BOOK61R

Notes:
"MISC INST +" on spine

Blank pages: inside cover sheets, 25, 26, 33, 38, 49, 56, 58-60, 64-79, 88, 112, 118, 122, 126, 128, 132, 134, 136, 142, 149, 164, 166-299, inside back cover sheets

-page 3 has sheet taped down
-page 4 has graph taped down
-page 11 has 2 pieces of stainless steel (1" by 1 ½" with 5 circular indentions on each) taped down and 1 index card taped down
-page 16 has sheet glued
-page 41 has large graph sheet taped to it
-page 51 has sheet taped to it
-page 55 has graph taped to it
-page 131 has graph taped to it
-pages 132/133 has long thin sheet between pages

Scanned by:
Sheila Finch
RSICC /Oak Ridge National Lab.
August 19, 1999

October 12 1955

Several discussion were held with R.R. Abele of ORNL Ins. Dept. concerning construction of miniature fission chambers and miniature BF_3 counters. The objective was to be able to move them through a critical assembly and obtain flux and power distributions directly. The design details were worked out by Zedler, and prints will become available as soon as possible. The active region is approx. 1" long and the O.D. of the counter is approx 3/16". BF_3 press ~10 PSIG ~98% B^{10}

For testing BF_3 counter #1 was mounted inside a 1/4" x .035" Al tube x3.5" long which was drilled out to allow the counter to be inserted on one end. The outside braid was stripped from RG-62 cable and used inside the Al. tube to form the coax lead to the counter. A UHF connector, male, was put on the end of the tube. a plugwas machined to fit the counter end to seal the tube.

This assembly fits on the UHF connector on the preamps used in the east assembly room 9213 and this counter was put on the channel C-5. Preliminary checks showed no response to neutrons when source and counter were immersed in water.

10-14

Using C-5 preamp & linear amplifier on ATOMIC scaler, response to a source was observed. However, the modifications (safety blade & control rod) were in progress so that counts were erratic.

8 40A 910 V atten = 1 disc. ~~15~~ 2' counting time

~~neutrons~~ 41 X16 + 14

bkg 7 X16

neutrons 48 X16 + 15

Counting rate with ²source ~ 300/min.

11 00A 900 V 62x64 +12 2' ATTN = 1 DISC = 15

" 58 7 "

1000 V 80 37 "

" 76 3 "

" BKG 2 6 "

" " 3 36 "

900 BKG 1 17 "

" " 0 61 "

1 17 1000 BKG 1 22

" " 62 26

" " 61 42

153 1000 Source 1.6X10⁶ 16 x16 3 1 15

" " 17 3 1 "

" " 18 0 1 "

" " 15 12 1 "

" " 63 11 1 10

" " 66 7 1 11

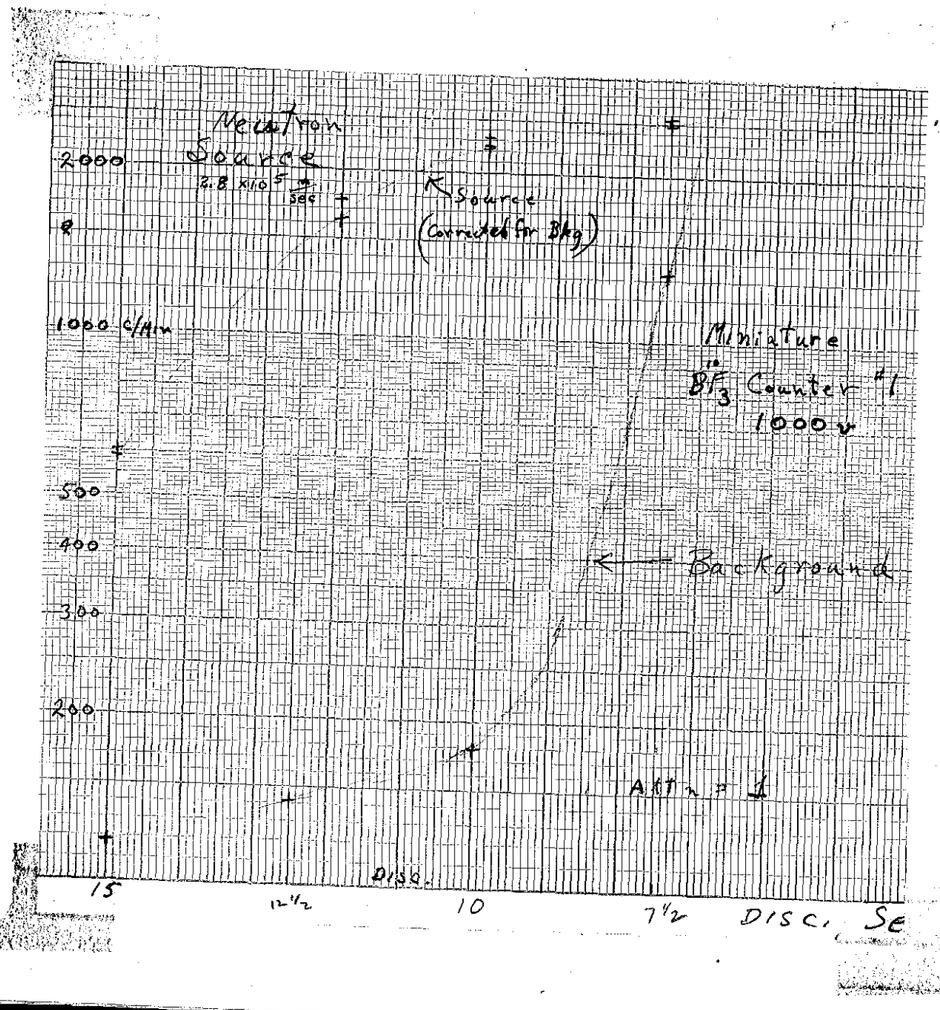
Bkg " " 66 5 1 "

Source = 1.6 x 10⁶ on 11/4/54, @ 2½ half lives later

∴ Source = ~2.8 x 10⁶

			atten disc				
3 39	BKG	1000 V	1-10	20x16 + 8	2'	328	164
3 42	BKG	1000 V	1-10	24x16 + 4	2'	388 Not reproducible	184
3 45	BKG	1000 V	1-10	24x16 + 12		396	188 (536/3 = 179)
	1.6x10⁶	Source	approx 1/2"	below	counter.		
3 49	Source	1000 V	1-10	150x16 + 1	1'	2401	2222
3 50	"	"	"	157x16 + 7	1	2423	2244
51	"	"	12½	110x16 + 12	1	1772	1631
52	"	"	12½	112x16 + 7	1	1799	1758
54	"	"	15	44x16 + 3	1	707	590
56	"	"	15	45x16 + 0	1	720	603
57	"	"	10	156x16 + 7	1	2503	2324
4 02	"	"	7½	59x64 + 28	1	3804	2472
03	"	"	7½	60x64 + 59	1	3879	2547
07	Bkg	"	7½	20x64 + 23	1	1303	1332
09	"	"	7½	21x64 + 17	1	1361	
11	"	"	12½	8x16 + 11	1		141
13	"	"	12½	8x16 + 15	1		
14	"	"	15	7x16 + 5	1		117
16	"	"	15	7x16 + 4	1		

The above counting data taken with source ~½ below the counter, but the tubes for counter and source were side by side.



October 17, 1955

				Reg Scale	Att.	Time	Total	C/MIN	
9 25 35	Bkg	1000 v drift 975	1 - 15	25x16+8		10'	108	10.8	N.G Ringale Walking
9 28 15	"	1000 v Zero Meter	1-15	28x16+13		5'	467	93.4	N.G
9 46	"	1000 v drift 990	1-15	12x16+4		5'	196	39.2	
9 52 10	"	1000 v	1-15	12x16+13		2'	205	102.5	
9 55 15	"	950 v	1-15	12x16+L		5'	193	38.6	
10 01	"	"	1-10	29x16+5		2'			

Counter or Scale seems erratic.

October 25, 1955, Replaced 6AS7 in ATOMIC SCALER

Bkg + Source	1000 v	Disc 55	55x16+12	2'	
Bkg	"	"	1x16+12	2'	

Seems to work using linear amp in scaler but doesn't work with Atomic Lin Amps.

Replaced 12AT7 in Lin Amps

Bkg	1000	55	3x16+14	2'	
Bkg	Replaced 6AK5 in preamp 1000	55	2x16+0	2'	
Bkg + Smrc	1000	55	64x16+14	2'	

MINIATURE BF_3 Counter in Paraffin

Oct 25, 1955

Background Counts.

	Volts	Disc		TIME
	1000	65	2x16+7 = 39	2'
5:47:45	"	60	3x16+8 = 54	2'
~~50~~ 50:30	"	~~55~~ 55	2x16+9 = 41	2'
53:10	"	50	5x16+0 = 80	2'
56:50	"	45	7x16+1 = 113	2'
59:20	"	40	12x16+4 = 192	2'
02:40	"	37½	140x16+8 = 2248	2'
05:05	"	35	454x64+4 =	2'
		35	Very Rapid.	
~~10:10~~ ~~08:45~~	900	37.5	30x64+0 =	2'
12:30	"	40	x64+ =	
		45		

Scaler not working. Doesn't transfer to light eight from four at times, esp when 8 is on. Checked all Tubes OK. Seem OK now

6:30 25	900	40	9x64+41 =	2'
33	900	45	7x16+12 =	2'
35 20	900	50	6x16+5 =	2'
54 40	1100	37.5	127x16+6	
39 30	1100	60	28x16+12	2'
42	"	~~55~~ 55	28x16+3	2'
44 30	"	~~55~~ 55	26x16+7	2'
47 00	"	~~50~~ 50	29x16+2	2'
49 30	"	45	33x16+12	2'
52	"	~~45~~ 40	50x16+1	

Source Plus Background

	Volts	Disc.		
58 25	1100	37.5	130x64+48 =	2'
01 05	1100	40	89x64+62 =	2'
04 00	"	45	77x64+43	2'
06 25	"	50	55x64+39	2'
09 05	"	55	108x16+8	2'
11 30	"	60	35x16+14	
15 00	900	60		
		50		
		40		

Scaler ain't work in!

Robrun et all continued the checkouts of these counters

Fuel Element Fabrication

An attempt to fabricate a fuel plate using a silicone rubber adherine was made. All surfaces were coated using a paint brush and dried ~ 30'. An extra layer was put on the crimped edges before flattening and this layer was dried ~ 20'. Flattened in Shop.

Weight of DWM 435 — 218.87 Kilbrush

(No Bubbles) in H_2O — 204.5 + 18.2 = 186.3 — 186.3 Ohaus

Wt on O Haus — 238.2 + 19.7 = 218.5

218.5 − 186.3

Loss in wt. 32.2 gm or 32.1 cc Volume

Measured thickness .029" - .031"

Used hydraulic press and flat blocks to further flatten. Cleaned and weighed data above.

Heat on hot plate.

6 30	70°	
7 00	130°	
7 45	120°	silicon rubber adherine is oozing on edges
7 49	140°	
7 52	160°	
7 55	170	
8 00	190°	
8 03	200°	No appreciable gain in thickness
07	210°	
13	208	
20	200	
31	180	
50	158	

after heating

237.9	Gross	203.1
19.7	zero	18.4
218.2		184.7
184.7		
33.5 gm		or 33.5 cc
		32.2
		1.3 cc Volume gain upon

heating and cooling

The change in wt (218.5 − 218.2) = 0.3 gm represents the amount of adherine squeezed out on heating.

Heating Experiment in H_2O

22°C	202.7	(Bumped Scale)
28°	202.9	
35	202.9	
58	202.6	
66	202.4	
75	201.7	
	Remove Bubbles 201.9	
78	201.9	
	Remove bubbles	
82	201.5	
off 85	201.2	
80	201.0	

$\rho(H_2O)$ @ 22 .9978

ρ @ 85 .96865

density ratio = .97

volume of 33.5

$\times .97 = 32.5$

or change of 1.0 gm expected due to change of Water density at high Temp

$-18.4 = \frac{218.2}{182.6}$ $\times .969 = 34.5$ cc

total change 1.8 gm

1.0

0.8 gm change in displacement due to heating.

11-11-55

Wt in H_2O	201.7	218.2
Air	18.3	183.4
	183.4 gm	34.8 gm
		.998 = 34.7 cc

Net change to date +2.6 cc.

11-14-55

Ripped apart DWM-435 with silicon adhesive well stuck but plenty of adhesive. It was also apparent that only the high ridges of adhesive were stuck together in assembly, lots of air pockets. Foil wt after cleaning with acetone 33.1232 gm. (Grammomatic balance)

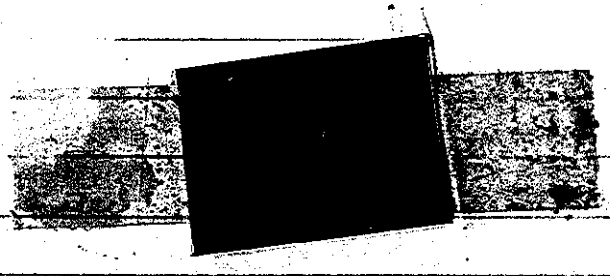
MAC 33.547

Apparent loss .424 gm

11-11-55

attempts to spot weld stainless uranium to stainless were very successful. Electrode description and welding specs. given below.

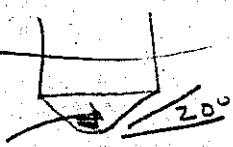
One sample was torn apart -- it left part of the uranium on one piece of the SS. and holes in the U foil (normal U.)



Electrode force – 230

Current - tap 2 – 25Φ-30Φ

~~Electrode contour~~



3"R.

3/16

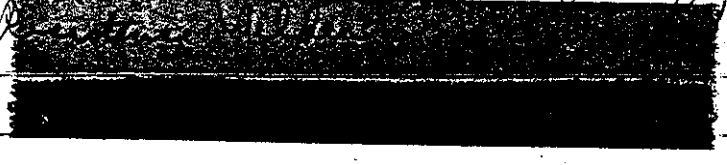
U - pickled in HNO_3

SS. - pickled in HNO_3 + HF.

Bench Press

T-52951

A 440



11-14-55 3[00] Started heating oven with three foils coated with silicone adhesive

Hg		Bimetal Surface	
3 [10]	73°C	190	
15	92°	230	Thermostat off @ 280
27	—	300	" " 320
3 ~~45~~		320	Reduce to 300
4[00]		315	" " ~~350~~
4[25]		270	Thermostat to 280

11-15-55 3[10] PM 300° Oven off door open

Silicone adhesive still tacky, uranium black underneath. Dissolved silicone with acetone. On one foil there was a little black layer which chipped off when foil was bent. Alpha count not very high ≈ 1000 c/min on a considerable amount of the black powder. Other foil was not coated with as thick a layer; evidence of a thin one that doesn't chip off on bending foil.

11-15-55

Plate MAC # 537 which arrived 11-10-55 was very fat. Upon cutting apart, it was noted that glue was very wet and hence not sticking properly. Foil was in two pieces.

Foil wt MAC 33.366

DWM 33.388$_2$

11-16-55

42 Fuel plate arrived Total wt. 9,020.82

20 coated with FC802, edges with FC-776

22 not " " " " " "

See page 16 for individual wts and volume

11-16-55

The results of seam welding small pieces of the 11 mil S.S. were very discouraging. Much warping occured, and the flat mess was destroyed

11-15-55

Callibon reports from telecon with

Minor Rubber Co

49 Ackerman St

Bloomfield, N.S. Edison 8 6800

(Mr Litts, Arthur Humphries, Drew)

Telecon with Drew:

Cement is 75% dispersion of Dow A-4000 with catalyst in Acetone or Xylene. Silicone base Adhesive. No rubber, no Cl. Sets in 24 hrs. max strength 3-7 days. all at room temp.

Directions:

Clean surfaces with acetone or xylene

Brush on film

Air Dry to tacky -- 30 min

Clamp surfaces together

Press to remove Air.

Remove pressure and allow to stand for maximum strength.

Material is primarily inorganic after removal of solvent.

11-15-55

Part of the A-4000 adhesive was diluted with equal part of acetone. Two final plates were fabricated (537 + 435) using thinned silicone adhesive. All adhesive surfaces dried 30' before assembly. An extra layer was put on the edges after assembly before crimping, crimping done with hammer.

