	OK	N ②	OK
	IC-4	2×10^{-9}	Calibration	OK	I ③	OK
	CRM		Motor Trip		R	
					O	

EXP #1 for HIRCE #5.

8²⁶ Start Refl. H₂O into tank. Source inserted, response on all instruments

8⁴⁶ Refl. removed. Purpose
 Initial criticality and determine outer vs inner positions for criticality including symmetrica pos.
 N.B. At some value of Multiplication, inner control should be rechecked for negative worth vs motion.
 Outer gauged quadrant motion vs. worth should also be checked and double checked before achieving criticality. Flow rates also to be established. Zero on Lig. w/ Level Unknown.

8⁵⁵ Motion of both inner & outer quadrant (center down and down up) increase multiplication!

Installed recirculating mixing line on Moderator system. Safety Fully inserted.

	IN	OUT	By pass	Feed	Feed Rate	Drain Rate
940	2.78	99946	wide open	Open 1 R	0	
949	"	"	2 R	2 R	(10.31-2.07)/2	
1006	"	"	"	"	(16.61-10.31)/2	

No Multiplication Observance

	OUT	IN	Feed
	999.46	2.78	(16.61 → 19.09)/MIN
10 ¹⁵	"	"	(19.09 → 21.31)/MIN
10 ²⁰	"	"	(21.31 → 23.58)/MIN

Reading of 23.58 had some water above fuel plate change selsyn to read 22.08. ($\Delta = 1.5$ in)

(22.08 → 23.76)/

Essentially no multiplication, and essentially no flow at end!

Open Dump for ~~one~~ minute. 27 sec.
 $2376 \rightarrow 12.84 = 10.92 \text{ in} / 27 \text{ sec}$
 $> 20 \text{ in} / \text{MIN.}$

Dump Rate is greater than feed rate
 Feed rate to be changed by Closing Rec. Valve
 $\frac{1}{2}$ T — Recirc Bypass now @ $1\frac{1}{2}$ Rev open
 Feed now @ 2 Rev Open.

10³⁰ Leak Found on Feed Valve gasket to Power Operated
 Tightened bolts — no obvious leak.

Mod H₂O
 del. Rates $\left\{ \begin{array}{l} (12.86 \rightarrow 18.94) / 2 \text{ MIN} \sim 3 \text{ in} / \text{MIN} \\ 18.94 \rightarrow 21.43 / \text{MIN} \quad 2.5 \text{ in} / \text{MIN} \\ (21.43 \rightarrow 22.05) / 9 \text{ sec} \end{array} \right.$

Inspection showed water just barely above end of fuel plates. Selsyn zero OK
 to 24.4 in 2' 15"

Close Bypass-Recirc Valve 1T to 1 Rev Open!

1119 Start approach to criticality
 Inner Safety to 10.0 Slight change on IC-3
 Outer Quadrant to 10.0 " " " "

Remove Source - response noted on
 all four instruments IC-4, ^{on west} increased
 IC-1 2 & 3 decreased

	OUT	IN	IC-1 10×10^{-11}	2 3×10^{-11}	3 @ 6×10^{-13}	4 7×10^{-13}
11 20	11.00	11.00	.14	.13	6×10^{-13}	7×10^{-13}
21	12.04	12.06	.14	.14	8×10^{-13}	7×10^{-13}
23	13.01	13.00	.14	.15	1.3×10^{-12}	7×10^{-13}
26	14.00	14.00	.14	.23	3.5×10^{-12}	8×10^{-13}

Output bypass on IC-2 did not
 bypass scram circuit when changing
 ranges. Attempt to catch water by reset ^{Neptuni} ~~scram~~
 dump is faster than drainis thru feed!
 Replaced bypass switch on IC-2 ERR

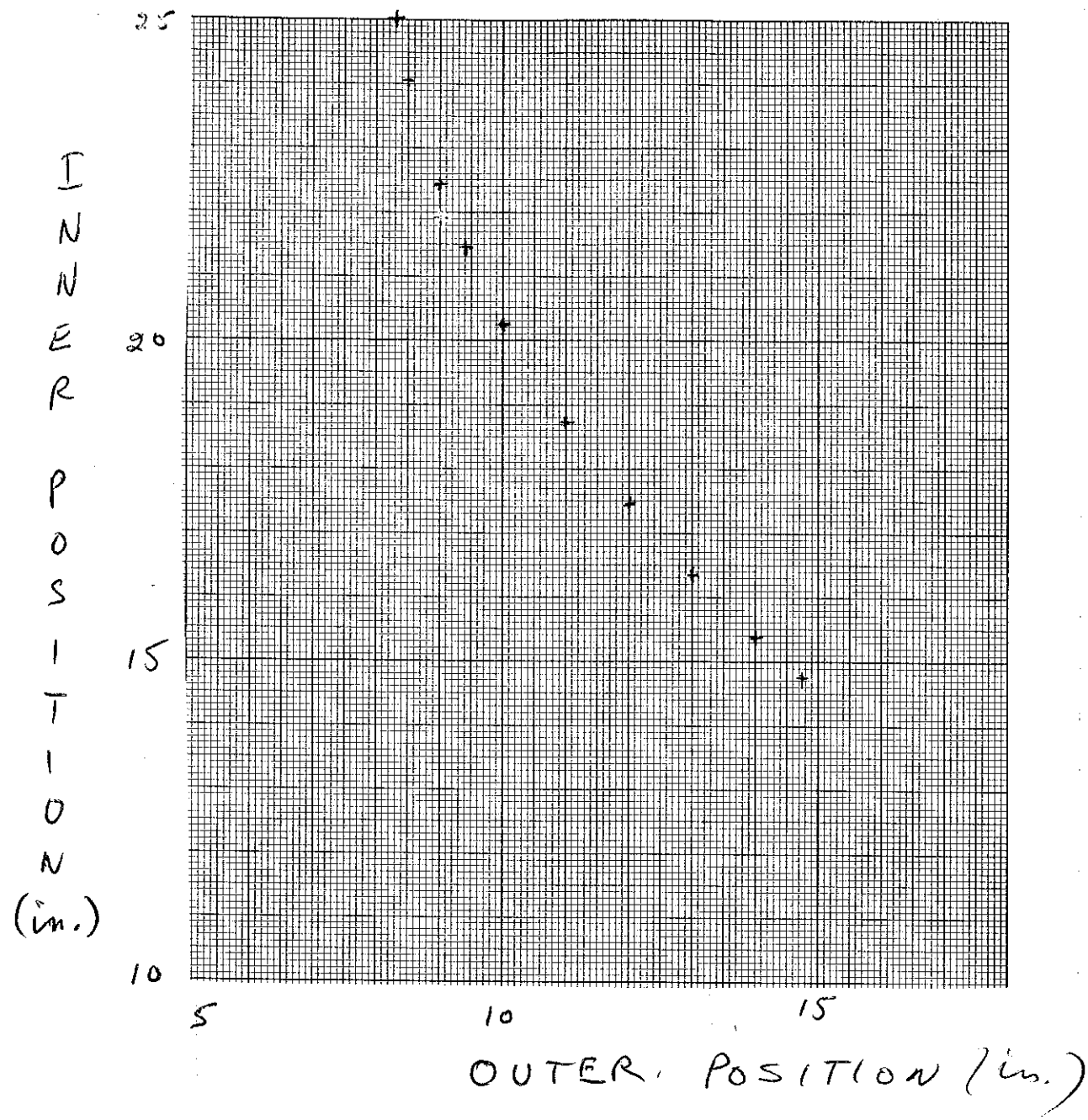
120 Start approach to criticality
EXP #2

