BOOK 117R

Notes:
"CA-4" on front
"C.A. 4-" on spine

Blank pages: page opposite page 1, 1, 2, 138-300, page opposite page 300

pages 18, 19, 22, and 135 each have 2 graphs taped
pages 20, 21, 55, 115, 118, 124, and 134 each have 1 graph taped

Scanned by:
Sheila Finch
RSICC /Oak Ridge National Lab.
May 8, 2001

10-9-21

Y-NB-1634

Dept. 3405
Bldg. 9735
Date. Feb. 11, 1952

Dr. A. D. Callihan

C-3

Return To -

TECHNICAL INFORMATION CENTER
Y-12 PLANT
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
P. O. BOX P
OAK RIDGE, TENNESSEE

"This document consists of _____ pages.
No. _____ of _____ copies, Series _____"

7/20/51 Removed all Plexiglass from CA3-

C.A. 4 Expr. 1 Run 1
Sheet ____ Date 7/20 1951 Time ____ AM PM
Purpose To convert CA-3 to Graphite moderated assembly

MULTIPLICATION

Scaler	c/____min.	BG/ 5 min.	Mult.	1/M
1		439		
2		482		
3		315		

Mass 18.63 Kg.

Run 2
Filled rows 9, 11, 13 both halves. (With 4" graphite).

MULTIPLICATION

Scaler	c/ 5 min.	BG/ 5 min.	Mult.	1/M
1	633	439		0.69
2	723	482		0.67
3	379	315		0.83

Mass 21.79 Kg

9/3/51 → Moderation of CA-4 : $\frac{C}{U} = \frac{1\text{-}4\text{" graphite block}}{1\text{-}0.01\text{" U disc}} = \frac{7276}{\frac{8\times12}{18}} = 990$ ✓

where 7276 gm is weight of 8-4" x 2.876" x 2.876" blocks - 235

18 gm is weight of 1-0.01" U disc.

$\frac{C}{X} = 1070$ assuming 93.4% assay -

4

7/20/57

C.A. 4 Expr. 1 3

Sheet ____ Date 7/20 AM PM

Purpose same.

Loading change - Complete 39"x39" x 36"
Cube - U with 4" graphite spacing.

Scaler	Smw	Smi	1/M
1	818	439	0.537
2	1060	482	0.455
3	521	315	0.597

Mass 37.38 kg.

7/23-24. Completed 45"x45"x44" cube weight 21 cells fixed Rf strip Rods 17" slug. (These mean center of core).

7/24

C.A. 4 Expr. 1 Run 4

Sheet ____ Date 7/24 1951 Time ____ AM PM

Purpose Continue graphite - U assembly - U with 4" graphite spacers.

INSTRUMENT CHECK

Time 3:40 AM PM Source ____

	Channel A	B	C	D	E
Range	10/25 OK		10^{-11}	10^{-11}	1200 V
Source Dist.	-	-	4.5'	5'	2"
% F.S. Trip	OK	-	100/100	90%	70%

MULTIPLICATION

Scaler	c/ √ m.n.	DG/ √ min.	Mult.	1/M
1	4427	439		0.099
2	2691	482		0.179
3	1154	315		0.274

Mass 43.2 kg.

1/25 Loading change - ① ~~Interchange~~ Removed 17" slugs from center 7 feet half reactor to edge. ② Removed 6 - 3" from each corner thereby rounding corners. ③ added 4 X 21 quarter size slugs to reactor - divided between two tables -

C.A. 4 Expr. 1 Run ✓

Sheet ____ Date 7/21 195 1 Time ____ AM PM

Purpose Confirm V-C assembly -

INSTRUMENT CHECK

Time ____ AM PM Source ____

	Channel A	B	C	D	E
Range	OK	OK	10^{-10}	10^{-10}	1200V
Source Dist.	____	____	10"	12"	____
% F.S. Trip	____	____	100	95	____

MULTIPLICATION

Scaler	c/ ✓ min.	BG/ ✓ min.	Mult.	1/M
1	10203	439	____	0.0821
2	5834	482	____	0.086
3.	2544	315	____	0.124
	mass 44.17 lbs.			

Loading change: added 3" graphite reflector & fixed half.

7/25/51

MULTIPLICATION

Scaler c/ 5 min. BG/ 5 min. Mult. T/M

1	130×232+195 / 71	33600	439		
2	162×236+107	18200	852		
3	137×64 +44	8800	315		

CRITICAL POSITIONS

C.A. ~~X~~ 4 Expr. 1 Run 7

Table Pos. ~~04~~ .76 L X T R X

Control Rod	Channel	
A 999.999	A 36	10/1000
B	B .0043	
C 2.54	C 3.8	2×10^{-9}
D 999.985	D 3.0	10^{-9}
	E 0	

Tim Crit. 4:05 AM/PM Duration min.

I
.040 Tables
all Rods Out

II
.50 Table
A 2"
D&C out

III
.59 Table
Ain
D@ 9.66"
C out

IV
.68 Tables
A&D in
C@ 17.8"

V
.76 Tables
A&D in
C@ 2"

8

C.A. 4 Expr. 1 8

Sheet See Diagram Date 7/26/51 1:45 ~~AM~~ PM

Purpose

INSTRUMENT CHECK

Time 1:40 ~~AM~~ PM Source 173 & 175

	Channel A	B	C	D	E
Range			10^{-10}	5×10^{-10}	1200V
Source Dist.			10"	3"	2"
% F.S. Trip	OK	OK	100	95	100

Counter 1, 2 & 3 OK

See loading sheet (7-26-51)

CRITICAL POSITIONS

C.A. 4 Expr. 1 Run 8

Table Pos. 000.000 T 2282 B 3318

Control Rod		Channel	
1	99.990	A	38 100/25
2		B	.0005
G	24.230 (out)	C	$4.2 \times 2 \times 10^{-10}$
D	15.885	D	~~4.2~~ 5.6×10^{-10}
		E	0 1200V

Tim. Crit. 2:10 ~~AM~~ PM Duration 5 min.

Same as Run 8
W/6 reflectors
removed from
Q20, R14, S18
T17, U16, V15

CRITICAL POSITIONS

Cr. 4 Expr. 1 Run 9

Tube Pos. 000.000 T_L 2280 B_R 3322

Control Rod		Channel	
A 99.995		A 32	100/25
		B .00035	
C 7.328		C 2.6	2×10^{-10}
D 99.985		D 6.6	5×10^{-11}
		E 0	1200V

Tim Crit. 2:40 ~~AM~~ PM Duration 5 min.

Date 4/27/51 195 Chief

Recorder Downes Zimmerman Crew

INSTRUMENT CHECK

Source 173+175

Time 8:30 AM PM

	Channel A	B	C	D	E
	ok	ok	10^{-10}	10^{-10}	1200
Range			10	15	4"
Source Dist.			100+	90%	100+
% F.S. Trip	Counters 1+2+3 ok				

C.E. 4 Expr. 1 10

Sheet Date 7/27/51 8:30 AM

Purpose Try to get graphite cube reactor. Loading: 15X15 cells F-T, 5-19 in. 3" reflector Rows 4&20, E and U. Length 19+25" = 44"

CRITICAL DATA

C.A. 4 Expr. 1 Run 10

Table Pos. 00000 2286 — 3322

Control Rod	Channel
1 — 99.993	A 45 — 100/25
2 —	B .0005
3 11.015	C 2.6 $5 \cdot 10^{-10}$
4 — 99.985	D 6.6 10^{-10}
	E 2 — 1200V

Time Crit. 8:47 — 5 min.

8/22 - Load is 11 x 18 x 225 = 44.55 lbs. U

Date 7/31/51 195__ Chief ____

Recorder ____ Crew ____

To investigate critical position of rods as function of time at criticality

INSTRUMENT CHECK

Time 2:25 ~~A.M.~~ PM Source 1/2 3 5 1/2 5

	Channel A	B	C	D	E
~~Range~~			10^{-10}	10^{-10}	
Source Dist.		ok	ok	12"	15"
% F.S. Trip			100+	95	

2 of 3 ok

CRITICAL POSITIONS

Run 4 Expr. 2 Run 1A

T - 0.2615, B - 0.3322

Table Pos. 000.00 I T R

	Control Rod		Channel	
A	~~000.065~~ 10.040	(~~Ag~~)	A	47 10/20
B	000.065	(Ag)	B	0.001
C	000.00	(Ag)	C	
D	999.986	(Ag)	D	2x10 6 or 2x10^{-10}
			E	out of order

Time Crit. 2:59 ~~A.M.~~ PM Duration 30 min.

In foils 1/4" dia loaded in M_N-11-1-5 and M_N-13-1-2

12

Barometer –

7/3/51

TIME	ROD A position –	Counts fission chamber in one min.	Recorder D
2:59P	10.040" *	7	
3:06P	~~9.995~~ 9.975	266 X16	
3:07		267	~~8.7~~
:09	9.975	259+ 8	5.9 X2X 10^{-10}
:12	9.975	256	5.9
.16	9.975	262	5.9
:18	"	262	"
:21	"	254	6.0
:25	"	270	~~Recorder~~ cxd. 6.0.
:27	"	267	5.9
:29	"	263	6.0

Raise power to B = 0.1 Rod A at 7.785 = 184 sec period

E-A on fission chamber. # CRM. X10

			Recorder C
3:54	9.504	5.65 X20000	6.9 X5X10^{-8}
4:01	9.456	5.5	"
4:04	9.485	5.6	7.0
:13	9.515 (slightly sub)	5.5	cxd Zero 6.9 X5 X10^{-8}
17	9.465 (slightly Super)	5.58	6.9
	(9.495 slightly sub).		
4:14	Scram - (Shut down).		

* These rod settings probably too far out because source was not effectively removed

7/31/51 13

CRITICAL POSITIONS

C.A. 4 Expr. 2 Run 1B

Table Pos: Same as Run 1A L T R

Control Rod		Channel	
1	9.504	A	60 1000/200
B		B	0.10
C	Same as Run 1A	C	6.9 x5 x10^{-8}
D		D	8.1 With range at top
		E	out of order.

Tim Crit. 354 ~~AM~~ PM Duration 24 min.

Date 1 August 1951 Chief

~~Recorder~~ To check results of 7/31/51 Crew (Critical position of rods as function of time at critical)

INSTRUMENT ~~CHECK~~

Time 8 30 AM ~~PM~~ Source 173 & 175

	Channel A	B	C	D	E
Range			2x10^{-10}	5x10^{-10}	
Source Dist.	OK	OK	contact	8"	Out
% F.S. Trip	2 & 3 OK		100+	100+	

Foil loading - 1/4" dia In in M_N-11-1-5 and M_N-13-1-2

14 8/1/51 Scott
William
Callihan

CRITICAL POSITIONS

C.R. 4 Expr. 2 Run 2A

Table Pos. 000.00 .2605 — .3323

Control Rod	Channel
A 9.700	50 — 10/200
B ~~0.038~~ 0.038	.001
C 0.005	—
D ~~9.986~~ in	5.9 2×10^{-10}
	E —

Tie Crit. 9:04 AM ~~PM~~ Duration 25 min.

8-1-51

Source was completely removed (to room 109) to check rod positions.

9:30 AM increased power level from .001 to .1

Scram on C — at ~.0015 on B.

Re start-up

CRITICAL POSITIONS

C.A. 4 Expr. 2 Run 2B

Table Pos. 000.00 L 0.2602 T 0.2325 R

Control Rod	Channel
A 9.785 (10:24A) 9.764 (10:32A)	60 100 / 200
B 0.045 (dn).	0.10
C 0.002 (dn).	$7.0 \times 5 \times 10^{-8}$
D 9.985 (dn)	6.5 (range max).
	E Out of order

Tim Crit. 10:00 AM ~~PM~~ Duration 42 min.

Source in Rm 109.

EA on fission chamber
1 REM $0.51 \times 2 \times 10^{4}$

10.42A - Lowered power to 0.001 on B -
During period 10.32 - 10:42 no adjustment of rod position was necessary and axial instruments indicated constant level -

CRITICAL POSITIONS

CA 4 Expr. 2 Run 2C
Table Pos. Same as 2B (M14) T R

	Control Rod		Channel	
A	9.769 (at 11:28A)	A	50 10/200	EA on CRM + fission chamber 0.04 x 2000.
B		B	0.001+	
C	Same as 2C.	C	0.9 x 2x10^-9	
D		D	6.0 x 2x10^-10	
		E	Out of order.	

Tim Crit. 10:53 ~~PM~~ AM Duration 39 min.

Zimmerman
Downes
Scott
Carlson

3:15P. Added 3" graphite reflector to top of south side of core ic on fixed table - 15 pcs 3"x3"x25". To try to get more reactivity for calibration & danger coefficient measures. This reflector added to Row 3, F → T (inclusive)

8/1/51

CRITICAL POSITIONS

C.A. 4 Expr. 3 Run 1

Table Pos. 00.000 L 0.2605 T 0.3324

Control Rod		Channel	
A	20.06 (out)	A	40 10/100
B	20.08 (out)	B	0.0004
C	0.005 (dn)	C	3.6 x 2 x 10^{-10}
D	6.115	D	8.5 x 5 x 10^{11}
		E	—

Tim Crit. 3:40 ~~AM~~ PM Duration 3. min.

Removed 10 pcs of reflector Row 3, P → T (inc). and F → J (inc). Added 5 pc 3" reflector on movable table - inc to Row 3 K' → O' inc -

Now 5 pcs 3" Graphite reflector in center top five positions - ~~the~~ complete - 8 44" long.

CRITICAL POSITIONS

C.A. 4 Expr. 3 Run 2

Table Pos. 00.000 L 0.2598 T 0.3325 P

Control Rod		Channel	
A	20.06 (out)	A	25 10/25
B	15.45	B	off scale —
C	0.005 (dn)	C	1.7 x 5 x 10^{-11}
D	9.988 (dn).	D	5.0 x 10^{-11}
		E	—

Tim Crit. 4:13 ~~AM~~ PM Duration 3 min.

Date 8/2/51 195 Chief

Recorder Crew

INSTRUMENT CHECK

Time 10:00 AM Source 172+175

	Channel A	B	C	D	E
Range		~~10~~	10^{-10}	10^{-6}	
Source Dist.			10"	12"	
% F.S. Trip			ok	100	90%

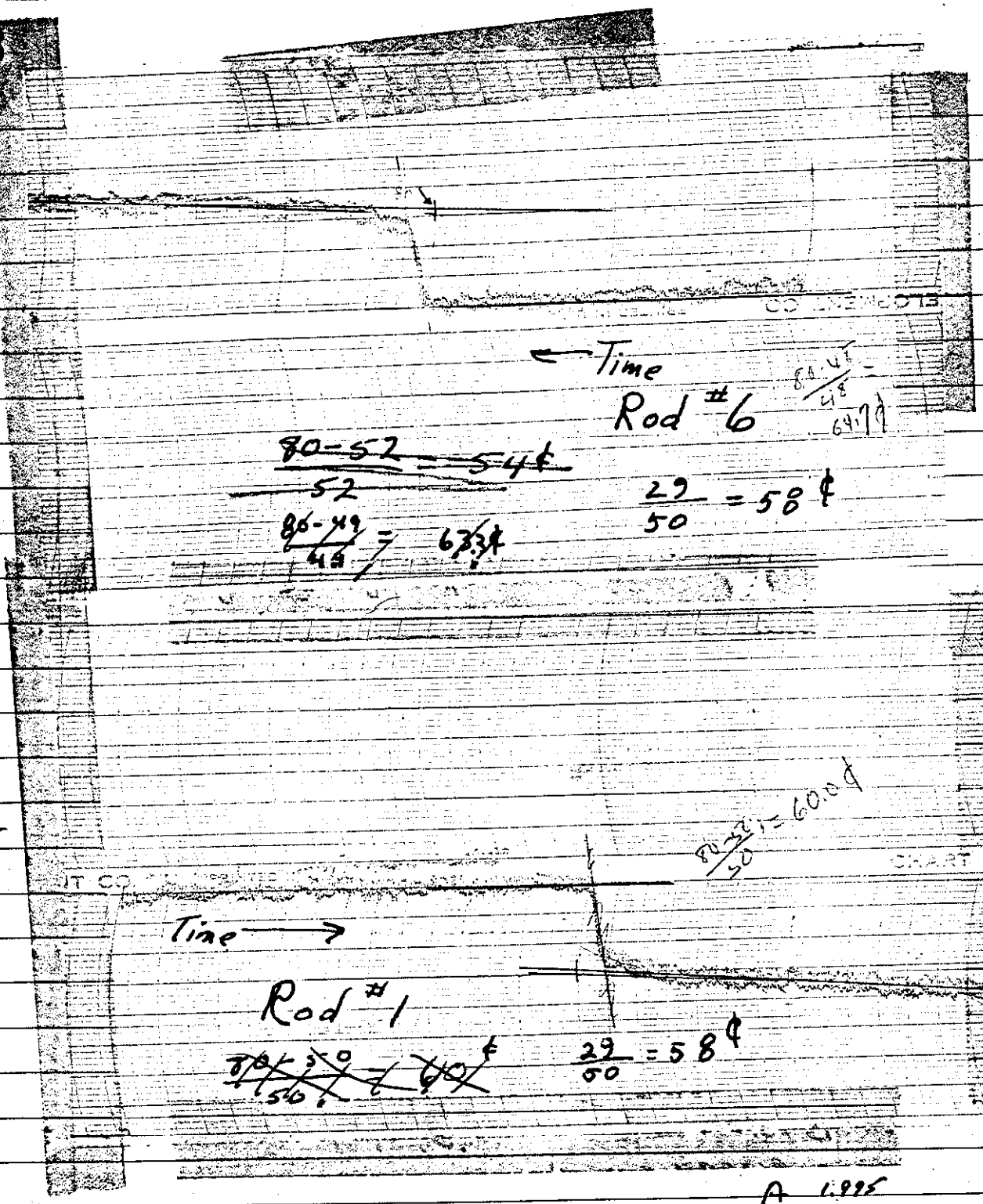
CRITICAL POSITIONS

C.A. 4 Expt. 3 Dup. 3

Table Pos. 000.000 T. 2592 B 3.321

Control Rod	Channel	
A 1.995"	50	100/200
B 13.055"	B .01	
C 24.228 (out)	C	
D 99.995" in	D 4.2	2×10^{-9}
	E	

Tim Crit. 10 55 AM PM Duration min.



A 1.995
B ?
C
D

Rod drop #6.
Brought reactor back to critical
Rod drop #1

CRITICAL POSITIONS

C/A 4 Expr 3 Run 4

Table Pos. 0000 2592 3328

Control Rod	Channel
1 2.020	A 50 — 100/200
2 13.015	B .01
3 24.230 out	C 4.7 5×10^{-7}
4 99.985 in	D 8.4 10^{-7}
	E —

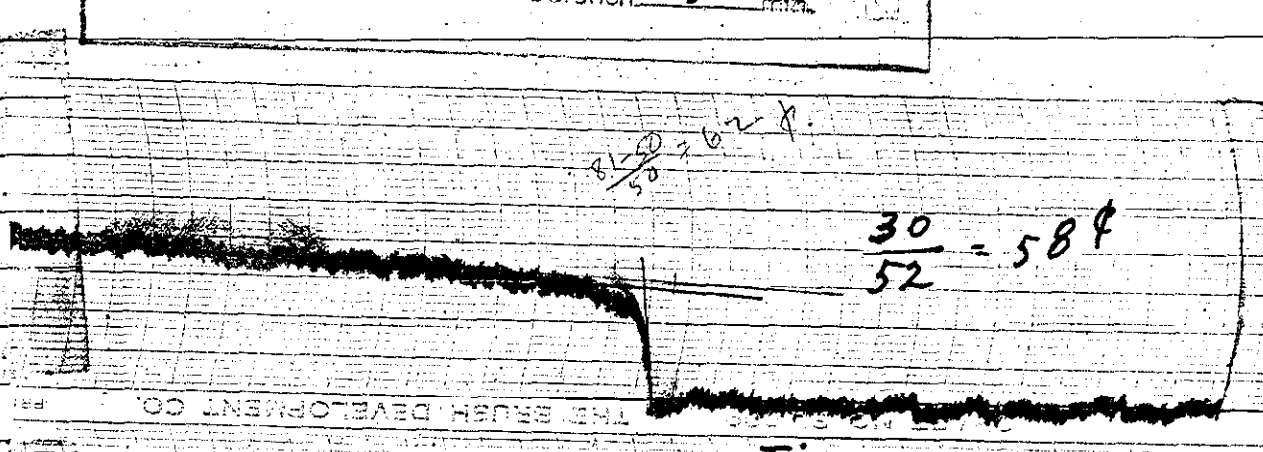
Time Crit 1'.20 Prod Duration 35 min.

Rod drops — (reverse order from last run.

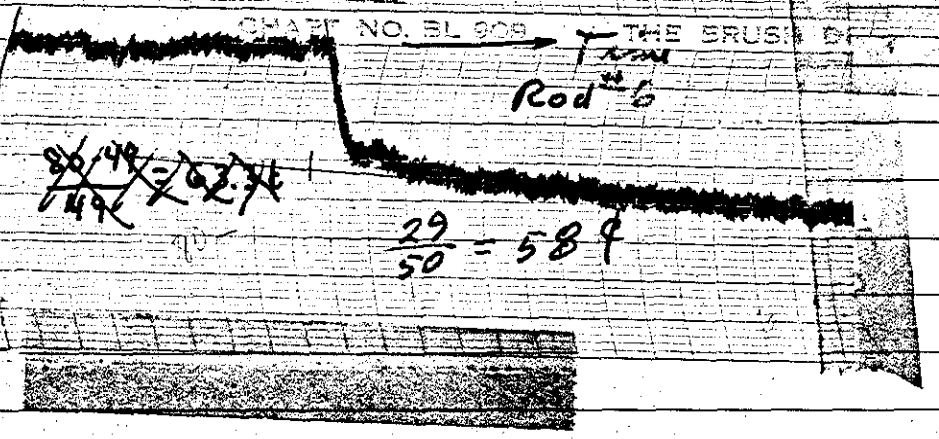
① Drop #1

Back to critical position A in
B in
C 19.47
D in

② Drop #6



80/51 = 56.8%



80/49 = 62.7%

CRITICAL DATA

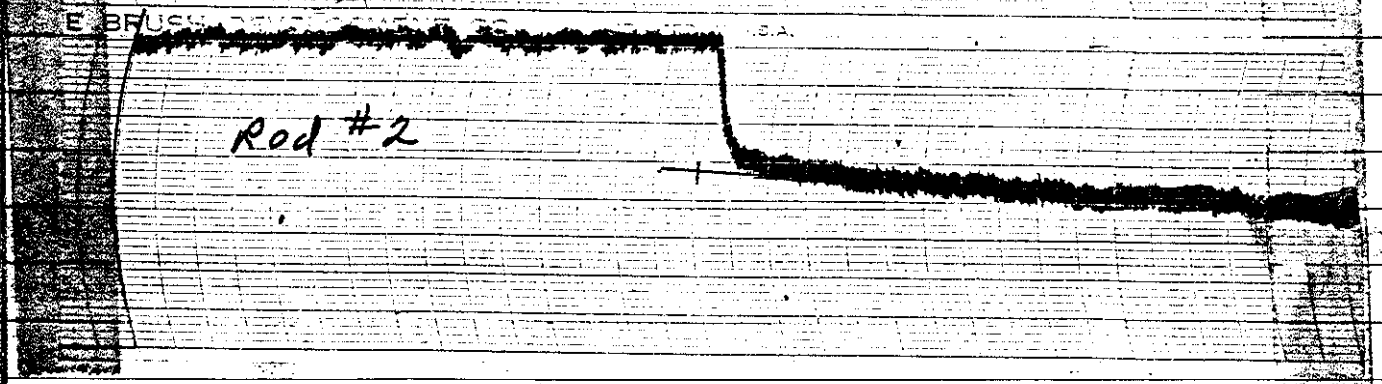
C.A. 4 Exp 3 Run 5

Table Pos. 0.000 T B

Control Rod	Channel
A in 99.989	A 49 100/200
Boot 20.085	B .01+
C 20.195	C 4.5 5×10^{-9}
Din 999.983	D 8.1 10^{-9}
	E ~~——~~

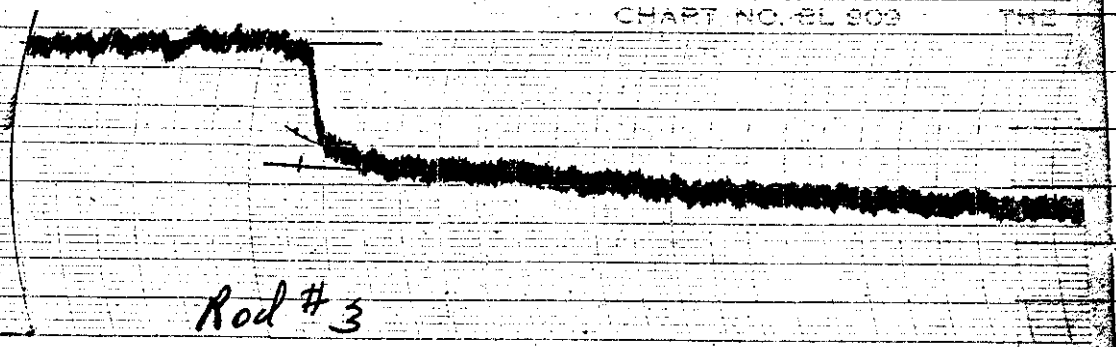
Tim Crit. 303 Tim Deviation ____ min.