Plates did not leak or bubble in water

Zero	18.3				
435	233.9	215.6			
537	235.4	217.1			Vol(cc)
435 in H_2O	185.9	185.9	29.7	gm	29.6
537 "	186.4	186.4	30.7	gm	30.6

11-16-55

Individual weights of 10-16 shipment of 72 fuel plates

with FC-802 coating on foil					w/o FC802 coating		
612 FC	214.5	175.1	39.4	663	213.4	177.6	34.8
613 FC	213.6	176.5	37.1	664	214.2	172.0	42.2
614 FC	215.4	177.4	38.0	665	213.9	164.0	49.9
615 FC	214.4	178.3	36.1	666	213.2	179.4	33.8
616 FC	215.7	179.9	35.8	667	214.5	175.5	38.9
617 FC	215.4	180.0	35.4	668	214.1	180.4	34.7
618 FC	215.2	176.0	39.2	669	213.0	175.1	37.9
619 FC	214.9	175.3	39.6	670	213.9	179.1	34.8
620 FC	213.8	177.1	36.7	671	213.8	179.1	34.7
621 FC	215.9	175.7	40.2	672	213.6	179.5	34.1
622 FC	215.9	176.1	39.8	673	212.6	176.9	35.7
623 FC	215.7	175.3	40.4	674	212.6	178.7	33.9
624 FC	214.4	175.7	38.7	675	212.9	176.6	36.3
625 FC	215.8	179.6	36.2	676	213.8	177.3	36.5
626 FC	214.3	152.9	61.4	677	214.2	179.5	34.7
627 FC	215.6	179.0	36.6	678	214.8	180.2	34.6
628 FC	214.7	176.5	38.2	679	213.3	178.2	35.1
629 FC	216.3	177.8	38.5	680	213.2	178.8	34.4
630 FC	216.6	176.0	40.6	681	214.3	178.5*	35.8
631 FC	214.6	176.2	38.4	682	214.1	173.0	41.1 gm
				683	213.5	178.4	35.1
				684	214.0	180.8*	33.2

December 5, 1955

Silicone bonded Plates 435 & 537

Air Weighing

Zero 18.7

435. 234.4 — 215.7

537 235.6 — 216.9

H_2O Weighing zero 17.8

	435	wt in H_2O	537	
29°C	204.1	186.3	194.3	176.5
74°C	202.2	185.3	191.9 (debubbled	174.1
	203.1 (no bubbles on surface			

435

Cold volume = 29.4 x .998 = 29.3

hot volume = 30.4 x .969 = 29.4

537

40.4 x .998 = 40.3

42.8 x .969 = 41.5

December 5, 1955

Seventeen plates were fluoroscoped. 7 had pinholes

~~Plates OK~~

Fluoroscoped plates

1-11	12-41
1-15	515
1-16	507
1-17	
7-16	
4-34	
4-35	
4-37	
4-39	
4-40	
4-42	
4-44	
4-45	

12-41	— MAC 681	Full of pin holes
4-42	441	" " " " 1/2 as many
4-43	252	Pin holes on one end
4-45 }	247	Few Pin holes
4-44 }		Alignment differed by 1/4", 4-44 one end edge trimmed .01"
1-16	30	Large Mottled area in Middle + few pin holes
	515	Few pin holes
	29	" " "

In Batch D.W. Magnuson

December 12, 1955

The machine shop, 9201-1, (Johnson & Gordon) are making x 110 $^{5.5}$ plates for fuel plate assemblies using M & C Corp dies and materials.

Six boxes have been made from stock shipped by M & C, and whose thickness is ~ 13.5 mils. Boxes have been weighed (Covers will be from orig S.S. thickness of 10.7 mils)

New Boxes

121.0	using Ohaus balance
120.8	
120.8	
120.8	
121.4	
121.3	
6 1726.1	

126.0 gm Average Box Weight.

ORig Box Wt	95.6 gm	ave of 12
" Lid Wt	83.4 gm	ave of 12
	179.0	
Soil	33.4	
	212.4	
Glue		

Dec. 14, 1955

Plate 669 measured 0.815" opened
667 opened H_2O in plate.
674 opened
gas sample pulled thru air monitor

677 H_2O in plate, gas released
675 " " " "
660 " " " "

Using a cigarette lighter flame, near gas evolving from 677, a slight pop was heard
678 gas released

Material MAC-CYT-152 12-15-55

MAC wts

Re Nancy ?

109 } 9 110 } 10		634.4	(33.39)
111 } 11 112 } 10		702.1	(33.43)
113 } 10 114 } 10		666.7	(33.34)
115 } 1 116 } 1		577.6	
117	8	262.5	(33.44)
118	12	401.0	33.42
129 } 22 130 }		701.7	

From Dick Butler.

129		130	
580	33.59	577	33.48
581	33.58	579	33.09
585	32.99	571	33.18
582	32.64	583	33.41
578	33.12	587	32.91
575	32.56	584	33.60
572	33.87	569	33.15
589	33.38	568	33.28
576	33.36	586	33.39
( )	15.75	588	31.14
		574	32.32
		570	33.30
		573	32.75

Wayfield 77-83-58

113	112	111	118	117	114
605	624?	649	696	654	600
602	639	642	687	658	601
610	637	635	691	659	603
592	636	633	689	656	609
591	638	640	688	655	593
598	641	651	693	657	611
604	645	647	686	661	597
590	652	650	690	662	608
599	643	632	694		595
606	646	648	692		594
		644	685		
333.49	334.31	368.19	368.81	262.36	333.32

No wayfield

109
627
631
630
628
620
629
624
(2 short 8 strips)

45 Above plates from series 13 see notebook

dry wt 10,726 g

wt in H_2O

22 above plates + 2 silicone (DWH 435-537)

dry wt 5,638 g

12-16-55

Final Plate #	Wt in air, grams	Wt in H_2O, grams	Dry Wt grams
13-1	240.6	210.0	30,6
13-2	240.8	210,6	30,2
13-3	240.3	210.6	29,7
-4	240.0	210.6	29,4
-5	241.6	211.3	30.3
-6	239.9	210.0	29,9
-7	240.2	210.0	30,2
-8	241.6	210.9	30.6
-9	239.7	209.7	30.0
-10	241.6	211,6	29,9
-11	240.2	210,3	29,9
-12	241.4	211.7	29.7
-13	240.5	210.4	30.1
-14	240.7	210.9	29.8
-15	240.6	210.6	30.0
-16	240.0	210,1	29,9
-17	241.4	211.6	29.8
-18	240.3	210.4	29.9
-19	241.2	210,5	30.7
-20	239.7	208.6	31.1
-21	239.3 ~~241.4~~	208.9	30,4
-22	240.3	210.5	29.8
-23	240.5	210.8	29.7
-24	240.9	210.9	30.0
-25	240.0	210.0	30.0

	Dry Wt grams		
13-26	240.5	210,8	29,7
27	239.8	209,9	29,9
28	240.9	210.6	30.3
29	240.9	210.7	30.2
30	242.0	210.9	31.1
31	242.9	210.9	32.0
32	240.5	210.5	30.0
33	216.0	188,5	27,5
34	243.1	211.4	31.7
35	242.3	210.5	31.8
36	242,3	211.0	31.3
37	241.4	210.5	30.9
38	241.7	211.4	30.4
39	217.0	188.6	28.4
40	214.7	187,3	27.4
41	240.9	209,9	31.0
42	215.0	187,5	27,5
43	216.0	188,7	27,3
44	242.2	210.9	31.3
45	241.2	210.9	30.3

12-19-55 Plates brought to 9213 (40T hyd. press for 1½')

572
575
576
578
580
581
582
585
589
625
626

Previous plate manufacturing methods

608, 601, 611, 630, 631, 597, 627, 628, 694, 564
595, 656, 658, and 624 40T for 1½ Min

All previous plates 20T for 2½ minutes.

See pages 1 - 7 - this notebook.

March 22 — Further work with BF_3 counters discontinued because of circuit problems. BF_3 & Fission counters were given to R. Rohrer to check in the instrument shop.

Progress to date: None on BF_3 counters.

Fission counters ~~Not mentioned in~~

Rohrer obtained curves of background and counting rates (with neutron source adjacent and surrounded with parafin) for various discriminator settings and various voltages. For #1 & #2. Approx. 100 c/min for this source were obtained the counters were not mounted in a long tube.

#1 and #2 were mounted in a long ¾ A tube connected by stripped RG-59 cable; the end fitted with a UHF connector. The preliminary check out indicated that the performance was not altered by this change. Likewise, setting up in the West end has not changed the sens. to the neutron source.

Mar 24 — Additional cable preceding pre amp (in order to have flexible lead for moving counter up & down) has not destroyed response to neutron source. Pulses look O.K.

Mar 27, 1956 Tower shielding Reactor ~~was~~ critical experiment was made critical ~~with 8 plates in tank 3~~ ~~in~~ and the miniature fission counter #1 was moved up and down. Counts were taken for 1 minute

Max. Count 26,834

Min Count 4,700 in reflector

$$\frac{\text{Edge}}{\text{Center}} = \frac{(9394+8963)/2}{26\,834} = 0.342$$

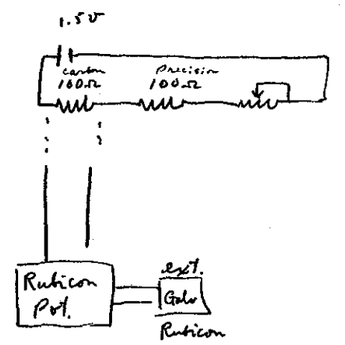
C.C. APPR $\quad \frac{-10+10}{0} = \frac{.41+.39/2}{1.0} = .40$

$$\frac{-10+10}{\text{Center}} = \frac{9894+10793}{26\,834} = 0.385$$

Jan 29, 1958

Use of Resistance thermometer

The following electrical system was set up



~ .53 volt drop across Carbon and Precision resistor.

Change in voltage from .5305 to .5310 setting on pot. changed the galv ~90 div.

∴ .00053 volt drop change across a 100Ω resistance thermometer with standard current of .0053 amp corresponds $\frac{5.3}{5}\,90 = 95$ galv div and also corresponds to $\frac{.00053}{.0053} = 0.1\,\Omega$ change in resistance

From Ni thermohm table ~.29 Ω/°F ∴ 100 div on galv corresponds to $\frac{1}{3}$ °F. Therefore with a potentiometer with finer control, K-1 or K-2, one should be able to read to ~ 0.01 °F ~~with better galv.~~ With this galv. ± 0.01°F corresponds to ± 3 div.

with more sens. galv. one should be able to do better than 0.01°F.

U foil #3661

Catcher Top A-13

Bottom A-145

5/16 Gold Top 1 - 50.0 ~~1 - 50.0~~

5/16 U-235 (93.2%) 1 & 2 on top of holder

(.0459g & .0450g)

The above foils were placed on top of the CCR reactor (.9" Be can) and activated for 20'. The relative activities are summarized below:

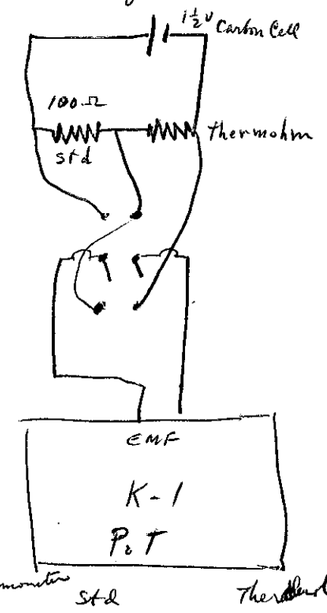
Type		SA-1 c/min	Prop. Counter #1 c/min	
Au		426		
		408		
Al Catcher	Bottom	24,090	87,840	$>1.110_3$ / $>1.095_0$
	Top	21,697	80,220	
U-235	5/16" 1	24,657		
	2	27,221		

#3661 Too hot to count.

February #18, 1958

Bench Test of Ni Thermohm

Ckt as follows



26° = 102.12 .34 Ω/°C

25° = 101.78 .35 Ω/°C

24° = 101.43

		Thermometer Std	Thermohm			Battery Volts
10 00 AM	25°C	.73007	.74330	101.81	25.1	1.47337
06	25°C	.72960	.74335	101.88		1.47295
12		.72945	.74339	101.91		1.47284
16		.72920	.74340	101.95		1.47260
22	25.1	.72906	.74345	101.974	25.	1.47251
32	24.5	.72990	.74225	101.692	24.8	1.47215
45	24.5	.72993	.74162	101.602	24.5	1.47155
54	24.3	.73005	.74145	101.562	24.35	1.47150
2 00 PM	24.4	.72680	.73891	101.666		1.46571
Turned off						
3 50		.72782	.73972	101.638		1.46754

Turned back on to leave on.

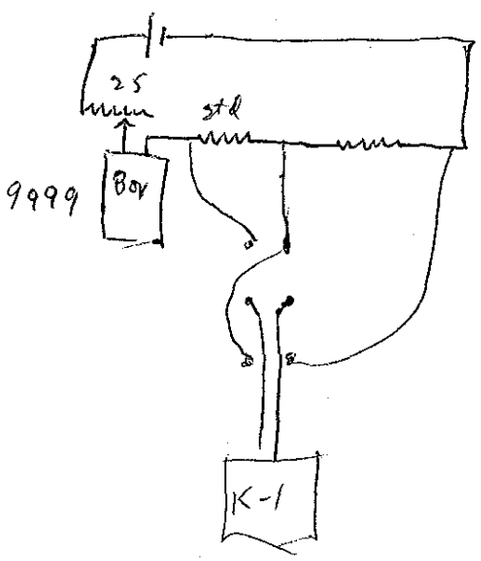
4[05] 72726 73953 1.46678

Using 1 ratio setting current setting
1 volt across 100 Ω Std Series Resista

	1.00	1.0167	126	
4[15]	1.0000	1.0164	1266	
4[30]	1.0000	1.0167	1266	
	1.0000	1.0168		
3-19-57 8[25] AM	1.0000	1.0179	~25°C	1266 Ω
8[42]	1.0000	1.0181	~25°C	1266 + part of 25 Ω

Carbone cell very stable for low current

helium



1[35] 1.0000 1.0172 ~24.8°
1[48] 1.0000 1.0175

Measurements with #1 long counter RCL-1665

Source (M-227) Distance = 73" to paraffin face

V: Amp. Gain = 4 Rise Time = 0.2 μs Scale PHS = 2

	Count Time	Amp Disc.	Total Counts	Voltage
Aug 24, 1960	10' 0	30	40 380	~ 1480
	1'	30	2860	1400
	1'	30	4340	1550
	1'	30	4140	1550
	1'	30	4240	1600
	1'	30	4350	1650
	1'	30	4260	1700

∴ Plateau between 1550 and 1700

with statistics. Set at 1600 volts

				Eff
	10'	30	42200	.0153
	10'	40	41680	.0151
	10'	20	42540	.0154
	2'	10	9490	.0172
	10'	15	42840	
M-226	Dist	73" (7.3 x 10⁶)	1600 V	
	10	30	41840	.0166
	10	15	42490	.0169
M-227	DIST	8.75		
	1'	15	144390	.00752
	1'	30	141580	.00737
M-227	Dis	22.25		
	2'	30	66240	.01115
	2'	15	67160	.01131

Solid angle calculation — use effective diam of counter 7.0 inches.

surface area of counter face $\pi D_1^2/4$

Total surface $4\pi D_2^2/4$

Fractional solidangle $= \frac{D_1^2}{4 D_2^2} = \frac{7^2}{4 \times 146^2}$

$= \frac{49}{85264} = 0.575 \times 10^{-3}$

Source Strength = 8.0×10^6 n/sec (M-227)

(the neutron fraction entering) counter face = 4.6×10^3 neut/sec

$= 276 \times 10^3$ neut/MIN

$= 2.76 \times 10^6$ neut/10 MIN

M-226 Neutron counts = 2.52×10^6 neut/10 MIN

Source Str. = 7.3×10^6

Solid angle $\frac{49}{4 \times 17.5^2} = \frac{49}{1225} = 0.04000 \rightarrow .32 \times 10^6$/sec $= 19.2 \times 10^6$/MIN

$\frac{49}{4 \times 44.5^2} = \frac{49}{7921} = 0.006186 \rightarrow .049 \times 10^6$/sec $= 5.939 \times 10^6$/2M

Recalculate solid angle — add 4" to Counts - Source dist. 30 EFF

$\frac{49}{16 \times 77^2} = \frac{3.0625}{5929} = .0005165$ $.248 \times 10^6$/MIN .0170

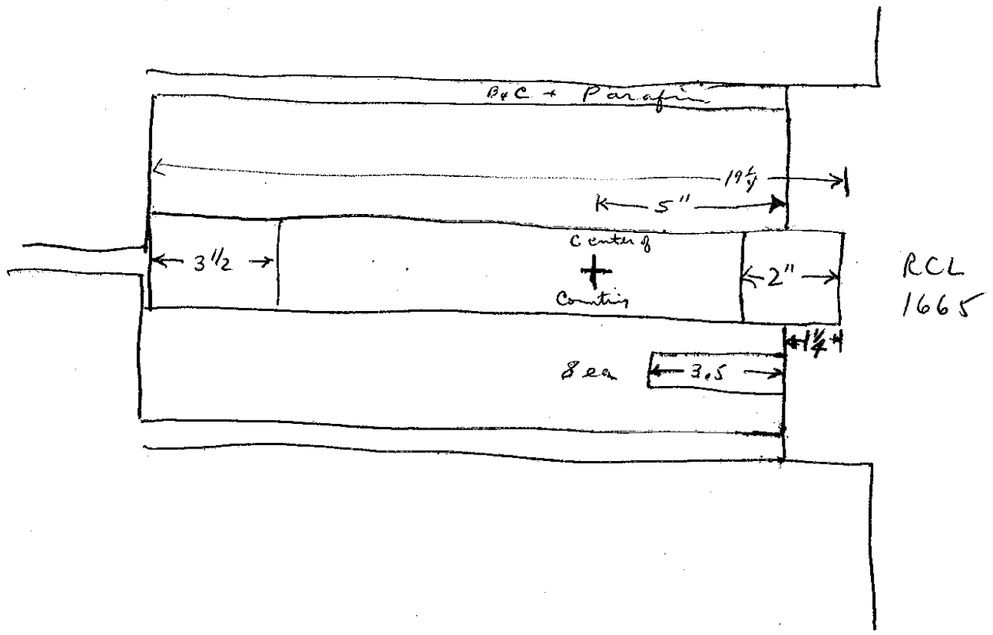
$\frac{3.0625}{12.75^2} = \frac{}{162.56} = .01884$ 9.043×10^6/MIN .0156

$\frac{3.0625}{26.25^2} = \frac{}{689.06} = .004444$ 2.133×10^6/MIN .0155

~~Overlaying this~~ Inspection indicates that the center of counter is more than 4" below face.

