

BOOK 6R

2826 on bottom edge

Notes:

Blank pages: inside sheet opposite of page 1, 2-10, 28, 34, 114, 117, 138-299, inside back cover

-front, back, and spine are too dark to reproduce. CA-16 is on front of book.

-pg 300 has 2 (8.5x11) sheets stapled to it

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Sheila Finch

RSICC /Oak Ridge National Lab.

July 23, 1999

10-9-21

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2. Assignee is responsible for the safeguarding of this notebook in accordance with security regulations.
3. This notebook must be returned to issuing office when completed or upon termination of assignee.
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5. Entries should be made in ink whenever it is reasonable to do so.
6. 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 entry.
7. 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.
8. 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." With stamps for this purpose are available in your department's office.
9. It is advisable to preface each new item, such as a heat treatment, process, reaction, etc., with a very brief description of the purpose, objective or result.
10. Description of the invention or discovery should be complete enough to be understood by anyone skilled in the art.
11. Reference to name or catalogue number should be made when standard items are being discussed, i.e., Westinghouse pump.
12. 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 recording of such conferences should always be entered in your notebook regardless of where they are held, giving the date, who was present (if possible), and an outline of the subjects discussed. This often will establish error in occasional reports of other parties that you have appropriated information from them by revealing an interview, and thus provide you with patent protection.

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10-9-21

NOTEBOOK NO. 2826

Assigned to: A. D. Callahan
Department: Physics
Location: 9735
Date: 1-26-53

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

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Subject
CLASSIFICATION/CANCELLED
DATE 6/3/60
For the Atomic Energy Commission
Jack H. Kahane for the
Classification Branch

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5-25-60

This document contains restricted information...
in the Atomic Energy Act of 1946...
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by an unauthorized person is prohibited.

Experimental Record Pertaining to the
First Pratt + Whitney Mockup of the
Super-Critical Water Reactor
(Pick Wick)

6/23/53

Experimental Procedure for developing an
autoradiographic technic for measuring
power distributions within fuel tubes

1/12/54

C.A. 16 Expr. P-1 Run 1
 Sheet _____ Date 1/12 1954 Time 9:30 ^{AM}
 Purpose To determine the feed & dump rates and consistency in fluid level determination

INSTRUMENT CHECK

Time Now ^{AM}/_{PM} Source _____

Channel

	A	B	C	D	E
Range	_____	_____	_____	_____	_____
Source Dist.	_____	_____	_____	_____	_____
% F.S. Trip	_____	_____	_____	_____	_____

Variation of depth readings over the bottom of the reactor tank - level indicator (low) 10.50"

Random fluid level -

	10 ¹⁵ / ₃₂	10 ¹⁵ / ₃₂
	10 ¹⁴ / ₃₂	10 ¹⁴ / ₃₂
	10 ¹⁴ / ₃₂	10 ¹⁴ / ₃₂
	10 ¹⁶ / ₃₂	
	10 ¹⁷ / ₃₂	
	10 ¹⁷ / ₃₂	
	10 ¹⁶ / ₃₂	

Aver. 10 ¹⁵/₃₂
 Mean deviation ¹/₃₂

feed adjust full open

<u>Time</u> min	<u>Level in inches by rule</u>	<u>Indicator level (low)</u>
0	0	8.744 in Base position
2.50	1.688	"
4.50	1.688	"
6.45	2.940	"
9.00	4.063	"
11.37	5.625	"
13.50	7.063	"
14.80	8.250	"
16.50	9.532	8.744
17.35	10.532	10.19
18.35	10.875	10.660
19.25	11.532	11.160
20.00	11.750	11.780
26.50	12.125	12.195
28.05	15.938	15.595 (man) float jams released by hand
29.10	16.812	16.795 (auto)
30.00	17.375	17.380
31.25	17.875	17.900
32.15	18.562	18.595
33.25	19.125	19.105
34.32	19.625	19.622
36.20	20.250	20.241 reading on wrong other jog
37.15	21.000	21.360
38.35	21.805	21.805
39.86	22.436	22.052
	23.250	23.230

41.00	23.820	23.820	← jam + released by control
43.20	25.000	24.980	
44.43	25.562	25.590	
45.35	26.062	26.070	
46.35	26.625	26.605	
47.43	27.125	27.130	
48.57	27.688	27.780	
49.57	28.188	28.224	
50.44	28.625	28.685	
51.38	29.125	29.150	
52.34	29.562	29.595	
53.15	29.960	29.990	
54.00	30.375	30.355	
54.00	30.562	30.150	manual } from above
55.00	30.562	30.090	
		30.050	automatic
		30.070	"
59.00		30.430	Automatic } from below
		30.360	"
		30.460	"
Dumping: tubes covering drain			
0.00	30.500	2.30	below bottom plate
0.30	23.125		
1.00	15.625		
1.30	8.750		
2.00	2.625		

Dump
 Acc. Rate for tank 0.233 in fall/sec.
 Area feed rate 3 gal/min

C.A. 16 Expt. P-1 Run 2
 Sheet 1/13 54 10:30 AM
 Purpose: to determine consistency of fluid level indicator - after reworking

Feed adjust full open; control, safety up; source in

Time	Level by rule	Level by float (low)
0	0	8.735 in
18.22	10.875	10.739
18.77	11.188	11.075
19.94	11.939	11.755
20.51	12.125	12.095
21.10	12.562	12.454
21.74	13.000	12.795
22.30	13.188	13.130
22.90	13.625	13.475
24.20	14.312	14.240
25.60	15.125	15.056
27.05	16.990	15.890
28.47	16.750	16.715
30.00	17.625	17.534
31.45	18.437	18.375

11:16 am ~~level reading~~ 19.937 14.750
 1:47 pm 14.750

Auto safety freeze

C.A. 16 Expt. P-1 Run 3
 Sheet Date 1/15 1954 Time 3:00 PM
 Purpose: to determine consistency of fluid level indicator

Feed adjust full open; control, safety down; source out

Measured furnace height - 11.750 ± .015"

Level indicator	11.688	11.682
	11.688	11.682
	11.690	11.675
	11.688	11.660
	11.689	11.684
	11.690	11.680
	11.680	11.685
	11.678	11.695
	11.688	11.684
	11.689	11.685
	11.687	11.695
	11.689	11.684
	11.688	11.684
	11.688	11.685
	11.688	11.675

Av. 11.685 ± .005"

Admittance factor .065" ± .020"

at approx 12" of furnace

Absolute error in height determination .020"
 Reproducibility of height 90% confid. .010"

Measured furnace height - ? 23.235
 Level indicator -

23.155	23.180
23.165	23.180
23.170	23.165
23.162	23.170
23.155	23.155
23.170	23.162
23.165	23.170
23.175	23.165
23.170	23.160
23.169	23.165
23.170	23.169
23.163	23.169
23.165	23.175
23.180	23.178
23.167	
23.170	

C.A. 16	Expr. P-2	Run 1
Sheet	Date 1/26 1954	Time 10:30 AM
Purpose Calibration of fluid level indicator - Reduce mechanical response time of pump or screen.		

Source rod in, control, safety rods not
 feed adjust wide open

Time	Level Indicator (Auto)	Measured height
13 min.	9.37	
	10.000	10.062
	10.005	10.062
	10.008	
	9.990	
	<u>10.005</u>	
	14.865	14.875
	14.900	14.875
	14.895	14.875
	14.892	
	14.898	
	14.920	
	14.888	
	14.855	
	14.870	

Level Indicator (Auto)	Measured height
19.875	19.980
19.859	
19.869	
19.881	
19.905	
<u>19.895</u>	
19.970 (man)	19.980
19.940	
19.945	
19.945	
19.945	
19.955	
<u>19.950</u>	

Level Indicator (MAN)	Measured height
9.110	M 9.156
9.125	I 9.119
9.126 9.119	diff. .037
9.115	
9.118	
<hr/>	
10.050	M 10.070
10.070	I 10.060
10.069 10.060	diff. .010
10.071	
10.040	
<hr/>	
11.152	11.180 M
11.161	11.149 I
11.140 11.149	.031 diff
11.154	
11.140	
<hr/>	
12.065	12.120 M
12.079	12.077 I
12.080 12.077	.043 diff
12.081	
12.079	
<hr/>	
13.230	13.260 M
13.239	13.237 I
13.229 13.237	.023 diff
13.240	
13.248	

<u>Level indicator (MAN)</u>	<u>Measured height</u>
14.218	14.240 M
14.232	14.215 I
14.229 14.215	.025 diff
14.200	
14.195	
15.086	15.125 M
15.095	15.082 I
15.065 15.082	.043 diff
15.080	
15.084	
16.065	16.120 M
16.065	16.061 I
16.055 16.061	.059 diff
16.050	
16.071	
17.218	17.260 M
17.219	17.233 I
17.240 17.233	.027 diff
17.240	
17.250	
18.084	18.130 M
18.105 18.088	18.088 I
18.112	.042 diff
18.050	
18.088	

<u>Level Indicator (MAN)</u>	<u>Measured height</u>
19.021	19.050 M
19.045	19.032 I
19.055 19.032	.018 diff
19.022	
19.018	
20.271	20.250 M
20.280	20.252 I
20.215 20.252	-.002 diff
20.252	
20.240	
21.000	21.050 M
21.030 21.025	21.025 I
21.045	.025 diff
21.018	
21.032	
22.170	22.180 M
22.162 22.157	22.157 I
22.145	.023 diff
22.150	
22.160	
23.105	23.125 M
23.085 23.086	23.086 I
23.075	.039 diff
23.095	
23.070	

<u>Level indicator (MAN)</u>	<u>Measured height</u>
24.195	24.188 M
24.182	24.170 I
24.145 ^{24.170}	<u>24.170</u> .018 diff
24.160	
24.170	
25.005	25.050 M
25.031	25.033 I
25.039 ^{25.033}	<u>25.033</u> .017 diff
25.050	
25.038	
26.110	26.125 M
26.105 ^{26.100}	26.100 I
26.088	<u>26.100</u> .025 diff
26.085	
26.110	
27.205	27.250 M
27.238 ^{27.217}	27.217 I
27.212	<u>27.217</u> .033 diff
27.224	
27.205	
28.095	28.135 M
28.085 ^{28.092}	28.092 I
28.090	<u>28.092</u> .043 diff
28.095	
28.095	

<u>Level Indicator (MAN)</u>	<u>Measured height</u>
29.132	29.135 M
29.105 ^{29.111}	29.111 I
29.100	<u>29.111</u> .027
29.118	
29.102	
30.085	30.130 M
30.104 ^{30.097}	30.097 I
30.079	<u>30.097</u> .033 diff
30.110	
30.105	
31.243	31.260 M
31.249 ^{31.239}	31.239 I
31.240	<u>31.239</u> .021 diff
31.235	
31.230	
32.420	32.500 M
32.435 ^{32.428}	32.428 I
32.450	<u>32.428</u> .072 diff
32.410	
32.424	

The "A" experiments have a fuel density of approximately $\frac{.505 \text{ gm } U^{235}}{\text{cm}^3 \text{ sol.}}$

CA 16 Expt. A-1 Run 1
 Sheet _____ Date 1/30 1954 Time 4:45 pm
 Purpose With specified fuel loading to determine multiplication
 Density of fuel $\frac{.505 \text{ gm } U^{235}}{\text{cm}^3 \text{ sol.}}$

Time 4:45	173	175		
	174	221		
Range	19/1000	180	9/1000	9000
Source Dist	1 1/2	0	0	To check
RS Trip	75	10	55	

Source In
 Control rod out
 Safety out
 Temp. 72 °F

EXP A-1: no SS inserts added to fuel tubes.