14.00	2.78	.14	.135	3×10^{-13}	7×10^{-13}	
add mod. H ₂ O to ~26.05						
14.00	14.00	.14	.26	3.7×10^{-12}	8×10^{-13}	

Changed IC-2 to 3×10^{-10}

#140	14.50	14.50	.14	$.175 \times 3 \times 10^{-10}$	1.1×10^{-11}	1.1×10^{-12}
#143	14.75	14.75	.14	$.38 \times 3 \times 10^{-10}$	$7. \times 10^{-11}$	7.8×10^{-12}

Proceed to criticality



Outer Inner
 146 Source Out
 14.75 14.78 Super
 14.75 14.75 Sub

- ~2⁰⁰ PM Criticality @ 14.76 - 14.76
 Start moving inner ~~up~~ and outer down, rod comparison
- 2¹¹ Delayed Crit @ 14.00 - 15.38
 - 2¹⁷ " @ 13.00 - 16.34
 - 2²⁴ " @ 12.00 - 17.43
 - 2²⁹ " @ 11.00 - 18.70
 - 2³⁵ " @ 10.00 - 20.25
 - 2³⁹ " @ 9.40 - 21.44
 - 2⁴⁵ " @ 9.00 - 22.42
 - 2⁴⁹ " @ 8.50 - 24.06
 - 2⁵³ " @ 8.30 - 25.03

Shut down Insert Inner Safety
 Drain H₂O, Add 1 Repl. cc. RW

Estimated Power level for foil run
 is 10⁻⁹ a on IC-3 for 1/2 hour.

Estimation of Change in Reactivity of HFIR ^{235}U Fuel Elements
 Previous Critical Position for HFIR'S C.E.

	15.23	- 15.23	
	14.76	14.76	← A number of fuel plates are missing
	.47	.47	
Outer Sens.	x 1.48	x 1.60	Inner Sens.
	.70	.75	
	$\Delta k = 1.45$		
6 inner empty	$\approx .20$		
	1.25		
12 outer empty	.44		
	$\approx .81$		

Film	Foil No.	Plate	Slot	Location
16	235 U	DE-16G		Center of Foil 4 HMP
4	235	IE-15G		" " " "

Only 2 Foils Used for Preliminary Run To Determine Power Level for Foil Irradiation.

Added plates to all vacant slots

Instrument Check on 2-8-71 Source $10 \mu\text{m}^{60}\text{Co}$

PM-1	Low Trip	OK	High Trip	OK
PM-2			Fuel Trip	Safety Scrammed OK
IC-1	10×10^{-10}	Low Trip	OK	MONITOR
IC-2	3×10^{-10}	Low Trip	OK	
IC-3	2×10^{-9}	Low Trip	Down	
IC-4	6×10^{-10}	Low Trip	Down	
CRM		Meter Trip		① OK
				② OK
				③ OK

Down CE

Exp #3

Preliminary foil irradiation - 30 MIN with IC-3 = $1 \times 10^{-9} \text{a}$

- 2⁰⁹ Refl. H₂O Started.
- 2¹⁴ Source Inserted.
- 2²⁹ Reflector H₂O full —
Set Outer quadrant @ 14.75 Safety @ 2.78
- 2³⁰ Start adding Mod. H₂O 2³⁹ 26.27 in
- 2³⁹ Start withdraw Safety (Inner) to achieve Criticality
- 2⁴⁹ + Period 15.15 15.15 3.63 div/sec → 78.84
11.86 ϕ excess

	Outer	Inner	
Reactivity Change of Core			
Old Position	15.23	15.23	BRNL CP 66-8-31
New Position	15.09	15.080	
	.14	0.14	
	1.47	1.60	
	.22	.23	

At Power

1	.19	$\times 10 \times 10^{-11}$
2	.40	$\times 3 \times 10^{-9}$
3	.95	$\times 10^{-9}$
4	.41	$\times 10^{-10}$

EXP #3 (Cont)

- 3²¹ Start timing Log N II-3 @ 0.37×10^{-9}
 Foil EXposure & irradiation.
- 3²⁵ 15.09 - 15.085 delayed critical (slight sub)
 with target with all fuel plates in Element
- 3²⁰ ~~15.09~~ ~~15.09~~ = ~~length~~
- 3²¹ Shut down foil irradiation
 Drain Dump for 30 sec
- | | |
|-------------------------|---------|
| | 26.2 |
| | 15.7 |
| | ----- |
| | 10.5 in |
| | ----- |
| Drain Rate \sim 21 in | 30 sec |
| Min | |

\sim 10 MIN after Shutdown 10m Above Element

\sim 15 MIN after Shutdown IE- and OE Plates
 read less than 5m.
 Removed Foil

- 3³⁹ Drain Refl. H₂O
 System Shutdown

Differences in #5 from #3.

- Black Gray interfaces were located by X ray
 Inner Distance from End (A+C) $39 \frac{7}{16} \rightarrow 39 \frac{5}{16}$
 Outer Distance from Support end 36 $\rightarrow 36 \frac{3}{32}$ average
 \therefore 1966 crit Positions

Outer $15.23 + .09 = 15.31$

Inner $15.23 + .25 = 15.48$

- Target modified to include 6 experiment holes
 Tubes removed and Alum guide ^{of frame} added.
- Removable Beryllium with Experiment holes

4. Beryllium Diameter Changes

	Old	Old	New
al liner ID	18.750		18.860
OD	18.875		18.990

The above results in a larger water gap.

