BOOK36R

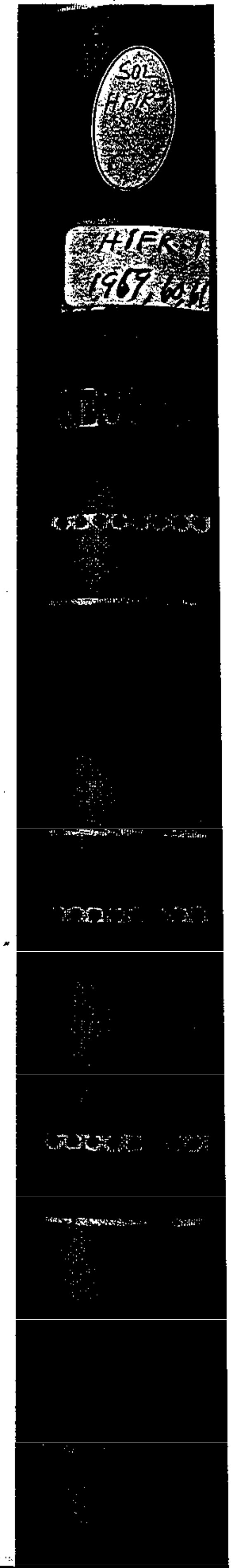
Notes:
"HFIR-1" written on tape on front
"SOL HFIR-1" & "HIFR-1 1959, 60, 61" on spine

Blank pages: inside front cover, 37-39, 45,50, 53, 56, 57, 95, 127, 194, 199, 258, 285-300, inside back cover opposite 300

page	sheets taped to it
51	1
53	1
69	3
71	2
75	2
77	1
81	4
87	3
95	2
97	2
99	1
101	1
107	1
133	2
147	2
153	2
155	2
157	1
161	1
163	1
168	1
171	3
175	3
177	1
197	2
198	1
203	1 small
207	3
213	3
221	3
223	2
227	3
233	2

page	sheets taped to it
239	2
246	1 small
256	1
258	1
260	2
264	2
267	1
279	2 small graph sheets

Scanned by:
Sheila Finch
RSICC /Oak Ridge National Lab.
August 7, 1999


SOL
1967,

Density pure D_2O @ 20°C
1,1054

@ 30°C 1,103

D_2O zero: 56.15

Fuel zero ~ 0.0

12-2-59 Inventory in slab storage:

Bottle no.	821	822	823
Sample no.	167202	167203	167204
Net wt.	17.334 gm	17.113	17.470 Total 51.92 kg
gm U/gm	~~.2534~~	~~.2507~~	~~.2558~~
	.253	.251	.256
gm U^{235}/gm (av. 93.15)			
sp. gr.	1.630	1.618	~~1.64~~ 1.635
Vol.	10.63 l	10.57	10.69 ~~7.63~~
			Total ~~28.83 l~~ 31.89
wt U	4385 gm	4295	4475

Total U 13,155

Total U^{235} 12,26

12-2-59

HFIR

Personnel; Cross, Rohrer, Fox

Expt #1

Preliminary expt. with soln. as received. Bare on top and bottom

Deionized water in region I } ~30"

Tap water in region IV }

Inst checked & safety cocked.

Ran out of soln at ~ 8.4"

with D_2O at ~ 13"

Very little multiplication

Drained Fuel

Expt I B

Personnel: Cross, Rohrer, Fox

Added bottom water refl. to expt above.

12-3-59 A.M. D_2O zero 56.1 Fuel zero 0.0

Instr. checked

Fuel ht 8.69 . all out not crit.

D_2O at ~ 73.5

appreciable multiplication but far from critical

12-3-59 PM Added to fuel soln 13.34 kg of D_2O and mixed for ½ hr.

12-3-59 2:30 PM Expt #2 Personnel; Cross, Rohrer, Burchstead, Fox

Preliminary expt. with side and bottom reflector after dilution with 13.34 kg D_2O

Instr checked & safety cocked.

D_2O — 71.01

Fuel 11.92"

Not critical — appreciable M^{-1}

12-3-59 4:15 Expt 2 B

Added 13.35 kg D_2O to fuel soln and mixed.

D_2O 71.22"

Fuel 15.02 Crit

$$\text{Total } D_2O \text{ added: } \begin{array}{r} 13.34 \\ \underline{13.35} \\ 26.69 \end{array} = 24.2\,l$$

$$\text{- Vol of conc. } \begin{array}{r} \underline{31.9\,l} \\ 56.1 \end{array}$$

$$gm\,U^{235}/l = 218.5$$

Expt 2C

Cross, Rahrer, Burchatt

Fox

12-4-59 9 AM. Repeat of 2B after mixing

Insts. checked safety cocked

D_2O 71.40 − 56.10 = 15.3"

Fuel 15.30" Crit

L ~~see indication below of zero shift~~

Expt. 3

12-4-59 10 AM. Removed bottom reflector same as expt. 2C otherwise

apparent zero shift. to 99.57 found by rise per feed jog. Due to draining water in bot. refl.

out of fuel at 16.82 + .43 = 17.25"

D_2O at 73.04 − 56.1 = 16.94

Significant M^{-1} but sub. crit

3B

Repeat with D_2O higher

Fuel zero 99.53.

D_2O − 74.08

Fuel out at 16.80 + .47 = 17.27

About same M^{-1} as above

Sample #1 taken: soln wt. 1259m.

Req. 593045

urchased
Fox
12-4-59 PM Added 12.23 kg D_2O to system
& mixed

Total D_2O added to date:

	13.34
	13.35
	12.23
	38.92 kg

at ~ 25° sp.gr. = 1.104

∴ Vol = 35.25 l

Vol. of conc. = 31.89

Total vol = 67.14 l

$gm\ U^{235}/l$ = 182.5

d
ing

Total wt. of soln. in slab: 38.92 kg. D_2O

17.33
17.11
17.47
90.83

543065 — gm U/gm = 0.16727
sp.gr. = 1.4055

12-4-59
3:30 PM

Expt. 4 — Cross, Burchsted, Fox

System bare on bottom and top

After 3rd addition of D_2O

to 182.5 gm U^{235}/l

D_2O 75.63 − 56.1

Fuel 19.49" crit

12-7-59
9 AM

Expt 4A — Cross, Fox

Repeat of above after further mixing

Fuel zero ~ 0.20

Crit. Fuel reading 19.76 − .20 = 19.56

D_2O at 75.84 − 56.10 = 19.74

Readjusting:

Crit Fuel 19.82 − .20 = 19.62

D_2O at 75.75 − 56.10 = 19.65

Vertical traverse limits:

1.6" from bottom

& 3.75" " top.

Sample #2 (593066) gm U/gm = 0.14466 — 183 gm U^{235}/l ←

sp.gr. 1.356

12/7/59 Exp. 5. Water added to bottom region. No top reflector. Water in
10^{30} region IV & I > 19.5". Same
Fox, Cross, Gilley fuel solution as last experiment.
Fuel level selsyn reads 0.30" at solution zero as determined by change in responce of selsyn to small fuel additions.

Fuel ~~Sy~~ selsyn	D_2O selsyn	
16.86"	72.70"	crit
- .30	- 56.10	[corrected for zeros]
16.56	16.60	

12/7/59 Expt 5A
2^{30} PM Repeat of above after allowing bottom refl. to warm toward room temp
Fuel zero .30

	Fuel	
Crit with	16.84	72.70
	30	56.10
	16.54	16.60

12-8-59 Sample #2 & 2A taken; #2 soln wt 91 gm.
593 866

12-8-59 D_2O concentration in fuel can be 92% ± 2%
per H.C Claiborne

DW Magnuson

12-8-58 Drained out of slab:

$$\begin{array}{r} 17.44 \\ 2.17 \\ \hline 15.27 \end{array}$$ kg soln into 5" bottle

Added to slab: $$\begin{array}{r} 14.31 \\ 2.31 \\ \hline 12.00 \end{array}$$ kg D_2O

mixed for 1 hr.

Put in top water refl. ~ $7\frac{1}{2}$ in in region II & III after putting in pipe extensions using teflon tape on thread.

Region II can was leak checked after extension was inserted and found to be tight.

Fraction of soln drained out of slab: 90.83 kg soln

Drained 15.27

$$\begin{array}{r} 90.83 \\ 15.27 \\ \hline 75.56 \end{array}$$

$$\frac{75.56}{90.83} \times 12.26 = 10.19 \text{ kg } U^{235}$$

$$\frac{15.27}{90.83} \times 67.14 \cong 11.28 \ell$$

Vol. of soln left at 182.5 gm/ℓ: $$\begin{array}{r} 67.14 \\ 11.28 \\ \hline 55.86 \end{array}$$

Vol of D_2O added $\frac{12.0}{1.104}$ = 10.87

Total vol ⟶ 66.73

new gm U^{235}/ℓ = $\frac{10.19}{66.73}$ = 153

Expt. 6 — Cross, Gilley, Burchsted, Fox

System completely surrounded with water.
Soln at ~153 gm/l
Instr. checked safety up.
Fuel zero at zero on selsyn.
Inserted control rod
Crit at 14.43 with D_2O region full

Small control rod (~1") give almost no change in K when fully inserted in reflector IV.

Without removing any soln. from slab, 18.61 kg. of D_2O was added and mixed.

Vol. of D_2O added 16.86 l.

Total vol. = 66.73 + 16.86 = 83.59

Total mass; 75.56 + 18.61 = ~~94.17~~ + 12.00 = 106.17

$\frac{10.19}{83.59} = 122\ gm\ U^{235}/l$

Vol of Fuel Annulus = 2.73 l/in

12/9/59 Expt 7 Cross, Gilley, Fox

system completely reflected
Fuel conc. at ~ 122 gm/l.
Fuel zero 99.8
D_2O region II full
Crit. with fuel at 15.65" on selsyn
For pos. period 15.69"
Actual fuel ht = 15.85" at crit.
period corresponding to .04 increase in fuel ht. = 122 sec.

11^{30} Soln removed from system:

12/9/59

g 17.30	g 18.00	Total mass left in slab: 94.17
T 2.31	T 2.92	30.07
N 14.99	N 15.08	64.10 kg
	14.99	12.00
	30.07	76.10

91.86 kg = D_2O added to system:
73.8 l
1.245 sp gr

g 18.55
T 2.79
N 15.76

Total U^{235} left in slab:

$\frac{76.10}{106.9}$ ~~$\frac{64.1}{94.17}$~~ × 10.19 = 7.26 ~~6.935~~ kg

Vol D_2O added
$\frac{15.76}{1.164} \simeq 14.3$

~~Total vol left in slab~~:
$\frac{76.1}{106.9}$ ~~$\frac{64.1}{94.17}$~~ × 83.6 = ~~56.8~~ 59.5

59.5
14.3
73.8

~~56.8~~
~~14.3~~
~~71.1~~ Vol. after dil.

Vol. drained: 83.6
~~56.8~~
~~26.8~~ l

83.6
59.5
24.1

$\frac{gm\ U^{235}}{l} = \frac{7.26\ \cancel{6.935}}{\cancel{71.1}\ 73.8} = 98.4\ \cancel{97.6}$ gm/l

Cron, Gitty 11
Fox

12-9-59 2³⁰ pm. Expt # 8

Test for crit. ht. after further dilution to ~100 gm/l

Fuel zero 49.87

Crit at 17.07" + .13 = 17.2

Fully refl.

8A

Repeat of above to test degree of mixing

Fuel zero at 0.12"

Crit ht = 17.41 − .12 = 17.29"

4⁰⁰ PM added D_2O:

1st g 18.04

2nd g 12.48

Net added 5.56

vol added = 5.02 l

Fuel removed 7.96
2.79
net. → 5.17 kg

soln. mass left ~~64.10~~ ~~5.17~~ ~~58.93~~ 91.86 ~~76.10~~ 5.17 ~~70.93~~ 86.69

Total vol. after dilution:

5.02
69.65
74.67

~~5.56~~ ~~65.8~~ ~~71.36~~ ~~73.8~~ l

U^{235} mass left: $\frac{58.93}{64.10} \times 6.935$ = ~~6.4~~ kg

~~vol. left = 65.8~~

U^{235} mass left: $\frac{86.69}{91.86} \times 7.26$ = ~~6.76~~ 6.855 kg

$\frac{gm\ U^{235}}{l}$ = ~~6415 / 71.34~~

= $\frac{6.855}{74.67}$ = 91.8

Vol left!

$\frac{86.69}{91.86}$ × 73.8 = ~~68.8~~ = 69.65

12/10/59 Expt # ~~9A~~ 9 — Cross, Dilley, Fox

Test for crit. ht. fully refl. at ~ 90 gm/l

$9^{\underline{11}}$ AM Fuel selsyn = 0.03" at soln zero.

Fuel selsyn = 18.33" (full) slightly sub.

$9^{\underline{45}}$ A.M. " " = 18.48" slightly super

" " = 18.39 just crit. [

" " = 18.73 pos. period

$10^{\underline{30}}$ AM Exp 9A

Soln drained and mixed ~30 min. No changes made in concentration.

Fuel selsyn = 0.15" at zero

recheck = 0.19

System full at ~18.00" according to change in selsyn increments per "tad".

$11^{\underline{40}}$ AM Fuel selsyn = 18.41" just crit.

.19

18.22 = actual fuel thickness

Sample #3, 3A; 3B Ref. 593067

#3 gm U/gm = .080245 gm U/gm = .07475

gm NO_3/gm = .04358 92.0 gm U^{235}/l

sp gr. = 1.2314

$\frac{\text{gm } U^{235}}{l}$ = 92

12-11-59 Expt. 10 Cross, Tilley, Fox
3:40 PM

After adding ~ 1 l at conc. 182 gm / l
ceased mixing for 1 hr.
Instr checked safety set.
D_2O Annulus full
Fuel zero at 0.10
crit with selsyn - 17.87
Lowered safety &
raised fuel - full at ~ 18.0"
safety begins to have an effect after lowering ~ 3".