Previously determined $k_{eff} = 3.00$

Scaler	MULTIPLICATION	fuel height	Mult.
1	scale 16 349	11.095 in	1/M
2	115		
3			

Scaler	MULTIPLICATION	fuel height	Mult.
1	scale 64 282	11.075 in	1/M
2	721		.307
3			.387

Scaler	MULTIPLICATION	fuel height	Mult.
1	scale 64 9653	11.010 in	1/M
2	2145		.092
3			.131

Scaler	MULTIPLICATION	fuel height	Mult.
1	scale 64 13063	14.282 in	1/M
2	2823		.066
3			1.00

furpm. M.282
Safety on 30.42

Scaler	Scale	TM
1	51.44	
2	11.42	
3		

Critical at $\begin{cases} 14.990 \text{ cm} \\ 14.982 \\ 14.987 \end{cases}$
 Fuel height: 19.5 cm or 4.2 kg U₂₃₅

SECTIONAL POSITIONS

CA. 16 Exp. A-1 Run 1

Table P. 1

Card #	Value	Unit
1 Control #1 out	11.050	38 1/50
2 Safety	13.412	just off the ped (ADC)
3	5.3	5 x 10 ⁻¹²
4	50	10/100

just sat (ADC)

Time Out 6:05 PM 3 min

Fuel loadings

- A - 11
- B₂ - 26
- B₃ - 1
- B₄ - 25
- C₂ - 15
- C₃ - 34
- D₂ - 38
- D₃ - 36
- D₄ - 6
- D₅ - 3
- D₆ - 111
- E₂ - 18
- E₃ - 55
- F₃ - 28
- F₄ - 23
- F₅ - 33
- F₆ - 16
- F₇ - 12
- F₈ - 37
- F₉ - 127
- G₄ - 39
- G₅ - 40
- G₆ - 13
- G₇ - 19
- G₈ - 27

Exp. A-1

- G₉ - 7
- G₁₀ - 217
- G₁₁ - 129
- H₅ - 21
- H₆ - 29
- H₇ - 8
- H₈ - 17
- H₉ - 20
- H₁₀ - 212
- J₆ - 16
- J₇ - 30
- J₈ - 2
- J₉ - 24
- K₈ - 4
- K₉ - 5
- L₈ - 14
- L₉ - 112
- M₈ - 10
- M₉ - 64
- N₈ - 193
- P₈ - 180
- P₆ - 32
- R₆ - 35
- S₆ - 31
- S₈ - 56

Run 1

- T₆ - 241
- T₈ - 237
- T₉ - 245
- U₁₄ - 302
- U₁₅ - 280
- U₁₆ - 289

total 56 tubes
 some of which were
 $\frac{3}{4}$ & $\frac{1}{2}$

C.A. 16 Expt. A-1 Run 2
 Sheet _____ Date 2/3 1954 Time 8:50 AM
 Purpose with specified fuel loading
to determine critical height
of reflector-moderator
density of fuel approx. 1.505 gm/cm³

INSTRUMENT CHECK

Time <u>8:50</u> AM	Source <u>173, 174, 175</u> <u>221</u>				
	Channel				
Range	A	B	C	D	E
	<u>10/1000</u>	<u>ok</u>	<u>10⁻¹⁰</u>	<u>1/1000</u>	<u>9000</u>
Source Dist.	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>4"</u>
% F.S. T-90	<u>80</u>	<u>40</u>	<u>50</u>	<u>100</u>	

Source in
 control out
 safety out

temp. 75 °F
 pressure 7.31 mm.

EXP A-1: - no stainless steel inserts
 added to fuel tubes

blk

Scaler	MULTIPLICATION c/ min. BG/ min. scale 16 1/2	furfund Lt. 6 inches M
1	10 ¹²	.172
2	39 ³	.626
3	13 ⁶	.214

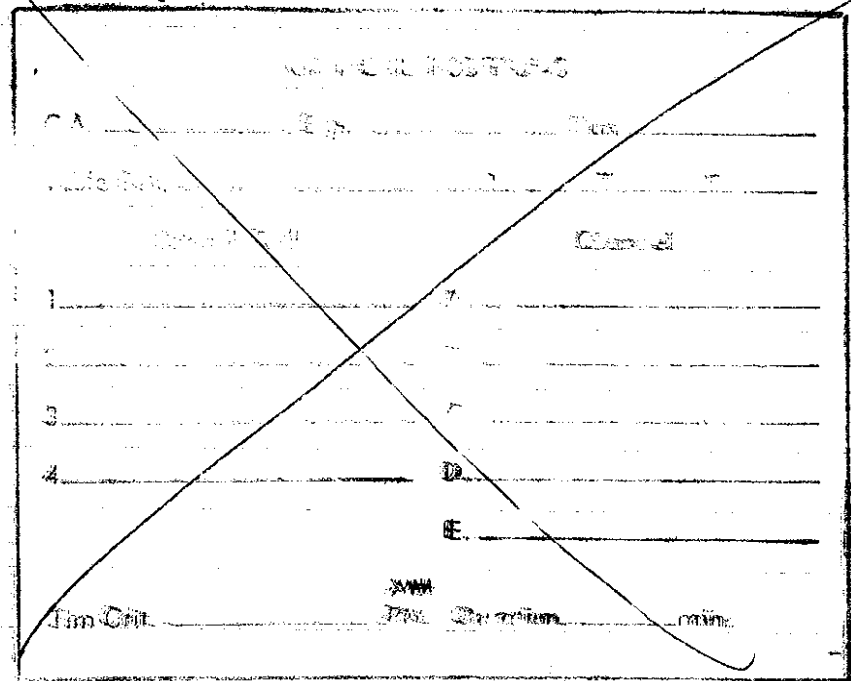
Scaler	MULTIPLICATION c/ min. BG/ min. scale 16	furfund Lt. 10,181 10,179 1/M
1	14 ⁰	.754
2	69 ⁴	.610
3	20 ³	.663

Scaler	MULTIPLICATION c/ min. BG/ min. scale 16	furfund Lt. 12,005 11,999 1/M
1	16 ²	.667
2	79 ⁹	.492
3	22 ¹¹	.589

Scaler	MULTIPLICATION c/ min. BG/ min. scale 16 scale 64	furfund Lt. 15,205 15,211 Mult. 1/M
1	27 ⁵	.394
2	37 ³⁵	.261
3	41 ¹³	.320

Scaler	MULTIPLICATION c/ min. BG/ min. scale 64	furfund Lt. 16,895 16,900 1/M
1	21 ²⁶	.123
2	129 ²⁶	.070
3	30 ³⁵	.107

Scaler	MULTIPLICATION c/ min. BG/ min.	Mult. 1/M
1		
2		
3		



CRITICAL POSITIONS		
C.A. 16	Expr. A-1	Run 2
Tube Pos.	L	T R
Control Rod	Channel	
1 Safety rod 9.53	A 21 x 10/250	
2 Control rod 11.02	B .00011	
3 17.525 } critical	C 4.5 x 5x10 ¹²	
4 17.525 } height of	D 23. x 10/500	
5 17.985 } fuel rod	E 0 900V	
Tim Crit. 10:50	AM	Duration 5 min.

fuel ht. 19.5 inches

fuel loading run 2 41 tubes total

- A-11 99-7
- B₁-28 910-217
- B₂-26 ~~911~~
- B₃-1 H₆-29
- 5 B₄-25 H₇-8
- C₁-39 30 H₈-17
- C₂-15 H₉-20
- C₃-34 H₁₀-212
- D₂-38 J₆-16
- 10 D₃-36 J₇-30
- D₄-6 35 J₈-2
- D₅-3 J₉-24
- D₆-111 K₇-21
- E₂-18 K₈-4
- 15 E₃-55 K₉-5
- F₄-23 40 L₈-14
- F₅-33 M₈-10
- F₆-9
- F₇-12
- 20 F₈-37
- F₉-127
- ~~95~~
- 95-40
- 96-13
- 97-19
- 25 98-27

C.A. 16 Expt. A-1 Run 3
 Sheet _____ Date 2/3 1957 Time 11:15 ^{AM} ~~PM~~
 Purpose with specified fuel loading
to determine critical height of
reflector moderator
 Density of fuel approx. .505 gm/cm³ ²⁵ ~~20~~

INSTRUMENT CHECK

Time 11:15 ^{AM} ~~PM~~ Source _____

	Channel				
	A	B	C	D	E
Range	<u>same as in A-1 run 2</u>				
Source Dist.	_____				
% F.S. Trip	_____				

same conditions as run # 2 with tubes 10 and 127 removed

EXP A-1: no SS inserts added to fuel tubes

same background as run 2

Scaler	c/	min.	BG/	min.	Mult.	1/M
1	total background				172	
2	counts				626	
3					214	

fuel height 15.152
15.162

Scaler	c/	min.	BG/	min.	Mult.	1/M
1	21 ⁵				.509	
2	121 ⁰				.323	
3	30 ⁹				.738	

fuel height 16.335
16.332

Scaler	c/	min.	BG/	min.	Mult.	1/M
1	7 ³⁰				.364	
2	70 ¹⁹				.243	
3	10 ²⁴				.322	

18.978
18.872
18.825

fuel height 17.962
17.950

Scaler	c/	min.	BG/	min.	Mult.	1/M
1	17 ⁵⁷				.150	
2	101 ⁵				.097	
3	24 ⁵⁹				.139	

fuel height

Scaler	c/	min.	BG/	min.	Mult.	1/M
1	scale 64					
2	scale 256					
3	scale 64					

CRITICAL POSITIONS

Run 16 Expr. A-1 Run 3

Control Rod	Channel
1 safety rod 7.22	A 30 10/200
2 control rod 18.80	B .00015
3 18.820 } critical height of fuel	C 6 x 5 x 10 ⁻¹²
4 18.825 } 18.872 18.825 18.850	D 73 10/200
	E 0 900 V

Tim Crit. 12:02 PM Duration 5 min.

fuel height 19.5 inches

fuel loading for run 3 (39 tubes total)

The fuel loading for run 3 is the same as run 2 with tubes (F₃-127) and (M₃-10) removed.

C.A. 16	Expr. A-1	Run 4
Sheet	Date 2/3 1954	Time 2:45 PM
Purpose: with specified fuel loading to determine the critical height of reflector-moderator		

Fuel density .505 gm/cm³ sol.

INSTRUMENT CHECK							
Time 2:45	AM	Source					
	PM						
		Channel	A	B	C	D	E
same as exp A-1	Range		same 2 + 3				
Source Dist.							
% F.S. Trip							

same conditions as run 3 with tube # 14 removed (38 tubes total)

temp 75°F
pressure 731 mm

EXP. A-1 - no SS inserts added to fuel tubes.

same background as run 2

MULTIPLICATION

Scaler	c/	2 min. BG/	2 min.	Mult.	1/M
1			172		1
2			626		1
3			214		1

MULTIPLICATION *fuel rod Lt. 16.150"*

MULTIPLICATION *16.155"*

Scaler	c/	2 min. BG/	2 min.	Mult.	1/M
1			409	172	.420
2			2099 563	626	.298
3			464	214	.462

MULTIPLICATION *fuel rod Lt. 17.505"*

MULTIPLICATION *17.495"*

Scaler	c/	2 min. BG/	2 min.	Mult.	1/M
1			631	172	.273
2			3020	626	.207
3			745	214	.287

MULTIPLICATION

Scaler	c/	2 min. BG/	2 min.	Mult.	1/M
1			172		1
2			626		1
3			214		1

CRITICAL POSITIONS

16 Expr. *A-1* Run *4*

	L	T	R
Control Rod			
safety rod 8.80	A	25	10/200
control rod 15.74	B	.00013	
20.038 20.050	C	6 or 5 x 70	12
20.040	D	73	10/200
20.025 19.995 20.003	E	0	1080v ← 1080v

Tim Crit. *3.40* AM
PM Duration *10* min.

20.038 19,
20.030
21.040
19.981
19.995
20.025
20.003

*fuel loading for run 4 (30 tubes)
the fuel loading for run (4) is
the same as run (3) with
tube (1-14) removed*

BA 16 Expr. A-1 Run 5
 Sheet _____ Date 2/4 19559 Time 10:07 AM
 Purpose with specific fuel loading to determine the critical height of reflector moderator.
 Fuel density .505 gm/cm³ rod.

source in control rod out safety out

INSTRUMENT CHECK

Time 10:07 AM/PM Source 173 221
174
175

	A	B	C	D	E
Range	<u>4/1000</u>	<u>072</u>	<u>10¹⁰</u>	<u>10/1000</u>	<u>1080V</u>
Source Dist.	<u>0</u>	<u>0</u>	<u>0</u>		
% S.S. Trip	<u>70</u>	<u>3.5</u>	<u>55</u>		

fuel rod height 5-3/8 inches (measured)

Scaler	c/	BG/	2 min.	Mult.	1/M
1			<u>100</u>		
2			<u>595</u>		
3			<u>252</u>		

EXP A-1 - no SS inserts added to fuel tubes

MULTIPLICATION fuel rod ht.
9.005
2.008

Scaler	c/	2 min.	BG/	2 min.	Mult.	1/M
1		<u>167</u>		<u>100</u>		<u>.6</u>
2		<u>1300</u>		<u>595</u>		<u>.458</u>
3		<u>384</u>		<u>252</u>		<u>.656</u>

MULTIPLICATION fuel rod height
10.289
10.290

Scaler	c/	2 min.	BG/	2 min.	Mult.	1/M
1		<u>221</u>		<u>100</u>		<u>.453</u>
2		<u>1797</u>		<u>595</u>		<u>.331</u>
3		<u>556</u>		<u>252</u>		<u>.453</u>

MULTIPLICATION fuel rod height
11.572
11.579

Scaler	c/	2 min.	BG/	2 min.	Mult.	1/M
1		<u>347</u>		<u>100</u>		<u>.288</u>
2		<u>3280</u>		<u>595</u>		<u>.181</u>
3		<u>842</u>		<u>252</u>		<u>.299</u>

MULTIPLICATION fuel rod height
12.523
12.516

Scaler	c/	2 min.	BG/	2 min.	Mult.	1/M
1		<u>968</u>		<u>100</u>		<u>.103</u>
2		<u>9520</u>		<u>595</u>		<u>.063</u>
3		<u>2370</u>		<u>252</u>		<u>.106</u>

CRITICAL POSITIONS

CA. _____ Expr. _____ Run _____

Table Pos. _____

Control Rod	Channel
1 _____	_____
2 _____	_____
3 _____	_____
4 _____	_____
_____	_____
_____	_____

Tim Crit. _____ AM
PM Duration _____ min.

CRITICAL POSITIONS

CA. 16 Expr. A-1 Run 5

Table Pos. _____

Control Rod	Channel
1 <u>safety 10.53</u>	<u>A 37</u> <u>1/1000</u>
2 <u>Control 18.80</u>	<u>B .00022</u>
3 <u>12.954</u> } <u>critical</u>	<u>C 6.7 x 10⁻¹¹</u>
4 <u>12.941</u> } <u>height of</u>	<u>D 54</u> <u>10/500</u>
_____ } <u>fuel</u>	<u>E 0</u> <u>1080</u>

Tim Crit. 12:40 ^{AM} PM Duration 5 min.

temp 74 °F
pressure 731 mm.