Source PN-467 Dist = 73"

Aug 24, 1960	Counting time	Amp Disc	Total Counts	Eff
11^{07}_{A}	10'	15	21230	.0156
11^{13}	10'	30	20830	.0153



PN-467 → 1.9×10^7 on Oct 15, 1959

Decay to Aug 24, 1960 = 314 day

or 2.269 half lives

$e^{-.693 \times 2.269} = e^{-1.57} = .208$

Aug 24 Strength = $3.95 \times 10^6 \frac{neut}{sec} \rightarrow 1.363 \times 10^6$ neut/10 min at counter.

Recalculate Solid Angle. Adding 5"

			30 Eff
$\frac{3.0625}{78^2} = \frac{}{6084} = .0005034$	→	$.2416 \times 10^6$ neut/min	.0175
$\frac{3.0625}{13.75^2} = \frac{}{189.0625} = .01620$	→	7.776×10^6 neut/min	.0182
$\frac{3.0625}{27.25^2} = \frac{}{742.5625} = .004124$		1.980×10^6 neut/min	.0167

this is close use this

M-226 →	$.2205 \times 10^6$ neut/min	.0190
PN-467 → 1.988×10^3 neut/sec	$.1193 \times 10^6$	.0175

Average efficiency = 0.0180

Eff Dist 5" below Surface!!

D W Thompson

Sept 14, 1960 Counting System for Pulsed Neutron Work

NJE P.S.

6810A + NE-400 scintillator

HP 460AR

HP 460BR

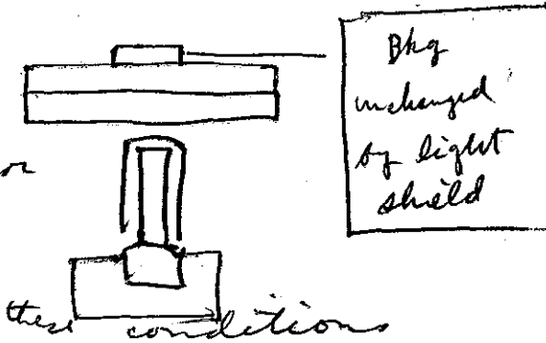
TMC # 212 (Pulsed Neutron Logic) CN-110, 220A, Monrol 205

The above system had been set up by E.R. Rohrer for neutron counting

HV = 1760 V, HP 460A MIN gain, HP 460B-linear TMC # 212 Disc = 2. With 60 cycle repetition rate and 160 μsec channel widths, delay = 2×, Bkg 2× a number of counts were taken with M-227 source. (Under these conditions, ERR says the gamma source does not affect counting rate)

A bias curve was taken with TMC # 212 Disc. varied from 0.5 — 4, and the counting rate varied drastically -- this phosphor does not have a "flat plateau".

The counting rate for the geometry below was 792 counts/sec or an eff. of $\frac{800}{8 \times 10^6} \simeq 10^{-4}$



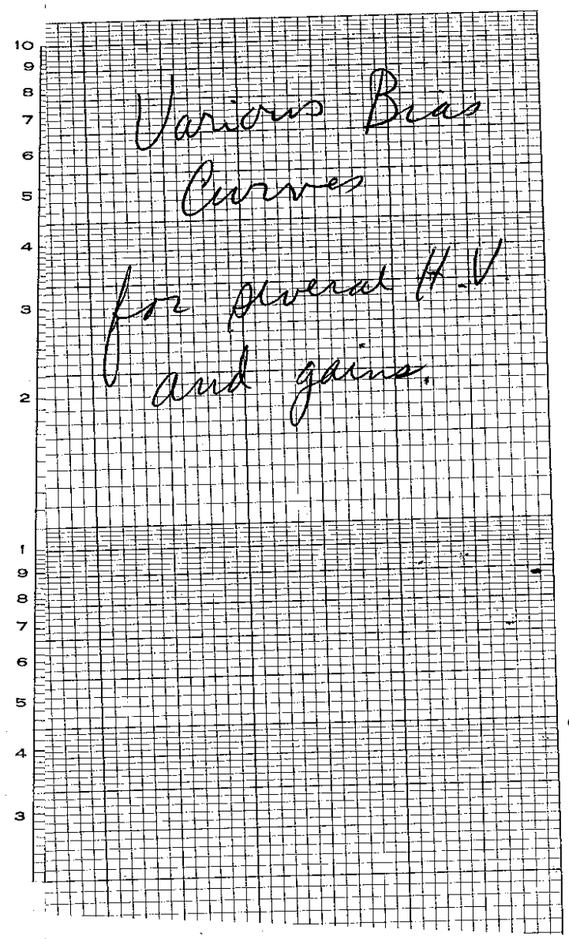
Estimated source to phosphor dist. ~ 4".

Background essentially zero for these conditions

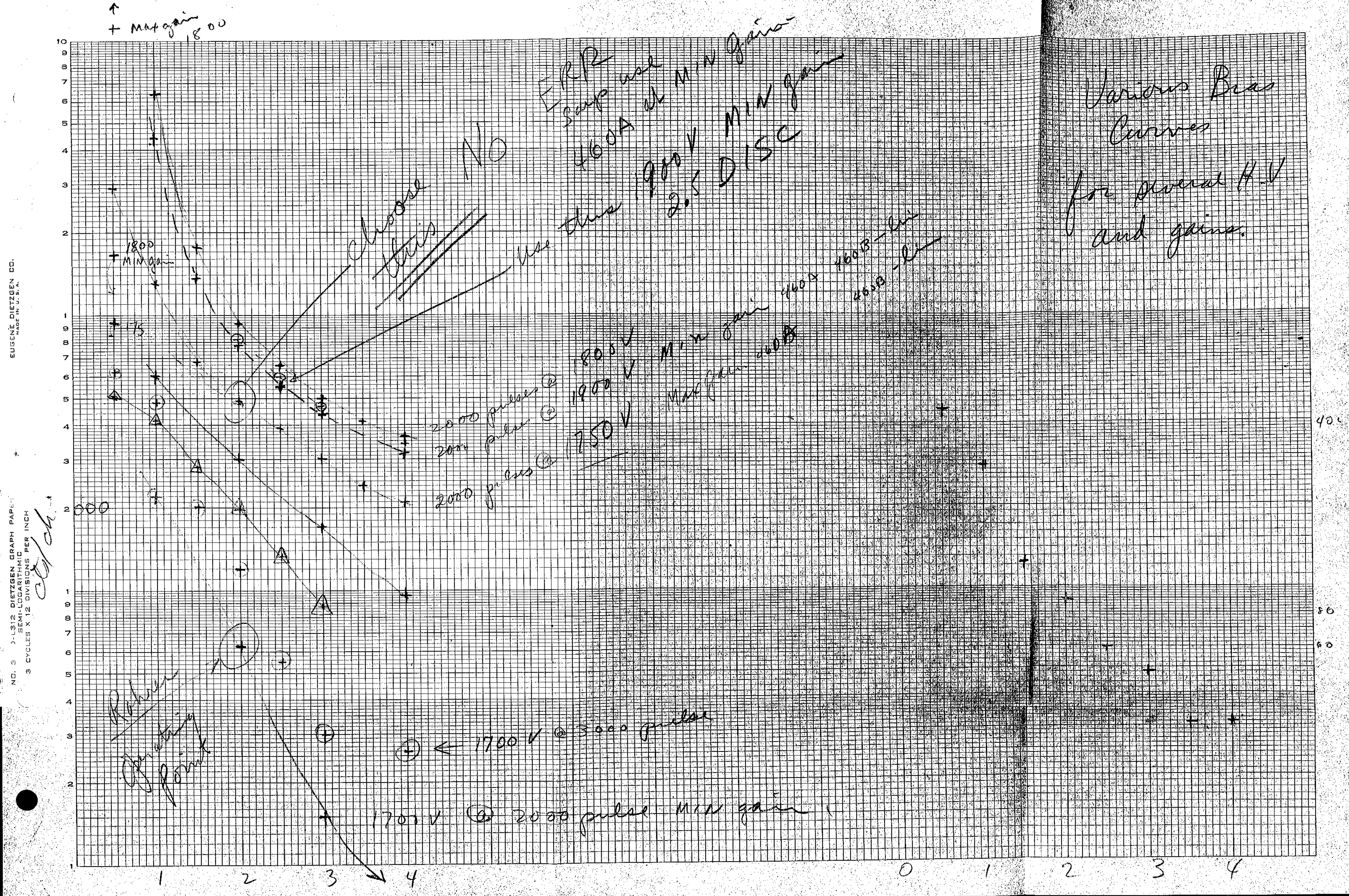
at 1750 volts max gain on HP460AR, the counting rate had increased to 14,375 counts/sec but the background had increased to ~100 cts/sec

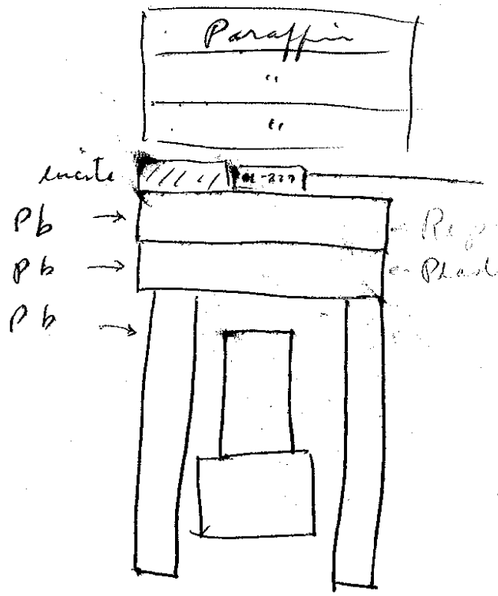
Further measurements have indicated that some of the above count rate is due to gamma rays from the neutron source. See next pages Bkg ~ 300
w.o. light sh. ~ 4000
w. M-227 12,700 no mod
w. Ra Be 5,200

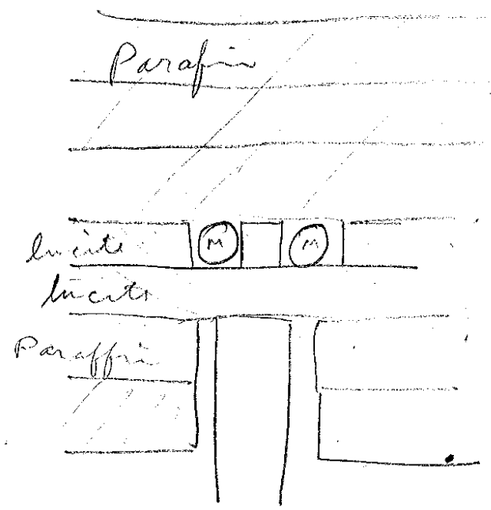
The graph shows in general the response of the crystal to M-227 source without any lead around essentially, the configuration of page 39.



40


+ Max gain 1800
1800 MIN gain
175
ERP
Surp use
460A & MIN gain
Choose this
NO
Use this 1900 V MIN gain
2.5 DISC
1800 V
1900 V
1750 V
2000 pulses @
2000 pulses @
2000 pulses @
Min gain 460x 460B-lin
460B-lin
Max gain 460B
Various Bias Curves for several H-V and gains.
Robinson
Operating point
1700 V @ 3000 pulse
1700 V @ 2000 pulse MIN gain
EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO. 3 J-L312 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 12 DIVISIONS PER INCH
1
2
3
4
0
1
2
3
4





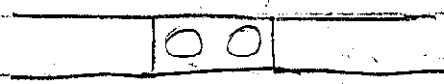
with conf of p 42

Background + M227	380 cts	20 000 x 160 μs	4" lead	(2)
with Moderator	1650 cts	"	"	(3) (4)
Remove lead Replace with moderator ~~make hole~~. 4" no moderator.	4200	"	"	(5)
Make hole in lead	150 cts	"	"	(6)
Bkg no M227	100 cts	"	"	(7)
Bkg no sideband	100 cts	"	"	(8)
Built up paraffin house				
Source at side of XTL	27,400 cts	"	"	(9)
1½ paraffin between Source, Source on top of XTL and XTL	30,700 cts	"	"	(10)
3" paraffin. 1" lucite paraffin	19,000			(11) (12)
Bkg 1" lucite 3" paraffin below with 2½ hole cut in	45,000	"	"	(13) (14)

M-227 (L) + M-226 (R)	~ 38,000	10,000 @ 160		(1)
M-226 + M-227	~ 38,000	"		(2)
M-226	~ 18,800	"		(3)
M-226	~ 18,800	"		(4)
M-227	~ 17,700	"	NG	(5)
M-227	~ 20,400	"		(6)
M-227	~ 19,100	"		(7)

Ved More accurate system for positioning source

Rebuilt house



L	R	Total (64ch)		
M-227	O	1311824		①
M-227	M-226	2494030	2606761	③
O	M-226	1294937		②
M-227	M-226	2517847	2626041	④
M-227	O	1331104		⑤

$\frac{②}{①+③} = 0.9568$

$\frac{④}{③+⑤} = 0.9588$

Bkg corrected ~4500 (900)

$\frac{②-Bkg}{①+3-2Bkg} = 0.9583$

$\frac{④-Bkg}{3+5-2Bkg} = 0.9604$

approx Max Counting Rate

$$\frac{2606\,761 \text{ counts}}{\frac{10,000 \times 1.60 \times 65 \times 10^{-6}}{104 \text{ seconds}}} = 25,065 \frac{\text{cts}}{\text{sec}}$$

If we assume that dead time correction account for this difference in counting rate

$$1 + \tau N_{1,2} = 1.0435$$

$$\tau N_{1,2} = .0435$$

$$\tau = \frac{.0435}{25065} = 1,735 \times 10^{-6} \text{ sec}$$

This is unreasonable since scalers will not jam until ≈ 11 mc/sec

(1) This may be amplifier base line depression
(2) which is an effective gain decrease
(3) with increased counting rate. The
(4) Discr setting and bias curve shape is
(5) important for these effects.
Needs further investigating

Sept 15 Moved system to Rm 107-108

(A) roll

with ~100 ft RG-114/U zoom Built a paraffin hovilser around PM 6810A. with gains as they were

HV = 1750

460A = max

460B = Pulser

~~C~~.212 disc = 2.0

M-226 count rate ~ 38000 per channel @ 160 μs

10000 sweeps

Sept 16 Source left on PM overnite

M-226 CR ~ 39000 per channel

① Bkg ~ 500 per channel

② " 476

③ " 380

Change disc to ③

① Bkg ~ 19

② M-226 ~ 27000

③ 2¼" wide Slot M-226 ~ 24000

M-226 + M-227 ~ 53600

④ M-227 ~ 18'

⑤ M-226+M227 48 000

⑥ M-226 2 000

Later found M-226 not mounted properly.

Repeat two source experiment

(B) roll

Using only Bkg channel for counts

M-226 50 573

M-226+M 227 42 270 +2'6 =107806

M-227 51 708

Ratio = 107806 / 102284

M-227 52 408

M226+M227 44 264 +2'6

45 044

M-226 49 068

" 50 415

50 236

50 965

Av 220382 / 203539

Some evidence of varying counting rate when viewed on scope.

6810A Ser. No. 179 with other NE-400 phosphor installed in paraffin.

© Roll

chg channel 320μs 10000 sweeps.