$\frac{34}{48} = 71\%$



After Droping Rod #2 Brought Back to Critical A in
C in B = 17.379"
D in

$\frac{32}{45} = 71\%$



Rod #3

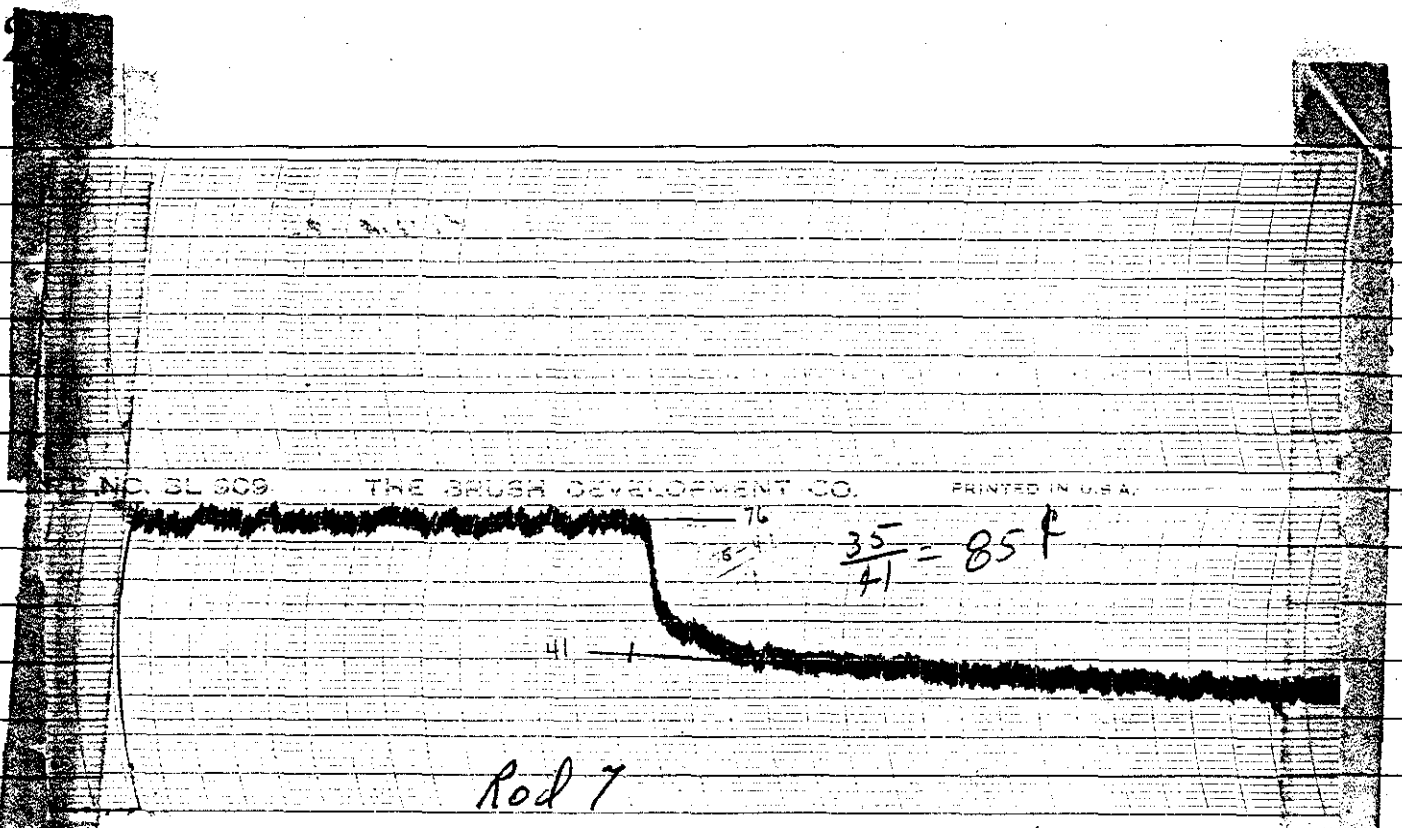
CRITICAL POSITIONS

C A. 4 Expr. 3 Run 6

Table Pos. 0.000 T. 2579 B. 3328

Control Rod		Channel	
A ~~999.590~~ ~~40~~		A 46	100/100
B out 20.088		B .01	
C 20.165		C .42	5×10^{-9}
D in 99.985		D 2.5	10^{-9}
		E	

Tim Crit. 3:13 ~~AM~~ PM Duration ~~[illegible]~~ min.



$\frac{35}{41} = 85\%$

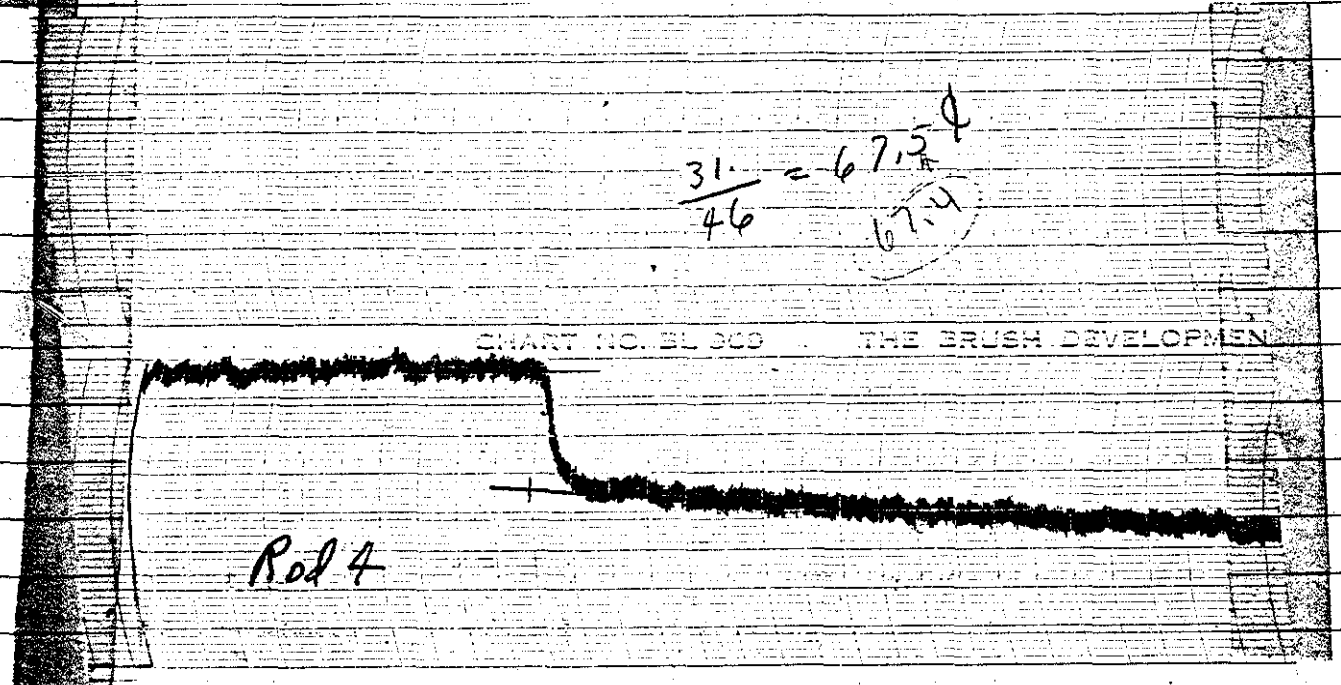
Rod 7

after Dropping Rod 7 went critical with A in C in Din B 12.640"

In
M

$\frac{31}{46} = 67.5\%$

67.4



Rod 4

C.A. 4 Expr. 4 Run 1

Sheet _____ Date 8/3/51 195__ Time 9:00 AM PM

Purpose Irradiate Foil D.W. Williams

INSTRUMENT CHECK

Time 8:03 AM PM Source 1734175

	Channel A	B	C	D	E
Range					
Source Dist.	ok	ok	8"	10"	
% F.S. Trip			20%	80%	

In foil
M 12-2-C

CRITICAL POSITIONS

C.A. 4 Expr. 4 Run 1

Table Pos. 000.000 T. 2579 B. 3321

Control Rod		Channel	
A	99.989 (in)	A	71 1020/200
B	20.09 (out)	B	.10
C	18.551	C	8.5 5×10^{-8}
4	99.985 (in)	D	7.8 ~~7.8~~ $\times 10^{-8}$
		E	

Tim Crit. 9:26:45 AM PM Duration 30 min.

C.A. 4 Expt. 5 Part 1

Sheet ____ Date 8/3/ Time 11:00 AM ~~PM~~

Purpose Period calibration & Incremental Calibration of Rods C & D

CRITICAL POSITIONS

C.A. 4 Expt. 5 Part 1

Table Pos. 99.995 T. 2575 B. 2321

Control Rod		Channel	
A	2.001	A	4.8 100/200
B	~~24,230~~ 13.165	B	.010
C	24,230 out	C	4.4 5×10^{-9}
D	99.985	D	8.0 10^{-9}
		E	~~X~~

Time 11:05 AM Duration ____ min.

Time	Rod A	Rod D	Rod C	Rod B	control with
11:12	2.001	99.985	24,230	13.165	B
11:20	99.995	2.028	"	"	D
11:25	2.000	99.985	24,230	13.095	
11:28	2.001	2.030	22,435	"	
11:30	9977	3.940 3.969	"	"	
11:35	2.000	"	20.595	"	

INSTRUMENT CHECK

Time 9:20 AM PM

Source Reactor Source

	A	B	C	D	E
Range			10^{-11}	10^{-11}	
Source Dist.			ok	ok	24" 15"
% F.S. Tap				95	100

CRITICAL POSITIONS

C.A. 4 Expr. 4 5 Run 2

Table Pos. 99.995 L 2571 T — R 2321

Control Rod		Channel	
1	1.995	A 64	100/100
2	12.775	B .010	
3	24.230 out	C 6.1	5×10^{-9}
4	99.995 in	D 5.6	2×10^{-9}
		E	

Tim Crit. 10:25 AM PM Duration ____ min.

Incremental rod calibration of C and D compared on 2" mA

Time	Rod A	Rod B	Rod C	Rod D	Control rods
10:34	1.995	12.775	24.230 out	99.985 in	B
10:36	99.978	12.775	24.230	2.015	D
10:42	2.030	12.775	22.4	2.015	C
10:46	99.980	12.775	22.41	3.710	D
10:50	2.00	12.775	20.741	3.710	C
10:54	99.978	12.775	20.741	5.440	D
11:07	2.010	12.775	18.925	5.940	C
11:10	99.978	12.775	18.925	7.160	D
11:14	2.010	12.775	17.05	7.160	C
11:16	99.978	12.775	17.05	8.950	D
11:21	2.012	12.775	~~17.05~~ 15.177	8.950	C
11:24	99.978	12.775	15.177	10.724	D
11:28	2.000	12.775	13.310	10.724	C
11:33	99.978	12.775	13.310	12.450	D
11:37	1.998	12.775	11.333	12.450	C
11:41	99.978	12.775	11.333	14.270	D
11:44	1.995	12.775	9.330	14.270	C
11:47	99.977	12.775	9.330	15.928	D
11:52	2.000	12.775	7.385	15.928	C
11:55	99.978	12.775	7.385	17.585	D
12:00	2.005	12.775	5.555	17.585	C
12:02	99.978	12.775	5.555	19.215	D
12:05	2.005	12.775	3.565	19.215	C
12:08	99.978	12.775	3.565	20.655	D
12:11	2.005	12.775	1.830	20.655	C
12:14	99.978	12.775	1.830	22.120	D
12:17	1.760	12.775	0.005 in	22.120	A
12:20	99.975	11.610	0.005 in	24.450 out	B
12:27	1.990	12.775	24.230 out	99.981 in	B

CRITICAL POSITIONS

C.A. 4 Expr. 5 Run 3

Table Pos. 999.995 T. 2574 B. 2329

Control Rod	Control
A 2.003"	A 25 100/25
B 12.87	B .0015
C out 14.225	C 2.5 10^{-10}
D in 99.985	D 7.5 2×10^{-11}
	E ~~X~~

Tim Crit. 2:20 ~~AM~~ PM Duration ____ min.

Rods A & B – ?

Rod D	Rod C	Time 2 Decades	1st Decade
2:30 99.985	22.412	14.00 Min	7:04
2855 5.440	17.050	14.162	7:02
	13.926	3.565	6:18

3:12

← 1 decade →

	min 1st	2nd	sec 1st	2nd	T	T	1st ¢	End ¢
2"	7.04	6.96	422.4	417.6	183.5	181.4	5.99	6.05
2"	7.02	7.14	421.2	428.4	183.0	185.8	6.00	5.92
4"	3.12	3.06	187.2	183.6	~~[illegible]~~ 81.3	79.7	~~[illegible]~~ 11.00	11.17

? ? ave 2" → 5.99¢ ~ 3.00 ¢/inch
ave 4" → 11.08¢ ~ 2.77 ¢/in
weighted ave = 2.92 ¢/inch.

on A – ?

Foi
M_N
M_N 12

INSTRUMENT CHECK

Time 9:30 AM PM
8-7-51

Source Reactor Source

Channel	A	B	C	D	E
Range	OK	OK	2X10^{-11}	2X10^{-11}	X
Source Dist.			2ft	15"	
% F.S. Trip			<100%	<100%	

Counters 1, 2 OK, Monitors OK.

Foils
M_N 11-2-2 5 (102 105)
M_N 12-2-2 5 (100 101)

CRITICAL POSITIONS

C.A. 4 Expt. 4 Run 2

Table Pos. 99.995 T 2574 B 2322

Control Rod		Channel	
A	16.455"	A	71 1009/200
B	20.085" (Out)	B	.10
C	00.000 (In)	C	8.7 5X10^{-8}
D	99.999 (In)	D	8.0 Top of Range
		E	

Tim Crit. 9:08 AM ~~PM~~ Duration 30 min.

CRITICAL POSITIONS

C.A. 4 Expr. 5 Run 4

Table Pos: 99.996 T. 2572 T B. 2822

Control Rod		Channel
A 99.990 in	A 55	100 200
B out 20.085	B .010	
C 17.985	C 5.4 X 5X10⁻⁹	
4 ~~6S~~ 2.000	D	
	E	

Tim Crit. 2:10 ~~AM~~ PM Duration: min.

Compare 2 and D.

Time	Rod A	Rod B	Rod C	Rod D	
2:19	99.990	20.085	17.985	2.000	
2:21	2.015	"	"	999.985	
2:24	2.015	17.513	"	2.001	
2:26	3.902	"	"	99.986	
2:28	"	15.765	"	2.000	
2:30	5.435	"	"	9.985	
*2:31	"	14.050	"	2.000	
2:33	6.945	"	"	9.988	
2:37	"	12.235	"	2.000	
2:39	8.729	"	"	.986	✓
2:42	"	10.198	"	2.000	✓
2:45	10.371	"	"	.988	✓
2:47	"	8.105	"	2.000	✓
2:49	11.925	"	"	9.989	✓
2:54	"	5.89	"	2.000	✓

Time	Rod A	Rod B	Rod C	Rod D
2:59	13.454	5.890	18.000	99.988
3:00	"	3.685	"	2.000
3:02	14.915	"	"	99.985
3:05	"	1.601	"	2.000
*3:08	16.285	"	"	99.986
3:10	"	.030	"	1.418
3:15	"	"	19.155	~~9.986~~ 9.986
3:20	"	"	17.410	2.000
3:22	17.725	"	"	9.986
3:25	"	"	15.595	2.000
3:27	19.230	"	"	9.986
3:29	20.064	"	14.815	9.986

Period Calibration

Rod A	Rod B	Rod C	Rod D	Time 10	Time 100
14.915	1.601	18.000	99.985	7.368	14.824
5.435	14.050	17.985	99.987	7.475	15.165

2.015"
2" on D
2.013"

Surface Tension

	1st.	2nd	Tan	Curved Tan.	P ~~5.75~~	P	Ave P
2.015"	7.368	7.456	192.1	194.4	~~5.75~~	5.69	5.72
2.013"	7.475	7.690	194.8	200.2	5.69	5.56	5.62

ave 5.67 ¢

5.67 ¢ for 2.014"

~ 2.82 ¢/inch on D.

INSTRUMENT CHECK

Time 3:17 ~~AM~~ PM Source Reactor Source

	Channel A	B	C	D	E
Range			10^{-10}	10^{-10}	
Source Dist	ok	ok	6"	2"	
% F.S. Trip			100+	100+	

CRITICAL POSITIONS

C.A. 4 Expr. 5 Run 5

Table Pos. 99.995 T.2512 L.2322

Control Rod		Channel	
1	32.210	A	56 100/200
2	.035	B	.010
3	13.500	C	5.2 5×10^{-9}
4	999.986	D	4.8-2 $\times 10^{-9}$
		E	

Tim Crit. 3:50 ~~AM~~ PM Duration ____ min.

T
3
3:
3
4:
4:
4
4
4
4
4
4
4
4
4
4
4

Time	Rod A		Rod B	Rod C	Rod D	
3:51	32.210	0	0.035	13.500	99.986	80
3:55	21.715	8.5	0.035	13.500	1.000	79.8
3:58	24.050	4	0.035	"	.500	79
4:00	25.860	4	"	"	.250	79
4:03	27.112	8.6	"	"	1.250	74
4:05	20.734	9.0	"	"	1.500	46
4:07	20.025	4.6	"	"	1.750	45.4
4:09	19.535	5.3	"	"	2.000	74.7
4:11	19.170	6.0	"	"	2.250	74
4:13	18.800	7.0	"	"	2.500	73
4:15	18.600	7.5	"	"	2.750	72.5
4:17	18.345	8.5	"	"	3:00	71.5
4:19	18.345	↓	0.035	16.2345	99.989	71
4:21	17.758	10.6	"	"	1.000	69.4
4:23	17.090	13.4	"	"	2.000	66.6

8-8-51

INSTRUMENT CHECK

Time 8:34 AM PM Source Reactor

	Channel A	B	C	D	E
Range			10^{-10}	10^{-10}	1200v
Source Dist.	ok	ok	4"	3"	½"
% F.S. Trip			100†	100†	

Purpose: Irradiate Au foils for dead time determination

CRITICAL POSITIONS

C.A. 4 Expr. 4 Run 3

Table Pos. 999.995 T.2575; B.2321

Control Rod		1st Channel	
A	32.207	A	65 on 1000/200
B	0.043	B	.09
C	13.118	C	7.7 on $5 \cdot 10^{-8}$
D	999.985	D	7.2 top of range
		E	

Tim Crit. 9:27 AM Dur. 30 min.

Foils:

M_N-12-1-5 S1

M_S-12-17-5 S2

CRITICAL POSITIONS

C.A. 4 Expr. 5 Run 6

Table Pos. 199.995 T.25'75" B.2322

Control Rod		Channel	
A	32.210	A	28 (109/25")
B	.045	B	.0002
C	13.506	C	3.2 x 10⁻¹⁰
D	99.988	D	9.2 x 2 x 10⁻¹¹
		E	

Tim Crit. 12:45 ~~AM~~ PM Duration ____ min.