Fuel loading for run 5 (56 tubes) ^{exp. A-1}

1	A-11	F ₅ - 33	J ₅ - 227
	B ₁ - 28	F ₆ - 9	J ₆ - 16
	B ₂ - 26	F ₇ - 12	J ₇ - 30
	B ₃ - 1	F ₈ - 37	J ₈ - 2
5	B ₄ - 25	F ₉ - 38	J ₉ - 29
	C ₁ - 39	G ₄ - 120	J ₁₀ - 180
	C ₂ - 15	G ₅ - 40	K ₆ - 117
	C ₃ - 34	G ₆ - 13	K ₇ - 21
	C ₄ - 127	G ₇ - 19	K ₈ - 4
10	D ₂ - 38	G ₈ - 27	K ₉ - 5
	D ₃ - 36	G ₉ - 7	K ₁₀ - 64
	D ₄ - 6	G ₁₀ - 217	L ₈ - 14
	D ₅ - 3	G ₁₁ - 129	L ₉ - 56
	D ₆ - 111	H ₅ - 179	M ₈ - 10
15	D ₇ - 35	H ₆ - 29	M ₉ - 193
	E ₁ - 308	H ₇ - 8	N ₈ - 112
	E ₂ - 18	H ₈ - 17	
	E ₃ - 55	H ₉ - 20	
	F ₃ - 196	H ₁₀ - 212	
20	F ₄ - 23	H ₁₁ - 32	

EXP A-1: - no SS inserts added to fuel fuel tubes.

C.A. 16 Expr. A-1 Run 6
 Sheet _____ Date 2/4 19557 Time 3:15 AM/PM
 Purpose with specified fuel loading to determine the critical height of reflector-moderator
 Fuel density .505 gm U²³⁵/cm³ sol.

Instrument check: - same as run 5 source in control rod out safety out

fuel height 6 inches
MULTIPLICATION *measured with rule*

Scaler	c/ <u>2</u> min.	BG/ <u>2</u> min.	Mult.	1/M
1	201	100		.500
2	1306	595		.458 = .458
3	532	252		.474

fuel height ~~6.90~~ 6.90 inches measured with rule
MULTIPLICATION

Scaler	c/ <u>2</u> min.	BG/ <u>2</u> min.	Mult.	1/M
1	234	100		.427
2	1770	595		.336
3	600	252		.420

fuel height 7.79 inches
MULTIPLICATION *measured with rule*

Scaler	c/ <u>2</u> min.	BG/ <u>2</u> min.	Mult.	1/M
1	374	100		.267
2	2428	595		.246
3	774	252		.329

fuel height 8.74 inches
MULTIPLICATION *measured with a rule*

Scaler	c/ <u>2</u> min.	BG/ <u>2</u> min.	Mult.	1/M
1	520	100		.192
2	3940	595		.151
3	1280	252		.197

fuel height 9.503 inches
MULTIPLICATION *measured with indicator*

Scaler	c/ <u>2</u> min.	BG/ <u>2</u> min.	Mult.	1/M
1	1033	100		.0967
2	8440	595		.0705
3	2440	252		.103

furfural height 5.98 inches
MULTIPLICATION

Scaler	c/ 2 min. BG	2 min.	Mult.	1/M
1	362	233		.644
2	2200	1080		.490
3	820	514		.627

furfural height 6.57 inches
MULTIPLICATION

Scaler	c/ 2 min. BG	2 min.	Mult.	1/M
1	636	233		.367
2	3880	1080		.278
3	1340	514		.384

furfural height 7.95 inches
MULTIPLICATION

Scaler	c/ 2 min. BG	2 min.	Mult.	1/M
1	1880	233		.124
2	12260	1080		.088
3	3870	514		.133

MULTIPLICATION

Scaler	c/ 2 min. BG	2 min.	Mult.	1/M
1				
2				
3				

CRITICAL POSITIONS

C.A. 16 Expr. A-1 Run 7

Table Pos. 7

	Control Rod	Channel
1	<i>safety</i> 50.90	A 65 ¹⁰ / ₅₀
2	control 21.68	B .0002
3	21.50 cm } <i>critical</i>	C 5.5 x 10 ⁻¹¹
4	8.47 in } <i>slight of furfural</i>	D .45 ¹⁰ / ₅₀₀
		E 0 10800

Tim Crit. 3.50 ~~AM~~ PM Duration 5 min.

temp 74 °
press 734

fuel loading comes at run 6 with following tubes added (total 112)

1	H ₁₂ -49	K ₁ -162	K ₁₅ -202
	H ₁₃ -101	K ₂ -109	K ₁₆ -131
	H ₁₄ -58	K ₃ -57	L ₁ -153
	H ₁₅ -99	K ₄ -62	L ₂ -130
5	J ₁₁ -135	K ₅ -189	L ₃ -158
	J ₁₂ -97	J ₄ -119	L ₄ -106
	J ₁₃ -138	K ₁₁ -208	L ₅ -90
	J ₁₄ -92	K ₁₂ -83	L ₁₀ -65
	J ₁₅ -175	K ₁₃ -96	L₁₁-108
10	J ₁₆ -154	K ₁₄ -166	M ₂ -222
		L ₁₄ -118	M ₃ -160

CA 16 Exp. A-2 Run 1
 Sheet 2/6 Date 4/25/54 Time 9:25 AM
 Purpose To determine the critical height of system loaded as in A-1 Run 5 but with the addition of two units of S.S.-2 (.1875" x .025" wall) tube

56 - 1" fuel tubes
 Fuel density .505 gm/cm³ sol

INSTRUMENT CHECK

Time 9:05 AM Source 173 221
 11/75

Range	Channel				
	A	B	C	D	E
Y1000 OR			10 ⁻¹⁰	10 ¹⁰⁰⁰	1080
Source Dist.	1"		0	0	
% F.S. Trip	75		36	55	

Temp 79 °F
 Pressure 737 mm.

fuel height 5.3 in.
 MULTIPLICATION

Scaler	c/2 min.	BG/2 min.	Mult.	1/M
1		126		
2		538		
3		222		

fuel height 10.490
 MULTIPLICATION 10.480

Scaler	c/2 min.	BG/2 min.	Mult.	1/M
1	236	126		.534
2	1615	538		.333
3	446	222		.498

fuel height 12.045
 MULTIPLICATION 12.031

Scaler	c/2 min.	BG/2 min.	Mult.	1/M
1	322	126		.391
2	2760	538		.195
3	757	222		.299

fuel height 13.322
 MULTIPLICATION 13.328

Scaler	c/2 min.	BG/2 min.	Mult.	1/M
1	1146	126		.110
2	9910	538		.0572
3	2400	222		.0926

temp 79°
pressure 737 mm.

CRITICAL POSITIONS			
C.A.	16	Expr	A-2 Run 21
Table Pos.		I	T
Control R.d		Channel	100/50
1	safety 14.92	A	34
2	control 22.91	B	.0001E
3	13.774 } critical	C	7.4 X 5 X 10 ⁻¹²
	13.773 } light of	D	78 10/200
4	13.778 } fuelval	E	0 1080
Tim Crit.	10:30	AM	Duration 5 min.

total 56-1" fuel tubes
Fuel loading same as experiment
A-1 run 5 with 2 - 3/16" x .025" wall
small ss tubes inserts added to each
1" fuel tube. (see pg 45)

C.A.	16	Expr	A-3	Run	1
Sheet		Date	2/6 1954	Time	11:00 AM
Purpose	Same as A-2 Run 1 with the further addition of 2 (.1875 x .025" ss) tubes Fuel density .505 gm U ²³⁵ /cm ³ of				

Instructions check as per A-2 Run 1

fuelval height

Scaler	Count	min. DG	min.	Mult.	1/M
1	126				
2	538				
3	222				

Scaler	Count	min. DG	min.	Mult.	1/M
1					
2					
3					

OVER

CRITICAL POSITIONS			
C.A.	16	Expr.	A-3 Run 1
Table Pos.	_____		
	Control Rod		Channel
1	safety 17.92	A	32 10/100
2	control 22.98	B	00
3	17.855 } critical 17.862 }	C	5.5 X 2.5 X 10 ⁻¹²
4	17.861 } height of 17.868 } fuelrod	D	62 X 10/100
		E	0 1080.5
Tim Crit.	11:15 AM	Duration	3 min.

temp 74 °F
pressure 737 mm Hg.

Fuel loading same as experiment
A-1 run 5 with 4 - $\frac{3}{16}$ X .025
wall SS tubes, added to each
1" fuel tube. (see pg 45)

CRITICAL POSITIONS			
C.A.	16	Expr.	A-3 Run 2
Sheet	Date 2/6 1954		Time 11:15 AM
Purpose	To determine the critical height of the system loaded with 80-1" fuel tubes as in A-1 run 6 but each fuel tube containing (4) $\frac{3}{16}$ X .025 tube inserts.		

Fuel density .505 gm/cm³
Instrument check as per A-2 run 1
temp 74 °F pressure 737 mm Hg.

CRITICAL POSITIONS			
C.A.	16	Expr.	A-3 Run 3
Table Pos.	_____		
	Control Rod		Channel
1	safety 17.92	A	50 10/100
2	control 22.98	B	00
3	11.747 } critical 11.719 }	C	7.2 2.5 X 10 ⁻¹²
4	11.729 } height of 11.733 } fuelrod	D	90 10/100
		E	0 1080.5
Tim Crit.	12:25 PM	Duration	3 min.

fuel loading same as experiment A-1
run 6 with 4 - $\frac{3}{16}$ X .025 wall SS
tubes added to each 1" fuel tube (see pg 48)

Total of 80 - 1" - fuel tubes

Fuel density .505 gm/cm³ sol.

C.A. 16 Expt. A-3 Run 3

Sheet Date 2/6 1957 Time 1:50 ~~AM~~ ^{PM}

Purpose to determine the critical height of the system loaded with 112 - 1" fuel tubes as in exp A-1 run 7 with each fuel tube containing 4 - 3/16" x .025" wall ss tube inserts.

temp 74 °F pressure 737 mm Hg.

Instrument check same as exp. A-2 run 1

CRITICAL POSITIONS			
C.A.	16	Expt.	A-3
Run	3	Date	2/6 1957
Time	1:50	PM	
Control Rod		Channel	10/100
1 safety	14.92	A	78
2 control	22.91	B	0000
3 9.360 } critical		C	6.5 x 2.5 x 10 ⁻¹²
4 9.345 } height of		D	72 10/200
9.380 } fuel at		E	0 1080
9.370 } power			
Tim Crit.	2:10	PM	Duration 70 min.

Fuel loading same as exp. A-1 run 7 with 4 - 3/16" x .025" wall ss tubes added to each 1" fuel tube (see pg. 51) total of 112 - 1" fuel tubes

Increased power of reactor to .001 and tried holding it there by feed control alone. Control rod had no effect safety killed reactor. at power B is .0012.

CRITICAL POSITIONS			
C.A.	16	Expt.	A-3
Run	3	Date	2/6 1957
Time	2:20	PM	
Control Rod		Channel	100/200
1 safety	14.92	A	80
2 control	22.91	B	.0012
3 9.360 } critical		C	8.0 x 5 x 10 ⁻¹⁸
4 9.380 } height of		D	68 100/50
9.370 } fuel at		E	0 1080
power			
Tim Crit.	2:20	PM	Duration 10 min. at power

total 12 runs

Fuel density .505 gm/cm³ ²⁵/_{ref.}

C.A. 16 Expr. A-4 Run 1
 Sheet 6 Date 2/6 1954 Time 2:40 ^{AM}/_{PM}

Purpose to determine the critical height of the system loaded with 112-1" fuel tubes as in exp A-1 run 7 with each tube containing 8- $\frac{3}{16}$ " dia x .025 wall SS tube inserts

temp 74° F pressure 737 mm Hg
 Instrument check same as A-2 run 1
 Tube 58 has 12 inserts instead of 8 (type B)

CRITICAL POSITIONS			
<u>16</u>	Expr.	<u>A-4</u>	Run <u>1</u>
Control Rod	Channel		
<u>safety 11.83</u>	<u>A 75</u>	<u>10/100</u>	
<u>control 18.67</u>	<u>B 0</u>		
<u>10.555</u> } <u>critical height</u>	<u>C 5.0</u>	<u>2.5 x 10⁻¹²</u>	
<u>10.554</u> }	<u>D 35</u>	<u>10/200</u>	
<u>10.552</u> } <u>off fuelrod</u>	<u>E 0</u>	<u>1080</u>	
<u>10.572</u> }			
Tim Crit. <u>3:40</u>	<u>AM</u>	Duration <u>3</u>	min.

Fuel loading same as A-1 run 7 with 8- $\frac{3}{16}$ " dia x .025 wall SS inserts in each fuel tube (see pg 5) total of 112-1" fuel tubes
 Tube 58 has 12 inserts instead of 8.