M-227 44634, 53686, 44350

226+227 23811, 22146, 21654, 21107 → 22180+2^16 = 87716

226 40165, 40564, 40433 → 40387

Sum Ratio = 87716 / 84737 = 1.035

Some sort of XTL behavior

Build PA-6810 and XTL pluglon into paraffin reflector & 2% block exp. to attempt period meas. with this counting system.

12-14-59 Blizard suggested that D.C. write informally to Hanford, and suggest ooms do large vessel critical experiments and offer perhaps one of our vessels, 4' sphere 27" sphere or 5' cylinder for this comparison. Discussed the advisability of some technical assistance also with the experiment. Letter to Paul Gaston John Faulkner

January 5, 1961

Eight miniature fission counters were delivered in December from R. Zeller. The uranium deposits are given below.

Film Number			Wt. U, mg. Plated/Side		Wt. U_3O_8, mg. Plated/Side
U^{238}-Side No. 1	1		2.5	5.0	2.9
FC-7	2		2.5		2.9
FC-8	3		2.4	4.8	2.8
	4		2.4		2.8
		Total	9.8		11.4
U^{235}-Side No. 1	1		2.6	5.2	3.1
FC-9	2		2.6		3.1
FC-10	3		2.5	5.0	2.9
	4		2.5		2.9
		Total	10.2		12.0
U^{236}-Side No. 1	1		2.5	5.0	2.9
FC-11	2		2.5		2.9
FC-12	3		2.4	4.8	2.8
	4		2.4		2.8
		Total	9.8		11.4
U^{234}-Side No. 1	1		2.3	4.6	2.7
FC-13	2		2.3		2.7
FC-14	3		2.2	4.4	2.6
	4		2.2		2.6
		Total	9.0		10.6

The materials used were sent to ORGDP by request of M. E. Ramsey for this job.

Disc. Bias vs. Count Rate

U^{235} Counter FC-9 in paraffin with for both 1x5" sources

M-226 - M-227

~~Bias Count~~

Counter Bias Voltage	Disc.	2 Min. Count.	Δc	+300 Bias Input – Max Pulse on Scope ~45V	+600
	5	25460			
−300	10	12700	12760	10640	12770
LA Y119060	15	12200	500		
Gain 16 Input +	20	11950	250	8910	12220
Rise 0.8	25	11330	620		
Y 120243	30	11200	130	6820	11420
Scaler Disc −5	35	10480	720		
	40	9940	540	4670	10610
Max Pulse on Scope	45	9400	540		
~60V.	50	8380	1020	3160	9560
	55	7240	1140		
Noise ~2V.	60	5940	1500	1610	7940
	65	4420	1320		
Sig/Noise < 30	70	3210	1210	350	5600
	75	2130	1080		
	80	1250	880		3280
	85	770	480		
	90	450	320		1900
	95 }	510/2 = 255			
	95 }			(100)	1200

Background (no sources)		X16 2' Counts −600	X64 2' Counts −600	X16 FC-13 2' Counts −600 +300	U-234
	Disc				
On scope	1				C
15480 ∠ pulses	2				O
582,920 prod. any noise	3	582,920			U
	4	15480			N
∠ pulses ~ 6 volts	5	10640		8,730,970	T
noise ~ 2 volts	6			6,873,350	6
	7	3000		5'470330	R
	10	110	2883620	1,930.180	
	15		18650		
	20		9400	16 030	
	14		32650		
	16		14920	(25) 880	
	17		13400	(35) 10	

Counting rate W.O. source 45 Disc 00,5'

W sources M-226-M227 45 530

90 110

U-235 Counter FC-10

Bias Voltage −600, LA Y119060, gain 16 Rise 0.8 Input +

SC. Y120243 Disc - 5

Max Pulse on Scope ~180 volt.

	2' Count		2' Counts	
90	2340			−300 V.
80	3840		1770	
70	6450		4060	
60	8080			
		50	8550	
40	10040			
		30	10410	
20	11000		10960	

See p 55 for graphs of data

Channel I FC-10 — 219 — 2048 — Decade PHS-5
-300
64
0.2
+

Channel II Ne 400 — 219 — 2548 — Decade PHS-5
□ — HAM
6292
-800V
2
0.2
—

2" lead

2' Count

X32 -800

DISC	I	II	I	II
	11140	1,120,610		
	10910			
10	10520	~~7230~~ (60 N)	7680	575430
	6760	270510	692	133430
20	6880	~~7210~~ (60 N)	6980	132540
	6760	29290		
30	6630	~~7210~~ (60 N)	5980	15020
40	6410	5650	3640	1620
50	6090	2730	1710	580
60	5590	2180	550	290
70	4880	1310		
80	4860	1300		
80	3530	700		
90	2180	400		
100	1410	170		
15	7220	—		
55	—	3040		
60		2340		
50		3970		

delay

½ Mil
-1000.

10	380360
20	265240
30	201350
40	147240
50	112340

½ Mil

KEUFFEL & ESSER CO., N. Y. NO. 359-71L
Semi-Logarithmic, 3 Cycles × 10 to the inch, 5th lines accented.
MADE IN U. S. A.

+ 600 v Bias (+)

- 300 v Bias (+)

+ 300 v. Bias

FC - 10

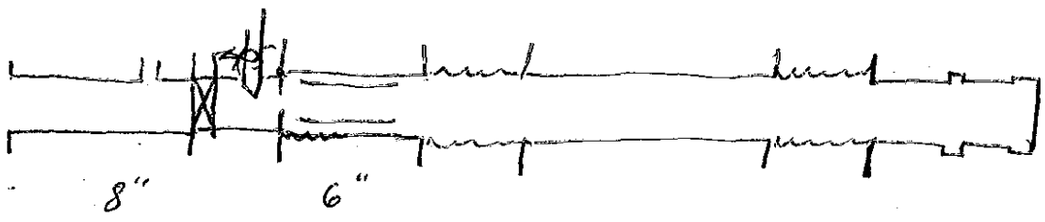
FC - 9 and 10

FC - 9 and 10

Disc. Setting

February 7, 1961

Test of Deflection scheme to reduce background (Morgan, Mihalczo & Magnuson)



45×10^{-6}	2.1×10^{-7}
39×10^{-6}	1.5×10^{-7}
66×10^{-6}	3.4×10^{-7}

Moved Target -4×10^{-8} Δ
Voltage off $+9 \times 10^{-8}$

With 1500 v on 6" plates	on	off
on target	54×10^{-6}	-2×10^{-8}

Data Taken at Hartford on 5-22-58
at Hartford Special Machinery Co Shops.

Table operating with 3/8" Run around Line

Pressure	Forward TIME	Rev. TIME
20 PSI	2.72 MIN	0.23 MIN
60 PSI	0.47	0.1
	Machined face of flow control valve plug	
20	2.50	0.21
30	1.65	.17
40	1.25	—
60	0.87	.1
	3/4 Cu Tubing Run around line	
15	0.38	0.31

December 5, 1960

20	would not move Table Rev.	
20	0'47.8"	15.2"
	47.8"	15.4
	Around 4-5 sec required to vent the 20# on feed side of cyl.	
26 Max	39.4	14.6 4
	39.6	14.6 4
15	61.4	Cylinder not returned at this pressure. Something is binding. released jam Nut.
15	62.8	22.4 ~6
	62.8	22.4 ~6

FORWARD

L P	H P		Screw
15	~~75~~ ~~80~~	63.6	Only 1.52"
	84 PSI		11"
	80 PSI		13.2"
	78 PSI		13.6" 52½ in.
	76		14.2" 51 in

All gauges reading wrong

67½	15.0"	50 in
85 PSI	11.5"	54 in
75 PSI	13.8	52 in

Closed Speed Control Valve

4 Turns Closed

	Forward Speed	Run	Delay
20 PSI			
20 PSI	1'14.7"	14.7"	
20 PSI	1' 12.2"		
20 PSI	1' 12.2"	15.6"	5

6 Turns Closed

20 PSI	2' 10"	15.6"	5
20 PSI	2' 10"	15.6"	5

7 Turns

20 PSI	3' 35.2"	

Reset @ 6T closed

2' 10" = 130", Speed = $\frac{54.0"}{13.0} \times 6' = \frac{32.4}{13} \approx 25$ in/MIN

Screw Speed at start =

TNC Neut. Generator

Long Counter Eff. $\sim 1.32 \times 10^{-2}$

as measured with: H.P Source

@ 14 Mev $\epsilon \sim .89$

Beam Current @ 4 μa 115 kV

804630 / 120 sec = 6700 n/sec

Long counter dist = 3 m.

Counter geom $\frac{2.22 \times 10^{2}}{9 \times 10^{4}} = \Omega = 2.47 \times 10^{-3}$ — counter area / dist squared.

$\frac{\Delta\Omega}{4\pi} = 1.2 - \frac{2.47 \times 10^{-3}}{4\pi} = 1.97 \times 10^{-4}$

(Time 1291 hrs)

Front Solid angle $= \frac{\pi (3.5 \times 2.54)^2}{4\pi (300)^2} = \frac{78.0}{8.89^2} = \frac{78}{36 \times 10^4} = 2.19 \times 10^{-4}$

Total Yield = (uncorrected for side scattering)

$= \frac{6700 \times 10^3}{2.19 \times 10^{-4} \times .89 \times 10^{-2}} = \frac{6.7}{1.95} \times 10^9$

$= 3.44 \times 10^9$ n/sec

Yield ratio 115/150 $= \frac{184}{222} = \frac{1}{1.205} = .83$

Yield @ 150 kv $= 4.15 \times 10^9$ @ 6 μa

Yield vs Voltage @ 50 μa

	Long Ctr	Sm XTL on 6292
	C-I	C-II
	1350 V	1250 V
	4 gain	8 gain
	0.2 μs	0.2 μs
	Disc 5	Disc 10
	Dist 3 m	Dist ~10 cm
Voltage	Counts / 100 μC	
75 kv	199280	1440
	211340	670
	210290	920
	212330	930

Found HV connection pin 14 ~~50 kv~~ gain 2, 1050 V 0.2 μs Disc 20 Col & probe height ~15 V, neutron pulses < 60 V

50 kv	50 μa	57660	1790	.0310
	5 μa	58990	1840	0312
60 kv	50 μa	99320	2950	.0298
70 kv	50 μa	204210	5880	.0298
80 kv	50 μa	311800	9210	.0296
90 kv	50 μa	404930	11940	.0295
100 kv	50 μa	489150	14430	.0296

	C_I	C_{II}	
110 kv 50 μa	582 330	17170	.0295
120 kv 50 μa	654280	19290	.0295
130 "	69 1640	20390	.0295
140 "	722960	21270	.0295
150 "	755240	22230	.0295

1:30 PM Jan. 12, 1961 SL

125	50 μa	358, 440	1147	
		403 160	1276	
		659 410	2085	6
		540 460	1681	8
		596 400	1694	6
		447 570	1379	6

Variation of Beam Current at Fixed Voltage

125 KV

Distance	300 cm		25 cm [90°]
Current	#1/100 sec	#2/100 sec	
20 μa	214250	6600	
40	472280	14420	
50	639380	19710	
60	776550	23690	
80	982240	30450	
100	1179880	36680	
140	1501560	47570	
180	2021710	65610	
220	2219250	72500	
260	2438640	80130	$43^{31} \times 64$
300	3221620	109840	57^{51}
400	3905380	148110	72^{18}
500	5003440	187010	95^{14}

Machine settings Solenoid 6 rev

Dent. —

Focus ~22 rev

500	4706910	172220	88^{+49}
500	4639700	169760	86^{+10}
500	3257430	109620	54^{+36}

~10-15 min

Regional Dental

9:50	500-15?	50570	—
10:00	500 μa 150 KV	26150	

Checked operation of pulsing system OK

Replaced .25 M resistor

Jan 13		C_I	C_{II}/100 sec
9[50] AM	50 μa 125 kv	59220	1840
		(300 cm	50 cm)
		65100	2000
		56020	

Moved target for new spot.

10[05]	50 μa 125 kv		
	50 μa	343970	10490
	5[0]	344470	10420
	50 μa 125 kv	360460	10900
	1000 μa 150 kv	4,862740	178120

Saturday Jan 14, 1961

Background ratios

		Cont Time	C_I	C_{II}	IC-2
off	(200 μa) 150 kv	100 sec	14620	730	
off	(") "	"	14280 (2890)	700	
on	200 μa "	"	57[8]500	25680	
on	1000 μa "	"	645,180	29050	
			(121 569)		
			2,38[8]0		
	Keithley IC-1				
	for Target				
	150 kv 50 μa		119620	5440	4.7×10^{-11}
	125 kv 50 μa		71790	3420	3.0×10^{-11}

High Voltage Beam [illegible] 0.4 μa

Several times the Background
current was measured at ≈ 1%
of the target current without deflection

DWM

Jan 16, 1961

Screwed in Single Chopping slit to keep beam off target. Found beam to be about 1/4" above center line with no real check if it was centered. Made some minor adjustments in the lens.

Turned on Deflecting voltage to move beam off target. Couldnot find beam, suspected that the voltages were not correct from the drift back on as the voltages were turned off. Voltage found to be incorrect to move beam onto chopping slit.

Therefore the box assembly below the deflecting plate was turned around so that the beam moved onto the slits in the correct manner.

In order to ascertain the simultaneous beam position at single chopping slit and the target, it was decided to remove the target and replaced it with the Molybdenum blanks. The H_2O leaks in the target assembly were fixed by putting pipe dope on the nylon fittings which screwed into the water cooling housing.

System pumped down readily and accelerator turned on in ~30-45 minutes. With Beam centered on slit, no beam reaches Target! The support for the extension had been moved to the far end of drift tube so that a flange must be crooked -- (any way tends to correct the beam rather than move the target out of the beam.)

D.W.M.

Considerable arcing from focus to terminal occurs at max focus voltage A polyethylene liner of the bob in terminal was made out of tubing by splitting and fitting on inside of bore as a collar.

D.W.M.

Beam aligned on target and on first chopping slit

Voltage 125 kv

Beam off target 5.5×10^{-8} ~1000

Beam on target $5\text{4} \times 10^{-6}$

Adjusted Double Chop Slits to be near Beam

Beam on target 100×10^{-6}

Beam off target 6.5×10^{-8} ~1600

Gas 1.

Reduced gas pressure to 1.6×10^{-5}

Beam increased reduced ext. ~2 turns

Beam on target 100×10^{-6}

5.7×10^{-8}

Reduced gas ~ 1.4×10^{-5}

90×10^{-6}

6.2×10^{-8}

80×10^{-6}

Lens was 42

Lens To 30 current reduced

on ~~100~~ 3×10^{-5}

" 2.0 ~~1.8~~ $\times 10^{-8}$: 1500

on 2.7×10^{-5}

	140 kv	50 ma
On	10×10^{-5}	> 1000
Off	1×10^{-7}	

	100 kv	35
On	10×10^{-5}	> 1111
	9×10^{-8}	

Nothing seems to change this background ratio of ~ 1000 - 1600 to 1.

Much trouble with focus arcing to bottle, and loss of vacuum

Solenoid at 4T
Focus at 20 T

100 kv	100 ma	On
	1.2×10^{-7}	Off

125 kv	100×10^{-6}	On
	1×10^{-7}	Off

Sol 6T, Focus at 20T
Dent @ 20T

125 kv	100×10^{-6}	
	9×10^{-8}	

January 18, 1961

It was decided to remove all the beam tubes and reassemble with deflecting chopping plate T and flange (3/4 entrance collimator)
Valve
Chopping Slit
Target.

One reason for this was to see if this ~~would~~ reduced path would reduce the background current.

Talked with Joe Kington and he says if you can see the beam, the pressure is too high. However his pressure volumes numbers agree with those achieved with the T N C machine

	J K	T N C
Before Gas	5×10^{-6}	3×10^{-6}
After Gas	1×10^{-5}	$1-2 \times 10^{-5}$

Considerable difficulty developed in pumping out - ion bottle started leaking - an apparent leak in target section developed after good vacuum was reached. It cured itself. May have been associated with cold trap warming

Jan 19, 1961

8⁰⁰ Gas pressure 7×10^{-6}

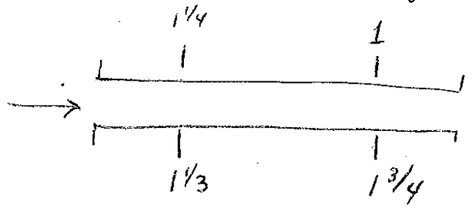
add liq N_2

8²⁰ 3.7×10^{-6}

Start gas flow to $1 \sim 2 \times 10^{-5}$

Adjustment of deflecting Plates

To set plates from fully separated to parallel and spaced 1" apart Turn each screw



according to diagram

Gas Pressure $\sim 2.5 \times 10^{-5}$ 100 kv

5.0×10^{-5} on
4.5×10^{-7} off 900 v
4.2×10^{-5} on

5.0×10^{-5} 1500 v
2.2×10^{-7} off
5.0×10^{-5}

Gas pressure 1.3×10^{-5} 100 kv

1500 v deflect.