12/14/59 Exp. 10 A Repeat of Exp. 10
8:45 AM

concentration ~ 92 g /liter (calculated)
Fuel selsyn = 0.00 at fuel zero

Fuel ht. = 17.87" just crit.
Reactor full at 18.00"

~~D_2O Selsyn = 85.31~~
~~Fuel " = 18.34~~
~~Full " = 18.00~~

12/14/59 Exp. 11 Changed concentration by adding ~.4 l D_2O

10^{55} A.M Fuel selsyn = 0.03" at fuel zero

? 11^{20} 18.07" = Fuel selsyn at crit.

? 78.37" = D_2O selsyn at crit

? 80.12" = " " ~~with~~ very slightly super

Question marks are because JJ (East End) was on high power level and changing

Fuel selsyn = 17.94" crit

D_2O " = 74.11 " "

D_2O raised to 80.3". Slightly super

Recheck of selsyn (fuel) reading when just full.

Fuel selsyn = 17.91" when full

12

12/14/59 Exp. 11A

1^{25} PM Fuel selsyn = 0.03" at sol'n. zero

Fuel selsyn = 17.86 crit

D_2O " = 81.07

Exp. 11A (cont.)

Fuel selsyn = 17.82" crit
D_2O selsyn = 80.86" ~~full~~

Fuel selsyn 17.85 {~~full~~}
D_2O " 74.90 crit

Fuel selsyn at full = 18.00

Added ~0.4 l D_2O and mixed for 1 hr.

12-15-59 Inserted Chromel-Alumel Thermocouples in 4 regions:

#			
14D	in Region II	approx. 2" down from top	
15E	" " III	" 4" " " "	
16F	" " IV		
17G	outside in air		
18H	in center		

#14 & 15 were inserted down thru vent tubes.

12/15/59 Exp. 12 $1^{\underline{00}}$ PM

Fuel selsyn = 0.10" at solution zero

D_2O " = 85.31 } sub. crit

Fuel selsyn = 18.36 } " "

Full " = 18.00 } " "

added solution to raise power:

D_2O selsyn = 85.31 } pos. period

Fuel " = 18.91 }

leveled ~ 60 X's last level ~~at~~ at crit.

$1^{\underline{55}}$ PM Fuel selsyn = 18.34, D_2O = 85.31

Neg. period:

~~Fuel selsyn = 18.34~~

D_2O " = 85.31

Fuel selsyn = 18.01 (Full)

Temp readings $2^{\underline{30}}$ PM

#	EMF	°C
18	.95	23.75
17	.90	22.5
16	.90	22.45
15	.90	22.5
14	.93	23.2

Thermocouples 15, 16 & 18 were checked by putting them in water at same temp. Readings were #15 - .90; #16 - .89, #18 - .95 m.v. Switched #16 & 18 at junction in reactor room. Readings were #16 - .94; #18 - .90

12-16-59 Exp # 13 JRF LWG

8^{25} AM D_2O Selsyn = "56.0" At Zero
" " = 73.0" Appears to be full
" " = 79.533"
Fuel selsyn = 0.14 at zero
" " = 17.88" crit
Fuel " = 17.98 when full

Rerun of Exp # 13
D_2O Selsyn = 79.533
Fuel " = 0.14 At soln Zero
" " = 17.94 full
fuel " = 17.84 critical

Drained fuel Back to 14.5 And lowered Safety Blade to Make Reactor Sub-Crit so that thermal Couple Wires could be Changed

11^{30} AM Temp of Soln & D_2O after above exp.

Therm #	Location	Millivolts		
14	Fuel	.9522	.9506	two readings each 10 min apart
15	D_2O	.8889	.8872	

Temp of #14 = 23.8 °C
" " #15 = 22.2 °C

m.v.

12/16/59

12 $\frac{45}{PM}$ Solution mixed through lunch so pump would warm solution some.

12 $\frac{50}{PM}$ Fuel selsyn = 0.14 at zero

" " = 17.83 " crit

D_2O " = 81.25 " "

Fuel " = 17.93 at full

Temp of soln & D_2O during above exp.

#	Location	Millivolts	°C
14	Fuel	1.0218	25.6
15	D_2O	0.8914	22.2

pos. period obtained corresponding to just full (17.93).

NOTE! Logrithmic amps. had not been calibrated for above period. To be repeated later

Exp. 13 A Calibration of Control Blade

crit control selsyn reading	Period control selsyn reading	Crit Ht	T	$\rho \times 10^4$
999.95	4.07	18.56	253	2.91
4.07	7.06	18.33	506	1.54
7.06	11.02	18.21	228	3.17
11.02	28.27	17.91	247 ~~231~~	2.96
9.49	13.24	18.08	346	2.18

Log N amplifiers were calibrated ~~after 1st~~ period

Pos. period corresponding to full reactor:
D_2O selsyn = 81.3
$3^{\underline{30}}$ P.M. Fuel selsyn = 17.94 (full) for period
control blade out
Crit. ht = 17.83 [i.e. selsyn reading]
Period = 231 sec.; $\rho = 3.13 \times 10^{-4}$

12/16/59 Samples # 4 & 4A taken; Reg # = 593068
by phone 0.08047 gm U/gm ~ 92.6 gm $\frac{U^{235}}{l}$.
sp.gr. 1.2352

12/17/59 ~$10^{\underline{30}}$ Sample # 1 of D_2O from system taken.

12/17/59 Check Out of Thermocouples {These are not the same thermocouples used earlier}

Six (6) Al-Cr thermocouples were made, by heli-arc welding, by inst. dept. All 6 thermocouples were placed in the same neighbourhood in a water bath and the following results obtained:

couple #	Mv		couple #	Mv		
11	.673		11	.684		The variation
12	.677		12	.688		is ~0.25 °C
13	.672	11^{30}_{AM}	13	.683		
14	.674		14	.683	12^{30}_{PM}	
15	.684		15	.688		
16	.684		16	.692		

12/17/59 Exp. 13-B

Note: It was found that ~6"-8" of non-stainless steel rod ~~was in the~~ 1/4-in dia was left in the fuel region [protruding down through the counter guide hole]. In addition to the perturbations introduced in the previous otherwise "clean" criticals, there was indication of some corrousion of the rod. A sample was taken for analysis. The purpose of this experiment is to repeat the clean critical with the rod removed [but with possibly small amounts of iron in solution].

D_2O selsyn = 80.00"

Fuel selsyn = 0.14 at soln. zero

Fuel " = 17.94 at full

2:10 PM Fuel " = 17.85 at crit.

Fuel " = 17.99 for pos. period

Period = 196 sec : $\rho = 3.62 \times 10^{-4}$

Soln drained back

2:00 PM Temp. by Thermocouples:

Couple #	Location	°C
11	II (fuel)	20.3
12	IV (H_2O)	17.5
14	I (center)	21.0
16	III (D_2O)	19.9

#'s 13 & 15 are not in use.

Exp. 13-B (cont.)

Repeat of pos. period

Fuel selsyn = 18.02 (full)

D_2O " = 85,09

T_1 = ~~20~~ 213 , T_2 = 217

4^{00} PM Temp by Thermocouple

couple #	MV	°C
11	.701	17.5
12	.764	19.1
14	.895	22.4
16	.782	19.6

12/18/59 Exp. 14. Repeat of clean critical to ~~Fue~~ get another check on temperature distribution. Relatively cold water was put in region IV (from tap) just prior to Exp. 13-A

Thermocouple # 13 was taped to side of soln storage tank. Temp. by #13 = 20.1 °C before feeding solution up (8 30 AM)

Fuel selsyn = 0.14" at soln zero

9 40 Fuel selsyn = 17.83 at crit.

D_2O " = 83.63 at crit

Fuel selsyn = 18.00 for pos period

[Fuel region apparently full ~ 17.95 - 18.00]

T_1 = 133 sec., T_2 = 136 sec.

These results are not consistent with Exp. 13-B

Temp. Readings by Thermocouple:

Couple #	Millivolts 9 20	9 40	~~9 56~~	°C 9 20	9 40	~~9 56~~
11	.677	.656				
12	.858	.855			21.4	
13	.817	.824			20.6	
14	.864	.862			21.6	
15	.922	.924			23.1	
16	.806	.807			20.2	

12/18/59 Exp. 14-A Repeat of last exp (14) after installing different thermocouple in fuel region [temperatures indicated in fuel were below room temp.] This couple better insulated from solution.

Fuel selsyn = ~.14 at soln zero
Fuel selsyn = 17.82 crit
11 00 AM Fuel " = 18.01 for pos period [full]
T_1 = 126 sec., T_2 = 127 sec.

Temp. readings: D_2O selsyn = 83.0

	Couple #	Millivolts	°C
IV (H_2O)	12	.860	21.5
Slab	13	.845	20.1
I (center)	14	.890	22.2
II (Fuel)	15	.856	21.4
III (D_2O)	16	.817	20.4

The above reading on slab was taken when solution was in reactor. An earlier reading with soln. in slab = .824 mv.

12/18/59 Exp. 14-B Repeat of 14-A above after mixing fuel and D_2O for several minutes in order to raise their temperature

Fuel selsyn = 0.14 at fuel zero
D_2O " = 83.0 .2
Fuel selsyn = 17.78 at crit
1^{45} Fuel " = 17.99 for pos period (full)
T_1 = 65 sec ; T_2 = 65 sec

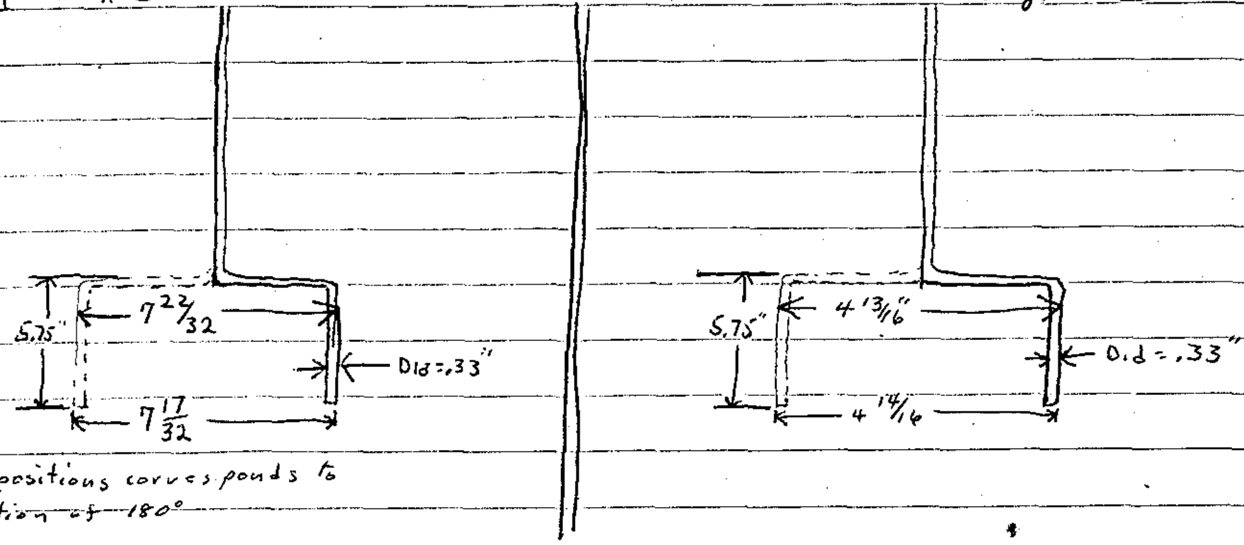
1^{45} Temp readings

	couple #	Mv		°C	
	~~11 12~~	1^{00} PM	1^{45} PM	1^{00}	1^{45}
H_2O(IV)	12 ~~13~~	.877	.880		22.0
slab	13 ~~14~~	.970	.908		22.7
center.	14 ~~15~~	.892	.957		24.0
Fuel	15 ~~16~~	.892	.958	21.8	24.0
D_2O	16	.912	.910	22.7	22.7

12-21-59 Zeroing of vertical traverse lift.
When selsyn reads zero, counter tip in region IV is up 0.12" from bottom & in region II " " 0.16" " " . This is with full reflector water in. The zero is decreased .3 - .4" when filling reflector compartments with water.
Top limit switch set at 11.81"

Notes on counters

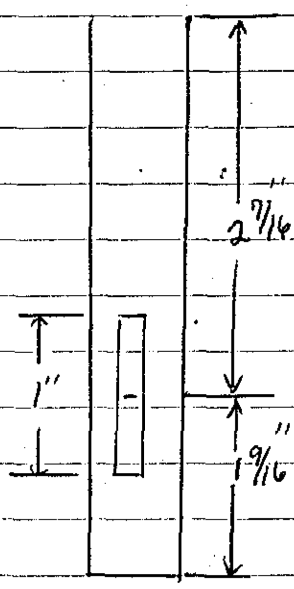
Region III #3 - U-235 | #4 - U-235 Region II



Two positions corresponds to rotation of 180°

(Note added 1/21/60)
See recheck of radius of rotation for Reg III & Reg. II p 83

Description of (bare) U-235 fission chambers:



The al. containing shell is 4" long. The one inch active chamber is located as shown (drawing is not to scale).

12-22-59 3³⁰ PM Expt 15A Fission ctr in regions I, II & III; proportional ctr in region IV, solution same as expt 14. This is a preliminary expt. to check on operation of ctrs. and crit. with perturbation due to ctrs.

