BOOK 111R

Notes:
on front cover: "5296"

page 1 has red tab "Exponential (37 ½ %)"
page 9 has graph and 8.5x11 stapled to it
page 43 has 3 graphs attached
pages 47, 51, 82, 87, 155, 165, 169, 171, 173, & 271 each have 1 graph attached
page 57 has 2 graphs attached
page 63 has red tab "Solution 37 ½ %"
page 151 has red tab "37 ½ % Sol'n"
page 163 has green card attached
page 182 has small paper attached
page 198 has 2 small papers attached
page 199 has red tab "TSR-II Mockup"
page 296 has 1 graph attached and 1 sheet attached

Blank pages: 2, 16, 39, 62, 167, inside page opposite page 296

Scanned by:
Sheila Finch
RSICC /Oak Ridge National Lab.
March 2, 2001

3510

~~SECRET~~

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E B Johnson

SOME INSTRUCTIONS FOR USE OF THIS NOTEBOOK

This notebook is assigned to personnel performing research and development work and must be used for all original calculations, notes and abstracts from reports.

Assignee is responsible for the safeguarding of this notebook in accordance with security regulations.

~~Classification changed to~~ SRD
(level and category)
By authority of: CG-W-5
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F C Harrington 6/24/94
ADC or ADD signature (first reviewer) Date
ADD signature (final reviewer) Date
Ted Doss 6/24/94

This notebook must be returned to issuing office when completed or upon termination of assignee.

Every page or entry should bear a date and the signature of the person who made the entry.

Entries should be made in ink whenever it is reasonable to do so.

Alteration or amplification of entries made on previous dates should be made as separate entries under their own dates and cross referenced to the previous entries.

Charts, drawings and graphs drawn on special paper should be glued or otherwise securely fastened in place and should individually bear a date and signature. Do not obscure any information.

The notebook should be periodically reviewed by one or more independent persons in the department and should be signed and dated by them. Likewise, they should make a statement that they have "read and understood the foregoing material." Witnessing stamps for this purpose are available in your department's office.

It is advisable to preface each new item, such as a heat treatment, process or reaction, etc., with a very brief description of the purpose, objective or approach.

Description of the invention or discovery should be complete enough to be understood by anyone skilled in the art.

Reference to name or catalogue number should be made when standard items are being discussed, i.e., Westinghouse pump.

In cases where work is conducted in cooperation with others, it is often necessary to meet with them from time to time and discuss new developments. The occurences of such conferences should always be entered in your notebook regardless of recording elsewhere, giving the date, who was present (if possible), and an outline of the subjects discussed. This often will establish error in occasional claims of other parties that you have appropriated information from them revealed during an interview, and thus provide you with patent protection.

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5-25-65

NOTEBOOK NO. 5296

Assigned to: E. B. Johnson
A. D. Callihan

Department: Physics Div

Location: Bldg. 9213

Date: July 12, 1956

INVENTORIED FEB 27 1975

This notebook is assigned to personnel performing research and development work and must be used for all original calculations, notes and abstracts from reports.

Assignee is responsible for the safe-guarding of this notebook in accordance with security regulations.

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[redacted]

Subject

Subject	Page
Exponential Exp	
Fuel dump valve timing + Safety	63
37½% Soln Exp	66-86/151-
BSR fuel elements for TSR	88-150

8-5-91 PFC

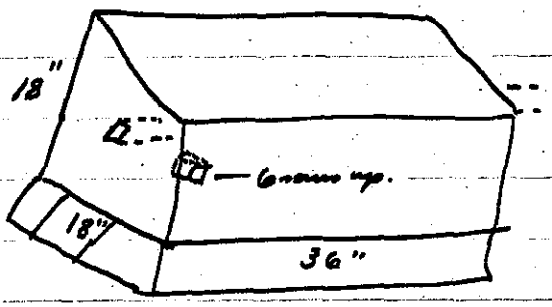
8/24/88 N

[redacted]

"This document contains restricted data as defined in the Atomic Energy Act of 1954. Its contents in any manner to any person is prohibited."

[redacted]

Exponential Experiment
37½% Enrichment

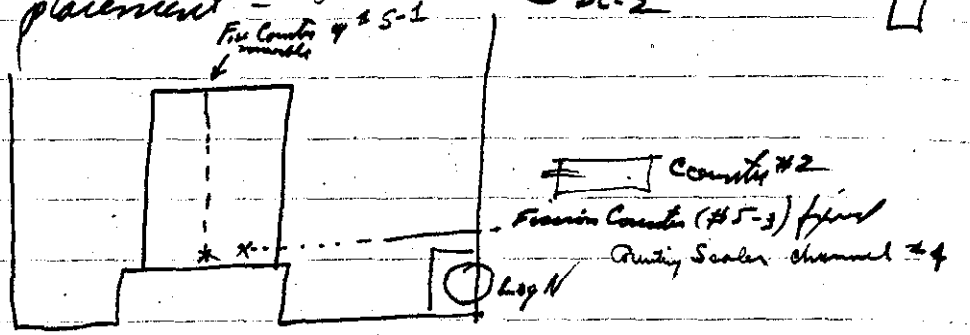


18 × 18 × 36" built up 3" above Al table
on 3 × 3 × 36" square Al boxes (.064" wall)
1" square hole 9" up (edge) + 1" West of center
for inserting 235 fission counter

DC-3

PM

Inst placement — counting channel #5



Classification changed to: U
(level and category)

By authority of: CG-W-5 Topic 93.2
(classification guide)

[signature] 3/31/00
ADC or ADD signature (first reviewer) Date

David C Hannan 3/16/00
ADD signature (final reviewer) Date

Expr. 1-1 Time 9:35 AM PM Date 3-15 1957

Purpose Exponential Exp - making reactor Critical

Personnel: _____

START-UP CHECK LIST

Equipment Checked by DWM Personnel Check by DWM

Instrument and Safeties Checked and Reset by DH

"Source In" Checked by _____ Source No. _____

Emergency Equipment in Control Room Checked by DH

Red Light On by TAF

Start-Up OK'd by DH Time 9:35 AM PM Date 3-15 1957

INSTRUMENT CHECK

Date 3-15 1957 Time _____ AM PM Source No. _____

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1	—			
DC-2	80	20x10		
DC-3	60	10x100		
Log N	10 ma	P		
R-1	8 —	100x1000		
R-2	—	—		
P. M.	1"	750V		

Selsyn for fission counter set so that 0 = 0

Sr Movable table = 3 layers fuel + 2 layers plastic (3/4")

fuel = 2 x 18 x 18 — fixed = 18 x 18 x 36"

	C_1	C_2	C_4	F.C. x16 C_5	Log N	Dial
with source Table Apart	67+29	640+20	2+15	0+9	.00042	

Counting rate together was too high (.0009) with source 213

No Source Table Apart	52+35	55+63	0	0		
Tables Together	38+29	70+19	0	0		
No. 214 Tables Together	44+61	613+21	0+4	0+5	.00038	~.952
No 214 Tables Apart	41+55	398+50	4	1	.00026	~

Loading 4 ea 2" fuel layers 3 ea 3/4" plastic layers

43 + 0 | 698 + 40 | 10 | 2 | .00043

Replaced last 3" on Fixed table with 2" fuel and 3/4" plastic

∴ when Tables Together reactor is 5 layers fuel + 4 ea 3/4" plastic

49 + 0 | 870 + 26 | 143 | 0 + 14 | .00055

Added 1 ea layer of fuel and plastic (6 layers fuel

59 + 1 | 1186 + 61 | 0 + 12 | 1 + 7 | .00078

Added 1 ea layer of fuel and plastic to movable table (7 fuel layers)

100 + 38 | 2361 + 8 | 2 + 0 | 2 + 14 | .00165

Added 1 ea layer of fuel and plastic

On movable Table 7 fuel + 6 plastic

On Fixed table 1 plastic + 35" of fuel

Critical Level — selsyn = 0.38"

C_1 2969 ×6
C_2 jammed
C_4 118 +2
C_5 195 +10
} 6 min ×16

In N .12

R-2 32 ×500×1000

DC-2 72 ×10 ×100

DC-3 35 ×10 ×100

R-1 12 500 × 100

INSTRUMENT CHECK

Date 3-18 1957 Time 9:00 AM ~~PM~~ Source No. Y

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	76	X 10 X 20		
DC-3	55	X 10 X 100		
Log N	7 sec			
R-1	10	X 1000		
R-2				
P. M.	1500			

Removed top row back edge (movable table) - a total of 6 enriched blocks and replaced them with 6 depleted blocks

Expr. 1-2 Time 9:10 AM ~~PM~~ Date 3-18 1957
Purpose Exponential experiment - trimmed reactor to get better table position.
Personnel: TAE DWM DFC

Positive period at .690 on dial .39 on scale
leveled at ln = .12 at .678 on dial .44 on scale.

Expr. 1-3 Time 10:07 AM ~~PM~~ Date 3-18 1957
Purpose Same - removing 2 horiz & 2 vert rows of fuel from center - replacing with depleted
Personnel: TAE DWM DFC.

total 24 fuel blocks approx center of last vertical layer.

11:05 ln N .122
R_2 38 X 500 X 1000
DC-2 96 X 10 X 100
DC-3 78 50 X 10
R-1 2 50 X 1000
CRM (C-1) = 40 scale 30 ppm

pos period scale .36 dial = .721
level scale .42 dial .700

5 min
C_4 X16 - 146 +8
C_5 X16 - 222 +11

Expr. 1-4 Time 11 ~~PM~~ AM Date ~~3~~ Mar -18 1957
Purpose of total 5% Hanford core face
16 and enriched rest depleted
Personnel: VMP DK

11 42 AM

Selsyn = 0.305 dial .774 pos period
In N .12 level dial .750 selsyn 0.36
R 2 36 500x1000
DC-2 83 10x100 5 min
DC-3 75 50x10 C_4 x16 147+6 > 1.60
R-1 1.9 50x100 C_5 x16 236+0
CRM 28(? each)

Expr. 1-5 Time 1:50 PM Date 3-18 1957
Purpose Remove 16 enriched blocks
Layer now "depleted".
Personnel: DWM TMF

1 03 PM Pos. Period selsyn 0.163 Dial .912
" ~ .20 Dial .896
In N .115
R-2 36 ~~500x1000~~
DC-2 84 10x100 5 Min Count
3 74 10x50 C_4 x16 159+6 > 1.57 4
R-1 3.3 200x100 C_5 x16 250+7
CRM 420 C/M

In N = 1.4 Dial 896 5 Min Count
R-2 Supposed zero. C_4 x64 582+47 1.60
CRM 6000 C/M C_5 x64 937+2

R-2

Expr. 2-1 Time 2^15 PM Date 3-18 1957
Purpose Fission Counter Traverse
Same system as 1-5 instruments
moved back
Personnel: TAF DWM DFC

Log N = 0.1
P.M - 1130 v
tripped

Counting Time (min)	Pos.	C_4	C_5	C_5/C_4	Scale
2	0	128 +0	204 +2	1.593	64
"	1	134 +45	137 +11	1.018	"
"	2	131 +3	98 +40	.752	
"	3	133 +56	81 +46	.610	
3	4	194 +29	101 +29	.522	at pos (2) N=.1 at 2:27 pm
"	5	690 +5	83 +23	.439	
4	6	263 +49	101 +49	.397	
4	8	261 +37	80 +20	.307	
6	10	395 +63	94 +26	.239	
6	12	389 +43	76 +60	.197	
	14				
8	16	528 +49	63 +62	.121	
	18				
10	20	659 +24	49 +61	.076	
	22				at Log N=1.0 4 o'clock pm
15	24	1022 +27	50 +21	.0493	← Raised Power level
2	24	348 +106 (×256)	69 +47 (×64)	.0493	Log N = .94
5	28	888 +5	104 +24	.0294	tripped P.M — at 830 v.
5	30	1070 +79	91 +59	.0215	
8	32	1430 +23	97 +52	.0171	
10	34	1975 +182	450 +57	.0634	
5	33	874 +76	101 +22	.029	

Shutdown at 5:09
at 5:11.5 Low by to 1000

8

INSTRUMENT CHECK

Date Mar 19 1957 Time 10⁵⁰ AM PM Source No.

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	82	10 X 20		
DC-3	57	10 X 100		
Log N	7 Acc			
R-1	7	10 X 1000		
R-2				
P. M.	750 V			

Expr. 8-2 Time 11⁰⁰ AM PM Date 3-19 1957

Purpose Check second fission counter 5-2 against #5 & 3

Personnel:

DC-3 not moved

R-2 and DC-2 have been moved and surrounded with lead

Stopped to repair counter 5-2 started up 1²⁵ P M

1³⁴ Pos Period Dial .919

1⁴⁰ Start leveling

Counter-2 zeroed in at plastic face

C-4 (#5-3) C-5 (#5-2) Ln N ~ 0.005

317 x64 +47 490 x64 +10 1.545 R-2 65 X 1000 X 1000

1⁴⁶ Shut down DC-2 60 X 10 X 100

Expr. 2-3 Time 2:30 ~~AM~~ PM Date Mar 19 1957
Purpose
Counting Rate of 8-2 in exp. column.
Personnel:

2" of lead (total of 4") added around DC-2 & R-2
& 8-2 counter on channel #5 (normally empty)
Normalizing counter still 5-3 on channel #4

U-Foil 3/4" OD in approx center of reactor
Started foil exposure at 2:46
2:49 ~~3:49~~ Leveled at dial reading .880 $\ln N = 1.0$

Time	counting time	Pos.	C_4	C_5	C_5/C_4	$\ln N$
2:49 ~~3:49~~	5	4.00"	856^{+17}_{-17}	371^{+11}_{-11}	.0268	1.0
2:55 ~~3:55~~	5	6.00	820^{+17}_{-17}	267^{+9}_{-9}	.0208	0.92
3:01	5	8.00	818^{+21}_{-21}	206^{+11}_{-11}	.0155	.96
	5	10.00	830^{+21}_{-21}	166^{+7}_{-7}	.0125	.98
3:14	8	12.00	1357	212^{+6}_{-6}	.00976	.98
3:24	10	16.02	1743	165^{+6}_{-6}	.00592	.99
3:35	15	20.00	2607^{+95}_{-95}	160^{+10}_{-10}	.00384	1.0
3:51	15	24.00	2539	101^{+12}_{-12}	.00249	1.0
4:04	15	28.00	2611	63^{+12}_{-12}	.001266 ~~.000506~~	1.0

4:26 Shut down (100' exposure) @ ln 1.0.

Foil wgt = 0.5017gm Area = 7.08 counts/sec at 67 hrs.

$$\frac{7.08 \text{ c/sec}}{0.149\,(.03732)(.56)} = \frac{7.08}{3.115\times10^{-3}} = 2.273\times10^{3} \text{ disintegrations/sec}$$

$$\frac{2.273\times10^{3} \text{ d/sec}}{(1.72\times10^{-24})(.1467)(.063)(.5017)(3.1\times10^{10})} = 0.922\times10^{-3} \text{ watts/gm or } 2.86\times10^{7} \frac{\text{fissions per sec}}{\text{per gm}}$$

Assuming uniform flux 0.922×10^{-3} w/gm $\times 83\times10^{3}$ gm = 76.5 watts
measured by Don Harvey

Absolute Power Determination West End

Run = 100 min

Area = 7.08 counts/sec at 67 hrs.

Foil = 0.5017 gm

$$\frac{7.08 \text{ c/sec}}{(.149)(.03732)(.56)} = \frac{7.08}{3.115\times10^{-3}} = 2.273\times10^{3} \text{ Disintegrations/sec. of } La_{140}$$

(.149) — crystal efficiency for 1.6 Mev γ; (.03732) — solid angle (geom. factor); .56 — 56% of β's over 1.6 Mev

$$\frac{2.273\times10^{3} \text{ D/sec}}{(1.72\times10^{-2})(.1467)(.063)(.5017)(3.1\times10^{10})} = \frac{2.273\times10^{3}}{2.465\times10^{6}} = .922\times10^{-3}$$

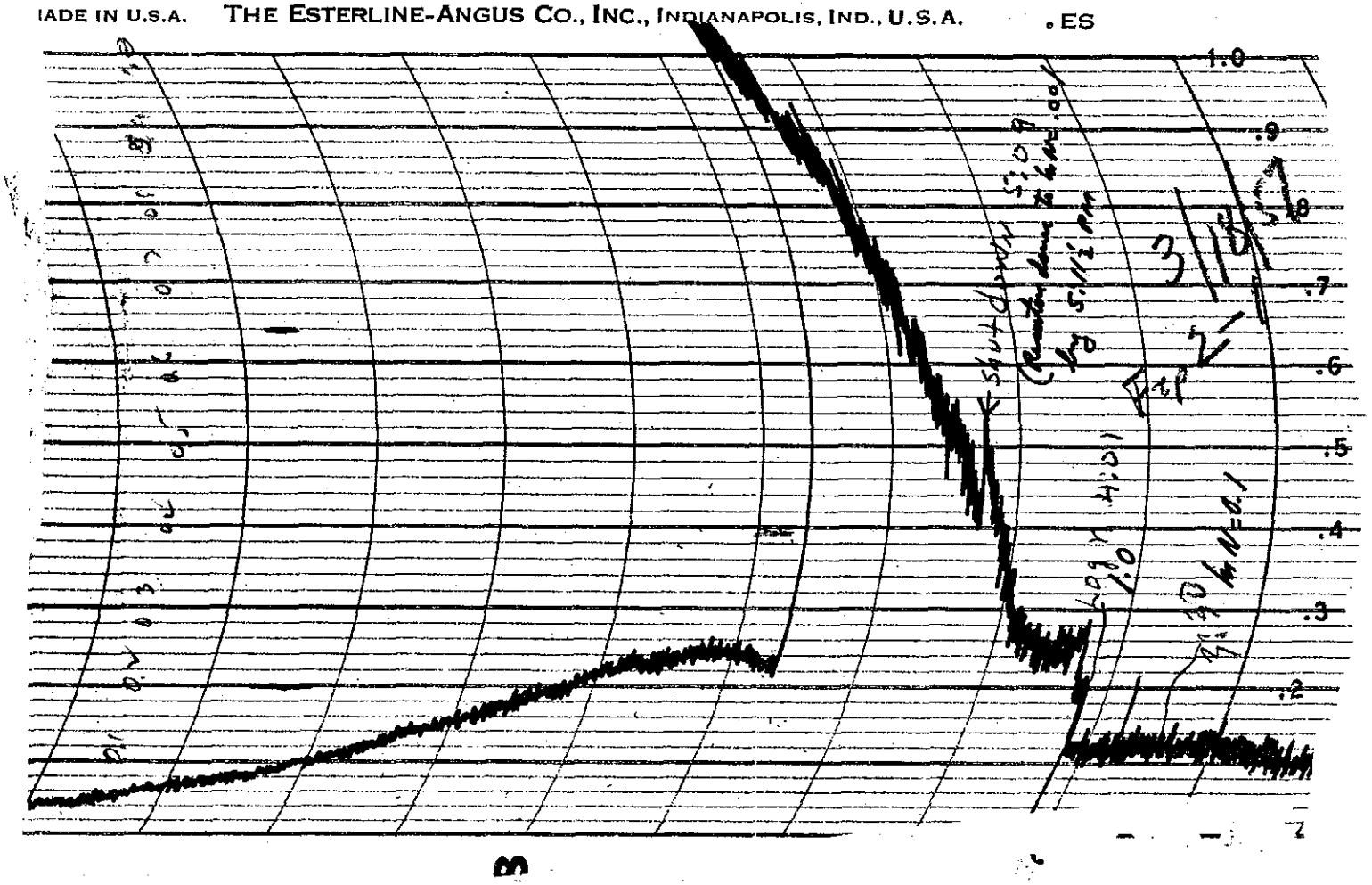
(1.72×10⁻²) — decay constant; .1467 — N La140 / ft²; .063 — fission yield Ba140; .5017 — foil weight; 3.1×10¹⁰ — fission/sec/watt

0.922×10^{-3} WATTS/gm. OR 2.86×10^{7} Fissons/sec-gm

Assuming uniform flux

0.922×10^{-3} w/gm × 83×10^{3} gm = 76.5 WATTS

→ AH



10

INSTRUMENT CHECK

Date 3-20 195 7 Time 3 ~~PM~~ Source No. _____

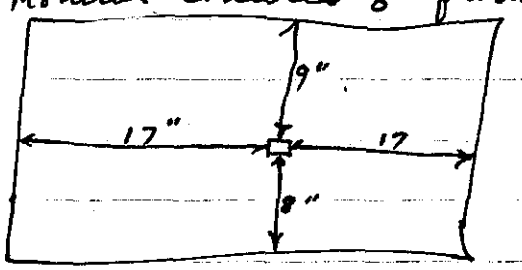
Instrument	Trip Value	Scale	Source Distance	Set-Up Scale
DC-1				
DC-2	74	10 X 2		
DC-3	55	10 X 100		
Log N	7 sec			
R-1	7	10 V 100		
R-2	Responds			
P. M.	260 V			

Expr. 3-1 Time 3:10 ~~AM~~ PM Date 3-20 195 7

Purpose Traverse in horizontal direction perpendicular to expandential dimension

Personnel: THF DWH DFC

Restacked for horizontal traverse moved counter drive. Monitor counter 8" from plastic in longitudinal hd.



west or east faces.

Zeroed tip of counter to end of assembly
Traversing counter is 5-2 - C5
Normalizing counter is 5-3 - C4

3:20 Positive period at .885 on dial and .20 on selsyn
~~3:20~~ .37 on log N at 3:29:22

3:32 Leveled at .859 on dial .25 on selsyn

Counting Time	Pos.	C_4 (x256)	C_5 (x64)	C_5/C_4	Log N	Time
5 min	0	225^{+72}	253^{+27}	.282	1.0	3:32
"	1.00	226^{+230}	271^{+12}	.299	1.0	
4	2.00	183^{+70}	246^{+10}	.336	1.0	3:46
5	3.00	138^{+82}	201^{+12}	.372	1.0	3:49
3	4.00	186^{+23}	219^{+53}	.403	1.0	
3	5.00	134^{+217}	232^{+51}	.433	1.0	3:58
3	6.00	134^{+102}	238^{+19}	.445	1.0	4:01
3	7.00	133^{+74}	243^{+44}	.455	1.0	4:05
3	8.00	133^{+205}	240^{+11}	.449	1.0	
3	9.01	133^{+211}	227^{+32}	.426	1.0	
3	10.00	131^{+202}	213^{+29}	.405		
~~3~~ 3 hr.	11.00	131^{+200}	199^{+21}	.378		
4	~~+3.00~~ 12.00	174^{+193}	234^{+23}	.335		
4	13.12	172^{+83}	199^{+45}	.280	.94	
5	14.00	208^{+170}	200^{+19}	.240		
6	15.00	254^{+164}	240^{+4}	.197	.96	
7	16.00	303^{+170}	300^{+11}	.247	.96	4:46
~~3~~ 5	17.00	216^{+211}	289^{+30}	.334	.97	4:55
3	18.00	132^{+242}	185^{+63}	.346		
3	−1	134^{+15}	198^{+25}	.370		
3	−3	136^{+28}	348^{+19}	.64		
3 yn	20.00	138^{+141}	209^{+53}			

5:18 PM Scrammed manually to shut down —

INSTRUMENT CHECK

Date 3-22 1957 Time 8:40 Source Y

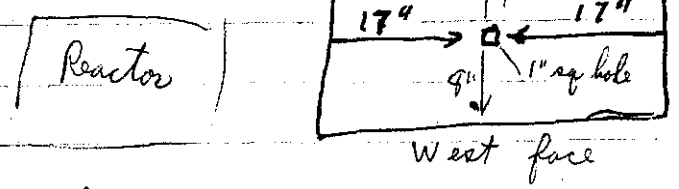
Instrument	Trip Value	Scale				Scale
DC-1						
DC-2	72	10X2				
DC-3	55	100X1				
Log N	7 sec					
R-1	13	10X1				
R-2	✓					
P. M.	½"	750 V				

Expr. 4-1 9:45 3-22 1957

Purpose Traverse in verticle dimension on equatorial pile - surrounded on top and sides by cadmium

Personnel: TAF, BFC, DWH

Restacked for verticle traverse - monitor counter 8" from plate as in 3-1



8 50 Started moving table

9 05 On reactor period dial - .866 - selsyn .21 (+50 sec period)

9 10 Leveled at .834 on dial .28 on selsyn

Counting time	P_{oa}	C_4 (x 256)	C_5 (x 64)	C_5/C_4	log N	Time
3	18.05	168^{+11}	184^{+8}	.278		9:11
3	16.04	166^{+202}	231^{+9}	.348		
2	14.01	111^{+45}	179^{+38}	.463	1.03	9:19
2	~~12.01~~	109^{+116}	189^{+20}	.433	1.00	
2	10.97	107^{+210}	185^{+36}	.433		
2	10.01	101^{+234}	171^{+42}	.423	.98	
3	8.02	148^{+171}	227^{+8}	.394	.95	
3	~~6.00~~ 5.97	145^{+7}	180^{+51}	.312		
~~4~~	~~5.01~~	~~97^{+250}~~	~~100^{+114}~~	.255		
4	5.01	195^{+88}	201^{+30}	.259	.92	
5	3.99	248^{+44}	209^{+12}	.212	.94	
6	3.02	307^{+54}	194^{+36}	.158	.92	
7	1.99	348^{+34}	188^{+42}	.135	.92	
7	0.99	341^{+232}	205^{+28}	.155		~~10:08~~ 10:03
6.	0.00	289^{+86}	262^{+8}	.227	.92	
2	13.00	94^{+184}	163^{+36}	.433		
2.	12.00	96	164^{+56}	.428	.92	
2	12.00	94^{+105}	162^{+3}	.428	.92	

Shut down at 10:24

Removed Cadmium for vertical traverse

Expr. 4-2 Time 1[30] AM PM Date 3-22 1957
Purpose
Vertical Traverse on Exp column
Personnel: DWM TAF DFC.

Monitor counter C-4 (#5-3)
Traversing Counter C-5 (#5-2)

1[30] Start table Together.
1[35] ln N = .0001 1[43] .01 80 sec P. 2'55 sec/decade
1[39½] ln N = .001 ~30 sec P. 1[46 55] .1 80 sec P.
1[51] ln N = 1.0 Start leveling
V
On period always 0.218

At Critical
600 MR/HR at Door to 20'
2 MR/HR at console in control Room
6 MR/HR at Window surface

1 MIN after Shutdown
40 MR/HR at Door to 20'
.1 MR/HR at console.

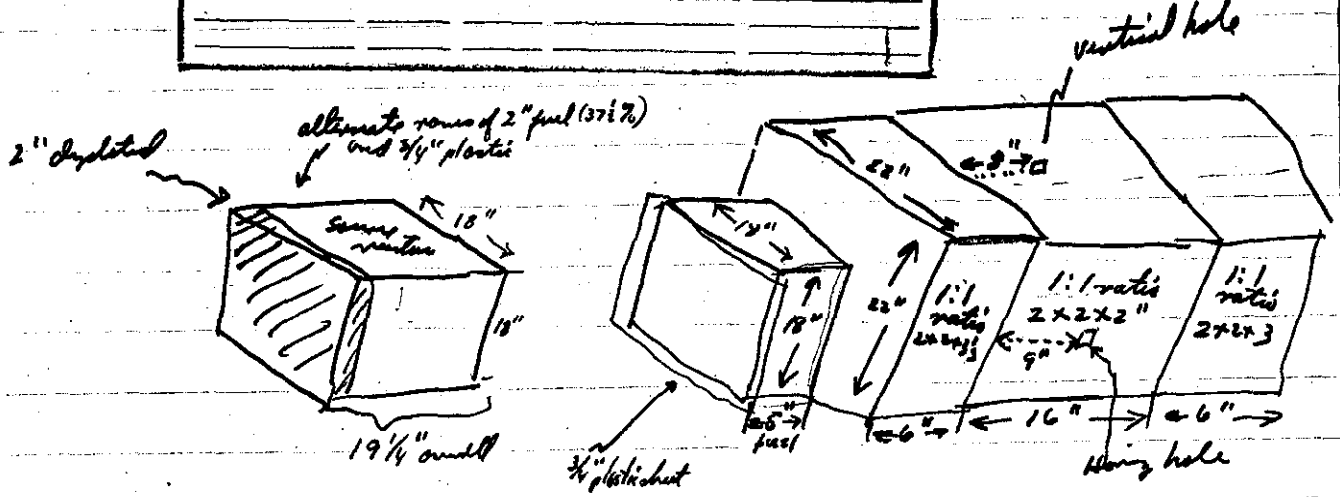
counting time	Position	C_4	C_5	C_5/C_4	ln N	R-1
		64				
4	17.99	716^{14}	204^{60}	.286	0.86	4.0 x1000x1000
4	2nd pm 16.98	756^{25}	243^{20}	.321	.90	
4	16.02	709^{57}	253^{28}	.357	.86	
4	15.00	747^{62}	290^{53}	~~.376~~ .389	.89	
4	13.98	783^{26}	323^{26}	.414	.92	
3	13.01	618^{60}	267^{31}	.432	.96	
2	11.99	402^{21}	178^{57}	.445		
2	11.01	389^{26}	176^{18}	.453	.94	
2	9.99	385^{18}	168^{35}	.437	.92	
4	9.01	753^{27}	310^{+2}	.411	.88	
4	8.02	741^{32}	291^{+50}	.394	.88	
4	7.00	741^{35}	262^{+95}	.354	.88	
4	6.00	729^{14}	226^{+28}	.311	.86	
5	5.01	898^{31}	238^{+49}	.271	.86	
5	4.01	884^{12}	194^{+42}	.220	.84	
85	2.98	877^{31}	163^{+46}	.187	.84	
7	2.00	1208^{21}	358^{+4}	.296 .296		
4	1.00	669^{48}	256^{+16}	.383	.82	3.7 x10^6
4	.00	654^{0}	259^{42}	.397		

Expr. 5 Time 1[15] ~~AM~~ PM Date 4-[8]9 195[7]
Purpose Exponential Exp making of 18% enrich
use slug Source reactor above
Personnel: TAF DJK

INSTRUMENT CHECK

Date 4-[8]9 195[7] Time 1[20] ~~AM~~ PM Source No. 8

Instrument	Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	62	10x20		
DC-3	62	10x100		
Log N	7sec			
R-1	9 on 10 x 1000			
R-2	responds			
P. M.	750V			



Assembles on 3" square Al honeycomb as before but exponential is wrapped in Cadmium (60 mil)
Center section of Exponential column built up of 2x2x2" increments in 1:1 ratio (enriched & depleted) with grosser elements on each end of same ratio built of 2x2x3" increments -
Column is 22" square with re-entrant tubes (3/4" Al) built in for horiz - vert & long transverse. Tubes in 1" holes built into assembly in center section (22x22x16")

(over)

Instruments approximately same location as during Exp I —
For Vertical traverse always reads 0.0 at top of assembly.
2 1/5 RM - start table speed = 6" / 35 sec
leveled at dial reading of .824 setting .305
log N = 4.4 R-1 = 3.75 X 1000 X 1000
Comp log N = .02
G. M. Survey reading at console 2 mr/hr
1 min Counting rates $C_4 = 36 \pm 164$ $C_5 = 17 \pm 100$

X 256

Counting Time	pos. ~~C_4~~	C_4	C_5	C_5/C_4	ln N	start time
5 min	0.01	176 +171 .67	84 +56 .22	.477	4.2	3:21
5 min	1.99	190 +54 .21	54 +74 .29	.285	4.4	
5 min	3.99	203 +24 .10	46 +146 .57	.229	4.6	3:32
5 min	5.00	193 +41 .16	51 +9 .04	.264	4.6	
4 min	6.00	147 +19	46 +54	.313	<	3:44
3 min	8.00	107 +1	43 +164	.402		3 49
2 min	10.04	69 +119	32 +187	.472	4.3	
2 min	12.01	68 136	36 83	.531		
2 min	14.02	73 +8	40 +77	.548	4.4	3 58
2 min	16.01	75 +148	39 +230	.528		
3 min	18.01	120 +160	58 +14	.479	4.6	4 04
3 min	20.05	121 +38	50 +90	.413	<	4 11
3 min	22.02	121 +114	39 +253	.33	4.8	
2 min	17.03	80 +113	41 +102	.512		
2 min	11.02	81 +0	41 +124	.506		
2 min	12.51	81 +11 .043	42 +207 .181	.525		
2 min	13.00	80 +100 .391	43 +53 .207	.538		
2 min	13.51	80 +141 .55	44 +171 .67	.554		
2 min	14.15	79 +160 .625	44 +193 .75	.561		
2 min	15.07	79 +226 .882	43 +123 .481	.544		
2 min	15.53	78 +219	43 +64 .25	.549		
2 min	12 04	78 +42 .164	41 +159 .62	.532		
2 min	14.04	79 +71 .277	43 +25 .098	.544		
2 min	14.52	78 +170 .665	43 +135 .722	.556		
2 min	14.52	77 +42 .164	42 +122 .481	.550	4.6	

Shutdown by manual Scram at 4:45 PM

INSTRUMENT CHECK

Date 4-10 195 7 Time 9 45 AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Trip Scale
DC-1				
DC-2	62	10x10		
DC-3	62	10x100		
Log N	7 on			
R-1	10	10x1000		
R-2	upscale			
P. M.	1"			

Expr. S-2 9 45 AM 4-10 195 7

Purpose Horizontal traverse of source assembled as S-1.

Personnel: TAF DHC

0.0 on relays is East face of assembly.

10^{20} Log N at 0.8 pen point on 100 on alum at 0.25 dial at 8.840

10^{35} level at 0.821 Log N = 4.4 R-1 = 3.8

Time counting

		Pos.	C_4	C_5	C_5/C_4	log N	R_1 (1000 x 1000)
10^{37}	5	0.0	$194^{+76}_{.295}$	$41^{+69}_{.27}$	.212	4.4	3-8
10^{86}	3	2.00	$116^{+192}_{.75}$	$32^{+94}_{.355}$	.278	4.6	
10^{51}	3	4.00	$105^{+29}_{.113}$	$35^{+67}_{.261}$	.335	4.3	
	3	5.01	$104^{+35}_{.137}$	$38^{+65}_{.254}$	.367	4.3	
	3	6.00	$104^{+204}_{.798}$	$41^{+219}_{.85}$	.399	4.2	
	3	2.00	$114^{+126}_{.493}$	$45^{+232}_{.908}$	.401	4.5	
	2	8.01	$79^{+248}_{.97}$	$33^{+88}_{.304}$	.419	4.6	
	2	9.02	$82^{+172}_{.672}$	$34^{+227}_{.886}$	.422		
	2	10.01	$83^{+253}_{.705}$	$35^{+37}_{.34}$	.421	4.7	4.1
	2	11.04	$82^{+205}_{.798}$	33^{251}	.410	4.8	
	3	12.04	$124^{+77}_{.3}$	48^{+10}	.3865	4.7	
	3	13.00	$122^{+392}_{.37}$	$45^{+154}_{.63}$	.373	4.7	
	3	14.00	$120^{+109}_{.425}$	$41^{+242}_{.942}$	.348		
	4	15.01	155^{+254}	49^{+108}	.317	4.6	
	4	16.02	$152^{+236}_{.922}$	$42^{+164}_{.64}$	.280		
	5	17.01	$182^{+127}_{.495}$	44^{+0}	.242		
	5	19.00	$175^{+72}_{.282}$	$29^{201}_{.785}$	.170		
	5	21.02	$167^{+233}_{.91}$	$49^{+195}_{.76}$	.296	4-2	
	4	3.00	$129^{+31}_{.121}$	$29^{+230}_{.9}$	.309		
	3	7.50	$92^{+109}_{.425}$	$29^{+29}_{.113}$	.423		
	3	8.51	$91^{+17}_{.044}$	$38^{+140}_{.546}$	.423		
	3	9.50	$87^{133}_{.52}$	$37^{+64}_{.25}$	.426		3.2
	4	10.50	$113^{+246}_{.96}$	$47^{+179}_{.70}$	~~.451~~ .418		
	4	10.50	$107^{+165}_{.642}$	$45^{+35}_{.134}$	.418		

Expr. 5-3 Time 10:15 AM ~~PM~~ Date 4-11 1957
Purpose Pulse ht analyzer on channel 4

Personnel: TAF DEMcC DH

C_4 - fixed at horiz trace 11" in

C_5 - traversing in longitudinal channel

INSTRUMENT CHECKS

Date 4-11 1957 Time 10:15 AM Sample No. X

Instrument	Trip Value	Scale	Stability Scale
DC-1			
DC-2	50	10 x 20	
DC-3	50	10 x 100	
Log N	Zero		
R-1	10	10 x 1000	
R-2			
P. M.	3"		

10 30 Start up -
10 42 Pos Period Selsyn 0.25
10 46 Leveling at Log N = 0.1 dial = .819
Log N leveled at 0.038 - R-2 200 x 1000 - 60
DC-2 (40) - 5 X 10
DC-3 (27) 100 X 10
R-1 (2) 200 X 100
C_5 X 256 0 + 212 (3 min)

10 58 Leveling Log N = 100 dial = 0.819
13 C_5 = 10 + 93
DC-2 = 47 on 10 x 100
R-1 = 2.1 200 x 1000
Corr log N = .0015

11 02 C_5 10 + 62 3 min on x 256 2622
10 07 9 + 244 3 min 256 2538
10 11 10 + 102 2462

2560
170
3 | 2700
+170 (415) c/min

11 AM 3 min C_5 x 256 10

C_5 in long channel at 0.0 = edge of 2x2x3 transition element

11 14 PHA on C_5 - at 0.0 C_4 monitor
C_4 | 3 min | 4 +163 - 1187

11 25 C_5 - at 0.0 C_4 x 256 (3 min) 7 +101 1893

11 33 C_5 at 6.00 C_4 x 256 | 3 min | 4 +144 = 1168
11 41 C_5 - at 9.00 C_4 x 256 | 3 min | 4 +78 = 1102
11 47 C_5 at 14.01 C_4 + 256 | 3 min | 3 +235 = 1003
11 52 AM C_5 at 3.01 C_4 x 256 | 3 min | 4 +98 = 1202
12 00 Shut down —

24

4-12-57

Exp 5-4

Expr. 5-4 Time 2 45 AM PM Date 4-12 1957

Purpose Longitudinal traverse on same foil as Exponential also 2 foils irradiated

Personnel:

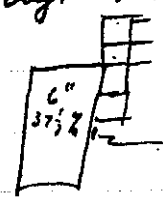
INSTRUMENT CHECK

Date 4-12 1957 Time 2 45 AM PM Source No.

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	50	10X20		
DC-3	58	10X10		
Log N	7m			
R-1	8	10X100		
R-2				
P. M.	1"			

U. 25 foil # 595 wgt 0.4957 gm wrapped in Al foil & loaded in reactor in center fuel element — foil centered vertically & horiz.

foil #0 wgt .4570 gm on Exponential assembly



foil at interface between 6" source plate & 6" transition element.

3:50 Start

3:14:58 Log N = 1 at start of foil Expo. -

			P∞	×256 C_4	×256 C_5	C_5/C_4	log N
3 21	(4)	0.0	~~40 ±147~~	35 ±214		2.5
				27 ±193 .67	78 ±171 .67	2.66	
3 32	4	1.0	28 ±148 .56	67 ±92 .36	2.36	2.6
	4	2.0	29 ±141 .16	62 ±160 .23	~~1.79~~ 2.14	2.65
3 35	4	4.0	29 ±183 .48	46 ±147 .57	1.59	
3 40	4	6.0	29 ±71 .277	36 ±203 .179	1.25	
3 46	5	8.0	36 ±194 .367	36 ±137 .144	0.995	
	5	10.00	86 ±164 .642	28 ±79 .308	.773	
	7	12.00	51 ±147 .57	29 ±135 .523	.572	
	10	14.00	74 ±187	32 ±186 .173	.423	
	12	16.02	91 ±6	28 ±197 .77	.305	2.8
4 27	12	18.00	89 ±91 .355	18 ±157 .61	.208	
	4	3.00	28 ±197 .77	52 ±245 .96	1.84	

Shutdown at 4:44:58 PM = 90 min Exp.

avg c/m C_4 = $\frac{5525 \times 256}{75} = \frac{141,4630^4}{75} = 1,886$ c/m

INSTRUMENT

Date 4-15 1957 Time 100 Y

Instrument	Value	Scale
DC-1		
DC-2	90 X 10 X 20	
DC-3	60 X 10 X 100	
Log N	7 sec	
R-1	10 X 10 X 1000	
R-2		
P. M.	750 V	

Expr. 5-5 Time 115 4-15 1957

Purpose Comparison of U-235 and U-238 fission counters by making longitudinal traverse with U-238 counter S-2

Personnel: TAF DFC DWH

U-238 fission counter S-2 used for traverse along longitudinal dimension of experimental pile.

140 Positive period at 0.845 on dial setsyn at 0.27

157 Leveled at $\ln N = 3.4$ and 0.823 on dial

R-2 65 X 1000 X 100

Compensated $\ln N = .008$

		P_{00}	C_4 (×256)	C_5 (×256)	C_5/C_4	log N
1	(5)	1.0	42^{+123}	2^{+153}	.0648	3.4
	(5)	1.0	44^{+236} (87 +103 / 40 / 423)	2^{+245} (5 +144 / 56)		3.6
			×64	×16		
2 09	(10)	2.00	430^{+23} (27,540)	95^{+9} (1529)	.0555	3.5
2 20	(10)	3.00	411^{+28} (26330)	81^{+12} (1308)	.0497	3.4
2 30	(10)	4.01	417^{+63} 26750	70^{+10} (1130)	.0423	3.5
2 41	(10)	5.005	441^{+49} 28,210	63^{+14} (1032)	.0362	3.6
2 52	(10)	6.00	462^{+} 29,570	67^{+10} (1072)	.0363	3.8
3 03	(10)	7.00	444^{+32} (28480)	53^{+9} (857)	.0301	3.8
3 14	(15)	8.00	595^{+44} 36,100	59^{+6} (950)	.0249	3.7
3 30	(20)	10.00	775^{+37} 49,600	62^{+10}	.0204	
5 51	(10)	2.01	397^{+} 255	88^{+3} 1411	.0554	
4 12	(10)	6.00	393^{+60} 2521	58^{+2} 850	.0337	
	(10)	7.00	396^{+33} 254	47^{+11} 763	.0302	
			35,3094			

2 min after shut down: 80 mv/hr at door & Pen 201

C_4 $\frac{35,3094}{135}$ = 2615.5 c/min avg

To normalize Run 5-5 & 5-4 multiply 5-5 values by 0.721

INSTRUMENT CHECK

Date 5-2 195 7 Time 12 ~~AM~~ PM Source No. _____

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	95	10×10		1×5
DC-3	60	10×100		1×5
Log N	Low point			
R-1				100×10
R-2				100×10
P. M.	750V			750 V

Vertical 0.0 = all out 28.0 = all in
C-4 – 5-3
disc. – 20 Gain 16

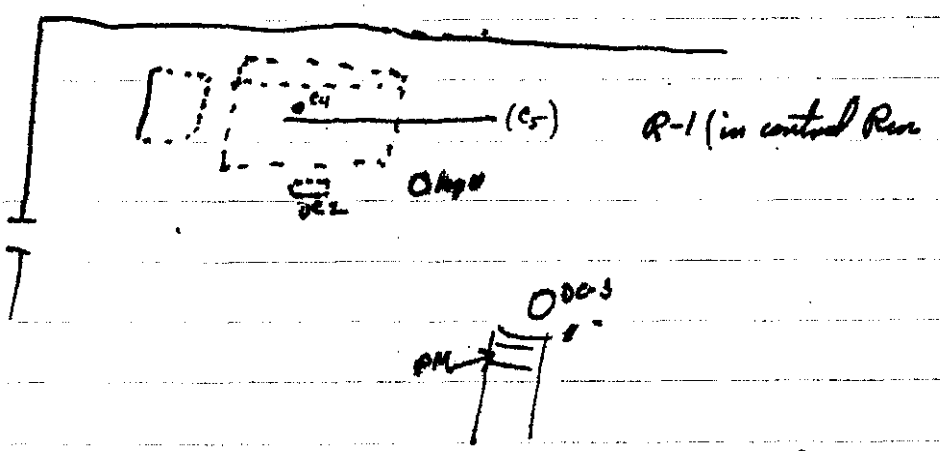
C-5 = 5-2 (longitudinal) 0.0 = all in
disc. – 20 Gain 16

Expr. 6-1 Time _____ AM PM Date 5-2 195 7
Purpose Eff – 1'1 ratio – 4×4×4" units
28" with 3" core 37½% –

Personnel: DWM, DJC

START-UP CHECK LIST

Equipment Checked by DJC Personnel Check by DWM
Instrument and Safeties Checked and Set by DJC
"Source In" Checked by _____ Source No. _____
Emergency Equipment in Control Room Checked by DJC
Red Light On by DWM
Start-Up OK'd by _____ Time 1 00 ~~AM~~ PM Date 5-2 195 7



~~Counts~~ ~~Time~~ Det = 1.026" at limit Sw in

Since face of Egg is 28×28"
Source reactor changed to 22" hi × 18" w × 10" fuel + 6 (¾") plastic
22×18" face opposite 28×28" Egg column face
3960 in³ fuel on movable table × 19.43 g/in³ = 76.9 Kg 25
4" of depleted on back face –
Plastic face on fixed table ¾" × 28×28" (between Reactor & 3" source layer.

Super critical -- approaching
stopped at 2.47 inches.

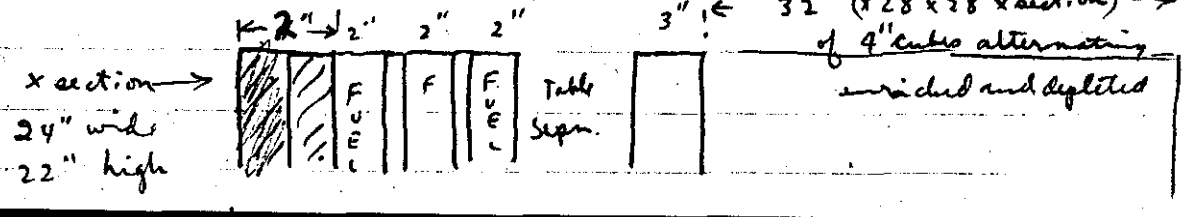
Removed 1 layer fuel + 1 layer plastic from moving table.

Dial 0285 0.80 + 200 sec period
(Too much excess k)

3rd PM – rebuilding source reactor 24" wide × 22" hi × 6" fuel from 1½" plastic
2" – ¼ depleted on back – no plastic between fuel & depleted –

3:35 PM dial .645" "Critical" DC-3 70 (10×100) Log 6 = .026

C_4 ×16 5 min 94 +8
C_5 ×16 5 min 258 +1



30

INSTRUMENT CHECK

Date May 195 7 Time 9 00 AM ~~PM~~ Source No. Ra ⓪

Instrument	Trip Value	Scale	Source Distance	[illegible]	[illegible] scale
DC-1					
DC-2	95 x 10 x 200				
DC-3	55 x 10 x 100				
Log N	70 c				
R-1	77 x 10 x 1000				
R-2					
P. M.	740 V				

C-4 = 5-3 (Vert)
C-5 = 5-2 (Long)

Expr. 6-12 Time 9 25 AM ~~PM~~ Date 5-3 1957

Purpose Vertical traverse with previous counter 28" x 28" x 32" Exp chamber Cad wrapped

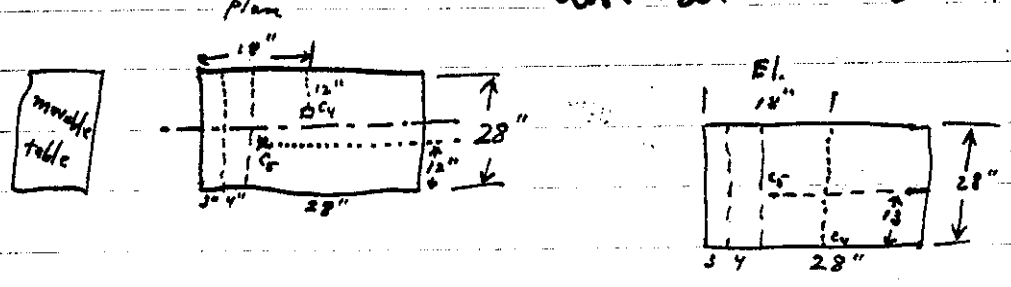
Personnel: DWM etc

9 55 .653 dial 0.45 ubayer - per print about 100 cm

10 07 AM Log N 0.53 dial 0.645 4

on C-4 (Vertical) 28.00" is bottom.

10 40 AM approx 1 mr/hr (2610) at console.
corridor outside door to 202 9 mr/hr
~~Near door to 201~~ just past 5' wall 250 mr/hr
door 201 600 mr/hr



C_5 at 0.03 (nonadjusted)

Time	Pop. (C_4)	$C_4 \times$	$C_5 \times 256$	C_4/C_5	log N	
10[10]	28.0	$911^{+17}_{\times 16}$	321^{+138}	.177	0.53	5 min
10[13]	27.03	$588^{+3}_{\times 16}$	192^{+205}	.191	.44	3
10[18]	27.03	$152^{+43}_{\times 64}$	$795^{+1}_{\times 64}$	.192		3
10[22]	2602	$122^{+57}_{\times 64}$	$558^{+26}_{\times 64}$	.206		2
	25,03	144^{+62}	575^{+57}	.252		2
10[23]	24,02	157^{+27}	567^{+53}	.277	.48	2
	23,02	170^{+53}	559^{+52}	.308		
	22.02	178^{+9}	534^{+52}	.333		
	2096	187^{+3}	523^{+38}	.356		
	20.02	189^{+16}	515^{+34}	.368		
10.[40]	19.01	188^{+26}	493^{+34}	.381	.42	
	18.01	191^{+5}	476^{+26}	.401		
	17.00	192^{+28}	481^{+57}	.399		
	16.00	195^{+8}	486^{+3}	.401		
	15.01	196^{+46}	501^{+60}	.391		
	14.05	201^{+6}	514^{+19}	.391		
	12.19	200^{+43}	527^{+38}	.384		
	11.98	198^{+41}	538^{+61}	.368		
	11.01	192^{+10}	536^{+42}	.345		
11[45]	10.00	184^{+11}	568^{+10}	.3245	.475	
	9.01	167^{+33}	550^{+46}	.304		
	8.02	143^{+7}	527^{+25}	.2715		
	7.00	123^{+40}	502^{+42}	.244		2 min
	6.01	161^{+12}	746^{+58}	.216		3 min
	5.00	137^{+1}	749^{+37}	.183		
11[20]	4.00	114^{+63}	772^{+23}	.149	log N=.43	

		C_4			
11^{24}	2.98"	91^{+31}	286^{+27}	.1165	3 min
	2.00	66^{+33}	798^{+5}	.0708	
	1.00	81^{+33}	811^{+56}	.1005	

Beginning long. traverse $\log N = 0.45$

11^{35}	15.995	223^{+59}	563^{+55}	2.515	2 min
C.S = 1.00		226^{+49}	533^{+9}	2.35	
11^{41} AM	2.00	229^{+43}	486^{+20}	2.15	
	3.00	230^{+34}	452^{+3}	1.955	
	4.00	236^{+61}	416^{+25}	1.755	
	5.00	231^{+47}	381^{+13}	1.644	
	6.00	225^{+20}	338^{+10}	1.505	
	7.00	221^{+54}	301^{+1}	1.36	
	8.00	217^{+95}	278^{+17}	1.265	
	9.00	208^{+63}	248^{13}	1.186	
	10.00	212^{23}	222^{+7}	1.045	
	11.00	206^{+63}	195^{+55}	.947	~~2.5~~ min
	12.00	251^{+33}	220^{+30}	.876	2.5
	13.00	252^{+28}	198^{+28}	.785	
	14.00	245^{+61}	177^{+63}	.723	
	15.00	295^{44}	191^{+31}	.646	3 min
	16.00	295	176^{+40}	.602	
	17.01	295^{+19}	160^{+61}	.546	
	18.01	294^{+58}	140^{+19}	.474	
	19.01	395^{+25}	160^{+33}	.406	4 min
12^{35} PM	20.00	502^{+41}	175^{+8}	.349	5 min
	21.	611^{+9}	182^{+60}	.300	

		C_4	C_6		
12 45 PM	~~22.0~~ 22.05	531^{+22}	135^{+2}	.254	
	23.02	548^{+45}	119^{+53}	.218	5 min
	24.00	525^{+4}	96^{+5}	.183	
	25.01	452^{+3}	79^{+5}	.1635	
	25.60	455	81^{+62}	.180	
1 15	6.00	19.7^{+30}	300^{+49}	1.523	[.14] 2 min

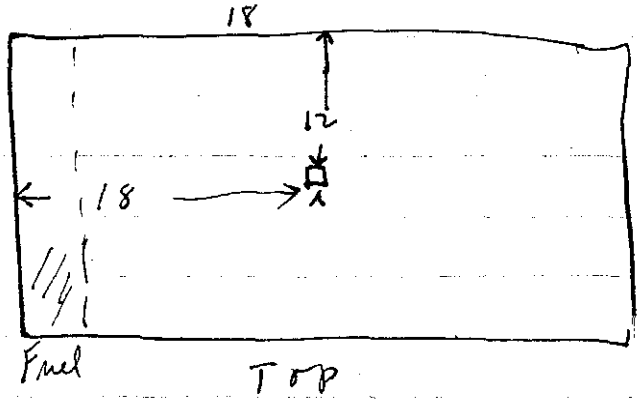
Shut down at 1:17 ± PM

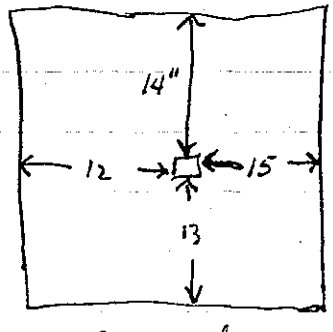
May 8, 1957

Cronin Cross and Lyon restacked exponential assembly to consist of 2:1 depleted enriched ratio with 2x2x3 blocks:

3" layer of fuel is still on fixed table

Exponential is 38" x 28 x 28





INSTRUMENT CHECK

Date May 8 1957 Time 8 45 AM ~~PM~~ Source No. ~ 213 ~

Instrument Make Style Viewing Distance Start-Up Scale

D-1
D-2 90 10 x 20
I-1 53 10 x 100
Log N 7 sec (x)
R-1 7 10 x 1000
R-2
P. M. 730 v (8)

C_4 (5-5) Vertical
C_5 (5-2) Longitudinal

START-UP CHECK LIST

Equipment Checked by DFC. Personnel Check by DWM
Instrument and Safety Checked and Recorded by DWM
"Source In" Checked by X X Counter On
Emergency Switch Tested Control Room Notified by DWM
Red Light On by DWM AM
Start-Up OK'd by DFC Time PM Date 195

Expr. 7-1 Time AM ~~PM~~ Date 5-8 1957
Purpose 2:1 ratio in 12½% exponential

Personnel: DWM DFC

9 45 AM Sub-Critical -
9 50 adding more enriched to reactor (2 rows on top plug plate now 24" high
10 15 alarm 0.59 dial .448
10 21 dial .452 alarm 0.585
10 25 dial .443 back Cog V .017
10 27 Shut down -

36 Exp - 7-2

12:20 Re start after lunch for tunnel
dial = 0.450 slope 0.585 (pos. pivot)

1:00 dial .441" slope 0.625 log N 0.80

C_4 at 16.00 "

			C_5/C_4	log N	counting
12 yr	Cyl	n25c C_5		.85	2
0.00	0- ~~20~~ 167			made calc.	
	$74^{+55}_{.995}$	$169^{+102}_{.40}$	2.26	2.259	2
1.00	76^{+17}_{07}	$157^{+107}_{.42}$	2.07	2.069, 75	2
2.00	$79^{+49}_{.19}$	$152^{+217}_{.85}$	1.93	1.930	
3.00	$93^{+220}_{.86}$	$141^{+32}_{.12}$	1.715	1.719	
4.00	$83^{+8}_{.03}$	$128^{+24}_{.09}$	1.545	1.543	
5.01	$80^{+66}_{.26}$	$106^{+223}_{.87}$	1.33	1.332	
6.00	$76^{132}_{.51}$	$80^{+145}_{.57}$	1.183	1.184	
x64 → 801	$296^{+52}_{.20}$	$208^{+63}_{.25}$	.906	0.906	
10.01	$292^{+25}_{.10}$	$214^{+20}_{.08}$	.732	0.733	
12.00	$296^{+9}_{.04}$	$170^{+42}_{.16}$	.578	0.575	
14.00	$303^{39}_{.15}$	$129^{+1}_{.00}$	.425	0.426	
16.01	$313^{+46}_{.18}$	$99^{+19}_{.07}$	.295	0.316	
1800	$327^{+29}_{.11}$	$73^{+8}_{.03}$	.222	0.222	
20.00	$513^{+62}_{.21}$	$91^{+46}_{.18}$	.1784	0.178	3 min
22.01	$518^{+49}_{.19}$	$118^{+54}_{.21}$	.210	0.228	
23.00	$535^{+44}_{.17}$	$129^{+25}_{.10}$	.242	0.241	
15.00	$357^{+54}_{.21}$	$130^{+2}_{.01}$	.364	0.364	2 min
17.00	$343^{+59}_{.23}$	$91^{+56}_{.22}$	.267	0.266	
13.03	$334^{+60}_{.23}$	$164^{+22}_{.09}$	.491	0.491	
11.00	$314^{+9}_{.04}$	$201^{+51}_{.21}$	.643	0.641	

38 Vertical traverse C_5 at 11.60"

Twin 2nd PM	C_4 x64	C_5 x64	(slide rule)	Log N. (calculated)	4 Min
28.00	272^{+33} .5	365^{+1} .02	~~.748~~	.747	
26.00	264^{+34} .5	290^{+25} .39	~~.908~~	.911	3 min
25.00	306^{+6} .1	296^{+45} .70	1.03	1.032	
24.02	348^{+5} .1	298^{+4} .1	1.15	1.151	
23.04	386^{+7} .1	308^{+61} .95	1.248	1.250	
22.01	428^{+46} .70	312^{+17} .9	1.368	1.370	
21.01	394^{+49} .75	272^{+58} .98	1.44	1.447	
19.98	363^{+34} .5	242^{11} .17	1.50	1.501	
19.01	366^{+45} .7	238^{+3} .05	1.53	1.534	
18.00	386^{+26} .4	243^{+13} .83	1.58	1.585	
17.00	417^{+45} .7	253^{+24} .52	1.64	1.648	
15.98	445^{+37} .58	270^{+39} .6	1.645	1.647	
15.01	458^{+38} .6	280^{+39} .6	1.655	1.634	
14.02	427^{+41} .62	263^{+31} .5	1.622	1.623	
12.99	413^{+12} .34	268^{+24} .21	1.545	1.547	
12.01	407^{+4} .1	268^{+19} .3	1.516	1.517	
11.00	398^{+2} 0	274^{+21} .33	1.450	1.451	
9.99	385^{+49} .75	275^{+2} .03	1.40.	1.403	
9.00	362^{+49} .74	283^{+8} .12	1.28	1.281	
8.00	337^{+26} .4	293^{+15} .23	1.154	1.131	
7.03	306^{+49} .75	298^{+2} .03	1.027	1.029 Log N = 0.8	
6.02	263^{+7} .1	292^{+23} .36	.802	.900	
3 20 PM 5.01	228^{+37} .58	290^{+29} .48	.777	.787	
4.01	188^{+24} .53	285^{+46} .73	.664	.660	
3.00	149^{+14} .21	289^{+43} .67	.514	3 3/4 PM shut down .515	
2.00	118^{+10} .15	283^{+15} .23	.418	.417	
1.00	143^{+63} .98	285^{+2} .03	.506	.505	

air sample
0.8 d/m/cm³

Expr. 8-1 Time 1[10] ~~AM~~ PM Date 5-13 195 7
Purpose Critical Exp - 3/4" plastic
37½ in array
Personnel: SWM DHC

INSTRUMENT CHECK

Date 5-13 195 7 Time 1[10] ~~AM~~ PM Source No. Y

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	90	10×20		
DC-3	50	10×100		
Log N	7 mr			
R-1	10	10×1000		
R-2				
P. M.	750V			

START-UP

Equipment Checked by DHC
Instrument and [illegible] by DHC
"Source In" [illegible] by
Emergency [illegible]
Red Light On by
Start-Up OK'd by DHC 195

1[05] PM 3 layers with 3/4" plastic between 2" layers of fuel (7 layers 3" wide on movable Table)

C₁ ×64 C₂ ×64 } Tables apart

5 min 93[+18] 15[+24]

Tables in contact 0.920 on dial

5 min in { 77[+49] 16[+12]
76[+4] 15[12]

1[12] Tables apart 77+" 14[58]
Tap[+40]

13.63 kg/layer

(+6.3) (15.5)

1 33 PM Tables Apart – 5 layers ~~Footer~~ 16" x 18" x 2" layers (¾" plastic)
76^{+48} 15^{53}

1 45 Tables together
78^{+24} .98 18^{+99} .83 . 65.1 Kg .