Fuel density .505 gm/cm³ ²⁵/_{ref.}

C.A. 16 Expr. A-4 Run 2
 Sheet _____ Date 2/8 1954 Time 9:45 ^{AM}/_{PM}

Purpose to determine the critical height of the system loaded with 80-1" fuel tubes as in exp A-1 run 6 with each tube containing 8- $\frac{3}{16}$ " dia x .025 wall SS tube inserts

INSTRUMENT CHECK					
Time <u>9:45</u>	<u>AM</u>	Source <u>173</u>	<u>221</u>	<u>174</u>	<u>175</u>
		Channel			
Range	<u>1/1000</u>	<u>A</u>	<u>B</u>	<u>C 10-10</u>	<u>D 10</u>
Source Dist.	<u>3"</u>			<u>0</u>	<u>0</u>
% F.S. Trip	<u>75</u>			<u>30</u>	<u>50</u>

CRITICAL POSITIONS			
<u>16</u>	Expr.	<u>A-4</u>	Run <u>2</u>
Control Rod	Channel		
<u>safety 13.00</u>	<u>A 55</u>	<u>10/100</u>	
<u>control 19.79</u>	<u>C 0.0016</u>		
<u>13.120</u> } <u>critical height</u>	<u>D 7.5</u>	<u>5 x 10⁻¹²</u>	
<u>13.118</u> }	<u>E 80</u>	<u>10/200</u>	
<u>13.111</u> } <u>off fuelrod</u>	<u>F 0</u>	<u>1080</u>	
<u>13.122</u> }			
Tim Crit. <u>10:30</u>	<u>AM</u>	Duration <u>3</u>	min.

Exp A-4 run 2 cont.

temp 74 °F
pressure 737

Fuel loading same as exp A-1
run 6 (pg 48) with 8- $\frac{3}{16}$ x .025 wall
SS tube inserts in each fuel tube.
Total of 80-1" fuel tubes

total 14 runs

Fuel density .505 gm/cm³ ad.

C.A. 16	Expr. A-4	Run 3
Sheet	Date 2/8 1957	Time 1:30 PM
Purp. to determine the critical height of the system loaded with 56-1" fuel tubes as in exp. A-1 run 5 with each tube containing 8- $\frac{3}{16}$ Dia. x .025" wall SS tube inserts.		

Instrument deck same as exp A-4 run 2

CRITICAL POSITIONS			
C.A. 16	Expr. A-4	Run 3	
	Control Rod	Channel	
1	safety 8.790	A 36	10/100
2	control 15.888	B 00	
3	17.896 } critical	C 2.9	2.5 x 10 ⁻¹²
4	17.845 } height of	D 33	10/100
	17.840 } fuel fuel	E 0	10 80
	17.865 } in inches		
Tim Crit.	1:55	PM	Duration 3 min.

Fuel loadings same as exp A-1
run 5 (pg. 45) with 8- $\frac{3}{16}$ dia x .025" wall
SS tube inserts in each fuel tube.
Total of 56-1" fuel tubes

C.A. 16 Expr. A-4 Run 4
 Sheet _____ Date 2/11 1954 Time 2:00 ~~AM~~ PM
 Purpose With same conditions as
exp A-4 run 3 to check
the reproducibility of critical
height

Fuel density .505 gm / ¹/_{cm³} sol.

INSTRUMENT CHECK

Time 1:55 ~~PM~~ PM Source 173 221
174
175

	Channel				
	A	B	C	D	E
Range	<u>1/100</u>	<u>OK</u>	<u>10⁻¹⁰</u>	<u>1/1000</u>	<u>1050</u>
Source Dist.	<u>0</u>		<u>0</u>	<u>0</u>	
% F.S. Trip	<u>80</u>		<u>28</u>	<u>55</u>	

CRITICAL POSITIONS

C.A. 16 Expr. A-4 Run 4
 Table Pos. _____

	Control Rod	Channel
1	<u>safety 12.77</u>	<u>A 24 100/100</u>
2	<u>control 17.95</u>	<u>B .00065</u>
3	<u>17.885</u>	<u>C 4.5 5x 10⁻¹¹</u>
4	<u>17.875</u>	<u>D 40 100/200</u>
	<u>in J of farford</u>	<u>E 0 1080 v</u>
	<u>in tubes</u>	
Tim Crit.	<u>2:45</u> AM PM	Duration <u>5</u> min.

Fuel loading same as
exp. 4 run 3. Total of
56 tubes.

C.A. 16 Expt. A-4 Run #5
 Sheet _____ Date 2/15 57 1:4 PM
 Purpose same as exp A-4 run 3 but
with a total of 46 - 1" fuel tubes

Fuel density .505 gm / cm³ vol.

INSTRUMENT CHECK

Time <u>2:14</u> <u>PM</u>	Source _____				
	Channel				
Range	A	B	C	D	E
	1/1000		10 ⁻¹⁰	10 ⁻¹⁰	1080
Source Dist.	1"		0	0	
% F.S. Trip	70		30	55	

Temp. 75 °F
pressure 742 mm. Hg.

CRITICAL POSITIONS

C.A. 16 Expt. A-4 Run 5

Control Rod	Channel	
1 control 11.025	A 57	10/50
2 safety 5.760	B 00	
3 25.68 } critical	C 76	2.5 x 10 ⁻¹²
4 25.66 } height	D 53	10/100
5 25.66 } full well	E 0	1080
<i>in duplicate</i>		
Tim Crit. <u>2:25</u> <u>PM</u>	Duration <u>5</u> min.	

Fuel loading same as exp A-4 run 3 with following ten tubes removed. Total of 46 - 1" tubes.

- | | |
|----------------------------|----------------------------|
| <i>E₁ - 308</i> | <i>K₆ - 117</i> |
| <i>F₃ - 196</i> | <i>L₉ - 56</i> |
| <i>G₄ - 120</i> | <i>M₂ - 10</i> |
| <i>H₅ - 179</i> | <i>N₇ - 193</i> |
| <i>J₅ - 227</i> | <i>N₈ - 112</i> |

Fuel density .505 gm / $\frac{25}{cm^3}$ sol.

C.A. 16 Expt. A-4 Run 6
 Sheet _____ Date 2/19 1954 Time 2:45 ^{PM}
 Purpose to determine the critical height of the system with 155 - 1" fuel tubes with each tube containing 8 - $\frac{3}{16}$ x .025 wall SS inserts,

INSTRUMENT CHECK

Time 2:30 ^{PM} Source 173, 174, 175, 221

	A	B	C	D	E
Range	$\frac{1}{1000}$ etc		10^{-10}	$\frac{10}{1500}$	1080
Source Dist.	0	|	0	1"	
% F.S. Trip	80	|	35	55	

fuel height 4.21 inches
 MULTIPLICATION 10.7 cm

Scaler c/ 2 min. Mult. 1/M

1	788		
2	785		
3	527		

fuel height 15.2 cm
 MULTIPLICATION 5.98 inches

Scaler c/ 2 min. Mult. 1/M

1			
2	1683	985	.584
3	713	527	.739

fuel height 17.9 cm
 MULTIPLICATION 7.04 in.

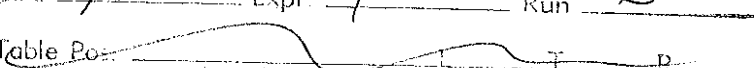
Scaler c/ 2 min. BG/ 2 min. Mult. 1/M

1	2590		
2	2590	985	.380
3	1040	527	.506

fuel height 20.8 cm
 MULTIPLICATION 8.19 in.

Scaler c/ _____ min. BG/ _____ min. Mult. 1/M

1	5		
2	5850	985	.168
3	2080	527	.254

CRITICAL POSITIONS			
C.A.	Expr.	Run	
16	A-4	6	
Table Pos: 			
Control P. d	Channel		
1 safety 9.925	A 29	10/200	
2 control 17.940	B 10010		
3 9.208 } critical	C 9.5	10-11	
4 9.225 } height of	D 72	10/500	
5 9.200 } flange in	E 0	1080	
6 9.205 } lip			
Tim Crit. 7.03		3	

Exp. A-4 run 6 ~~total 175 tubes~~

Fuel loading same as exp ~~A-4~~ run ~~6~~ 7 with following 43 tubes added. Each fuel tube contains 8 - $\frac{3}{16}$ " x .025" wall ss insert/tube. Tube 58 has 12 - $\frac{3}{16}$ " x .025" ss inserts
Total 155 - 1" fuel tubes.

- | | | |
|-------------------------|-----------------------|----------------------|
| L ₆ - 132 | N ₄ - 89 | R ₁ - 73 |
| L ₁₂ - 169 | N ₅ - 187 | R ₂ - 143 |
| L ₁₃ - 123 | N ₉ - 232 | R ₃ - 144 |
| M ₁ - 76 | N ₁₀ - 142 | R ₄ - 215 |
| 5 M ₄ - 220 | N ₁₁ - 50 | R ₅ - 71 |
| M ₅ - 110 | N ₁₂ - 63 | R ₆ - 61 |
| M ₆ - 139 | N ₁₆ - 161 | R ₈ - 46 |
| M ₁₀ - 66 | P ₁ - 185 | R ₉ - 88 |
| M ₁₁ - 183 | P ₃ - 167 | S ₃ - 67 |
| 10 M ₁₂ - 98 | P ₄ - 68 | S ₄ - 72 |
| M ₁₃ - 177 | P ₅ - 80 | S ₅ - 170 |
| M ₁₄ - 178 | P ₆ - 86 | S ₆ - 79 |
| N ₁ - 48 | P ₈ - 52 | S ₈ - 125 |
| N ₂ - 168 | P ₉ - 174 | |
| 15 N ₃ - 100 | P ₁₀ - 152 | |

18 June

C.A. 16 Expr. 17.7 Run 7
 Sheet 2 Date 2/20 1957 Time 2:30 ^{AAA} PM
 Purpose to determine the critical height of the system with 175-1" fuel tubes with lead tube containing 18-³/₁₆" x .025" wall SS inserts.

Fuel density .505 gm / ^{1.25} / cm³ vol.

INSTRUMENT CHECK

Time 1:55 ^{PM} Source 123 221
124
125

Range	Channel				
	A	B	C	D	E
	<u>1/1000</u>	<u>10</u>	<u>10⁻¹⁰</u>	<u>10/1000</u>	<u>1080</u>
Source Dist.	<u>0</u>		<u>0</u>	<u>0</u>	
% F.S. Trip	<u>75</u>		<u>35</u>	<u>55</u>	

fuel height 11.2 inches
 MULTIPLICATION 7.71
 Scaler c/ 2 min. BG/ 2 min. Mult. 1/M

1	<u>1170</u>
2	<u>516</u>
3	

fuel height 17.8 cm
 MULTIPLICATION 5.83 in
 Scaler c/ 2 min. BG/ 2 min. Mult. 1/M

1	
2	<u>1855</u> <u>1177</u> <u>.634</u>
3	<u>836</u> <u>516</u> <u>.617</u>

fuel height 18.0 cm
 MULTIPLICATION 7.09 in
 Scaler c/ 2 min. BG/ 2 min. Mult. 1/M

1	
2	<u>3520</u> <u>1170</u> <u>.634</u>
3	<u>1360</u> <u>516</u> <u>.379</u>

MULTIPLICATION

Scaler c/ _____ min. BG/ _____ min. Mult. 1/M

1	
2	
3	

CRITICAL POSITIONS

C.A. 16 Expr A-7 Run 7

Table Pos. _____

Control	Channel
1 control 27.240	A 5.5 1/500
2 safety 19.844	B .0022
3 22.5 cm. } <i>critical height</i>	C 3.5 10 ⁻¹¹
4 8.86 in. } <i>off fuel</i>	D 24 10/500
	E 0 1080

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

8.86 inches → 8.86 in.

Exp A-7 run 7

Fuel loading same as exp A-4 run 6 with following 20-1" fuel tubes added. Each tube contains 8- $\frac{3}{16}$ " x .025" ss inserts. Tube 58 contains 12- $\frac{3}{16}$ " x .025" inserts. Total 175-1" fuel tubes.

- | | | |
|----|-------------------------|-----------------------|
| 1 | Z ₆ - 150 | R ₁₂ - 213 |
| | S ₁ - 155 | R ₁₃ - 191 |
| | S ₂ - 107 | R ₁₄ - 126 |
| | S ₄ - 133 Sq | P ₁₁ - 105 |
| 5 | S ₁₀ - 171 | P ₁₂ - 59 |
| | S ₁₁ - 140 | P ₁₃ - 78 |
| | S ₁₂ - 116 | P ₁₄ - 84 |
| | S ₁₃ - 141 | N ₁₃ - 157 |
| | R ₁₀ - 134 | L ₁₆ - 137 |
| 10 | R ₁₁ - 176 | S ₇ - 136 |

Fuel density .505 gm U²³⁵ / cm³ vol

C.A. 16 Expr A-5 Run 1

Sheet _____ Date 2/20 95 Time 4:30 ~~PM~~

Purpose: *to determine the critical height of the system with 175-1" fuel tubes with each tube containing 8- $\frac{3}{16}$ " x .025" wall and 9- $\frac{3}{16}$ " x .028" wall ss tube inserts.*

Exceptions -
 tube 58 has 12- $\frac{3}{16}$ " x .025" tubes
 tube 20 has { 8- $\frac{3}{16}$ " x .025" and
 { 8- $\frac{3}{16}$ " x .028" tubes

Temp 77 °F

fuel height 12.9 cm

MULTIPLICATION 5.08 inches

Scaler	cl	min	min	Mult.	1/M
1					
2					
3					

fuel height 17.6 cm

MULTIPLICATION 6.93 in.