5.0×10^{-5}
4.0×10^{-8}
5.0
3.0×10^{-8}

Gas	kv	DeF V.	On	Off	
1.4×10^{-5}	100	900-200	5.0×10^{-5}	~~2.5×10^{-8}~~	4×10^{-8}
"	"	900-0	5.0×10^{-7}		3×10^{-8}
1.2	100	900-0	5.0×10^{-5}	$-.1 \times 10^{-8}$	
				1.9×10^{-8}	
1.2	125	900-0	5.0×10^{-5}	1.2×10^{-7}	
1.2	150	900-0	5.0×10^{-5}	6.4×10^{-7}	
1.2	150	1500-200	5.0×10^{-5}	-1×10^{-8} ↓ 2.5×10^{-8}	

Gas	kv	D.V	D.V	ON	OFF
10^{-5}	100	1500	200	5.0×10^{-5}	$-.4\times10^{-7}$
1.3×10^{-5}					$+2.6\times10^{-9}$
10^{-5}	150	1500	200	5.0×10^{-5}	—
1.3×10^{-5}					$+6.6\times10^{-9}$
10^{-5}	150	1500	200	5.0×10^{-5}	—
1.3×10^{-5}					$+3.\times10^{-8}$

The above data shows that the background current does indeed drop to very low values when the beam is first swept off the target ~~but then~~ and is negative probably due to the suppressor leakage current. The target current does change with the time that the current is off the target and the values tabulated above are reasonably constant after a few minutes. With this rise in background the pressure rises on the Phillips gauge

Gas	kv	D.V	D.V	On	Off
1×10^{-5}	150	1500	0	5×10^{-6}	1.2×10^{-8}
1×10^{-5}	150	1500	220	5×10^{-6}	1.2×10^{-7}
1×10^{-5}	150	1500	0	5×10^{-5}	-1×10^{-8}
1.2×10^{-5}					$+1.5\times10^{-8}$

Since it sweeps off and goes negative for 50μa and not for 5μa, the conclusion is drawn that the focussing changes between these!

1×10^{-5}	150	1500	0	2×10^{-5}	-5×10^{-8}
1.1×10^{-5}	150	1500	0		-1.4×10^{-8}
1×10^{-5}	150	1500		10×10^{-6}	$-.8\times10^{-8}$
					-1.7×10^{-8}
				5.2×10^{-6}	-2.5×10^{-8}
					-2×10^{-8}
			RF in sweep off		-2.1×10^{-8}
			Voltage 0		-2.0×10^{-8}

Jan 19, 1961

Kingdon de Sanssure and Silver visited and observed the accelerator Kingdon stated that the pressure is $\sim 1 \times 10^{-5}$ if one can see the beam. Although the vac gauge says 1×10^{-5} at Cold trap — pressure at target may be much higher.

Observed a general fluorescence when beam was swept ~~W~~ target, Spectra

Joe Kingdon thought that perhaps we had a small leak also.

Observed that manipulation of the cold trap and Target valves always gave an increase in pressure.

Cleaned chevron and O-ring seals on target valve reassembled to pump down overnite.

Jan 20, 1961

8^{30} AM pressure 7×10^{-6}
Add N_2
Close Valve To trap — Gauge $\rightarrow 2 \times 10^{-7}$
Open rest of system — $\sim 5 \times 10^{-6}$ but slowly dropping. It is my opinion that we do not have a leak but just outgassing problems. Every time one operates the vacuum valves one gets a burst of occluded gas. It is also possible that the water cooled target and water cooled slit collected oil vapors during the night when the trap warmed up.

9^{10} AM 4.4×10^{-6} m.m. closed Target and slit H_2O, put Heat lamps on

9^{23} AM 6.6×10^{-6}
9^{35} AM 6.7×10^{-6}
943 Removed water leads 1.5×10^{-5}

Evidence of a leak at Target assembly. Removed cleaned and smoothed edges of blank Target by polishing on table and crocus cloth. Replaced and would not pump down

~ 5×10^{-4}. Filled H_2O chamber with Alcohol. Pressure dropped to $\times 10^{-5}$
Emptied Alcohol $P = \sim 5 \times 10^{-4}$
admitted alcohol organic $P \rightarrow 10^{-5} \rightarrow 6 \times 10^{-6}$
drained alcohol. $P \rightarrow 10^{-4}$

Flood crack between flanges only but allowed some spillage to epoxy glass metal seal.

Flood epoxy seal only — this is the leak QED.

Put on heat lamp. — glass cracked !

Painted crack with vinyl seal
Painted epoxy joint " " "
Air dry ~ 20 - 30 min
Oven to 90°C air temp (metal ~ 60°C)

Pump with R pump for 10'

Accelerator Tube Vac 1.6×10^{-6}

2^{00} PM	Open Target →	3.0×10^{-4}
2 06		3.1×10^{-4}
	Repainted glass crack with Vinyl Seal (Bakelite in Thinner)	
2 20		1.4×10^{-5}
	Much vacuum checking and	
4 30	pondering —	2×10^{-5}
	painted all epoxy joints, vacuum improved immediately →	5×10^{-6}
	Isolated ~~pump~~ target, pump →	4×10^{-7}
4 50	open to accelerator	1.8×10^{-6}
	open to Target	6.5×10^{-6}
4 58	(entire system	4.4×10^{-6}
5 00		3.9×10^{-6}
	Leaks are fixed ! ! !	
5 05		3.5×10^{-6}
5 10		3.5×10^{-6}
5 22		3.2

January 23, 1961

8^{20} AM	4.3×10^{-6}	10^{30} add liq N_2
10 40	1.1×10^{-6}	
10 45	4.3×10^{-6}	
47	1.3×10^{-6}	

BSR Acc beam at 14 ma @ 150 kv not viable!

10^48 Start to get beam in accelerator

10^55 Ion source blue

11^00 Source SR press 2×10^{-5}

58 ma Target

5.5×10^{-7} Target current beam off

Suppressor 90 v ON
- 56 ma Target ~500
- 1.2×10^{-7} beam deflected

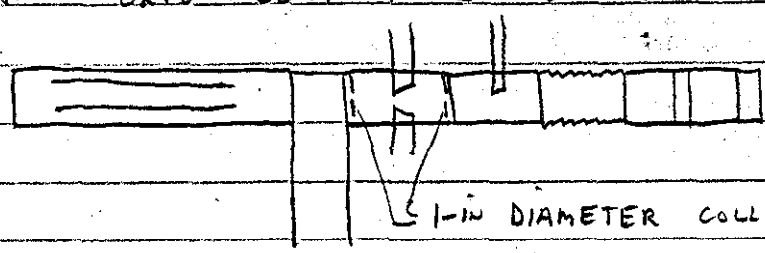
76 ma on Target Suppressor ou

86 ma on Target Suppressor off

76 ma on target " on

suppressor 90 ou
- 1.8×10^{-7} deflected with 1500 v and 220 v on
- 1.8×10^{-7} deflected with 1500 v and 220 v off

Double chopping slit put in with entrance and exit collimators of 1-in. DIAMETER



Accelerator Tube 1.8×10^{-6}

Opti Target, valve → .03 mm.

12:56 PM 3×10^{-5} mm

2:00 PM 4.5×10^{-6}

5.0×10^{-5} 145 KV

2×10^{-7} 145 KV 1500 V + 220 V

5.3×10^{-5} — —

~400

1.2×10^{-7} 1500 V —

1.2×10^{-7} 1500 V + 220 V

5.7×10^{-5} — —

3.0×10^{-5} — —

~1000

2.7×10^{-8} 1500 V + 220 V

3.0×10^{-5} — —

~1000

2.5×10^{-8} 1500 V

1.0×10^{-5} — —

-1×10^{-8} 1500 V + 220 V

-5×10^{-9} 1500 V + 220 V

-3.8×10^{-8} no Beam —

1×10^{-5} — —

5×10^{-5} defocused — —

3×10^{-7} " 1500 V + 220 V

$.5 \times 10^{-5}$ "

-4×10^{-8} " oscillator off no beam

Suppressor 300 v	5×10^{-5}	diffused	–	–
"	2×10^{-7}	diffused	1500 v	220 v
"				
"	7×10^{-5}		1500 v	220 v
"	7×10^{-8}			

125 Kv

Suppressor 90.	BEAM ON		BEAM OFF
	8×10^{-5}		4×10^{-9}
	5.4×10^{-5}		-3×10^{-9}
			2.5×10^{-8}
	2×10^{-5}		-2.4×10^{-8}
	Ion source off		-3.6×10^{-8}
	1×10^{-5}		-3×10^{-8}
	Ion source off		-3.7×10^{-8}
	$.5 \times 10^{-5}$		-3.6×10^{-8}
			-3.9×10^{-8}
	$.092 \times 10^{-5}$		-3.7×10^{-8}
			-3.8×10^{-8}
Suppressor off	1.1×10^{-6}	current up factor of 10	-3.3×10^{-8}
	1.1×10^{-6}		3.5×10^{-8}
	7.2×10^{-7}		

Proton Target, Prong

Target	TO 5×10^{-6} Current	e_I $2.5^{\times 10^{-5}}$	100 cm dist 10" count	2" plastic on edge of Tube 6810 = 1400 V 204B x 2 gain DISC = 5
Beam On	5.0×10^{-5}		163800	13320
Beam Off	1.7×10^{-7}		2850	300
	1.85×10^{-7}		1.74%	2.25%
Beam On	5.0×10^{-5}			
Beam On	1.0×10^{-5}	3×10^{-5}	17310	1410
Off	$+2 \times 10^{-8}$ / 2.4×10^{-8}		620	110
			3.58%	7.8%
Beam On	1.0×10^{-5}	2×10^{-5}	14270	1160
Off	5.0×10^{-9} / 1.25×10^{-8}		570	130
			4.0%	11.2%
Beam On	1.0×10^{-6}	1.8×10^{-5}	5480	510
Off	-1.5×10^{-8} / -1.6×10^{-8}		180	90
			3.28%	18%
Beam On	5.0×10^{-5}	1.5×10^{-5}	115060	9080
Off	1.5×10^{-8} / 3.9×10^{-8}		1520	220
			1.32%	2.42%

Orig yield at 5 μa @ 380 cm = 639 380 cts/100 sec

$\frac{637.38}{163.800} \times 9 = 3.94$

$= 35.1$

Above data at 125 kv

Solenoid at 11 turns, each current focussed for max current.

Jan 23, 1961

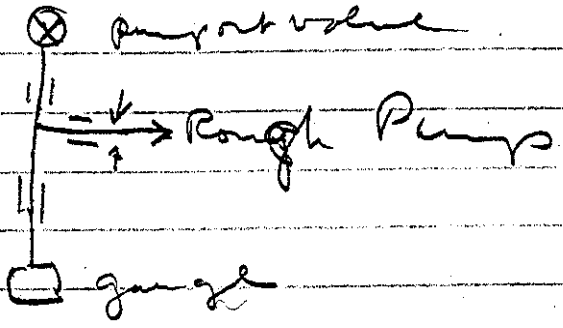
5^25 PM - 7.1 x10^-6 mm Hg

Jan 24, 1961

8^00 AM 4.8 x10^-6 mm Hg. Add light

8^20 2.0 x10^-6 mm Hg

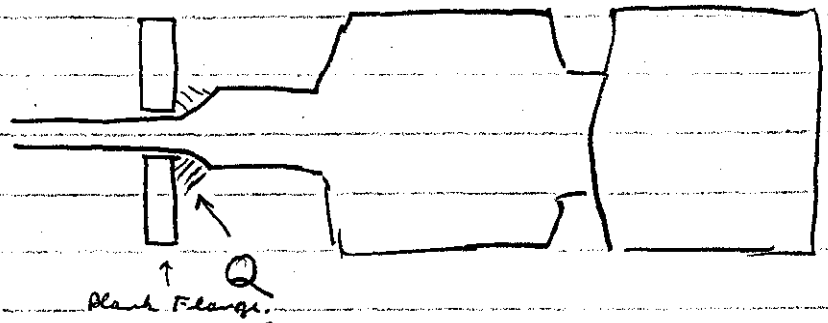
Add Add. Philips gauge on temp connection to pump out port



8^25	3 x10^-4 mm Hg	
8^28	3.7 x10^-4	close rubber pinch clamp
8^30	5.0 x10^-4	open to atm
8^31	4.0 x10^-4	check diff pump vac.
8^52	3.0 x10^-4	
9^12	3.5 x10^-4	
9^18	3.0 x10^-4	
9^45	2.7 x10^-4	
10^33	2.0 x10^-4	11^23 1.6 x10^-4

Not practical to have rubber in system.

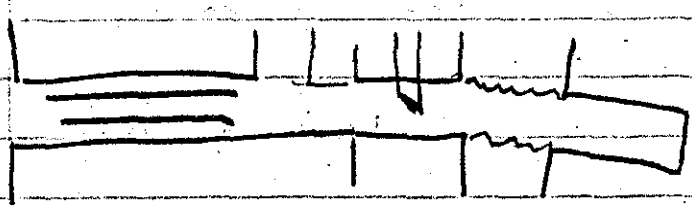
The following system will be tried.



Mount this instead of target assembly on bellows.

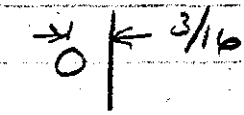
Atoms deferred until later

talked with Morgan - he suggested trying deflecting beam on target for pulses.



Removed target, valve and double slit

Single slit adjusted so that beam undeflected is



deflected centered on target 125 ma

Target Current 900 V

40 μa on 125 kv

7.5×10^{-7} off

2×10^{-6} off 125 kv 1 turn

90×10^{-6} on "

50×10^{-6} on

$.8 \times 10^{-7}$ "

20×10^{-6}

3×10^{-7}

5×10^{-6}

6×10^{-7}

1×10^{-6}

2.0×10^{-7}

Increase focus 3 turns with 900 V off
increase current on target
Decrease focus to minimize current

1×10^{-7}

1×10^{-6}

Install 9' drift tube and
phillips gauge waxed with glicerine
Pressure @ trap $< 10^{-7}$ before pumps on drift tube and near phillips gauge

4^04	1.4×10^{-4}	on Target end
4^04½	9.0×10^{-5}	on Trap.
4^06	1.5×10^{-5}	on Trap
4^06½	8.0×10^{-4}	on Target
4^08	5.5×10^{-5}	on Target
4^08½	1.2×10^{-5}	on Trap

D_2 was leaking thru for above readings. Pump off trap

4^12½	8.1×10^{-6}	on Trap
13	7.8×10^{-6}	" "
13½	4.5×10^{-5}	on Target (2')
14	3.7×10^{-5}	" "
14½	7.0×10^{-6}	on Trap
15	6.9×10^{-6}	" "
15½	4.0×10^{-5}	on Target
16	3.3×10^{-5}	" "
22	2.5×10^{-5}	" "
27	2.1×10^{-5}	" "

Jan 25, 1961

Phillips Gauge at target (2' drift Tube)

8^01 AM	7.7×10^{-6}	and leg N2
03	6.3	
05	5.8	
30	5.5	Press at trap 1.5×10^{-5} ??

8:33 Press at Target 6.1×10^{-6}
8:34 " " trap $8. \times 10^{-6}$ still going down
36 5.4×10^{-6}
37 9.8×10^{-6}
4.5×10^{-6}

Start up accelerator
Spot formed ~ 3/16" glow red on slit
press = 1.7×10^{-5} at trap
press = 3.5×10^{-5} at target
press = 1.7×10^{-5} at trap

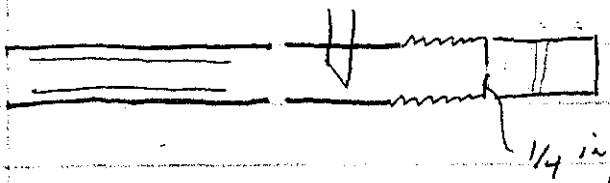
press 1.5×10^{-5} reduce high V ⇒ 0
↓
1.4

therfore we do not have high press at the target and Beams of 50 μa and greater are easily seen at gas pressures of 10^{-5} in well darkened room.

Also noted that the spot was not steady The beam moved about electrically!

1/25/61

Added 1/4-in diameter collimator between bellows and target assembly.



1/4 in diameter hole in 20 mil tantalum

1×10^{-7} off target 5.5×10^{-8}

6.8×10^{-6} on target 40×10^{-6}

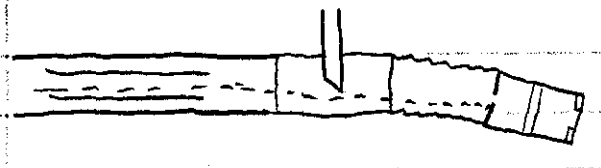
leads reversed above

3.8×10^{-5} on target

-3.7×10^{-8} off target

3.8×10^{-5} on target

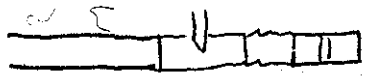
	on target	off target
1500 v	10×10^{-6}	-3×10^{-8}
1500 v	$+70 \times 10^{-5}$	1.5×10^{-8}
1500 v		2.0×10^{-8}
1500 v + 220 v		2.1×10^{-8}



900 v
220 v

Attempts to bend the beam through the 1/4-in hole in the tantalum did not work. Most of the beam hit the collimator. Need collimator with hole off center.