1 55 6 layers = 18 x 18 x 16½" dial = 0.926
85^{+38} .895 24^{+18} .63 = 75.7 Kg

2 10 7 layers dial 0.922 18 x 18 x 19¼ 88.3
98^{+57} .773 89^{+14} .395
15.6 Kg / 20 x 20" layer 109 Kg

2 37 20 x 20" layers. 7 layers tall – 109 Kg
Evidently would be super crit when together (mult > 1000 at 0.68")

2 50 Removed 9 x 2 x 20" fuel 101.98 Kg (net)
286^{+35} 222^{41} .07 (Subcrit)

3 07 added 10 2 x 2 x 3/8
definitely Super Crit at 0.25" separation

3 25 Removed 2 x 2 x 20" = 1.56 Kg net = 100.42 Kg
still super

3 35 Removed 3 x 2 x 20 2.34 Kg net = 98.08 Kg
Sub Crit in contact at high mult.

3 43 Adding 1" x 2" x 20" now = 0.78 Kg 98.86 Kg net
Penthouse now 10 x 20"

3 58 contact on period in zone

Expr. 8-2 Time 4 10 AM PM Date 5-13 195 7
Purpose Change dimensions of 2-1 3/4" plastic mod
Personnel: DWM DFC

4 10 PM Base now is 19x20 7 layers hi
Mass now 103.5 Kg 25
Pos period .806 dial Neut 0.18
4 30 PM Level .779 dial Log N = .0095

INSTRUMENT CHECK

Date May 14 195 7 Time 8 30 AM PM Source No. 8
Trip

Instrument	Meter	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	95	10X30		
DC-3	57	10x100		
Log N		1 sec		
R-1	10 X 10 X 1000			
R-2				
P. M.	730 V			

air sample 5-14-57
17.6 d/m/cm³

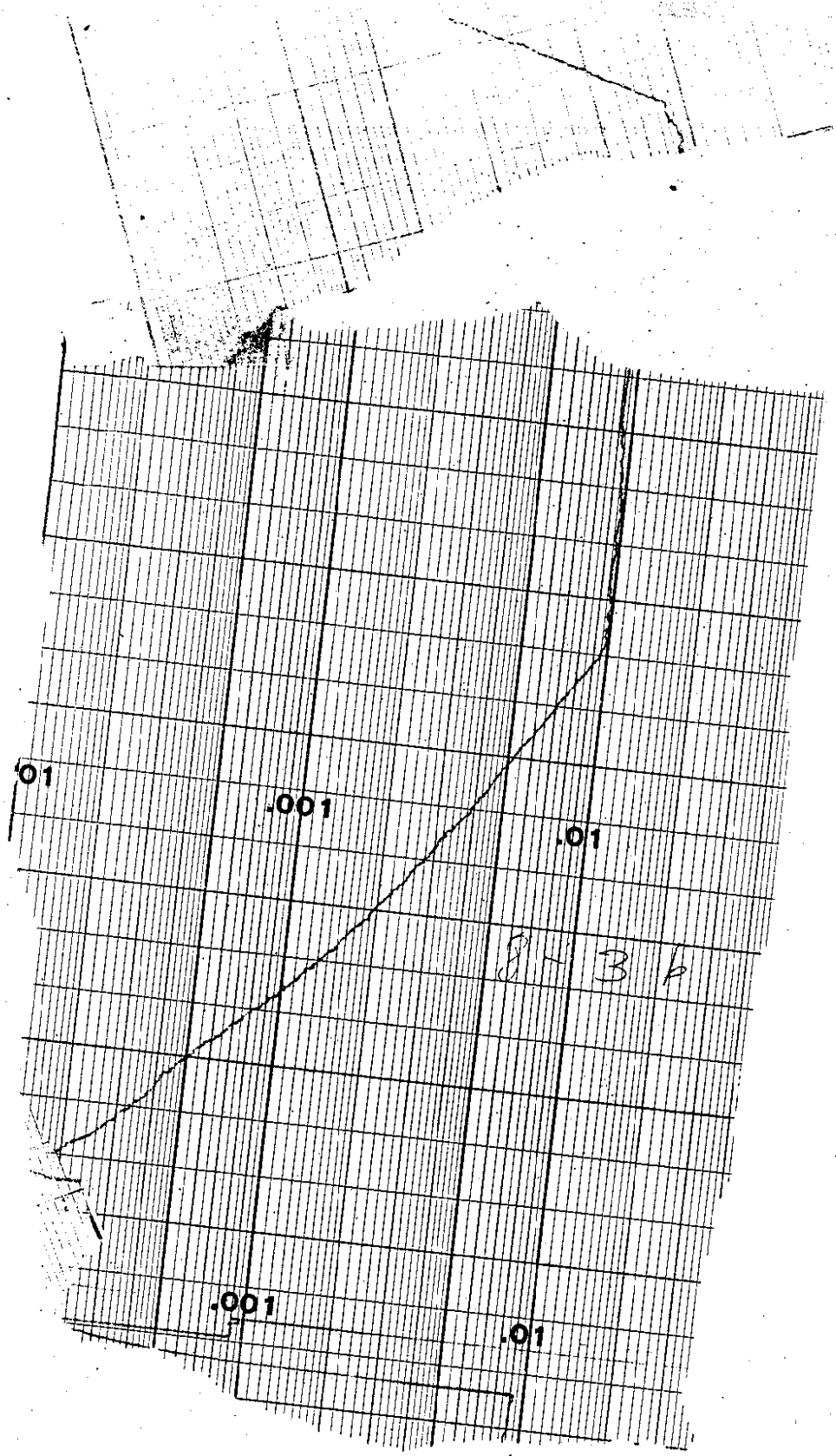
Expr. 8-3 Time AM PM Date 5-14 195
Purpose Crit Mass detn
Personnel: DWM DFC

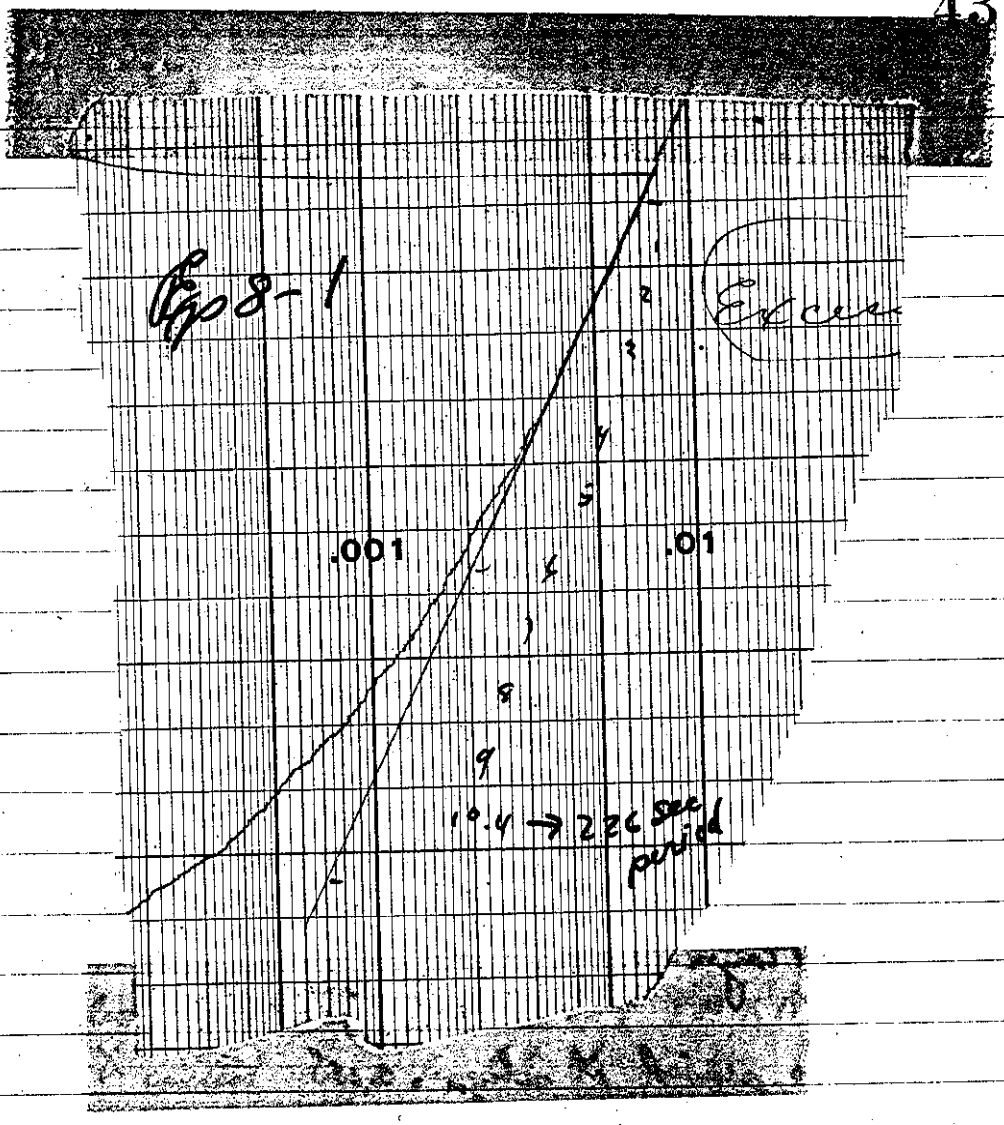
Removed 1" x 8 1/4 x 20" from Movable table (3 layers 1" x 20") 30 (2x2x15)

8-3a 8 50 Subcritical as described above with table at .02
Added one row 1" x 20 x 2 3/4" 10 (2x2x15).
8-36 9 10 ~~Critical~~ On positive period with tables together
Dial reading = 0.924 period ≈ 100 sec.
9 15 Leveled at 0.898 on dial Log N = .01
Final stack 19 x 20 x 19 1/4" high with corner out 1" x 5 1/2" x 20"

Move To
1" x 5 1/2"
4

TED IN U.S.A.

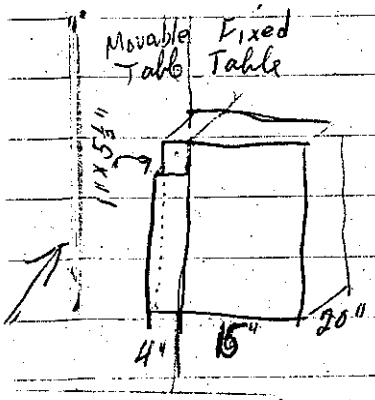

.01
.001
.01
8-3b
.001
.01



Plastic wgt = 3279 kg ~~mt~~

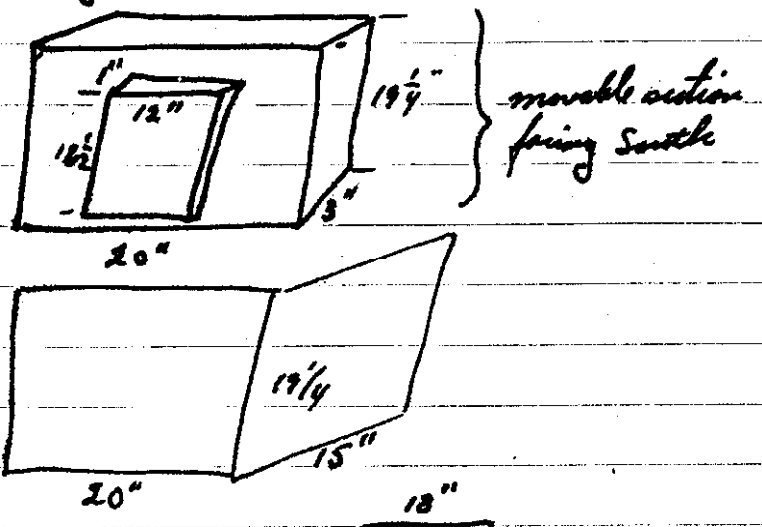
Mass = 420 2×2×3's = 97.108
50 2×2×1's 3.895
101.003 kg

H/t = 7.03'
.07
7.10



Expr. 8-4 Time 1[15] ~~AM~~ PM Date 5-14 195 7
Purpose Evaluate Al plate by placing 1" Al on top of system
Personnel: TAF DSC

7 layers with 1" Al on top + bottom



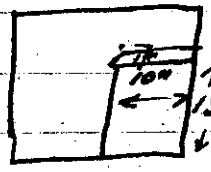
each layer 2" ~~in~~ 1"x12"

A 1^{35} Poo period at selayn = 0.25"

Removed 6 - 2"x2"x1" blocks across top of end
End face now 13 3/4 X 12"x1"

B 1^{55} Poo period at selayn = 0.17"

2^{07} Removed 5 2×2×1's & re-arranged blocks on N end of movable table



C 2^{15} rpm table in contact apparently leveled at Log N = .0002

added 2 (2×2×1's) near & center on 1" layer

D 2^{22} table in contact apparently level at Log N = .0003

E 2^{42} added 3 2×2×1's, 1" layer now is 10"×16 1/2"
contact Log N = .00095

F 3^{05} added 1 more layer – now 1"×10"×19 1/4" (1/2 layer)
at & contact Log N leveled at .00075

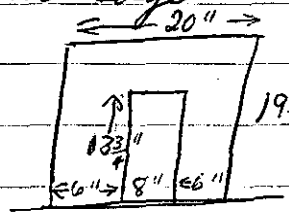
3^{25} altered 1" layer to a 8" × 19 1/4 × 1" centered horizontally on 20"×19 1/4" face of movable table

G 3^{35} Positive period at dial reading of 0.914 (contact)
Leveled at 0.837 on dial (Period ≈ 49 sec)

H 3^{45} Removed 4 blocks from top of 1" layer (now 8"×16 1/2"×1")

3^{55} Positive period at dial reading of 0.914 (contact)
Leveled at 0.760 on dial (Period ≈ 73 sec)

J Removed 4 more blocks from top
1" layer now consists of 20 blocks (8" x 13¾ x 1")
centered horizontally but toward bottom edge



405 Tables in contact at 0.915 on dial
420 Barely Critical, very long period
longer than a 1200 sec period

K 425 Restacked to 6" x 19¼" section centered (21 blocks)
430 Tables in contact at 0.916 on dial
Subcritical Log N = .00045 after 10 min.

Running table back & 0.52" on logs & then together
gives 12 sec pseudoperiod—

Mass of U-235 in 8-4J 420 - 2x2x3 = 97.108
20 - 2x2x1 = 1.558
98.666 kg

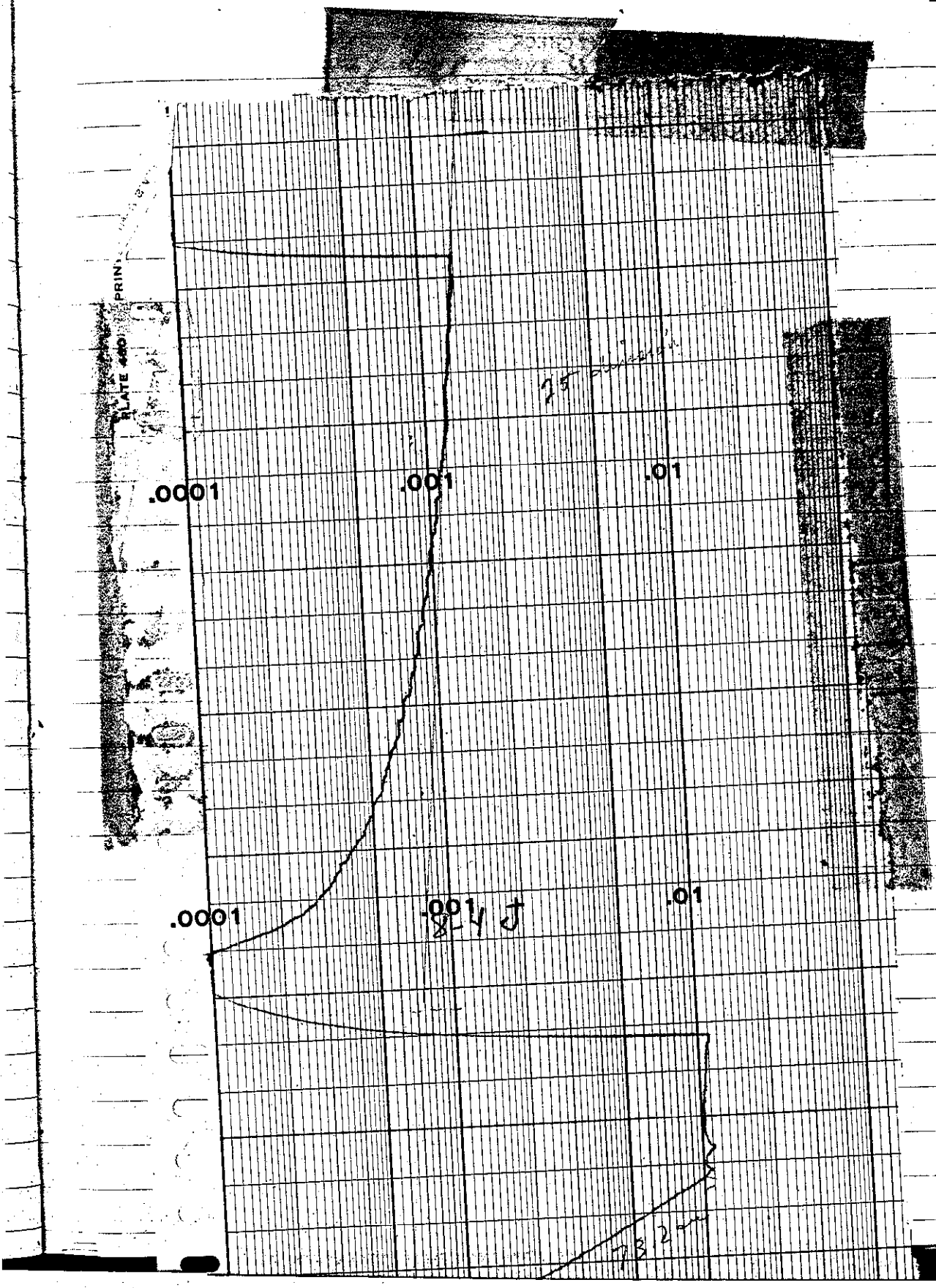


PLATE 440
.0001
.001
.01
25
.0001
.001
.01
84 J
782

.0001
.001
.01
8-4 J
.0001
.001
.01
33.2 mm
8-4 H
.0001
.001
.01
49 mm
8-4G
PLATE 460 PRINTED IN U.S.A.

INSTRUMENT CHECK

Date 5-15 195 7 Time 11 65 AM PM Source No. _____

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				10 x 1
DC-2	85	10 x 20		10 x 1
DC-3	55	10 x 100		7 cm
Log N	7 cm	10 x 1000		100 x 10
R-1	10			
R-2				
P. M.	1"			

air sample
11.1 d/m/m³

START-UP CHECK LIST

Equipment Checked by DSC — Personnel Checked by CC
Instrument and Safeties Checked by DSC
"Source In" Checked by _____ Source No. _____
Emergency Equipment in Control Room Checked by DSC
Red Light On by DSC AM
Start-Up OK'd by DSC PM Date _____ 195_

Expt. 9-1 Time 1:15 AM PM Date 5-15 195 7
Purpose 3/4" plastic in 2 dimensions
Personnel: DSC TMF

Fixed table - 4 layers high 1 layer = 6 x 4 (on floor)
movable each layer = 6 2x2x1's 6 2x2x3's

11²⁰ Fixed table only 5 min count

C_1	C_2
91^{+36}	11^{+96}

11²⁵ base tabel = 16 x 15 3/4 ~~58~~ 4 layers tall when together
Tables together

80^{+21}	13^{+38}	.89

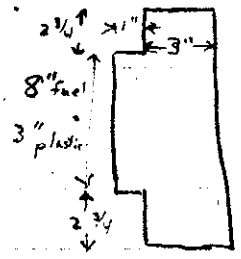
11 40 5 layers fuel + plastic = 16 × 15 3/4 × 13 3/4
11 45 tables together
81 +85 19 +36 .615

Added 1 layer to fixed table now 6 layers on both.
1 40 PM start table together. (16 × 15 3/4 × 16 1/2)
1 46 Tables Together.
161 +42 84 +37 (.139)

"Added plastic to West face { E-W = 16 1/2" ; N-S = 16" ; H = 16 1/2" }
2 06 PM Tables started together
2 21 PM Rising on Period dial .800 Selsyn 0.17 3
2 23 Start to level
2 26 Level dial dial .785 5 Selsyn 0.21
Critical

Movable table -- removed 12 ea 2 x 2 x 1 pc. of fuel and associated plastic.

Top view



Fuel 5 x 36 2 x 2 x 3
24 2 x 2 x 1

Expr. 9-2 Time 2 55 ~~PM~~ PM Date 5-15 1957
Purpose
Crit mass data.
Personnel:

Poo. period table at 0.11"
level Coy N = .002 adm 0.15 dif = 0.855"

Expr. 9-3 Time 3^05 ~~AM~~ PM Date 5-15 1957
Purpose Removed vertical rows of 6 - 2 x 2 x 1's
Personnel:

180 2x2x3's plus 18 2x2x1's

3'0" table in contact dial 0.9365" per. period = 60 sec

Fissions counted 6" inside on center line (in plastic) 5-3

58^+10 x64 3 min
57^+3 x64 3 min
59^+30 x64 3 min

level log N = .0085 dial x 0.809 subsyn 0.07

Plastic wgt = 39.13 Kg

U =	180	2x2x3's x 231.21	41.618
	18	2x2x1's x 77.89	1.402
		Net U235	43.020
		H/U = ~~12.10~~ 12.10	

final assembly = 15 x 16 1/2 x 15 3/4
plus 1 x 15 3/4 x 8 1/4" (on North face

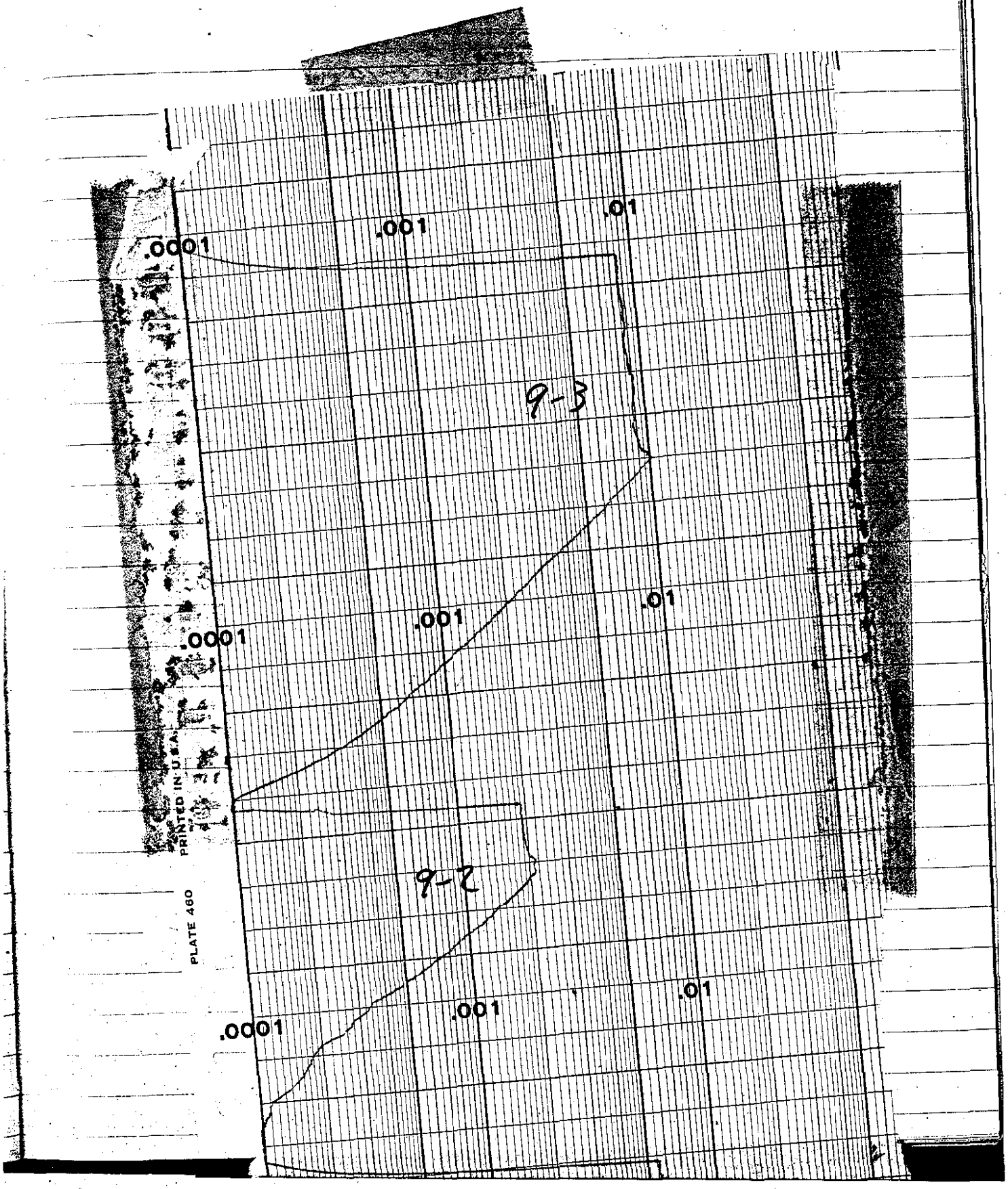

.0001
.001
.01
9-3
.0001
.001
.01
9-2
.0001
.001
.01
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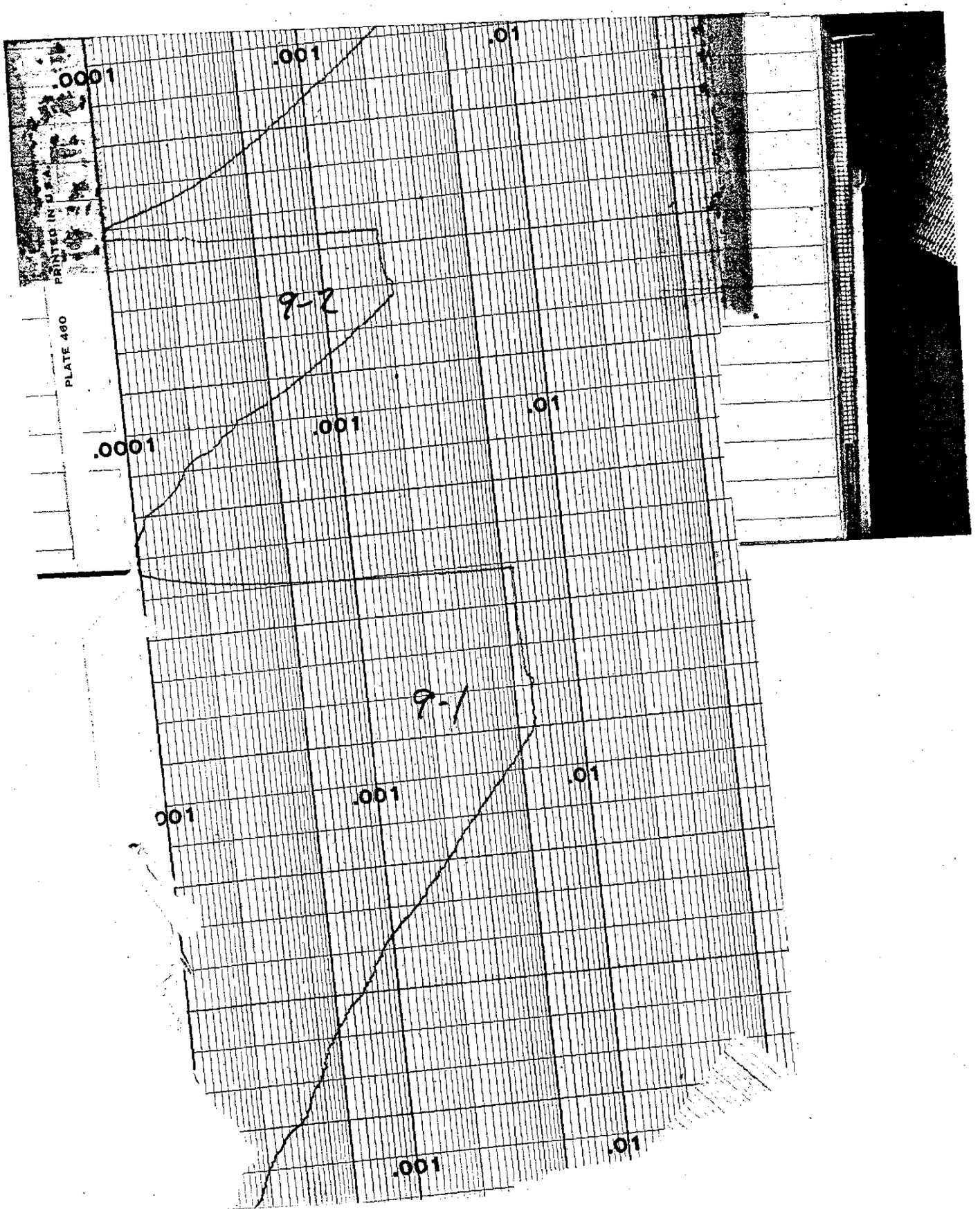
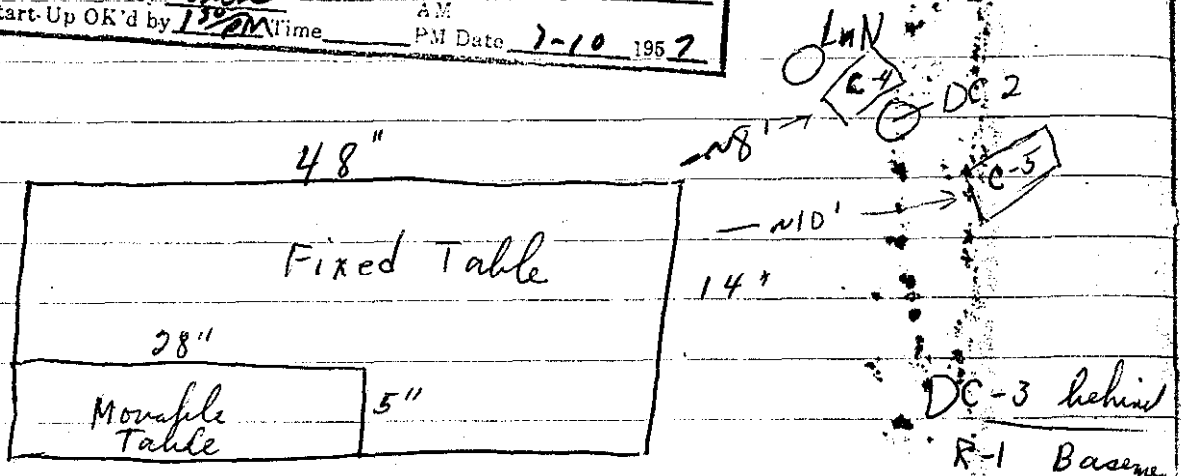
PLATE 460


.0001
.001
.01
9-2
.0001
.001
.01
9-1
001
.001
.01
.001
.01
PLATE 460

Expr. 10-1 Time 12:30 PM Date 7-10 1957
Purpose 1:1 ratio 18.8% Slab —
48" Long x 14" x ?ht H/4 = 14 (3/4" plastic in each dimension
Personnel: TAF DSC

START-UP CHECK LIST
Equipment Checked by DSC Personnel Check by DSC
Instrument and Safeties Checked and "Source In" Checked by TAF DSC
Emergency Equipment in Control Room Checked by DSC
Red Light On by none
Start-Up OK'd by 1:30 PM Time AM PM Date 7-10 1957



10-minute counts on way to critical

C_4 x64			C_5 x64		
13	+60	(14)	31	+14	(31)
15	+17		31	+13	
18	+56		29	+41	
4th PM 22	+15		30	+36	

No blocks stacked
4 layers (2 + 3/4 + 1/4) on fixed table
6 layers (16 1/2" total) on fixed table
6 layer on fixed + movable (tables together)

Shut down for day

Expr. 10-1 B Time 12 ~~AM~~ PM Date 7-11 1957
Purpose Cont. Exp 10-1

Personnel: TAF DK, DMK, 3 visitors

START-UP CHECK LIST

Equipment Checked by DK Personnel Check by CC
Instrument and Safeties Checked and Reset by DK
"Source In" Checked by — Source No. —
Emergency Equipment in Control Room Checked by DK
Red Light On by DK
Start-Up OK'd by DK Time 12 ~~AM~~ PM Date 7-11 1957

12 55 PM Tables together 6 layers - bare - 48 × 14" (16½" tall)

C4 C5 64 (10 min)

22 +32 30 +12

INSTRUMENT CHECK

Date 7-11 1957 Time 1 10 ~~AM~~ PM Source No. 7

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	28 10×20			
DC-3	45 >10×10			
Log N				
R-1	28 10×100			
R-2				
P. M.	750V			

1 30 PM Total stack now 8 layers (48×14) (22" tall)

C4 C5

(10 minutes) 34 +27 0.412 34 +35 .897

Added 2 layers - assembly now 10 layers (27½") high

3 05

(5 minutes) 29 +12 .299 22 +10 .70

Added 2" ~~to~~ the back face of the assembly
Base area now 48" x 16" still 27½" high

4:15 Positive period at
dial reading = .2005 selsyn at 0,79

4:22 Leveled at .182 on dial selsyn at 0.855
4:23 Shut down

INSTRUMENT CHECK

Date 7-12 195 7 Time 8 30 AM PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
[illegible]				
[illegible]	75	10 x 20		
[illegible]	50	10 x 100		
[illegible]	75 cm			
Log N	470	10 x 1000		
R-1				
R-2				
P. M.				

Expr. 10-2 Time 8 30 AM PM Date 7-12 195 7

Purpose determine Crit with 18.8% (1:1) 3/4" plastic H/F = 14 boxes = 48 x 16"

Personnel: ZWG DFC

Fuel removed down to 24 3/4" tall on fixed table 27 1/2" on movable section - approx 13.95 kg 25/layer

START-UP CHECK LIST

Equipment Checked by DFC Personnel Check by DFC

Instrument and Safety Equipment Checked and Reset by DFC Fuzz

Source [illegible] Badge No.

Emergency Radio [illegible] Checked by DFC

Red Light On by DFC

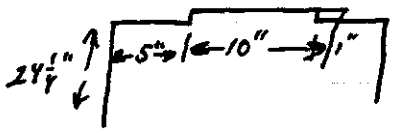
Start-Up OK'd by DFC Time 8 30 AM PM Date 7-12 195 7

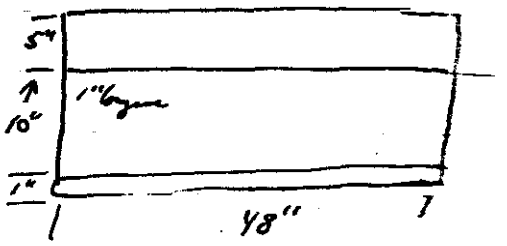
8 50 AM

C_4	C_5
191 + 33	108
.073	
m = 13.7	Sat Crit.

9 00 Added 1 in to fixed sect plus 1/4" plastic using 2x2x1" blocks & 1x1x1 & 1x1x2 - 26" tall movable still 27 1/2" tall Would be super together - level at 0.38" on slope ± .01"

10 ^{00}/AM Removed 2" fuel 3/4" plastic from movable plus 1" × 20"×5" fuel + 1" × 1" × 48"



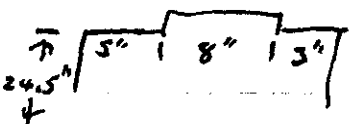


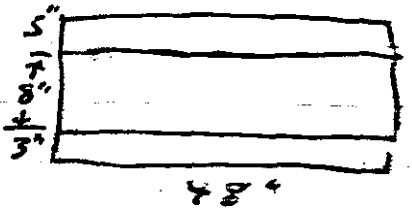
1" layer has 1/4" plastic on top.

10 ^{35}/AM Critical log N = .012

Selayer = 0.165" dial 0.869 slightly over
.864 level

2" widths of 1" layer + plastic removed from back





11 ^{15} Table in contact dial = 0.938 selayer = .02"
log N = .01
dial .908 just crit

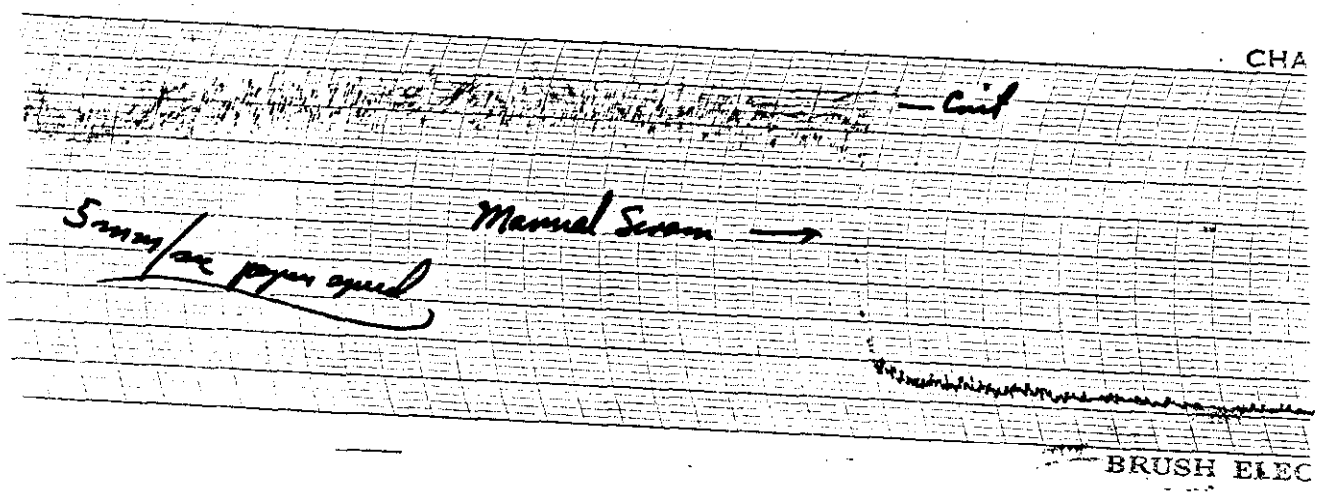
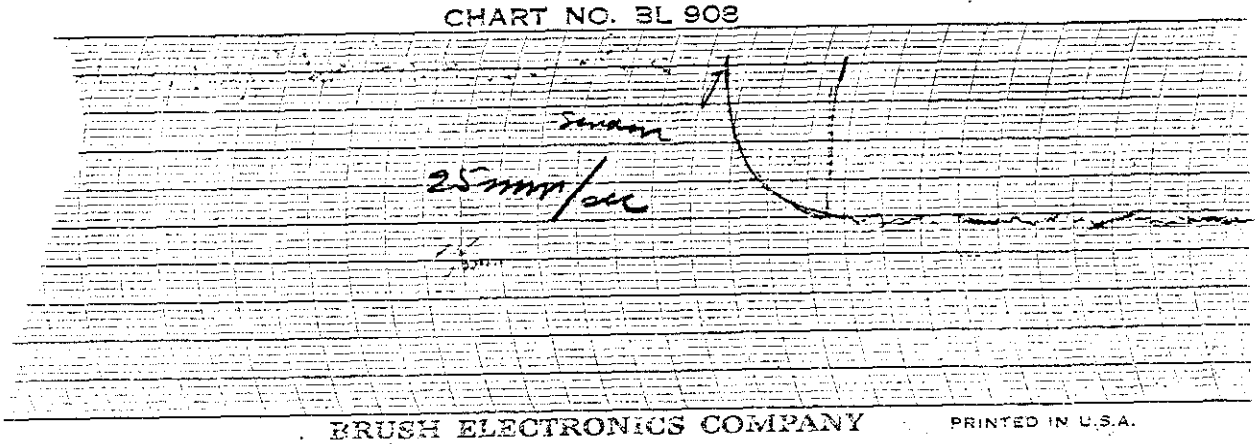


CHART NO. BL 908



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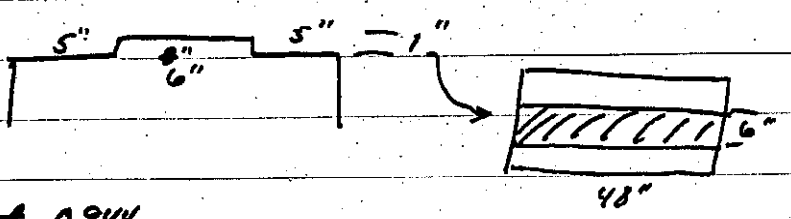
12 30 pm Removed 2"x1"x48" row



12 40 pm table in contact 0.944

apparently leveled off at log N = .00055

very high power level

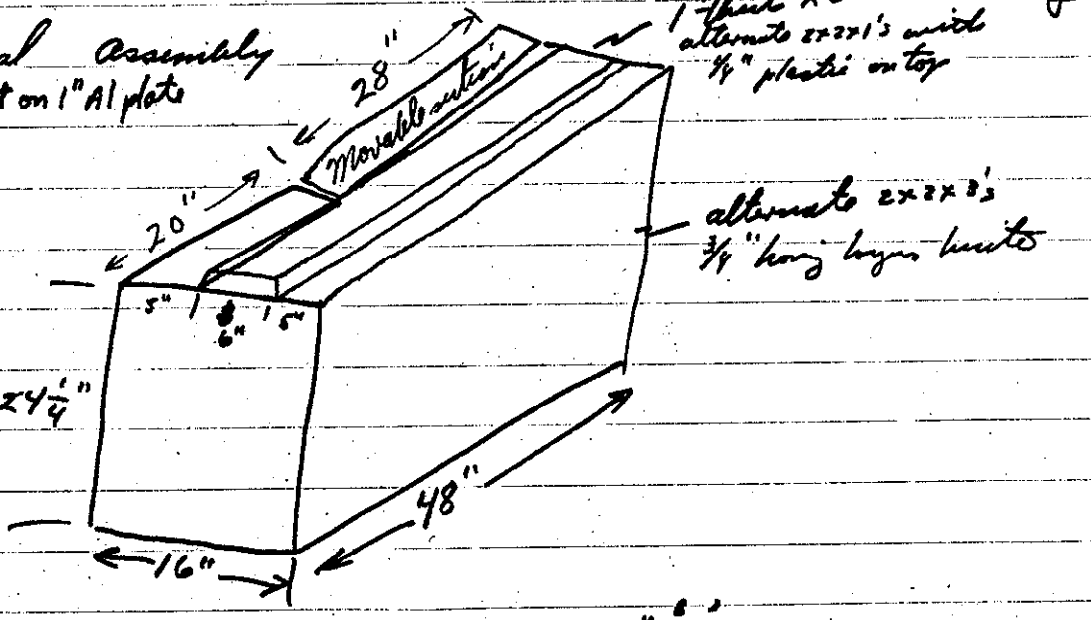
C_4 C_5

$144 \times 256^{+60}$ 5 min $72^{+121} \times 256$

$N^{-1} = .0136$ MM 73

$144 \times 256^{+144}$ $76^{+122} \times 256$

Final assembly built on 1" Al plate



Est M_c = 13.95 Kg x 9 = 125.55 lb

+72 2x2x1 = 5.60 lb

not dm 25 in depleted blocks 131.16 kg @ $\pm^{900\text{ gms}}_{0}$

Wgt Plastic = 101.67 Kg 11/x = 14.57

INSTRUMENT CHECK

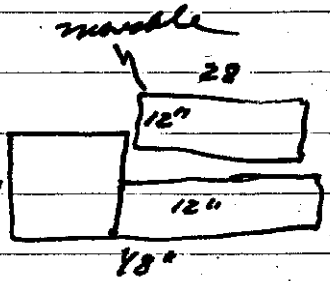
Date 7-23 195 7 Time 10 35 AM ~~PM~~ Source No. γ

Instrument	Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	85	10x20		
DC-3	45	10x100		
Log N	13m	period		
R-1				
R-2				
P. M.	750			

Expr. 11-1 Time _____ AM PM Date 7-23 195 7

Purpose 24x18x? slab approx 12½% U²³⁵ ~ 14 (½" plastic between)

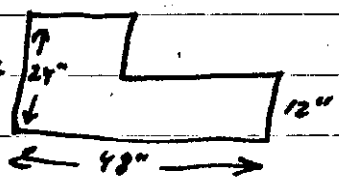
Personnel: JKT, JWC, ~~JMC~~ DR



avg ~~64~~ enriched blocks/layer. (~~partly~~

64

12 30 PM 6 layers fuel = 15" tall assembly



C_4 1 min $\quad$ C_5 10 min

$10^{+111} \times 256$ $\quad$ $10^{+230} \times 256$

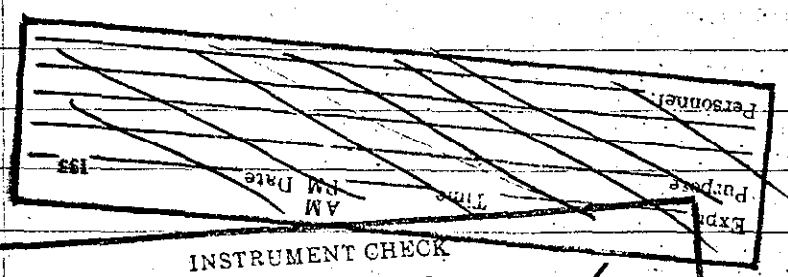
Expr. 11-2 Time 8 30 AM Date 7-24 195 7

Purpose continue 11-1

Personnel:

8 21

	C_4 1 min	C_5	
Tablespoon	$10^{+0} \times 256$	$9^{+29} \times 256$	24.4 Cg
7 layers		$9^{+160} \times 256$	34.4 Cg
Table together	10^{+24}		



INSTRUMENT CHECK

Date 7-24 195 7 Time 8 40 AM Source No. 6

Instrument	Value	Scale	Source Distance	Start Up Scale
DC-1				1X10
DC-2	84	10 x 20		1 x 20
[illegible]	55	10 x 100		
Log N	15ua			
R-1	70	10 x 1000		
R-2				
P. M.	750V			

9^{20} AM — 31.45 — 9 layers — 44.25 — C_4 9^{+267} 9^{+233} — C_5 8^{+233} 8^{+172} — apart together

10^{05} — Source PN 213 on top center of stack

2 min count — C_4 — C_5

1 — 0^{+167} .65 0.69 — 2^{+252} .55

tables apart. — 0^{+116} .45 — 1^{+165} .64

10^{35} AM — 11 layers — 38.233 — 54.12 — 0^{+110} — 2^{+167} .22 .74

assembly together = 24 x 48 x 27½".

11^{10} AM — together — 0^{+180} 170 — 4^{+0} .4

0 105 — 3^{+178}

11^{20} — 12 layers on fixed — 44.9 — 0 .41 — 2^{+196} .41 .68

11^{35} — 12 layers together — 57.04 — 45.3 — 1^{+33} .13 .375 109 — 6^{+92} .36 .258 — 2^{+72}

1^{20} PM — 13 layers — 63.96 — Source removed high mult.

Salayers at 0.31 in lucite Log N ~~.01~~ .01 to .04 (in 100 sec)

Critical

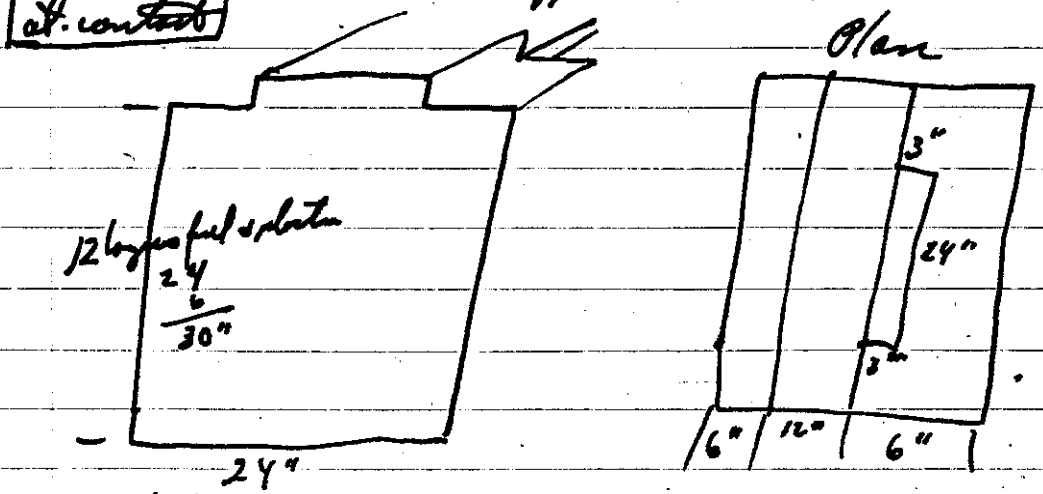
(OVER)

2⁰⁰ pm Removing top 2" layer (2×12×48) from fixed section
0^253 6^51
Sub Cut

2⁴⁵ pm Restacked top layer - so that a 12" wide section centered when section together
top 2" now 12×48 centered. Sub Cut
C4 2 min C5 2 min
3 3/4 19^22

3¹⁵ pm added 2" duck nail 24" long 8" side to end half
Sawn Critical with approx 100 mm. period

At contact



El

top section = 36 blocks mixed 72 dyketed
12 layers. remainder = 768 " " 1536 "
804 x 231.24 gm 1608 x 1.295 gm
185.893 Kg 25 1.945 Kg
1.945
187.838
-.472 gm
187.366 ± 0.5 Kg 4²⁸⁵

Weighed Plastic = 138.105 Kg

H/H = ~~13.82~~ 13.92 avg wgt 12 x 48 x 1/8 x 3/16 = 5.386 Kg (avg of 8)

on basis of Enriched only = H/H = 13.97 H/

185.893

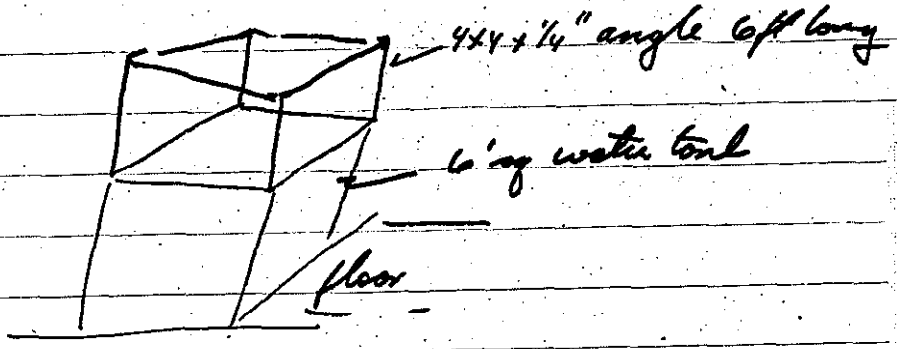
-.472

185.421 ± 0.5 Kg 2σ (no depleted counted)

top 2" x 12" x 48" + 2 x 3 x 24"

9-20-57

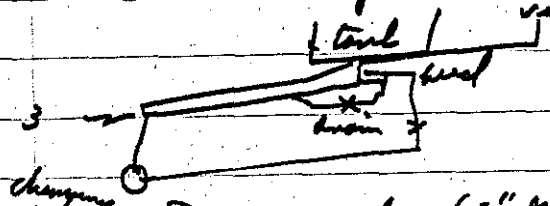
Steps in Well for 37½% salmon steps -
Superstructure modified:



Variable speed DC motor in machine mounted on L iron on top - Probe moved & U tube on balcony

permanent probe lines.

