BOOK 113R

Notes:
on spine "37 ½ Exp. I"
on cover: "4421" and "DFC"

7 pages of lined sheets added at front of book
pages 12, 16, 21, 56 have each one big graph attached
pages 31 & 63 each have 1 sheet attached
pages 68 & 254 each have one 8.5x11 graph
pages 70, 71, 79, 82, 86, 88, 96, 98, 118, 141, 142, 147, 162, 163, 167, 168, 171, 191, 257, 258, 264, 278 each have 1 graph attached
page 94 has 1 long sheet attached
page 109 has 1 lined page attached
page 250 has 1 sheet attached
page 266 has 1 drawing attached
page 293 has 1 sheet attached

Blank pages: inside opposite page 1, 111, 222, 230, 238, page opposite 304

Scanned by:
Sheila Finch
RSICC /Oak Ridge National Lab.
March 27, 2001

4421 10-9-20 [illegible]

INV 85

"This document consists of 304 pages.
No. 1 of 1 copies, Series A"

INV. 63

~~SECRET~~

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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.

Classification changed to: U (level and category)
By authority of: CG-W-5 931.2 (classification guide)
ADC or ADD signature (first reviewer) Date 3/31/00
David R Hamrin 3/16/00
ADD signature (final reviewer) Date

Classification changed to: CRD (level and category)
By authority of: CG-W-5 (classification guide)
ADC or ADD signature (first reviewer) Date 6/24/94
ADD signature (final reviewer) Date
Ted Lewis 6-24-94

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

Every page of 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.

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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 [illegible] less of recording elsewhere, giving the date, who was present (if possible), and an outline of the subjects discussed. This often will establish [illegible] claims of other parties that you have appropriated information [illegible] ring an interview, and thus provide you with patent protection.

~~RESTRICTED DATA~~

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~~RESTRICTED DATA~~

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4421

Correct documentation as of 5-25-60

Dr ORNL-2968 (Conf)

Exp	Page	
1	4	Preliminary stacks of blocks for Reflected exps
2	9	Preliminary unmoderated multiplication
3	14	Reflected unmoderated critical 22×23" base
3-2	16	cont
4	18	Unreflected multiplication unmoderated
5	22	Reflected unmoderated Critical 21" square base 1/8" wall rubber sack
6	24	Reflected unmoderated Critical 21" square base 1/16" wall rubber sack
7"	27½	continuation of #6
8	29	" " " "
8-2	30	" " " " also water deltaum in blocks
9	32	Repeat of #7 to check reproducibility
10	33	Prelim foil (Cd) exposure
10-2	34	Same
10-3	35	Foil exposure (Cd
10-4	36	" " Al catcher on 235 plate
10-5	37	Cd covered Cd foils
10-6	38	Cd covered catcher foils
10-7	39	Rpt of 10-6
10-8	40	Bare 235 foils
11	42	Moderated (1/16" plastic H/H = 1.12) reflected
12	46	Moderated (1/4" plas H/H = 5.2) reflected
13	48	" (1/2" plas H/H 10.8) "
14	50	" (1/8" plas H/H = 2.4) "
15	52	" (3/8" plas H/H = 8.01) "

see p. 55 + 60 for H/H calc.

16	56	Multiplication Exp - moderated (1/4" plas H/H 5) no reflector
16	62	Multiplication Exp no moderator no reflector
16-2	68	continuation
16-3	74	Cont removed unreflect
16-4	76	Repeat of 16-3 without source (natural)
16-5	78	Critical with 1" Al top reflector
	79	" " Iron reflector

Exp	Page	
16-6	81	Repeat of 16-5 #8
16-7	82	Rearrangement of unmoderated blocks
16-8	83	Adjustment of 16-7 to crit
	84	"
16-9	85	Measurement of effect of .080" face on movable section
16-10	86	Comparison of mass on top & mass on side
16-11	87	Mass vs table position
-12	87	" " "
-13	88	" " "
-14	88	" "
-15	89	Al top reflector vs mass vs table position
Summary	pages 90-93	
17-1	95	Table alignment
17-2	"	" "
-3	96	table calibration position vs period
-4	97	same with added mass
17-5	99	evaluate Fe (1/4") reflector
-6	"	" " (1/2") "
-7	100	reactivity measurements
-8	"	2" lead refl.
-9	101	4" lead
-10	101	checks of clean crit
-11	103	" " "
-12	"	2" depleted blocks as reflector
-13	104	4" " " " "
-14	"	6" " " " "
-15	105	small amt of fuel added to 17-14 + mass remeasured
-16	"	replacing outer fuel with depleted
-17	106	1 1/2" paraffin as reflector
-18	"	3" " as reflector
-19	"	repeat of 17-16
-20	108	Fuel added
-21	108	Clean crit same as 17-3 - 17-11, 17-10

Exp	page	
17-22	109	6" concrete as reflector
-23		6" concrete but higher
18	112	Prelim Foil exp
18-1	114	Foil calibration
19-1	115	Sensing runs for foil exps.
-2	116	" " with movable face covered with 27 mil Cadmium sheet
-3	116	Repeat with Cad removed
-4	118	Au foil exp + S foil exp.
-5	120	Grown with exposure slot in center
-6	121	Au + Mn + Ind foils exp
-7	122	S - Na + Au foils
-8	123	Catcher foil exp.
-9	124	Au foil exp.
-10	125	" " "
11	127	" " "
Page	128	Letter from Comerau for Inventory of blocks
19-12	129	Foil exp.
-13	130	U-235 — VS U238 foil
-14	132	small U 235 foils
-15	132	" " "
-16	133	235 + 37 1/2% foils
-17	134	Repeat of Mn + 37 1/2% foil
-18	135	Run to check small fission counters
20-1	138	No Reflector .010" plastic shutmoderator
20-2	143	Cint Exp 20-1 H/X = 0.165
21-1	144	No Reflector 1/8" plex moder. Mn only
21-2	147	cont—
-3	148	"
-4	148	Cint F/X = 1.32
22-1	154	Hemisphere 1/4" plastic moderator
-2	160	Cont.
-3	162	"
-4	164	Foil calibrations

Exp	Page	
22-5	165	table calibration
-6	166	zero check
-7	166	Imp of top position of blocks
-8	167	" " corner blocks
-9	168	Cont
-10	169	"
-11	169	"
Summary p 170		
22-12	172	1" Al plate on top
-13	173	cont eval of 1" plate
-14	173	"
-15	"	"
-16	174	"
-17	175	Variation in reactivity with location of top block
-18	"	cont
-19		"
-20		"
-21		"
-22		"
-23		"
23-1	178	235 foil exp
-2	199	bare + Cd covered 235 foils
-3	180	37½ vs 93% foils
-4	181	Au + Mn foils
-5	182	235 foil vs catcher
-6	183	calibration of foils
-7	184	"
-8	185	"
-9	186	linearity check on Inst
24-1	189	No refl 1/4" plas mod (2 di)
-2		Crit Mass detm'n
-3		
-4-5-6		1/4" plas H/X = 4.81

Exp	page	
25-1	195	1" Al top refl.
-2	196	cont'd
26-1	197	No refl 1/2" plex mod
-2		"
-3		" H/A = 4.82
-4		"
-5		"
27-1	201	1" Al, Gd top refl.
28-1	202	Inhomogeneity (varying moderation
-2		same H/A
-3		
-4		
-5		
-6		
-7		
-8		
29-1	206	1 1/2" Lucite between fuel layers
-2	207	cont'd
-3	208	"
30-1	210	1" plastic layers
30-2		"
-3		"
31-1	214	No refl 1/2" plastic in 2 slots
-2		H/A = 10.68
-3		
-4		
31-5	217	1" Al top plate
32-1	218	1" fuel 3/4" plast
32-2	220	
-3		H/A = 13.64
-4		
33-1	223	Low assay mockup ~ 30%
33-2	224	cont'd

Exp	page	
34-1	226	depleted & enriched 1:2 (18½%)
-2	228	cont — #/x = 13.5
35-1	231	1:1 ratio & ¾" plastic layers
35-2-3		same
36-1	235	1:1 ratio ½" plastic
-2-3	239	cont
-4	239	1" Al top plate
-5	240	cont
37-1	241	2 depleted & 1 enriched ½" plas mod
-2	242	cont
-3	242	1" Al top plate
-4	243	cont
-5		"
-6		"
38-1	245	2 depleted & 1 enriched (¼" plastic
-2	248	cont
-3	248	1" Al top plate
39-1	250	Foil run zero
39-2	251	catcher foil exp
39-3	252	Bare 235 foils
39-4	253	Au foils
-5	254	Au foils
-6	256	Cd covered Au foils
-7	258	small 235 foils
40-1	260	1:1 enriched & depleted ⅛" plas.
-2		cont
-3	263	using depleted reflector & [illegible] unit
-4	"	1" Al plate on top
-5	265	foil exp zero run
40-6	266	U foil exp
-7	267	Au foil exp
-8-9	268	Cd covered foils 235 vs 238
-10	269	Cd covered 235 foils
-11	270	bare 235 catcher

#/x = 13.86

Exp	page	
40-12	271	calibration of U foil
-13	272	power level check run
-14	273	re-calibration
-15	274	check min fission counter
41-1	276	Bare pseudo cylinder
-2	277	cont
41-3	279	foil exp 235 Au + Mn
42-1	280	Graphite mod assy
43-1	283	Slab exp 3/4" plast mod 2 dim
43-2	286	cont
-3	287	cont
44-0	288	1:1 enriched & depleted water reflector
-1	289	cont
44-2	291	cont
45	292	top 1/2 stacked with larger modules
45-1	294	" " still " "
46	295	2 depleted & 1 enriched water refl
		1/8" plastic
47	299	Mult exp 1/4" plas same ratio water refl.
48-1	301	repeat of reflected unmod 37½% crit
-2	302	cont
49-1	303	1:1 ratio with 1/2" plastic mod
		water refl.

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INVENTORIED FEB 27 1975

NOTEBOOK NO. 4421

Assigned to: J. T. Thomas. A. D. Callihan

Department: Physics Div.

Location: Bldg. 9213, 4-12

Date: March 1, 1955

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.

Do not use scrap paper.

Be sure to record all personal conferences.

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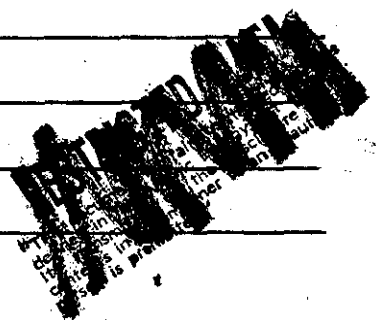
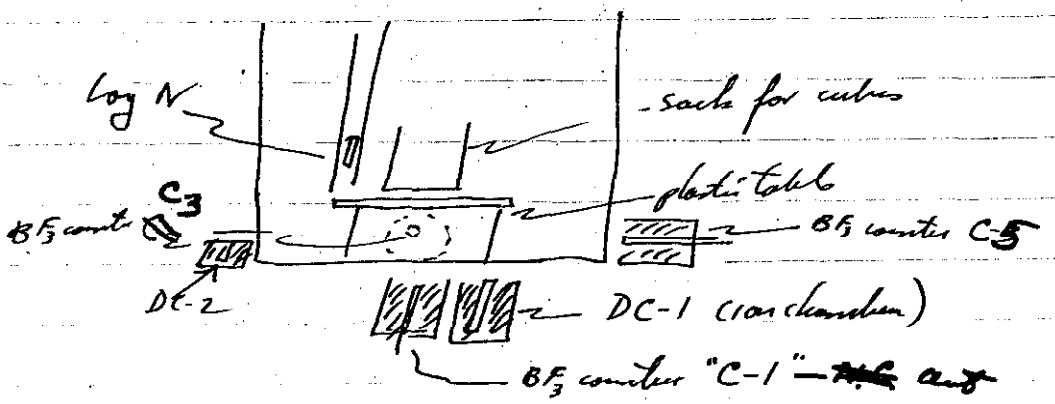
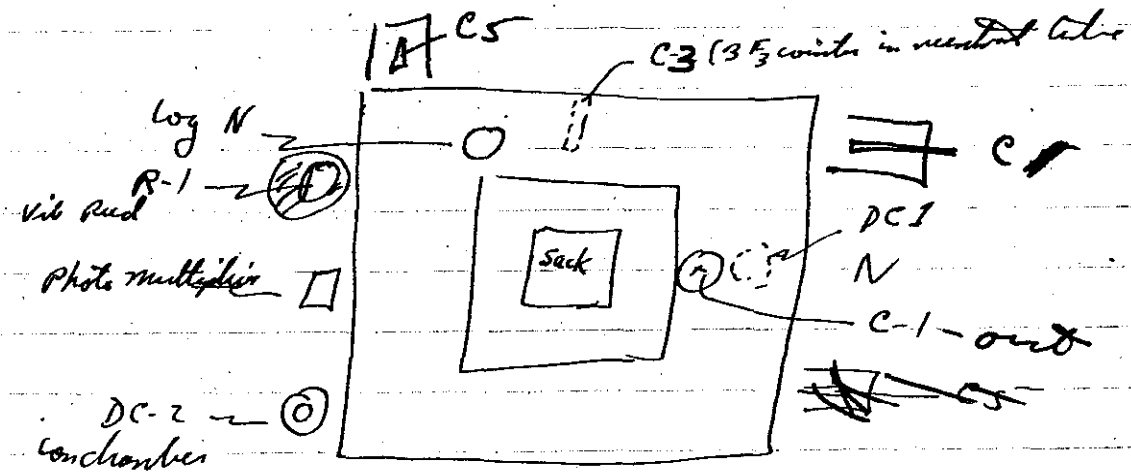
Subject	Page



7-26-55- 37.5% cubes -

23½" + 23½ square base (30" tall) rubber sack - ¼" bottom 1/16" sides placed on plastic table in 6×6×6 ft reflector tank -

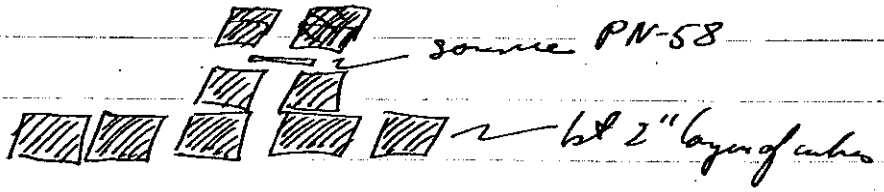


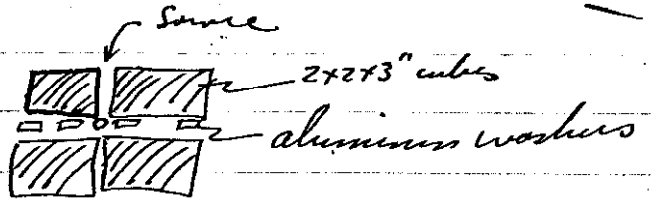


On Scram: DC-2 ion chamber
R-1 - ion chamber w/ vibrating reed
PM — Xtal + photomultiplier tube -
Log N (period)

Cubes to be stacked on plastiplate inside rubber sack Source to be built in assembly for stack -

Procedure: build a portion & flood - repeating until critical



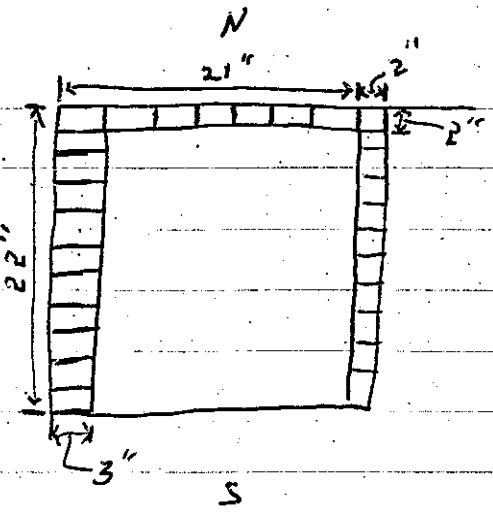


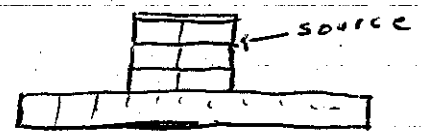
Propose to hand stack to multiplication of no greater than 10 as determined from ratio of background counts to counts as stacked

Amount available 609 Kg Lt

While stacking - hand survey just close & audible counter on -

10/7/PM





Expr. 1 Time 1:00 ~~AM~~ PM Date 7-26 1955
Purpose Preliminary Stack of 37½% UF_4 cubes
Personnel: Callihan Fox Cronin Silly Rohrer Ellis

INSTRUMENT-CHECK

Date 7-26 1955 Time 1:00 AM PM Source No. 8

Instrument	Trip Value	Scale	Source distance	Trip Scale
DC-1		responds to source		
DC-2				
DC-3	out			
Log N		responds to source		1 sec
R-1		on 1000 scale		
R-2				
P. M.		950 V	5"	

START-UP CHECK LIST

Equipment Checked by JKF DK Personnel Check by JTT
Instrument and Safeties Checked and Reset by
"Source In" Checked by Cronin Source No. PN 58
Emergency Equipment in Control Room Checked by DKC
Red Light On by JTT
Start-Up OK'd by DK Time 1:00 ~~AM~~ PM Date 7-26 1955

For background counts – 1 layer of cubes plus penthouse for source –

7 (3×2×2) by 11 (2×2×3

total 77 (2×2×3" cubes) plus 11 (2×2×2" cubes)

plus 6 (2×2×3) cubes for source penthouse

Total 83 2×2×3" cubes at gms 25 per cube

11 2×2×2" cubes at gms 25 per cube

Background counts (2 min)

1^{42}	C-1 x64	C 3 x16	C-5	No Reflector
	88 + 55	168 + 2	———	x16
	72 + 52	161 + 15	138 + 4 — NG changed dia —	
	94 + 10	163 + 12	———	
	93 + 16	162 + 11	57 + 3	
		4) 14 38 (8, 46)	54 + 4	
Avg Bkgd	91 + 54	163 + 12	54 + 6	
	→ 93 + 2	163 + 12	55 + 4 avg	

2^{08} PM adding water Reflector —

Top of plastic table: 6.5 on back scale of Sightglass

0 on Back scale = 24.0 on side scale.

2^{20} PM Water Reflector at 12.5 cm = 6 cm above zero —

	C-1 x64	C-3 x16	C5 x16	Reflector
2 min →	8 + 48	254 + 13	40 + 5	
5 min →	19 + 11	647 + 14	97 + 2	
	2,0 + 23	6,4,4 + 1,4	9,8 15	
	4) 47 + 8 2	6) 154 5 + 41 (48, 84)	6) 235 22 (10)	
	8 + 1			
Avg 1 min		257 + 15	39 + 6 1/3	
	3000	24,700	3760 counts	

Bare

		C_1	M^{-1}	C_3	M^{-1}	C_5	M^{-1}	
2 layers	5 min.			$492^{16}+7$		$123^{16}+14$		
	2 min.			$197^{-}+1$		$49^{+}+3$		
3 layers	2 min.	$45^{64}+61$		$266^{16}+13$		$47+1$		
	"	$44+41$	2.10	$272+1$	0.599	$48+12$	1.14	3^{30} pm

4^{11} pm Counter C-3 moved to howitzer under tanks.

3 layers	2 min	$41+54$	$214+3$	
	5 min	$99+51$	$529\ 1$	
		$7)\ 140\ 105$	$7\ (743+4$	
		$20\ \ 15$		
Avg 2 min		$40+30$	$106+3$	
			$\times 2$	
			$212+6$	
5^{20} pm	5 layers 2 min.	$64+58/0.615$	$366^{16}+6/0.58$	$70^{16}+6/0.787$
5^{55} pm	6 layers 2 min	$131+40\ 0.307$	$417^{16}+12/0.508$	$83+0/0.662$
		$131+38$	$434+2/$	
6^{20}	7 layers 2 min.	$172+62/0.232$	$484+19/0.438$	$100+8/0.55$
8^{58}	(154 kg 70) 8 layers 2 min.	$203+46/0.197$	$533+0/0.398$	$\cancel{336}^{64}+9$
		$195+10/0.205$	$531+0/0.399$	$108.5/0.51$
10^{00} pm	Moved DC-2 under tank.			
10^{18} pm	9 layers; 2 min	$227+63/0.175$	$554+2/0.382$	$115+7/0.478$
		$220+58$	$558+24$	$115+10$
10^{40}	193 kg 25 10 layers 2 min.	$264+54/0.151$	$591+3/0.359$	$129+11/0.426$
		$267+61$	$592+6$	$120+9$
11^{30}	(222 kg 75) 11.5 layers 2 min	$304+3/0.131$	$631+10/0.336$	$148+4/0.371$
	-23	$303+3$	$638+3$	

		C_1	C_3	C_5
3 layers	2 min.	$3^{64}+49$	$97^{16}+8$	$36^{16}+15$
4 17 PM	adding H_2O after moving C-3 to 21.5 cm = ht of top layer			
9 20 PM	3 layer 5 min.	$11^{64}+12$	$56^{14}+1$	$90.^{14}+0$
		$6+58$	$51+8$	$90+15$
		7 4.8 7	$53+1$	
			21.6	36.0
5 30 PM	5 layers 2 min.	$2+52$	$28+11$	$36+12$
		$3+14$ / 1.6	$30+4$ / 0.7	$34+8$ / 1.02
6 35	7 layers 2 min.	$3+20$	$42+19$ / 0.505	$50+12$ / 0.705
		$2+55$	$42+11$	$48+11$
9 19	8 layers 2 min.	$4+3$	$52+13$ / 0.414	$38+14$
		$3+46$	$56+6$ / 0.386	$37+16$
9 30 PM	8 layers	added top reflector		
9 40 PM	8 layers 2 min.	$4+58$ / 0.975	$84+10$ / 0.252	$34+12$
		$4+51$	$80+17$	$32+7$
9 50		raised water level 4" above cubes		
	8 layers 2 min.	$2+19$	$88+13$ / 0.241	
10 00		Removed top reflector.		
			$17^{2}_{86}+22$ / 0.125	$04+12$
7/21/55 12 05 AM		added top reflector + adding water as side + base reflector		

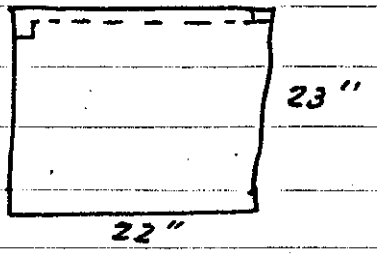
Water at 50.5 cm – multiplication's great enough to justify removing built in source and testing for criticality.

Removed reflector + moderators to 10 layers.

11 30 AM Final assembly built was:

22 × 23 × 23" less a (1×22" × 1") strip on ~~s~~ west edge and a (1×1×1") on S.W corner.

total volume = 11,638
−23
11,615 cu in



Built up of 2"-thick horizontal layers plus an almost complete 1"-thick layer on top

assuming 19 gms U235 per cu in = 220.666 Kg U25

INSTRUMENT CHECK

Date 7-28 1955 Time 9 25 AM ~~PM~~ Source No. 8

Instrument	Value	Scale	Source Distance	Start-Up Scale
~~DC-1~~				
~~DC-2~~	55-20x10			
DC-3	20x10			
Log N	Tone tuning			Tone
R-1	1000 on 1000 scale			50 x 1000
R-2				
P. M.	~~500~~ 1000 V		3½"	1000 V

START-UP CHECK LIST

Equipment Checked by DFC Personnel Check by DFC
Instrument and Safeties Checked and Reset by DFC
"Source In" Checked by DFC Source No. PN 58
Emergency Equipment in Control Room Checked by DFC
Red Light On by DFC
Start-Up OK'd by DFC Time 9 30 AM ~~PM~~ Date 7-28 1955

Expr. 2 Time 9 30 AM ~~PM~~ Date 7-28 1955
Purpose Finish counting bone + check for activity reflected
Personnel: DFC JKF

Starting with Source built in a 10 layer high stack: 22 x 23 x 20"
as Exp 1 for same position.

Note: From Wayhill: gms T shipped = 596,702.1 gms
from 9206 cube inventory = 11,603 cu in
51.4265 gms T/cu in
at 37½% = 19.285 gms 25/cu in

No Reflector (except Table)

7/28/55

		C-1	C-2	C-3	C-4	C-5
		×64	×64	×64	×16	×16
9 30	5 min 0+14		229+32	376 +0	200+13	120+7
			45+16/min	75.2/min	40+2/min	
11 03	started to restack remaining 1½ layers - total of 11½ layers					
			BKg = 45.1	BKg = 111.5	BKg = 20.4	BKg = 22.9
11 30	Restacked - 11½ layers - 22×23×23 less 23 in³					
	Includes all cubes received -					
			249 +21 .181	24 +268 ×1024 (323.05 ×16/min)	251 +9 / 0.280	127 +8 .180
12 42 PM	no change - lunch period		—	399 +48 ×64 .279	253 +10 ×16 0.278	120 +8 ×16 .190
12 48 PM	still (22×23×23) -23		253 +8 .178	399 +58 .278	266 +5 0.265	118 +0 .177
1 08 PM	top 1" layer removed 22×22×23		246 26 .181	386 25 .288	234 0 0.300	117 4 .195
1 25 PM	West side 1-2" vertical layer out					
1 35	now E-W N-S Ht. 21×22×22		213 26 .211	329 29 .338	190 10 .369	98 9 .233
			214 15 .211	328 25 .339	188 4 .374	99 11 .230
2 00 PM	now E-W N-S Ht 21×20×22		191 23 .236	309 38 .360	.414 170 3 ; .407 172 13	.271 84 10 ; .257 89 0
2 20 PM	21×20×20		184 13 .245	294 49 .378	151 13 .464	85 14 .267
			184 34 .244	299 9 .372	161 10 .436	87 10 .261
2 50	18×20×20		160 14 .281	274 19 .406	134 4 .524	78 3 .293
3 25	18×20×18		154 38 .292	266 2 .419	120 2 .586	68 3 .335
	15 20 18 ~~18×17×18~~		121 34 .371	211 58 .527	82 11 .851	56 6 .406
3 40	15×16×16		100 8 .450	181 51 .613	92 8 .761	45 7 .504
			98 15 .459	183 62 .606	106 15 .658	47 4 .485
4 20 PM	12×12×12		72 9 .625	142 15 .784	95 6 .738	33 2 .691
4 35 PM	EW NS Ht 9×8×8		47 44 .945	115 59 .962	52 10 1.34	20 1.14

Water Reflector

	C-1	C-2 ×64	C-3 ×64	C-4 ×16	C-5 ×16
9 AM	5 min Paraffin top added	256+31	404+60	257+1	135+10
	Water gap = 6.2 cm Max = 50.8 / 57.0 cm				
10 30 AM	Water added 20 inches above table – system so nearly critical that no reason to count linear rate of rise for 5 min on DC-2, DC-3 + R-1				
	water dropped –				
	Volume = 10,120 cu in × 19 =				192.28 Kg 25 lbs
	Stopped until Source is removable –				
	Further Bare data				
		×64	×64	×16	×16
4 45 PM	5 min counts 9×8×8	47 20 0.95	118 96 .939	49 13	21 7
4 50 PM	10 min counts 6×6×8	90 37	229 39	132 14	46
5 00 PM	Counter left on for 10 min – Read in Am	89 49	230 37	148 14	45 12
	Background	5797	14,694	2126	736.0
		5745	14757	2382	732 / 1468
	20 c/min	11,542 / 577.1	29451 / 1472.5	4508 / 225.4	73.4
	c/5 min/meter	45.1	111.5	70.4	22.9

.180 .190 .177 .195 .233 .230 .257 89 0 .267 .261 .293 .335 .406 .504 .485 .691 1.14

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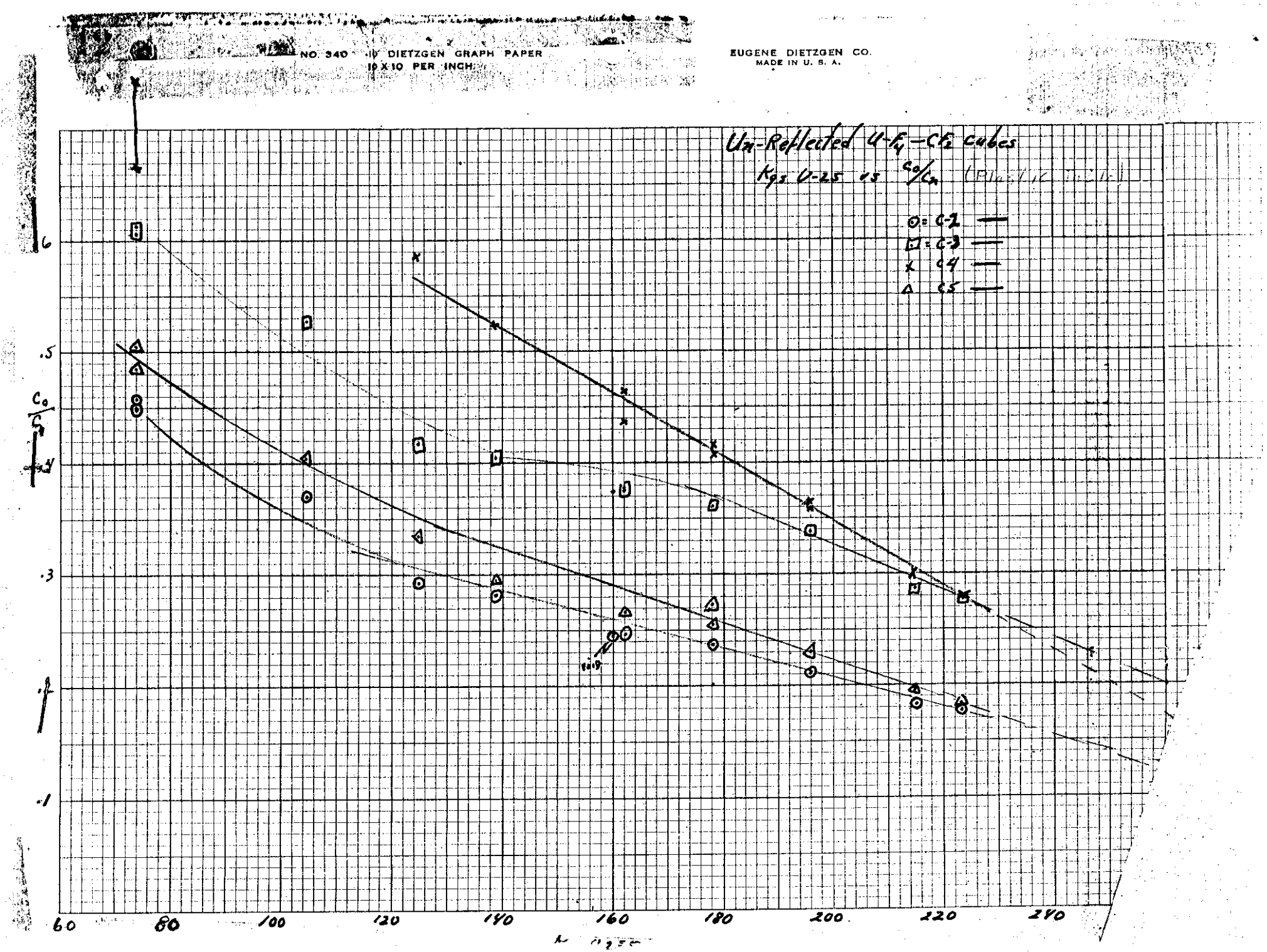
10 X 10 PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.



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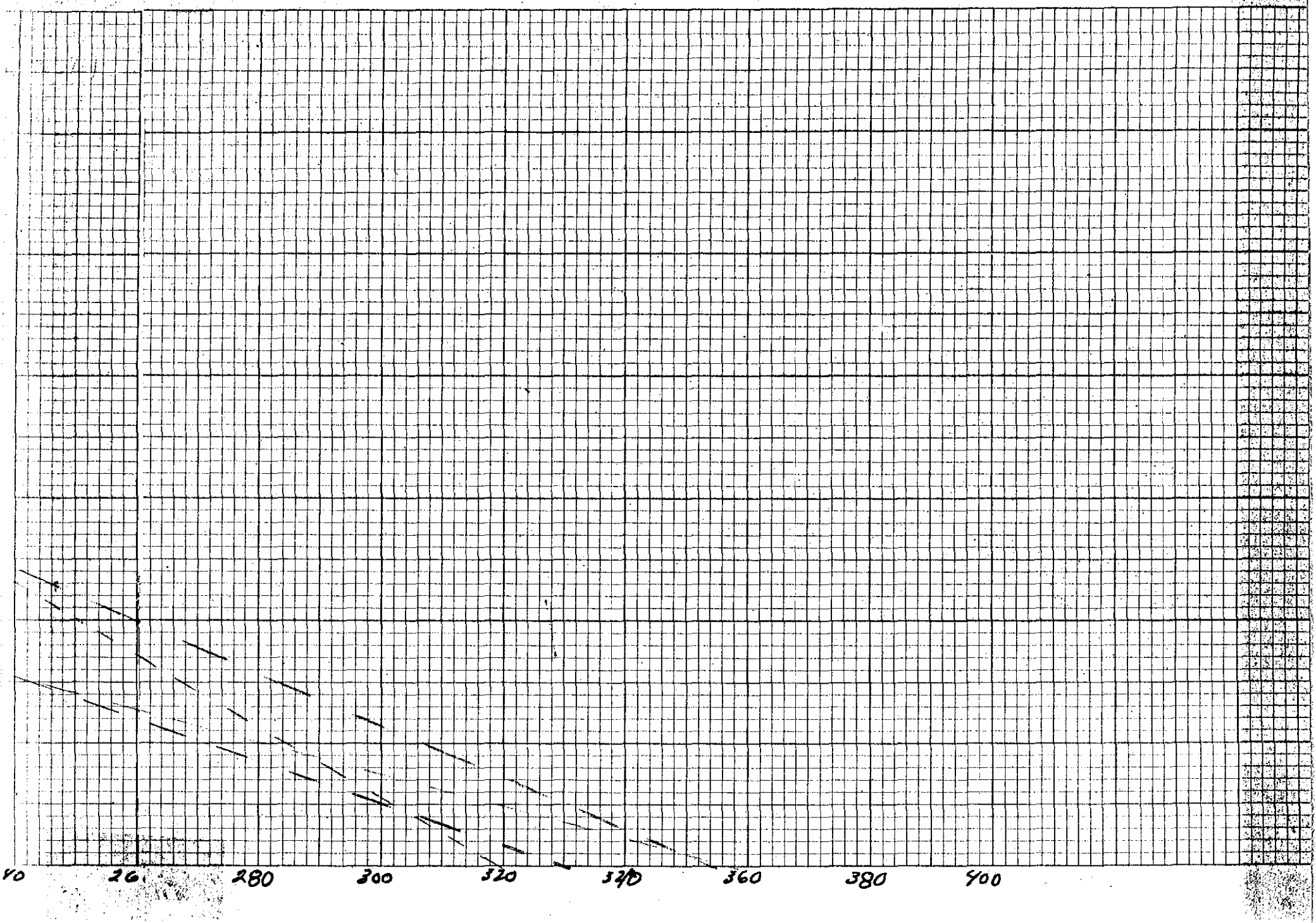


Bare Multiplication (See P.10)

Array	IN^3	51.43 gm/in³ 19.285 gm/in³ GN T	Gm X	C_2	C_3	C_4	C_5
6×6×8	288	14,811.8	5,554.1	~~0.953~~	—	—	—
8×8×9	576	29,623.7	11,108.2	0.945	.962	1.34	1.14
				0.953	.939	—	—
15×16×16	3840	197,491.2	74,054.4	.450 ~~0.625~~	.613	.761	.504
				.459	.606	.658	.485
15×20×18	5400	277,722	104,139	0.371	.527	.851	.406
18×20×18	6480	333,266.4	124,966.8	0.292	.419	.586	.335
18×20×20	7200	370,296	138,852	0.281	.406	.524	.293
21×20×20	8400	432,012	161,994	0.244	.372	.436	.261
~~21×20×22~~				0.245	.378	.464	.267
21×20×22	9240	475,213.2	178,193.4	0.236	.360	.414/.407	.271/.257
21×22×22	10,164	522,734.5	196,012.7	0.211	.339	.374	.230
				0.211	.338	.369	.233
22×22×23	11,132 ~~11,118~~	572,518.8	214,680.6	0.181 ~~.211~~	.288	.300	.195
				~~.211~~			
22×23×23 (less 23 in³)	11,615	597,359.5	223,995.3	~~0.181~~			
				0.178	.278	.265	.177
				0.181	.279	.278/.280	.180
12×12×12	1728	88,871	33,324.5	0.625	.784	.738	.691

Extrapolation of this curve Estimates 320-360 Kg U25
or between 16,593 and 18,667 cu in
equiv to a 25½ in cube to 26½ in

Expr. 3 Time 8^00 AM Date 8-1 1955
Purpose Reflected Critical using external source
Personnel: Pumm

INSTRUMENT CHECK

Date 8-1 1955 Time 8^20 AM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	82	20×10	6 inches	20×1
DC-3	75	20×10		20×1
Log N		7 sec		7 sec
R-1		1000×100		25×1000
R-2		~~1000~~		
P. M.		1000 V	3-4 inches	1000

START-UP CH[illegible]

Equipment Checked by _____ [illegible] by _____
Instrument and Safeties Ch[illegible] _____
"Source In" Checked by _____
Emergency Equipment in [illegible] _____
Red Light On by _____
Start-Up OK'd by _____ Time _____ PM Date _____ 195__

From previous multiplication with built in source plan to stack (external source to a 22×23 & 18" parallelepiped - expecting at 22×23×20 to be critical.

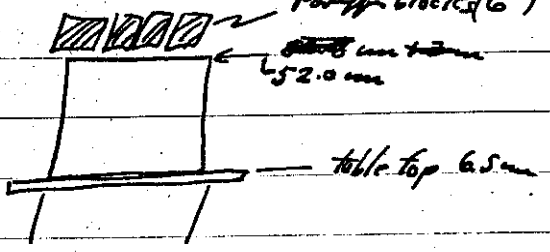
1/16" thick walls on rubber sack -

Partially reflected - sides and bottom

	Array	C_1	C_3	C_4	C_5
9 15 A.M.	22×23×6	3^{32}	7^{10}	0^{2}	~~1^{8}~~
9 45 A.M.	22×23×10	4^{24} 3^{37}/.815	8^{30} 7^{40}/.88	0^{6}, 0^{3}	0^{9}, 0^{7}
10 40 A.M.	22×23×18	5^{24}, 5^{0}/.67	9^{40}, 9^{57}/.737	0^{6}	0^{12} H_2O = 55.6 cm
1 00 PM →	22×23×20				

Paraffin top — water ht 55.7 cm Source Out

gens: 6.5 / 49.2 cm



1 31 PM Super Critical with 3.8 cm to go to meet top reflector.

1 W PM Removed 6" × 23 × 2" strip on top & replaced top reflector equiv to ~~5.09~~ 5.323 kg U25

2 20 PM Super Critical - Water at 58.2 cm Source Out

22×23×20 = 10,120 cu in = 195.164 kg U25

~~5.091~~ − 5.323

Still Super. 190.073 kg U25 189.841

2 35 PM Removed a second 6" × 2 × 23" strip on opposite side of top mass now 189.841

Sub Critical − 5.323 / 184.518

3 35 PM Removed all 2" thick cubes replacing with 1" thick cubes — 22 × 23 × 19"

9,614 cu in Mass ≡ 185.406 kg

3 50 PM Sub-Critical water at 73.0 cm

INSTRUMENT CHECK

Date 8-2 1955 Time 9 10 AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	75	20x10		20x1
DC-3	75	20x10		20x1
Log N	7 sec			7 sec
R-1	7x1000x100			7x1000x25
R-2				
P. M.	1000V			1000V

START-UP CHECK LIST

Equipment Checked by DK [illegible] Check by DK

Instrument and Safeties Checked [illegible] DK

"Source In" Checked by DK [illegible] PN-58

Emergency Equipment [illegible] DK [illegible] Checked by

Red Light On by DK

Start-Up OK'd by DK Time 9 10 AM ~~PM~~ Date 8-2 1955

Expr. 3-2 Time 9 10 AM ~~PM~~ Date 8-2 1955

Purpose addition of section on top center of ~~[illegible]~~ 12x12x1 = 144 cm in more

Personnel: Fox Cronin

9 30 AM Paraffin top reflector in place + adding water reflector

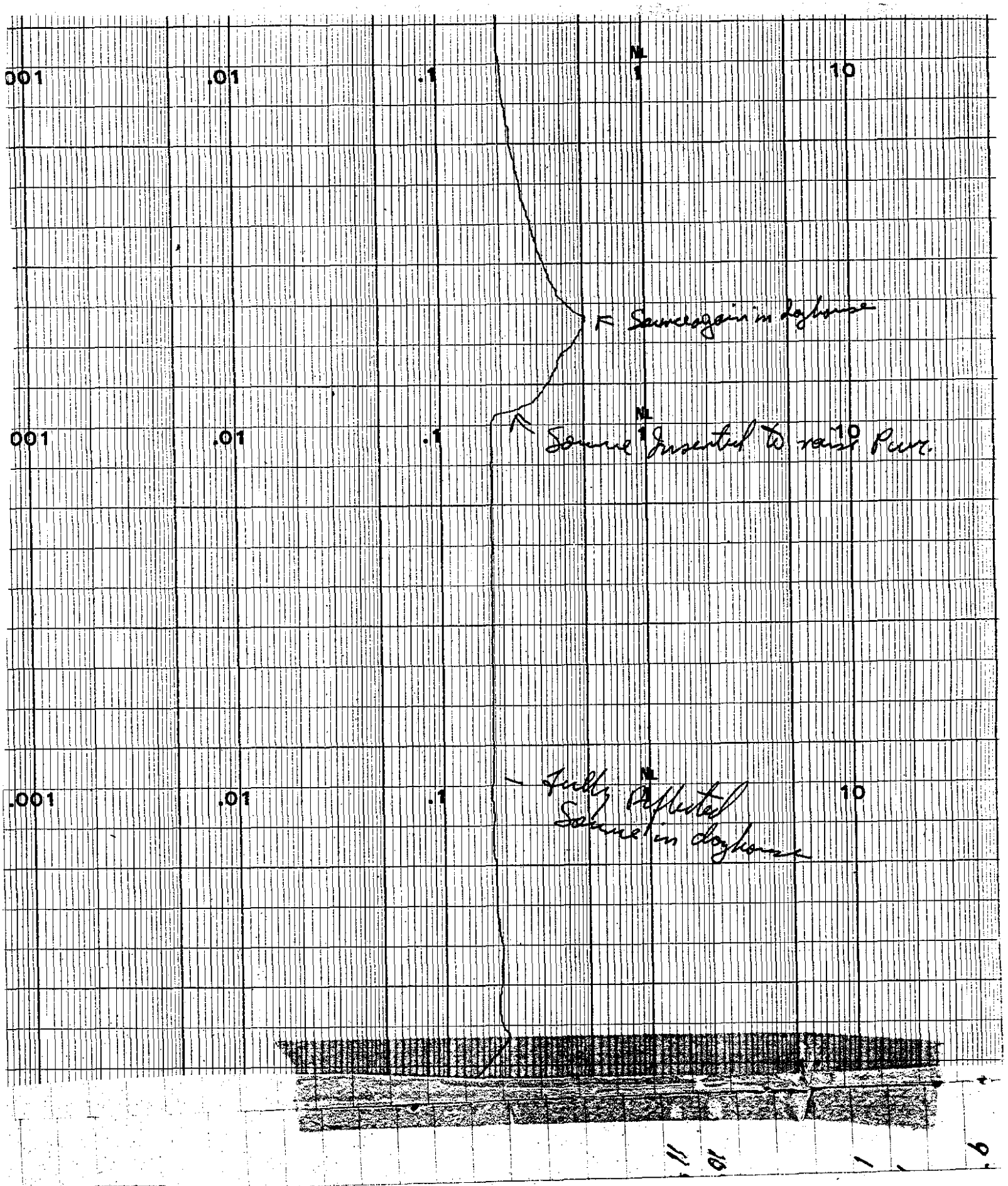
9 40 AM Super Critical water at 56.8 cm

Mass = 185.406
+ 2.777
188.183

188.183 Super M_c = 186.795 ± 1.4 kg

185.406 Sub

2) 2.777
1.389



.001
.01
.1
NL
1
10
Source again in doghouse
Source Inserted to raise Pwr.
Fully Reflected Source in doghouse

9 50 AM Removed 1/2 of top half

Mass now = 186.795 Kg 25

10 00 AM Super Critical at 61.8 cm water

10 10 Removed a 6" x 6" x 1" piece from top half = 0.694 Kg 4

186.795
- .694
186.101 Kg 25

10 50 AM Water Reflector at 73 cm (max ht - for effect. Infinite Reflector)

11 05 AM System just critical with some removed.
Possible some more neutrons still over by
assembly (see attached sheet from Log Book)

Critical conditions:
(22 x 23 x 19") plus 6 x 6 x 1" close to center
total cu in = 9,614 plus 36 = 9,650 cu in
Mass = 186.101 Kg 4 25
Equiv cube (calculated of 9650) = 21.3 in
Better value = 9,668 cu in critical ± 18 cu in
9,686 cu in Super 186.795
9,650 cu in Sub 186.101
2) .694
.347

M_c = 186.448 Kg
vol - in³ x 19.091 gm/in³ = 184.571 Kg

INSTRUMENT CHECK

Date 8-4 1955 Time 8 00 AM ~~PM~~ Source No. 8

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

Responded to source

START-UP CHECK

Equipment Checked by DK Personnel Check by DK

Instrument and Safeties Checked and Reset by DK

"Source In" Checked by DK Source No. PN15

Emergency Equipment in Control Room Checked by DK

Red Light On by DK 50 AM

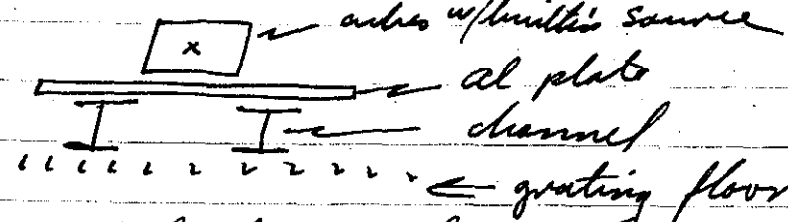
Start-Up OK'd by DK Time 10 ~~PM~~ Date 8-4 1955

Expr. 4 Time _____ Date _____ 195__

Purpose Bare Multiplication of 4F4 cubes

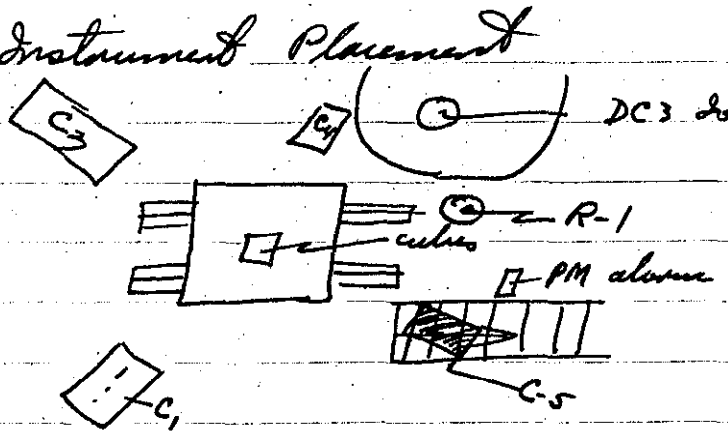
Personnel: DK

Stacking cubes on aluminum plate supported by 2-6" channel iron —

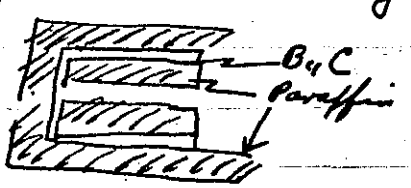


Distance of at least 5 feet from any solid structures.

Instrument Placement



C_1, C_3, ~~C_4~~, ~~C_5~~, Boron lined proportional counters
C_4, C_5 – BF_3 enriched proportional counters.
each counter tube is now in neutron moderators patterned after Los Alamos "long counter" –



R-1 – is Ion chamber with BF_3 thru Vibrating Reed to Recorder

20

Time + Size

6×6×6"

	C_1 ×64		C_3 ×64		C_4 ×64		C_5 ×64	
10^{55} AM 6×6×6	209^{+43}	209	328^{+37}	323	52^{57}	53	25^{44}	20.6
10 min Bkgd	208^{+23}		323^{20}		53^{41}		19^{5}	
12^{40} PM	209^{24}		322^{34}		53^{39}		17^{2}	

12×12×12" cube 88.871 Kg T; 33.325 Kg 25

1^{06} PM 10 min	262^{49}	0.797	353^{45}	.916	75^{55}	0.70	21^{11}	.968

15×16×16" 197.49 Kg T 74.054 Kg 25

2nd	272^{43}	0.768	349^{38}	.926	79^{61}	.662	27^{23}	/0.754
	268^{19}	0.70	348^{50}	.928	82^{34}	.642	28^{42}	.722

18×18×18" = 5832 cu in 112.470 Kg 25

2^{45} PM	338^{2}	.617	392^{4}	.823	88^{1}	0.602	25^{63}	?
round away pellet of cubes	390^{24}	.614	387^{9}	.834	86^{32}	.617	27^{30}	0.754

3^{40} PM

21×20×20" 432.012 Kg T; 161.994 Kg 25

	358^{3}	.583	415^{60}	.778	103^{60}	.510	34^{49}	.588

4^{10} PM

21×22×22 196.012 Kg 25

	428^{58}	.487	484^{33}	.667	122^{21}	.434	40^{53}	.502

22×23×23 − 23 in³ = 223.895 Kg 25

	479^{40}	.436	540^{18}	.596	143^{44}	.369	41^{54}	.490

5^{01} PM Extrapolation of these points gives an indefinite value - low of 388 Kg — upper - 450 Kg 25 — possible - poor counter geometry.

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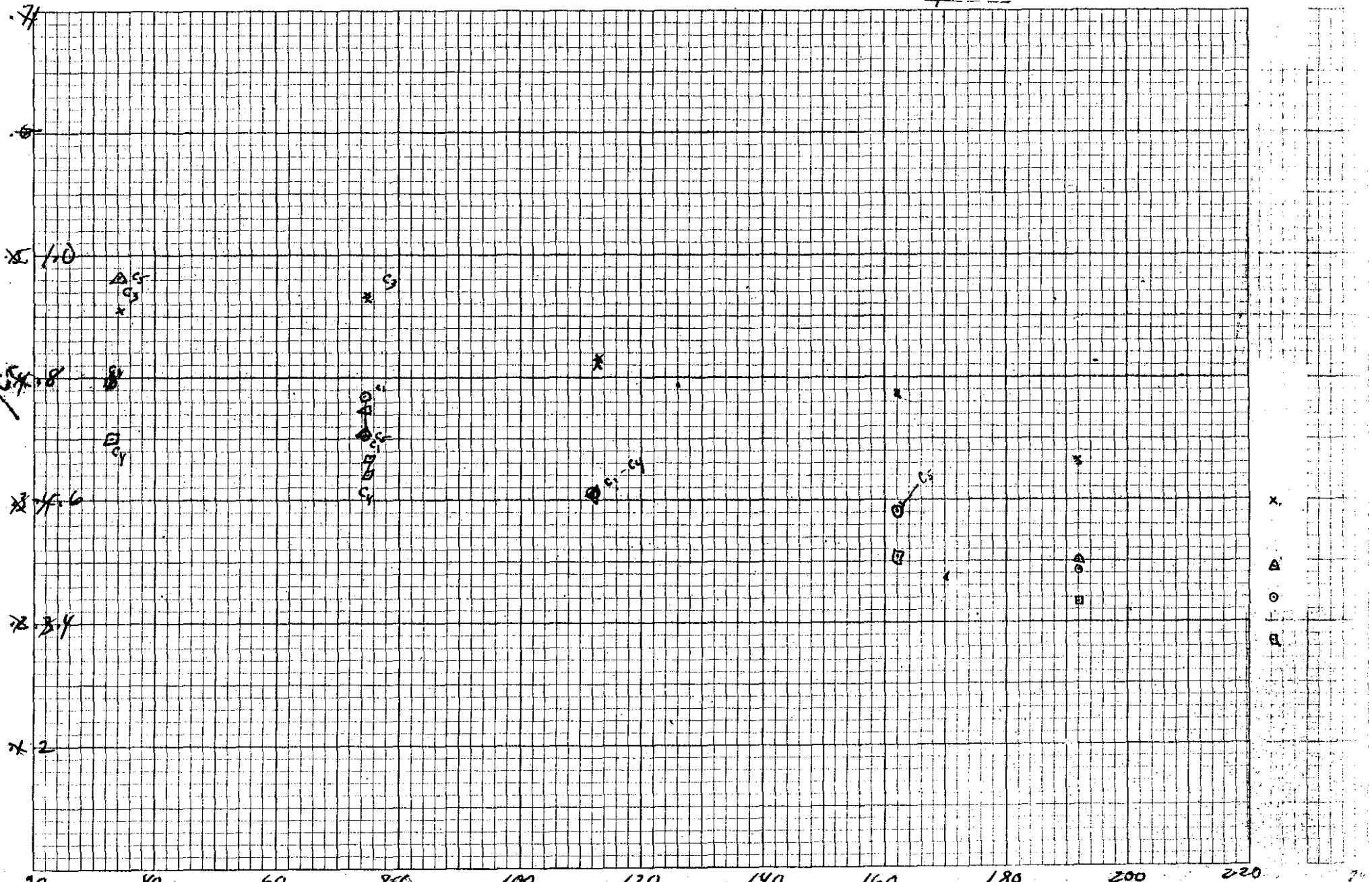
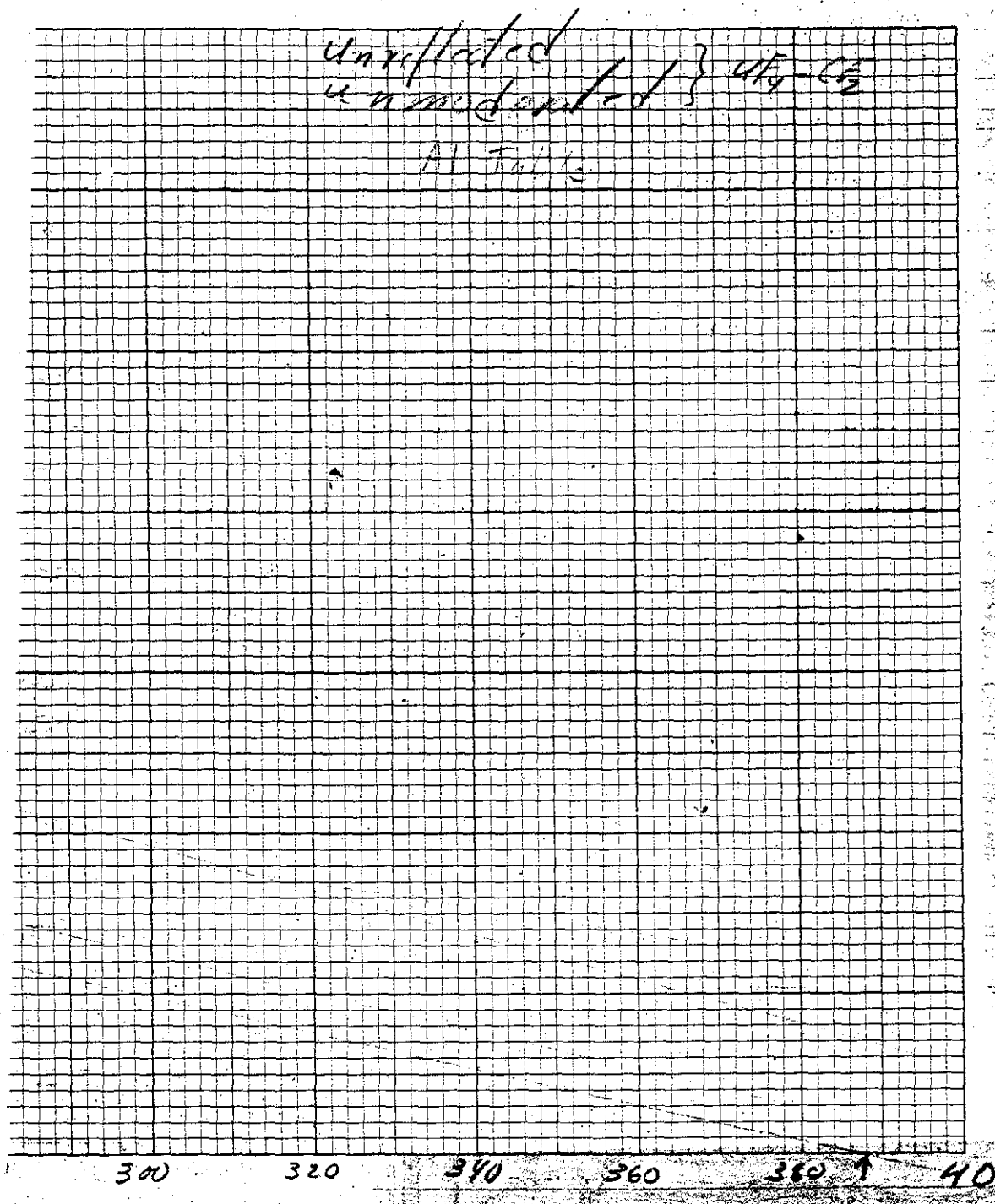
Exp 4



Kg 425

EUGENE DIETZGEN CO.
MADE IN U. S. A.