Fuel zero at ~ 0.0
crit at 17.89 (full)
Vert ctr. lift at 11.72

4¹⁵ PM Counters lowere to ~ 6" (tip from bottom) and slow (~14) neg. period resulted.
Counters lowered to 0.00 and positive period resulted (few cents) [counter heads were near inside edges of respective regions]

Counters rotated 90° so counter heads are near center of regions; also counters raised to ~7.5" Crit ht, = 17.95

12/23/59 Exp. 16

Region I counter "zeroed" against wall. When chamber "just" touches wall selsyn reads 4 units = .02"

Fuel selsyn = 0.10 at solution zero
D_2O " = 81.8
Fuel selsyn = 18.00 when full
Fuel selsyn = 17.98 at Crit.

Counts obtained at crit. with vertical selsyn = 7.49

Rotating Counter position	Center counter position	I 16, 0.8, 15	II 16, .8, 15	III 16, .8, 10	IV 16, .8, 13	
181	489	98700	5000	58+6	55+17	1 min
"	"	98820	4820	57+16	52+55	"
"	"	99090	4930	56+46	55+29	"
"	"	102630	5320	59+18	62+13	"
"	"	102470	5150	60+49	60+19	"
181	489	108050	4630	53+35 ×64	52+54 ×64	1 min
"	"	109500	4730	51+45 ×64	54+51 ×64	"
"	"	107370	4650	54+56 ×64	49+50 ×64	"
"	"	107140	4480	54+5 ×64	50+19 ×64	"
194	489	107670	4580	54+5 ×64	69+56 ×64	"
"	"	106850	—	54+35 ×64	71+30 ×64	
		106710	4430	52+32 ×64	68+30 ×64	

Amplifier Settings:

Counters		Detector		Amplifier Setting			HV
Region	Channel	~~fission Ctr #~~		Gain	R.T.	PDL	~~135 v (batt)~~
I	1	fission Ctr # 5-4-235		16	0.8 μs	15	135 v (batt)
II	2	"	4-235	16	0.8 "	15	135 v "
III	3	"	3-235	16	0.8 "	10	135 v "
IV	4	BF_3	767	16	0.8 "	13	1400 v

IC-3 = ~ .1 ; IC-4 = ~ .02

~~ID~~	#	I	II	III	IV	
221	489	105920	—	$51+3^{\times 64}$	$173+7^{\times 64}$	
"	"	102750	4260	$49+6^{\times 64}$	$154+22^{\times 64}$	
		102900	4390	$49+27^{\times 64}$	$143+5^{\times 64}$	
		103010	4460	$51+46^{\times 64}$	$149+24^{\times 64}$	
271	489	98480	4800	$43+4^{\times 64}$	$325+21^{\times 256}$	
"	"	99160	4770	$44+32^{\times 64}$	$362+61^{\times 256}$	
"	"	100780	4780	$45+34^{\times 64}$	$410+56^{\times 256}$	
"	"	103080	—	$46+2^{\times 64}$	$44+131^{\times 256}$	#IV PDL=15
		104900	5060	$46+7^{\times 64}$	$45+64^{\times 256}$	"
		106160	5330	$47+11^{\times 64}$	$45+\cancel{235}\ 133^{\times 256}$	"
		103490	—	$44+52^{\times 64}$	$165+5^{\times 64}$	"
		100550	4930	$43+58^{\times 64}$	$155+14^{\times 64}$	"
		98610	4860	$43+27^{\times 64}$	$142+34^{\times 64}$	"
		98320	4790	$43+0^{\times 64}$	$138+62^{\times 64}$	"
360	489	84290	9180	$27+58^{\times 64}$	$305+10^{\times 64}$	"
"	"	78860	8590	$25+23^{\times 64}$	$269+32^{\times 64}$	"
"	"	73000	8110	$23+8^{\times 64}$	$216+30^{\times 64}$	"

Exp. 16 (cont.)

Temperature

Region	couple #	mv 2^{30}	mv 3^{00}	°C 2^{30}	°C 3^{00} pm
~~12~~ IV	12	.834	.841	20.7	20
~~13~~ slab	13	.785			
~~14~~ I	14	.921	.945	23.0	23.5
~~15~~ II	15	.766	.772	19.0	19.4
~~16~~ III	16	.890	.900	22.2	22.5

Gilley, Rohrer, Fox

12-24-59 Exp. 16-A ~~Pl~~ Preliminary traverse with four counters and check-out of instruments.

D_2O selsyn = 81.4
Fuel selsyn = 0.13 at solution zero

Expt 16 B

12/28/59 Preliminary traverse and check out of counting equipement.

$9^{\frac{00}{AM}}$. Fuel selsyn = 0.10 at soln zero

D_2O " = 82.5

Fuel selsyn = ~18.00 at full.

Fuel " = 17.96 (essentially full) for traverse with exact critical being maintained with control blade.

Vertical lift selsyn	Rotating counters selsyn	Reg. I counter selsyn	I	II	III	IV		
				×256	×64			
7.5	361	488	346568	190+89	314+33	371220	10^{43} AM	1 min
"	~~340~~ "	"	348794	191+169	310+28	348040		"
"	340	"	365396	155+221	340+35	348850		"
"	"	"	397996	163+180	397+12	397960	10^{50}	"
"	320	"	410963	137+210	430+45	340870		"
"	"	"	430339	142+57	456+43	369040		"
"	302	"	459064	132+150	519+40	324630		"
"	"	"	471685	140+149	530+9	336350	11^{02} AM	"
					×64			
"	281	"	468369	120+87	533+16	221400		"
					×256			
"	"	"	462351	116+106	145+65	215810		"
					×256			
"	261	"	471730	106+253	192+202	143260		"
"	"	"	484430	109+181	199+124	149200		"
"	239	"	509198	110+97	180+6	100600	11^{17} PM	"
"	"	"	509767	109+99	179+205	99320		
"	220	"	512618	104+146	197+109	60650		
"	"	"	512178	105+62	195+198	61120		
"	200	"	518445	107+30	194+89	36240		
"	"	"	526050	107+219	198+253	37650		
"	180	"	540252	109+129	209+11	23170		
"	"	"	542620	115+159	211+54	22800		

	Vertical Lift	Rotating ctr. Pos.	Reg. f selsyn	I	II	III	IV	
	7.5"	160	488	547941	120^{+239}	199^{+97}	14000	
	"	"	"	553027	121^{+204}	201^{+31}	—	
	"	140	"	554583	127^{+63}	192^{+211}	—	
	"	"	"	541057	126^{+53}	189^{113}	7800	
	"	120	"	528120	127^{231}	173^{172}	4680	
	"	"	"	534910	132^{86}	174^{187}	4730	
	"	100	"	537470	143^{128}	168^{251}	3420	11^{53}_{AM}
	"	"	"	536334	140^{171}	170^{68}	3450	
	"	80	"	535802	147^{159}	164^{252}	2750	
	"	"	"	536682	150^{243}	167^{90}	2880	
1 min	"	60	"	536180	164^{1}	160^{184}	2370	
"	"	"	"	534625	164^{59}	163^{21}	2510	
"	"	40	"	535586	174^{174}	156^{25}	1800	
"	"	"	"	535714	175^{195}	157^{231}	1790	
"	"	20	"	538108	184^{146}	154^{19}	1410	
"	"	"	"	537022	184^{74}	153^{96}	1470	
"	"	0	"	534977	191^{220}	151^{00}	1130	
"	"	"	"	533364	195^{237}	150^{240}	1180	
"	"	59	"	537047	167^{112}	155^{148}	1770	
"	"	"	"	539194	174^{194}	156^{72}	—	
"	"	120	"	543622	138^{35}	224^{11}	—	
"	"	"	"	546929	136^{148}	228^{182}	5110	
"	"	180	"	523125	109+241	233+127	18510	
	"	"	"	518364	113+188	235+33	17480	
	"	240	"	507216	107+162	194+227	94940	
	"	"	"	508225	108+216	187+37	93990	
	"	280	"	488968	121+209	147+216	237520	$121m^{50}$
	"	"	"	478274	121+114	146+153	229600	

Vert. lift	Rot. Ctr. position	Reg I Ctr position	I	II	III	IV	
7.5	300	488	442631	126+18	122+248	282890	
"	"	"	427361	125+~~103~~ 87	121+21	262430	58 12 Em
"	320	"	413990	146+205	104+9	339220	
"	"	"	412475	142+73	103+215	335350	
"	360	"	345339	197+59	78+69	376680	
"	"	"	355058	188+165	76+194	357500	
	Counts for		Center	traverse			
				x256	x256		
7.5	360	440	417167	290+4	90+225	450730	
"	"	"	424936	290+94	91+116	460670	
"	"	390	424714	301+18	93+163	474770	
"	"	"	431033	305+214	93+56	474350	1 32
"	"	340	425645	241+153	92+217	469600	
"	"	"	422746	230+69	92+163	457770	
"	"	290	402052	225+220	88+149	421840	
"	"	"	400265	217+43	88+5	411220	
"	"	240	380325	266+153	83+154	380430	
"	"	"	378871	278+217	84+208	371600	
"	"	190	354966	258+149	80+183	344300	
"	"	"	354566	250+106	81+197	342600	
"	"	140	317928	245+7	76+174	316790	
"	"	"	314805	232+230	76+114	304690	
"	"	90	279015	238+216	74+160	293890	
"	"	"	273076	243+194	73+155	281370	
"	"	40	219613	172+248	69+144	258280	
"	"	"	213304	217+191	67+4	240910	

Vert lift.	Rot Ctr. position	Reg I Ctr position	I	II	III	IV
7.5	360	-10	162525	212+220	69+93	250650
"	"	"	167366	240+86	70+178	264230
"	"	-30	151196	242+254	78+88	315980
"	"	"	158496	218+51	82+111	345780

~4^{00} PM ~~I~~ The region I counter was found to not have the stroke anticipated. Some alterations were made and new selsyn zero determined. Chamber is against wall when selsyn = ~~999, 3??~~ 2 units. Stroke now is ~ 3 3/8".

The counter in region II touches the wall of region I hard enough to almost hang when rotated by hand. It is worse near the upper end of the stroke, but is present also when at the mid-plane. It does not touch the wall of region III. Either the bearings of region II counter are not in the center of the annulus or the counter is bent slightly.

Rotating counter position indicator reversed to read zero at ctrs. pointing toward center rather than opposite center direction

Expt 16B

12-29-59 Expt 17 Horizontal traverse at approx. midplane (Lift selsyn reads 7.50".
Fuel zero ~ .10"
D_2O at 82.17"
Full at ~ 17.9" Region I ctr. at 562

Rot. ctr Pos.	Region I	Region II x256	Region III x256	Region IV	Reg II ctr.	Reg III ctr.
0 *	136270	109 + 40	29 + 111	93100		
0	135910	107 + 51	28 + 245	90640		
20	139195	92 + 44	31 + 66	79240		
〃	144538	94 + 184	30 + 162	83310		
〃	149047	98 + 238	31 + 192	90750		
Restart after work on ctr					x100	x100
0	441673	359 + 98	38 + 5	902590	920.0	97.2
〃	450370	365 + 69	39 + 93	909950	935.0	100.8
20	490921	336 + 15	45 + 83	905440	860.0	116.0
〃	530986	367 + 59	49 + 44	1004270	940.0	126.0
41	265909	143 + 184	26 + 1	268020	367.7	546
〃	270598	146 + 25	26 + 112	~~2~~	374.0	577
〃	286838	166 + 68	27 + 211	305780	3990	712
60	292617	134 + 106	29 + 223	251370	3442	766
〃	291765	132 + 234	30 + 137	244910	3407	782
80	297057	115 + 43	35 + 91	185030	2950	905
〃	301960	118 + 142	37 + 95	191960	3038	957
100	311531	109 + 9	39 + 231	145410	2790	1022
〃	321127	109 + 151	41 + 182	149580	2807	1067
120	337334	107 + 119	45 + 9	117590	2753	1162
〃	345678	109 + 171	45 + 78	123200	2805	1157

* Zero at ctr nearest center of reactor

Rot. Pos.	Reg I	Reg II	Reg III	Reg IV	Reg II ctr.	Reg III ctr.	III/I
140	354807	108+122	67+93	90890	2779	1925	
11	362543	110+54	72+129	94400	2822	1856	
160	381440	113+78	50+39	73860	2900	1285	
11	390633	115+175	51+107	76080	2940	1318	.3375
180	406248	124+8	54+42	63740	3175	1388	.342
11	377974	114+33	49+19	57090	2920	1255	.332
200	341268	105+179	44+252	41490	2704	1152	.338
11	333228	105+61	44+242	41060	2693	1152	.344
11	325824	101+167	41+84	38830	2600	1057	.3245
220	322131	106+94	~~75+17~~	35570	2725	—	—
11	320080	105+252	59+9	35440	2715	1510	.472
11	319349	104+29	61*+149	34920	2665	1574*	.493
240	320400	113+252	~~70*+46~~	35280	2920	—	[illegible]
11	320789	113+40	61+141	35080	2896	1574	.491
11	320553	113+122	64+243	35060	2916	1662	~~.754~~ .5185
	Stopped and checked on Reg III ctr. (same settings on ctr.)						
240	294559	106+1	24+27	28340	2715	617	.2093
11	295571	107+95	23+201	28580	2726	611	.2067
11	298209	109+60	24+194	29180	2795	634	.2125
260	311694	121+44	25+84	32220	3102	648	.2080
11	318578	122+230	25+145	32650	3148	656	.2060
280	327805	136+45	25+192	35780	3487	661	.2016
11	339873	143+163	26+203	37720	3478	686	.2018
300	327403	148+144	24+49	38770	3800	620	.1893
11	306801	140+188	22+213	36630	3600	586	.1911
320	317472	154+41	23+100	39980	3950	599	.1886
11	329868	160+181	24+63	41700	4113	620	.1880
340	316437	162+186	22+169	42100	4163	580	.1832
11	305137	157+90	22+55	40690	4030	569	.1865
360	295624	153+97	20+143	39550	3928	527	.1783
11	287798	149+149	20+15	38560	3830	514	.1785