Chart speed 1 div = 50 sec

	Rod A	Rod B	Rod C	Rod D		
0	32.210	.045"	13.506	99.988	Level	
S1 1	20.064	"	"	"	19 +11.62 Min	+13.87
S2	20.064	.045"	13.506	1.405"	Level	
2	32.209	"	"	"		-15.05
	20064	.045"	13.506	1.405"	Level	
3	19.500	"	"	"		+47.00
	19.500			1.798	Level	
4	20.065	"	"	"		-48.38
	19.500	"	"	1.798	Level	
5	19.000	"	"	1.798		+42.7
6	19.000	"	"	99.985		+ 7.90
	19.000	"	"	2.200	Level	
7	19.502	"	"	2.200		- 32.30
8	18.504	"	"	2.200		+34.6
	18.504	"	"	2.710	Level	
9	19.005"	"	"	2.710		-34.8

	Rod A	Rod B	Rod C	Rod D		
10, D4, 12 div						
10	18.000	.045"	13.506	2.710		+28.32
	18.000	"	"	3.295"	Level	⑨
11	18.502	"	"	3.295"		-38.10 ⑩
12	17.500	"	"	3.295"		+25.80
	17.500	"	13.430	3.965	Level	⑪
						⑫

INSTRUMENT CHECK

Time 8:25 AM ~~PM~~ Source _____

Channel

	A	B	C	D	E
Range	OK	OK	10^{-10} ~~Foot~~	10^{-10} ~~100+~~	
Source Dist.			4"	2"	
% F.S. Trip			100+	100+	
		OK			

CRITICAL POSITIONS

CA 4 Grp 5 Run 7

Table Pos. 99.995" T.2571 T B.2322

Channel Fig		Channel	
A 19.000	A	7R	1000/100
B 0.050	B	.065"	
C 13.025"	C	3.7	5×10^{-8}
D 2.713	D	5.6	10^{-8}
	E		
Tim Crit. 9:25			

		Rod A	Rod B	Rod C	Rod D		
		19.000	0.050	13.025	2.713	Level	
2		18.505 19	0.050	13.660	2.713	Level	
⑨	13	19.000	0.050	13.660	2.713		-38.3
⑩	14	18.000	0.050	13.660	2.713		+34.5
		18.000 16	0.050	13.660	3.290	Level	
⑪	15	18.503	0.050	13.660	3.290		-36.4
⑫	16	17.500 16	0.050	13.660	3.290	~~Level~~	+29.35
		17.500	0.050	13.660	3.950	Level	
	17	17.998	0.050	13.660	3.950		-36.75
	18	17.002	0.050	13.660	3.950		+29.95
		17.002 13:9	0.050	13.660	4.610	Level	
	19	17.500	0.050	13.660	4.610		-31.25
	20	16.500	0.050	13.660	4.610		+28.45
		16.500 15:8	0.050	13.660	5.285	Level	-32.7
	21	17.000	0.050	13.660	5.285	736 sec Period (27.88-19/1)	
	22	16.004	0.050	13.660	5.285		+26.45
		16.004 17:8	0.050	13.660	6.007	Level	
	23	16.505	0.050	13.660	6.007		-33.0
	24	15.500	0.050	13.660	6.002		+31.3
		15.500 19:8	0.050	13.660	6.606	Level	
	25	16.006	0.050	13.660	6.606		-30.8
	26	15.000	0.050	13.660	6.606		+30.9
		15.000 21:5	0.050	13.660	7.284	Level	
	27	15.561	0.050	13.660	7.284		-32.7
	28	14.797	0.050	13.660	7.284		+31.9
		14.797 23:0	0.050	13.660	7.890	Level	
	29	15.003	0.050	13.660	7.890		-36.0
	30	14.003	0.050	13.660	7.890		+32.7

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	Rod A	Rod B	Rod C	Rod D	dial/gauge
	14.003	0.050	13.660	8.531	Level
31	14.498	0.050	13.660	8.531	-33.1
32	13.500	0.050	13.660	8.531	+30.4
	13.500	0.050	13.660	9.198	Level 2:06 PM
33	14.002	0.050	13.660	9.198	-31.1
34	13.000	0.050	13.660	9.198	+35.3
	13.000	0.050	13.660	9.841	Level 2:44 PM
35	13.500	0.050	13.660	9.841	-35.0
36	12.500	0.050	13.660	9.841	+33.2
	12.500	0.050	13.660	10.460	Level
37	13.000	0.050	13.660	10.460	-35.4
38	11.999	0.050	13.660	10.460	+33.7
	11.999	0.050	13.660	11.070	Level
39	12.505	0.050	13.660	11.070	-38.3
40	11.500	0.050	13.660	11.070	+35.1
	11.500	0.050	13.660	11.662	Level
41	12.000	0.050	13.660	11.662	-39.7
42	11.000	0.050	13.660	11.662	+33.5
	11.000	0.050	13.660	12.245	Level

INSTRUMENT CHECK

Time 8:30 AM PM Source Reactor

	Channel A	B	C	D	E
Range			10^{-10}	10^{-10}	
Source Dist.	ok	ok	4"	3"	ok
% F.S. Trip			100+	100+	

CRITICAL POSITIONS

C.A. 4 Expr. 5 Run 8

Table Pos. 9.995 T. 258 F B. 2322

Control Rod		Channel	
A	11.00	A	59 100% /100
B	.045	B	.055
C	~~13.08~~ 13.677	C	3.0 5×10^{-8}
D	12.244	D	8.8 5×10^{-9}
		E	49 1050

Time Crit. 9:15 AM PM Duration ____ min.

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	Rod A	Rod B	Rod C	Rod D	
~~43~~	11.000	0.045	13.765	12.243	Level
43	11.502	0.045	13.765	12.243	9:35 A -35.4
44	10.500	0.045	13.765	12.243	+34.7
	10.500	0.045	13.765	12.844	Level
45	11.000	0.045	13.765	12.844	-35.0
46	10.000	0.045	13.765	12.844	+31.5
	10.000	0.045	13.765	13.412	Level
47	10.501	0.045	13.765	13.412	-34.6
48	9.502	0.045	13.765	13.412	+32.3
	9.502	0.045	13.765	13.984	Level
49	10.001	0.045	13.765	13.984	11:00 A -37.9
50	9.002	0.045	13.765	13.984	+32.2
	9.002	0.045	13.765	14.522	Level
51	9.501	0.045	13.765	14.522	-39.4
52	8.500	0.045	13.765	14.522	+32.6

8-13-51 — Poison Rod Calibration —
Used a 1/4" wide .020" ~~Cd~~ Cd strip 18" long in tube M-13

	A	B	C	D
Crit position with Cd.	32.210	in	8.23	in
" " without	32.210	.035	13.500	99.986 in

Lost about 5.27" on C.
need ~ 20" equiv of rod
— Used 25" long 1½" wide .020" Cd. strip in cell M-12. Can be removed by D control drive. —
Critical reading on D — 6.670

CRITICAL POSITIONS

C.A. 4 Expr. 6 Run 1

Table Pos. 99.995 T 25 22 82.322

Control Rod		Channel	
A	99.96	A	53 1000/Two
B	12.375	B	.05
C	0.005	C	5.4 2×10^{-5}
D	6.670 (zero position)	D	8.00 5×10^{9}
		E	21.2 960V

Tim Crit. ____ AM / PM Duration ____ min.

To determine effect of poison rod.

	Rod D	Rod C	Rod B
1	6.670	0.005-	
2	7.660	2.027	
3.	8.710	3.885-	
4	9.690	5.655-	
5	10.671	7.240	
6	11.695-	9.213	
7	12.715-	11.228	
8	13.705-	12.995-	
9	14.651	14.466	
10	15.706	16.335	
11	16.698	17.875-	
12	17.670	19.286	
13	18.676	20.420	
14	19.697	21.705-	Rod B
15-	20.698	22.800	
16.	21.670	23.590	12.375-
17	22.676	~~22.676~~	13.235-
18	23.710		13.975-
19	24.665-		14.665-
20	25.705-		15.195-
21	26.678		15.501
22	27.685-		15.795-
23	28.658		16.005-
24	29.675-		16.170
25	30.650		16.215-

INSTRUMENT CHECK

Time 8:30 AM ~~PM~~ Source PB 174

	Channel A	B	C	D	E
Counter 1±7 - ok					
Range			10^{-10}	10^{-10}	1200V
Source Dist.			4"	2"	9"
% F.S. Trip			ok	ok	100+ 100+ 100

CRITICAL POSITIONS

Test No. 4 Expr. 4 Run 4

Source Pos. 999.993 L 2573T — R 2324

Control Rod	Channel	
1 20.060 out	A 6.1	1000/200
2 0.030 in	B .10	
3 15.183	C 7.4	5×10^{-9}
4 999.988 in	D Top scale 6.8	
	E 5 — 750V	

Tim Crit. 9:01 AM PM Duration 30 min.

To irradiate Au. foils for counter calibration.

M_N 11-1 -

M_N 11-2 -

CRITICAL POSITIONS

C.A. 4 Expr. 7 Run 1

Table Pos. 999.995 2594 — 2322

Control Rod	Channel
1 999.995 in	A 74 — 1000/25
2 9.545	B 0.013
3 000,002 in	C 5.8 5X10⁻⁹
4 33.673 out	D 5.2 2X10⁻⁹
	E 25 — 1200 V

Tim Crit. 10:55 AM PM Period — min.

(Blanks slug is 0.1" short due to thickness of fuel. subtract 0.1 from all readings on D)

Exp 7.
Control rod D replaced by a no fuel control to determine effect of rod as reflector and/or moderator. using 1" increment on rod A as fixed change in reactivity.

Critical positions

	Rod A	B	C	D	dk/dx
	999.995	9.545	0.002	33.673	
	1.002	"	"	26.355	
	999.985	10.405 ~~10.458~~	"	"	
level	1.005	"	"	24.885	
	999.980	11.428	"	"	
	1.002	"	"	24.07 ~~24.045~~	5.98±0.17
#1 Period =3ΔA	999.995	9.545	"	24.07	Period #1
	999.982	12.465	"	24.070	
	1.000	"	"	23.228	
	999.980	13.460	"	"	
	1.005	"	"	22.490	
	999.980	14.360	"	"	
level	1.001	"	"	21.800	
	994.995	15.245	"	"	
	1.005	"	"	21.040	
	999.978	16.146	"	"	

dw/dc

DJ

	A	B	C	D	
(Repeat)	999.978	16.146	0.002	21.040	
level	1.005	"	"	20.303	
	999.979	17.030	"	"	
	1.005	"	"	19.518	9.42 ± 0.60 (8.0 m/dec)
2ΔA Period #2	999.978	16.146	"	~~21.040~~ 19.515	
	999.975	17.998	00.000	19.515	
	1.001	"	"	18.700	
level	999.980	18.935 ~~18.935~~	"	"	
	1.000	"	"	17.895	
	999.975	20.108 out	0.260 ~~0.260~~	"	
	1.001	"	"	17.080	
	999.986	"	1.380	"	
	1.005	"	1.380	16.204	
	999.980	"	2.318	"	
	1.000	"	"	15.306	
	999.978	"	3.198	"	
	1.000	"	"	14.360	
	999.979	"	4.158	"	
	1.000	"	"	13.420	
	999.979	"	5.071	"	
	1.000	"	"	12.418	9.90 ± 1.00 / 8.3 m/dec.
2ΔA Period #3	999.978	"	4.158	"	
	"	"	6.048	"	
	1.006	"	"	11.360	
	999.978	"	6.964	"	
level	1.002	"	"	10.356	
	999.980	"	7.872	"	
	1.000	"	"	9.291	

	A	B	C	D	
Report	1.000	20.108	7.872	9.291	
	999.975	"	8.840	"	
	1.002	"	"	8.232	
	999.978	"	9.821	"	
	1.006	"	"	7.125	
	999.978	"	10.795	"	
	1.006	"	"	6.041	
	999.978	"	11.80	"	
	1.002	"	11.798	4.940	
	999.975	"	12.783	"	
	1.003	"	"	3.862	
	99.978	"	13.715	"	
	1.000	"	"	2.765	
	99.975	"	14.710	"	
	1.011		"	1.610	dw/dec.
	99.975	"	15.686	"	
	1.001	"	"	.277	8.32 ± 0.5
Period #4	~~1.001~~	"	"	~~2.765~~	
	1.001	"	13.715	.277	6.82 M/Dec

$\Delta A - n''$

INSTRUMENT CHECK

Time 1:20 AM PM Source RB174

	Channel A	B	C	D	E
Range	OK	OK	10" 1	10" 1	
Source Dist.			12"	16"	○
% F.S. Trip			100	100	100

Counters OK

CRITICAL POSITIONS

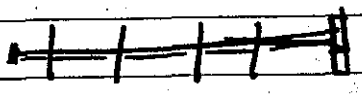
C.P. 4 Expr. 7 Run 2

Table Pos. 999.995 T 2513 L 2325

Control Rod		Channel		
A	99.991	A	74	1000/25
B	9.235	B	.025	
C	00.001	C	5.7	5×10^{-9}
D	33.697	D	5.1	2×10^{-9}
		E	25	1200 V

Tim Crit. 2:55 ~~PM~~ AM Dur.

Purpose to run Sensitivity curve on fuel – no G.



(Al spacers of ½" Al tubing.)

#	A	B	C	D
0	99.991	9.235"	0.001	33.697
1	1.006	"	"	16.035"
2	99.980	10.275"	"	16.035"
3	1.000	"	"	8.000
4	999.979	11.180	"	8.000
5	1.430	11.180	"	0.10 (in)

INSTRUMENT CHECK

Reactor

Time 10:05 AM PM

	A	B	C	D	E
Range			10^{-10}	10^{-10}	1200V
Source Dist.	R	4"	4"	½"	½"
% F.S. Trip			100+	100+	100+

Date 195 Chief

Recorder Crew

Purpose: To check table position reproducibility. The dial indicators are located on the four corners of the interface. Dial readings increase as table close. The T near is taken at closest to top corner closest to the Control Room

POSITIONS

C.A. 4 Expr. 8 Run 1

Table Pos. 99.998 T. 2575 T B. 2330 R

Control Rod	Channel
A 20.065	A
B 20.111	B
C 24.227	C
D 25.148	D
	E

Tim Crit. AM PM Duration min.

Micrometer Dial Indicator Readings

	T_{Near}	B_{Near}	T_{Far}	B_{Far}
	+.230	+.320	+.140	+.071
Run #1	+.235	+~~.342~~ .358	+.145	+.069

Control Run. Top .2575 B .2330 Table Position 99.998

	T_N	B_N	T_F	B_F
#2	.230	~~.358~~ .342	.148	.068

Cont. Run. Top .2573 B .2330 Table position 99.997

	T_N	B_N	T_F	B_F
#3	.230	~~.359~~ .342	.148	.069

Cont R. Top .2572 B .233 Table Position 99.997

	T_N	B_N	T_F	B_F
#4	.230	~~.357~~ .341	.149	.067

Cont R. Top 2.573 B .2331 Table Position 99.997

	T_N	B_N	T_F	B_F
#5	.231	~~.361~~ .339	.148	.069

Cont Run Top .2571 B .2330 Table Position 99.995

	T_N	B_N	T_F	B_F
~~Micrometer~~	.230	.342	.149	.069
~~Control~~ Top	.2573	B	.233	Table Position 99.999
Vernier Col	Top Mic	Bottom Mic.		Table Position
.848	~~.2573~~	.2330		99.999

(Over)

Vernier Calip	Table position	Top Micro.	Bott Micro.
1.390	0.5698	0.3352	.7587
1.290	0.4697	"	.6571
1.191	0.3699	"	.5607
1.086	0.2698	"	.4605
.988	0.1697	"	.3582
.900	0.069	"	.2820
.801	99.999	.2940	.2331
1.083	0.2750	.2583	.4491
1.178	0.3699	.3348	.5422

8/16/51 51

Block of Na * 00151, 122.095 gm placed in M_N-12-0→1, i.e. 3x3x1" volume on north side of & at reactor center - Graphite replaced - Al foil separating fuel from Na can -

DANGER COEFFICIENT

Sample Nw 00151 Weight 122.095g Molus

Thickness 1" Pieces 1 Composition Na

AM

PM Sample Pos. M_N-12-0→1 C.R.

Can yes ☑ S.S. no ☐ C.R. Pos. c c c/M

Empty Control

Sample 18.482

Graphite Control

Control Can 0-15-32

CRITICAL POSITIONS

C A 9 Expr. 9 Run 1

Table Pos. 00.000 T.2592T B.2330

Graphite	Central Rod	Na	Empty	Channel	
-999.993	A	99.990	9.995	A	22 100/25
20.110	B	20.110	20.110	B	.00018
20.060	C	18.482	18.805	C	7.6 2x10⁻¹¹
-979.973	D	99.975	99.975	D	8.8 10⁻¹²
				E	Bkg

Tim Crit. 2:50 ~~AM~~ PM Duration ____ min.

52 8/16 Rod position at Critical vs table position-

Table Position	Rod C	B	A & D in.	ΔR (inches of rod)
			1.050	Total R 1.050
00.000	20.060 ± 0.1	20.110 out		
0.022	19.010 ± 0.1		3.490	4.540
0.082	15.52 ± 0.1		1.77	6.310
0.110	13.75 ± 0.1		5.65	11.960
0.155	8.10 ± 0.5		11.06	23.02
0.233	999.95	17.20 ± 1	10.43	33.45
0.309	11	6.77 ± 1		

8/17/51 · 53

INSTRUMENT CHECK

Source Reactor

Time 1:35 PM

	Channel A	B	C	D	E
Range			10^{-10}	10^{-10}	nos
Scale Div.	ok	ok	9	3	½
By			100	100	100

Run for Wheels! —

CRITICAL POSITIONS

C.A. 4 Expr. 9 Run 2

Table Pos. _____ L T R

Control Rod	Channel
1	A
2	B
3	C
4	D
	E

Tim Crit. _____ AM / PM Duration _____ min.

54

8/20/51

INSTRUMENT CHECK PB174

Time 1:05 ~~AM~~ PM

Source Reactor

Channel	A	B	C	D	E
Range	___	___	10^{-10}	10^{-10}	1200 V
Source Dist.	o/c	o/c	3"	1"	0
~~% F.S.~~ Trip	___	___	100 t	100 t	95

C.A. 4 Exp 9 Run 2

Sheet ___ Da 8/20 1951 Time 1:00 ~~AM~~ PM

Purpose To measure neg shielding of fuel. and measure $\Delta k/k$ of S.P. #8 by rod drop.

TEMPORARY LOADING CHANGE

M-12-0

Slug 102 Pos ~~M-12-0~~ Add 0010 Fuel disc Pos 1302

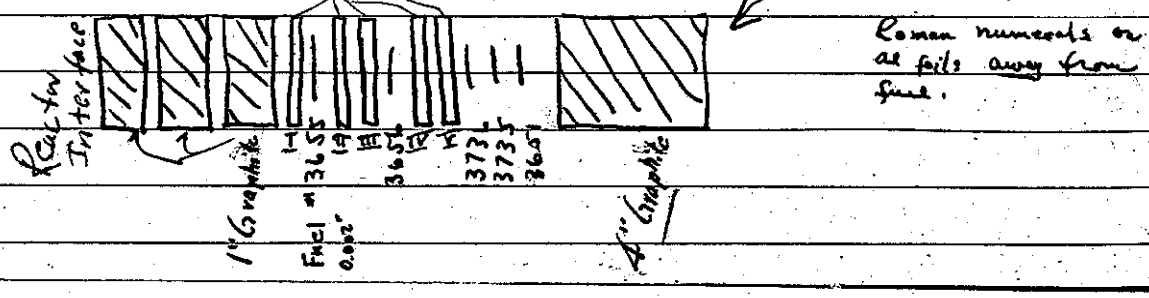
Remove ___ Pos ___

Slug ___ Pos ___ Add ___ Pos ___

Remove ___ Pos ___

Slug ___ Pos ___ Add ___ Pos ___

Remove ___ Pos ___



Roman numerals on al foils away from fuel.

CRITICAL POSITIONS

C A. 4 ÷ Expr. 9 Run 3

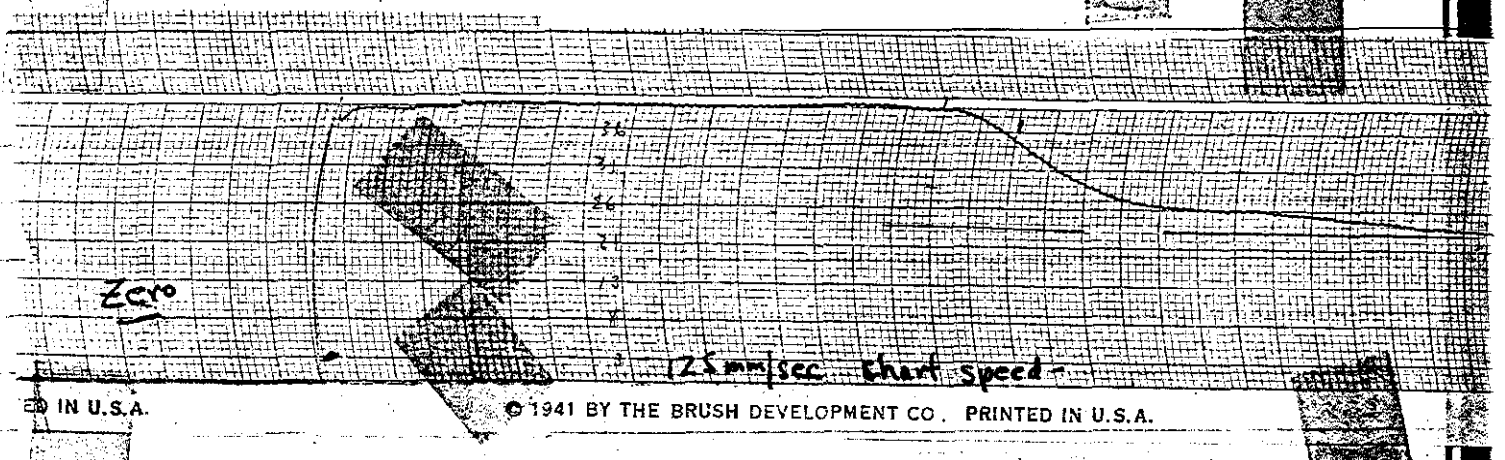
Table Pos. _____ I _____ T _____ R _____

	Control Rod		Channel
A	Dn	A	62 1000/200
B	Out-	B	0.1
C	Critical on C.	C	5.8 x 5 x 10^{-8}
D	or Dn	D	6.8 x (~2 x 10^{-9})
		E	

Tim Crit. 15 ~~AM~~ PM Duration 5 min.

Rod #8 DROP:

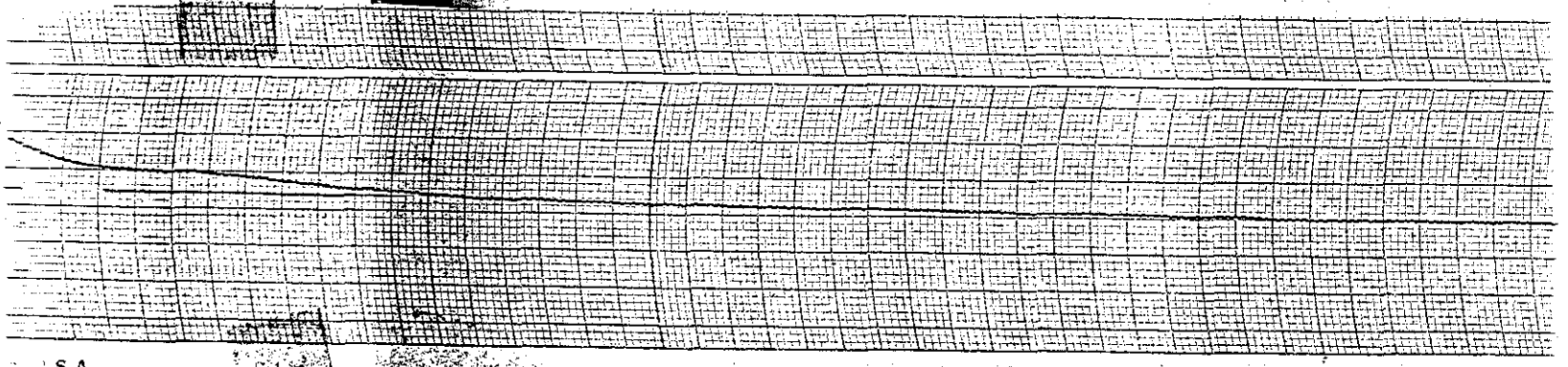
Channel C; Brush Amp USAF/FC 6476-A.