Expr. 5 Time 10 30 AM Date 8/11 1955
Purpose Obtain Mc on 21" square
bare reflected assembly -
Personnel:

Date 8/11 1955 10 30
Instrument
DC-1
DC-2 trip @ 100 on 10x20
DC-3
Log N trip
R-1 trip on 100 scale
R-2
P. M. trip

9 30 AM Began Stacking - now using respirators & carefully vacuuming drying area -

3 10 PM Now stacked: 21x21x20 with 6" paraffin top reflector

3 30 PM Sub Critical when flooded

3 50 PM Restacked - now 21x21x22" with 6" of paraffin
Water ht on scale = 76.0 cm
- 56.25 - assembly
19.75
- 6.3
13.4 cm above core

4 35 PM System barely Sub Critical
probably 600 gm 25 more needed.

CH

Note = corr. × 19.091 = 185.221 Kg

9,702 cu in × 19.285 = 187.103 Kg

8-12-55 Rechecked by flooding assembly after tightening — ie any loosenness taken out — Indefinitely Sub Critical at a very high multiplication.

Previous Super C = 22×23×20 = 10,120 cu in = 195,164 Kg 25

minus 6"×23×2" = 276 cu in

9,844 cu in = 189.841 Kg 25

Sub C 22×23×19 9,614 cu in = 185.406 Kg 25

Super = 22×23×19 plus 144 cu in 9758 cu in = 188.183 Kg 25

~~9,758~~

Now Sub = 21×21×22 9,702 = 187.103 Kg 25

Est Critical = 9,730 cu in ±30 18.7643 Kg ±.5 25

11^15 Added 1 pc 6×6×1" = 36 cu in to top — with 1st inch of reflector of bricks with 6" square hole in center — Remainder is paraffin

11^35 Water Reflector = 65.6 cm

System Super Critical = 21×21×22 + 36 cu in

9702
36
9738 cu in total

Est Crit = 187.450 Kg ± 347 gms 187.797 = Super

187.103 Sub

187.450 Kg 25 2 | .694

347

Expr. 6 Time 3 30 AM Date 8-23 1955
Purpose Repeat a Reflected 21" sphere base 22" tall with thin walled sod (1/16" thick walls
Personnel:

INSTRUMENT CHECK

Date _____ 195__ Time 3 30 ~~AM~~ Source No. 8

Instrument	Trip Value	[illegible]	[illegible]	[illegible]	Up Scale
DC-1					
DC-2					
DC-3					
Log N	10 sec		regards		10 sec
R-1	1000 mv				10 v
R-2					
P. M.	3"	900 V			900 V

START [illegible]

Equipment Checked by DH by _____
Instrument and S[illegible]
"Source In" Ch[illegible] DH PN-58
Emergency Equ[illegible] OK
Red Light On by DH
Start-Up OK'd by DH _____ 195__

3 35 PM Started

4 00 PM Water Ht. 68.1 – Super Critical (very slight period)
187.103 Kg 25

8 - 24 - 55

Summary to date -

1. Extrapolation & Criticality of unreflected (except for rubber sack + plastic table - Exp. 2 pages 9-13
Est Critical = 320 - 360 Kg U 25 - highest M = 5.6

2. Re-Run of unreflected on Aluminum Plate supported 6" above grating floor - no sack Exp 4 p-18-21
Est. Critical 388 - 450 Kg U 25 highest M = 2.71

3. Reflected Criticals (in rubber sack with 6" paraffin top)
base = 22 x 23"

	Super	Sub	Avg.
195.164 Kg	22x23x20 = 10,120 in³		
189.841	22x23x20 less 276 in³		
~~184.~~		Sub → 184.518 Kg 22x23x20 less 512 in³	187.18 Avg.
185.406	22 x 23 x 19 = 9,614 in³	Sub	

22x23x19 plus 144 cu in = 188.183 Kg Super
22x23x19 plus 72 cu in 186.795 Super
22x23x19 plus 36 cu in 186.101 Sub
} ~~187.142 Kg 65 Avg~~ 186.448 Kg

Avg = 22 x 23 x 19 plus 54 in³ = 9668 cu in

Exp 6 21 x 21 x 22 = 9702 cu in 187.103 Kg - Super C

↑ Mass figures are based on 19.285 gms/in³ and should be corrected to 19.091 gms/in³

Cubes =

13.78% $(CF_2)_n$ 86.22% UF_4 65.276% T (corrected for assay)

Assay avg = 37.494%

number	Avg dimensions	Vol cm^3	wgt	wgt T	wgt X
841	2.009 × 2.009 × 3.004	198.676	945.4	617.12	231.38
122	2.009 × 2.009 × 1.003	132.472	629	410.59	153.39
127	2.008 × 2.008 × 1.002	65.646	316	206.27	77.34
27	.9995 × 1.006 × 1.006	16.584	79.8	52.090	19.531

weighted avg = ~~19.082~~ 19.091 gms X/in^3

~~1.1644~~ 1.165 gms X/cm^3

total Vol = 192 032.9 cm^3

total wgt X = ~~223.611.6~~ 223.727.4 gms (estimated from weybill incoming)

Reflector Water Analysis →

Req 354715 see water notebook

Expr. 7 Time 3 40 AM Pl. Date 8-24 1955
Purpose Reflected 21" square x 22 Tall
less 2 x 1 x 21" (42 cu in from top edge South
Personnel: DK JTT

INSTRUMENT CHECK
Date 8-24 1955 Time 3 40 AM Source No. 8
Instrument
R-1
R-2
P. M.

START-UP CHECK LIST
Equipment Checked by DK Personnel Check by JTT
Instrument and ... JTT
Source ... No. PN 58
Emergency ... DK
Red Light On ... DK
Start-Up OK'd by ... 3 40 AM Pl. Date 8-24 1955

When 2 x 1 x 21" strip removed - replaced by 1" of plastic (lucite) to avoid hole in reflector -

9702
- 42
9660 cu in now — Previous Critical = 9702 in³ 187.101 Kg

4 05 PM With water at 68.5 cm System Still Super C.
Seems a possibility of blocks picking up moisture - edges are quite friable.

9660 x 19.091 = 184.419 Kg 25-

8-24-55

Moisture Detm'n on Cube #1158 (2x2x3)

4 35 PM

wgt of Beaker plus cube 1085.088 gms — placed in Oven at 95°C

8-25-55

11 30 AM Weighed cube + beaker 1084.455

.633 gms loss.

$\frac{.633}{231.3} \times 2611 =$ 71.45 H/425

2 15 PM wgt = 1084.420

.668 gms loss — presumably moisture

9-6/55 wgt beaker alone 139.555

1085.088
139.555
945.533
.668
4.865

Expr. 8 Time 3 30 ~~AM~~ PM Date 8-25 1955
Purpose 21" square bus 22" tall with 2x1x21 and 21x3x2" strip removed - water reflector
Personnel: DK

INSTRUMENT CHECK

Date 8-25 1955 Time 3 30 AM PM Source No. 5

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	80x200			80x20
DC-3	7 sec			7 sec
R-1	100xx100			100x100
R-2				
P. M.	3" 900V			800V

START-UP CHECK LIST

Equipment Checked by DK Personnel Check by BC
Instrument and Safeties Checked and Reset by DK
"Source In" Checked by DK Group No. PN 58
Emergency Equipment in Control Room Checked by DK
Red Light On by GL
Start-Up OK'd by DK Time 3 35 ~~AM~~ PM Date 8-25 1955

3 50 Water at 70.0 cm System Sub Critical.

Vol. = 9702
− 170 188
9532 cm in
9660
2) 1192
Avg 9598 cm in

2x21x1 = 42 cm in
3x2x21 = 126
17.0 cm "

Expr. 8-2 Time 4^10 Date 8-25 195
Purpose added 66 cu in to array
Personnel:

Added on side from which 2×3×21" section was removed: 2(2×2×3)'s in center
plus 10 (2×2×1)'s and 2 (1×1×1)'s
total 66 cu in
Vol now

9532
+ 66
9598 cu inches

Plastic inserts fill vacant spaces on top
4^30 PM Probably Sub Critical – leaving source in to come to equilibrium Water at 71-5

9660 – Super
9598 – Sub?
1258

Avg 9629 ± 31 cu in

Definitely Sub at 9598 cu in

183.827 Kg 25 ± 59 gms

157.79 Liters ± 0.51 Liters

ANALYTICAL REPORT

Report to: A.D. Callihan Requisition Number 354716

Material Type Teflon-UF_4 Block Batch Number 29

Answers are in: (circle) PPM (Percent) Other

Ag	Al	As	Au	B	Ba	Be	Bi	Ca	Cd	Co	Cr	Cs	Cu	Fe	Ga	Ge	Hg	In	K	Li	Mg

Mn	Mo	Na	Ni	P	Pb	Pd	Rb	Sb	Si	Sn	Sr	Ti	Tl	V	Zn						

H_2O

		#1	#2	#3	#4		Avg. of (4)									C	U	Zr	Hf	RE
		.046	.042	.047	.039		.044% as rec'd													
		.00070	.00064	.00073	.00069		.00066 g H_2O/g U													

Remarks: Determined by weight loss 120°C for 2 hrs

LAB-68

SPECIAL SAMPLES LAB.
BUILDING 9995

By EFM Date 9-7-55

5 ^{20} PM Set up 4 beakers to bake out cubes taken from critical assembly

120°C heat 14 hrs.

(plus beaker)

2×2×3 #371 wgt 1079.04 gms
wgt beaker 138.711 — 138.711 — 940.33 — .66 — .67

2×2×2's #108
#104 1400.23 gms
wgt beaker 140.482 — 140.48 — 1259.75 — .71

2×2×1's #173
#274 774.61 gms
wgt beaker 139.4578 — 139.46 — 635.15 — .45

6 (1×1×1's) [3, 11, 16, 26, 30, 33] 618.54 gms
wgt beaker 138.614 — 138.61 — 479.93 — .50

8-26-55

10 ^{00} AM Taken out of oven and placed in dessicator to cool.

11 ^{10} AM Reweighed —

		wgt loss	Vol	Surface Area
6 (1×1×1's)	618.040 gms	= 0.50 gm	→ 6 in^3	6 in^3
2 (2×2×1's)	774.18	= 0.45 gms	→ 8 in^3	32 in^2
2 (2×2×2's)	1399.52	= 0.71 gm	→ 16 in^3	48 in^2
2×2×3	1078.38	= 0.66 gms	→ 12 in^3	32 in^2

Avg 0.07 wgt % water

Greatest percentage loss seems to be in smaller cubes.

8/31/55 Cube #29 2×2×2 sent for analysis of H_2O content on Req # 354716

9/7/55 by phone: 0.116 wgt % H_2O ≡ 1.8 mg H_2O/gm U = 0.126 H/X

4 Karl Fischer titrat – lab doesn't feel too confident

Expr. 9 Time 4^10 ~~AM~~ PM Date 9-6 1955
Purpose Repeat of Exp 7 to check reproducibility 21×21×22 minus 2×1×21
Personnel:

INSTRUMENT CHECK

Date 9-6 1955 Time 4^10 ~~AM~~ PM Source No. 8

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

START-UP CHECK LIST

Equipment Checked by	DK	Check by	DK
Instrument and Sa[illegible]	DK	[illegible]	DK
"Source In" Chec[illegible]	DK	[illegible]	PN-58
Emergency Equ[illegible]	DK	[illegible]	DK
Red Light On by	DK		
Start-Up OK'd by	DK	[illegible]	195

4^15 Started adding water

4^35 pm Water at 70 cm zero of table = 6.5 = 63.5 cm
22" = 55.88 cm so 7.6 cm above ashes approx
(not allowing for ½" of rubber plus plastic on bottom)
Sub C at 68.5 cm } fairly good check on Exp 7
Super C at 70.0 cm }

Water drop: start 70 cm
after 1 min 40.5
29.5 cm/min

Expr. 10 Time 1 20 ~~AM~~ PM Date 9-7 1955
Purpose Preliminary Foil Exposure
21 x 21 x 22" "cube" with 1/4" x 2" x 21" slot 10" down from top — approximately centered - 12" from ~~X~~ face (see sketch)
Personnel: DK

21
12

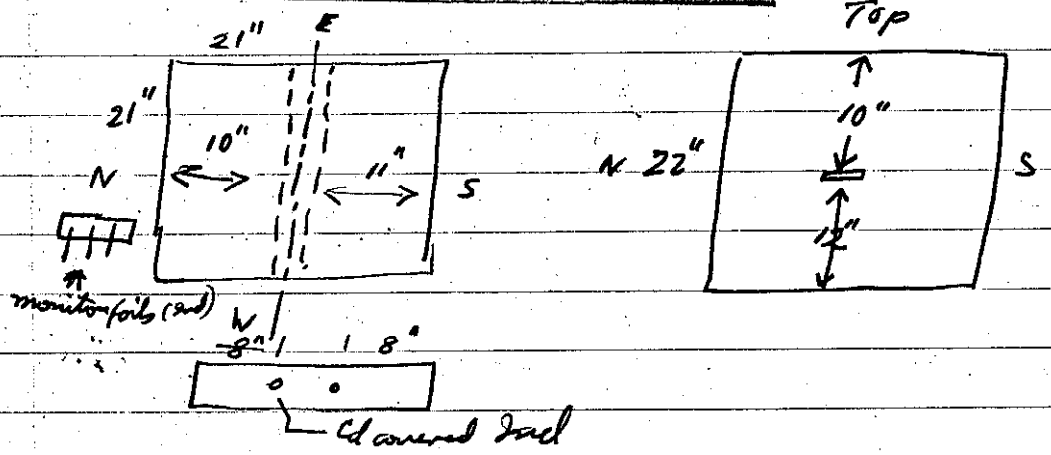
INSTRUMENT CHECK

Date 9-7 1955 Time 1 20 ~~AM~~ PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	80	x 200		x 20
DC-3		x 200		x 20
Log-N	7 sec	7 sec		7 sec
R-1	7	x 100 x 1000		25 x 1000
R-2				
P. M.	3"	900 V		750 V

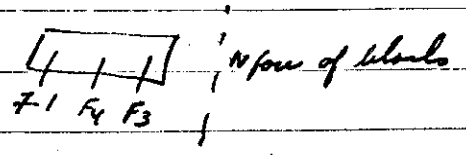
START-UP CHECK LIST

Equipment Checked by DK Personnel Check by DFC
Instrument and Safeties Checked and Reset by DFC
"Source In" Checked by DFC Source No. PN-58
Emergency Equipment in Control Room Checked by DK
Red Light On by DFC
Start-Up OK'd by DK Time 1 20 ~~AM~~ PM Date 9-7 1955



2 05 PM Previous Crit = 68.1 — Started water
2 25 PM Just barely Super C at 70 — not enough exposure for foil run — (over —

Expr. 10-2 Time AM Date 195
Purpose Add more U to Exp 10
6" x 2" x 21" = 252 cm in
Personnel:



2^{40} Started again

3^{00} PM 59.7cm just critical.

3^{03} 62cm on period

62.1cm approx 100cm period.

Inst reading - during exposure (20 min)

log N = 0.2 x 78

DC-2 = 46 x 100

DC-3 = 41 x 50

R-1 = 2.5 x 200 x 1000

3^{25} slow downward drift on log N now reads 0.24

Foil Results -

7-3 = 439 c/m

7-4 176

7-1 95

Bare Ind = 30 = $\frac{19}{30}$ =

Cd covered = 11 Cd fract = 0.63

INSTRUMENT CHECK

Date 9-8 1955 Time 9 35 AM Source No. 8

Instrument	Trim Value	Scale	Source Distance	Start-Up Scale
Dt-1				
Dt-2	72	20x10	10"	20x1
Dt-3	80	20x10	2"	20x1
Log N	7sec	7sec	2"	
R-1				
R-2	7	1000x1100	3"	25x1/100
P. M.		750V	1"	750V

Foil distribution (numbers up) Bare Indium

→ E9 ← centered

Normalizing Foils

B 12 1"
20 3"
25 5"
19 7"
21 9"
14 11"
24 13"
27 15"

← N

74 73 71

note: apparently 4" between #20 & 25 instead of 2

Expr. 10-3 Time AM PM Date 195

Purpose Expose foil on assembly 10-2

Personnel:

9 58 AM just critical at 60.5 cm

10 00 61.8 cm on period - decreasing

10 16 Log N = 3.7 starting clock - & go to log N = 10 & level -

62.7 ≈ 62.7 cm

62.5 - level at log N = 10 PM trips at 890V - Recorder -

Inst meter reads 0.6

10 30 Radiation at door to Rm 101 = 12.5 mm/hr

DC-2 × 10×100 = 51

DC-3 10×100 = 33

10^{35} AM Shutdown

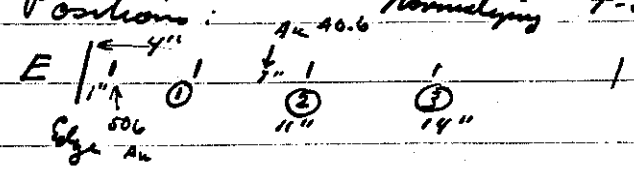
Expr. 10-4 Time 2^{45} PM Date 9-8 1951

Purpose Flux using Al catcher foils + U-235 discs – same slot as end foils

Personnel:

Note log N recorder re-adjusted to correspond with meter

Foil Positions: Normalizing F-5 (same loc as F-4



3^{04} PM Source Out 62.0cm H_2O

3^{10} 63.0cm H_2O on period approx 100sec

R-1 tripped at 0.175 log N

DC-2 } < 0.25 on log N > 0.175
DC-3 }

Scale Readings at Pwr.

log N = 1.0

DC-2 70 × 10 × 100

DC-3 90 × 10 × 100

R-1 off scale

PM trips at 750V set at 700

3^{30} PM 62.6cm H_2O

INSTRUMENT CHECK

Date 9-9 1955 Time 9 00 AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	60	20x10	3"	20x1
DC-3	70	20x10	3"	20x1
Log N	7 sec	7 sec	5"	7 sec
R-1	7	1000x100	contact	100x1000
R-2				
P. M.	750V	750V	1"	750V

moved R-1, PM, and DC-2 away from ass'y.

Expr. 10-5 Time AM PM Date 195

Purpose Expose Cd covered Ind foils - same foils same location as Exp 10-3 except Cd covered. Also Dysprosium + Au foils for test run

Personnel:

START-UP CHECK LIST

Equipment Checked by DHC Personnel Check by DHC

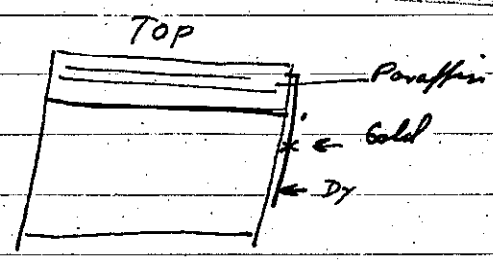
Instrument [illegible] Checked by DHC

"Source In" [illegible] by DHC [illegible] No. PN-58

Emergency [illegible] by DHC

Red Light On by DHC

Start-Up OK'd by DHC Time 9 00 PM Date 9-9 1955

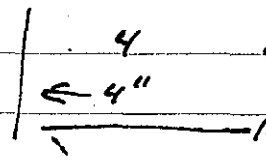


monitor = 7.4

9 40 AM Started on approx 200 sec period H_2O = 62.9 cm

10 10 shut down.

Foils. Cl covered w catchers



Normalizing 7-5

Expr. 10-6 12:50 pm 9-9 1955
Purpose Cl covered catcher foils
Personnel:

4 pm 2 of 3 foils came off stringer -
left in assembly until Mon.
Ont. water height 62.5'

New Foil

	(10)	(11)	(12)
E ←	4"	10½"	14"

Expr. 10-7 Time 9:30 AM ~~PM~~ Date 9-12 1955
Purpose Rept 10-6

Personnel:

INSTRUMENT CHECK

Date _____ 195__ Time _____ AM ~~PM~~ Source No. _____

Instrument	Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	60 x 200	3"		20 x 10
DC-3	70 x 200	2"		
Log N	7 sec			7 sec
R-1	7 x 1000 x 1000			100 x 1000
R-2				
P. M.	700V	1½"		700V

START UP CHECK LIST

Equipment Checked by DK Personnel Check by CC
Instrument and Safety Checked and Reset by DK
"Source Is" Checked by DK Source No. PN 58
Emergency Equipment [illegible] Checked by DK
Red Light [illegible] DK
Start Up [illegible] DK 9:30 AM 9-12 1955

9:47 AM Critical at 62.4 cm H_2O
approx 100 sec 62.9 " "
" 50 " 63.2

10:15 AM Shutdown after 20 min exposure

Run 10-8
Foil Positions

9/13 monitor foil F-5

	(7)	(13)	(14)	(15)
9-12-55	4"	7"	10½"	14"

5:40 PM Foils loaded & assy - restacked - note: monitor foil not yet loaded.

Expr. 10-8 Time 7:20 AM ~~PM~~ Date 9/13 1955
Purpose Expose bare U foils
Personnel: Thomas & Cronin

INSTRUMENT CHECK

Date 9/13 1955 Time 7:30 AM ~~PM~~ Source No. RA-4.80

Instrument	Trip Value	[illegible]	[illegible]	Source Distance	Start-Up Scale
DC-1					
DC-2	✓	–	–	–	100/10
DC-3	✓	–	–	–	100/10
Log N	9 sec			2"	–
R-1	✓	–	–	–	1000/1000
R-2					
P. M.	✓	–	–	1"	✓

START-UP CHECK LIST

Equipment Checked by D.F.C. Personnel Check by D.F.C.
Instrument and Safeties Checked and Reset by D.F.C.
"Source In" Checked by D.F.C. Source No. PN-58
Emergency Equipment in Control Room Checked by D.F.C.
Red Light On by D.F.C.
Start-Up OK'd by D.F.C. Time 7:30 AM ~~PM~~ Date 9/13 1955

Placed Two catcher foils #'s 16 and 17 on Top layer, north side, ~9 inches from east side.

SUMMARY OE CRITICAL CONDITIONS

Expr. 10-8 Reactor 37.5 % cubes

Time Critical 7:45 AM Duration 20 min. Log N 1.0

Expr. Data: Fuel $UF_4(CF_2)_n$

Reflector H_2O; height at critical 62.4

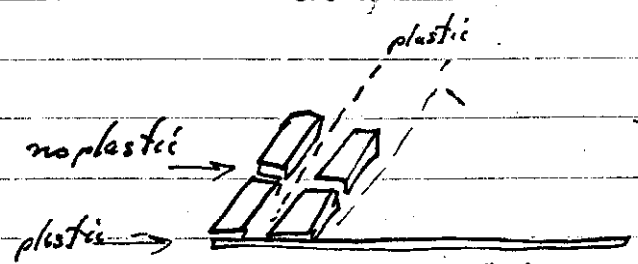
Analytical Data

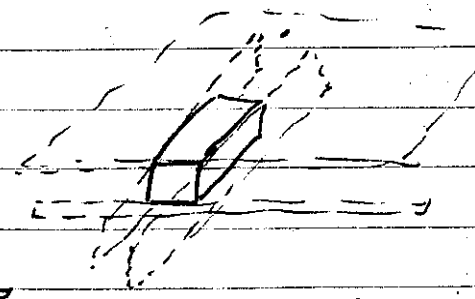
Critical Mass U-235 Volume Moderator None

8:10 AM Shutdown time. Start clock 8:10

Beginning of Moderated Exp

5^{45} PM - Restacked up to 5 layers with 1/16" plastic between blocks





none on the 2×2×2" faces of a 2×2×3" block

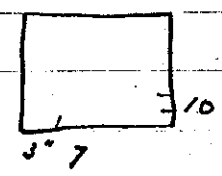
Expr. 11 Time 8^{40} ~~AM~~ PM Date 9-13 1955
Purpose Begin moderation of UF_4 system 1/16" Sheets
~~Personnel:~~ ADC JTT DFC

5^{45} PM Stopped work until AM

9-14-55

7^{20} AM Background counts:

System = $21 \times 20\frac{7}{8} \times 10\frac{1}{4}$



10 × 7 blocks × 5 blocks high

6 × 5 plastic $2 \times 20\frac{7}{8} \times \cancel{1/8}$ 1/16

plus 4 sheets ~~1/8~~ 1/16" × $21 \times 20\frac{7}{8}$"

at 231.38 gm U235 per 2×2×3" block = 80.9 Kg 25

INSTRUMENT CHECK

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

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				20
DC-2	60	200		20
DC-3	75	200		7 mm
Log N	7 mm			
R-1	7	10000		
R-2				700V
P. M.	1"	200V		

assy ~~27.6~~ cm tall 26.0 cm

table = 6.5 cm

34.1 cm on scale

15.2

49.3 cm on scale for full reflector

7:50 AM water at 48 cm = 15.5 cm above cone

#1 ×64	#3 ×64	#4 ×64	#5 ×64
1 +63	127	7 +53 500	0 +11 11	0 +26
	122		
1 +58	124½	7 +56 503	0 +6 6	0 +20 23
		501	85	

Background 8:30

added two more layers = 140 blocks 32.3 kg (32.4)

80.9

113.2

Total Mass = 113.2 Kg. 25

some indication on Inst. as stacking – just above 8 kg d.

added top reflectors –

8:50

#1	#3	#4 ×16	#5
4 +30 285	13 +11 843	0 +19	0 +45
2 52 170	13 +26 858		
4 35	13 +33 850		
0.446	0.590	.448	.512

44

total 8 layers

9^{25} AM added more 1 layer = 70 blocks = 116.18 Kg
113.2
129.38 Kg 25

Bkg	#1	#3	#4	#5
	124½	501	9	23

9^{40} water at 56 cm.

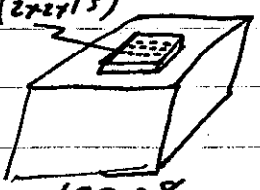
11^{30}	59^{7}	2^{30}_{158}	46^{1}	317	.073
734	3782	.057			
.169	.132				

10^{15} added 28 blocks centred N-S - running full length
E+W - = 6.46 Kg Mass now 136.05 / 135.84 Kg 25
Top reflector - pinned out with plastic - some gaps -

10^{30} 48.5 cm water - just critical

11^{00} AM Removed 2×2×3's and added 2×2×1's maintaining plastic spacers

540 2×2×3's
25 2×2×1's



77.34 / 25 = 1933.5 g/m3

Mass now 129.38 + 1.93 = Total 131.31 Kg
129.57 + 1.93 = 131.40

11^{20} 53.7 cm H_2O just Crit first one with top layer

11^{30} AM removing top 1" layer - this leaves 129.57 kg U^{235}

11^{45} Sub Critical water at 68 cm

M

SUMMARY OF CRITICAL CONDITIONS

Expr. 11 Reactor

Time Critical 11 30 AM Deviation min. Log N .05

Expr. Data: Fuel ~~21" x 20 9/16" x 19 1/2"~~ with interspaced plastic

Reflector Water bottom & side top paraffin

Analytical Data 37.49% assay

Critical Mass U-235 129.38 — 131.31 Volume Moderator 7,691 gms

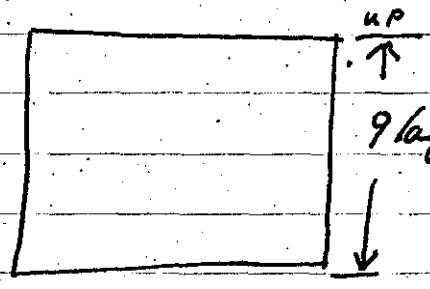
$21\frac{1}{16} \times 20\frac{5}{8} \times 16\frac{1}{2}$

$$\begin{array}{r} 131.31 \\ 129.38 \\ \hline 2)\ 1.93 \\ \hline .965 \end{array}$$

$$\begin{array}{r} 129.38 \\ .965 \\ \hline 130.345 \end{array}$$

Kg 25 to 0.5 Kg

wgt of moderator = 7,691.0 gms



9 layers blocks so 9 full sheets plus spacers this counts ½ sheet on top & bottom.

~~19" tall~~

$$\frac{7,6910 \times .08}{129.38} \times \frac{235}{\cancel{234}} \quad H/\alpha = 1.118$$

u^{235}

Expr: 12 Time 2 ~~AM~~ PM Date 9-14 1955
Purpose Using 16 x 17" sack UF_4 blocks with 1/4" plastic on 3" dimension
Personnel: ADC CC DH

5 (2x2x3's) plus 1 (2x2x2) on E-W line
7 (2x2x3)^3 on N-S line – plus 1/4" plastic on side
each layer – = 35 2x2x3's = 8.1 Kg
7 2x2x2's = 1.074
9.124 Kg per layer

8.098
1.078
9.176

3^{10} PM 4 layers completed

3^{15} PM 5 layers completed + top reflector added

3^{35} PM water at 52.5 cm

#1		#3		#4		#5	
1^{51}	115	8^{9}	521	0^{+12}	12	0^{+38}	38
2^{13}	141 / 256 / 128	7^{44}	492 / 1023 / 512	10	11	0^{+26} / 64	32

3^{55} PM 7 layers completed + top reflector on = 64.2 ~~6~~ 1 8^{2} Kg^{5} 25
245 2x2x3's ; 49 2x2x2's

4^{07} PM 42.7 cm H_2O just Super Crit.

4^{20} Removed 3 strips – = 15-2x2x3's = 3.467 Kg
3-2x2x2's = 0.459
3.926

3.471
.462
3.933

64.218
3.926
Mass = 60.292 H/f in S

64.23
3.93
60.30

4^{30} 45.5 cm Supercritical.

Critical Conditions

Removed two more strips —

10 2×2×3's 2.3138 2.3138

2 2×2×2's = 316.76 .3079

2.6217

Mass = 60.292 2.6306 60.30

2.631 2.62

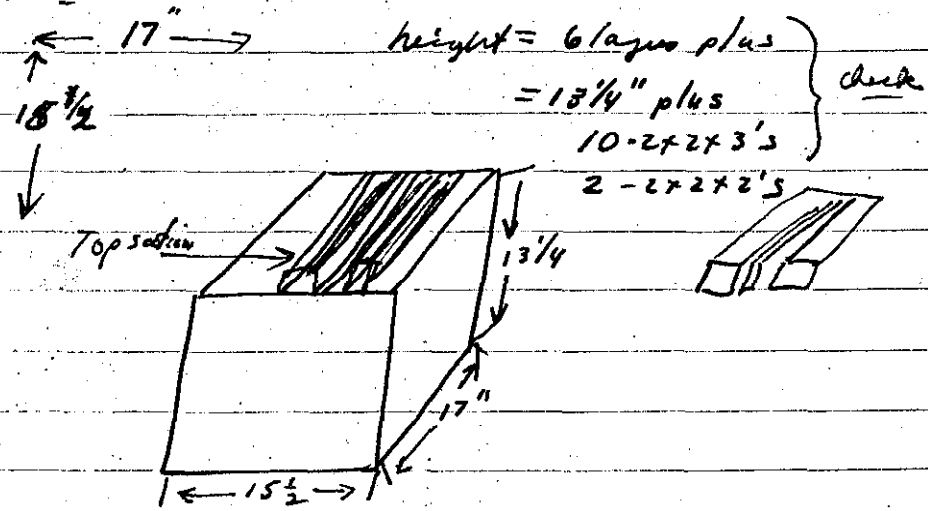
57.661 Kg 25 57.68

4 60/PM Stacked Plastic = 15,782 gms

56 cm H_2O = very slight positive pressure —

57.1 ± 0.5 Kg 25

dimensions:



$\frac{15.782}{57.661} \times .08 \times 235 = 5.15$ H/X

Expr. 13 Time 9⁴⁵ ~~AM~~ PM Date 9-14 1955
Purpose Further moderation of UF_4 blocks using 1/2" lucite spacers
Personnel:

9⁴⁵ PM completed 4 layers plus top reflector

1	3	4	5
3^{+11}	6^{+56}	0^{+4}	0^{41}
2^{+17}	6^{+37}	0^{+10}	0^{28}

10²⁰ PM completed 6 layers plus top reflector = ~~30.92 Kg~~ 25 35.6 Kg 25
120 2×2×3's
5 2×2×2
7 2×2×1

10⁵⁵ 26 cm H_2O = just Critical

10⁴⁰ PM Removed 1 layer — now 5 layers = ~~25.025 Kg~~ 25 29.62 Kg 25

36.2 cm on H_2O — super critical

10⁵⁰ PM Removed 7 2×2×1's mass = ~~2[illegible]~~ 0.541
29.08 Kg 25

38.7 cm on H_2O — Critical

11¹⁰ Stopped air samplers

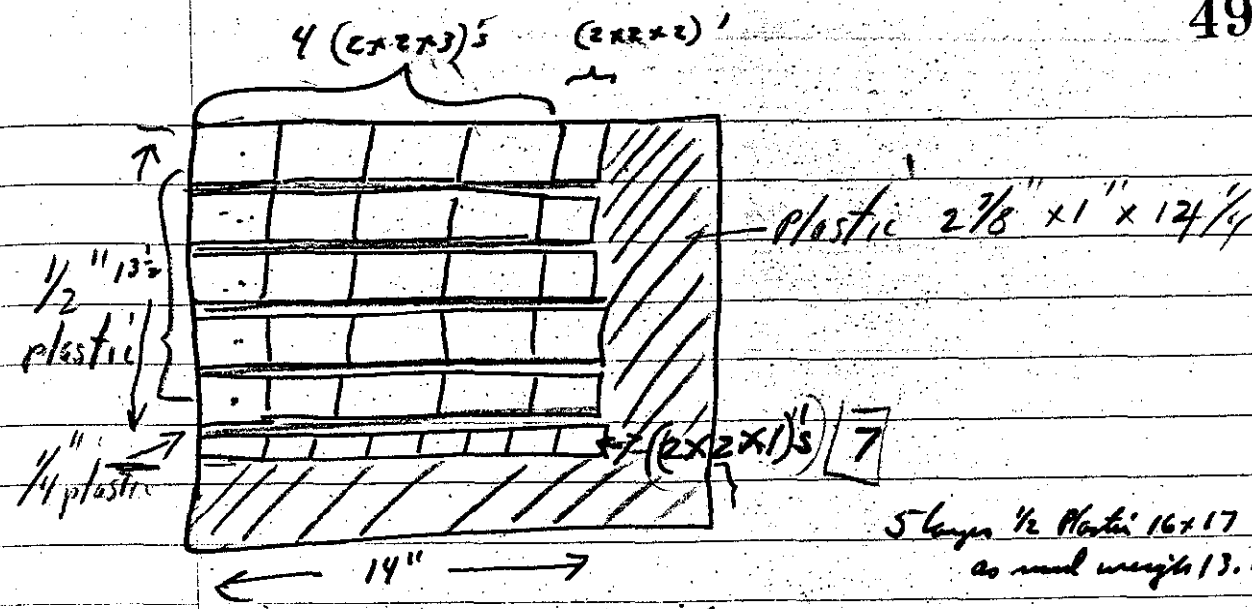
Removed 7 - 2×2×1's mass = ~~2[illegible]~~ .54
28.54 Kg 25

45.9 cm on H_2O super critical

11²⁵ PM Removed 7 - 2×2×1's Mass = ~~23.105~~ .54
28.00 Kg 25

55.5 cm on H_2O sub critical

corrected values = 28.08 28.00 Kg 25 Sub C
28.62 / 28.35 ± .27 28.54 " Super
28.27 Kg ± .27



5 layers 1/2 Plastic 16x17
as used weigh 13.175 Kg

Critical Condition

wgt ~~mass~~ ratio = ~~23.405 Kg~~ 28.27 25 per 21.566 Kg Plastic
less 1.345
20.221 Kg Plastic net

~~Est~~ Critical Mass

28.27 ~~23.675~~ ± 0.270 Kg 235

size = 14" x 13 1/4 x 12" less 17 (2x2x[illegible]

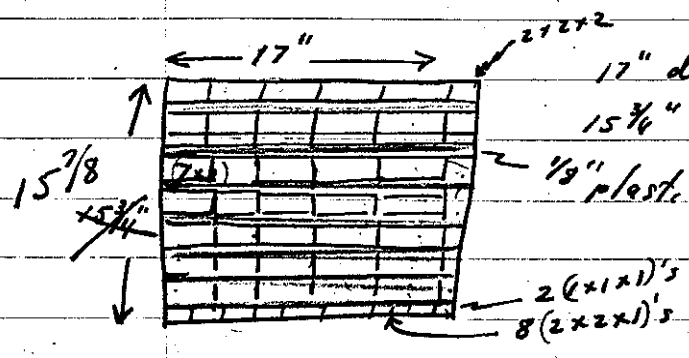
mass per layer = 5.9306 Kg (re-checked 11 30 AM 9-15)

since horizontal plastic sheets were 16x17 only 13 1/4 x 14 1/4 area

so 20.221 Kg
~~.828~~
4.189 ~~19.333~~ Kg Plastic Net x .08 = 0.~~154664~~ Kg H 0.128256 Kg H
16.032 Kg

.128256
.~~154664~~
28.00 x 235 = ~~12.98~~ 10.76

Expr. 14 Time 8 30 AM ~~PM~~ Date 9-15 1955
Purpose UF_4 blocks using 1/8" plastic as moderator
H/f = 2.7
Personnel:



17" dimension = 5(2x2x3) plus 1 2x2x2
15 3/4" " = 7(2x2x3's (2" edge)] plus 1"
~~9.670 Kg~~ layer.
9.830 Kg U235/layer
9.834

1/8" sheets between layers.

9 05 9 layers completed w/ top reflector = 18" + 1" = 19" = 48.2 cm
water needs to go to ~~59.7 cm = top~~ 68.7
top of core = 59.7 cm water

15
63.2
6.5
~~79.7 cm~~

INSTRUMENT CHECK

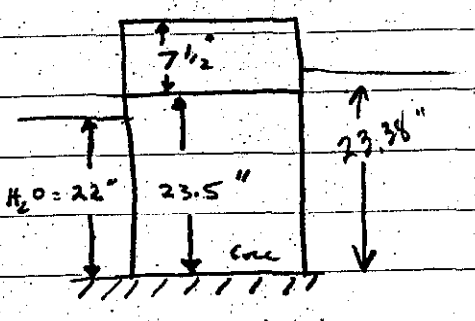
Date 9-15 1955 Time 9 20 AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	50	200		x 20
DC-3	50	200		x 20
Log N				
R-1	7	1000		1000
R-2				
P. M.	2"	7000		

9^{30} AM water ht 60 cm 87.03 Kg 25
no apparent multiplication

10^{00} AM 11 layers completed + top reflector added.

10^{20} AM 11 layers critical; H_2O = 62 cm.



Plastic associated as moderator with 11 layers = 13.752 Kg

11 layers = ~~10.037 × 10.27~~

= 108.13 Kg 235
108.17

H/H =

$$\frac{13.752 \times .08}{108.13} \times 235 = 2.39$$

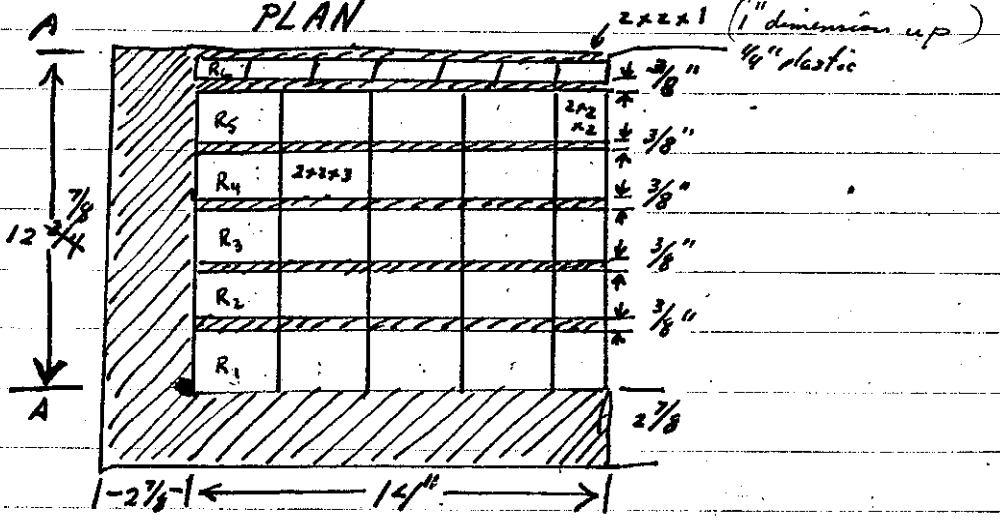
Not = even 9 layers stuck already taller than tube + 11 layers worse — assume good value is $10\frac{1}{2}$ layers ± 3 Kg

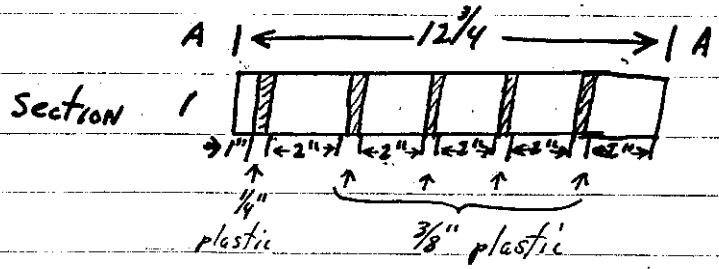
$9.834 \times 10\frac{1}{2} = 103.26$ 103.3 ± 3

Expr. 15 Time 11⁰⁰ AM Date 9-15 1955

Purpose 3/8" plastic spacers are being using 16 x 17" racks

Personnel:





11 35/AM 7 layers plus top reflector stacked

mass U^{235}/layer = 5.931 Kg

Mass U^{235} in 7 layers = 41.527 Kg

11 45/AM H_2O ht. = 38.5 cm — supercritical

12 25/PM Removed 1 layer: Mass Present 35.596 Kg U^{235} (35.63)

H_2O ht = 56.0 cm subcritical

6 layers + R_2, R_3 & R_5 in 7th.

12^{45} PM Added Rows R_2, R_3, and R_5 : Mass present 35.596 + 3.238 38.834

H_2O ht. = 40.3 cm super critical.

1^{00} PM Now 6 layers plus Rows R_3 + R_4 Mass = 37.754 Kg U^{235}

42.1 cm

1^{20} Now 6 layers plus Row R_3 Mass = 36.675 Kg

45.2 cm H_2O just Super.

Super = 36.675 corrected value 36.71 36.17 ± 0.5

Sub = 35.596 35.63

2) 72.271 2) 1.08

36.135 Kg ± 0.549 Kg .54

.675

~~.668~~ = ~~7.87~~

Horizontal layers Plastic wgt 11.856 × ~~0.694~~ = ~~8.228~~ 8.00.3

Spacers wgt 7.163 Kg = 7.163

~~5.22~~ ~~15.391~~

~~15.082~~ 15.166

H/X = 15.166 ~~15.082~~

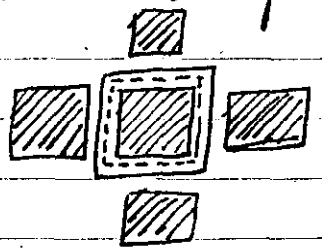
$\frac{\cancel{15.391} \times .08}{35.586} \times 235 = \cancel{8.13}$ ~~7.97~~ 8.01

if R_3 row included

$\frac{15.166 \ \cancel{15.082}}{36.675} \times .08 \times 235 = \cancel{7.73}$ 7.77

H:X calculations See also page 60

Assuming that ½ thickness of whatever size plastic used covered each row of blocks on 4 sides, but none at the ends of a row



1/16" plastic

24 sq in × 1/32 = vol plastic = 0.75 cu in 12.29 cu cm

12.29 × 1.2 = 14.748 gms × 0.08 = 1.1798 gms H

$\frac{1.1798}{231.38} \times 235 = 1.198$ H:U235

1/8" plastic

24 × 1/16 × 16.387 × 1.2 × .08 = 2.359718 gms H

~~4.66~~ 2.396 H/X

1/4 = 4.792

1/2 = 9.594

3/8 = 7.188

plastic used had density of 1.18

so calc H/X × 1.18/1.2 or × .9 8333

H/X

	Calculated	dens. corr.	Weighed Plate
1/16	1.198	1.175	1.118
1/8	2.396	2.356	2.391
1/4	4.792	4.71	5.15
3/8	7.188	7.068	7.77
1/2	9.594	9.434	10.76

corrected for corner in sack when system was less than 16×17"

1/8 = 2.396
1/4 = 4.95
3/8 = 7.64
1/2 = 10.47

} generally good agreement

	Mc
to ~~3~~ 2 sig figures = 1.12	130.35 ± 0.5
2.40	108.13 ± 0.5
5.15	57.1 ± 0.5
7.87	36.135 ± 0.5
10.8	28.27 ± 0.27

9-16-55

11:30 pm Water reflector Sample Rq. 354717
less than 0.01 ppm U total

Dried 84 ppm
muffled 29 ppm 800°C
Cd = 2 ppm
B = .02 ppm

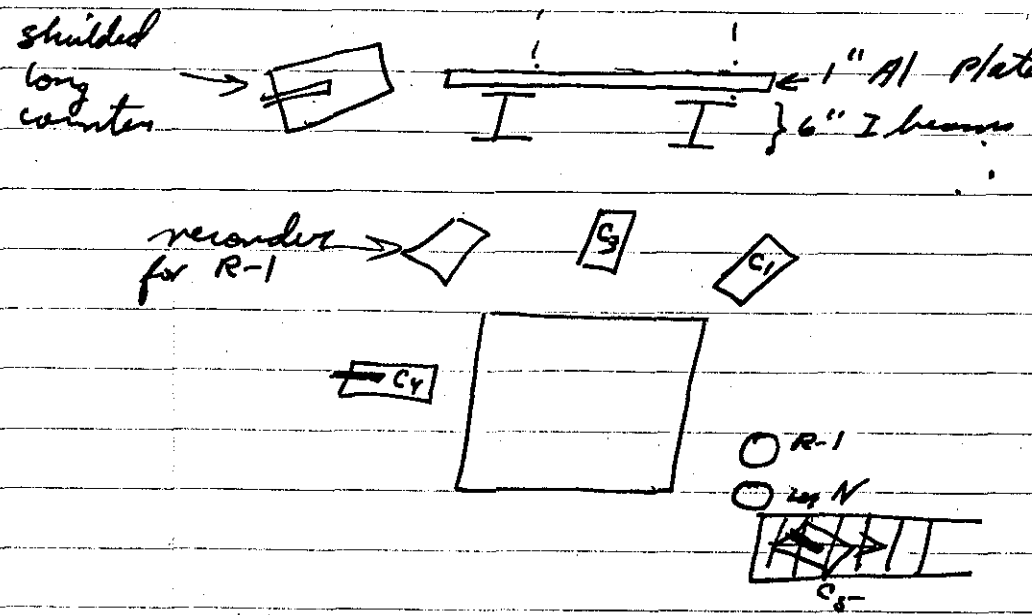
} by phone

Mostly Ca, Mg + Na - Slime in outside tank
probably Al + Fe

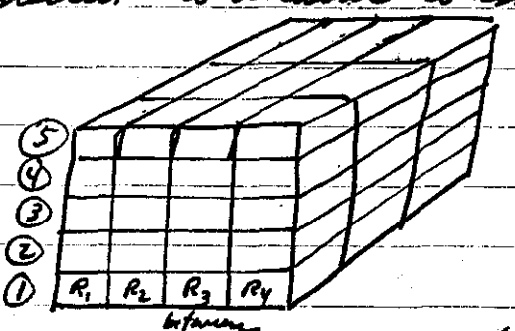
9-16-55

Exp 16

Hand stacking of blocks unreflected with 1/4" plastic spacers -



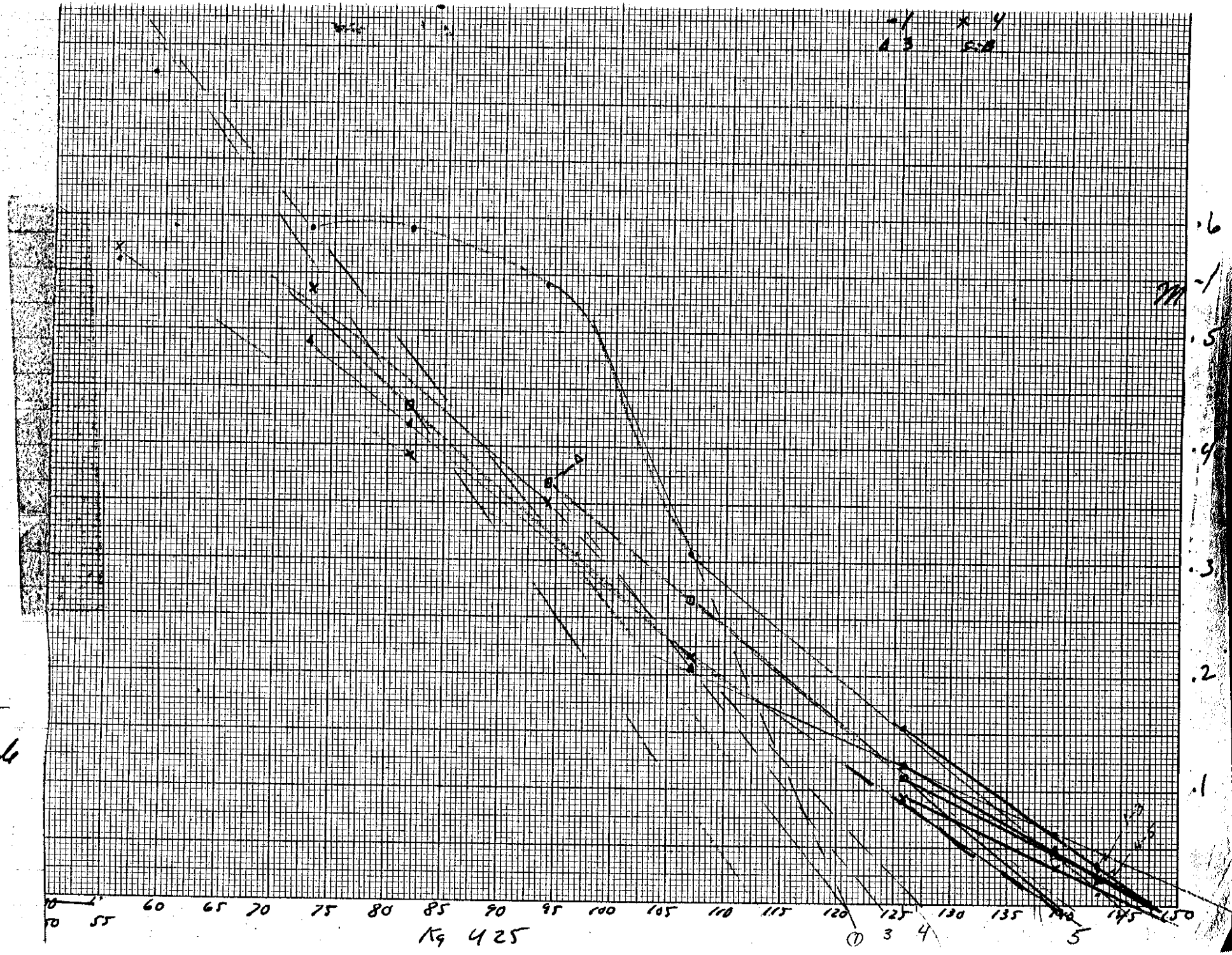
C-1 connected to audible counter



Source PN 58 in Row R_2 and R_3 between layers 4 & 5

blocks separated by 1/4" plastic which protrudes from faces of blocks - plastic between rows & layers only

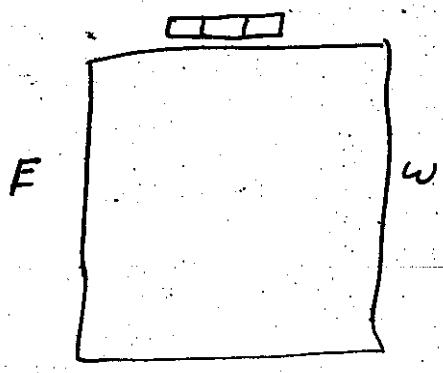
1/8" plastic sheet on bottom



.6
.5
.4
.3
.2
.1
m
60
65
70
75
80
85
90
95
100
105
110
115
120
125
130
135
140
145
150
55
Kg 425
1
3
4
5

4+5

North face



N-S = 22" long rows
Hi = 18" blocks plus 2 3/8" plastic
EW = 18" blocks plus 2 1/4" plastic
top = 3 2" long rows (2 x 2 x 21")

22" x 20 1/4 x 20 3/8" plus 2x2x21 on 22" x 20 1/4" form

Time	Size	C-1	C-3	C-4 x64 (5 min)	C-5 x64
5:00 PM Bkgd	8¾ x 7½ x 11⅝	10 +46	69 +12	198 41 198.75	43 52
5:07 PM	11	11 19 } 11.0	68 1685	198 44	43 9 43.25
60 blocks any	13.7 Kg	704	4390		
4x4x5 blocks	806 lbs	8 4	53 10	203 21	44 63
11⅝ x 12 x 12¾		7 63	51 29	203 22	43 00
18.5 Kg 25					

Moved counter C-1 changed to smaller Source #267
to 5:45 PM and set counters for 20 min count for Bkgd

8:15 PM		4.0 { 39 58 / 39 54 } M_1^{-1}	22 36 / 22 34 } 1.2 M_2^{-1}	57 22 (5.7) 6 M_3^{-3}	11 58 (1.2) 0 52
2 min →					
5-2x2x3's N-S		4 5 1.0	2 53 1.0	7 24 .826	1 19 .8
~~6 layers~~ 6 x 5 x 6 = 180 blocks		5 18 .76 ~~.577~~	2 41	7 6	1 4
13¾ EW x 15 N-S		4 34 .89	2 38	7 40	1 18
13⅜ high 41.7 Kg					
15" NS - 5 blocks		5 10 .8	3 61 .55	9 59 .57	1 36 .8
15⅛ EW 7 blocks		5 4	3 46	9 59	1 50
15⅝ hi 7 blocks					
245 Blocks 56.6 Kg 25					

	C_1	C_3	C_4	C_5
9^{05} pm Bkg δ wres →	4	2.2	5.7	1.2

added 2×2×2's to north face 7×7 = 49×152.39 = 7.51 Kg

dimensions = 17" × 15½ × 15⅝ — 56.6 / 64.11 Kg Total

6^{+46} 0.59	4^{23} 0.49	10^{36} .54	1^{4}
6^{+3}	4^{20}	10^{13}	2^{19}

9^{10} adding 2" to top = 35 2×2×3's plus 7 2×2×2's = 8.09 Kg + 1.072 / 9.162 total = 73.27 Kg

17 × 15½ × 17⅞"

6^{+46} .59	5^{16} 0.419	14^{27} .393	2^{48} 0.436
6^{+48}	5^{55}	13^{22}	2^{23}

9^{20} added 2" more to top = 73.27 / 9.16 total 82.43 Kg

NS EW Hi

17 × 15½ × 20⅜

6^{34} .59	5^{63} .367	16^{17} 0.35	3^{15} .369
7	6^{16}	15^{54}	3^{10}

9^{50} NS EW

17 × 18 × 20⅜

8

9×5 = 45 2×2×3 — 10.42 — 82.43

9 2×2×2 — 1.38 Kg — 11.80 — 11.80 — 94.23 Kg

9^{47} 0.41	7^{3} 0.314	20^{55} 0.274	3^{31} 0.343
9^{37}	7^{54}	20^{56}	3^{46}

10^{10} Added two more inches to East face = 11.8 Kg = 107.03 Kg 25

17 × 20 × 20⅜

12^{60} .308	10^{47} .204	26^{13} .218	4^{27} .267
Extrapolate to 143 Kg	130 Kg	155 Kg	147 Kg

11^{10} added 81 blocks 2×2×3 = 107.03 + 18.72 = 125.75

①		③		④		⑤	
25^{58}	0.154	18^{7}	0.122	60^{41}	.094	10^{29}	0.114
26^{14}		19^{5}		59^{50}		10^{39}	

11^{47} pm added 9 rows on top = 1.542 Kg/row = 125.75 + 13.878 = 139.628

	59^{25}	.0675	42^{59}	.051	37^{+72} (×256)	.038	27^{3}	.044
9-17-54	58^{39}		42^{5}		37^{76}		27^{18}	

12^{15} AM Removed 9 rows from top now 125.75

added 81 2×2×2" blocks to N face = 12.42

12^{20} AM — now 138.17 Kg 25

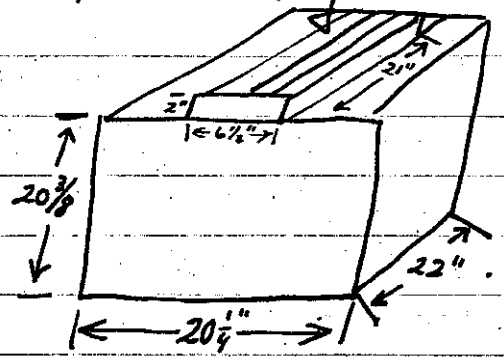
adding more to top row 7 2×2×3's per row 1.619 Kg

12^{30} AM 3 rows added 4.857 Kg

138.17 + 4.857 = Total 143.027

113^{3}	.0354	64^{29}	.035	58^{98} (×256)	.0243	45^{20}	.0267
114^{8}		65^{57}		58^{252}		46^{60}	

Final Assembly = 143.027 Kg 4235



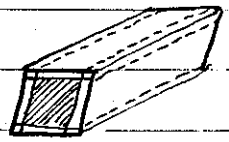
NS = 22" long rows (2×2×22)

EW = 18" of blocks plus 2¼ ~~2⅜~~" plastic

Hi = 18" of blocks plus 2⅜" plastic

Plus 3 rows on top 2×2×21 with ¼" plastic spacers

H/X calculations



Plastic around UF_6-(CF_2)n blocks except for ends

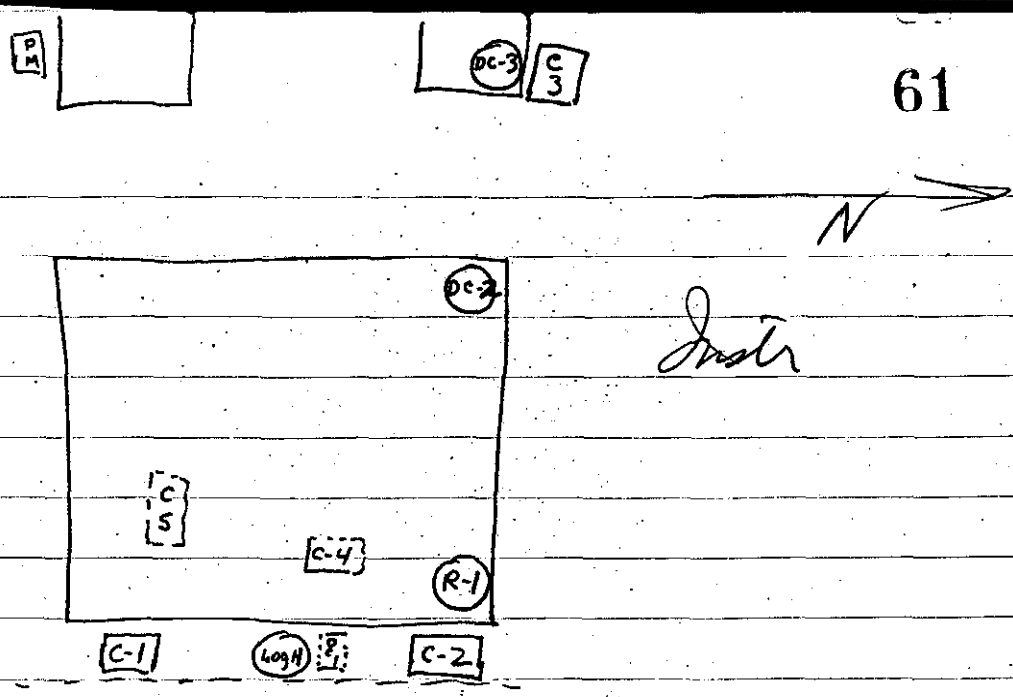
= (Area × thickness of plastic ÷ 2) + 4 × (thickness plastic ÷ 2)^2 × length

volume of plastic (in^3) × 16.387 × 1.18 = wgt plastic

$$\frac{\frac{\text{wgt plastic} \times 98}{100}}{\frac{\text{wgt U235}}{235}} = H/X$$

spacers	Volume plastic	in^3.	cm^3
1/16"	$24 \times \frac{1}{32} +$ ~~0.0~~0.011718	= 0.762 in^3	= 12.487
1/8	$24 \times \frac{1}{16} +$ 0.0469	= 1.547	= 25.351
1/4	$24 \times \frac{1}{8} +$ 0.188	= 3.188	= 52.418
3/8	$24 \times \frac{3}{16} +$ 0.4219	= 4.9219	= 80.66
1/2	$24 \times \frac{1}{4} +$ 0.750	= 6.75	= 110.61

spacing	H/X
1/16	1.197
1/8	2.42
1/4	5.026
3/8	7.73
1/2	10.61



Instr

length

DC-1 C-4 C5 under grating

R-1 DC-2 DC-3 at 7 ft above grating

PM, C-3, C-1, LogN, C-2 at floor level.