Instrument Check on 2-11-71 Source 10 mc ⁶⁰Co

PM-1	Low Trip	OK	Hi Alarm Trip	OK
PM-2			Alarm Trip	
IC-1	10×10^{-10}	Meter Trip	Screen Rod. ^{OK}	Fast Trip OK
IC-2	3×10^{-10}	Meter Trip	OK	Monitors
IC-3	5×10^{-10}	Calibration	ADN	(1) OK
IC-4	2×10^{-9}	Calibration	ADN	(2) OK
	Source Response	OK		(3) OK
	Control Exh Fan on	✓	Red Lt & Personnel Check	✓
			EXP #4	

Purpose: Irradiate Foils at higher power X50.

- Foil #1 HMP $1 \frac{3}{8}$ in from outer edge IE-15A Slot 1A
- Foil #15 HMP $1 \frac{3}{4}$ in from outer edge OE-1W Slot 1B
- IC-3 to $\sim 2 \times 10^{-9}$ IC-1 to $\sim 1 \times 10 \times 10^{-10}$ ^{at 15.31}
- IC-4 to $\sim 5 \times 10^{-8}$ IC-2 to $\sim 2 \times 3 \times 10^{-8}$

Set inner control at ~~2.78~~ 2.78 (fully inserted)

Set Outer quadrants at 15.09 Exh Fan on

Add Reflector Water.

Add Moderator Water to 26.10

No magnet power so that control cannot be lifted! Fuse Blown!
 Fuse Replaced by ERR. (12 replaced by 6/10 Δ)

145	multiplication on IC-2	43	4.3	diver pos.
148	on positive Period	15.16	15.16	$\rightarrow 51.9 \mu c$ <u>116.04</u>
150	posi " "	15.16	15.18	IC-3
153	start timing foil exp. at	18.5		(1.85×10^{-8})
	Level at 1			(5.0×10^{-8})
203 ²⁰	Shut down by failure of magnet power supply			

Drain Mod H₂O complete shutdown.

Drain Refl. H₂O Move Outer to 23.70 so covers can be put on.

Irradiation time was $7\frac{1}{2}$ Minutes on chart and by time recorded for entries in log. After repair, then a $22\frac{1}{2}$ minute further irradiation will complete the desired 30 minute irradiation.

IC-1 $.23 \times 3 \times 10^{-9}$
 2 $.51 \times 10 \times 10^{-8}$
 4 5×10^{-8}
 3 1.5×10^{-9}

Instrument Check on Feb 16, 71 Source STmc Co

PM-1	Low Trip	OK	(+) Alarm Trip	OK	
PM-2			Alarm Trip		
IC-1	10×10^{-10}	Meter Trip	OK	Fast Trip	OK
IC-2	3×10^{-10}	Meter Trip	Screened down		
IC-3	5×10^{-10}	Calibration	DWN	A	OK
IC-4	1×10^{-9}	Calibration	DWN	B	OK
CRM		Meter Trip		c	OK

Exp # 5 (Cont #4)

11⁰⁵ Start Refl H₂O - Found Tank valve closed - 11³³ Full

Set Outlet @ ~~14.76~~ 15.10 Inlet @ 2.78

Set Screen Bypass Panel Inlet Source OK Exh Fan On

11⁴² Reflector with moderator H₂O up to 25.97 OK.

11⁵⁰ On Pos Per 1 out In
 15.10 15.25

12¹² 15.10 15.12 Level

IC-1 $.24 \times 3 \times 10^{-9}$
 -2 $.55 \times 10 \times 10^{-8}$
 -3 1.9×10^{-9}
 -4 4.7×10^{-8}

Start Timing 11 54^{1/2} at IC-4 = 1.8×10^{-8}

Stop Timing 12 17 Shut down by drain in

H₂O and inserting Safety to 2.78 ~~Order to 23.70~~

Close Mod feed for Ref H₂O - Drain Refl H₂O.

Order to 23.55, Cover Tank.

PM-1	8rd 8.80	Low Trip	Scram Safety	HL	Trip	OK
PM-2				Alarm	Trip	
IC-1	10×10^{-10}	Water Trip	OK	Fast Trip	OK	
IC-2	3×10^{-10}	Meter	OK	Monitor		
IC-3	4×10^{-8}	Calibration	DWM	A	OK	
IC-4	1.6×10^{-9}	Calibration	DWM	B	OK	
CRM		Meter Trip		C	OK	

Ceiling Exh. Fan \checkmark Alarm Red Light Personnel CC down
 Source In & ^{Int} Pump \checkmark Alarm 9¹⁹ Mod H₂O to 26.10 CC
 Outer Control 15.10 Alarm Start Withdraw Source
 Inner Safety 2.78 L10936
 9¹⁰ AM Refl H₂O Full Alarm

Exp # 6

Purpose Foil Irradiation for 45 MIN @ Same level.

Foil 23	IE-14A	Slot 1A	@ HMP	Inside Edge
21	IE-15A	13A	"	"
22	IE-11A	37A	"	"
25	OE-5S	1B	Outside Edge	Bottom
24	OE-15U	31B	"	"
27	OE-10H	44B	"	"

Outer Inner

9²⁵ On Positive Period 15.10 15.18

9²⁹ IC-2 = $.20 \times 10^{-8}$ Start Timing

Level 15.10 15.06

1 2 3 4

$.24 \times 3 \times 10^{-9}$ $.55 \times 10 \times 10^{-8}$ 4.6×10^{-8} 1.4×10^{-9}

10¹⁴ Shut down (Insert inner & Drain)

Mar 4, 71 Sims, brought over be inserts for 4 RB holes ←

at 11⁰⁰ Bel
on PM → 9.35

9.40	PM-1	Low Trip	OK	Hi Alarm Trip	Scram Inner
	IC-1	10 x 10 ⁻¹⁰	Meter Trip	OK	Fast Trip
	IC-2	3 x 10 ⁻¹⁰	Meter Trip	OK	Monitor Alarm
	IC-3	5 x 10 ⁻¹⁰	Calibration	Swan	A OK
	IC-4	1.8 x 10 ⁻⁹	Calibration	Swan	B OK
	CRM		Meter Trip		C OK

NOTE Added FOUR BG INSERTS FOR EXP. HOLES

Exh. Fan + AP OK DWA Red Light Plus CC - DWA
 some inserted DWA RespK Scram Bypass On DWA
 Outer 15.10 Refl H₂O Filled DWA CC
 Inner 7.78 Mud H₂O 726.
 EXP #7 (FLUX EXP #1 for 70')

FOIL IRRADIATION - 1A	IE - 14A	65 foils
37A	IE - 15A	65 foils
1B	OE - 15U	65 foils
62B	OE - 10H	65 foils

Note: Feed Opened 1/4 T, now open 2 1/4 T
26.20 min / 7' 20" - Rate could be faster.