Scaler	cl	min	min	Mult.	1/M
1					
2	2110			1240	.588
3	813			572	.707

fuel height		21.9 cm
MULTIPLICATION		8.62 in.
Scaler	c/ <u>2</u> min. DG <u>2</u> min.	Mult. 1/M
1		
2	4639 1240	,267
3	1628 572	,352

CRITICAL POSITIONS		
CA	16	Exp: A-5 Run 1
Table		
	Control Rod	Channel
1	control 24.240	A 35 10/200
2	safety 19.344	B .0004
3	critical	C 6 x 10 ⁻¹¹
	10.110 } height of	
	10.117 } fuel height	D 48 10/500
	10.102 } inches	E 0 1080
Tim Crit.	5:25 PM	Duration 3 min.

Exp A-5 run 1
 Fuel loading same as A-4 run 7
 with a total of 175 - 1" fuel tubes.
 Each tube contains 8 - $\frac{3}{16}$ " x .025 and 7 - $\frac{3}{16}$ " x .028" SS inserts. Tube 58 contains 12 - $\frac{3}{16}$ " x .025" wall inserts + tube 20 contains 8 - $\frac{3}{16}$ " dia. x .025 and 8 - $\frac{3}{16}$ " x .028" SS inserts.

total
 volume

Fuel density .505 gm/cm³ at 25^oC

C.A.	16	Exp.	A-5	Run	2
Sheet		Date	2/20 1954	Time	5:45 PM
Purpose	to determine the critical height of the system with 155 - 1" fuel tubes with each tube containing 8 - $\frac{3}{16}$ " x .025 wall SS inserts and 7 - $\frac{3}{16}$ " x .028 wall SS tube inserts				

Exceptions:
 tube 58 - 12 - $\frac{3}{16}$ " x .025" SS inserts
 tube 20 { 8 - $\frac{3}{16}$ " x .025" } SS inserts
 { 8 - $\frac{3}{16}$ " x .028" }

Total of 155 - 1" tubes

CRITICAL POSITIONS		
CA	16	Exp. A-5 Run 2
Table Pos.		
	Control Rod	Channel
1	Safety 14.74	A 48 10/100
2	control 20.75	B .00023
3	10.6117	C 6 x 5 x 10 ⁻¹²
	10.598 } crit. fuel height	D 67 10/200
	10.599 }	
	10.600 }	
	10.583 }	
	10.590 }	
Tim Crit.	6:00 PM	Duration 5 min.

Loading same as exp A-4 run 5

Fuel density $.505 \text{ gm/cm}^3$ ^{0.25} sol.

C.A. 16 Expt. A-45 Run 3
 Sheet _____ Date 2/22 1954 Time 2:35 ~~AM~~ PM
 Purpose to determine the critical height of the system with 112-1" fuel tubes each tube containing 8- $\frac{3}{16}$ " x .025 wall tubes and 4- $\frac{3}{16}$ " x .028" wall ss inserts

Exceptions: - tube 58 tube 20
 $12-\frac{3}{16}$ x .025" inserts 8- $\frac{3}{16}$ x .025" inserts
8- $\frac{3}{16}$ x .028" inserts

INSTRUMENT CHECK					
Time	Source				
	A	B	C	D	E
<u>2:05</u> AM PM					
Range	<u>1000</u>	<u>02</u>	<u>10⁻¹⁰</u>	<u>$\frac{10}{1000}$</u>	<u>1000</u>
Source Dist.	<u>0</u>		<u>0</u>	<u>0</u>	
% F.S. Trip	<u>70</u>		<u>35</u>	<u>55</u>	

temp

CRITICAL POSITIONS					
C.A. <u>16</u>		Expt. <u>A-5</u>		Run <u>3</u>	
Tube No.	Height of Rod	Channel			
1	<u>Control</u>	<u>20</u>	<u>14/50</u>		
2	<u>critical</u>	<u>B</u>	<u>00017</u>		
3	<u>height of</u>	<u>C</u>	<u>4.2 x 5 10⁻¹²</u>		
4	<u>fuel in</u>	<u>D</u>	<u>17</u>	<u>10/500</u>	
	<u>inches</u>	<u>E</u>	<u>0</u>	<u>1880</u>	
Tim Crit.	<u>2:55</u> AM PM	Duration	<u>3</u> min.		

Exp A-5 run 3
 Fuel loading same as exp A-1 run 7
 or exp A-4 run 1.
 Total of 112-1" fuel tubes

C.A. 16 Expr. A-5 Run 4
 Sheet 22 Date 2/22 1954 Time 3:10 ^{AM} PM
 Purpose to determine the critical height of the system with 80-1" fuel tubes each tube containing 8- $\frac{3}{16}$ " x .025" wall tubes and 4- $\frac{3}{16}$ " x .028" wall SS inserts

Fuel density $.505 \text{ gm} / \text{cm}^3 \text{ sol.}$

Temp. 74 °F

CRITICAL POSITIONS	
<u>16</u>	Expr <u>A-5</u> Run <u>4</u>
Control Rod	
Control Rod	Channel
control <u>13.915</u>	A <u>32</u> <u>10/50</u>
safety <u>13.62</u>	B <u>000</u>
<u>15.930</u> critical	C <u>3 X 2.5 X 10⁻¹²</u>
<u>15.900</u> height of	D <u>15</u> <u>10/200</u>
<u>15.930</u> fuel tube in	E <u>0</u>
<u>15.920</u> inches	
<u>15.875</u> inches	
to Crit. <u>3:45</u> ^{AM} PM	Duration <u>3</u> min.

Exp A-5 run 4
 Fuel loading same as A-1 run 6
 or exp. A-9 run 2
 Total of 80-1" fuel tubes

C.A. 16 Expr. A-5 Run 5
 Sheet _____ Date 2/23 1954 Time 9:20 ^{AM} PM
 Purpose to determine the critical height of the system with 56-1" fuel tubes with each tube containing 8- $\frac{3}{16}$ " x .025" wall tubes and 4- $\frac{3}{16}$ " x .028" wall tubes per

Fuel density $.505 \text{ gm} / \text{cm}^3 \text{ sol.}$

INSTRUMENT CHECK					
Time <u>9:25</u> ^{AM} PM					
					<u>173</u>
					<u>174</u> <u>221</u>
					<u>175</u>
Range	A	B	C	D	E
	$1/1000$		10^{-10}	$10/1000$	<u>1080</u>
Source Dist.	<u>0</u>	<u>0</u>	<u>2</u>		
% F.S. Trip	<u>75</u>	<u>2.5</u>	<u>55</u>		

CRITICAL POSITIONS		
16	Exp. A-5	Run 5
	L	T R
Control Rod		Channel
control 10.93	A 62	10/50
safety 5.74	B .0002	
24.732 critical	C 66	5x10 ⁻¹²
24.770 height of	D 63	10/200
24.789 fuelrod	E 0	1080
24.779 in inches		
On Crit. 10:10 PM AM		Duration 3 min.

Exp A-5 run 5
 Fuel loading same as exp A-1
 run 5 or exp A-4 run 3
 Total of 56 1/2" fuel tubes.

Exp B-2 Fuel density 444 g/cc sol.

C.A. 16	Exp. B-1	Run 1
Sheet	Date 3/7 1954	Time 12:50 AM PM
Purpose to determine the critical height of the system with 80-1" fuel tubes each tube containing 8-3/16" x .025" wall tubes & 1-3/16" x .028" wall SS inserts. 102.1 gm U ²³⁵ tube		

INSTRUMENT CHECK					
Time 1:40 PM					
					Source 173 221 175
					Channel
					A B C D E
Range	1/1000	OK	10 ⁻¹⁰	10/1000	900
Source Dist.	0	0	0		
% FS. Trip	80		40	75	

fuelrod height MULTIPLICATION			
Scaler	1.2 min.	Mult.	1/M
1		*	
2	1080	1	1
3	408	1	1

furural height
MULTIPLICATION *13.00 in*

Scaler	c/ 2 min.	2 min.	Multi.	1/M
1				
2	2050	1080		.526
3	764	408		.534

furural height
MULTIPLICATION *15.25 in.*

Scaler	c/ 2 min.	2 min.	Multi.	1/M
1				
2	3660	1080		.294
3	1150	408		.355

furural height
MULTIPLICATION *16.50 in.*

Scaler	c/ 2 min.	2 min.	Multi.	1/M
1				
2	11600	1080		.093
3	3470	408		.117

CRITICAL POSITIONS

CA 16 Expr B-1 Run 1

Control Field	Channel
control 20.83	A 18 10/200
safety 10.11	B .00046
17.265 } critical 17.250 } height 17.248 } of furural 17.260 } in inches.	C 24 2.5 x 10 ⁻⁴
	D 32 100/100
	E 0 1080

Time Crit. 11:37 PM Duration 3 min.

Exp. B-1 run 1

Tube loading same as exp ~~7~~ 7-5
run 24. total of 80-1" fuel
tubes.

Fuel density $.347 \text{ gm U}^{235} / \text{cm}^3 \text{ sol.}$
 Experiment C's $\rho = .347$

C.A. 116 Expr. C-1 Run 1
 Sheet _____ Date 3/9 1954 Time 1:40 ~~PM~~ PM
 Purpose to determine the critical height of the system with 80-1" fuel tubes each tube containing 8- $\frac{3}{16}$ " x .025 and 4- $\frac{3}{16}$ " x .028 wall SS inserts. Total of 79.9 gm U²³⁵ per 1" fuel tube

INSTRUMENT CHECK 173
174 221
175
 Time 1:45 ~~PM~~ PM Source 175
 Channel
 A B C D E
 Range 1000 sk 10⁻¹⁰ 10/1000 900
 Source Dist. 1" | 0 | 2" |
 % F.S. Trip 70 | 40 | 70 |

fuel height 10.20 in.
 MULTIPLICATION
 Scaler 2 min. 2 min. Mult. 1/M
 1 _____
 2 1065
 3 352

fuel height 15.9 in
 MULTIPLICATION
 Scaler 2 min. 2 min. Mult. 1/M
 1 _____
 2 1880 1065 .566
 3 506 352 .695

fuel height 18.5 in
 MULTIPLICATION
 Scaler 2 min. 2 min. Mult. 1/M
 1 _____
 2 3170 1065 .336
 3 957 352 .369

fuel height 20.84
 MULTIPLICATION
 Scaler 2 min. 2 min. Mult. 1/M
 1 _____
 2 11930 1065 .089
 3 3310 352 .106

CRITICAL POSITIONS

C.A. 16 Expr C-1 Run 1

Table No. _____

Control Rod	Channel
safety 5.75	A 37 $10^4/100$
control 11.00	B .00075
21.470 } critical	C 6.8 10^{-11}
21.465 } height of	D 38 $10^4/100$
21.462 } fuel rod	E 0 1080.0
21.455 } in	

Tim Crit. 2:40 AM
PM Duration 3 min.

Exp. C-1 run 1.
 tube loading same as exp. A-5
 run #4. Total of 80-1" fuel tubes.

C.A. 16 Expr. C-21 Run 2

Sheet _____ Date 3/12 1954 Time 1:30 ~~PM~~

Purpose *to determine the critical height of the system with 112-1" fuel tubes and tube containing 8- $\frac{3}{16}$ x .025 and 4- $\frac{3}{16}$ x .028 wall ss inserts*

Total 77.9 gm U²³⁵ per 1" fuel tube

Fuel density .347 gm U²³⁵ / cm³ vol.

INSTRUMENT CHECK

Time 1:30 ~~AM~~ PM Source 173 221
174
175

Range	Channel				
	A	B	C	D	E
	$1/1000$	DR	10^{-10}	$10^4/1000$	900
Source Dist.	0		0	0	
% F.S. Trip	70		40	55	

fuel rod height
MULTIPLICATION in.

Scaler	c/ min.	Per 2 min.	Mult.	1/M
1	_____	_____	_____	_____
2	_____	_____	_____	_____
3	_____	_____	_____	_____

MULTIPLICATION

Scaler	c/	min. BG	min.	Mult.	1/M
1					
2					
3					

MULTIPLICATION

Scaler	c/	min.	min.	Mult.	1/M
1					
2					
3					

MULTIPLICATION

Scaler	c/	min. BG	min.	Mult.	1/M
1					
2					
3					

CRITICAL POSITIONS

CA 16 Expr C-1 Run 2

Table Pos. _____

	Control Rod	Channel
1	<u>control 17.77</u>	A <u>34</u> <u>10/50</u>
2	<u>safety 10.290</u>	B <u>1.003</u>
	<u>15.062</u>	} <u>critical</u> } <u>height of</u> } <u>fuel</u> } <u>in rods</u>
	<u>15.085</u>	
	<u>15.070</u>	
	<u>15.065</u>	D <u>33</u> <u>10/500</u>
		E <u>0</u> <u>1080N</u>

Min Crit. 2.03 ~~PM~~ Duration 3 min.