May 19, 19[illegible]

[illegible]

D.F.C.

A.D.C.

17 startups
6 hrs

Expr. 16 Time 10 40 AM ~~PM~~ Date 5-19 1956
Purpose Block Stacking - Unreflected Unmoderated
Personnel: DWM, DC DFC

INSTRUMENT CHECK

Date 5-19 1956 Time 10 40 AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1		responds		
DC-2	55	20x10		
DC-3	35 ~~40~~	20x10		
Log N	5 sec			
R-1		1000x1000		
R-2				
P. M. 900V				

START-UP CHECK LIST

Equipment Checked by _____ Personnel Check by _____
Instrument and Safety Checked and Reset by _____
"Source In" Checked by _____ Source No. PN 123
Emergency Equipment in Control Room Checked by _____
Red Light On by _____ AM
Start-Up OK'd by _____ Time _____ PM Date _____ 195__

Blocks available

20 604
3 580
54
24 238

2x2x3 = 1717 x .944 1620.848
2x2x1 = 895 x .318 284.610
1x1x1 = 54 x .0796 4.298
1909.756 kg x .24493 → 467.757 kg U-235

.6530
.8625 x .7571 x .375 DB = .24493

467.756 kg / 24,238 = 19.29847 gm/in³

28 x 28 x 6

28 x 28 x 29 22736

22 x 28 x 1 616

24,354

+ ~~616~~

~~24,970~~

10,84

24,462

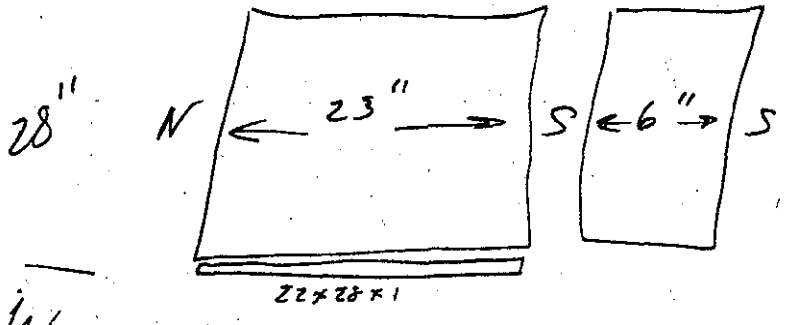
24,484

22 cm

56

56

E



W

kg
5

7/19/12

DOM Background Counting rates -

DFC Assembly 12" N-S

DC. 14" E-W

10" high.

(4 x 7 x 5)

Count on 12"x14"x10" cube					M
C-1	33 x 64	+29	5'	= 2141	1.0
C-2	79	+25	5'	= 5081	1.0
C-3	63	+32	5'	= 4064	1.0
C-4	354 x 64	+30	10'	= 22686/2 = 11,343	1.0
C-5	569 x 64	+50	10'	= 36466 = 18,233	1.0

N-S E-W high 12"x14"x10" in.

Count on ~~12"x14"x14"~~ (5x7x7) cube + 6" x 28 x 28 Table					1/M
C-1	33 x 64	+33	5'	= 2145	1.0
C-2	93	+99	5'	= 5996	.847
C-3	60	+27	5'	= 3867	1.05
C-4	202	+18	5'	= 12,946	.875
C-5	319	+17	5'	= 20,433	.892

Stacked assembly to 15" N-S 14" E-W x 14" high (5x7x7)

C-1	40x64	+4	5'	= ~~3844~~ 2564	.834
C-2	166	+52	"	= 10,676	.476
C-3	85	+6	"	= 5446	.746
C-4	275	+33	"	= 17633	.643
C-5					

Count with tables together (245 cubes + 392 cubes)

7
5 kg
35

64 May 19, 1976

Fixed stack only (245 stacks)

				cts/5 min.	Y/M
C-1	34	x64	+49	= 2225	.963
2	142		14	= 9102	.559
3	84		21	= 5397	.752
4	240		+26	= 15386	.737
5	474		+30	= 30366	.600

Added cubes 15" N-S 16" EW x16" high 5x8x5 = 320

Count fixed stack only

C-1	41	x64	+ 16	= 2640	.811
2	170		+ 0	= 10880	.467
3	84		+ 16	= 5392	.754
4	267		+ 28	= 17186	.662
5	550		+ 28	= 35228	.518

Count fixed table + Movable table = 320 + 392 = 712

C-1	46	x64	+21	= 2971	.721
2	205		+44	= 13164	.386
3	85		+43	= 5483	.742
4	315		+0	= 20,160	.563
5	594		+16	= 38,032	480

Added cubes 15" N-S 20" E-W x 20" high, 5x10x10 = 500

fixed	C-1	46	x64	+42	= 2984	.718
table	C-2	214		+5	= 13701	.297
only	C-3	75		+1	= 4801	846
	C-4	325		+33	= 20,833	.563
	C-5	696		+39	= 44,583	.409

May 19, 1956

15" x 20" x 20" plus 6" x 28 x 28 Moving table = 892 Circles

Fixed table 500 + Moving Table 392 = 892	C1	55 x 64	+1 = 3521	.608
	C2	278	+22 = 17814	.285
	C3	89	+1 = 5697	.713
	C4	403	+63 = 25855	.938
	C5	819	+15 = 52431	.348

Added cubes @ 18" N-S 22 E-W x 20" high 6x11x10 = 660

	C-1	57 x64	+50 = 3698	.579
	C-2	290	+3 = 18563	.274
	C-3	101	+9 = 6473	.628
	C-4	407	+34 26,082	.435
	C-5	931	+12 59,596	.306

Fixed table + Movable Table

	C-1	67	0 = 4288	.500
	C-2	384	8 = 24584	.125
	C-3	122	11 = 7819	.52.
	C-4	520	+17 = 33,297	.340
	C-5	1151	+16 = 73,680	.247

Added cubes 18" NS 22" E-W x 26" high 6x11x13 = 858

	C1	63 x64	+61 = 4093	.523
	2	347	+22 = 22,230	.228
	3	116	+11 = 7,435	.546
	4	484 x64	+3 = 30,979	.366 ~~.588~~

858 / 392 / 1250	C1	84 x64	+63 = 5439	.394
	C2	504	46 = 32,302	.157
	C3	163	+10 = 10,442	.390
	C4	677	42 = 43,370	.261
	C5	395 x256	+33 = 88,353	.206

Added cubes, 21" N-S x 22" E-W x 28" high (7 x 11 x 14) = 1078

Fixed Table Count	C-1	74 x 64	27	4763	.450
	2	453	24	38552	.132
	3	149	19	9555	.425
	4	623	57	39929	.284
	5	329 x256	10	= 84234	.216
Fixed + Moving Tables 1078 392 1470	C-1	104 x64	35	6691	.320
	2	711	39	45543	.1115
	3	242	36	15524	.262
	4	236 x256	+165	60581	.187
	5	460 X	61	117,821	.155

Covered edge due to source tube displacing blocks by removing 5 2x2x3 and adding 7 2x2x1 ($\frac{7}{3} - 5 = -2\frac{2}{3}$)

Added cubes 21" N-S 26" E-W x 28" high (7 x 13 x 14) = 1274

Net blocks = $1274 - 2\frac{2}{3} = 1271\frac{1}{3}$

	C-1	82 x64	24	5272	.406
	C-2	519	24	33240	.1528
	C-3	177	54	11382	.357
	C-4	196 x256	4	50180	.226
	C-5	410 "	204	105164	.1732
Fixed Table + Movable Table 1274 392 1666	C-1	138 x64	48 =	8877	.241
	2	987	12 =	63180	.082
	3	369	2 =	23490	.173
	4	371 x256	138 =	94,114	.119
	5	750 x	33 =	192,033	.095

Added Cubes Incomplete 27 x 28 x 28 − (22" x 2" x 2") $7\frac{1}{3}$

9 x 14 x 14 = 1764 − $7\frac{1}{3}$ − $2\frac{2}{3}$ = 1755

Fixed +	C-1	160	+16	10 256	.209
Moving	2	1193	+25	76 377	.066$_6$
Table.	3	465	+52	29 812	.136$_3$
	4	484	+38	123 942	.091$_6$
	5	976	+60	249 916	.073

All cubes except 54 1 in x 1 in x 1 in

On table Basic cube 23 in NS x 28" EW x 28" High 18 032
(this has 1" x 2" x 2" missing) Source −32 −4

Added on West face 1" x 22" N.S. x 28" high 616

" " Top 1" x 28" E.W x 20" N.S. 560

Top 1" x 16" E.W. x 18" N.S. 288

+ 5 2 x 2 x 1 pieces 20

Moving Table 6" x 28" x 28" 4704

24,184 in^3

or 2 015.5 2 x 2 x 3 blocks.

@ 231 V = 466.39 kg

5 = −$2\frac{2}{3}$

274

C_1	514 x 64	+42	32,938	.065
C_2	2572	+25	164,633	.0309
C_3	1527 x 1024	+182	1,563,830	.0026
C_4	2714 x 256	+7	694,794	.0164
C_5	—			

7 startups
5 hrs

Expr. 16-2 Time 4:00 ~~AM~~ PM Date 5-22 1956
Purpose Restack of blocks to elimate Source hole - Source external
Personnel: DWM CC DJC

START-UP CHECK LIST
Equipment Checked by DJC Personnel Check by
Instrument and Safeties Checked and Reset by
"Source In" Checked by Source No. PN123
Emergency Equipment in Control Room Checked by DJC
Red Light On by AM
Start-Up OK'd by Time PM Date 195

INSTRUMENT CHECK
Date 5-22 1956 Time 4:00 ~~AM~~ PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1		x5		x5
DC-2	45	20x10	2"	5x1
DC-3	80	20x10	3"	10x1
Log N	15 sec	7 sec		
R-1	6.5	1000x100	contact	100x100
R-2				
P. M.	[illegible]	900V	2"	900V

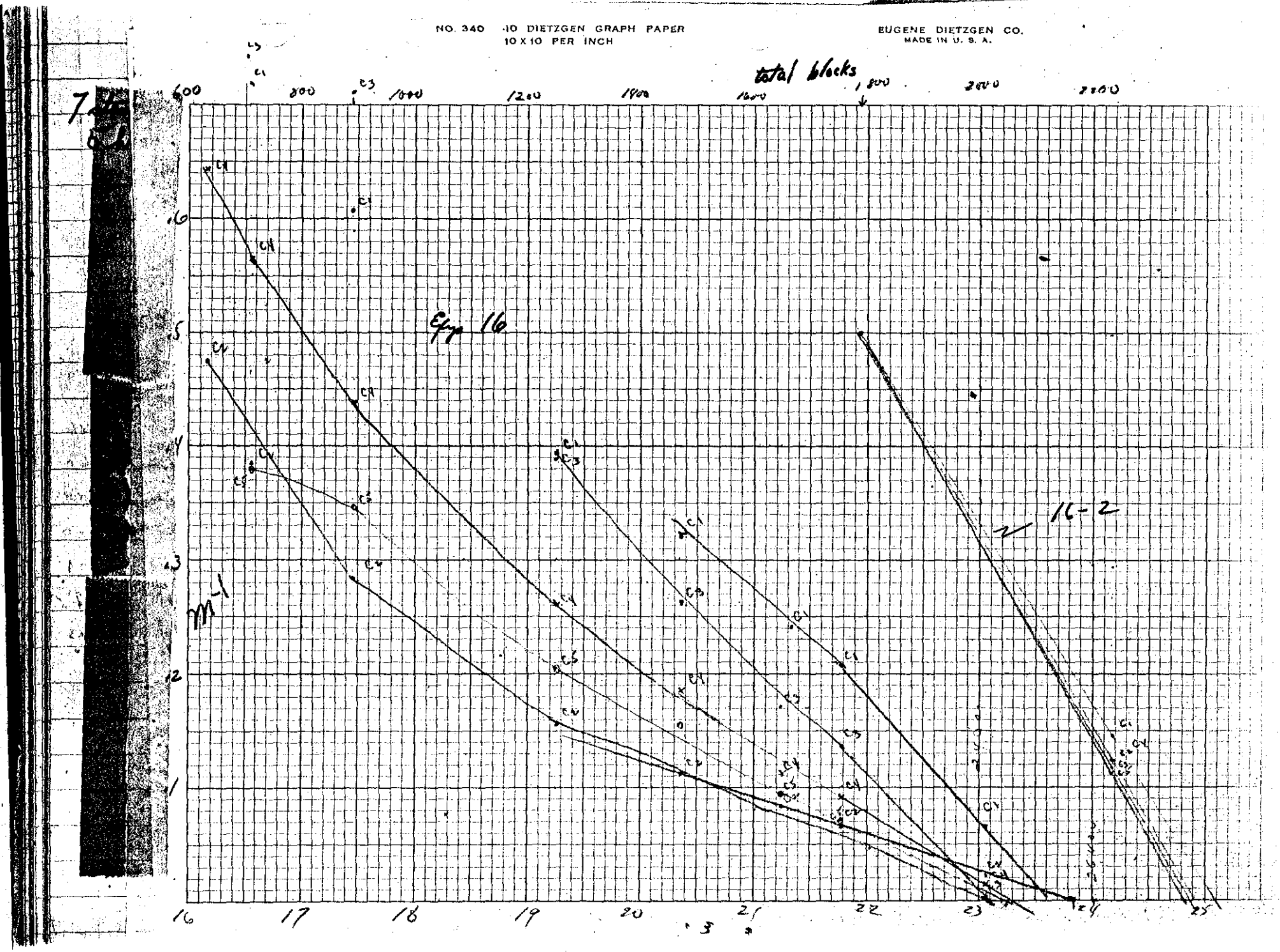
Arbitrary Background - with partial stack - 28+28 in face about 6 blocks wide with 24x28+28 behind it.

3:48 PM	C_1 x64	C_2 x64	C_3	C_4	C_5
5 min	74 +54	154 +56	52 +2	328 +3	315 +50

∴ 28 x 28 x 30

NO. 340 -10 DIETZGEN GRAPH PAPER
10 X 10 PER INCH

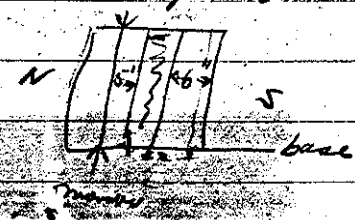
EUGENE DIETZGEN CO.
MADE IN U. S. A.



5^{45} PM Movable table: 28 × 28 × 6
Fixed " N S 23"
EW 28" + 22 × 28 face on W 1" [illegible]
Ht 28"
Layer on top 22 × 28 × 1"
Layer centred on top EW 6" × 18" × 1"

Base = 29 × 28 × 28

+



Not Critical 24,184 in^3

5 min counts

C_1 × 64	C_2 × 64	C_3 × 256	C_4 × 256	C_5 × 256
628 +6	1512 +53	152.17 +44	746 +9	1193 +153
.2945	.268	.2365	.267	.2245

Extrap Values = 25.12 − 24.82 × 10^3 in^3 average 24,970 in^3
× 1.9296
481.8

Using 28 × 28 × 28 of M = 1.0

6^{45} PM Unstacked to 28 × 28 × 28" (when tables together)

C_1 × 64	C_2 × 64	C_3 × 256	C_4 × 256	C_5 × 256
185 +8	405 +9	36.0023 +6	199 +118	268 +54

21,952 in^3

E.

7^{30} PM Began stacking pseudo-cylinder (see sketch)

~~Loading: 28 x 28 x 28 plus.~~
~~+ 2 x 12 x 27 on Moving table~~
~~+ {1 x 16 x 28 on} other face 1 x 14 x 28 } East and~~
{1 x 12 x 28 on} south face 1 x 12 x 28 } West face

Critical at table setting of 0.23 in

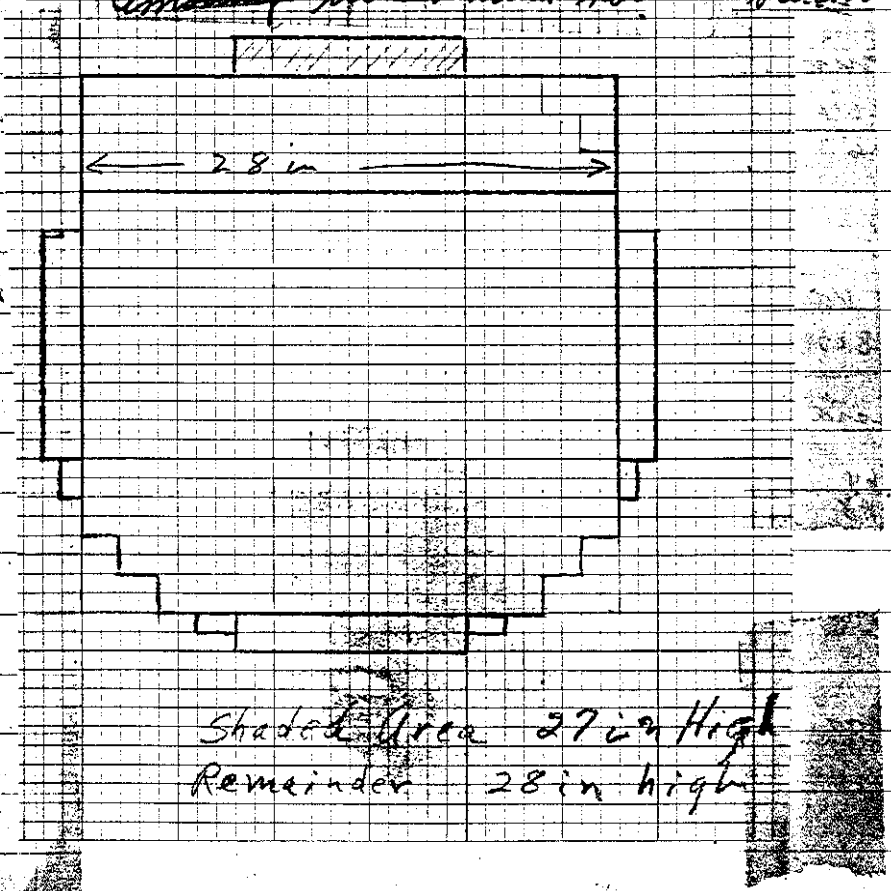
Log N .5

DC-3 73 x 1 x 20

DC-2 75 x 10 x 10

R-1 4.3 x 200 x 1000

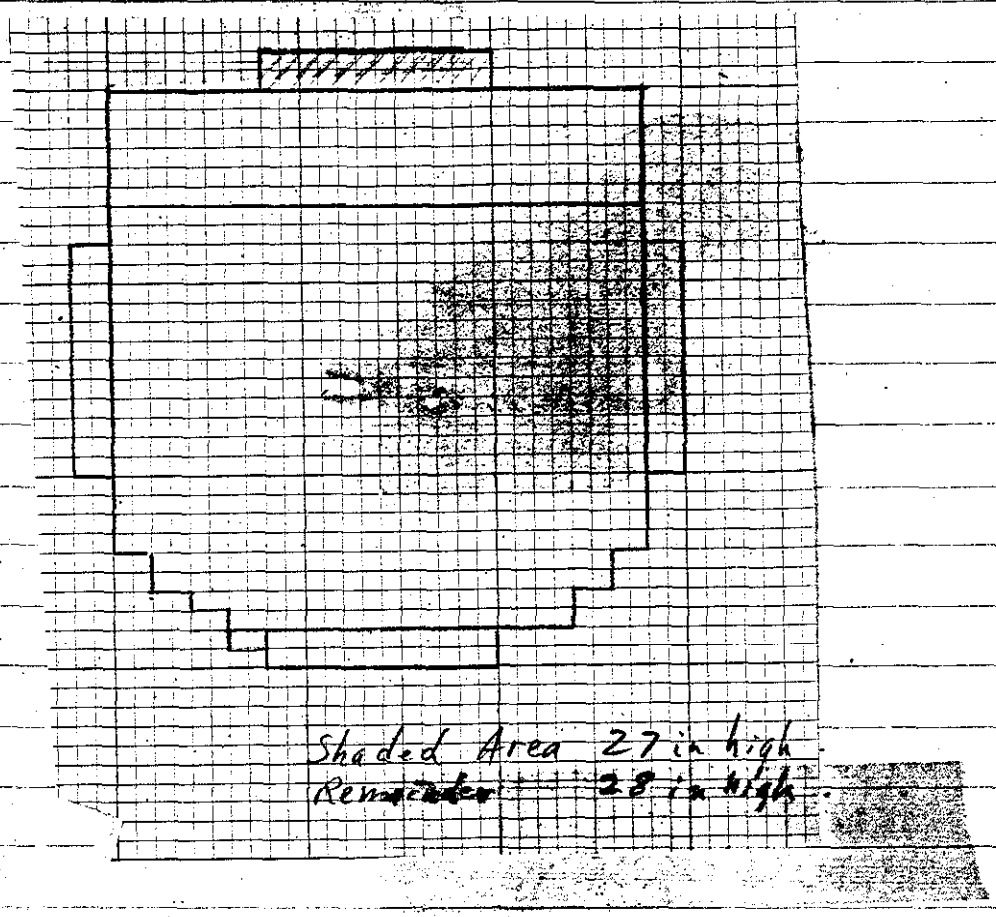
~~9:20 PM Removing two vertical rows of blocks~~



N.B Sub critical W.O. 2 x 12 x 27 on Mov. Table

Removed 4 stacks 1 x 2 x 28

Loading see sketch



Critical at ν 0.19 Log N@ .2

to 0.135 Log N leveled ν .27

∴ not critical previously source must still contribute to 0.08 and to .06 and tables fired.

∴ It is believed that the system was not critical previously. hence return to previous loading

Loading same as page 70

On pos period 0.15 reading on scope
Log N → ~3.5 period was not linear
it seems as though source is contributing
Level at 0.19 log N reads 3.6
Level at 0.28 log N reads 0.35
Remove source from room.
Level at 0.27 log N read 0.37
Approx level at 0.16 log N read 3.9 still rising
but not holding constant period.
Assembly behavior not explained.
Power level in room must be
small, Read 15 MR/hr near recorder

5/23/56 Part of the difficulty may be due to the αn reaction with F giving a distributed source —

From data on previous shipment of billets $U235 = 37\frac{1}{2}\%$ assuming same ratio of U234 – U235 as in normal – $\left[\frac{.715\ U235}{.0058\ U234}\right]$

this gives 0.3% U234

λ for $235 = \frac{0.693}{7.13\times10^{8} \times 8760\times3600} = \frac{3.09\times10^{-17}}{9.2\times10^{14}}$

λ for $234 = \frac{0.693}{2.48\times10^{5}\times8760\times3600} = 8.82\times10^{-14}$

assuming 460×10^{5} grms U235

$= 1.17\times10^{27}$ atoms $= 3.6\times10^{10}\ \alpha/\text{sec}\ (N\lambda)$

U 234 $= 9.36\times10^{24}$ atoms

$N\lambda = 8.28\times10^{14}\ \alpha/\text{sec}$

Total α's $= \frac{8.28\times10^{14}\ \alpha/\text{sec}}{.36\times10^{14}} = 8.64\times10^{14}\ \alpha/\text{sec}$

if neutrons in assembly then $(N)\ M = x$

if known source added $= ((N)+S)\ M =$

Using PoBe source PN123 3.96×10^{6} N/sec on 5/23/56

no source $\begin{cases} C_1 = 39^{+25}\ (\times64) & C_2 = 73^{+29}\ (\times64) & C_3 = 67^{+8}\ (\times32) \\ C_4 = 150^{+10}\ (\times64) & C_5 = 64^{+206}\ (\times256) \end{cases}$

with PN123 $\begin{cases} C_1 = 103^{+47} & C_2 = 191^{+18} & C_3 = 202^{+17} \\ C_4 = 396^{143} & C_5 = 165^{+252} \end{cases}$ same cycles

$.736\ (N) = .1645 = .1264 \times 2\times10^{6}$ ← assume 50% geometry source laid on top

When 7.3×10^{5} n/sec from assembly

effluency as source $= \frac{7.3\times10^{5}}{8.64\times10^{8}}\ 0.849\ \text{n}/\alpha \times 10^{-6}$

Log N Range Change by 1/100

1 start up
2 hrs

Expr. 16-3 Time 4 30 ~~AM~~ PM Date 5-23 1956
Purpose Check system for Crit
Personnel: DWM DH ADC

INSTRUMENT CHECK

Date _____ 195__ Time _____ AM PM Source No. PN123 + gamma

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	52	20x10	3"	
DC-3	65	20x10		
Log N	100c			
R-1	5	1000x1000		
R-2				
P. M.				

START-UP CHECK LIST

Equipment Checked by DH Personnel Check by DH
Instrument and Safeties Checked and Reset by DH
"Source In" Checked by DH Source No. PN123
Emergency Equipment in Control Room Checked by DH
Red Light On by DH
Start-Up OK'd by DH Time 4 45 ~~AM~~ PM Date 5-23 1956

5 20 Tables at 0.18 – DC-3 screwed – not Crit
5 39 " at 0.21 Log N = .0075 DC-2 = 40 on 10x20
DC-3 30 on 50x1
5 42 Tables at 0.19 .0105 Log N
DC-2 = 60 10x20 DC-3 45 1x50

5.44 Tables at 0.18 log N .016
DC-2 86 on 20×10
DC-3 65 50 × 1

5.48 Tables at 0.13 at log N (0.1) PM trips at 1230V
PM reset at 800V indications of approx 150 sec period
Top of stack in contact – gap at bottom

5.50 at log N = 1.0 PM trips at 1020V
Set back at 800V

6.03 PM set at 800V Scrammed at 4.4 – tables at 0.13

INSTRUMENT CHECK

Date May 24 1956 Time 3:15 ~~AM~~ PM Source No. gamma source

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	50	10x20	3"	1x5
DC-3	53; 50	10x20	5"	1x10
Log-N		10 Sec	Moving	
R-1	6	100x1000	Contact	50x100
R-2				
P. M.		800V	3"	

Loading same as page 70 plus 4 ea 2x2x1 on top.

• 2" Lead Brick between assembly & R-1
4" " " " " " DC-3

Moved Log N 2 ft South

1 start up
2 hrs

Expr. 16-4 Time 4:30 Date May 24 1956
Purpose Repeat critical Conditions
Personnel: DFC DWM

Voltage
Photo Multi vs log N for trip

1240	.011
1200	.09
1150	.47
1070	1.2

START-UP CHECK LIST

Equipment Checked by DWM Purpose Check by DWM
Instrument and Sa[illegible] DWM DFC
"Source In" Check[illegible] X
Emergency Eq[illegible] Checked by DFC
Red Light O[illegible] DFC
Start-Up OK'd by DFC [illegible] 4:45 May 24 1956

"No Source" Startup

Internal Source F(α, n) Na

DC-1	DC-2	DC-3	Log N	R-1	Selsyn		
23 x10	56 x1x5	35 x1x10	.00013	2·8 x50x100	5.0 in		
37.5	70	37	000 17	3.8	3.0		
57	40 x1x10	38	.0002₂5	2·8 x100x100	2.0		
57	47	13	000225	"	2.0		
62 x20	78x1x10	15	00643	2·8 x200x100	1.0		
45 x50	54 x2x10	20	00068	4.4	.7		
55 x50	64	22	.0008	5.4 x25x1000	.61 · 50		
90 x 50	37 5x10	34	.0012	4.0 x50 x1000	.50 · 45		
82 x100	53 5x10	96	.0017₃	5.8	.40 .18	~~Rising~~	
	79 20 x10	59 1x30	.012	3.4 x500 x1000	.18	Rising	
	62 100 x10	69 x10x20	.054		.18		
		72x10x100	.4		.15	Rising	
					.19	level	263 ~~268~~ sec 4.34
				+ Period #1	.14		
			.47	Level	.18		
				+ Period #2	.135		213 ~~295~~ sec 5.29
			2.0	Level	.1875 .19+	Super sub	
			∞	Neg Period #3	.27		102 100 sec 26.8
			.085	Level	.165 .105		
				Neg Period #4	.27		126 100 sec 16.3
			.018	Level	.185 .085		
				Neg Period #5	.27	NG	
			.0053	level	.27		
			.0018	level	.40		

INSTRUMENT CHECK

Date May 28 1956 Time 6⁰⁰ ~~AM~~ PM Source No. Neutron Source

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	55	10x20	2"	1 x 5
DC-3	70	10x20	Contact	1 x 10
Log N Period	10sec		Moving	
R-1	6.5	100x1000		100 x 100
R-2				
P. M.	800V		Gamma Source not available	

Loading: Same as page 70

7 Startup 5 hrs

AM
Expr. 16 - 5 Time PM Date 195
Purpose Evaluate Top Reflector alum
Evaluate Iron reflector.
Personnel:

START-UP CHECK LIST

Equipment Checked by DWM Personnel Check by DWM
Instrument and Safeties Checked and Reset by DWM
~~"Source In" Checked by~~ ~~Source No.~~
Emergency Equipment in Control Room Checked by DWM
~~Red Light On by~~ DWM
AM
Start-Up OK'd by DWM Time PM Date 195

Zero Run + Period 0.10⁻ > .07 16/sec → 6.6 ¢
#1 Level 0.17⁻ Log N ~ 0.3
added 4 1/4" x 36" x 36" Alum (25) pieces on top
+ Period 0.34 > .05 195 sec → 5.7 ¢
#2 Level 0.39 Log N ~ 0.3

#3 2 - 1/4" pc's black iron (hot rolled steel) 16 x 27" nominal

+ Period 0.28 — 91 sec → 10.4¢

Level 0.35 — > .07 Log N ~ 0.3

9:05 pm Removed 2 rows 1 x 2 x 28" = 112 in³

Iron plate still on top.

→ 139 sec → 7.5¢

#4 + Period 0.19

level 0.265

at log N = 0.3

#5 - Removed 2 rows

1 x 2 x 28"

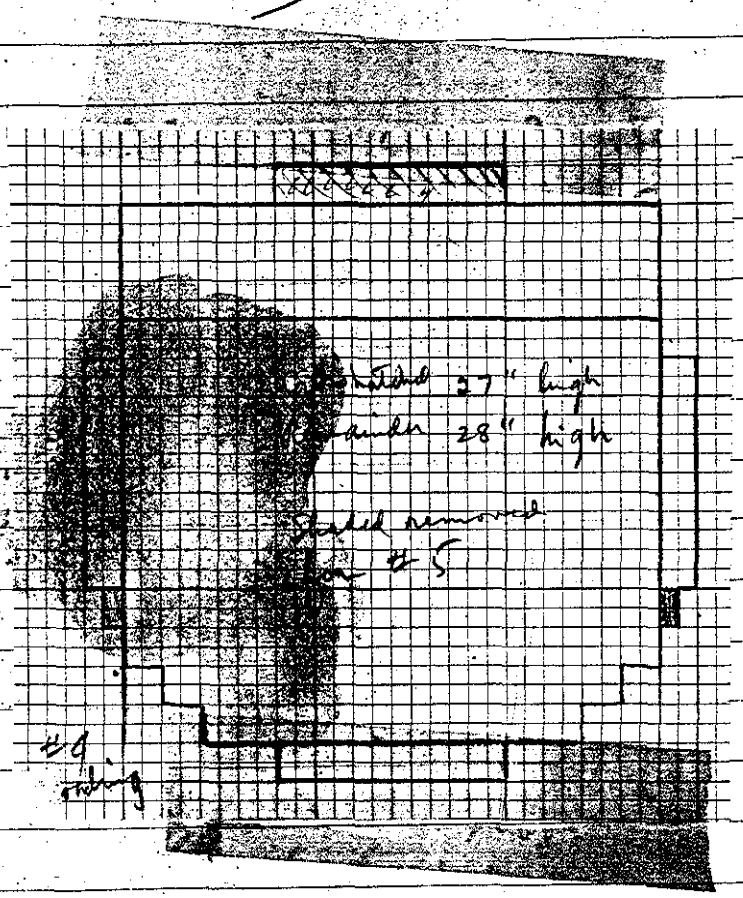
(Tells 0.12")

+ period

level 0.19"

at log N = 0.3

→ 117 sec → 8.6¢



(~~[illegible]~~)

#6 .080" al spacer added to movable table
Mass same as P. 70 same as Run # 3 p 79.
Table at 0.31 + period 72 sec → 12.4¢
level at 0.39 log N 0.3

#7 Same as #6 with Iron removed –
table at 0.15 + period 410 sec → 2.9¢
level at 0.18 log N = 0.3

#8 Same as #1
+ period at 0.10" 141 sec → 7.4¢
level at 0.15"
– period at 0.17" Too large too measure.
approaching level by only inc. selsyn. .16 super
level at .18⁻
approach level by only dec. selsyn .155 sub
.14⁺ sub
.14⁻ super

Table Drive Motor Support was braced; hence zero may change

INSTRUMENT CHECK

Date 5/29 1956 Time 4 45 ~~AM~~ PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1		Responds		10
DC-2	72	20x10		5 x 1
DC-3	82	20 x 10		20 x 1
Log N	7 sec	period		100 x 100
R-1	9	100 x 1000		
R-2	—			
P. M.	800V			800V

START-UP CHECK LIST

Equipment Checked by DK Personnel Check by DWM

Instrument and Safeties Checked and Reset by DK ADC

"Source In" Checked by DK Source No. — built in —

Emergency Equipment in Control Room Checked by DK

Red Light On by DK

Start-Up OK'd by DK Time 4 45 ~~AM~~ PM Date 5/29 1956

1 startup
1 hr

Expr. 16-6 Time 4 45 ~~AM~~ PM Date 5/29 1956

Purpose check reproducibility of table ~~same~~ configuration as 16-5 #8

Personnel: DK DWM

Variac set at 1.5 Speed = 1.75"/min → will not recover table

" " " 2.0 Speed = 5.69"/min

Variac set at 2.5 Speed = 15.00"/min

R-1 moved approx 10 ft farther away —

Selsyn = 0.12 (dec.) + period

~~0.18 (dec)~~

.20 (dec) sub-limit
.19 " " "
.18 " " "
.178 " sym

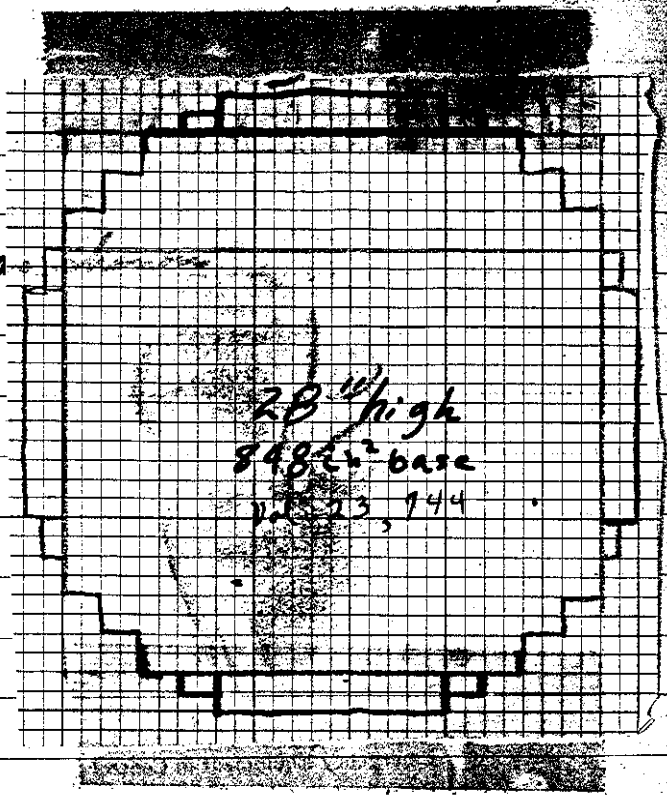
} level at 0.18 dec Selsyn

.19 (inc) sym
.20 (inc) "
.209 (inc) "
.213 (inc) level
.219 (inc) sub

} level at 0.215 inc Selsyn
.18
.035

Exp 16-7

Restacked blocks a
as shown →



1 startup
1 hr

Not Critical but close at 0.045ⁿ (limit Sw)
23744 cc in Area base 848 in² [28" tall]
Log ~ .05 after ~10' but still rising
very very slowly. Multiplication ~ $\frac{.05}{.0001} \approx 500$
$k \approx 1 - \frac{1}{M} = 1 - .002 = .998$
at 19.28 gm/in³ loading = 457 Kg

SUMMARY OF CRITICAL CONDITIONS

Expr.____ Reactor____

Solution____ Height____ Volume____ Temp____

Reflector____ Height____ Temp____

Time Critical____ AM PM Duration____ min. Log N____

Anal. Req.____ gms U/gm____ Sp. Gr.____

Critical Mass____ Atomic Ratio____

Expr. 16-8 Time 11:00 AM ~~PM~~ Date 5-30 1956
Purpose add small increment to make system crit. - 12 - 2x2x1's approx 960 gms added top-centered
Personnel: ADC DWM DK

START-UP CHECK LIST
Equipment Checked by DWM Personnel Check by DK
Instrument and Safeties Checked and Reset by ADC
"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 11:00 ~~AM~~ PM Date 5-30 1956

INSTRUMENT CHECK

Date 5/30 1956 Time 11:00 AM PM Source No. 8

2 start ups
2 hrs

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1	—	—	—	
DC-2	72	20x10		5 x1
DC-3	82	20x10		10 x1
Log N	7 sec	—		10 sec
R-1	9	1000		100x100
R-2	—			10
P. M.	800V			

Loading: added 12 pc 1x2x2 (1" x 6" N-S x 8" EW centered on top)
23,792 in³ @ 19.28 = 458.7

11:00 Table at 0.12 + period = 96 sec ≡ 9.9¢
" " 0.195 level (dn sl.
" " 0.210 level inc sls.
Crit -

Expr. 16-8A Time 11^30 AM ~~PM~~ Date 5-30 1956
Purpose Crit
Removed 1/2 top layer
Personnel:

loading now has 6 2x2x1's ~~to~~ centered on top.

Limit Stop = .046 + period 135 sec ≡ 7.7¢

Level inc Selsyn ~~[illegible]~~ 0.173 super
~~[illegible]~~ .178 level Log N ~ .3

Dec Selsyn 0.14 level Log N ~ .3

SUMMARY OF CRITICAL CONDITIONS

Expr. 16-8-B Reactor Pseudo cylinder
Solution ~~Height~~ ~~Volume~~ ~~Temp~~
Reflector None Height Temp
Time Critical 11^30 AM ~~PM~~ Duration 10 [illegible] Log N 0.3
Anal. Req. gms U/gm Sp. Gr.
Critical Mass Atomic Ratio

Crit Position

0.140
0.175
2).315
.157 ± .02
.046
Table Separation = .111 ± .02
Block Separation = .080
0.191 ± .02

2 start up
1 hr

Expr. 16-9 Time 12^30 ~~AM~~ PM Date 5-30 1956
Purpose Removed aluminum .020" face from movable table
Personnel: Same

Loading same ~~at~~ as 16-7 which was sub critical at contact

1^50 pm Contact at 0.05" on Selsyn - no alum separation
Probably sub crit - appeared to be leveling off at 0.05 on log N

Expr. 16-9 Time 1^05 ~~AM~~ PM Date 195
Purpose Adding 6 (2+2+1's) top centered
Same loading as 16-8 without Al.
Personnel:

1^15 pm contact at 0.045 on Selsyn - no Al. limit Sw on -
+ period - 80 sec ≡ 11.5¢

Table direction

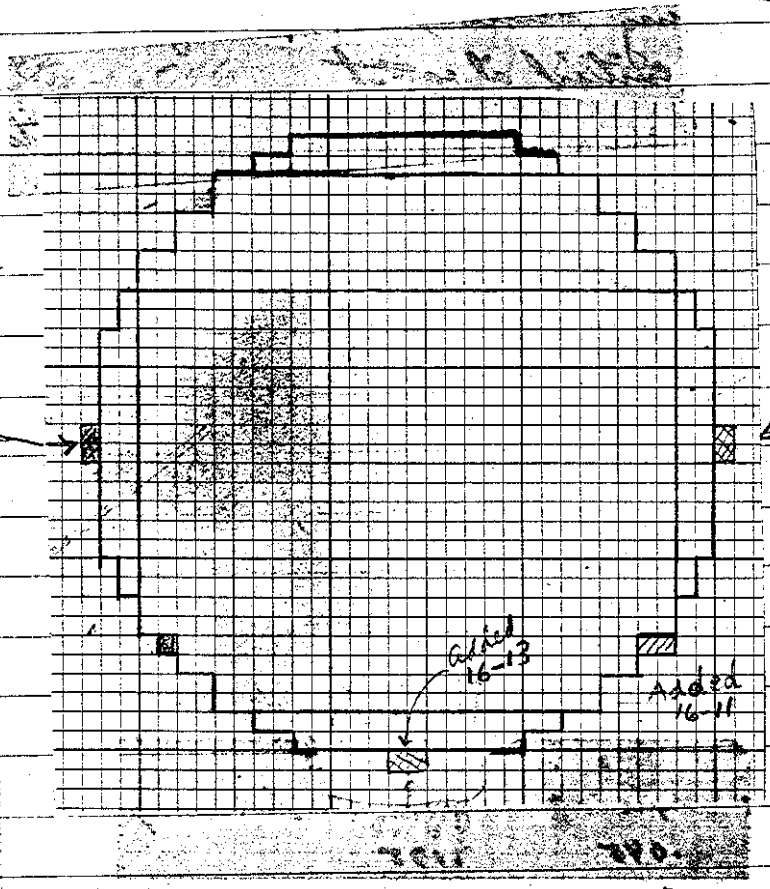
IN Sub	IN Super	OUT Sub	OUT Super
.14	.045	.175	
	.12	.15	.13
0.125			.14
			.145
			.148 level

SUMMARY OF CRITICAL CONDITIONS
Expr. 16-9 Reactor [illegible]
Solution Height Volume Temp
Reflector Height Temp
Time Critical ~~AM~~ 1^15 PM Duration 15 min Log N 0.3
Cal. Req. gms U/gm Sp. Gr.
Critical Mass Atomic Ratio

Crit position = 0.125
0.148
2) 0.273
0.1371 ± .02
-.045
Separation = 0.0921 ± .02

Expr. 16-10 Time 2:50 PM Date 5/30 1986
Purpose Removed top 6 2×2×1's adding 28 1×1×1's to periphery in Vertical stack
Personnel:

3 start up
2 shut



Base Area 849 in²
height 28 in
Volume 23,772 in³
458.32 kg @ 19.28 kg/m³
r eq = 16.44 in

3 13/PM Tables at 0.048" (limit) no al exp. + period. 7.5¢ = 139 sec = 7.5¢

$$\frac{7.5¢}{166\ ¢/in} = 0.045_2''$$

$$\times 29.46 \frac{kg}{in} = 1.33\ kg$$

excess

Table direction

3:20 PM

IN		OUT	
Sub	Supr	Sub	Supr
	.048		.12
.12	.10	.14	.13
	.105	.135	
	.115	.132	
.118 level		.130 level	

DFC. .1 DWM

Critical position = going in 0.118 $\frac{.048}{.052}$ between .10.5 – .99

" out 0.130 Selsyn 0.132 log N 0.3

1 start up
1/2 hr

Expr. 16-11 Time 4:10 AM PM Date 5/30 1956
Purpose
Mass vs. Table position
Personnel: DFC DWM

Added 14 pc 1x2x2 on edge. (56 in³)
loading: 23,828 in³ Base area 851 in² 28 in high
+ period selsyn Dec. 0.06 – 76 sec ≡ 11.9¢
level selsyn Dec. 0.12

1 start up
1/2 hr

Expr. 16-12 Time 440 AM PM Date 5-30 1956
Purpose
Mass vs Table position
Personnel: DFC DWM

Loading: 23,884 in²
Area 853 in²
ht 28 in²

+ Period: Sel Dec 0.10 – 80 sec ≡ 11.5¢
Level " Dec 0.15

1 start up
1/2 hr

Expr. 16-13 Time 5:00 AM PM Date 5-30 1956
Purpose
Mass vs Table Pos
Personnel: DEC [illegible]

add 4 in² x 28
or 112 in³
23,996 in³
area 857 in²

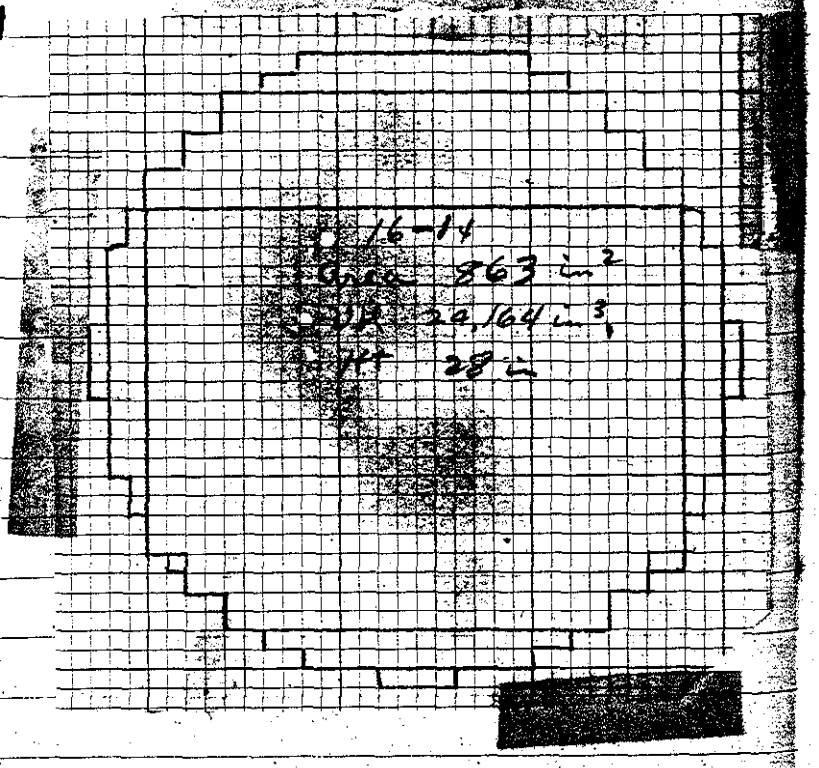
+ Period 0.165 (sel dec) 96 sec ≡ 9.9¢
level 0.210 (" ")

1 start up
1/2 hr

Expr. 16-14 Time 5:30 AM PM Date 5-30 1956
Purpose
Mass vs Table Pos
Personnel:

add 6 in² x 28
or 168 in³
24,164
area 863 in²

+ Period 0.27 (sel dec)
level 0.302 (sel dec)
period = 113 sec ≡ 8.8¢



Expr. 16-15 Time 6:05 AM PM Date 5/30 1956
Purpose alum vs Mas vs Table P.S
Personnel: DFC ADC DWM

1 start up Loading Same as 16-10.
1 hr Top reflector 1" alum on fixed Table
3/4" over movable Table
+ Period 0.32 (Sels. dec)
level 0.36 (" ")
period = 106 sec = 9.2 ¢

16-15 $\frac{9.2}{04} = 230$
16-14 $\frac{8.8}{032} = 275$
16-13 $\frac{9.9}{055} = 180$
16-12 $\frac{11.5}{50} = 230$
16-11 $\frac{11.9}{60} = 198$

av $= \frac{1113}{5} = 223$ ¢/in

Summary

Total Blocks

2×2×3" = 1717

2×2×1" = 895

1×1×1" = 54

Dimensions: Sum of 12 [2×2×1"] = 12 1/32 × 24 3/16"

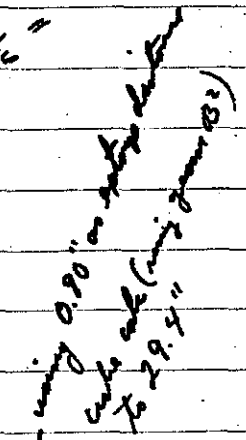
Sum of 2×2×3' 14 blocks [2"] = 28 3/8"

6 blocks [3"] = 18 1/16

10 blocks [2"] = 20 3/16

14 blocks [2"] = 28 3/16

Using nominal dimensions



Clean pseudo cyl. [no Al. sup. but on 1" Al plate]

Vol = 23,772 in³ Hgt = 28" Area = 849 in²

critical with 7.5 ¢ xenon at contact Eqn 16-10

Sub Critical with 28 in³ removed. Eqn 16-7 (M.n.500)

→ Critical = 23,758 ± 14 cubic in Equiv Radius = 16.44"

Measured dimensions: 32 3/8 × 32 3/8 × 28 3/16 [across largest dimensions]

Approx stacking fraction: ~~.375 × .125 × .1875 = .008789~~

$$\frac{32\frac{3}{8} \times 32\frac{3}{8} \times 28\frac{3}{16}}{32 \times 32 \times 28} = 1.0225$$

Crit. Mass: 2×2×3's = 1717 = 20,604 = 396.112 Kg (19.223 g/in³)

2×2×1's = 785 = 3,140 = 61.011 (19.93 g/in³)

1×1×1's = 28 = 28 = 0.545 (19.45 g/in³)

23,772 − 14 ± 14 in³

4
457.668
−.273
457.395 ±
457.4 ± 0.3 Kg

Crit Volume 23,758 ± 14 × 1.0225

24,293 ± 14 cubic inches

Period measurement Avg value = 166¢ per inch
measurements made from 0.36" to .04"
· scatter evident due to positioning = ± 0.02"

Graph of sq. in added peripherally vs Table location at Crit.

$$\text{slope} = \frac{\Delta M}{\Delta l} = 20''^2 \times 28 \times 19.43\ g/in^3 \div 0.304\ in$$

$$\therefore \frac{\frac{\Delta k}{k}}{\frac{\Delta M}{M}} = \frac{\frac{\Delta k}{\Delta l k}}{\frac{\Delta M}{\Delta l M}} = \frac{166 \times .304 \times 0.755 \times 10^{-4} \times 457.4 \times 10^{3}}{20 \times 28 \times 19.43} = 0.16$$

(omperimeter)

Cl ?

Psuedo Cyl. [Critical Values or Slightly Super Crit < 15¢ excess]

	Mass	Vol. in³	Eq. Radius at 28" ht.
Clean	466.9 ± 0.3	24,276 ± 14 *	16.64 in
		23,758 ± 14 *	
w 1" base	457.4 ± 0.3 Kg	24,293 ± 14	16.44 in
w 1" base plus .080" sep.	457.4 ± 0.3	23,785 ± 14	16.44 in
w 1" base + 1" top	447.9 ± 0.3	23,268 ± 14 *	16.27 in

Cube—

Extrap Value = 24,820 — 25,120 in³ [24.96]
[24.96 ± 0.14 in³ × 10³]

Assume mass added is 2×2×1's at 19.43 gm/in³
= 23.4 Kg added + 457.4 = 480.8 Kg est. with 1" Al base
or 490.3 kg est. without 1" Al base

* Nominal value

Dial Indicators

Direction	EAST	West	Selsyn
Together	0	0	23.09
"	.100	.106	22.99
"	.208	.214	.88
"	.300	.306	.79
"	.400	.406	.69
"	.599	.605	.49
"	.808	.814	.28
"	.898	.903	.19
Apart	.816	.823	.29
"	.717	.725	.39
"	.616	.625	.49
"	.419	.429	.69
"	.216	.227	89
"	.116	.128	.99
"	.080	.092	03
"	.018	.030	09

Dial indicators were fastened to the tracks to indicate table position on each side. This set of data shows the reproducibility, and the skewness is negligible. However, the direction of travel can cause errors in selsyn readings, and one dial indicator will be set up to be read thru the water window for the exact table position.