NOTE PM - Zero shifted changed balance to ~~5.00~~
to 7.75 for zero

10³⁶ Start withdraw inner control
 10⁴⁰ " " Source approx crit at low power
 42 On Positive Period 15.10 15.09

10 44 40 Start timing Irradiation
 Level Outer 15.03 Inner 15.00 +
 11⁰⁷ " " 15.03 " 15.01 -
 30 " " 15.03 " 15.01 -

1 .24 x 3 x 10⁻⁹
 2 1.54 x 10 x 10⁻⁸
 4 3.35 x 10⁻⁹
 3 4.3 x 10⁻⁸

11⁵⁵ Shut Down (Drain H₂O AND insert Safety
(70' on timer)

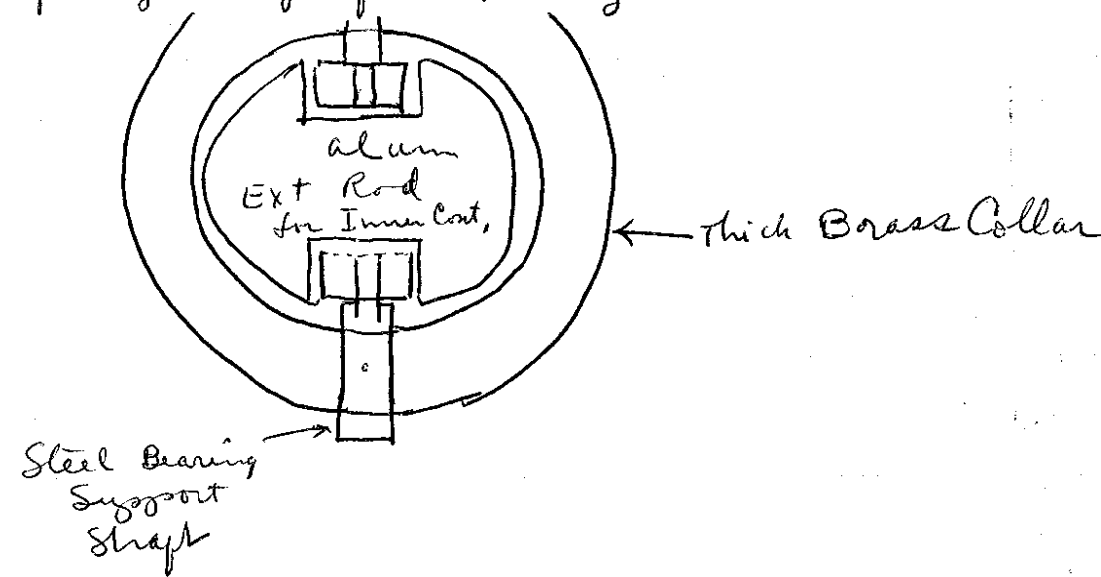
Mar 4, 1971

Dropped limit Switch not actuated
 Binding found in key guide for inner safety
 by Tunnel Garrison Cross & DWM.

28.84 Up Limit } without key
 2.78 Down Limit } no friction observed

Mar 12, 1971

Redesigned extension rod to have ball bearing rollers
 to keep large shaft from twisting



As control rod tends to twist ball bearing
 surface acts as a restrainer.

DWM

March 15, 1971

Set setpoint from 6.78 to 3.25 when
top edge of control set at $20\frac{9}{16}$ inches above
fuel plates in fuel element (see page 9)
Change of 3.53 in vs 3.625 in. on dwg
for added length to control extension rod.

The magnet support swivel bolt was also tightened
by M. Garrison $\frac{1}{4}$ to $\frac{1}{2}$ turn. If bolt is $\frac{3}{8}$ " by 16
62.5 mils per rev. or 15 to 31 mils change

M.G. DWR, C.C.

When lowered to limit - 2.78 in.

Raised to limit 25.32 in.

C.C. DWR

March 16, 1971

Performed drop test at $18" + 2.89 = 20.89$ setpoint reading
for comparison to previous drop time data. The new
arrangement falls faster! Details filed in FFS-1006-A.
Dropped control 2 additional times.

Rechecked inner control zero i.e. $20\frac{9}{16} = 3.25$ setpoint
for Reflector water pumped up. Added weight
has deflected system a negligible amount!

DWR, C.C.

Lower limit now 2.89 when down.

Safety could not be picked up by magnet.
 CC & DWM by hand ~~pushed~~ moved it a bit.
 then the magnet would pick it up!

Instrument Check on 3-23-71 Source ^{60}Co (10 mCi) 47

PM-1	Low Trip	OK	Alarm Trip	OK	
PM-2			Alarm Trip		
IC-1	10×10^{-10}	Meter Trip	OK	Fast Trip	OK
IC-2	3×10^{-10}	Meter Trip	Screamed	Red Monitor	
IC-3	H; Reaking Bkg	Calibration	OK	A	OK
IC-4	2×10^{-9}	Calibration	OK	B	OK
CRM		Meter Trip		C	OK

IC-2 & IC-3 Chamber now 2" from
 beryllium Reflector = Sens. reduced perhaps by X8
 Exh Fan on DWM Red Rite + Pers. CC down
 Source Inserted Scram Bypass CC set
 Outer 15.00 Refl H₂O Full
 Inner 3.08 Mod H₂O 24.22

Water Temp before Pumping 16°C

Water Temp after Draining _____

3 removable plates out of the core 2 Outer + 1 inner

Purpose: Experiment #8

Irradiate Preliminary Foil Packet for 45'

HMP Center of Inner Annular fuel plate
 Slot #1A.

11¹⁷ On positive period Source out

15.00 14.82 ± Period

11^{20:38} start timing Irradiation

27 Approx level 14.83 14.83

44 14.83 14.83

12⁰³ PM low level

triggered - inst screen

Irradiation of 43 min.
 OK.