*Exp C-1 run 2
 Tube loading same as exp A-5
 run 3. Total 112-1" fuel tubes.*

C.A. 16 Expr. C-1 Run 3
 Sheet _____ Date 3/15 1954 Time 2:00 ~~PM~~
 Purpose Same as C-1 Run 2 with
155 tube loading described in
A-5 Run 2

INSTRUMENT CHECK

Time 1:45 ~~PM~~ ^{AM} Source 173 174 175 171
 Channel
 Range 1/1000 20 10⁻¹⁰ 10/1000 900
 Source Dist. 0 1 0 2" 1
 % F.S. Trip 65 30 65 1

CRITICAL POSITIONS

C.A. 16 Expr. C-1 Run 3
 Tube Pos. _____
 Control Rod Channel
 1. fuel level A 5.8 10/50
 12.515 } critical height
 12.522 } in
 12.540 } inches
 12.538
 2. Safets - 17.721 B .00012
 3. Control - 20.774 C 4.2 5x10⁻¹²
 D 42 10/200
 E _____
 Tim Crit. 2:00 ~~PM~~ ^{AM} Duration 2 min.

C.A. 16 Expr. C-1 Run 4
 Sheet / Date 3/23 1954 Time 9:35 ~~PM~~ ^{AM}
 Purpose Same as C-1 run 2 with
175 - 1" fuel tubes with loading same
as A-5 run 1.

INSTRUMENT CHECK

Time 9:15 ~~PM~~ ^{AM} Source 173 174 175
 Channel
 Range 1/1000 20 10⁻¹⁰ 10/1000 900
 Source Dist. 6" 0 6"
 % F.S. Trip 75 100 65 100

CRITICAL POSITIONS

C.A. 16 Expr. C-1 Run 4
 Tube Pos. _____
 Control Rod Channel
 1. control 20.830 A 14 10/200
 2. safety 14.610 B 0
 3. 11.885 } critical
 11.870 } height of
 11.870 } fuel level
 11.882 } inches
 11.865
 4. _____ C 3 5x10⁻¹²
 D 26 10/200
 E 0
 Tim Crit. 9:53 ~~PM~~ ^{AM} Duration 3 min.

C.A. 16 Expr. C-2 Run 1
 Sheet 1 Date 3/23 1954 Time 2:20 PM
 Purpose To determine the critical height of the system with 175-1" fuel tubes each tube containing 8- $\frac{3}{16}$ x .025" and 8- $\frac{3}{16}$ x .028" S.S. inserts.
Total of 79.9 gm U²³⁵ per 1" fuel tube

Fuel density .347 gm U²³⁵/cm³ sol.

Instrument check same as exp C-1 run 4.

CRITICAL POSITIONS			
Control Rod	Channel		
control 20.930	A 55		10/50
safety 14.610	B 0		
15.080 } critical height	C 46		2.5 x 10 ⁻¹²
15.079 } of fuel rods	D 46		10/100
15.086 } 15.088 in inches	E 0		
Tim Crit. <u>2:40</u> PM	Duration <u>2</u> min.		

Tube loading same as exp A-5 run 1.
 Total of 175-1" fuel tubes.

C.A. 16 Expr. C-2 Run 2
 Sheet 1 Date 3/23 1954 Time 3:15 PM
 Purpose Same as C-2 run 1 with 155-1" fuel tubes. Tube loading same as exp A-5 run 2

Fuel density .347

Instrument check same as exp C-1 run 4.

CRITICAL POSITIONS			
Control Rod	Channel		
control 13.480	A 34		10/100
safety 8.390	B 0		
16.148 } critical height	C 34		5 x 10 ⁻¹²
16.170 } of fuel rods	D 32		10/200
16.150 } 16.165 in inches	E 0		
Tim Crit. <u>3:38</u> PM	Duration <u>2</u> min.		

Tube loading same as exp A-5 run 2
 Total of 155-1" fuel tubes.

C.A. 16 Expr. C-2 Run 3
 Sheet _____ Date 3/29 1954 Time 9:00 AM
 Purpose same as C-2 run 1 with 112-1" fuel tubes. Full loading same as exp. A-5 run 3. fuel density .347 gm/cm³ vol.

INSTRUMENT CHECK

Time 9:00 AM Source 173, 174, 175 Yunnan

	Channel				
	A	B	C	D	E
Range	<u>1/1000 OR</u>		<u>10⁻¹⁰</u>	<u>10/1000</u>	<u>900</u>
Source Dist.	<u>5"</u>		<u>0</u>	<u>4"</u>	<u>0</u>
% F.S. Trip	<u>80</u>		<u>95</u>	<u>60</u>	<u>100</u>

CRITICAL POSITIONS

16 Expr. C-2 Run 3

Control Rod	Channel
1 control <u>13.445</u>	A <u>70</u> <u>10/50</u>
2 safety <u>8.390</u>	B <u>.00012</u>
3 <u>21.188</u> } <u>critical</u>	C <u>4.5</u> <u>5 x 10⁻¹²</u>
<u>21.180</u> } <u>height of</u>	
<u>21.175</u> } <u>fuel</u>	D <u>40</u> <u>10/200</u>
<u>21.190</u> } <u>inches</u>	E <u>0</u>

Time Crit. 9:30 AM Duration 2 min.

C.A. 16 Expr. C-2 Run 4
 Sheet _____ Date 5/10 1954 Time 1:45 PM
 Purpose Repeat of run C-2 run 1 to determine evaporation rate since 3/23

INSTRUMENT CHECK

Time 1:45 PM Source 123, 45, 221

	Channel				
	A	B	C	D	E
Range	<u>1/1000 OR</u>		<u>10⁻¹⁰</u>	<u>1/1000</u>	<u>900</u>
Source Dist.	<u>1"</u>		<u>0</u>	<u>12"</u>	<u>0</u>
% F.S. Trip	<u>70</u>		<u>30</u>	<u>45</u>	<u>95</u>

CRITICAL POSITIONS

16 Expr. C-2 Run 4

Control Rod	Channel
control <u>15.848</u>	A <u>19.5</u> <u>10/100</u>
safety <u>7.982</u>	B <u>.000125</u>
<u>15.124</u> } <u>critical</u>	C <u>2.8</u> <u>10⁻¹¹</u>
<u>15.123</u> } <u>height of</u>	
<u>15.125</u> } <u>fuel</u>	D <u>26</u> <u>100/50</u>
<u>15.130</u> } <u>inches</u>	E <u>0</u>

Time Crit. 2:37 PM Duration 3 min.

C.A. 16 Expr. C-2 Run 1
 Sheet _____ Date 5/11 1954 Time 10:30 AM
 Purpose Determine the effect of displacement of reflector with Al inserts. Same fuel loading as C-2 run 1.

INSTRUMENT CHECK

Time 10:20 AM Source 172, 45, 234

	Channel				
	A	B	C	D	E
Range	$1/1000$ OR		10^{10}	$1/1000$	900
Source Dist.	0	|	0	10"	0
% F.S. Trip	60	|	25	75	06

CRITICAL POSITIONS

C.A. 16 Expr. C-2 Run 1

Table Pos. _____ I _____ T _____ R _____

Control Rod	Channel	
1 control 10.795	A 45	$1/500$
2 safety 9.370	B .00015	
3 15.010 } critical	C 74	5×10^{-12}
4 15.030 } height of fuel	D 56	$10/200$
5 15.025 } fuel	E 0	
6 15.013 } in inches		

Tim Crit. 11:00 AM Duration 3 min.

Eye D's Fuel density $.196 \text{ gm U}^{235} / \text{cm}^3 \text{ sol}$ Run 1 only

C.A. 16 Expr. D-1 Run 1
 Sheet _____ Date 5/21 1954 Time 10:45 AM
 Purpose determine height of fuel system with 155-1" tubes. Same inserts + loading as C-1 run 3. Fuel density $.196 \text{ gm U}^{235} / \text{cm}^3 \text{ sol}$. 45.2 gm U²³⁵ per 1" fuel tube total of 7.006 Kg U²³⁵

INSTRUMENT CHECK

Time 10:00 AM Source 173, 45, 221

	Channel				
	A	B	C	D	E
Range	$1/1000$ OR		10^{10}	$10/1000$	900V
Source Dist.	10"	|	0	12"	0
% F.S. Trip	40	|	30	50	10

fuel height 9.5 inches
MULTIPLICATION

Scale	2	Mult.	1.7A
1 out			
2	754		1
3	277		1

furfural height 12.4 inches
MULTIPLICATION

Scaler	c/ 2	min. BG 2	Mult. 1/M
1			
2	843	754	.893
3	321	277	.863

furfural height 18.25 inches
MULTIPLICATION

Scaler	c/ 2	min. BG 2	Mult. 1/M
1			
2	956	754	.790
3	401	277	.692

furfural height 23.25 inches
MULTIPLICATION

Scaler	c/ 2	min. BG 2	Mult. 1/M
1			
2	961	754	.885
3	320	277	.866

furfural height 28.05 inches
MULTIPLICATION

Scaler	c/ 2	min. BG 2	Mult. 1/M
1			
2	789	754	.762
3	350	277	.792

Not Critical

C.A. 16 Expt. D-1 Run 2
 Sheet Date 5/21 1954 Time 1:50 PM
 Purpose *determine critical height of system with 175-1" fuel tubes.*

The inner 155-1" tubes same as D-1 run 1. Each tube contains 15.2 gms U²³⁵ per 1" tube of the 155 tube lot. The outer 20 tubes making up the 175-1" tube lot contains 79.4 gms U²³⁵ per tube. Total of 8.6 Kg U²³⁵

F.F. height 9.0 inches
MULTIPLICATION

Scaler	c/ 2	min. BG 2	Mult. 1/M
1			
2		759	
3		327	

f.f. height 12.2 inches
MULTIPLICATION

Scaler	c/ 2	min. BG 2	Mult. 1/M
1			
2	930	759	.816
3	342	327	.956

ff height 18.3 inches
MULTIPLICATION

Scaler	2	2	min.	Mult.	1/M
1					
2	1160	759			.654
3	430	327			.760

ff height 28.31 inches
MULTIPLICATION

Scaler	2	2	min.	Mult.	1/M
1					
2	1446	759			.525
3	534	327			.612

Not Critical

C.A. 16 Expr. D-1 Run 3
 Sheet Date May 29 1954 Time 11:00 AM
 Purpose Same as D-1 run 2 with all 1" tubes in reactor. Total of 193-1" tubes. Last 18 tubes added contained 116 gm U²³⁵ per tube.

Total of 10.69 Kg U²³⁵ in total reactor

INSTRUMENT CHECK

Time 10:55 AM	Source 193, 45, 221
Range 1/100 OK	10 ⁻¹ / 1000 900 U
Source Dist. 6"	0 12" 0
% P.S. Trip 50	30 35 10

ff height 9.2 inches
MULTIPLICATION

Scaler	2	2	min.	Mult.	1/M
1					
2		889			
3		378			

ff height 12.6 inches
MULTIPLICATION

Scaler	c/ 2 min.	2 min.	Mult.	1/M
1				
2	1162	889		.765
3	738	378		.863

ff height 18.2 inches
MULTIPLICATION

Scaler	c/ 2 min.	2 min.	Mult.	1/M
1				
2	1699	889		.523
3	712	378		.531

ff height 23.5 inches
MULTIPLICATION

Scaler	c/ 2 min.	2 min.	Mult.	1/M
1				
2	2408	889		.369
3	1128	378		

ff height 25.00 inches
MULTIPLICATION

Scaler	c/ 2 min.	2 min.	Mult.	1/M
1				
2	3016	889		.295
3	1979	378		.256

ff height 25.00 inches
MULTIPLICATION

Scaler	c/ 2 min.	2 min.	Mult.	1/M
1				
2	4386	889		.203
3	2379	378		.159

raised source to 4 of reactivity

ff height 27.1 inches
MULTIPLICATION

Scaler	c/ 2 min.	2 min.	Mult.	1/M
1				
2	6537	889		.136
3	3688	378		.102

C.A. _____ Expr. _____ Run _____ 7. _____
 Sheet _____ Date _____ 195 _____ Time _____ AM _____ PM _____
 Purpose _____

ff height 28.6 inches
MULTIPLICATION

Scaler	c/	m.n.	2 min.	Mult.	1/M
1					
2		8566	889		.104
3		5303	378		.071

ff height inches
MULTIPLICATION

Scaler	c/	2 m.n.	2 min.	Mult.	1/M
1					
2			889		
3			378		

*With 3.5 inches of end reflector ~~you~~
we had a multiplication of 0.08.*

C.A. 16 Expr. D-1 Run 4
 Sheet _____ Date May 29 1957 Time 2:55 ^{AM} PM
 Purpose To determine critical mass at fuel
height. 155-1" tubes 45.2 gm of ²³⁵U
 20-1" " 79.9 " " "
 18-1" " 116 " " "
 8-3/4" " ~~553~~ " " "
 25-1/2" " ~~29.1~~ " " / tube

ff height 9.25 in.
MULTIPLICATION

Scaler	c/	m.n.	BG/	2 min.	Mult.	1/M
1						
2				990		
3				406		

ff height 14.3 in.
MULTIPLICATION

Scaler	c/	2 min.	BG/	2 min.	Mult.	1/M
1						
2		1524	990		.650	
3		657	406		.618	

ff height 19.2 in.
MULTIPLICATION

Scaler	c/	2 min.	2 min.	Mult.	1/M
1					
2		2533	990		.391
3		1142	406		.356

ff height 22.4 in

Scaler	1	2	M
1			
2	4484	990	.221
3	2347	406	.173

CRITICAL POSITIONS

CA 16 Exp D-1 Run 4

Channel	Control	Count	Rate
1	control 4.00 out	10/200	48
2	safety 5.730 out	.0003	
3	25.456 } critical height of	C 4	10 ⁻¹¹
4	25.462 } 1/2 in	D 30	10/500
5	25.465 } 1/4 in	E 0	

Tim Crit. 3:40 PM Duration 3 min.