Solution system installed (3 parallel 6" pipes)



Dump Valve (3" Grinnell Saunders-exit air vent opened to 1" & a Ross M&T valve used. Dump valve opening time now 140 msec versus 8-900 msec. approx 500 ms for water to fall 1" in 12" manometer at 50# gage pressure.

9-23-57

Finally solenoid valve does not operate properly under 50# pressure or at 55# pressure water standing in 12" reactor from 2:47 PM Fri to 8:45 AM Mon dropped from 56.78 to 56.60"

feed rate (fill pump = 20" in 2.58 min =
or 7.7 in/min = 14.35 liter/min no bypass.
at 36" head(
probe travel = 21.85 in/min -

dump time from 56 in = 120
110
110
110 ms
4)445
112 msec avg.

measured from dump on
to breaks probe contact

dump time from 0.0 in = 150
160
130
120
130
5)690
138 msec avg

1-20-58

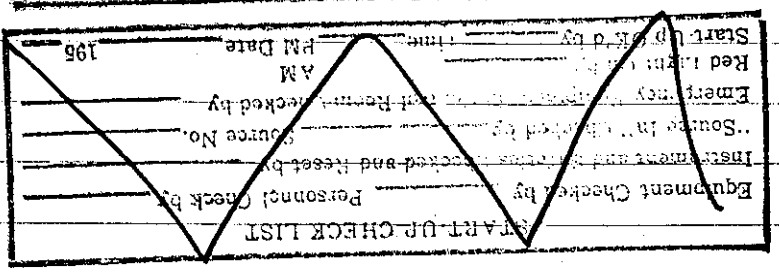
Measured holding volume = 1" in 12" diam cyl-
$\cong$ 1.853 liters – (includes amt in probe sight glass)
system washed with de-ionized water and drained
drain plug installed in pump casing – lowest point
in storage system.

of the dead volume all but 450 cc can be pumped
into the reactor – but air bubbles come in –

INSTRUMENT CHECK

Date 1-22 1958 Time 300 PM Source No. 8

Instrument	Trip Value	Scale	Range Multiplier	Time Delay Switch
DC-1				
DC-2	40	10x20		
DC-3	40	10x50		
Log N	Free			
R-1	10 on 2000			
R-2	megamho			
P. M.	800V			



START-UP CHECK LIST

Equipment Checked by DK Personnel Check by DK

Instrument and Safeties Checked and Reset by DK

"Source In" Checked by DK Source No. 213

Emergency Equipment in Control Room Checked by DK

Red Light On by DK

Start-Up O.K.'d by DK Time 3 ~~00~~ PM Date 1-22 1958

avg analysis = 4456 ± 37.29% total = 35.3 ± 13.1 ± 4

Put in.	37.21%	37.34%	37.48%	37.28% avg. = 37.33
#	1500	1501	1502	~~1503~~ 1503
G	21625	20950	22600	21775
T	1911	1953	1884	1934
N	19714	18997	20716	19844
Reg	394019	394020 394055	394056	394057
	.4544 gm U/gm	... 20 ... 55	.43644	.4400 4
ratio	.9788	4 .4504	.4523	.07057 F .07093 F
	.07133 gm T/gm	F .07174	.07147	1.0083 1.0051 Ratio
		Ratio .9931	.9852	
		Sp # 2.0522	Sp #. 1.9890	Sp #. 1.9928

Expr. 1-1 Time 3 30 AM PM Date ~~1-~~ 1-22 1958
Purpose 37½% Silva in 12" SS cyl—
one water refl — — no refl—
Personnel: ADC ~~DSC~~ JKF WJG

Probe level set at 99997 for 3 min—

	Fuel	C_1	C_2	2 min counts —
4 20 PM	3.12"	31 1/4	15 1/4	
4 25	6.02"	92 3/4	15	
4 30	9.08"	65 1/2	13 1/2	
4 35 40	11.03"	179 1/2	54	log N almost on scale

Tested safety + scram - system responds as it should—

27.9

~~4~~ 4 57 11.825 Sub Crit Scram out

11.83 Supr Crit (very slightly)

Critical between 11.82+ and 11.83

Crit volume = ~~39.203~~ Litres 21,904 = 7.3 Kg U 235
19.96 Kg U

Fuel Inventory = 35,342 gms U 13.22 Kg 25

Expr. 1-2 Time 9 00 AM PM Date 1-27 1958
Purpose Repeat of 1-1 for reproducibility
32½% soln
Personnel: DJC JKF

INSTRUMENT CHECK

Date 1-27 1958 Time 9 25 AM Source No. γ
Trip

Instrument	Value	Scale	Range
DC-1	—	—	5
[illegible]			
Log-S	55	10×50	10×1
Log-N	7cm	period	1×10
R-1			
R-2			
P. M.	800V	800V	

START-UP CHECK LIST

Equipment Checked by DJC
Instrument and Safeties Checked by DJC
"Source In" Checked by DJC
Emergency Equipment in Operation DJC
Red Light On by DJC
Start-Up O.K'd by DJC Time 9 30 A Date 1-27 1958

9 35 AM probe zero re-checked and set at ~~0.05~~ 0.03°
9 40 .02 9 50 .025 (probably drop on end of wire)

10 15 A Fuel 11.825" prob just crit — or slightly super-
11.82 crit.
10 20 Fuel added to 11.89" period is now on
10 25 Fuel 11.84" sub crit at log Nn .0045
10 27 11.845 super (detectable on Inst - not)
10 37 Fuel 11.89" per period
10 35 Fuel 11.84" log N = .016 just crit —
PM trips at 1200V at this level —

10 40 Am Fuel at 11.87" & make DC 2 trip (post period)
from 20 on 10x20 to 63 on 10x20

10 41 System scrammed as planned.
Inst readings -

R-1 - 63 1000 x 200
DC2 - 53 20 x10
DC-3 - 100 on 100 x10
R-2 - 3035 1000 x1000
log N - .028

Fuel	Δ"	Period	log N
11.82 - 11.89	.05"	102.4 sec	0.00022 & 0.005
11.84 - 11.89	.05"	103.2	0.05 & 0.022
11.84 - 11.87	.03"	217.3 sec	0.018 & 0.028

→ evidently crit Ht was low due to source & low power level

Expr. 1-3 Time 1⁴⁰ ~~AM~~ PM Date 1-27 1958
Purpose Reflected 12" SS cyl.
Personnel: DKC JKF

START-UP CHECK LIST
Equipment Checked by DK Instrument Check by DK
Instrument and Safeties Checked and Reset by DKC
"Source In" Checked by DKC
Emergency Equipment in Control Room Checked by DK
Red Light On by DKC
Start-Up OK'd by DK Time 1⁴⁰ ~~AM~~ PM Date 1-27 1958

Relocated safety - now 15" wide 20" long unobtanium coated Cadmium sheet - in reflector touching cylinder, Water reflector up 24" above tank floor -
DC-3 and boy N moved to approx ½ of reactor
Source moved to locate near base of cyl.

2 ~~35~~ PM Set fuel at 1.04" - tamper limit set too high = 47.51" (rods touching
2 ~~40~~ " " " 2.04 tamper touches at 46.82"
tamper zero at 48.86" ~~tamper = 45.79"~~
Fuel at 5.03 tamper = 45.79"

2 ~~55~~ PM Fuel at 5.10 Tamper at ~~47~~ 43 ~~47~~.71
3 ~~05~~ Fuel at 5.86 tamper at 42.95 - added ~ 43.08 (
0.13" below indicated level before no change in reactivity
3 ~~10~~ 6.18" fuel Tamper at 42.50 empty unit. source out

3 20 PM 6.15 tongue at 42.72 engine unit.
Period announced (toy tongue runs down & forth.)

3 45 PM Safety blade reset - water pumped back in
starting & pump fuel -

3 50 Fuel at 6.12 tongue at 40.78" screws in
3 55 tongue down - contact at 42.73"
Critical at 42.77" on TT
4 08 Just Critical TT at 42.91" fuel at 6.04" (See Summary #5604 p.107)
toy tongue at 5.95" .09" of TT immersed -
toy tongue has irregular base -
Note: - toy tongue motor should be slowed
down - valve screw set at 3.0

9-11-63 Tank zero	2.04	46.82	= 48.86	
	3.03	45.79	48.82	
	5.10	43.71	48.81	
1-11 ✓ ✓ was 2 repeat;	5.86	42.95	48.81	
CH = 5.95 in.	6.18	42.50	48.68	Mayes not in contact
∴ Use 5.935 in.	6.15	42.72	48.87	Mayes not in contact
	6.12	42.73	48.85	
		Ave	48.83	
	6.04	42.91	42.91	
			5.92	

Fuel Annulus = .12 in.

Expr. 1-~~27~~ 4 Time 9:30 ~~PM~~ AM Date 1-28 1958
Purpose 12" 35. Cyl reflected experiment for top
Personnel: KF DHC

START-UP CHECK LIST

~~Equipment~~ Checked by DHC Personnel Checked by DHC
Instrument and Safeties Checked and [illegible] DHC
Source Inserted by: DHC
Emergency Equipment in Control Room DHC
Red Light On by ~~DHC~~ KF
Start-Up OK'd by DHC Time 9:30 ~~PM~~ AM Date 1-28 1958

INSTRUMENT CHECK

Date 1-28 1958 Time 9:30 ~~PM~~ AM Source No. 8

Instrument	Value	Scale	Range Dial	Pick-Up Cable
DC-1				
DC-2	50	10x20		
DC-3	55	10x50		
Log N	Inc			
R-1	10	10x1000		
R-2				
P. M.	-900			

Water reflector set at 25 cm above base

$10\frac{05}{A}$ fuel 7.4 l/cm water 20 cm supercrit.

water

$10\frac{10}{A}$ ~~7.45~~ 7.47" 20.9 cm just crit

$10\frac{12}{A}$ 7.50" 19.7 cm " "

7.53 19.2 cm slightly supercrit.

19.0 cm slightly subcrit.

$2\frac{30}{PM}$ Sample taken 136 gms net Reg 635325

all page 83

Expr. 1-25 Time 3 40 ~~AM~~ PM Date 1-28 1958
Purpose Repeat of 1-4
Partially inflated 12" 55 mil
Personnel: JKF DK

START-UP CHECK LIST

Equipment Checked by DK Personnel Check by DK
Instrument and Safeties Checked and Reset by DK
"Source In" Checked by DK Source No. 213
Emergency Equipment in Control Room Checked by DK
Red Light On by DK
Start-Up OK'd by DK Time 3 10 AM PM Date 1-28 1958

INSTRUMENT CHECK

Date ____ 195__ Time ____ AM PM Source No. ____

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2				
DC-3				
Log N				
R-1				
R-2				
P. M.				

Water ht 19.1 cm
4 15 PM 7.53" fuel 19.1 cm H_2O
7.55" in stainless mean. 73 cm
let DC-3 screen at 55 on 10 x 50
$C_g N = .0068$

74

Expr. 1-6 Time 8:30 AM ~~PM~~ Date 1-31 1958

Purpose 12" SS cyl - water expl. plug
13 layers of 1/8" S Steel on lateral surface

Personnel:

Shells one 3 ft long - 1/8" thick

INSTRUMENT CHECK

Date 1-31 1958 Time 8:30 AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	45	10X20		
DC-3	45	10X50		
Log N		7 cm		
R-1		10 on 10X1000		
R-2				
P. M.		810V		

START-UP CHECK LIST

Equipment Checked by DJC Personnel Check by DJC

Instrument and Safeties Checked and Reset by DJC

"Source In" Checked by DJC Source No. PM 213

Emergency Equipment in Control Room Checked by DJC

Red Light On by DJC

Start-Up OK'd by DJC Time 8:40 AM ~~PM~~ Date 1-31 1958

Valve at 5 @ 6.7 cm

8:50 B Wide, fuel pump off + fuel valve closed and in let kept rising - possible in-leakage of water? fuel went from 1.33 to 1.53

9:15 Cause - pump foaming liquid - air in pump from pipe - filling operation before starting

9:35 A 54.1 cm water reflector replaced -

9:45 fuel set at 1.57 in remained there for 10 min.

10:46 Fuel 6.0V TT at 42.9V (Sat Curve

10:55 Fuel 6.09" JT - 42.85 just Emitted → Optical pyrometer.
Shutdown -

42.85
6.09
48.94

42.85
48.83
5.98

6.09
5.98
.11

Expr. 1-7 Time 2 45 ~~AM~~ PM Date 2 - 3 1958
Purpose 3/8" S. Steel Lateral refl.
with water refl on 12" refl (35)
Personnel: Zweifel - DJK

START-UP CHECK LIST

Equipment Checked by DJK Personnel Check by DJK
Instrument and Safeties Checked and DJK
"Source In" Checked by DJK 213
Emergency Equipment & Control Rod Checked by DJK
Red Light On by DJK 45 ~~AM~~
Start-Up OK'd by DJK Time 2 PM Date 2-3 1958

note fuel pin discharge leaks at small fitting

INSTRUMENT CHECK

Date 2-3 1958 Time 2 45 ~~AM~~ PM Source No. Y

Instrument	Trip Value	Scale	Starting Scale
DC-1			
DC-2	45	10×20	
DC-3	50	10×50	
Log N	3 cc		
R-1	1.	10×1000	
R-2		magenta	
P. M.	5400	V	

3 20 PM water at 57.5 cm

	Selsyn Probe	Top Tamper *	
	3.37"	45.51"	48.88
	5.15"	43.57"	48.72
3 45	6.08"+	42.85"	45.93 sub. crit 48.82 Log N just on scale
	~~6.16"~~ 6.11"+	42.71"	sub. crit 48.82 " " " "
	6.13"+	42.69"	" "
	6.18"	42.65"	48.83 "

* Selsyn reading when top tamper is just in contact with fuel. Maximum reactivity occurs ~ .1" lower.

Soln probe	Top Tamper *		Log N
6.22"	42.61	48.83 sub. crit.	100@2
4.10" 6.25"	42.58	48.83 " "	.00026
~~6.31~~ ~~6.30~~ 6.32	42.50	48.82 sub. crit.	

(Exp. discontinued for lack of time)

Expr. 1-7 (Cont.) Time 3 ~~AM~~ PM Date 2/4 1958
Purpose 5/8" S. Steel lateral ref. with water ref. on 12" cyl. (S.S)
Personnel: D. F. C., J. W. D.

START-UP CHECK LIST
Equipment Checked by ✓ Person Check by ✓
Instrument and Safeties Checked and Reset by ✓
"Source In" Checked by ✓ Source No.
Emergency Equipment in Control Room Checked by ✓
Red Light On by ✓
Start-Up OK'd by ✓ Time 3:10 ~~AM~~ PM Date 2/4 1958

R-1 as ours
DC-3 52 on 10x50
PM trip
DC-2 65 on 10x20

H_2O ht. = 55.5 cm

Soln Probe	Top Tamper	
2.35 +	46.51	48.86
5.11	43.73	48.84
6.31 +	42.50	48.81 sub. crit.
6.35	42.45	48.80
6.34	42.49	48.83 Crit. optimum top tamper setting = 42.58"

water alone 6.04"
.30" more with 5/8" steel (laterally only)
.04" " " 1 5/8" steel (" ")

Expr. 1-8 Time 9[10] AM Date 2-7 1958
Purpose 1/2" S.S. Cutout expt. on 12" cyl w water refl
Personnel: JHW & DK

Top Tamper reads .03" higher than soln.

START-UP CHECK LIST

Equipment Checked by DK Panel Checked by DK
Instrument and Safeties Checked and DK
"Source In" Checked by DK PN 213
Emergency Equipment in Control Room Checked by DK
Red Light On by Hall
Start-Up OK'd by DK Time 9[00] AM Date 2-7 1958

INSTRUMENT CHECK

Date 2-7 1958 Time 9[00] AM Source No. Y

Instrument	Volts		Range Dial Reading	Range Dial Scale
DC-1				
DC-2	40	10x20		
DC-3	45	10x50		
Log N	7			
R-1	100	10x1000		
R-2	negligible			
P. M.	800 V			

fuel	Top Tamper	H_2O	
~~2.89~~ 2.86	2.89	51.5 cm	.03
5.075	5.105	"	.03
~~6.33~~ 6.34	6.40		.06
6.36	6.46		.10
6.39	6.45		.06

10^{10} — Crit TT dumped @ 6.33 cyl

Expr. 1-9 Time 10^25 AM PM Date 2/7 1958
Purpose 3/8" s. steel lateral reflector on 12" cyl. in H_2O ref.
Personnel: D, F.C., L.W., G

START-UP CHECK LIST
Equipment Checked by ✓ Power Supply Check by ✓
Instrument and Detectors Checked and "Source In" Checked by ✓ Log No. PM 2/3
Emergency Equipment and Control Rods Checked by ✓
Red Light On by ✓
Start-Up OK'd by ✓ Time AM PM Date 195

DC-2 ~40 10x20
Log W trip
DC-3 45 10x50
R-1 trip
R-2 responds
PM trip

Soln	Top Tamper	H_2O	
4.10	4.14	.04	52.8 cm
6.04	6.11	.07	
6.22	6.31	.09	
6.34	6.41	.05	sub. crit
6.38+	4.44	.06	crit

optimum top tamper position = 6.33
Temp. = 23°C by thermocouple

Expr. 1-10 Time 12 40 ~~AM~~ PM Date 2-7 1958
Purpose 1/4" SS on 12" sgl
water sgl.
Personnel: Lewis DSC

START-UP CHECK LIST
Equipment Checked by DK Personnel Briefed by DSC
Instrument and Safeties Checked and Re[illegible] DSC
"Source In" Checked by DSC [illegible] No. PM 113
Emergency Equipment in Control Room Checked By DK
Red Light On by DSC
Start-Up OK'd by DK Time 12 ~~45~~ PM Date 2-7 1958

Refl water set at: 52.5cm

Soln	Top Tamper	
5.10	5.15	
6.16	6.21	sub.
~~6.34~~ 6.29	6.33	sub.
6.27+	6.33	sub.
	6.42	
16.37+	~~6.~~ 6.42 ~~6.44~~	crit.

optimum tamper position = 6.32

Expr. 1-11 Time ~~AM~~ PM Date 2-7 1958
Purpose 1/8" SStnl on 12" cyl
Refl -
Personnel: Ewb OK

START-UP CHECK LIST
Equipment Checked by _____ Check by ✓
Instrument and Safeties [illegible] ✓
"Source In" Checked by _____ ✓
Emergency Equipment [illegible] ✓
Red Light On by _____
Start-Up OK'd by OK Time 2 PM Date 2-7 1958

Water gap between Flexiglas tel shell + stainless section as much as 1/8" in places - shell is not round -

Water ht. = 51.5 cm

Soln Wt.	Top tamper	
6.02	6.08	sub. crit.
6.09	6.14	sub. crit.
6.20	6.29	sub.
6.24	6.31	super
6.24+	~~6.20~~ 6.29	crit

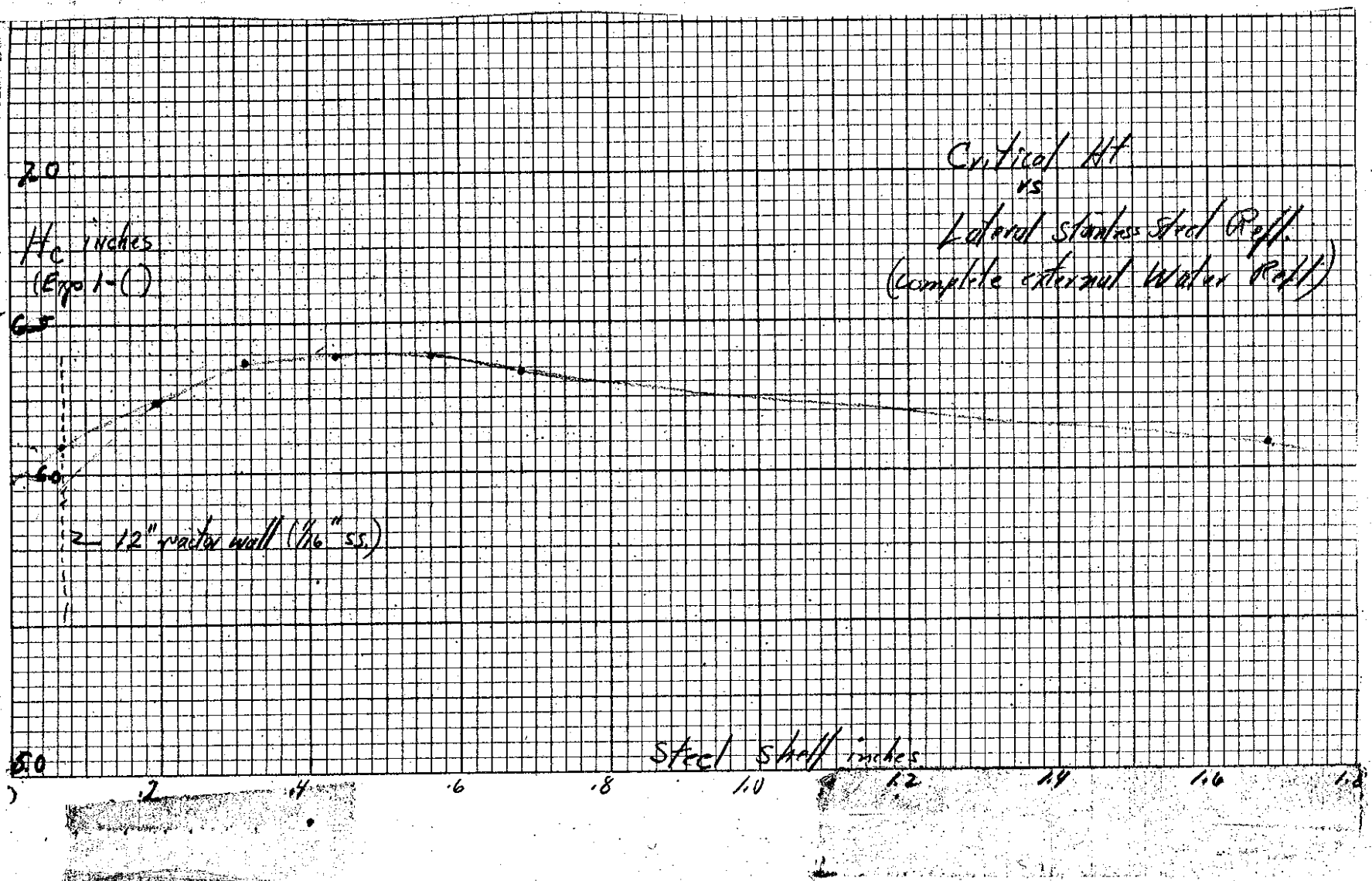
optimum tamper position = 6.20

Expr. I-11 (Repeat of I-3) 23° ~~—~~ Time ____ Date 2/7 1958
Purpose Completely reflected (H₂O)
12" cyl.
Personnel: DFC LWG

H_2O ht. = 51 cm

Soln wt	top tamper	
6.04	6.10	super
6.02+	6.09	crit.

optimum position of top tamper = 5.95


Critical Ht
vs
Lateral Stainless Steel Refl.
(complete external water Refl)
Hc inches
(Eqn 1-()
20
60
50
12" water wall (1/16" SS.)
Steel Shell inches
.2
.4
.6
.8
1.0
1.2
1.4
1.6
1.8

Sample Req 635325

0.44359 gms U/gm sample 2.0094 Sp Gr @ 25.0°C

Assay = 60.96% 238

0.31% 236 H/4 - 73 - 66.4, based on alpha of U/F cmpd

38.78% 235 U (37.3) EJ 11/4/64

0.25% 234

Spec results in ppm in U_3O_8 from ignited Sol'n (divide by 2.66 to get ppm/gm sol'n

Be < .3	Fe 80
Ni 40	Cu < 2
Sn 30	Cr 6
Si < 10	Ca < 50
Li 2	Ba < 10
P 150	B < 1
Na 20	Al 13
Mn 5	Ag < 1
Mg < 5	
K < 50	

START-UP CHECK LIST

Equipment Checked by DK Personnel Check by JKF

Instrument: JKP

"Source In": DK Source No. DN 213

Emergency: DK

Red Light: [illegible]

Start Up Cleared by: DK 10[40] Date 2-21 1958

INSTRUMENT CHECK

Date 2-21 1958 Time 10[35] AM Source No. 8

Instrument	Trip Value	Trip Source	Start-Up Scale
DC-1	—	—	
DC-2	48	10×50	
DC-3	52	10×50	
Log N	7m	7m	
R-1	80	10×1000	
R-2	misread		
P. M.	1"	800V	

Probe 2nd = 0.04" tangent source

2-1

Expr. 2-1 Time 10[40] 4 PM Date 2-21 1958

Purpose 6½ #1 - reflected

Personnel: DK JKF

Start up postponed @ 12[50] pm (water tank leaks)

12[50] pm Water reflector 85.8cm (back end)

1[05] pm water 85.7cm Fuel 12.33"

	Fuel	Water	Temp
1[25] pm	30.12"	85.4cm	30.25"

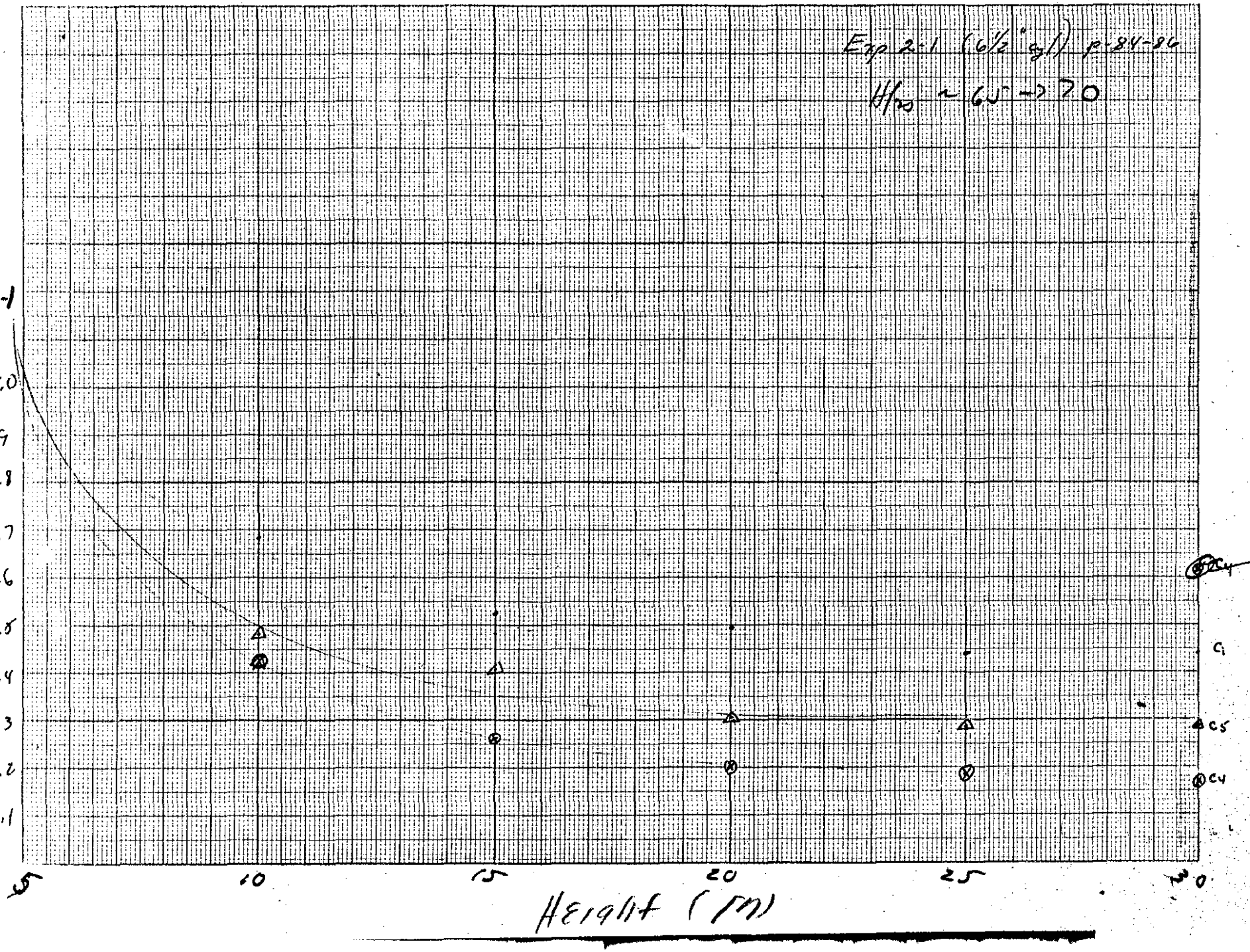
	C_1	C_2	C_4 ×10
Source put out	2^{+45}	3^{+28}	3^{+6}
	1^{+62}	3^{+3}	3
moved C_4 →	7^{+1}	11^{58}	

	Fuel	TT	Water content
1 40 PM	30.12"	30.25"	85.3cm
10 min counts	$C_1 \times 64$	$C_2 \times 64$	$C_4 \times 16$	$C_5 - \times 16$
	34^{+57}	53^{+48}	17^{+15}	15"
1 52				
2 52 PM	25.85"	25.88"	85.2cm	
10 min counts	$C_1 \times 64$	$C_2 \times 64$	$C_4 \times 16$	$C_5 - \times 16$
	35^{+48}	59^{+23}	16^{+1}	17^{+5}
2 01				
PM	20.39"	20.27"	85.0cm w	
10 min	C_1	C_2	$C_4 \times 16$	$C_5 - \times 16$
16	84^{+64}	62^{+38}	17^{+8}	20^{+2}
2 [illegible]	15.17" F	15.14" TT	85.0cm w	
	32^{+28}	56^{57}	16^{+11}	18^{+6}
	9.80" F	9.80" TT	84.8	
2 30	29^{+0}	64^{54}	16^{+5}	18^{+1}
2 42	5.10"	5.07	84.8	
	24^{26}	61^{53}	17^{+3}	18^{+8}
2 56	0.04" F	1.04" TT		
	18^{+33}	70^{+2}	17^{+13}	16^{+14}

Source moved (see next page)

3 20 PM Source 1" off center of reactor ~~axially~~ radially, approx 4" up from bottom vertically — Fuel (TTin contact) Counters 4 & 5 mounted about 2 ft from Cf in tank

		C1	C2	C4 x16	C5 x16	
3 31	5.50"	29 +61	(3.0)/min	749 +3	831 +7	20.8
		x64		74.9/min (18.7) x64	83.1/min x64	~~+135~~
	30.01"	.442 33 +46	5 min	.174 526 +5	5 min 365 22	5 min .28
	"	.429 20 +44	3 min	.174 210 +52	2 min 147 40	2 min .285
4 00	25.05"	.442 34 +10	5 min	.195 506 +54	5 min 364 19	5 min 0.285
	20.01	.492 32 +35	"	.202 463 +5	346 +14	0.301
4 15 PM	15.04	.527 28 +40		.263 3589	290 +61	.409
4 22	10.04	.682 21 +56		.42 223 +49	216 +39	.483



[redacted]

[redacted]

P-88-150
BSR fuel Element Eqp

[redacted]

[redacted]

[redacted]

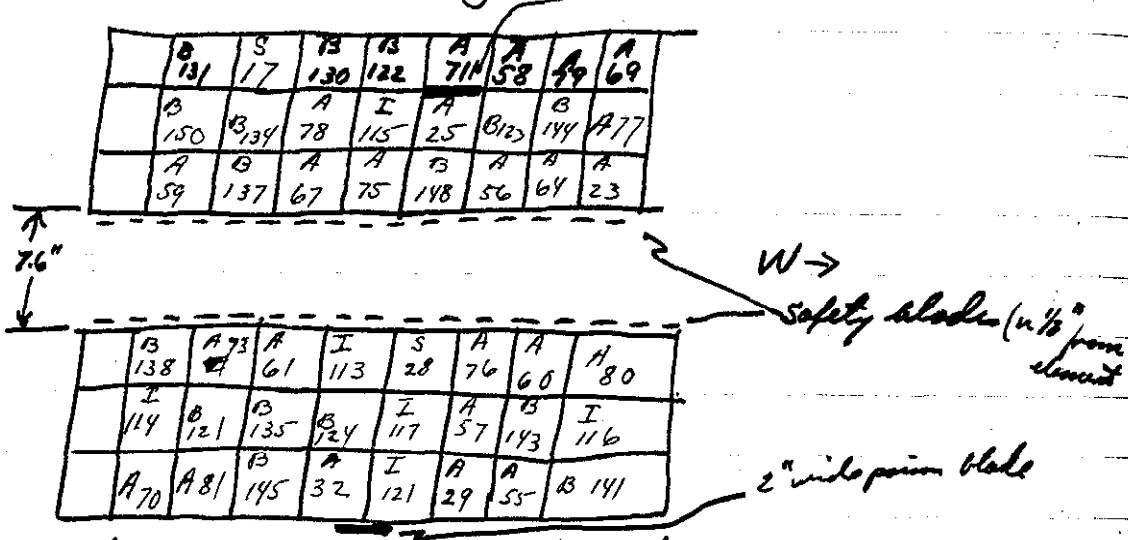
[redacted]

88

5-3-58

Temperature Coefficient Test of BSR fuel elements alone and with boral and ~~[illegible]~~ lead slugs as symmetrical opposing slabs 7.6" apart (edge of element to edge of element.

Initial loading



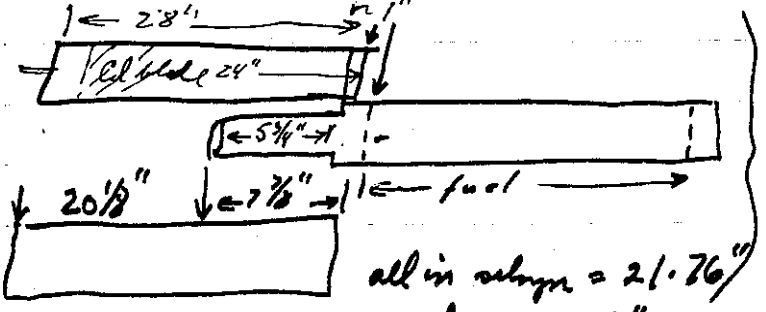
Element	U	X	Element	U	X
A-69	143.95	134.09	A-25	146.30	137.19
A-79	150.31	140.02	I 115	150.58	140.28
A-68	148.79	138.92	A 78	150.31	140.02
A-71	143.95	134.09	B 134	150.86	140.53
B-122	150.19	140.99	B 150	150.88	140.54
B-130	151.02	140.68	A-23	147.74	138.54
S-17	150.31	140.08	A-64	149.14	139.20
A-77	150.31	140.02	A-56	148.25	138.43
B-144	150.34	140.06	B-148	150.88	140.54
B 123	150.81	140.49	A-75	150.28	139.99

Element	U	X
A-67	149.31	138.43
B-137	150.74	140.44
A-59	148.91	139.07

A-80	150.42	140.13
A-60	148.91	139.07
A-76	150.31	140.02
S-28	150.56	140.33
I-113	150.25	140.01
A-61	148.91	139.07
A-73	143.87	134.17
B-138	150.74	140.44
I-116	150.74	140.43
B-143	150.45	140.17
A-57	148.66	138.87
I-117	150.52	140.26
B-124	150.81	140.49
B-135	150.86	140.53
B-121	150.19	140.99
I-114	150.26	140.01
B-141	150.80	140.49

	U	X
A-55	148.25	138.43
A-29	148.83	139.85
I-121	150.70	140.43
A-32	147.80	138.10
B-145	150.29	139.98
A-81	150.31	140.02
A-70	143.85	134.09

Heavy Control Rod → Motor #4 Cd blade (2" wide .025" thick 24" long Cd) mounted as shown on page 88 (OD of blade = 2¾" × 28"



all in elevn = 21.76"
out = 0.40"

Safety → Motor #3 Cd Safety blade mounted in ½" from fuel (North face) in center hole – out approx 5/4" above top of fuel
70 ~~50~~ ma current adequate for holding + pickup (Elephant Bar)
drops at 40 ma min holding = 50 ma

Safety → Motor #2 Cd Safety on APPR rod mounted on ½" from fuel South face of Center hole out is approx 6" above fuel
70 50 ma current adequate for holding + pickup
still holds at 40 ma Selsyn reads −0.15" all up. in = 23.68"

Small Control Rod → Motor #1 Cd blade (2" wide .025" × 24" Cd) in S steel sandwich (OD = 2¾" × 28") mounted as shown on page 88. bottom of blade 1¾" above fuel line selsyn at 22.08" all in out = − 0.20
Source Drum mounted as source gas in EW channel approx center

INSTRUMENT CHECK

Date 3-5 195 8 Time 2 05 AM PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	44	20X100		
DC-3	45	~~50X100~~	50X10	
Log N		~~50X100~~		
R-1	67	10 X1000		
R-2				
P. M.	800V	800V		

under Null

water edge of fuel

Trip changed to 86 on ~~50X100~~ 50X10

platform under Well

south side of Well

south side of Well on floor

START-UP CHECK LIST

Equipment Checked by JKF Personnel Check by

Instrument and Safeties Checked and Reset by JKF, DFC

"Source In" Checked by JKF Source No. PN 213

Emergency Equipment in Control Room Checked by DFC

Red Light On by JKF AM

Start-Up OK'd by DFC Time PM Date 195

Expr. 1-1 Time 2 20 PM Date 3-5 195 8

Purpose Room temp init of BSR fuel elements with 8" channel as p 88 water reflect

Personnel:

2 50 pm Control Rods out Safetis up Source In

Personnel: Cronin, Fox, Rohrer, Gilley

3 25 Back scale set to read zero when water level is at top of support grating (~2½" below fuel)

Water raised to 87 cm. Water level is same as top edge of fuel elements.

Temp.: Thermocouple # 13 24.5° C

Water level is 93 cm when water is at level of bottom of heater

Sub. critical (no apparent ∆k from instruments) when water lvl. = 87 cm (flooded).

quantity of H_2O in west tank approx. 100 gal. more than enough to fill Well to 93 cm

92

Expr. 1-2 Time 9^00 AM Date 3-6 1958

Purpose Fuel elements added & orig array as in dwg

Personnel: JKF WRR BWB DSC

START-UP CHECK LIST

Equipment Checked by JKF Electrical Check by DWM

Instrument [illegible] JKF DWM

"Source In" [illegible] JKF [illegible] No PN 213

Emergency Equipment [illegible] Room Checked by DSC

Red Light On by JKF 3^0 AM

Start-Up OK'd by DSC Time 10 ~~PM~~ Date 3-6 1958

INSTRUMENT CHECK

Date 3-6 1958 Time 10^10 ~~AM~~ Source No. Y

Instrument	[illegible]	Check Up Scale
DC-1		
DC-2	85	10×50
DC-3	50	10×50
Log N	7	
R-1	7	10×1000
R-2	negligible	
P. M.	500 V	

added:
B-140
B-125

	B 131	S 17	B 136	B 122	A 71	A 58	A 77	A 69
B 140	B 150	B 134	A 78	I 115	A 25	B 123	B 144	A 77
B 125	A 59	B 137	A 67	A 75	B 148	A 56	A 64	A 23

W →

added B 139, B 133

B 139	B 136	A 73	A 61	I 113	S 28	A 76	A 60	A 80
B 133	I 114	B 121	B 135	B 124	I 117	A 57	B 145	I 116
	A 70	A 81	B 145	A 32	I 121	A 29	A 55	B 141

U X ↓N

B-140 150.79 140.48

B-125 150.81 140.49

U X

B-139 150.74 140.44

B-133 150.86 140.53

total X added = 561.94 gms as shown

Water ht. = 91 cm, system not critical.
Very small M⁻¹ indicated by instruments
Shim blades and control ~~blades~~ blades as well as safety blades were operated. Shim is less valuable than safeties
At a water ht. of 92.6 cm heaters and stirers come on
When the stirers come on a small amount of air was ejected from element.
~~Top~~ Top of fuel is 66.4 cm above grating i.e. zero on back scale.

2

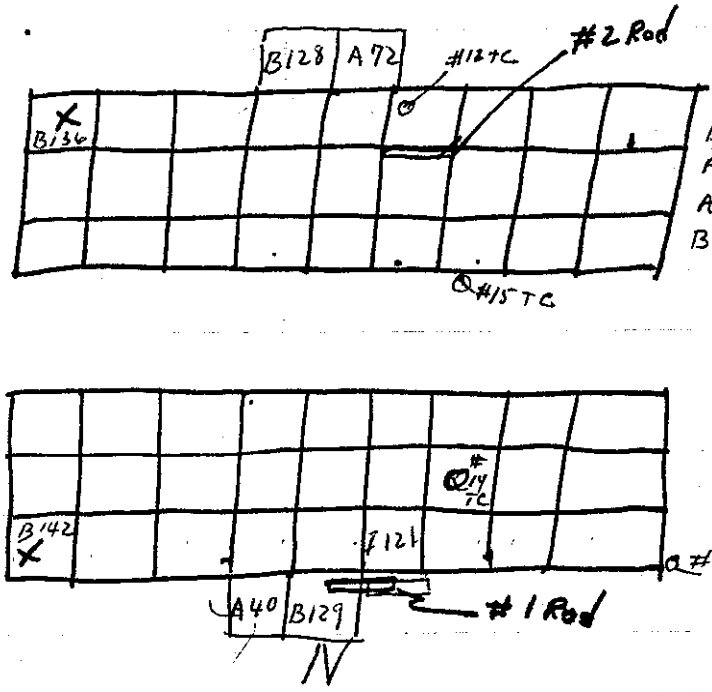
Expr. 1-3 Time 1 30 ~~AM~~ PM Date 3-6 1958

Purpose addition of fuel to orig assembly now a full (3×9)×2 plus 4 partial elements

Personnel: Cronin, Fox, Holland, ~~Gifford~~ Gilley

added Elements

#	u	x
B136	150.46	140.37
B142	150.45	140.17
B128	75.38	70.22
A 92	117.71	109.65
A 40	86.43	80.82
B 129 P	117.29	109.26



~1[45] Begin feeding water

Rod #1 moved west ~1"; is now behind element I 121

2[15] ~~System~~ H_2O Rod #2 Rod #1

67
~~68~~ 9 sub

68.0 super

2[30] 76.1 cm 12.01" 4.5" crit.

Expr. 1-4 Time 2:57 AM PM Date 3-6 1958
Purpose Removal of 2 partial fuel element

Personnel: same

Removed A-40 + B128-P

3 35 PM Water at 92.5cm (startup on - no heat)
elements covered @ Rod #2 at 11.4" Sub Crit

3 40 PM Rod out - Log N = .00023 Source at max
Water at 92.5cm - Sub Critical

Expr. 1-5' Time 8:35 3/7 1958
Purpose Element B-12X8 added to last array (previous position)
Personnel: WG JF, Reedy etc
Equipment Checked by
Instrument unit ← Time ←
"Source fuel" ←
Emergency ←
Red Light ←
Start-Up Order ←
Time 195

+70.22gm 25

DC-3 50 10x50
DC-2 87 10x20
R-1 trip
PM "
2N "
R-2 responds

9 AM Water 68.8cm same unit - Cnt at Rm temp
23.5C° on #13 Thermocouple - no rods

9:17
TC #13 - 23.5°C Steven on water at 92.5cm
#11 - 24.0
#12 - 24.0
#14 - 24.0
#15 - 24.0
Room Temp 77°F

9:40 AM Rod #2 ~~7.775~~ 7.75" Log N .0019 Water at 92.5cm
Rod #1 999.87 R-1 62 on 100x100
DC-2 34 on 50x1
DC-3 92 on 5x1

9 43 AM Htrs on to ~ 80°F both 21Kw + 18Kw

9 50 Instruments slightly rising but less than at start

9 50	DC-2	39	50×1
	DC-3	51	5×1
	R-1	72	100×100
	LN	100±4	

9 53 Instruments indicate downward trend

#13	thermocouple	26°C	@ 9 59
#12	"	"	"
#16	"	"	"
#14	"	"	"
#15	"	"	"

~ 9 50 – Temperature Equilibrating

10 13 Temp 26°C by Thermocouples (all)

10 30 "

#11	29°C		30°
12	29°C		30°
13	29°C		29°
14	29°C	OK	29°
15	29°		28°
16	27°		

10 40 AM Evidently temp creeping up – 18Kw cut off Variac set back to 50 (100 = max)

10 45 AM Rod #2 at 7.30" Log N = .009 R1 55 50×1000
DC-2 56 10×10
DC-3 3[redacted]9 1×20

TC	°C	
11	30°	≈ 86°F
12	30°	
13	30°	
14	30°	1KF
15	30°	

10 57 Htrs (at 12Kw) remains on longer to maintain temp.
Rod #2 at 7.28" very slight increase in activity ~~rate~~

TC #11, 12, 13, 14, 15 — 30.5° — 1 WG

10 57 Rod next to 7.29"

11 00 AM / 11 05

TC #11	30.5°	87.8°F
#12	31°	
#13	30.5°	
#14	30.5°	
#15	31°	1 WG

11 10 All Htrs on - 24Kw + 18Kw demand set for 125°F
11 11 ~~increase~~ level rising on R-1 Rod at 7.29"
11 15 ~~#12~~ #12 TC 32°C R-1 at 60 on 50×1000
13, 11, 14, 15
11 16 R-1 level dropping back after initial rise.
11 20 R-1 back to orig level 55 on 50×1000 (Rod #2 at 7.29")

11:25	Rod #2 moved to 7.22"		
11:24	" " " " 7.13	Temp ~ 34°C	
11:29	7.06		
11:31	7.06	Temp ~ 36°C	DC-2, DC-3 level
11:27	6.89	36.5°C	
11:43	6.78	37.5°C	
11:50	6.68	39°C	
11:57	6.50	40	
12:04	6.41	41	
12:07	6.29		
12:15	6.00	42	
12:30	5.66	45.5°C	
12:45	5.15	48°C	
1:00 PM	4.84	49.5°C	
1:03 PM	4.63	50°C	
1:07	4.52	51°C	
1:15	3.98	53	
1:30	3.15	53.1	
~~1:42~~ 1	3.15	54 — Heaters off	
1:48	2.55	55.5	
2:05	R_1	log N	56.0
2:07	2.10"		56.0° #14 + #13
2:10			56.0 #14
2:11	28 on 80×1000 22 ~~#~~ .15 .0044		
2:15	Rod out to 0.385" in 200 sec period		
2:22	Rod ~~#~~ in 12"	log N	56.0° #14
		.065 (slight + period)	56°

	Rod #1	Rod #2	log N	temp
2 30 PM	15.53"	0.385 (out)	.07	55.5°C #14
				55.5°C #15
				55.5°C #13

15.53" of Rod #1 ≅ 1.7" of Rod 2 from 2:1 & 0.39 avg 131.9°F

I 33 Controller set for new temp demand - 130°F (actually 135

3 00 PM Temp. Equilibrium at 59.2°C

3 17 PM Temp 60°C Rod #1 (out) Rod #2 = 0.88 log N 1.07

3 21 PM TC #11 = 60°C #14 = 60°C

3 20 PM TC #11 = 60°C #14 60°C R-1 going up
Rod #2 down to 1.08 momentarily level.

3 31 Rod #2 at 0.88 R-1 started down no temp change -

3 33 PM TC #11-61.5°C #14-61°C R-1 still going down
Rod #2 at 0.88 (Rod 1 out)

3 44 PM #011-61.5°C #14-62°

3 43 PM #11 #14 61.5°C

3 45 PM #11 #61.5°C

3 47 PM #11 = 61.5°C #14-61.5°C

3 51 PM #11 = 61.0°C #14 - 61.0°C

4 07 All rods out System just Cirt.
Temp. #11 = 60.5°C #13 = 60.5°C #15 = 60.5°C
#12 = 60.5°C #14 = 60.5°C
60.5 ≅ 140.1°F
Continue with about 12Kw of Atm

4:10 Shut down (dropped safeties
4:15 Radiation level at tank water in = 11 mr/hr.
50 mr/hr at top of fuel elements -
note: on 3-10-58 water in west storage tank is 28°C

Conclusion:

Critical at room temp (24C°)
with Rod #2 at 7.775" Rod #1 out

Critical at 30.5C° Rod #2 at 7.29" Rod #1 out

Critical at 60.5C° Rod #2 out Rod #1 out

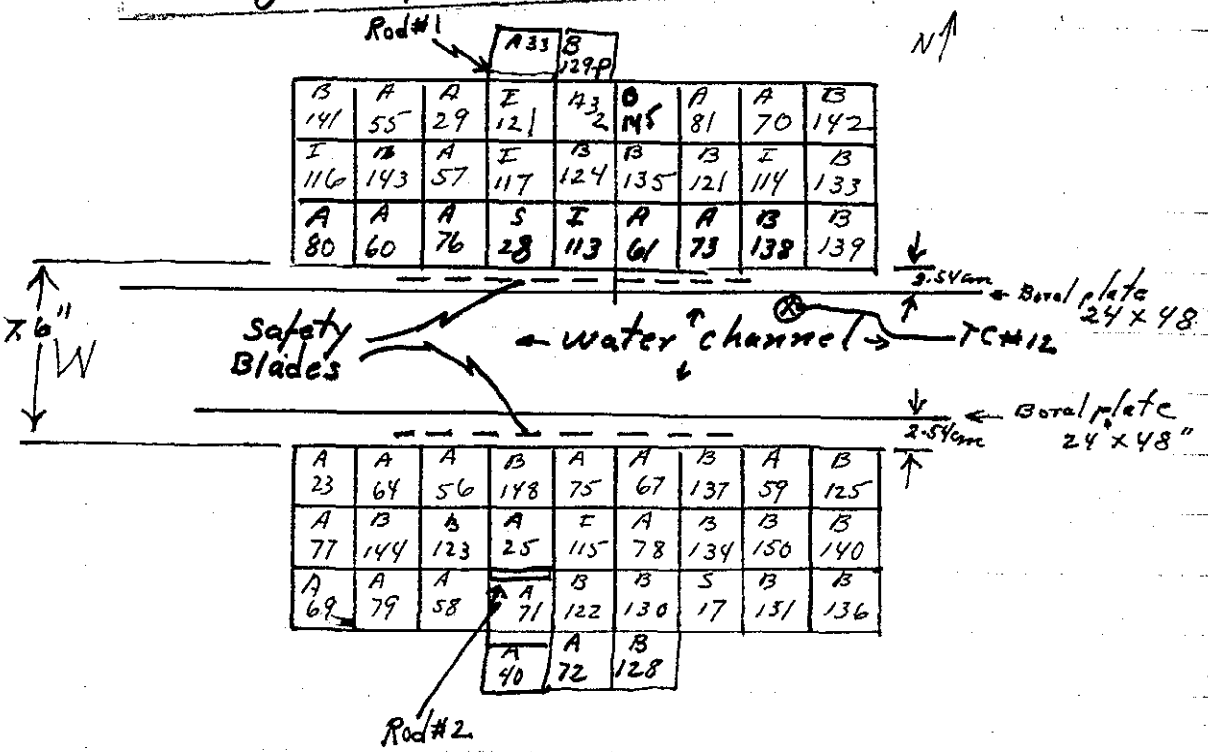
System showed a momentary increase in reactivity when first kbrs on followed by a decrease in activity much more pronounced Net temp coeff. is negative.

Expt. 2-1 Time 2:30 Date 3-10 1958

Purpose: Boral plates inserted into water channel between fuel halves.

Personnel: JKF Rudy JWB DK

TC
#11 bottom of B-145
#14 inside near top of B-145



B 141	A 55	A 29	E 121	43 2	B 145	A 81	A 70	B 142
E 116	B 143	A 57	E 117	B 124	B 135	B 121	E 114	B 133
A 80	A 60	A 76	S 28	E 113	A 61	A 73	B 138	B 139

A 23	A 64	A 56	B 148	A 75	A 67	B 137	A 59	B 125
A 77	B 144	B 123	A 25	E 115	A 78	B 134	B 150	B 140
A 69	A 79	A 58	A 71	B 122	B 130	S 17	B 131	B 136
			A 40	A 72	B 128			

Log N chamber

total U^{25} in system = 7.964 Kg

Location of thermo-couples:

#11 bottom of B-145

#14 inside near top of B-145

#13 in South East corner about 3 ft up from floor and 1 foot from walls taped to TC from Symplytrol

#15 inside A-71 2-3" down into fuel

#12 about center Nt on NE corner of water channel

equipment note

PN 213
Source moved from between baker & outside North side between B-145 and B-139 P

START-UP CHECK LIST

Equipment Checked by JKP GWB Control Check by LCL

Instrument and Safeties Checked and Recorded by DJK

Source Put at Location by DJK PN-213/Pu-Be

Equipment Checked by DJK

Start-Up OK'd by DJK Time 3 20 PM Date 3-10 1958

Plut-Be source from Sid also installed to be in on South face

pump and dump shifted to East water tank -

Rod # 2 (Motor # 4) speed control set at 1.5 on Variac

INSTRUMENT CHECK

Date 3-10 1958 Time 3 10 PM Source No. 7

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
	86	10 x 50		
	49	10 x 50		
	7 mm			
	7	10 x 1000		
		megaohms -		
	1"	800V		

3 35 PM 6 3 cm water #11 #12 } 24.5°C

3 40 PM 92.8 cm water

Sub-Critical

Log N = .00026

INSTRUMENT CHECK

Date 3-11 1958 Time 1200 PM Source No. γ

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	88	10x50		
DC-3	53	10x50		
Log N	7on			
R-1	7.2	10x1000		
R-2	responds			
P. M.	1"	800V		

START-UP CHECK LIST

Equipment Checked by JKF Personnel Check by

Instrument and Safety Circuit Checked and Set by DK

"Source" Withdrawal Checked by JKF Source Position pwr bl and Pu Be

Emergency Equipment in Control Room Checked by DK

Red Light On by DK

Start-Up OK'd by DK Time 1 06 PM Date 3-11 1958

Expr. 2-2 Time 1 06 PM Date 3-11 1958

Purpose 3" of Al between halves in water channel to increase reactivity some areas

Personnel: RKR, JKF JWB, DK.