42 Rot. Pos.	Reg I	Reg II	Reg III	Reg IV	II ×100	III	
300	292328	134+166	21+201	34970	345	558	
11	304300	139+247	22+48	36360	358.4	568	
240	317041	115+84	25+204	30950	295	661	
11	315452	116+8	25+69	30840	297	648	
200	312155	98+148	26+257	29010	252.5	691	
200	308763	98+136	26+147	28930	252	681	
160	299904	88+68	26+87	33620	226	674	
11	302351	90+87	26+171	34440	231.3	683	
100	293059	95+223	24+29	75170	245.5	617	
11	281988	93+156	23+15	70090	239	590	
50	257342	125+42	17+87	144910	321	444	
11	252771	121+254	17+24	136570	312.2	438	
0	242912	191+86	13+112	229330	490	344.5	
11	240805	192+25	13+215	226510	492	354.5	
Ctr. Pos	Traverse in region I (Rot Pos. = 0).						
563	use last two ctr. above						
510	237181	188+74	13+198	214450	482	353	9989
11	242889	191+129	13+230	222690	490	356	1006
460	258442	206+227	14+188	247960	529	378	.9917
11	255331	202+87	14+141	240680	518	372.5	1000
410	244025	194+192	13+210	222090	499	353.5	9925
11	242950	193+26	13+145	218710	494.5	348	9971
360	240459	192+204	13+159	214600	493.5	348	9892
11	238640	191+180	13+220	210030	491	354.5	9864
310	228944	184+91	12+224	201360	472	330.5	9843
11	223767	179+153	13+12	191910	460	334	9876
260	218986	180+130	12+186	193120	462	325.5	9622
11	219593	179+197	12+182	195020	460	325	9691
210	206740	177+33	12+182	188720	453.5	325	9257
11	201885	173+87	12+116	180390	444	319	9230

	Ctr Pos.	Reg I	Reg II	Reg III	Reg IV	I	II	
	160	189358	173+143	12+111	172600	444.5	319	9650
	11	193789	176+153	12+240	179080	457	331.5	8705
	110	174202	177+30	12+125	181150	453.5	322.5	7797
	11	174175	172+218	12+139	174410	442.5	321	7992
	11	168746	171+130	11+202	169390	439	302	7799
	60	139755	174+202	12+6	168850	440	307	6449
	11	141411	170+148	12+48	166780	437	312	6567
	30	117949	168+197	11+250	165510	432	307	5540
	11	119258	169+211	12+2	167900	435	307	5566
	0	97439	179+225	13+26	185600	460.5	335.5	4295
	11	100336	189+231	13+28	200890	486	340	4189
	110	184086	184+157	13+99	190140	472.5	343	7909
	11	183418	182+246	12+133	187570	468.5	320	7945
	210	227579	193+57	13+180	205500	495	351	9334
	11	264584	206+44	14+125	229520	528	371	1017
	310	272978	220+96	15+125	261980	562	397	9856
	11	287666	232+189	16+127	285430	596	422	9799
9989	410	294259	237+184	16+59	288930	608	415	9825
1006	11	295834	237+252	16+230	289750	610	433	9843
9917	510	300133	243+238	17+15	301310	624	437	9762
1000	11	296370	237+13	16+132	289530	607	422.5	9912
9925	563	284469	231+165	16+50	274040	593	415	9807
9971	11	282473	227+44	16+58	266540	583	415	9837
9892								
9864								
9843								
9876								
9622								
9691								
9257								
9230								

Pos	II/I	III/I	IV/I	Pos	II/I	III/I	IV/I
0	.208	.0220	.2043	240	.0922		.09619
0	.208	.0224	.2020	"	.0922		.09670
20	.175	.0236	.1844	"	.0938		.09785
"	.177	.0237	.1891	260	.0996		.1034
41	.138	.0213	.1007	"	.0988		.1025
"	.138	.0213	—	280	.1065		.1092
"	.139	.0248	.1066	"	.108		.1110
60	.117	.0262	.8591	300	.116		.1184
"	.117	.0268	.8461	"	.1174		.1194
80	.0994	.0305	.6227	320	.1245		.1259
"	.101	.0317	.6358	"	.1248		.1264
100	.0895	.0328	.4667	340	.1316		.1331
"	.0875	.0332	.4657	"	.1320		.1334
120	.0816	.0341	.3486	360	.1328		.1337
"	.0812	.0336	.3563	"	.1331		.1339
140	.0784	.0486	.2562	300	.1182	.01909	.1196
"	.0777	.0511	.2604	"	.1178	.01867	.1195
160	.0761	.0337	.1937	240	.09306	.02085	.09763
"	.0757	.0337	.1948	"	.09410	.02054	.0977
180	.0782		.1569	200	.08088	.02213	.0929
"	.0773		.1510	"	.08160	.02205	.0937
200	.0793		.1216	160	.07536	.02247	.1121
"	.0809		.1232	"	.07648	.02259	.1138
"	.0798		.1192	100	.08375	.02105	.2564
220	.0846		.1104	"	.08475	.02092	.2485
"	.0848		.1107	50	.1248	.01726	.5631
"	.0836		.1093	"	.1235	.01733	.5403
240	.0912		.1101	0	.2017	.01418	.944
"	.0903		.1094	"	.2043	.01472	.9406
"	.0910		.1094				

12-31-59

Expt 18

Gilly, Robrn
Fox

Horizontal Traverse

vert. lift ht 7.50" D$_2$O annular fill
Fuel " "

Reg I Horiz. Pos.	Reg I	~~Reg I~~ Reg I / Reg V	Reg II	~~Reg II~~ Reg II / Reg I	Reg III	III / I
25 8	141472	.1212	35220	.03013	~~70120~~ 2765	? .2369
"	146918	.1211	36910	.03043	~~4468~~	[illegible]
"	152019	.1215	38120	.03047	3720	? .2974
57 40	186444	.1297	30220	.02103	3980	.2769
"	192446	.1305	31340	.02125	4135	.2803
87 70	222217	.1361	24870	.01523	5410	.3313
"	225251	.1361	25030	.01511	5340	.3225
"	222445	.1360	24700	.01510	5400	.3300
117 100	249967	.1439	21870	.01259	6110	.3518
"	243756	.1410	21580	.01248	6080	.3516
147 130	246586	.1443	20370	.01191	6080	.3557
"	248692	.1452	20570	.01197	6110	.3567
207 190	269921	.1490	21280	.01175	6450	.3561
"	272153	.1501	21350	.01177	6480	.3574
267 250	271978	.1513	21250	.01182	6440	.3584
"	275621	.1509	21440	.01175	6540	.3582
327 310	290210	.1528	23330	.01229	6360	.3349
"	300052	.1526	24500	.01246	6710	.3413
377 360	304170	.1535	25860	.01301	7050	.3548
"	297136	.1535	25030	.01293	6870	.3050
427 410	292050	.1538	26360	.01388	6490	.3417
"	284996	.1524	25830	.01381	6470	.3460
477 460	285031	.1548	27170	.01475	6150	.3341
"	285786	.1554	27380	.01488	6040	.3283
517 500	280146	.1516	29880	.01617	5800	.3139
	184968?	~~.1889~~ .1803	29810	.01616	5940	.3220

III #15 21.3°C at 350 PM
II - 11 - 21.2 "
IV - 14 - 21.4 "
I - 12 - 21.1 "

Rot. Pos ~~Reg I~~ Deg x2	Reg IV ~~Reg V~~			Normalizer Reg V
0	1689490 ~~1166821~~		1.447	1166821
"	1695720	1.41	1397	1213086
"	1727550		1381	1251095
40	1659130	1.15	1152	1437147
"	1702650		1154	1475216
80	1417890		8683	1632536
"	1423930	.863	8599	1656286
"	1411600		8631	1634339
120	1016590	.583	5854	1737125
"	1003720		5807	1729478
140	785900	.459	4599	1709328
"	782280		4566	1712772
160	659260	.366	3641	1811027
"	664730		3666	1813004
180	484880	.269	2698	1797180
"	489610		2681	1826227
200	381290	.200	2007	1898847
"	393470		2002	1966063
220	294930	.148	1484	1986975
"	286400		1480	1935301
240	209060	.110	1101	1898538
"	205090		1096	1870408
260	151640	.0822	8234	1841055
"	150950		8206	18394[illegible]
280	113670	.0616	6152	1847306
"	113800		6168	1844642

Reg I Pos	Reg I		Reg II		Reg III	III/II
500	278479	1514	29540	.01606	5840	3176
540 557	277294	.153 ~1537	33850	.0187 .01876	5330	294 2955
"	264590	1501	32990	.01871	5170	2932
600 617	243564	.150 .01494	32860	.0202 .02016	4955	302 3040
"	246245	1518	32760	.02018	4860	2994
655 672	225641	.142 ~1426	31690	.0201 .02003	4675	301 2955
"	219258	1424	31080	.02019	4635	3012
540 557	254894	.150 1505	30180	.0179 .01782	5350	319 3158
"	268453	1502	32130	.01796	5760	3221
460 477	275709	.152 ~1520	26620	.0147 .01471	5980	326 3303
"	278458	1519	26900	.01468	5910	3224
360 377	284416	.152 ~1522	23980	.0129 .01284	6235	326 3338
"	290916	1530	24660	.01297	6065	3192
250 267	292463	.152 1517	22660	.0119 .01175	6420	330 3330
"	293982	1519	23220	.01200	6340	3276
130 147	278277	.145 1446	23490	.0121 .01221	6165	32x 3204
"	278791	1449	23260	.01208	6285	3267
70 87	243592	.139 1369	36810	.0207 .02068	5875	326 3301
"	254195	1416	37280	.02077	5780	3220
9 26	199760	.122 1222	50020	.0307 .03061	5210	315 3188
"	201119	1223	50690	.03083	5110	3108

II	Rot Pos. I	Reg III	IV/V		Reg V
6	280	113350		6166	1839392
55	320	65780	36x	3646	1804304
32	11	64170		3639	1763266
40	360	36690		2251	1630368
94	11	36660	225	2259	1622907
55	11	35480		2242	1581886
12	11	34620		2250	1539094
58	280	69790	414	4119	1693741
27	11	74140		4147	1787705
303	240	148340	818	8192	1809760
24	11	149920		8177	1833194
338	200	258240	138	13822	1867796
92	11	261570		1377 ~~4505~~	1900472
30	160	322460	272	2710	1928401
276	11	529250		2735	1934978
204	120*	1004830	521	5223	1924072
267	11	1001300		5202	1923954
301	40	1942670	109	1091	1780271
220	11	1941960		1082	1794526
188	0	2063640	125	1262	1633552
108	0	2047720		1246	1643528

Reg I zero found to be ~~[illegible]~~ −17 for above expt.

Note added 1/4/60: The D_2O traverse counter was found to be loose in its sleeve and "off" ~90°.

* Drive stopped at one pt. due to some obstruction

1-4-60

Expt 19
Horizontal Traverse

Vert. lift at 7.50" Reg I reads 2 at wall

Fuel zero at 0 D_2O at 81.4

Rot Pos.	Reg I Position	Reg. I	Reg II	Reg IV	Normal.	Reg III
0	2	227066	62450	270500 ~~5860~~	2016727	5860
"	"	233698	64830	2732100	2071358	6080
"	"	238963	65240	2735800	2109652	6085
48	40	278692	62610	2460730	2242936	6970
"	"	297284	65640	2705190	2340579	7300
80	90	352327	47840	2374720	2517852	9620
"	"	374922	44150	2239230	2348895	8840
"	"	301498	39390	2073070	2131470	7840
100	130	283098	31130	1662430	2005151	8010
"	"	290564	31770	1686620	2037858	8120
120	170	311418	28510	1422240	2122322	8950
"	"	318368	29470	—	2172935	9290
"	"	257095	30550	1480880	2224346	9640
140	210	231271	30200	1286910	2371569	10500
"	"	253789	32580	1354030	2543950	11350
161	250	425456	34230	1174970	2766559	12830
"	"	446619	35820	1211660	2879348	13200
180	290	442406	34710	945430	2837302	13400
"	"	436386	34540	923010	2800921	13100
200	330	447223	34640	709880	2844631	13100
"	"	458869	35810	729550	2916926	13480
220	370	468590	38100	—	2973206	13370
"	"	467235	37980	555310	2968783	13660
"	"	468224	37980	548940	2976281	13400
240	410	470562	40290	407200	2993950	13140
"	"	476203	41030	412140	3018895	13570
260	450	481824	43720	304800	3044600	13000
"	"	481658	44410	307980	3057831	12840