12.46 kg of X in system

CA 16 Exp D-1 Run 5

Sheet _____ Date 195 Time _____ AM/PM

Purpose To determine crit. height with the following loadings:

Loadings	Count	Rate
155 - 1" tubes	45.2 gm X/tube	
New distribution	20 - 1" ..	79.9 ..
as per chart	18 - 1" ..	116. ..
	8 - 3/4 ..	65.3 ..
	8 - 3/4 ..	25.7 ..
	25 - 1/2 "	29.1 ..
	28 - 1/2 "	11.3 ..

INSTRUMENT CHECK

Time 10:30 AM Source 123, 4, 5, 221

Range	Channel				
	A	B	C	D	E
1/1000 OR 10 ⁻¹⁰	10	0	12	0	
Source Dist.	10	0	12	0	
% T.S. Trip	55	28	50	15	

Source

Position raised from 4" (bottom of source to tank floor) to 12" (bottom of source to tank floor)

MULTIPLICATION

Final 11.86"

Scaler	Count	Rate	Multi	1/M
1				
2		821		
3		459		

Surfural
14.20"

MULTIPLICATION			
Scaler	c/	min. DG	min. Mult. 1/M
1			
2	1369	821	.600
3	680	459	.675

Surfural
16.12"

MULTIPLICATION			
Scaler	c/	min. DG	min. Mult. 1/M
1			
2	1907	821	.430
3	815	459	.563

Surfural
20.10"

MULTIPLICATION			
Scaler	c/	min. DG	min. Mult. 1/M
1			
2	5507	821	.067
3	2382	459	.193

CRITICAL POSITIONS

C.A. 16 Expr. D-0-0 Run 50 #

Table Pos. _____

Control Rod	Channel
1 <i>control</i> 3.995 out	A. 70 $10/200$
2 <i>safety</i> 5.710 out	B. 00022
	C. 6.4 10^{-11}
	D. 4.0 $10/500$
<i>Surfural</i> 22.670	E. 0.5
22.655	
22.665	
22.658	

Tim Crit. 11:50 AM AM Duration _____ min.

The whole control rod is worth a -90 second period.

10.0 Kg.(X) in critical reactor

C.A. 16 Expr. D-21 Run 26
 Sheet _____ Date 6-3 1954 Time 9:10 AM
 Purpose To determine critical height with following loading

18-1"	75.2 gm x / tube
8-3/4"	116 gm x / tube
8-3/4"	25.4 " / "
25-1/2"	29.1 " / "
28-1/2"	11.7 " / "

11.77 Kg(X) in system

INSTRUMENT CHECK

Time 9:50 AM Source 173, 4, 5 221

	A	B	C	D	E
Range	<u>1/1000 sk</u>	<u>15¹⁰</u>	<u>1/1000</u>	<u>900V</u>	
Source Dist.	<u>6"</u>	<u>0</u>	<u>9"</u>	<u>0</u>	
% F.S. Trip	<u>60</u>	<u>25</u>	<u>60</u>	<u>10</u>	

CRITICAL POSITIONS

C.A. 16 Expr. D-21 Run 26

Control	Channel	Value
1 control	A 34	10/50
2 safety	B 0	
27.528 } critical	C 3.5	5 x 10 ⁻¹²
27.495 } key bit of	D 22	10/200
27.503 } furthest	E 0	
27.495 } first inches		

Tim Crit. 10:30 AM Duration 3 min.

C.A. 16 Expr. E-1 Run 1
 Sheet _____ Date 6/4 1954 Time 1:45 PM
 Purpose Radial indium traverse

Z₁ (C-28), Z₂ (C-18), Z₃ (C-38)
Z₄ (C-30), Z₅ (C-29)

INSTRUMENT CHECK

Time 1:45 AM Source 173, 4, 5 221

	A	B	C	D	E
Range	<u>1/1000 OR</u>	<u>15¹⁰</u>	<u>1/1000</u>	<u>900V</u>	
Source Dist.	<u>6"</u>	<u>0</u>	<u>10"</u>	<u>0</u>	
% F.S. Trip	<u>60</u>	<u>22</u>	<u>50</u>	<u>05</u>	

CRITICAL POSITIONS

C.A. 16 Expr. E-1 Run 1

Control	Channel	Value
1 control (out of circuit)	A 33	1000/1000
2 safety	B .05	
27.532 } critical	C 4.1	2.5 x 10 ⁻⁹
27.538 } key bit of	D 45.5	1000/1000
27.538 } furthest	E 2.7	690V

Tim Crit. 2:45 AM Duration 35 min.

C.A. 16 Expr. E-1 Run ✓
 Sheet _____ Date 6/7 1954 Time 10:25 ^{AM} ~~PM~~
 Purpose Cd covered in radial traverse.
Z₁-42, Z₂-39, Z₃-31, Z₄-34
& Z₅-24.

INSTRUMENT CHECK

Time 10:00 ^{AM} ~~PM~~ Source 173, 174, 175, 221

	Channel				
	A	B	C	D	E
Source Dist.	<u>1</u>	<u>1</u>	<u>0</u>	<u>4</u>	<u>0</u>
% F.S. R.F.	<u>70</u>	<u>1</u>	<u>25</u>	<u>60</u>	<u>05</u>

CRITICAL POSITIONS

C.A. 16 Expr. E-1 Run 2

Table Pos. _____

	Control Rod	Channel
1	<u>safety 5.69 out</u>	<u>A 33 1000/1000</u>
2	<u>control (out)</u>	<u>B .055</u>
3	<u>27.555 } critical pt</u>	<u>C 4.2 2.5 x 10⁻⁹</u>
4	<u>27.556 } off in</u>	<u>D 45.5 1000/1000</u>
	<u>27.555 } inches</u>	<u>E 34 720.5</u>
	<u>fflt 27.760 for 1/100 sec period</u>	
	Tim Crit. <u>11:05</u> ^{AM} PM	Duration <u>30</u> min.

C.A. 16 Expr. E-1 Run 3
 Sheet Date June 7 1957 T.me 12:50PM
 Purpose Repeat of E-1 Run 2
Z₁-18, Z₂-28, Z₃-38 Z₄-30
Z₅-29.

CRITICAL POSITIONS

C.A. 16 Expr. E-1 Run 3
 Table Pos. T.

Control Rod	Channel
1 <u>safety</u>	A 30 $1000/1000$
2 <u>27.555</u> } <u>fuel rod ht.</u>	B 0.50
3 <u>27.580</u> } <u>in inches</u>	C 3.7 2.5×10^{-9}
4 <u>27.555</u> } <u>when critical</u>	D 4.0 $1000/1000$
	E 3.0 720

Tim Crit. 1:25 ~~PM~~ Duration 35 min.

ff. ht = 27.785 inches for ≈ 100 sec period

C.A. 16 Expr. E-1 Run 7
 Sheet _____ Date JUNE 8 1957 Time 1:00 ~~PM~~ PM
 Purpose In longitudinal traverse

INSTRUMENT CHECK

Time 1:00 ~~PM~~ PM Source 173, 4, 5, 221

	A	B	C	D	E
Range	<u>1000 OR</u>		<u>10⁻¹⁰</u>		<u>1000 900</u> ✓
Source Dist.	<u>5"</u>		<u>0</u>	<u>12"</u>	<u>0</u>
% F.S. Trip	<u>60</u>		<u>24</u>	<u>50</u>	<u>07</u>

CRITICAL POSITIONS

C.A. 16 Expr. E-1 Run 7

Table Pos. _____

Control Rod	Channel
<u>safety</u>	A <u>59.5</u> <u>1000/1000</u>
<u>27.480</u> } <u>critical</u>	B <u>0</u>
<u>27.495</u> } <u>lt of ff.</u>	C <u>87</u> <u>7.2</u> <u>5x10⁷</u>
<u>27.495</u> } <u>in inches</u>	D <u>87</u> <u>1000/1000</u>
<u>27.505</u> }	E <u>7.3</u> <u>720</u>

Tim Crit. 1:40 ~~PM~~ PM Duration _____ min.

ff. Lt 27.832" for a 60 sec period = .338" ff

Eleven In foils placed in a holder in hole Z.

Distance from bottom of reactor	foil no.
<u>2"</u>	<u>C-22</u> ← <i>(drops out before counted)</i>
<u>5</u>	<u>C-6</u>
<u>8</u>	<u>C-14</u>
<u>11</u>	<u>C-33</u>
<u>14</u>	<u>C-17</u>
<u>16</u>	<u>C-13</u>
<u>19</u>	<u>C-9</u>
<u>22</u>	<u>C-15</u>
<u>25</u>	<u>C-20</u>
<u>28</u>	<u>C-73</u>
<u>30</u>	<u>C-21</u>

10 foils used

C.A. 16 Expt. E-1 Run 5
 Sheet _____ Date 6/9 1954 Time 1:00 ~~AM~~ PM
 Purpose Cd-In longitudinal traverse

INSTRUMENT CHECK

Time 1:00 ~~AM~~ PM Source 173, 4, 5, 221

	A	B	C	D	E
Range	$\frac{1}{1000}$		10^{-10}	$\frac{1}{1000}$	9000
Source Dist.	5"		0	10'	0
% F.S. Trip	70		23	70	09

CRITICAL POSITIONS

C.A. 16 Expt. E-1 Run 5
 Table Pos. _____

	Control Rod	Channel
1	<u>safety 5.695 out</u>	<u>A 60.5</u> $\frac{1000}{1000}$
2	<u>27.608</u>	<u>B .1</u>
3	<u>27.614</u>	<u>C 4.3</u> 5×10^{-9}
4	<u>27.592</u>	<u>D 88.5</u> $\frac{1000}{1000}$
	<u>27.598</u>	<u>E 7.0</u> <u>720</u>

Tim Crit. 1:35 ~~AM~~ PM Duration 30 min.

ff. Lt. 27.837" for ≈ 200 sec. period.
 .234

Position from bottom of reactor	foil no.
5	C-70
8	C-23
11	C-42
14	C-28
16	C-33
19	C-18
22	C-29
25	C-34
28	C-29
30	C-31

C.A. 16 Expr. E-2 Run 1
 Sheet _____ Date 6/80 1954 Time 9:45 AM
 Purpose To determine reactivity of
movement in horizontal height

INSTRUMENT CHECK

Time 9:45 AM
 Source 13, 4, 5 221

	A	B	C	D	E
Source	$\frac{1}{1000}$	$\frac{1}{1000}$	$10''$	$\frac{1}{1000}$	900
Source Dist.	5'		0	8'	0
...	65		23	65	08

	ff. ht.	approx power	approx period
(0)	$\left. \begin{matrix} 27.550 \\ 27.540 \\ 27.555 \\ 27.548 \\ 27.562 \end{matrix} \right\} 27.551$	.001	∞
(1)	$\left. \begin{matrix} 27.595 \\ 27.600 \\ 27.595 \\ 27.618 \end{matrix} \right\} 27.602$	.001 to .003	400 435 sec.
(2)	$\left. \begin{matrix} 27.670 \\ 27.690 \\ 27.675 \\ 27.678 \\ 27.688 \end{matrix} \right\} 27.680$	.003 to .01	200 200 sec.

	ff. ht.	approx power	approx period
(3)	$\left. \begin{matrix} 27.741 \\ 27.760 \\ 27.755 \\ 27.746 \end{matrix} \right\} 27.750$	.01 to .05	100 105 sec.
(4)	$\left. \begin{matrix} 27.485 \\ 27.516 \\ 27.488 \\ 27.490 \end{matrix} \right\} \begin{matrix} 27.495 \\ \cancel{27.470} \\ \pm .021 \\ \pm .01 \end{matrix}$	.05 to .02	-400 - 965 sec.
(5)	$\left. \begin{matrix} 27.366 \\ 27.366 \\ 27.363 \\ 27.373 \end{matrix} \right\} \begin{matrix} 27.367 \\ \pm .006 \\ \pm .003 \end{matrix}$	.02 to .01	-200 - 261 sec.
(6)	$\left. \begin{matrix} 27.254 \\ 27.255 \\ 27.265 \\ 27.255 \end{matrix} \right\} 27.257$	.01 to .001	-100 - 154 sec.
(7)	$\left. \begin{matrix} 27.850 \\ 27.856 \\ 27.855 \\ 27.866 \end{matrix} \right\} 27.857$	.0012 to .075	+50 67.3 sec.

Eliminate all of Exp. E-3

C.A. 16 Expr. E-3 Run 1
 Sheet _____ Date 6/11 1954 Time 8:45 AM
 Purpose Determination of importance
of k_{eff} as function of radius
using fuel tube loaded with .5056 gm ^{235}U
total of 116.0 gm

INSTRUMENT CHECK

Time 8:45 AM
 Source 173, 4.5, 221

	A	B	C	D	E
Range	$\frac{1}{1000}$	OR 10^{-10}	$\frac{1}{1000}$	9000	
Source Dist.	5"	0	12"	0	
% F.S. Trip	60"	18	50	05	

Perturbation location K_{eff} 7.343" radius

CRITICAL POSITIONS

C.A. 16 Expr. E3 Run 1
 Date _____ Time _____
 Control Rod Channel

Safety out	5.69	A	29.5	$\frac{10}{100}$
		B	.002	
		C	4.6	10^{-10}
		D	37	$\frac{10}{100}$
		E	0	

66. $\left. \begin{matrix} 26.744 \\ 26.750 \\ 26.756 \\ 26.756 \end{matrix} \right\} 26.751$
 Tim Crit. 10:15 AM Duration 2 min.