1 50 PM Sub Critical Water at 92.5 cm 24.5°C

log N = .00038

3-11-58 after checking with Leo Holland decided:

1. Most important to have slab geometry as regular — no protrusions = 2 - 3×9's

2. Halves may be adjusted closer (up to 5" separation) to maintain criticality

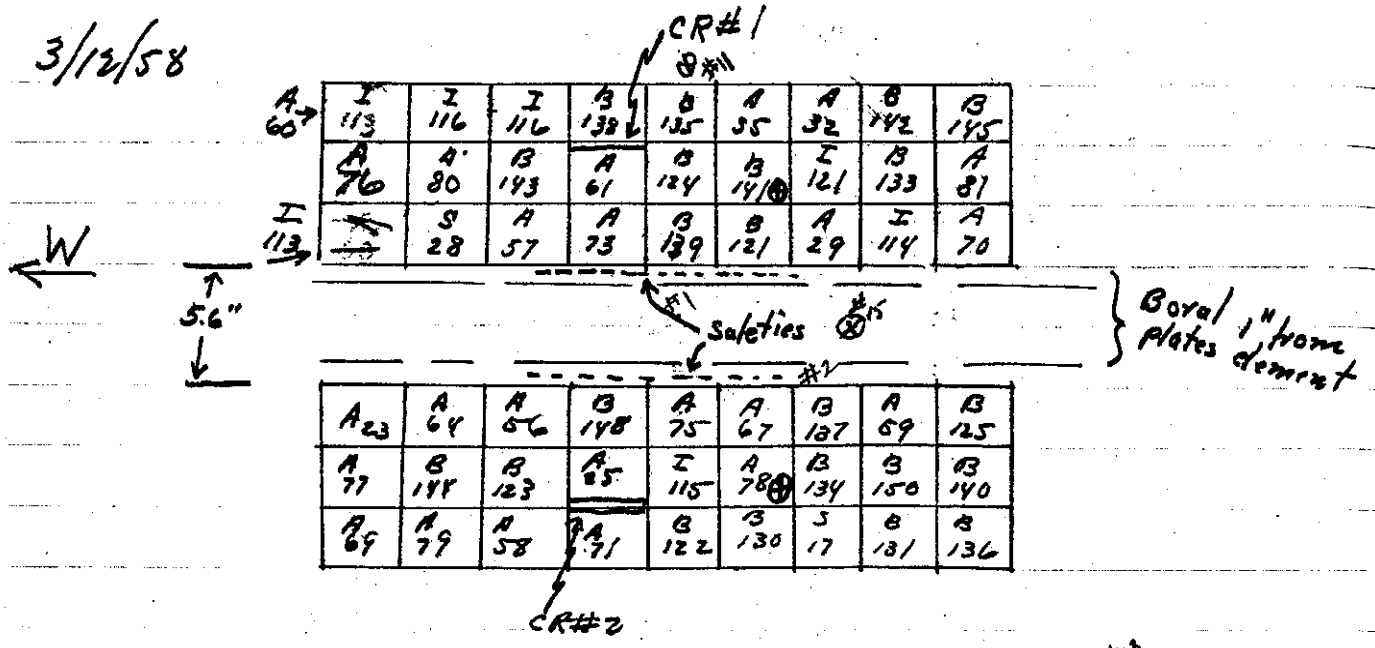
3. Bond plates may range from 5/8" to 2.5" from edge of elements.

4. Partial elements may be placed in 3×9 row to lower reactivity

5. If necessary partial elements on outer faces of 3×9's

6. If still sub-critical change system to a 4×8 (3×8 - plus partial's in 4th row)

3/12/58



A 60 → I 113	I 116	I 116	B 138	B 135	A 35	A 32	B 142	B 145
A 76	A 80	B 143	A 61	B 124	B 141 ⊗	I 121	B 133	A 81
I 113 →	S 28	A 57	A 73	B 139	B 121	A 29	I 114	A 70

A 23	A 64	A 56	B 148	A 75	A 67	B 137	A 69	B 125
A 77	B 144	B 123	A 85	I 115	A 78 ⊗	B 134	B 150	B 140
A 69	A 79	A 58	A 71	B 122	B 130	S 17	B 131	B 136

Note: All fuel elements in 3×9's are full elements

Thermocouples: [Cu-Constantin

#15 water channel 26" down 8" up from grating -13" in from E

#14 In element B 141 ~4" from top of fuel

13 steel in outer reflector SE corner 3ft up 1ft in

12 In element A 78 ~4" from top of fuel

11 north edge of array at center of bottom, (outside

INSTRUMENT CHECK

Date 3-12 1958 Time 1 50 ~~AM~~ PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	84	10×50		
DC-3	50	10×50		
Log N	Tau	period		
R-1	7.5	10×1000		
R-2	recipanda			
P. M.		800V		

START-UP CHECK LIST

Equipment Checked by _____ Personnel Check by _____

Instrument and Safeties Checked and Reset by DWG DFK

"Source In" Checked by DFK Source No. PuBe-PuB3

Emergency Lights & Control Room Checked by DFK

Red Light On by DWG

Start-Up O.K.'d by DFK Time 2 00 ~~AM~~ PM Date 3-12 1958

Expr. 3-1 Time 2 00 ~~AM~~ PM Date 3-12 1958

Purpose achieve Crit in 3×8's by moving closer - opening between halves now 5.6" between edges of elements. ¼" thick boral plates as shown in diag.

Personnel: JKF, DWG, DFK

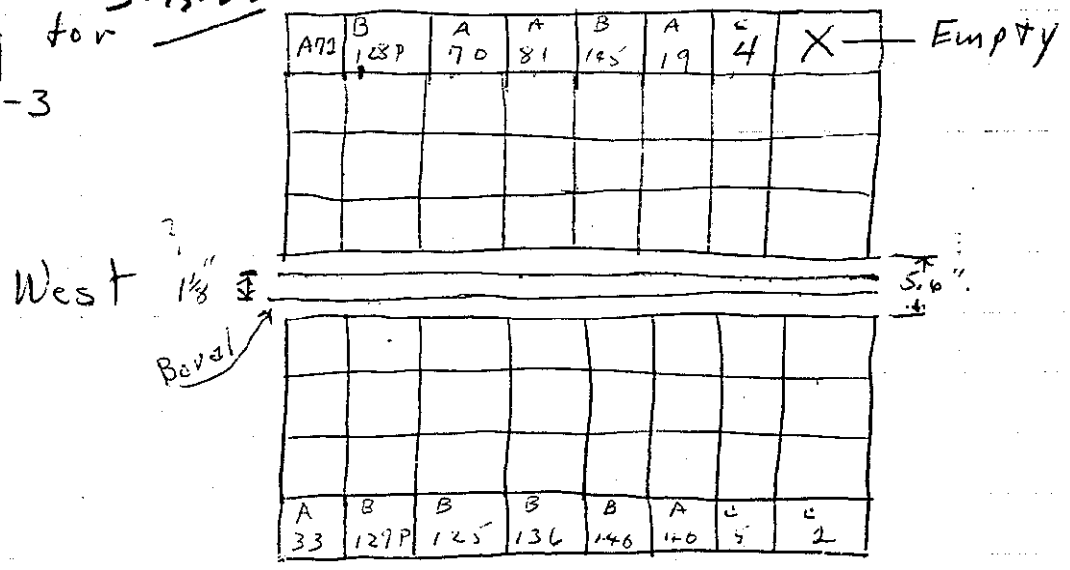
2 15 PM Sub Critical Water at 8¼ cm all rods out

Expr. 3-2 Time 2~~55~~ PM Date 3-12 1958
Purpose 2" between boral plates & edge of element leaving 1⅛" water gap. between Boral plates
Same fuel Loading
Personnel: LWG, Rudy, JJK 7

Very little multiplication at 92.5 cm H_2O

3-13-58

Drawing for Exp 3-3



Dc-3 trip 50×500
Dc-2 " 83×500
R-1 " 7
R-2 responds

Thermocouple locations are approximately same as noted on page 106

Expr. 3 3 4-1 Time 10 ~~AM~~ PM Date 3/13 1958
Purpose 1⅛" between boral plates. Boral plates are 2" from face of element. Fuel loading is given on page 108
Personnel: C.F.C. J.K.F., Reedy, J.W.S.

10¼ AM. H_2O ht. = 50.5 cm. Since reactivity was sufficient to be critical well below effecting as reflector, experiment was discontinued to make changes.

Expr. 4-2 Time 2 ~~AM~~ PM Date 3-13 1958
Purpose Boral plates moved in to 1" from face of elements
Personnel: RFR JWS DFC

H_2O ht, 65.5 cm Both control rods "in" (Rod #1 is 22.18, Rod #2 is 21.34)

Fuel Element Weights

Element	Weight U-235
A19	30.81 gms
C2	69.87
C4	69.81
C5	69.94
	240.43

110

3/14/58 Restacking of Elements for uniform loading.

I 113	A 70	A 81	B 145	B 142	I 114
I 117	I 116	B 138	B 135	A 55	A 32
A 80	B 143	A 61	B 124	B (14) 141	I 121
S 28	A 57	A 73	B 139	B 121	A 29

3.348 Kg 235

(15)

← 5.6" edge to edge
1/4" boral plates
1" from edge of elements

A 64	A 56	B 148	A 75	A 67	B 137
B 141	B 123	A 85	I 115	A. 12 B 79 ⊗	B 134
A 79	A 58	A 71	B 122	B 130	S 117
A 69	B 125	B 136	B 131	B 150	A 59

3.345 Kg 235

W

Expr. 5-1 Time AM 3-14-1958
Purpose Loading as shown above
Personnel: L W G, R. K R., J K T.

R-1 Trip>
PM "
LN "
DC-3 – 50 x 5
DC-2 – 80 x 5

Crit at H_2O at 65.5 with rods out
67.1 #2 rod at 8.65
68.1 " 21.35

INSTRUMENT CHECK

Date 3-17 1958 Time 8 30 AM Source No. 1

Instrument	Value	Scale	Source Distance	Temp. Corr.
DC-1				
DC-2	85	10×10		
DC-3	50	10×10		
Log N	7			
K-1	7	10×100		
K-2				
P. M.				

Expr. 5-2 Time 9 00 AM PM Date 3-17 1958

Purpose Same loading - boral plates moved in to 3 3/8" of fuel elements

Personnel: LWH RKR DAC

9 07 System slightly sub-critical with water at ~92 cm and with both control blades "out".

Expr. 5-3 Time AM PM Date 3-17 1958

Purpose Boral plates moved out to 3/4" spacing from elements

Personnel: LWH RKR, DAC

11 45 Crit # Water at 92.5 cm water water temp (Stabilized at ± 0.5°C)

#15 22.5°C

#12 22.5°C

11 55 CR #2 8.15 ± .05" Crit Log N = .009

Shut down by dropping safety blades.

Expr. 5-4 Time 3[45] PM Date 3-17 1958
Purpose Repeat of 5-3 after securing bonded plate more firmly
Personnel: 3 wds DH RKR

3:45 PM Thermocouple #12 + #15 = 23°C
Crit. water at 92.0 C.M.
CR #2 at 7.70" ± .05
Crit Log at .0024
Shut down - water dumped

INSTRUMENT CHECK

Date 3-18 1958 Time 8[15] AM Source No. γ

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
D[illegible]				
[illegible]				
[illegible]	45	10x50		
[illegible]	70c			
R-1				
R-2	~~response~~			
P. M.	1"			

START-UP CHECK LIST

Equipment Checked by DH Checked by DH RKR
Instrument [illegible] DH PN213
"Source" [illegible] DH
Emergency [illegible] DH
Rod Guide Pin [illegible] DH
Start-Up [illegible] by DH Time 8[30] AM Date 3-18 1958

Expr. 5-4 Time 8:30 AM PM Date 3-18 1958
Purpose Beginning of temp runs using heater from West tanks — Coolant used for 5-4
Personnel: JWH, RKR DAC

9:00 Water 92.5 cm critical
temp: #15 23°C

9:05 CR at 6.79" pro. period

9:10 CR # at 7.75" level log N at 0.01

9:15 Liters on (18+24 KVA)

9:30 #5 TC kicked out - liters set back to 12 KVA initial rise followed by long drop in reactivity

9:40 CR #2 at 6.74" pro period

9:45 CR #2 5.50" pro period

10:00 CR #2 at 6.95" seems level by Nat .01 Temp #15 - 26°C

10:07 Htr demand set to 37°C full heat (18+24 KVA)

10:22 #15 TC 29°C #12 29.0°C

10:29 #12 30°C #15-30.5°C CR set at 5.50"

10:45 #15 33.5°C

10:58 Heaters turned off momentarily (equilibrating).

11:01 AM # 12, 14, 15 @ 34°C (thermocouple)

11:35 #15 - 37°C Rod at 3.70" (just appears level)

12:20 All thermocouples read 42.5°C, control Rod # 2 is out, system is critical.

114

3-18-58

2" lead face covered with 1/4" Boral on outside (North South) face of each section - array otherwise same as before.

Expr. 6-1 Time 10[00] AM ~~PM~~ Date 3-19 1958

Purpose Criticality check on lead boral shielded array

Personnel: Fox Reedy Erwin

START-UP CHECK LIST

Equipment Checked by RKR Personnel Check by RKR

Instrument and Safetrols Checked and Reset by RKR

"Source In" Checked by RKR Source No. PNZ13

Emergency Equipment in Control Room Checked by RKR

Red Light On by RKR

Start-Up OK'd by RKR Time 10[20] AM ~~PM~~ Date 3-19 1958

INSTRUMENT CHECK

Data 3-19 1958 Time 10[00] AM ~~PM~~ Source No. Y

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	82	10×50		
DC-3	48	10×50		
Log N	7on			
R-1	8.2	10×1000		
R-2	responds			
P. M.		800V		

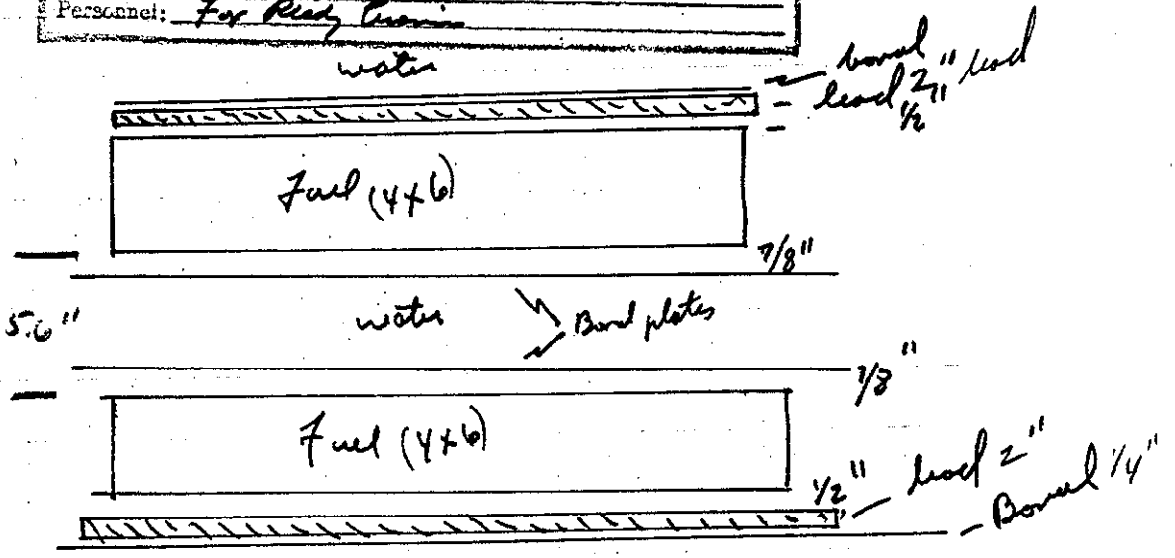
$10^{50}/_{4}$ Water 92.5 cm - system subcritical Reduced

Water temp #15 / #14 } 23°C Log N n .001

Expr. 6-2 Time 12 ~~AM~~ PM Date 3-17 1958
Purpose Same Array with Boral Plates now 7/8" from fuel elements — 7/8" ± 1/32
Personnel: Jay Ready Cronin

1 50/P Water at 92.5 cm Temp 23°C
Rods out very slowly period (593 sec) 1.3 ¢
~ 00 Rod # 2 - 1.24" level Log N at .0008

Expr. 6-3 Time 3 45 ~~AM~~ PM Date 3-19 1958
Purpose Seal Boral on outside spaced 1/2" from fuel elements
Personnel: For Ready Cronin



4 15/PM CR#2 18.53" Water at 92.5 cm slight plus
18.60 plus 18.80 plus 19.00 + 19.56 +
#15 = 23°C 20.00 − 19.75 +
(all in = 21.34")
Critical with Rod #2 at 19.875 ± .125"

Expr: 6-4 Time 8 25 AM PM Date 3-20 1958
Purpose Continuance 6-3 with Temperature changes.
Personnel: JKP RKR DK

START-UP CHECK LIST
Equipment Checked by RKR Personnel Check by RKR
Instrument and Safeties Checked and Reset by DK RKR
"Source In" Checked By DK PN213
Emergency Equipment in Control Room Checked by DK
Red Light On by DK
Start-Up OK'd by DK Time 8 35 AM PM Date 3-20 1958

9 15 CR#2 at 10.50" water 92.5 cm per period. 141 sec 7.4¢
9 25 temp readings #15, 14, 13, 12, 11 28°C - 28.2°C

CR#2 at 12.50 by N .055 + level
9 40 Steam turned on.
9 44 .411 Kilo on - demand set #40°C
9 46 Beginning of very slight rise on R-1
9 47 Starting down on R-1
9 52 CR#2 out 12.00"
10 02 #11 = 31.5°C #15 = 31.5°C
10 12 #15 = 33°C
10 23 #15 35°C
10 34 #11 37.25°C
10 38 #11 38°C
10 48 #11 39.75°C. #15 39.75°C

11 05 42.25° C #15 CR#2 at 5.60"
11 14 #11 ~~45.25~~ 44.0°C CR at 4.48"
11 25 #11 46°C #15 46°C
11 29 #14 46°C #15 46.25°C
11 37 #13 47.5°C
11 39 #13 48°C #14 48°C #15 48.5°C
#11 48.75°C
11 41 Varian at 50% 18Kw Nbn off.
11 50 #11 48.5°C #14-48.5°C #15 48.5°C
11 52 Varian out at 75%
11 53 #13 48°C #11-48.5°C
11 55 Varian at 75% 18Kw Nbn 0V
11 57 #11- 48.25°C
12 00 AM #15- 48.25°C #14 48.25°C Rod at 1.46" +
12 03 AM #11 48.25°C Rod at 1.55" +
12 05 Rod #2 at 1.65" #11 48.25°C slight +
12 10 #13 ~~48.25~~ 47.75°C Rod #2 at 1.70"-
12 15 Rod #2 at 1.67
12 18 #13 47.75°C #15 48.75°C #11 48.50°C
12 21 #15 48.50°C #12 48.25°C #14 48.25°C
12 24 #15 48.50°C #11 48.25°C
12 28 #11 48.25°
Rod #2 1.37" ± .05" level log N at 0.036
12 31 Rod #2 Out (-99999)
12 33 #14 48.1°C #15 48.25°C

12[40] Shut down (water dump)
Period Rod out = 434.6 sec 2.754
avg temp = 48.25°C

Sample taken of lead for analysis - scrapings from 15 of 28 pieces used.

START-UP CHECK LIST
Equipment Checked by RKR Personnel Check by RKR
Instrument and Safeties Checked and Reset by DFC RKR
"Source In" Checked by DFC Source No PN 213
Emergency Equipment in Control Room Checked by JKF
Red Light On by DFC
Start-Up OK'd by DFC Time 8[45] AM PM Date 3-21 1958

Expr: 6-5 Time 8[45] AM PM Date 3-21 1958
Purpose Critical with no lead/board outside - inside board plates 7/8" from full
Personnel: JKF RKR DFC

9[10] Water at 40cm #11 TC = 23.5°C

9[20] 67.45cm water Supcm 67.35 Sub
Crit Rod out at 67.4 cm 23.5°C

9[27] 76.5cm water Rod #2 at 21.34" (slight Supcm.

9[40] Crit Rod #2 21.34" Rod #1 at 2.61
92.5cm water

Time	Cont Rod #1 inches	Control Rod #2 inches		Pressure mm	∅
9 60	0.0	21.34"	+	136.5	9.2
9 47	2.81	21.34		level	
9 48	2.81	16.00		too low	
9 50	2.81	15.00	+	168	6.4
9 ~~58~~ 57	4.05	15.00		level	
10 00	4.05	13.00	+	245	4.6
10 08	4.76	13.00		level	
10 10 all TC 23.25°C	5.46	13.00	−	−260	5.8
10 18	4.76	13.00		level	
10 19	4.76	12.00	+	377.5	3.2
10 25	6.54	12.00	−	−145.5	12.8
10 35	5.27	12.00		level	
10 36	5.27	11.00	+	258	4.4
10 41	7.02	11.00	−	147.5	12.4
10 51	5.85	11.00		level	
10 52 23.25°C	5.85	10.00	+	210	5
11 02	7.12	10.00	−	−302	4.9
11 08	6.60	10.00		level	
11 09	6.60	9.00	+	163	6.6
11 12	8.00	9.00	−	−282	6.4
11 14	9.00	9.00	−	−134.5	8.8
11 19	7.45	9.00		level	
11 20	7.45	8.00	+	134.5	7.4
11 29 23.25°C	8.00	8.00	−	−178	8.8
11 35	8.64	8.00		level	
11 36	8.64	7.00	+	99.8	9.6

Time	Rod #1	Rod #2		Period	¢
11 38	11.05	7.00	—		
11 39	12.05	7.00	—	-195.5	8.2
11 42	13.02	2.00	—	-147.5	12.4
11 47	10.45	7.00		level	
11 52	10.45	6.00	+	97.6	9.8
11 57	15.00	6.00	—	-314	4.6
11 59	17.00	6.00	—	-199.5	8.2
12 03	13.31	6.00		level	
12 04	13.31	4.50	+	60.7	14.1
12 06	22.17	4.50	+	269	4.4 & safety #2 = Rod #3
	Rod #3				
12 08	11.01	22.17	—	-99.6	29
12 13	11.01	10.85		level	
12 17	11.01	10.85	+	108.5	9
12 22	11.01	22.17	—	-167	10.3
12 39	11.01	13.75		level	
12 40	11.01	13.75	+	95.7	10 ¢

temp #15 23.2°C dec #14 & 11

12 45 Shut down by allowing DC-2 to scram

DC-2 = 87 on 10 x 50

Log N = 0.36

$10^{8.5}$ ¢ = Rod 2

from 21.34" to 0.0

Expr. 6-6 Time 2:20 PM Date 3-21 1958
Purpose Temperature survey on source assembly in 6-5 (no center lead-board)
Personnel: JKF, RKR, DK

START-UP CHECK LIST
Equipment Checked by RKR DK Personnel Check by RKR
Instrument and Safeties Checked and Reset by RKR DK
"Source In" Checked by DK RKR Source No. PN213
Emergency Equipment in Control Room Checked by DK
Red Light On by DK
Start-Up OK'd by DK Time 2:00 PM Date 3-21 1958

2:00 Start Rod #1 13.74 Rod #2 21.34 Safeties all out
temp #11 32.25°C (at 55 cm water) 32.75°C
#12 23°C (at 65 cm water) 26.50°C
#15 33.50°C (at 85 cm water)

2:35 Rod #1 out Rod #2 - 13.35" Level Log N = .001 88,14 cpm
#11 33.0°C #15 33.25°C #14 33.50°C
2:45 Steam On - no change
2:46 HT on - 24 + 18KVA
2:48 noted initial rise from 35 on R-1 to 40 (200 x 10 mv)
#15 - 39.75°C #14 53.75°C (at peak of rise
3:01 PM #14 33.25°C #15 - 35.25
3:02 PM #14 35.00°C #15 - 35.50°C
3:13 PM Level Log N = .0016 Rod #2 11.36" Rod #1 out
#14 36.75°C #15 - 37.3°C
3:22 Level Log N = .0015 Rod #2 10.36" Rod #1 out
#14 38.8°C #15 39.75°C
3:38 41.50°C #14 #15 - 42.25°C
3:44 43.25°C #15 #14 42.5°C
3:50 44.0°C #15 43.75° #14 Rod at 8.27 + Level Log N = .03
(over)

4:04 Rod #2 = ~~7~~ 7.35" Log N = .042
#14 1.85 45.75°C #15 1891 46.75°C

4:15 PM Log N = .041 Rod #2 = 6.91" Level
mv
#15 1.927 47.75°C
#14 1.90 — 47.0°C
#13 1.914 47.25°C
#12 1.92~~5~~0 47.5°C
#11 1.927 47.75°C

4:30 PM
#15 1.958 48.50°C
#14 1.937 47.75°C
#13 1.944 48.0°C
#12 1.955 48.25°C
#11 1.955 48.25°C
} Level Log N = .042 Rod #2 = 6.66"

4:38
#15 1.951 - 48.25°C
#14 1.943 - 48.0°C
#13 1.934 - 47.75°C
#12 1.941 - 48.0°C
#11 1.944 - 48.0°C
} Level Log N = .042 Rod #2 = 6.70"

4:46
#15 1.955 48.25°C
#14 1.947 48.2°C
#13 1.935 47.75°C
#12 1.945 48.1°C
#11 1.945 48.1°C
} Log N = .042 Rod #2 = 6.70"

4:55 PM After Run — Slight mix on R-1 37 to 38 on 50 x 100 mesh

#5	1.978	49 °C
#14	1.984	48.1 °C
#13	1.966	48.70 °C
#12	1.978	49 °C
#11	~~1.980~~ 1.9885	49.25 °C

4:57 — R-1 level filling — 53.25 °C

5:05 PM

#15	2.1765	~~49.6~~ °C	Rod 5.17"
#14	2.0995	~~49.5~~	Log N = .016
#13	2.1065	~~49.5~~	
#12	2.10955	~~49.5~~	
#11	~~2.1~~ 2116	~~49.50~~ °C	

5:27

#15	2.226	54.5 °C	
#14	2.163	53.0 °C	
#13	2.175	53.25 °C	
#12	2.185	53.50 °	
#11	2.207	54.00	

5:40

#15	2.242	55 °C	
#14	2.205	54.0 °C	Log N = .016
#13	2.192	53.5	Rod = 4.15"
#12	2.212	53.50	
#11	2.207	54.0 °C	

avg = 54.0°

5:43 #14 2.207

5:47 Rod #2 Out (1st 3 min = 67.2 sec 13.4
last 2 min = 97.8 sec 9.8 avg = 11.4

Shutdown by using R-1 to trip — avg = 82.5 sec ± 1.2

9.1118 3-11-69

Expr. 6-7 Time 2[3] AM PM Date 3-24 1958
Purpose Check of Reproducibility also test of interlocks Log.
Personnel: Dunn RKR DFC

START-UP CHECK LIST
Equipment Checked by RKR Personnel Check by RKR
Instrument and Safeties Checked and Reset by DFC
"Source In" Checked by DFC Personnel Check by PNEL3
Emergency Equipment in Control Room Checked by DFC
Red Light On by DFC
Start-Up OK'd by DFC Time 235 PM Date 3-24 1958

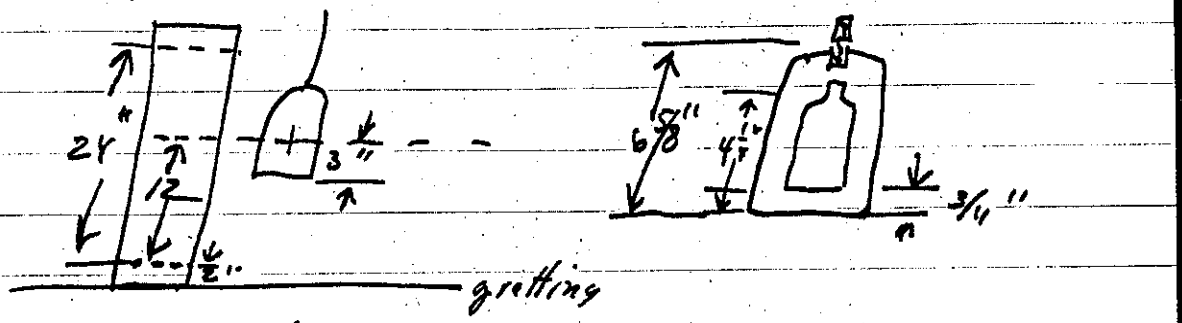
Bottle #2 gross wgt H_2O only 156.507 gms
outer container filled with water.
Bottle on motor #1 — zero = top of grating —

3[15] P Water 92.5 cm Rod #1 4.19 in } Source in
Rod #2 16.00 or in } Sub Cent.
water temp 23.25°C all thermocouples (0.905)

3[20] Rod #1 4.19" #2 13.39" pos period 282 sec 4¢
3[25] Rod #1 4.19" #2 12.00" pos period 128 sec. 8¢
3[35] Rod #1 5.27 #2 12.00 level Log N = .0011
R-1 66 (50 x 1000)
3[40] Rod #1 2.98 #2 21.34 Log N .00075 } level
R-1 65 (50 x 1000)
3[45] temp 23.0°C all thermocouples 0.902 mv
3[53] Rods reset to Rod #1 5.27" Rod #2 12.00"
very slight upward trend on R-1
Rod #1 at 5.30" Rod #2 12.00" slightly sub on R-1

4[10] PM Rod #1 5.29 Rd #2 11.98 level
Reed #1 70 (50 x 1000) log N .0012

4[08] PM Bottle set at ~~[illegible]~~ 11.00" on shaft (fuel = 24" long
base of fuel approx 2" up from grating



4[13] Period to ~~small~~ large to measure
Bottle month = 0.284 (Rod #1 at 5.29 Rod #2 12.05" at Cutoff.)

4[20] Bottle out - slight negative (38.96" up)
Rod #1 at 5.29 Rod #2 11.98" Cutoff

Expr. 6-8 Time 4[05] ~~AM~~ PM Date 3-24 1958
Purpose Repeat of 6-7 with 4-235
in 3-4 gms in same bottle
Personnel: DWM DJC

Gross wgt bottle #2 (with Cd) 160.899 gms
40 ml of Soln put in #2
60 ml " " put in Sample bottle Reg No

5[14] Water at 92.5 cm per period 22.75°C Bottle at 11.00
5[20] Bottle out Temp .899 mv avg Rd 1 at 5.29
Level log N = .001 P-1 = 65 on 50 x 1000 Rd 2 at 11.98
R-1 = 5.29"
R-2 = 11.99"

(over)

5 PM Battle replaced at 11.00"
System level at 5.29" on Rod #1
12.70" on Rod #2

Log N .001
RJ-1 66 (50 x 1000)

Thermocouples #11 .886
#12 .887
#13 .888
#14 .892
#15 .888
.8882
} 22.75°C Carey

Period = 401 sec (Battle at 11.00 rods at 5.29 - 11.98
≡ 3 ¢

Expr. 6-9 Time 9 10 AM PM Date 3-25 1958
Purpose Same array - bottle now has 80 ml of soln of UO_2F_2 (= 6.4 gms
Personnel: RG RKF DK

START-UP CHECK LIST
Equipment Checked by DK Personnel Check by DK
Instrument and Light Bias Checked and Reset by DK
"Source In" Checked by DK Log No. RN 213
Emergency Radiation Alarm in Control Room Checked by DK
Red Light On by DK
Start-Up OK'd by DK Time 9 10 AM PM Date 3-25 1958

Bottle #2 emptied, rinsed out + refilled with 80 ml of UO_2F_2 soln + water + replaced in reactor

10^{07} Water at 92.5° @ cm Rd #1 22.17" Rd #2 21.34" Sus Ctr.

T.C. #1 .893
#2 .882
#3 .890
#4 .890
#5 .882
} 22.75°C

10^{23} Source Out Rd 1 at 5.289" Rd 2 at 11.98" Water at 92.5 cm

light period — 256 sec 4.5 ¢

10^{30} Log N = .0001 R-1 = 66 (50×100)

10^{40} #11 .8915 #13 .843
#12 .838 #14 .845
#15 .848
} note only ice in thermos as designed

10^{41} Bottle removed to 38.56" Rd #1 = 5.29 } slight neg period
Rd #1 1.88
leveled at 11.93 on Rd #2 } Log N = .001
5.29 on Rd #1 }

11^{04} A Bottle re-inverted at Log N = .001 Rd 1 = 5.29
Rd 2 = 11.2893
263 sec 4.4 ¢

11[05] Thermocouple all read .920 mv 23.50°C

11[12] bottle removed at Log V = -.01 @ 38.5"

11[16] Thermocouples all 0.920 mv

11[20] #2 Safety run in = 23.70" — 110 sec

11[21] Thermocouples all 0.920 mv

11[22] AM Manual cram to shut down

~~165.8~~ ~~165.815~~ Bottle empty full = 165.3 grams

3-25-58

1 PM #2 162.9375 gm (60 ml sol'n

0.93"

Note: Zero of selsyn Motor #1 is 0.~~78~~" with bottle and filled carrier. so actual position of all measurements & data at nominal 11.00" is actually ~~10.27~~" 10.07"

Expr. 6-10 Time 2 ~~00~~ AM PM Date 3-25 1958
Purpose Same Apparatus - bottle now with 60 ml of Sol'n
Personnel: R.A. RKR

START-UP CHECK LIST
Equipment Checked by RKR Personnel Check by DSC
Instrument and Safeguards Checked and Tested by DSC
"Source In" Checked by DSC Film Badge No. PN213
Emergency Equipment in Control Room Checked by DSC
Red Light On by DSC
Start-Up OK'd by DSC Time 2 08 ~~AM~~ PM Date 3-25 1958

2 30 PM Zero of bottle + carrier rechecked with 27 cm of water in tank = −0.18"
2 37 Recheck with water out of tank = 0.90"
3 05 Bottle at 38.5" Rd 1 = 5.29 Rd 2 = 11.00" to point 290 mv 4¢
3 ~~05~~ all Thermocouples = 0.920 mv
3 ~~05~~ Level Log N .00017 R-1 = 28 (25 x 1000)
Rd #1 = 5.29 Rd 2 = 11.85"
3 25 Thermocouples = 0.918 mv
3 20 Bottle in - pt point Rd 1 = 5.29 Rd 2 = 11.85 ~~to~~ 11.00" 307 mv 3.8¢
3 ~~55~~ Level Bottle out R1 = 5.29 R-2 = 11.85 Log N = .001

3 36 Rd 1 = 5.29 Rd 2 = 11.85" Bottle at 12.00" 32 1/2 cm 3.64

3 44 R 1 = 5.29 Rd 2 = ~~[illegible]~~ 17.98 Bottle at 12.00

3 45 Bottle at 10.00 Rd 1 = 5.29 Rd #2 11.85" 346 cm 3.44

Thermocouples all at 0 - 92.5 cm

3 52 Leveling Lig N .0035

Rd #1 at 5.29 Bottle at 10.00"

Rd #2 at 12.68"

~~B~~ 3 57 Shut down

Recheck of bottle + carrier zero (water drained out)

1.09"

3-26-58

8 25 A Bottle filled with water - 157.900 gms.

START-UP CHECK LIST

Equipment Checked by RKR DAL Personnel Check by RKR

Instrument and Safeties Checked and Reset by RKR/DAL

"Source In" Checked by DAL Source No. IV 213

Emergency Equipment in Control Room Checked by DAL

Red Light On by DAL

Start-Up OK'd by DAL Time 8 30 AM ~~PM~~ Date 3-26 1958

Expr. 6-11 Time 8 30 AM ~~PM~~ Date 3-26 1958

Purpose Repeat of Exp 6-7

Personnel: RA RKR DAL

9 50 A Rd #1 5.29 Rd 2 - 10.62" bottle out per period

water 92.5 cm

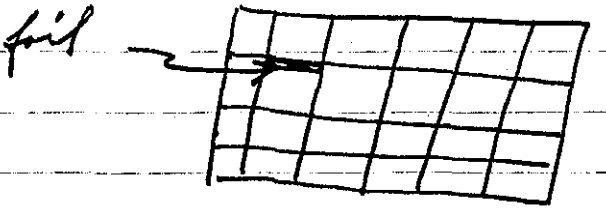
9^{40} Rd 1 = 5.29 Rd 2 = 11.80 water 92.5 cm
bottle at 38.5" R-140 (85×1000) log N .00025
#11 0.925 #13 0.928 #15 0.928
#12 0.925 #14 0.931
9^{50} R-1 - 40 ($\frac{85}{50}$×1000) log N .00025.
Rd 1 = 5.29 Rd 2 = 11.80 level
9^{54} Bottle placed at 11.00" Rd #1 = 5.29 Rd 2 = 11.80"

10^{30} Rd 1 = 5.29 Rd 2 = 11.85" bottle at 11.00"
R-150 (85×1000) Log N .00032
temp. 0.925 mv all thermocouples } level
10^{35} Shut down.

Expt. 6-12 Time 2:30 AM PM Date 3-26 1956

Purpose Preliminary Foil exposure (3/16" foil

Personnel: JRE, RRR, DFL



foil on stringer approx 20" down from top of spot on element.
measured 19¼"
− 7¾"
11.5" into fuel

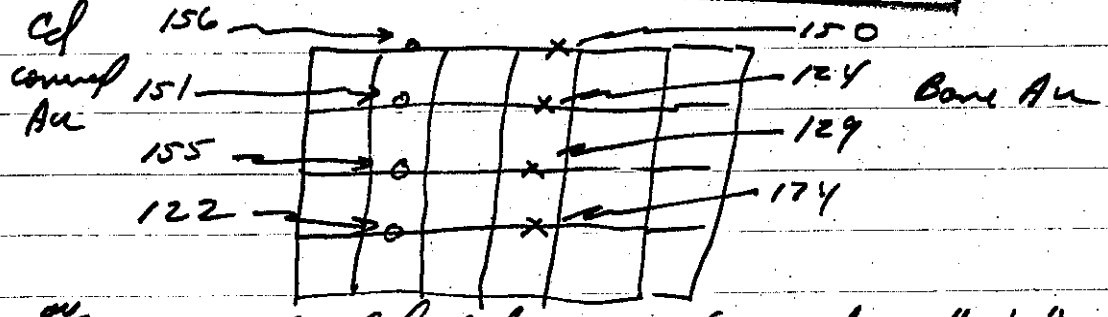
2:55 PM water at 92.5 cm Rd#1 at 5.29 Rd#2 at 21.34 Snd Cnts

2:57 PM Rd 1 at 5.29 Rd 2 at 10.62 Slight + Period

3 10:54 .00037 on Log N (25 on R1 (50×1000)
3 15:54 Shut down from log N = .001 R-1 = 60 (50×1000)

foil counted 300 c/min on SA-1, 400 c/m SA-2
(after subtracting background)

Expt. 6-13 Time 3:57 PM Date 3-26 1958
Purpose Foil runs as loaded
Personnel: JKF PKR [illegible]



4 $\frac{00}{PM}$ foils located between elements 12" ± ½" down from top of fuel

4 $\frac{15}{}$ Water at 92.5 cm Rods + Screw In Temp 23°C

4 $\frac{35}{}$ Rd #1 out Rd 2 12.00 pos. period = 100 sec

4 $\frac{31}{PM}$ .007 4 on Log N

4 $\frac{00}{PM}$ level on Log N .019 R-1 = 49 (1000 × 1000)
Rd 1 out Rd 2 = 16.00"

4 $\frac{51}{PM}$ Shut down

Foil	c/min	Foil	c/min
156	~~7966~~ 4750	150	~~31558~~ 35036
151	8824	124	32455
155	~~27602~~ 9828	129	37602
122	~~4750~~ 7966	174	31558

out

Expr. 7-1 Time 2 30 ~~AM~~ PM Date 3-27 195 8

Purpose Two 3 X 9 arrays separated by 5.6" of water shy of Safe

Personnel: RKR DWS DJK

START-UP CHECK LIST

Equipment Checked by DWS Personnel Check by RKR

Instrument and Safeties Checked and Reset by DJK DWS

~~Source In~~ Checked by DJK Source No. PU213

Emergency Equipment in Control Room Checked by DJK

Red Light On by DJK

Start-Up OK'd by DJK Time 2 30 ~~AM~~ PM Date 3-27 195 8

E

A-76	A-23	B-140	B-133	A-60	A-77
A-79					I-117
A-58					I-116
A-71					B-138
B-172					B-135
B-130					A-55
S-17			A-29		A-32
B-131	B-150	A-59	I-114	B-142	B-145
A-69	B-125	B-136	A-81	A-70	I-113

N

W → 5.6" ← E

S

Z →

3% P Sub Critical as limit log N max = .0015
Water at 92.5 cm

temp #11 .911 23°C
#12 .913 max
#13 .914
#14 .911
#15 .91

Expr. 8-1 Time 1 00 AM PM Date 3-28 1958
Purpose 3 x 9 arrays 4" apart Cedge to edge

Personnel: RKR ZWA DK

START-UP CHECK LIST
Equipment Checked by DK Personnel Check by RKR
Instrument and Supplies Checked and Ready by DK
"Source In" Checked by DK Source No. PN 213
Emergency Exit Checked in Control Room Initialed by DK
Red Light On by DK
Start-Up OK'd by DK Time 1 00 PM Date 3-28 1958

A 77	I 117	A 73	A 138	B 121	A 32	A 81	B 145	A 55
A 60	A 80	A 57	A 61	B 134	B 141	A 29	I 113	A 70
B 133	S 28	B 143	I 116	B 138	B 135	I 121	B 142	I 114

Safety →

4" edge to edge

B 140							A 59	B 136
A 23							B 150	B 125
A 76	A 79	A 58	A 71	B 122	B 130	S 17	B 131	A 69

CR #2

1 25 PM Water at 65.6cm Rod #2 all in 21.34"
Source out just Crit - log N = .008 - R, 38 (100 & 1000)
temp #11 } .911 = 23.25°C
#12
#15

1 30 PM Water at 62.2 ±.25cm Rod #2 all out - just Crit

Expr. 9-1 Time 2 ~~AM~~ PM Date 3-28 1958
Purpose 3 x 8 assy 4" apart —
6 elements removed from 8-1 →
Personnel: RKR IWH DK

A-76
A 23
B-140
B-133
A-60
A-77

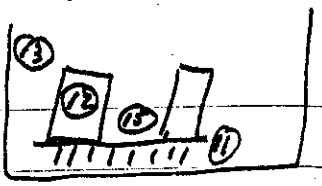
2 30 PM Water at 68.7cm Super Crit } Rod out
" " 68.5cm Sub Crit }

temp 23.25°C

2 25	Rod out	water 68.85cm	+ Period 121.6 in 8.2¢
	9.70"	"	Level log ν .031
	9.00"	68.85cm	- 86.9cm - 40¢ (?)
2 35	9.00	74.8 cm	+ 71.7cm 12.3¢
	11.05	74.8	Level log N = .046 (79 (25x100) P,
	~~13.00~~	74.8	- 112.8 - 21¢
	~~Rod out~~		
2 55	12.24	92.5cm	Level log N = .0085 69 (50x100) P,
	water temp	23.25°C	
	11.05	92.5cm	~~+~~ 147.8 7¢

total excess rod = 67.2¢

Thermocouples



START-UP CHECK LIST

Equipment Checked by DFC Personnel Check by DFC
Instrument and Safeties Checked by DFC
"Source In" Checked by DFC Rod No. PN-213
Emergency Equipment in Correct Position Checked by DFC
Red Light On by DFC
Start-Up OK'd by DFC Time 10[45] AM Date 3-31 1958

Expt. 9-2 Time 10[45] AM PM Date 3-31 1958
Purpose Rept of 9-1 with changing temp.
Personnel: Gulf RRC DFC

Rod #1 mounted between A-61 and B-138. roughly equidist to Rod #2

11[15] #15 TC = 0.910 mv } 23.2°C
#12
#11

11[20] Water left at 30 cm Safety blade in -

12[10 PM] stand up again

12[47] Water at 68.2 cm Rods out Source out temp = 0.920 mv
Critical 68.2 ± 0.1 cm

12[55] Rods out water 68.8 cm temp 88.9 cm³ period 10.6 ¢
#15 0.927 mv #12 0.928 #11 0.929
Rd #1 0.0 Rod 2 5.45 (5:05) Water 68.8 cm level by N -
Rd #1 6.96 Rod 2 out " " "
" 6.96 " " " 69.4 + period + 79.2 cm 11.6 ¢
Rd #1 6.96 " 5.60 " 69.4 level
1[20] Water at 97.5 cm Rd #1 Rd #2
6.96 10.59 level
6.96 9.59 + 169.6 cm 6.6 ¢
8.30 9.59 level

1 30 Rd #1 Rd #2 mixed
~~8.50~~ 10.29 9.59 135.5 cm 12.8 ¢
10.29 7.75 level
10.29 5.45 + 83.5 cm 11.2 ¢
12.~~18~~ 18 5.45 level
12.18 0.00 + 65.1 cm 13.4 ¢
14.42" 0.00 level Log N = .18 R, 68 (50x1000)
1 55 17.00 0.00 - 140 cm. 13.6 ¢
14.42" 0.00 level
0.00 12.97" level temp 0.919 mv #11 #12
Log N = 0.05 R-1 = 42 (50x1000) .927 mv #15
2 25 Steven on no change #15 = 0.925 mv (23.5°C)
2 27 Liters on Rise in
2 29 Rise on R-1 from 43 to 45 (50x1000)
2 30 R-1 = 49 (50x1000)
2 32 Rod #2 moved to 13.21" R-1 at 50 (50x1000) Rd #1 out
2 34 approx level temp #15 0.976 mv #12 0.972 mv
2 37 Rd 1 = ~~2.49~~ 2.49" Rd 2 = 12.97 level
2 52 temp #12 1.12 mv 28.5°C #11 1.164 mv 28.5°C
Rd #1 2.14" Rd 2 = 12.97"
3 08 temp #11 1.257 mv 31.75°C Rod 1 at 2.05" Rd 2 12.97"
#12 1.249 31.25°C
#15 1.267 32.0°C
3 20 Rd #1 - 1.08" Rd 2 = 12.97" (slight +)
3 25 temp 11 - 1.392 34.90°
12 - 1.362 34.25°C } Rd #1 = 1.75" } level
15 - 1.366 34.25°C } Rd #2 12.97" Log N = .07

3^45 PM Rd#1 out Rd#2 12.97" almost level log N = .05

temp #11 1.577 - 59.25°C
#12 1.532 - 38.25°C
#15 1.554 - 38.75°C

4^20 PM Rd#1 out Rod#2 12.68" almost level log N = .04

Temp #11 - 1.830 mv 45.25°C
#12 - 1.779 44.25°C
#13 - -
#15 - 1.794 44.5

Dim Rod#2 to 12.39"

Rod#2 at 12.97" = 57.4¢ = Rod#1 at 14.42"

5^03 PM Rd 1 out Rd 2 at 12.00 log N = .04
#11 2.137 52.5°C
#12 2.080 51.25°C
#13
#15 2.145 52.75°C

5^27 PM 55.25°C 2.26 mc

5^40 pm phone call from Holland began leveling - (temp - reads.

Thermo couples
#15 2.341 57.2°C Rod#2 11.36"
#12 2.27 55.5°C
#11 2.34 57.2°C

5^50 PM
#11 2.33 57.0°C
#12 2.285 56.25°C
#13 2.332 57.0°C
#15 2.346 57.3°C
} Rod#2 11.51"
~~26~~ 49.5¢

6 00 PM #11 – 2.357
12 2.294 56.25° level 11.43" #2 Rod
13 – 2.345
15 – 2.360 57.7 °C 49¾ q

6 09 PM #11 2.33
#12 2.29 56.25° #2 Rod 11.42 ± .05" level
#13 2.34 Log W .02
#15 2.36 57.7 °C R-1 27 50 x 1000

6 15 PM Shutdown

Expr. 10-1 Time 1[10] ~~AM~~ PM Date 4-1 1958

Purpose 8x8 array with a 3x3 hole off center as shown -

Personnel: _____

START-UP CHECK LIST

Equipment Checked by RHR Personnel Check by HWS

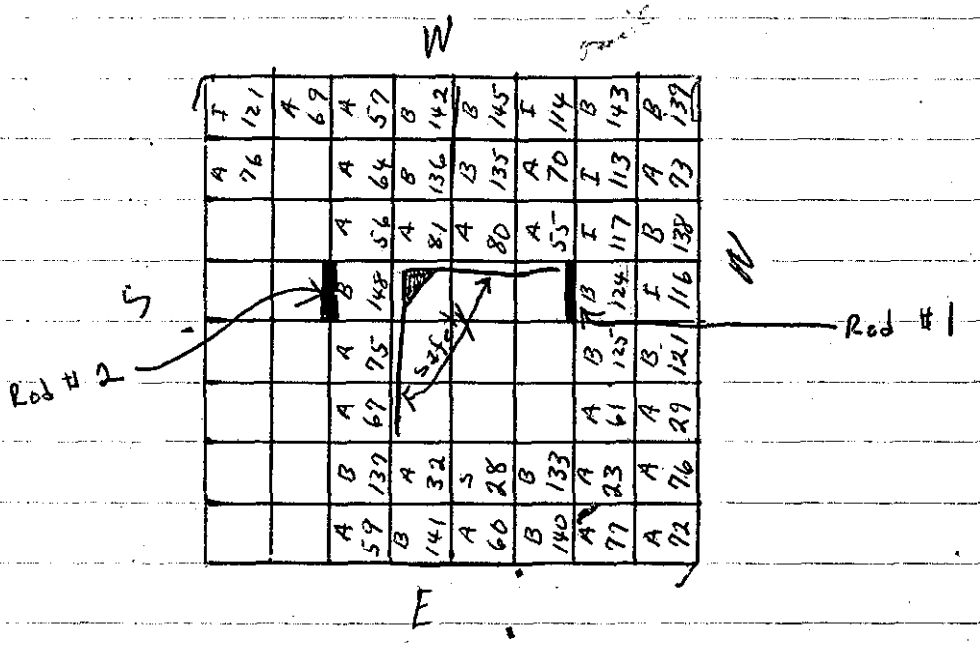
Instrument and Safeties Checked and Reset by DR

"Source In" Checked by DR Source No. Pu Be

Emergency Equipment in Control Room Checked by RICR

Red Light On by DR 10 AM

Start-Up OK'd by DR Time 1 PM Date 4-1 1958



I 121	A 69	A 57	B 142	B 145	I 114	B 143	B 139	
A 76		A 64	B 136	B 135	A 70	I 113	A 93	
		A 56	A 81	A 80	A 55	I 117	B 138	
		B 148				B 124	I 116	
		A 75				B 125	B 121	
		A 67				A 61	A 29	
		B 137	A 32	S 28	B 133	A 23	A 76	
		A 59	B 141	A 60	B 140	A 77	A 72	

H_2O

52.10 cm crit.

52.1 cm super

52.6 cm Rod #1 in @ 22.17 crit

54.1 cm Rod #2 in @ 21.34 crit

Temp. #11 .885 mv

Expr. 10-2 Time 2^15 ~~AM~~ PM Date 4-1 1958
Purpose Removed 3 inner elements on east face (A-81, A-80, A-55)
Personnel:

Safety position unchanged
- Rod #1 and #2 unchanged

H_2O

63.9 cm sub. } both rods out
64.0 cm super }

3^05 89.6 cm Rod #2 = 17.07, just crit.

Temp #11 ,378
#12 "
#13 "
#14 "
#15 "

~1,024 gross

	Safety	Rod #1	Rod #2		Log N
	5.54	0.00	17.01	crit	.00048
	"	0.00	16.04	9.3 ¢	
	"	22.17 (in) ~~Safety~~	16.04	~level	.004
	7.80		16.04	~level	
	7.80		15.04	9.6 ¢	
3^21 PM.	10.50		15.04	level	.033
3^24	11.90		15.04	neg period	
	10.50		15.04	~level	
3^28	10.50		14.04	11.9 ¢	
	12.35		14.04	level	.05
	14.36		14.04	neg per.	
	12.35		14.04	level	

Exp. 10-2 cont

	Safety	Rod #2		Log N
	12.35	13.04	11.9 ¢	
3 40 P.M.	All thermocouple	.865	22 °C	
	13.80	13.04	level	.05
	15.80	13.04	neg. period.	
3 52 P.M.	13.75 (best value)	13.04	level	.01
	13.75	12.04	12.7 ¢	
	15.02	12.04	level	.04
reduce power level →	17.05	12.04	neg. per.	.01
4 04	15.02	12.04	level	
	15.02	11.04	12.2 ¢	
	15.85	11.04	level	.05
	18.02	11.04	neg. p.	
	15.85	11.04	level	.01
4 16 PM	15.85	10.04	14.1 ¢	
3 17 PM	All Thermocouples	= .923	= 23.5 °C	
	17.10	10.04	level	.05
	19.06	10.04		
	17.05	10.04	level	.006
	17.05	9.04	7.9 ¢	
4 30	18.07	9.04	level	
	20.00	9.04	neg p.	
	18.07	9.04	level	
	18.07	7.60	12.7 ¢	
	18.93	7.60		.04
	23.70	0.0 (out)	still neg	

Expr. 10-3 195

Purpose Same array as 10-2
Here water is pre-heated (from exp 10-2)
to ~

Personnel: Cronin, Callihan, Gilley

5 15 PM. Thermocouple #11 1.517
#12 1.393

5 19 PM #11 1.529 Rd 1 out

5 20 Water 92.5 cm Rd 2 -21.34 Scal Cont
Stirrer Acc —

5 22 P.M #11 1.525

5 23 PM #12 1.521 #15 1.522

5 24 PM #14 1.524 #13 1.518

5 26 PM #11 1.518 #12 1.510

5 28 #11 1.520

~~5 29~~ Rod #2

5 30 P.M. #11 1.514 38°C

5 32 ~~#~~ #11, 1.513 #12, 1.515 #13, 1.516
#14, 1515 #15 1.519

Rod #2 Rod #1 Safety

H_2O 92.5 16.11 0.0 5.54 just crit.

5 35 PM 15.11 0.0 5.54 91.3 cm 10.4 ¢

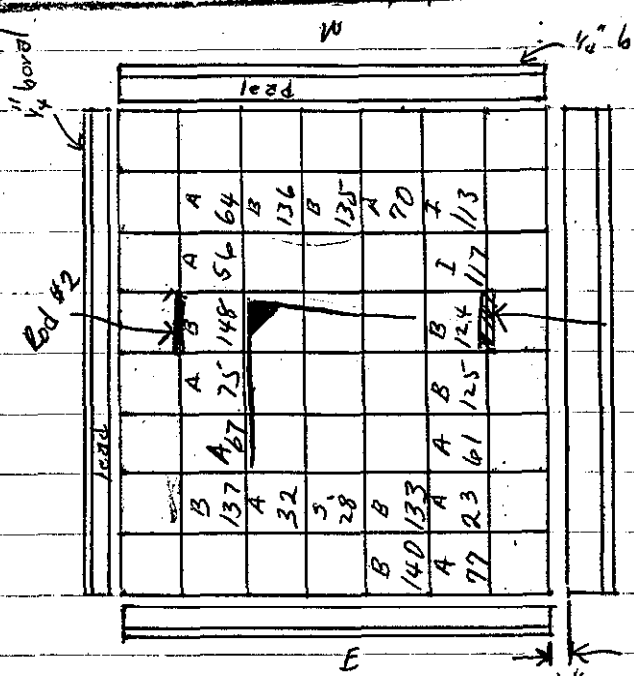
= 9.3 ¢ decrease

Expr. 10-4 Time 1:30 ~~AM~~ PM Date 4/2 1958

Purpose Same array of elements as exp # 10-2

Personnel: Cronin, Gilley.