IC-1	.30	3×10^{-9}
2	.46	3×10^{-8}
Bkg High	→ 3	$[1.2 \times 10^{-8}]$
or	4	1.9×10^{-9}
Chamber		(3.4×10^{-10})

Balance
@ 3.13

FM-1	Low Trip	Safety Scram	Alarm Trip	OK
FM-2			Alarm Trip	
FB-1	Meter Trip	OK	Fast Trip	OK
FB-2	Meter Trip	OK		
IC-3	Not Working	Calibration		A OK
IC-4	1.5×10^{-9}	Calibration	Down	B OK
CRM	Meter Trip			C OK

Experiment #9

Irradiate 3 foil packets on inner plate 14A
IC-3 repaired and bkg & response OK Slot 1

Ref H₂O Full Esh Fan ✓
Outer 14.83 Red Lite Pres Check ✓
Inner 2.89 73.07 Scram Bypass ✓
Mod H₂O 26.2 Source Inserted ✓
Magnet on ✓

1" Ont Period 14.84 14.95
1:16'40" start timing Irradiation.
1:28 14.84 14.84
2:01'40" Shutdown Insert Safety Drain Mod H₂O
Temp °

IC-1	$.32 \times 3 \times 10^{-9}$
2	$.45 \times 3 \times 10^{-8}$
3	7.8×10^{-9}
4	1.9×10^{-9}

$1.35 \times 80 = 10.80$

Start timing @ 0.8 ^{shell} or 8×10^{-10} amp. IC-4
Power level for run should be 45 on scale 3×10^{-8} for IC-2

PM Balance
3.70

	Source	
PM-1	Alarm Trip	
IC-1	Fast Trip	
IC-2		
IC-3		
IC-4		
CRM		

Instrument Check on Apr 1, 71 Source / one ^{60}Co

PM-1	Low Trip	OK	Hi Alarm Trip	OK	
PM-2			Alarm Trip		
IC-1	10×10^{-10}	Meter Trip	OK	Fast Trip	OK
IC-2	3×10^{-10}	Meter Trip	Scrammed	Radio Meter	
IC-3		Calibration		A	OK
IC-4		Calibration		B	OK
CRM		Meter Trip		C	OK

Experiment # 10

Refl H₂O Full Exh fan ON ✓
 Outer 15.00 Red lite Pers. Check ✓
 Inner 2.89 Scram By Pass ✓
 Mod H₂O 26.44 Source Inserted ✓

H₂O temp. 20.3 C

Foil Irradiation - 1A-IE-14-A
 13A-IE-15-A -
 1B-OE-15-U
 31B-OE-10-H

89³³

Start withdrawing safety
 Pos Per Outer 15.00 Inner 15.07

9⁴⁶

Start timing foil Exposure

9⁵⁵

Approx level 15.00 inner 14.97 (over)

9⁵⁸ ~~Outer~~ Outer 15.00 INNER 14.97 IC-1 $3.1 \times 3 \times 10^{-9}$
 IC-2 $4.5 \times 3 \times 10^{-8}$
 IC-3 9×10^{-9}
 IC-4 1.9×10^{-9}

10⁴⁶ Shut Down Drain H₂O AND insert Safety

12⁰⁵ ^{H₂O} temp. 21.9 C IN Storage TANK

Instrument Check on 4-13-71 Source 60Co (10 mc)

BD 4.60

PM-1	Low Trip	✓	HI Alarm Trip	✓
PM-2				
IC-1	10×10^{-10}	Water Trip	✓	Test Trip
IC-2	2×10^{-10}	Swam Safety	✓	Radiation Monitor
IC-3	4×10^{-10}	Drain	✓	A
IC-4	2×10^{-9}	Drain	✓	B
CRM	Motor Trip		✓	C

Clock Bypass Valve 1/4 Turn, Reaction 0.6'

Temp 21.7°C Before 22.4°C After Reflector H₂O

Ref. H ₂ O	Failed Swth	Exhaust	on
Mod. Drain	On	Reduct. Gas	✓
Control outlet	Drain	Bypass	✓
To be lifted	Mod H ₂ O	Source	✓
Before magnet			
unclassified			
	Fuel Hole	IE 14A	→ 5A, 1A
		IE 15A	13A
		OE 15U	1B
		OE 10H	31B

Purpose: Poil Irradiation with Control (Max Asymmetry with Drain no absorber and outer quadrants withdrawn to criticality.)

3" Safety withdrawn to 25.00
 Quadrants withdrawn to achieve crit.

3²⁰ Pos Period On 9.22 Drain 25.00

3^{25 40} Start timing @ $1.8 \times 3 \times 10^{-8}$

3³⁷ Approx Crit 9.06 25.00

4^{05 00} Shutdown with H₂O, insert Safety, withdraw quadrants @ 23.70 @ 25.00

Values start.

1	$3.4 \times 3 \times 10^{-9}$
2	$4.7 \times 3 \times 10^{-8}$
3	9×10^{-9}
4	2×10^{-9}

$\pi R^2 L = 3.1416 \times 30^2 \times 1 \times 16.387 = 46.33 \text{ l/inch}$
 Add 50 l of H₂O to Reflector H₂O. CC down

N.B. Newton Chamber on IC-4, previous developed high sky constant

Instrument Check on Apr 27 Source ⁶⁰Co 10mc

Bal 5.60	PM-1	Low Trip	Safety Screen	Hi Alarm Trip	OK
	PM-2			Alarm Trip	
Scale Noisy →	IC-1	10 x 10 ⁻¹⁰	Meter Trip	OK	Fast Trip OK
	IC-2	3 x 10 ⁻¹⁰	Meter Trip	OK	Monitor
	IC-3		Calibration	down	A OK
	IC-4		Calibration	down	B OK
	IC-5		Meter Trip		C OK

JL & DMM
 Bypass set down Set inner & outer at 280 & 0.01
 Red light Pers. JTL 2 outer quadrants disconnected
 Insert source down and withdrawn to 25.00.
 Inst Response OK Initial Temp Refl H₂O = 22.1 °C
 Δp exh Fan on OK down Add Mod Refl H₂O — Full — 1 in. ^{~5 in. at source}
 Initial Temp Refl H₂O = ~~22.6 °C~~

132 1/2 start withdrawing inner. Add Mod H₂O to 26.18 in.
 137 1/2 @ 25.00
 138 Start withdraw outer (2 quad only)

+ Period ~ 13.87

147	Start Timing Irradiation				
155	Approx level	13.325	Outer 2 quad	IC-1	275 x 3 x 10 ⁻⁹
		25.00	Inner 2 quad	-2	48 x 3 x 10 ⁻⁸
		25.00	Outer 2 quad	-3	1.05 x 10 ⁻⁸
			Inner Cylinder	-4	2.4 x 10 ⁻⁹

202 Level ~ 13.33

221 " ~ 13.328

247 Shut down — Drain Mod H₂O Inst Controls Inner + 2 quad
 Drain Refl H₂O. Close Valves on feed lines.

Note IC-4 gives somewhat higher reading than previously because of different ion chamber.