C.A. 16 Expr. E-3 Run 2
 Sheet _____ Date 6/11 1954 Time 10:25 ^{AM}~~PM~~
 Purpose Same as E-3 #1

"Perturbation" location R₁₁ zero run - no total change in fuel or local perturbation

CRITICAL POSITIONS

C.A. 16 Expr. E-3 Run 2
 Table Pos. _____ L _____ T _____ R _____
 Control Rod Channel

1	Safety out 5.69	A	27	$10/500$
2		B	.0002	
3		C	2.2	2.5×10^{-11}
		D	36.	$10/500$
		E	0	

16 $\left. \begin{matrix} 27.4527 \\ 27.474 \\ 27.455 \\ 27.425 \end{matrix} \right\} 27.451$
 Tim Crit. 10:35 ^{AM}~~PM~~ Duration 3 min.

C.A. 16 Expr. E-3 Run 3
 Sheet _____ Date 6/11 1954 Time 11:05 ^{AM}~~PM~~
 Purpose Same as E-3 #1

Perturbation location "A"

CRITICAL POSITIONS

C.A. 16 Expr. E-3 Run 3
 Table Pos. _____ L _____ T _____ R _____
 Control Rod Channel

1	Safety out 5.69	A	35	$10/500$
2		B	.00026	
3		C	2.0	10^{-12}
4		D	47	$10/500$
		E	0	

11 $\left. \begin{matrix} 26.784 \\ 26.770 \\ 26.775 \\ 26.770 \end{matrix} \right\} 26.775$
 Tim Crit. 11:35 ^{AM}~~PM~~ Duration 3 min.

Sensitivity of R to fuel height checked & found to fall on sensitivity curve determined by Series E-2 #1.

C.A. 16 Expt. E-3 Run 4
 Sheet _____ Date 6/11 1954 Time 11:45 ^{AM}
 Purpose same as E-3 #1

Perturbation located at E_3

CRITICAL POSITIONS

C.A. 16 Expt. E-3 Run 4

Table Pos. _____

	Control Rod	Channel
1	<u>safety out 5.69</u>	A <u>33</u> $\frac{10}{500}$
2		B <u>.00025</u>
3		C <u>25</u> 25×10^{-11}
4		D <u>43</u> $\frac{10}{500}$
		E <u>0</u>

Hf $\left. \begin{matrix} 26.604 \\ 26.606 \\ 26.596 \\ 26.584 \end{matrix} \right\} 26.598$

Tim Crit. 12: N ^{AM} Duration 4 min.

C.A. 16 Expt. E-4 Run 1
 Sheet _____ Date 6/11 1954 Time 1:10 ^{PM}
 Purpose to determine importance of
215 by replacing each radial
tube in order with tube 164 "S"

Zero run all tubes in place as in Exp. D-2 #2

CRITICAL POSITIONS

C.A. 16 Expt. E-4 Run 1

Table Pos. _____

	Control Rod	Channel
1	<u>Safety out 5.69</u>	A <u>48</u> $\frac{10}{500}$
2		B <u>.0004</u>
3		C <u>1.8</u> 5×10^{-11}
4		D <u>65</u> $\frac{10}{500}$
		E <u>0</u>

Hf $\left. \begin{matrix} 27.544 \\ 27.550 \\ 27.554 \\ 27.560 \end{matrix} \right\} 27.557$

Tim Crit. 1:30 ^{PM} Duration 5 min.

C.A. 16 Expr. E-4 Run 2
 Sheet _____ Date 6/11 1954 Time 1:40 ~~AM~~ PM
 Purpose same as E-4 #1
Interchange Tube 164 "S₂" with
208 "K₁₁" - Perturbation in K₁₁

CRITICAL POSITIONS

C.A. 16 Expr. E-4 Run 2
 Table Pos. _____
 Control Rod Channel
 1 Safety out 5.69 A 25 $\frac{10}{500}$
 2 _____ B 0002
 3 _____ C 10 $\frac{5 \times 10^{-4}}$
 4 _____ D 35 $\frac{10}{500}$
 H. 26.962 } 26.967 E 0
26.970
26.965
26.972
 1:50 _____ 5

C.A. 16 Expr. E-4 Run 3
 Sheet _____ Date 6/11 1954 Time 2:00 ~~AM~~ PM
 Purpose same as E-4 #1
Interchange tube 164 "S₂" with
55 "E₃" - Perturbation in
E₃

CRITICAL POSITIONS

C.A. 16 Expr. E-4 Run 3
 Table Pos. _____
 Control Rod Channel
 1 Safety out 5.69 A 39 $\frac{10}{500}$
 2 _____ B .0003
 3 _____ C 32 $\frac{25 \times 10^{-4}}{500}$
 4 _____ D 52 $\frac{10}{500}$
 H. 26.844 } 26.840 E 0
26.830
26.838
26.848
 Tim Crit. 2:10 ~~AM~~ PM Duration 5 min.

C.A. 16 Expr. E-4 Run 4
 Sheet _____ Date 6/11 1954 Time 2:20 ~~AM~~ ^{PM}
 Purpose same as E-4 #1
Interchange tube 164 "E" with
11 in "A". Perturbation at "A"

CRITICAL POSITIONS

C.A. 16 Expr. E-4 Run 4

Table Pos.	Control P.d	Channel
1	<u>safety out 5.69</u>	A <u>40</u> $\frac{10}{500}$
2		B <u>.0001</u>
3		C <u>1.2</u> 2.5×10^{-11}
4		D <u>19</u> $\frac{10}{500}$
	H. <u>26.990</u> <u>27.000</u> <u>27.005</u> <u>26.994</u> } <u>26.997</u>	E <u>0</u>

Tim Crit. 2:35 ~~AM~~ ^{PM} Duration 5 min.

C.A. 16 Expr. E-4 Run 5
 Sheet _____ Date 6/11 1954 Time 2:45 ~~AM~~ ^{PM}
 Purpose same as E-4 #1
Interchange tube 164 "A" with
308 in E, - Perturbation at E,

CRITICAL POSITIONS

C.A. 16 Expr. E-4 Run 5

Table Pos.	Control P.d	Channel
1	<u>safety out 5.69</u>	A <u>24</u> $\frac{10}{500}$
2		B <u>.0002</u>
3		C <u>1.8</u> 2.5×10^{-11}
4		D <u>31</u> $\frac{10}{500}$
	H. <u>27.082</u> <u>27.086</u> <u>27.075</u> <u>27.080</u> } <u>27.081</u>	E <u>0</u>

Tim Crit. 2:50 ~~AM~~ ^{PM} Duration _____ min.

C.A. 16 Expt. E-4 Run 6
 Sheet _____ Date 6/11 1954 Time 3:00 ^{AM} PM
 Purpose Same as E-4 #1
 Interchange tube 164 E₁ with
 57 in K₃ - Perturbation at K₃

CRITICAL POSITIONS

C.A. 16 Expt. E-4 Run 6
 Table Pos. _____
 Com. _____ Channel _____
 1 Safety out 5.69 A 23 $\frac{10}{500}$
 2 _____ B .0002
 3 _____ C 2.0 2.5×10^{-11}
 4 $\left. \begin{matrix} 27.395 \\ 27.396 \\ 27.397 \end{matrix} \right\} 27.392$ D 31 $\frac{10}{500}$
 E 0
 Tim. Crit. 3:10 ^{AM} PM Duration 5 min.

C.A. 16 Expt. E-4 Run 7
 Sheet _____ Date 6/11 1954 Time 3:20 ^{AM} PM
 Purpose Same as E-4 #1
 Interchange tube 164 K₃ with
 144 in K₃ - Perturbation at K₃

CRITICAL POSITIONS

C.A. 16 Expt. E-4 Run 7
 Table Pos. _____
 Com. _____ Channel _____
 1 Safety out 5.69 A 23 $\frac{10}{500}$
 2 _____ B .0002
 3 _____ C 1.7 2.5×10^{-11}
 4 $\left. \begin{matrix} 27.630 \\ 27.625 \\ 27.642 \\ 27.640 \end{matrix} \right\} 27.634$ D 30 $\frac{10}{500}$
 E 0
 Tim. Crit. 3:30 ^{AM} PM Duration 5 min.

CA 16 Expr. E-4 Run 8
 Sheet _____ Date 6/11 1954 Time 3:35 ^{AM} ~~PM~~
 Purpose Same as E-4 #1
Interchange tube 164 at R₃
with 32 in H₁₁ - Perturbation at H₁₁

CRITICAL POSITIONS

CA 16 Expr. E-4 Run 8
 Table Pos. _____ I _____ T _____ R _____
 Control Rod Channel
 1 Safety out 5.69 A 37 $\frac{10}{200}$
 2 _____ B .00012
 3 _____ C 1.0 2.5×10^{-11}
 4 _____ D 48 $\frac{10}{200}$
 H. 26.932
26.944 } 26.944 E 0
26.954
26.946
 Tim Crit. 3:42 ^{AM} ~~PM~~ Duration 5' ~~min.~~

CA 16 Expr. E-4 Run 9
 Sheet _____ Date 6/11 1954 Time 3:52 ^{AM} ~~PM~~
 Purpose same as E-4 #1
Interchange tube 164 at H₁₁
with 34 in C₃ - Perturbation at C₃

CRITICAL POSITIONS

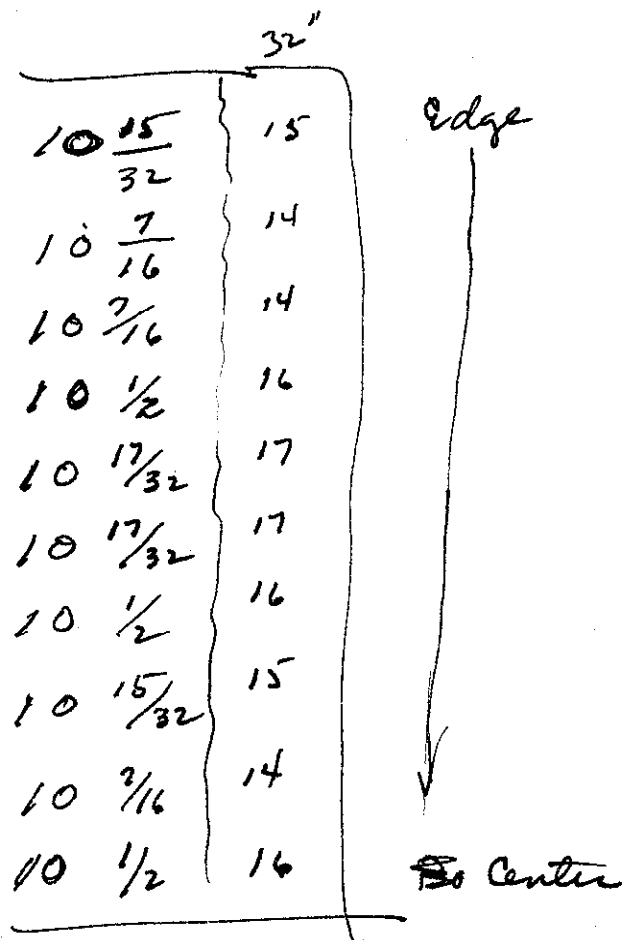
CA 16 Expr. E-4 Run 9
 Table Pos. _____ I _____ T _____ R _____
 Control Rod Channel
 1 safety out 5.69 A 28 $\frac{10}{300}$
 2 _____ B .00016
 3 _____ C 1.4 2.5×10^{-11}
 4 _____ D 26 $\frac{10}{500}$
 H. 26.9587
26.972 } 26.968 E 0
26.970
26.970
 Tim Crit. 4:00 ^{AM} ~~PM~~ Duration 5 ~~min.~~

Zero in of Level Indicator

1st low level	9.125
	9.188
1st high level	9.5/16
	9 5/16
	9 7/8
	10 1/2

Reproducibility

Travel	order of Lights	Position
Down	low on	99971
	high on	999578
up	high off	000213
	low off	00049
Down	low on	999716
	high on	999574
up	high off	000195
	low off	00048
Down	low on	999746
	high off	99951
Down	low	99967
	high	99954
Down	low	99970
	high	99952
Down	low	999713
	high	999582
	low	999723
	high	99960



Start from	
2"	.615
1.5	.605
	.605
1.53	.600
4.01	.645
2.01	.645
3.50	.655
.69	.665
.79	.675
1.93	.655
	.740

15	0
14	1
14	1
16	1
17	2
17	2
16	1
15	0
14	1
16	1
<hr/>	<hr/>
15.4	10

Dry Run P-1

Time:

Level in inches by rule

Level given by indicator
in automatic
position

~~SECRET~~
~~SECURITY INFORMATION~~

Classification Change to *Dec L* BY
Authority of *J.H. Kahn* Date *6/3/60*

~~RESTRICTED DATA~~
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Classification Change to Decls. 70
Authority of J.H. Kato 6/3/60