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293

Reg I		I/V		II/V		III/V		IV/V	
0	0	.113	1126	.310	3097	.291	2905	132	1341
"	"		1128		3130		2936		1319
"	"		1132		3092		2883		1297
40	40	.126	1242	.280	2791	311	3107		1186
"			1269		2803		3118	.117	1155
80	90	.140	1292	.188	1899	375	3820		4432
"			1596		1879		3763	.95	4531
"			1415		1848		3679		9727
100	130	.142	1412	.156	1553	399	3993	.83	8285
"			1425		1558		3982		8278
120	170	.147	1467	.136	1343	425	4217		6701
"			1465		1356		4275		~~6459~~
"	210		1156		1373		4335	.6459	~~5421~~
140	210	990	4751	.128	1273	444	4420	5421	~~5330~~
"	"		9970		1281		4461	5330	~~4244~~
161	250	155	1537	.124	1237	461	4636	4246	~~4227~~
"			1551		1244		4584	4227	~~3332~~
180	290	.158	1557	.123	1223	470	4723	3332	~~3295~~
180	290		1558		1233		4676	3295	~~2495~~
200	330	.157	1572	123	1218	461	4604	2495	~~2501~~
"	"		1573		1228		4620	2501	~~1870~~
220	370	.158	1576	.128	1281	453	4497		~~1844~~
"			1574		1279		4601	1870	~~1360~~
"			1575		1276		4502	.1844	~~1366~~
240	410	.158	1572	.135	1345	444	4388		1360
"	"		1577		1359		4494		1366
260	450	.158	1581	.145	1434	424	4266		1007
"			1578		1455		4207		1009

Rot. pos.	Reg. I pos	I/V		II/V		III/II		IV/V
280	490	.158	1582	.157	1577	414	414	.07601
"	"		1583		1552	4133		7546
300	530	.160	1612	.170	1698	4015	401	
"	"		1594		1697	4017		5577
"	"		1596		1705	3980		5613
360	600		1554	.211	2106			2715
"	"	.157	1563		2112	3712	373	2698
"	"		1565		2103	3754		2743
"	"		1568		2105	3751		2702
300	679	.1515	1508	.179	1793	3996	400	5000
"	"		1519		1775	4003		5040
260	600	.157	1574	.154	1536	4223	421	8142
"	"		1573		1537	4194		8072
200	530	.159	1588	.125	1258	4602	463	2109
"	"		1584		1245	4660		2121
160	450	.159	1595	.127	1261	4645	470	3698
"	"		1591		1275	4769		3711
110	370	.158	1582	.144	1440	4441	444	6446
80	290	.158	1573	.182	1810	4002	403	8226
"	"		1576		1827	4057		8266
40	210	.154	1535	.280	2790	3257	328	9910
"	"		1535		2805	3306		9907
2	130	.144	1437	.328	3270	3006	299	1014
0	"		1442		3290	2970		9931
140	40	.127	1270	.134	1340	4610	458	5171
"	"		1267		1338	4568		5111
"	2	.117	1166		1337	4559		5152
"	"		1167		1325	4576		

Expt 19 cont

Rot Pos.	Reg I Pos.	Reg I	Normal	Reg II	Reg III	Reg IV
280	490	485,431	306,8121	48,360	12700	233150
"	"	486403	3073183	47708	12700	231920
300	530	491865	3051050	51860	12250	—
"	"	481850	3024584	51340	12150	168770
"	"	478899	3000116	51880	11940	168430
360	600	464204	2987436	62910	~~11150~~	81100
"	"	486015	3104396	65650	11540	83850
"	"	502530	3210250	67490	12050	88040
"	"	510128	3252211	68480	12200	87880
300	679	492021	3260240	58420	12030	163020
"	"	508598	3347078	59390	12420	168680
260	600	526293	3343030	51350	14120	272150
"	"	522583	3319609	51010	13920	268020
200	530	519259	3268336	41130	15040	689410
"	"	518735	3273433	42020	15260	694270
160	450	529050	3315449	41800	15400	1223990
"	"	531794	3343606	42640	15950	1241010
[illegible]	370	518337	3276306	47200	14550	2112370
80	290	502723	3195804	57820	12790	2628740
"	"	500929	3178678	58090	12900	2628190
40	210	461290	3005358	83850	9790	2978430
"	"	461623	3007066	84340	9940	2979160
[illegible]2	130	442727	3080660	100620	9260	3123610
"	"	460293	3191537	105040	9480	3170020
[illegible]	40	417023	3284355	44020	15140	1697780
"	"	407458	3215827	43030	14690	1644250
"	2	367504	3152202	42170	14370	1623870
"	"	371036	3179390	42130	14550	—

↳ after expt it was found that ~~Reg.~~ I counter at zero was actually 0.49 inch from wall, due to tube not being vertical

Exp. 20 Horizontal U-235 traverse
1/6/60 Vertical position selsyn = 7.5

Rot pos.	Reg I pos	Reg I	Nor	Reg II	Reg III	Reg IV	Δt
0	0	284406	1563892	137000	9250	8016420 ~~925~~	6 min
"	"	248567	1375565	120610	8020	7270930	"
40	40	376335	1308625	103320	8270	7271010	"
"	"	401070	1340174	105510	8310	6602810	"
80	80	335428	948061	48910	7300	3,731,040	4 "
"	"	547535	1019516	51920	7720	3,806360	"
100	120	374846	1096190	47850	8910	3502010	"
"	"	396704	1161572	50880	9420	3952650	"
120	160	437742	1179485	44860	10120	2958390	"
"	"	418852	1123727	43200	9940	3040590	
–		stopped (lowered safety) to check on Reg IV					

	I/N	II/N	III/N	III/N
	.1818	876	592	512
	.1807	877	583	528
	288	790	632	556 ×
	298	788	620	493
×	347	505	755	385
	.537	.509	757	373
	.342	.437	.813	3195
	342	438	811	340
	371	380	.858	251
	372	384	.884	270

Expt 21

Preliminary Vertical Traverse
Region IV ctr. out

Counter rotated to ~ 90°, Region I ctr. at ~ center

Vertical pos	I	Nor	II	III	~~IV~~ III/N.	I/N
.32	430971	1518783	41150	1137	754	.284
"	481390	1693835	45900	1290	762	.284
.75	494971	1644561	44630	1354	822	.301
"	477568 ~~47568~~	1584539	42720	1300	821	.301
125	481584	1498039	41010	1256	839	.3215
"	463324	1439940	39660	1136	790	.3216
175	502418	1478296	42010	1492	101	.340
"	530689	1557557	44170	1260	808	.341
"	523496	1532197 ~~1532197~~	43250	1210	790	.3415
225	525182	1480211	42710	1205	814	.355
"	506118	1424957	41260	1145	804	.355
275	497864	1348725	40250	1120	831	.3695
"	488478	1326969	39480	1067	805	.368
325	593624	1545702	47500	1315	850.	.384
"	606154	1579817	49140	1349	853	.3835
375	616224	1560356	49540	1350	865	.395
"	604429	1533938	48490	1332	868	.394
425	602394	1487311	48310	1294	870	.405
"	582437	1441009	46780	1257	873	.404
475	587771	1423901	46980	1265	889	.413
"	589769	1431810	47630	1280	894	.412
525	598952	1428012	48120	1262	884	.419
"	594123	1417055	47650	1309	924	
"	588509	1405189	46980	1269	903	

H/N

.271	542
.271	
.2715	542
.270	
274	550
.2755	
.284	568
284	
.282	
.289	.578
.2895	
2985	596
.297	
.3075	.618
311	
.318	634
.316	
.325	650
.325	
330	664
.3325	
.337	674
336	

Vert. pos	I	N	II	III	III/N	I/N	II/N
575	603586	1426706	48300	1303	912	.428	.3385
"	625731	1473016	50150	1350	917	.425	.340 .680
625	630792	1475141	50520	1361	923	.4270	344 688
"	612583	1433388	49120	1313	916	.428	.343
675	603612	1405183	48060	1264	899	.4295	342 686
"	601038	1396758	47710	1309	936	.4305	.3415
"	594917	1381180	47490	1335	967	431	.344
725	592297	1373707	47190	1309	953	.431	344 688
"	596477	1386002	47520	1330	959	.430	343
775	603412	1402405	47750	1324	944	.4305	3405 686
"	606129	1413136	48640	1393	985	4290	344
825	610888	1427286	49100	1376	964	.428	344 684
"	623287	1453285	49240	1376	947	429	339
875	631430	1488230	50170	1380	928	.424	337 674
"	640960	1512212	51210	1412	933	.424	339
925	650068	1553136	51940	1427	919	.419	.3345 668
"	657021	1570220	52490	1455	927	.4185	.334
975	676060	1628962	53030	1467	901	415	324 652
"	692872	1665300	54340	1489	924	.416	.3265
1025	642029	1568308	49800	1385	884	.4095	3175 640
"	589423	1446319	46640	1295	896	.4085	323
1075	575595	1457535	45140	1268	870	.395	310 620
"	583987	1464555	45410	1286	879	399	310
1125	586054	1514690	45670	1314	869	.387	3015 600
"	600194	1536586	46520	1350	877	.3905	303
1175	570105	1535819	44440	1274	829	.371	289 582
"	569614	1522907	44550	1275	837	3735	.292

	I	N	II		III/N	I/N	II/N
775	615918	1433364	48990	1334	931	430 ~~342~~	342 (684)
〃	611106	1423999	48590	1331	935	.429	341
325	581327	1520248	47310	1280	842	383	311 (624)
〃	605272	1580835	49540	1364	.863	.383	313
.32	456813	1619215	43620	1166	.721	.282	269
〃	454012	1601340	43110	1117	.698	.2835	269 (538)

1/11/60 Vol. of fuel in tank and pipes

26.5 in height in storage tank
114.75" of 3/4" pipe containing soln.)

1/11/60 normilization of U-235 counter to be used as ~~cal~~ relative calibration of other counters.

	Position of U-235 chamber	U-235 countrate	BF_3 Normilizer count rate	$35/BF_3$
10^{30} AM	In center of Reg. I	101110	~~57676~~ 121106	.8349
		101680	121985	.8335
1 min counts		102580	123633	.8299
		104700	125357	.8352
		101760	123284	.8254
		97780	119391	.819
				ave = .830
	In center of annulus of Reg. II			
2 min counts	~.8 sec less than 2 min	27030	400600	.06747
		28100	414828	.06774
		29170	427435	.0682
	~.5 sec < 2min	30310	445084	.0681
	~.2 sec < 2min	29410	432453	.0680
	"	29720	438339	.0678
	"	30370	451428	.0673
				ave = .0678

10
70

 1/11/60

12 50 PM

Pos. of U-235	U-235 Count Rate	BF_3 Count Rate	
In Center of			
Annulus of	131410	518730	.253
Reg. III	134870	535780	.252
~.2 sec < 2min	123960	494350	.251
on 235 counts	118960	477935	.249
	118280	475100	.249
	118710	475105	.250
	119130	476954	.250
			av .251

Temp readings: I – 22.0°C; II – 21.5°; III – 20.8°; III – 22.0°

Pos. of U-235	U-235 Count Rate	BF_3 Count Rate	
In Center of			
Annulus of			
Reg. IV-	10140	464415	.02183
~7 sec < 2min	~~979~~ 9780	462918	.0211
on 235 counts	9960	462594	.0215
	10080	464158	.0217
	10020	468780	.0214
		~~473567~~	
	10050	477553	.0210
	10180	483601	0212
	10410	491539	0212
	10610	498342	.0213
			av .02136

Sample 5 & 5A taken 1-12-60 after Expt 22

Pos. of U-235	U-235 Count Rate	BF_3 Count Rate	
In Center of Reg I [Repeat]			
	121420	148800	816
	129490	159178	813
	125210	152259	822
	122570	149136	822
	121500	148662	817
	119940	148460	808
	120460	149161 → 808	ave = .816 [of 6
	122300	150733 811	

-22.0°

In center of Annulus of Reg II [Repeat]	20070	299911	6692
	20750	311275	667
	20920	315771	663
	21500	323749	664
	22250	334110	666
	22480	333107	675
	21970	331080	664
	21810	328014	ave = .0667

J. Iley
Crook
Fox

Expt 23 A
Preliminary checkout of Fission Counters. Rotator selsyn = 9998 at zero
Reg I selsyn reads .002 at zero
Apparent reading at center 525

Part I. Reg I & Normalizer on print-out for pos. period; see graphs

Part II Reg II & Reg III
print out on for pos. periods

Part III Reg II & IV on print out for pos. period
see Graphs

1-13-60 Expt ~~#~~ 23 B

Repeat of pos. periods to determine where counters begin to loose in efficiency. All five counters operated at the same time.
Data is plotted on graphs.

1/13/60 ~~Expt~~ Vertical Left position = 7.04"

Expt 24

Rot. Ctr. position	Reg. # pos.	I	N	II	III	IV
0	499	339626	190932	77200	31740	62190
"	"	358557	201557	81690	30010	65240
"	"	354464	200039	81060	29880	64390
40	550	369467	207496	52000	38100	57300
"	"	381180	215442	54040	39110	59200
80	600	389391	219992	41210	44850	43840
"	"	394114	221746	41410	45350	44480
120	650	404978	229371	36100	49220	28330
"	"	406915	230855	36410	49510	28540
140	600	390842	221719	33540	~~49440~~ 47440	21220
"	"	363620	204801	31370	43970	20000
160	550	375102	212256	32190	45300	15910
"	"	372725	209763	32300	44910	15300
180	500	353192	200008	30480	41930	10890
"	"	340355	192321	29640	40490	10530
200	450	366534	206917	32810	41840	8220
"	"	376367	213201	33890	43740	8610
220	400	377580	214960	36230	41990	6260
"	"	367629	209760	35180	41320	06200
240	350	354824	204409	36300	38960	4530
"	"	353085	203796	36930	38580	4440
"	"	353829	204256	36290	38190	04370
260	300	348562	203986	39840	37350	3380
"	"	353859	207870	41650	39720	3420
"	"	360328	210566	41020	38330	03540
280	250	360355	217013	46040	38840	2870
"	"	473983	288995	62000	51880	3670
"	"	473656	287658	61260	51210	

Rot. Ctr	Reg I position	I	N	II	III	IV
280	250	475088	288718	61140	51650	3830
320	200	438745	279604	69160	48950	02190
"	"	429183	272576	68020	46360	2070
"	"	426470	271678	67680	46230	2160
360	150	390192	271020	70290	45000	1480
"	"	387953	270558	69460	45670	1510
"	"	385662	269195	69290	44810	1520
280	100	330350	262538	59680	45220	2730
"	"	322069	255131	58420	43890	2640
240	50	254237	252624	48530	46320	4430
"	"	254945	254089	48740	46370	4370
200	0	192154	270823	44420	53640	8930
"	"	199341	280250	46320	55830	9240
160	100	339836	267685	40940	55840	17530
"	"	331562	261376	39750	54910	17130
120	200	427431	273513	42170	58460	30220
"	"	433074	277386	42570	58770	30960
40	300	450948	267677	66920	47550	71960
"	"	447690	266255	67130	48320	72520
0	400	439400	256230	99590	39310	80810
"	"	429980	249291	97780	37300	79710
160	520	459216	263212	39910	55910	20680
"	"	452185	259325	39200	54760	20190
170	530	445574	255156	39080	53200	17180
"	"	442845	254739	39360	53070	17060
180	540	444907	254003	38850	52040	14840
"	"	446302	254714	39280	52570	14740
160	520	439466	252314	38060	52990	17670
"	"	438941	251261	38100	52410	17680

Position	C_N^{IV}
320	.003271
360	.002335
280	004359
240	007294
200	.01386
160	.02702
120	.04576
40	.1115
0	.1308
160	.03225
170	.02768
180	.02397
160	.02892
0	.1334
40	.1134
80	.08234
120	.05083
140	.03987
160	.03048
180	.02253
200	.01652
220	.01207
240	.008979
260	.006838
280	.005355

actual vertical position in region at selsyn reading of 7.04

	Reg I	Reg II	Reg III	Reg IV
	8.38"	8.75	8.53	8.65

For centers of ctr.

at selsyn vert. pos. zero!