Instrument Check on ^{May 71} ~~April 4~~ Source ^{60Co (Com)}

PM-1	Low Trip	OK	Hi Alarm Trip	Scrammed
PM-2			Alarm Trip	
IC-1	10×10^{-10}	Meter Trip	OK	Fast Trip OK
IC-2	3×10^{-10}	Meter Trip	OK	Monitor
IC-3	5×10^{-10}	Calibration	DwM	A Trip
IC-4	1.7×10^{-9}	Calibration	DwM	B "
CRM		Meter Trip		C "

Experiment #13

CC of DwM

Set Quadrants BC & D at 0.0, fixed fully inserted and disconnected from drive, Quadrant A near Radial Beam HB-2,

Foil Plate Slot

IE-11A	13A
14A	72A
15A	146A
OE-5S	1B
15U	87B
10H	131B
5H	315B

Befr Temp 21.8°C
Afta 22.3°C

All outer plates were difficult to insert. Thickness of foil packets + tape puts pressure on plate tending to flatten and increase width. Insert quadrant A @ 3.08 @ 0.0

- 13³⁰ Start Refl H₂O - Refl Fuel @ 2⁰⁰ PM Exh Fan OK
- 2⁰¹ Start Refl H₂O - Mod @ 26.20^{20.5} PM Press .14 in.
- 2⁰⁵ Start withdraw Inner (Safety) to 25.00 @ 2⁰⁰ PM Red Light CC
- 2¹¹ Start withdraw Quad A Source On DwM
- 18³⁰ On Positive Period 20.00 Outer Inst Resp. Under Reset Types Magnet DwM

EXP #13 (cont)

2²³ Start Timing Irradiation
 2³⁹ Approx level Outer 19.43 1 Quad
 INNER Cylinder 25.00

- IC-1 - $.33 \times 3 \times 10^{-9}$
- 2 - $.5 \times 3 \times 10^{-8}$
- 3 - 1.6×10^{-8}
- 4 - 2×10^{-9}

3²³ Shut Down - Lower Safety AND Dump
 Mod H₂O. Insert Outer Quad to 0.0

Outer H₂O temp 12.3 °C

+ Period 2.08 div/sec → 45.2 sec → 17.53 φ
 $\Delta g = 17.53 \phi$
 $\Delta l = 20.00 - 19.43 = 0.57 \text{ in}$
 one quadrant
 3 quadrants fully inserted at 0.00
 inner at 25.00

5-12-71 Measured 34⁵/₈ from Top of Be to top of Control Curve Plate
 on Quadrant C (South).
 A (North) near B-2 and near removable Be piece.
 B (East)
 D (West)

Instrument Check on May 12 Source 10mc ⁶⁰Co

Bal @ 6⁴⁰

PM-1	Low Trip	OK	Hi Trip	OK
PM-2			Alarm Trip	
IC-1	10×10^{-10}	Meter Trip Scrammed	Fast Trip	OK
IC-2	3×10^{-10}	Meter Trip		
IC-3	5×10^{-10}	Calibration	Monitor	
IC-4	1×10^{-9}	Calibration	A	OK
ORM		Meter Trip	B	OK
			c	OK

EXPERIMENT #14

Foil Run #6

Quadrant C fully inserted (south quad)

Other controls must be symmetric

1¹² PM start adding Rpt H₂O Exh Fan + Δp OK
 1¹⁵ Set 3 quadrants (Outer) at 15.00, dump at 0.00 Source Sh. OK
 1²⁷ Start adding Mod H₂O Inst Resp. OK
 1³² Level @ 26.22 Personnel Chk OK OK
 1³² Start withdraw inner. [Inst T = 217 °C
 1⁴¹ Positive Period - Source Out. Fund T
 Out 16.14 In 16.22
 1⁴⁵ Start timing Irradiation @ $.18 \times 3 \times 10^{-8}$ on IC-2
 (Maintain level @ $.50 \times 3 \times 10^{-8}$)
 2¹⁵ Approx level 16.10 16.10 IC-1 $.31 \times 3 \times 10^{-9}$
 2¹⁰ " " 2 $.49 \times 3 \times 10^{-8}$
 2⁴⁵ PM Shut down drain Mod 3 1.2×10^{-8}
 insert safety inner 4 2.2×10^{-9}
 insert 3 quad to
 reconnect all four quadrants

Instrument Check on May 20 Source 10 mc ^{60Co}

Bal 6.80

FM-1	Low Trip	OK	Hi Alarm Trip	OK	
FM-2			Alarm Trip		
IC-1	1.0×10^{-10}	Water Trip	OK	Fast Trip	Screened OK
IC-2	3×10^{-10}	Water Trip	OK		Monitor
IC-3	4×10^{-10}	Calibration	OK		A OK
IC-4	10^{-9}	Calibration	OK		B OK
ORM		Water Trip			C OK

Experiment #15

Foil Irradiation #7

2 adj. quadrants fully inserted (C & D)