Air pressure 20 #/in²

Counter weight 2 lead bricks

Considerable data was taken with no counter weights and pressure of 20# & 35# on cylinder. This asymmetric loading reduced the difference due to direction of motion by a factor of 2 but the operation of the tables was then not satisfactory.

Together curve under Apart curve by ≈ .015 inch

With Dial Indicator mounted near cubes and a long extension bar clamped to movable table, the following data was taken under operating conditions ~~Dist~~ of 35 #/in² and 5 lead bricks counter wt.

Dial Indicator Reading	Selsyn Reading	Dir.
~~17.21~~ .004	17.21	Together
.164	17.05	"
.416	16.80	"
.620	.60	"
.830	.39	"
.918	.30	"
.997	.22	"
954	.29	Apart
818	.43	"
684	.57	"
473	.77	"
270	.97	"
162	17.08	"
134	17.11	"
029	17.21	"
.611	16.60	Together

Together curve lies under Apart curve by 0.03 inch

Ram tables to 30.0 Magnet off rack selsyn to 0.
ram selsyn @ 80.0 pickup table

~~17.21~~ .013	17.21	Together } check ok
.623	16.60	"
.994	16.23	"

-.006	91	
.056	.85	
.110	.79	
.426	.48	
.652	.25½	
.786	.12	
.806	.10	
.840	.025	
.788	.12	
.810	.09⅛	
.820	.08½	
.826	.068	25# air pressure
.829	.06	
.834	.05½	
.835	.049	
.839	.042	
.841	.030	
.844	.020	
.796	.11	
Eir Tables.		
-.008	.91½	
.022	.88½	
.136	.78	
.217	.70	
.290	.63	
.376	.54	
.489	.43	
.590	.32	
.687	.22-	
.688	.22	
.788	.122	
.821	.085	
.823	.08	
.842	.035	

Expr. 17-1 Time 935 AM PM Date June 25 1956
Purpose Table alignment
Personnel: DW M. J.K.T.

START-UP CHECK LIST
Equipment Checked by DM Personnel Check by ✓
Instrument and Safeties Checked and Reset by ✓
"Source In" Checked by _____ Source No. α-n
Emergency Equipment in Control Room Checked by ✓
Red Light On by ✓
Start-Up OK'd by DM Time _____ AM PM Date _____ 195_

1 stand up
1 hr

INSTRUMENT CHECK
Date 6-25 1956 Time 935 AM PM Source No. _____

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	3"			
DC-3		80	100	
Log N	✓			
R-1	2"			
R-2				
P. M.	✓			

Loading same as p 86 less 28 in² x 27
(expected to be sub-crit)

Magnet did not hold when limit switch stopped the table travel.

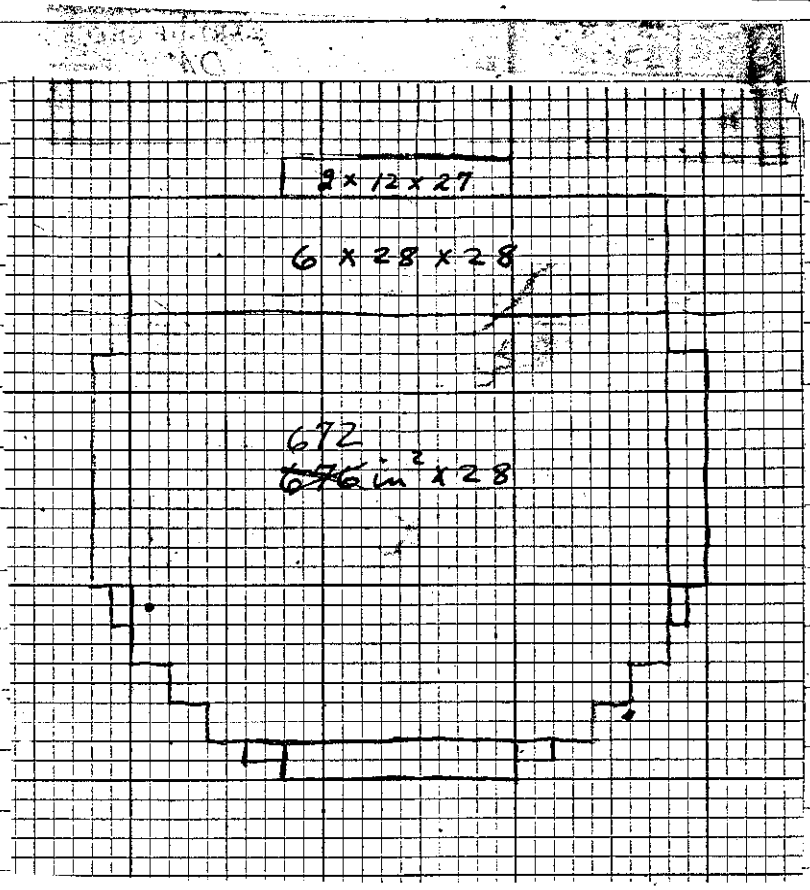
1 standup
1/2 hr

Expr. 17-2 Time 1035 AM PM Date 6-25 1956
Purpose Table alignment checks
Personnel: DW M J. F.

Loading: 6 x 28 x 28 on Movable Table
Subcritical

Expr. 17-3 Time 142 AM PM Date 6-25 1956
Purpose Table calibration
Personnel: D.W.M. J.K.T.

1 shot up.
1 hr



Pos Period 5.5 div → = 123.5 sec 8.2¢/.024 = .342 ~~.149~~ ¢/in

Selsyn 0.10 Dial 0.788

Critical Level Selsyn ~185 Dial = 0.764 Log N ~ .26

Neg Period Dial .717 DC-3 ~ 80 x 10 x 50

6.8 div → = 147.7 12.5¢/.047 = 266 ¢/in

1 shot up
1 hr

Expr. 17-4 Time AM PM Date 195
Purpose added 1 x 2 x 28 to south face - center.
Personnel: DWM, JKT

Positive Period 8 div → = 173.8 $6¢/.018 = 333$ ¢/in

Dial .749 Selsyn 0.15

Level Critical

Dial .731 Selsyn ~.23

Negative Period 6.6 div → = 143.4 $13.1¢/.048 = 273$ ¢/in

Dial .683 Selsyn ~.278

$$\text{Average Table worth} = \frac{8.2 + 12.5 + 6 + 13.1}{.024 + .047 + .018 + .048} = \frac{39.8}{.0137} = 290.5 \text{ ¢/in}$$

$$\text{Fuel worth } \frac{.033 \text{ in}}{2 \text{ in}^2} = .0165 \text{ Dial in/in}^2 \text{ area}$$

or $.0165 \times 290.5 = 4.8$ ¢/in²

on periphery of 28" tall ass'y

Table displacement from cont.	Positive React. (¢)	¢/in
+.024	+8.2	341.7
−.047	−12.5	266
+.018	+6	333.3
−.048	−13.1	272.9
	290.5 ¢/in avg	

¢/in

.26

30 x 10 x 50

¢/in

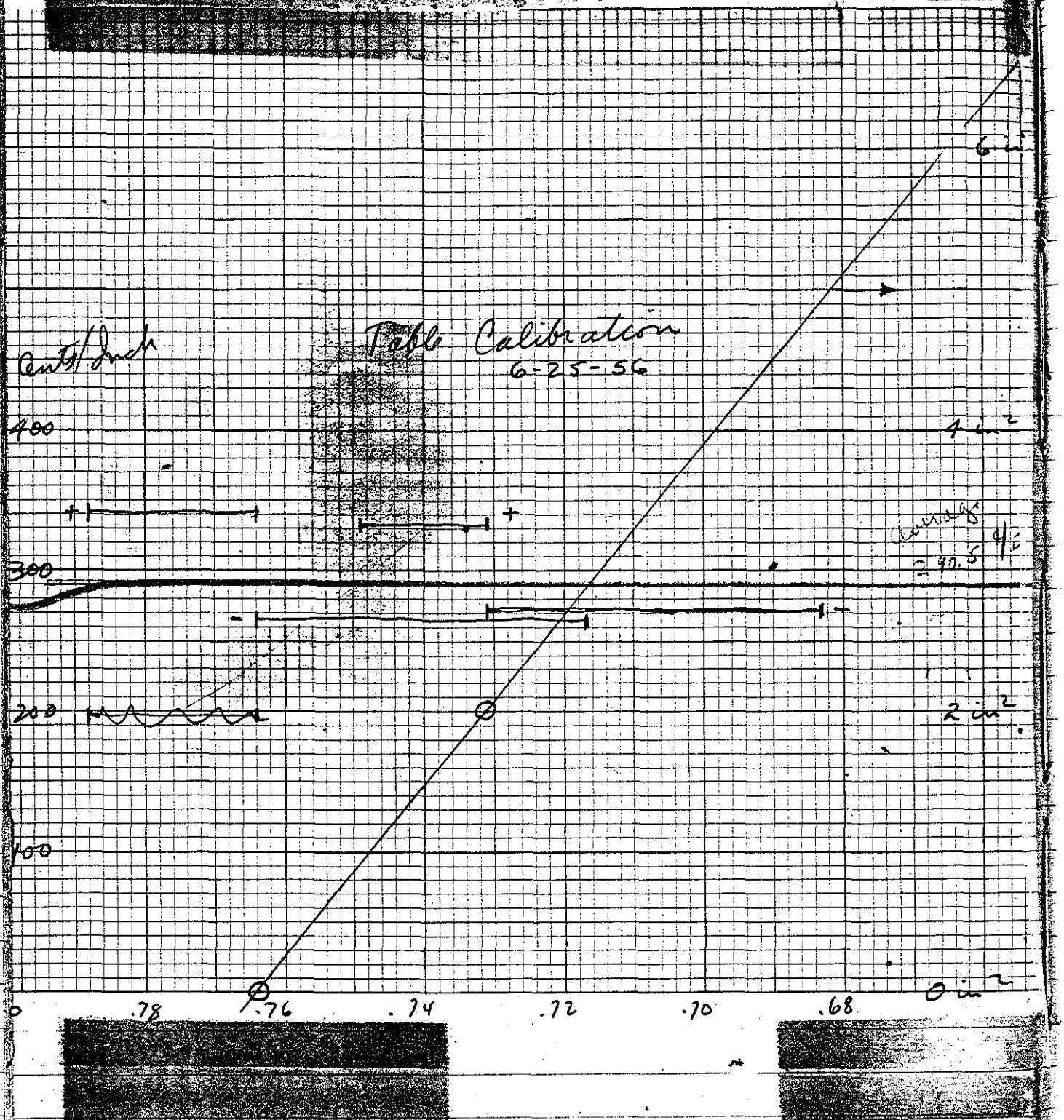


Table Calibration
6-25-56
Cents/Inch
400
300
200
100
0
.78
.76
.74
.72
.70
.68
6 in²
4 in²
2 in²
0 in²
Pounds
240.5

Expr. 17-5 Time 9:00 AM ~~PM~~ Date 6-26 1956
Purpose Iron Reflector 1/4"
Personnel: D.W.M., J.K.F.

1 start up
2 hr.

START-UP CHECK LIST
Equipment Checked by D.W.M. Personnel Check by C.C.
Instrument and Safeties Checked and Reset by J.K.F.
"Source In" Checked by ✓ Source No. ✓
Emergency Equipment in Control Room Checked by J.K.F.
Red Light On by ✓
Start-Up OK'd by ✓ Time ____ AM PM Date ____ 195__

D	Inst	T.L
1"	DC-2	35x260
4"	DC-3	80x201
	L-N	✓
1"	P.M.	✓
	R-1	✓

One 1/4 x 16 x 27 piece of iron on west 12" face

POSITIVE Period 4.2 div → 91.2 sec 10.4 ¢
Selsyn 0.17 Dial 0.726 0.033 → 315 ¢/in

Level (Crit) Log N ~0.26 DC-3 77x10x50
Selsyn 0.268 Dial 0.693

Neg Period 7.7 div → 167.2 sec 10.4 ¢
Selsyn 0.303 Dial 0.655 0.038 → 274 ¢/in

Expr. 17-6 Time 10:00 AM ~~PM~~ Date 6-26 1956
Purpose 1/2" Iron reflector
Personnel: DWM, JKF

1 start up
1 hr

2 - 1/4 x 16" x 27" pcs. of Iron plate on west 12" face

POSITIVE PERIOD (100 sec) 4.8 div → 104.3 sec → 9.3 ¢
Selsyn 0.27 Dial 0.676 .036 → 258 ¢/in

Level (CRIT) Log N ≈ 0.22 DC-3 71 x10 x 50
Selsyn 0.305 Dial 0.640

Neg (Per) 5.1 div → 110.8 sec 21.3 ¢
Selsyn 0.37 Dial 0.584 .056 → 380 ¢/in

Expr. 17-7 Time 10³⁰ AM ~~PM~~ Date June 26 1956
Purpose
Reflector, Fuel and Table evaluation
Personnel: DWM JKF.

1 start up
1/2 hr

Added 1"x2"x28" blocks to South face, center,
(1/2" iron remains on W face)

POSITIVE PERIOD 4.9 div → 106.4 sec 9.2 ¢
Selsyn 0.272 Dial 0.650 .033 → 279 ¢/in
Level (Crit) ~.25 DC-3 7 x 10 x 50
Selsyn 0.345 Dial 0.617
Neg Period 5.8 div → 126.0 sec 16.4 ¢
Selsyn 0.395 Dial 0.565 52 → 315 ¢/in

Expr. 17-8 Time 1:00 AM ~~PM~~ Date 6-26 1956
Purpose 2" lead against W. face
2 x 12 x 28
Personnel: DWM, JKF.

1 start up
1/2 hr

2"x12"x28" lead added (removed 1x2x28 blocks)

POSITIVE PERIOD 4.4 div → 95.6 sec 10.0 ¢
Selsyn 0.34 Dial 0.590 038 → 263 ¢/in
Level (Crit) Log N = 0.26 ; 77 x 10 x 50
Selsyn 0.41 Dial 0.552
Neg Period 7.1 div → 154.2 sec 11.7
Selsyn 0.455 Dial 0.510 .042 → 279 ¢/in

note ~~add reactivity from 1x2x28" blocks~~ use genomin

Expr. 17-9 Time 11 35 AM ~~PM~~ Date 6-26 1962
Purpose Lead: 4 X 12 X 28 against West face
Personnel: D W M, JKF.

[201 Temp ~76°F Neuromax]

1 start up 1/2 hr

Positive Period 5.6 div → 121.6 8.4 ¢
Selsyn 0.45 Dial 0.463 .030 → 280
Crit (level) log N = 0.25 DC-3 = 75 x10x50
Selsyn 0.50 Dial 0.453
Negative Period 6.5 div → 141.2 13.5 ¢
Selsyn 0.565 Dial 0.405 .048 → 281

1 start up 1 hr

Expr. 17-10 Time ___ AM ~~PM~~ Date 6-26 1966
Purpose Re-zero run
Personnel: D.W M, JKF

Sec 17-3

Pos. Period 4.5 div → 97.7 sec 9.8 ¢
Selsyn 0.125 Dial 0.815 .035 → 280 ¢/in

CRIT (level) log ~.25 DC-3 = 75 x10x50
Selsyn 0.173 Dial 0.780

Neg Period 7.1 div → 154.2 sec 11.7
Selsyn 0.24 Dial 0.738 .042 → 279 ¢/in

N.B Zero shifted from 0.764 to 0.780
Average table worth $\frac{120.8 ¢}{.427 \text{ in}}$ = 283 ¢/in

Fuel worth .640 - .617 = $\frac{.023 \text{ in}}{2 \text{ in}^2}$ x 0.0115 Dial in/in^2

X 283 = 3.25 #/in^2

Expr. 17-11 Time 9:00 AM PM Date 6-27 1956
Purpose Zero run See 17-3
Personnel: DWM, JKF

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 ✓ AM
Start-Up OK'd by DWM Time PM Date 195

Inst	Trip L.	Dist.
DC-2	50 x 200	2"
DC 3	80 x 200	4
LN	✓	
PM	✓	1"
R-1	✓	

1 start up POSITIVE PERIOD 4.5 div + 98 9.8¢/034 = 288¢/in
1 hr Selsyn 0.104 Dial 0.790
CRITICAL (Level) log N = 0.26 DC-3 = 78 x 10 x 50
0.24 Sub 0.756
Selsyn 0.18 Super Dial 0.756

~~Negative~~

Expr. 17-12 Time 10:20 AM PM Date 6-27 1956
Purpose added 2" x 12" x 28" of depleted blocks against W. face
Personnel: DWM, JKF

1 start up
1 hr

POSITIVE PERIOD 5.6 div 122 9.34/029 = 286¢/in
Selsyn 0.37 Dial 0.550
0.28
CRITICAL log N = ~~0.81~~ DC-3 81 x 10 x 50
Selsyn 0.435 Dial 0.521

Expr. 17-13 Time 10:50 AM ~~PM~~ Date 6-27 1956
Purpose Added 2" layer depleted blocks: total 4 x 12" x 28" on West face
Personnel: DW. M. JKF

1 start up
1/2 hr.

POSITIVE PERIOD 6.9 div 150 sec 7.1¢ / .026 = 273 ¢/hr
Selsyn 0.48 Dial 0.447

CRITICAL Log N DC-3
Selsyn 0.51 Dial 0.421

Expr. 17-14 Time 11:20 AM Date 195
Purpose
ADD 2" layer depleted Blocks
Total 6" x 12" x 28"
Personnel: DWM JKF

Micromax Temp.
~79°F

1 start up
1/2 hr

POSITIVE Period 5.2 div 113 sec 8.8¢ / .034 = 259 ¢/hr
Selsyn 0515 Dial 0.416

CRITICAL DC-3 80x10x50
Selsyn .586 Dial 0.382

Expr. 17-15 Time 1[10] ~~AM~~ PM Date 6-27- 1956
Purpose Same as 17-14 except added 1x2x28" fuel to south face
Personnel: DWM, JKF

1 start up
1/2 hr

POSITIVE PERIOD 5.5 div 119 sec 8.5 ¢/033 = 258 k/w
Selsyn 0.545 Dial 0.388

Critical (level) logN DC-3
Selsyn 0.618 Dial 0.355

Expr. 17-16 Time 1[55] ~~AM~~ PM Date 6-27 1956
Purpose
Replaced 2x12x28 Fuel with Depleted on East Face, West Face has 6x12x28 Reflector
Personnel:

1 start up
1 hr

(1x2x28 on south removed) compare this run with 17-14 for effect of Fuel replacement with depleted.

POSITIVE PERIOD (Meas. NG. Paper on logN chart not aligned engaged
Selsyn 0.45 Dial 0.486

CRITICAL (level) logN = 0.24 DC-3 = 74 x 10 x 50
Selsyn 0.52 0.454

Expr. 17-17 Time 305 ~~AM~~ PM Date 6-27, 1956
Purpose Evaluate paraffin as reflector: 1½" x 12" x 28" against west face.
Personnel: DWM, C.C., JKF

1 stand up 1/2 hr

Critical DC-3 log N ~ 75 x 10 x 50
Selsyn 0.56 Dial 0.386

Expr. 17-18 Time 335 ~~AM~~ PM Date 6-27- 1956
Purpose added another 1½" paraffin Total 3" x 12" x 28" against West face
Personnel: DWM, JKF

1 stand up 1 hr

POSITIVE PERIOD 8.2 div → 178 sec 6.24 ~~0.286~~ /.024 = 258 #/in
Sel 0.63 Dial 0.~~286~~.287

Critical (level) log N DC-3 = 74 x 10 x 50
Selsyn 0.695 Dial 0.263

Negative Period 6.9 div → 150 sec 12.24 /.043 = 284 #/in
Selsyn 0.735 Dial 0.220

INSTRUMENT CHECK

Date 6-28-56 195__ Time 9 30 AM PM Source No. Gamma

Instrument	Value	Scale	Meter Distance	Start-Up Scale
DC-1				
DC-2	55	10X10	2"	
DC-3	80	10X10	4"	
Log N				
R-1	7	100X1000	~ 3"	
R-2				
P. M.		800V	1"	

Period Meter screamed - separated tables

START-UP CHECK LIST

Equipment Checked by Durm Personnel Check by Durm

Instrument and Safeties Checked and [illegible] Durm

"Source In" Checked by X X No.

Emergency Equipment and Rooms Rechecked by Durm

Red Light On by Durm

Start-Up OK'd by LWG Time 9 40 AM PM Date 6-28 1956

Expr. 17-19 Time 9 30 AM PM Date 6-28-56 195__

Purpose Report 17-18

3" Paraffin on Work Face

Personnel:

1 shot
1 hr

POSITIVE PERIOD 7 div → 152 sec 9.04 / 023 = 304 #/in

Selsyn 0.618 Dial 0.278

CRITICAL Log N = 0.26 DC-3 = 80 x10 = 50

Selsyn 0.695 Dial 0.255

Negative Period 9.3 div → 202 sec 8.14 / 034 = 248 #/in

Selsyn 0.725 Dial 0.221

Expr. 17-20 Time 10^45 AM ~~P.M~~ Date _____ 195__
Purpose ADD 1 x 2" x 28" Fuel Blocks on South Face center
Personnel: Dunn LWG

Micromax ~78°F

I started up 1/2 hr

(3" x 12 x 28" Paraffin on West face)

POSITIVE PERIOD 4.6 div 100 sec 9.6¢ / .038 = 252 ¢/in
Selsyn 0.698 Dial 0.265

CRITICAL DC-3=80 x 10 x 50
Selsyn 0.726 Dial 0.227

NEGATIVE PERIOD 7.6 div 165 10.6¢ / .038 = 279 ¢/in
Selsyn 0.76 Dial 0.189

I shut up 1/2 hr

Expr. 17-21 Time 10^50 AM Date 6-28-56 195__
Purpose Zero Run (See 17-3 & 17-11 & 17-10)
Personnel: Dunn LWG

(Remove Paraffin & Fuel of 17-20)

POSITIVE PERIOD 6.1 div 133 sec 7.8¢ / .029 = 269 ¢/in
Selsyn 0.13 Dial 0.793

Critical DC-3 ~80 x 10 x 50
Selsyn 0.17 Dial 0.764

Expr. 17-22 Time 11:15 AM ~~PM~~ Date June 28 1956
Purpose
Added 5 concrete Blocks 6"x8"x30"
Personnel: Burma LWG

1 stud 1/2 hr

POSITIVE PERIOD 4.6 div 100 sec 9.64 /037 = 2 1/4 in

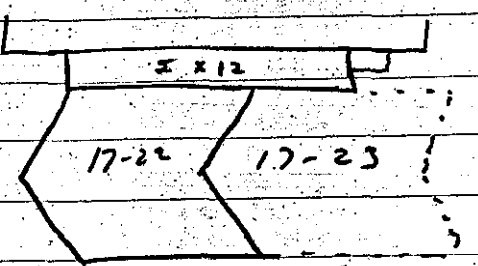
Selsyn 0.36 Dial 0.569

Critical log N = 0.24 0c-3 76 x 10 x 50

Selsyn 0.42 Dial 0.532

1/4 in

Block alignment



1 stud up 1/2 hr

Expr. 17-23 Time 11:40 AM ~~PM~~ Date 6-28 1956
Purpose
Added 5 more Concrete Blocks
Total 6" x 24" x 30"
Personnel: Burma LWG

69 4/m

POSITIVE PERIOD 5.5 div → 120 sec 8.44 /033 = 255 4/m

Selsyn 0.695 Dial 0.236

CRITICAL

Selsyn 0.74 Dial 0.203

Summary of 17-3 thru 17-23

$$\frac{\text{Total } \phi}{\text{Total Dist.}} \quad \frac{282.6\ \phi}{1.019''} = 277.33\ \phi/\text{inch}$$

Material	Subcritical position at Critical	Change in Critical position	Reactivity ②				Date	Time
None	0.764	—	—				6-25	1 50 PM
1×2×28" fuel	0.731	0.033					6-25	?
¼×16×27" Fe	0.693	.087					6-26	8 AM
½"×16×27" Fe	0.640	.140					"	10 AM
1×2×28" fuel	0.617	0.023					"	10 30
2×12×28" Pb	0.552	.218					"	11 00
¼×12×28" Pb	0.453	.317					"	11 30
none	0.780			.016 in 24 hrs			6-26	11 00 PM
None	0.756	—	—	.024 in 30 hrs			6-27	9 00
2×12×28" (238)	0.521	.235						10 20
¼×12×28 "	0.421	.335						10 50
6×12×28	0.382	.374						11 20
1×2×28" fuel	0.355	.027						1 10
2×12×28" removed + replaced	0.454	−.072						1 55
1½×12×28" paraff.	0.386	.370						
3×12×28	0.263	.493						3 35
3×12×28	0.255	changed	by .008 in 16 hrs (negligible/hr)				6-28	9 30
1×2×28" fuel	0.227	.028						10 15
none	0.764	—	—					10 50
6×8×30 Concrete	0.532	.232						11 15
6×24×30 "	0.203	.561	"					11 40
				.033				

(stand up 4 hrs

Expr. 18 Time 11 30 AM ~~PM~~ Date 7-2 1956
Purpose Prelim Foil Exp
1½" Paraffin on top - 12" x 12"
Personnel: DWM DH

INSTRUMENT CHECK

Date 7-2 1956 Time 11 30 AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	60	20x10	1"	20x1
DC-3	95	20x10	9"	20x1
Log N	10 ma			
R-1	1	100x1000		100x25
R-2				
P. M.	1"	800V		800V

START-UP CHECK LIST

Equipment Checked by DWM Personnel Check by DH
Instrument and Safeties Checked and Reset by DH DWM
"Source In" Checked by — Source No. —
Emergency Equipment in Control Room Checked by DH
Red Light On by DH
Start-Up OK'd by DH Time 11 30 AM ~~PM~~ Date 7-2 1956

air press on safety cyl = 90# (Magnet current now @ 3 amps)

N.B. → 2" Lead on 5 sides of DC-3

SUMMARY OF CRITICAL CONDITIONS

Expr. _____ Reactor _____
Solution _____ Height _____ Volume _____ Temp _____
Reflector _____ Height _____ Temp _____
Time Critical _____ AM PM Duration _____ min. Log N _____
Anal. Req. _____ gms U/gm _____ Sp. Gr. _____
Critical Mass _____ Atomic Ratio _____

No Run — Motor failure

Expr. 18 Time 8:15 AM ~~PM~~ Date 7-3 1956
Purpose Same exp -

Personnel: DK RWG

Date 7-3 1956 Time 8:15 AM PM Source No. 8

Instrument	[illegible]	Scale	[illegible]	Start-Up Scale
DC-1		20x10		
DC-2	60			
DC-3	90	20x10		20x1
Log N	10cm			20x1
R-1	—			
R-2	1	100x1000		
P. M.	1"	800V		100x25
				800V

START-UP CHECK LIST
Equipment Checked by DK Personnel Check by
Instrument and Scalers Checked and Reset by DK
"Source In" Checked by Source No.
Emergency Equip. DK Control Room Checked by
Red Light On by DK
Start-Up OK'd by Time 2:30 AM PM Date 7-3 1956

3:04 PM Selsyn 0.23 positive period
3:05 0.32 level at log N = 1 (going apart on table)
3:04 53 am shut down

Loading Same as 17-3 with 1½" x 12 x 12 parafin on top

1 start up
1½ hr

INSTRUMENT CHECK

Date 7-5 1956 Time 12 30 ~~AM~~ PM Source No. _____

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	55	10x20		1x20
DC-3	160	10x20		1x20
Log N				
R-1	FS	100x100	2"	25x100
R-2				
P. M.	800 ✓		1"	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 — Source No. —
Emergency Equipment in Control Room Checked by DK
Red Light On by DK
Start-Up OK'd by DK Time 12 30 ~~AM~~ PM Date 7-5 1956

Expr. 18-1 Time 12 30 ~~AM~~ PM Date 7-5 1956
Purpose Foil calibration

Personnel: DWM DK

1 17 pm Poo period approx 100 sec Selsyn = 0.24"
0.?47 on dial

1 19:50 ~~start~~ foil exp at 0. & go & log N = 2

1 39:50 Shut down

In Foils irradiated on wheel near South face center with 4" Be block behind plastic wheel. Au 1¼ 6c (.3282g) and Mn #7 (3.6087g) in center of movable table

Expr. 19-1 Time 10^{30} AM ~~PM~~ Date 7-9 1956
Purpose Zero'ing Run - removed paraffin added depleted on East face - 12" x 2" x 28"
Personnel: DWM DK

1 start up
1 hr

START-UP CHECK LIST
Equipment Checked by DK Personnel Check by DK
Instrument and Safeties Checked and Reset by DK
"Source In" Checked by — Source No. —
Emergency Equipment in Control Room Checked by DWM
Red Light On by DWM
Start-Up OK'd by _____ Time 10^{30} AM ~~PM~~ Date 7-9 1956

INSTRUMENT CHECK
Date 7-7 1956 Time 10^{30} AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	42	20x10	5"	1x20
DC-3	85	20x10	1"	1x20
Log N				
R-1	10	100x1000	Constant	25x100
R-2				
P. M.	800V		1"	800V

10^{45} AM .10 Selsyn 0.587 positive period
10^{50} leveling at Log N = ~0.34 DC-3 = 80 x 10 x 50
0.21 selsyn - .547 - dial sub
.205 " .549 - dial Supra
> average .548
Est Crit Pos.

#7

[illegible] .027" [illegible]

1 stand up
1/2 hr

Expr. 19-2 Time 11^05 AM ~~PM~~ Date 7-9 1956
Purpose Same with 1/2 face covered with 10 mil Cd.
Personnel:

11^13 AM 0.10 Selsyn pos. period .582 dial

11^24 AM 0.208 Selsyn level .549 dial Subcritical by about same amount
log N ≈ 0.3x DC-3 = 85 50x10

Critical est 0.550

1 stand up
1/2 hr

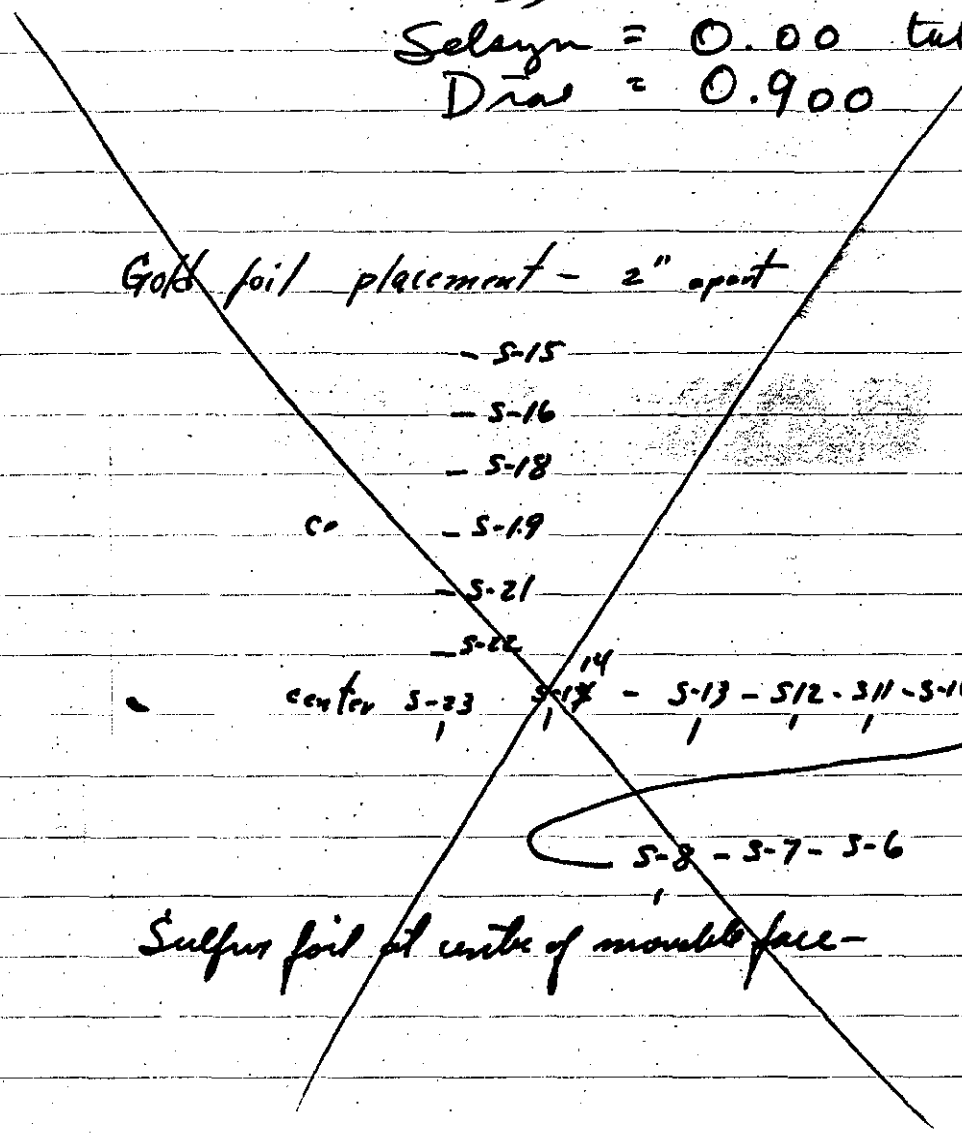
Expr. 19-3 Time 11^40 AM ~~PM~~ Date 7-9 1956
Purpose Cd removed to ck zero
Personnel:

0.11 selsyn 0.600 Positive Period

11^48 AM 0.188 selsyn 0.549 level
log N ≈ .34 DC-3 84x10x50

Rezeroed Selsyn and Dial indicator

Selsyn = 0.00 tables together
Dial = 0.900



Loading: same as 17-3 plus 2 x 12 x 28 depleted on East Face (Same as 19-1)

1 start up

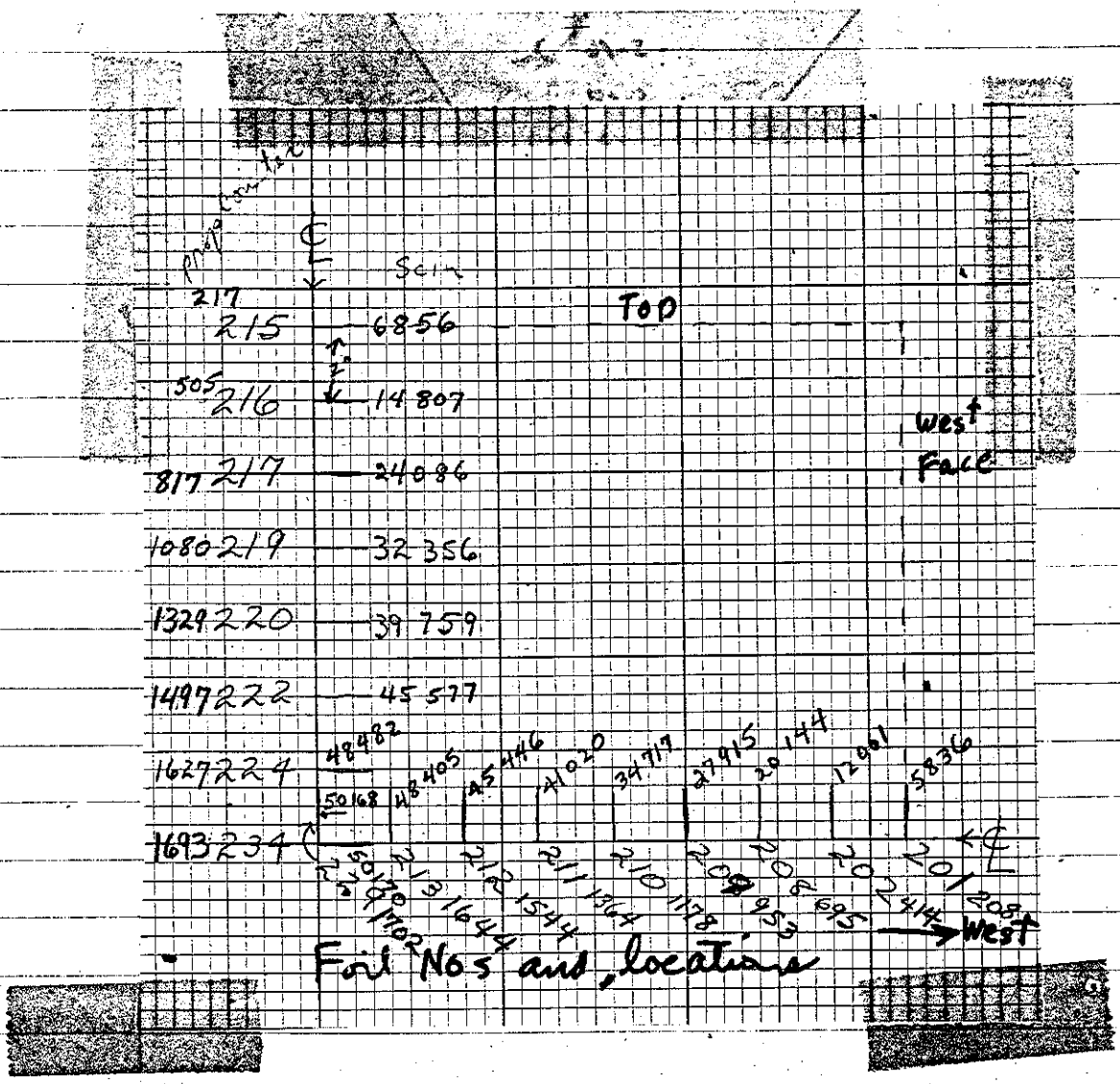
1 hr

Expr. 19-4 Time 4^00 ~~AM~~ PM Date 7-9 1956

Purpose Au foil traverse + single S foil.

Personnel:

Sulfur foil in center of movable face between kalves



Start

3:17:17 Selayn .295 0.713 on dial

Power level = log N = 2.7 DC-3 = 42 on 101 x 10

(with zero shift)

Selayn = 0.40 (going up) dial = 578

4 4z " = .0405 dial 0.577

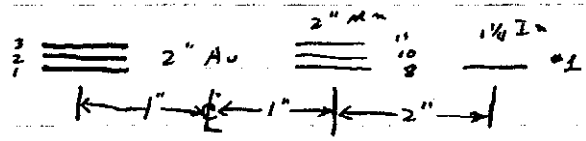
5:17:17 PM Shut down —

just before shut down rad counts = 1.5 m/hr —

Note: Gold foils 1¼" OD x .5" ID weighing ~ .6 g were irradiated for 1 hour at log N = 2.7 for vertical and radial flux distributions. A Sulphur disc was placed on the middle of the movable table face to check its activation.

July 11, 1956

A slot was built into the assembly extending from the west face to 2" beyond the center, total depth 18"; it is 14" above the table. The north edge of slot is 13" from the north face when tables are together. The south edge is 12" from the south face. The top and bottom are lined with 1/16" x 3" x 18" aluminum the sides are 1/4" x 1/4" x 18" aluminum. Slot inside dimensions are 1/4" x 2 1/2" x 18".



1 start up 1/2 hr

INSTRUMENT CHECK

Date 7-12 1956 Time AM PM Source No.

Instrument	Trip Value	Scale	Range	Start-Up Scale
DC-1				
DC-2	75	20x10	1"	
DC-3	90	20x10	contact	
Log N		10 sec		
R-1		100x1000		
R-2				
P. M.	1 1/2"	800V	1 1/2"	800

DC-3 now Cd covered & lead shielded

START-UP CHECK LIST

Equipment Checked by _____ Personnel Check by _____

Instrument and Safeties Checked and Reset by DWM

"Source In" Checked by _____ Source No. _____

Emergency Equipment in Control Room Checked by DWM

Red Light On by DWM

Start-Up OK'd by DH Time 9 10 AM PM Date 7-12 1956

Expr. 19-5 Time 9 10 AM PM Date 7-12 1956

Purpose zero min - (slot in center)

Personnel:

did not get cut but close enough to be sure when fails in.

1 start up
1 hr

Expr. 19-6 Time 9:12 AM
Purpose Au & M foils & Ind in hole as shown on p-119 Date 7-12 1956
Personnel: DSL Dan M

9:48 AM Posit Period log N 7 - .09
Selsyn at 0.25 log N = .1
DC3 = 49 ~~20~~ x 10 x 10
R-1 = 6 7000 x 1000 (Saturated)
DC-2 = 75 10 x 100 (Sat)

9:51.75 AM Start Exp at log N = 1 DC-3 = 49 x 10 x 100
dial Ind = 28 mils - Selsyn (going ~~together~~ apart) = 0.335
(Sub very slight)
= 29½ Selsyn = 0.31

10:11.75 AM Shut down -
Time at Pwr = 20 min
Table posit = 0.335 (going apart)
0.310 (" together)

1 stand on 1/2 hr

Expr. 19-7 Time 2:00 Date 7-12 1956
Purpose S- Na, Au foils

Personnel: DFW DWM

Bone Au = #4 Cd covered Au = #5
Na blocks (Na_2F_2) on top center
S foil (pellet) on interface center

Pos Period Selsyn 0.255 Dial 0.655
Start Time 2:23:23 PM DWM watch 2:23:52
Level Sels 0.36 0.621
End 2:43:23 PM DWM Watch 2:43:52

INSTRUMENT CHECK

Date July 13 1956 Time 1:40 ~~AM~~ PM Source No.

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	~50	10x20	contact	1 x 20
DC-3	~80	10x20	"	1 x 20
Log N	7 sec period		"	
R-1				
R-2				
P. M.	800V		1"	

(All inst also checked by JKFox) 7-13-56

START-UP CHECK LIST

Equipment Checked by DWM Personnel Check by DFC
Instrument and Safety Checked by DWM
"Source In" Checked by —
Emergency Equipment & Control Room Checked by DWM
Red Light On by DWM
Start-Up OK'd by DWM Time 1:50 PM Date July 13 1956

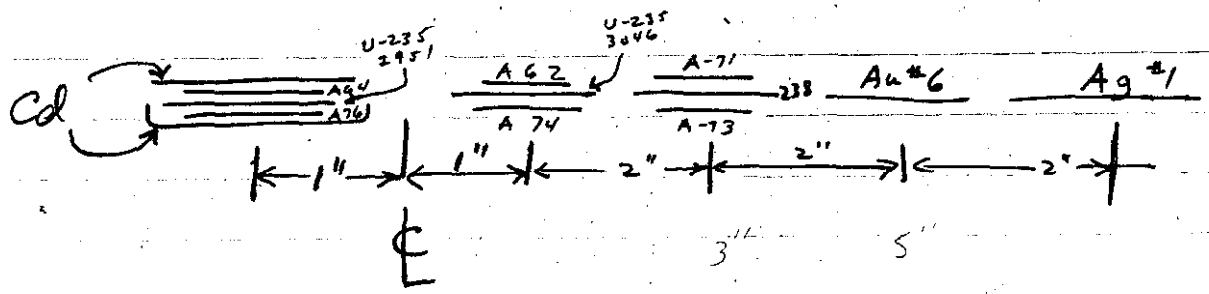
1 start up
1 hr

Expr. 19-8 Time 1 50 ~~AM~~ PM Date 7-13 1956
Purpose Foil Exposure
Personnel: DFC DWM

Log N not calibrated
.001 reads
.0011 on chart

S foil on movable half

Foil locations



Sulphur foil on middle of interface

Pos Period Dial 0.657 Selsyn 0.250
2:05:26 Start exposure timer
Level Dial 0.624
Dial 0.625

July 17, 1956 log N was 1.0 for this run
(Check log N chart paper DWM DFC

Expr. 19-9 Time 12 30 PM Date 7-17 1956
Purpose Au foil exp
check on 20' halflife act. in Au
Personnel: 5 foil on movable half

#5 @ -1" in double Al
#26 @ +1" in glass

1 stand up
1 hr

SUMMARY OF CRITICAL CONDITIONS
Expr. _____ Reactor _____
Solution _____ Height _____ Volume _____ Temp _____
Reflector _____ Height _____ Temp _____
Time Critical _____ Duration _____ min. Log N _____
Anal. Req. _____ gms U/gm _____ Sp. Gr. _____
Critical Mass _____ Atomic Ratio _____

Inst ck —
Log N trip set at 7 sec
DC-3 20×10 95 contact 8 source
PM 800 V 2"
DC-2 20×10 75
12 37 pm log N = .04 selsyn 0.25 pos. period
12 40 selsyn 0.24 log N = .15 pos period

~~12:41 8"~~
12:40 +17 sec start time at log N = 0.37 to level at log N = 1
x 0.633 in dial
12 52 log N meter reads 0.85 recorder reads 1.0
DC-3 = 70 / 10 2.50
12 57 log N meter reads 0.95 recorder = 1.0

Expr. 19-10 Time 1:30 ~~AM~~ PM Date 2-17 195
Purpose Au foils 10x hotter
S foil on movable half
Personnel:

1 start up
1/2 hr

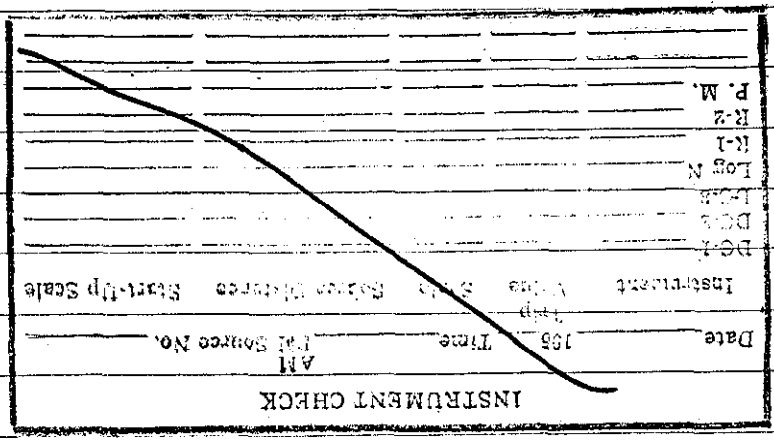
8, 9, 10 } at -1" in glassine

23, 24, 25 } at +1" in Glassine

1:43 DC-3 = 74 on 10 x 5 log N = 0.1
1:44:20 DC-3 = 70 10 x 10 log N = 0.2
1:45:30 DC-3 67 10 x 20 log N = 0.4
84 10 x 20 log N = 0.5
47 10 x 50 log N = 0.7
1:47:22 start time 67 10 x 50 log N = 1.0
zero shift on DC-3 from 55 - 35 on 10 x 50
PM trips at 1600 on log N = 2
log N = 2.7 DC3 = 74 on 10 x 50

1

Counted by Lazar -- identified fission product act.



INSTRUMENT CHECK

Date 7-18 1956 Time 2 55 ~~AM~~ PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	71	20x10	18	20x1
DC-3	89	20x10	20	20x1
Log N	10 sec	pencil		10 sec
R-1	7	1000x1000	counted	100x100
R-2				
P. M.		500V	counted	6

START-UP CHECK LIST

Equipment Checked by DK Personnel Check by DK

Instrumentation Setting Checked and Reset by DK

Source In Checked by _____ Source No. _____

Emergency Equipment in Control Room Checked by DM

Red Light On by DK

Start-Up O'K'd by DK Time 2 55 ~~AM~~ PM Date 7-18 1956

1 start up
1/hr

Expr. 19-11 Time 2 53 ~~AM~~ PM Date 7-18 1956
Purpose Chest Irradiate Au foils & checks for spurious short lived activity
Personnel: WH DWM

#5 -1"
#26 +1"
bare Al# +3"

3 09 PM Selsyn at 0.25 posit. period 100 sec
3 12 PM " " 0.23 posit period 100 sec (period had slowed down)
3 14+5 sec PM Exposure started log N = 0.37
Selsyn at 0.335 dial .631 (very slightly
3 34+5 Shut down

log N = 1.0

Letter from W.F. Cameron July 17, 1956

I $\frac{U}{UF_4}$ = 0.7571 (Analyses.)

II U-235 assay 37.28 to 37.59 (anth: 37.508) wt percent

III Density 4.71 to 4.85 (tolerance 4.70 – 4.90)

IV Blend Comps. 86.25% UF_4 13.75% Teflon by wt.

V 2" x 2 x 3" Cube

A. 944 gm av. wt (938 – 965)

B. Ht tolerance ± 0.015" 230.5 gm / 11.98 in³ = 19.208 gm/in³

VI 2 x 2 x 1

A. 318 av. wt. (314 to 321)

B. Ht Tolerance ±0.015" 77.746 gm / 4 in³ = 19.44 gm/in³

VII 1 x 1 x 1

A. 79.6 av. wt (78.6 to 80.3)

B. Ht Tolerance ± 0.010"

VIII Moisture Content (loss in wt on heating)

A. Teflon .02% to .05%

B. Lamp Black 1%

C. Depleted UF_4 .06% – 08%

230.5 gm / 12 in³ = 19.208 gm/in³

$\frac{93.4}{37.5}$ = 2.49

.37508 x .7571 x .8628 = 0.24493

944 x .24493 / 4 = 231.214 → 19.2678 g/in³

318 x " = 77.888 19.4720 g/in³

79.6 " 19.496

INSTRUMENT CHECK

Date July 20 1956 Time 8 45 AM PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				∝
DC-2	75	X10 X 20		1 x 20
DC-3	6895	X10 x 20		1 x 20
Log N	Period			
R-1	7.0	X10 X 1000		100 x 100
R-2				
P. M.	700 V			

START-UP CHECK LIST

Equipment Checked by DWM Personnel Check by JKF

Instrument and Safeties Checked and Reset by DWM

"Source In" Checked by ____ Source No. ____

Emergency Equipment in Control Room Checked by DWM

Red Light On by DWM

Start-Up OK'd by DWM Time 8 45 AM Date 7-20 1956

Expr. 19-12 Time 8 45 AM Date 7-20 1956

Purpose

Foil Run Check for Reactor Contamination

Personnel: DWM JFC

1 start up 1 hr.

Sulfur foil on Movable Table

-1" #11 in Vinyl chloride bag

+1" #7 in alum + Scotch tape

+3" #12 in Cd + Vinyl bag sealed with Scotch tape on one end

9:03:52 Start exposure timer @ log N = 0.37 level at log N ~ 1.0 DC-3 = 70. X10X10 Did 0.632

9 23 52 Shut down

Expr. 11-13 Time 1:15 ~~AM~~ PM Date 7-20 1956
Purpose
Fission Rate in U-235 bare, cl
" " " U-238 bare.
Personnel: DWM DFC

1 stand up
1/2 hr

-1" — A-146
— 2951 (U)235
— A-160

— Cd
— A85
+1" — 3046 (U235)
— A80
— Cd

— A-133
+3¼" — 238
— A-154

+5¼" — Teflon

Previous foils were not very active hence this run will be at 2.7 on log N.

Changed lead, Cd Parafin around DC-3.

Sulfur foil on Movable table.
Zeroed DC-2 2-5 x 1 x 2
" DC-3 5-10 x 1 x 2

Period Positive Dial 0.659
1:33'24" Start timing exp at log N = 1.0
Level Selsyn 0.349 Dial 0.621
1:43'24" Stop log N = 2.7
DC-3 = 50 x 10 x 100

7-23-56

A new sealed "glory hole" was stacked into the assembly 3/8" x 2 7/8" x 30". ID of hole ~ 0.21" A long aluminum paddle was made and marked in inches from the end. By measurement 0" on the paddle is - 3/4" with respect to the center of the assembly

@ 1 inch position — A-141 3046 A-140

@ 3 inch position — A-143 2951 A-142

@ 5 inch position 1/32" x 2" x 1 3/4" piece of teflon

INSTRUMENT CHECK

Date 7-24 1956 Time 8 50 AM ~~PM~~ Source No. _____

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	70	10x20	Contact	
DC-3	75	10x20		
Log N		Period Scram		
R-1		100x1000		
R-2				
P. M.	800V		1"	

START-UP CHECK LIST

Equipment Checked by DWM Check by _____

Instrument and [illegible] DWM

"Source In" Checked [illegible] No. _____

Emergency Equipment [illegible] by DWM

Red Light On by DWM AM

Start-Up OK'd by [illegible] Time 9 50 ~~PM~~ Date 7-24 1956

1 start up 1/2 hr
no sulfur.

Expr. 19-14 Time 9:30 AM ~~PM~~ Date 7-24 1956
Purpose check new foil holder - (sealed to prevent diffusion - U + Teflon foils.
Personnel: DH Dan.

Selsyn at 0.218 for positive period - approx 100 sec

9:35 Exp time started log N = 1

9:37 at log N = 2.7 DC-3 = .53 x10x100 Selsyn ~~.335~~ .315 (going apart)
dial .647

9:55 Shut down

19-15 Foil positions

— A-151	A-147	— A-159 5"
3046 1"	2951 3"	— U-238
— A-150	A-149	— A-152
Cd Covered	Bare	Bare

1 start up 1/2 hr

Expr. 19-15 Time 12:20 ~~PM~~ Date 7-24 1956
Purpose
Bare and Cad. Cover U-235
U-238 Fission rate
Personnel: DWM DEC.