The shape of the trace after drop is not understood - may be ~~=~~ motion of rod.

guess at -1/2 : $\frac{39.5-23.5}{23.5} = \frac{16}{23.5} = 68\%$

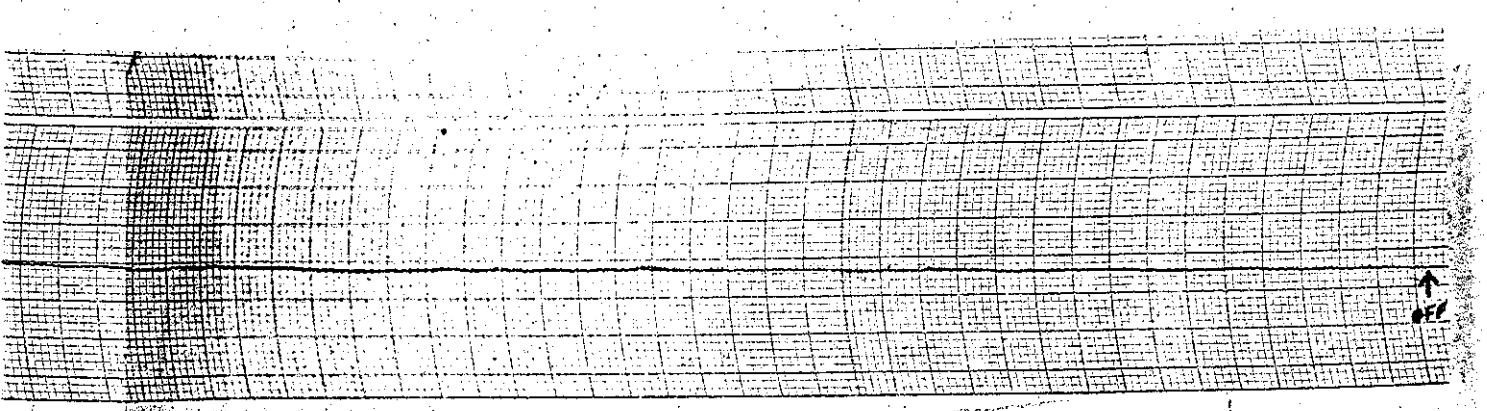
3/20/51 55



U.S.A.

= motion of rod.

$= \frac{16}{23.5} = 68.1\%$



CRITICAL POSITIONS

C A. 4 : Expr. 9 Run 3

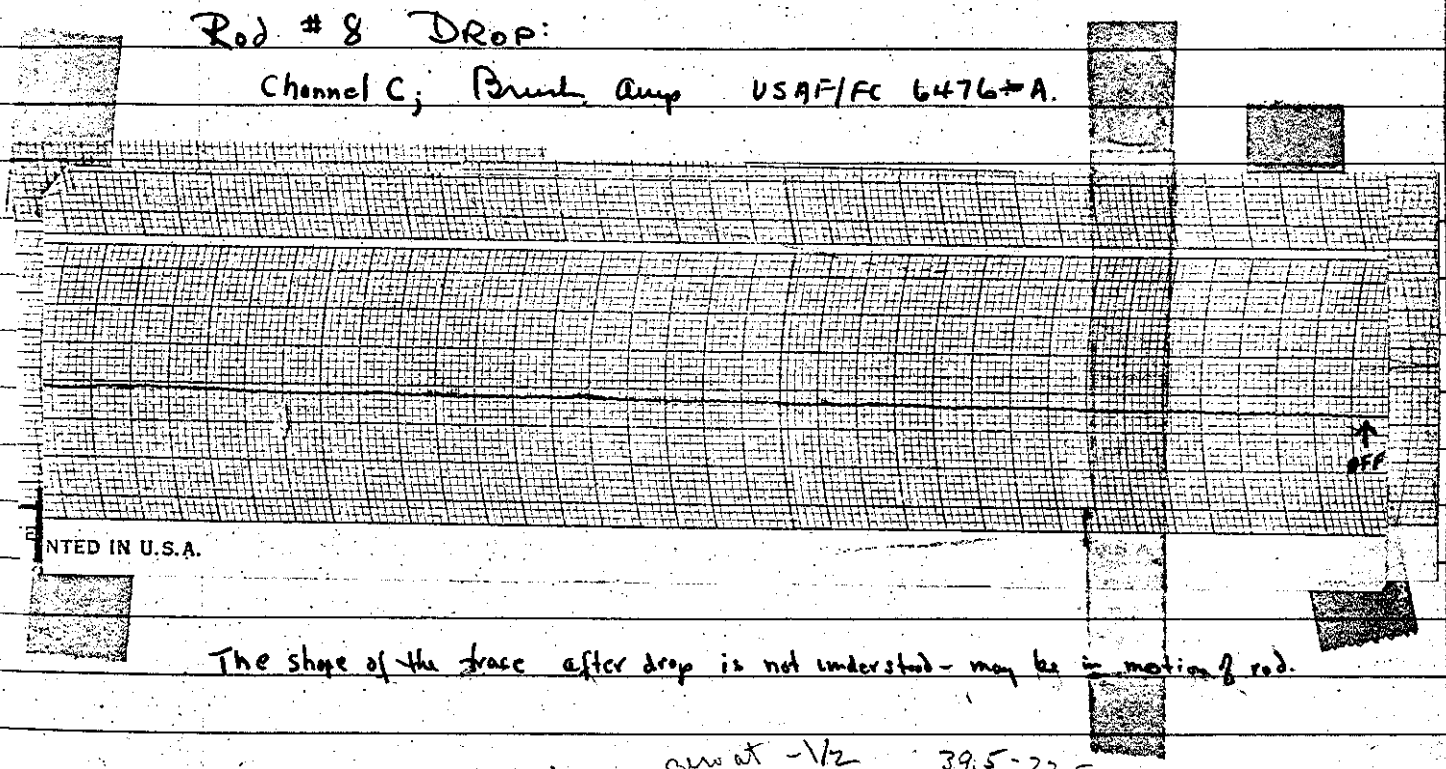
Table Pos. ____ L ____ T ____ R ____

	Control Rod		Channel
A	Dn	A	62 1000/200
B	Out-	B	0.1
C	Critical on C.	C	5.8 x 5 x 10^{-8}
D	or Dn	D	6.8 x (~2 x 10^{-8})
		E	

Tim Crit. 150 ~~AM~~ PM Duration 5 min.

Rod #8 DROP:

Channel C; Brush Amp USAF/FC 6476-A.



NTED IN U.S.A.

The shape of the trace after drop is not understood - may be in motion of rod.

grow at -1/2 $\frac{39.5-23.5}{23.5} = \frac{16}{23.5} = 68\%$

56 8/22/51

Hanke Collector

C.A. 4 Expr. 9 Run 4

Sheet ____ Date 8/22/51 195__ Time ____ ~~AM~~ PM

Purpose Measure fraction of thermal fissions.

TEMPORARY LOADING CHANGE

Slug 766 Pos N-12 — Add 875 + Al + Cd Pos 0

Remove 2 Pos 0

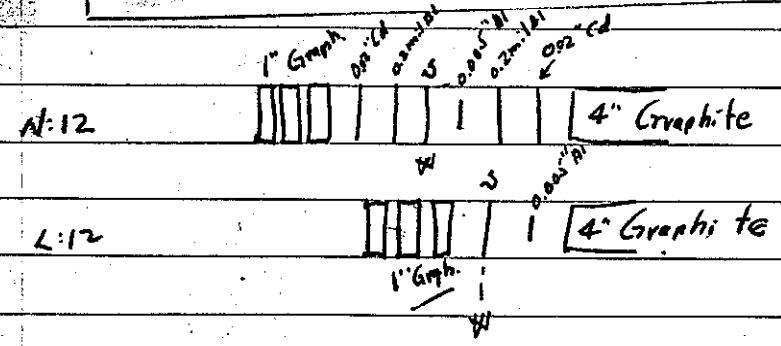
Slug 701 Pos L-12 — Add 192 + Al Pos 0

Remove 3935 Pos 0

Slug ____ Pos ____ — Add ____ Pos ____

Remove ____ Pos ____

See below



INSTRUMENT CHECK

Time 1:00 ~~AM~~ PM Source PB 174

	Channel A	B	C	D	E
Range	OK	OK	10^{-10}	10^{-10}	1200 V.
Source Dist.			4"	1.5"	0"
% F.S. Trip			100+	100+	100

CRITICAL POSITIONS

C.A. 4 Expr. 9 Run 4

T- 0.2605 95 0.2880

Table Pos. 0.000 L T R

Control Rod		Channel	
A	-999.995 (dn)	A	79 100/200
B	20.115 (out)	B	0.02
C	8.122	C	7.8 x 5 x 10^{-9}
D	-999.994 (dn).	D	7.0 x 2 x 10^{-9}
		E	23 @ 1110 v.

Tim Crit. 1:41 PM Duration 20 min.

58

8/23/51

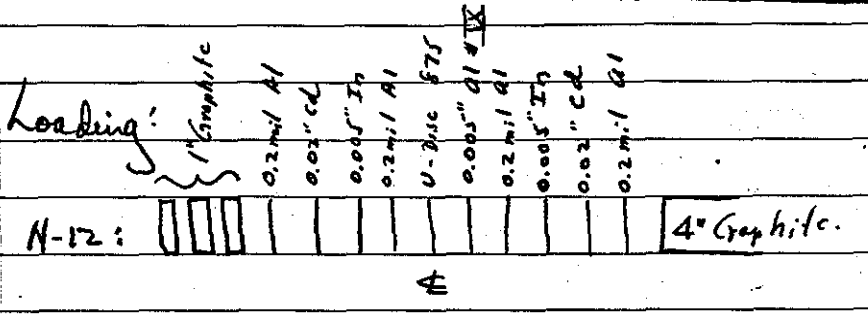
Hooke
Downs
Cawthon

C.A. 4 Expr. 9 Run 5

Sheet ____ Date 8/23/51 195 Time ~~AM~~ ~~PM~~

Purpose To measure fraction of fissions caused by neutrons to which Cd + In is transparent.

Loading:



L-12: Same as Run 4 Except Al foil is ^ VIII

INSTRUMENT CHECK

Time 10:25 AM ~~PM~~ Source PB174

	Channel A	B	C	D	E
Range	6K	6K	10^{-10}	10^{-10}	1200V ST
Source Dist.	—	—	1/2"	0	0"
% F.S. Trip	—	—	100 (out)	100+	91 ~~6~~

CRITICAL POSITIONS

CA 4 Expr. 9 Run 5

T-0.2600 B 0.2330

Table Pos. 0000 L T R

	Control Rod		Channel	
A	−999.989 (dn)	A	75	100/200
B	20.115 (out)	B	0.02	
C	5.715	C	7.2	$\times 5 \times 10^{-9}$
D	−999.971 (dn)	D	6.6	$\times 2 \times 10^{-9}$
		E	8 @ 1050	

Tim Crit. 10:51 ~~AM~~ PM Duration 22 min.

60

8/24/51

Haake

Callihan

C.A. 4 Expr. 9 Run 6

Sheet ____ Date 8/24 1951 Time ____ ~~AM~~ PM

Purpose Measure fraction of fissions caused by neutrons of energy above Cd + In cut off. (at edge of assembly)

TEMPORARY LOADING CHANGE

Slug 491 Pos F-12 Add 875 Pos 0 + Al X

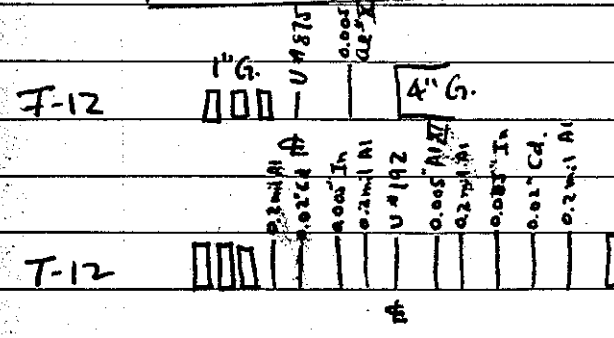
Add 4025 Pos 0

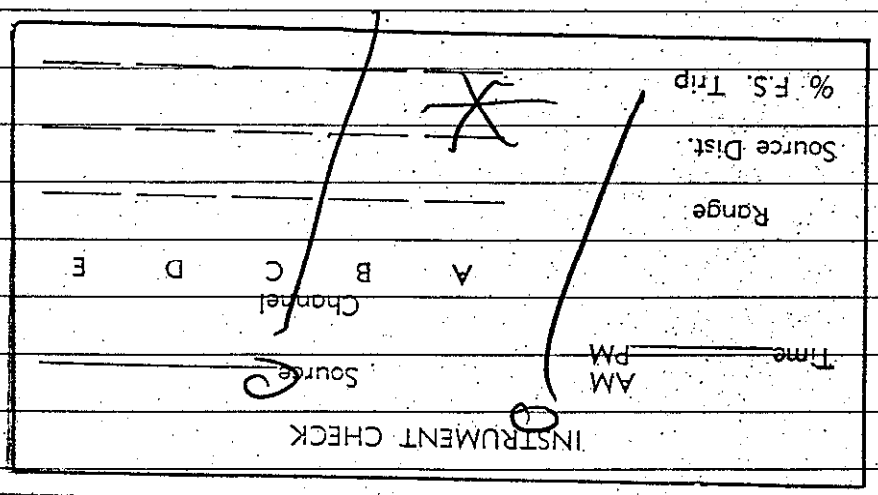
Add 192 Pos 0 Al + Cd + In

Slug 428 Pos T-12 Add 553 Pos 0

Slug ____ Pos ____ Add ____ Pos ____

See below. Al XI





INSTRUMENT CHECK

Time 930 AM ~~PM~~ Source PB174

Channel	A	B	C	D	E
Range	OK	OK	10	10~0 3"	1200 V 0
Source Dist.			4"	3"	0'
% F.S. Trip			100+	100+	100

CRITICAL POSITIONS

C.A. A Expr. 9 Run 6

~~T0.2721~~ ~~B~~ T0.2611 B-0.2232

Table Pos. 000.00 L T R

Control Rod		Channel	
~~A~~ -999.988	dn	A 64	1000/200
B 70.115	out	B 0.10	
C 18.171		C 5.6 x 2 x 10^{-8}	
D -999.971	dn	D → 7.7 x 5 x 10^{-8}	
		E 29 @ 870 V	

Tim Crit. 10:00 AM ~~PM~~ Duration 20 min.

62

8/30/51

Haake
Williamson
Cronin

C.A. 4 Expr. 9 un 7

Sheet ____ Date 8/30 .95 1 Time ____ AM PM

Purpose To check result of previous run by interchanging positions.

TEMPORARY LOADING CHANGE

Slug 491 Pos F 12

Add 192 + al, XII C2, 9m Pos 0

Remove 4025 Pos 0

Slug 428 Pos T 12

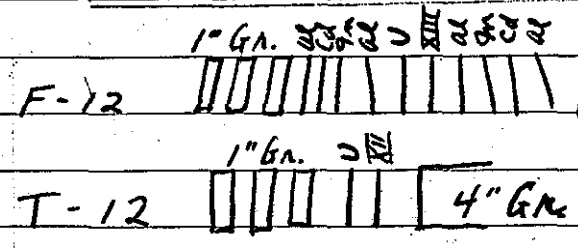
Add 875 + al XII 0

Remove 553 Pos 0

Slug ____ Pos ____

Add ____ Pos ____

Remove ____ Pos ____



Same loading as previous run with positions of bare and covered discs interchanged.

INSTRUMENT CHECK

Time 12:45 ~~AM~~ PM Source PB 174

	Channel A	B	C	D	E
Range	07<	07<	10^{-10}	10^{-10}	1050
Source Dist.			6"	2"	4"
% F.S. Trip			100+	100+	90

CRITICAL POSITIONS

Crit 4 Expr 9 Run 7

Table Pos. 000.000 T 2608 B.2332

	Control Rod		Channel	
1	A 999.990	A	5.6	100/200
2	B 20.115 ~~out~~	B	.10	
3	C 18.258	C	6.75	5×10^{-8}
4	D 999.975	D	4.9	2×10^{-8}
		E	21.5	690V

Tim Crit 1:34:30 ~~PM~~ Duration 20 min.

th
and
tn =

64

8/31/57
Hooke
Callihan

C.A. 4 Expr. 9 8

Sheet ____ Date 8/31 '57 Time ____ ~~AM~~ PM

Purpose To repeat 4-9-7 of yesterday

Reason - Scatter in data -

TEMPORARY LOADING CHANGE

Slug 491 Pos F-12 Add 192 + al XII Pos 0

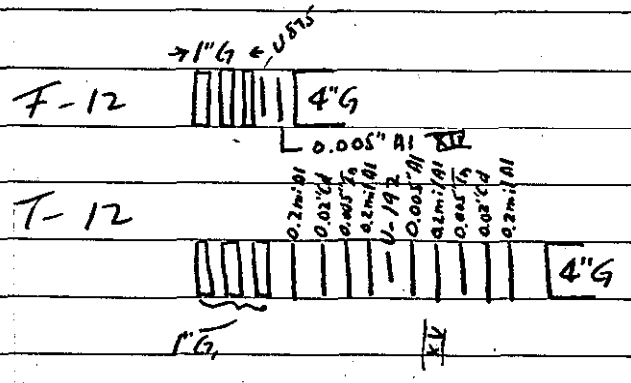
Slug 428 Pos T-12 Add 405 Pos

Add 875 + al XII + CD + M

Remove 553 Pos

Add ____ Pos

Slug ____ Pos ____ Pos



Note: In this Run Source PB 174 was placed in the center of the core, on the usual motor-drive. In preceding ones, beginning with CA4, Exp 2 Run 2A, the source lay in an Al tube adjacent to core until almost critical then manually removed.

INSTRUMENT CHECK

Time 1:10 ~~AM~~ PM Source PB 174

	Channel A	B	C	D	E
Range	OK	OK	10^{-10}	10^{-10}	1050v.
Source Dist.	|	|	3"	2"	1½"
% F.S. Trip			100+	100+	100

CRITICAL POSITIONS

C.A. 4 Expr. 9 Run 8

T 0.2606 B 0.0330

Table Pos. 000.000 L T R

	Control Rod		Channel	
A	-999.989 (dn)	A	66	1000/200
B	20.115 (out)	B	0.10	
C	18.299	C	$8.0 \times 5 \times 10^{-8}$	
D	999.970 (dn)	D	$5.9 \times 2 \times 10^{-8}$	
		E	28.5 @690+	

Tim Crit. 1:33 ~~AM~~ PM Duration 20 min.

66

9/4/51
Frake
Williams
Zimmerman
Fant

INSTRUMENT CHECK

Time 1:10 ~~AM~~ PM Source PB 173,175

	A	B	C	D	E
Range	10	OK	10^{-10}	10^{-10}	1050V
Source Dist.	4"		4"	2"	1"
% F.S. Trip	55		100	100	100

RB Repeating run #8 without the indium.
At XVI - Cd covered, at XVII - bare

CRITICAL POSITIONS

C.A. 4 Expr. 9 Run 9

Table Pos. 000.003 T. 2611 B. 0332

Control Rod	Channel
A 999.986 (in)	A 62.5 1000/200
B 20.115 (out)	B .10
C 18.435	C 7.6 5×10^{-8}
Q 999.971 (in)	D 5.5 2×10^{-8}
	E 35.5 690V

Tim Crit. 1:48 ~~AM~~ PM Duration 20 min.

Date 9-6 1951 Chief

Recorder Hanke Crew Scott

Zimmerman

INSTRUMENT CHECK

Source PB 173, 175

Time 1:45 ~~AM~~ PM

9-6-51

Channel	A	B	C	D	E
Range	1/500 OK	$5X10^{-11}$	$5X10^{-11}$	1050	
Source Dist.	12"	18"	4'	4"	
% F.S. Trip	+100	100	100	100	

Counters 1 & 2 OK Monitor OK

TEMPORARY LOADING CHANGE

Slug M 12 Pos 8

Add 192 + al XVIII Pos 0

Remove 1302 Pos 0

Slug " Pos

Add 875 + al XIX Pos 4

Remove 1303 Pos 4

Slug " Pos

Add 139 + al XX Pos 8

Remove 1304 Pos 8

TEMPORARY LOADING CHANGE

Slug " Pos

Add 176 + al XXI Pos 12

Remove 1305 Pos 12

Slug " Pos

Add 650 + al XXII Pos 16

Remove 1306 Pos 16

Slug " Pos

Add 877 + al XXIII Pos 20

Remove 1307 Pos 20

CRITICAL POSITIONS

C.A. 4 Expr. 10 Run 1

Table Pos. 000.004 T. .2615 ; B. .0330

	Control Rod		Channel
A	999.990 in	A	51.5 on 1000/100
B	20.115 out	B	.051
C	18.448	C	6.2 on $2 \cdot 10^{-8}$
D	999.974 in	D	4.5 on 10^{-8}
		E	51.5 on 825 v.

Tim Crit. 2:40 AM PM Duration 20 min.

C.A. 4 Expr. 10 Run 1

Sheet Date 55 Time AM PM

Purpose Power distribution using aluminum catcher foils. Center & shield longitudinal traverse

C.A. 4 Expr. 10 Run 2

Sheet ____ Date 9-7 195 L Time 9:00 ~~PM~~ AM

Purpose Continue Power distribution with al catcher foils. Center to west face lateral traverse

Zimmerman
Scott
Hooke

INSTRUMENT CHECK

Time 9:05 ~~PM~~ AM Source PB 173,175

	Channel A	B	C	D	E
Range	$10/1000$	OK	10^{-10}	10^{-10}	1050 v.
Source Dist.	4"		10"	6"	4"
% F.S. Trip	50		100+	100+	100+

Counters OK

TEMPORARY LOADING CHANGE

Slug 102 Pos M-12 — Add 877 Pos 0 + al ~~XXIV~~

Remove 1307 Pos 0

Slug 766 Pos N-12 — Add 660 Pos 0 + al ~~XXV~~

Remove 2 Pos 0

Slug ~~102~~ 342 Pos P-12 — Add 476 Pos 0 + al ~~XXVI~~

Remove 102 Pos 0

TEMPORARY LOAD CHANGE

Slug 343 Pos Q-12 — Add 139 + al XXVII 0; Remove 108 0

Slug 344 Pos R-12 — Add 875 + al XXVIII 0; Remove 111 Pos 0

Slug 345 Pos S-12 — Add 192 + al XXIX Pos 0; Remove 120 Pos 0

Slug 428 Pos. T-12 — add 1113 + al XXX Pos. 0; Remove 550 Pos. 0

CRITICAL POSITIONS

C.A. 4 Expr. 10 Run 2

Table Pos. 000.005 T. 2615; B. 0335

Control Rod		Channel	
A	999.990 In	A	72 on 100/200
B	20.115 out	B	.02
3	18.330	C	3.4 on 10^{-8}
4	999.975 In	D	6.5 on 2.10^{-9}
		E	31 on 900 v.

Tim Crit. 9:33 ~~PM~~ AM Duration 20 min.