2 adj. " withdrawn to critical

Inner Cylinder #5 fully withdrawn to 25.00

Order of approach to critical ① Refl H₂O

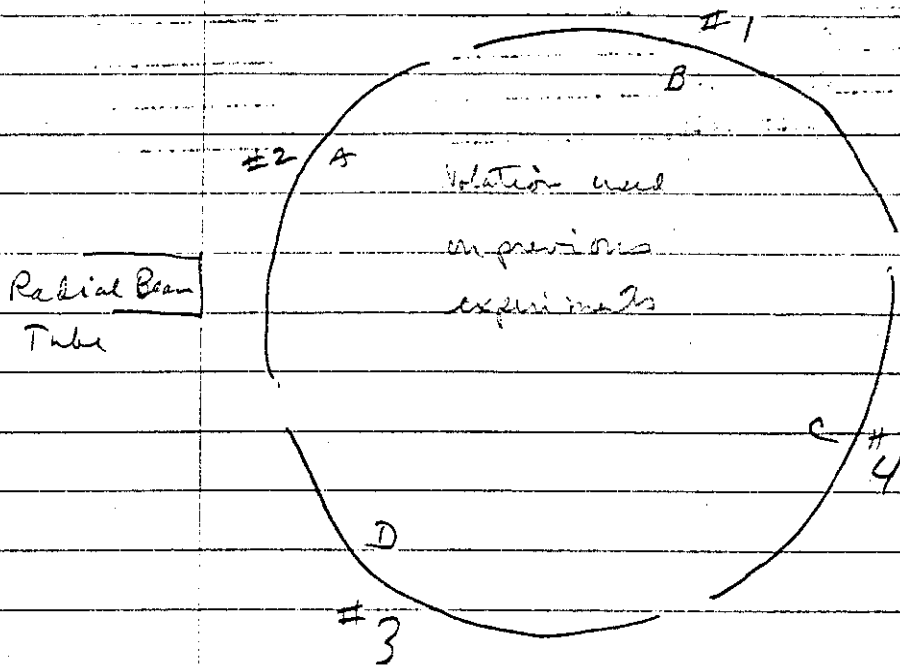
Out + Inner drive @ 0.0 ② Mod H₂O

③ Inner from 0.0 to 25.00

④ Outer (2 quad) from 0.0 to crit. crit expected 10-13 in.

Refl H ₂ O Full	Red Light + Pres	CC
Start Mod H ₂ O @ 139P → 26.67 @ 143	Ech Fan + ΔP	CC
143 Start Withdraw Safety - Inner 0.0	Source Direct	CC
149 @ 25.00 } 7.00 → 11.38 / 1 Min	Int Temp	22.9
149 Start Withdraw Outer (2 quad)	Final Temp	—
156 Pos Period 13.11		
Start Timing @ $.18 \times 3 \times 10^{-8}$ on FC-2	4 decades in 5.6 = $\frac{1.4 \text{ dec}}{\text{dec.}}$	
Approx. Crit 12.81	+30.6 sec	
2 ⁵⁶ Shut Down drain Mod H ₂ O	+22.4 φ / 0.30 in	
insert Safety	754 in	

Reactor Nomenclature for Quadrant Outer Control Rods.



N.B. Monitor B contacts do not trip easily. Set back to 10R/4R
 PM-1 seems in stable and had now up to 8.25 → 9.18.
 → 2.55
 -8.10
 -7.90
 -7.20

Instrument Check on May 27, 71 Source 10 mc ⁶⁰Co

Bal. 7.80	PM-1	Low Trip	OK	Hi Alarm Trip	OK
	PM-2			Alarm Trip	
	IC-1	Meter Trip	OK	Fast Trip	OK
	IC-2	Meter Trip	Screwed OK	Monitor	
	IC-3	5×10^{-10} Calibration	OK	A-OK	
	IC-4	2×10^{-9} Calibration	OK	10R B-OK	
	CRM	Meter Trip		C-OK	
				CC & DW	

Foil Pk #8 3 questions 14 & 3 inserted @ 0.0 Temp 22.5°C
 Inner + 1 good symmetric Experiment #16

- 1¹² start adding Refl H₂O 1" Full w/ 1" low Pers. & Lite OK
- 1²¹ Inner & Outer @ 0.0 DP + Eff Fan OK
- 1³¹ Insert Source, - Inst. Resp OK
- 1³² start add Mod H₂O 1³⁷ ~ 26.5

start withdraw inner and outer to Crit.

Observative Period Outer Inner

1⁵⁰ 21.83 22.30

1⁵³ 1⁵⁵ Start timing Irradiation

21.72 21.72

2⁰⁰ Approp level 21.69 21.69

2⁰⁵ Level 21.70 21.70

2⁵³ shut down

$$\frac{8.6 \text{ div} \cdot 2.65 \text{ div/sec}}{4} = 44.85 \text{ sec} \rightarrow +17.64$$

IC-1	$.34 \times 3 \times 10^{-9}$
2	$.5 \times 3 \times 10^{-8}$
3	1.6×10^{-8}
4	2×10^{-9}

Added ~ 25 gal of H₂O to Refl Tank ~~Array 2~~ June 3, 71.
 Quadrant #4 (C)

Instrument Check on June 3, 71 Source 10 mCi ⁶⁰Co

PM-1	Low Trip	Scan	Hi Trip	OK
PM-2				
IC-1	10 x 10 ⁻¹⁰	Upper Trip	OK	OK
IC-2	3 x 10 ⁻¹⁰	Upper Trip	OK	Monitor
IC-3	Response OK	Calibration	Swgn	A OK
IC-4	" "	Calibration	Swgn	B OK (10R)
CRM		Meter Trip		C OK

EXP #17
 Symmetrical Power Dist. Repeat Exp #7

100 PM Start adding Refl H₂O
 Set Outer controls to 15.0 Inner 2.89 Red Light - on (Erd on)
 Inset Source, Inst Resp. OK
 Inlet Temp 23.0 °C
 Exh Fan on Δp OK

IC-1 on 10 x 10⁻¹⁰, IC-2 on 10 x 10⁻¹⁰

120 PM Refl H₂O Full
 Set Bypass Panel -

121 PM Start adding Mod H₂O. 126 26.8

126 Start withdraw Inner.

135 On Positive Period 15.40⁺ 15.51⁺

138²⁰ Start Inrad (@.18)

157 approx level 15.39 15.39

238²⁰ shut down

Plate	Slot
IE-14A	in 1A
11A	in 37A
15A	in 72A
0E 54	in 1B
55	87B
9U	131B
10H	231B
15U	315B

IC-1	0.28 x 3 x 10 ⁻⁹
2	0.5 x 3 x 10 ⁻⁸
3	1.1 x 10 ⁻⁸
4	2.2 x 10 ⁻⁹

Experiment #18

Power Distribution with Quad #4 fixed at 19.40 in.

3 Quad + 2 in symmetric at critical

IE-15A in 72A slot	OE-15U in 305B
14A " 1A "	5S in 315B
11A " 146A "	10H in 337B
	5H in 1B
	9U in 131B

Instrument Check on _____ Source _____

FM-1 _____ Trip
 FM-2 _____
 IC-1 _____
 IC-2 _____
 IC-3 _____
 IC-4 _____
 CRM _____ Meter Trip

Instrument Check on June 9, 71 Source 10 Mc ⁶⁰Co.