Teflon piece at 7"

1:05' 24" Start exp. time at log N = 1.0 Selsyn .205 Dial .691

Log N ≈ 2.8 DC-3 = 60 x 10 x 100 Selsyn .310 Dial .655

1:25' 24" Stop exposure

(st 1/2

1" 3" 5"

— A-124 — A-110 — 136 3047 3048 3118 137 138 3135 3136 3137 A-139

37-25 — 2951

— A-126 — A-120

INSTRUMENT CHECK

Date 7-25 1956 Time 1 30 ~~AM~~ PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	70	10x20		
DC-3	75	10x20		
Log N		10 sec Period	Moving	
R-1	7	100x1000		
R-2				
P. M.		800V		

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 _____ AM

Start-Up OK'd by _____ Time _____ PM Date _____ 195__

(start up 1½ hr

AM

Expr. 19-16 Time _____ PM Date _____ 195__

Purpose Foil Exposure .060" Fuel Sandwich and 37.5% Foil

Personnel: _____

2 40 PM Pos. period slaym at 0.215 dial = .685

2' 42" 53" Timing started Log N = 1.0

2 50 Selaym at 0.32 dial = 0. ~~6~~ 640

2 53 .315 " = .638

1"	3"	5"	7"
		Au	Mn
A-111	A128	14	7
37-25	3047	15 16	10
A-83	A-127	17 18	11

8 50 AM Inst ck - DC-2 at 75 x 20 x 10
DC-3 at 65 x 20 x 10
R-1 at 10 x 1000
PM at 800 V (contact)
log N at 15 sec

1 stand up
1 hr

START-UP CHECK LIST
Equipment Checked by DWM Personnel Check by DWM
Instrument and Safeties Checked and Reset by DHC
"Source In" Checked by — Source No. —
Emergency Equipment in Control Room Checked by DHC
Red Light On by DWM
Start-Up OK'd by DHC Time 9 50 AM ~~PM~~ Date 7-27 1956

Expr. 19-17 Time 9 50 AM ~~PM~~ Date 7-27 1956
Purpose Repeat Mn foils and check 37½ vs 93% foils using cleaned discs.
Personnel: DHC DWM

9 26 AM On Pos Period dial at 0.685 (selsyn = 0.25 going apart)
9 39 AM level log N = 1.0 DC 3 = 63 on 10 x 100 0.645 dial

Expr. 19-18 Time 10^{55} AM ~~PM~~ Date 7-30 1956
Purpose Check small Fission counter between halves -
2 x 12 x 28" depleted added on West face
Personnel: DSL DWM

1 stop by 2 hrs

START-UP CHECK LIST
Equipment Checked by DWM Personnel Check by DWM
Instrument and Safeties Checked and Reset by DSL
"Source In" Checked by _____ Source No. _____
Emergency Equipment in Control Room Checked by DSL
Red Light On by DSL
Start-Up OK'd by DSL Time 10^{55} AM ~~PM~~ Date 7-30 1956

INSTRUMENT CHECK
Date 7-30 1956 Time 10^{36} AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	72	20x10	1/2"	20x10
DC-3	74	20x10	contact	
Log N	12 sec			12 sec
R-1	1	1000x1000	—	100x100
R-2				
P. M.	1"	800V	—	800 V

Selsyn 0.875 dial .004"
11^{15} AM Lost table at 0.48 on Selsyn evidently mechanical
11^{25} Log N at .0105 Selsyn at 0.542 dial = 0.?77"
Fiss C. 7x16+0 (5 min) = ~~7x~~ 22.4 c/min
10^{37} Log N at 0.1 [0.100] Selsyn at 0.541 dial 0.?07"
DC-2 = 82 x ~~10~~ 10 x 100 DC-3 = 82 x 1 x 20
Fission C = 56 x 16 + 9 (5 min)
12^{00} AM Log N = 1.03 Selsyn = 0.541 dial = 0.?11
DC3 = 82 x 10 x ~~100~~ 20
Fission Counter = 744 x 16 + 10 (5 min

(cellulose acetate)

0.010" plastic 2305.6

2305.6/10752 = 0.2144 gm/in²

14 pc 20×28 = 14×560
14 pc 20×8 160
14 pc 6×8 48
14×768 = 10752

107.52 in³

17619 cm³

2305.6/17619 = 1.309 gm/c m³

add 14 pc 2×8 or 48.09
Hence total for 28" cubic would be 2353.6 gm Acetate

$H/X = \left[C_6 H_7 O_2 (OH)[OC_2 H_5]_2\right]_n$

$C_8 = 96$ 80
$O_5 = 80$ .18
$H_{14} = 14$ 21.8
190 .0825

density = 1.309 measured

$\frac{14}{190} = .07368$

for a 2×3×2" block on two faces =
= 2×2×.01 = (.06")²

×16.387 = 0.98322 cm²

× 1.309
1.2870 gms
× .07368
.094826 gm H

.106 × 235 / 230.845
.104 / .1075 / .185

$\frac{.094826}{230.845} \times 235 = \frac{22284}{230845} = 0.09653$ H/X

Assume from previous work H/X = .0749 (from moist)

Net 0.1714

$$\frac{2353.6 \text{ kg}}{467.9 \text{ kg} / 235} \times \frac{.07368}{} = \begin{array}{r} .087 \\ 075 \\ \hline 0.162 \end{array}$$

INSTRUMENT CHECK

Date 8-6 1956 Time 8 15 AM ~~PM~~ Source No. _____

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	72	60×10	1"	
DC-3	83	20×10	1"	
Log N	10 sec	—	—	
R-1	1	100×1000	contact	
R-2				
P. M.	800V		1/2"	800V

START-UP CHECK LIST

Equipment Checked by DH Personnel Check by DH

Instrument and Safeties Checked and Reset by DWM

"Source In" Checked by — Source No. —

Emergency Equipment in Control Room Checked by DH

Red Light On by DH

Start-Up OK'd by _____ Time 8 10 AM ~~PM~~ Date 8-6 1956

Expr. ~~19-18~~ Time _____ AM PM Date 8-6 1956

Purpose Slight Moderation using .010" cellulose acetate sheets - 4/4 n 0.09

Personnel: DH DWM

20-1
12 start up
8 hr

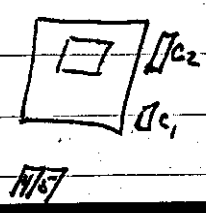
8 25 array = 8" × 28" on movable table 26" high
with a 28" × 7" × 2"
fixed — 20" × 28" × 8"
with horizontal layers 0.010" thick of cellulose acetate

a

5 min
Tables Apart

C_1	×64	4^{+68} ← 7 min	(3×64 + 8)/5'	2^{+50}	5'	$\frac{692}{17}$ = 40.7 c/min
C_2	×64	1^{+0} ← 7 min	(0 0)/5'	—		
C_3	×128	9^{+124} ← 7 min	(7×128 + 7)/5'	7^{+102}	5'	$\frac{3177}{17}$ = 187.0
C_4	×16	14^{+15}	(16×16 + 7)/5'	17^{+2}	5'	$\frac{776}{15}$ = 51.7
C_5	×16			—		

Positions



p 01

Selsyn 000 dial 0.910

#1 3^{+4} 2^{+50}

#3 6^{+90} 6^{+68}

#4 17^{+4} (x16) 16^{+12}

Loading: Fixed 28" x 20" x 12"

Movable 28" x 26" x 8" + 28" x 2" x 7"

Tables apart ~18.00"

C_1 (0 x64 + 0)/5' (2 x64 + 25)/5'

b C_3 (14 x64 + 50)/5' (15 x64 + 17)/5'

C_4 (18 x16 + 11)/5' (15 x16 + 15)/5'

C_5 (27 x16 + 15)/5'

Selsyn 0.00 Dial 0.920

C_1 (3 x64 + 1)/5'

C_3 (14 x64 + 44)/5'

C_4 (17 x16 + 2)/5'

C_5 (27 x16 + 1)/5'

Loading: Fixed 28" x 20" x 16" Movable: See above

Selsyn 0.00 Dial 0.913

c C_1 (3 x64 + 1)/5'

C_3 (16 x64 + 2)/5'

C_4 (17 x16 + 15)/5' R-1 ~ 2.0 x100x100

C_5 (29 x16 + 15)/5'

11^{00} AM 2 layers added – fixed now 28×20×20"
Tables together

11^{05} AM C-1 ~~4+5~~ (3×64+46)/5' R-1 2.3×100×100

d) C-3 ~~19+~~ (18×64+58)/5'

C-4 20+2 (19×16+9)/5'

Fission – , 0

11^{30} Adding 2 more layers. 28×20×24" on fixed
See above ~~+28×8×26" on movable~~

0.00 Dial 0.892 R-1 2.7×100×100

e) C-1 (7×64+32)/6' 80 c/min M = .509 DC-2 60×1×5

C-3 (32×64+14)/6' 344 c/min = .544 DC-3 80×1×5

C-4 (21×16+9)/5' 69 = .750

Min Fission Ct.

1^{00} PM Loading Fixed 28"×20"×26" Movable see above
Selsyn 0.00 Dial 0.885

f) C-1 (8×64+23)/5' 107 → .381 R-1 3.2×100×100

C-3 (36×64+14)/5' 464 → .404 DC-2 75×1×5

C-4 (25×16+13)/5' 83 → .623 DC-3 45×1×10

MIN FISS. (0×16+2)/5'

1^{25} PM Loading Fixed 28"×20"×28" Movable see above
Selsyn 0.00 Dial 0.877 R-1

g) C-1 (11×64+29)/5' 147 .277 DC-2 49×1×10

3 (51×64+35)/5' 660 .284 DC-3 51×1×10

4 (35×16+9)/5' 114 .453 log N = 0.00012

MIN FISS. 2

2^{30} PM Loading: Fixed table 28" x 22" x 29" =
all fuel available Pent house on top. 158 in² x 1"
Movable Table See above

h)

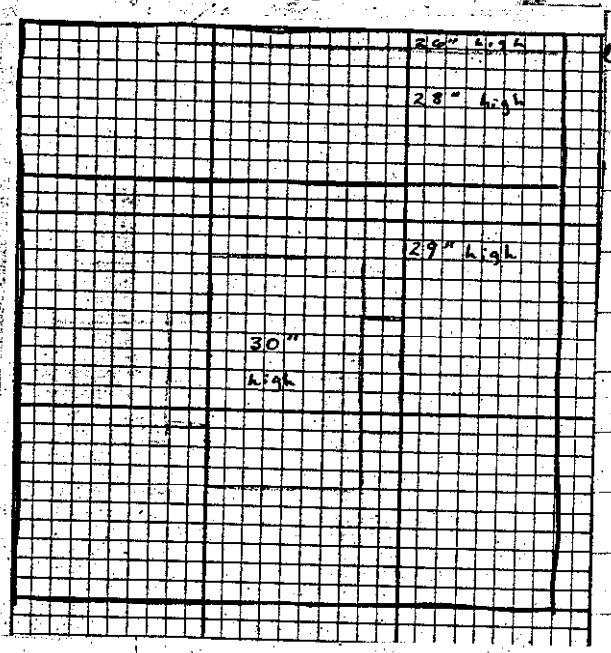
Critical 0.825 dial Slightly super
fixed Stack in contact at Top.

3^{00} PM Removed 158 in² x 1" from top – straightening stack.

Selsyn 0.00 0.890 Dial log N = .0022
DC-2 = 23x10x20

C-1 (60x64+11)/5'
C-3 (36x1024+814)/5'
C-4 (21x256+15)/5'
MIN FISS (1x16+0)/5'

4^{10} Added 30 2x2x1 block on Top.
Pos Period 0.00 Dial 0.898 → 93.4 sec → 10.24
log N ~ 0.26



...ity with above loading

Volume = 24,200

2^{30} PM Loading: Fixed table 28" x 22" x 29" =
all fuel available Pent house on top. 158 in² x 1"
Movable Table See above

h)

Critical 0.825 dial Slightly super
Fixed Stack in contact at Top.

3^{00} PM Removed 158 in² x 1" from top – straightening stack.

Selsyn 0.00 0.890 Dial log N = .0022

C-1 (60x64+11)/5' DC-2 = 23x10x20

i C-3 (36x1024+814)/5'

C-4 (21x256+15)/5'

MIN FISS (1x16+0)/5'

4^{10} Added 30 2x2x1 block on Top.

Pos Period 0.00 Dial 0.898 → 93.4 sec → 10.2¢

Critical log N ~ 0.26

.862 Super

.860 Crit

10.2¢ excess reactivity with above loading

Volume = 24,200

10^50 ~~2" layer added now 28×20×18" on fixed half~~
~~very slight increase on intimator~~
10^52 ~~adding another 2" layer~~
10^57 ~~now 28×20×20" on fixed~~ movable - same as before -

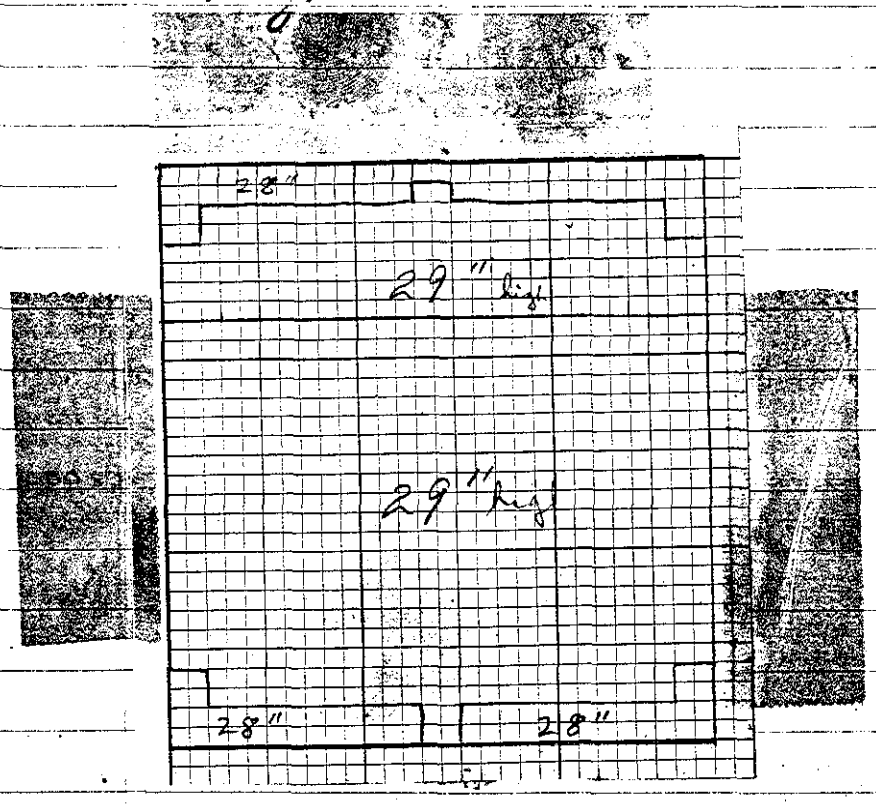
INSTRUMENT CHECK

Date Aug 7 1956 Time 10^50 AM ~~X~~ Source No. _____

Instrument	Trip	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	60	X10X20		
DC-3	80	X10X20		
Log N	10 sec period.			
R-1	7	X100X1000		
R-2				
P. M.	800V			

Removed upper support on movable Table

Loading: all the material a near 28×29×30 (cube)



Volume = 28×29×30

Less 122 in³ = 24238

1 start up
1 hr

Expr. 20-2 Time 10^50 AM ~~PM~~ Date 8-7 1956
Purpose
Clean cube + 0.010 acetate sheet
Personnel: D F Cronin Alex Magnuson Tom Fox

Sub Crit. log N → 0.004

If log N = 0.30 ~ M ≈ 3000

then log N = .004 ≈ M ≈ 40 ∴ 1 - k = 1/M = .025

See page 147

for 1/8" stack M rel. to log N = 0.0035

then 2 ea 9×2×1 on top center corrects to just critical.

∴ One can guess that a 29×28×30 will be critical with the 0.010 plastic every 2" (14 layers of plastic)

M = 467.757 kg U-235
.155
467.912

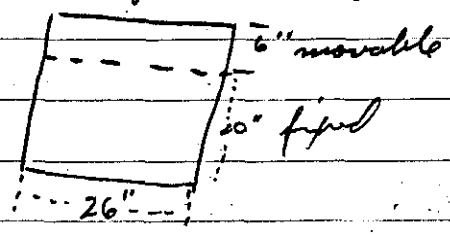
See page 150 for plastic wt

H/X = 0.165

6 start up
3 1/2 hrs

Expr. 21-1 Time 1^20 ~~AM~~ PM Date 8-8 1956
Purpose Using 1/8 plastic as moderator horizontal layers only
Personnel:

1^20 Assembly = 6" of blocks high overall = 26 x 26"



ht = 6 3/4"
wide = 26 x 26

i

C_1		2^{+2}
C_2		—
C_3	+64	11^{+8}
C_4		4^{+30}
Fission C_5		0

1^50 10" high same base areas –

h

C_1 2^{+34}
C_3 10^{+19}
C_4 4^{18}
C_5 – 0

2^20 12" high same base area

g

C_1 3 + 34
C_3 11 + 37
C_4 3 + 57
C_5 – 0

3 00 16" blocks + total 1" plastic tall (plus 2" x 6" more on movable) base 26 x 26

C-1 3 +30

f C-3 14 +38

C4 4 +46

C5 0

3 15 18" blocks tall – no counts

3 35 20" blocks plus 1 1/4" plastic same base (26 x 26)

676 in² x 20 = 13520 in³ approx 262 Kg 235°

e C1 4 + 45 .21

C3 19 + 36 .051

C4 5 + 45 .175

C5 0

4 05 22" blocks + 1 3/8" plastic total base = 26 x 26"

approx 289 Kg 235°

d C1 – 8 21 .12

C3 31 +43 .0322

C4 7 +1 .104

C5 0

INSTRUMENT CHECK

Date Aug 9 1956 Time 8:30 AM PM Source No.

Instrument	Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	N 80	10 X 20		
C-3	75	10 X 2		
Log N	10 Sec			
CR-1	7	100 X 1000		
P.				
P. M.	800 V		2"	

START-UP CHECK LIST

Equipment Checked by DFC Tested by DFC

Instrument and Safeties Checked by DEC

"Source In" Checked by ✓

Emergency Equipment in Control Room Tested by DWM

Red Light On by DFC

Start-Up OK'd by _____ Time _____ AM PM Date _____ 195_

3 startups
5 hrs

Expr. 21-1 (cont) Time 9:00 AM PM Date Aug 9 1956

Purpose Multiplication for 1/8" Plastic 26x26 Back

Personnel: DFC DWM T Fox

24" x 26" x 26" act hit = 24" + 1 1/2 = 25 1/2

Selsyn 0.00 Dial 0.865 (Support on Mon. Table)

a C_1 20 + 7 .05

C_3 86 + 40 .0115 log N = 0.00022

C_4 13 + .13 .077

C_5 1

Loading 26" x 26" x 26" act hit = 26 + 1 5/8" Plastic = 27 5/8"

+ Period Selsyn 0.482 Dial 0.375 > 10 sec Period

level x64 Selsyn 0.555 " 0.340 > 9.34 / .035 = 266 c/min

b C_1 487 + 27

847 x 1024 + 909

C_4 1153 x 256 + 132

C_5 12 x 64 + 61 (Min Fire) CR = 829/5 = 166 c/min ln N = .105

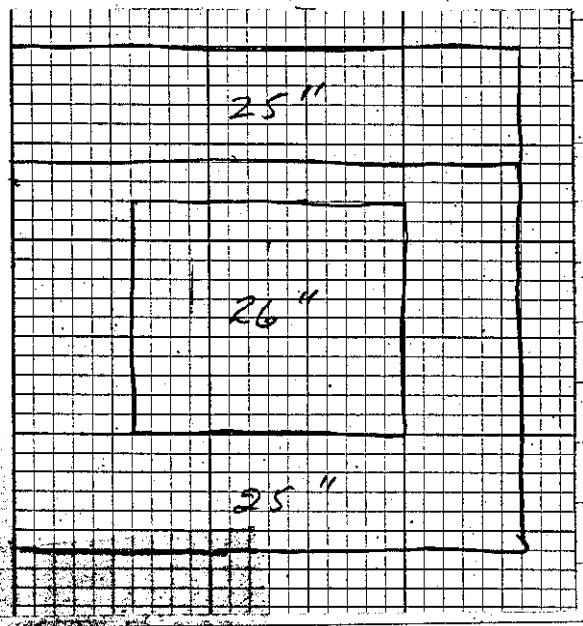
Loading 25 x 26 x 26 plastic

C log N = 0.0035

Sub critical ~.875

Added 42 2x2x1 blocks on top

plus 1/16 plastic on top



+ Period 0.28 Did 0.575 119 sec → 8.54

level 0.547 .028 = 304 ¢/in

log N = 0.1

C_1 478 x 64

C_3 854 + 532 x1024

C_4 1169 x 256 + 130

C_5 9 x 64 + 56

Expr. 21-2 Time AM PM Date 195

Purpose

Personnel: Dwm DFC T Fox

148

Expr. 21-3 Time 1:30 AM PM Date Aug 9 1956
Purpose
Personnel: Dunn DFC JA Fox

1 stand up 1/2 hr

Loading: 25 x 26 x 26 + 25 Ea 2x2x1 on center of top
Plastic 12 1/8 layer 1 ea 1/16" layer, + 1/16 on partitions

1:37 Period at 0.19 on selayn. → 9.54 / .036 = 264 #/in
dial = .663

when DC-3 45 10x10 . log N = 0.1
dial Selayn = 0.263 ~~.527~~ 0.627

2 stand up 1 hr

Expr. 21-4 Time AM PM Date 195
Purpose snow mich 3x3 (9 blocks on top of stack
loading = 26 x 26 x 25" + of blocks)
Personnel: JFC TAF Dunn

2:02 PM Tables initially in contact dial .770
Selayn = 0.02 positive period
at 0.18 on log N DC-3 at 73 on 10x10 screened (too hi pres)
2:10 PM Selayn at 0.02 dial = 0.773 Table again in contact
positive period.
dial log N at 0.2 DC-3 at 76 on 20x10
~~0.625~~ 0.725

.773 / .725 / .048" → 11.4 #
238 #/in

.770 / .725 / .045" → 11.0
244 #/in

Total loading 112 2×2×3 } per layer
2 2×2×1 }

12 layers 1344 2×2×3 ×.944 kg 1268.734
24 2×2×1

+1 layer 169 2×2×1
+ 9 9 2×2×1

202 ea 2×2×1 ×.318 kg 64.236

1332.972

1332.972 × .2449₃ = 326.48 kg U-235
7 × .318 × .2449
35

~~.3751 × .6530 = 0.2449₃~~ 325.93
.0778₈₈ g U²³⁵/2×2×1
9 × .318 × .2449₃ = ~~1.51 kg~~ U

25 ea	2×2×1	.627
9 ea	2×2×1 →	.725
16 ea	2×2×1 →	.098"
	or	.0063 "/block

Average Table worth 244 ¢/in
238
264
304
~~266~~

Average 263 ¢/in

Supercritical ~ 11.2¢

or 0.043"

or 0.043/.0063 = 7 blocks excess

∴ System would be critical at 2 Ea 2×2×1 on top.

~~326.03 kg~~

~~16900 in³ + x = 16,900 in³~~
~~1.9296 gal/in³~~

325.~~84~~.93

Wgt of Plexiglass = 21,700 gms = 1.248 kg U-235
H/X = ~~1.56~~ ~~.07~~ 1.32 325.93

Wt of .010 plastic acetate removed
2450 gm

From p. 143

29 x 29 x 29 lies 126 in³ on edge ~ near critical

126 in³ x 1.93 = 0.243 kg
+ 467.76
470.19 kg

$$\frac{2450\ \text{gm} \times 0.07368\ \frac{\text{gm H}}{\text{gm acetate}}}{470.1\ \text{gm} \times 10^3\ \text{gm} \times 235} = 0.09\% = H/x$$

+ .075 0.165

Summary of loadings.

		2×2×3	2×2×1	1×1×1	Loading	Excess
21-4		1344	202	0	326.48	11.24
21-3		1344	218	0		
21-2		1344	235	0		
21-1	a	1344	24	0		Sub
	b	1456	26	0		(Super 0.340)
	c	1344	193	0		
	d	1232 ~~336~~	24 ~~6~~	0		
	e	1008 ~~560~~	18 ~~10~~	0		
	f	896 +156	16	0		
	g	672	12	0		
	h	560	10	0		
	i	336	6	0		
20-2		1717	895	54	467.757	(Sub.)
20-1	a	Mov 481 Fin 372	13 4	0		
	b	481 558	111 5	0		
	c	481 744	111 8	0		
	d	481 930	111 10	0		
	e	481 1116	111 12	0		
	f	481 1209	111 13	0		
	g	1717	312	0		
	h	1717	895	54	467.757	0.825
	i	1717	(856	52) [assumed only 2 × 1×1]		
	j	1717	886	52		.860 (Super)
	k					

		2x2x3	2x2x1	1x1x1		
~~19-18~~						
19-1						
thru 18 & 18-1	Foil Runs					
17-1 thru 23	Reflector evaluations					
16-15						
16-14		1717	883	28		
13		1717	841	28		
12		1717	813	28		
11		1717	799	28		
Pseudo cylinder	10	1717	785	28	458.68	7.5¢ excess no alum Sub.
	9	1717	785	0		
	8A					
	8					
Sub.	7	1717	785	0		Sub critical
	6					
	5					
	4					
	3					
16-2	a					
Cubical shape	b					
	c					
	d					
with source hole	16-1					

no .080 alum.

Pseudo cylinder 458.68 kg loading

-1.20 kg excess k (7.5¢)

457.48

1" top Reflector alum 9.81 kg

Assume Bottom = top 467.29 Clean Geometry critical Mass.

Base Area 849 in² 7.5¢ excess Ht 28"

? " " 848 in² Subcritical? Ht 28"

28"

Corrected base area 846.8 in² R(eq) = 16.41"

Nom Volume = 23,710.4 × 1.0225 = 24,244 actual Volume

Mass added peripherally in 28 inch heights = $\frac{65.8 \text{ in}^2 \text{ (area)}}{\text{in (table drive)}}$

Table calibration 223 ¢/in

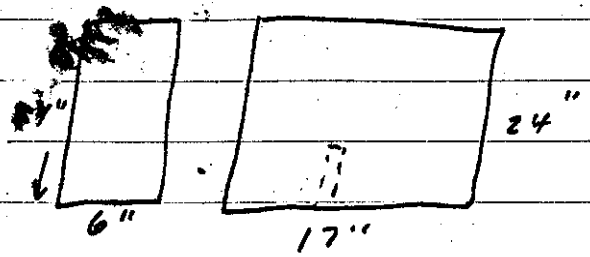
Excess k 7.5¢. Excess Mass = 7.5¢ × $\frac{1}{223 ¢/in}$ × 65.8 in²/in (→ 2.21 in²)

× 28 in high × 19.47 g U-235/in³ = 1.20 kg

This 2.21 in² correction implies that the base area of 848 in² (Run 16-9) should have been critical

8 starts
4 hrs

Expr. 22-1 Time 8[30] AM ~~PM~~ Date 8-13 1956
Purpose Using 1/4" plastic in heavy layer only
Personnel: [illegible] CC [illegible]



Fission counter is at 10" level

6" in west side - 9" from South

5 min	C_1	18^{+53}	19^{+1}	17^{+41}	1180
	C_2	$^{\times 64}$?	—	16^{+56}	1090
	C_3	27^{+18}	27^{+13}	25^{+27}	1710
	C_4	24^{42}	23^{+53}	24^{31}	1560
	FC C_5 ×16	0	0	0	

No Source

Tables apart

9[50] AM Source in same hole as Fission Counter

C_1	42^{+59}	2750
C_2	47^{+47}	3060
C_3	103^{+46}	6640
C_4	45^{+40}	2920
FC ×16 C_5	0^{+14}	14

10^{10} Tables together no source C_0/C source

C_1	20^{+15}	1295	.912
C_2	20^{+44}	1324	.816
C_3	34^{+8}	2184	.783
C_4	24^{+18}	1554	1.00
C_5	—		

10^{20} Source in same hole as fission counter - Tables Together

C_1	47^{+15}	3025	.909
C_2	54^{+34}	3490	.877
C_3	125^{+6}	~~7970~~ 8000	.831
C_4	52^{+23}	3350	.872
F.C x16 C_5	0^{+11}	11	

24" x 23" x 12" tables apart - no source

C_1	18^{+40}	1190	.992
C_2	18^{+8}	1160	.931
C_3	25^{+48}	1650	1.03
C_4	23^{+44}	1520	1.03
F.C. x16 C_5	0		

10^{50} 24 x 23 x 12 tables apart - source next to F.C

C_1	63	4030	.682
C_2	72^{+18}	4610	.664
C_3	149^{+49}	9590	.693
C_4	61^{+27}	3900	.749
F.C.x16 C_5	2^{+3}	35	

11 07 24 x 23 x 12 Source in - tables together

Log N - .00011	C_1	80 + 29	5150	.534
DC-2 - 46 10x1 scale	C_2	95 + 55	6140	.498
DC-3 - 0 1x5 scale	C_3	207 + 20	13250	.500
R-1 1.5 on 200x100	C_4	69 + 54	4470	.654
F.C x 16	C_5	1 + 2	18	.055

24 x 23 x 12 No source - tables together

Log N - L.0001	C_1	20 + 62	1340	.881
DC-2 20 x 10 x 1	C_2	21 + 7	1350	.800
DC-3 0	C_3	31 + 48	2030	.843
R-1 1 on 200x100	C_4	25 + 21	1620	.964
	C_5	0 + 1	1	

13 start up 4 hrs

Date 8-13 1956 Time 12 40 PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1	—	—	—	
DC-2	70	20x10	2"	
DC-3	74	20x10	[illegible]	
Log N	7	—		
R-1		100 x 1000		
R-2				
P. M.	800V		14	

START-UP CHECK LIST

Equipment Checked by DJC Personnel Check by DJC

Instrument and Safeties Checked and Reset by DJC

"Source In" Checked by _____ Source No. PN

Emergency Equipment in Control Room Checked by DJC

Red Light On by DJC

Start-Up OK'd by DJC Time 12 45 PM Date 8-13 1956

100

24 X 23 X 14 no source - tables apart

	C_1	20^{+62}	1340	.881
	C_2	18^{+49}	1200	
	C_3	28^{+8}	1800	
	C_4	23^{+8}	1480	
F.C x16	C_5	[illegible]		

24 X 23 X 14 with source - tables apart

log N - .00013
DC2 - 45 on 20 x 1
DC3 - 10 on 5 x 1
R-1 - 3.2 on 100 x 100

C_1	89^{+15}	5710	
C_2	102^{+12}	6540	
C_3	196^{+3}	12540	
C_4	89^{+28}	5720	
C_5	2^{+11}	43	

120

log N - .00018
DC2 - 55 on 20 x 1
DC3 - 15 on 5 x 1
R1 - 4.1 on 100 x 100

24 X 23 X 14 source in - tables together

	C_1	130^{+55}	8370	.328
	C_2	167^{+54}	10,340	.296
	C_3	316^{+20}	20,200	.331
	C_4	110^{+34}	7,050	.414
F.C x16	C_5	2^{+0}	37	.031

24 X 23 X 14 source out - tables together

log N < .0001
DC2 - 20 on 10 x 1
DC3 - 18 on 5 x 1
R1 2.3 on 100 x 100

	C_1	23^{+8}	1480	.799
	C_2	26^{+0}	1660	.651
	C_3	38^{+19}	2450	.690
	C_4	25^{+31}	1630	.956
F.C x16	C_5	0		

170,500 gm.
= ~~170,500~~

= 8830 x 19.43

2 15

24 X 23 X 16 Source in - tables apart

Log N - .00016
DC2 50 on 10x1
DC3 15 on 5x1
R-1 3.7 on 100x100

C_1	117 +5	7490	
C_2	143 +32	9180	
C_3	234 +21	14,990	
C_4	111 +63	7160	
F.C x16 C_5	2 +10	42	

24 X 23 X 16 Source in - tables together

Log N - .00026
DC2 75 on 10x1
DC3 15 on 5x1
R-1 5.5 on 100x100

C_1	213 +46	13,680	.202
C_2	283 +58	18,170	.168
C_3	452 +31	28,950	.229
C_4	167 +59	10740	.272
C_5	2 +6	38	.026

24 X 23 X 16 Source out - tables together

Log N <.0001
DC2 20
DC3 15
R-1 2.1

C_1	29 +11	1580	.747
C_2	36 +40	1980	.546
C_3	43 +25	~~2350~~ 2780	~~.728~~
C_4	26 +47	~~1450~~ 1710	.912
C_5	0 +4	4	

2 50

Log N - .00019
DC2 55 on 10x1
DC3 12 on 1x5
R-1 4.2 on 100x100

24 X 23 X 18 Source in - tables apart

C_1	160 +12
C_2	184 +27
C_3	275 +34
C_4	140 +19
C_5	2 +4

24 x 23 x 18 — Source in — tables together — dial reads 0

log N .0004
DC2 52 on 20x1
DC3 20 on 5x1
R-1 3.5 on 200x100

C_1	358 +51	22950	.120
C_2	497 +53	31,850	.096
C_3	670 +42	42,940	.156
C_4	269 +1	17,200	.169
C_5	5 +0	80	.012

24 x 23 x 16 — Source out — tables together

log N <.0001
DC2 10
DC3 42
R1 1.4 on 25x1000

C_1	39 +41	2540	.465
C_2	51 +15	3280	.330
C_3	69 +3	4420	.387
C_4	30 +29	1950	.800
C_5	0 +4	4	

3 40 — 24 x 23 x 20 — Source in — tables apart —

log N .00024
DC2 32 on 20x1
DC3 15 on 5x1
R1 2.3 on 25x1000

C_1	189 +9	12,100	
C_2	233 +13	14,900	
C_3	313 +22	20,000	
C_4	169 +34	10,840	
C_5	2 +0	32	

3 60 — 24 x 23 x 20 — Source in — tables together — dial at +10 pwr

log N .0008
DC2 37 on 60x1
DC3 28 on 6x1
R1 2.8 on 50x1000 x 128

C_1	695 +18	44,500	.0618
C_2	1005 +31	~~64~~,400	.0475
C_3	561 +119	~~35,902~~ 71,800	.0925
C_4	535 +38	34 300	.095
x16 C_5	6 +7	103	.010

4⁰⁰ 24 X 23 X 20 - Source out - tables together

Log N .00001		C_1	69^{+10}	4420	.267
DC 2 3 m 5 X 1		C_2	96^{+26}	6180	.175
DC 3 15	X 128	C_3	57^{+68}	7370	.232
R 1 .6		C_4	51^{+44}	3300	.473
		C_5	0		

INSTRUMENT CHECK

Date 8-14 1956 Trip Time 8¹⁵ AM ~~PM~~ Source No. _____

Instrument	Value	Scale	Source Distance	Start-Up Scale
DC-1	—	—		
DC-2	72	20×10	3"	20 × 1
DC-3	24	20×10	2"	20×1
Log N	7am			
R-1	1	100×1000	contact	100×100
R-2				
P. M.	500V	—	1/2"	

START-UP CHECK LIST

Equipment Checked by _____ Technician

Instrument and Safeties Checked and Reset by DJL

"Source In" Checked by DJL Source No. PN123

Emergency Equipment in Control Room Checked by DJL

Red Light On by DJL

Start-Up OK'd by DJL Time 8³⁰ AM ~~PM~~ Date 8-14 1956

7 stations
4 hrs

Expr. 22-2 Time 8³⁰ AM ~~PM~~ Date 8-14 1956

Purpose Continuation of multiplication curve -

Personnel: _____

Base area = 24 X 23 [fixed = 17 × 23 movable 6 × 24]

Height = 20" (Source in - tables apart)

						With Source Co	No Source Co
Log N .00026							
DC 2 60 m 10 X 1		C_1	193^{+0}	188^{+27}	12,200	2775	1190
DC 3 25 m 5 X 1		C_2	237^{+47}	235^{+36}	15,400	3160	1120
R 1 4.7 m 100 X 100		C_3	318^{+48}	311^{+27}	~~17,000~~ 20,300	6740	1735
		C_4	180^{+51}	183^{+17}	11,650	3140	1675
		C_5	2^{+6}	3^{+6}	44		

9 15 . 24 X 23 X 22 Source in - tables apart

Log N .00028
DC 2 68 on 10X1
DC 3 20 on 6X1
R 1 5.2 on 100X100

C_1	232	+19
C_2	293	+57
C_3	345	+61
C_4	216	+35
C_5	2	+9

Log N .0022
DC 2 23 on 20X10
DC 3 23 on 20X1
R 1 1.7 on 200X1000

24 X 23 X 22 Source in - tables together

	C_1	2147		137,000	~~.0087~~ .020
	C_2	2264	+51	145,000	~~.0077~~ .022
X1024	C_3	180	+178	184,600	~~.0094~~ .037
X256	C_4	416	+85	106,500	~~.057~~ .029
	C_5	12	+7	199	.005

Log N .00019
DC 2 - 27 on 20X1
DC 3 - 20 on 10X1
R 1 1 on 50X1000

24 X 23 X 22 Source out - tables together

C_1	197	+18	12,600	.095
C_2	299	+63	19,200	.058
C_3	302	+3	19,300	.090
C_4	143	+46	9,200	.182
C_5	0	+9	9	

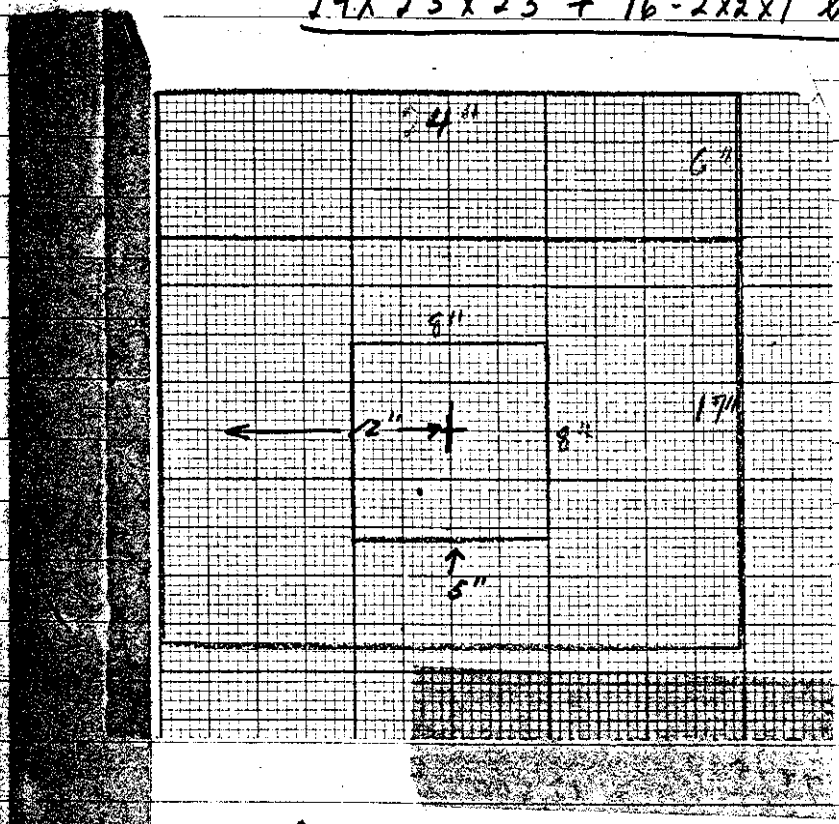
10 45 24 X 23 X 23 last row 1" thick with 1/8" plastic

no source - tables together

Log N .0024
DC 2 25 on 20X10
DC 3 25 on 20X1
R 1 1.7 on 200X1000

	C_1	too fast			
	C_2	too fast			
X1024	C_3	192	+521	197,000	.0093
X256	C_4	439	+154	112,500	.015
	C_5	10	+2	162	.0062

24 x 23 x 23 + 16 - 2x2x1 blocks centered on fixed table

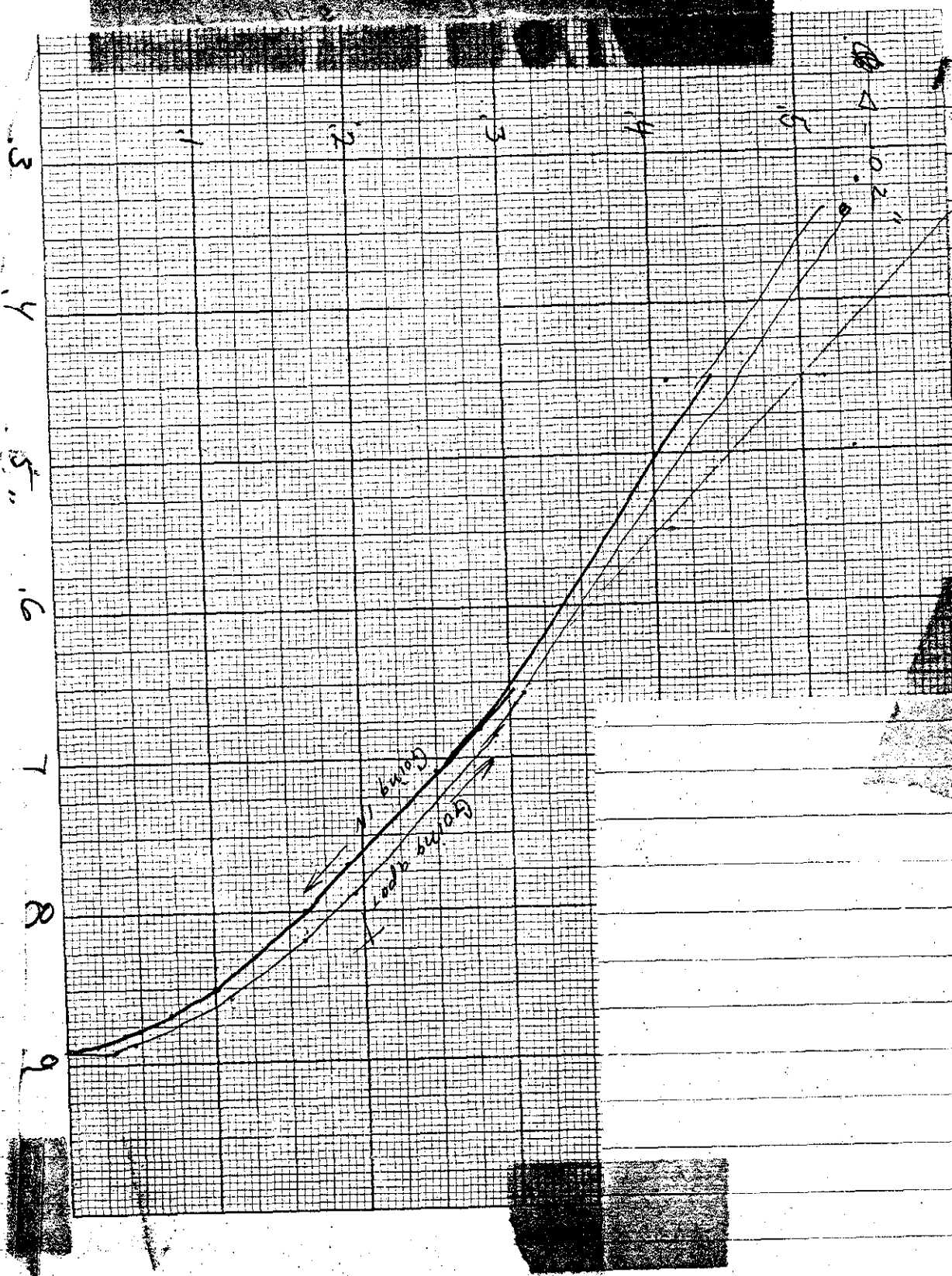


Position period with
Selsyn at .125
Dial .757 .757

level Log N = 0.11 DC 3 = 41 (20x10)
Selsyn = 0.159 dial = .743
pos period = 0.125 dial = .757
232.5 sec ≡ 4.9¢ .014 mils

Expr. 22-3 Time 1-15 ~~A.M.~~ P.M Date 8-14 1956
Purpose To check zero point on dial and selsyn.
Personnel:

Base area: 24 x 23 with 23" high. The 16 - 2x2x1 blocks have been removed from previous stacks.


Going in
Going out

Expr. 22-4 Time 2 20 ~~AM~~ PM Date 8-14 1956
Purpose Table calibration in terms of reactivity
Personnel: JK Fox DF Cavnia FA Fox

1 start up
2 hr

Configuration same as 22-2 on page 162
Positive period with Selsyn at .125 and dial at .827

3 30 pm Log N = 1
DC3 58 (10 x 100)
dial .814 selsyn .165 } just critical

Table calibration

Sep	Position	Δ	period (secs)	Reactivity
-.081	.814		∞	0
-.068	.827	.013"	234	4.85¢
-.118	.777	-.037	-173.9 secs	9.9¢
-.033	.862	.048	~~144.8 secs~~ 74	~~7.25¢~~ 12.1
0	.895	.081	45.6 secs	16.6¢
	.648	-.166	-76 secs	

1 d

10

INSTRUMENT CHECK

Date 8-15 1956 Time 8 20 AM ~~PM~~ Source No. γ

Instrument	Trip Value	Scale	Source Distance	Source Scale
DC-1				
DC-2	70	20x10		
DC-3	70	20x10		
Log N	5 sec	5 sec		
R-1	5	100x1000		
R-2				
P. M.	800V	800V		

START-UP CHECK LIST

Equipment Checked by DK Personnel Check by CC

Instrument and Safeties Checked and Reset by DK CC

"Source In" Checked by DK Source No. none

Emergency Equipment in Control Room Checked by DK

Red Light On by DK

Start-Up OK'd by DK Time 8 30 AM ~~PM~~ Date 8-15 1956

1 start up 5 hr

Expr. 22-5 Time 8 30 AM ~~PM~~ Date 8-15 1956

Purpose continue table calibration

Personnel: DFC W.D TAF

Sep	Selsyn	Dial Position	Δ	period (secs)	Reactivity Log
	~~.109~~	~~.844~~ .814			
-.050	.109	.845	.031	104	9.35 ¢
-.055	.145	.840	.026	119.5	8.4 ¢
0	.0	.895	.081	43.5	17.6 ¢
-.038	.092	.857	.043	81.5	11.25 ¢
10 -.057	.115	.838	.024	152	6.95 ¢
-.022	.06	.873	.059	57.6	14.7 ¢

Leveled at Log N = 1 DC-3 60 (100 x 10)
selsyn at .18 dial at .812 F.C. x 64 - 1082 +51

10 10 Leveled at Log N = .875 DC3 55 (100 x 10)
selsyn at .167 dial at .815 F.C x 64 - 931 +9

1 start up
1 hr

Expr. 22-6 Time 12 55 pm ~~AM~~ ~~PM~~ Date 8-15 1956
Purpose Check zero
Personnel: DK LWG

START-UP CHECK LIST
Equipment Checked by DK Personnel Check by DK
Instrument and Safeties Checked and 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 55 AM ~~PM~~ Date 8-15 1956

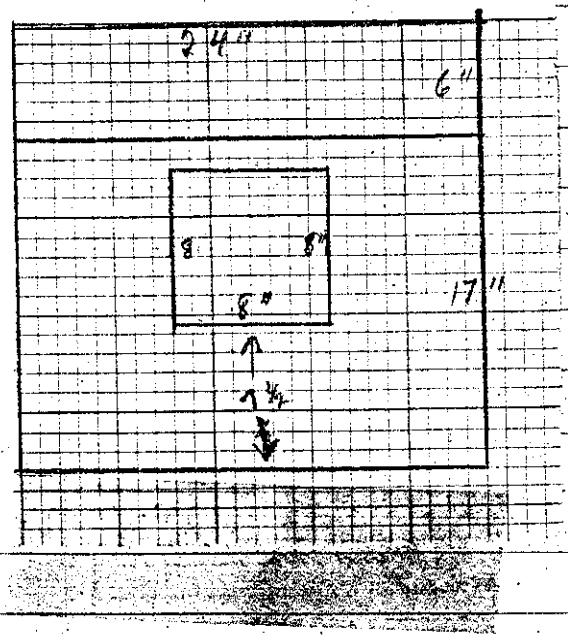
1 00 pm dial .833 Selsyn = 0.12+ pos. period (of 150 sec or 74) 169.2 sec
dial .812 selsyn 0.175 Leveled off
Log N .54 DC3 35 (100x10) F.C x 64 - 623 +5

1 start up
1/2 hr

Expr. 22-7 Time 1 35 ~~AM~~ PM Date 8-15 1956
Purpose To check the effect of position of top blocks.
Personnel: DFC LWG [illegible]

24 x 22 x 23 with 16 blocks 2x2x1 centered on top of the base area.

1 40 PM table set at 0.813 on dial Sel-0.185 period too long.
150
Changed dial .840 Selsyn - .112
Leveled at .803
Log N-1 DC3 61 (100 X 10
F.C x 64 - 1306



Δ = .037 Period = 91 sec 10.99
Δ = .037" Period = 9/sec or 10.4 ¢
loading = 245.08 Kg 235

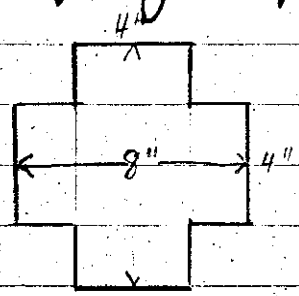
~~Removed 4 corner blocks~~
~~leaving 12 - 2x2x1 blocks on top~~

1 shot up
1/2 hr

Expr. 22-9 Time 2 10 AM PM Date 8-15 1956
Purpose To ~~check~~ get the value of the 4 Corner blocks in terms of reactivity
Personnel: DFC IWG TAF

loading = 244.771 Kg 235

Removed for corner top blocks from above (22-7) array giving Configuration as follows.



Tables in Contact at dial .890
On a positive period - 72 sec or 12.5 ¢
Δ = .059
Leveled at .831 Log N-1
DC3 60 (100 X 10)

Change in reactivity due to removing the four blocks 4.5¢ giving ≈ 17.27 g/¢ reactivity

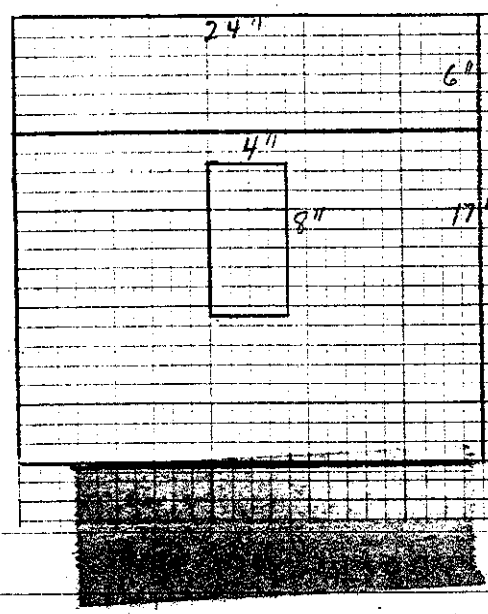
1 stand up
1/2 hr

Expr. 22-9 Time 2 40 ~~AM~~ PM Date 8-15 1956
Purpose Continuation of mass vs reactivity measurement
Personnel:

~~Two~~ 8 more blocks were removed leaving a small top layer of 4 - 2x2x1 blocks in the ~~exact~~ center of the base area. Tables were brought in contact at dial .892
Just critical or slightly subcritical
Log N reached .0085 and drifting very slowly up.
[Loading = 244.15 Kg 4235]

1 stand up
1 1/2 hr

Expr. 22-10 Time 3 05 ~~AM~~ PM Date 8-15 1956
Purpose Continuation of mass vs reactivity measurement
Personnel:



Four blocks were added giving a total of 8 - 2x2x1 positioned as shown. Tables in contact as .893 on dial - positive Period of 235 sec or 4.8¢
Leveled at .864 dial ~~[illegible]~~
Log N = 1 DC 3 = 60 (100x10)

loading = 244.460 Kg

1 stand up
1/2 hr

Expr. 22-11 Time 3 50 ~~AM~~ PM Date 8-15 1956
Purpose Continuation of mass vs. reactivity measurements.
Personnel: D.F.C. L.W.G. T.A.F.

Fission Chamber removed - 8 blocks 1 x 1 x 1 were inserted in hole. ~~Contact~~ Tables at contact at .892. Positive Period - 63 sec or 13.8¢

Leveled at dial .830 Set .15 Log N = 1 DC3 = 60 (100 x 10)

244.6 Kg U235 loading

63 secs period = 13.8¢

Summary

(1) Assembly built on 1" Al platform
24 x 23" base 25 7/8" tall with 4 (2x2x1") blocks centered, and a 1"x8" hole on West face 10" up + centered North-South - was just critical or slightly sub -
Mass loaded = 244.15 Kg U235 [1/4" plastic in 1 dimension]

(2) 4 2x2x1" blocks added to #1 ≡ 4.8¢ added reactivity
Mass loaded = 244.460 Kg

(3) 1" x 8" hole in #1 + #2 plugged up ≡ 13.8¢ added reactivity Mass loaded = 244.6 Kg
activity due to 1x8" hole = 9¢ (estimated)

Table calibration 24x23" base with 64 in³ off center on top
- (see Eqs 22-2 p162) 1x8" hole for fission counters
Mass loaded = 245.08 Kg 235

Table position

Selsyn	dial	Crit	Δ from Crit	Period	excess reactivity
.165	.814	.814	0	0	0
	.827	.013	.013	234 sec	4.85¢
	.862	~~.04~~	.048	74 secs	12.1¢
	.895		.081	45.6 secs	16.6¢
.109	.845	.814	.031	104	9.35
.145	.840		.026	119.5	8.4¢
0	.895		.081	43.5	17.6¢
.092	.857		.043	81.5	11.25
.115	.838		.024	152	6.95
.06	.873		.059	57.6	14.7¢

Excess Reactivity (¢)

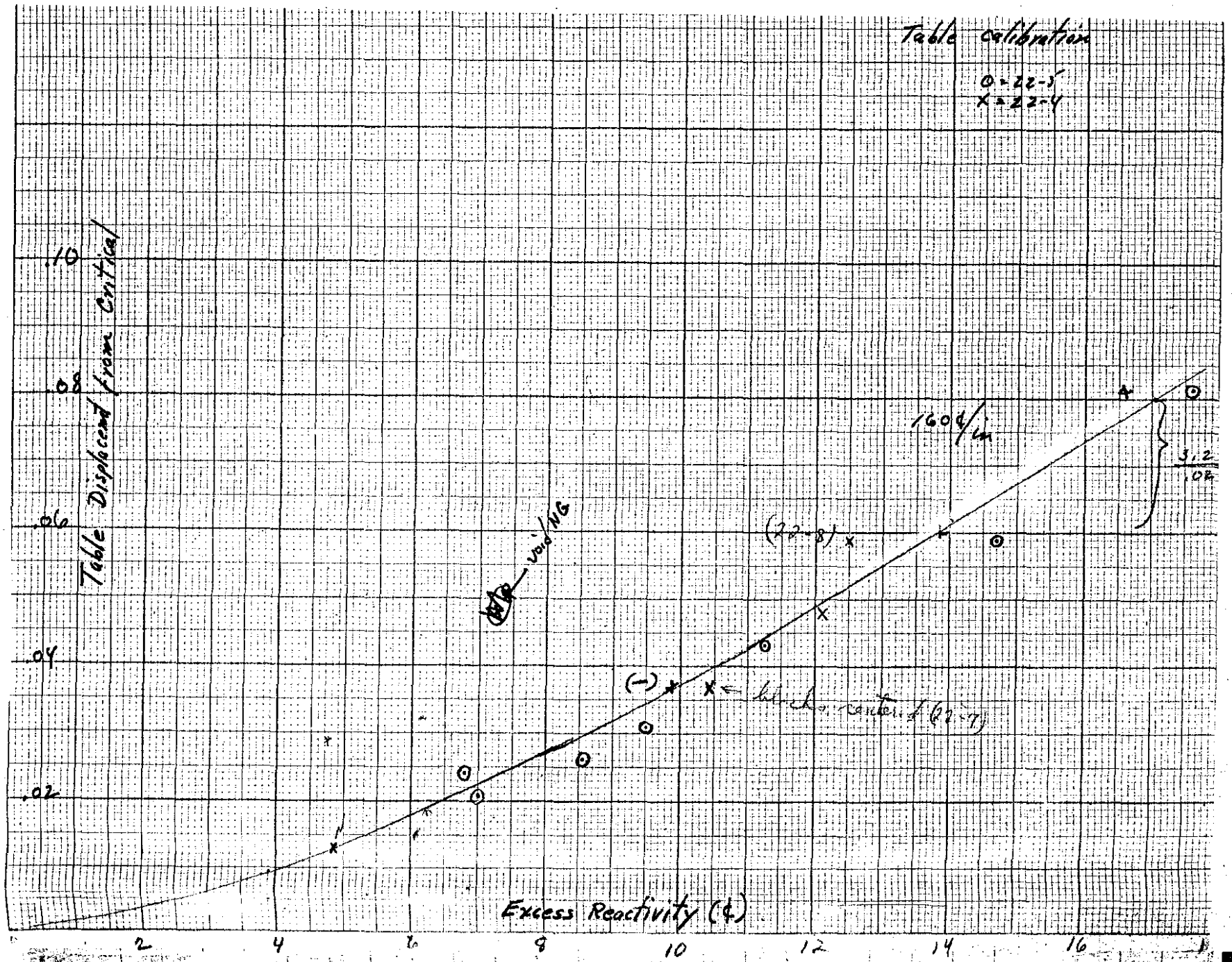


Table calibration
⊙ = 22-5
X = 22-4
Table Displacement from Critical
.10
.08
.06
.04
.02
Excess Reactivity (¢)
2
4
6
8
10
12
14
16
160¢/in
3.2
.02
(22-8)
void NG
(−)

from curve est 160 ¢/in (close together)

Critical point for ③ = 0.830 on dial (0.892 = contact)
sep = .062" excess activity at contact = 13.8 ¢ of which
estim 9¢ due to 1×8" hole = 4.8 ¢ plus reactivity or approx 4 blocks

From Exp 22-8 removing 4 of top 16 blocks changed
crit position from 0.803 to .831 = .028" = 4.48 ¢
mass removed = 311.04 gms = 69.42 gms/¢
~~so crit for hole plugged = 957.996 gms~~

④ So - Estimate Crit as

$$\begin{array}{r} 244.6 \\ -\quad 332 \\ \hline 244.268 \end{array} \pm 155 \text{ gm } U235$$

INSTRUMENT CHECK

Date 8-16 1956 Time 12 45 AM PM Source No. PM123

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	70	20x10	contact	
DC-3	70	20x10		
Log N	5 sec			
R-1				
R-2				
P. M.	800 V			

START-UP CHECK LIST

Equipment Checked by DK Personnel Check by
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 45 AM PM Date 8-16-56

Time AM PM Date 195

Expr. 22-12 Time 12 50 AM PM Date 8- 195
Purpose Evaluate A1 platform by placing A1 on top
Personnel: DK LWB TF

(stand up
1 hr

1 54 Removed 8 (2x2x1") blocks from top
assembly: 11 layers 24"x23"x2" plus a 1" layer 24"x23"
Each layer has 1/4" plastic between. - Top has
1/8" layer of plastic on it.
A1-4-1/4" layers 6x24" on movable 3'x4' on fixed

1 23 pm posit period Selsyn at 0.21 0.750

1 30 pm level Log N=1 DC3 = 52 on 50x10
0.708 on dial Selsyn = 0.29
.830 → Δ .042 = 45.2 sec ≐ 17.2 ¢
.708
.122

Expr. 22-13 Time 2 00 AM PM Date 8-16 1956
Purpose Eval - al - by adding 20 blocks (2x2x1) to top of assembly (#1 off)
Personnel: DK & LWG TF

1 start
1/2 hr

2 00 20 blocks centered on top

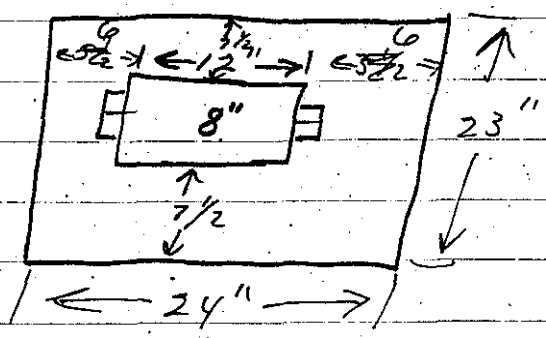
2 10 Selsyn 0.145 dial .813 posit period

2 15 PM dial .758 selsyn = 0.235 level at log N = 1.0

TC-3 - 50 on to 10x50 [41.3 sec Δ = .055 ≡ 18.2 ¢

Expr. 22-14 Time 3 00 AM PM Date 8-16 1956
Purpose added 8 (2x2x1) blocks
Personnel: TF LWG DK

1 start
1/2 hr



3 10 PM dial 0.763 Selsyn 0.187 posit. period

3 20 PM dial 0.728 selsyn 0.265 level (log N = 1

AI = .708
U = .728
.020

160
.02
3.2 ¢ needed

Δ = .035 period = 80.3 secs 15.4 ¢

Start up 1/2 hr

Expr. 22-15 Time 330 PM Date 8-16 1956
Purpose Added 4 (2 x 2 x 1) blocks
Personnel: TF LWG DFC

Δ = .036 = 78.2 mcs

330 Dial at .753 selsyn .20 positive period
Leveled at .717 selsyn .28 Log N = 1 DC 3 - 57 (50 x 10)

Start up 1/2 hr

Expr. 22-16 Time 400 AM Date 8-16 1956
Purpose Added 4 (2 x 2 x 1) blocks
Total of 36 blocks
Personnel: TF LWG DFC

4 PM Dial at .755 selsyn .20 positive period
Leveled at .705 selsyn .27 Log N = 1 DC 3 - 50 (50 x 10)
2,797.2 gms on top
period = 52.2 mcs Δ dial = 755 Δ = .050 ≡ 15.6 ℓ

1 start up
1 hr

Expr. 22-17 Time 9 00 AM ~~PM~~ Date 8-17 1956
Purpose Measure variation in reactivity with position of a 1X2X24" bar across top Top Shown's clean
Personnel: LWG TF, DSC VGH JE

INSTRUMENT CHECK

Date 8-17 1956 Time 8 30 AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	90	20x10		
DC-3		20x10		
Log N		7 sec		
R-1		100x10		
R-2				
P. M.	800 V			

Bldg alarm checked with 8 source

START-UP CHECK LIST

Equipment Checked by DSC Personnel Check by DSC
Instrument and Safeties Checked and Reset by DSC
"Source In" Checked by — Source No. —
Emergency Equipment in Control Room Checked by DSC
Red Light On by LWG
Start-Up OK'd by DSC Time 9 00 AM ~~PM~~ Date 8-17 1956

Bar at edge - center line 1" from S-edge
9 10 Contact at .892 on dial very slow pos. period
9 45 Leveled at .881 on dial Log N = .31 DC3 = 80 (20 X 10)

1 start up
1 hr

Expr. 22-18 Time 9 55 AM ~~PM~~ Date 8-17 1956
Purpose Continuation of Reactivity vs position measurement
Personnel: LWG DFC TAF

Bar of 2X2X1 blocks moved two inches to ~~[illegible]~~ ℄ 3" from S-edge
10 05 Contact at .890 on dial pos. period
10 35 Leveled at .868 on dial Log N = 1 DC3 48 (100x10)

Expr. 22-19 Time 10 45 AM PM Date 8-17 1956
Purpose Moved blocks another 2"
Personnel: LWG DFC TAF

1 stand up
1/2 hr

Row of Blocks on a ℄ 5" from S-edge.
10 55 Contact at .891 on dial Positive Period
11 05 Leveled at .856 on dial Log N .95 DC3 43 (100 x 10)

Expr. 22-20 Time 12 AM PM Date 8-17 1956
Purpose Row of blocks now 7" from S-edge
Personnel: DFC TAF

1 stand up
1/2 hr
12 45 Table in contact, 0.892 on dial Pos period -
1 00 Leveled at .843 Log N

Expr. 22-21 Time 1 10 AM PM Date 8-17 1956
Purpose Row of blocks now 9" from S-edge
Personnel: DFC TAF JE LWG

1 stand
1/2 hr
1 13 at contact at .892 on dial Positive Period
1 25 Leveled at .837

Expr. 22-22 Time 1 33 AM PM Date 8-17 1956
Purpose Row of blocks in center or 11½" from S-edge.
Personnel: LWG TAF DFC

1 stand
1/2 hr
1 40 at contact at .892 on dial - Positive Period
Leveled at at .832 on dial

Expr. 22-23 Time 2:00 AM PM Date 8-17 1956
Purpose Pow. of Blocks now 14" from S-edge
Personnel: LWG TAF DFC

Start 1 hr

2:03 Table At contact at .892 on dial - Positive Period
Leveled at .846 on dial

P. Multiplier trips at 1010 when Log N is 1
2:20 PM Photo Mult set at 990 Tripped at Log N = 1.05
DC3 = 63 on 100 x 10

Summary of 22-17 to 22-23

Exp	Position from S-edge	Period	Reactivity, ¢	Position Δ for crit.
22-17	1"	660	>1¢	-.011
18	3	300	2.66	-.024
19	5	161	6.65	-.036
20	7	98	9.8	-.049
21	9	76	11.9	-.055
22 center	11½	70	12.7	-.060
23	14	76	11.9	-.046

INSTRUMENT CHECK

Date 8-21 1956 Time 1 40 ~~AM~~ PM Source No. _____

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2				
DC-3	80	20x10		
Log N	7 ms	—	contact	
R-1				
R-2				
P. M.	700V	700V		

START-UP CHECK LIST

Equipment Checked by DK Personnel Check by _____

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 2 00 ~~AM~~ PM Date 8-21 1956

Expr. 23-1 Time 1 40 ~~AM~~ PM Date 8-21 1956

Purpose 235 fail Exposure

Loading - 24x23" base ~~pl~~ x23" blocks with 12 blocks on top (3x4)

Personnel: DWM TF DK

1 start up

1 pm

2 09 PM ~~Start~~ moving table

2 15 PM Stopped - reloaded top to 36 blocks centered

2 35 R-1 tripped at Log N = 0.28 -

Positive Period dial at 0.632

2 45 PM 0.5935 on dial - level at Log N = 2.7

DC-3 = 85 x 100 x 10 (zero shifted)

Fission Counter counting during exposure

2 56 PM Shut down F.C. 256 - 1107

Fails: 238 # ~~3262~~ (130/131) ~~3292~~ → 3262 A1

130 A1 238

131 A1

3292 A1

~~238 # 3292~~ (132/130) 3.