110 STRAIGHTEN BELLOWS & ALIGNED BEAM TO HIT TARGET & JUST MISS THE CHOPPING SLIT



~~ON~~	~~OFF~~
5×10^{-5}	4×10^{-8}
1×10^{-5}	3.4×10^{-8}

TARGET PUT IN. ROUGHING PUMP STARTED AT 4: P.M.

1/26/61

Vacuum 5×10^{-7} 9:15 AM

	Target Current	Long Counter
	4.5×10^{-5}	84050
ON	5.2×10^{-5}	160910
deflected	2.5×10^{-8}	2510

Spectrum of Deflected neutrons is 14.8 MEV

5×10^{-5}	111010
1×10^{-8}	2050

TARGET OF CENTER ABOUT 1-IN SO THAT AXIS OF TUBE DOES NOT INTERCEPT THE TARGET

-2.5×10^{-8} 320

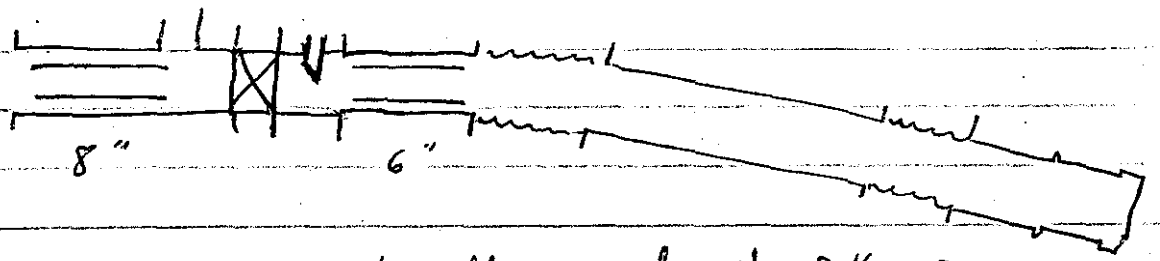
SUPPRESSOR CURRENT HV + RF OFF

-3.4×10^{-8} -3

Observed the RF supply to be rich in harmonics and amplitude saturates at variac setting of 25. J. Ellis states that it is possible that the circuitry is not proper for variable RF output without harmonics. 1) output tube grid signal should vary
2) It is probably over driven
3) screen on output tube should vary

Febr 7, 1961

Test of deflection scheme to reduce background



target offset ~~about~~ 2½ - 3 inches

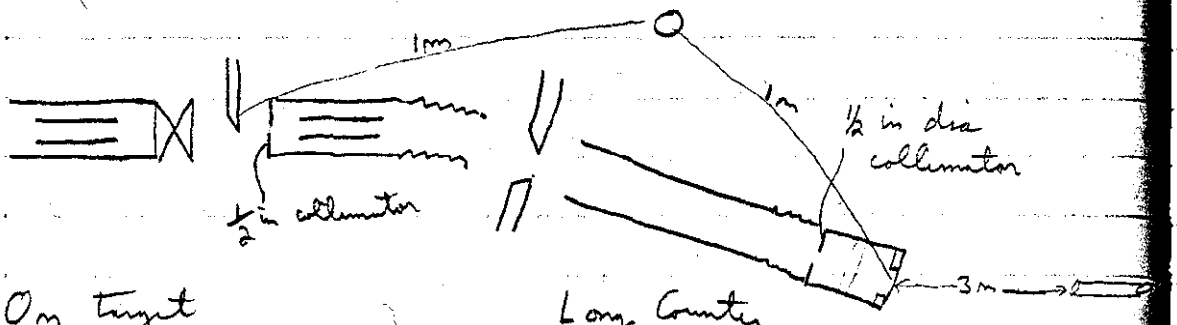
Max voltage of Hammer 1500 on 6" plates to get beam on target.

17.5 μa on target

-9.3×10^{-8} on target 8" plate @ 1500 V

Pressure	On target		Long Counter
2.5×10^{-5}	+ 45 μa	100 sec	494 × 256 + 223 = 126687
	-0.4×10^{-7}	600 sec	1 × 256 + 31 = 287
			2648
	33 - 37 μa	100 sec	449 × 256 + 107 = 115051
1.5×10^{-5}	4×10^{-8}		0 + 207 = 207
			333611

Feb 8, 1961



Pressure	On target		Long Counter		
	26 sec	100 sec	454 × 256 + 192		
2.0×10^{-5}	28 30 sec	100 sec	615	164	157604
$\sim 2.2 \times 10^{-5}$	-5×10^{-8}	600 sec		249	
			3800 : 1		
1.6×10^{-5}	30 - 30 sec	100 sec	482 × 256 + 83		123475
	4.1×10^{-8}	600 sec		+196	
			3780 : 1		

2" Saint 12" from Single Slit
42" " Target
Prop Cont 18" from Target

2.7 μa	530 × 256 + 128	100 sec	
-4×10^{-8}	185	600 sec	
	~ 4400 : 1		

(I count in 10' with beam off.
Screen in chopping stick each ~37 sec

2.5 μa	774 × 256	
2.2	340 = 583 × 6 = 3498	
	3500 : 1	

2.4 ma 665 x 256

1 x 256 = 107

New Target 1.6×10^{-5}

1.1×10^{-7} 419 x 256 → 102,264 100 sec

-4.8×10^{-8} Deflected 117 600 sec

1.1×10^{-7} 396 x 256 → 101,376

891.6 x 6 = 5350 : 1

Feb 9, 1961 two BF_3 counters below

Target BF_3 long counter at 3 m ≈ 200 watt in mode

Pulses on scope equal gain x 4 x 1.0 0.3 μs — dpt

Center of target displaced ~3 in

Target current 2.25×10^{-7} C_1 1168

press 2×10^{-5} C_2 1112 5 Min.

Long. C_3 102[4] $\frac{C_1+C_2}{C_3} = 223.5$

Target current 3.6×10^{-6} C_3 313[137] 1 MIN

8025

Deflected -5×10^{-8}

	C_1	5[498]	1478	C[55] 1571
Scale 256	C_2	5[48]	1324	5[108] 1388
5 MIN	C_3	0[+89]	2806 89	187 2929 0
		3196		30109

Target current After Count 3.6×10^{-6} C_3 319[+49]

Moved Long counter to near entrance to room. About twice as far from target. Tunnel broadside & shielded with paraffin
Repeat of background measurement with higher beam current

3.6×10^{-6} amp on target

1.6×10^{-5} mm

scale 250	C_1	1017210	1.9967×10^6	
Time 10 min	C_2	3826		
	C_3	14 119	$.3703 \times 10^4$	$\frac{C_1+C_2}{C_3} = 531.1$

74 mm on target C_3 301 180 77236 1 min
78

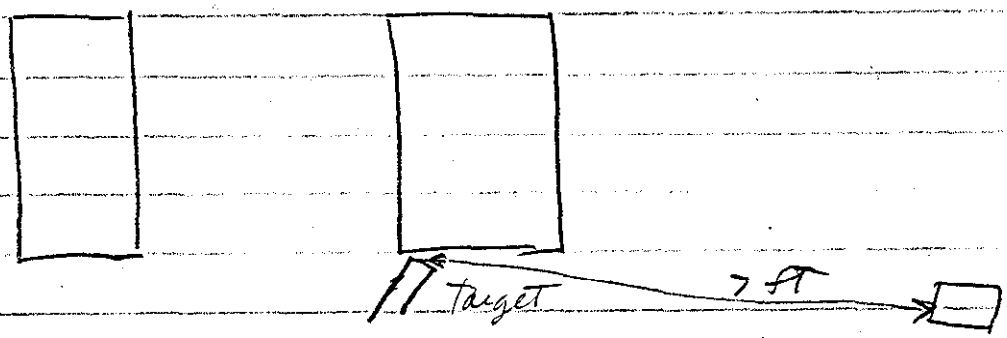
Differential	C_1	94300	8350	16,265
-3.2×10^{-8}	C_2	8844 34 +140	30 235 7915	
160415 $-3. \times 10^{-8}$	C_3	18,274 +32	+29	5 min
		34531	in 10 min on $C_1 + C_2$	

On Target 80 ma C_3 324 235 83179 1 min

160415 / 34539 $4.644 \times 531 \times 5 =$ **12,330**

Feb 17, 1961

Some approx. target yields with target next to ~~[illegible]~~ 16x30x30



The fixed wedge for bending accelerator drift tube was installed and with lights out, no glow of collimator edge could be seen with target current peaked. With beam deflected partially off target the collimator glow could be seen thru the 5' water window with a mirror

4 log N	Beam	V	Long Counter
1.6×10^{-9}	45-50 μa	130 kv	
2.4×10^{-10}	~6	130 kv	272 x 256

$\frac{2.4 \times 10^{-10}}{1.6 \times 10^{-9}} \times 50 = 7.5 \mu a \rightarrow$ 69,632 Cts/MIN or 1,510 cts/sec

Yield $= \frac{1.51 \times 10^{3} \times 2.5 \times 10^{4}}{.89 \times 10^{-2}} = 4.24 \times 10^{9}$ @ 7.5 μa

If front solid angle is $2.19 \times 10^{-4} \times \frac{9}{49} = .9 \times 10^{-4}$ (see p-80)

February 14, 1961

An 18" plastic cube was set up, covered with 0.0 in cadmium sheet. A NE-400 +6292 neutron detector was mounted on top over a 1½" hole in the center of the top face. The plastic cube is setting on 15" of aluminum boxes (3×3 in) on top of the fixed table of the Split Table Apparatus in Rm 113.

The neutron pulse is amplified by a 219 preamp 204B Linear Amplifier (1 X8 0.2μs — input) and a HP 460B (pulse) to input of TMC. The EP-110A was modified so that the variable freq. unit is used to trigger the TMC #212 The source trigger then goes back into the EP-110A and makes the initial pulse to start the accelerator. The EP-220A unit produces a delayed pulse from this for the final pulse.

The target or neutron source is approx. centered on the west face ≈ 1" from the surface.

PN #1 Bkg x2 Delay x2 Ch 10 μs Mem ½
333 cps 100 μs delay,
Total Beam [redacted] ?

PN #2 Removed Cadmium on 4 sides
otherwise the same Total Beam 35 cps
Settings same as above.

Overload trip stopped Accelerator

After this run Target was observed to have a deposit on it ——
could be carbon or the mo-ti-ta
targets are no good.

Feb 16, 1961

Measured pressure at forepump
2.5×10^{-4} m m Hg on Phillips Gauge
= 0.25 micron 1 micron = 10^{-3} m
for many conditions of source on.
with gas flow — no change
with gas flow! Pressure at
diff pump must have been in range
of 10^{-6} with out gas flow to $1-3 \times 10^{-5}$
with gas flow

91' 2" of cable RG-11/U
delay = .128 μs ch 27
2.4 μs = ch 252
27

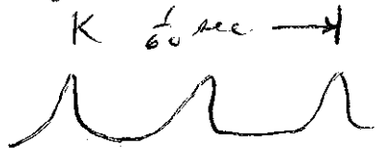
$$\frac{2.4}{.128}$$

$$\frac{2.27}{27} \quad \frac{225}{} = 11.2 \text{ m}\mu\text{s/ch}$$

$\frac{128}{27} = 4.74$ $\frac{2.4}{252} = 9.52$ m μs/ch

March 20, 1961

After observing apparent production neutron bursts that were either periodically larger or smaller by noting neutron sensitive instruments show a cyclic behavior with a period of ~ 1 sec. at rep rate of 40 cps At 80 cps this changed. Observation of the target current after changing to proton beam, 60 cycle modulation was noted



this pattern could be drastically changed by changing the deflection voltage.

Source Off ripple Values	5-43 Scope peak to peak	Simpson Voltage
Deflection Voltage	8	2KV.
Lens or Focus	6	2KV
Extraction	11	2KV.
RF Supply	6	(800) not meas.
No 60 V modulation of RF itself		
150 kv @ ~20KV		
1st electrode from GND	1 v	2KV
Solenoid	.2	20 (=12.5 m scope)

EXT.

These ripple voltages were observed to increase as solenoid current was increased to 17

The Focus changed also and depended on Ext and Solenoid. Max Value was 32 V.

These were taken with Source ON

Put a 10 meg load on the Focus supply

to measure ripple with 0.2 ma load

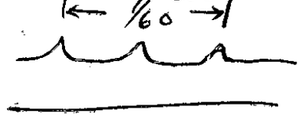
There were also large jumps or instabilities similar to that associated with the red hot spot on slit jumping about?

Using circular magnet reduces this, but beam must hit collimator on bottom (near target) We must align Beam

3-22-61

Removed ½ collimator near target and pumped all night.

Looking at target current on scope now shows much less ripple. Background ratio may have changed and should be checked. Typical 120 cycle modulation now is 1.6 cm valley 2.2 cm peak on scope



Changing focusing to maximum at 125kv always increases current. At this max beam does not seem to be over focused and a sheath of current on target - single max when deflected across target.

Ion source runs good at 2×10^{-5} mm Hg and has increased yield ~50% over a pressure of 3×10^{-5}.

100 μa of target current ~ 150 μa increase on power supply.

March 29, 1961

9⁰⁰ AM Hooked up two relays to cycle table operation automatically, Table apart LS— Drives tables together, tables together LS— , drives tables apart. Apr

W. 15 # Pressure moving Table, cycle time ~75s

10⁰⁰ PM Removed needle valves on vent lines to speed up the start & reverse motion time ~60 sec per cycle

3 PM Table cycling Stopped.

April 9, 1961

The attempts to produce short neutron bursts using only the 8" plates without collimator at target were not successful - the burst width were approx 1/4 μsec wide as observed on the counts with the time converter and pulse height logic on TMC.

80 volts on variac, 8" plates @ 1" separation

5 - 55 channels above 100 cts

peak channel 41 757

125 - 170 channels above 100 cts

peak chan 157 @ 594

Average Bkg between channels 63 to 111 ≈ 20 cts.

Average Bkg 176 to 238 1-2 cts,

These data were taken Thursday Mar 30, 1961

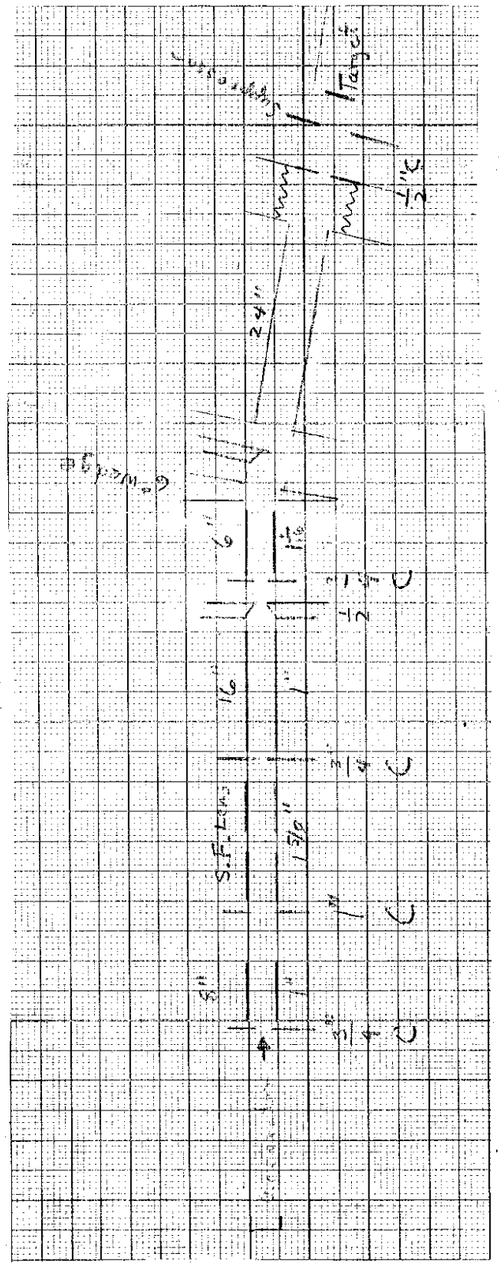
Detector NE 404 @ 1100 V DD2 - 0.5 μa/l (Considerable pickup of 0.5 mc R.F.)

The accelerator was moved to Rm 108 where the SF lens and 16" deflecting plates were added between valve and single chopping slit. A new heater for diff Pump MCF 300 was necessary. A leak developed on drain port on MCF-300, tightening (control) allen head screw corrected the leak. The focus for the SF lens will be the small variac (-10) on the ion source panel. The deflecting voltage will not be controllable from the console.