NOTICE: This drawing is in error. There should be 3 rows of elements on the south side, same as fig. in exp. 10-1



lead is 2" thick

Temp. ~~45~~ 57 #11, .920 #12, .910 #13, .940 #14, .915 #15, .912

1:57 P.M	Rod #1	Rod #2	Safety	#10
	0.0	0.0	5.54 (out)	63.15 ± 05

Temp by thermocouple #11, .916 : #12, .917 : #13, .920 : #14, .923 : 15, .923

Thermocouple locations:

#15 in water channel ~ ½ way up

#14 between lead & fuel on ~~West~~ East face ~ ½ way up

#13 Southeast corner ~ 4' off floor

#12 in element S 28 ~ ½ way down

#11 ~ 1 ft outside array, at the base

Log W	Rod #1	Rod #2	safety	H_2O		P
	0.0	20.40	5.54	92cm		crit
	0.0	21.34	5.54	"		neg. 258cm
~~.003~~ .0015	"	20.40	"	"		level
	"	19.00	"	"	8¢	+126 cm
.013	15.81	19.00	"	"		I
	15.81	18.00	"	"	7.2¢	+142.5cm
	22.20 (in)	18.00	"	"	4.2¢	+ {st. in 273.2cm}
.07	22.20	18.00	9.05	"		I
	"	16.50	"	"	12.7¢	+69.5cm
.7	"	16.50	11.51	"		I
	"	18.00	"	"		−146.5cm
.1	"	16.50	"	"		I
	"	15.50	"	"	10¢	+95.6cm
.6	"	15.50	12.69	"		I
	"	16.50	"	"		−165cm
.15	"	15.50	"	"		I
	"	14.50	"	"	"	+84.6cm
Thermocouples all read .921 @ 3 PM				23.75°C		
	"	14.50	13.92	"		I
	"	15.50	"	"		−141cm

total poison crit at 14.5" Rd 2 = 97.8¢ [48.9¢ Rd 2 48.9¢ safety plus Rd 1]

4 PM Water drained. 8.5" cd safety blade placed in assembly between two rows of elements (on north side of elements A61, B125, B124. Rod #1 was removed.

worth = approx 44.7¢

Log N	Rod #2	Safety	H_2O	P
.005		9.05	"	I

5^00 Water drained. 3" wide control rod (#1) placed in assembly as shown in fig. on page 149

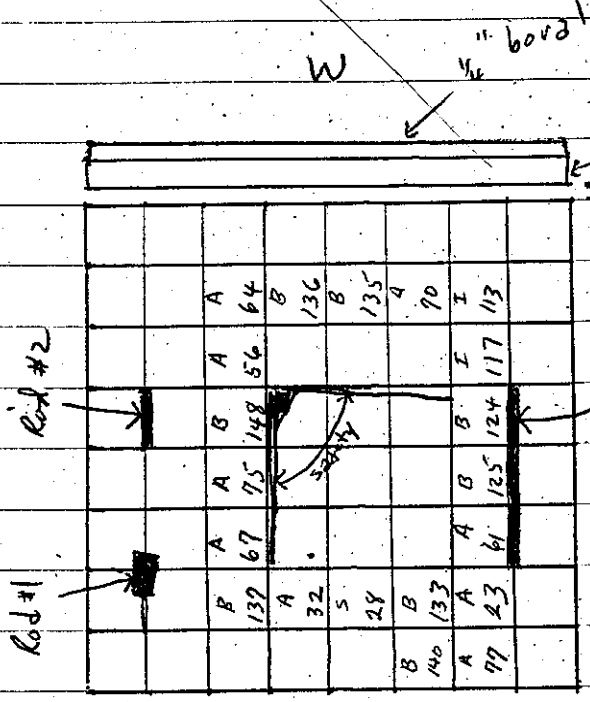
System critical (approximately) with safety at 5.55 and with control #2 = 0.00 .

5^35 8 ½" blade removed from reactor. Rod #1 moved ~3" East of position shown in fig. on p 149

~~21.34~~ ~~5.55~~

5^45	12.25	5.55	85.4	I	
	11.50	5.56	" 10.5	+ 88.9 mm	
	11.50	10.56	"	I	
	10.50	10.56	" 12	+ 70.5 mm	
	10.50	12.39	"	I	
6^08 PM	10.50	13.94	"	— 117.2 mm	
	10.50	12.39	"	I	
	9.50	12.39	" 11.4	+ 80.3 mm	
	9.50	13.59	"	I	
6^20 PM.	11.54	13.59	"	— 86.8 mm	
	9.50	13.59	"	I	
	8.50	13.59	" 11.5	+ 79.2 mm	
	8.50	~~14.90~~ 14.63	"	I	
6^33 PM	10.50	14.63	"	— 88.9 mm	
	8.50	14.63	"	I	

Temperature at 5^45	
#11	.922
#12	.922
#13	.925
#14	.927
#15	.914
.920 ± 23.25 °C	



Lead and board on four sides of assembly placed as shown.

E cast

Rod #2	Safety	H_2O		e	Temp	
7.50	14.63	"	10¢	+ 95.6	#11	.923
7.50	15.48	"		1	#12	.921
9.50	15.48	"		~~95.6~~	#13	.923
7.50	15.48	"		1	#14	.923
6.00	15.48	"	13.2¢	+ 67.3	#15	.913
6.00	16.50	"		1		
8.50	16.50	"		− 84.7		
6.00	16.50	"		1		
4.00	16.50	"	12.4¢	+ 74.9		
4.00	17.38	"		1		
7.50	17.38	"		87.9		
4.00	17.38	"		1		
0.00	17.38	"	11.2¢	+ 84.6		

6:41 PM

4-7-58 Sample of Reflector water for ppm U + spec -
Req 354 915 Composite of both tanks (1 gal)

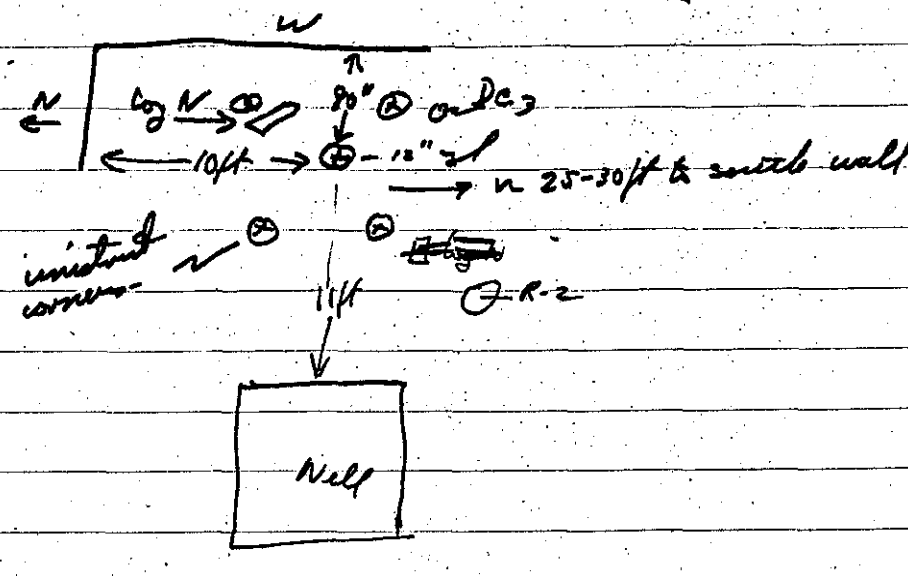
.02 ppm U

Spec on 5 ml of sample -

element	ppm
Be	< .001
N.	.1
Si	8
Li	.05
Na	9
Mn	< .1
Mg	40
Fe	< 1
Cu	.1
Cr	.2
Ca	25
B	.05
Al	.6
Cd	.03
Co	< .1
V	< .1

6 ppm.

Expr. 3-1 Time _____ AM / PM Date 4-28 1958
Purpose 12" SS cyl no reflector (see expt 1-1) cyl on stand on floor ~8 @ feet from basement wall
Personnel: _____



bottom of cyl approx 3 ft from plywood floor [29"]

4:00 PM • Exp not run - much difficulty.
cont on next page

Expr. 3-1 a Time 10 30 AM PM Date 4-29 1958
Purpose 12" B.S. outside Well
in fbsr -- no reflector.
Personnel: JWS RM-DK

START-UP CHECK LIST
Equipment Checked by DK Personnel Check by RKA
Instrument and Safety Checked and Reset by DK
Source Installed by DK Source No. PN 213
Emergency Equipment in Control Room Checked by DK
Red Light On by DK
Start-Up OK'd by DK Time 10 00 AM Date 4-29 1958

Probe zero (just in bottom of reactor) = 0.04 on selsyn -
Previous H_c = 11.84" (inside Well no other reflector)

10 20 AM First detectable change (on DC 3 n 270) at 7.27"
10 40 Level B reactor (had tilted) --
drain back - zero on probe now 0.00.

12 55 PM Restart - solution zero [covers 1/2 the radius of reactor (bottom is tapered)] = 0.05 on selsyn -

1 20 PM at 11.88 super critical Log N .008
at 11.87 sub critical.
at 11.99 for period. 130.4 secs.
at 11.91 Critical Log .12

Critical Conditions

HT

11.91

−.05

11.86 inches

.03 inch = 130.4 sec period.

START-UP CHECK LIST

Equipment Checked by DK Personnel Check by RKR

Instrument and Safeties Checked and Reset by RKR

"Source In" Checked by DK Source No. AN 213

Emergency Equipment in Control Room Checked by DK

Red Light On by DK

Start-Up OK'd by DK Time 8 40 AM Date 5-5 1958

Expr. 4-1 Time 8 40 AM Date 5-5 1958

Purpose 10" Al Cyl no reflector out on floor of Bay 201

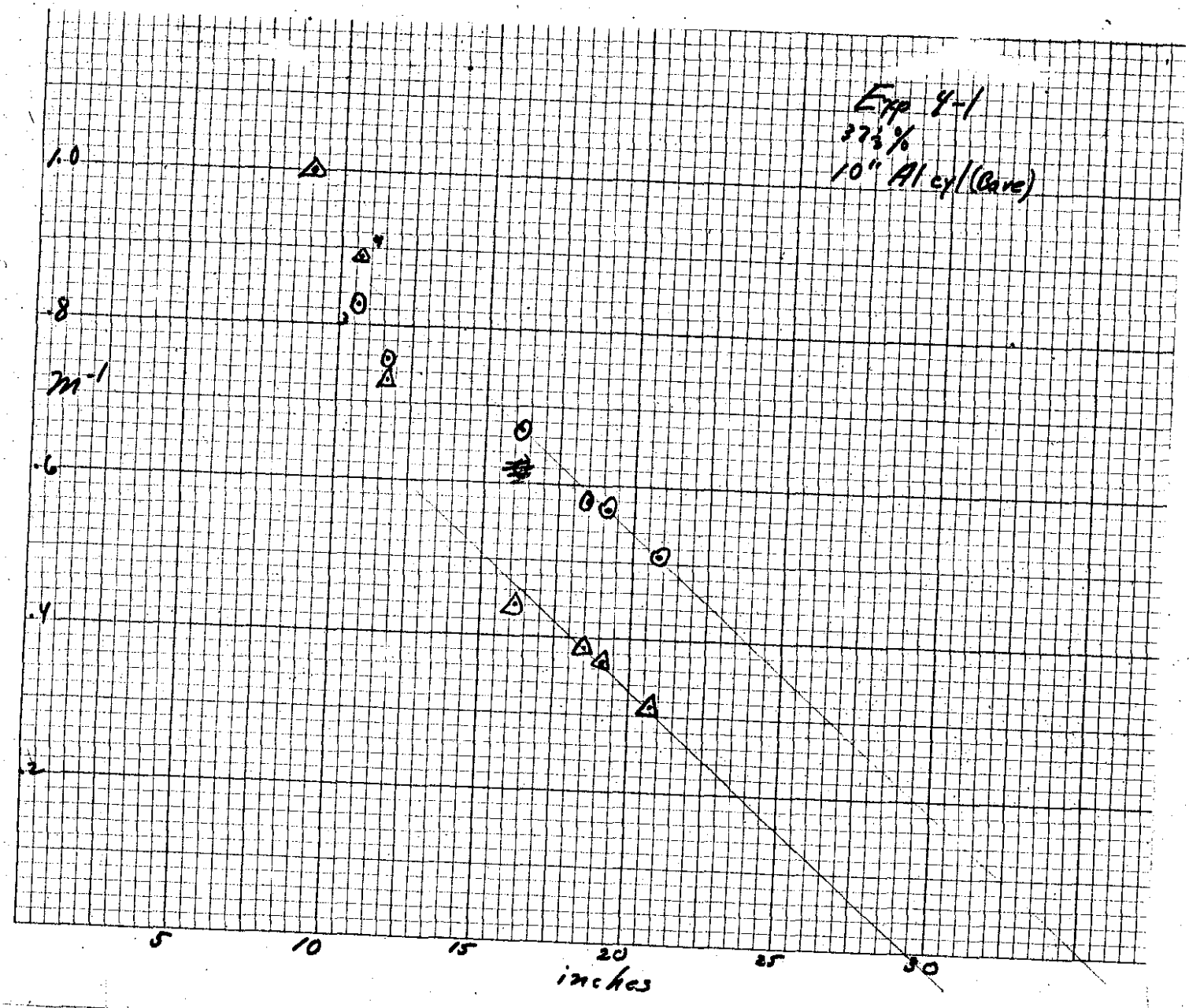
Personnel: Plutz. RKR DK

Probe set at .0

9 00 19.00" fuel Sub Critical by N from .001 to .0025

9 30 20.87" fuel max available

	Fuel Ht.	C_4	C_5 (2 min count)
9 50 AM	20.87"	.508 16^{+2} x16 16^{+15} 527	730 23^{+2} x16 22^{+8} .313
	"		
	19.12"	.567 15^{+5} 14^{+4} 473	623 18^{+12} 20^{+3} .367
	18.18"	.581 14^{+9} 14^{+5} 462	599 18^{0} 19^{+2} .385
	18.18"		
10 11 AM.	16.27"	.674 12^{+11} 12^{+3} 398	520 6^{+10} 15^{+14} .44
	"		
	11.70"	.756 10^{+15} 11^{4} 355	303 10^{+8} 9^{3} .732
	"		287 12
	10.67	.826 10^{+2} 10^{3} 325	257 7^{5} .89
	10.68		8


Exp 4-1
37½%
10" Al cyl (Cave)
1.0
.8
m⁻¹
.6
.4
.2
5
10
15
20
25
30
inches

$10\frac{34}{A}$ 9.06"

0.00

8^{+7} $9\frac{2}{}$ } 281 7^{10} 6^{11} 229

$7\frac{2}{}$ 16^{13}

Expr. 5-1 Time 9[15] AM PM Date 5-7 1958
Purpose 10" Al reactor (36" dia)
with water reflector
Personnel: EWA RNR DH

START-UP CHECK LIST
Equipment Checked by DH Personnel Check by
Instruments and Safeties Checked and Reset by DH RNR
"Source In" Ch... DH Source No. PN 213
Emergency ... Control Rods Locked by DH
Red Light On, by DH 2[35]
Start-Up OK'd by DH Time [illegible] AM PM Date 5-7 1958

9[30] Probe zero
Leaks in solution flange caused by using 2 gaskets by mistake -
10[30] Leak checking began -

2[05] Re zero probe - 999.98
2[12] Solution set at 1.01 = 0.99" Top temp at 0.99"

3[35] PM Sol = 7.43" TT sol - 7.54"

	R-1	DC-2	DC-3	R-2
	35-38 (10x100)	53 (1x20)	32 (1x50)	50-55 (10x100)

3[40] Solution dumped
3[45] Solution returned to probe = 7.43" TT at/at 7.54"

	R-1	DC-2	DC-3	R-2
3[50] PM	18-20 (10-100)	44 (1x20)	19 (1x50)	40-45 10x100

3[52] Solution dumped

Expr. 5-2 Time 8[20] AM ~~PM~~ Date 5-8 1956
Purpose Repeat last part of 5-1 to check reason for apparent change in reactivity
Personnel: 2 Ops. RKR DSK

START-UP CHECK LIST
Equipment Checked by DSK [illegible] Checked by RKR DSK
Instrument [illegible]
"Source In" [illegible] DSK
Emergency [illegible] Checked by DSK
Red Light [illegible] by RKR
Start-Up O.K.'d by DSK Time 8[20] AM Test Date 5-8 1956

8[22] Water ht still 57.6 cm after sitting all night - with empty sol cyl - evidently no major in-leakage
8[35] Fuel ht at 7.43" TT at 7.54"

	R-1	DC-2	DC-3	R-2
8[45]	45-50 (10x100)	5-7 (1x10)	36 (1x50)	50-52 (10x100)

8[58] Sol'n dump + re-circulation started.
9[00] Stopped circulation + allowed to cool
9[12] Opened fuel valve -
9[35] Fuel 7.43" TT at 7.54"

	R-1	DC-2	DC-3	R-2
	28 (10x100)	46 (1x50)	22 (1x50)	42 (10x100)

9[43] Recirculating fuel
9[50] stopped
10[00] started feeding again
10[20] Fuel at 7.43" TT at 7.54" (never moved

	R-1	DC-2	DC-3	R-2
	32 (10x100)	49 (1x20)	25 (1x50)	47 (10x100)

Crit. Condition

10:38A Fuel TT

7.23 6.90 contact Sub

7.69 6.88 Super

.46 → probe level up when TT is contact

TT left at 6.88

fuel dumped (7.23 "actually)

10 55 Fuel brought back to 7.69 on probe – Sub crit.

10 57 Fuel at 7.25 TT at 6.90" = contact sub

probe at 7.86 TT at 6.87" just –

" 8.50 6.84 super

11 07 Dumped

.35
6.87
7.96
7.32

Expr. 5-3 Time 12 45 PM Date 5-27 1958
Purpose Repeat to check reproducibility
10" RI reflected
Personnel: LWY RKR DFC

12 55 Water at 57.6 cm

RI	DC-2	DC 3	R-2
32 (10×10)	49 (1×20)	26 (1×50)	96-48 (10×100)

Fuel at 7.43" TT at 7.54"

1 05 Fuel at 7.23" TT at 6.87" = contact

probe TT probe 7.48"

fuel drained

probe	TT	
7.95	6.85	super -
789	6.82	crit
812	681	super

1:20	ambe	TT	
	8.34	6.80	super
	7.99	6.80	sub
	8.60	6.77	super
	8.46	6.77	super
	8.39	6.77	super crit
	8.24	6.77	sub.
	8.53	6.75	super
	8.33	6.75	sub
	8.75	6.74	super
	8.75	6.72	super
	8.77	6.71	sub
	8.80	6.70	super
	9.23	6.67	super
	9.33	6.65	sub
	9.69	6.63	super
	10.00	6.61	super
	10.59	6.56	sub
	10.19	6.59	just crit.
	9.80	6.61	~~just crit. sub crit~~ just crit.
	8.82	6.66	sub crit
	7.71	6.71	sub. crit.
	7.08	6.81	sub. crit.
	7.11	8.05	"
	7.11	9.06	"
	7.11	6.74	contact

No solution added or titrated here.

over:

Crit Condx

Solution Ht w toy tongues just in contact = 7.11"

Toy tongues when reading = 6.74" diff 0.37"

at optimum toy tongues position

Dwtr 9.82 Fuel = 10.19" TT = 6.61"

3.08" of fuel between sides of TT + cyl

corrected just Crit fuel ht (no clearance for toy tongues

= 6.98"

8 3/3 PM Probe zero at ~~999.96~~ 99.99 Water out

" " " 99.94 " in

3 3/3 PM Sample taken from system C26 0.33

Reg 635326 G 84.6499 25 - 37.38%

T 19.5580 W - 0.26%

N = 65.0869 gm U - 62.03

duplicate held back G 144.5788 — loss of weight by 5/15/58

T 19.9780 G. 144.5770 gm

124.6008 gm

Reg 635 327 Re sample of Reg 635 326

G - 69.4866

T 19.8367

N 49.6499

See page 161

My phone Sp G = 2.0064

.44134 gm U/gm

Drop = 170 ppm Fe

6 Mg

4 Cu

rest on Zeolite.

Expr. 6-1 Time 10 AM PM Date 5-16 1958
Purpose 8" Al cyl, Cannular type
water reflected
Personnel: DFC, RKR, JKF, WA Pryor

START-UP CHECK LIST
Equipment Checked by DFC Personnel Check by RKR
Instrument and Safety Checked by DFC
Source In Checked by WAP PW213
Emergency Equipment in Control Room Checked by OK
Red Light On by RKR 20 AM
Start-Up OK'd by DFC Time 10 PM Date 5-16 1958

10 sec Water at 47.6 cm above reactor bottom

	John P.	Tamper In Contact R.	C_1	C_2	C_4	C_5
	3.22	3.27				
	6.02	6.09	60	290	4.2	1.4
			60	280	3.2	2.0
11 sec	8.01	8.09	80	320	3.2	1.2
			80	300	3.0	2.0

Dumped water to move instr. ~~closer~~ closer

Raised H2O → to 47.8 cm	6.01	6.08	70	280	16.7	5.8
	8.02	8.09	70	280	25.0	7.1
	10.05	10.12	110	290	41.0	8.2
	12.01	12.10	170	380	146.7	79.6
	12.61	12.69	sub.			
	12.69	12.77	"			
	12.92	13.01	"			
	13.09	13.20 (Not in cont)	sl. super			
	13.04	13.14	"	"	"	
	12.96	13.10 cont.	"	"		
13.00	~~12.92~~	13.07	"	"	"	
	12.93	12.93	just crit			

5/20/58 Re-sample of system – salts circulated for 45 min before sampling – Reg 635328 0.4410 gm U/gm

G. 77.3862 2.004 gm U.
T 19.9214
N 57.4748 gm

Duplicate held back

Results from Reg 635326 & Reg 635327

U = 0.441340 Sp G = 2.0064 at 25°C

Spec.

Ni <25	Cu 4	Al <7
	Cr <6	Ag <1
Sn 40	Ca <50	
Si <10	Mn <10	
Mg 6	B <1	
Fe 140	Cd <50	

Assay W = 0.26 234
X = 37.38 235
V = 0.33 236
Φ = 62.03 238

6-25-58/ Salvage

#1 11 liters #2 8 liters

Reg 635329 (89.2 gm sample) Reg 635330 (80 gm sample

ANIUM IDENTIFICATION TAG

No. 4910

PART 1 OF 1 PARTS

DATE 5-19-38 MATERIAL TYPE 1337

SOURCE UO2F2

WEIGHT GROSS 31,435

TARE 2709

NET 28,726

OPERATION OPERATOR

U 12,320 gms LIMIT U Safe Cont

ASSAY 37.3 % X LIMIT X Safe Cont

REQUISITION 394629

DISPOSITION For shipment to Y-10

REMARKS awaiting analysis

Y-1676 (1-58) NRC

2.37 — 2.26 16.76

4" solid (counter)

START-UP CHECK LIST

Equipment Checked by DSC Instruments and Portables Checked by RKR DSC

Source In "Lead" by DSC PM 2 1 3

Emergency Equipment Checked by

Red Light On by DSC 45

Start-Up OK'd by DSC Time 1 PM Date 7-15 1958

Expr. 7-1 Time 3 1 45 PM Date 7-15 1958

Purpose Continue Exp 4-7 (10" Al eq) no reflector - in Well - with manganese sulfate - fission extrapolation = 30-35 " sol'n

Personnel: EWS. RKR DSC

L.L	Probe Setting	West reentrant tube C_1		South wall on floor C_2		under tank C_3		H. Button {on opposite side from source}	
5.94	6.00	1240		1450		~~6+7 x64~~			
"	"	1160	1152	1440	1433	6^{+34} x64	429	115 @ 850 volts	
"	"	1140		1430		7^{+4} x64			
"	"	1170		1420		7^{+7} x64			
9.96	10.0	2310	.498	2430	.588	4^{+32} x64		300	.383
"	"	2280	~~.555~~ .491	2340	.612	7^{+19} x64			
"	"	2370	.485	2380	.602	6^{+53} x64			
11.98	12.0	3030	.380	2860		8^{+1} x64		415	.277
"	~~13.00~~ "	3200	.360	2840	.505	8^{+19} x64			
12.98	13.00"	3490	.33			9^{+10}		~~4~~	C 4 / 428 (1 min)
"	"	3480	.33	3040	.470	8^{+56} x64			
15.99 to	16.0	4800	.24	3690	.38	9^{+46} 11^{+4} x64		.189 →	75^{+13} x16 (2 min)
19.95	~~19.95~~ 20.01	6820	.169	4810	.298	~~1114~~ 49		.145 →	99^{+3} x16
24.02	24.04			6150	.233	13 x64		.117 →	123^{9} x16
"	"	9400	.125	6110	.234	15^{+6} x64			117^{+4} x16

L.L	Probe	C_1	C_2	C_3	H. Button
27.96	28.00	12520 .092	7520 .19	15^{63} x16	.098 → 145^{+10} x16
29.96	30.00	14060 .082	8480 .168	17^{+53} x16	.092 → 156^{+5} x16
31.98	32.01	16430 .07	9580 .149	20^{4} x16	.083 → 173^{+14} x16
33.97	34.00	19240 ~~.059~~ .04	11060 .128	22^{+6} x16	.076 → 188^{+12} x16

Entrop Intrusion 44-45 inches

Exp 7-1
7-15-53
10" HI cyl
NO refl- inside HGH

Mach

Miles

START-UP CHECK LIST

Equipment Checked by RLR Personnel Check by RLR
Instrument and Safeties Checked and Reset by JKF
"Source In" Checked by _____ Source No. PN213
Emergency Equipment in Control Room Checked by DJC
Red Light On by DJC
Start-Up OK'd by 9:30 Time AM Date 7-16 1958

Expt. 8-1 Time 9 30 AM Date 7-16 1958
Purpose Repeat of Expt # 5
10" Al ref expected with water Commutator type of fuel = 2.11" Pu = 6.74"
Personnel: JKF RLR DJC

Time	Water	Fuel	Max.	Top Tamper		Probe	Δ
10 15	68 cm	.001		—		.07	.04
10 18	"	1.96	.35	2.31	Contact	2.03	.32 1.99
10 27	"	4.04	.38	4.42	"	4.12	.34 4.08
10 32	"	4.90	.45	5.35	"	5.04	.38 4.97
10 35	"	5.66	.66	6.32	"	~~5.99~~ 6.045	
10 43	"	~~6.66~~ 6.94	.38	7.32	"	7.01	.34 6.98
10 52	"	6.99	.41	7.40	"	7.10	.35 7.05
	"	~~7.06~~		7.32 Max. P		"	
10 55	"	7.13, 7.13		7.49 Contact 7.41 Max. P		7.20	
11 04	"	7.14,		7.42 Super crit.		7.30	
11 08	"	7.14	.41	7.37 Contact Super crit		7.22	
11 18		7.20		7.48 max P		7.253	just crit.

7.48
.35
7.13 — Hc

DWH
14 Sept 66

Exp. 8-1 Time 1 00 AM PM Date 7-16 1963
Purpose Repeat of Exp #5 - 10" above bfl reflectors with water.
Personnel: Fox, D.E.C., R.K.R.S.

Time	Water	Fuel S-Monometer	Fuel Probe	Top-Temp.
1.12 PM	68 Cm	1.04 (Dwn)	1.09	
1.23 "		2.02	2.06	
	14 Sep 66	2.99	3.01	
		3.98	4.00	
		5.00	5.01	
1.30 PM		6.00	6.01	
	△	6.99	6.50	
N	.32	6.96	7.00	7.30 Cont.
		6.98 4.99	7.225	7.53 "
		7.18	Inf. crit. (7.225)	7.44 Pmax
		7.17	" " 7.24	{7.54 contact 7.45 - P max.
		7.21	7.24	
		7.23	7.30	7.60 contact
			Super crit	
		7.24	7.245	Pmax 7.45

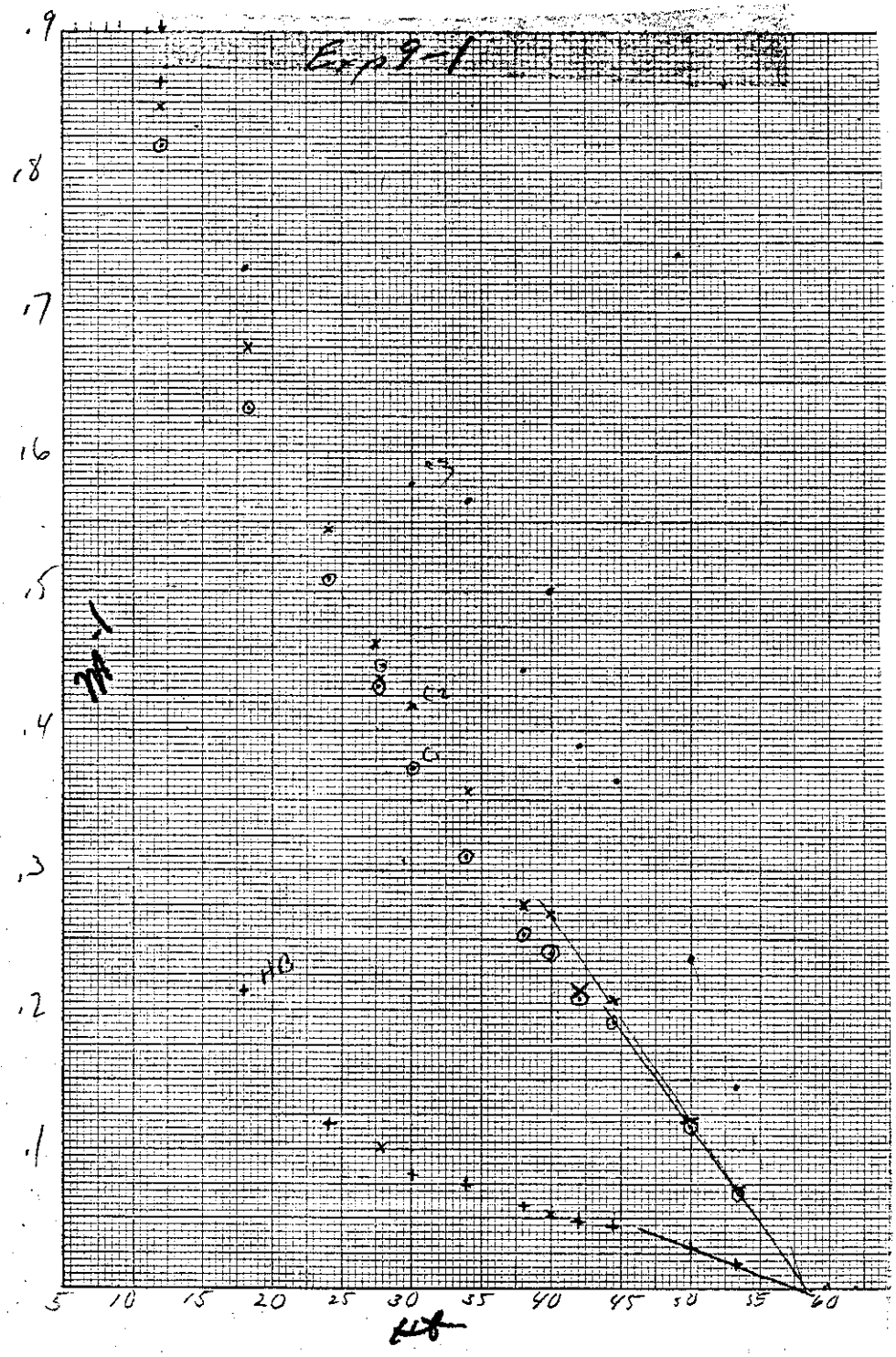
Same as
8-1 9 00 AM
Dwn

Run 9-1 Time 8:15 Date 7-18 Sh 8
Purpose 10" Bore A1 cyl outside on floor
Machine RKR SW DK

H. Button is against wall at cyl. ~ 15" up from bottom

START-UP CHECK LIST
Equipment Checked by RKR Personnel Check RKR
Instrument and Safeties Check DK DK
Safety PN213
Emergency DK
Recording Equipment DK
Meter Flow Rate by DK Time 8:15 AM 7/18 Sh 8

Time	L.L.	Probe	C_1	C_2	C_3	H Button
8:30 AM	6.275	6.275	310, 350, 310 → 323	360, 390, 370 → 373	2 14/64, ~~2 15/64~~, 2 17/64 → 137	5 +11/16, 4 +13/16, 4 +7/16 → 80.3
8:45 AM	12.13	12.13	400, 390 → 395; .818	450, 430 → 440; .848	1 53/64, 2 42/64 → 128	6 +44/64 +2/16, 5 +8/16 → 93; .864
9:05 AM	18.30	18.30	480, 560, 500 → 510; .633	550, 570, 540 → 553; .675	2 54/64, 2 46/64, 3 12/64 → 187; .733	24 +6/16, 23 +10/16 → 383; .214
9:18	23.95	23.95	640, 610 → 625; .5095	710, 660 → 685; .544	2 44/64, 2 62/64 → 161	42 +6/16, 42 +14/16 → 682; .118
9:30	30.22	30.22	880, 850 → 865; .373	910, 880 → 895; .417	3 3/64, 3 26/64 → 237; 5.18	61 +2/16, 61 3/16 → 979; .084
9:42	34.02	34.02	1030, 1050 → 1040; .31	1070, 1010 → 1040; .358	4 23/64, 3 13/64 → 340; 2.13; .402	68 3/16, 65 +12/16 → 1071; .075
8 9:55 AM	38.02	38.02	1300, 1240 → 1270; .254	1380, 1320 → 1350; .276	4 43/64, 4 41/64 → 408; 4.43	83 12/16, 90 +3/16 → 1391; .5578


Exp 9-1
.9
.8
.7
.6
.5
.4
.3
.2
.1
m
C3
C2
C1
C0
5
10
15
20
25
30
35
40
45
50
55
60
t

	L.L.	Probe	C_1	C_2	C_3	H Button
10[10]	42.0	42.0	1510 } 1555	1680 } 1745	5^{34} } 351	104^{5} } 1680
			1600 } .208	1810 } .214	5^{24} } .39	105^{11} } .0478

DC-2 examined – at 1^20mb – no other instrument can ~~replace~~ augment it.

10[50] A.M. Probe become faulty – no longer usable for this experiment. Monometer to be raised for higher readings
Liquid level monometer reads 10.021" before moving
" " " " 10.005 after moving and resetting selsyn.

	Selsyn Reading				
11[00] A.M	10.005	700 [4min]	830 [4min]	6^{33} [4min]	10^{0} [4min]
	28.02	730 [2min] .043	850 [2min] .438	3^{35} [2min]	47^{0} [2min] .106
	"	740	800	3^{34}	50^{2}
11[20] A.M.	39.97	1300 } 1335	1390 } 1385	~~4^{+17}~~	82^{3} } 344
		1370 } .242	1380 } .269	4^{+18} } .500	88^{9} } .0586
11[30]	44.00	1680 } 1690	1730 } 1790	6^{25} } 376	$108'$ } 1760
		1700 } .191	1810 } .209	5^{24} } .365	112^{5} } .0455
11[42] AM	50.02	2740 } 2780	22890 } 3095	9^{+8} } 584	$174''$ } 2736
		2890 } .116	3100 }	9^{+8} }	168^{4} } .029
		2710 }	3090 } .1205	9^{+13} } .234	
12[00]	53.31	4520 } 4660	5100 } 5140	15^{-7} } 972	$272''$ } 4208
	"	4800 } .0692	5180 } .0725	15^{+14} } .141	254^{9} } .019

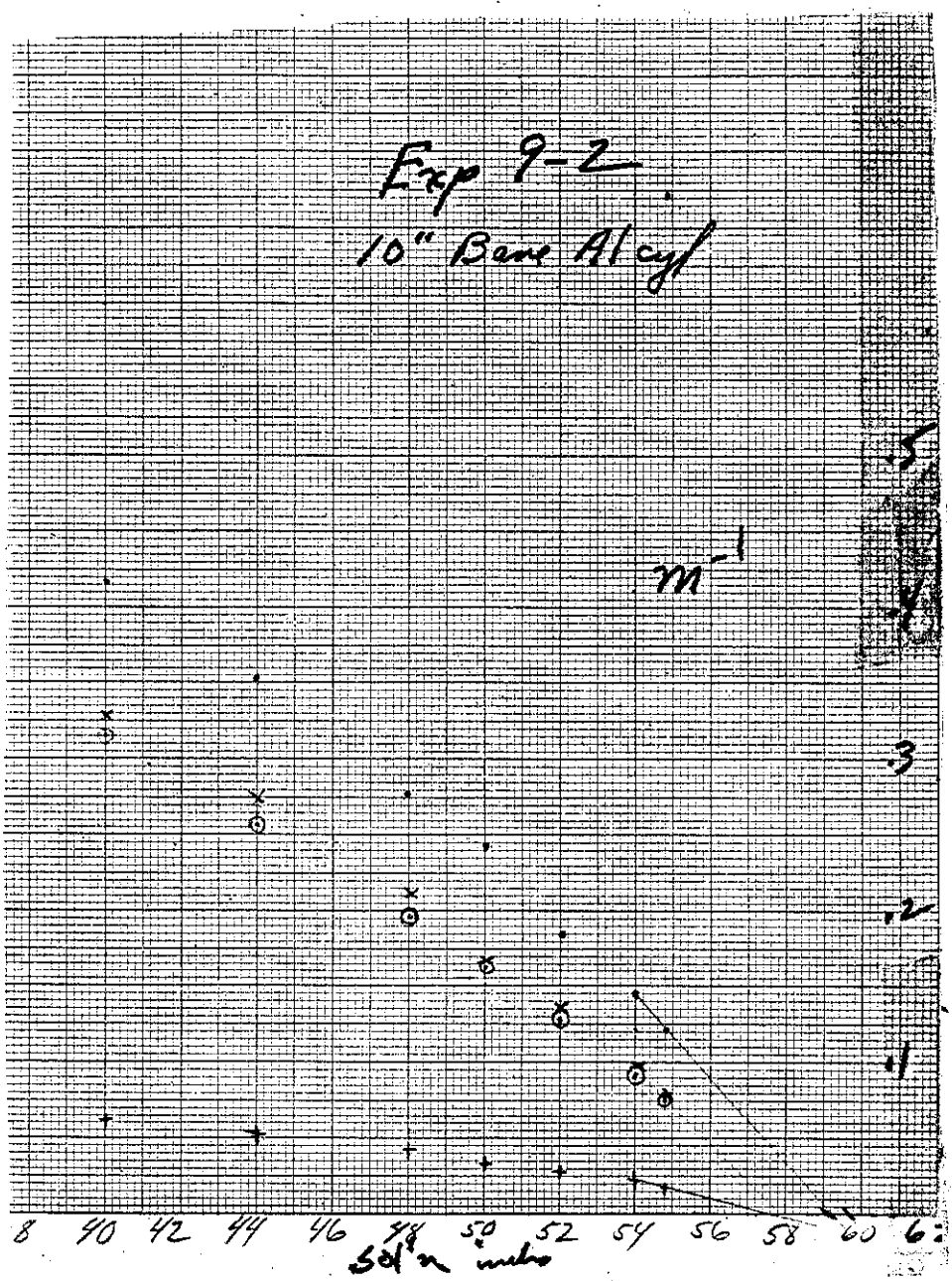
2 20 PM Float on liquid level manometer stuck — probe was pulled out — Re-zeroed probe + servomanometer

Servo	Probe	
7.81	7.91	this is a check on agreement of L.L and probe

Solution circulating - by-pass closed to gain additional volume

~~Time L.L. Probe C_1 C_2 C_3 H Bottom~~

~~2 30 PM 12.01 12.05~~


Exp 9-2
10" Bare Al cyl
m⁻¹
.5
.4
.3
.2
.1
40
42
44
46
48
50
52
54
56
58
60
Set in inches

Expr. 9-2 Time 2:30 PM Date 7/18 1958
Purpose 10" al. cyl. bare (outside on floor)
Personnel: JKF DSC

5 Minute counts

Time	L.L. Probe	C_1	C_2	C_3	H Button
2:34	12.01 - 12.05	1020	1180	4^{61} x 64	13^{0} X16
2:49	20.01 - 20.01	1360 .75	1550 .76	6^{+31} .77	17^{+3} .77
3:01	29.99 29.99	1980 .514	2260 .522	7^{50} .625	137^{3} .095
3:20	40.05 40.06	3250 .315	3610 .327	11^{56} .417	215^{1} .0605
3:27	43.96 43.99	3870 .264	4290 .275	14^{6} ~~.348~~ .357	250^{11} .0504
	47.97 47.98	5200 .196	5560 .212	17^{58} .278	316^{3} .041
	50.04 50.08	6360 .161	7070 .147	20^{18} .244	385^{13} .0337
3:55	52.07 52.09	8000 .128	8740 .135	26^{62} .185	464^{14} .028
	54.02 54.04	10820 .0944	~~10202~~ 12020 .0982	34^{21} .146	614^{5} .0212
4:22 PM	54.80 54.81	13020 .0785	(3320)	41^{19} .122	716^{4} .0181

this is all of solution that can be pumped to cyl. = 70.54 liters

4:37		13020	~~14.840~~ .0795	42^{+12} .119	

64.696 Kg U 23.94 Kg X in 70.54 liters Volume

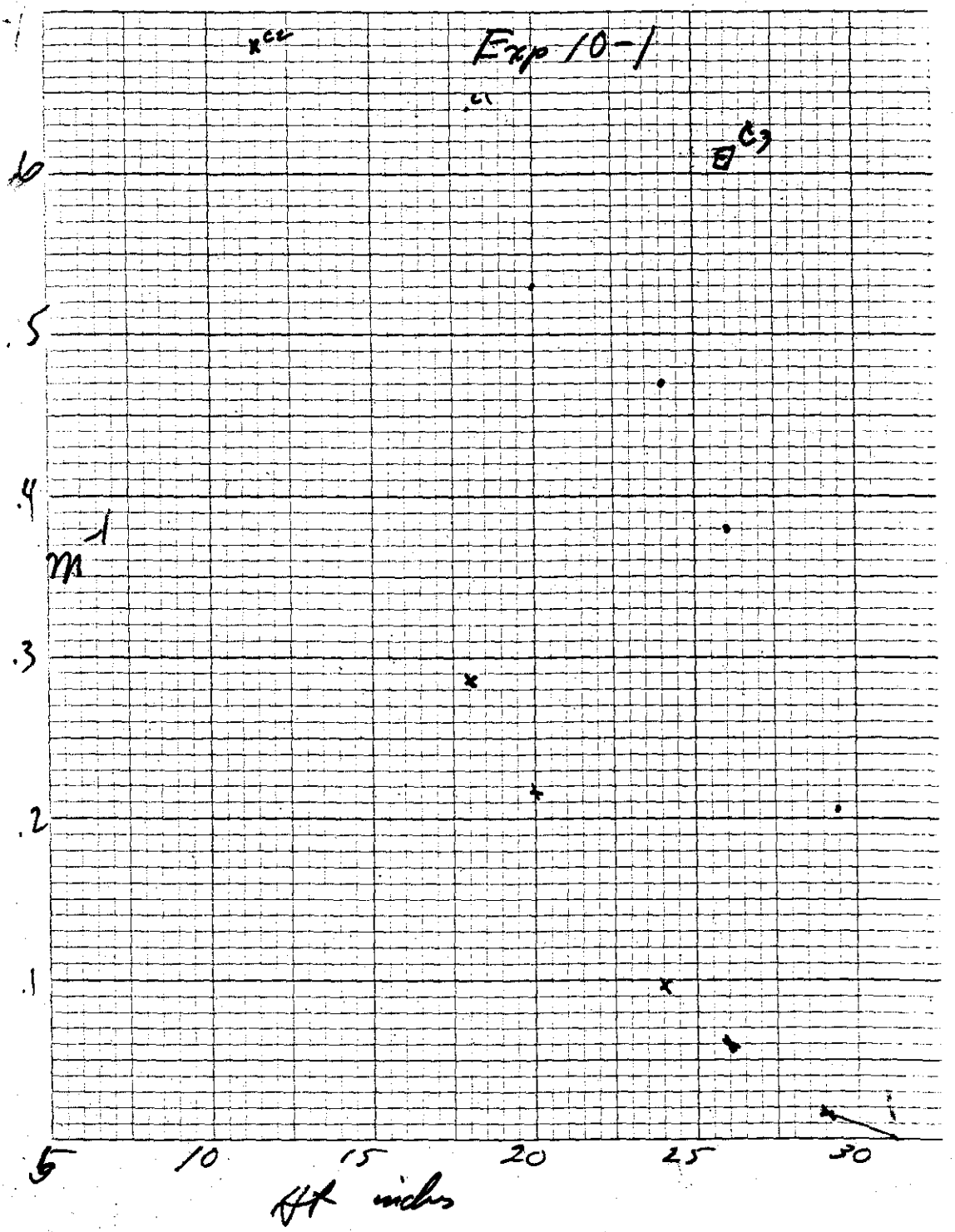
7/21/58 Sol'n sampled - 58.7 gm sample Reg 635331
0.84750 gm U/gm
Sp. Gr. = 2.0495

Expr. 10-1 Time 10⁰⁰ AM PM Date 7-22 1958
Purpose 7" Al cyl water reflector
no top reflector at first
Personnel: JKF DSC

START-UP CHECK LIST
Equipment Checked by DSC Personnel Check by JKF
Instrument and Safeties Checked and Reset by DSC
"Source In" Checked by DSC Source No. CN213
Emergency Equipment in Control Room checked by
Red Light On by DSC
Start-Up OK'd by DSC Time 1⁰⁰ PM Date 7-22 1958

Water set at 182cm (full

	Servo	Probe	C_1	C_2		C_3
	0.009	0.05				
1⁰⁵ PM	6.862	7.050	160	340		1^{+14} x6K 78
				330		1^{+5}
1²⁹	12.026	12.10	190	500	.48	1^{+5}
	18.059	18.135				
	stopped to adjust system for unsteady leaks					
1⁵⁵ PM	18.050	18.18	250	1190	.286	1^{+19} 94
2¹³	19.954	20.06	300	1570	.217	1^{+22}
	24.04	24.16	340	3450	.099	1^{+35} .79
2³³	25.975	24.09	420	5570	.061	$2^{\pm 0}$ .61
2⁴³	28.959	29.00	770	17.830	0.019	1^{+58}
	Drained due to stuck Probe drive to ~22"					
3¹⁷	31.198	31.25	slightly super crit			
	31.164	31.16	very sl. super			
	~~31.15~~	31.15	just crit			
	31.04	31.08	slightly sub.			


Exp 10-1
CC
C
C3
.6
.5
.4
.3
.2
.1
m⁻¹
5
10
15
20
25
30
Hr miles

3 54 PM 175cm

START-UP CHECK LIST

Equipment Checked by JTK Personnel Check by LWM
Instrument and Safeties Checked and Recorded by JTK
"Source in" Checked by PWC13
Emergency Equipment in Control Room Checked by DK
Red Light On by LWM
Start-Up OK'd by DK Time 3 PM Date 7-23 1958

Expt. 10-2 Time 3 10 PM Date 7-23 1958
Purpose 7" Al cyl with top reflector
Personnel LWM, JTK, RRA

~~Hour~~ Servo = 0.00 at zero H_2O

3 30 P.M. Probe = 0.09 " " 149.5 cm (side scale)

no top tamper used here, i.e., repeat of exp. 10-1 →

Servo	Probe	
31.137"	31.21"	" sub
31.272"	31.36"	slightly super
31.208	31.28	just crit.

Servo	Probe	Tamper
~~17.443~~ 17.53	17.57	
21.234	21.31	(above limit switch)
26.06	26.09	5.20 [tamper just in contact]
31.123	31.19	
29.94	30.07	8.92 [29.81 by probe] Top tamper at point of max. reactivity

Readings with top tamper raised

8.92 − 5.20 = 3.72

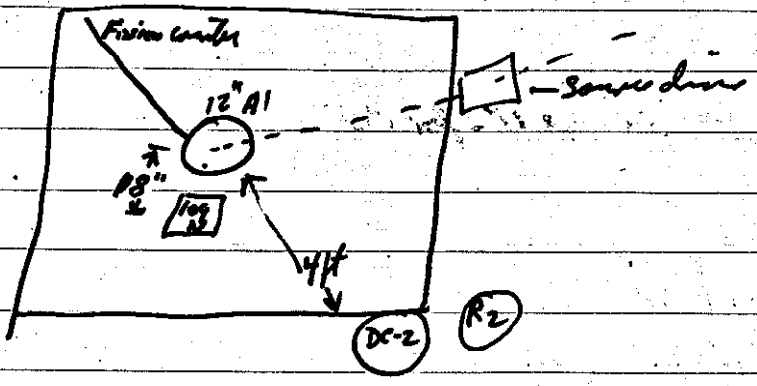
26.09 − .09 = 26.00

29.72

Expr. 11-1 Time 11 ~~PM~~ AM Date 7-29 1958
Purpose 12" Al cyl no refl- outside tank on floor- compare with 1-1 3-1
Personnel: RRR IWD- DK

1-5/16" Au foil on outside of cyl in 6" up

START-UP CHECK LIST
Equipment Checked by DK Personnel Check by RRR DK
Instrument and Safeties Ch[illegible]
"Source In" Checked by [illegible] No. PN213
Emergency Equipment in [illegible] Checked by DK
Red Light On by IWD
Start-Up OK'd by DK Time 11 ~~PM~~ AM Date 7-29 1958



Source Zero Probe zero
23.082 0-0 .06

The purpose of this exp. is to determine appropriate power level to expose Au foils.

Time	Probe	LL	R-1	DC-3	H. Hutton	Log N	
11[24]	12.59	35.687	10	25x1000	30 on 1x10	46% on 10,000	.0006	slightly supc
	12.585	35.689	"	"	"		.0006	just crit.
11[45]	(235) fission counter = 1+13 x 16 for 5 min count at [illegible]							
	Log N = .0006							
	12.595 (recheck of probe)							

Probe LL R-1 D-C3 Hi Button Log N

11 52 12.67 35.731 ~50 sec period

Starting time for exposure = 11:54:54

12 00 12.605 35.662 76 100x1000 35 on 10x50 78 on 10^6 .1 crit

[4.285 counter = 73^{+14} x16 for 2 min count at Log w = .1]

Shut down time = 12:04:54 #127 ~112c/min

Expr. 11-2 12" Al. Cyl no ref 1958

Purpose

foil exposure (Au) for flux traverse

Bare Au foils foils positioned along vertical axis

Personnel:

see page 183 for data

Probe 2.545 Servo 25.447

#70 0-1"
#6 0-1"
#5 0-1"
#4 0-1"
#3 0-1"
#2 0-1"
#1 0-1"
#0 0- } 2½"

2 10 K-235 fission counter turned on and solution begun feeding

2 15 PM 10.47 33.415 Instruments stable not crit.

11.91 34.84 ~~34.76~~

2 30 P.M. 12.63 35.508 Log w: .005 slightly super

2 36 P.M. 12.67 ~~09~~ ~200 ~~100~~ sec period

Probe LL ~~R-1 D-C 5 Hi Button Log N~~

Starting time for exposure = 2:49:34

12.655 | 35.559 | R-1 58 1000x1000 | — | Dc-3 58 (10x100) | Log w = 1 { just crit.

Shutdown 3:09:34 PM

F.C. 406+130 (x256) #5 channel ~~attenuator~~ .32 division = .25

Gain = x16 .8 sec

pH Gain = 15 on linear amp - #505

Expr. 11-3 Time 3 45 AM PM Date _____ 195__
Purpose Cd covered Au foil exposure foils positioned along vertical axis
Personnel: DEC. Realy, Ellis, Gilley
see page 183 for dates -

U-235 fission counter being used for normalization (integrated counts from start-up to shut down)

~~Probe~~ Start up 3 45 PM

Probe LL R-1

3 57 12.675 35.628 slightly super

12.705 ~~35~~ 35.661 pos. period

foil exposure began at 4:06:50

#39 0
#38 0
#36 0
#34 0
#32 0 — 2½" — bottom of cyl.