30 46

3273 Al
132 - Al
235 foil —— 3046
125 - Al
3270 - Al

INSTRUMENT CHECK

Date 8-22 1956 Time 8 30 AM ~~PM~~ Source No. _____

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	—	—		
DC-3	90	20 x 10		
Log N	7 sec			
R-1				
R-2				
P. M.	900V			700V

START-UP CHECK LIST

Equipment Checked by DWM Personnel Check by TF
Instrument and Safeties Checked and Reset by DHC
"Source In" Checked by — Source No. —
Emergency [illegible] DHC
Red [illegible]
Start [illegible]

1 start
1 hr

Expr. 23-2 Time 8 30 AM ~~PM~~ Date 8-22 1956
Purpose Fission foil comparisons

Personnel: DWM TAF DHC

Foils — on 6th Row 2" off center

2" East A129 / 3046 / A135

2" West Cd covered A114 / 2951 / A118 / Cd

8 45 AM On point pinned selsyn at .223 dist. 6 39
9 00 Level at log N = 2.7 dist 0.5 98
F.C #5 893 x 256 + 187

1 start
1/2 hr

Expr. 23-3 Time 10:00 AM Date 8-22 1956
Purpose 37½ vs 93% foils (bare catcher mounted 12" up 2" each side of center
Personnel: DK TAF

37-25 A82/A104 3047 A98/A103

10:25 AM start up
10:30 dial at 0.639 posit. period -
10:40 devel Log Nat 2.7 DC3 (zero set back) 100×10 = 55
dial = .592
F.C - 967 × 256 + 110

INSTRUMENT CHECK

Date 8-23 1956 Time 1:10 ~~AM~~ PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	62	20×10	contact	
DC-3	80	20×10	contact	
Log N	7 sec	Period	contact	
R-1				
R-2				
P. M.	1"	700V		

START-UP CHECK LIST

Equipment Checked by DWM Personnel Check by DWM
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 1:10 ~~AM~~ PM Date 8-23 1956

1 start
1 hr

Expr. 23-4 Time 1:10 ~~AM~~ PM Date 8-23 1956
Purpose Gold + Mn foils

Personnel: DWM DFC

Au #22 Mn #7
2" West of Center 2" East of Center

1:29 PM Pos Period Dial 0.740 Selsyn 0.22
1:30:45 Start Exp. 55 DC-3 log N 0.37
Level 0.7025 Selsyn 0.295
Log N = 1.0 DC-3 62x10x50
1:50:45 Start Down
F.C. 209x256 +170

INSTRUMENT CHECK

Date Aug 24 1956 Time 1 PM AM Source No. 8

Instrument	Value	Scale	Tolerance	Start-Up Scale
DC-1				
DC-2	tripped at 65		(10 X 20)	
DC-3	at 75		(10 X 20)	
Log N	10 sec			
R-1	at 7 X 10 X 1000			
R-2				
P. M.	700 V			

START-UP CHECK LIST

Equipment Checked by DWM Personnel Check by D.F.C.
Instrument and Samples Checked and Reset by DWM
"Source In" Checked by — Source No. —
Emergency Equipment in Control Room Checked by DWM
Red Light DWM
Start-Up Checked by DWM Time 1:15 PM Date 8-24 1956

1 start
1 hr

Expr. 23-5 Time 1 20 ~~AM~~ PM Date 8-24 1956
Purpose Fast Exp (25) for vol counting

Personnel: TAF DWM DH

(R-1 covered with Cd + Boron loaded plastic) (off scale log N = 0.67

1 28 Selsyn at 0.22 on posit period dial = 642

1 33 Exp started log N = 1.0

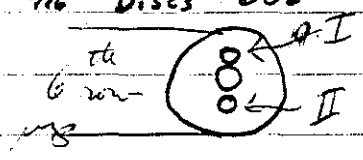
dial 0.604 at log N = 2.7 (level)
.606

DC-3 = 90 x 10 x 100

Foil locations

U-235 + Catchers
2" East of Center
A-108 / A-115 3046

U-235
2" West of Center
2 . 5/16" Discs .002"



Fission Counter register missed about 5 registers — jammed in passing 100

Reading (761 x 256 + 100) + 5 reg = (766 x 256 + 100)

INSTRUMENT CHECK

Date 8-28 1956 Time 8 45 AM ~~PM~~ Source No. Y

Instrument	Scale	Source	Source Distance	Start-Up Scale
DC-2		tripped at 60		(20 x 10)
DC-3		tripped at 95		(20 x 10)
Log N		~~tripped at~~		
R-1		at 7 on	1000 x 10	
R-2				
P. M.		700 V		

START-UP CHECK LIST

Equipment Checked by DFC Personnel Check by TAF

Instrument and Safety Checked and Reset by ~~TA~~ DFC

"Source In" Checked by — Source No. —

Emergency Tim... Room Checked by DFC

Red Light On by TAF

Start-Up OK'd by DFC Time 9 30 AM ~~PM~~ Date 8-27 1956

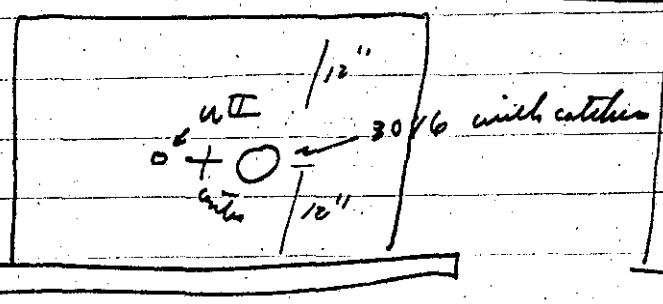
Expr. 23-6 Time ___ AM ~~PM~~ Date 8-28 1956

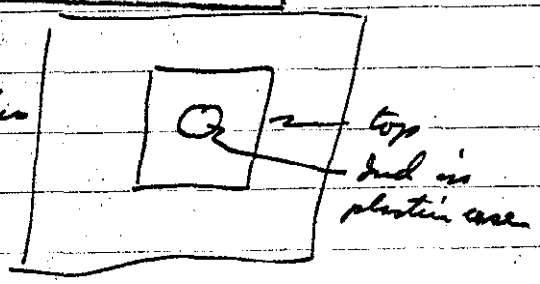
Purpose checks on calibration of catcher foils

Personnel: DFC, TAF, JKF, JE.

1 start
2 hr

Al 3273
Al A134
U 3046
Al A119
Al 3270





9 45 AM Point period slope at .22 —

9 50 AM timing started Log N = 1.0

10 54 Log N = 2.7 DC-3 (20 min zero shifted) = 48 and 100 x 10 (Level —)

Slope = .305 0.598 dial (most of Run at 2.6)

10 09 Shut down — F.C x 256 − 1196 + 44 = 306,220

INSTRUMENT CHECK

Date 8-29 1956 Time 900 AM PM Source No. Y

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2				
DC-3	trip	at 80 on 10X20		
Log N				
R-1	trip			
R-2				
P. M.	trip			

START-UP CHECK LIST

Equipment Checked by LWG Personnel Check by TAF

Instrument and Safeties Checked and Reset by LWG

~~"Source In" Checked by~~ _____ Source No. _____

Emergency Equipment in Control Room Checked by LWG

~~Red Light On by~~ DFC

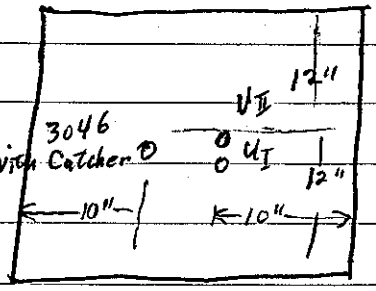
Start Up OK'd by DFC Time 915 AM ~~PM~~ Date 8-29 1956

Expr. 23-7 Time 915 AM ~~PM~~ Date 8-29 1956

Purpose Check calibration of catcher foils

Personnel: TAF DFC LWG

Al 3270
Al A121
U 3046
Al A90
Al 3273



Indium Foil on Top as in 23-6

935 AM Scaler 0.215 pos. period

939 Start time

Log N = 1 dial = 0.579 Scaler = 0.308

959 Shut down F.C. X 256 = 304 + 100 = 77,924

START-UP CHECK LIST

Equipment Checked by DK Personnel Check by DK

Instrument [illegible] by DK

"Source In" [illegible] by _____ Source No. _____

Emergency [illegible] by OK

Red Light OK

Start-Up Ordered by _____ Time _____ AM PM Date 8 30 1956

INSTRUMENT CHECK

Date 8-30 1956 Time 855 AM PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	60	20K10		
DC-3	80	20K10		
Log N	7sec			
R-1	10	10 x 1000		
R-2				
P. M.	800V			

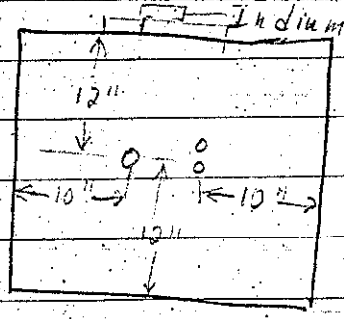
Start
1hr

Expr. 23-8 Time _____ AM PM Date 8-30 1956

Purpose check calibration

Personnel: _____

41-3268
41-A122
41-3046
41-A123
41-3265



This is same as 23-7.

926 Selsyn = 0.24 positive period
dial 0.574 level at log N = 2.7 Selsyn = 0.80

951 Shut down F.C x256 = 1048 +12

4

INSTRUMENT CHECK

Date Aug 31 1956 Time 9 30 AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	62	10x20		
DC-3	75	10x20		
Log N	10 sec	Period		
R-1		1X1000		
R-2				
P. M.	800V		Contact	

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__

12 start 8 pm

Expr. 23-9 Time _____ AM PM Date _____ 195__

Purpose Same loading

LINEARITY CHECK ON INST.

Personnel: _____

Moved C_3 to floor below

Moved C_4 to SE corner of 201

Moved R_1 to Lead Cd Concrete house under Motor Control Sw

DC-3 house of lead Cd plastic rebuilt.

Selsyn Dial

.32

.542

.3-5

.592

.594

.591

.59

Sulzer Dial	LOG N	LOG N_2	DC-2	DC-3	R-1	C_1	C_2	C_3	C_4	C5
	<0001	.0054 .009	5x1x5	12x1x5	1.4x10x100	32x64+20	42x64+39	15x64+2	14x16+14	0
			2.5×10^1	60	1.4×10^3					
.32	.00075	.124	55x1x50	25x1x5	2.6x10x100	1270x64+63	x64 2104+11	x64 398+49	44x16+1	0x256 +21
542			2.75×10^3	125	2.6×10^3	CRM		2545×10^4	1	
[illegible]	.0089	.80	52x10x50	86x1x10	3.9x50x100			1240x128 +2	875x16 +0	+177
.592			2.6×10^4	860	1.95×10^4	75x1		$1,587\times10^5$	1.4×10^4	
	"	"	"	"	"			1243x128 +113	856x16 +2	+210
.594								159×10^5	1.37×10^4	
	028	2.0	68x10x100	54x1x50	2.9x25x1000	90		x1024 325 +271	674x64 +0	2x256 +139
			6.8×10^4	2.7×10^3	7.25×10^4			3.33×10^5	4.31×10^4	649
	.1	5.1	X	46x10x20	4.3x50x1000	60x3		1024 554 +564	578x256 +18	x256 8 +6
				9.2×10^7	2.15×10^5	180		568	1.48×10^5	
	.095	5.0		42x10x20	9.0x50x1000			x1024 528 +647	517x256 +80	6x256 +255
				8.4	2.0			541	$1,324\times10^5$	1791
			Shut down for lunch. Added more							
	plastic around R-1 added Pb Cd & hydrogen DC-3									
1 Sw .591	.11	6.8	[illegible]	60x10x10	3.6x50x1000	75x3	2610	x1024 553 717	610x256 +36	x256 8 +92
				6.0×10^3	1.8×10^5	225	0.1mr	567		2150
	.32	17.0		83x10x20	4.9x100x1000	160x3		x1024 611 +306	1760x256 +	x256 23 +82
				1.66×10^4	4.9×10^5	480	0.3mr	626	DISC +10	5790
590	1.0	43.0		54x10x100	3.2x500x1000			925 517		x256 92 +104
				5.4	1.6×10^6	1800	0.8mr	948		23656
	1.8	70.		97x10x100	6.5x500x100			569x2 1138		199 +22
					3.25			1165		50966

11 layers 23×24×2 plus 30.73 Kg fucite as 1/4" having strips
1 layer 23×24×1

2×2×3's: 230.5 gm × 92 × 11 = 233,266.0 (10/2)
2×2×1's: 77.746 gm × 138 × 1 = 1,068.948°

~~233,266.~~ ~~1068.9~~ ~~234.3349~~

233,266
10 689.5
243,955.5 Kg U^{25}

Sub. Crit Mass

$$\frac{30.73 \times 8 \times 235}{100 \times 243{,}9555} = 2.368 \text{ H/X}$$

.075
2.443

From a plot of mass vs table position
Alum Table worth 38 2×2×1 blocks or 3.0 kg

START-UP CHECK LIST

Equipment Checked by ____ Personnel Check by ____

Instrument a[illegible] [illegible]ked and [illegible] by ____

"Source In" Che[illegible] by ____ Source No. PN124 — on West edge of stack (centered at base)

Emergency [illegible] Room Checked by ____

Red Light On [illegible] AM

Start-Up OK'd by ____ Time ____ PM Date ____ 195__

8 starts
4 hrs

Expr. 24-1 Time 1 00 AM PM Date 8-9-5 1956

Purpose New Moderation 1/4" [illegible] in 2 dimensions 4/x ~ 5

Personnel: DWM CC TAF [illegible]

$\frac{22}{(2.25)^2} = \frac{4}{5 \times 25}$

$= .79$

1 35 PM

C_1 45+24 $C_4 \times 16$ 15+5

C_2 55+51 $C_5 \times 16$ 58+8

$C_3 \times 16$ 838+2 209.5

Background - 3-2" rows of blocks = 6 3/4" high tables apart

1 45 PM Tables together $C_4 \times 16$ 15+24

C_1 47+58 $C_5 \times 16$ 45+1

C_2 58+8

$C_3 \times 64$ 211+30

INSTRUMENT CHECK

Date 9-5 1956 Time 2 00 AM PM Source No. 8

Instrument	Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2			tripped at 60	(20 x 10)
DC-3			tripped at 94	(20 x 10)
Log N				
R-1				
R-2				
P. M				

2:25 PM — 5 rows of blocks tables together

45 — C_1 45^{+41} (4 min) .80

55 — C_2 71^{+36} .77 — C_4 16^{+5} (15) .94

209 — C_3 223^{+18} .94 — C_5 19^{+2} (58)

2:45 — 6 rows of blocks tables together

C_1 66 x64 + 25 .676

C_2 88 x64 + 49 .618 — C_4 16 x16 + 5 .94

C_3 235 x64 + 3 .89 — C_5 21 x16 + 11

3:05 — 7 rows of blocks tables together

C_1 82^{+19} x64 .55 — C_4 20^{+3} x16 .75

C_2 111^{+35} x64 .49

C_3 253^{+3} x64 .83

3:20 — 8 (layers) rows tables together

C_1 107^{+60} x64 .42 — C_4 19^{+3} .79

C_2 156^{+6} x64 .352 — C_5 164^{+14} .292

C_3 282^{+3} x64 .74

3:40 — 9 layers tables together

C_1 174^{+47} x64 .259 — C_4 24^{+9} x16 .625

C_2 258^{+47} x64 .213 — C_5 227^{+1} x16 .21

C_3 342^{+7} x64 .61

4:00 — 10 layers tables together

C_1 460^{+37} x64 .098 — C_4 42^{+6} .36

C_2 714^{+23} x64 .077 — C_5 490^{+10} .118

C_3 579^{+1} x64 .36

Exp. 29-1

.6
.5
.4
.3
.2
.1

$m^{-1}\left(\frac{c_0}{c_x}\right)$

0 12 14 16 18 20 22

ht of UF_6 blocks

INSTRUMENT CHECK

Date 9-6 1956 Time 8.45 AM ~~PM~~ Source No.

Instrument	Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	60	10x20		
DC-3	85	10x20		
Log N	10sec			
R-1	6	1000x10		
R-2				
P. M.	800V			

Continuing 24-1

9-6-56 10 layers + penthouse 2"x10"x17" with 1/4" plastic

(Source Removed) Selsyn 0.11 + period 102 sec ~~Dial 865~~

during approach to crit

Critical Condition Log N = .089

Selsyn 0.193 DC-3 = 73 X 10 x 10

Dial 0.633 R-1 = 4.8 X 200 x 100

Remove Blocks on West face used as a stacking guide (2 ea approx 2x3x22)

Repeat crit conditions without source

Subcritical Selsyn 0.01 Dial

Log .00032

START-UP CHECK LIST

Equipment Checked by DFC Personnel Check by DWM

Instrument and Safeties Checked and Reset by

"Source In" Checked by No Source Source No.

Emergency Equipment in Control Room Checked by ✓

Red Light On by ✓

Start-Up OK'd by ✓ Time 10 AM PM Date 195

Expr. 24-2 Time 10 20 AM PM Date 9-6 1956

Purpose

~~Cut~~ Detn Crit Mass

Personnel: DFC DWM T Fox

1 start 1 hr

Loading: ~~[illegible]~~ 17" long x 22½ x 22½ Fixed

3" x 20¼ wide x 22½ hi Movable

Selsyn 0.57 } + period 111 sec 8.94

Dial 0.326 }

Selsyn 0.66 } level log N = 0.90

Dial 0.273 } DC-3 74 x 10 x 10

R-1 2 x 500 x 100

1 start 1/2 hr

Expr. 24-3 Time 11 30 AM ~~PM~~ Date 9-6 1956

Purpose

Crit Mass Detn

Personnel: DWM DFC T Fox

Loading 17" long x 21⅜" wide x 22½" high Fixed

3" x 21⅜" x 22½ " Movable

Sub critical log N = 0004

Expr. 24-4 1:30 PM Date 9-6 1956
Purpose Crit Mass Detn
Personnel:

1 start
1 hr

Added 1" x 8" x 10" on Top
(20 pc 2x2x1)

5"	from	N edge	
5"	"	E	"
5"	"	S	"
6"	"	W	"

+ Period Selsyn 0.10 to 82.6 sec 11.2 ¢
Dial 0.702 → 187 ¢/in
Level Selsyn 0.19 log N
Dial 0.642 DC-3
R-1

Expr. 24-5 Time 2:00 AM PM Date 9-6 1956
Purpose Crit Mass Detn
Personnel: Dw Jn T Fox DFC

1 start
5 min

4 pc worth .054 in
→ x 175 ¢/in
= 9.45 ¢

Penthouse now 12 pc 2x2x1
Selsyn .005
Dial 0.764
Subcritical

1 start
1/2 hr

Expr. 24-6 Time 2:05 AM PM Date 9-6 1956
Purpose Crit Mass Detn
Personnel: Dw Jn T Fox DFC

Penthouse now has 16 pc 2x2x1
contact
+ Period Selsyn .005 - 85 sec → 10.9 ¢
Dial .763 163 ¢/in
Level Selsyn .13 log N = 0.098
Dial 0.696 DC 3 = 81 x 10 x 10

6" from N edge
5" " E "
6" " S "
6" " W "

Critical Mass: Est 13 pc on top

Fixed	2×2×3	5	×9×10 = 450	450	180	20
	2×2×1	2	×9×10 = 180	90	70	20
	2×2×1	7	×10 = 70		90	
	1×1×1	2	×10 = 20		12	
Penthouse	2×2×1	13			352	
Movig	2×2×3	9	×10 = 90			
	2×2×1	10	= 10			
	1×1×1	10×2	= 20			

Total loading = 540 × .23121 = 124.85

352 × .07789 = 27.50

40 × .01947 = .78

153.13 kg

U-235

~~153.~~

153.13 Kg

- 77.89 gm

9-11-56 153.05 Kg U25 with 39.17 Kg Lucite plastic (weighed)

$\frac{39.17 \times 8 \times 235}{100 \times 153.05} = 4.81$ H:U235 (from added plating)

.27 / 4.88

Al plate = 1.34 Kg — Cupp 25-2

Net = ~~154.39~~ Kg

154.47 25

INSTRUMENT CHECK

Date Sept 7 1956 Time 2 00 AM PM Source No. γ 5mg/Ra

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	66	20x10	1"	
DC-3	82	20x10		
Log N	7 sec			
R-1	9	1000x10		
R-2				
P. M.	800V			

START-UP CHECK LIST

Equipment Checked by DHC Personnel Check by DHC

Instrument and Safeties Checked and Reset by

"Source In" Checked by — Source No. —

Emergency Equipment in Control Room Checked by

Red Light On by DHC AM

Start-Up OK'd by Time PM Date 195

Loading - same as 24-3

1 start
1/2 hr

Expr. 25-1 Time 2 00 AM PM Date 195

Purpose Correct for A1 tables

Personnel:

2 25 PM posit period dial 0.768 + period = 76 secs ≡ 11.9¢

level log N = .108 DC-3 75 x10x10 R-1 5.8x200x100

dial = .698 Solsyn 0.125

Neg period .603 −117.3 sec ≡ −18.8¢

2 34 PM contact 0.786 + period 67.4 sec ≡ 13.1¢

Expr. 95-2 Time 5 01 ~~AM~~ PM Date 9-7 1956
Purpose Loading = added 17 2x2x1 blocks & 25-1
and 1 1x1x1 antenna
Personnel: TAF DWM DK

1 start
1 hr

+ Period Dial 0.769 Selsyn 0.005 (Tables contact) 65.2 sec
level 0.679 log N = 0.26
DC-3 83x10x20
R-1 3.2 x 1000 x 100

65.2 sec ≡ 13.5 ¢
Al plate ≡ 17 2x2x1's + 1 1x1x1
77.89 6 5 1947
54523
7789
1324.13
19.47
1,343.60 gm 25

∴ 153.13 Kg
+ 1.34
~~[illegible] Kg net~~
154.47 Kg net

INSTRUMENT CHECK

Date 9-17 1956 Time 8 35 ~~AM~~ ~~PM~~ Source No. Y

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	Tripped at 6	2	on (20 x 10)	
DC-3	"	8	(20 x 10)	
Log N				
R-1	"	6.5	(1 x 1000)	
R-2				
P. M.			6 sec.	

START-UP CHECK LIST

Equipment Checked by AF Personnel Check by DJC

Instrument and Safeties Checked and Reset by AF

"Source In" Checked by _____ Source No. _____

Emergency Equipment in Control Room Checked by _____

Red Light On by AF

Start-Up OK'd by _____ Time 9 00 AM PM Date 9-17 1956

1 stack 2 hr

Expr. 26-1 Time _____ AM PM Date _____ 195_

Purpose New moderation ½" layers in one dimension.

Personnel: CC DEC TAF

Base 21" x 20" — 3 layer of blocks + plastic (6" block + 1½" plastic)

9 20 Background count - 7 min CPM C_0 (5 min)

x 64 C_1	21^{+39} - 1173	~168		838
x 64 C_2	21^{+7} - 1141	~163		815
x 128 C_3	8^{+56} - 1080	154		772
5 min				
x 16 C_4	12^{+13}	203	41	203
x 16 C_5	50^{+8}	908	162	808

Pile size 21" x 20" x 20" (16" blocks + 4" plastic)

x 64 C_1	50^{+47} - 3247	
C_2	73^{+37} -	
C_3	33^{+62}	
x 16 C_4	11^{+11} - 187	
x 16 C_5	76^{+8} -	

11 50 AM 21" x 22" x 22½" (2" more on movable + 18" ÷ 4½ height)

C_1 29^{+58} 123

C_2 41^{+82}

C_3 19^{+51}

C_4 9^{+85} x16

C_5 65^{+6} x16

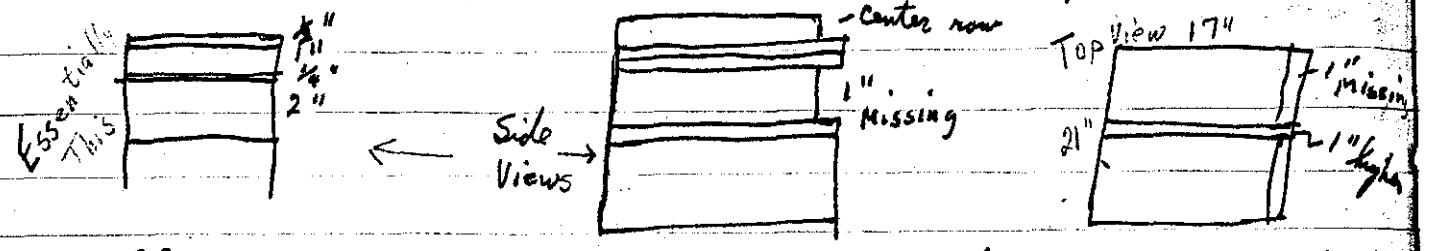
} tables agree

1 05 PM System on positive period Selsyn at 1.20"

Expr. 26-2 Time 1 45 ~~AM~~ PM Date 9-17 1956
Purpose Changed size - removed blocks from top
Personnel: TAF DFC

1 stop 1 hr

21" x 22" x 21¼" The row of 2x2x1 blocks has ¼" plastic underneath and ½" plastic on top.

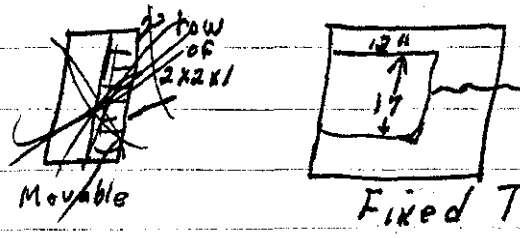


2 20 System on positive period Selsyn at 0.545

Expr. 26-3 Time 2 30 AM PM Date 9-17 1956
Purpose removed more blocks
Personnel: TAF DFC CC

1 stop 1/2 hr

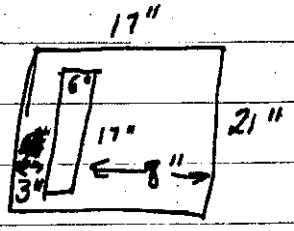
21" x 22" x 20" + the following blocks.



3 00 System on positive period selsyn at 0.33

1 stack
1/2 hr

Expr. 26-4 Time 300 ~~AM~~ PM Date 9-17 1956
Purpose Removed blocks. Left on was a 1" layer 6" x 17" as below
Personnel: TAF DEC CC



selsyn set to 0.00 at contact
Dial at 0.754

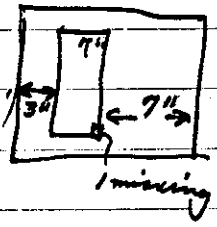
3 30 Straightened stack Contact at 0.005 on selsyn dial at ~~0.774~~ 0.774

Subcritical

x 64	C_1	1649	- 10,550	C/c
x 64	C_2	2459	- 15,730	
x 1024	C_3	6^{+913}	- 7,057	C_0
x 256	C_4	8^{+86}	- 2,130 25,370	1.15
x 256	C_5	99^{+28}	- ~~2,130~~	3^{+149}

1 stack
1/2 hr

Expr. 26-5 Time 400 ~~AM~~ PM Date 9-17 1956
Purpose added 1 row of 1x1x1" blocks
Personnel:



Contact at 0.769 on dial + zero
Leveled at 0.729 on dial

8 div → 173.8 sec

572 ~~577~~ 2x2x3"

3.

9-17-56 Summary: [Plastic ½" in horizontal layers]

Base area = 21 x 22"

Ht (blocks) = 16"

Penthouse = 6 x 17" plus 16 in³

estim

Mass U^{25} = ~~141.926~~ Kg base

~~2.199~~ penthouse

~~144.125~~ Kg

Exp 27-1 Al plate = 2.198

146.323 Kg ½" 1 dimension

Exp 24 & 25 = 154.47 Kg ¼" 2 dimensions

571 ~~572~~ 2x2x3's x 231.21 = 132.02091

32 1x1x1's x 19.47 = .62304

127 2x2x1's x 77.89 = 9.89203

142.53

penthouse 22 1x1x1's x 19.47 = 428.34

24 2x2x1's x 77.89 = 1.86936

2.2973

144.827 Kg

Plastic = ~~36.5K~~ 36.59 Kg H/X = 4.75

.07

4.82

144.827

2.297

147.124 Kg 25 Crit with no Al top or bottom

INSTRUMENT CHECK

Date 9-18 195 6 Time ____ AM PM Source No. 8

Instrument	Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	60			
DC-3	80			
Log N	7 mc			
R-1	9	10 x 1000		
R-2				
P. M.	800V	800V		

START-UP CHECK LIST

Equipment Checked by OK Personnel Check by OK

Instrument and Sa[illegible] Checked and [illegible]

"Source In" Checked by ____

Emergency Equ[illegible] Control Room Checked by ____

Red Light On by [illegible] 8 50 AM Date 9-17 195 6

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

Expr. 27-1 Time ____ AM PM Date ____ 195

Purpose al plate on top of assembly

Personnel: ____

1 start
1 hr

8 45 AM 22 x 21 x 21 1/4" (no penthouse)

Mass of U^{25} stacked = 141.926 kg 1" Al above + below - tables in contact for 1/2 hr - system apparently critical (constant linear rise due to built in source)

9 15 Built up to level .024 on log N (still rising)

Therefore assumption is that al plate is worth "penthouse" = ~~2.198 kg~~ 2.297

1 start
1 1/2 hr

Expr. 28-1 Time 10^30 AM ~~PM~~ Date 9-18 1956
Purpose Increase inhomogeneity by using 1" plastic layers (same H:U235 ratio
Personnel: DWM TAF DFC

10^50 AM 10" tall [2" plastic + 8" blocks] base = 17×21"

C_1 13^+37 C_4 10^+7
C_2 19^+52 C_5 49^+2
C_3 19^+62

11^10 12" plus 3" plastic tables together 22×21" base

C_1 23^+32 C_4 12^+7
C_2 34^+23 C_5 63^+5
C_3 21^+63

11^30 8 rows ie (16") plus 4" plastic
Positive period log N above .02 .328 3.0 div 65.2 sec
Selsyn at 0.485
Level Selsyn at 0.55 0.284

1 start
1/2 hr

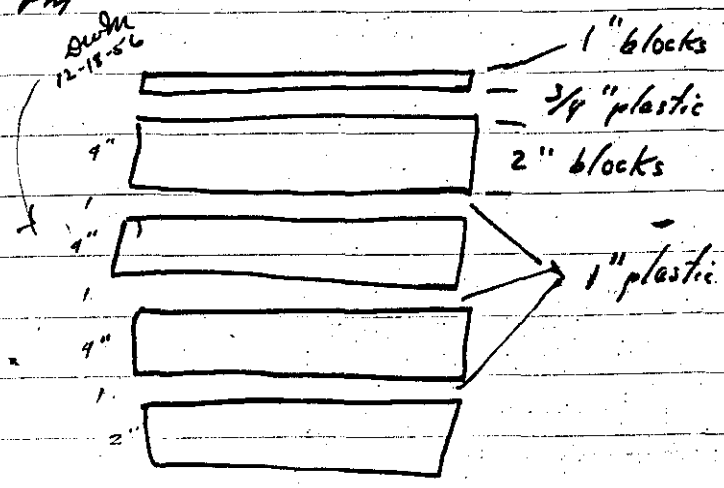
Expr. 28-2 Time 12^50 ~~AM~~ PM Date 9-18 1956
Purpose Trimming of pile to approach criticality.
Personnel: TAF DFC DWM

21" x 22" x 20" minus at (10" x 21" x 1" strip on 5 end)
1^02 PM 0.~~590~~ 590 dial Selsyn .225 positive period
Level Log N = .094 dial .~~451~~ 551 selsyn 0.285
2.8 div → 60.9 sec

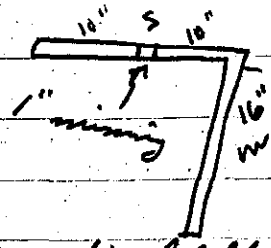
1 start
1 hr

Expr. 28-3 195
Purpose
Personnel:

1 30 PM



note: on periphery
West face add 1" x 17"
South face 1" x 19"



fixed table only on top

Sub Critical at Contact

Expr. 28-4 Time 1 55 PM Date 7- 195
Purpose
Personnel:

1 start
1/2 hr

Top = 7 x 21 x 1" added + 1/4" x 7 x 21 plastic
7" from North 8" from South
On West edge additional 1 x 1 x 9"
Overall hgt (except top penthouse) 15" blocks
3 3/4" plastic

2 16 PM Contact Belsyn = 0.01 dial 0.775 → 3.8 d.v. → 82.6 sec
level log N = 0.14 dial 0.729 →

1 start
10 min

Expr. 28-5 Time 2 35 ~~AM~~ PM Date 9-18 1956
Purpose
Personnel:

top (penthouse) 5"×21"×1 — 1 in³
on west edge 12 in³ (extra) [1×12
Sub Critical log N level .00046

1 start
20 min

Expr. 28-6 Time 2 45 ~~AM~~ PM Date 9-18 1956
Purpose
Personnel:

penthouse { 6"×21×1" - on 1" plastic
South face 1"×20"
West face 1"×10" } penthouse is on top of
21×22×
EW NS
15" bi fuel
3 3/4" plastic

Sub Critical log N up to .002 + level —
contact

Expr. 28-7 Time 3 05 ~~AM~~ PM Date 9-18 1956
Purpose adding more material
Personnel:

top center = 7"×13"×1" (.7×13" section on 1" plastic) - 1".
base = 21×22 × 15" fuel (3 3/4" plastic)
18 in³ fuel around periphery
contact - Sub Critical log N up .002

1 start
1 hr

Expr. 28-8 Time 3 20 ~~AM~~ PM Date 9-18 1956
Purpose
Personnel:

21 X 22 X 15 (+3 3/4" plastic) (6930 in³)

penthouse = 7 X 19 X 1" periphery 12 in³ plus 1
@ 133 in³

neglecting peripheral = 7063 in³
positive period dial 0.775 (contact) 6.4 div → 134 sec
level log N = 0.1 dial .744
Est 1.36 Kg

plastic = 36.59
2.3
34.29 Kg

penthouse 2+2+3's = 16
rest of top 1" plus penthouse = 2+2+1's

(7) each layer 56 2+2+3's +17
10 2+2+1's +1
2 1+1+1's +2

Totals = 511 2+2+3's = 6132 in³ + 16
77 2+2+1's = 308
28 1+1+1's = 28
6468 in
2+2+3's 1.92
6660 in³

plus 403 in³ as 2+2+1's

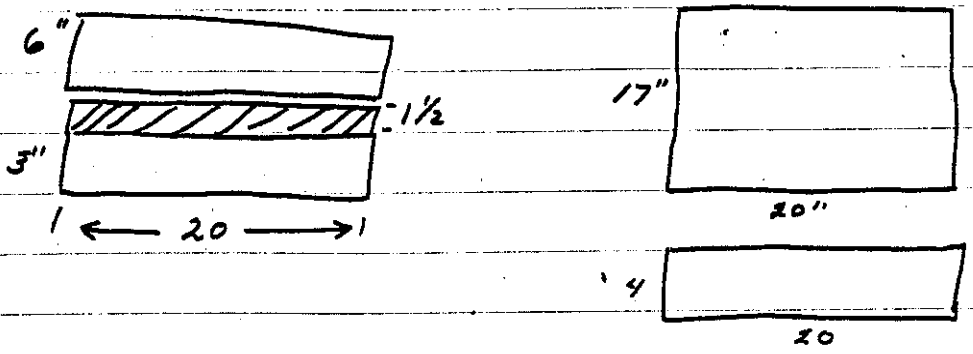
6324 in³ (527 x 231.21) = 121.385
711 in³ as 2+2+1's (177 3/4 x 77.89 13.844
28 x 19.47 = .545
135.774 Kg 25

H/X = 4.747
.075
4.82

4 ~~8~~ starts
2 hrs

Expr. 29-1 Time 8^{30} AM ~~PM~~ Date 9-20 1956
Purpose 1½" lucite between 6" layers

Personnel:



8^{30} AM

(a)

C_1 13 x64 +2
C_2 18 x64 +24
C_3 14 x64 +34
C_4 12 x14 +12
C_5 48 x16 +9

8^{40} Tables together

(b)

C_1 15 +29
C_2 18 +61
C_3 12 55
C_4 11 +3
C_5 49 +6

(c) 9^{50}

C_1 22 +13
C_2 30 +45
C_3 19 +14
C_4 11 +0
C_5 57 +4

Contact dial = 0.945

INSTRUMENT CHECK

Date 9-20 1956 Time 10 15 AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	55			
DC-3	76			
Log N	7 sec			
R-1				
R-2				
P. M.	800 V			

17" U high 4 1/2" Plastic Movable Table 18" high 4 1/2" plastic

Total blocks 531 2x2x3
147 2x2x1 } 6980 in³
20 1x1x1

(d)

log N = 0.0004

x64 C_1 148 + 10
C_2 237 + 52
C_3 68 + 4
C_4 5 + 2
C_5 40 + 35

18" UCF_6 blocks high 4 1/2" Plastic

~~531~~ 51	(2x2x3)	x 231.21₄	122.775
227	(2x2x1)	77.88₈	17.681
40	(1x1x1)	19.99₆	.780
			141.236
			4.624
			145.860

11:10 dial 0.890 posit period → 3.2 → 69.5 sec
.055"

dial 0.839 level at log N = 0.11

1 start
1/2 hr

Expr. 29-2 Time 11 20 AM Date 9-20 1956
Purpose
Personnel:

Loading: 5 50 2x2x3x0
140 2x2x1
40 1x1x1

Removed
2x20 on Movable Table.

+ period Contact Dial 0.936
Selsyn 0.025

level Dial 0.860
Selsyn ~~0.0~~ ?

11:35 AM 2.4 div → 52.2 sec →
141.236

log N ~ 0.12
DC-3 ~ 90 x 10 x 10

1 start
1/2 hr

Expr. 29-3 Time 1 00 AM PM Date 9-20 1956
Purpose Mat'l removed from top edge
Personnel: TAF DH

Loading: → ~~530 2x2x3~~
~~130 2x2x1~~
~~20 1x1x1~~

~~122.54~~
~~16.13~~
~~.39~~
~~133.06~~

550 = 127.166
210 = 16.357
20 = .389
143.912

Removed
1x2x20 on Movable Table
1x1x20 on Fixed Table
1/4 Plastic from movable Table

1 00 contact dial ~~0.950~~ 0.940 Selsyn 0.01 13.0 div → 283 sec
1 30 level dial 0.909 log N 0.11

Mass = ~~133.06~~ 143.912 Kg 25
Plastic Mass = 35.69

H/X = ~~5.042~~ 4.662
.075
4.74

Mod	Mass 25	H:W25	Exp.
¼" 2dimen	153.13 Kg	4.81 $^{+.075}$	24 – –
½" 1dimen	144.83	4.75 $^{+.075}$	26 – –
1" 1dimen	135.77	4.75 $^{+.075}$	28 – –
1½" 1dimen	143.91 ~~132.06~~	~~4.64~~ 4.66 $^{+.075}$	29 – –

U thickness to plastic ratio keeps constant (4:1)

INSTRUMENT CHECK

Date 9-20 1956 Time 9 10 AM ~~PM~~ Source No. ____

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	55			
DC-3	—			
Log N	7			
R-1	9/10	x1000		
R-2				
P. M.	500V			

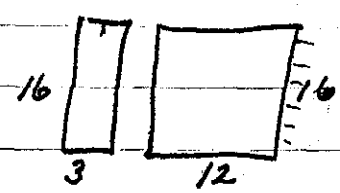
10 start
4 hrs

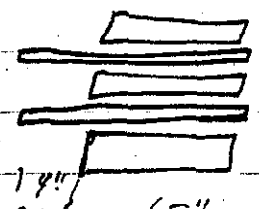
Expr. 30-1 Time 9 20 AM ~~PM~~ Date 9-20 1956
Purpose H/L n 10
11" plastic horizontal layers
Personnel: DWM TAF DJC

START-UP CHECK LIST

Equipment Checked by DWM Personnel Check by DWM
Instrument and Safeties Checked and Reset 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 DJC Time 9 20 AM ~~PM~~ Date 9-20 1956

9 20 AM





dial .910

14" overhang (5" overhang in back

C_1 14 +49

C_2 18 +46

C_3 9 +27

C_4 ——

C_5 50 +12

movable = 8 − 2 × × 2 × 3 . 5 rows 40 231.21

fixed 8 × 4 2 × 2 × 3 3 ~~5~~ rows 96 ~~160~~ 136 ~~200~~ 136 ~~46.242 Kg~~

~~31.8~~

9 35 movable } dial .913 5 rows 40

fixed } 4 rows 128 38.9 Kg

168

C_1 13 +17 C_4 11 +11

C_2 16 +47 C_5 48 +13

C_3 10 +62

With Source on movable table.

x64 { C_1 52 +53 C_4 16 +13 } x16

C_2 88 +24 C_5 101 +12

C_3 88 +19.

C

10 10 movable 5 rows } 200 blocks = 46.242 Kg contact 0.913

fixed 5 rows }

C_1 63 +34 C_4 16 +4

C_2 100 +55 C_5 106 +13

C_3 75 +44

10 30 movable 6 rows } 240 blocks = 55.5 Kg contact .910

fixed 6 rows }

C_1 78 +42 C_4 16 +10

C_2 129 +51 C_5 128 +2

C_3 77 +31

Added 2" to back of 15" dimension
base now 16" x 17" and 6 rows high
blocks added - 30 - 2x2x3 + 6 - 2x2x1
Total number blocks: 270 - 2x2x3 = 62.42
6 - 2x2x1 = ~~4.68~~ 4.47
~~67.10 Kg~~
62.89 Kg

10.50 Contact at .913

x64 { C_1 116 + 39
C_2 188 + 60
C_3 79 + 17

C_4 19 + 4
C_5 153 + 15 } x16

Log N = .00012

Added 2" to 16" dimension
size now 18" x 17" x 6 rows high
blocks added: 30 - 2x2x3 + 12 - 2x2x1
Total: 300 - 2x2x3 = 69.40
18 - 2x2x1 = 1.40
70.80 Kg

11.15 Contact at .914 Log N = .00028

x64 { C_1 275 + 14
C_2 441 + 26
C_3 98 + 16

C_4 2 + 27
C_5 18 + 191 } x256

Added 1" to 17" dimension
size 18" x 18" x 6 rows high
blocks added: 54 2x2x1 blocks
totals: 300 - 2x2x3 = 69.40
72 - 2x2x1 = 5.61
75.01 Kg

Contact at .918 - no source - positive period
Leveled at .870 on dial
~~122 sec~~ 119 sec 8.4 ¢

2 starts
1/2 hr

Expr. 30-2 Time 12 55 AM PM Date 9-20 1956
Purpose Trimming pile
Personnel: DFC TAF

Removed 9 - 2X2X1 blocks - top row.
1 00 Contact at 0.918 - subcritical 1

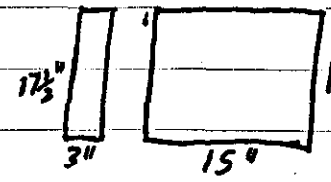
Expr. 30-3 Time 1 AM PM Date 195
Purpose
Personnel: DFC TAF

Added 5 - 2X2X1 blocks centered top row back
1 10 Contact at 0.915 - positive period ~~195.5 sec~~ 191 sec 5.84
leveled at 0.885 Mass = 74.62 Kg.

Kg

Expr. 3/-1 Time 2:30 AM PM Date 9-20 1956
Purpose ½" plastic in 2 dimensions
approx 18" cube -
Personnel:

Started 2 hr



overall dimensions

movable - 7 rows high (17½")
Fixed Table - 4⅔ rows (4 - complete + partial)

3 05

C_1	13^{+44}	C_4	245^{+0}
C_2	17^{+55}	C_5	109^{+16}
C_3	13^{+57}		

3 25 Fixed Table 17½" X 18" x 6 rows high
Movable Table 3" X 17½ X 7 rows high
Contact dial at 0.914

C_1	19^{+52}	C_4	243
C_2	25^{+43}_{+18}	C_5	111^{+14}
C_3	16		

Whole Assembly - 7½ rows on 15" fuel + 3¾"
overall dimensions - 18 x 17½ x 18¾
dial at .034 selsyn .885 - positive period
leveled at dial .016 selsyn .963

INSTRUMENT CHECK

Date 9-21 1956 Time 8:50 AM Source No.

Instrument	Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	55	10 x 20		
DC-3	55	10 x 20		
Log-N		7sec		
R-1	7	10x100		
R-2				
P. M.	800V			

Expr. 31-2 8:30 AM Date 9-21 1956

Purpose Crit Mass Detn.
1½" plastic in 2-dim.
18" N-S x 17½" E-W x 17½" N-S

Personnel: DWM TAFox, DFC

1 load
½ hr

Loading: 294 ea 2x2x3 blocks → ~~68~~. 67.976 kg

Sub critical : log N = 0.00022 DC-2 = 85 x 1 x 10

Dial = 0.915
Selsyn = 99999

C_1 229 x64 + 2 C_4 64 x64 + 36

C_2 369 x64 + 30 C_5 74 x64 + 47

C_3 104 x64 + 25

Expr. 31-3 Time 9:00 AM Date 9-21 1956

Purpose Crit Mass Detn

Personnel: DWM TAFox, DFC.

1 load
½ hr

Loading: added 4" x 17½" strip centered on N-S on E-W Dim on Top.

(14 ea 2x2x1 blocks added) 69.08₂ kg

U-235

Super crit.

Pos. Per Dial 0.790 Selsyn 0.11 11.64

Level Dial 0.745 0.20

8.84

Expr. 31-4 Time 9^20 AM ~~PM~~ Date 9-21 1956
Purpose
Crit Mass detn
Personnel: DWM TAF DFC

1 start
1/2 hr

Loading: (Removed 7 ea 2x2x1) Penthouse now 2"x17½" x1"
68.528 kg
19.5 div → 424 sec
~9^25 Contact Selsy: 99999 Dial .916 + Period 3.9¢
9^55 Leveled at .897 on dial, selsyn at ~~25~~ 05
Log N = .1 DC-3-60 x10 x10

Table Calibration

31-1	.034 − (−.016) = .050	8.8/.050	= 176 ¢/in
−3	.790 − 745 = .045	11.6/.045	= 258 ¢/in
−4	.916 − 897 = .019	3.9/.019	= 205 ¢/in
			639

Average 213 ¢/in

1 ~~stop~~
1 hr

Expr. 31-5 Time ~~10:40~~ 12:25 PM AM ~~PM~~ Date 9-21 1956
Purpose Evaluation of at table
Personnel: DFC PWM THF

Loading: Same as 31-2 18" x 17½ x 17½ "cube"
1:00 selsyn at .105 dial at .810 — positive period 10.0¢
1:15 leveled at .160 dial at .769 4.4 di. 95.6 sec

Dial = 769 ~ 3.7 in x 17 in x 1 in or
1.020 kg. U-235

∴ Crit Mass = 68.528
1.020
69.548

Wgt Plastic = 38.94 Kg (with box) Wgt U 25 = 67.976
.6
38.34

↑ Subcritical mass of blocks

$\frac{L}{x}$ = 10.604
.075
10.68

INSTRUMENT CHECK

Date 9-25 1956 Time 900 AM ~~PM~~ Source No. Y

Instrument	Trip Volts	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	Tripped	54		
DC-3				
Log N	cut 10 sec			
R-1				
R-2				
P. M.				

START-UP CHECK LIST

Equipment Checked by DFC Personnel Check by DFC

Instrument and Safeties Checked and Reset by TAF

"Source In" Checked by DFC Source No.