	Reg I	Reg II	Reg III	Reg IV
	1.34	1.71	1.49	1.61
New → (Exp. 56 onward)	1.62	1.78	1.62	1.81

Distance to center:

Reg I	Reg II	Reg III	Reg IV
~~7.41-R~~	~~7.24 R~~	~~7.46 R~~	~~7.34-R~~
7.33-R	7.17-R	7.33-R	7.14-R

Expt #24

Rot Pos.	Reg I Pos.	I/N	II/N	III/N	IV/N	I/1776	C_N^{II}	C_N^{III}
320	200	1,570 1576	.2474 2486	~~1757~~	.00784	.8851	.1338	.2500
"	"	1576	.2495	1700 1701	.00760 779			
"	"	1570	2490	1702	.00795			
360	150	1440 1435	.2594	1660 1671	.00546	.8079	.1390	.2450
"	"	1434	.2567 2578	1688	.00558 554			
"	"	~~1482~~	~~.2573~~	1664	.00564			
280	100	1257 1260	.2273 2280	1723 1723	.0104 1038	.7094	.1228	.2530
"	"	1262	2290	1722	.01035			
240	50	1006 1005	.1922 1920	1.834 1830	.01753 1737	.5658	.1034	.2688
"	"	1004	1918	1825	.01720			
200	0	0.710 711	1640 1647	1982 1987	0330 330	.4003	.0887	.2920
"	"	.712	1653	1992	0330			
160	100	1,270	1532 1526	2087 2084	.0655 656	.7145	.0822	.3060
"	"	1,268 1269	1520	2100	.0654			
120	200	1,563 1562	1541 1538	2137	.1105 1111	.8795	.0828	.3125
	"	1561	1535	2120 2129	.1116			
[illegible]	300	1685 1684	2.503 2510	1777 1801	.2690 2707	.9482	.1350	.2645
	"	1,682	2520	1815	.2723			
[illegible]	400	1,715 1720	3890 3907	~~1534~~	.3152 3176	.968	.2104	.2225
"	"	1.725	~~3925~~	1497 1516	.3200			
[illegible]	520	1745	1516	2123 2117	.0784 783	.9825	.0815	.3110
"	"	✓1.745	1511 1514	2110	.0779			
[illegible]	530	1744 1748	1532 1539	2085 2098	.0674 672	.9842	.0828	.3080
"	"	.1730	1.545	2110	.0670			
[illegible]	540	1,752	1530 1536	2050 2057	.0584 582	.9864	.0827	.3020
"	"	1752	1542	2063	.0579			
160	520	1744 1744	1508 1512	2100 2093	.0700 702	.9819	.0814	.3075
"	"	1,746	1514	2088	.0704			

Expt #24

Rot Pos.	Reg I Pos.	I/N	II/N	III/N	IV/N	I/1776	C_N^{II}	C_N^{III}
0	499	1778	404	~~1664~~?	3255	1	.2180	~~.2190~~
"	"	1778 1776	.4055	1489 1492	3240 3238			
"	"	1773	.4055	1495	3220	.9994	.1350	.2680
40	550	1780 1775	2505	1836 1826	2760 2754			
"	"	1769	2508	1816	2747			
80	600	1770 1774	.1875	.2040 2044	1993 1999	.9988	.1006	.300
"	"	1777	.1868	2045	2005			
120	650	1766	.1575 1576	2146 2146	1235 1234	.9938	.0848	.315
"	"	1764 1765	1577	2145	1232			
140	600	1763 1768	1513 1523	2040 2143	0958 968	.9954	.082	.3144
"	"	1774	1532	2045	0977			
160	550	1767 1772	1516 1528	2135 2138	0750 740	.9977	.0822	.314
"	"	1776	1540	2140	0730			
180	500	1765 1766	1524 1533	2095 2100	0545 547	.9943	.0825	.3085
"	"	1768	1542	2105	0548			
200	450	1772 1768	1585 1587	2020 2036	0397 401	.9955	.0854	.299
"	"	1765	1588	2052	0404			
220	400	1756 1755	1687 1684	1952 1969	0291 293	.9881	.0908	.288
"	"	1753	1678	1968	0295			
240	350	1735	1775	1905	0221	.9757	.0961	.2775
"	"	1732 1733	1812 1785	1890 1888	0218 218			
"	"	1732	1778	1870	0214			
260	300	1725	1953	1830	0165	.9639	.1055	.268
"	"	1702 1712	2004 1964	~~1910~~	0165 166			
"	"	1710	1948	1822	0168			
280	250	1660	2122	1790	0132	.9279	.1145	.263
"	"	1647	2145 2130	1795	0127 130			
"	"	1646 1648	2131	1780 1789	—			
"	"	1646	2117	1790	0132			

Temp #11 – 21.2°C ; 12# – 22.5°C ; 14 – 22.7° ; 15 – 21.2°

Relative flux at positions where U-235 normalizing counter was placed

$$II/I = \frac{.0672}{.823} = .08165$$

$$III/I = \frac{.251}{.823} = .3049$$

$$IV/I = \frac{.02134}{.823} = .02595$$

To normalize regions I, II, III, + IV to each other

$X^{II} C_N^{II} = .08165$, where C_N^{II} is count rate in region II normalized to BF_3. "X" is found by substituting C_N^{II} at the position of the U-235 normalizer

Then

$$X^{II} = \frac{.08165}{C_N^{II}} = .5385 \quad , \quad C_N^{II} = .1517$$

$$X^{III} = \frac{.3049}{C_N^{III}} = 1.468 \quad \quad C_N^{III} = .2076$$

Final values slightly different

$$X^{IV} = \frac{.02595}{C_N^{IV}} = .4199 \quad \quad C_N^{IV} = .0618$$

Region I is normalized to 1 at center

Div. normalized count rate by 1.776

701-14-led

~2 30 pm

Expt 26A

Vertical Traverse

~~Rotat~~ Rotary position = 160°
Reg. I position = 521

Lift Pos.	Reg I	Nov.	Reg II	Reg III	Reg IV	Lift Pos
.42"	245011	202491	25040	33870	10680	8.00
"	254687	211782	26040	35210	11000	"
1.00	286934	219590	27130	38110	11290	9.00
"	294149	226178	27910	38500	11660	"
150	311893	224827	28540	39920	11850	10.00
"	305651	221875	27950	38840	11600	"
200	321247	221298	28870	40220	11800	10.50
"	319492	220248	28310	39920	11600	"
250	332506	219672	29150	−41090	11740	11.00
"	332707	220616	29310	40870	11850	"
300	349479	224122	30380	42790	12540	11.80
"	359617	229943	31100	43520	12620	"
350	376004	233382	32690	45970	12920	10.75
"	377624	235065	32930	45950	13000	"
400	387531	234161	33420	46410	13160	9.75
"	385597	235188	33650	46090	—	"
"	~~12819~~	234137	33310	46820	13450	8.75
450	~~13408~~	234045	34220	49090	13530	"
"	397149	235291	34390	47320	13540	7.75
"	400807	237226	34660	47940	13710	"
500	408094	239675	35640	49380	13870	6.75
"	412039	241025	36410	49720	13830	"
550	417268	240062	36230	49740	14010	5.75
"	418660	242185	36610	49880	13930	"
650	424515	240075	36910	50550	13660	4.75
"	423639	239591	36310	50140	13980	4
700	421368	238814	36550	50540	14000	
"	420648	237450	36180	50260	13800	

Expt 25 A

Lift Pos	I/N	II/N	III/N	IV/N
8.00	1.758 1.739	.1508	.2090	.05786 (9)
"	1.719	.1474 .1491	2016 .2053 ~~.2092~~	5529 .0566
9.00	1.732 1.730	.1470 .1478	.2064 ~~.2016~~ .2058	5542 .0552
"	1.727	.1486	.2053 ~~2064~~	5502
10.00	1.671 1.670	1432 .1429	.2035	5358 (6)
"	1.608	.1425	1990 .2012	5228 (3) .0530
10.50	1.682 1.634	1.377 1380	1989	5270 .0527
"	1.633	1.383	1939 1964	5264
11.00	1.595 1.599	.1349 1348	1924	5010 .0502
"	1.602	.1346	1912 1918	5023
11.80	1.518 1.522	.1293 .128	1847 1852	4669 (7) .0467
"	1.525	.1282	1856	4670
10.75	1.622 1.617	.1352 .1362	1943 1939	4991 .0503
"	1.612	1372	1935	5064
9.75	1.684 1.680	1449 1440	2005 2013	5369 (7) .0545
"	1.676	1432	2021	5527 (3)
8.75	1.727 1.729	1489	2047 .2056	5594 .0558
"	1.730	1482 .1486	2065	5560
7.75	1.754 1.754	1512 .1512	2099 2084	5772 (8)
"	1.754	1512	2072	5735 (4) .0576
6.75	1.743 1.747	1520	2082 2081	5880
"	1.751	1512 .1516	2079	5883 .0588
5.75	1.723	1495	2054 2059	5841 .0585
"	1721 1.722	1490 .1493	2064	5848
4.75	1668 1.671	1448 1453	1996 1987	5799 (80) .0579
"	1674	1457	1977	5783
3.75	1598	1397 1402	1860 1839	5658 .0559
"	1601 1.600	1406	1819	5521
2.75	1495	1338 1333	1793 1818	5429 (3) .0542
"	1490 1.493	1328	1849	5404
1.75	1369 1.369	1253 1251	1622 1639	5034
"	1368	1249	1657	5046 (5) .0504
.75	1213 1.214	1199 1195	1572 1544	4575 (8) .0457
"	1214	1190	1515	4538 (6)

Expt 257

Lift Pos	I/N	II/N	III/N	IV/N
42	1210	.1237	.1672	.0528
511	1.202 1206	.1230 1233	.1662 1667	.0520 .0524
100	1.307 1.304	.1235 1234	.1736 1718	515 .0514
"	1.300	.1234	.1702	514
150	1.388 1.388	.1270 1265	.1774 1765	527 .0525
"	1.387	.1261	.1752	523
200	1.452 1.451	.1305 1295	.1818 1815	533 .0530
"	1.450	.1286	.1812	527
250	1.515 1.512	.1328 1327	.1870 1861	535 .0536
"	1.508	.1328	.1853	537
300	1.560 1.562	.1355 1353	.1910 1901	560 .0555
"	1.563	.1352	.1892	549
350	1.612 1.609	.1400 1400	.1970 1962	554 .0554
"	1.605	.1401	.1955	554
400	1.655 1.648	.1427 1429	.1983 1980	563
"	1.640	.1430	.1980	— .0569
"	—	.1422	.2000	575
450	—	.1462 1462	.2013	578
"	1.688 1.689	.1462	.2010 2014	.0576 .0577
"	1.690	.1460	.2020	578
500	1.703 1.706	.1487 1498	.2061 2062	579 .0577
"	1.709	.1510	.2063	574
550	1.739 1.734	.1509 1510	.2072 2066	584 .0580
"	1.729	.1512	.2060	576
650	1.768 1.768	.1538 1527	.2105 2100	569 .0577
"	1.768	.1516	.2094	584
700	1.765 1.768	.1531 1527	.2116 2115	586
"	1.770	.1524	.2115	586 .0586

25A

Reg I	Nov	II	III	IV
424615	241440	36400	50500	13970
440548	256298	37770	51680	14170
448761	259055	38070	53500	14360
462135	267549	39760	54920	14720
454579	272056	38970	55360	14580
456251	273526	39000	54430	14300
455703	279294	38440	55570 ~~14720~~	14720
470716	287799	39800	55810	15150
474714	297454	40130	57250	14900
468520	292602	39390	55970	14700
442904	291691	37720	53900	13620
451336	295975	37950	54920	13840
469688	289639	39160	56270	14460
460974	285917	39210	55350	14480
468738	278049	40320	55760	14930
465317	277895	39790	56170	15360
480680	278331	41440	56980	15570
476684	275465	40850	56880	15320
480356	273859	41420	57490	15830
481865	274792	41550	56950	15760
479091	274806	41770	57220	16160
480681	274532	41510	57070	16150
477704	277171	41460	56940	16190
483929	281081	41910	58010	16440
484284	290173	42020	57940	16830
498135	297422	43350	58820	17200

 Exp. 25-A

Lift Pos.	Reg I	Nov	II	III	IV
3.75	498146	311574	43530	57960	17610
"	503083	314246	44190	57160	17350
2.75	475712	318071	42560	57050	17270
"	478639	321038	42630	59340	17350
1.75	438841	320585	40180	51990	~~16~~ 18140
"	430613	314656	39320	52130	15880
0.75	375994	309873	37180	48720	14180
"	370641	305052	36320	46230	13910

$5\frac{05}{pm}$ Thermocouple readings

#	Reading
11	880
12	905
14	939
15	894

$X^{III} = \frac{.3049}{.21} = \cancel{1.452}$ 1.466

$X^{IV} = \frac{.02595}{.058} = .4474$

$X^{II} = \cancel{.5368}$ .5451

$C^{I} = 1.76\#$ [for normalizing reg. I.]