Acc in Run 108

Protons were put on accelerator and will be used for timing purposes. Ion source started ~ 200pm to flush out deuterons in system. Accelerator is on 5' scaffold, and needs only to be rotated ~ 40-60 degrees in order to bring target near the Fast Burst Reactor Critical Assembly. A 1/2" ID collimator was placed at intrance to Target, a 1" ID Collimator was placed at entrance to Strong Focus lens and a 3/4" collimator was placed at entrance to 16" plate See sketch on p 131.

Components of accelerator with spacings of electrodes



April 6, 1961, R- 102-105.

Double chopping slits opened 1 turn each
Spacing now 0.50 +. = in.

Without deflecting beam, (beam impinging on single chopping slit) beam was observed not to move up or down with changes in the S.F. lens.

With 150 μa on target, P.S current increased 300 μa. Pressure increased from 2 to 3×10^{-5} mm Hg

Several breakdowns were experienced during the testing accompanied with vacuum changes. These were inside the tube.

Dial settings.

S.F. Lens 55
Ext Variable
Focus Max
Dent var. set press to 2×10^{-5}
Solenoid var. up 405 turns for
H.V ~135
Deflect V. 200 + (5kv)

Pulsing
80 volts
Variac
8" Plates
at 1" apart

~~8~~	~~6 5 9 0 6~~
1	0
2	2
3	0
4	2 0
5	1 1 0
6	1 0 9
7	1 0,0
8	9 9
9	9 8
1 0	1 2 2
1 1	1 1 2
1 2	1 5 7
1 3	1 5 0
1 4	1 7 4
1 5	1 6 1
1 6	2 0 7
1 7	2 0 3
1 8	2 6 4
1 9	2 6 6
2 0	3 0 7
2 1	3 0 3
2 2	3 2 3
2 3	3 8 3
2 4	4 2 5
2 5	4 4 0
2 6	4 5 7
2 7	5 0 1
2 8	5 4 6
2 9	5 5 8
3 0	6 3 9
3 1	6 1 1
3 2	6 6 8
3 3	6 4 1
3 4	6 7 8
3 5	7 2 2
3 6	7 0 1
3 7	7 3 5
3 8	7 4 6
3 9	7 0 8
4 0	7 3 1
4 1	7 5 7
4 2	7 0 4
4 3	6 7 0
4 4	6 1 6
4 5	5 6 8
4 6	4 9 6
4 7	4 4 9
4 8	4 2 3
4 9	3 6 9
5 0	2 9 2
5 1	2 5 6
5 2	2 3 3
5 3	1 4 9
5 4	1 5 2
5 5	9 7
5 6	7 4
5 7	7 1
5 8	5 3
5 9	3 8
6 0	2 9
6 1	1 8
6 2	1 8
6 3	2 2
6 4	9
6 5	9
6 6	6
6 7	6
6 8	0
6 9	1 2
7 0	7
7 1	7
7 2	5
7 3	4
7 4	6
7 5	8
7 6	5
7 7	7
7 8	6
7 9	4
8 0	7
8 1	5
8 2	9

80	7
81	5
82	9
83	8
84	9
85	8
86	12
87	10
88	7
89	9
90	14
91	8
92	14
93	10
94	15
95	17
96	24
97	12
98	19
99	17
100	16
101	9
102	17
103	21
104	25
105	31
106	29
107	19
108	22
109	27
110	27
111	23
112	35
113	51
114	41
115	60
116	46
117	44
118	49
119	60
120	55
121	76
122	81
123	72
124	72
125	95
126	108
127	94
128	136
129	141
130	149
131	154
132	194
133	195
134	189
135	224
136	242
137	231
138	246
139	292
140	302
141	352
142	325
143	341
144	381
145	448
146	438
147	485
148	461
149	517
150	550
151	584
152	558
153	560
154	606
155	584
156	591
157	594
158	579
159	564
160	536
161	493
162	463
163	456
164	364
165	323
166	262
167	250
168	176
169	138
170	111
171	60
172	40
173	23
174	19
175	13
176	4
177	3
178	4
179	2
180	0

180	0
181	0
182	0
183	0
184	0
185	1
186	0
187	1
188	1
189	0
190	1
191	0
192	1
193	0
194	1
195	0
196	1
197	0
198	0
199	0
200	0
201	0
202	1
203	0
204	2
205	1
206	0
207	0
208	0
209	0
210	0
211	0
212	0
213	1
214	0
215	2
216	0
217	0
218	0
219	1
220	0
221	2
222	0
223	1
224	0
225	0
226	0
227	0
228	1
229	3
230	0
231	1
232	0
233	4
234	2
235	1
236	3
237	2
238	6
239	11
240	10
241	10
242	15
243	18
244	12
245	8
246	6
247	1
248	3
249	0
250	0
251	0
252	0
253	0
254	0
255	0
256	0

April 6, 1961

The NE 404 (Hornyak Button) fast n detector gave a pulse width that was not characteristic of the neutron burst Rise in a 50 mμs and decay of the order of 1/4 μs. (250 mμs.) This was independent of the R.F. voltage.

The 2" NE-102 plastic scintillator was a 6810 A which has a 1 meg anode load amplifies by DD-2 for the start signal. This pulse size was 1300 volts and 1.1 X 0.5 gain was such that most pulses were below 7.00 setting on P.H.S.

PHS was set at 3.50 for a 10 min count. The RF voltage variac was set at 30. At higher settings of the variac the pulse width increased and at 70-80 each peak became double. This behavior was not expected!

PH-1

With NaI on 6810A and 1" x 2" OD U-Mo Converter, the time neutron spectrum was also observed.

PH-2

Modified Start input for 1000 ns
(and 820 ns to 180 ns)
with 6810 A No 102 as detector

Delay Line (RG-65)	Peak Ch No	Peak Ch. No
29.5" – 103.3	32	160
$\Delta L = 31.375$	→ ~~.145 μs~~ 109.8	
60.875" 213.1	19	146
$\Delta L = 54.875$	→ .192 μs	
115.75" 405.1	248	120

RG-65 Cable .042 μs/ft = 3.5 nano sec/in.

$\frac{109.8 \; \cancel{+145}}{32-19} = \cancel{11.15}$ nano/ch 8.446

$109.8 \; \frac{\cancel{+145}}{160-146} = \cancel{10.36}$ 7.84

$\frac{192}{146-120} = 7.38$ nano/ch

$\frac{\cancel{145+192}}{40} = \frac{7.55}{\cancel{8.425}}$ nano/ch

$30' \; 11\frac{1}{2}" = 371\frac{1}{2}" = 1.300 \mu s$
Cut Cable
$10' \; 2\frac{1}{2}" = 122\frac{1}{2} = .429 \mu s$

$20' \; 8\frac{3}{4} = 248\frac{3}{4} = .871 \mu s$

29.75 → 104.1

114.75 → 401.6

April 7, 1961

Repeat exp w. delay line

Time	Delay Line	ch Pk		ch Pk	
.1033	30	23 - 32	27.5	~~141 - 152~~ 157 - 168	162.5
.2131	61	13 - 21	17	147 - 156	151.5
.3164	30+61	(>242)		127 - 139	133
.4051	116	229 - 237	233	115 - 125	120
.5084	116+30	216 - 225	220.5	97 - 107	102
.6182	116+60	205 - 213	209	83 - 94	88.5
.7215	116+60+30	192 - 201	196.5	69 - 79	74
	30	24 - 34		158 - 169	
1.300	371.5	128 - 138	133	( )	
1.403	371.5 +30	112 - 123	117.5	230 - 241	235.5
1.513	" +61	96 - 106	101	219 - 228	223.5
1.616	" +30 +61	80 - 91	85.5	206 - 216	211
1.705	" +116	69 - 79	74	197 - 206	201.5
1.808	" +30 +116	68 - 78	73	183 - 192	187.5
	~~+61 +116~~				
	30	22 - 30		136 - 144	
		30 - 42		163 - 175	

Repeated accelerator focus etc.

Delay Line	Time	Pk Ch	Pk Ch
30	.103	39½	~~153½~~ (173½)
30+61	.316	X	145½
30+116	.508	230½	117
30+122	.532	230½	117
30+61+116	.721	208	86
30+248	.974	183	55
30	.	37½	171
30+248+61	1.187	154	26½
30+248+116	1.379	126½	—
30+248+116+61	1.592	98	
30+248+116+122	1.808	71	199½
30+248+122+61	2.021	41	172
30+248+116+61	1.592	99	222
30		35	167

The previous data were taken with a wiring error in converter however correcting this did not change the appearance of the display of random input. The converter was corrected, the output triple was checked, and the potentiometers checked

April 12, 1961

for best display. In addition the output of the A-1 D amplifier was matched with a 1K term resistor at the TMC. (TMC input impedance 10K) this has apparently made the display more linear!

DWR

It is believed that the assortment of delay lines can be used on the Start pulse to calibrate the time converter.

April 12, 1961

Optimum Settings for Acceleration for fast pulsing with light plate RF pulsing at RF. gnd.

ST Focus 35
Deflecting Voltage 130/200 X5KV
H.V. 145 KV

This produced pulses not equally spaced. Detector NE-102 (w. 6810A @1300 V DD2 at 1.1 x 0.5) was placed near target. Sharpness of neutron burst unaffected by PHS setting on DD2 from 50 to 350 only counting rate changed.
Peaks were ~ 8 ch wide. with the delay cables the linear region of converter was found to have channels 7.66 mμs wide.

therefore neutron bursts ~ 61 mμs wide

-the D-D neutrons were clearly evident as an extra peak of amplitude ~ 5% when low values of PHS used.

℄ Target 2½" above diaphragm 9" from U-Mo
Detector 1½" " " " in contact 11

April 17, 1961

ERR and DWH checked linearity of A/D + TMC by using BA Test pulse generator (~1 μs's wide) Input to A/D was at test pulse input Linearity was about 1 ch maximum! And no term resistor needed between A/D

April 18, 1961

Changed input trim cond on A/D amp on conv: output from ~~0.5 μs~~ 2 μs or 0.5 mc bandwidth to 4 μs or 0.25 mc bandwidth by adding .0012 to a 001 coupling condenser and added 22 μμf to a 22 μμf condenser in the feed back loop

and set the delay trig in TMC PHS to maximum delay ~ 3 μs.

These changes have made the converter display on TMC with random inputs more linear in the upper channels. Other non linearities are evident, and are somewhat sensitive to the bias settings in the converter.

April 20,

TMC dropped 4 channels on printout of PH-36. This is the first time that this has happened during pulsing as well as during the checkout of the punch on April 17 when many punched and ~~tape~~ printed tapes were made. However the address current voltage setting was increased from 7.05 → 7.25

April 26

TMC adding counts to upper channels – found voltage @ 7.1 reduced to 7.0, still adding counts therefore reduced from 7.05 to 6.95 Run Temp. quite high and probably is the culprit

May 2, 1961

Attempts were made to modify the Time to pulse Height conv. so that the 50kc pulsing scheme could be used for the FBR metal systems.

The time conv. charging condenser was increased by adding ~~0.0007 μfd~~ 0.0022 μfd. The A10 amplifier when used on the 0.1 mc bandwidth gave an output pulse that was felt to be not correct, and a 204-B was used. Adding an 0.025 μf condenser was added in parallel with (C 31) an 0.01 μf cond in series with S-4.

The delay trig card in the TMC-210 was modified so that the time constant was longer, an 3300 μμfd condenser was added in parallel with the 470 μμfd

These changes did not give a very linear display on the TMC scope for a random count input, nevertheless it was decided to proceed with pulsing to see if it would work. The 50 kc R F sepatron was found not to be working during some of the above tests and the 6C4 osc. tube was replaced. When pulsing of the accs. was started. The ~~back of finding a~~ no spike of neutrons was observed. It was later found that the P-to-P 50 kc voltage was ~~to~~ 200 volts instead of > 1000 at a variac setting of 30. It was also found that the oscillator was

at 50 kc whereas the output ckt was tuned to ~55 kc/sec. Tuning the oscillator so that the output was peaked (to 55kc) resulted in doubling the output at the time of the adjustment. However the output seemed to wander in magnitude.

Changing the Variac from 30 to 50 changed the RF amplitude only a few percent.

May 8

J. ELLIS reports that the 50 kc/sec system is impossible to make work without rebuilding He plans a better system using link coupling at the oscillator in the control room and a tuned ckt balanced at the deflection plates.

May 9, 1961

Returned the TMC delay trig to orig cond. (Removed the .0033μfd cond)

Returned the trig cond. to orig cond. (Removed the .0022μfd cond)

January 22, 1962

The accelerator was moved back into Room 113 and the target assembly developed a leak. Oil changed in Fore Pump

This target assembly was removed, and the target carefully removed and placed in a jar. The molybdenum backing has been eroded 5-10 mils by the water. The entire assembly was immersed in water and nitric acid as a precautionary measure to reduce the tritium contamination problem.

The target assembly was disassembled by heating, and residual epoxy removed with cyclohexanone. New glass pieces 1.75 in. x 2.00 in. OD were obtained and vinyl seal T-24-9 used to assemble the target. Joe Kingdon recommends the following procedure

1. Brush vinyl seal on both surfaces.
2. Heat to 160°C for 30 min. to dry solvent.
3. Cool and assemble.
4. Heat with pressure on joints to 160°C for 30 min. or longer.

Because of the nature of the joints, assembly had to be made with pieces warm when the dried T-24-9 was plastic.

One joint leaked and was sealed by brushing T-24-9 over joint.

The Hydrogen gas bottle was installed and a 5 mil ss. target to facilitate finding and removing the cause of the 60 cycle modulation of the Beam Current.

Measured Ripple Voltages

	D.C Level	P-P Ripple
Focus (10 kv)		
Ext (5kv)		
Strong Focus (5kv)		
Sec. Deflection( )		
Pulsing Bistable P.S.		

Monday and Tues Feb 12 & 13, 1962

Volume Calibration of 3' plastic sphere,
water contains 30 ml Triton X-100.

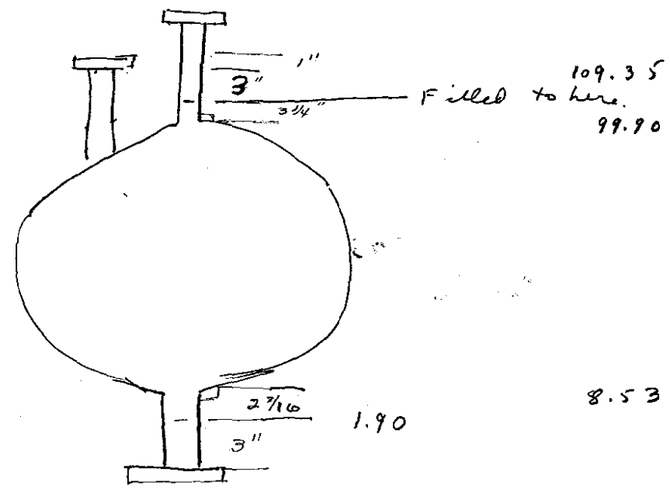
Manometer Height	Volume Removed		Total Volume Removed	Sphere Volume
109.35	0		0	
100.50	805	865 / 9.45 =		
99.90 slight below top of sphere	865			

H* with sphere filled estimated to be 99.9 ± 0.1 mm (less than 1 mm in)

99.0	1365		1365	10.5
98.28	520		1885	1.0
97.70	1000		2365	1.5
96.75	1000			2.5
96.00	2000			3.5
94.70	2	(1.9945 kg)		5.5
93.63	2			7.5
92.70	2			9.5
91.85	2	(1.9945 kg) ρ = .99725		11.5

Wt Removed

	Gross	Tare	Net	Volume
88.10	(12.85	2.55	10.30)	
84.23	27.00	2.55	84.45	
74.22	49.2	0 (4.6)	49.2	
58.78	98.8	0 (8.65)	98.8	
54.1	(33.1	0 (8.70)	)	
49.75	(64.8		)	
44.90	(98.4		)	



Sphere mean Diam 91.37 cm

	Manometer	Wt Removed	
4"	41.53	22.0	0 (8.70))
8.0 mm	(41.50	22.0	]
	(37.80	45.2	)
	(33.80	68.4	)
	(29.00	93.4	)
	23.75	23.1	0 (8.65)
	16.12	46.65	
	8.53	56.2	— sphere emp
	1.90	56.5	

Summary of Calibration Data Feb 13, 1962.