Probe	R-1	Log N	Dc-3	
12.675	58 on 10 on x100	.95-1.1	85	crit

foil exposure shut down 4:26:50 (20 min)

U-235 fission counter = 450 x256 +67

Note: #38 + 39 must have large transposed - (from plate data)

Expr. 11-4 Time ____ AM PM Date 7-31 1958

Purpose 12" Al refl core — with fission counter set for epicd traverse FC (1235)

Personnel: ____

START-UP CHECK LIST

Equipment Checked by ____ Personnel Check by ____

Instrument and Safeties Checked and Reset by ____

"Source In" Checked by ____ Source No. ____

Emergency Equipment in Control Room Checked by ____

Red Light On by ____

Start-Up OK'd by ____ Time ____ AM PM Date ____ 195__

Normalizing Fission Counter #5-3

Scaler #5

Fission Amp

Traversing counter is ~1" off center

Traverse Counter #5-2

Scaler #4

Fission Amp.

counter

Sol'n zero Source = 22.645 Probe = 0.10

9[32] 24.964 2.18 2.14

Time	Sol'n zero	Probe	After Counter	LN	[5-3] Counting Normal	Traverse [5-2]	Ratio T/N
					[4] [16]	[25]	
10[05]	32.331	9,48					
10[12]	34.438	11.58					
10[22]	35.486	12.58	slightly super				
10[35]	35.504	12.61					
10[40]	35.435	12.585	2,14	.10	just crit.	69[11] .69	268[234] .89	3.87
	11		4,05	.095		62[6] .375	286[120] .452	4.66
			4,53	.10		69[5] .31	297[117] .44	4.30
			5.06	.10		68[11] .69	300[82] .31	4.38
			5,55	11		65[0] .0	295[243] .91	4.55
			6,02	11		69[5] .31	288[1] 0	4.15
			6,54	11		64[15] .94	280[53] .20	4.32
				11		71[3] .18	288[135] .52	4.05
				11		73[5] .5	289[63] .23	3.93
				11		69[5] .5	279[204] .77	4.03
1127				11		67[4] .25	267[168] .63	3.91

NG 9-18-63 DWM

H.B. | Reed

	6.54	LN		67 .13	266	148	.71	3
39.5 (10^6)	7	1 (100/100)	"	094 Lowered Power	67 .5	260	144	.70
40.5 (10^5)	71	(100/100)	"	008	6 .141	24	148	.163
			"		5 .82	24	93	.35

Traversing counter is approx 1" off center at 6.54

Expr. 11-5 Time ____ AM PM Date ____ 195__

Purpose Rpt of 11-4 with added counting C_1C_2 for normalizing, Fission Ctr

Personnel: G ____ Hs. ____ Zs. ____

2 min counts

Time	F.Ctr Power	C_3	C_1	C_2	(5-3) F.C.	(5-2) TFC	TFC/C_1	TFC/C_2	TFC/FC	Ln N
1 45	12 (6.54)	23 135	95,960	31,410	1 5/.31	3 2 29/.89				.0011
	"	174 129	708,680	282,770	9 2/1.12	35 28/.1				.011
2 00	"	179 231	716,930	282,880	10 6/.38	35 282/.85				"
	"	(313 904) 324	3,201,409	2,336,120	69 12/.75	300 71/.28			4.31	.11
				10 min counts						
	"	1576 416	16,449,140	12,085,840	366 85/.5	1482 494/.76			4.04	"
	8.50	320 77	3,347,580	2,299,300	76 5/.5	217 194/.76			2.84	"
	10.00	338 71	3,454,908	2,417,808	76 3/.19	120 153/.161			1.58	
				5 min						
2 35	6.54	822 312	8,614,530		195 5/.13	785 445/.18			4.03	
	5.50	796 192	8,539,289		190 +12/.75	815 81/.52			4.27	"
2 51 PM	4.52	760 293	8,389,990		173 +9/.156	777 206/.82			4.48	.10
	3.49	752 898	8,372,200		169 +4/.45	741 203/.81			4.38	.09
3 06	2.15	629 483	7,620,160		144 12/.75	545 2/.01			3.77	.08
					1240.1					

A

NG

Dunn

9-11-63

Expr. 11-6 Time ____ AM PM Date 8/1 1958

Purpose 12" Al cyl bare. (same as 11-4, 11-5)

Personnel: JWG JEllis JSK

Normalizing counter is 5-3 and is in same position as in 11-4, 11-6

Traversing counter is 8-3 and is 1" off center

Probe selsyn = 0.04 when soln at zero

LL = 22,697 " " " "

Probe 2;385 TFC (8-3) at 2.36" LL 25,065

Time	Traverse counter position	C_1	~~C_3~~ C_4/C_5	C_4 Traverse counter	C_5	C_4/C_5 Log N
10 17 AM	Probe = 12,645		LL = 35,40		Critical	
	0.50"	16,961,250	~~1659~~ 0.245	$6^{+15}_{.06}$	$24^{+198}_{.77}$	.11 10 min count
	0.50	—	0.23	$23^{+250}_{.97}$	$103^{+165}_{.165}$	0.90 5 min counts
	2.0"	—	—	—	—	PM trips at 900V
11 35	2.0"	—	0.321	$34^{140}_{.54}$	$107^{122}_{.48}$	0.85 5 min count
	3.5"	—	0.3585	$37^{187}_{.73}$	$105^{65}_{.25}$	0.95 "
11 42	4.5	—	0.372	$36^{171}_{.61}$	$98^{160}_{.162}$	0.85 "
11 52	5.5	—	.383	$37^{+16}_{.106}$	$96^{+205}_{.180}$	0.80
12 00	6.50	—	.385	$37^{+37}_{.115}$	$96^{+134}_{.52}$	0.80
12 07	8.50	—	.1308	$34^{+232}_{.90}$	$113^{+94}_{.151}$	1.0
12 17	10.01	—	.141	$16^{+204}_{.80}$	$119^{+44}_{.17}$	1.0
					737.21	

NG Dwn 9-10-63

$\frac{100 \times 2^{6}}{.10}$ = 2560 C/MIN

Expt. 11-7 Time 2 ~~AM~~ PM Date 8-7 1958
Purpose 12" Al - bare - with counter #5-1 as traversing counter -
Personnel: LWA RKR DFK

START-UP CHECK LIST
Equipment Checked by DFK Personnel Check by RKR
Instrument and Safeties Checked and Reset by LWA
"Source In" Checked by DFK Source No. PN213
Emergency Equipment in Control Room: Checked by DFC
Red Light On by LWA ~~AM~~
Start-Up OK'd by RKR Time 2 PM Date 8-7 1958

Time	LL	Probe	Traverse counter position	C_4 traverse S-1 counter	C_5	Log W	
2 50	35.336	12.51			— Critical	C_4/C_5	.10
	"	"	1.47	$610^{187}_{\times 256}$,57	$11^{244}_{\times 256}$,95	[5 min. counts]	.10
3 05	"	"	2.00	$577^{236}_{\times 256}$,89	$10^{+101}_{\times 256}$ 1395	5.55	.08
3 12			3.50	$602^{94}_{\times 256}$,37	$9^{50}_{\times 256}$,19	6.56	.075
3 20			4.50	$741^{183}_{\times 256}$,72	$11^{54}_{\times 256}$,122	6.161	.10
3 25 P.M.			5.0	$777^{112}_{\times 256}$,144	$11^{165}_{\times 256}$,165	6.67	.10
3 32			5.5	751^{54}_{256} ,121	$11^{119}_{\times 256}$,466	6.55	.10
3 38			4.0	$716^{213}_{\times 256}$,183	$11^{72}_{\times 256}$,128	6.35	.9
3 45 PM			6.5	$636^{5}_{\times 256}$	$10^{114}_{\times 256}$,145	6.09	.9
3 51			8.5	$476^{238}_{\times 256}$,93	$11^{137}_{\times 256}$,54	4.13	.1
3 57			10.00	$226^{132}_{\times 256}$,51	10^{89}_{256} ,35	2.19	.9
	35.308	12.53	17.0		slightly 78.16 sub		.9
	35.359	12.535	17.0		super		.9

NB - DWM
9-11-63

Expr. 11-8 Time 10[85] AM ~~PM~~ Date 8-8- 1958
Purpose Repeat of 11-7 with a collimator (1 mile + 3" dia) over end of counter not covered under
Personnel:

START-UP CHECK LIST
Equipment Checked by _____ Personnel Check by _____
Instruments and Supplies Checked and Set by _____
"Source" _____ No. _____
Emergency Equipment and Control Rooms Checked by _____
Red Light On _____ AM
Start-Up OK'd by _____ Time _____ PM Date _____ 195__

time	Probe	Zero = .03 LL	(5-1) C_4 CO_2 cont.	C_5
10^{55} A	.03	22.5553		
	2.05	24.619	2.07	

Suspended operation to fix instruments $\frac{11-7}{11-8} = \frac{78.06}{73.71} = 1.058$

Pwr rate

NG-DWM 9-11-63

~~PM~~
2 23

12.756	35.386	Slightly super just in Crit Log N = .09 (5 min counts)					
12.78	35.404						
12.76	35.366	2.07	252 $\frac{234}{252}$	11 $\frac{234}{.88}$	2.13 × f =	2.25	
12.80	35.455	3.51	238 $\frac{234}{.91}$	9 $\frac{234}{.91}$	2.41	2.55	
"	"	"	224 $\frac{204}{.80}$	9 $\frac{78}{.3}$	2.42	2.56	
		4.51	219 $\frac{80}{.31}$	8 $\frac{273}{.84}$	2.48	2.62	
		"	217. $\frac{170}{.66}$	8 $\frac{187}{.73}$	2.49	2.64	
12.81		5.00	251 $\frac{441}{.11}$	10 $\frac{0}{}$	2.51	2.66	
		"	270 $\frac{182}{.71}$	11 $\frac{144}{.56}$	2.34	2.48	
		5.51	256 $\frac{4}{}$	10 $\frac{144}{.56}$	2.42	2.56	
		6.50	217 $\frac{93}{.36}$	9 $\frac{216}{}$	2.40	2.54	
		8.72	163 $\frac{10}{}$	10 $\frac{210}{.82}$	1.51	1.61	
		10.00	116 $\frac{187}{.73}$	13 $\frac{161}{.62}$	73.71.88	.93	

 Expt 11-8 cont.

Probe	L.L.	Tr. Ctr	
12.64"	35.298	17.0"	Cr. t.
12.63		"	Sub.

8-15-58

Sample taken from pump drain -

Reg 635 332 G = 71.1 − 20.0 = 51.1 gm .44997 g/cm³

Sp Nr. 20452

No

Req. No. 635 332.

N.C.		PYRO		AVG.
Be	<.30	Be		
Ni	<25	Ni		
Sn	25	--	--	
Si	<10	Si		
Li	<2	Li		
P	<100	P		
Na	11	Na		
Mo		--	--	
Mn	<5	Mn		
Mg	<5	Mg		
K	<50	--	--	
Fe	150	Fe		
Cu	<2	Cu		
Cr	<6	Cr		
Ca	<50	Ca		
Ba	<10	--	--	
B	<1	B		
Al	<7	Al		
Ag	<1	--	--	
		Cd		
		Co		
		V		
		Hg		
		In		
		C		
		F		

$\frac{1}{2}$ oz

Comp. Spec. 1538 Mat.

T67 2744

<6 ppm

Spectrographic Report
All results in ppm.

12" diam Al cyl - no refl

Eggs 11-2, 11-3 Bare Cd and Pb foils see page 175, 176

Normalized Data Vertical traverse

Pos.	bare	Cd		
	#40	#32		
#40 2.65"	5.08	3.70	1.373	C.R.
	#41			
#41 3.65"	6.01			
	#42	#34		
#42 4.65"	6.74	4.81	1.401	
	#43			1.389
5.65	6.98			
	#44	#36		
6.65	7.00	5.02	1.394	
	#45			
7.75	6.63			
	#46	#38		
8.75"	6.06	2.98	(X) 2.034	
	#47			
9.75"	5.08			

Eggs 11-5 11-6 = 238 counts #8-3 12.65" unit

Normalizing sum of 35 min count 1240.11 737.21 (same counter #5-3 on scaler C-5 ×256)

Position	C ×256	ratio T/N
6.54"	1200.28	4.31
"	1482.76	4.04
8.50	217.76	2.84
10.00	120.61	1.58
6.54	785.18	4.03
5.50	815.32	4.27
4.52	777.82	4.48
3.49	741.82	4.38
2.15	545.61	3.77

11-6

Pos.	TC ×256	T/N	Power normal ×1.685
0.50	6.06	0.245	.413
0.50	23.97	0.23	.387
2.0	34.54	0.321	.540
3.5	37.73	0.359	.604
4.5	36.67	0.372	.627
5.5	37.06	.383	.645
6.5	37.15	.385	.648
8.5	34.90	.308	.518
10.0	16.8	.141	.237

Expr. 12 Time ____ AM PM Date 8·26 1958

Purpose 14.42" diam Al sphere in Nell - no other reflectors

~~Personnel~~ START-UP CHECK LIST

Equipment Checked by _____ Personnel Check by _____

Instruments and Safeties Checked and Reset by _____

Source in" Check by _____

Emergency Switch in Control Room Checked by _____

Red Light On by _____

Start Up OK'd by F.S. Time 3 02 PM Date 8/26 1958

Probe = 0.07 at soln zero

Mono = .023 " " "

Probe mono	Mono probe	
11.19	11.079	slightly super
11.185	11.079	" sub
11.115	11.056	

3 PM Reg 635333 G = 70.05 T 20.0 N = 5205 gms 0.449207 gm U/gm 2.09511 gms.

Re-check gms on probe ① 0.225 999.995 ② 0.208 000.035 0.216 0.010

Dia 36.7 in

Capacity 75.14 L

This Experiment and 13-2, 13-3, 14-1, 14-2 and 14-3 were with a fully reflected sphere.

Expr. 13 Time 9⁰⁰ AM PM Date 8-28 1958
Purpose appx 12" sphere (36" Cmin)
Personnel: JCF DFC

12" sphere* calibrated as 14.350 δ

START-UP CHECK LIST

Equipment Checked by DFC Personnel Checked by RFR
Instruments and Safeties Checked and [illegible] DFC
Source In" Checked by [illegible] PI213
Emergency Equipment in Control Room Checked by DFC
Red Light On by DFC
Start-Up O.K'd by JCF Time 9²⁰ AM PM Date 8-28 1958

Probe zero is 0.03" Servo = -.07

Probe	Servo	
8.75"	8.65"	slightly super crit.
8.74	8.60	
.03	-.07	
8.71	8.67	

8.69 in. = 22.1 cm

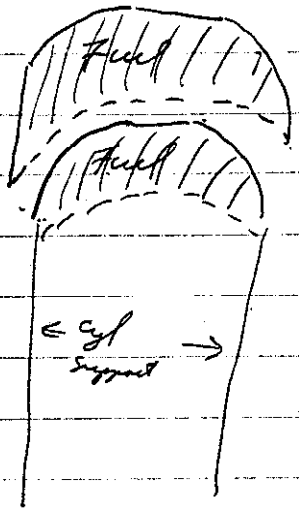
* Actual Dia 11.37 in
28.9 cm

Epoch 14,350 δ

Expr. 14 Time 10:00 AM Date 8-28-1958
Purpose Crit. Test on TSR Elements
See ORNL print # E-32500 - (Enclosed sections rearranged for closest packing.)
Personnel: Cronin, Reedy, Fox

11.4 Kg per section — 2.8 Kg total

START UP CHECK LIST
Equipment Checked by ✓ Personnel Check by ✓
Instruments Checked by ✓
Control PN-213
Reserve
Safety Rods ✓
Start Up OK'd by ✓ Time AM Date 1958



Water ht. 152.5 cm Not critical
Activity drops off sharply when source is withdrawn.

9-15-58 2 40/PM Pump turned on to circulate fuel—
3 30/PM Pump off.
Reflector tank around sphere filled with fresh deionized water.

Expr. 13-2 Time 7 00 AM PM Date 9/22 1958
Purpose Repeat of 13-1

Personnel: RKR

START-UP CHECK LIST

Equipment Checked by DK Personnel Check by DK
Instrument and Switches Checked and Reset by DK
"Source In" Checked by RRK Source No. PN 213
Emergency Equipment in Control Room Checked by DK
Red Light On by DK
Start-Up OK'd by _____ Time 7 45 AM PM Date 9/22 1958

Source
45,851
97,473
98,233

probe zero = 0.27
998,95
997,55
998,47
99831
0,30
~~0,58~~
0,29

probe zero = 0.30 (just on edge of mild bend
source = 0.1

Shut down at 7 50 PM — DC-2 out of order
Log N questionable DC-3 erratic
R-2 erratic — R-1 and PM seem to work —

Expr. 13-3 Time 4 15 AM PM Date 9-24 1958
Purpose Repeat 13-1

Personnel: RKR DK

START-UP CHECK LIST

Equipment Checked by DK Personnel Check by RKR
Instrument and Switches Checked and Reset by DK
"Source In" Checked by DK Source No. PN 213
Emergency Equipment in Control Room Checked by DK
Red Light On by _____
Start-Up OK'd by _____ Time _____ AM PM Date _____ 195_

Zero = Source probe

	426		0.21
re-check	178	avg 0.30	— .01
4:51 P.M	8.98		8.77
9:53 "	8.98		8.775 Upper Crit.
9:59 "	8.98		8.77 Lwr Crit

probably closer value is 0.1

Expr. 14-1 Time 5:30 AM PM Date 9-24 1958
Purpose dilution to make 12" ophase just Crit = 11.19 liters fuel 3 liters water added
Personnel: D.F.C. R.K.R.

12" ophase calibrat = 14.350" 2

START-UP CHECK LIST
Equipment Checked by DK Personnel Check by RKR
Instrument and Safetrip Checked and Reset by DK
"Source In" Checked by DK RKR
Emergency Equipment in Control Room Checked by
Red Light On by DK
Start-Up OK'd by DK Time 5:30 PM Date 9-24 1958

fuel allowed to circulate for 30 min before "blowing" out monometer -

6:00 PM Servo = 3.177 Probe = 2.92
2.92
.25 diff previous = .21

8.95 8.735 Super Crit
8.95 8.72 Sub Crit

Expr. 14-2 Time 6:30 AM PM Date 9-24 1958
Purpose Repeat of Expr 14-1
Personnel: D.F.C. R.K.R.

Servo	Probe
.426	0.21
8.97	8.71 Super crit
8.97	8.70 Sub Crit

Expr. 14-3 Time 6:45 AM PM Date 9-25 1958
Purpose Repeat of Expr. 14-1
Personnel: L.F.C. R.K.R.

7 AM PM	Servo	Probe	
	0.926	0.21	
7 AM PM	8.95	8.71	Super Crit
	8.95	8.70	Sub Crit

START-UP CHECK LIST
Equipment Checked by DFC Personnel Check by DFC
Instrument and Reset by DFC RKC LWB
"Source In" Source No. PN 213
Emergency Red Light On by LWB Control Room Checked by DFC
Start-Up OK'd by RKC Time 11:45 AM PM Date 9/25 1958

note (orifice-value set in servo manometer

Expr. 15-1 Time 4:35 AM PM Date 9/25 1958
Purpose 7" Al vl no top vyl
water surrounding
Personnel: LWB DFC

Expr 10-1
- previous cal
= 31.15"
- .05
31.10

servo .02" probe zero = -.03"
water bath set at 150 cm

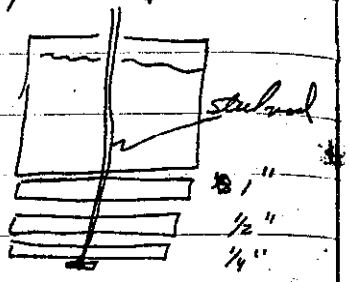
4 47	servo 10.885	probe 10.93	+.04	
4 50	15.41	15.53	+.12	
4 55	19.903	19.94	+.04	
5 12 PM	29.315	29.35	+.04	Servo Crit Sub
	29.347	29.38	+.04	almost just Crit
	29.368	29.40	+.04	super Crit
Crit	29.35"	29.38		
		+.03		
		29.41"		

10-22-58

Start up with new instruments —

Re-check of zero - liquid covers about 1/2 of bottom probe = —.04".

Instruments checked + safeties operate three complete cycles.



Run No. 16-1 Time 9^35 AM Test Date 10-22 1958

Purpose 7" Al w/s reflected with top reflector having Al plates → heresite coated

Personnel D.F.C. R.K.R.

START-UP CHECK LIST

Safety Rods Checked by DHC Personnel Check by RKR

Control Rods and Safeties Checked and Reset by DHC RRR

Neutron Source Checked by DHC Source No. M-43

Emergency Equipment in Control Room Checked by DHC

Red Light On by DHC

Start Up OK'd by DHC Time 10^30 AM Test Date 10-22 1958

Probe = -.04 LL = +.009 } Top tamper set 0 = 0

4.86 4.88

Water ht in cm above base of reactor = 120.7cm

Fuel = 4.80" (with water in tank -) LL = 4.83

Probe	L.L.	
29.38	29.13	Slightly super Crit.
29.32	29.13	" " "
29.25	29.05	Sub Crit. > 400cm (-) Log N = 10
29.07	28.90	
29.29	29.11	" Super Crit
29.26.	29.07	Just Crit.

Probe 2801	L.C.	T.T.
29.95.	29.25	28.69. (no contact)
	Optimum Loc.	28.58
		.11"
29.92	29.9 (drifting)	28.66
final crit.		
28.58	28.93	36.14 (no contact)

LOG N = 2
K_{eff} = .9 8 x 10^-10

Critical Conditions:

no Top Refl = 29.26 + .04 = 29.30" fuel

Top reflector plus Al plate (1/2") = 28.58" fuel

top reflector adjusted for optimum reactivity

= 28.66 : fuel level = 29.92 ± .04 = 29.96"

fuel annulus = 28.58 (-) 1.38" = 1.34"

11 4/7 AM Fuel drained

Expt. 16-2 Time 1:30 PM Date 10-22 1958

Purpose Same conditions as 16-1 — With 1" top Al. plate removed —

Personnel: RRR DFC

Probe	L. Level.	T. Temp.	Water ht. 120.76 m.
6.00	5.992	60.00	.06" diff
20.23	19.992	" "	
25.06	24.785	" "	
28.58	28.295	" "	
Full Ht → 28.58		27.69 - in Contact	
28.60	28.902	28.27	

T.T at Optimum. Source out.

	Probe	L.L.	T.T.	
2:10 P.M.	30.14	29.905	27.61	Log n = .008
	~TT in contact			K-1 = 20 3×10^{-10}

2:15 P.M. Very slow drift upon K-1 and Log N (> 400 sec (+) period

Probe	L.L.	T.T.	
Full Ht → 28.59	28.910	35.00 (out of contact)	

Sub Cnt.

Probe	L.L.	T.T.	
23.96	23.820	23.06 (in contact)	Δ = .78"
18.97	18.85	18.08 (in contact)	
	18.08		
	Δ = .77"		

Expr. 16-3 Time 2 ~~95~~ PM Date 10-22 195X
Purpose Same conditions as 16-1, 16-2 without Al plates.
Personnel:

Probe	L. L.	T. temper water ht.
6.21	6.35	6.35 4.96 (in contact) 20.7 cm.
	.21	1.89" diff (from orig setting
	.14	1.75
20.13	19.92	18.44 ~~Δ1.69~~
29.27	29.00	38.00

3 15/PM Lights shut down.

4 00/PM Expr 16-3 continued.

Probe	L. L.	Top temper.	
29.57	29.29	38.19	just cut.
29.54	29.295	38.19	just cut with upstream for on.

T. T. at optimum. = 24.49 "just cut."

30.98	30.775	26.94	
just cut → 28.93	28.258	36.00	Lab cut.
temper out			

Expt. 16-4 Time 3:00 Pile Date 10-23 1958
Purpose Repeat of 16-3
Supply fan off
Personnel: RKR JLL

Reflector water ht = 124 cm

Probe	L.L. 6.000	Top Tamper		
6.00	5.911	36.00		"
	.089			"
				"
3.32 PM	25.00	24.771		"
3.35 PM	29.96	29.205	50.11" Just Crit.	"
	29.50	29.245	50" Super Crit	Water temp 22°C.
	29.34	29.145	50" Sub Crit	"

3.45 PM ~~Tap Tamper = 26.95 Optimum~~
Tap Tamper = 26.40 Optimum. just Crit
Log n = .01

28.29 28.078. Fuel level at Crit with tap tamper out.

3.50 PM Shut down.

Expr. 16-5 Time 8 33 AM PM Date 10-28 1958
Purpose Repeat of 16-3, 16-4 after air conditioning + test repair
Personnel:

START-UP CHECK LIST
Equipment Checked by DK Personnel Check by
Instrument and Safeties Checked and Reset by DK CER
"Source In" Checked by DK Source No. M-43
Emergency Equipment and Room Checked by DK
Red Light On by AM
Start-Up OK'd by Time PM Date 195

8 45 AM Starting water temperature 22°C Water ht = 120. cm

9 45 starting fuel feed - top tamper out (at 50.20")

Probe	L.L.	Diff
6.46	6.263	.197
10.15	9.951	.199
15.02	14.81	.210
19.78	19.578	.210
29.95	29.739	.211
29.98	29.286	.194

= Very slightly super crit.

10 02 AM Log n = .02
K I = 49 10x10-10

Temp No 2 = 23°C
" 4 = 23°C
} center of reflector tanks. (Well)

10 04 AM K-I = 50
Log n = .025
} fuel = 29.48"

10 06 AM 29.46 29.301 diff .159 "just crit"

10 24 AM 30.78 ← Hi fuel reading → 30.697 Top TAMPER at optimum 26.39 just crit.

10 39 AM 28.29 ← fuel level at critical 28.159 50.0 Top tamper out.

shut down.

Expr. 16-6 Time 10 AM PM Date 10-26 1958
Purpose Same as in modified 7" Cyl
TT has 1 1/2" Al plate on bottom
Personnel: RRR, DR

Water ht = 120 cm
" Temp = 22°C

	Probe	L.L.	T.T	
10 55	6.23	6.105	63.72"	
	20.02	19.831 Diff = .189		
11 07 AM	29.58	29.380 = .200	63.7	Source cnt. Sub crit.
	29.64	29.427 = .213	63.7	Probably Sub crit
	29.69	29.996 = .194	63.7	Super crit.
11 19 AM	29.96 not full ht	29.265	28.91	at optimum / just crit
	28.77	28.644	63.7 Top Tamper	crit. (sub crit)
				Water temp = 22 1/2°
11 27 AM	29.68	29.501	63.7	Super Crit
Log n = .02	29.59	29.458	63.7	" "
	29.53	29.387	63.7	" "
	29.45	29.307	63.7	Sub Crit.
11.37 AM	29.72	29.598	63.7	Super Crit
11.49 AM	29.46	29.326	63.7	just Crit
				Log n = .1

Run	Crit Ht	Fuel annulus	TT	+.04 Zero corr	corr Ht
16-1	29.26"		none		29.30
	28.58	29.92 / 28.58 / 1.34"	TT plus 3/4" Al		28.62
16-2	28.59	30.11 / 28.59 / 1.50"	TT plus 3/4" Al		28.63"
16-3	28.54	30.98 / 28.54 / 2.44"	TT only		28.58
16-4	29.46		no TT		29.50"
	28.29		TT only		28.34"
16-5	29.46"		no TT		29.50
	28.29	30.64 / 28.29 / 2.35	TT only		28.33"
16-6	29.65"	29.46 / 28.77 / .69"	no TT (at 60"		29.69"
	28.77		TT plus 1 1/2" Al		28.81
	29.46		no TT		29.50"

	TT only	TT plus 1 1/2" Al	No TT	diff no TT (TT + 1 1/2" Al)
16-3 /	28.58"	28.62	29.30"	- 0.68"
16-4	28.34"	28.81"	29.50	
16-5	28.33"		29.50 / 28.81 / .69	- .69"
	29.30 / 28.58 / .72"	29.50 / 28.33 / 1.17"		
		1.16"		

Top tamper only = 1.16" decrease in Crit Ht over no TT (16-4 16-5)
with 1 1/2" Al = 0.68" decrease in Crit Ht over no TT (16-1 16-6)
due to 1 1/2" Al = .48" more fuel rod to be added to maintain criticality. 3/4" Al = no apparent diff from (1 1/2") 29.64

10-28-58

Zero check top tongues out water dumped

Probe = -.02 LL = 99.898 Bottom almost covered

-.04 LL = 99.897 Bottom still not grot mended

-.06 LL = 99.879

10-29-58

Sample from Pump housing —

Reg 635336 also for X-10 sample 6-144

6-132.2 T 20

T 20 N = 124

N 112.2 gms sol'n Coupon

U = 0.43088 U = 0.4326 gms U/gm

D = 1.9745 D = 1.9721 gm/ml

pH = 3.2 pH = 0.6

9

Req. No. 635336

N.C.		PYRO		AVG.
Be	<.30	Be		
Ni	25	Ni		
Sn	40	--	--	
Si	<10	Si		
Li	<2	Li		
P	<100	P		
Na	18	Na		
Mo		--	--	
Mn	28	Mn		
Mg	25	Mg		
K	<50	--	--	
Fe	5000	Fe		
Cu	3	Cu		
Cr	<6	Cr		
Ca	<50	Ca		
Ba	<10	--	--	
B	1.8	B		
Al	25	Al		
Ag	<1	--	--	
		Cd		
		Co		
		V		
		Hg		
		In		
		C		
		F		

5164

1900

NC 51460

MBB

Spectrographic Report
All results in ppm.

Req. No. 635336

N.C.		PYRO		AVG.
Be	<.30	Be		
Ni	<25	Ni		
Sn	60	--	--	
Si	<10	Si		
Li	<2	Li		
P	<100	P		
Na	14	Na		
Mo		--	--	
Mn	<5	Mn		
Mg	<5	Mg		
K	<50	--	--	
Fe	115	Fe		
Cu	<2	Cu		
Cr	8	Cr		
Ca	<50	Ca		
Ba	<10	--	--	
B	<1	B		
Al	60	Al		
Ag	2	--	--	
		Cd		
		Co		
		V		
		Hg		
		In		
		C		
		F		

P.S. 2811

1500

NC

Spectrographic Report
All results in ppm.

See also 186

Expr. 17-1 Time 9 00 AM Date Nov. 3 1958

Purpose Test of Tower Shielding Reactor loading - full with Cadmium plate in

Personnel:

START-UP CHECK LIST

Equipment Checked by DHAIER Personnel Check by RICR

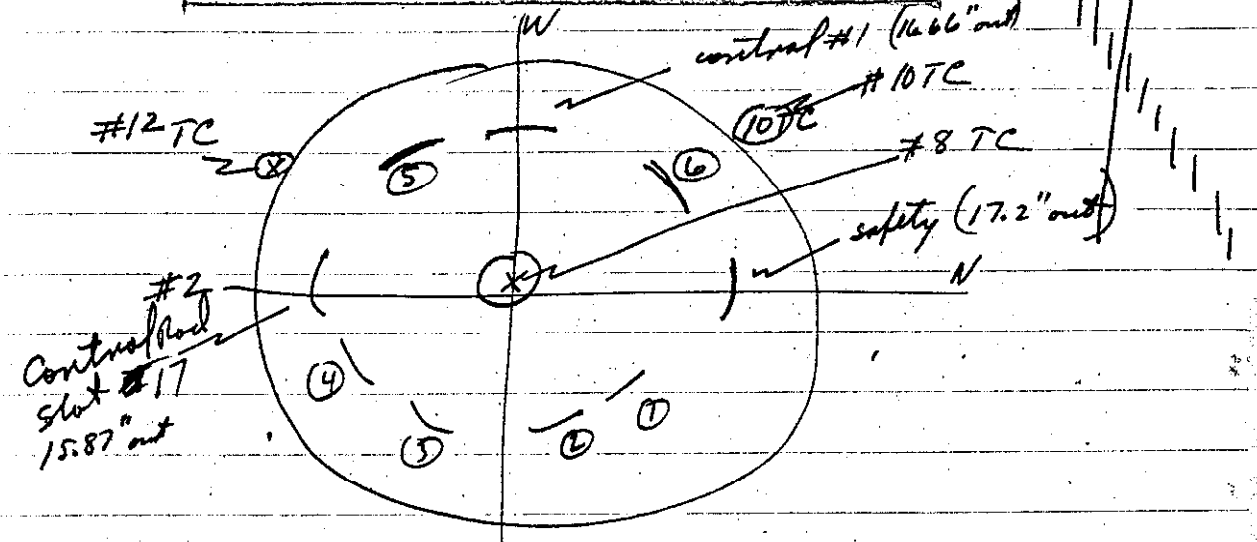
Instrument ... DSL CRR

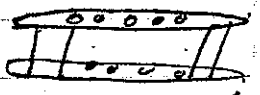
Source ... DSL M-43

Emergency ... DSL

Red Light on by DSL

Start-Up OK'd by DSL Time 8 30 AM Date 11-3 1958



Center has 3 3/16" Spacer made of brass rings  to hold center tubes apart - holes in rings to allow water thru

Thermocouples approx at center line of sphere -

Loading Cd plate slot 17 except for safety + CR #1 slot 15

Starting condx all Rods in except for safety

Top of plastic tube 9 3/4" from bottom - Sphere resting on table

9:15 AM → 28.0 cm on piped right floor side.

All water in S. G - 132.5 cm LL = 52.2"

Log N start .004 Log N now .0114

K-1 start 30 K-1 now 68

(over)

9:25 AM all movable rods out

Log N K-1 (3×10^{-12})

.014 76 (canvas)

Safety IN

.011 54

9:30 AM CR#2 IN

.013 72

CR#1 IN

.011 68

temperature on TC 23.5°C (8, 10, 12)

	Δ on SG cm		LL in	Δ in
	132.4		52.550	
2.79	32.5 cm	99.9	40.175	12.375
8	30.0	69.9	29.587	10.588
85"	19.9	50.0	21.823	7.764

104 / 25 / 76 } 29.9"

Expr. 17-2 Time 9[45] AM ~~PM~~ Date 11-3 1956
Purpose 3 Cd plates removed (approx equal)
Personnel: RKR ERR HDC

	S. G.	S. S. (off)	Log n	K-T
9[55]	CR 1 and 2 = 0.0	S. G. 42.0cm	LL 17.035 in	
9[57]	" " "	S. G 69.9cm	shut off -	
10[07]	water at 132.5cm	CR-1 = 0.0	CR2 = 0.0	Safety 17.2
	K-1 (10×10^{-12})	Log N		
	28	.02		
10[10]	CR-1 = 16.64 out	CR2 = 0.0		
	K-1 = 34 (10×10^{-12})	log N = .025		
10[11]	CR-1 out	CR-2 15.87 (out)		
	K-1 = 38 (10×10^{-12})	log N = .028		
10[15]	Water = 104 Cm = tap H$_2$O			

Expr. 17-3 Time 10[10] AM ~~PM~~ Date 11-3 1956
Purpose all fired Cadmium plates removed
Personnel: RKR ERR HDC - SLC

10[44] AM Water at 123cm
10[43] CR#2 = 15.87 Sub Crit
CR#1 = 16.66 Sub Crit
10[47] same out Sub Crit
CR1 = 16.66 CR2 = 15.87
K-1 (10×10^{-11}) log N
35 0.25

temp 24°C

11-3-58

11:27 Source in - Rods 1 & 2 in.

Cooling water -

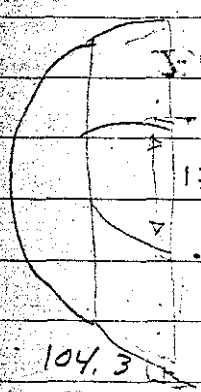
Bottom of sphere - 27.8 cm

Center - 66.9 cm

Top of active fuel element - 92.5 cm

Top of elements - 103.7 cm

Top of sphere - 104.3 cm



104.3
27.8
76.5

103.7
66.9
36.8

66.9
27.8
39.1
36.8
75.9
29.4

17.5
.5
11.0
.5
.75
30.25

103.7
92.5
31.2

START-UP CHECK LIST

Equipment Checked by RKR Personnel Check by DAC

Instrument [illegible] Source Loading Supervised by DAC ERR

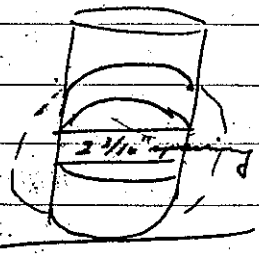
Emergency [illegible] DAC Source No. M-43

Red Light [illegible] by DAC Checked by DAC

Start-Up OK'd by DAC Time 8:30 A.M. Pd Date 11-4 1958

all Page 208-209, for periods

Expr. 18-1 Time 8 11 AM ~~PM~~ Date 11-4 1956
Purpose attempt to make TSR critical by moving center lamicoplus 1" down
Personnel: RICK DK ERR



8 30 AM top of table = 27.7 cm on left hand side
starting CR1 = 0.0 CR.2 – 0.0 Safety 17.2"

9 00 AM water lvl 120.7 cm LL 47.830 CR1 - 0.0 CR. 2 0.0 Safety 17-2
Sub critical (source partly out)

~~CR II 2~~

9 02 AM Source out, safety out. ~~Safety~~ Water temp 8, 10, 12 = 24°C
C.R II 1 = 0.0
C.R. II 2 = 1.35 just crit K-1 52 10×10^{-11}
Log n = .26

9.07 Period by C.R. II 2 only. Log n = .26 start
C.R. II 2 = 6.00 Log n = 2.6 finish.

9.11 C.R II 2 = 1.35 system crit. Log n = 2
K-I 38 10×10^{-10}

9.12 C.R. II 2 = 3.00
~~C.R. II = 1.41~~
C.R. II 2 = 1.41 system crit. Log n = 2 start
Log n = 40 finish
K-I from 2 to 71
on 10×10^{-9}

9 27 Lowering safety. Water Temps 8, 10, 12, = 24°C

9.28 Dropped safety.

9,29. Shut down.

Expr. 18 - 2 Time 9 45 AM PM Date 11 - 9 1958
Purpose Repeat of 18-1 with one (1) Cd plate in east orange pad -
Personnel: D. F.C. R.K.R. C.R.R.

log N moved appox 18" to NW corner of Nell

Filling in

S.G. in	L.L
37.0	14.840
50.3	21.94
69.3	27.580
82.5	32.674
99.9	39.519
120.3	47.750

Starting
- C.R II 1 = 0.0 K-1 16 (10×10^{-11})
- C.R II 2 = 0.0 K-2 45 (3×10^{-12})
- Safety = 17.2
- Source in.

Water temp 8, 10, 12 = 24°c

10 20 AM Water at 120.3 CR#1 0.0 CR#2 0.0 safety 12.2 (Sub Crit source in)

10 23 C.R. II 2 = 15.87. Sub crit after rods the same.

10 26 Crit cond Source out. Water temp 8, 10, 12 = 24°c
C.R. II 2 = 15.87 K I = 89 3×10^{-10}
C.R II 1 = 6.87 Log n = .008 just Crit

10 34
C.R II 1 = 8.00 other cond same.

10 44 C.R. II 1 = 6.87 Log n = .09 sub crit.

10 46 C.R II 1 = 6.88 just crit. Water temp 8, 10, 12, = 24°c

10 47 C.R. II 1 = 8.00 just crit. Log n = .09
C.R II 2 = 14.26

10 49 C.R. II 1 = 8.50. Log n = .48
C.R. 2 = 13.55 K 1 = 51 3×10^{-8} just Crit.

Period

11 a.m. CR#1 9.15 CR2 at 13.55 Log N .48 to 2.6 Water Temp 8,10,12 = 29°C

11 15/ C.R.$^{II}_1$ = 9.15 K-I = 79 $^{10 \times 10 -8}$

C.R.$^{II}_2$ = 12.74 Log n = 2.6

2610 reads 26 M.R. per hr at console

Gamma rate meter = 70 ^{R10} 980 V

R1 = 68.5 100-5

R2 = 80 100-5 just quit

P.M 2 = 96 @ 480 V

K-2 = 6.6 X ^{10} = 11

Neg Period

11 19/ C.R.$^{II}_1$ = 8.00

C.R.$^{II}_2$ = 12.74

Por Period. Water temp 8,10,12 = 24°C

11 24/ C.R.$^{II}_1$ = 10.01 Log n = .16 To 1

C.R.$^{II}_2$ = 12.79

11 38/ C.R.$^{II}_1$ = 10.01 Log n = 1 just quit

C.R.$^{II}_2$ = 11.70 K-1 = 32 $^{10 \times 10 -8}$

Neg Period. Water Temp 8,10,12 = 24.2°C

11 40 C.R.$^{II}_1$ = 8.00 Log n = 1 to .12

C.R.$^{II}_2$ = 11.70

11 47/ Por Period

C.R.$^{II}_1$ = 12.00 Log n = .12 to 2.2

C.R.$^{II}_2$ = 11.70 K-1 = 66 $^{10 \times 10 -8}$

C.R.$^{II}_2$ = 9.33 just quit.

neg Period

11.55 C.R II 1 = 8.00 Log n = 2.2 to .1

C.R II 2 = 9.33

11.59 Post period

C.R II 1 = 13.52 Log n = .1 to 1.8

C.R II 2 = 9.33 K-1 = 52 $^{10 \times 10 - 8}$

C.R. II 1 = 13.52 just Crit Log n = 1.8

C.R II 2 = 7.50 K-1 = 52 $^{10 \times 10 - 8}$

12.09 PM neg period. Log n = 1.8 to .1

C.R. II 1 = 8.00

C.R. II 2 = 7.50

12.13 PM Pos period. Log n = .1 to 1.35

C.R II 1 = 15.34 K-1 = 41 $^{10 \times 10 - 8}$

C.R II 2 = 7.50 ~~just Crit~~

12.19 C.R. II 15.34 Log n = 1.35

C.R. II 5.45 K-1 = 41 $^{10 \times 10 - 8}$

just Crit.

~~12.20 Post~~

12.20. Pos period. Log n = 1.35 ~~to~~ ^{7}

C.R. II 1 = 16.63 = out ~~K-1~~

C.R. II 2 = 5.45

12.27 C.R II 1 = 16.63 Log n = 7

C.R II 2 = 4.00 K-1 = 55 $^{3 \times 10 - 7}$

just Crit

Neg Period.

12:30 C.R ⌶1 = 16.63 Log n = 7 to .75
C.R ⌶2 = 0.0

12:36 P.M. C.R ⌶1 = 6.87 Log n = .75 Water temp
C.R ⌶2 = 15.87 K-1 = 72 3×10^{-8} 8, 10, 12 = 24.2° C
just cut.

12:37 P.M. Neg Period.
C.R ⌶1 = .09 Log n = .75 to .11
C.R ⌶2 = 15.87

12:43 P.M. C.R ⌶1 16.63 Log n = .11
C.R ⌶2 15.87 K-1 = 76 3×10^{-9}
Softy = ~~5.96~~ 5.78 just cut.

12:47 P.M. Pos period.
C.R. ⌶1 = 16.63 Log n .11
C.R ⌶2 = 15.87 K-1 = 7 3×10^{-8}
Softy = 5.78 to 10.00
12:53 P.M. Lysten (also called) acromid by P.M. ⌶2 @ 850 V
Log n = .8
K-1 = 85 3×10^{-8}
Reading of 10 R at surface of door.
reading at door 10 M.R.

Exp.	CR-1	CR2	period	cents.
18-1	0.0	1.35	∞	0
		6.00	43.94	17.6
		3.00	226	5¢
from LCRM		3.00	208.4	5.35¢
18-2	6.87	15.87 (cont)	∞	0
	8.00	"	141.3	7.4
	8.00	14.26	∞	—
	8.50	"	317.2	3.70
	8.50	13.55	∞	—
	9.15	11	252	4.35
	9.15	12.74	∞	—
	8.00	12.74 (—)	217.2	7.35 (—)
	10.01	12.74	180.4	6.05
	10.01	11.70	∞	—
	8.00	11.70 (-)	147.6 cm	12.3 (-)
	12.00	11.70	163 cm	~~6.65~~ 6.55
	12.00	9.33	∞	—
	8.00	9.33 (-)	139.6	4.65 (-)
	13.52	9.33	91.2	~~9.2~~ 9.4
	13.52	7.50	∞	—
	8.00	7.50 (-)	115.1	~~3.45~~ 21.8 (-)
	15.34	7.50	89.1	~~3.65~~ 9.5
	15.34	5.45	∞	—
	16.63 cut	5.45	163	~~6.65~~ 6.55
	16.63	9.00	∞	—

CR-1	CR-2	Safety	period	cents
16.63 out	0.0	17.2 out (-)	141.2	13.5 (-)
6.87	15.87	17.2	∞	—
.09	15.87	17.2 (-)	160.9	11.0 (-)
16.63	15.87	5.78	∞	—
1663	15.87	10.00	30.41	20.5

CR1 from 6.87 to 16.63 = 53.5¢
from my period 6.87 to 0.09 = 11.0
64.5¢

CR2 from 15.87 to 4.00 = 53.5¢
-13.5
67.0¢

Safety from 17.2 to ~~10.00~~ 5.78 = (-) 53.5¢ ≡ CR1 from 6.87 to 16.63
from 5.78 to 10.00 = 20.5¢

Assuming Cd plat on East face is equivalent to any of CR-1 & CR-2 in 65¢

$\frac{P_k}{B_1} = P_4$ ~~$B_1 = .0073$~~ ~~$6.5 \times .0073 = .474$~~ $P_k =$

then 1 plat = 65¢

plus CR-1 53.5¢

$118.5(.0073) = .864$

	S.G. cm	LL in.
Zero	27.8	—
	40.1	16.080
	71.3	28.365
	99.5	39.468
	123.5	49.062
	L.L.	

Can 15" more travel left

Expr. 19-1 Time 8[30] AM ~~PM~~ Date 11-5 1958
Purpose TSR = spacing between Ventical sections was 3 3/16" - 1" = 2 1/16"
~~other conditions same as 18-1~~
Personnel: RKR DFC

START-UP CHECK LIST
Equipment Checked by DFC Personnel Check by RKR
Instrument and Switches Checked and Passed by CRR
Source In" by DFC Source No. M-43
Emergency Equipment ~~and Control Room~~ Checked by DFC
Red Light On by DFC
Start-Up OK'd by DFC Time 8[45] AM ~~PM~~ Date 11-5 1958

Starting Conditions: CR1 = 0.09 in
CR2 = 0.00 in
Safety = 17.19 out
Source IN
No other col plates

K-1 [32] on 3×10^{-11} K-2 45 on 3×10^{-12}

log N .006 Reads x1 range x6 ($R_1 = 3.7$ $R_2 = 2.5$)

PM2 45 on 1100 V

9[12] Water ht = 123.5 cm (S.G.) . 49.062" (LL) (sub crit with above conds)

9[17] C.R#2 = 15.87 Sub crit.

9[19] C.R#1 = 7.52 pos period.
C.R#2 = 15.87 (+) 152 sec 6.9¢
Log n = .018
K-I = 58 10×10^{-10}

9[30] C.R#1 = 6.13 just crit
C.R#2 = 15.87

9[34] C.R#1 = 0.08 neg period. Water temp: 8, 10, 12, 24.2°C
C.R#2 = 15.87 (-) 200 sec (-) 8.1¢
~~Log n = .036~~

9[37] C.R#1 = 8.51 pos period
C.R#2 = 15.87 (+) 78.2 sec
Log n = .036
K-I = 46 3×10^{-9} (+) 11.6¢

9[45] CR#1 = 8.51
CR#2 = 12.92 just crit
Log n = .04
K-I = 46 3×10^{-9}

9 46 CR#1 = 8.51 neg period. Water temp 8, 10, 12 = 24.2°C
CR#2 = 11.01 (−) 152 cm (−) 12 ¢

9 50 CR#1 = 10.00 pos period. Log n = .05
CR#2 = 12.92 + (123.8 cm) K-I = 55 3x10-9 9.65 ¢

9 55 CR#1 = 10.00 Log n = .05 just cnit
CR#2 = 11.31 K-I = 55 3x10-9

9 57 CR#1 = 10.00 neg period. (−) 20.4 cm (−)8 ¢
CR#2 = 10.00

10 04 C.R#1 = 11.83 pos period Log n = from .012 to .051
C.R#2 = 11.31 (+) 93.4 cm K-I = 59 3x10-9 + 10.2 ¢

10 08 CR#1 = 11.83 just cnit. Log n = .051
CR#2 = 9.37 K-I = 59 3x10-9

10 10 CR#1 = 11.83 neg period Log n = .051 to 013
CR#2 = 7.37 (−) 180.3 cm (−) 9.4 ¢

10 15 CR#1 = 14.01 pos period. Log n = 013 To 062
CR#2 = 9.37 K-I = (+) 80.4 cm (+) 11.2 ¢

10 20 CR#1 14.01 just cnit Log n = 062 Water temp 8, 10, 12 = 24.2
CR#2 ~~7.20~~ 7.20 K-I = 69 3x10-9 Water ht = same.

10 23 CR#1 = 11.83 neg period, Log n = .062 to .0125
CR#2 = 7.20 [−] 167.4 cm (−) 10.4 ¢

10 30 CR#1 = 16.62 pos period Log n = .0125 to 07
CR#2 = 7.20 9" 91.3 cm K-I = 73 3x10-9 10.4 ¢

10 35 CR#1 = 16.62 just cnit Log n = 07
CR#2 = 4.95 K-I = 73 3x10-9

10[37] $CR^{II}1 = 16.62$ Neg period Log = 07 to .014
$CR^{II}2 = 0.0$ (-) 126 cm (-) 16.4¢

10[40] $CR^{II}1 = 6.13$ neg period ~~Log n~~ Water temp
$CR^{II}2 = 4.95$ 8, 10, 12 = 29.2°C
Log n = .014 to .005
(-) 43.44 cm

10[45] Shut down.
K-I = 35 $^{10 \times 10^{-11}}$
Log n = .015
P.M $^{II}2$ = 780 V - 25 peaks on Recorder
K-2 = 50 $^{3 \times 10^{-12}}$
R-1 = 1 x 6 - 5
R-2 = 1 x 6 - 6.5
course (out)

Expr. 20 - 1 Time 11[20] AM PM Date 11 - 5 1958
Purpose same as Expm 19-1 except full plug in batton.
Personnel: D.F.A. R K K.

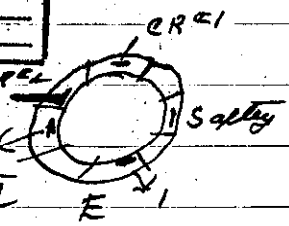
11[20] stabilizing cond. K-1 = $\frac{10 \times 10^{-11}}{16}$ $\frac{}{3 \times 10^{-12}}$
K-2 = 45
Log n = .008
P.M-2 = ~~780~~ 880 V
Source in
$CR^{II}1 = 1.08$
$CR^{II}2 = 0.0$
Log Log = 17.19
Water ht
L.L. 48.877" L.L. 123.2 cm.
Water Temp
8, 10, 12, = 29.3°C

11.[42] $C.R^{II}1 = .09$
$C.R^{II}2 = 15.87$ por period.
Log n = .005 to .037
228.2 sec 4.9¢

11.[53] $C.R^{II}1 = .09$
$C.R^{II}2 = 14.58$ just Cut
Log n = .037
K-I = 46 $^{3 \times 10^{-9}}$

11 54 C R II 1 = 6.13 just exit Log n = .0495 3 x 10 -9
C R II 2 = 10.10 K-L = 47
Estimated worth of plug = 25 ¢
12 00 PM Shut down.
P M - 2 = ~~880 V~~ 880 V ~~30 counts~~ 35 peaks on recorder.

Expr. 20-2 12 00 PM to 11-5 195 Y
Purpose Same as 20-1 with 2 fuel plates added.
Personnel: D.F.C. R.K.R.



Water ht
L.L. S.L.
49.021" 123.3 cm

Water temp
8, 10, 12
24.5° C

Plate II 1 in one section from safety
Plate II 2 in one section from C R II 2
Plate one in second row in each section.

12 30 PM C.R II 1 = 6.13 just exit Log n = .0041 3 x 10 -10
C.R II 2 = 9.50 K-L = 38

12 30 C.R II 1 = 6.13 for period. Log n = .0041 to .016
C.R II 2 = 10.10 369.5 cm 3.15 ¢

12 40 C.R II 1 = 6.13 just exit Log n = .016
C.R II 2 = ~~9~~ 9.50 K-L = 52 10 x 10 -11

Water temp 8, 10, 12, 24.3° C

12 41 Shut down
P.M - II 2 880 V 17 peaks on recorder.

addition of two small fuel plates = 3.15 ¢ even

START-UP CHECK LIST

Equipment Checked by DFC Personnel Check by RKR

Instrument and Recording Checked and Reset by DFC

Source Int' Source Type DFC Source No. M-V3

Emergency Shut Down and Alarm Checked by DFC

Reactor Unit RKR

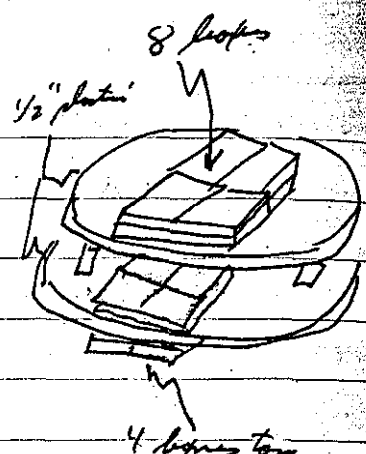
Start-Up O.K.'d by DFC Time 9 00 AM PM Date 11-6 195 8

Expr. 21-1 Time 9 00 AM PM Date 11-6 195 8

Purpose Evacuation of void (16 3/4 x 4 x 1" Al bars) between critical loading same as 20-1

Crit = #1 .07 #2 14.58 & or #1 6.13 #2 10.10

Personnel:



Starting K-1 (10×10^{-12}) 38 R-1 X1

K-2 34 (3×10^{-12}) R-2 X1

PM 2 900V

9 25/ AM Water Lt, L.L. = 49.197" Water temp 8, 10, 12, = 24.3°C

C.R #1 = .07 per period Log n = .005 to .04

C.R #2 = 14.58 82.6 avg. = 11.3 ¢

9 35/ C.R #1 = .07 just crit Log n = .04 $K-L = 53$ 3×10^{-9} } 24.3°C water temp

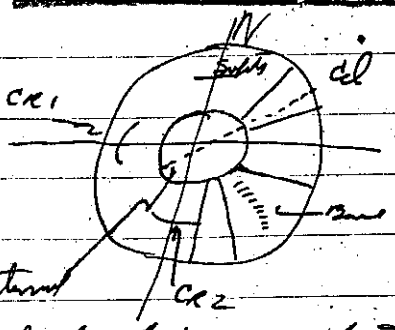
C.R #2 = 12.10

9 37/ Shut down.

L.L. at at 9.757" at table top = actual water lt

manometer stops at 8.943"

Expr. 22 Time 3 50 ~~AM~~ PM Date 11-7 1958
Purpose Foil Eqp with 2"/16" opening in water block Bore + Cd covers
Personnel: RKR DSL



Foil location as per sheet

4 PM Water ht = 49.411" Water temp 8, 10, 12 = (23.5°C)
4 22 C.R ☐ 1 = 2.35 Slightly super
C.R ☐ 2 = 15.87 Log n = .2 to 1
4 25 C.R ☐ 1 = 4.16 per period
C.R ☐ 2 = 15.87
4 26 At power, Log - n = 1
4 30 C.R ☐ 1 = 1.41 just crit.
C.R ☐ 2 = 15.87
4 31 Shut down. (pull out one foil) Counts 250 (Counts per min)
4 47 Start up on foil run.
4 49 Water ht = 49.787" water temp = 8, 10, 12 = 23.5°C
4 59 C.R ☐ 1 = 4.74 per period.
C.R ☐ 2 = 15.87
5 12 at power, Log n = 35 Water temp 8, 10, 12 23.5°C
5 14 C.R ☐ 1 = 1.47 Log n = 3.5
C.R ☐ 2 = 15.87 K-1 = 35 3 X 10⁻⁷
K-2 = 45 10 X 10⁻¹¹
P.M ☐ 2 = 620 V 1 scale on recorder.
5 32 Shut down. (Shut down scale on P.M ☐ 2 620 V - 50 scale on recorder)

Foil	location	relative activity
W-37	41M (inside)	1.3831
W-41	41M outside	X13817 1.2648
W-33	42F	
W-46	44G	1.1260
W-44	47M	1.0548
N W-45	50G	1.0000
W-43	54F	recount 0.9990 0.30186
W-32	63A	0.82360
W-42	66C	0.82312
W-34	69B	.89518
W-35	70L	.93517
W-40	71M (outside)	1.0271
W-39	3/16" from outside plate	1.2062
W-47	on outside plate	1.1380
W-36	5/8" from outside plate	1.2899
W-31	1 1/8" " " "	1.2674
W-38	2 1/4" " " "	.87926

W-foils = 47.6 mg Au

inside water gap on stringer

Z 43	inside surface of cyl	1.2483
Z 34	1/4" from cyl	1.4876
Z 37	1/2" " "	1.6514
Z 35	3/4" " "	1.7623
Z 45	2" " "	1.6992
Z 32	5" " "	.82660

Z series = 47.9 mg.

Cd covered

Foil	location	
Y-43	41D (inside)	.31000
Y-37	41D (outside)	.30473
Y-41	42Q "	.53518
Y-49	50M	.39275
X-48	51F	0.38794
Y-40	52G	.37702
X-42	53K recount 0.5544	.55169
Y 31	60P	0.33265
X-36	66N	0.27478
X-35	69P	0.42025
Y-33	71H	0.26598
X-38	outer plate	0.20606
Y-51	13/16 from outer plate	.13239
Y-39	3/8 " " "	.18755
Y-32	1 1/2" " " "	0.11312

inside water gap on stringer

Y-34	cyl surface	0.29270
Y-50	1/4" from cyl surface	0.28420
Y-44	1/2" " " "	.26242
Y-47	3/4" " " "	
Y-45	2" " " "	.17353
Y-46	5" " " "	0.58574

Y series = 47.8 mg

Exp. 23 Time 8 AM PM Date 11-11 1958
Purpose System loaded on a reading with approx 10 gms U-Al alloy strips — 2 11/16" center spacing
all check ✓
Personnel: RICR DJL

START-UP CHECK LIST
Equipment Checked by RICR Personnel Check by RICR
Instrument and Safeties Checked and Reset by DJL
"Source In" Checked by DJL Source No. M-40
Emergency Equipment in Control Room Checked by DJL
Red Light On by DJL
Start-Up OK'd by DJL Time 8 00 AM PM Date 11-11 1958

Starting Scales

K-1	85	3×10^{-12}
K-2	45	3×10^{-12}
R-1	6	6×1
R-2	1	6×1
PM-2	1	800 V

log N = .002

1 = 18 35/AM Water 49.0" K-1 60 10×10^{-11} log N .017. } Source in CR's in subcrit

Water temp 8, 10, 12, = 23°C

8 40 AM C.R II 1 = .07 pos period.
C.R II 2 = 11.38

8 45 C.R II 1 = .07 just crit.
C.R II 2 = 9.23

8 53 Seem to be some drift in activity. Moved CR II 2 from 9.20 to 8.90 to remain crit.

9 02 C.R II 1 = .07 just crit
C.R II 2 = 8.56

log N = .16
K-1 = 60 10×10^{-11}

9 04 Shut down.

Reactivity change apparently caused by loosening of type holding U-Al strips.