TEMPORARY LOADING CHANGE — AR Calibration

Slug T-12 Pos 0 — Add 877 Pos 34 — Remove 553 Pos

Slug T-12 Pos 4 — Add 476 Pos 31 — Remove 554 Pos

Slug T-12 Pos 8 — Add 139 Pos 18 — Remove 555 Pos

Haake Bruce

Continue Power distribution Longitudinal traverse at face West edge center (T-12)

TEMPORARY LOADING CHANGE

Slug T-12 Pos 12 — Add 192 Pos XXXIII — Remove 556 Pos

Slug T-12 Pos 16 — Add 1113 Pos XXII — Remove 1257 Pos

Slug T-12 Pos 20 — Add 656 Pos XXI — Remove 1258 Pos

CRITICAL POSITIONS

CA 4 Expr. 10 Run 3

Table Pos .1003 L .2622 R .0332

Control Rod		Channel	
1	-999.991	A	62.5 100%/200
2	20.115 out	B	0.10
3	18.375	C	7.7 5×10^{-8}
4	-999.978	D	5.6 2×10^{-8}
		E	30 690 V

Tim Crit. 2:44 AM PM Duration 20 min.

72

9/11/51

Zimmerman

Scott

INSTRUMENT CHECK

Source 173,175

Time 9:30 AM PM 9-11-51

	Channel A	B	C	D	E
	1/1000	5×10^{-11}	5×10^{-11}	105	
Range					
Source Dist.	18"	15"	10"	4"	
% F.S. Trip	100 OK on Counter 1&2	OK	100	100	100 Monitor OK

TEMPORARY LOADING CHANGE

Catcher Foil #

Slug 131 Pos Q B12LL (M?) Add 2358 Pos 0 } 104

Remove 2089 Pos

Add 2359 Pos 4 } 127

Slug 146 Pos N11 UR

Remove 2129 Pos

Add 2357 Pos 8 } 132

Slug 4 Pos P9 LL

Remove 2613 Pos

Note LL = lower left
UR = upper right

TEMPORARY LOADING CHANGE

Add 2356 Pos ~~12~~ } 134

Slug 68 Pos Q8 UR

Remove 2479 Pos

Add 2860 Pos 16 } 135

Slug 81 Pos S6 LL

3096

1580 20 } 137

Slug 80 Pos T6 UR

1580

CRITICAL POSITIONS

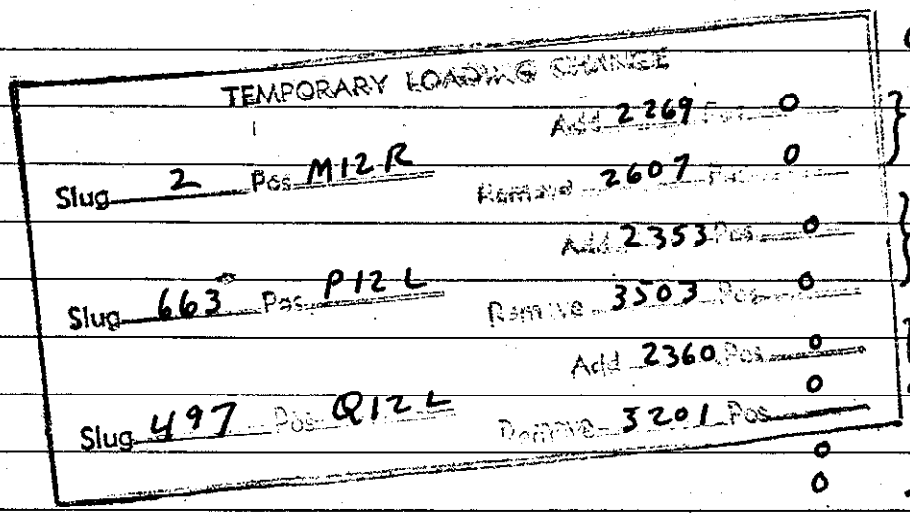
C.A. 4 Expr. 10 Run 4

Table Pos. .005" T.2630 T B.0335

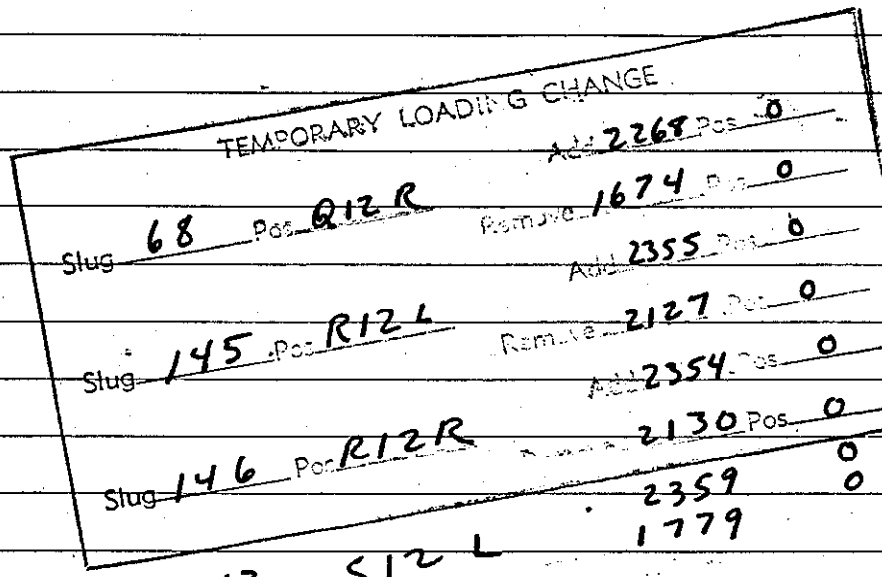
Control Rod		Channel	
A	99.990 in	A 58	1000/200
B	20.115" out	B .10	
C	17.560	C 7	5×10^{-8}
D	99.970 in	D 6.6	$2.X10^{-4}$
		E 65"	750

Tim Crit. 8:55 AM ~~PM~~ Duration 20 min.

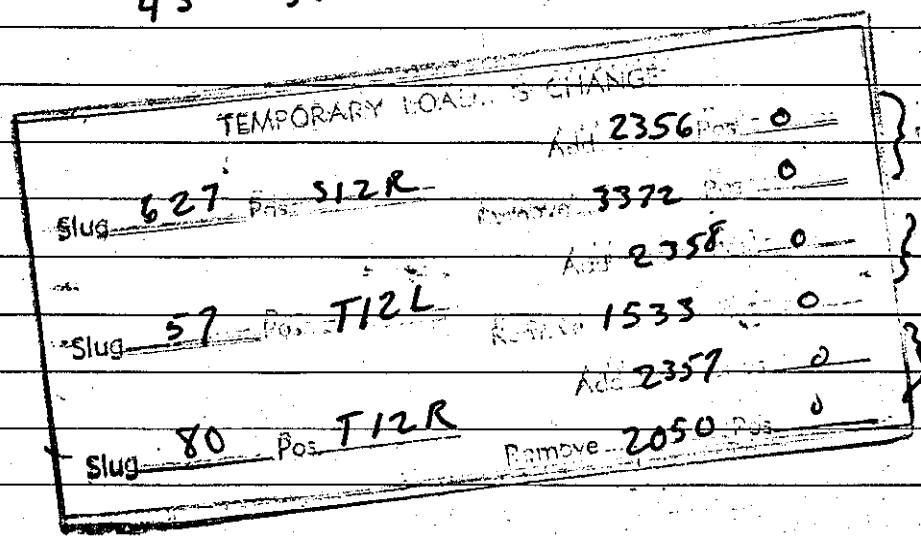
74



Catalina



43 S12L



CRITICAL POSITIONS

CA 4 Expr. 10 Run 5

Tank Rad. 00.005 .2625 T — R.0333

Control Rod

1 9.992 in

2 20.116 out

3 17.415

4 -9.974 in

Channel

A 5.7 1000/200

B 0.10

C 7 5×10^{-8}

D 6.5 $\sim 2 \times 10^{-8}$

E 6.2 750 V

Tim Crit. 11:14 AM Duration 20 min.

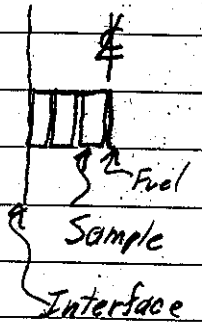
9/11/51

Scott, Zimmerman

Purpose: to continue power distributing using 1½" catchers.

Lateral axis — center to west face.

CA4 Exp 9 Run 10



DANGER COEFFICIENT

Sample 01532 Weight Empty SS can Moles

Thickness 1" 3"x3" Pieces 1 Composition Air

Time 1:20 AM PM Sample Pos. ℄ 1" Interface C.R.

Can yes ☑ no ☐ C.R. Pos. c c c/M

Control

Sample

Control

DANGER COEFFICIENT

Sample 01531 Weight Moles

Thickness 1" Pieces 1 Composition ~~H₂O~~

Time 2:00 AM PM Sample Pos. See above C.R.

Can yes ☑ no ☐ C.R. Pos. c c c/M

Control

Sample

Control

76

5,6,7,8,0,3

Effect of Sodium

CRITICAL POSITIONS

C.A. 4 Expr. 9 Run 10

Table Pos. .003 T. 262 B. 0331

Control Rod HF.O Channel

	Empty			
.01 Sor. out	A 99.990	99.995	A 83	100/500
16.115 Rdc	B 20.115	1.6035	B .048	
.05 Sor. in	G 16.100	99.998	C 5.2	2×10^{-8}
16.140 Rdc	D 99.975	99.975	D 3.8	1×10^{-8}
.05 Sor. out			E 10	750 Volts
16.100				

Tim Crit. 1.8 s' AM PM Duration ____ min.

Purpose: To measure effect of Sodium entering a hole in the reactor.

CRITICAL POSITIONS

C.A. 4 Expr. 11 Run 1

Table Pos. 000.000 T. 2588 B. 0331

Empty SS Sonsat interface K13, 14, 15 16, 17, 18, 19 20, 21 — additional Reflector added in H21 & I21 H21 & I21

Control Rod Channel

A 9.990	A 84	100/500	
B 0.030	B .049		
C 10.575	C 5.2	2×10^{-8}	
D 25.140 out	D 7.5	5×10^{-8}	
	E 11	750V	

Tim Crit. 3.2 s' AM PM Duration 10 min.

Removed SS Bolts from K21, K20 and K19
Inserted Na 00142 in K21
Na 00143 in K20
Na 00144 in K19

CRITICAL POSITIONS

C.A. 4 Expr. 11 Run 2

Table Pos. 000,000 T. 2592 B. 0330

Control Rod		Channel	
A	999.990	A	82 ~~100/600~~
B	.028	B	.049
C	11.030	C	5.0 2X10^{-8}
4	25.142 cut	D	7.4 5X10^{-9}
		E	10.5 750V

Tim Crit. 3:50 ~~AM~~ PM Duration 5 min.

Removed SS Bolts from K-18, 17, 16, 15, 14, 13
Inserted Na #145-K18 Na #148-K15
#146-K17 Na #150-K14
#147-K16 Na #153-K13

CRITICAL POSITIONS

C.A. 4 Expr. 11 Run 3

Table Pos. 00.000 T. 2592 B. 0330

4:20

Control Rod		Channel	
A	19.999	A	
B	00.028	B	.055
C	10.103	C	
D	25.142	D	

78

C.A. 4 Expr. 11 Run 4

Sheet _____ Date 9-12-51 Time 10:15 AM ~~PM~~

Purpose To repeat runs 2 and 3 using 2" voids instead of 1"

(This set-up (4) has 2" empty cans in column K13 – K21)

INSTRUMENT CHECK

Time 10:15 AM ~~PM~~ Source 173,175

9-12-51

	Channel A	B	C	D	E
Range	~~1/1000~~ 1/50 OK		10^{-11}	$2X10^{-11}$	~~1/1000~~
Source Dist.	15"		10"	30"	3"
% F.S. Trip	95		100+	100+	100

Counters 1, 2, ~~3~~ OK Monitor OK.

CRITICAL POSITIONS

C.A. 4 Expr 11 Run 4 & 4

Table Pos. = 99.700 L.2585 T R0330

Control Rod	Channel
1 99.989	A 4.7 – 100%/100
2 0.030	B 0.05
3 1.936	C $2.6 - 5X10^{-8}$
4 25.142	D $8.1 - 5X10^{-9}$
	E 2.2 – 840V

Tim Crit. 10:55 AM ~~PM~~ Duration 10 min.

Empty S.S. cans in cells K13 – K21 (2" each)

CRITICAL POSITIONS

C.A. 4 Expr. 11 Run 5

Table Pos. 999.698 L.2582 T R.0331

Control Rod		Channel	
1 99.991	A 25	1000/200	
2 0.030	B 0.055		
3 3.075	C 3	5×10^{-8}	
4 25.138	D 4.4	10^{-8}	
	E		

Tim Crit. 11:30 AM PM Duration 10 min.

Empty SS cans in cells K13 – K18
Sodium filled cans in cells K19 – K21 (each 2")

CRITICAL POSITIONS

C.A. 4 Expr. 11 Run 6

Table Pos. 99.699 L.258 T R.033

Control Rod		Channel	
1 99.994	A 52	1000/100	
2 0.034	B 0.052		
3 1.770	C 2.9	5×10^{-8}	
4 25.138	D 4.4	10^{-8}	
	E 23	840	

Tim Crit. 3:00 ~~AM~~ PM Duration 10 min.

Sodium filled cans in cells K13 – K21 (each 2")

80
Sept 14 5-1 — Parkerby 9/13 —
William Scott

INSTRUMENT CHECK

Time ____ AM / PM Source ____

	Channel A	B	C	D	E
Range	1/100 OK		5×10^{-9}	2×10^{-9}	1050V
~~Source Dist.~~	24"		14"	12"	2"
% F.S. Trip	50%		100+	100+	90%

1 & 2 ok

Na Cans replaced by Graphite in K13-K21 (2" thick) Still runs if Expr. 11, the shield is pushed back from the face to make room for the cans.

CRITICAL POSITIONS

C.A. 4 Expr. 11 Run 7

Table Pos. 99.697 T.2577 B.0330

Control Rod		Channel	
A	99.990 in	A 46	100/1000
B	0.040 in	B .05	
C	19.013	C 2.8	5×10^{-8}
D	25.198	D ~~7.8~~ 8.5	5×10^{-9}
		E 30	900 Volt

Tim Crit. 9.05 AM ~~PM~~ Duration ~~20~~ 10 min.

Probably 9-13-51
9-14-51 afternoon. Exp 10 Run 6. 81
1) Re check (1½" catcher) Catcher from power distribution near reflector.
2) To check range of activity in Au foils.
3) To measure cd shielding in foil.

TEMPORARY LOADING CHANGE — Catcher

Slug 2 Pos. M12 Right	Add 2353 Pos. 0		117
	Remove 2607 Pos. 0		
Slug 146 Pos. R12R	Add 2261 Pos. 0		136
	Remove 2127 Pos. 0		
Slug 43 Pos. S12 Left.	Add 2356 Pos. 0		122
	Remove 1779 Pos. 0		

TEMPORARY LOADING CHANGE

Slug 627 Pos. S12R	Add 2357 Pos. 0		118
	Remove 3372 Pos. 0		2360 DC
Slug 57 Pos. T12L	Add 2860 Pos. 0		133
	Remove 1533 Pos. 0		
Slug 80 Pos. T12R	Add 2268 Pos. 0		60
	Remove 2050 Pos. 0		

Callahan
Zinn

CRITICAL POSITIONS

C.A. 4 Expr. 10 Run 6

Table Pos. 999.698 0.2379 T 0.0329

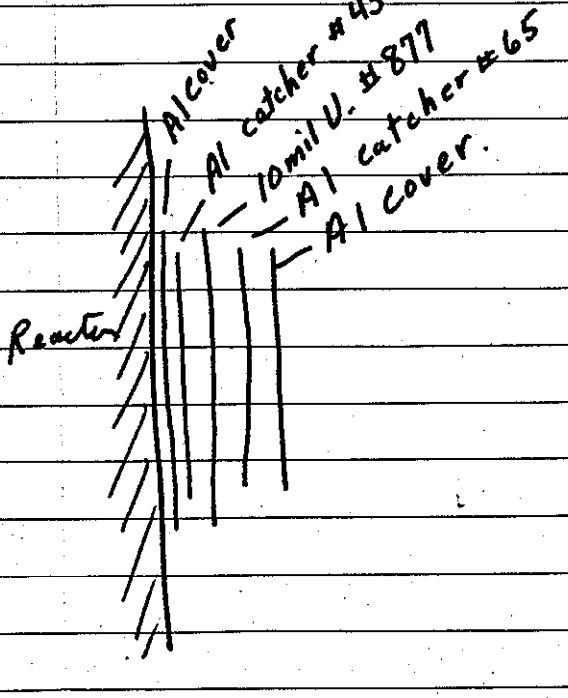
Control Rod		Channel	
1	-99.999 in	A 54	1000/200
2	20.12 out	B 0.1	
3	17.908	C 6.5	5×10^{-8}
4	-99.970 in	D 4.8	2×10^{-8}
		E 38 — 810	

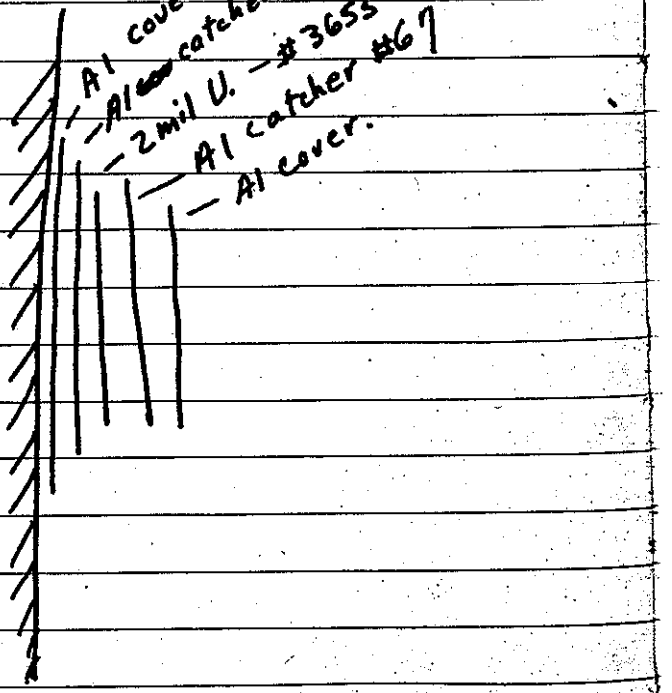
Tim Crit. 2:01 PM Duration 20 min.

note on run 6. —

"Bare Dn foils are placed on top of slugs in cells: Dn # 28 cell M14 (near center)
Dn # 22 " M21 (in reflector)

An alternate method for measuring self shielding in the fuel is being tried. This method consists of measuring the fission products activity on either side of a fuel ~~disc~~ disc which was placed flat against ~~the~~ a face of the pile. This ~~simplifies~~ assumes zero back scattering from the air outside the ~~pile~~ reactor.





9/14

Williams
Emmerson
Calitha

C.A. 4 Expr. 12 Run 1

Sheet ____ Date 9/14 1951 Time ____ AM ~~PM~~

Purpose In foil harness.

INSTRUMENT CHECK

Time 9:45 AM ~~PM~~ Source 173 + 175

	Channel A	B	C	D	E
Range	½00	6K	10^{-10}	10^{-10}	1050V
Source Dist.	15"	6"	1½"	5"	
% F.S. Trip	95%	10+	100+	70	

Counter 1+2 OK

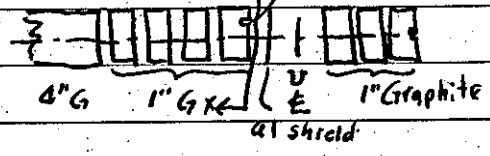
Row 12.

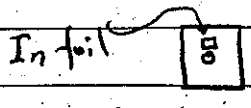
Columns

Slug No.	M		R	S	T	U
In foil No.	12		146	1627	80	R
Al catcher	(1)		4	8	10	71

reflector

Typical details.





Sect X-X

84

9/14/51

CRITICAL POSITIONS

C.A. 4 Expr. 17 Run 1

T 0.2575 B 0.0320

Table Pos. 999.995 L T R

	Control Rod		Channel
A	99.990 in	A	55 100½200
B	20.120 out	B	0.10
C	17.550	C	$6.8 \times 5 \times 10^{-8}$
D	99.970 in	D	9.7×10^{-8}
		E	48 @ 810V.

Tim Crit. 10:09 AM ~~PM~~ Duration 20 min.

9/14/51
Zimmerman
Callihan

C.A. 4 Expr. 12 Run 2

Sheet ____ Date 9/14 1951 Time ____ AM ~~PM~~

Purpose Continue To traverse -

Column

Row	Slug # / Fil #	M		R	S	T	U (Reflector)
12		12 IA 1/2		145 In 68	43 In 63	57 In 3	L In 14

See pg 83 for detail -

TEMPORARY LOADING CHANGE

~~ER~~-12 U Add 2359 Pos 0

Slug 145 Pos 0 U Remove 2130 Pos 0

Add ____ Pos ____

Slug ____ Pos ____ Remove ____ Pos ____

Add ____ Pos ____

Slug ____ Pos ____ Remove ____ Pos ____

CRITICAL POSITIONS

C.A. A Expr. 12 Run 2

T 02576 B 00350

Table Pos. -99.995 L ____ T ____ R ____

	Control Rod		Channel	
A	99.990	Rw	A 57	1000/200
B	20.120	Out	B 0.10	
C	17.500		C $6.9 \times 5 \times 10^{-8}$	
D	99.995	in	D 10.0×10^{-8}	
			E 48 @ 810 v	

Tim Crit. 11:22 AM ~~PM~~ Duration 20 min.

Run 9-17-51

INSTRUMENT CHECK

Time 11:50 ~~PM~~ AM

Source

	Channel A	B	C	D	E
Range	1/1000 OK		10^{-10}	5×10^{-11}	1050
Source Dist.	12"		8"	10"	5"
% F.S. Trip	100		100+	100+	95

OK Counter 1, 2 & Monitor

Foils In: Cd

Slug No. In Foil 3

Al Catcher

R	S	T	V
145 140 68	43 63	57 1	L 14

CRITICAL POSITIONS

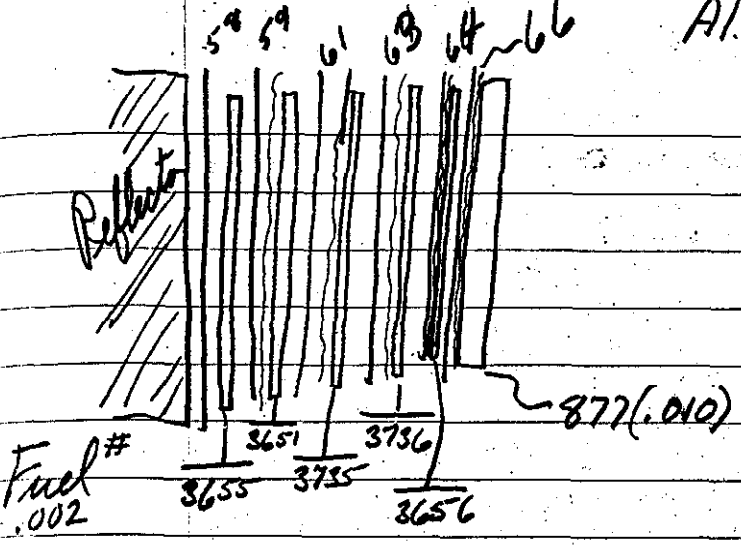
C A 4 Expt 12 Run 3

Table Pos. 99.995 T. 2578 B. 0330

	Control Rod		Channel	
A	99.990	A	60	1000/200
B	20.120	B	.10	
C	16.925	C	5.8	5×10^{-4}
D	99.972	D	10^{+}	10^{-8}
		E	50	810 V

Tim Crit. 12 10 ~~AM~~ PM Duration 20 min.