Zero of lift selsyn;

Reg II − +.26"

Reg III − +.04

Reg IV + .16

1-15-60 Expt 25 B <u>Omit</u>

Check on vertical lift reproduceability $\bar{s}$ normalizer

Stability — 1 min. counts

Lift Pos	Dir. of appro.	Reg I	Nor	Reg II	Reg III	Reg IV	R I/N	R II/N
103	↓	104121	77023	9790	13450	3540	1353	1272
"	"	289778	219661	27280	37540	10160	1320	1242
"	"	322180	244087	30160	41920	11450	1320	1235
"	"	344013	265008	32790	45340	12340	1305	1237
"	"	366492	281563	34476	47620	13110	1302	1225
"	"	379291	292810	36130	49460	13720	1295	1233
"	"	11^43 393299	306855	37480	50480	14370	1282	1222
"	"	396265	308577	37690	51740	14480	1284	1222
"	"	391904	305255	36890	51340	14020	1284	1208
"	"	11^48 390693	304889	37280	51850	—	1282	
"	"	391203	304929	37100	51050	14060	1283	
"	"	388703	304089	37150	51180	14060	1277	
"	"	391091	305031	37190	51030	14260	1282	
"	"	392898	308616	37150	51430	14390	1273	
"	"	396221	310651	37900	52120	14320	1278	
"	"	396778	311141	37410	51430	14270	1275	
"	"	398583	313689	38140	52790	14540	1271	
"	"	400392	314696	38210	52620	14690	1272	
"	↑	381347 ~~400392~~	298661 ~~314696~~	36490	49980	13680	1277	
"	"	362532	284465	34700	47630	13060	1274	
"	"	346879 ~~364687~~	272184	33148 ~~34314~~	45410	12420	1274	
"	"	381546	298653	36050	49680	13720	1278	
"	"	395488	311166	37130	51470	14230	1271	
9.00	↑	R4 642 538480	311731	46090	60810	16060	1728	
	"	550332	318060	47250	63890	16470	1728	

POS LIFT	DIR	Reg I	NORM	Reg II	Reg III	Reg IV	$\frac{I}{N}$
9.00	↑	558122	323166	47860	65960	16750	1.726
"	" ed	568750	327983	49060	66920	17080	1.734
9.00	↓ 5.98	574836	331432	49120	67990	17080	1.736
"	"	570071	330651	49060	67340	17000	1.725
"	"	570961	330911	48950	67340	17020	1.725
"	"	570284	330456	48990	67140	⊢—⊣	1.726
"	"	573261	330486	48700	67400	17140	1.734
9.00	↑	578337	333766	49340	68460	17110	1.734
		582641	334986	49700	68480	17150	1.738

End of Expt 25B

Expt 2 Ce

Rot. Pos	Reg I Pos	Reg I/N	Reg II/N	Reg III/N	IV/N	C_N^I	C_N^{II}
0.0	449	.1334	.314	1103	.2117	.9971	.2084
"	"	.1334 .1334	.314 .0314	1166 .1135	2102 .2109		
40	600	.1338 .1338	.2204 .2052	1383 .1386	~~4705~~ 1802 .1801	1.000	.362
"	"	.1338	2063	1389	1801		
80	550	1339 .1342	.1443 .1452	.1588 .1589	~~4819~~ 1301 .1301	1.003	.0964
"	"	1347	1459	1590	1301		
120	500	1342 .1345	1248 .1250	~~1653~~ 1654 .1657	8331 ~~1295~~ ~~1293~~ .0835	1.005	.0830
"	"	1348	1252	~~1648~~ 1659	8367		
140	450	1342 .1342	1230 .1228	~~1644~~ 1649 .1648	6626 .06653	1.003	.0815
"	"	1342	1226	~~1616~~ 1647	6677		
160	400	1340 .1338	1235 .1234	1616 .1614	5249 .05234	1.000	.0820
"	"	1335	1233	1613	5218		
180	350	1315 .1320	1248	1580 .1580	~~4142~~	.990	.0830
"	"	1321	1255 .1250	1580	~~4133~~ 4142 .04138		
"	"	1322	1247	1577	4133		
200	300	1305 .1302	1308 .1303	1552 .1543	3157 .03160	.973	.0865
"	"	1297	1297	1534	3163		
220	250	1265 .1263	1380 .1370	1504 .1500	2375 .02394	.944	.0909
"	"	1262	1360	1495	2413		
240	200	1195 .1200	1470 .1479	1425 .1436	1739 .01785	.897	.0982
"	"	1205	1487	1447	1828		
260	150	1106 .1109	1612 .1610	1458 .1456	1325 .01337	.829	.1069
"	"	1110	1605	1460	1347		
"	"	1110	1612	1450	1339		
280	100	975 973	1763 .1764	1398 .1400	1036 .01025	.727	.1171
"	"	972	1755	1402	1030		
"	"	971	1775	1398	1003		

$X^{II} = \frac{.08165}{.123} = .6638$

$X^{III} = \cancel{\frac{.3049}{.1668}} = \cancel{.1826}$

$X^{IV} = \frac{.02595}{.422} = .06149$

III — 1.668 = "

II — .123 = relative flux at normalizing position for II

IV .422

Expt 2e

Rot Pos	Reg I Pos	Reg I/N	Reg II/N	Reg III/N	Reg IV/N	C_N^I	C_N^{II}
300	50	796	.1915	1375	2754		
[illegible]	"	794 793	.1902 1914	1374 .1371	8085 .08815	.594	1271
"	"	790	1924	1365	8404		
340	0	543	2148	1356	5287	406	
"	"	542 543	2132 2147	1332 1340	5208 .05321		1425
"	"	543	2160	1332	5113		
360	25	679	2150	1337	4501	.504	
"	"	675 677	2113 2140	1321 1336	4596 .04533		1421
"	"	677	2156	1347	4604		
320	125	1037	2112	1348	5729		
"	"	1037 1039	2140	1340 1341	5732 .00570	778	
"	"	1043	2156 2127	1334	5575		1412
"	"	1039	2100	1343	5799		
270	225	1224	1805	1402	1002		
"	"	1224 1225	.1830 1810	1443 1418	1012 .01006	917	.1201
"	"	1227	1795	1410	1002		
230	325	1304 1304	1512 1506	1506 1511	1680	975	.09991
"	"	1303	1500	1517	1697 .01687		
190	425	1324 1328	1305 1310	1612 1610	2795 .0281	994	.0870
"	"	1331	1314	1607	2839		
180	500	1335 1338	1310 1291	1698 1684	3565 .0351	~~994~~ 1000	.0857
"	"	1341	1272	1670	3472		
170	525	1340 1338	1242 1249	1685 1692	4044 .0398	1000	.0829
"	"	1335	1255	1700	~~8439~~ 3924		
160	550	1336 1339	1230 1236	1700 1709	4524 .0447	1000	.0820
"	"	1342	1243	1718	4425		
100	625	1342 1342	1297 1299	1755 1764	9984 .0998	1003	.0862
"	"	1341	1300	1773	9983		
50	648	1335 1336	1807 1809	1579 1581	1651 .1651	9985	1200
"	"	1337	1810	1582	1652		
0 ↑	525	1333	3045	1220	~~2056~~ 2056 ~~2058~~		
"	"	1332 1332	3035 3045	1225 1220	~~2058 2049~~ 2058	9955	
" ↓	"	1327	3028	1215	~~2048~~ 2048 .205 2076		.2021
"	"	1334	3040	1221	~~2067~~ 2076 2067		

1/15/60 Exp. 26 Vertical lift position 1.50"

Horizontal Traverse

Rot. Pos.	Reg I	Reg. I	Nor.	II	III	IV
0.00	649	347726	260759	81890	28740	55,200
"	"	334410	250805	78810	29250	52720
40	600	349428	261077	53230	36100	47050
"	"	346413	257812	53210	35810	46910
80	550	348177	260333	37660	41350	33870
"	"	354160	262683	38320	41750	34020
120	500	366417	273150	34080	45190	22760
"	"	376864	279402	35000	46340	23380
140	450	379849	282819	34780	46620	18740
"	"	384735	286828	35160	47240	19150
160	400	375608	280350	34650	45310	14720
"	"	369812	276949	34160	44660	14450
180	350	361099	274500	34240	43360	—
"	"	357217	270380	33930	42710	11200
"	"	351588	265904	33140	41920	10990
200	300	347349	266010	34800	41280	8400
"	"	351899	271288	35190	41610	8580
220	250	343786	271611	37460	40900	6450
"	"	343021	271926	37000	40640	6560
240	200	313997	262804	38620	37440	4570
"	"	306868	254630	37860	36860	4650
260	150	277360	250534	40410	36540	3320
"	"	277455	250059	40100	36520	3370
"	"	277570	250139	40360	36360	3350
280	100	241360	247151	43570	34570	2560
"	"	235786	242820	42630	34050	2500
"	"	231418	238409	41850	33340	2390

Rot. Pos	Reg I Pos	Reg I	NOV ~~II~~	II ~~III~~	III ~~IV~~	IV
300	50	185758	233426	44700	32100	1810
"	"	183517	231314	44010	31800	1870
"	"	185985	235577	45290	32150	1980
340	0.0	134633	247792	53240	33610	1310
"	"	139560	257337	54910	34270	1340
"	"	148593	273842	59150	~~140~~ 36480	1400
360	25	189844	279852	60170	37390	1260
"	"	188222	278960	58930	36870	1260
"	"	188253	277989	59980	37460	1280
320	125	284183	274036	57850	36930	1570
"	"	284152	273922	58650	36720	1570
"	"	286565	274399	58200	36610	1530
"	"	286795	275860	57980	37060	1600
270	225	360189	294328	53140	41230	2950
"	"	361732	295534	54790	42530	2990
"	"	389372	317261	56960	44770	3180
230	325	409796	314174	47500	47300	5280
"	"	404031	310025	46510	47060	5280
190	425	414958	313355	40920	50500	8760
"	"	424724	319126	41950	51310	9060
180	500	420870	315006	41280	53490	11230
"	"	437982	326617	41540	54580	11340
170	525	441515	329565	40900	55580	13330
"	"	441226	330261	41420	56180	12960
160	550	442536	331139	40740	56290	14980
"	"	442301	329689	40950	56610	14590

Rot Pos	C_N^{III}	C_N^{IV}
300		
~~"~~	.2504	.00501
"		
340	.245	.0032
"		
"		
360	.244	.0028
Bal?		
"		
320	.245	.0035
"		
334		
3[illegible] "		
270		
"	.259	.0062
"		
230	.274	.01037
"		
190	.294	.01728
"		
180	.308	.027~~38~~46
"		
170	.309	.0245
"		
160	.312	.0275
"		
100	.322	.0414
"		
50	.289	.1015
"		
0		
"	.223	.126
" "		

Rot. Pos	C_N^{III}	C_N^{IV}
0		
"	.2075	.1297
40	.253	.1107 ~~.0743~~
"		
80	.290	.080
"		
120	.303	.051
"		
140	.301	.041
"		
160	.295	.0322
"		
180	.289	.0254
"		
"		
200	.282	.0194
"		
220	.274	.01473
2[illegible]	.263 ~~.224~~	.0110
260	.266	.0082
"		
"		
280	.254	.0063
"		
"		

		I	N	II	III	IV
100 ~~120~~	625	427191	318098	41240	55870	31760
"	"	415335	309894	40280	54920	30940
50	648	377624	282424	51040	44600	46640
"	"	369487	276492	50090	43730	45700
0.0 ↑	525	337604	253165	77100	30910	52070
"	"	327926	246243	74690	30150	50660
-0.0 ↓	525	309533	232286	70500	28200	47580
"	"	304676	228593	69840	28550	47460
"	"	303205	227177	69040	27750	46960

3[35] Pm Temp by thermocouples

Couple #	Reading (mv)
11	864
12	912 ~~99~~
14	906
15	852

1-19-60

Expt 27

Omit

Horizontal Traverse; Vert. pos. 11.82"