Bal
7.80

FM-1	Low Trip	OK	Hi Alarm Trip	Scrammed
FM-2			Alarm Trip	
IC-1	Meter Trip	OK	Fast Trip	OK
IC-2	Meter Trip	OK		Monitor
IC-3	5×10^{-10}	Calibration	down	A OK
IC-4	2×10^{-9}	Calibration	down	B OK 10 eff
CRM	Meter Trip			C OK

Red Light & Pers. OK
 Fan Exp + DP OK
 Source On + Resp. OK
 Set 3 quad @ 15.0

A & B Chatter
 and don't latch
 at first

#18 (Cont)

12⁵¹ pm Start Refl H₂O Full
 1¹⁰ Start Mod H₂O 26.71 @ 1¹⁶
 1¹⁶ Start with Safety Jumper.
 1¹⁹ On Position Period 15.00 14.88 (dinner)
 1²⁷⁴² Start Timing Exposure @ 0.18 on IC-2 (3×10^{-8})
 2⁰⁰ Level. 14.82 14.82
 2²⁷⁴² shut Down

IC-1	$.265 \times 3 \times 10^{-9}$
2	$.51 \times 3 \times 10^{-8}$
3	2.2×10^{-9}
4	9.5×10^{-9}

EXP #19

Instrument Check on Jun 17, 71 Source ^{60}Co

(Bal 8.10) PM-1 Low Trip OK Hi Alarm Trip OK
 PM-2 Alarm Trip _____
 IC-1 Motor Trip Sealed Fast Trip OK
 IC-2 Motor Trip OK M. enthal
 IC-3 5×10^{-10} Calibration OK A OK
 IC-4 1.4×10^{-9} Calibration OK M. enthal B OK (16 R/hr)
 CRIS Motor Trip OK 10^{-8} C OK

Foil Irradiation # 11

SS + AL tubes in RB-1 & 5

Foil plates in

31B-0E-5H 1A - IE-15A
 44B-0E-10H 13A - IE-11A
 62B-0E-5S 146A - IE-14A
 78B-0E-9U
 122B-0E-15U

12³⁰⁺ Set Outer to 15.03 Down Dist. Temp 23.5°C
 Inert Source Down
 Sp OK Down
 Personnel Ch CC
 ϕ Red Light With
 Bypass Set CC

12⁵² pm Start filling Refl H₂O 1¹² pm Start adding Mod H₂O, 27.0°

1¹⁶ Start with draw Inner Outer Inner

12² On Positive Period 15.48 15.59

#19 (Cont.)

1:27³⁰ Start Timing Fil Irradiation
 1:30 Approx level @ 15.46 - 15.46
 1:48 Level @ 15.46 - 15.46
 2:27³⁰ Shut Down

IC-1 2.5×10^{-9}
 2 1.5×10^{-8}
 3 1×10^{-8}
 4 2×10^{-9}

Instrument Check on Jun 23 Source 10mc ⁶⁰Co.

Bpl
 8.45
 ↓
 8.05
 ↓
 8.25

PM-1	Low Trip	OK	Hi Alarm Trip	OK
PM-2			Alarm Trip	
IC-1	Water Trip	OK	Fast Trip	Scrammed
IC-2	Water Trip	OK		Monitor
IC-3	5×10^{-10}	Calibration		A OK
IC-4	2×10^{-9}	Calibration	Down	B OK
GEM	Water Trip			C OK

Set Outer Overhaul @ 15.10 Down
 " Inner Control @ 3.01 Down
 Set Bypass Panel Down
 Set Inst Range IC-11B x 15" Down
 Set Inst Range IC-23 x 15" Down
 Insert Source Response OK Down
 Extension DP 118 Down

Hot Temp 22.8°C CC

2:20 Start adding Refl. H₂O 2:40 Ref full.
 Red light on Personnel Check CC/DWA

POWER DIST. MEAS. WITH BLACK EXP in

RB-5 (50 mils of Cadmium wrapped around
 Al coil in SS thimbles)

IE-11A in 97A	OE-55 in 31B
14A " 37A	9U in 44B
15A " 13A	15U in 122B
	10H in 78B
	5H in 218B

2:40 PM Start add Mod H₂O 2:45 @ 26.5
 2:45 Start withdraw Inner Control,
 2:52 On positive period @ 15.55 Out. 15.56 Inner
 2:55²⁰ Start timing Irradiation.

#20 (Continued)

3⁰⁰ Approx Level 15.52 Outer 15.515 Inner
 3¹² Level 15.515 - 15.515
 3⁵⁵ ²⁰ Shut Down

IC-1 .29
~~3.2 x 10⁻⁹~~
 2 .5 x 3 x 10⁻⁸
 3 1 x 10⁻⁸
 4 2.8 x 10⁻⁹

N.B. Steps function in IC-1 output
 .33 → .29 unexplained
 IC-4 is noisy and unstable.

PM-1	Low Trip	OK	H ₂ O Alarm Trip	OK
PM-2			Alarm Trip	
IC-1	10 x 10 ⁻⁴ Meter Trip	OK	Fast Trip	Scanned
IC-2	2 x 10 ⁻¹⁰ Meter Trip	OK		Monitor
IC-3	Calibration	✓		R ok
IC-4	Calibration	✓		R ok
CRM	Meter Trip			C ok

Set Outer Quadrant at 15.50"
 " inner Control at 3.12"
 Set By Pass Panel c.c.
 Set int Ranges 20.1 3 x 10⁻¹¹ c.c.
 20.2 3 x 10⁻¹¹ c.c. (Red light ON)
 Emit Source Response OK c.c. (Per check c.c.)
 Exhaust Exhaust fan ON Pos Pres. c.c.

1⁰⁰ PM H₂O Temp 23.5° C c.c.
~~1²³~~ Start Adding Refl H₂O Refl full ~~26.41~~
 1²³ Start Adding Mod H₂O 1²⁹ Mod H₂O full 26.34
 Power Dist. Meas. with Black Expt in RB-3
 And RB-5 - (50 mils of Cad wrapped around
 Al Cyl in 55 thimble.)
 OE-55 - 122B
 IE-11-A - 121A OE-9U - 78B
 IE-14-A - 13A OE-10H - 185B
 IE-15-A - 37A OE-5H - 271B
 OE-15U - 218B

1³³ Pos Per INNER 15.74 Outer 15.56
 1⁴¹ Start timing Exposure
 1⁴⁴ Approx level INNER 15.585 Outer 15.585

2¹⁵ Level INNER 15.585 Outer 15.585

IC-1 $.29 \times 3 \times 10^{-9}$

IC-2 $.51 \times 3 \times 10^{-8}$

IC-3 1×10^{-8}

IC-4 1.8×10^{-9}

2⁴¹ Shut Down Dump Mod H₂O Lower Safety