Al. Catcher



Foils In-Cd

Probat 9-17-51

CRITICAL POSITIONS

C.A. 4 Expr. 12 Run 4

Table Pos. 00.000 T. 2578 B. 0329

	Control Rod	Channel	
A	99.990	A 52	1000/200
B	20.115	B 010	
C	17.240	C 6.4	5×10^{-8}
D	99.972	D 4.7	2×10^{-8}
		E 29	810V

19-720V

Catcher M12 UR — #4

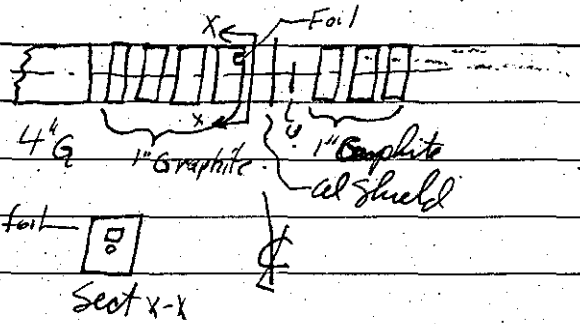
Tim Crit. AM PM Duration min.

In. Cd

Slug No	2
Infoil No	Cd
al Catch	

R	S	T	U
1.146	.627	1.30	R
4	8	10	71

Reflector



88

Probably 9-18-51

INSTRUMENT CHECK

Time 3:10 ~~AM~~ PM Source PB 173, 175

	Channel A	B	C	D	E
Range	10/1000	OK	10	10	1050
Source Dist.	4"		8"	6"	3"
% F.S. Trip	40		100	100+	90

Counters O.K.

Temporary loading change

Shish 52 Pos. I 11 Disc Out 3927, Disc In 877
Position 0

Large Al 3 in position 0 of I 11
Small Al 5 in position 0 of M 12 Upper rt.

C.A. 4 Expr. 12 Run 5

Sheet ____ Date ____ 195 __ Time ____ AM PM

Purpose To establish normalization point for new catcher position.

CRITICAL POSITIONS

C.A. 4 Expr. 12 Run 5

Table Pos.: 0.000 T 2580 R .0327

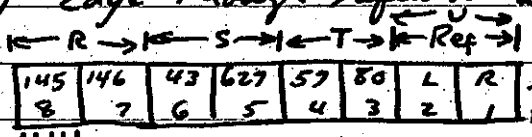
Control Rod		Channel	
A	9.986	A 59.5	1000/200
B	20.115	B .11	
C	17.460	C 7.2	5×10^{-8}
D	9.975	D 5.2	2×10^{-8}
		E 30.5	690V

Tim Crit. 3:45 ~~AM~~ PM Duration 20 min.

77

Loading Chart for Dr and Dr-Cd Travers to be used in runs 6—15 Roman numerals indicate run numbers.

1) Edge Through reflector top of row 12 (center of small circles)



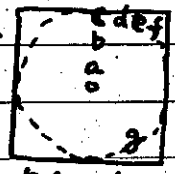
unprimed numbers are positions against fuel

primed numbers indicate 2" from fuel (or half way between fuel 3½" 4"

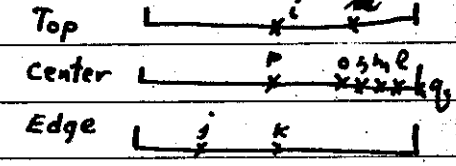
8 B II
4 A II
4 D V
3 A IV
3 D III
3 E I
2 A II
2 B V
2 D IV

1 B I
1 E V
8' B V
4' A V
3' A III
3' E II
2' A V
2' E IV
1' A III
1' E II

Unit Cell →

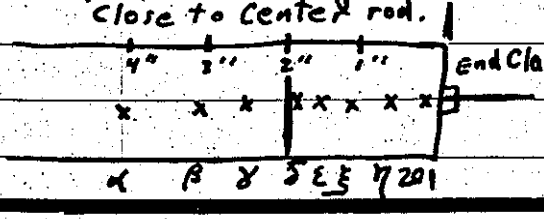


Against fuel



Between fuels

Foils in end of M12 Close to Center rod.



κ III
θ III
γ II
δ III
e I
ζ IV
η II
θ III

a I
b II
c III
d IV
e V
f I
g III

h III
i IV
j I
k II
l V
m IV

n out.
o II
p I
q I

90

9/21/51 I

Scott
Hoake

INSTRUMENT CHECK

Time 10:00 AM ~~PM~~ Source PB 173, 175

	Channel A	B	C	D	E
Range	10/1000	OK	10^{-10}	10^{-10}	1050 v.
Source Dist.	4"		8"	8"	3"
% F.S. Trip	40		100+	100+	100

Counters OK.

C.A. 4 Expr. 12 Run 6

Sheet _____ Date 9-21 195 1 Time 10:15 AM ~~PM~~

Purpose To continue Indium traverse.

Bare Indium I

See Chart for Notation P79

Catcher 37 in I 11

CRITICAL POSITIONS

C.A. 4 Expr. 12 Run 6

Table Pos. 0.000 T. 2578; B .0328

Control Rod		Channel	
A	999.988	A	64 on 1000/200
B	20.117	B	.10
C	17.950	C	7.9 on $5 \cdot 10^{-8}$
D	999.974	D	5.8 on $3 \cdot 10^{-8}$
		E	29 v on 690 v.

Tim Crit. 10:25 AM ~~PM~~ Duration 20 min.

Posn	Foil
3E	5
1B	6
E	9
a	12
f	15
j	17
p	23
g	33

Posn	Foil
4A	7
2A	66
3'E	38
1'E	44
γ	48
η	49
b	52
k	57
O	58

Catcher #4 in I 11

Bare Indium II

CRITICAL POSITIONS

C.A. 4 Expr. 12 Run 7

Table Pos. 999.996 T.2578 B.0328

Control Rod		Channel	
1	49.988	A	54 $\frac{1000}{200}$
2	20.117	B	.10
3	18.080	C	7.2 5×10^{-4}
4	99.973	D	5.3 2×10^{-4}
		E	29 690V

Tim Crit. 1:57 ~~AM~~ PM Duration 20 min.

9-24-51

Zimmerman
Haake

INSTRUMENT CHECK

Time 10:30 AM ~~PM~~ Source 173,175

	Channel A	B	C	D	E
Range	1/1000 OK		2×10^{-11}	2×10^{-4}	1050 v.
Source Dist.	6"		2'	6"	
% F.S. Trip	100		100	100	

Counter 1, 2 OK.

recorder not operating

(see page 89)

Purpose: Continue In traverses, LE

CRITICAL POSITIONS

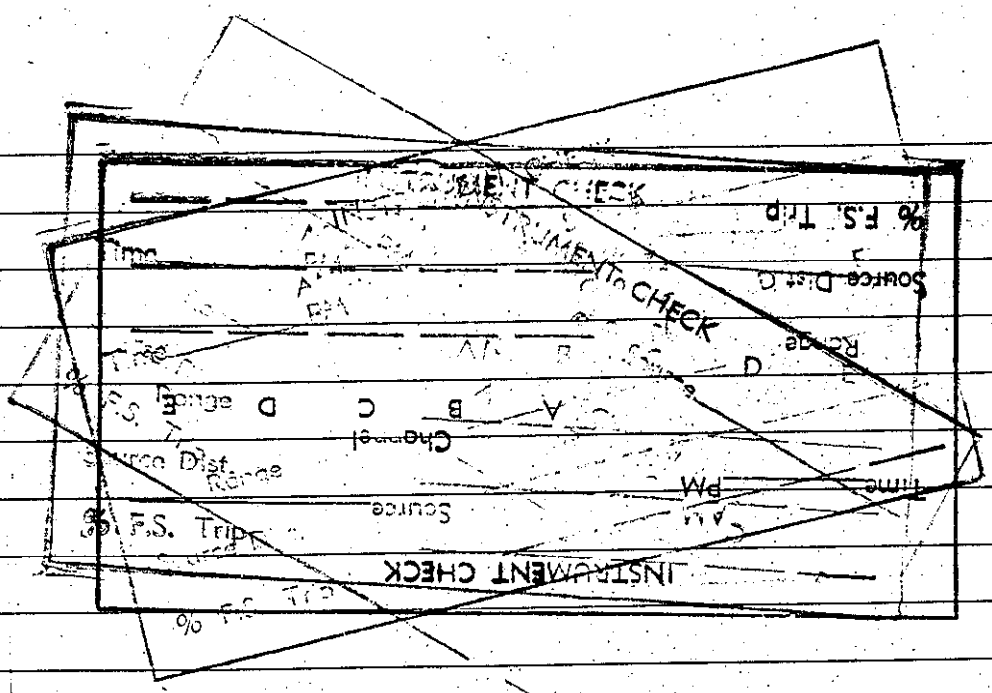
CA 4 Expr. 12 Run 8

Crit Pos. 999.995 T.2576, B.0330

Control Rod		Channel	
A	999.989	A	65 on 100%/2
B	20.120 out	B	.10
C	18.030	C	8.2 on $5\cdot10^{-8}$
D	999.973	D	
		E	50 at 720 v.

Tim Crit. 11:09 AM ~~PM~~ Duration 20 min

Pos'n	Foil
3D	In 5
3'A	" 6
1'A	" 9
δ	" 12
α	" 15
θ	" 17
c	" 23
g	" 43
gl	" 37
I II 0	al 6



9-25-51

INSTRUMENT CHECK

Time 8:30 AM ~~PM~~ Source PB 123,125

Haahr
Williams

	Channel A	B	C	D	E
Range	10/1000 OK		NO	10"	1050V.
Source Dist.	1"		R_{E_C}	6"	4"
% F.S. Trip	90		R_{E_R}	100+	100

COUNTERS O.K.

94

9-25-51

C.A. 4 Expr. 12 Run 9

Sheet ____ Date 9-25 1951 Time ____ AM PM

Purpose Cont. In Traces

Base Indium IV (see p 89)

CRITICAL POSITIONS

C.A. 4 Expr. 12 Run 9

Table Pos. 599.998 To. 2579 B .0329

Control Rod	Channel
# 599.589	A 57 @ 1000/200
B 20.118 (Out)	B 0.10
R 17.988	C Out
D 599.972	D 4.9 x 2x10^-8
	E 28 @ 690 Volts

Tim Crit. 9-05 ~~AM PM~~ Duration 20 min.

Position	Foil
3 A	In #7
2 D	66
4' E	38
2' E	44
β	48
ξ	49
d	52
i	57
m	58
I-11-0	Al #7

Catcher #7 was separated from fuel by a second piece of Al, Therefore it was of no value. However In foils will be placed in positions i and β in next run for normalization

f-25-51

G.A. 4 Expr. 12 Run 10

Sheet _____ Date 5-25 195 1 Time _____ AM PM

Purpose Cont. In Transmit

Base Section IV. (See p 89)

CRITICAL POSITIONS

G.A. 4 Expr. 12 Run 10

Table Pos 999 998 To. 2578 R. 0330

Control Rod Channel

1 999.990 A 58 ∝ 100.0/200

B 20.118 (out) 0.10

C 18.018 Out

D 999.972 D 5.0 × 2 × 10⁻⁸

E 28 ∝ 490 V

Tim Crit. 11:18 AM ~~PM~~ Duration 20 min.

Position	Foil
8 B	In 5
4 D	6
2 B	9
1 E	12
8' B	15
4' A	17
2' A	23
e (e)	43
l	37
i	72
β	73
I-11-6	Al 8

96

CdI

Cd-In. transmission

CRITICAL POSITIONS

CA. 4 Expr. 12 Run 11

Table Pos. 999.990 L. 2578 R. 0329

Control Rod		Channel	
1	999.990 in	A	64 1000/200
2	20.119 out	B	0.10
3	16.755	C	
4	9.974 in	D	5.6 2×10^{-8}
		E	3.05 690V

Tim Crit. 2:22 ~~AM~~ PM Duration 20 min.

Position Foil

3E	42
1B	71
e	59
a	76
f	21
j	22
p	24
g	27

Al catcher #9

9/26

INSTRUMENT CHECK

Time 10:05 AM ~~PM~~ Source PB 175,175

	Channel A	B	C	D	E
Range	10/1000	OK	No	10^{-10}	1050 v.
Source Dist.	0"			8"	6"
% F.S. Trip	95			100	100

Counters OK.

9/26

Cd II (See p89)

Continue Cd-Sn Furnace

CRITICAL POSITIONS

C.A. 4 Expr. 12 Run 12

Table Pos. 000.000 T. 2590 B. 0329

Control Rod		Channel	
A	999.988	A	62 on 1000/200
B	20.118	B	0.1
C	16.934	C	0
D	999.974	D	6.9 x 2x10^-8
		E	27 690V

Tim Crit. 10:44 AM PM Duration 20 min.

Loading

Position	Foil
4A	7
2A	66
3'E	38
1'E	44
γ	48
η	49
ι	52
κ	57
σ	58
Al Catcher	#10

Cd III

CRITICAL POSITIONS

C.A. 4 Expr. 12 Run 13

Table Pos. 99.995 T. 2571 B. 0329

Control Rod		Channel	
A	99.989	A	61 1000/200
B	20.118	B	.1
C	17.050	C	—
D	999.970	D	67 x 10^-8
		E	47 720V

Tim Crit. 1:09 AM PM Duration 20 min.

Loading

Rom	Foil (In Cd)
3D	5
3'A	6
1'A	9
δ	12
α	15
θ	17
ε	23
ζ	43
λ	37
Catcher	# Al 12

9-27-51

INSTRUMENT CHECK

Time 8:40 AM PM

Source 173, 175

	Channel A	B	C	D	E
Range	1/100. OX		5X10"	Q	90c
Source Dist.	1'		14"	Q	0
% F.S. Trip	95%		98%		10c

Counts 1, 2, Ok

C.A. 4 Expr. 12 Run 14

Sheet — Date 9/27/51 Time AM PM

Purpose Cd Covers In foil's

Cd III

Pos	Loading — Counts In
3A	21
2D	22
4'E	24
2'E	27
β	71
ξ	76
d	72
i	59
n	42
Catcher	All 13.

Purpose: Continue Cd-9m Traverse

CRITICAL POSITIONS

C.A. 4 Expr. 12 Run 14

Table Pos. 999.999 L.2576 T R.0330

Control Rod		Channel	
1	999.990 in	A	60 — 1000/200
	20.118 out	B	0.10
3	17.130	C	7.4 — 5x10⁻⁸
4	999.970 in	D	out
		E	58 at 750V

Tim Crit. 9:04 AM ~~PM~~ Duration 20 min.

Cd V (Sep 89)

Purpose: Complete Cd-9m Traverse

CRITICAL POSITIONS

C.A. 4 Expr. 12 Run 15

Table Pos. 000.000 L.2579; B.0329

Control Rod		Channel	
A	999.993	A	56 on 1000/200
B	20.118 out	B	.095
C	17.169	C	7.0 on 5x10⁻⁸
D	999.965	D	out
		E	20 on 690 v.

Tim Crit. 1:10 ~~AM~~ PM Duration 20 min.

Loading

Pos	Cd-9m
8B	5
4D	6
2B	9
1E	12
8'B	15
4'A	17
2'A	23
e	43
l	37

Catcher:

I 11 Al 14

9-28-51

INSTRUMENT CHECK

Time 2:15 ~~AM~~ PM Source PB 173, 175

	Channel A	B	C	D	E
~~Range~~	10/1000 OK		10^{-10}	O	1050 v.
~~Source Dist.~~	1/4"		4"	T	3"
% F.S. ~~Trip~~	95		100		95

INSTRUMENT CHECK

Time 9:00 AM ~~PM~~ Source PB-173,175

10/1/51

	Channel A	B	C	D	E
Range	1/1000	OK	2X10"	out	1150V
Source Dist.	14"		2'		5"
% F.S. Trip	95		100		95

Counter OK.

C.A. 4 Expr. 13 Run 1

Sheet 1 Date Oct 1 95 1 Time 9:00 AM ~~PM~~

Purpose To compare decay curves of fission products due to thermal neutrons, and fast neutrons.

10-1-51

CRITICAL POSITIONS

C.A. 4 Expr. 13 Run 1

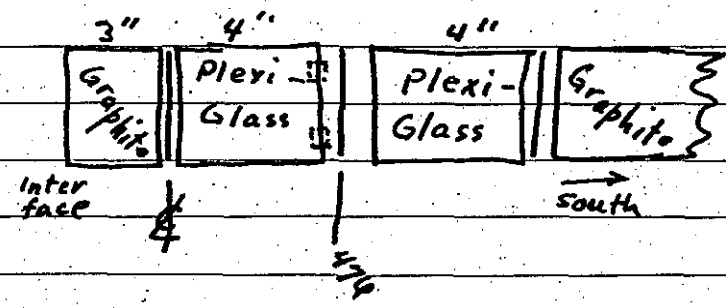
Table Pos. 000.00 1.258 T — R.033

Control Rod		Channel	
A	.035 Ins	A	61 — 1000/200
B	20.12 out	B	0.11
C	24.235 out	C	~~out~~ 7.4 5×10^{-8}
D	~~1.222~~ 1.265	D	Out
		E	61 — 750V

Tim Crit. 9:21 AM ~~PM~~ Duration 20 min.

J11 — In 44 (bare)
In 52 (Cd.)
P11 — Al 15

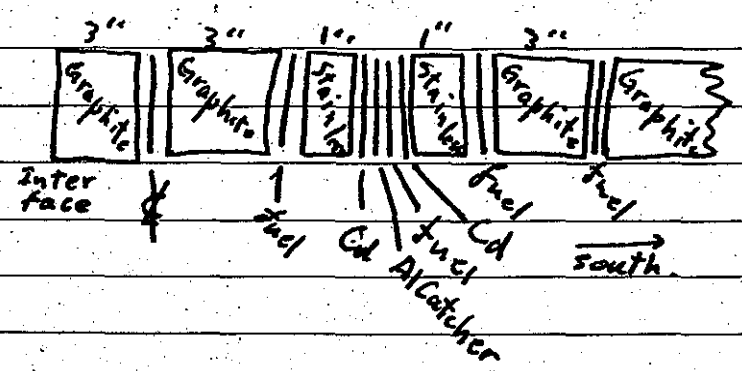
Loading J11 — Thermal Cell



Fuel Loading:
Remove — 3955
Add — 476

Run I — In 44 Bare
In 52 Cd. Cover
(Next to fuel).
Run II Al Catcher #16

P-11 — Fast Cell



Fuel Loading
Add — 139 & 192
Run I Al Catcher #15
Run II In # 24 Bare
In # 37 Cd Cover

CRITICAL POSITIONS

C.A. 4 Expr 13 Run 2

Table Pos. 000.00 .2588 .0330

Control Rod		Channel	
A	999.99 in	A 31	100/500
B	20.17 out		-0.022
C	24.237 out	C	8.0 5×10^{-9}
D	1.601 —	D	Resting
		E	58 – 960V

Tim Crit. 12:10 ~~AM~~ PM Duration 20 min.

See loading description on page 101.

J11 – A1 – 16
P11 On 24 (Bank)
On 37 (Drum)

INSTRUMENT CHECK

Source

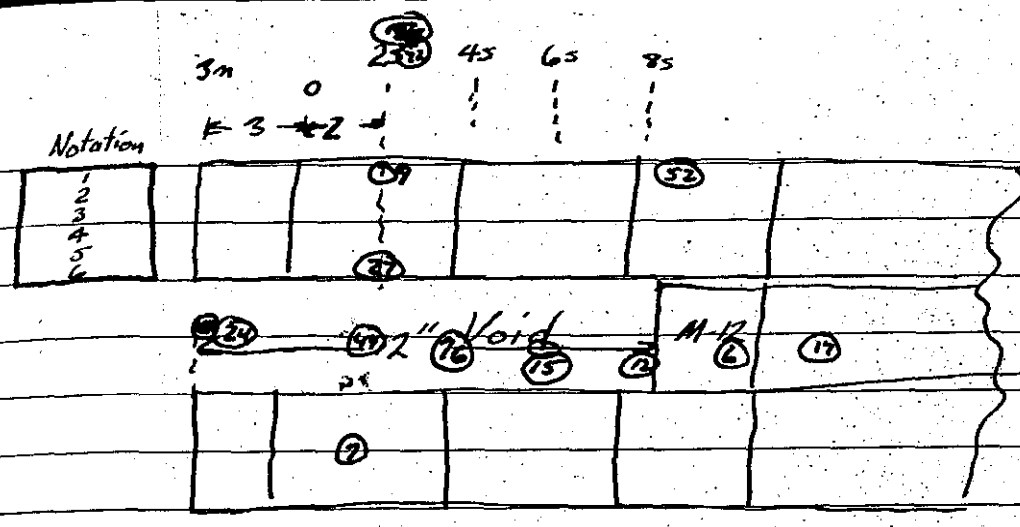
Time 12:45 ~~AM~~ PM

	Channel A	B	C	D	E
Range	1/1000	OK	2×10^{-11}	a	900V
Source Dist.	14"		24"		4½"
% F.S. Trip	92%				100

Zimmerman
Scott

Mountain, Counter 12 OK

Purpose: To investigate a hole in C-A4 by foil measurements.



Shish	Position	Foil
M13	254	37
M12	3n4	24
	254	44
	454	76
	654 –	15
	954 (3n'4)	12
	1154 (1N'4)	6
	1454 25'4	17
M11	251	9
	256	-27
	951	52
M9	256	72

Catcher I 110 #17

CRITICAL POSITIONS

Cr A 4 Expr. 14 Run 1

Tube Pot. 00.000 T.258 B.0532

Control Rod	Channel
A 99.988 in	A 50 $\frac{1.0000}{100}$
B 20.118 out	B .050
C 4.000	C 5.8 2X10^{-4}
D 99.968 in	D
	E 52 840 V

Tim Crit. 2:14 ~~AM~~ PM Duration 20 min.

104 10-3-51

INSTRUMENT CHECK

Time 10:25 AM PM Source 173,175

	Channel A	B	C	D	E
Range	1/50	OK	2x10"		1050V
Source Dist.	24"		10		2"
% F.S. Trip	45%		100+		100+

10K

Purpose: To study the flux distribution in and around a void. ~~(12" long)~~ (12" X 3" X 3")

Cd – Dr. traverse. Loading (See p 103)

Shield	Position	Foil
M13	254	66
M12	3n4	7
	254	58
	454	48
	654	42
	954 (3n4)	57
	1154 (1n4)	49
	1454 (2n4)	38
M11	251	59
	256	71
	951	21
M9	256	22
Catcher	I11 0	19 Al

CRITICAL POSITIONS

C.A. 4 Expr. 14 Run 2

Table Pos. 000.000 T .2593 BR.8329

Control Rod		Channel	
A	55.986 (in)	A	61 ~ 100%
B	20.118 (out)	B	.010
C	0.247	C	7.7 ~ 5 x 10⁻⁸
D	55.965	D	—
		E	18 ~ 730 Volts

Tim Crit. 10:55 AM ~~PM~~ Duration 20 min.