Expt. 23-2 Time 12 35 PM Date 11-11 1955
Purpose Rpt 23-1 with U-81 stopper more securely attached - same wt of U as before - on rubber from inter SE
Personnel: RKR - DFC

To be compared with expt 20-1 $CR^{II}1 = .09$ $CR^{II}2 = 14.58$.
(20-1) same water but with out extra U-81 stopper.
Water Ht = 50.455 Temp 8, 10, 12 = 23.2°C

1.05 PM $CR^{II}1 = .07$ just exit Log n = .017 to .09
$CR^{II}2 = 11.35$ R-1 = 59 10 x 10-11
1.09 PM $CR^{II}1 = 2.50$ par period. Log n = .017 to .09
$CR^{II}2 = 11.35$
1.15 PM $CR^{II}1 = 2.50$ just exit Log n = .09 Water temp 8, 10, 12 = 23.2°C
$CR^{II}2 = 10.11$
1.19 PM $C.R^{II}1 = 3.50$ par period Log n = .02 to .05
$C.R^{II}2 = 10.11$ 304 sec
1.25 PM $C.R^{II}1 = 3.50$ just exit Log n = .05
$C.R^{II}2 = 9.98$
1.30 PM $C.R^{II}1 = 4.50$ par period. Log n = .013 to .05
$C.R^{II}2 = 9.98$ 243.3 sec
1.36 PM $C.R^{II}1 = 4.50$ just exit Log n = .05
$C.R^{II}2 = 8.68$
1.39 PM $C.R^{II}1 = 6.00$ par period. Log n .013 to .06
$C.R^{II}2 = 8.68$ 147.7 sec 7.24
1.46 $C.R^{II}1 = 6.08$ just exit Log n = .06
$C.R^{II}2 = 7.42$

1.52 C.R.$_1$ = .08 per period. Log n = .01 to .1

C.R.$_2$ = 19.58 56.47 sec 14.8 ¢

1.59 Shut down.

U-Al alloy strips 20.71% U at 93.7%

total wgt = 368 gm U + 343 gm 25

Bottom plug = 33 gm U + 31 gm 25

loading on radius: (note strips not uniform inside quadrant

total wgt in reactor

133.2

484.7

617.9 gm alloy

127.97 gms U

119.27 gm 25

Plate #	Strip	wgt alloy gms
1	1/8 × 4 7/8	0.6
2	1/8 × 5 5/8	0.9
3	3/16 × 4 1/4	0.9
4	3/16 × 4 3/4	1.1
5	" × 5 1/4	1.3
6	" × 5 3/4	1.5
7	1/4 × 4 1/4	1.3
8	" 5 1/8	1.5
9	" 5 1/2	1.7
10	5/16 × 4 3/4	1.7
11	" 5.0	1.7
12	" 5 3/8	1.8
13	" 5 3/4	1.9
14	3/8 × 5.0	2.3
15	" 5 3/8	2.3
16	" 5 5/8	2.5
17	" 5 7/8	2.7
18	7/16 × 5 3/8	2.7
19	" 5 5/8	2.8
20	" 5 7/8	2.9
21	" 6 1/4	3.0
22	1/2 5 5/8	2.9
23	" 5 7/8	3.4
24	" 6 1/4	3.5
25	" 6 3/8	3.6
26	" 6 1/2	3.5
27	9/16 × 6 3/8	4.0
28	" × 6 1/2	4.2
29	" × 6 3/4	4.4
30	5/8 × 6 1/2	4.5

Plate	Strip	alloy wgt
31	5/8 × 6 3/4	4.7
32	" × 7.0	4.7
33	" × 7 3/8	5.1
34	11/16 × 7 1/8	5.6
35	" 7 3/8	5.9
36	" 7 7/8	5.9
37	" 8 1/8	6.0
38	3/4 × 8	6.7
39	" × 8 1/2	7.0
40	" × 9 1/4	8.5

133.2 gms

outer section

41	25/32 × 20	17.8
42	" × "	17.1
43	" "	16.7
44	13/16 × 20	18.9
45	"	17.6
46	"	17.2
47	"	17.6
48	"	17.4
49	"	18.1
50	7/8 × 19	18.3
51	"	17.8
52	"	18.4
53	29/32 × 18	18.0
54	" 1/4	18.2
55	15/16 × 17 1/4	18.6
56	" × 17 1/8	18.8
57	" × 16 5/8	17.9
58	31/32 × 16	17.1
59	" × 15 5/8	17.6
60	1 × 15	16.5
61	" × 14 1/2	16.0
62	" × 13 3/4	15.3

Plate	Strip	alloy wgt
63	1 × 13	14.5
64	1 × 12	13.1
65	1 1/16 × 11 5/8	13.0
66	1 1/16 × 10 5/8	12.5
67	1 1/8 × 9 3/4	12.1
68	1 1/8 × 8 5/8	11.3
69	1 1/8 × 7 3/4	9.0
70	1 3/16 × 5 7/8	7.5
71	1 3/16 × 3 3/8	5.0

484.7 gms

Expr. 24-1 Time 10^30 AM ~~PM~~ Date 11-12 1958
Purpose loading same as 23-2 except, al strips loaded on same diameter as U-Al strips + in same manner
Personnel: RKR DFC

starting { K1 65 (3x10^-12) log N = .0008
K2 30 (3x10^-12)

Previous Critical -

	CR1	CR2	
20-1	.09	14.58	(no extra U)
23-2	.07	11.35	[Extra U = 14.8]

10^54 Water ht = 99.921 Water temps 8, 10, 12 = 23.2°C
Log n = .013
KI = 40 10x10^-11

10^57 C.R^II 1 = .09 just crit. Log n = .02.
C.R^II 2 = 12.85

10^59 C.R^II 1 = .08 few period. Log n = .02 to .11
C.R^II 2 = 14.58 115.1 cm 8.8 ¢

~~11^02~~ C.R^II 1 = .08 just crit Log n = .11
C.R^II 2 = 12.75

11^07 C.R^II 1 = .08 Neg period Log n = .11 to .03
C.R^II 2 = 11.35 239 cm (-) 6.5 ¢

11^12 C.R^II 1 = 2.50 just crit Log n = .03
C.R^II 2 = 11.32

11^13 C.R^II 1 = 3.50 few period Log n = .03 to .09
C.R^II 2 = 11.32 395 cm 3 ¢ water temp 8, 10, 12 = 23.8°C

11^21 C.R^II 1 = 3.50 just crit Log n = .09
C.R^II 2 = 10.80

11^23 Shut down

	CR1	CR2		
20-1 =	.09	14.58	no added fuel	
23-2	.19	11.35	= +14.8 ¢	
24-1	.08	14.58	+8.8 ¢	6.0 ¢ diff
	.08	11.35	−6.5 ¢	

CR-1 from 2.50 - 3.50 23-2 = 3.85 ¢ } possible depression due to Al strip.
2.50 - 3.50 24-1 = 3.0 ¢ }

Effect of Al alone = 6 ¢ neg
" " U-Al = 14.8 ¢
" " U " = 20.8 ¢

222

Expr. 24-3 Time 8:30 AM PM Date 1-13 1958
Purpose Rpt 24-2 with U-Al alloy strips staggered on orange fuel
Personnel: ORNL, E.R.K.

9:05 Watt 49.13" 23°C

9:10 Critical Condition log N = .05 K-1 = 58
CR-1 - .08 Safety 17.2
CR-2 11.24

9:12 Positive period log a .05 to .45
CR-1 .08
CR-2 12.75 130.5 sec 7.8¢

9:22 Pos. Period log N .1 to log N 1.2
CR1 .08
CR2 14.58 50 sec 16.2¢

9:24 Shut down

Staggering fuel - 16.2¢ total
alone 7.8¢
Optim fuel worth 14.8
6.
28.6¢

Expr. 24-4 Time 11 AM PM Date 11-13 1958
Purpose Full strips staggered thru 1 quadrant so that any strip is at least 2" from next
Personnel: RKR DSK

11[16] Water ht = 49.112 Water temp 8,10,12, = 23.2°C

11[20] C.R ## 1 = .08 per period Log n = .02 to .2
C.R ## 2 = 12.75 478 sec 16.5 ¢

11[29] C.R ## 1 = .08 just Cril Log n = .2
C.R ## 2 = 9.74

11[25] C.R ## 1 = .08 per period Log n = .2 to .7
C.R ## 2 = 11.24 124 sec 8.2 ¢

11[31] C.R ## 1 = ~~.08~~ .08 per period Log n = .05 to 1
C.R ## 2 = 14.58 26.1 sec 23.4 ¢

11[38] C.R ## 1 = .08 per period ~~Log~~ Log n = .08 to 1
C.R ## 2 = 14.58 26.1 sec 23.4 ¢

11[39] Shut down.

Optimizing fuel = 8.2 ¢ more.

~~23.4~~ ~~30.8~~ ¢ total 14.8
8.2
.6
28.0 ¢

check = 23.4 ¢
6 ¢
29.4 ¢

Expr. 24-5 Time 1 ~~AM~~ 10 PM Date 11-13 1958
Purpose Same loading but Al strips distributed over sphere uniformly
Personnel: RKR DFC

1 30 PM Water Rt = 99.205 Water temps 8, 10, 12, = 23.2°C
1 34 C.R$^{II}_1$ = .08 pre period Log n = .02 to .07
C.R$^{II}_2$ = 12.75 65.2 cm
1 38 C.R$^{II}_1$ = .08 just crit Log n = .07
C.R$^{II}_2$ = 10.23
1 40 C.R$^{II}_1$ = 1.14 just crit Log n = .07
C.R$^{II}_2$ = ~~7.74~~ 9.74
1 42 C.R$^{II}_1$ = 1.14 positive period Log n = .07 to .15
C.R$^{II}_2$ = 10.23 50.9 cm
1 47 Shut down.

Expr. 24-6 Time 2 ~~AM~~ PM Date 11-13 1958
Purpose Al strips removed
U-Al strips still in
Personnel: JCF DFC

2 18 PM Water Ht 49.217 Temp 23.2°C
Crit ~~Cond~~ Condx
2 23 CR-1 .08 just crit Log n = .02
CR-2 = 8.95
2 29 C.R ☐ 1 = .07 for period Log n = .02 to .14
C.R ☐ 2 = 10.23 104.2 sec = 9.4¢
2 26 Shut down.

Expr. 24-7 Time 2 ~~PM~~ AM PM Date 11-13 1958
Purpose U-Al strips removed
ssmes loaded 20-1 .09 #1 #2 8.58 } crit
6.13 #2 10.10 }
Personnel: RIKE DFC

3 12 PM Water 49.2" Temp 23°C
Pos. Period 369 sec
3 18 PM CR-1 .07 Log N .015 to Log N .035
CR-2 15.86
Crit Condx
3 26 CR-1 .07 Log N = .035
CR-2 14.80
Crit Condx
CR-1 3.47
3 31 CR-2 - 12.50
Pos. Period 91.2 sec = 10.4¢
3 33 CR-1 - 5.47 } Log N - .035 to Log N 0.2
CR-2 - 14.80 }

(over)

3^35 Neg Period 139 sec
CR-1 = 3.47 CR2 = 10.23 13.7¢ (-)

3^42 Critical
CR-1 = 5.91 CR2 = 10.23 Log N = .07

3^43 Pos. Period 82.5 sec 13.2¢
CR-1 5.91 CR-2 - 12.50 Log N - .07 to 0.5

Neg Period 169 sec (-) 10.2¢
3^46 CR-1 5.91 CR.2 - 8.45 Log N 0-5 to

Critical Condx
3^55 PM CR-1 7.78 CR-2 8.45 Log N = 0.12

Pos Period . 104 sec 9.4¢
3^56 CR-1 7.78 CR-2 10.23 Log N 0.12 to Log N = 0.7

Critical Condx
4^05 PM CR-1 7.78 CR-2 8.45 Log N = 0.6

Shutdown

Summary

	Rods #1	#2	
loaded with A1 + U-Al alloy	.08	10.23	
loaded with U-Al alloy	.08	8.45 -	9.4¢
no loading	.08	14.80 =	32.0¢
worth of U alone			42.4¢

#

Expr. 25-1 Time 1:20 ~~AM~~ PM Date 11-14 1958
Purpose 12¼" sphere (solid Al) in center of void space (2"116" opening between support cavity sections — 6 cadmium plates added to sphere
Personnel: RKR DJC

START-UP CHECK LIST
Equipment Checked by RKR Prem... checked by RKR
Instrument and ... DJC
Source ... M43
Emergency ... Control Room ... DJC
Reactor Engineer DJC
Start-Up OK'd by DJC Time 1:25 PM Date 11-14 1958

1:42 PM water ht = 49.195" water temps 8, 10, 12, = 23.2°C

1:44 PM C.R #1 & C.R #2 out: Sub Crit:

Expr. 25-2 Time 1:50 ~~AM~~ PM Date 11-14 1958
Purpose 3 Cd plates removed
Personnel: RKR DJC

2:05 PM Water 49.2" water temp 23°C
2:09 PM CR-1 16.63 } slightly Sym 126 cm
CR2 11.98 }
Crit Condx
2:19 PM CR-1 16.63 } by M = .02
CR-2 10.82 }

Expr. 25-3 Time 2[27] ~~AM~~ PM Date 11-14 195[6]
Purpose 2 ~~[illegible]~~ Cd plates fixed - at least 1 orange pad away from neps
in reactor
Personnel: RKR DH

2[45] PM Water 49.2 inches

2[48] #1 ~~2.46~~ 3.53 Pos. Period 336.6 mc
R#2 15.87 ~~Pos. Period~~ Log N -.0015 to Log N = .02

Note from Exp 24-1 Rd 1 2.50 → 3.50 = 3 ¢
23-2 2.50 3.50 : 3.85 ¢

Critical Conditions

3[00] PM #1 - 2.57 #2 15.87 Log N = .02
Pos. Period 121.6 mc 5.45 ¢

3[07] #1 - 4.50 #2 15.87 Log N .02 to .2

Crit Condx

3[15] #1 4.50 #2 14.31

3[16] #1 5.50 #2 14.31 Pos period Log N .2 to .3 217.2 mc 6.15

3[22] #1 5.50 #2 13.50 just Crit Log N = .3

3[24] #1 6.50 #2 13.50 Pos period Log N .3 to .9 208.5 mc 6.35

3[28] #1 6.50 #2 12.73 just Crit Log N = .9

3[45] #1 7.50 #2 12.72 pos period Log N .07 to .2 199.0 5.80

3[46] #1 7.50 #2 11.95 just crit

Shutdown

Expt. 25-4 Time 9 AM PM Date 11-14 1958
Purpose Continuation of CR calibration (25-3)

Personnel: RKR DJC

9 55 AM Water 49.2" 23.0°

10 03 #1 5.50 #2 15.86 Pa Brief Lg N=.011 8.2 73.8 cm 12.2

10 #12

10 #1 2.79 #2 15.86 level Lg N 0.14

10 05 #1 5.50 #2 13.65 level Lg N 0.16

10 25 #1 7.50 #2 13.65 po. prim Lg N .16 - .17 84.7 cm 11

10 30 #1 7.50 #2 12.05 level Lg N = 0.7

10 32 #1 8.50 #2 12.05 po prim Lg N 0.7 — 186.7 cm 5.85

10 39 8.50 11.29 level Lg N = 1.9

10 40 #1 2.79 #2 11.29 neg prim Lg N 1.9 → -82.5 cm

10 44 8.50 11.29 level Lg N = .03

10 49 9.50 11.29 po. prim .03 & .15 171.6 cm 6.35

10 50 9.50 10.50 level Lg N .15

11 00 10.51 10.50 po prim 173.8 cm 6.25

11 07 10.51 9.75 level Lg N .45

11 08 10.51 3.50 neg prim -69.5 cm

11 13 12.50 9.75 po prim 71.7 cm 12.6

11 18 12.50 8.29 level Lg N = .19

11 19 14.50 8.29 po prim 84.7 cm 11

11 25 14.50 6.87 level Lg N = .7

11 26 16.57 6.87 po prim 129.4 cm

16.57 5.73 level Lg N 2.1

(over)

	#1	#2	
11[32]	16.57	0.0	my prime Gy N2 → -80.4 cm
			water Temp 23 °C
11[37]	Shutdown		

worth of CR1 from 2.5 to 16.57 = 75.15¢
estimate from 2.5 to 0 = 5¢
so each Cd plate = ~ 78¢
2 plates = 1.56
+ CR-1 = .73
[epicene with sphere] = $2.29

no sphere CR-1 = 6.13
CR2 = 15.87
no fiber plates – ~ 17¢ loss on #1
56¢ Cd in

Est. value of sphere = $1.73 ± 20%

START-UP CHECK LIST

Equipment Checked by DK Personnel Check by RKR

Instrument and [illegible] Checked and Recorded by DK

Source Installed by M-43

Emergency Equipment in Control Room Checked by DK

Red Label Removed by

Start Up OK'd by DK Time 8[illegible] Date 11-18 1958

Expr. 26-1 Time 8[55] AM PM Date 11-18 1958

Purpose 1 Cd plate added to system
note - all Cd plates operated by
1 orange pull evaluate final plate -

Personnel: RKR DK

8[55] 49" water at 23°C

CR-1 CR-2

9[01] 16.65 ext 15.87 (ext) Sud Cut 8

Expr. 26-2 Time 9[05] AM PM Date 11-18 1958

Purpose Cd Plate removed from SE section

Personnel: RKR DK

9[28] Water = 49.190 at 23°C

9.[20] C.R#1 = 5.50 for period

C.R#2 = 15.87

C.R#1 = 2.35 just cut. 6 pull 1

9[37] C.R#2 = 15.87

Plant down.

Expr. 26-3 Time 9[45] AM Date 11-18 1958

Purpose Cd plate moved from NE section
to SE - 1 orange pull from CR-2 (via 2nd pull)
same row as CR-2

Personnel: RKR DK

10[00] Water 49" temp 23°C

10[05] C.R-1 6.50 CR 2 15.87 for period

over

10[07] CR1 7.50 CR2 15.87 gas purge

1013 CR1 5.51 CR-2 15.87 level $\gamma N = .05$

Expr. 26-4 Time 10[45] AM PM Date 11-18 195_
Purpose #3 Cd plate inserted in Cent (γN)
orange pul + SE Cd plate removed
Personnel: RKR DSC

Blotting paper wrapped around shut cables
~ 75% of path particularly where in forced air draft—
including junction box.

11[04] water at 49.2" temp 23°C

11[10] CR1 4.50 CR2 15.87 gas purge

11[15] CR-1 2.80 CR2 = 15.87 Cent $\gamma N = .05$
note γN appears much more stable

Expr. 26-5 Time 11[22] AM PM Date 11-18 195_
Purpose NW Cd plate moved to SE
orange pul note: Cd plate marked — placed #3 Cd in NE pul
Personnel: RKR DSC

11[24] Blotting paper taken off junction box only
water at 49" temp 23°C

11[40] CR1 - 4.35 CR2 15.87 just cent $\gamma N = .02$

11[47] Shutdown

Expr. 27-1 Time 8:30 AM Date 11-18 1958
Purpose Internal expansion 1/2" annular - 3 3/16" 2 Cd plates in + Al sphere =
Personnel: R I & R Opr

8:40 AM 47.153" water 23°C
8:49 C.R ☐1 = 16.63 Sub crit.
C.R ☐2 = 15.87

Expr. 27-2 Time 8:50 AM Date 11-19 1958
Purpose Same 1 fixed plate removed SE corner
Personnel: D.F.C. R.K.R.

9:01 water ht = 49.182 at 23°C
9:05 C.R ☐1 = 9.50 for period
C.R ☐2 = 15.87
9:13 C.R ☐1 = 7.53 just crit
C.R ☐2 = 15.87
9:18 shut down

CR1 = + 25¢
plate = 73¢
loss of reactivity = -.98¢

47.9
473

Foil loading –

Bare Normalizer = Z 31 on plate 50 Z = 47.9 mg ea.

on plastic spacer (upper

clockwise in front of each pel

C (47.0 mg) factor = 1.019

Foil	plate	
~~Z 33~~	41 – .35616	
36	42 – .7447 ← .17460	
38	43 – .363	
39	44 – .42161	
40	45 – .38725	
41	46 – .38804	
42	47 – .39493	
44	48 – .3964	
46	49 – .408	
47	50 – .3987	
48	51 – .39655	
49	52 – .40343	
A (47.4 mg) [factor 1.01]		
53	53 – .394	.398
54	54 .3863	
55	55 – .38698	.396
56	56 – .41164	.421
57	57 – .37164	.375 ← .3736
58	58 – .41848	.423
59	59 – .4029	.417
60	60 – .36671	.370 ← .3661
61	61 – .3433	.346
62	62 – .53571	.542 ← .5324
63	63 – .3237	.328
64	64 – .32608	.330
B (47.3 mg) [factor 1.013]		.3622
65	66 – .31667	.321 ←
67	67 – .29352	.298
68	68 – .46523	.473
69	69 – 2933	.297
70	70 – .25726	.261
71	71 – .228976	.232
72	72 – .54728	.555 ← .5488
73	(on orange peel inside) – .334	.339
74	0" inside ag – .328	.333
75	¼" " " .31351	.318
77	1" " " .24405	.2475
76	0" inside ag (bare) 1.5651 = 1.59	

1	= CR#2	1.6207
2		1.6049
3		1.4750
4	CR#1	1.2946
5		1.5039
6		1.6522
7		1.6958
8		1.7911
9		1.7482
10		1.8187
11		1.7276
12 (D = 47.3 mg (f = 1.013)		1.6900 = 1.72

A-65 = .3149
B65 = .3612

Expr. 28-1 Time 4:30 AM PM Date 11-19 1958
Purpose Foil Run - 2 1/16" spacing
Bare & Cd covered Au as shown
Personnel:

Loading of foils in orange pod.

41 R	51 L	61 R	71 C
42 C	52 C	62 C	72 R
43 L	53 R	63 L	#50 bare foil in
44 R	54 L	64 R	n.c. orange pod must
45 C	55 R	65 C	be lofty.
46 L	56 C	66 L	
47 R	57 L	67 R	
48 L	58 R	68 L	
49 C	59 L	69 C	
50 R	60 C	70 R	

5:07 PM Water ht = 49.214 at 23°C

5:09 C.R #1 = 2.75 foil exit. Log N = .011

C.R #2 = 15.87

5:10 CR 1 = 5.13 pos pair

CR 2 15.87

5:22 Started to level.

C.R #1 = 2.75 Lofty = 17.2"

C.R #2 = 15.87

P.M. #2 = 620 V 6 on meter. P.M #1 = .58

K-1 = 36 3×10^{-7}

K-2 = 9 3×10^{-10}

Log n = 36

R-1 = 3.8 5x100

R-2 = 2.8 5x100 ans

5 ~~PM~~ Shut down. water temp = 23°C

Expt. 29-1 Time 10 ~~PM~~ AM Date 11-25 1958
Purpose Test Cd safety plate interval
Rod #2 removed — all UP = 10.00
Personnel: [illegible]

Cd plate
" 8½ x 8½ "
system inverted

11 $\frac{20}{AM}$ Water level monometer faulty. Water level measured with sight-glass.

11 $\frac{30}{}$ Instrument scram (K-1). Exact cause not determined System was not critical

	H_2O ht (cm)	Rod 1	Safety	Rod 2	
11 $\frac{45}{AM}$	106.3	0.08	out	4.00	slightly super
	106.0	"	"	"	critical
	106.0	"	"	6.5	sub crit
	107.0	"	"	6.5	critical
	129 (flooded)	"		7.29	sub
	"	"		7.23	~~super~~ just critical
12 $\frac{00}{AM}$	"	3.11		8.00	critical
				~~8.5~~	
				10.08 (out)	
		15.68		At 10.08 the cd is in contact with the inner surface of upper hemisphere	

12 $\frac{08}{}$ Water temp = 24°C

All measurements made between Log N = .01 and Log N = .02

9.0 ¢

$12\frac{10}{pm}$ Pos. period Rod 1 = 15.68 , Rod 2 = 108.7 / 9.85

Log N = .1 Rod 1 = 13.48 , Rod 2 = 9.85 Level

130cc 7.9 ¢

Pos period Rod 1 = 13.48 ; Rod 2 = 9.64 16.99

Log N = .3 Rod 1 = 11.94 , Rod 2 = 9.64 Level

47.8cc 17 ¢

pos period Rod 1 = = 11.94 , Rod 2 = 9.20

Log N = .4 Rod 1 = 9.04 , = Rod 2 9.20 Level

37cc 19.4 ¢

$12\frac{3^2}{pm}$ pos period Rod 1 = 9.04 , Rod 2 = 8.50

Log N = .6 Rod 1 = 5.51 , Rod 2 = 8.50 Level

47.8cc 16.64

pos period Rod 1 = 5.51 , Rod 2 = 7.50

Log N = 1 Rod 1 = 1.5 , Rod 2 = 7.50 Level

63cc 13.7 ¢

pos period Rod 1 = 1.5 , Rod 2 = 2.00

from 200" to 10.08" 83.6

10.0 ¢

9.5

~~Sept~~ Control plate inverted to work on lower segment - contact with legs = -.04" unseleys = limit sw set at +.15" legs extend 7/16" up from full down at top segment

Expr. 30-1 Time 4:05 ~~AM~~ PM Date 11-25 1958
Purpose ~~Test~~ control plate (CR#2) on lower segment of internal splines
Personnel: RKR DJC

4:31 pm Water ht = 99.2 Temp = 24°C
4:36 C.R #1 = 10.01 just exit Log n = .05
C.R #2 = 0.15
4:39 C.R #1 = 10.01 pos period. Log n = .05 to .15
C.R #2 = 0.46 102 cm 9.6 ¢
4:47 C.R #1 = 8.37 just exit Log n = .15
C.R #2 = 0.46
4:49 C.R #1 = 8.37 pos period Log n = .15 to .6
C.R #2 = 0.96 73.9 cm 12.4 ¢
4:54 C.R #1 = 5.98 just exit Log n = .6
C.R #2 = 0.96
4:56 C.R #1 = 5.98 pos period Log n = .6
C.R #2 = 1.46 115 cm 8.6 ¢
5:03 C.R #1 = 4.00 just exit Log n = 1.8
C.R #2 = 1.46
5:10 C.R #1 = 1.12 just exit Log n = .7
C.R #2 = 2.46

5/11 C.R #1 = 9.01 for period Log n = 1.7 to 2.0
C.R #2 = 2.96 95.6 sec 10¢

5/15 C.R #1 = 1.12 first cut Log n = 2.0
C.R #2 = 2.96

5/17 C.R #1 = 1.12 for period Log n = 2.0 to 5.0
C.R #2 = 5.96 174 sec 6.2¢

~~C.R #1 =~~
~~C.R #2 =~~

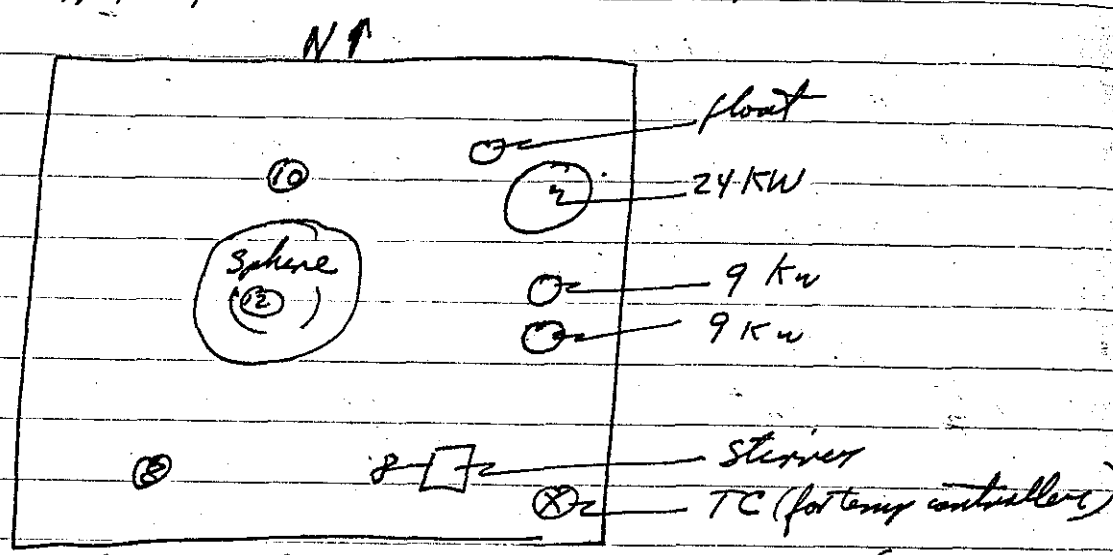
5/19 PM Shut down

CR-2 = 0.15 to 0.46 = 9.6¢
.46 .96 12.4
.96 - 1.116 8.6¢
1.46 2.46 10.0
2.46 5.96 = 6.2
46.8¢

Rd 2 all In = Rd 1 at 10.01" (0.15") starting cut in 31¢
77.8¢

11-26-58 Set up for Mixing tanks

10[40] A 8, 10, 12, 24°C 24+18 Kw Htrs on —



Htrs set to operate only if water is at 50.6" (42" above center cyl in sphere)

10[45] temp demand 100°F

11[04] #8 = 26°C #10, 12 26.5°C

11[12] #8 = 27.5° #10, 28.0° #12 28.0 C

11[15] demand set back to 90°F

11[21] control - operated 8 - 10 - 12 29°C

Expr. 31-1 Time 8:30 AM ~~PM~~ Date 11-28 1958
Purpose temp coeff of 75R
Personnel: RKR DLC

9:37 Water Temp (mixer on) Water Ht = 131.5 Cm.
K-3 = 22.25°C .865 mv.
Brown = #8 = 25.25°C #10 = 25.25°C #12 = 25.25°C

9:45 Water temp same as above.

~~9:47~~ C.R #1 = 3.15 Brown 25.25°C

9:55 C.R #2 = 2.46 K-3 = .857 mv

9:57 C.R #1 = 4.15 per period Log n = .03
C.R #2 = 2.46

10:05 CR1 = 5.15 per period Log n = .08.
CR2 2.46

10:15 CR #1 = 3.15 just quit Log n = .22
CR #2 = 2.46 Water temp = same or above.

10:16 System made sub cuit. (came in) Control rod in.
C.R #1 = .07
C.R #2 = .13

10:25 Heaters on, temp set on [redacted] 35°C.

11:15 CR #1 = 5.15 per period Log n = .03 to .13
C.R #2 = 2.46

11:25 C.R #1 = 3.78 just quit Log n = .13
C.R #2 = 2.46 Brown = 34.8°C
K-3 = 1.278 mv

over.

Log n = .12

11 40 C.R II 1 = 4.34 just exit Brown = 34.6 °C
C.R II 2 = 2.46 K-3 = 1,278

11 55 C.R II 1 = 4.78 just exit Brown = 34.6 °C
C.R II 2 = 2.46 K-3 = 1,300 mv
Log n = .11
(There has been a drift in exit positions in past half-hour.)

11 57 C.R III 1 = 5.15 Log n = .11 to
C.R II 2 = 2.46 for pressure

12 00 C.R II 1 = 07 (counts in.)
C.R II 2 = 13 (system shut down to ~~input thyratron~~ input sphere.)

12 10 demand Temp increased to 95°C.

2 20 PM remained at 45°C

2 40 PM Water Temp K-3 = 1830 mV Brown 8,10,12 = 47°C

2 54 PM C.R II 1 = 7.83 } Exit { Amp K-3 1.824 = 45.25°C
C.R II 2 = 2.46 } Room 46.5°C

3 00 PM (C R II 1 & C R II 2 one in) (counts in) sub exit. shut down,

Water dumped - (& remove air bubbles clinging to sphere)

3 20 PM Water back in & 120 cm (exhaust no storing) air bubbles not evident

3.27 C.R$^{II}_1$ = 1.60 just init. Water temp
C.R$^{II}_2$ = 2.46 K-3 = 1.750
Brown 8, 10, 12 = 23.5°C

3.35 Shut down,

Note = bubbles may be coming thru pinhole effect (

Expt. 31-2 Time 8^{30} AM TM Date 12-1 1958
Purpose Cont. temp exp - stirrer blades ~~restored to position~~ are being ~~pushed~~ pushed in by stirrer -
Personnel:

9^{10} Am Water Ht - 130.1 cm Temp - 23.5°C
9^{20} C.R$^{II}_1$ = 1.31 just init Log n: .08
C.R$^{II}_2$ = 2.46 Brown = 24.2°C.
Temp = K-3 = .853 + mv.
9^{25} Shut down to input system.
Stirrer operating - no evidence yet of ingassing
Brown = 24.0°C K-3 = .910mv (Circ bath coming to equilibrium)
9^{55} C.R$^{II}_1$ = 1.31 just init. Log n = .08 Temp Brown = 23.6
K-3 = .905 mv.
C.R$^{II}_2$ = 2.46 with Stirrer operating.
9^{56} Shut down to input system.
9^{57} All heaters on, Temp set at 45°C.
11^{13} temp = 34.9°C 6, 10, 12 // K$_3$ = 1.373$_{mv}$ = 34.5°C
11^{20} C.R$^{II}_1$ = .06 just init Temp = K$_3$ = 1.373 / 1.372
~~C.R$^{II}_2$ = 2.17~~ Log n: .08 Brown = 34.9°C
C.R$^{II}_2$ = 2.19

206.5 sec ≡ 5.4¢

11:25 C.R II 1 = 1.31 per period Log n = .07 to .22
C.R II 2 = 2.46
Temp K-3 = 1.373
Brain n = 34.9°C

11:37 C.R II 1 = .07 just cnit Log n = .22
C.R II 2 = 2.19
Temp K-3 = 1,373
Brain = 34.5°C

11:40 Shutdown - still no evidence of air bubble on reactor - draining water thru feed valve + pump - Same IN CR1 .07 / CR2 .12 } K-1 = 60 on 10 x 10" scale —

Expr. 31-3 Time 12:50 PM Date 12-1 1958
Purpose cont. Temp runs.
Personnel:

1:30 PM TC, 8, 10, 12 = 34.5°C water = 130 cm
K-3 1.373 mv

1:37 C.R II 1 = 1.31 per period 217. sec period.
C.R II 2 = 2.46

1:51 PM C.R II 1 = .07 just cnit Temp K-3 = 1,373
C.R II 2 = 2.21 Log n = .2 T.C. 8, 10, 12, = 34.5°C

1:58 Temp demand set to 45°C. K-1 = 65 10 x 10 - II
Log n = .02
Shut down, Source in.

3:15 Temp TC 8, 10, 12 = 45.2°C
K-3 = 1.822

3:17 C.R II 1 = 1.31 per period, Log n = .05 to .2
C.R II 2 = 2.46 208.5 sec.

3:27 C.R II 1 = .07 just cnit Log n = .2
C.R II 2 = 2.26 Temp 8, 10, 12 = 45.1°C
K-3 = 1.820 mv

3 $\frac{30}{PM}$ Temp demand set to 60°C

Note: from response of K-1 temp coeff - positive up to ~ 40°C + begins neg from there - at 48°C definitely negative - Visual examination of reactor - air bubble formation on metal plates - [past history of reflector water evidently makes a difference].

12-2-58

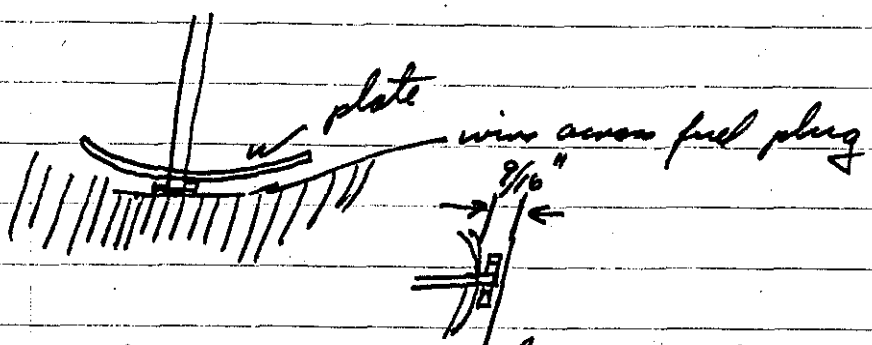
top center sectors (4) removed from T.S.R. to heat water safety - Inst. on - safety rod & connection - Starting Temp Powers 8,10,12 = 36°C
-Rod set to 65°C K-3 = 1.377

11 $\frac{30}{AM}$ temp 55°C some evidence of bubbles ~ 45°C

2 $\frac{07}{PM}$ temp 68.5°C draining back thru pump to avoid putting in air -

Expr. 31-4 Time 4^00 ~~A.M.~~ P.M. Date 12-2 1958
Purpose cont temp runs after outgassing (water ht @ 68.5°C) + drained back
CR-2 reset
Personnel: RKR DAC

CR# 2 (coated plate no-guard)



Selsyn on CR2 set & read 0.55"
appox distance of plate from fuel

4^19 Water ht = 130 cm.
4^42 K-3 = 2.4275 @ 57.7°C
4^55 C.R #1 = .07 final cnt
C.R #2 = 2.35
5^20 C.R #1 = 5.14 Log n .16 final cnt.
C.R #2 = 1.50
5^35 C.R #1 = 10.82 final cnt
C.R #2 = 0.55
5^40 Shut down,

Brown 9, 10, 12 = 58.5°C
K-3 =
Log n = .18
Log n = .15

TC #10 4 59.5°C
K3 2.456 mv

TC 4

10

Expr. 31-5 Time 8^45 AM PM Date 12-3 1958
Purpose Cut temp core, after water cooled.
Personnel: D.F.C. R.K.R.

9^05 AM Water ht = 129 Cm. Temp = 40°C
Log N = .62 K 3 = ~~65~~ on 10×10^{-11}.
9^35 AM temp Brown 41.5°C K3 = 1.700 mv
9^35 AM CR-1 .07 CR. 2 2.50 Pos. Period
9^44 C.R #1 = .07 just cut Log n = .2
C.R #2 = 1.97
9^45 C.R #1 = .07 pos period 191.2 cm 5.8% Log n = .2 Brown = 41.7°C
C.R #2 = 2.31 K-3 = 1.700

~~C.R #1~~
~~C.R #2~~

9^47 Shut down, Reset temp to control at 45°C

Expr. 31-6 Time 10^30 AM PM Date 12-3 1958
Purpose Core Temp = 48°C
Personnel: D.F.C. R.K.R.

10^35 Water ht = 129 Cm Brown = 48°C
246 cm 4.6% K-3 = 1,960
~~191.6 cm~~
10^36 C.R #1 = .07 pos period. Log n = .1 to .35
C.R #2 = 2.31
~~10~~ 10^43 C.R #1 = .07 just cut Log n .35
C.R #2 = 2.05 K-3 = 1,960
10 ~~9^44~~ Shut down, cooling off system —

1:05 PM Cold water from faucet added to system in 8" in Well water at 23°C

Expt. 31-7 Time 2 48 AM PM Date 12-3- 1958
Purpose Town Temp. 35°C
Personnel: D.F.C. R.K. Kelly.

2 48 PM Water ht = 130 Cm. Temp Brown = 35°C
K-3 = 35°C
2 59 C.R#1=.07 195.5 cm for period. Log n = .1 ~ .19 5.7¢
C.R#2=2.78
2 59 C.R#1=.07 78.2 for period Log n = .19 to .6 1.16¢
C.R#2=3.50
3 07 C.R#1=.07 just quit Log n = .6
C.R#2=2.33
3 10 C.R#1=07 Log n = .6
C.R#2=3.50 quit
Note Softey from 17.20 to 14.74
3 12 C.R#1=07 228.5 for period. Logn .6 to 1 4.8¢
C.R#2=4.50
Softey from 17.20 to 19.74
3 17 C.R#1=07 just quit Log n = 1
C.R#2=4.50
Softey from 17.20 to 14.00
3 25 C.R#1=07 1520 cm for period. Log n = .1 <1¢
C.R#2=6.50 Brown n = 35°C
K-3 = 1.915
Softey from 17.20 to 14.00

3 29 C.R.#1 = 0.7 — 1850 sec — Log n .15 to < 1 ¢
C.R.#2 = 8.50 — post period
Softy from 17.20 to 14.00

3 36 C.R.#1 = 4.83 — just exit — Log n = .12
C.R.#2 = 1.50
[redacted] Softy is out = 17.20

3 37 C.R.#1 = 4.83 — 46.8 sec — Log n = .12 to .5 — 17 ¢
C.R.#2 = 2.33 — post period
Softy = 17.20

3 42 C.R.#1 = 7.81 — just exit — Log n = .7
C.R.#2 = 1.00
Softy = 17.20

3 49 C.R.#1 = 7.81 — 54.7 sec — Log n = .7 to .5.3 ¢
C.R.#2 = 1.50 — post period
Softy = 17.21

3 47 C.R.#1 = 10.43
[redacted] C.R.#2 = 0.55 — just exit — Log n = .8
Softy 17.21

3 49 C.R.#1 = 10.43 — 43 sec — Log n = .8 to 1.8 — 18 ¢
C.R.#2 = 1.00 — post period
Softy = 17.21 — Brown = 3.5°C
K-3 = 1.415

3 50 Shut down.

Expt. 31-8 Time 10 35 AM PM Date 12-4 1958
Purpose ~~Room temp~~ Cont temp run at about 30°C
Personnel: D.F.C. R.K.R.

10 50 Water ht = 129.5 Cm temp 29.5°C
light ht added-
11 20 K3 = 1.2075 mv Brown = 29.8°C
30.50°C
11 32 C.R#1 = .08 Log n -.2
C.R#2 = 2.19 just exit. Brown
Lofty = 17.20 K-3
11 35 Brown temp = 29.9°C K-3 = 1.2075 mv
11 40 Shutdown

Expt. 31-7 Time 8 20 AM PM Date 12-5 1958
Purpose Room temp same system
Stirrer on
Personnel: RKR DFC

8 44 Water ht = 130 Cm Brown = 25°C
K-3 = 0.993
8 54 C.R#1 = 08 just exit Log n = .13
C.R#2 = 2.55
8 59 C.R#1 = 10.77 just exit Log n = .13
C.R#2 = 0.54
9 00 C.R#1 = 13.03 Log n .13 to .5
C.R#2 = 0.54 Pen period 58.6 Sec period. 11.54
Lofty = 17.19
9 01 C.R#1 = 13.03 just exit Log n = .5
C.R#2 = 0.54
Lofty = 14.25

9^09 C.R #1 = 11.02 — 34.7 sec period
C.R #2 = 0.54 per period — 24
Lofley = 14.25
9^10 Shut down.
Replaced stirring assembly on Well—

Expr. 31-10 — 10^00 AM — Date 12-5 1958
Purpose Removed C.R #2 plate. Tightened set screw & washers.
Personnel: R.K.R. D.L.C.

10^17 Water ht = 129.3 cm. Brown = 29.8°C
K-3 = 0.985

10^25 C.R #1 = 13.53 — Log n = .013
C.R #2 = 0.54 (just rad.) just emit
Lofley = -.32
10^33 C.R #1 = .075
C.R #2 = 0.54 just emit Log n = .04
Lofley = 13.50
10^35 C.R #1 = .075 — 14/10 sec
C.R #2 = 8.50 per period Log n = .04 to
Lofley = 13.50 — Brown = 29.8°C
K-3 = 0.985
10^40 C.R #1 = .075
C.R #2 = 8.50 just emit Log n .051
Lofley = 13.30
10^45 C.R #1 = .075 — 43.4 sec — 7.74
C.R #2 = 8.50 per period Log n .051 to .55
Lofley = 17.21
10^46 Shut down

Expr. 32-1 Time 3 AM PM Date 12-19 1956
Purpose Repeat of temp exp on on TSR
Personnel:

Water pre-heated to 65°C and dumped (degassing)
Center sections of TSR out during heating — .51
Replaced C#-2 contact on bottom of 0.55 on #4 rod

3:32 PM Water at 130 cm
temp — Brown = 60.75°C
K-3 = 2.505 mv = 60.75°C

3:45 C.R #1 = .07 just crit Log n = .1
C.R #2 = 2.16
3:52 C.R #1 = 5.14 (See Expr 31-4)
C.R #2 = 1.39 just crit Log n = .15

4:07 PM C.R #1 = 10.37 temp #4+10 59.9°C
C.R #2 = 0.50 K_3 = 2.471
4:15 Shutdown by dumping

Expr. 32-2 Time 8:30 AM Date 12-10 1958
Purpose cont temps run
Personnel: D.J.C. R.K.R.

8[42] Water hit = 129.5 Cm.
9[10] CR-1 .075 CR2 1.81 Crit. log N = 0.15
temp K-3 1.647 mv Brown 40.8°C
9[24] C.R#1 = 8.86 just crit Log n = .2
C.R#2 = .55
9[23] Shut down.

9[50] Water dumped + pumped back = 39.8°C very little cooling
9[52] Draining back thru pumps —

Expr. 32-3 Time 10[30] AM Date 12-10 1958
Purpose Dry Ice put in open end tube to cool system
Personnel:

11[30] Water at 80cm rubber cooling
temp = 37½°C
1[34] PM Water hit = 129.5 Cm. Temp Brown 39°C
K-3 = 1.368 mv.
1.[45] CR#1 = .08 just crit Log n = .2
C.R#2 = 1.95
33.9°C
1[50] #1 = 9.60 Crit log N = 0.2 temp = 1.368 mv
#2 0.55

1[55] temp demand set at 35°C

2[00] K-3 = 1.400 mv = 35°C Room = 35°C

2[02] PM CRH1 = 9.53 #2 0.55 Temp = 35°C

3[00] PM Decided on 100# pound from cafeteria & dumped in tanks - temp of 75 cm water = 32°C

Expr. 32-4 Time 10[35] AM PM Date 12-11 1958
Purpose run after cooling all night temp = 25°
Personnel: RKR DHC

10[50] AM Water ht = 129.5 Cm. Temp Room = 27°C K-3 = 1.054

11[07] CR#1 = 9.85
C.R#2 = 0.55 just exit. Log n = .2
note: 9.85[#1] slightly sym w 1500m 9.80[#1] slightly sub-

11[32] C.R#1 = .08 just exit log n = .2
C.R#2 = 2.03

11[33] Shut down.

~~Expr.~~ Expr. 32-5 Time 1[55] PM Date 12-11 1958
Purpose Temp Run.
Personnel: D.J.C.R.K.R.

1[55] PM Water ht = 129.5 Temp Room = 26.5°C
K-3 1.030

2 PM #1 10.78 #2 0.55 pos. period 200. sec period.

2 00 To 2 09 C.R. #1 = 9.83 Sub crit.
C.R #2 = 0.55

2 09 To 2 12 C.R #1 = 9.85 Sub Crit
C.R #2 = 0.55

2 12 To 2 13 C.R #1 = 9.91 just crit Log n = .14
C.R #2 = 0.55

2 19 C.R #1 = .08 just crit Log n = .16
C.R #2 = 2.05 Room temp = 26.8°C K-3 = 1.031/mv

2 20 Shut down.

Expr. 32-6 Time 2 00 PM Date 12-11 1958
Purpose Temp Runs.
Personnel: D.S.C. R.K.R.

2 00 PM Water ht = 129.5. Temp Demand set for 30°C.

3 10 C.R #1 = 10.78
C.R #2 = 0.55 pos period.

3 15 C.R #1 = 9.81 just crit 31°C Room K_3 = 1.228
C.R #2 = 0.55 Log n = .2

3 24 C.R #1 = .08 just crit Log n = .2
C.R #2 = 2.05 Room Temp = 31.2°C
K-3 = 1.230

3 30 P.M. Shut down.

256

Expr. 33-1 Time 9:20 AM ~~PM~~ Date 12-15- 1958
Purpose Temp Runs.
(after changing water and water pumps)
Personnel: D.J.C. R.K. Reedy.

9:35 AM water 130 cm K-3 = .0510 Brown = 14°C
K-1 = 48 cm ~~mho~~ x10 x10⁻¹¹ Log N = .015⁻

9:41 C.R ~~II~~ 1 = 13.50 Log n = .03 ~~to~~ .16
C.R II 2 = 0.55 for period 80.36 cm 11.4 ¢ 5.614/m

9:50 C.R II 1 = 11.47 just quit Log n = .16 2.03
C.R II 2 = 0.55 K-3 = .0510
Brown = 14°C

9:51 C.R II 1 = 11.47 for period Log n = .16 ~~to~~ .5
C.R II 2 = .88 91.224 cm 10.4 ¢

10:00 AM. C.R II 1 = 9.53 just quit Log n = .5 1.94 5.137¢/m
C.R II 2 = .88

10:04 shut down. (Set temp demand to 65°C)

12:35 PM copious bubbles in tank (on metal surfaces) temp = 36°C
3:48 PM Brown temp 65°C K-3 = 2.665

N

Expr. 33-2 Time 4^10 AM PM Date 12-15 1958
Purpose Temp Runs after heating water to 65°C + holding for 1 hr (trying to do yes-
Personnel:

4 30 PM Still some fine air bubbles on reactor surface—

4 30 C.R #1 = 13.51 per period 9.2 sec Brown = 64.9°C
C.R #2 = 0.55 10.44 K-3 = 2.667

4 34 C.R #1 = 11.64 just exit Log n = .18
C.R #2 = 0.55

4 36 C.R #1 = 13.50 per period Log n = .18 to .5
C.R #2 = 0.55 K-3 = 2.667
Brown = 65.5°C

4 38 Shut down

4 45 Trying to drop temp about 10°C

5 20 Still air bubble at 55°C so water dumped + pumped back to scavenge reactor surface

5 30 C.R #1 = 13.50 per period Log n = .1 to .4
C.R #2 = 0.55 23.9 sec
25.4 ℓ

5 35 CR #1 = 9.28 } Cut Log N = 0.4 K-3 2.128
CR #2 0.55 } Brown 52.3°C

5 37 C.R #1 = 11.64 per period Log n = .4 to 1.2
C.R #2 = 0.55 56.5 sec
14.9 ℓ

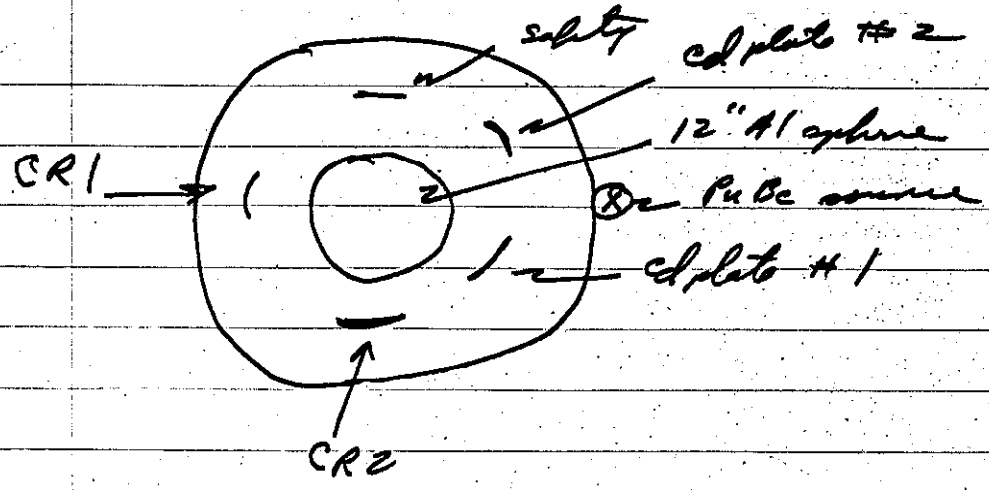
5 39 Shut down

Note 6 00 temp 47.5°C K-1 sealed while temp dropped (at 78 cm 10 x 10")
K-3 = 4.930

6 05 C.R #1 = 11.64 per period Log n .1 to
C.R #2 = 0.55 50 sec

6[12] C.R #1 = 9.05 just crit Log n = .5
C.R #2 = 0.55
6[17] Shut down. (Heat-exchanger on.)
6[55] Brown = 40°c K-3 = 1.610
6[58] C.R #1 = 11.65 for period Log n = .05 to .18
C.R #2 = 0.55 45.6 cc = 17 ℓ
7[05] C.R #1 = 8.97 just crit Log n = .18
C.R #2 = 0.55
7[06] Shut down (Heat-exchanger on)
7[32] K-3 = 1.430 Brown = 35.5°c
7[36] C.R. #1 = 11.65 for period Log n .02 to .15
C.R #2 = 0.55
7[40] C.R #1 = 9.05 just crit. Log n = .15
C.R #2 = 0.55
7[46] Shut down (Heat-exchanger on)
8[27] K-3 = 1.165 Brown = 30°c
8[29] C.R #1 = 11.47 for period Log n = .05
C.R #2 = 0.55 ~~78.3 cc~~ 11.6 ℓ
8[36] C.R #1 = 9.36 just crit Log n = .18
C.R #2 = 0.55
8[37] Shut down (Heat-exchanger on)
9[25] temp 25.2°C K-3 0.975 mV
9[25] CR-1 11.46 for period 100 cc
CR-2 0.55 log N .05 to 9.6 ℓ
9[31] C.R #1 = 9.74 just crit Log n = .2
C.R #2 = 0.55
9[32] Shut down.

12-18-58 N



Setup similar to Exp 25-3 (11-14-58)

CR-1 = .08 to
CR-2 = -.02 & 16.05
Safety = 17.20 (out)

cd plates fuel clear down
fuel slot + rest on table

all Cd plates in same peripheral ring —
+ at least 1 fuel segment apart —
Upper section - 2 1/16" spacing from lower section center —
Ball is centered

Expr. 34-1 Time 11 45 AM Date 12-18 1958
Purpose Set above - plus runs with styrofoam patch on bottom of sphere this time is zero runs - and patch —
Personnel:

12 35 PM Water ht = 129.5 cm Temp Room = 23°C
K-3 = 0.871
Extension (no heat)
Log N = 0.17

12 47 C.R #1 = 9.98 just exit
C.R #2 = 16.05

12 54 C.R #1 = 9.924 just exit Log N. 15 Temp = Room = 23°C
K-3 = 0.871
C.R #2 = 16.05

12 57 Stirrer off — 1 min — then On no change —

Expr. 34-2 Time 3⁵⁵ ~~AM~~ PM Date 12-18 1958
Purpose Stroufoam pellets 2" thick on bottom of Al sphere = volume = 1,360 cm³
in 1 cm pack filed
Personnel:

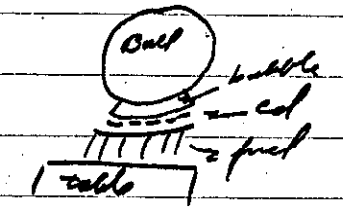
9²²/PM Water ht = 123.5 Cm Temp Brown = 23°
C.R #1 5.07" K-3 = 0.871
C.R #2 = 16.05" Critical at Log N = 0.16

4 3⁵⁵ 5⁴⁵ CR-1 6.07 pro point Log N = 0.16 to 1.3
4 #2 16.05
4 5⁴⁵ CR-1 6.07 crit Log N = 1.3
CR-2 14.45
4⁵⁵ CR-1 7.50 pro point Log N 1.3 to 1.9
CR-2 - 14.45
5⁰⁵/ CR-1 - 7.50 crit Log N = 1.9
CR-2 12.39
5⁰⁵ temp K-3 = 0.871 MV Brown = 25°C
CR-1 8.66 pro point Log N = .2 to 1.7
CR-2 12.39
5¹⁵ CR-1 8.66 level Log N = 1.7
CR2 10.75
CR-1 9.94 pro. point Log N 0.2 — 1.8
CR-2 10.75
5²⁵/PM CR-1 9.94 level Log N 1.8
CR-2 8.90

CR-1	CR-2	Keithley log N prime	Keithley log N ¢	LCRM prime	LCRM ¢
5.07	16.05	—	—		
6.07	16.05	134.6 cm	7.7	134.6 cm	7.6 ¢
6.07	14.45	—	—		
7.50	14.45	78.2	11.6	80.3	11.3
7.50	12.39	—	—		
8.66	12.39	93.4	10.3	97.7	9.8
8.66	10.75	—	—		
9.84	10.75	82.5	11.4	80.3	11.3
9.84	8.90	—	—		40.0 ¢

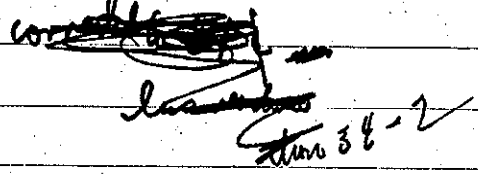
Bubble worth = 41.0 ¢

Expr. 34-3 Time 9[15]/A Date 12-19 1958
Purpose Cd plate on outer surface of styrofoam
Personnel:



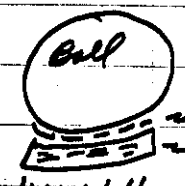
Cd is 8½" diam plate - folded & fit sphere radius -
wgt Cd = 222.5 grams - 0.0476" thick.