Emergency Equipment in Control Room Checked by

Red Light On by DFC

Start-Up OK'd by _____ Time 915 AM ~~PM~~ Date 9-25 1956

7 shots
4 runs

Expr. 32-1 Time 915 AM ~~PM~~ Date 9-25 1956

Purpose Critical mass data Fuel in 1" layers plastic 3/4" layers

Personnel: DWM DFC TAF

Assembly has 16"X 16" base assuming 1" fuel, 3/4" plastic

movable table 2" X 16" X 15 3/4" (9 rows)

fixed table 14" X 16" X 7" high (4 rows)

920 tables at contact at .865

X16 { C_1 89 +43 C_4 19 +11 C_2 138 +20 C_5 89 +14 C_3 91 +21 } X16

Added 2 rows to fixed table ~~---~~

movable table 2 X16 X 15 3/4 - fixed table 14 X16 X 10 1/2 (6 rows)

9:45 Contact at .893

C_1 104 +28 C_4 16 +12 C_2 174 +20 C_5 98 +2 C_3 86 +26

Added one more row to fixed table
movable table - 2"x16"x 15 3/4" fixed table 14"x16"x 12 1/4" (7 rows)

Selsyn 999.995 Dial 0.870 (contact)

C1 114 x64 + 14 C4 20 x16 + 11

C2 189 x64 + 58 C5 108 x16 + 9

C3 86 x64 + 8

Add one more row To fixed Table

Movable Table 2 x 16 x 15 3/4 Fixed 14"x16"x14" high

Selsyn 999.995 Dial 0.870

C1 134 x64 + 30 C4 21 x16 + 1

C2 218 x64 + 40 C5 122 x16 + 9

C3 73 + 50

Reset limit
Switches and moved blocks. Dial zero ~0.860

Add one more row to Fixed table

Movable Table 2 x 16 x 15 3/4 576 ea 2x2x1

Fixed Table 14 x 16 x 15 3/4 loading ~44.8 kg

Selsyn 0.015 Dial 0.867 Log N ~0.001

Selsyn .015

C1 170 x64 + 35 (524) C4 22 x16 + 11

C2 278 x64 + 0 (.497) C5 149 x16 + 0 (.598)

C3 93 x64 + 31

add one more row to movable and fixed Table

Movable 2 x 16 x 17 1/2 } 640 each 2x2x1

Fixed 14 x 16 x 17 1/2 } 49.85 kg

Selsyn .02 Dial 0.876 log N 0.0002

C1 281 x64 + 50 (.317) C4 27 x16 + 11 (.704)

C2 470 + 54 (.294) C5 239 x16 + 9 (.373)

C3 110 + 44 (.825)

add 2" x 16 x 17½ to movable table

assembly size 16 x 18 x 17½ 720 ea 2x2x1 → 56.080 kg

the assembly is super critical with source and

selsyn @ 0.44 Dial 0.569 0.006 log N

No source startup

Pos Period Selsyn @ 0.40 Dial 0.608

Level .458 0.581

DC-2 = 93x10x100

log N = .065

R-1 = 3.9x200x100

1 start 1 hr

Expr. 32-2 Time 1 35 AM PM Date 9-25 1956

Purpose Removed part of top

Personnel: DWM DFC

base area = 16 x 18 15¾" high plus 16x10x1 (9 layers blocks)

72 x 9 = 648 blocks

plus 40

688 blocks = 53.588 Kg 25

9x1 = 9

9x¾ = 6¾

10¾

pos. period selsyn 0.18 .710

level log N 0.06 dial .696

1 start 1/2 hr

Expr. 32-3 Time 2 45 AM PM Date 9-25 195

Purpose

Pint house now 6 x 16x1¾ (24 ea 2x2x1)

Base 16 x 18 x 15¾

Personnel: DWM DFC

648
24
672 → 52.342 kg

3 05 PM Sub Critical 0.868 dial

Expr. 32-4 Time 3:10 PM Date 9-25 1956
Purpose adding 2×16×1
Penthouse now 8"×16"
Personnel:

1 stout
1 1/2 bc

77.89
8
623.12 gm

Mass = 52.342
.623
52.965 kg 25

Contact 0.868 on dial posit. period
level log N 0.05 dial = 0.818

From plot of 32-3 and 32-4 estimated width of penthouse for just critical is 7.15 in
Critical mass = 52.700 kg U-235
Dwm

Weight of Plastic = 38.03 kg

H/X = 13.56
0.15
13.64

INSTRUMENT CHECK

Date 1-26 1956 Time 11 15 AM ~~PM~~ Source No. _____

Instrument	Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	~50			
DC-3				
Log N	7 sec			
R-1	10 x 1000	7		
R-2				
P. M.	800 V			

Expr. 33-1 Time _____ AM PM Date _____ 195__

Purpose Depleted and enriched 1 to 4 2x2x1

Personnel: TAF DWM DFC

7 starts 4 hr

Loading 18" x 18" base Dial zero 890 891 891

1^15 movable table 4 x 18 x 16¼" (10 rows)

fixed table 14 x 18 x 13" (8 rows)

tables apart

x64 { C1 50 +34 48 +49 C4 ~~13 +7~~ 17 +5 x 16
C2 67 +45 66 +52 C5 ~~79 +7~~ 95 +13 x 16
C3 67 +54 69 +7

tables together at .875 log N = .00011

x64 { C1 60 +12 C4 1 +23 x 256
C2 88 +25 C5 107 +3 x 16
C3 70 +19

added 2 rows to movable table - assembly now 18" x 18" x 16¼"

2^00 tables together dial at .906 log N = .00015

C1 115 +4 C4 19 +4
C2 172 +30 C5 151 +3
C3 96 +52 DC-2 46 x 20 x 1

added one row all over Assembly
now 18 X 18 X 17 7/8" (11 rows)

2 30 tables together at .898
DC-2 - 69 X 1 X 20 Log N = .000 22

X64 { C1 233 +16 / C2 378 +7 / C3 122 +60 } x64 { C4 6 +16 / C5 62 +58 }

added one row all over
Assembly 18 X 18 X 19 1/2 (12 rows)

3 10 positive period at .792 on dial
leveled at .765 on dial
Log N = .038 DC-2 - 89 X 100 X 10

12-18-56 DWM
1.625
705906
19 1/2
12
∴ plastic = 5/8
UF6c = 1"
∴ 1 5/8" per layer
11 layers
= 11 + 55/8 = 17 7/8

Expr. 33-2 Time 320 ~~AM~~ PM Date 9-26 1956
Purpose Removed 1 layer from movable table
Personnel: DWM DFC TAF

1 start
1 hr

Removed 15 enriched and 3 depleted 2 X 2 X 1 from the movable table (1 layer).

3 35 Contact at .891 - ~~[illegible]~~ stack crooked

3 40 straightened stack contact still at .891 on dial
positive period

3 55 leveled at .864 on dial

total number of block ~~[illegible]~~ 762 enriched 2X2X1
762 X 77.88 = 59.352 Kg of U-235 - 192 depleted 2X2X1

From an extrapolation of Runs 33-1 and 33-2 the amount of material for just critical would be ~ 1" x 18" less on top or less 14 in^3 of enriched and 4 in^3 of depleted. ~ 273g U-235 less

For the 33-2 loading (59,352) the plastic weight is 43.95 kg 273

$L/x = 13.92$ $C_M = 59.08$ kg/U235

08

14.00

U-235 in Depleted Blocks.

192 x 78 x .0021

.375

78 x .0056

192 x .436 g/Block = 5908 .084 kg

Crit Mass 59.16

INSTRUMENT CHECK

Date 9-27 195 6 Time 11 00 AM ~~PM~~ Source No. Y

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	54	20x60		
~~DC-3~~				
Log N	70			
R-1				
R-2				
P. M.	800	80	Contact	

START-UP CHECK LIST

Equipment Checked by DWM Personnel Check by DWM

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 11 00 AM ~~PM~~ Date 9-27 195 6

Expr. 34-1 Time 11 00 AM ~~PM~~ Date 9-27 195 6

Purpose Increasing depleted Uranium ratio now 1:2 Count of 3

Personnel: DWM DK

8 plate 3 hr

1/2" plaster in layer only

Loading Mould 6 x 20 x 13 Fixed 14 x 20 x 7

Tables apart Source at base on West side

C_1 41 x64 +11 C_4 3x64 +63

C_2 55 x64 +52 C_5 ~~0x64 +29~~

C_3 82 x64 +58

Tables Together Dial = 0.918 ~.921

C_1 46x64 0 C_4 4 x64 +17

C_2 65 +45 C_5 ~~0 x64~~

C_3 70 +31

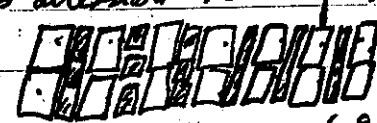
4

Movable Table 6 X 20 X 13 hi + 6½ plastic
Fixed 14 X 20 X 10 + 5" plastic
Dial 0.920 log N = .00011

C_1 65 x64 + 51 C_4 4x64 + 6
C_2 96 x64 + 2 C_5 27 x64 + 16
C_3 90 x64 + 4

1[10] Fixed table 1½ layers higher
movable table same log N = .00014
dial 0.917

C_1 95 + 57
C_2 142 +57 C_4 4 +60
C_3 96 +15 C_5 34 +14

2[11] 14 complete layers on fixed table
12 complete layers on movable table
On movable table only last 2" layers - (making equivalent of 14 layers) is alternate rows of enriched (2×2×3) and depleted (2×2×1)  = 3.737 Kg 25

Hgt of stack = 21⅛" (measured)
NS = 20¼" EW = 20¼"

69.556
~~69.712~~
3.737
~~73.449~~ Kg 25
73.293

2[25] → posit period .814 dial
4 min or 87 sec
level log N = .03 dial = 0.789

Mass — Inventory

1st 12 layers = total 1200 blocks 400 depleted 800 enriched

fixed part — 13th layer = 70 blocks 47 enriched 23 depleted

14th layer = 70 blocks 476 24

893 enriched = 69.556 kg

movable 14 2×2×3's (enriched

18 2×2×1's depleted

2 45 pm Removing 2×2×3's = −3.737 kg

adding 2×2×1's so that 1 left over

note 52 1×1×1's used to make up 13 − 2×2×1's

14th layer 20 2×2×1's in penthouse (12×20")

(40 enriched)

13th 10 depleted 20 enriched

---

1 start 1 1/2 hr

Expr. 34-2 Time 3 05 Date 9-27 1956

Purpose C.M. detn.

Depleted Ratio 1:2 enriched

Personnel: DWM D.F.C.

9 div 195 sec Pos: to Period Contact 0.921

Dial ~~0.8~~

Level Dial 0.909

log N = 0.033 DC-3, 90×10×100

Loading

	E	D
12 layers	800	400
13 layer M	407	23
F	20	10
14 layer M	40	20
	907	453

907 × 77.81 = 70.646 kg

From extrapolation of 341 and 34-2, the mass necessary for just critical would be 11½ wide x 20" long penthouse on Top.

On 34-2 , wt of plastic = 50.72 kg

$$\therefore \frac{H}{K} = \frac{50.72 \times 235 \times .8}{70.646} = 13.50$$

188

08

13.58

$$\frac{11\frac{1}{2}}{\cancel{12}\ 3} \times \cancel{40}^{10} = \frac{115}{3} = 38.3$$ hence corr is 1.7 x 77.89 or 132 g

Crit Mass = 70.646
132
70.514

U-235 in Depleted pt blocks

$$453 \times 78 \times \frac{.0021}{.375} = \cancel{188}\ 198\ g$$

Hence Crit Mass = 70.71 kg

INSTRUMENT CHECK

Date 10-8 1956 Time 10 50 AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	52	20x10		
DC-3	—	—		
Log N	5 sec	—		
R-1	8x10	x 1000		
R-2				
P. M.	800V	800V	2"	

8 starts
8 hrs

START-UP CHECK LIST

Equipment Checked by _____ Personnel Check by _____
Instrument and Safeties Checked and Reset by DHC
"Source In" Checked by — Source No. —
Emergency Equipment in Control Room Checked by DHC
Red Light On by _____ AM
Start-Up OK'd by _____ Time _____ PM Date _____ 195__

Expr. 35-1 Time _____ AM PM Date 10-8 1956
Purpose 1:1 depleted to enriched ratio
moderated using 2x2x3" blocks
3/4" plastic layers (1 dimension only) 2" UF_2C layers
Personnel: _____

12 15 Background Count - Tables apart with 6" of Fuel
Fixed Table 18"x24" x 8 1/4"
Movable " 6"x24" x 8 1/4"

	C_1	11 x64 + 50	C_4	8 x64 + 49
35-1a	C_2	15 x64 + 19	C_5	0 x256 + 49
	C_3	9 x64 + 10		not working

Tables together Dial 0.895 Selsyn 0.04

35-1b	C_1	12 x64 + 26	C_4	8 x64 + 62
	C_2	14 x64 + 12	C_5	8 x64 + 16
	C_3	10 x64 + 50		

35-1c Fixed table and movable table 13 3/4" (5 rows) high

C_1 12^{+25} C_4 2^{+68} } x256

C_2 16^{+51} C_5 8^{+49}

C_3 13^{+37}

35-1d Fixed and movable tables at 19 1/4" (7 rows) high

C_1 24^{+7} C_4 11^{+22}

C_2 35^{+7} C_5 11^{+44}

C_3 26^{+38}

35-1e Fixed and movable tables at 24 3/4" (9 rows) high very supercritical - did not ~~get closer than~~ take tables closer than 1 1/2"

35-1f Fixed and movable tables at 22" (8 rows) high

~~Contact~~ at .922 on dial

selsyn at .050 light not on

C_1 349^{+19} C_4 90^{+11}

C_2 582^{+18} C_5 90^{+32}

C_3 170^{+18}

Log N .00029

D.C-2; 72 x 10 x 2

35-1g Added to 35-1f : 12-2x2x1 ~~+12~~ enriched and 12 depleted plus 2 x 24 x 3/8" plastic

3:00 positive period at .954 on dial

selsyn at .145

3:10 Leveled at ~~.~~ .926

1 start
1/2 hr

Expr. 35-2 Time 3:15 ~~AM~~ PM Date 10-8 1956
Purpose Removed 12 block (6 fuel + 6 depleted.
Personnel: TAF DWM DFC

Assembly now 24" X 24" X 22" + 1 row 2x24x1
with 3/8" plastic 2x24 (centered N-S) 89.252
3:25 Contact at .928 on dial
~~[illegible]~~ adjusted air pressure
3:40 Contact at .947
Adjusted voltage
3:45 Contact at 0.953
Very close to critical, DC-3
DC-2, R-1 linear rise almost.

1 start
1/2 hr

Expr. 35-3 Time 4:00 ~~AM~~ PM Date 10-8 1956
Purpose
Same loading as above
Personnel: DWM

Same loading penthouse 4"x12"
Contact Pos. Period. Dial .950 Subsys .015
Level (897 super / 895 sub) .896

48 depleted 48 enriched 2x2x3 per layer

$$\begin{array}{r} 8 \\ \hline 384 \\ 2 \\ \hline 386 \end{array} \times 231.21 \times \frac{.0021}{.375} = 386 \times 1.295 = 500g$$

Summary:

Plastic weight 23.475
42.250
65.725
Box .70
65.025 kg plastic

Uranium 235 89.252
235 in depleted .500
89.752 kg U-235

$\frac{H}{x}$ $\frac{65.025 \times 18.8}{89.75}$ = 13.621
+ .075
$\left(\frac{H}{x}\right)_{Total}$ = 13.70

Additional plastic weighed by H Fox 10.08 Kg
65.025
Total 75.105 kg

Net weight of plastic in other box - 13.74 Kg
box .60
~~Gross total~~ 14.34 Kg

Grand total 89.845 Kg

INSTRUMENT CHECK

Date 10-9 1956 Time 11 15 AM ~~PM~~ Source No. ✓

Instrument	Trip Value	Scale	Source-Distance	Start-Up Scale
DC-1				
DC-2	Tripped at 50 on 20X10			
DC-3				
Log N	7 sec			
R-1	9 x 1000 x 10			
R-2				
P. M.	800V			

START-UP CHECK LIST

Equipment Checked by F Personnel Check by

Instrument and Safety Checked and Reset by

"Source In" Checked by Source No.

Emergency Equipment Pool Room Checked by

Red Light On

Start-Up OK'd by Time 11 15 AM ~~PM~~ Date 10-9 1956

6 starts
4 hr

Expr. 36-1 Time 11 30 AM ~~PM~~ Date 10-9 1956

Purpose 1:1 depleted to enriched 2x2x3 blocks moderated with ½" of plastic every 2" in height (1 dimension)

Personnel DWM DFC TF CC

11 20 Backround Count - Tables apart

Fixed table 21 x 28 x 12½" (5 rows)

Movable table 6 x 28 x 25 (10 rows)

36-1a

C_1 11 + 35 C_4 8 + 54

C_2 12 + 52 C_5 9 + 1

C_3 12 + 40

Tables together Dial 0.980 Selsyn .015

36-1b

C_1 12 + 28 C_4 8 + 10

C_2 15 + 33 C_5 9 + 46

C_3 13 + 19

1 40

36-1c

Fixed table - 21 x 28 x 17½" (7 rows)
Movable table - 6 x 28 x 25" (10 rows)
Tables together at 1.001 Selsyn at .010

C_1	17^{+49}	C_4	10^{+15}
C_2	25^{+60}	C_5	10^{+16}
C_3	20^{+43}		

B6-1d

2 05

table contact at 1.002 on dial

Fixed Table - 21 x 28 x 20" (8 rows)
Movable table - 6 x 28 x 25" (10 rows)

C_1	28^{+32}	C_4	13^{+13}
C_2	45^{+59}	C_5	13^{+43}
C_3	31^{+8}		

36-1e

2 30

Fixed table - 21 x 28 x 22½ (9 rows)
movable table - 6 x 28 x 25 (10 rows)
Tables together at 0.999 selsyn .012

C_1	103^{+19}	C_4	30^{+63}
C_2	167^{+42}	C_5	30^{+4}
C_3	80^{+25}		

36-1f

3 00

*Fixed table - 21 x 28 x 23 3/4 (9½ rows)
movable table - 6 x 28 x 23 3/4 (9½ rows)
* 1"x1" x 28" row off 5-facer of fixed table,
Positive Period at 0.825 on dial .22 on selsyn

3 20

leveled at 0.798 on dial .25 on selsyn

Expr. ~~36-2~~ 36-2 Time 3:20 ~~AM~~ PM Date 10-9 1956
Purpose Trimmed Pile to approach critical
Personnel: TAF DWM DFC

1 start
1 hr

removed 1" layer from movable table
*Fixed table 21 X 28 X 23 3/4 (9 1/2 rows)
Movable table 6 x 28 x 22 1/2 (9 rows)
* minus 1 X 1 X 28 row.

3:40 Positive Period at 0.957 on dial selsyn at .08
3:50 Leveled at 0.895 on dial selsyn at .16

Loading: 9 rows = 567 Ea 2 x 2 x 3 131.096
Penthouse 70 Ea 1 x 2 x 2 5.452
136.548 kg U-235

Wt of Plastic ~~68.505~~ 66.80 Kg.

U-235 Enriched blocks 136.548
Depleted = 136.548 x .0021/.375 = 0.765
Total 137.313 kg U-235

$H/\gamma = \frac{\cancel{68.505}\ 66.80 \times 188}{137.313} = \cancel{9.374}\ 9.146$
$\cancel{.075}\ 75$
$\cancel{9.454}\ 9.221$

Extrapolating 36-1F and 36-2 back to 1.000 dial reading width of penthouse for just critical would be 18.4 inches

$\frac{20.0 - 18.4}{20.0} \times 5.452 = 0.436$ kg

Just Critical Mass = 137.313 - 0.436 = 136.877 kg

INSTRUMENT CHECK

Date 10 - 10 1956 Time 1000 AM ~~PM~~ Source No. Gamma

Instrument	Range	Scale	Energy Estimate	Start-Up Scale
DC-1				
DC-2	50 x10 x 20			
DC-3	Not working			
Log N	Period			1
R-1	7 x 1000 x10			
R-2				
P. M.	800V			

1 start
1 hr

Expr. 36-3 Time 10^05 AM PM Date 10-10 1956
Purpose Check of test point ~~in~~ ~~Aug 1957~~ 36-2
Personnel: DWM TAF

11^00 Positive Period at 0.941 on dial 0.10 on selsyn
Leveled at 0.881 on dial
Log N = .12 DC3 = 80 x 1 x100
R1 = 6 x 200 x 1000

1 start
1/2 hr

Expr. 36-4 Time 11^20 AM Date 10-10 1956
Purpose Evaluation of 1" Aluminum Table
Personnel: DWM TAF

11^25 Pos. Period at 0.643 Selsyn 0.40
Level at 0.603 Selsyn 0.475

From 36-1, 2 3 and 5
Mass at 0.603 is ~~1~~ 7" x 28" penthouse
additional to 36-1
∴ Alum Table worth 91 2x2x1 or 7.088kg

240

1 sheet
1/2 lb

Expr. 36-5 Time 12^05 PM Date 10-10 1956
Purpose
Mass end of tube and alum.
Personnel:

Loading 12 x 28 x 1 added to 36-1 f
12^13 PM Pos Period Dial 0.498 Selsyn 55
Level Dial 0.448 Selsyn .63

Summary

Bare Cubic Mass with 1" alum base 136.877 kg
" " " w.o. 1" alum base 143.965 kg

INSTRUMENT CHECK

Date 10-11 1956 Time 9 30 AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1	—	—	—	
DC-2	70	20x10		20x1
DC-3	72	20x10		20x1
Log N	7 su			7 su
R-1	7	10x1000		10x100
R-2	—	—		
P. M.	800V			800V

35# dry on cyl

trip point was adjusted on DC-2 owing trip at 40 on 20x10

11 starts 8 hrs

Expr. 37 Time 8 10 AM ~~PM~~ Date 10-11 1956

Purpose Reduce assay using 2 depleted to 1 enriched block base area 27 x 28" (1/2" plastic moderator)

Personnel:

Background (x64 5 min)

Time

C_1 9^{+63} (10) C_4 8^{+32} ($8\frac{1}{2}$) contact 0.871

C_2 14^{+4} (14) C_5 8^{+45} ($8\frac{1}{2}$) 0.976 1.020 1.010

C_3 10^{+1} (10)

	layers Ht.	C_1	M_1^{-1}	C_2	M_2^{-2}	C_3	M_3^{-3}	C_4	M_4^{-4}	C_5	M_5^{-5}
8 30	(5 layers) 12 1/2"	11^{+12}	.9	15^{+7}	.93	10^{+63}	.9	8^{+15}	1.1	9^{+5}	.95
	(7) 17 1/2"										
9 05	(9) 20"	13^{+26}	.77	18^{+13}	.78	13^{+50}	.72	9^{+9}	.94	9^{+45}	.85
9 45	(10) 25"	(table fired accidentally)									
10 20	(10) (25") [11 layers on movable	18^{+1}	.56	23^{+22}	.61	15^{+7}	.66	10^{23}	.85	10^{46}	.77
10 40	(11) (27 1/2")	18^{+61}	.53	29^{+61}	.48	17^{+45}	.56	10^{+20}		10^{62}	
11 00	Changing base area to 28 x 30"										
11 30	(11) 118.61 Kg 25	25^{+42}	.39	41^{+51}	.34	22^{+39}	.45	12^{+27}	.68	12^{+50}	.66
1 00 PM	(12) 30"	38^{58}	.263	62^{+7}	.225	29^{+56}	.333	16^{+24}	.515	14^{+52}	.565
2 00 PM	(13) 32 1/2 (fired only)	62^{50}	.16	107^{29}	.13	36^{+55}	.28	22^{0}	.386	15^{30}	.556

2 30 Changing base area to 28" x 33" (added 3" to movable table)

3 20 Almost critical but having mechanical problems with movable table.

INSTRUMENT CHECK

Date 10-12 1956 Time 1100 AM ~~PM~~ Source No. Y

Instrument	Trip Value	Scale	Source Distance	Start-Up Sc
DC-1				
DC-2	80	x 20 x 10		
DC-3	77	x 100 x 10		
Log N	5 sec			
R-1	9	x 1000 x 10		
R-2				
P. M.	500 V			

Expr. ~~37~~ 37-2 Time 1115 AM ~~PM~~ Date 10-12 1956

Purpose Continuation of 37-1 after stack straightening and table modifications

Personnel: DWM DFC TAF

1 stud
1/2 hr

Movable table was restacked after aluminum facing had been removed.
Assembly size remained the same as 37-1 i.e.
Fixed Table 24" x 28" x 32½" (13 rows)
Movable Table 9" x 28" x 32½" (13 rows)
~~Positive period at 0.623 on dial selsyn at 0.35~~
1145 Positive period at 0.673 on dial selsyn at 0.3[illegible]
Leveled at 0.627 on dial selsyn at 0.36

Expr. 37-3 Time 100 ~~AM~~ PM Date 10-12 1956

Purpose Evaluation of the Aluminum Table

Personnel: DWM CC TAF

1 stud
1 hr

Added 1" of Al to assembly of 37-2
Positive Period at 0.548 on dial 0.42 on selsyn.
leveled at 0.504 on dial 051 on selsyn.
log N = .28 DC3 - 55 X10 X100

1 start
1/2 hr

Expr. 37-4 1:50 ~~AM~~ Date 10-12 1956
Purpose continue evaluation of Al-
by removing Al & replacing w fuel
Personnel:

37½ 19 2x2x1's . 37 2x2x1's depleted [~~top left~~ S.W quadrant)

2:30 PM dial 0.589 Selsyn 0.38 Posit period
Level dial 0.545 log N = 0.20

1 start
1/2 hr

Expr. 37-5 2:40 PM Date 10-12 1956
Purpose Continuation of 37---
Personnel:

total top 3 half - now: 37 - 37½% 75 depleted 2x2x1's
as 2x2x1's

2:58 PM Selsyn 0.49 dial 0.4839 pos. period

3:08 PM Level log N 0.19 dial - 0.446

1 start
1/2 hr

Expr. 37-6 Time AM PM Date 195
Purpose cont.
removing mat'l
Personnel:

Top layer (13th layer) 23 - 2x2x3 } 37½ 47 - 2x2x3 depleted
42 2x2x1 } 84 - 2x2x1 depleted

3:48 PM Posit period 0.934 dial Selsyn 0.02
Level log N = 0.19 0.856 dial Selsyn 0.15

Loading = (37 - 2) - 14 enriched blocks - 28 depleted
155.946 - 3.237 kg - .036 = 152.675

Summary: 37-1 thru 6.

Extrapolated just crit loading is (37-2)-loading -60 ea 2x2x1
Est. loading for 1" alum ~~to~~ equiv is (37-2) loading + 26.5 ea 2x2x1

37-2 loading 28"x33" x 32½" hi → 667 2x2x3 Ex → 154.217 kg
1335 2x2x3 D. → 1.729 kg
155.946

Estimated ~~Table~~ worth of 1" alum is worth 26.5 x 77.89 Ex. = 2.063
53 x 1.285/3 x 10⁻³ Depleted = .023
2.086

10-14-56 " 15/AM Weighed plastic = 111.97 Kg

~~H/X = 13.50~~

$\frac{111.97 \times 188}{152.675} = 13.787$
.075
(loading of 37-6)
$\frac{H}{X} = 13.86_2$

Just Critical = 155.946 − 4.673 − .052 (−4.725)
= 151.22, kg U-235

2 startups
1 1/2 hr

Expr. 38-1 Time 3:00 PM Date 10-15 1956
Purpose Lower H/X at 1:2 ratio (~12.5%
H/X ~ 4 1/4" plastic
Personnel: DWM TAF CC DFC

6 layers (2") Background (Tables Apart) x64

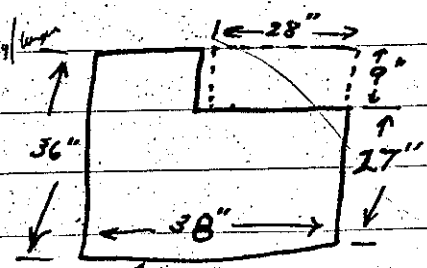
C_1 10^{+35} 10½ C_4 4^{+58} 5

C_2 12^{+21} 12 C_5 9^{+51} 10

C_3 13^{+59} 14 C

76 2+2+3" 37½ blocks/layer

~~[illegible]~~ total 456 = 105.43 Kg



counts w sections together

3:15 PM C_1 C_2 C_3 C_4 C_5 zero = 0.901

10^{+50} 13^{+12} 15^{+8} 4^{+34} 9^{+11}

4:12 PM 9 layers = $\frac{76}{9}$ $\frac{5}{68}$ 4 = 158 Kg 25 zero = 0.892

12^{+42} .81 17^{+48} .67 13^{+54} 1.0 4^{+36} 10^{+30}

8:30 (10-14) recount of 9 layers zero 0.910

13^{+60} 19^{+31} 16^{+26} 4^{+58} 9^{+41}

10-16-56
9:30 AM 12 layers = 912 blocks = 211 Kg U^{235} zero 0.922

19^{+55} .62 28^{+10} .43 20^{+8} .7 4^{+9} 10^{+62}

10:30 AM Power failure caused shutdown

1 start
1 hr

– over –

INSTRUMENT CHECK

Date 10-16 1956 Time 12 ~~AM~~ PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	70	20x10		
DC-3	76	10x100		
Log N	7			
R-1	10	10x1000		
R-2				
P. M.			1"	

4 shots
4 hrs

17.6 Kg / layer

Background $C_1 = 10\frac{1}{2}$ C_2 12 C_3 14 $C_4 = 5$ $C_5 = 10$

12[20] PM 13 layers ~ 228.8 Kg

C_1 20[57] 0.5 C_2 30[17] 0.1 C_3 23[+55] 0.6 C_4 11[50] 0.46 C_5 11[+14]

36 x 38 x 33¾ hi

15 layers ~~[illegible] kg~~ 263.6 kg Selsyn 0.02 Dial .940"

1[23] PM

C_1	32[+37]	.32	C_4	14[+43]	.33
C_2	48[47]	.25 .40	C_5	14[+43]	.68
C_3	28[+45]	.49 .50			

36 x 38 x 36" hi 16 layers → 281.2 Selsyn 0.019 Dial .991

2[10] PM

C_1	38[57]	.27	C_4	16[36]	.30
C_2	60[18]	.20	C_5	17[17]	.58
C_3	34[3]	.41			

4[15] PM 39 N-S x 38 E-W x 38¼" hi N 322.7 Kg 25 gms 0.766

C_1	C_2	C_3	C_4	C_5
75[95] .139	119[58] .10[0]	59[91] .235	25[61] .192	30[13] .03

1 start
3 hr

INSTRUMENT CHECK

Date 10-17 1956 Time 8:30 AM ~~PM~~ Source No.

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	70	20×10		
DC-3	76	10×100		
Log N	7 sec			
R-1	9	70×1000		
R-2				
R.M.	800V	800V	1/2"	
R-2				
R.M.				

9:30 AM ~~19~~ 18 layers 38" EW 39" N.S × ~~42 3/4~~ 40½" n ~~361~~ 342 Kg zero = 0.990

C_1 136+52 C_2 227+63 C_3 89+41 C_4 28+13 C_5 45 57

.077 .052 .158 .2 .22

increasing width (EW) to 40" – now = 39" NS × 40" EW × 40½ tall

11:30 AM n 360 Kg 25 log N = .0015 zero = 0.986

C_1 512 37 C_2 851 23 C_3 227 57 C_4 125 12 C_5 170 31

0.025 .014 .061 .04 .059 DWM 9/8 R-18-56

increased to 41 3/4" high – now 39" NS × 40" EW × 41 3/4" high

Top layer is 38" × 40" – 177 – 9.38 Kg enriched 2×2×1 blocks

253 depleted 2×2×1 blocks

SUMMARY OF CRITICAL CONDITIONS

Expr. 38-1 Reactor 39 × 40 × 41¾"

~~Solution~~ _____ Height _____ ~~Volume~~ _____ Temp 78°F

~~Reflector~~ _____ ~~Height~~ _____ ~~Temp~~ _____

Time Critical 1:55 ~~AM~~ PM Duration 20 min. Log N 0.28

DC-3 = 84 × 50 × 10

Anal. Req. _____ gms U / gm _____ Sp. Gr. _____

Critical Mass _____ Atomic Ratio _____

3 d ~~4.44~~ 1:55 Positive period at 0.801 on dial Selsyn at 0.245

391 sec Leveled at 0.777 on dial selsyn at 0.280

1 start
15 min

Expr. 38-2 Time 2:30 ~~AM~~ PM Date 10-16 1956
Purpose remove 2×2×1' blocks - from North 12" - 40 enriched blocks removed
mass 3.116 kg removed
Personnel: DWM DFC TAF

369.8
3.12
366.68

2:40 PM tables in contact dial 0.972 plus period → 123.7 sec
8.3 ¢

SUMMARY OF CRITICAL CONDITIONS

Expr. 38-2 Reactor 39×40×41¾ (-12" × 40"×1") .01
Time Critical 2:40 ~~AM~~ PM Duration 5 min. Log N 0.31 level DC-3 = 91 on 50×10
Expr. Data: Fuel UF_4 blocks - 1-37½% & 2 depleted
Est. 12½% avg. Dial at 0.851
Reflector none except 1" Al table
Analytical Data
Critical Mass U-235 _____ Volume _____ Moderator _____

1 start
1 hr

Expr. 38-3 Time 3:10 ~~AM~~ PM Date 10-16 1956
Purpose Evaluation of 1" al. table
Personnel: DWM DFC TAF

3:25

195.5 sec ← Positive Period at 0.754 on dial selsyn at .30
5.7 ¢ leveled at 0.700 on dial selsyn at .375
Log N = .32 DC-3 = 95 × 50 × 10

From a plot of 38-1, 2 and 3, Dial reading 9.700 corresponds to 169 ea 2x2x1 blocks on top

bid 87

1" Alum worth $2 ea 2x2x1 → 6.387 kg

From 38-1 and 38-3 table calibration is

$\frac{3.1}{.024} = 129$ ¢/in and $\frac{5.7}{.054} = 105$ ¢/in

average is 117 ¢/in

From 38-1 and 38-2 table calibration is 340 ea 2x2x1 blocks per inch

∴ Excess period of 38-2, 8.3 ¢ corresponds to $\frac{8.3}{117} \times 540 = 38.3$ ea 2x2x1

∴ Just critical loading has a top layer of (87 − 38.3) = 48.7 ea 2x2x1

3.793 kg

18x13x20 = 4680 or 1560 enriched 2x2x3 360.688

3120 depleted 4.040

48.7 2x2x1 in 3.793

97.4 2x2x1 kg .042

368.563 kg

6.387

Corrected for 1" 374.950

250

START-UP CHECK LIST

Equipment Checked by DKC Personnel Check by TAF

Instrument and Safeties Checked and Reset by DK DWM

"Source In" Checked by — Source No. —

Emergency Equipment in Control Room Checked by DKC

Red Light On by

Start-Up OK'd by Time 39 AM PM Date 10-18 1956

INSTRUMENT CHECK

Date 10-18 1956 Time 3 10 ~~AM~~ PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	62	10x20		20x1
DC-3	84	10x100		10x1
Log N	15 sec	Period		
R-1				
R-2				
P. M.	800V			

1 start 1 hr

Expr. 39-1 Time 3 10 ~~AM~~ PM Date 10-18 195

Purpose Trial foil run A Catcher + Au on vertical foils roughly centered — same assy at 38-3

Personnel: DWM TAF DKC

12" in (on needle)

catcher foil 1" off center on enriched blocks

Au foil 2" to right

3 38 PM Start up

3 53 PM Sel. 0.2375 dial 0.801 pm. period

3 55:45 PM

SUMMARY OE CRITICAL CONDITIONS

Expr. 39-1 Reactor ~ 40" cube

Time Critical 3 50 ~~AM~~ PM Duration 20 min. Log N 1.0

DC-3 62 on 10x100 spread from 57½ to 62'

Expr. Data: Fuel 1:2 ratio H/x ~ 7.5

dial reading 0.702 selsyn 0.365

Reflector none

Analytical Data 12½% assay

Critical Mass U-235 366 kg Volume Moderator plexiglas

4 16 PM Scram time down 1/10 in 0.42 min

" 1/100 in 1.25 min

4	793 + 14	
01:05	395 + 9	201 + 11
02:10	594 + 5	198 + 12
03:15	796 + 13	202 + 8
04:20	1006 + 14	210 + 1
05:25	1211 + 2	204 + 4
06:28	1420 + 13	209 + 11
07:30	1633 + 1	212 + 4
8:35	1836 + 2	203 + 1
9:45	2047 + 5	211 + 3
10:50	2250 + 13	203 + 8
11:55	2461 + 4	210 + 7
12:55	2664 + 4	203 + 0

Disc @ 20

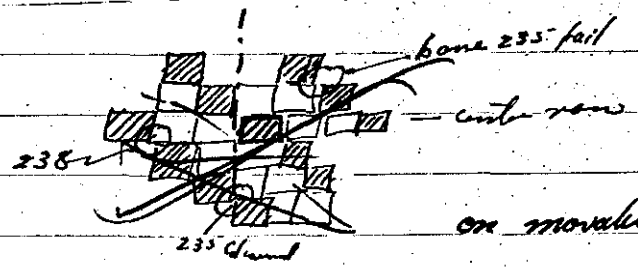
Fission counters 1 min counts
at W. face

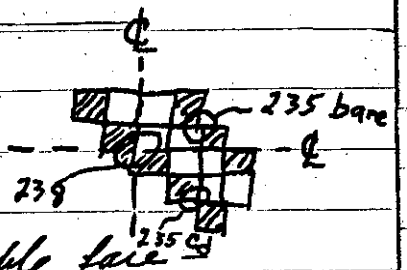
4 24 PM Radiation level at stairs: 25 Mr/hr (on Juno)
at movable table 250 Mr/hr x10 (2500

4 30 PM at movable table 500 Mr/hr.

10-19-56 8 30 AM at table 25 Mr/hr

Foil Positions
10-23-56





on movable table face

START-UP CHECK LIST
Equipment Checked by DHC Personnel Check by TAF
Instrument and [illegible] Checked and Reset by DHC TAF
"Source In" Checked by — Source No. —
Emergency Equipment in Control Room Checked by DHC
Red Light On by _____ AM
Start-Up OK'd by _____ Time 9 25 ~~PM~~ Date 10-23 1956

A-72 Cd Cover 235 3138
A-112 Bare 235 3046
A-116 Bare 238

1 start
1 hr.

Expr. 39-2 Time 9 25 AM ~~PM~~ Date 10-~~23~~ 22 1956
Purpose Expose catcher foils as shown

Personnel:

INSTRUMENT CHECK
Date 10-~~23~~ 22 1956 Time 9 25 AM ~~PM~~ Source No. 8

Instrument	Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	76	20x10	1"	
DC-3	74	10x100		
Log N				
R-1				
R-2				
P. M.	800V	900V	1"	

FC = 220 +68

at 11 10 AM 50x1 (Juno at reactor

10 35 On posit period Schyn at 0.2375 dial 0.801
10 35:16 Start Exp time log N = 0.37
level at 0.709 log N = 1.0 52 on DC3 10x100
shut down 10:55:16 1/100 down 1.2 min

Expr. 39-3 Time 2^10 ~~AM~~ PM Date 10-22 1956
Purpose Expose Bare 235 foils for normalizing

Personnel: DK TAF

1 start
1 hr

A-161 163 162
center where 238 foil was 3138 where Cd was 3046 2951 where 235 bare foil was
→ 156 158 105

156, 158, 105 toward fixed half

2^26 pm posit period did = 0.801 adsyn 0.2375
level Log N = 1.0+ (1.1) DC-3 = 56 on 10 x 100 did = 0.693

down 1/10 0.35 min F.C. 227+282
" 1/100 - 1.20 min

		Cd covered foil	bare foil
238 foil	26.8	756.5	1278
235 foil	1180	1235	1185
toward fixed half →	1506	1279	1318

corr = 1.0466 = 28.05 (1) 756.5 1.042 = 1332

$\frac{238}{235} = \frac{28}{1235} = 2.26 \times 10^{-2}$

$\frac{Cd}{bare} = \frac{756.5}{1332} = 0.5679$

front to back ratio (front = toward fixed half)
① 1.276
② 1.036
③ 1.112

INSTRUMENT CHECK

Date 10-23 1956 Time 900 AM PM Source No. _____

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	61	X 20 X 10		
DC-3	77	X 100 X 10		
Log N	4 sec			
R-1				
R-2				
P. M.	800 V			

START-UP CHECK LIST

Equipment Checked by TAE Personnel Check by DFC

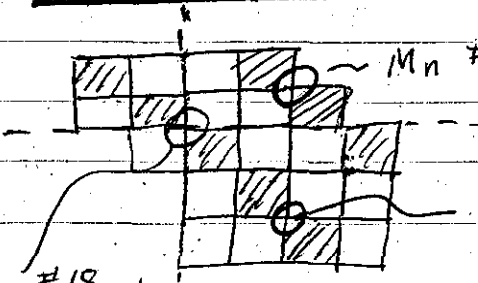
Instruments and Safeties Checked and Reset by TAE

"Source In" Checked by _____ Source No. _____

Emergency Equipment in Control Room Checked by TAE

Red Light On by DFC

Start-Up OK'd by DFC Time 915 AM PM Date 10-23 1956



Expr. _____ AM PM Date _____ Personnel: _____

Purpose _____

Expr. _____ Time _____ AM PM Date _____ 195[1]

Purpose _____

Personnel: _____

Expr. 39-4 Time 930 AM PM Date 10-23 1956

Purpose Expose above foils

Personnel: TAE DWM. DFC

940 Position Period dial at 0.8015 selsyn .24

9:45.35

leveled at log N = 0.2 DC-3 = 64 20x10 dial = 0.716

down 1/10 ~0.30 F.C 41 +194

down 1/100 ~1.22 min

1 start 1/2 hr

Expr. 39-5 Time 350 ~~AM~~ PM Date 10-23 1956

Purpose Exposure of Gold foils

Personnel: TKF PWM DK

Au Foils were placed in assembly as indicated on accompanying diagram.

401 Positive Period at 0.942 on dial .275 on selsyn

4:09.6 started

Leveled at Log N = 1.1 DC-3 = 62 X 100 X 10

dial at 0.620 selsyn 0.44

Down 1/10 = 0.36 min FC = 265 +58 at 4:35

down 1/100 = 1.23 min

Shutdown time 4:29.6

NO. 340- M DIETZGEN GRAPH PA
MILLIMETER

EUGENE DIETZGEN CO.
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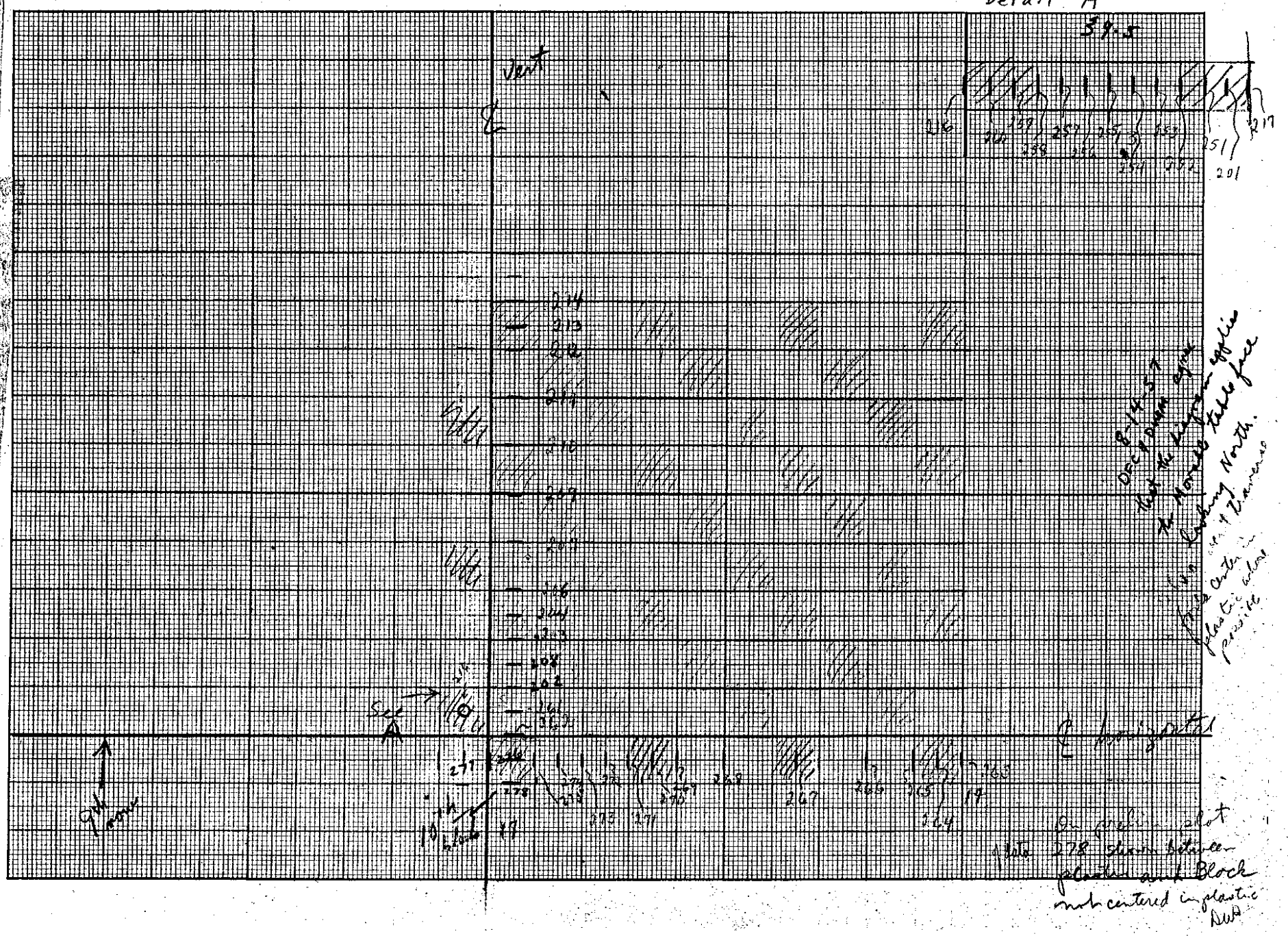


8-14-57
DEC & DIAM agree
that the diagram applies
to Movable table face
looking North.
[illegible] center in
plastic whose
possible

On preliminary plot
of data 278 shown between
plastic and Block
not centered in plastic
DWA

INSTRUMENT CHECK

Date 10-30 1956 Time 1:00 ~~AM~~ PM Source No. _____

Trip

Instrument	Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	75	10x20		
DC-3	60	10x100		
Log N	5 sec			
R-1	77	10x1000		
R-2				
P. M.	800 V			

Foil Calibrating wheel centered 22 7/8" off floor on West face

1 stat 2 hr

Expr. 3-9-6 Time 1:45 ~~AM~~ PM Date 10-30 1956

Purpose Expose Cd covered Au foils calibrate fission foils

Personnel: DH TAF

2:00 PM Posit Period Selsyn 0.2375 dial .8015

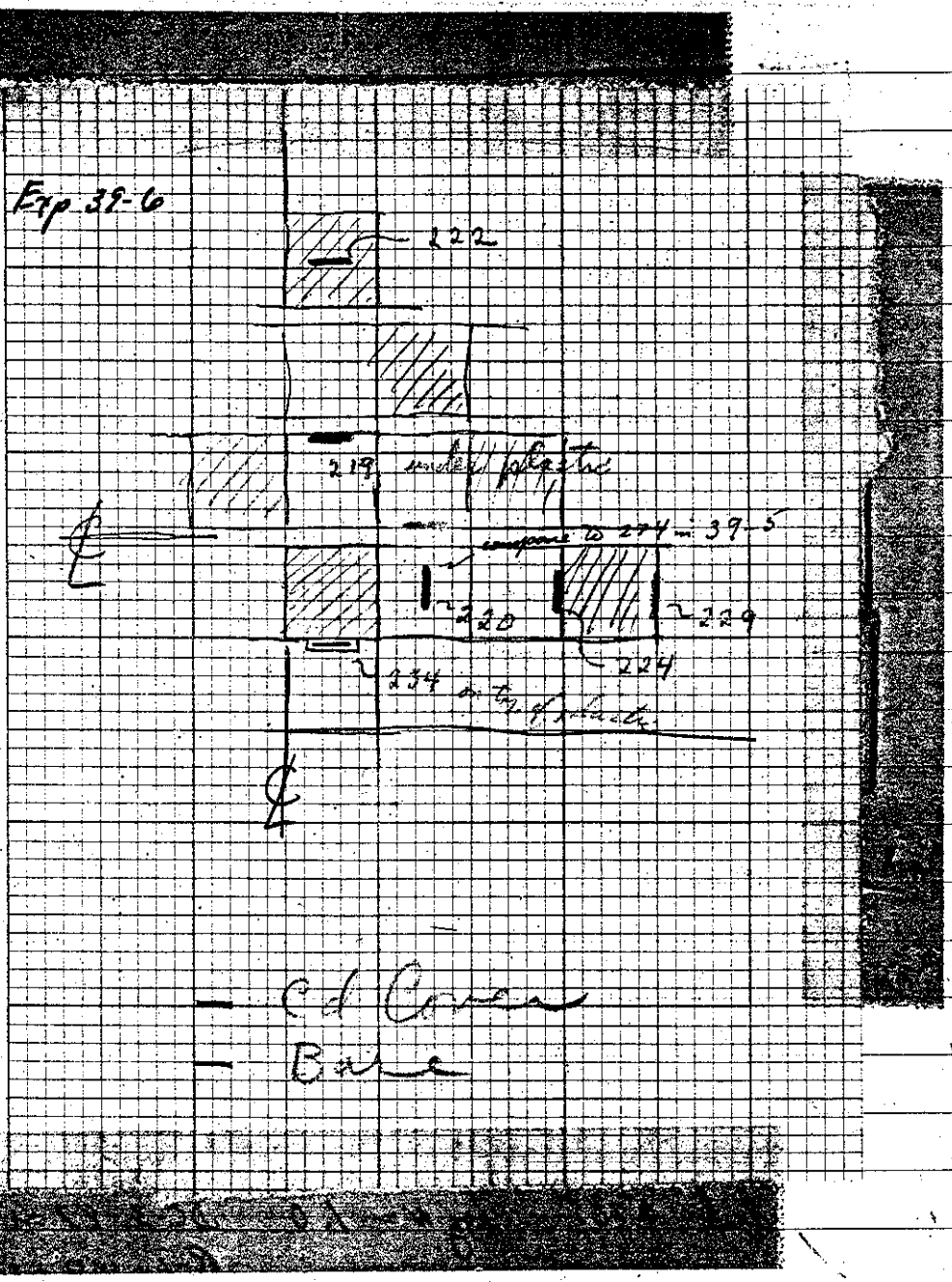
2:02 " " 0.215 dial .819

Log N 0.97
DC-3 62 (100x10)
R-1 3.1 (500x1000)
dial = .746 level

2:34:57 Shut down 1/10 = 0.42

1/100 = 1.27

EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO 340 -10 DIETZGEN GRAPH PAPER
10 X 10 PER INCH



222 CF

234 CF

229 CF

219 flux = 0.7115

INSTRUMENT CHECK

Date 11-1- 1956 Time 10^{20} AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	64	10x20		1x20
DC-3	68	10x100		1x20
Log N	7 sec			
R-1	7	10x1000		
R-2				
P.M.	800V		1"	

~~START-UP CHECK LIST~~

~~Equipment Checked by~~ DHC ~~Personnel Check by~~ DWM

Instrument and Safeties Checked and Reset by DWM

"Source In" Checked by _____ Source No. _____

Emergency Equipment in Control Room Checked by DHC

Red Light On by TAF

Start-Up OK'd by DHC Time 10^{20} AM ~~PM~~ Date 11-1 1956

Expr. 39-7 Time 10^{25} AM ~~PM~~ Date 11-1 1956

Purpose Expose 5/16" U foils Horizontal

Same loading as 38-3

Personnel: TAF DWM DHC

1 start
1 hr

10^{45} AM F.C. begins to count at ~ log N = .001

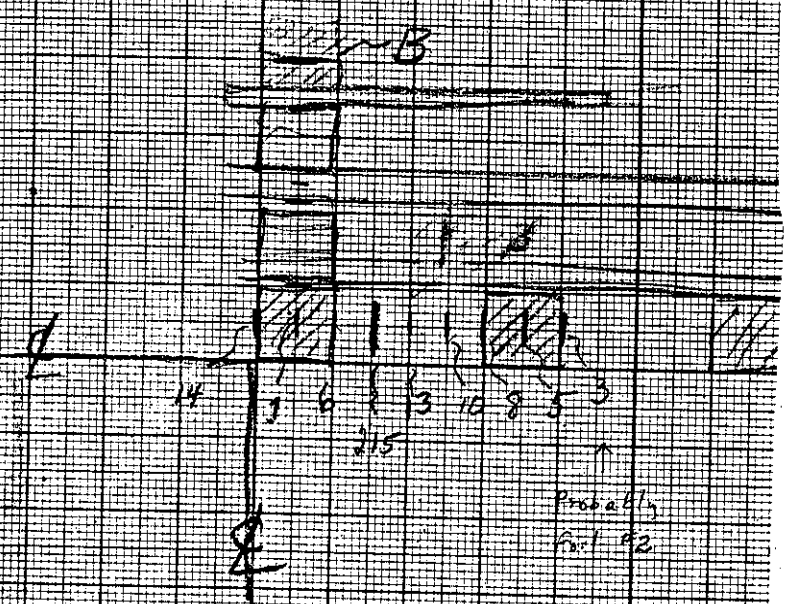
10^{52} AM Selsyn at 0.165 dial at 0.881 (posit period)
Movable stack has shifted leaning away from fixed so that base is now almost in contact

11^{10} AM dial 0.785 log N = 1.0 DC-3 · 47 on 10x100
R-1 4.9 x 200 x 1000

down 1/10 0.42 FC = 177 + 224 (256)
1/100 1.25

39-7

Foil Position
5/16 U foil



11-2-56 Net wgt plastic 138.91 Kg on unstacking.
From p. 249- Net U^{25} on tables = 371.54 Kg.

$$\frac{H}{x} = \frac{138.91 \times 188}{371.54} = 7.04$$

.07

7.11

.14

7.25

water in depleted [illegible]

[illegible] Aug 15, 1957

Expr. 40-1 Time 2:50 ~~AM~~ PM Date 11-2 1956
Purpose 1:1 ratio enriched & distilled
1/8" plastic 1 dimension (loose = 34 x 33)
Personnel: 65.

1 start
1 hr

10 layers high Tables apart

3:10 PM C1 C2 C3 ~~C4 (x16~~ 5 min counts
12+38 15+28 18+3

3:15 PM tables together dial 0.894
C1 C2 C3
12+12 16+45 20+45

Expr. 40-2 Time 8:30 AM ~~PM~~ Date 11-5 1956
Purpose Same as 40-1 increasing loading —
Personnel:

40-2a
10 layers C1 C2 C3 BK4 & tables together
11+53 (12) 15+31 (15½) 13+1 (13)

7 start
8 hr

INSTRUMENT CHECK

Date 11-5 1956 Time 8:30 AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	70	10 x 20		20 x 10
DC-3	60	10 x 100		~~10~~ 20 x 1
Log N	5 sec			7 sec
R-1	10	1000 x 10		100 x 10
R-2				
P. M.	800V			

START-UP CHECK LIST
Equipment Checked by DH Personnel Check by
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 DH
Start-Up OK'd by Time AM ~~PM~~ Date 195

40-2b ~~C1 C2~~ tables together at 0.912 on dial

13 layers C_1 C_2 C_3 .025 on selsyn,

21^{+6} .57 25^{+5} .62 16^{+29} .79

40-2c

15 layers 30^{+11} .4 44^{+22} .35 17^{+58} .12 dial at 0.924 selsyn at .020

to

40-2d

11:00 AM 16 layers (345.8 Kg) 36^{+48} .32 60^{+12} .26 20^{+53} .63 dial 0.928 selsyn 0.02

40-2e

1:00 PM Base dimensions increased to 33 x 36 (added 20.3 Kg 366.1 Kg ∠ 55.5 Kg on manual entry)

contact 0.922

43^{+27} .278 69^{+36} .225 26^{+50} .48

~~40-2f~~

40-2f . Base dimensions 36 x 36 (total U^{235} = 400 Kg)

66^{+43} .18 103^{+45} .15 32^{+21} .41 Contact at 0.942

40-2g . adding 17^{+4} layers = 424.5 Kg

98^{+4} .122 158^{+15} .098 37^{+26} .35

INSTRUMENT CHECK

Date 11-6 1956 Time 8 45 AM PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	68	10×20		1×20
DC-3	60	10×100		1×10
Log N	7 sec			7 sec
R-1	10	10×1000		10×100
R-2				
P. M.	800V			800V

Expr. 40-2-h Time 9 00 AM PM Date 11-6 1956
Purpose Continue adding to 36×36" base (1/8" plastic separation)
Personnel: DWM JAF DEC

3 start
3 hr

36" × 36" base = 18 × 12 blocks = 108 enriched/layer

Start = 108 × 17 = 1836 blocks = 424.48 Kg 25 (from enriched blocks above

added one layer - 18 layers high - contact at .961

10 20 C_1 C_2 C_3 log N = 00036

$165^{+43}_{.072}$ $291^{+61}_{.053}$ $65^{+9}_{.20}$ DC-2 55×1×20

(1944 blocks = 449 Kg)

40-2j Added 8 rows (8 × 18 rows to top) 24" × 36" - none on movable table or elbow corner - one row off S edge Out of enriched material. Contact at .965

(total U^{235} = 2016 blocks × 231.2 = 466 Kg)

$403^{+12}_{.03}$ $696^{+57}_{.022}$ $115^{+49}_{.103}$ log N = .00088

DC-2 = 40 × 10 × 5

40-2K Rearranged top - added some 1×1×1 (see sketch)

531 944 106 log N = .0012

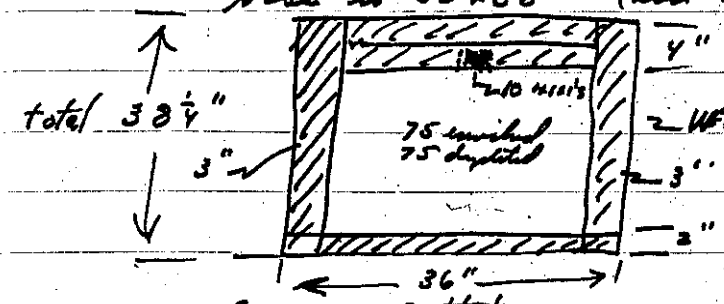
506 888 100 DC-2 = 52 × 5 × 10

510 913 99 Contact at .969

Expr. 40-3 Time 12 45 ~~AM~~ PM Date 11-6 1956
Purpose attempt to get become critical by rearranging stack as shown.
Personnel: DWM TAF DK

1 start
1 hr

base is 36×38" (last 2" vertical is different)



cross hatched area all depleted
otherwise same ratio

~~[illegible] 2×2×3 block~~
{ ~~[illegible]~~ blocks made up as shown of 10-1×1×1's total vol = 24,238 cu inches of U^{25} blocks

1 12 Mass = 467.76 Kg U^{25}

1 25 totals together dial = 0.968 log N = .009

C_1	C_2	C_3
810	1421	132
804 .0148	1450 .0107	128 .099

1 start
1/2 hr

Expr. 40-4 2 06 AM Date 11-6 1956
Purpose Same assy with 1" Al plate on top
Personnel: TAF DK

2 22 log N = .009 contact dial .975 not level

2 35 log N = .075

2 47 log N = .204 12 min (by step watch) = 720 sec period.