INSTRUMENT CHECK

Time 10:30 AM PM Source 173,175

	Channel A	B	C	D	E
Range	1/100 OK			10^{-10}	10^{50} V
Source Dist.	10"		4"	10"	4"?
% F.S. Trip	95			100	100

C.A. 4 Expr. 4 Run 5 *

Sheet ~~____~~ Date 10/4 195 1 Time 10:30 AM PM

Purpose *(See Run 4 p 43)
To approve pure indium for calibration of counter #4

Loading Pure In # 4 in 1B4 slick J-12

CRITICAL POSITIONS

C.A. 4 Expr. 4 Run 5

Table Pos. 000.00 I.2588 T R.0330

Control Rod		Channel	
1	999.998 in	A 55	1000/200
2	20.12 out	B 0.10	
3	17.242	C Reading	
4	999.967 in	D 6.0	2×10^{-8}
		E 46 @ 750V	

Tim Crit. 10:46 AM PM Duration 20 min.

C.A. 4 Expr. 15 Run 1

Sheet — Date 4 Oct 195 1 Time 1-52 ~~AM~~ PM

Purpose Irradiate Various type Foils to compare activations.

Catches A1-25 in I11

A0-13 - K10n2

In 18 - K14n2

Mn 8 - O10n2

Ag 1 - N-15n2

CRITICAL POSITIONS

C.A. 4 Expr. 15 Run 1

Table Pos. 000.000 T.2591 B.0332

	Control Rod		Channel	
A	99.990	A	60	1000/200
B	20.120		-0.10	
C	16.455	C	—	
D	9.968	D	6.8	2 X 10⁻⁸
		E	58	7500

Tim Crit. 2.02 ~~AM~~ PM Duration 20 min.

10-10-51

Scott
Callihan

INSTRUMENT CHECK

Time 9:20 AM ~~PM~~ Source PB 173, 175

	Channel A	B	C	D	E
Range	10/1000 OK		10^-10		1050 V.
Source Dist.	4"		2"		2"
% F.S. Trip	55		95		100

Counter #1 OK.

C.A. 4 Expr. 15 Run 2

Sheet _____ Date 10-10 195[illegible] Time 10:45 AM ~~PM~~

Purpose Irridate ~~Tantalum~~ Cobalt

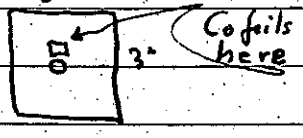
Catcher A121 I_s-11-0

$Co\ 1$ (1¼d) M_N-13-1 c

$Co\ 2$ (1¼d) ~~M_N~~ N_N-12-1c

$Co\ 3$ (1½×1½) M_N-11-1c

In P5 S_s-6-14



CRITICAL POSITIONS

C.A. 4 Expr 15 Run 2

T 0.2600 B 0.0331

Table Pos. 00.005

	Control Rod	Channel
A	99.988 In	A 65 1000/20
B	20.116 Out	B 0.11
C	17.335	C 5 5x10^-4
D	99.965 In	D —
		E 28 @ 670 V

Tim Crit. 11:05 AM ~~PM~~ Duration 20 min.

Oct. 18
Veale
Williams
Scott

INSTRUMENT CHECK

Time 2:30 ~~AM~~ PM Source PB 173, 175

	Channel A	B	C	D	E
Range	10/ma OK		10^{-10}	10^{-10}	1050v
Source Dist.	2"		2½"	1¾"	1"
% F.S. Trip	50		90	100+	100+

Counters O.K.

Gold Foil Activation

Location	Foil
M-12,2n	Au 7
M-12,52	Au11
U-4,2n	Au15
U-4,2s	Au2
U12,2n	Au18
U12,2s	Au12
P12 2n	Au14
S12 2n	Au3
F11-0	Al 94

CRITICAL POSITIONS

C 4 Expr. 15 Run 3

Table Pos. 000.003 T. 2.611 B. 0331

Control Rod Channel

A 998.985 53 on 1000/200

B 20.115 (Out) - 6.10

C 17.536 - 4.2×10^{-9}

D 995.968 $4.5^- 12 \times 10^{-9}$

E 24 @ 690 Volts

Tim Crit. 3:00 ~~AM~~ PM Duration 20 min.

10-19-51

Zimmerman
Haake

INSTRUMENT CHECK

Time 10:40 AM ~~PM~~ Source PB 173, 175

	Channel A	B	C	D	E
Range	10/1000 OK		10^{-10}	10^{-10}	1050 v.
Source Dist.	8"		6"	8"	6"
% F.S. Trip	40		90	100+	95

Counters OK.

Purpose: Activation of Cd. covered gold foils

Location	Foil
M12-n2	Au 10
M12-S21	6
P12-n2	4
S12-n2	1
U4-n2	19
U4-S21	5
U12-n2	17
U12-S21	13
I-11-0	Al 46

CRITICAL POSITIONS

C.A. 4 Expr. 15 Run 4

Table Pos. 000.000 T. 2598, B. 0331

Control Rod		Channel	
A	999.987	A	61 on 1000/200
B	20.115	B	.11
C	~~8.490~~ 8.440	C	5.0 on 5.10^{-8}
D	999.968	D	5.3 on 2.10^{-8}
		E	61 on 750 v.

Time Crit. 11:08 AM PM Duration 20 min.

110

19 Oct
Williams
Hoake
Scott

Dangle Coefficient

DANGER COEFFICIENT

Sample 01478 Weight — Pos. —

Plexi 1 S. Steel + air

Time 1:40 P Sample Pos. M-12 & N

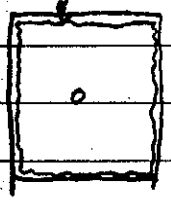
Can yes ✓ / NO — Pos. — c/M

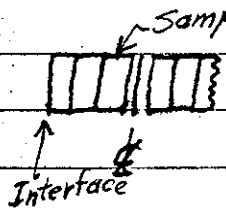
Control —

Sample —

Control —

.020 Cd. Lined Can (SS)





CRITICAL POSITIONS

C.A. 4 Expr. 9 Run 12

Table Pos. 000.000 T.2596 B.0330

" .2600 .0331

	Control Rod	Channel
	Empty ss can	Cd Lined Can
A	999.984	999.987
B	20.115 and	16.164
C	16.364	999.993
D	999.969	999.968

A 29 on 1000/500

B .11 | .10

C 5.8 on $5 \cdot 10^{-8}$

D 6.4 on 2×10^{-8}

E 33 on 690 v.

Tim Crit. 1:55 ~~AM~~ PM Duration 25 min.

DANGER COEFFICIENT

Sample .01528 Weight _____ Moles _____ 156.96 g. B_4C 1.8905 g. Kleenex

Thickness _____ Pieces 1 Composition 33.3959 g. S.S. 1.9573 g. Scotch Tape

Time 3:55 ~~AM~~ PM Sample Pos. M-12 & N C.R. _____

Can be yes ☑ C.R. Pos. _____ _____ _____

Control _____

Sample _____

Control _____

CRITICAL POSITIONS

C A. 4 Expr. 9 Run 13

Table Pos. _____ L _____ T _____ R _____

Did not go critical

Control Rod	Channel
1 _____	A _____
2 _____	B _____
3 _____	C _____
4 _____	D _____
	E _____

Time Crit. _____ AM PM Duration _____ min.

112

Scott
Heake

C.A. 4 Expr. 15 Run 5

Sheet ____ Date Oct. 26 1951 Time 3:00 AM PM

Purpose To irradiate gold foils for counter standardization on this date.

Foils
M 12,2n Au 20
I 11,0 Al

INSTRUMENT CHECK

Time 3:05 ~~AM~~ PM Source PB 173,175

	Channel A	B	C	D	E
Range	10/1000	OK.	10^{-10}	10^{-10}	1050 v.
Source Dist.	4"		8"	5"	3"
% F.S. Trip	40		80	100+	100+

Counters 1+2 OK.

CRITICAL POSITIONS

C.A. 4 Expr. 15 Run 5

Table Pos. 000.003 T. 2599 T B. 0331

Control Rod		Channel	
A	999.987	A	75 on 1000/200
B	20.128	B	0.10
C	17.585	C	6.2 on $5 \cdot 10^{-8}$
D	999.966	D	6.6 on $2 \cdot 10^{-8}$
		E	32 on 690 v.

Tim Crit. 3:29 AM PM Duration ____ min.

10 min!

10-29-51

INSTRUMENT CHECK

Time 1:45 ~~AM~~ PM Source PB173, 175

Hanke
Zimmerman

	Channel A	B	C	D	E
Range	10/1000 OK		10^{-10}	10^{-10}	1050 u
Source Dist.	3"	|	6"	10"	2"
% F.S. Trip	40		80	100+	95

Counters 1, 2, 3 OK

20

CRITICAL POSITIONS

C A. 4 Expr. 16 Run 1

Table Pos. 000.00 T .2595/.0331

Control Rod		Channel	
A	999.990	A	54 @ 1000/200
2	17.306	D	0.099
3	999.991	C	$4.4 - 5\times10^{-8}$
4	999.966	D	$4.6 \rightarrow 2\times10^{-8}$
		E	22 @ 690 V

Tim Crit 2:15 ~~AM~~ PM Duration ____ min.

(Fast fission counter $7\times16+9 = 121$ c/m; $8\times16+7 = 135$; $8\times16+0 = 128$)

Purpose: To measure In res. flux by Sandwich method

Loading: (see below)

~~Shield Cell Pos~~

In cover was of ~~Material~~ 3 mil In.

0.4 mil (effective) Al-In foils in center of Sandwich.

Loading:

Shield	Cell	Position	Foil	Covering	
—	I-11	0	Al 29	——	catcher
~~87~~	K11	0	In 77	Cd, In	
350	L-14	N-2	In 7	Cd, In	
329	N-10	0	In 66	Cd	
23	O-13	N-2	In 57	Cd.	

(Lower 5 reflectors out of fixed half)

114 10-30-51

Zimmerman
~~Seale~~
Haake

INSTRUMENT CHECK

Time 9:50 AM ~~PM~~ Source PB 173, 175

	Channel A	B	C	D	E
Range	10/1000	OK	10^{-10}	10^{-10}	1050 v.
Source Dist.	3"		8"	6"	3"
% F.S. Trip	40		80	100+	100

Counter 1, 2 OK; Monitor OK

C.A. 4 Expr. 16 Run 2

Sheet ____ Date 10-30 1951 Time 10:00 AM ~~PM~~

Purpose To measure Au resonance flux by sandwich method.

CRITICAL POSITIONS

C.A. 4 Expr. 16 Run 2

Table Pos. 000.000 T.2609; B.0331

Control Rod		Channel	
A	999.988	A	67 on 1000/200
B	4.280	B	.11
C	999.990	C	5.5 on $5 \cdot 10^{-8}$
D	999.967	D	5.9 on $2 \cdot 10^{-8}$
		E	49 at 720 v.

Tim Crit. 10:15 AM ~~PM~~ Duration 20 min.

Position	Foil	
I 11, 0	Al 26	
K 11, 0	Au 8	III
L 14, 0	Au 22	I
N 10, N2	Au 9	III
O 13, N2	Au 21	I

Note: Au 8+9 had .002" gold and .020" Cd on either side. Au 21+22 had only .020" Cd on either side.

C.A. 4 Expr. 17 Run 1

Sheet Date Oct. 30 195 1 Time 2:30 AM PM

Purpose To investigate relation between S.R. firing pattern and associated flux level trace.

Scott
Williams
Haake

CRITICAL POSITIONS

C.A. 4 Expr. 17 Run 1

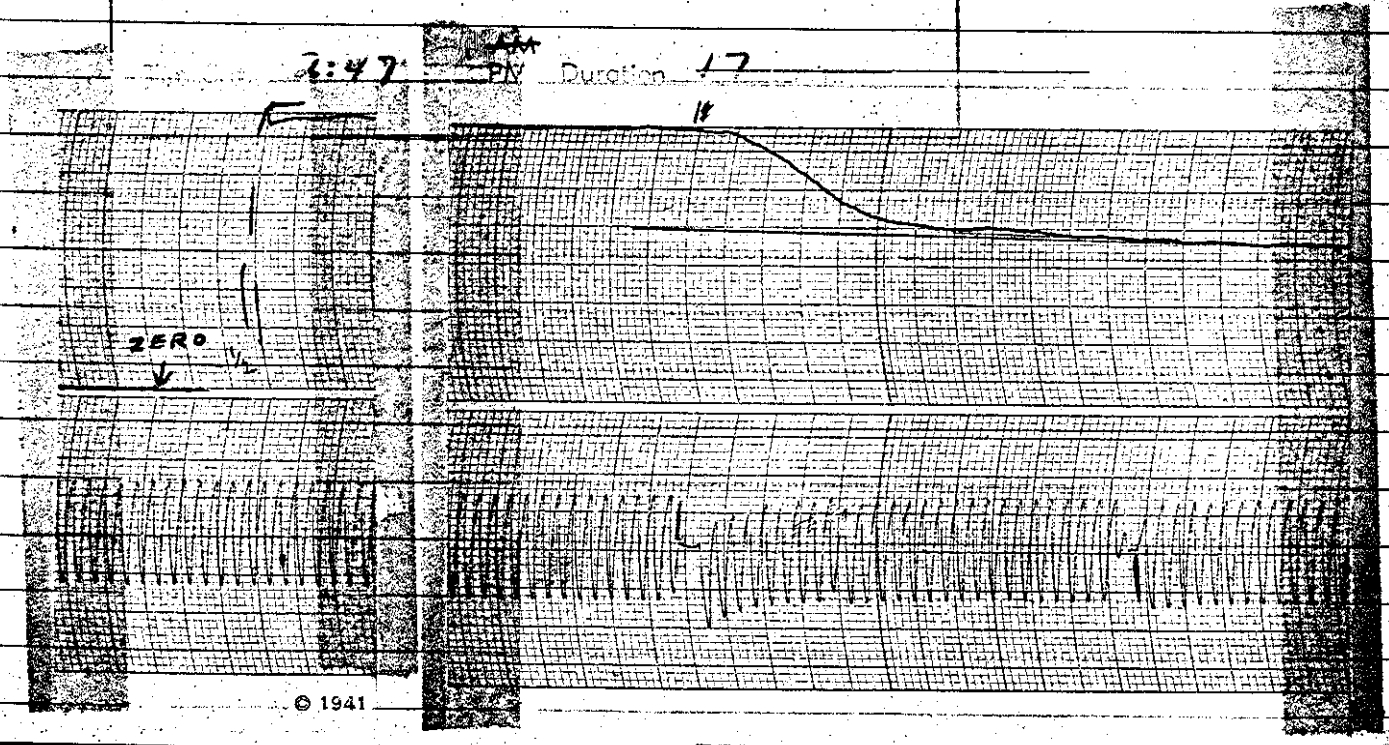
Table Pos. 000.004 T.2596 B.0331

Control Rod		Channel	
A	999.988	A	63 on 100°/200
B	19.725	B	0.1
C	999.990	C	5.1 on $5 \cdot 10^{-8}$
D	999.970	D	5.4 on $2 \cdot 10^{-8}$
		E	30 on 690 v.

Microswitches placed on S.R. 1 show start and end of firing rod movement.

36 - 23 / 23

Time 4:47 AM PM Duration 17



116

10-31-51

Scott Haake

INSTRUMENT CHECK

Time 11:00 AM ~~PM~~ Source PB 173, 175

	Channel A	B	C	D	E
Range	10/1000	OK	10^{-10}	10^{-10}	1050v.
Source Dist.	3"		5"	4"	3"
% F.S. Trip	40		80	100+	95

Counters OK.

CRITICAL POSITIONS

C.A. 4 Expr 17 Run 2

Table Pos. 800.000 T. 2591 ; B. 0330

Control Rod		Channel	
A	999.990	A	61 on 100v/200
B	19.925	B	0.1
C	999.997	C	5.0 on $5 \cdot 10^{-8}$
D	999.965	D	5.3 on $2 \cdot 10^{-8}$
		E	20 on 675

Tim Crit. 11:24 AM ~~PM~~ Duration 12 min.

Purpose: To continue investigation of safety rod firing vs. flux level trace.

CRITICAL POSITIONS

C.A. 4 Expr. 16 Run 3

Table Pos. 200.000 T.2541 B.0331

Control Rod		Channel	
1	99.988	A 70	1000/200
2	11.020	B .11	
3	99.996	C 5.8	5×10^{-8}
4	99.968	D 6.2	2×10^{-8}
		E 29	695 Volts

Tim Crit. 2:54 PM Duration 20 min.

Foil #	Condition	Posn
Au 2	.020 Cd / .004 Au / foil (Au)	L 14-0
Au 5	.020 Cd / .005 Au / foil (Au)	N-10-0
In. ~~22~~ 17	.020 Cd / .005 In / foil (In)	O-13-0
In. 22	.020 Cd / .006 In / foil In	K-11, 0
Al. 22	Catcher	I 11, 0

118 11-1-51

Williams
Scott
Haake

INSTRUMENT CHECK

Time 2:10 ~~AM~~ PM Source PB 173,175

Channel	A	B	C	D	E
Range	10/1000	OK	10^{-10}	10^{-10}	1050 v.
Source Dist.	4"		5"	6"	3"
% F.S. Trip	35		80	100+	100

Purpose: To notice change in rod drop traces when air hose is disconnected after cocking rod.

CRITICAL POSITIONS

C.A. 4 Expr. 17 Run 3

Table Pos. 000.000 T. 2590; B. 0332

Control Rod		Channel	
A	999.993	A	63.7 on 1000/200
B	20.05	B	.11
C	000.055	C	5.2 on $5 \cdot 10^{-8}$
D	999.969	D	5.5 on $2 \cdot 10^{-8}$
		E	28 on 690 v.

Time Chart 2:35 ~~AM~~ PM Duration 25 min. CHART No. 4-25

S

Safety #1

11-2-51

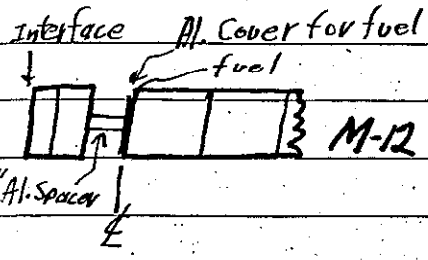
INSTRUMENT CHECK

Time 9:00 AM ~~PM~~ Source PB 173, 175

	Channel A	B	C	D	E
Range	10/1000	OK	10^{-10}	10^{-10}	1050 v.
Source Dist.	6"	|	2"	2"	1½"
% F.S. Trip	30	|	80	100+	100

Counter #1, Monitron OK.

Run for Standardization



Replaced lower 5 reflector shishes in fixed half.

CRITICAL POSITIONS

C.A. 4 Expr. 9 Run 14

~~Table Pos.~~ 000.000 ~~T.2580~~ ~~B.0330~~

Control Rod		Channel	
1	99.991	A	56.5 1000/200
2	20.049	B	1
3	16.936	C	4.6 5×10^{-5}
4	99.971	D	4.8 2×10^{-8}
		E	25.5 - 690V

Tim Crit. 9:46 AM ~~PM~~ Duration ____ min.

DANGER COEFFICIENT

Sample #1 Weight ____ Moles ____

Thickness ____ Pieces ____ Composition Iron

Time ____ AM PM Sample Pos. ____ C.R. ____

Can ____ yes ☐ no ☐ C.R. Pos. ____ c ____ c/M

Control ____ ____

Sample ____ ____

Control ____ ____

CRITICAL POSITIONS

C.A. 4 Expr. 9 Run 15

Table Pos. 020.000 T. 2579 B. 0330

Control Rod		Channel	
A	99.990	A 54	1000/200
B	20.049	B .1	
C	9.530	C 4.3	5×10^{-8}
D	99.968	D 4.6	2×10^{-8}
		E 24	690V

Tim Crit. 10:25 ~~PM~~ AM Duration 20 min.

DANGER COEFFICIENT

Sample 1, 2, 3, 4 Weight _____ Moles _____

Thickness 4 x 1/4" = 1" Pieces 4 Composition Iron

Time 10:40 ~~PM~~ AM Sample Pos M-12-NO C.R. C

Can yes ☐ no ☑ C.R. Pos. c — c c/M

Control 16.936 _____

Sample 9.530 _____ _____

Control _____ _____

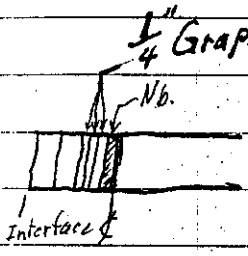
CRITICAL POSITIONS

CA 4 Expr. 9 Run 16

Table Pos. 990.000 T.2578 B.0331

Control Rod		Channel	
A 99.993	A	51	$\frac{1000}{200}$
B 20.049	B	0.1	
C 15.361	C	4.	5×10^{-8}
D 99.965	D	4.2	2×10^{-8}
	E	22.5	690V

Tim Crit. 11.15' ~~PM~~ AM Duration _____ min.



DANGER COEFFICIENT

Sample #1, #2, #3 Weight _____ Moles _____

Thickness Total 1/4" Pieces 3 Composition Niobium

Time 11:35 ~~PM~~ AM Sample Pos. M12 N-0 C.R. C

Can yes ☐ no ☒ C.R. Pos. C C C/A

Control	~~16.936~~			
Sample	15.361			
Control				

See CA 4 EXP 9 R 19

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11/45

CRITICAL POSITIONS

C.A. 4 Expr. 9 Run 17

Table Pos. 000.00 T 0.2519 B 0.0371

	Control Rod		Channel
A	999.984 ~~Out~~ In	A	48 x 1000/200
B	~~20.048 Out~~	B	0.10
C	~~14.635~~ 14.625	C	$3.8 \times 5 \times 10^{-8}$
D	999.968 ~~Out~~ In	D	$3.9 \times 2 \times 10^{-8}$
		E	20.5 @ 690 volts

Tim Crit. 12:20 ~~AM~~ PM Duration ~ 18 min.

DANGER COEFFICIENT

Sample #1,2,3,4 Weight _____ Moles _____

Thickness 1" 1/4 Total Pieces 4 Composition Nickel

Time ~~AM~~ PM Sample Pos. M-12-N-0 C.R. C

Can yes ☐ no ☑ C.R. Pos. c c c/M

Control	16.936			
Sample	14.625			
Control	17.036			

11/4/51

CRITICAL POSITIONS

CA 4 Expr. 9 Run 18

T 0.2578 B 0.0331

Table Pos. 000.000 L T R

	Control Rod		Channel
A	999.986 Ins	A	50.5 x 1001/200
B	20.048 Out	B	0.10
C	17.036	C	$8.0 \times 2 \times 10^{-8}$
D	999.966 Ins	D	$8.6 \times \pi \times 10^{-8}$
		E	~~710~~ 2.5 @ 690V

Tim Crit. 1:02 ~~AM~~ PM Duration 21 min.