9[45]/A 123 cm water 22.5°C
CR-1 15.04 prompt Log N = .07 @ 1.53 cm 8.8 ¢
CR2 16.05
40[00] CR1 - ~~15.82~~ 13.77 crit. Log N = .07 n 20 ¢ less than 34-A1
CR2 - 16.05 n 60 ¢ less than 34-2



Personnel:
Purpose
Expr. Time AM PM Date 19

Expr. 34-4 Time 10[45] AM PM Date 12-19 1978
Purpose Sol plate moved to surface of sol
Personnel: RKR DHC



11[05] # 123cm water 22.5°C K·3 = .87/mv

11[07] #1 13.77 pos. period log N .05 to 0.20
#2 16.05

11[15] #1 11.47 } Crit log N = 0.20
#2 16.05

11[16] #1 12.76 } pos. period log N .20 to 2.0
#2 16.05

11[20] #1 9.95 } neg. period log N 2.0 to
#2 16.05

	#1			
	period ¢		p. ¢	
				(CRM
13.77	39.2	18.8	34.7	20.4
12.76	80.2	11.5	86.88	10.8
9.95	130	15.5	130	15.5
		19¢		

log pos. period plate = 19¢ diff between outer face & inner face

neg period plate on inside & ns plate = 15.5¢

pos " plate on outside & ns plate = 60¢

plate motion measured = 19¢

Expr. 34-5 Time 8:30 AM PM Date 12-22-1958
Purpose Styrofoam removed - Cd plate at surface of sphere
Personnel: DJC. RKR.

9:15 Water ht = 129.5 cm Temp Bmann = 21.9°C
K-3 = 0.820
9:22 CR-1 13.77 per pencil 139.9 cm
CR-2 16.05 7.7 f
9:35 CR-1 12.85 / 11.97 } Critical log N 0.2
CR-2 16.05
9:39 Shut down.

Expr. 34-6 Time 9:50 AM PM Date 12-22 195
Purpose Cd plate dropped to rest on bare-shroud
Personnel:

10:15 water ht = 125 cm Temp Bmann = 21.9°C
K-3 = 0.845
10:23 C.R # 1 = 16.59
C.R # 2 = 16.05 sub crit.

Expr. 34-7 Time 10:30 AM PM Date 12-22 1958
Purpose N.E Cd plate removed
Personnel: DJC. RKR.

11:07 Water ht = 123 cm. Temp Bmann = 21.9°C
K-3 = 0.845
11:20 C.R # 1 = 7.20 first Crit
C.R # 2 = 16.05 log = 2.05

11:25 Shut down.

Expr. 34-3 Time 11:30 AM PM Date 12-22 1958
Purpose Control clade melting on Lyse.
Personnel: D.Z.C. R.K.R.

11:55 Water ht = 123 cm Temp Bromm = 22°C
K-3 = 0.845.
12:06 C.R II 1 = 8.55 just cnil
C.R II 2 = 16.05 Log n = .05
12:07 Shut down. Diff between Cd plate and
Control ~~Clade~~ Clay is 11.4

Expr. 35-1 Time 8:30 AM PM Date 12-24 1958
Purpose Thymfoam on M1 ball all chromo
to sphere compare w 34-2
Cd plate in same position 2 plate
Personnel:

8:55 Water ht = 123 cm Temp = 22.6°C
9:07 C.R. II 1 = 2.85 just cnil Log n = .09
C.R. II 2 = 16.05
9:14 C.R II 1 = 5.07 just cnil Log n = .14
C.R II 2 = 13.00
16.5 ¢ more than Expr 34-2.
9:15 C.R II 1 = 5.07 per period.
C.R II 2 = 16.05 52.2 in 16 ¢

1-5-59

Cd plate moved into contact with fuel—
6 gms Cd removed (slots) to make room
for bugs - styrofoam in place - on bottom of Al. sphere —

Expr. 35-2 Time 1.05 AM PM Date 1-5-59 1959
Purpose Cd plate in contact with fuel, styrofoam in place, on bottom of al sphere
Personnel: D.F.C. R.K.R

3.34 Water ht = 123 cm Temp = 23.2°C
3.49 C.R□1 = 13.49 just exit Log n = .14
C.R□2 = 16.05
3.50 Shut down.

Expr. 35-3 Time 1.30 AM PM Date 1-6 1959
Purpose Same Cd plate moved into contact with sphere - styrofoam between fuel & sphere - in contact with fuel
Personnel: DK RKR

1.58 Water ht = 123.5 cm Temp = 23.2°C
2.05 C.R□1 = 11.31 for period.
C.R□2 = 16.05 91.2 cm 10.4 ¢
2.12 C.R□1 = 10.17 just exit Log n = .17
C.R□2 = 16.05
2.19 C.R□1 = 11.31 just exit Log n = .16
C.R□2 = 13.97 Log n = .16 to .6
2.22 C.R□1 = 12.54 for period.
C.R□2 = 13.97 89 cm 10.6 ¢
over.

2 27 C.R ☐ 1 = 12.54 first exit Log n = .6
C.R ☐ 2 = 12.15
2 28 C.R ☐ 1 = 13.49 for period Log n = .6 to 2
C.R ☐ 2 = 12.15 130.5 mc - 7.9 q
2 29 C.R ☐ 1 = 13.99 first exit Log n = 2
C.R ☐ 2 = 10.85
on dumping water - all inst worn - safety dropped
2 ☐ Water back at 123 mc - Source in
Safety withdrawn - & report Exit Condx
on draining water - inst up - because of
removal of shielding -

Effect of moving Cd from fuel to Cell thro sphere

10.4
10.6
7.9
= 28.9 q

Expr. 36-1 Time 11 45 AM PM Date 1-7 1959
Purpose Al bell (12" dia) in water 3 3/16" spacing between upper & lower section - Cd plates on No 1 and No 2 in same position as in Expr no 34-1.
Personnel: D.F.C. R.K.R.

11 45 AM Water ht = 123 cm Temp = 23.2°C
11 52 C.R II 1 = 17.16 sub crit.
C.R II 2 = 16.05
1 20 PM Cd plate No 2 removed. (See Expr no 34-1)

Expr. 36-2 Time 1 40 AM PM Date 1-7 1959
Purpose Same as Expr 36-1. Bare with Cd plate No 2 removed.
Personnel: D.F.C. R.K.R.

1 40 PM Water ht = 123 cm Temp = 23.2°C
2 06 C.R. II 1 = 9.75 just crit Log n = .14
C.R II 2 = 16.05

Expr. 37-1 Time 3 42 AM PM Date 1-7 1959
Purpose Water between 12" Al sphere and fuel replaced by styrofoam - 3 3/16" spacing - Cd plate No 2 replaced.
Personnel: D.F.C. R.K.R.

3 42 PM C.R II 1 = 08 Water ht = 87.5 Log n = 02
C.R II 2 = 01 just crit.

Expr. 37-2 3 50 Date 1-7 1959
Purpose Same as 37-1, but with 2 more Cd plates added. 1 in S.W corner and 1 in N.W. corner.
Personnel: D.F.C. R.K.R.

4 05 C.R II 1 = 08
C.R II 2 = 01 Water ht = 93.8 Log n = 018
just crit.

Expr. 37-3 Time 1 35 AM PM Date 1-8 1959
Purpose More Cd strips added - total of 6 fixed strips now in T 5R
Personnel: RRR DK

2 17 PM water ht = 100.2 cm · Temp = 23°c
C.R ¤ 1 and C.R ¤ 2 [redacted] in. just exit.
Safety = 17.21
2 25 water ht = 104. cm
C.R = 1 and C.R ¤ 2 in just exit.
Safety in.

Expr. 37-4 Time 3 30 AM PM Date 1-8 1959
Purpose 3 strips of Cd only added from Cd sheath all slots but Safety filled = 9 fixed plates
Personnel: RKC DK

9 00 water ht = 123 cm Temp. 23°c
4 16 C.R ¤ 1 = 17.16 just exit Log n = .06
C.R ¤ 2 = 4.89

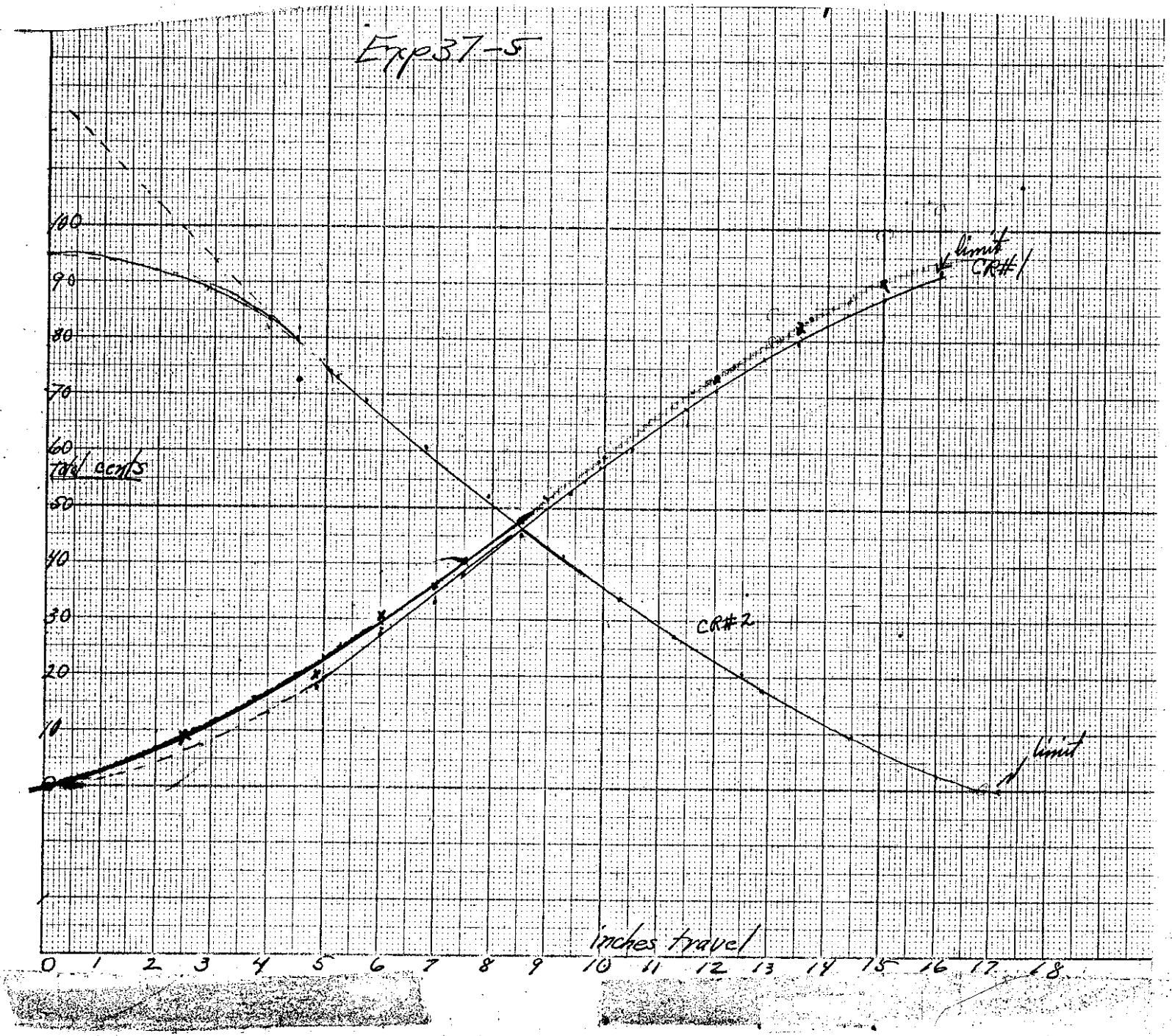
Expr. 37-5 Time 9:05 AM Pil Date 1-9 1959
Purpose Rpt 37-4 & calibrate Rod
Personnel: D&C. RKR.

9:05 Water ht = 123.4 Cms Temp = 22.5°C
9:13 C.R #1 = 17.16 for period Log n = .02 to 07
C.R #2 = 6.00
9:20 C.R #1 = 17.16 just quit Log n = .07
C.R #2 = 9.50
9:24 C.R #1 = 14.52 just quit Log n = .08
C.R #2 = 6.00
9:25 C.R #1 = 14.52 for period Log n = .08 to .23
C.R #2 = 7.50
9:30 C.R #1 = 12.98 just quit Log n = .24
C.R #2 = 7.50
9:31 C.R #1 = 12.98 for period Log n = .24 to
C.R #2 = 8.50
9:40 C.R #1 = 11.33 just quit Log n = .7
C.R #2 = 8.50
9:42 C.R #1 = 11.33 for period Log n = .7 to 2.5
C.R #2 = 9.91
9:50 C.R #1 = 10.36 just quit Log n = 2.5
C.R #2 = 9.91
10:00 C.R #1 = 10.36 for period Log n = .13 to .8
C.R #2 = 10.50
10:06 C.R #1 = 9.31 just quit Log n = .8
C.R #2 = 10.50
10:07 C.R #1 = 9.31 for period Log n = .8 to
C.R #2 = 12.01

10^{12} C.R #1 = 7.95 Log n = 2
C.R #2 = 12.01 just exit
10^{22} C.R #1 = 7.95 po period Log n = .15 to .6
C.R #2 = 13.51
10^{27} C.R #1 = 6.78 just exit Log n = .6
C.R #2 = 13.51
10^{29} C.R #1 = 6.78 po period Log n = .6 to 1.8
C.R #2 = 15.03
10^{38} C.R #1 = 5.75 just exit Log n = 1.8
C.R #2 = 15.03
10^{43} C.R #1 = 5.75 po period Log n. 2 to
C.R #2 = 16.05
10^{50} C.R #1 = 5.21 just exit Log n = 2
C.R #2 = 16.05
10^{52} C.R #1 = .08 neg period
C.R #2 16.05
water temp = 22.5
11^{02} C.R #1 = 17.16 po period
C.R #2 = 7.00
11^{06} C.R #1 = 17.16 just exit Log n = 1.9
C.R #2 = 9.85
11^{07} C.R #1 = 17.17 neg period
C.R #2 = 0.0

Note: water gap of 1 7/16" on diameter between styrofoam sections -

Note - OD styrofoam w ball = 18.35"
OD " wout ball = 17.25"
OD of ball = 12.~~17~~25" 1.10" diff


Exp 37-5
100
90
80
70
60
50
40
30
20
10
0
Total cents
limit
CR#1
CR#2
limit
inches travel
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

	II 1	II 2		
	0	17.16	6.00	95.7 mm 9.8 ¢
		17.16	8.50	∞
	9.8 ¢	14.52	6.00	∞
		14.52	7.50	91.2 mm 10.4 ¢
	20.2	12.48	7.50	∞
		12.48	8.50	145.5 mm 7.2
	27.4	11.33	8.50	∞
		11.33	9.41	165.3 mm 6.5
	33.9	10.36	9.41	∞
		10.36	10.50	137. mm 7.6
	41.5	9.31	10.50	∞
		9.31	12.01	100 mm 10.6
	52.1	7.95	12.01	∞
	60.9	7.95	13.51	113 mm 8.8
	↘	6.78	13.51	∞
		6.78	15.03	128 mm 8.0
	68.9	5.75	15.03	∞
		5.75	16.05	260 mm 4.4
	73.3	5.21	16.05	∞
		0.08	16.05	−84.8
		17.16	7.00	56.5 mm 15.2
		17.17	4.90	∞
		17.17	0.0	−121.8 mm 17.8 ¢
	Est worth		73.3	¢
			20.0	±5 ¢

38-1

Expr. ~~38-5~~ Time 10 AM ~~PM~~ Date 1-~~12~~13 1959
Purpose Similar to 37-4-5
~~Stryofoam hemisphere rings fit closely~~ ~~to #1 core~~ 9 lined plates of Cd in reentrant
Personnel: D.F.C. R.K.R.

11^00a 102.5 cm Crit Rd #1 in 0.07 log N = .02
Rd #2 in 10.0

temp = 21.5°C

11^12 113.2 cm Crit log N = .02
all Rds in including safety
in 7 cm of water more needed for
infinite reflector — in 10 ¢ more —
12 rds in = 90¢ each = $0.8
From #38-5 at 113.2 cm = 5¢ ~~[illegible]~~ & flooded
at 107.5 cm = 1.1$ flooded
Excess reactivity = $0

Expr. 38-2 Time 1^15 ~~AM~~ PM Date 1-13 1959
Purpose Two styrofoam hemispheres 7.5" O.D. and
12" O.D. (Water void) 9 lined plates of Cd in.
Personnel: D.F.C. R.K.R.

1^40 Water Rt = 123.5 cm temp = 22°C
1^42 C.R = 1 = 17.18 sub crit.
C.R = 2 = 16.05

Expr. 38-3 Time 1 50 AM PM Date 1-13 1959
Purpose same as 38-2 but with only 5 cl fixed plates in.
Personnel: D.F.C. R.K.R.

2 13 100 cm water crit dy n = .011
#1 Rd at .05 #2 at 0.0
9.9.8 cm = one crit

Expr. 38-4 Time 2 20 AM PM Date 1-13 1959
Purpose same as 38-2, but with 7 cl fixed plate in.
Personnel: D.F.C. R.K.R.

2 41 PM. water ht = 123 cm temp = 22°c
2 53 C.R ⌀1 = 17.16 just crit Log n = .02
C.R ⌀2 = 5.09 7 plates vs 12 plate =
5 plates = 4.65
plus .05
4.70 less nearly

Expr. 38-5 2 55 PM. Date 1-13 1959
Purpose same as 38-2, but with 6½ cl fixed plate in.
Personnel: D.F.C. R.K.R.

3 10 water ht = 123 cm temp = 22°c
3 19 C.R. ⌀1 = .08 per period Log n = .008 to
C.R ⌀2 = 16.03 192 sec. 5.7¢
3 25 C.R ⌀1 = .08 just crit Log n = 02
C.R ⌀2 = 14.25
3 26 C.R ⌀1 = 2.53 per period Log n = .02
C.R ⌀2 = 14.25 115 sec 9¢
3 31 C.R ⌀1 = 2.53 just crit Log n = .14
C.R ⌀2 = 12.19
3. 33 C.R ⌀1 = 4.89 per period Log n = .14
C.R ⌀2 = 12.19 78.1 sec 11.6¢

over.

3 37/ C.R #1 = 4.89 just exit Log n = .5
C.R #2 = 9.65

3 40 C.R #1 = 11.95 just exit Log n = .5
C.R #2 = 00

3 45 C.R #1 = 9.14 just exit Log n = .4
C.R #2 = 4.50

3 47 Water drained to 113.3 Cm = n 5 ¢
C.R #1 = 9.14 just exit Log n = .4
C.R #2 = 5.00

3 52 Water drained to 102.5 Cm
C.R #1 = 16.01 just exit Log n = .08
C.R #2 = 16.05 = n 1.14 ¢

Expr. 39-1 Time 9^00 AM ~~PM~~ Date 1-14 1959
Purpose 17½" Styrofoam ball in reactor
9 fuel Cd plates in fuel slots
Personnel: DSE RWR

9^40 95.1 cm water at 27.5°C
Crit log N = .01 all Rdgs in group safety —
from previous exp = need 4 more fuel plates to
flood system —

94.8 cm water Sub Critical —

Expr. 40-1 Time 10^40 AM ~~PM~~ Date 1-15 1959
Purpose 2½" styrofoam with Al ball
covered with 40 mil Cd — 9 fuel Cd plates
in slots
Personnel: DSE JWB CB

Water Temp = 23 °C # 1.044
H_2O Ht. = 123 cm
~~Too~~ # 1 control rod = 17.17
2 " " = 16.05
Log N = .001 Sub. crit.

Expr. 40-2 Time 11^15 AM ~~PM~~ Date 1-15 1959
Purpose Same as 40-1 work only
1 fuel plate in reactor
Personnel: DSE JWB CB

11^30 92.5 cm Crit — #1 .08
#2 .00 Log N = .01

Expr. 40-3 Time 11:30 AM Date 11/5 1959

Purpose Same as 40-1 except 6 fixed Cd plates in reactor

Personnel: Cronin, Gilley

Rod #1 = 6.34

Rod #2 = 16.03

H_2O ht. = 123.5 cm

Log N = .02. Crit.

B 3.98 poison more than Ex 34-1

2-3-59

16.5" Al ball covered with boron plates in TSR — spacing between upper & lower shells = 3 3/16" (uniform circular cavity of 17.5" —)
No fixed Cd blades inserted —

Expr. 41-1 Time 2 ~~PM~~ AM PM Date 2-3 1959
Purpose See above —
Personnel: RKR DFC

3 25 PM Water Ht 45" temp 22.5°C

3 27 #1 Rod 16.74 } out
#2 " 16.03 } out Sub Crit ~~Crit~~ not

log N = .006
T-1 = 40 on 3×10^{-11}

Expr. 41-2 Time 10 00 ~~AM~~ PM Date 2-2- 1959
Purpose ~~Con~~ One half of boron plate removed from top section of Al ~~above~~
Personnel: D.F.C. R.K.R.
3/4 of boron on

10 23 AM Water ht = 45" temp = 22.5 °C
10 29 AM C.R. #1 = 16.71 just crit log n = .03
C.R. #2 = 11.8 T-1 = 65 on 10×10^{-11}

Expr. 41-3 Time 12 ~~PM~~ AM PM Date 2-4 1959
Purpose Cont Bonnet clad exp - 1/2 boron in alternate segments removed 2 - Cd plates inserted
Personnel: RKR DFC

1 $\frac{08}{PM}$ water lvl = 45" Temp 21.5°C
1 $\frac{18}{PM}$ C.R II-1 = 16.76 just crit: Keff 1.03
C.R II-2 = 12.20 K-1 = 5-8 on 10 x 10⁻¹¹

Expr. 41-4 Time 2 ~~PM~~ AM PM Date 2-4 1959
Purpose all bond removed from 16.5" sphere - total of 6" fuel plus 3 Cd plates in
Personnel: RKR DFC

Expr. 41-4 Time 3 ~~PM~~ AM PM Date 2-4 1959
Purpose all bond removed from 16.5" sphere - total of 6" fuel plate in.
Personnel: RKR DFC

3 $\frac{06}{PM}$ Water lvl = 33.2"
all C.R.'s in just crit.

Expr. 41-5 Time 3 ~~PM~~ AM PM Date 2-4 1959
Purpose all bond removed from 16.5" sphere - total of 9 fuel plates in
Personnel: RKR DFC

3 $\frac{32}{PM}$ Water lvl = 45.1" Temp = 22.5°C
3 $\frac{37}{PM}$ C.R II-1 = 16.80 just crit Keff = .005
C.R II-2 = 4.25

Expr. 42-1 Time ____ AM PM Date 2-5 1959
Purpose 16.5" Al ball with 1/2" styrofoam around it - 9 fuel blades in
Personnel: ____

Temp. 22.3 °C (#'s 4 & 10)
Water ht. = 45.03"

#1 Rod	#2 Rod	Safety
.07	0.0	run in from 16.60" to 12.80

Log N .015 Crit

Check water drain time:
Drain for 1 min. Height decreased from 45.03 to 43.66

START-UP CHECK LIST
Equipment Checked by DK Personnel Check by ____
Instrument and Safety Checked and Reset by ____
"Sourced Up" Checked by ____ Source No. M-43
Emergency Equipment and Control Room Checked by ____
Red Light ON by DK
Start-Up OK'd by DK Time 950 AM PM Date 2-6 1959

Expr. 41-6 Time 950 AM PM Date 2-6 1959
Purpose 1/4 of bored plate on spruce - 9 fuel blades
Personnel: LBH DK Lig

Water Ht = 45" Temp = 22.5°C
10 15 AM C.R #1 = 16.85 Log n = .001
C.R #2 = 16.05 Sub Crit

Expr. 41-7 Time 10 30 AM ~~PM~~ Date 2-6 1959
Purpose 1/4 load plates on sphere 6 liquid bladders.
Personnel: RKR DFC LDC

11 15 AM Water ht = 95" Temp = 22.5°C
11 30 AM C.R #1 = 16.83 just cmit. Tag n = .025
C.R #2 = 12.70

Expr. 43 Time 3 55 ~~AM~~ PM Date 2-6 1959
Purpose 1/4" styrofoam around ball with load plates on ball - large gaps (vertical) is styrofoam cover 6 bladders in
Personnel: RKR LDC DFC

2 17 PM Water ht 52" Temp = 22.5°C
2 21 PM. C.R #1 = 16.85 sub cmit.
C.R #2 = 16.05

Expr. 43-2 Time 2 21 ~~AM~~ PM Date 2-6 1959
Purpose Same as above. Expn 43. but with 2 liquid bladders in
Personnel: DFC LDC RKR

2 45 PM Water ht = 45" Temp = 22.5°C
2 47 PM C.R #1 = 16.72 sub cmit.
C.R #2 = 16.05

Expr. 43-3 Time 2[50] AM PM Date 2-6 1959
Purpose All fired plate removed
Same as Expr 43.
Personnel:

3[20] Water ht = 45" Temp = 22.5°C
2[23] C.R.#1 = 16.84 Sub Crit Log n = .003
C.R.#2 = 16.03

START-UP CHECK LIST
Equipment Checked by D.J.C. RKR Check by R.K.R
Instrument
Source
Emergency No. M-43
Red Light
Start-Up Operator RKR 1[00] PM Date 2-9 1959

Expr. 43-4 Time 1[00] AM PM Date 2-9 1959
Purpose 1/4" aluminum around bolt with 1/4 total bonal removed. All of above all fired plate removed
Personnel D.J.C. R.K.R
total of 5 bonal plate removed.

1[17] PM Water ht = 45" Temp 22.5°C
1[21] PM C.R.#1 = 16.83 Log n = .006
C.R.#2 = 16.05 Sub Crit.

Expr. 43-5 Time 1[55] AM PM Date 2-9 1959
Purpose Same as Expr 43-4, but with 1 bonal plate removed from bottom of above total of 6 bonal plates removed.
Personnel D.J.C. R.K.R

2.[30] PM Water ht = 45" Temp = 22.5°C
2.[35] PM C R #1 = 16.85 Sub Crit Log n = .012
C R #2 = 16.05

START-UP CHECK LIST

Equipment Checked by DJC Personnel Check by [illegible]

Instrument and Safeties Checked and Reset by DJC

"Source In" Checked by DJC Source No. M-43

Emergency Equipment in Control Room Checked by DJC

Red Light On by _____

Start-Up OK'd by _____ Time _____ AM PM Date _____ 195_

Expr. 43-6 Time _____ AM PM Date 2-10 1959

Purpose Total of 7 bond plates removed 5 by 2 bottom of Sphere,

Personnel: Cronin, Gilley

Temp = 22.5 °C 4 + 10 thermocouples

	Rod 1	Rod 2	H_2O	Log N	
4 $\frac{20}{PM}$	16.83	16.01	45"	.028 .035	sub. crit

START-UP CHECK LIST

Equipment Checked by RKR Personnel Check by RKR

Instrument and Safeties Checked and Reset by DJC

"Source In" Checked by RKR Source No. M-43

Emergency Equipment in Control Room Checked by DJC

Red Light On by RKR

Start-Up OK'd by DJC RKR Time 9 20 AM PM Date 2-11 1959

Expr. 43-7 Time 9 20 AM PM Date 2-11 1959

Purpose Total of 8 bond plates removed. 5 from top - 3 from bottom.

Personnel: D.J.C. R.K.R. F.D.C.

9 $\frac{49}{AM}$ water = 45" Temp = 22.5° C

9 $\frac{59}{AM}$ C.R #1 = 16.82 Log n = .025

C.R #2 = 9.50 just crit.

Expr. 44-1 Time 11 AM PM Date 2-11 1959
Purpose Scissor & Exp 41-
8 boron plates off Al ball (5 Exp - 3 bottom)
no styrofoam 3 1/16" spacing bitumen segments
Personnel: RKR DFC

note 4 fixed cd plates in

$11\frac{29}{AM}$ Water ht = 45.1" Temp = 22.5°C
$11\frac{31}{AM}$ C.R II 1 = 16.83 Log n = 0.018
C.R II 2 = 16.02 Sub Crit.

Expr. 44-2 Time 12 33 AM PM Date 2-11 1959
Purpose Same as above, but with
only 2 fixed Cd plate in.
Personnel: D.F.C. R.K.R. I.D.C.

$12\frac{59}{PM}$ Water ht = 45" Temp = 22.5°C
$1.\frac{09}{PM}$ C.R II 1 = 16.83 Log n = .006
C.R II 2 = 16.02 Sub Crit.

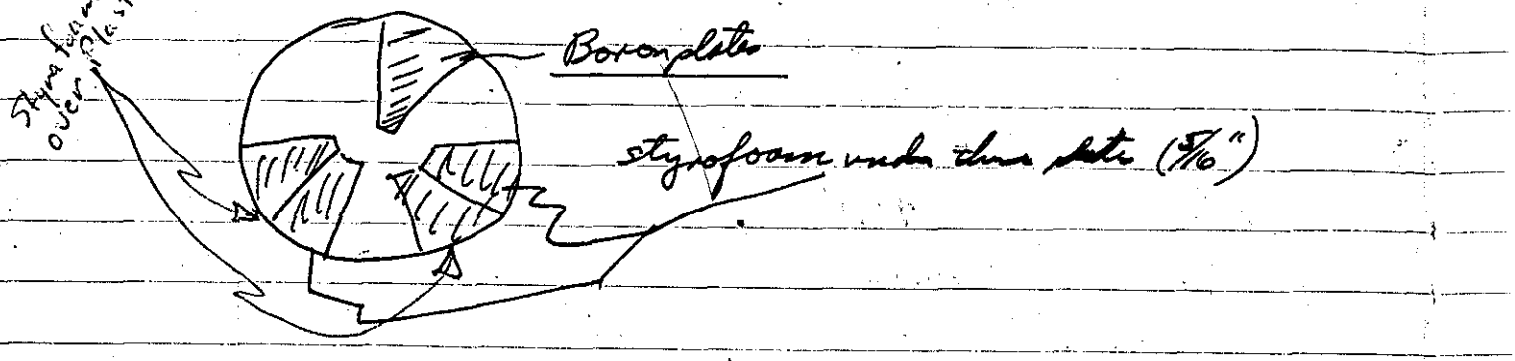
Expr. 44-3 $1\frac{17}{PM}$ Date 2-11 1959
Purpose Same as above, but with
out any fixed Cd plate in
Personnel: D.F.C. R.K.R. I.D.C.

$1.\frac{31}{PM}$ Water ht = 45.9" Temp = 22.5°C
$1.\frac{35}{PM}$ C.R II 1 = 12.20 just crit Log n = .02
C.R II 2 = 0.0 (in)

Expr. 44-4 Time 2 AM PM Date 2-11 1959
Purpose 5 plates off ball 2 top + 3 bottom
essentially 1/4 total boron (3 1/16" spacing are 41-2
Personnel: D.F.C. R.K.R. I.D.C.

$20\frac{5}{PM}$ 44.9" water 23°C
#1 Rod = 16.81 #2 Rod 16.03
Barely Sub Crit with source Out
Reg point = 400 cc

2-13-59



Expr. 45-1 Time 1⁰⁰ ~~AM~~ PM Date 2-13 1959
Purpose overlap effect of boron plate
½ Total boron on ball
2 fuel plates in
Personnel: JWS DJC

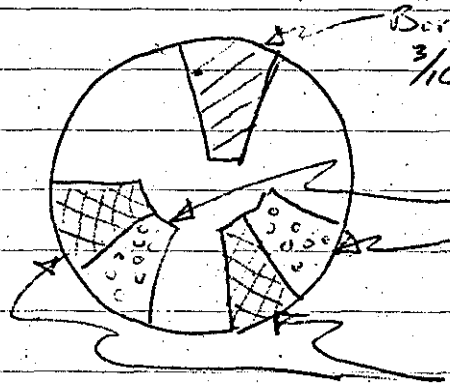
1⁴⁰ 45.05" water 23°C
CR#1 = 16.82
CR#2 = ~~16.7~~ 16.03
} Log N = .007 Sub Crit.

Expr. 45-2 Time 2⁴⁰ ~~AM~~ PM Date 2-13 1959
Purpose same - no fuel plates
Personnel: D.J.C RKR.f.

2 $\frac{26}{PM}$ Water lvl = 46.9" Temp = 23°C
2 $\frac{29}{PM}$ C.R#1 = 4.~~68~~ 53 first crit Log N = .03
C.R#2 = 0.0

Expr. _____ Time _____ AM PM Date _____ 195_
Purpose
Personnel:

Expr. 45-3 Time 3 37 AM PM Date 2-13 1957
Purpose Three one 4 fingers (slides) in ½ hole on both sides have been removed, see sketch below.
Personnel: D.F.C. R.K.R.

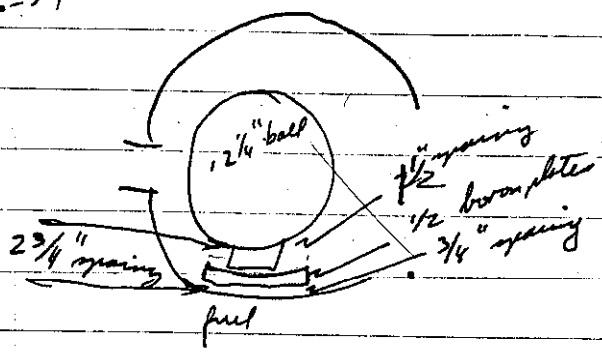


3 55/PM Water ht = 45" Temp = 23°C
C.R #1 = 16.82
C.R #2 = 16.03
Sub. Crit.

Expr. 45-4 Time 4 01 AM PM Date 2-13 1957
Purpose Same as above except 2 Fixed cd blades
Personnel: D.F.C.

4 20/PM Water ht = 45" Temp = 23°C
CR #1 = 14.39, just Crit Log n = .015
CR #2 = 0.0

2-16-59

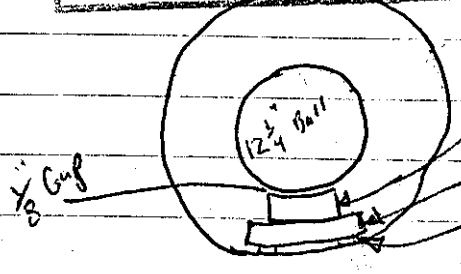


Expr. 46-1 Time 2 PM Date 2-16 1959
Purpose Boron plastic as poison in 12¼" ball to compare with Ed slug
Personnel: JRT, JH, DK

2.5-7 PM Water lvl = 45" Temp = 23°C
3.0-4 PM C.R #1 = 16.80 first crit Log n = .013
C.R #2 = 12.45

Expr. Time AM PM Date 195
Purpose
Personnel:

Expr. 46-2 Time 10:30 AM PM Date 2-17 1959
Purpose see sketch
Personnel: JH DK



#1 16.82 23.3°C 42" water

#2 ~~8.78~~ 8.49

Log N = .016

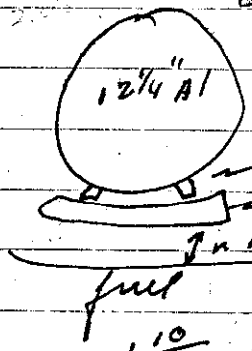
n 25¢ more reactivity than 46-1

11 10/A Shut down -

Expr. 46-3 Time 1 PM Date 2-17 1959

Purpose see sketch

Personnel: RKR Dfe



41.6" water Water temp = 22.5°C

1. 10/PM C.R II 1 = 16.82 Log n = .02

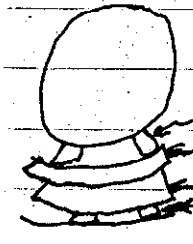
C.R II 2 = 0.25

n 50¢ more reactivity than 46-2

Expr. 46-4 Time 9:15 ~~AM~~ Date 2-18 1959

Purpose see sketch

Personnel: O.J.C. RKR



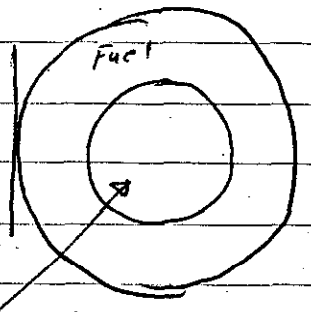
Water bt = Temp = 23°C

9 34/AM 45.1"

9 39/AM C.R II 1 = 16.82 just crit

C.R II 2 = 6.12 Log n = 022

Expr. 46-5 Time 10:40 AM PM Date 2-18 19 9
Purpose See sketch
Personnel: D4C, L Hellens



BSR-II Boron 10 Steel Rod
This Region Same 46-4

Water Temp. 23.2°C
CR #1 16.85
CR #2 9.15
This is approximately 25¢ less critical than 46-4

Expr. 46-6 Time AM PM Date 195
Purpose Same as 46-5 with Cd plate same size as B10 rod in same location
Personnel:

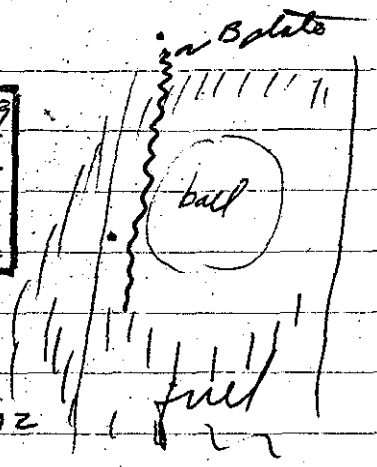
Water Temp. 23.0°C
CR #1 16.82 } Crit Log N = .02
CR #2 8.90 } water = 44.7"

Expr. 46-7 Time 9 AM PM Date 2-18 195 9
Purpose see below
Personnel: Lary D4C

water = 44.7"
22.5°C

Same as 46-4 except 50 g. Boron Plate 2½" wide. Inserted 6" in top central element.
4:30 P CR1 = 16.85 Critical Log N = .015
CR2 = 9.77 n 27¢ poison

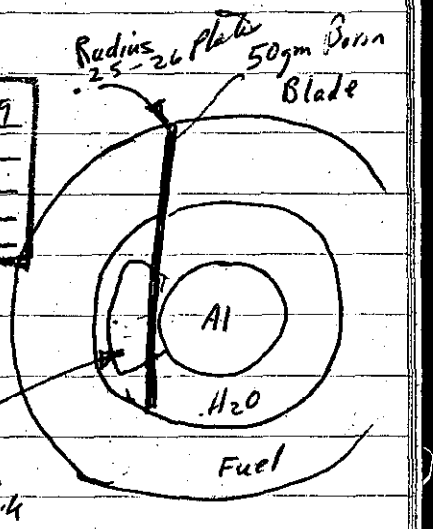
Expr. 46-8 Time ____ AM PM Date 2-19 1959
Purpose B-C plate inserted thru center fuel to top of fuel plate
Personnel: LH DSC



Water Temp. 22.7°C Level. 42
CR. #1 - 16.85" } Log N at .02
CR #2 - 13.8" }
n 55# poison

Expr. 47-1 Time 11:37 AM PM Date 20 Feb 1959
Purpose
Personnel:

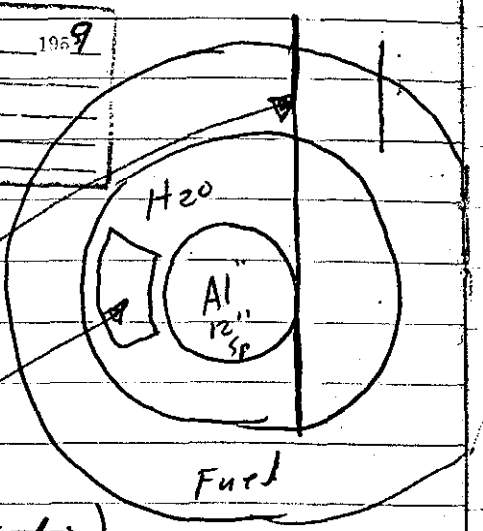
added fixed Cd blade.



Water Temp 22.3°C
Water Height 44.8 in

Both rods out - subcritical
Removed fixed blade.
CR #1 16.83" out
CR #2 3.00"

Expr. 47-2 Time 12:46 AM ~~PM~~ Date 26 Feb 1959
Purpose
Personnel:



Water Height 42.0 ends.
CR #1 12.25"
CR #2 - 0
Log N .016
Diff between 47-1 & 47-2
23¢ (47-2 more reactive)

Boron plate
50 gm.
2" Styrofoam

Person
Between Plates 28-29

Expr. 47-3 Time 11:40 AM ~~PM~~ Date 24 Feb 1959
Purpose
Personnel: LH DJC

Water Temp. 22.8°C
Level - 43.5"
CR #1 16.83"
CR #2 5.20"
Source Out

} Log Nat .02

Boron
Two Plates Between
25 & 26
Arrangement as Above.

Expr. 47-4 Time 12:22 ~~AM~~ PM Date 24 Feb 1959
Purpose Same as 47-3 except one boron plate removed.
Personnel:

Water: Level 43.3" Temp 22.8°C
CR #1 12.70" } Source Out
CR #2 0.0 } Log N

Expr. 47-5 Time 12:39 ~~AM~~ PM Date 24 Feb. 1959
Purpose Same as 47-3 except removed both boron plates and added 1 cd blade
Personnel:

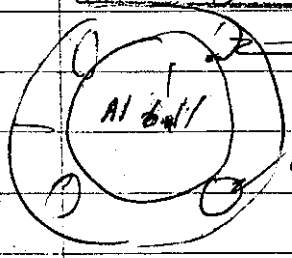
Water Level 43.5" Temp 22.8°C
CR #1 Out - 16.83" } Source Out
CR #2 8.10" } Log N .02

Expr. 47-6 Time 4:00 ~~AM~~ PM Date 2-24 1959
Purpose ~~Repeat of~~ 47-5 Except Cd Blade has been removed.
Personnel:

Water Level 43.3 Temp.
C.R #1 4.78" } Log N .02
CR #2 0.0 "

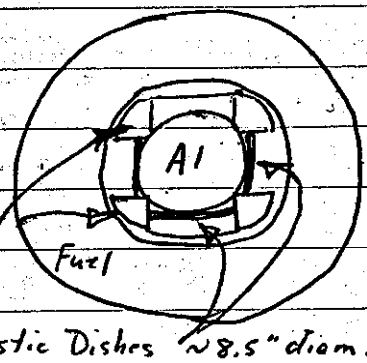
7.5
12.25
5.25
2.67
2.42

Expr. 48-B Time 4 AM PM Date 2-25 1959
Purpose
Personnel: JRT DFC LW



Water Height 43.8" Temp. 22.7°C
Rod #1 10.0" } Source Out N $3.15 excess
Rod #2 0.0" } Log N at .02

Expr. 48-2 Time 11:30 AM PM Date 26 Feb 1959
Purpose ~~1 fixed Cd plate~~
Personnel: DFC, L.W.N



See page 294

Water Temp. 22.8°C
Level 43.7" Five Boron Plastic Dishes ~8.5" diam.
Sub crit Log N more = .005
12:11P Removed One Fixed Cd. Blade
Rod #1 Out } Source Out
Rod #2 9.5" } Log N .02

Plates Worth ~$1.85 or 1.35%

93
~$1.30 excess
1.30

Expr. 48-3 Time 12.30 AM PM Date Feb 26 1959
Purpose Same as 48-2 except both Cd plates removed. - Calibration Point.
Personnel:

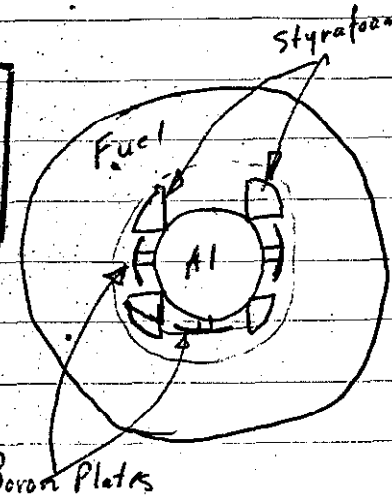
See Report 93

3.15
1.49
1.66 Plate Worth
1.2%

Shows Excess 93 1.49
1.09%

Water Level 43.7" Temp 22.8°C
CR #1 7.4
CR #2 All In 0.0" } Source Out
Log N - .02

Expr. 48-3A Time 4:11 ~~AM~~ PM Date 26 Feb. 1959
Purpose Moved Boron Plates 48-3 1-3/4" closer to fuel - No fixed Cd.
Personnel: DFC LBH



Water Level 43.7" Temp. 22.8°C
CR #1 Out.
CR #2 12.90"

Expr. 48-4 Time 11:36 ~~AM~~ PM Date 27 Feb. 1959
Purpose Same as Above 48-3 except spacing from alum. ball is 13/16"
Personnel: DFC L.B.H

Safety Out. Source In.
Water Temp 23°C Level 43.7"
CR #1 Out } Source Out
CR #2 4.2" } Log N .02

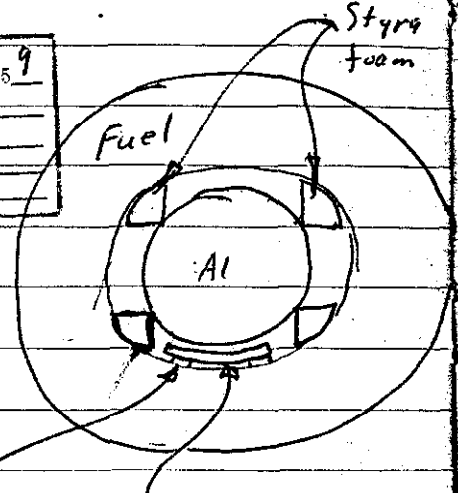
Expr. 48-5 Time 4:10 ~~AM~~ PM Date 27 Feb. 1959
Purpose Removed All But Bottom Boron Plate from 48-4. Inserted 2 Fixed Cd Blades.
Personnel: DFC. LBH

Saftey Out. Source In.
Water Level 43.8" Temperature 23.0°C
CR #1 16.82"
CR #2 2.0"

See Page 296 Repeat

Expr. 49-1 Time 11:43 AM PM Date 2 Mar. 1959
Purpose ~~one~~ Fixed Cd Blades
Personnel: DFC LBH

Water Level 123 cm. ; Temp. 23.1°C
CR#1 16.83" Out } Source Out
CR#2 2.25" } Log N .02



See New Book 5062 Exp 51-1

Expr. 49-2 Time 3:55 AM PM Date 2 Mar. 1959
Purpose Moved Boral; Spacing to Fuel 13/16"
Otherwise Same as 49-1
Personnel: DFC LBH

Water Level 123 cm. Temp 23°C
CR#1 16.25 } Source Out
CR#2 0.0" } Log N .02

Expr. 49-3 Time 4:40 AM PM Date 2 Mar. 1959
Purpose Moved Boral; Spacing to Fuel 13/16"
Otherwise Same as 49-1
Personnel: DFC L.B.H.

Water Level 123 cm. Temp. 23°C
#1 10.70 } Source Out
#2 0.0 } Log N = .02

See Page 50

See Page

See Page 2

See 50-1 Page 296

Expr. 48-6 Time 5:10 PM Date 2 Mar. 1959
Purpose See Run 48-5 - ~~2 Cd Plate~~ Boral ¼" From Fuel One Cd. Blade
Personnel: DFC LBH

Water Level 123 cm Temp 23°C
#1 14.1" } Source Out
#2 0.0 } Log N. .02

Expr. 48-7 Time 5:55 PM Date 2 Mar 1959
Purpose Same as 48-6 - Except Added 2" Styrafoam Behind Boral.
Personnel: DFC LBH.

Water Level 123 cm.
Water Temp 23°C
#1 16.2 } Source Out
#2 0.0 } Log N.

See Page 292

Expr. 48-2 Time 11:30 AM PM Date 3 Mar. 1959
Purpose Repeat Run
Personnel: DFC LBH

Water Level 123 cm Temp. 23.2°C
CR #1 16.86" out } Source Out
CR #2 13.24 } Log N .02

See Page 292

Expr. 48-3 Time 12:00 AM PM Date 3 Mar. 1959
Purpose Repeat Run
Personnel: DFC LBH

Water Level
Water Temp.
CR #1 11.02 | #1 0.0
CR #2 0.0 | #2 10.61

See Page 294

Expr. 49H Time 4:15 AM PM Date 3 Mar 1959
Purpose Repeat
Personnel: DFC LBH

Water Level 123 cm. Temp. 23.2°C

CR #1	16.83	Source Out	CR #1	10.5
CR #2	1.00	Log N .02	CR #2	9.3

Expr. 49-4 Time 4:55 AM PM Date 3 Mar 1959
Purpose Same as 49-1 But with 1 3/8" thick Styrafoam behind boron plastic
Personnel:

Water Level 123 cm. Temp. 23.2°C

CR #1	14.38"	Source Out	CR #1	10.5
CR #2	0.0 "	Log N .02	CR #2	6.5

See 48-6 ?

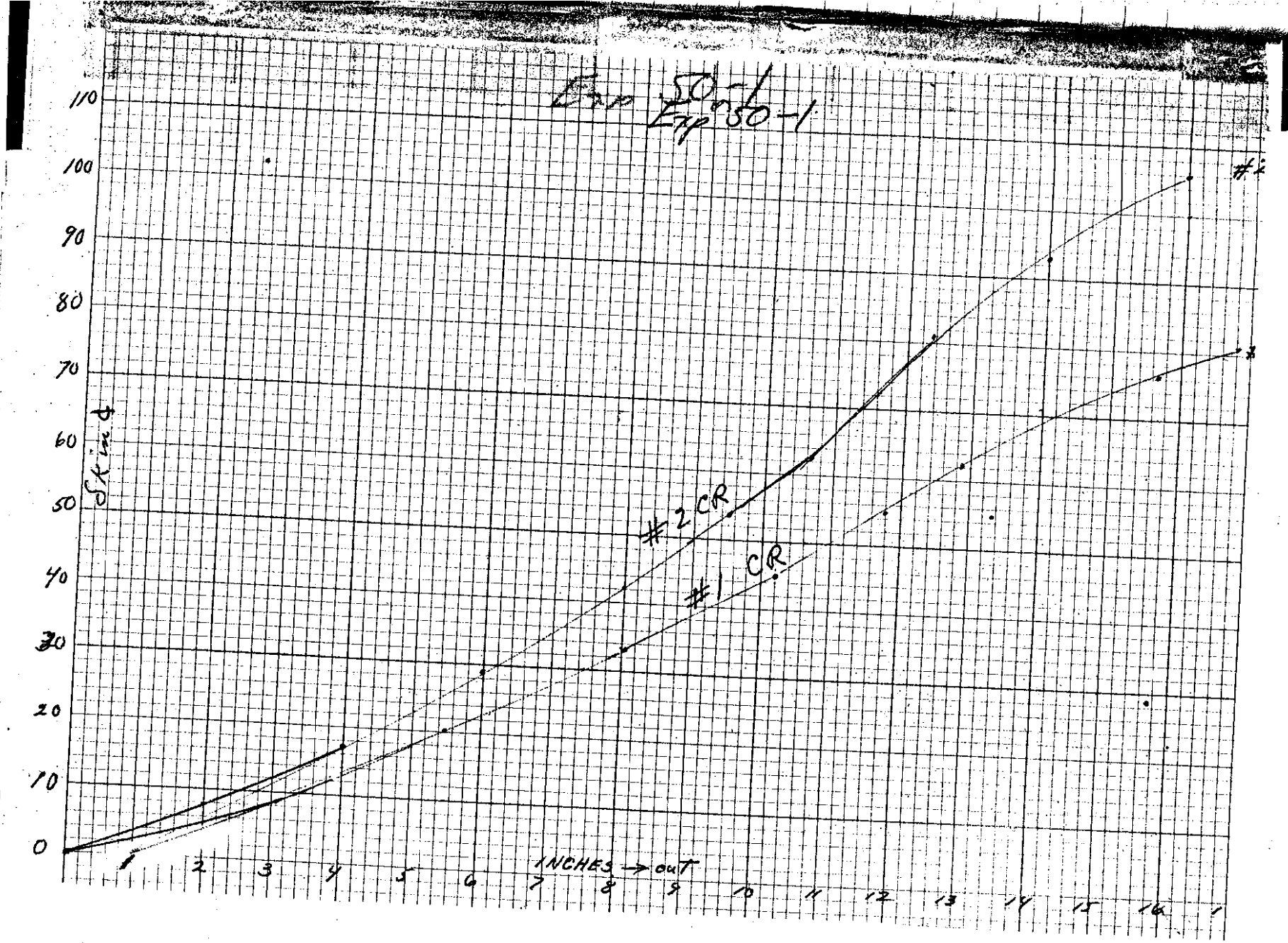
Expr. 50-1 Time 4:25 AM PM Date 4 Mar. 1959
Purpose Also duplicates 48-6
Rod Calibration
Personnel: DFC. LBH

Water Level 123 cm. Temp.

CR #1	11.78	Source Out	Fixed Blade 180° From CR #1
CR #2	0.0	Log N 0.2	

Put Fixed Blade 30° C.C. From Safety Removed Blade 180° from CR

CR #1	12.85	Source Out.
CR #2	0.0	


110
100
90
80
70
60
50
40
30
20
10
0
SKIN
#2 CR
#1 CR
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
INCHES → out

Exp 50-1

Exp 50-1

#1	#2	Safety	P	d	#2	#1	d	
11.78	0.0	16.60	∞	0				
12.85	0.0	16.60	60.9	1.4		0.06	0	
15.70	0.0	13.20	∞	C		3.10	8.4	
16.83	0.0	13.20	243.5	4.6		5.50	11.7	20.1
12.85	0.0	16.60	∞			8.06	13.1	33.2
12.85	2.0	16.60	132.6	7.8		10.20	11.7	44.9
11.79	2.0	16.60	∞			11.79	9.5	54.4
11.79	4.0	16.60	104.4	9.5	17.3	12.85	7.8	62.2
10.20	4.0	16.60	∞			15.70	14	76.2
10.20	6.0	16.60	78.3	11.7	29.0	16.83	4.6	80.8
8.06	6.0	16.60	∞					
8.06	8.0	16.60	67.4	13.1	42.1			
5.50	8.0	16.60	∞					
5.50	9.50	16.60	78.3	11.7	53.8			
3.12	9.50	16.60	∞					
0.06	10.65	16.60	∞					
3.10	10.65	16.60	119.5	8.4	62.2			
0.06	12.35	13.20		18.6	1.5 .C 80.8			
0.06	14.00	13.20	74.0	12.4	~~93.2~~			
0.06	16.02	10.65	69.6	12.6	~~105.8~~			
					105.8			
	Safety 13.20 — 16.60 = 18.6 d							