Manometer Height	Volume
91.37	433.1
90.47	432.6
89.75	432.1
89.17	431.6
88.22	430.6
87.47	429.6
86.17	427.6
85.10	425.6
84.17	423.6
83.32	421.6
79.57	411.2
75.70	397.1
65.69	347.7
50.25	248.7
45.57	215.5
41.22	183.7
36.37	150.0
32.97	127.9
29.27	104.7
25.27	81.4
20.47	56.3
15.22	33.2
7.59	9.6
0.	0

Specification 94.46 cm (37.188)

Polar Diam 91.37 cm

Volum Average Diam 93.87 cm

Equatorial Diameter averaged over

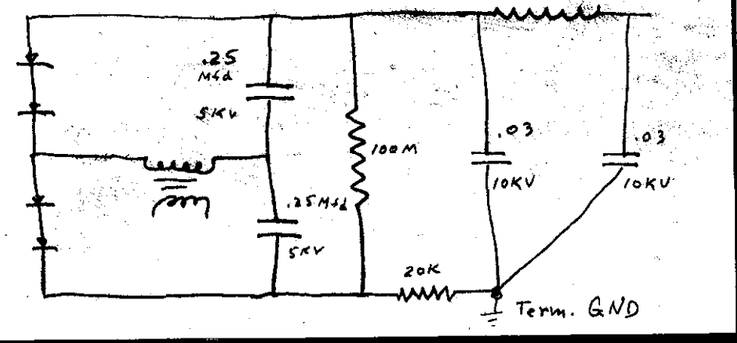
centred 4.35cm 96.45 cm

centred 13.88cm 95.14 in.

January 23, 1962

After additional filtering was added to focus supply (new ckt below) Measured ripple at 5000 V and 2 ma load was ~1% , previously was 5.2%.

On when accelerator was operated, arcing occured over the surfaces of the insulators even at 125 kv. These have been cleaned but there are still occasional flashes of light and corresponding thunderclaps. The maximum target current obtainable was ~ 80 - 90 μa. Source color has a lot of blue in it but Mikalczo believes that it has never been any better. Source bottle is dirty and quartz insulator has carbon deposits on its surface. It should be cleaned if other troubles make it necessary to break the vacuum. The solenoid coil was found to have a resistance of 5.5 Ω suggesting that half the turns are shorted. With a 10 Ω resistance load, the P.S. delivers 3 A (30 volt) with 13 turns on the solenoid at which point the mechanical stops prevent further increase in voltage.



The beam on target is not focussed properly by the S.F. lens, and it is apparent that perhaps something else is wrong. Without the S.F. lens, 50-60 μa could be obtained on target which appeared as a diffuse spot. However the S.F. lens spread the beam into a horizontal line. The action of the S.F. lens must be further investigated when the new solenoid coil is installed.

Feb. 26, 1962

Installed new solenoid coil, resistance 10 Ω. It is physically larger than the originals. A 1/16 bakelite spacer was used on each side of coil for insulation from source plate and clamps. Vac n.g. perhaps rising stem valves leak when moved. Accelerator beam is very diffuse.

S.F. Lens does not focus the beam properly. Shut down to disassemble. Double slits now open each 2 turns widen 9-2=7 8-2=6. Checked focus voltage = 5 KV @ AC = 55. ∴ will go to 10 KV @ 110. Solenoid operation seems OK with replacement coil Target current peaking seems better than ~~previous~~ original behavior of machine.

4⁴⁰ PM 2.8 x 10⁻⁶ mm Hg

Feb. 27, 1962

8¹⁰ 1.5×10⁻⁶ Close Target Valve 3×10⁻⁷

Target region outgassing ?

Removed target assembly and deflecting plates downstream of S.F. lens. Evidence on entrance collimator to deflecting plates that beam has been hitting in a line.

Smears for Tritium

① 7180 Flange facing.
② 19200 Inside S.F. lens.
③ 1200 On floor below.
④ —— On top of S.F. Lens (Outside

2²⁵ 6.8×10⁻⁵ Cold Trap warming since 11³⁰ AM

Disassembled accelerator

① Removed 1/2" Collimator at Target
② Found Single Chopping slit 10 turns in (at inside edge of tube when turned out.) Should have been ~ 8 or 6.
③ Double Chopping slits 8 & 9 ~1/2 in now open 6 7 (12 turn per inch on these threads)
④ 6" Deflecting plates ~ 1/16 sep. fully separated.
⑤ Set deflecting plates 16" at 7/8"

⑥ 8" deflecting plates fully separated
⑦ Cleaned source bottle and quartz sleeve. Broke bottle installed other bottle.

Started pumping ~ 4'15

4 25 P	10^{-4}	(.03)
36	$2_4 \times 10^{-5}$	(10^{-4})
43	5×10^{-5}	(10^{-4})
55	4×10^{-5}	
5 15	3.2×10^{-5}	(10^{-4})
20	2.5×10^{-5}	
8^{00} AM	1.7×10^{-6}	(10^{-5})

9^{00} AM Gas flowing 2×10^{-5} source Blue when on momentarily.
10^{05} Gas press 1.5 vary 3.2 source not as red as it showed. Turn Power off replace source
10^{10} 4.2×10^{-6}

Attempts to get beam current were only partially successful. System still outgassing, beam visible. Beam not a spot but a horizontal line. Focus controls do not change shape appreciably. Source very blue. Occluded solvent still evolving from ion source bottle. Source very hot from solenoid being run at full current
11^{00} Run Solenoid at most, deuterium at maximum for 1 hour to sweep ion bottle clean of impurities
11^{10} Turn power off for 5' pumps to 4×10^{-6} (no large leak.
11^{15} 6.5×10^{-5} deut 28 ma solenoid 12 ma

2/27/62 1^{00} PM 7.5×10^{-5} Reduce Pressure (Term Power Off)
12^{10} 3.3×10^{-6} Increase Pressure to ~ $1-2 \times 10^{-5}$
Source still Blue!

Continued flushing source color improved!

System looks OK Max current on Target 200 μa!

EXT	24 Turns	S.F. 32
Focus	Max	
DEUT		
Solenoid	Max	
Pressure	3.5×10^{-5}	reduced to 2.2×10^{-5} when off.
P.S Voltage	115 KV	
P.S Current	1.050 ma	−570 = 430 μa

3 15 Fill with dry N_2
Change to tritium target and deuterium gas

3^{45}	7.5×10^{-4} (.03)
50	4.0×10^{-4}
4 00	3.8×10^{-4}

∴ there is a leak in target region.

Remove Tritium Target, Clean O-ring groove - remove O-Ring from target sand edge smooth (Rubber sticking to O-Ring — start pumping down, to 10^{-4} in less than a minute.

4^{42}	5.0×10^{-5}	4^{46}	2.8×10^{-5}	4^{53}	2.0×10^{-5}
		5^{20}	7.8×10^{-6}	5^{10}	1×10^{-5}

February 28, 1962

9.2×10^{-6} ~~Must be a leak?~~

Close Target Valve 7×10^{-6} Target OK open Target V

Add N_2 2.5×10^{-6}

8^{18} 7×10^{-7} No leak.

8^{43} 3×10^{-7} Source on Blue Sol on

10^{08} Source Still Blue.

Turn off Remove Dome Pump TO 2×10^{-6}

Start gas flowing again w. sol off. $p = 5.5 \times 10^{-5}$

10^{30} source getting pink. Sol on

10^{50} Source with sol on full operates @ 1×10^{-5}

10^{55} Still OK

Replace Dome To make neutrons. 1.5×10^{-6}

11^{00} Term Power On.

Target	1	2	3	4		
25 μa	$.19 \times 3 \times 10^{-10}$	$.26 \times 10 \times 10^{-10}$	7×10^{-11}	2.8×10^{-9}		
100 μa	$.19 \times 10 \times 10^{-10}$	$.28 \times 3 \times 10^{-9}$	2.2×10^{-10}	9×10^{-9}	115	830
	Tripped				115	580
200 μa	$.42 \times 10 \times 10^{-10}$	$.7 \times 3 \times 10^{-9}$	5×10^{-10}	2×10^{-8}	115	950

Move Accelerator back into Radial Beam hole. (pumped to 10^{-6})

Date	8:00 AM Pressure	add N_2	Source
3-2-26	3×10^{-4}	3×10^{-7}	Gold Cath.

Move vac. pump and water line after arcing several times during initial adj.) no further arcing in a run of 1 hr. Several times during day arcing occurred inside accelerator tube. This upset left accelerator on when should have been off and the increase in neutron level scanned several times.

Mar 4, 1956

Pump out Trap over weekend – 3×10^{-6}

Acc closed, open acc 1×10^{-3}

within 1 min 2×10^{-5}

5 min 6×10^{-5}

3-5-62

One lightning discharge @ 115 kv.
Several internal discharges.

Accelerator History

Date	Time	mm Hg Pressure	Conditions
3-5-62	4^{35} P	5×10^{-7}	Liq. N_2 in Trap,
"	5^{02} P	$< 10^{-7}$	"
3-6-62	8^{25} A	$< 10^{-7}$	"
3-6-62	Time is a	bad connection in the high voltage cable, supply	
900 –	1500 v.	for pulsing. Lightning 5 x @ 120 KV	
3-7-62	8^{00} A	7×10^{-4}	Liq. N_2 Left on 10^{-5} Scale, Tripped at 10^{-5}.
	8^{35}	9.5×10^{-6}	
	905	3.7×10^{-6}	Source Blue at First. OK 5' later
Cleaned lucite and nylon insulating rods and electr. Moved vacuum pumps so that belt could not throw grease and carbon on accelerator parts.			
3 inside tube arcs and 8 lightning discharges prevented any runs. Shut down and added 5K resistor in			
series with 10 KV supply to focus electrode. (This has been removed by ERG			
3-7-62	11:15	1×10^{-7}	
3-7-62	1:15	1×10^{-7}	No more arcing Difficulties!!
	150	$< 1 \times 10^{-7}$	
3-8-62	810	$< 1 \times 10^{-7}$	
3-9-62	8^{20}	$< 1 \times 10^{-7}$	After liq N_2 added
Note: When pulsing, increasing S.F.P.S beyond 50 increases target yield, but increases background tremendously. Looked for ripple at 60 cps and found very little – no increase in noise of IC-2!			
3-9-62			Only 1 arc inside accelerator tube
			Close Trap Valve $2.5 \times 10^{-7} \rightarrow < 10^{-7}$

3-12-62	8^00 AM	5×10^{-4}	Buzzer Ringing - Diff. Pump off.
	8^32	5×10^{-7}	Open Trap Valve → 7×10^{-4}
	40	1.5×10^{-5}	
	9^00	4.5×10^{-6}	Start gas flow at this pressure.
	335 P	1.8×10^{-6}	(30' after shut down)
	440	$<10^{-7}$	
3-13-62	9^00 A	$<10^{-7}$	after liq N_2 added
	420	$<10^{-7}$	after pulsing at Crit.
3-14-62	805	10^{-4} .03	Before adding
	820	$<10^{-7}$	After adding liq. N_2
3-15-62	750	4×10^{-5}	Before
	810	$<10^{-7}$	after } adding liq N_2
3-16-62	810	$<10^{-7}$	after adding liq N_2
	350	$<10^{-7}$	after Pulsing
	320	$<<10^{-7}$	after closing trap valve for weekend.
3-19-62	8	$>5\times10^{-4}$	Diff Pump off
	822	3×10^{-6}	
		.01	open Trap valve
	25	4×10^{-5}	Pressure not stable $1-5\times10^{-5}$
ERR)	10^15 AM	10^{-6}	
	343	10^{-5}	Shut off gas flow
	345	$<10^{-6}$	
	400	4×10^{-7}	
3-20-62	800	$<<10^{-7}$	
	500	$<10^{-7}$	
3-21-62	810	$<<10^{-7}$	after liq N_2 added.
3-22	Moved accelerator from platform to floor.		
	415	$<<10^{-7}$	Pressure OK.
3-23-62	Max Target current obtainable was 4 ma		
	Discovered fuse blown on focus supply		
	and solenoid coil burned out.		
	Unwound sol. coil and was burned throughout		
	probably overheating.		

3-23-62

Set Max Volt on Sheroid = 29 V on Simpson

Accelerator arc to gnd outside tube evidently focus does not work. Replaced 1 amp fuse with 1½ A.

3-24-62 $q^{30}A$ 1.5×10^{-6} Trap Warm. Add liq N_2 trap V, close Deflection Plates voltage down from 55 to 20 Plates are arcing across when gas fills Tube Open Trap Valve $10^{00} \sim 5 \times 10^{8}$ ($\Omega = 10^{-8}$) Found Focus fuse blown again replaced with 1/A, blown again replaced with 2A — no more trouble. I think that the large condensers in P.S. give a large surge if selsyns left at max, and this blows the fuse — no trouble found in P.S. Repaired Variac on focus. (38')

After running Acc at 100μa beam and full focus selsyn setting, beam current dropped to 15μa — neutron level also no response to changes on focus selsyn — suspect blown fuse on ~~selsyn~~ focus supply.

Found intermittent impedance from focus electrode to gnd — 22K, no doubt this blows fuses!

Found place on Bakelite insulator in hole for screw which showed a carbonized crack

there was carbon on alum. surfaces as well. this crack was filed out with jewelers file We may need a new ~~at~~ bakelite piece.

there was also evidence of a crack in the horizontal plane of the bakelite in the vicinity of the same screw hole.

5^50 PM System back together $p = 5 \times 10^{-5}$ 5KV OK on Focus – no breakdown.

With 5 ea 20 Meg resistors in series with 5000 V range (5K x 20 KΩ/V = 100 Meg) extends range to 10KV, Max voltage at ~25 turns 9.3 KV. AC voltage max ~95

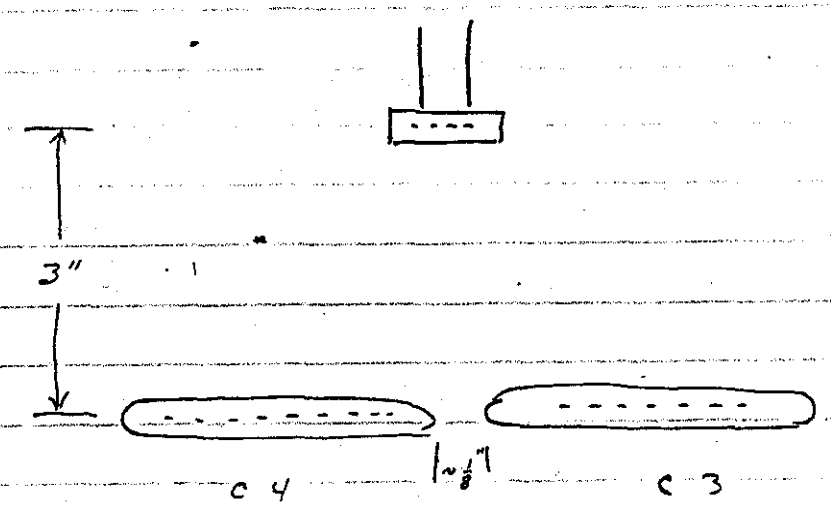
6^00 PM 2×10^{-5} (Trap Full)
6'15 1×10^{-5}

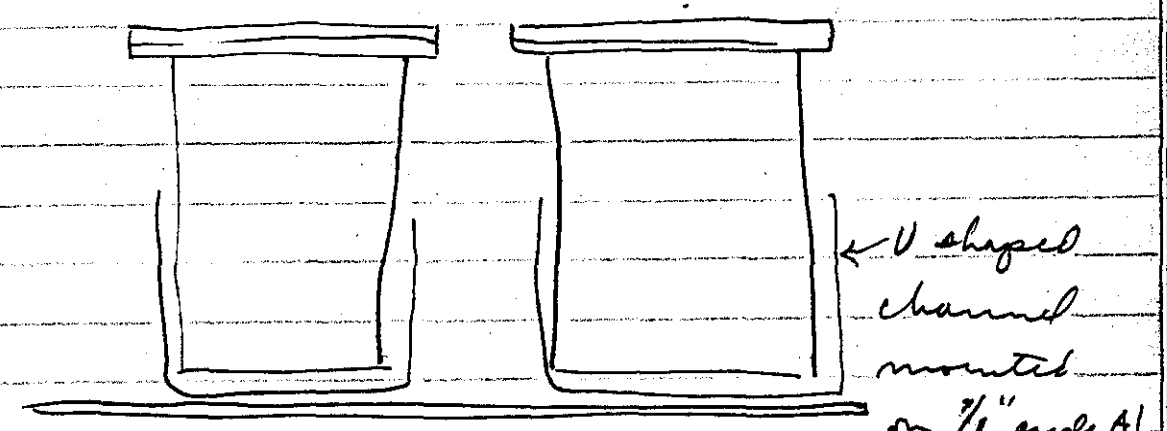
10-25 8^30 10^{-7} m/m Hg Focus Voltage up to 9.3 KV OK

Using only 1A fuse.

3-28-62 Calibration of FC-7, 8, 9, 10, 11, 12, 13 and 14

After preliminary measurements, the following geometrical arrangement was used.





Accelerator operated as follows

$p = 1.7$ to 2.0×10^{-5} m.m Hg

SF = 75 Sol 3 1/2 turns

F = Max H.V. 150 KV