Zero Run (to check CA4E9R14) Critical (See CA4. Exp 9 Run 14)

DANGER COEFFICIENT

Sample Weight Moles

Thickness 1" Pieces Composition Air (All tubes in open)

~~AM~~ 1.15 PM Sample Pos. M-12NO C.R. C

	C.R. Pos.	C	C	C/M
	16.936 ~~17.031~~"			
	17.036			

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11/7/51

CRITICAL POSITIONS

C.A. 4 Expr. 9 Run 19

Table Pos. 000.000 T. 2578 B. 0331

Control Rod		Channel	
A	999.990	A 48	1000/200
B	20.049	B .10	
C	17.846	C 9.7	2×10^{-8}
D	99.966	D 8.3	$\times 10^{-}$
		E 20.5	690V

Tim Crit. 2:10 ~~AM~~ PM Duration 20 min.

Rod Drop for SR #6

DANGER COEFFICIENT

Sample _____ Weight _____ Moles _____

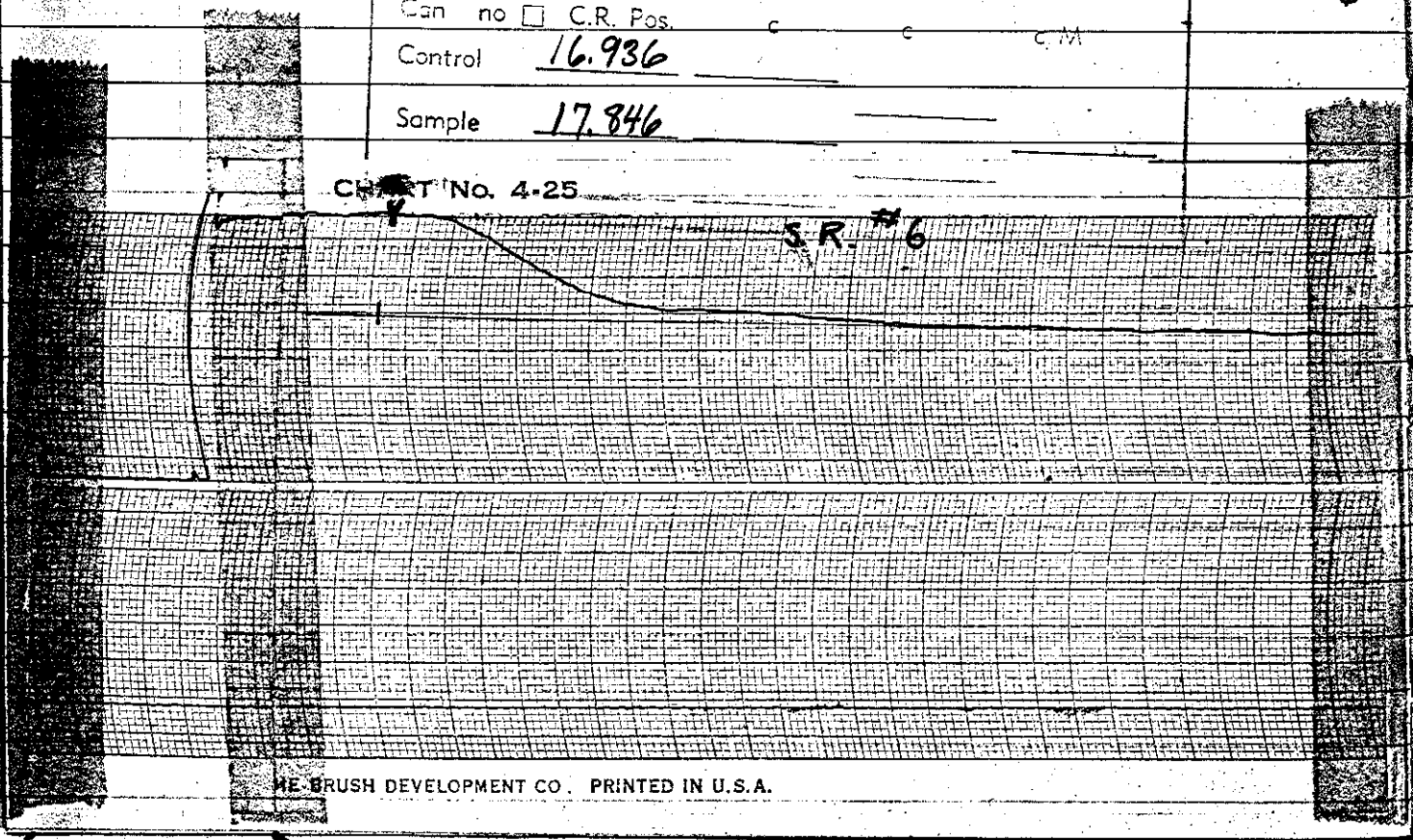
Thickness 1/4" Pieces _____ Composition Air (Al. Spacers)

Time _____ AM PM Sample Pos. _____ C.R. C

Can yes ☐ no ☐ C.R. Pos. c e c.m.

Control 16.936

Sample 17.846



11/7/11

CRITICAL POSITIONS

Cr. 4 Expr. 9 Run 20

Table Pos. 00.000 T. 2577 .0330

Control Rod		Channel	
A	99.985	A 50.5	1000/200
B	20.048	B .10	
C	10.720	C 8.1	2×10^{-8}
D	99.966	D 8.1	10^{-8}
		E 22	690V

Tim Crit. _____ AM PM Duration _____ min.

Rod Drop for S.R. #2 (see p. 135 for trace)

DANGER COEFFICIENT

Sample #1,2,3,4,5 Weight _____ Moles _____

Thickness 5.1 = .5 Pieces 5 Composition Moly

Time 3:00 AM PM Sample Pos. M12NO C.R. C

Run yes ☐ no ☑ C.R. Pos. 1 c c/M

Control 16.936

Sample 10.720

Control

CRITICAL POSITIONS

C.A. 4 Expr. 9 Run 21

Table Pos. 00.000 T. 2578 B. 0331

	Control Rod		Channel	
A	999.986	A	59	1000/200
B	20.649	B	0.100	
C	~~9.96~~ 13.277	C	3.9	5×10^{-8}
D	4.968	D	8.4	10^{-8}
		E	23	690V

Tim Crit. 4:000 AM PM Duration 20 min.

Rod Drop for S.R. #4 [See p. 136 for oscillogram]

DANGER COEFFICIENT

Sample #1, 2, 3 Weight _____ Moles _____

~~Thickness~~ 3 x .1 = .3 Pieces 3 Composition Ti

~~AM~~ PM 4:00 Sample Pos. M12N0 C.R. C

Can yes ☐ no ☑ C.R. Pos. c c c/M

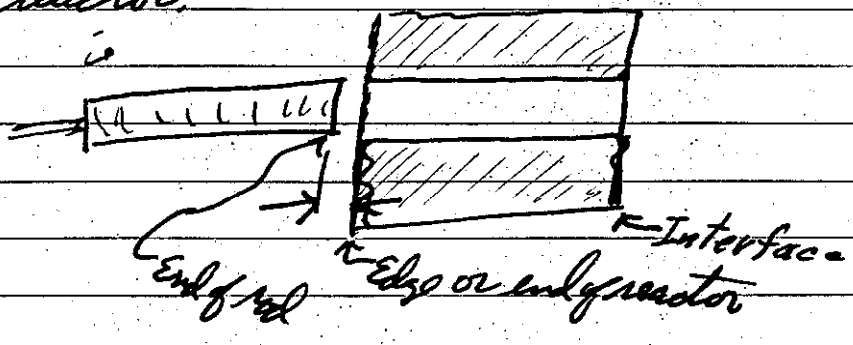
Control 17.846

Sample 13.777

Control

5 Nov. 1951

For rod drop calibration it is necessary to know the position of rod after firing. The following list gives the position of the end of the rod relative to the edge of the reactor.



SR1	$4\frac{5}{8}$" (out)
SR2	$4\frac{1}{4}$" (out)
SR3	$4\frac{3}{4}$" (out)
SR4	$4\frac{5}{8}$" (out)
SR6	2" in
SR7	0"
SR8	$\frac{3}{8}$ in

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5/100 '51
Vasko
William
Scott

INSTRUMENT CHECK

Time ____ AM / PM Source ____

	Channel A	B	C	D	E
Range	10/1000	.3 [illegible]	10^{-10}	10^{-10}	1050r
Source Dist.	4	.007 ok	1 3/4"	2"	1"
% F.S. Trip	.35	~~80.5~~ 80	100+	100+

Counts 42 ok

CRITICAL POSITIONS

4 Expr 9 Run 22

999.996 To. 2578 δ. 6331

Control Rod	Channel
# 999.986	A 56 ≈ 1000/700
1 20.049	B .10
2 17.685	C 4.6 ≈ 5×10^{-8}
3 999.966	D 4.8 ≈ 2×10^{-8}
	E 28.5 ≈ 690 V

Tim Crit. 1:15 ~~AM~~ / PM Duration ____ min.

Rod Drop for S.R. #3

[See p. 135 for trace]

DANGER COEFFICIENT

Sample ____ Weight ____ Moles ____

Thickness 4 Pieces 1 Composition Air (1/4" Al spacer)

Time 1:00 ~~AM~~ / PM Sample Pos. M12N0 C.R. C

Can yes ☐ no ☑ C.R. Pos. c c c/M

Control ____

Sample 19.685

Control ____

11/5/51

CRITICAL POSITIONS

C 4 Expr. 9 Run 23

Pc 995.995 T .2597 B .0331

Rod Dwg for S.R. # 7

[See p. 136 for oscillogram]

Control Rod		Channel	
A	995.998	A	$5.8 \times \frac{+.010}{-.006}$
B	20.049	B	0.10
C	16.920	C	$4.7 \times 5 \times 10^{-9}$
D	995.965	D	$5.0 \times 2 \times 10^{-8}$
		E	28 × 690

Tim Crit. 1:55 ~~AM~~ PM Duration ~20 min.

DANGER COEFFICIENT

Sample — Weight — Moles —

Thickness 1" Places 1 Composition Air (4 in Space)

Time 1:50 ~~AM~~ PM Sample Pos. M1210 C.R. C

Can	yes ☐ no ☐	C.R. Pos.	c	c	c/M
Control					
Sample					
Control					

11/15/51

CRITICAL POSITIONS

C.A. 4 Expr. 9 Run 24

Table Pos. 999.995 T. 257C B: 0331

Rod drop for SR #8

[See p. 137 for oscillogram]

Control Rod	Channel
A 999.986	A 53 on 1000/100
B 20.049	B .10
C 17.109	C 4.2 x 5 x 10^{-9}
D 998.966	D 4.5 x 2 x 10^{-9}
	E 25 x 690

Tim Crit. 2:32 ~~AM~~ PM Duration ____ min.

DANGER COEFFICIENT

Sample ____ Weight ____ Mass ____

Thickness 2½ = 1" Pieces 2 Composition Mg

Time 2:30 ~~AM~~ PM Sample Pos. M12-N0 C

Can yes ☐ no ☑ C.R. Pos. c c c M

Control ____ ____

Sample ____ ____

~~Control~~ ____ ____

4/5/51

CRITICAL POSITIONS

Case 4 Expr. 9 Run 25

Source Pos. 999.993 T. 25745; B. 0331

Control Rod		Channel	
A	999.990	A	51 on 1000/200
B	999.990	B	0.10
C	15.535	C	4.0 on $5 \cdot 10^{-8}$
D	999.965	D	4.2 on $2 \cdot 10^{-8}$
		E	21 on 690 v.

Tim Crit. 3:18 AM PM Duration ~~3:30~~ 12 min.

~~DANGER COEFFICIENT~~

Sample #1 Weight _____ Moles _____

Thickness 1/4" Pieces 1 Composition IRON

Time 3:20 AM PM Sample Pos. M-12 NO C.R. C

Time yes ☐ no ☑ C.R. Pos. c c c M

Control 17.085

Sample 15.535

Control _____

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CRITICAL POSITIONS

C.A. 4 Expr. 9 Run 26

Table Pos. 999.992 T. 2575 T A. 0330

Control Rod	Channel
1 999.987	A 55 (1000/20)
B 20.045	B 10
C 17.756	C 4.2 x 5 x 10⁻⁹
D 999.965	D 4.4 x 2 x 10⁻⁸
	E 21 a 690 V. (T)

Tim Crit. 4:15 ~~AM~~ PM Duration 15 min.

DANGER COEFFICIENT

Sample _____ Weight _____ Moles _____

Thickness 2 x ½" - 1" Pieces 2 Composition Teflon

Time _____ ~~AM~~ PM Sample Pos. _____ C.R. _____

Can yes ☐ no ☐ C.R. Pos. c c c/M

Control _____ _____ _____

Sample _____ _____ _____

Control _____ _____

2/16/51

INSTRUMENT CHECK

Time 9:00 AM ~~PM~~ Source PB 173, 175

	Channel A	B	C	D	E
Range	10/1000	OK.	10^{-10}	10^{-10}	1050 V.
Source Dist.	6"		6"	6"	3"
% F.S. Trip	40		80	100+	100

Counters #1, 2 Monitron OK.

CRITICAL POSITIONS

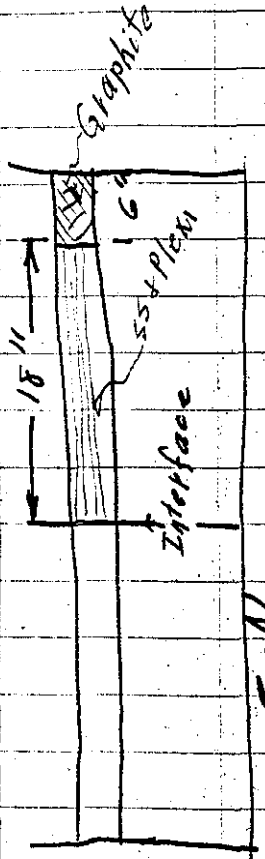
C A 4 Expr. 9 Run 21

Table Pos. 99.992 T. 2578 B. 0330

Control Rod	Channel	
A 99.990	A 78	100/25
B 20.048	B .002	
C 20.238	C 5.1	5×10^{-10}
D 99.966	D 6.5	2×10^{-10}
	E 12.5	1050 V

C - 19.980 @ B, at .01
A at 48 100/200

Tim Crit. 9:20 AM ~~PM~~ Duration 10 min.



DANGER COEFFICIENT

Sample Air-Water slush Weight ____ Moles ____ No fuel

Thickness ____ Pieces 10 1"x18" Plexi. 6 @ .015"x18" SS Composition ____

Time ____ AM ~~PM~~ Sample Pos. ____ C.R. ____

Can yes ☐ no ☐ C.R. Pos. c c c/M

Control ____ ____

Sample ____ ____ ____

Control ____ ____

11/6/51

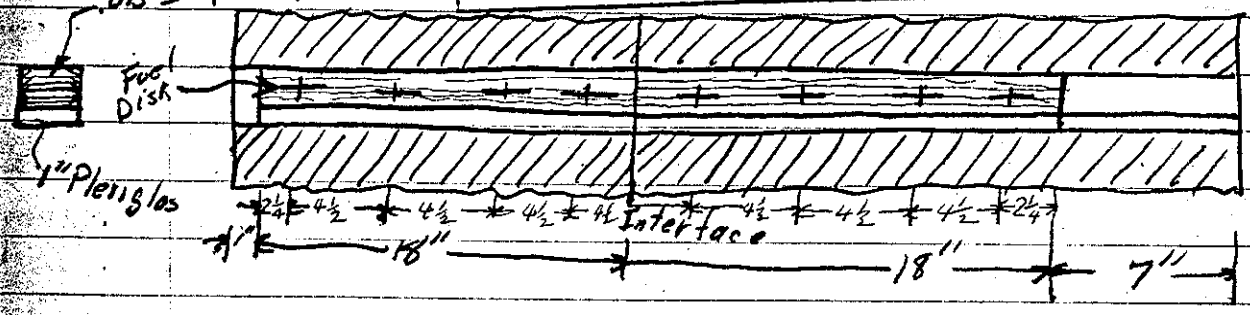
CRITICAL POSITIONS

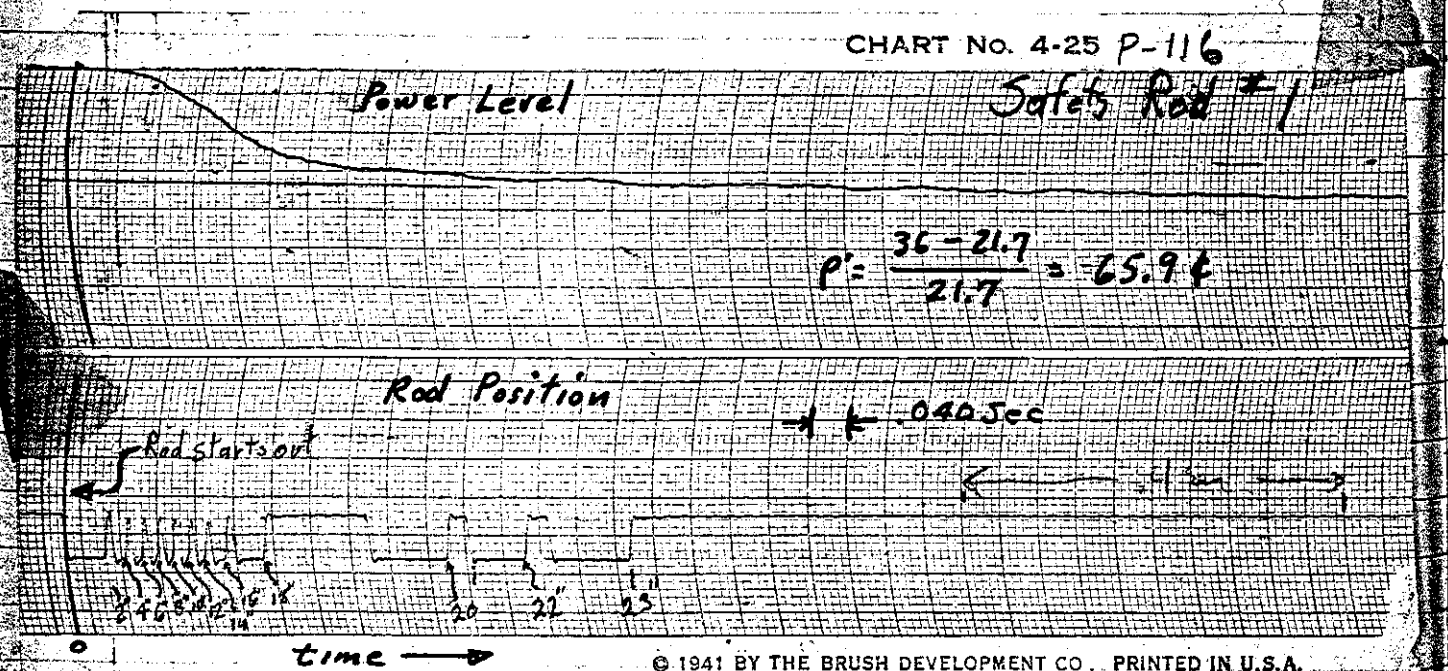
C.A. 4 Expr. 9 Run 28

Table Pos. 999.994 .2576 - .0330

Control Rod		Channel	
A 999.989 in	A	52	109 60
B 20.048	B	.0026	
3 24.735 out	C	68	5×10^{-10}
4 000.002	D	4	5×10^{-10}
	E	18	10500

Tim Crit. 10:25 ~~PM~~ AM Duration 10 min.





$$\rho = \frac{36 - 21.7}{21.7} = 65.9\,\phi$$

4-25

S.R. #2

See p. 125 for above run.

CHART No. 4-25

S.R. #3

See p. 128 for above run.

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CHART No. 4-25

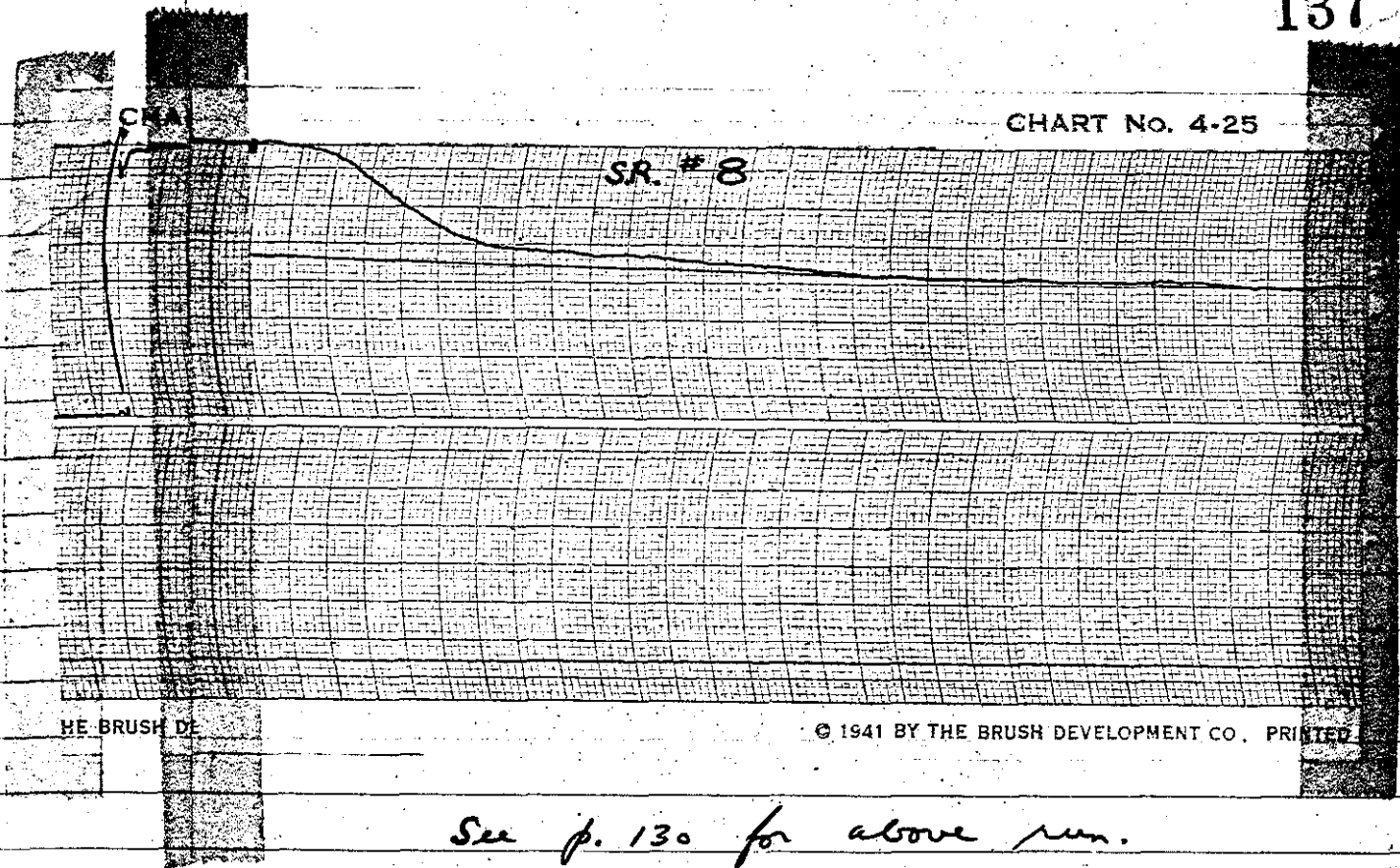
S. R. #4

[See p. 126 for above run]

CHART No. 4-25

S.R. #7

See p. 129 for above run.



See p. 130 for above run.