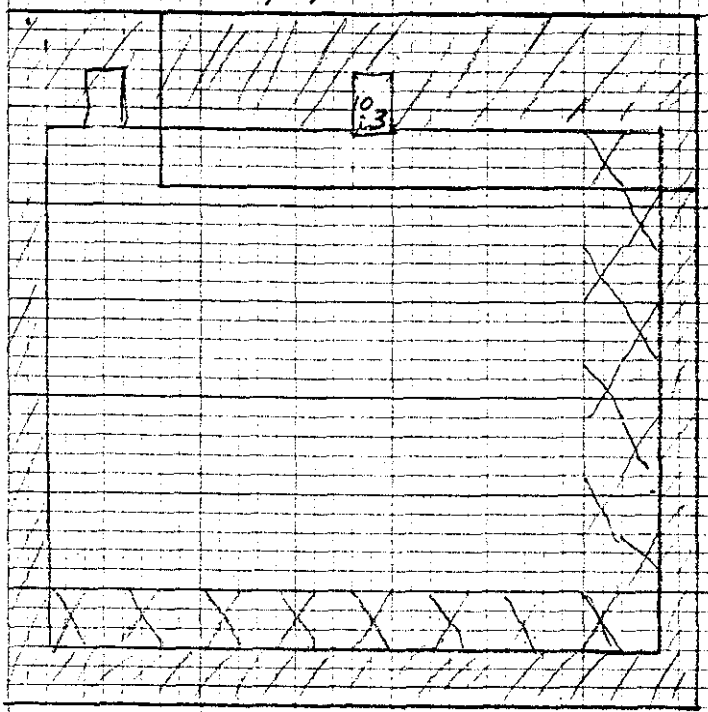
Jan 10, 1956

there is 7.4 kg U-235 missing from West Face and alum reflector worth is ~10 kg for 37.5 unmoderated. this exp. alum will be worth less. Therefore we will use +75 ± 5 as crit mass for 36×38×38¼ cube with bottom reflector

DWM. DF.C.

See 90-2K p.262

19th row



Shaded area all depleted

Enriched $8 \times 9 = (72+1) 2 \times 2 \times 3$

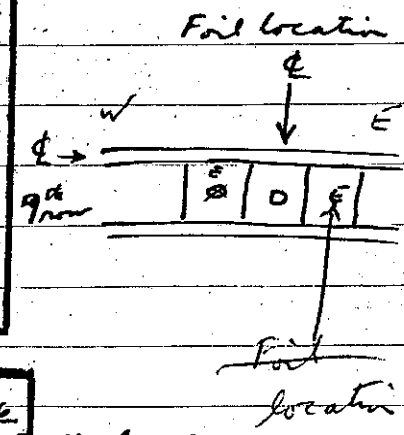
$+ 10 \text{ in}^3$

$= 73\frac{9}{12} \text{ R} \times 2 \times 3$

INSTRUMENT CHECK

Date Nov 7 1956 Time 9 35 AM PM Source No.

Instrument	Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	70 x 10 x 20			
DC-3	60 x 10 x 100			
Log N	7 sec			
R-1	5 x 10 x 1000			
R-2				
P. M.	800 V			



Expr. 40-5 Time 10 00 AM PM Date Nov 7 1956

Purpose Preliminary foil run to det. n power level.
FA U-235 Foil #12

Personnel: AWM TAFox DFC

Start 1 hr

Fission counter inserted between blocks on ℄

Loading same as 40-4. 1/4 Alum. reflector added on all sides

1" reflector removed from movable table.

10^{15} In + period ~~~~ ln N = .025 Selsyn 0.28

16 " (~ 100 sec) ln N ~ 0.05 " .27 Dial 0.739

$10^{19:50}$ Start timing exposure

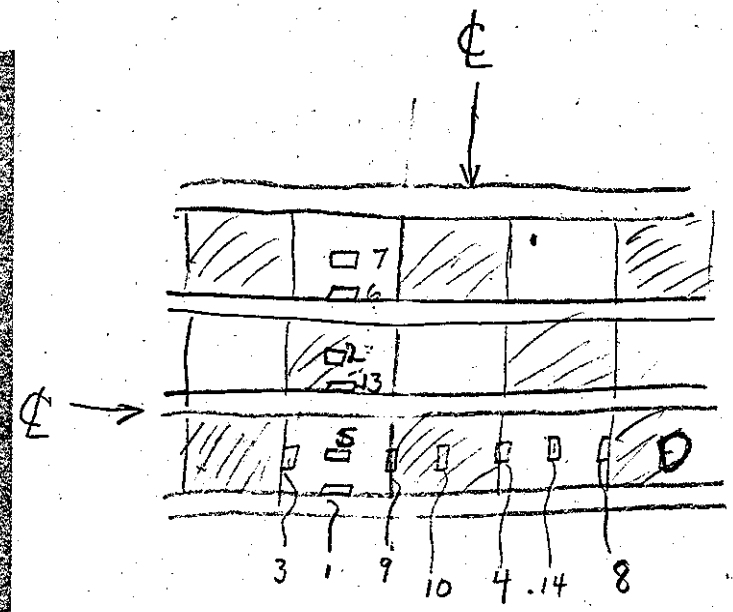
Level readings log N = 1.0 DC-3 = 74 x 10 x 100 R-1 = 3.8 x 500 x 1000

Selsyn 0.397 Dial = 0.653

$10^{39:50}$ Stop exp. On 0.35' ln = 0.1 FC-1978 (x64) 142

1.29' ln = 0.01

Expr. 40-6 Time 1:00 AM PM Date 11-6 1955
Purpose Expose U foils no cleaner
Same assembly as 40-8
Personnel: DWM TAFDR



Fission Foil Positions
Exp 40-6

1^{50} + period ~~Dial~~ Selsyn 0.26_5 Dial 0.740

$1\ 52^{41}$ start timing exposure

Level ~ 0.756

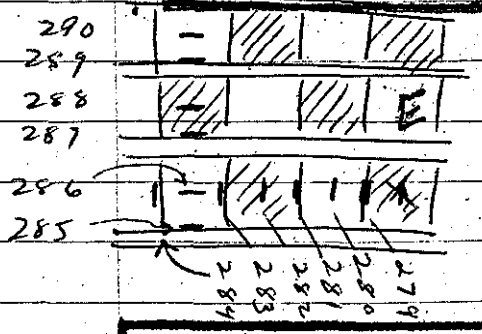
Fission Count

$2^{12\ 41}$ Shut down lnN 0.1 @ 0.36 min 458 x256

0.01 @ 1.30 " +212

Expr. 40-7 Time 2^50 ~~AM~~ PM Date 11-8 1956
Purpose Expose Au foils as shown

Personnel: TAF DK DWM



Gold foil locations for Run 40-7

1 start 1/2 hr

INSTRUMENT CHECK

Date 11-8 1956 Time 2^50 ~~AM~~ PM Source No. Y

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	50	10 x 20		10 x 1
DC-3	50	10 x 100		10 x 1
Log N	7 sec			
R-1	10	10 x 1000		10 x 100
R-2				
P. M.	800 V			

~~Contact at~~

320 Positive period at 0.740 on dial
exposure started at 3:22:38
leveled at 0.739 on dial
log N = 1.0 (recalibrated before run)
Shutdown at 3:42:38 DC-3 = 59 x 100 x 10
Fission Counter x 256 = 364 + 74
log N 0.1 @ 0.33 min
.01 @ 1.17 min

Counter
x256
212

INSTRUMENT CHECK

Date 11-11 1956 Time 10^{30} AM ~~PM~~ Source No. _____

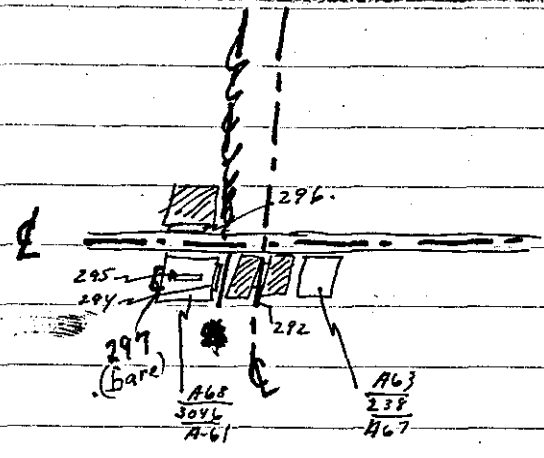
Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	70	20×10	≈	
DC-3	60	10×100		
Log N	7 sec			
R-1	10	10×1000		
R-2				
P. M.	800V			

log N calibrated

1 start.
1 hr

Expr. 40-9 Time 10^{30} AM ~~PM~~ Date 11-11 1956
Purpose Expose Cd covered Au + 235-238 catchers as shown

Personnel: _____



61 + 67 at interface - facing fixed section

comp log N

log N .005 .0002

11:03:42 AM exposure time started 0.37 log N

11:05:35 log N = 1.0 DC-3 = 66 (100 × 10) R-1 3.2 (500 × 1000)

log N_2 (comp) 0.05 dial 0.664 Scaler = 0.385

11:22:42 time started 1/10 down 0.30 min 1/100 down 1.15

F.C × 256 = 510 + 206

INSTRUMENT CHECK

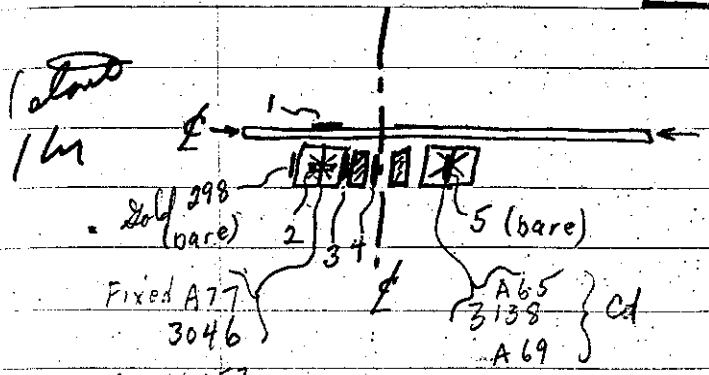
Date 11-13 1956 Time 8 46 AM ~~PM~~ Source No. Y

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	73 X 20 X 10			
DC-3	6.2 X 100 X 10			
Log N	7 sec			
R-1	at 7 X 10 X 1000			
R-2				
P. M.	760 V			

Expr 40-10 Time 8 50 AM ~~PM~~ Date 11-13 1956

Purpose Expose Cd-Covered U-235 and Cd-235 catchers as shown

Personnel:



1-4 Cd-Covered U-235

5 bare U-235

9 12 Positive Period at 0.742 on dial

9:15:00 Exposure time started 0.37 log N.

9 18 log N = 1.0 DC-3 = 60 X 100 X 10 R-1 3 X 500 X 1000

dial 0.666 relayn 0.39

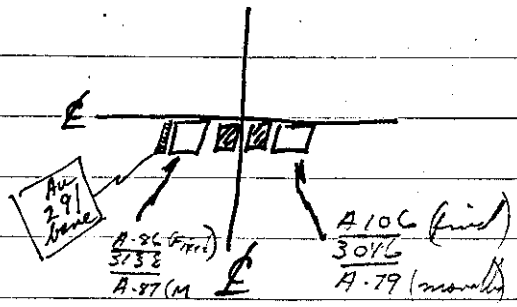
9:35:00 Shutdown $\frac{1}{10}$ down = .33 $\frac{1}{100}$ down = 1.18

178 @ 11 20 AM

F.C x 256 = 455 ~~+140~~

Expr. 40-11 Time 1:00 ~~AM~~ PM Date 11-13 1956
Purpose 2 bare catcher foil on shower at interface w Au foil on nanolite
Personnel:

1 start
1 kw



1:17 PM + period Selsyn 0.26

1:21:10 Exp started Log N = 0.37
level 1.04 Log N lid 0.659
1/10 dec 0.35 min 1/100 dec 1.2 min
F. C. 500 x256 + 157

START-UP CHECK LIST

Equipment Checked by DRC Personnel Check by TAF
Instruments and Safeties Checked and Reset by DRC
"Source In" Checked by — Source No. —
Emergency [illegible] Control Room Checked by DRC
Red Light [illegible] DRC
Start-Up OK'd by DRC Time 8:30 AM ~~PM~~ Date 11-20 1956

Expr. 40-12 Time 8:30 AM ~~PM~~ Date 11-20 1956
Purpose Calibrate U foils using wheel on West face of assembly
Personnel:

INSTRUMENT CHECK

Date 11-20 1956 Time 8:30 AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1	—	—		
~~DC-2~~	70	10×20		
DC-3	60	100×10		
Log N	7			
R-1	10	10×1000		
R-2	—	—		
P. M.	800V			

1 count / 1 hr

2 Fission Counters (1-235 / 1-238) in same slot (about midway on West face

8:57 AM Pos. period Slope 0.26

9:01:04 exposure time started Log N = 1

DC-3 zero set back from 80 & 25 (on 100 × 10 scale)

leveling at Log N = 2.7 DC-3 = 75 R-1 5.2 (1000 × 1000)

9:10 dial = 0.648 slope = 0.37

9:11:15 AM Fission counters started

9:16 dial reset & 0.645 G level slope = 0.395

9:21:04 Stopped down 1/10 0.4 1/100 1.4

9:26 20 mr/hr at door to Room 201 (outside) in corridor

9:28 AM { 238 111^{+4} ×16
235 382^{+98} ×256

START-UP CHECK LIST

Equipment Checked by DJC Personnel Check by DWM

Instrument and Safeties Checked and Reset by [illegible]

"Source In" Checked by ——— Source No. ———

Emergency Equipment in Control Room Checked by DJC

Red Light On by DWM

Start-Up OK'd by DJC Time 3:00 ~~AM~~ PM Date 11-23 1956

Expr. 40-13 Time 3:00 ~~AM~~ PM Date 11-23 1956

Purpose immediate foil #14 (U25) for power level check — (depleted U piled around wheel

Personnel: DJC DWM

1. stand
1/2 hr

INSTRUMENT CHECK

Date 11-23 1956 Time ——— AM PM Source No. ———

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	60	10x20		
DC-3	62	10x100		
Log N	7 [illegible]			
R-1	10	1000x10		
R-2	respondo			
P. M.	[illegible]			

3:18:30 +Period Start exposure Dial 0.203 0.82

Level .106 0.93

3 38 30 Stop exposure

ln = 0.1 T = 0.33 Min

ln = 0.01 t = 1.24 Min.

5 x 256 + 134

398 x 256 + 36

INSTRUMENT CHECK

Date 11-27 1956 Time 9^30 AM ~~PM~~ Source No. γ

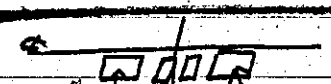
Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	58	10×20		1×20
DC-3	66	10×100		10×1
Log N	7 sec	–		7 sec
R-1	9	10×1000		10×100
R-2		responds		
P. M.	800V			800V

Expr. 40-14 Time 9^30 AM ~~PM~~ Date 11-27 1956

Purpose check foil calibration using plexiglass around wheel - same position as 40-13

Personnel:

1 start
2 hr



A70 A-117
Cd 3046 3138
A109 ℄ A-113 – toward fixed table

10^45 AM at Selsyn = 1.23" log N = .00105 DC-3 = 50 (1×1) DC-2 53 (1×10)
R-2 = 70 (200×100)
tables run apart – Al removed from movable half and arm of fixed half – so 1st 9" has no Al side or top reflector.

10^55 at Selsyn = 1.23" log N = .00083 DC-3 46 DC-2 41
R-2 52

11^05 Al removed from E face, S face & 1/4" sheet from top of fixed section
log N = .00044 DC3 = 46 (10×1) DC2 31 (1×10) R2 = 32 (200×100) Selsyn 1.23
pos period selsyn 0.715

11^29:55 AM Exp started log N = 0.37
R-1 32 (1000×500)
dial = ~~.822~~ .222 slsyn = 0.825 log N1 = 1.0 DC3 64 (10×100)
comp log N2 = .024

11^49:55 AM Stopped Exp dn 1/10 0.36 min 238 FC = 8^+33 ×256
dn 1/100 1.28 min 235 FC = 1255^+110 ×256

INSTRUMENT CHECK

Date Nov 28 1956 Time 2 45 AM PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1	—	—		
DC-2	68	10x20		
DC-3	64	10x100		
Log N	7sec	7sec		
R-1	9	10x1000		
R-2	responds			
P. M.		800V		

Expr. 40-15 Time 3 00 ~~AM~~ PM Date Nov 28 1956

Purpose Check Min. Fission Counters

Personnel: DWM TAF.

1 start 1 1/2 br

The 238 and 235 Miniature fission counters were positioned in the middle of the assembly at the separation interface

on ℄ in E-W dirs.

on ℄ of 9th row up vertically (or 10th row down from Top)

	x256		238	235
238	Counter	235	12	601
1	Registers	98	13	648
2	Reg	102	14	696
4	Reg	206	15	745
6	Reg	304	16	795
7		352	17	846
8		404	18	899
9		451	19	946
10		503	20	999
11		555		

log N = 1.0 DC-3 266

Dial 4.96 Selsyn 0.565

Run Duration 0.37 to end

20.25 x 50 = 1013 sec = 16.9 MIN.

ln N @ .001 235 Counts 20 x 256 + 37 = 5157

235 Counts 100.7 x 256 + 64

$\frac{257856}{5157} = 50.00$

#1 (235) 345.2 μg U-235

#2 (238) 398.9 μg U-238 ∴ $50.00 \times \frac{398.9}{345.2} = 1.1556 \times 10^{..}$

$\frac{\sigma_f (235)\phi}{\sigma_f (238)\phi} = 57.78$

wgt plastic = 59.53 kg

Wgt's 235 in enriched blocks = 467.753 kg

" " in depleted " 2.616

Total 470.369 kg

H/X = 2.38

+ water content = .07

net 2.45

+ water in depleted .07

2.52

Adm

8-15-57

INSTRUMENT CHECK

Date Dec 1956 Time _____ AM PM Source No. _____

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	70	10x20		
DC-3	65	10x100		
Log N	7sec			
R-1	7	10x1000		
R-2	Responds			
P. M.	800V			

Expr. 41-1 Time 10 20 AM ~~PM~~ Date 12-6 1956

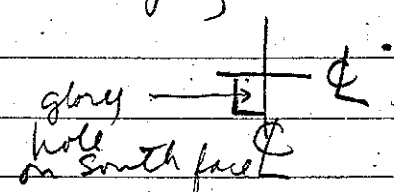
Purpose Bare assembly 37.5 % blocks only - pseudo-cylinder as before.

Personnel: TAF DWM

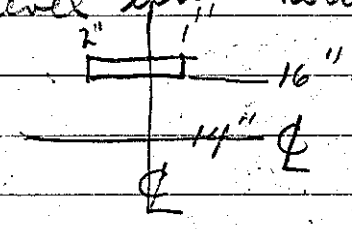
3 start
3 hr

	C_1	C_2	C_3	
x64	13 + 11	17 + 11	11 + 38	7 layer fixed table

1" x 1" x 17" glory hole on South face {14 layers movable / 10 1/3 layers fixed}



1/4" x 3" x 32" hole thru the E-W dim of assembly at the 16" level lined with alum Tube



x64	29 + 53	43 + 31	30 + 14	
x64	854 + 59	1432 + 49	290 + 39	28" high

[redacted]

1.30 Added 3 sq. in to base area - now totals 851 sq. in

~~2.10~~ Still not critical

Expr. 41-2 Time 2 30 ~~AM~~ PM Date 12-6 1956
Purpose Trimmed pseudo-cylinder in manner shown to go critical
Personnel: TAF DWM

1 start 2 hr

start level 3:45 pm

U-238 x256	U-235 x256
1	19
2	41
3	63
4	~84
5	106
6	130
7	153
8	174
9	197
10	220
11	243
12	265
13	286
14	308
15	330
16	351
17	374
18	~397
19	417
20	438
21	460
22	484
23	507
24	532
25	554
26	577
27	599
28	624
29	646
30	668
31	693

level Selsyn 0.25 | log H = .72
Dial 0.703 | .0135

238	235
32	715
33	? 7 ?
34	759
35	779
36	804
37	827
38	850
39	873
40	894
41	916

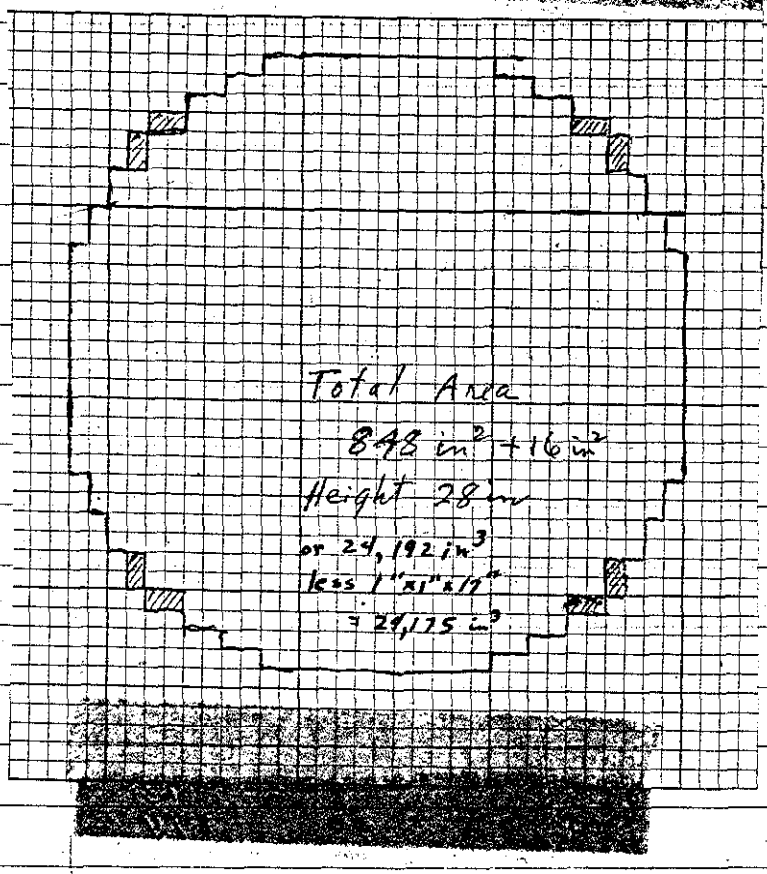
Start Shutting down. 3:04:45

41 + 71 921 + 60 ln @ .0007

$\frac{235,836}{10567} = 22.32$

22.32 x 1.1556 = 25.79

table



Loading for

41-2
40-2

1717	@	231.21	→ 396.988
19	@	19.996	.370
888	@		69.166
24			466.524

INSTRUMENT CHECK

Date 12-11 1956 Time 1 25 AM PM Source No. ✓

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	80	X 100	X 10	
DC-3	65	X 100	X 10	
Log N	7 sec			
R-1	7 X 10 X 1000			
R-2	Responds			
P. M.	800 ✓			

Expr. 412-B Time 3 20 AM PM Date 12-11 195

Purpose Cadmium Covered U-235 Counter and Au and Mn foils on instead of bare unmod pseudo cyl.

Personnel: TAF DWM

1 start
1/2 hr

started 3:47:48

leveled at log N = 2.7 Compensated log N = .075

R_1 = 6 X 1000 X 1000

stopped 4:07:48

down to .50 at 0.1 min on log N

down to .0075 in .80 min on compensated log N

down to .027 in 1.13 min on log N

U-238 U-235 (Cd Covered)

176 x256 +88 3890 x256 + 43

Au foil #6 -1" Mn #7 +1" from Center

Expr. 42 - 1 Time 1 00 ~~AM~~ PM Date Dec 12 1956
Purpose Carbon - UF_6C stack
2" grey block - 2 7/8" layer graphite
Personnel: ~~DEC~~ DWM TAF CC

$\frac{C}{U^{235}} \approx 41.8$

6 starts 3 hrs

	x64 C_1	$\frac{1}{M_1}$	x64 C_2	$\frac{1}{M_2}$	x64 C_3	$\frac{1}{M_3}$	kg (60.112 per layer)
2 layers Apart	22.72 22 + 46	1.0	16.27 16 + 17	1.0	21.19 21 + 12	1.0	
2 layers Together	.53 24 + 34	.927	.16 17 + 10	.948	.42 23 + 27	.905	
4 layers Apart	.09 17 + 6	1.00	.22 18 + 14	.892	.39 27 + 25	.774	
4 layers Together	.84 19 + 53	.862	.56 21 + 36	.755	.81 33 + 52	.626	
5 layers together	.60 22 + 38	~~.845~~ ~~.756~~ .756	.56 34 + 36	.474 ~~.527~~	.09 48 + 5	.440	300.573

Dec 13, 1956

8 20 AM 5 layers Together	.47 21 + 62	.378	32 + 0	.508	.48 47 + 31	.446	

6 starts 3 hrs

INSTRUMENT CHECK

Date Dec 13 1956 Time 8 30 AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	70	10x20		
DC-3	65	10x100		
Log N	75cc			
R-1	7	10x1000		
R-2	Respond			
P. M.	800V			

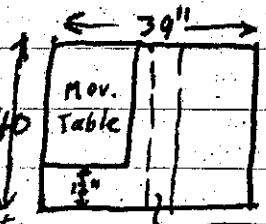
9 20 6 layers Together	.38 41 + 24	.413	.19 64 + 12	.253	.09 75 + 6	.282	360.685
10 05 7 layers Together	538 + 47	.032	848 + 21	.019	475 + 25	.045	

(seventh layer has 480 - 2x2x1's + 100 2x2x3's)

dial reading .865 at contact

selsyn at .045

Added strip 6" x 40" across top (~~40~~ 2x2x3)
strip was centered in the 39" dimension as
per sketch



total blocks
1700 - 2x2x3 = 393.057
480 - 2x2x1 = 37.387
430.444 kg

Centered 6" strip
log N at .00062 (same multiplication as last run)
is attained at 0.38 on selsyn.
10⁴⁵ Positive period at 0.11 on selsyn
11⁰⁰ leveled at 0.24 on selsyn - 0.740 on dial
Critical log N = .18

11¹⁰ Removed 16 blocks leaving 6"x24" penthouse centered (4 large graphite pc.)
log N at .00062 at 0.33 on selsyn
(was .00050 at 0.38 on selsyn)
11³⁰ Positive Period at .08 on selsyn - 0,851 on dial
essentially in contact
11³⁵ leveled at 0.19 on selsyn - 0,884 on dial
log N = .19

Expr. 42-1
Purpose
Dec 13 1956
Personnel: DWM TA Fox C.C.

Uranium 235 mass = 426.745 kg

graphite wt.
7 pc 6.37
16 pc 43.06
16 pc 42.40
16 pc 42.34
48 pc 128.71
or 2.6815 kg/pc

Total graphite in stack = 45 large 12" pcs + 1 sm (4") pc

45
7
315
4 on penthouse
319 large pcs @ 2.6815 855.40
7 sm pc 6.37
861.77 kg graphite

$$\frac{C}{U_{235}} = \frac{\overset{2025.16}{861.77 \times 235}}{\underset{512.094}{12 \times 426.745}} = 39.547$$

$\frac{C}{U_{235}}$ in UCF_6 blocks = $\frac{1}{.375}$ = 2.667

Total $\frac{C}{U_{235}}$ = 42.214

Alum foil 1.67 kg

layer

INSTRUMENT CHECK

Date 12-27 1956 Time 2:00 AM PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	70	10x100		
DC-3	70	10x20		
Log N	7m			
R-1				
R-2				
P. M.	800✓	800✓		800✓

START-UP CHECK LIST

Equipment Checked by DK Personnel Check by _____
Instrument ... ...ked and Reset by Fox
"Source In" _____ Source No. _____
Emergency ... ...l Room Checked by _____
Red Light ... _____
Start-Up OK'd by _____ Time _____ AM PM Date 12-27 195__

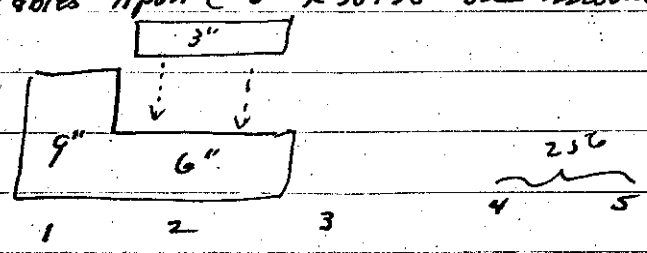
8 [illegible]
4 hrs

Expr. 43-1 Time _____ AM PM Date 12-27 1956
Purpose 3/4" plastic mod in 2 dimen.
Slab geometry 48" wide x 30" tall
H/X ~ 14
Personnel: Fox J Knight Cross - DK

4.30 PM Stacking stopped at 48" x 6" x 13 3/4" (10" fuel)

800 AM - 12-28-56 - Background counts

Tables Apart (3" x 30" x 30" on movable)



23 +7 20 +52 91 +21 1 +56 0 +196

84 (1) (23) (2) (21) (3) (91) (4) 311 (5) #986

Exp 43-1 (cont.)

8:30 Tables together

1	2	3	4	5
53^{+3}	27^{+6}	110^{+49}	1^{+93}	0^{+241}

INSTRUMENT CHECK

Date 12-28 1956 Time 8:45 AM PM Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	72	10x20		
DC-3	68	10x100		
Log N				
R-1				
R-2				
P. M.				

Movable table = 121 blocks (2+2+3) = 2.8 Kg

17½ blocks long by 3 wide when tables together

per layer = 11.2 Kg.

5 layers = 56.0 kg 25

① .7 ② .78 ③ .82

9:05 6 layers.

35^{+23}	30^{47}	111^{9}	1^{+111}	0^{+176}
.66	.68	.82		

10:45/A 8 layers. #3 #2

41^{+44}	137^{7} ⟷	33^{43}	1^{82}	0^{+168}
.56	.66	.62		

11:25/A 10 layers

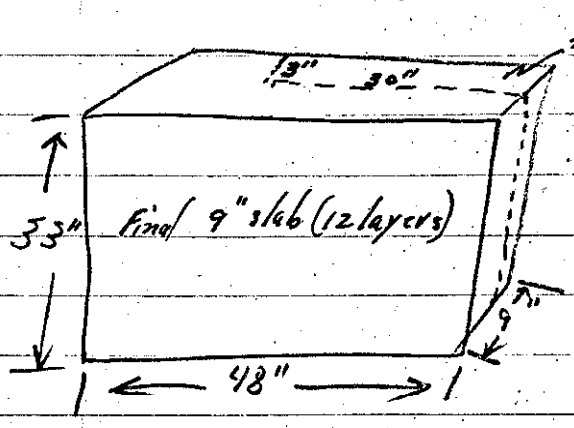
70^{34}	75^{31}	164^{35}	2^{85}	1
.326	.278	.55		

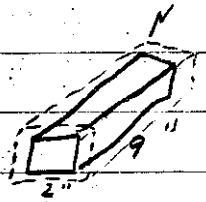
12 45 PM 11 layers –

79.2 71.7 177 2 +142 1 28

.29 .273 .52

net 3/8" lucite





1 20 PM 12 layers approx 134.4 Kg 4 235

100 39 97 18 174 16 2 255

.229 .215 .52

Epoxy to approx 15-16 layers of this thickness

48 × 9 × 42 – 45"

Expr. 43-2 Time 1 45 PM Date 12 - 28 1956
Purpose Same moderation as 43-1 (3/4" lucite)
but adding 1" to 9" dimension
base layer now 48 x 10"
Personnel: JKP JK CC DK

4 starts
3 hr

1 layer = 17 1/2 long x 3 1/3 wide = 58.3 blocks/layer = 13.46 kg 25 kg/layer

1 2 3 4 5
(23) (21) (91) (311) (196)

2 10 PM 6 layers 10" wide plus 4 layers 9" wide
too active to count

2 45 9 layers tall on fixed (total 10" wide) 10 layers on movable

3 15 Critical at 0.845 on Selsyn

3 40 8 layers [48 x 10" x 22"]
Sub Critical at a high multiplication >10

4 05 8 layers plus a 1" layer 8" wide centered on top
without any plastic layer on top.
~~dial 0.680~~
Critical at 0.654 on dial Selsyn 0.285

INSTRUMENT CHECK

Date 12-30 1956 Time 8.30 AM ~~PM~~ Source No. _____

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	70	10x20		
DC-3	70	10x100		
Log N	7 sec			
R-1	10	1000x10		
R-2	- -	- -		
P. M.				

Expr. 43-3 Time _____ AM ~~PM~~ Date _____ 195

Purpose Continue 43 til just critical removing 2x2x1 blocks

Personnel: Fox Cross Cranin

2 starts
1 hr

assembly when together = 48 x 10" 8 layers hi with a (1" thick x 2" wide x 48" row centered on top with 3/8" plastic on top + 3/4" spacers) remainder having all 3/4" plastic spacers.

DWM 1/9/57

9^05 critical Selsyn at 0.21" dial at 0.735

9^15 A Removed 1 strip 2" x 1" x 48" of fuel

9^20 A dial 885 selsyn = 0.02+ + period = 169.5 sec

9^35 dial .855 selsyn 0.0875 slightly super

9^40 .853 " .09 just Crit.

Plastic weighed = 94.59 Kg net. } H/X = 16.07 + .07 = 16.14

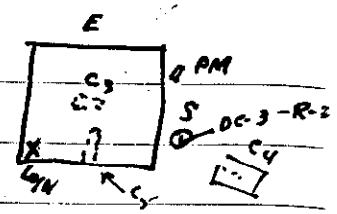
U235 = 51 (2x2x3) } 11.792
23 2x2x1 } 1.791
4 1x1x1 } .078
13.661 Kg/layer x 8 = 109.288 Kg U235
plus 17 (2x2x1) 1.324
2 (1x1x1) .039
1.363 Kg.
1.363
110.651 Kg U235

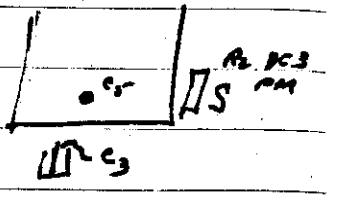
assembly = 10 x 47 3/4 x 22.3"

INSTRUMENT CHECK

Date 1-16 1957 Time 1:00 AM PM Source No. 8

Instrument	Value	Scale	Source Distance	Start-Up Scale
DC-1			1	
DC-2	70	10 x 20		1 x 10
DC-3	65	100 x 10		
Log N	Zero	Zero		
R-1	10	10 x 1000		
R-2	—	—		
P. M.	700V	700V		





START-UP CHECK LIST

Equipment Checked by DSC Personnel Check by ———

Instrument and Safeties Checked and Reset by DSC

"Source In" Checked by DSC Source No. PN-213

Emergency Equipment in Control Room Checked by DSC

Red Light On by DSC

Start-Up OK'd by DSC Time 1:00 AM PM Date 1-16 1957

Expr. 44 Time 1:00 AM PM Date 1-16 1957

Purpose Reflected Assembly in 4'6" well consisting rock 1:1 water depthed & involving 36" square base stacked on limestone with 6" paraffin on top

Personnel: TAE DWM DSC

1:00 PM 12" thick reflected

		C_1	C_2	C_3	C_4	C_5
Background Source PN 213 with 77 cm of H_2O	Source in water	0 +50	0 +60	14 +26	8 +9 (x16)	7 +4 (x16)
	out of water	2 +14	1 +11	15 +37	14 +5	15 +1
	out	3 +15	2 +43	15 +48	16 +1	12 +12
	in	1 +63	1 +63	13 +30	9 +4 (x16)	6 +6 (x16)
12" reflected slab.	in	0 +39	1 +5	31 +19	16 +142 (x256)	6 +11 (x16)
	out	2 +12	1 +8	14 +33	5 +160	14 +9

Background

dropped safety blade with source in — no visible effect on integrating instruments.

12" slab	in	0 +61	2 +21	32 +46	16 +127	7 +1

Loading	Source	×64 C_1	×64 C_2	×64 C_3	256 C_4	×16 C_5
18" Slab	In	0+41	1+16	~~39+40~~ .63 ~~.833~~ .79	47+180 .7 .347	7+4
1 to 1 depleted Safety In	In	0+51	1+13	37+36	45+3	6+10

log N < .001 ↘ log N = 0.00016 for both runs above.

	Out	2+8	1+15	14+7	9+210	11+4

Expr. 44-1 8^10 AM Date 1-17 1957
Purpose ~~Check~~ ~~[illegible]~~ Continue building Assembly
Personnel:

~108 blocks enriched per layer or 25 kg/layer

8^10 AM Same assembly as on 1/16/57 (18" × 36 × 36)
Source In reflector water at Safety out

9 layers or 225 kg	In	0+58	1+24	39+39	47+121	6+3
11 layers or 275 kg	In	0+41 ln N .00026	1+15	40+45 .7 .744	78+24 .09 .212	5+9
	out	1+60 <.0001	1+19	14+55	14+251	5+4
Safety Dropped	In	0+28 .00024	1+24	42+14	71+16	5+13

11^30 AM 14 layers fuel + 6" paraffin Safety drive at 4.30" (bottom of blade top of paraffin)
ln N = .0006

	In	0+40	1+52	58+46 .72 .533	182+37 .15 .091	4+15
	Out	1+52 .00010	1+6	16+41	30+191	10+0

In dropped blade ln N .0006 → .00055

1^50 P.M. 16 layers fuel + 6" parafin Safety drive at 8.42

	In	1+39 log N .00135	3+24	96+0 .326	412+178 .7 .04	5+10
	Out	3+22 .00022	3+19	93+41	66+105	11+8

In dropped blade ln N = .00105 (from .00135)

		0+37	2+60	83+10	318+35	6+1

Background

12" slab

	C_1	C_2	C_3	C_4	C_5
Loading:	18 layers 36" x 36" x 36" with 6" Paraffin on Top			1:1 enriched to Depleted ~450 kg U-235	

For Period 95.3 cm H_2O

Smt 92.2 > 92.35 Crit

Super 92.5

Raised Safety

216 blocks 108 enriched (2+2+3") x 231.21
= 449.478 Kg (from enriched blocks)
2.516 Kg (from depleted
Total 451.994 Kg

INSTRUMENT CHECK

Date Jan 18 195~~6~~7 Time 9 15 AM ~~PM~~ Source No. 84 Neutron

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	80	10x20		
DC-3	68	10x100		
Log N	75ea			
R-1	7	10x1000		
R-2	Responds to source			
P. M.	800V			

Expr. 44-2 Time ____ AM PM Date ____ 195__

Purpose Neutron Crit Mass

Loading: 44-1 less 2 ea 2x12 x18 from opposite corners

Personnel: DFC - DWM - TAF

Top layer has {72 cm, 72 depth} only 2/3 of a layer.

Approx Crit @ 10 10 AM water @ 101.1 cm period decreases

Linear Inst on const rise with time ~10' $\ln N = .032$

10 23 Source In Lin Inst on const rise ~10'

10 30 Lowered water 1 cm to 100.1

10 31 1' Const C_3 46 + 485 > 4 + 419

33 1' 50 + 904

35 1' C_3 54 + 701 > 3 + 820

Slope of const rise did not change apprec. $\log N = .16$

Removed Source

∴ Lowering H_2O 1cm did not affect react. hence water is essentially infinite reflector although it is ~~not~~ only ~7 or 8 cm above fuel parafin interface at reading of 100.1 cm

loading total = 443.624 Kg 25°

essentially just critical

INSTRUMENT CHECK

Date 1-21 1957 Time 8 30 AM PM Source No.

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	62	10x20		
DC-3	65	10x100		
Log N	7 sec	period		
R-1	10	10x1000		
R-2	responds			
P. M.	1/2"	700V		

Expr. 45 Time 8 30 AM ~~PM~~ Date 1-21 1957

Purpose Top 1/2 [illegible] restacked same overall ratio (1:1) but lumped into 4x4x3" blocks

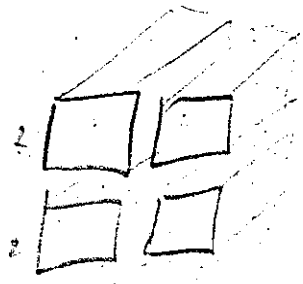
Personnel: DWM DFC TAF

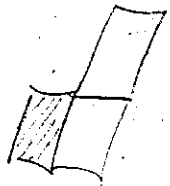
9:30 - Cube 36 x 36 x 36 1:1 ratio (top half lumped 4 x 4 x 3)

10:00 ln N = .006 at

Water height 105.5 cm. and source in subcritical assembly with high multiplication

loading = 451.994 kg

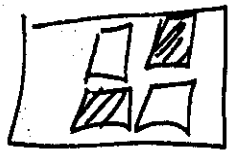




1 × 4 × 3

~~2 × 8 × 3~~

4 × 4 × 3



4 × 4 × 3

8 × 8 × 3

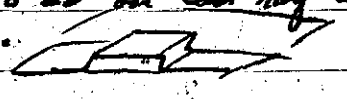
11^{50} added to East half of top 2" layer 2×18×36"

11^{38} Water ~~[illegible]~~ 96.0 cm pos period from log N .01 to .02 (not [illegible])

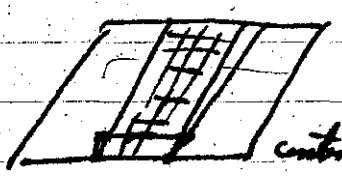
11^{40} water 96.6 cm log N .024 approx 100 cm log N 0.07

11^{45} AM 94.6 cm — critical 464.549 Kg 25

12^{55} PM Top layer now has a 12×18"×3" on East half water



2^{00} PM Sub Critical with water at 105 cm 456.179 Kg

2^{30} PM Top layer 12×36"×2"  centered E & W

Critical water at 92.8 cm pos period at 94.8 cm
loading 460.364 Kg 25

INSTRUMENT CHECK

Date Jan 22 1957 Time 1:00 ~~AM~~ PM Source No. _____

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	1	85	10x20	
DC-3		65	10x100	
Log N		75 ec		
R-1		Responds		
R-2		10x1000		
P. M.		46 V.		

Expr. 45-1 Time 1:00 ~~AM~~ PM Date Jan 22 1957

Purpose TOP half restacked into lumps 2x4x3 of each material

Personnel: JWM TAF DFC

Size 36"x36"x36"

1^{15} 10.4 cm H_2O

1^{20} 44.0 cm H_2O > 34.0/5 = 6.8 cm/min.

1^{25} 76.7 " " > 32.7/5 = 6.5 cm/min.

~1^{35} 104.5 assembly almost crit.

power rising with source in. linear rise. Just critical

1^{45} ln N = .09 remove source. level on ln N and DC-2 & DC-3

Loading 451.994 Kg

INSTRUMENT CHECK

Date 1-23 1957 Time 3 ~~AM~~ PM Source No. 8

Instrument	Value	Scale	Source	Scale
DC-1	—			
DC-2	—			
DC-3	68	10x100		
Log N	7mm			
R-1	10	10x1000		
R-2				
P. M.	750V			

Expr. 46 Time 3 15 ~~AM~~ PM Date 1-23 1957

Purpose 2 depleted to 1 enriched with 1/8" plastic in horizontal layers - 36"x36" base

Personnel: Fox Magnuson C

8 layers

3:30 pm 46cm water - Source in

5 min counts on x64

C_1	C_2	C_3	C_4	C_5 (x16)
0^{+35}	0^{+58}	31^{+34}	55^{+28}	6^{+14}

1-24-57 Checked count at above conditions

8:45 a.m

C_1	C_2	C_3	C_4	C_5 (x16)
0^{+22}	0^{+53}	$29^{+16}_{.25}$	$54^{+27}_{.42}$	5^{+14}

INSTRUMENT CHECK

Date 1-24 195 7 Time 1045 AM Source No. Y

Instrument	Trip Value	Scale	Source Distance	Signal's Scale
DC-1				
DC-2	75	X10X20		
DC-3	65	10X100		
Log N	tripped at 7 sec			
R-1				
R-2	Y			
P. M.	750 V			

10 layers of blocks + 1¼" plastic

11¹⁵ Water height 70 cm - Source in

C_1	C_2	C_3	C_4	C_5 (X16)
1 +14	1 +56	32 +59 (.92) .899	98 +16 (.25) .554	4 +12

added 2 layers

2⁰⁰ 13 layers of blocks + 1½" plastic

Water height 85 cm - source in ln N = .001

1 + 31	0 +54	35 +34 (.53) .824	128 +12 (.19) .424	5 +0

3¹⁵ PM 16 Layers of fuel + 2" plastic

100 cm water — Source in Log N = 100/3

0 +18	0 +56	34 +0	164 +12	4 +14

30.23

1-25-57 Recheck above Condition .00012

0 +21	0 +52	34 +30	163 +10	3 +14

1-25-56 18 layers fuel + $2\frac{1}{4}$" plastic = $38\frac{1}{4}$" overall

10^{43} AM water at 104.4 cm log N = .00014

0^{+21} 0^{+60} 34^{+22} 181^{+16} .30 4^{+0}

Changed position of counters

C_5 - directly under tank 6" below floor
C_3 - 6" under tank 2' west of center
C_1 - at south edge of tank
C_2, C_4 were not moved - ~~repaired C~~

11^{00} 0^{+59} 2^{+0} 21^{+24} 184^{+13} 33^{+2}
0^{+43} 1^{+4} 21^{+41} 181^{+59} 31^{+12}

1-28-56
18 layers fuel + $2\frac{1}{4}$" plastic - recount
C_1 and C_2 have been repaired

	(x64) C_1	C_2	C_3	C_4	C_5	lnN-Water ht.	
9^{00} 18 layers	15^{+1}	9^{+63}	21^{+53}	179^{+29}	5^{+58}	.00012	104.1 cm
"	14^{+30}	10^{+17}	20^{+32}	178^{+61} .385	6^{+9}		
17 layers	14 +30	10 +22	19 +26	163 +20	5 +42	.00012	103.7
	13 +40	10 +49	19 +56	161 +43 .425	5 +44		
16 layers	13 +21	9 +47	19 +48	159 +58	5 +16	.00105	
	14 +51	10 +9	20 +3	160 +34 .431	6 +32		104.1

1 30 PM 15 layers – 100 cm water

25 +35 7 +45 25 +51 29 +57 — no sample

14 +57 9 +60 20 +29 147 +4 6 +4

13 +58 10 +35 20 +21 149 +23 1466 6 +3

1 25 13 layers – 90 cm water

13 + 56 9 + 56 18 + 55 124 +36 1554 6 +10

15 + 0 9 + 37 19 + 5 123 + 1 6 +18

3 55 9 layers – 65 cm water

16 + 32 8 + 48 18 + 5 69 +23 5 + 4

15 + 33 9 + 15 18 + 41 6.8 + 28 5 + 13

68.8

1-29-57 Total Wgt Plastic 53.00 Kg

Total fuel wgt 199.648 Kg.

H/L = 3.33 3.33

.21 x 3 .21

3.4 3.54

INSTRUMENT CHECK

Date 1-30 1957 Time 10 30 AM Source No.

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	65	10x20		
DC-3	68	10x100		
Log N		7sec		
R-1		10	10x1000	
R-2		Responds		
P. M.		800 V	Alarm Checked also.	

Base Area 36 x 36 Layer Composition Enriched to 2 depleted

Plastic thickness 1/4"

Expr. 47 Time 10 45 AM Date 1-30 1957

Purpose

Multiplication Data on approach to Crit. cal C2 on top of assembly all others in the same places.

Personnel:

	Layers	C_1	C_2	C_3	C_4	C_5	log N	Water
47-1	9	source in	1107^{+14}	48^{+0}	251^{+19}	9^{+23}	.00146	60cm
		" out	149^{+60}	34^{+1}	33^{+18}	1^{+59}	=	"
-2	10	source in.	1636^{+7} (1678)	42^{+3}	421^{+43} (596)	8^{+7}	.00024	64.5
		Changed source to PN 124					<.0001	
-2b	10	PN-124 1-31-57	524^{+8}	17^{+1}	143^{+6}	3^{+6}		65.5
2c-	10		519^{+50}		140^{+19}	3^{+37}		65.0
Est. Bgnd			355		85		.000155	~~71.3~~
-3	11 (21)	PN-124	1698^{+36}		276^{+50}		.000155	71-3

INSTRUMENT CHECK

Date 1-31 1957 Time 9 50 AM Source No.

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	85	10x20		
DC-3	65	10x100		
Log N		7sec		
R-1		10x100		
R-		Responds		
P. M.		800V		

47-4 11 layers + ½ layer (2" thick) Water - 75 cm
$C_4 = 463 \pm 27{,}184$ $C_5 = 6 \pm 45$ $\log N = .00025$

47-5 12 layers + ½ layer (2" thick) water
Supercritical at 67 cm of water
leveled at $\log N = .006$ at 66 cm.

47-6 12 layers (Removed half layer) Sub Critical Water = 80.4

C_1	C_2 N.G.	C_3	C_4	
0 ± 17	317 ± 62	27 ± 51	$1592 \pm 29{,}0524$	17 ± 17

47-7 12 layers plus ⅙ layer centered on last half
Slightly Super critical; period > 400 sec

Plastic Weight for 47-7 77.09 kg

per layer = 72 2×2×3 Inverted = 16.647 kg
144 2×2×3 Lucite = 0.186 kg
16.833 kg

Total at 12 ⅙ layers = 204.8 kg

H/H = 7.07 + .07 = 7.14

7.077 + .21 = 7.287

INSTRUMENT CHECK

Date Feb 11 1957 Time _____ AM PM Source No. _____

Inst.			Source Distance	Start-Up Scale
DC				
DC-2	85	10x20		
DC-3	58	16x100		
Log	7 sec			
R-1	7x10x100			
R-2	Responds			
P. M.	800V			

C_1 - in thimble in back
C_2 - on top assembly
C_3 - under assembly
C_4 - ~~tube in back~~ in thimble with ln N
C_5 - under Sid

80.4

Expr. 48-1 Time 11 40 AM ~~PM~~ Date 2-11 1957
Purpose Check critical point on reflected 37.5% cubes - unmoderated
Personnel: DWM TAF

Top Reflector ~~Larger Moderation~~ with ~ 9" parafin.

21 x 21 base 10" high ≈ 85 kg - water 35.4 cm high

48-a	C_1	C_2	C_3	C_4	C_5	ln N
source in	122^{+58}	24^{+38}	$-^{+1}$	87^{+21}	1^{+33}	.00038
out	11^{+8}	14^{+20}	—	35^{+39}	1^{+29}	.00013

21" x 21" base 16" high ~136 kg 0-235 wtht. 46.

in	146^{+47}	34^{+52}	1401^{+45}	1^{+19}	.0016 (.238)
out	(.836)	(.704)	(.062)		.0005

21" x 21" base by 22" high ~187 kg 0-235

+ period ~300 sec. 57.6 cm H_2O

~100 sec 58.0

Slightly super 57.4
" Sub. 57.3 } ∴ Crit level 57.35

Expr. 48-2 Time 3:30 PM Date 2-11 1961
Purpose Trim pile to get Critical size
Personnel: DFC TAF

Removed fuel strip 8 X 21 X 1"
Left with pile 21 X 21 X 21 + 13 X 20 X 1 to one side of top

Positive period with source in - water level 60.1cm
Level with source out - just critical - 60.1cm
~~Positive period with water at 63.9cm~~
water at 63.9cm

From linear trace on DC-3, R-2 & DC-2
was just Critical

183.696

INSTRUMENT CHECK

Date 2-12 1957 Time 10:00 AM ~~PM~~ Source No. 8

Instrument	Trip Value	Scale	Source Distance	Start-Up Scale
DC-1				
DC-2	95	10x20	4"	1x20
DC-3	58	10x100		
Log N	4 sec			15 sec
R-1	10	10x1000		
R-2	responds			
P. M.	2"	750V		

Expr. 49-1 Time 10:00 AM ~~PM~~ Date 2-12 1957

Purpose 1:1 ratio depleted to enriched 20"x21" with 1/2" plastic separation

Personnel: DWM VAF DK

Fuel = 33½ cm above table 8.092 Kg U235/layer (neglecting depleted blob)

21" x 20" base 1:1 ratio depleted to enriched

5 layers of fuel + 2" plastic - 45.1 cm water

10:40 am	C_1	C_2	C_3	C_4	C_5	ln N
source in	94^{+62}	16^{+39}	—	75^{+35}	0^{+51}	.00013

Top of fuel - 59 cm

12:00 9 layers of fuel + 4" plastic - Cm water

~33 cm H_2O multiplication indicated that critical height would be with fuel not covered with water hence safety N.G. DC-3 75 x 1x10 ln N = .0008

1:00 8 layers of fuel + 3½" plastic

H_2O @ 41 cm Ln N = .008 DC-3 [illegible]

1:40 7 layers fuel + 3" plastic (48 cm to top of fuel) 56.964 Kg (includes depleted)

water at 55 cm log N = .00095

C_1	C_2	C_4 (x256)	C_5
222^{+2}	61^{+18}	354^{+253}	0^{+53}

Enriched

2^{30} 7 layers + 3" plastic plus 2 × 12 × 20" fuel (20 blocks

3^{05} 51.0 cm apparently pos period ca 100 cm ~~57.579 Kg~~

49.8 cm critical 61.614

3^{25} 7 layers + 3" plastic plus 2 × 6 × 20" fuel sub Crit

55 cm water 59.302 ~~57.112~~

4^{05} 7 layers + 3" plastic plus 2 × 9 × 20" fuel sub Crit

48.2 cm sub 50.4 supers

48.5 cm just critical 57.345 Kg

60.458

Total Plastic Wt (7 layers of plastic)
28.44 kg

$$H/t = 9.324$$
$$= 8.844$$
$$.14$$
$$8.984$$

August 26, 1957

Random samples of blocks after mix

2 × 2 × 3's - 176 blocks weighed 166.688 Kg
avg = 947.09 gms $^{+0.77}_{-1.3}$ gms

averaged in batches of 22 each = 20.836 Kg $^{+17}_{-29}$ per block per batch avg = $^{+0.77}_{-1.3}$ gms

2 × 2 × 1's - 132 blocks weighed 41.862 Kg
avg = 317.214 gms/block. ± .3

[redacted] [redacted]

Block data

37.508 37.59 39.28

No.	Size	wgt	wgt 235	d	U-235
1717	2 × 2 × 3"	944 965 938	~~230~~ 231.21	19.26 g/in³	396.98
	± .015"				
	1,05,8633 gms	wgt T = 616.56 gms			
895	2 × 2 × 1	318 321 314	77.89	19.47	69.712
	± 0.015		207.7 gms T		
	185,892 gms				1.053
54	1 × 1 × 1	79.6 80.3 78.6	19.49	19.50	467.75
	± 0.010"		51.97 gms T		

total = 24,238 cu inches

2806

1,247,331 gms T — depleted — 0.210 0.260 0.189 — 1.295 g/2×2 block U-235

2×2×3 — 944

2×2×1 — 318

5-15-57 (SF Acct #84

ratio $\frac{1 \text{ depleted } U^{235}}{1 \text{ enriched } U^{235}} = \frac{1.295 \text{ gms}}{231.21} = .0056$

[redacted]

[redacted]