Rot. Pos.	Reg I Pos.	Reg I	Normal.	Reg II	Reg III	Reg IV
163	525	311130	202020	1C3-0.6 —	—	—
0	648	311210	205,048	46,610	30,210	45320
"	"	319345	210607	48300	32110	46090
40	600	330944	218412	46890	34020	45580
"	"	321047	211737	45530	31450	44270
80	550	305863	201324	36900	32770	32980
"	"	301468	198655	36600	32910	32640
"	"	302593	197517	36990	33580	32900
"	"	303301	198554	36800	32810	32380
		Counter in Reg. III re-adjusted				
80	550	312413	205109	37650	~~26~~ 26650	33400
"	"	311472	206152	37980	27090	—
"	"	313077	208078	38650	27170	33880
"	"	314198	207882	38320	27250	33660
40	600	318198	211702	45100	24320	43220
"	"	326220	216546	45620	24820	44480
0.0	648	311932	207701	46680	23320	46280
"	"	299734	200850	44940	22080	44850
120	500	309813	204566	31070	30370	—
"	"	308034	203615	31010	30710	22600
"	"	307569	202702	30630	30380	22320
140	450	307156	201954	29360	31640	18600
"	"	305035	201719	29170	31350	18570
160	400	305329	202300	27000	32480	14270
"	"	306251	203488	27660	32660	13970
180	350	303048	202153	26390	32740	10630
"	"	301520	208435	26180	32700	10520
200	300	296384	201018	25890	33020	7710
"	"	301611	204190	26070	32780	7820

Rot Pos	Reg I Pos	Reg I	Nor.	Reg II	Reg III	Reg IV
200	300	303414	205946	25880	33430	7950
220	250	294365	204771	26160	32970	5780
"	"	291758	203714	26170	32530	5770
240	200	276778	201737	27030	31930	4260
"	"	287478	210526	27940	32730	4260
260	150	274798	216624	30910	33160	3080
"	"	272847	216014	30390	32500	3010
280	100	236211	212237	33500	31290	2260
"	"	233393	209170	33260	31280	2310
300	50	197811	217835	40930	30580	1740
"	"	199887	220835	41350	31110	1840
"	"	195474	215615	39300	30530	1690
360	0	142520	222574	71380	28090	800
"	"	145580	230060	73820	29520	870
"	"	144584	229266	73360	29310	770
320	50	204365	224170	90570 !	29550	1160
"	"	188678	207581	92830 ?	29160	1120
"	"	196583	215160	54800 ?	28600	1100
270	100	244491	218924	37380	31743	1930
"	"	247570	221889	38070	31570	2030
"	"	246788	221199	37940	31100	1990
230	150	273115	216319	29300	33700	3890
"	"	277333	219141	29110	33500	3890
"	"	278191	219694	29250	33630	3860
190	200	304009	223028	28080	35710	7940
"	"	297316	218547	27230	35060	7920
"	"	280191	204686	25600	33000	7280
150	300	~~10878~~	~~7393~~			

Ref. Pos.	Reg I Pos.	I	N	II	III	IV
150	300	268460	183734	24350	29100	11950
"	"	269713	183436	24530	29470	12510
100	400	290303	193593	30580	27330	24440
"	"	295560	196947	31010	30390	25110
50	500	303440	202682	40810 ~~395~~	23770	39540
"	"	307528	204749	40760	23960	40050
0.0	600	308607	205769	45810	22320	45890
"	"	308239	205867	45850	22460	45810
150	647	312620	208428	28490	33230	16270
"	"	306774	205433	27850	32300	16160
140	500	311263	206687	27420	32590	14660
"	"	315438	209719	27510	33420	14690
170	525	322167	211966	27700	33420	12980
"	"	326770	217361	28750	34850	13510
180	550	318855	211354	27370	34310	11180
"	"	301786	200552	26090	32470	10700

$$X^{II} = \frac{08165}{1.359} = .6008$$

$$X^{III} = \frac{3049}{1607} = .1897$$

$$X^{IV} = \frac{.02[illegible]95}{.0540} = .04398$$

Rot Pos	Reg I Pos (II)	Reg I N	Reg II N	Reg III N (1897)		IV/N (.04398)	C_N^I	C_N^{II}
200	300	1473	1256	1623		3861	9722	.07546
220	250	1438 1435	1278 1281	1610 1604		2822 .0283	9492	.07696
″	″	1432	1284	1597		2832		
240	200	1372 1369	1340 1334	~~1583~~ -1570		2112 208	9036	.08015
″	″	1366	1327	1555		2024		
260	150	1268 1265	1427 1417	1530 -1517		1421 141	8349	.08513
″	″	1263	1407	1503		1394		
280	100	1113 1113	1578 1581	1474	1482	1065 1085	7346	.09499
″	″	1112	1583	1496		1101		
300	50	9081 906	1879	1404		7988 810	598	.1120 ~~.0120~~
″	″	9049	1871 1865	1409	1410	8330		
″	″	9067	1832	1416		7838		
340	0.0	640	3207	1262	1270	3593		
″	″	6327 635	3210 3205	1283		3783 360	4191	.1926
″	″	6308	3199	1278		3358		
320	50	9716	4040 ?	1318	1824	5174		255(?)
″	″	9089 911	4447 424 ?	~~1404~~		5394 520	6013	
″	″	9135	2546 ?	~~1451~~ 1329		5111		
[illegible]0	100	1117	1708	1451		8817		
″	″	1116 1116	1715 -1710	1422 1425		9148 900	7366	.1027
″	″	1116	1715	1406		8996		
[illegible]0	150	1263	1354	1567		1798		
″	″	1266 1265	1328 1335	1528 1540		1775 177	8349	.08021
″	″	1266	1331	1531		1756		
[illegible]0	200	1363	1259	1602		356		
″	″	1368 1343	1246 1250	1604 1605		3625 -358	.8997	.07510
″	″	1368	1251	1613		3556		
[illegible]0	300	1462	1326 1330	1584		6505		.0799
″	″	1476 1466	1337	~~1414~~ 158		6821 665	9676	
~~200~~ 400	400	1499 1500	1579 1577	1414 147		1262		.09475
″	″	1501	1575	1543		1275 127	9901	

1

Rot. Pos	RegI Pos	Reg I / N	Reg II / N	Reg III / N	Reg IV / N	C_N^{I}	C_N^{II}	C_N^{III}
0	648	1.518 1517	.2273 2285	~~1473~~	221 220	1.001	.1373 ~~.04335~~	
"	"	1.516	.2294	~~1523~~	2188	1.001		
40	600	1.515 1516	2146 2148	~~1557~~	2087 2090		.1291 ~~.04075~~	
"	"	1.514	2150	~~1485~~	2091			
80	550	1.518 1525	1833 1850	~~1628~~	1638 144	1.007	.1111 ~~.03509~~	
"	"	1.518	1842	~~1657~~	1642			
"	"	1.532	1873	~~1701~~	1665			
"	"	1527	1853	~~1653~~	1630			
		Reg III adj.						
80	550	1524	1836	1300	1628			
"	"	1512 1514	1842 1842	1314 1308	— 1623	.9993	.1107 ~~.03494~~	02481
"	"	1505	1855	1306	1623			
"	"	1512	1843	1311	1619			
40	600	1503 1505	2130 2120	1148	2042 205		.1274 ~~.04022~~	2176
"	"	1507	2107	1147 1147	2055	9934		
0	648	1502 1497	2245 2241	1122 1111	2228 223	9881	.1346 ~~.04251~~	2108
"	"	1492	2238	1100	2232			
120	500	1514	1519	1485 1498	—	1.000	.0913 ~~.02883~~	2842
"	"	1513 1513	1523 1520	1509	1110 1105			
"	"	1517	1512	1499	1101			
140	450	1520 1517	1434 1450	1566 1560	9212 921	1.001	.08711 ~~.0275~~	2959
"	"	1513	1467	1554	9206			
160	400	1508 1506	1335 1345	1605 1605	7053 695	9941	.0808 ~~.0255~~	3045
"	"	1508	1358	1605	6864			
180	350	1500 1503	1307 1307	1621 1626	5257 525	9920	.0785 ~~.02479~~	3085
"	"	1507	1306	1632	5249			
200	300	1474 1475	1288 1282	1643 1623	3835 383	9736	.0770 ~~.02432~~	3079
"	"	1477	1277 1256	1605	3829			

Rot Pos 200

22

1.515

.64398

Rot 3 Pos	Reg I Pos	Reg I / N	Reg II / N	Reg III / N	Reg IV / N	C_N^{I}	C_N^{II}	C_N^{III}
350	680	1497	2013	1174 1172	1950 ~~2229~~ 1953	~~4881~~	.0202 ~~.0379~~	2223
320	11	1500 1502	200 1991	1171	1957	9901 ~~9914~~		
0.8	600	1499 1498	2227 2227	1085 1088	2229 2227	9887	.134 ~~.04225~~	2064
	11	1497	2226	1092	2224			
150	647	1500	1360 1358	1594 1582	7807 788	9881	.0816 ~~.02576~~	3001
	11	1493 1497	1356	1572	7867			
160	500	1506 1505	1326 1320	1577 1585	7092 705	9934	.0793 ~~.02504~~	3007
	11	1504	1312	1593	6995			
170	526	1521 1512	1306 1315	1577 1590	6126 617	9980	.0790 ~~.02495~~	3016
	11	1503	1324	1603	6214			
180	550	1508 1507	1294 1299	1624 1621	5288 531	9947	.0780 ~~.02464~~	3075
	11	1505	1301	1619	5334			

Rot Pos. 200	C_N^{III}	C_N^{IV}	Rot Pos.	C_N^{IV}
220	.3042	.01244	0	0967
"			40	0918
240	.2980	.00914	80	0721
"			80	0713
260	.2880	.0062	40	.0901
"			0	0980
280	.2810	.00477	120	.0485
"			140	0405
300	.2675	.00356	160	.03055
"			180	.0231
"			200	.0168
360	.2410	.00158		
"			30	.0858
"			0	.0978
320	.2510	.00229	150	.0344
"			160	.0310
"			170	.0271
270	.2705	.00394	180	.02335
"				
"				
230	.293	.00778		
"				
"				
190	.3045	.01575		
"				
"				
150	.300	.02925		
"				
100	.279	.0558		
"				

1/19/60 Samples taken for fission product analysis.

Exp. 27

Sample before run # 6-1

" after " # 6-2

~~Total vol. of soln in system:~~

~~1. Height in storage tank: 25.63" ≈ 7008.~~

~~2. 11/40" of 3/4" pipe~~

above measure applies after sample 7-1

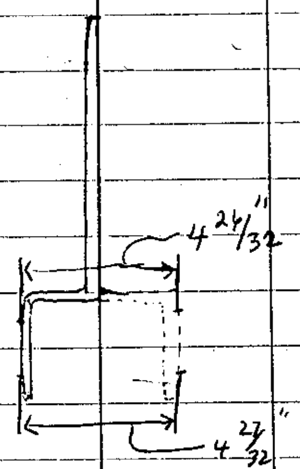
1/20/60 Exp. 27-B [Repeat of 27 after repair of rotating mechanism]
Vertical position = 11.82

Preliminary exploration

Rot. pos.	Reg I Pos.	I	N	II	III	IV
0	0	137313	223787	50170	20760	50650
"	"	137643	225042	49630	20530	51200
40	60	202960	226697	53030	21660	46230
"	"	212027	235262	53450	22770	48070
60	100	252785	234129	51140	24670	43160
"	"	243314	226147	49380	23530	41040
170	200	323029	238623	32970	32420	10360
"	"	331814	245653	33650	33060	10450
180	300	391820	264031	35040	35610	9210
"	"	376664	254041	34130	34360	9000
190	400	392417	253527	34170	34680	7930
360	500	398281	260729	80440	27630	830
"	"	404978	265968	82500	28480	870
300	550	422949	276317	54900	31420	1350
"	"	428530	280354	53790	31350	1490
0	550	414244	271659	60460	24930	62100
"	"	424626	277689	61940	25460	63610
40	"	442210	290565	65940	28040	60320
"	"	443813	289915	66360	27970	60520
300	"	444913	288867	53360	32430	1700
"	"	448926	292109	51820	33000	1750
360	"	43885	286673	89850	30300	910
"	"	430800	281250	88690	29630	960

Recheck of radius of rotation of counters in Reg. II + III.

Reg. II



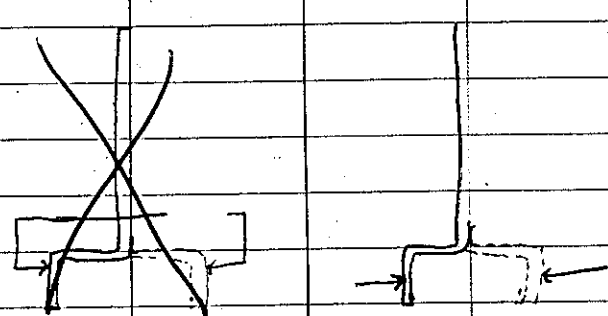
This drawing gives the outside dimensions of counter in the two positions shown (180° apart) when counter is near upper end of stroke vertically.

The corresponding dimensions when the counter is near lower end of stroke are $4\,{}^{27}/_{32}$" and $4\,{}^{29}/_{32}$".

Diameter of the chamber is 0.33"

∴ Average radius of rotation = 2.26"

Reg III



The outside diameter corresponding to the active portion is $7\,{}^{14}/_{32}$" at upper end of stroke and $7\,{}^{15}/_{32}$ at lower end.

The diameter of the chamber is ${}^{23}/_{64}$"

Average radius of rotation of active chamber = 3.55"

1/21/60

1 $\frac{30}{P.M.}$ Counters were removed from regions
II & III and checked for straightness,
"sameness" of radius of rotation near top
and bottom (see previous page) etc.
It was found that the chamber in region
II had become misaligned relative to the
angle of rotation i.e. it was several degrees
off when the other two were at zero.
Furthermore the cable used to
simultaneously rotate the three chambers
was found to be slack and ∴ did not rotate
them a full 180°.
Both difficulties have been corrected

1-21-60

EXP # 28 JKF LWG CC

Purpose: Horizontal Traverse
vertical pos. 11.82" on selsyn

8^{45} Inst Checked OK

Source in Inst Response OK

9^{20} D_2O Ht 80.125-56.1 fuel Ht 18.016 Critical

9^{37} Shut Down to Check Counters

Pot. Pos	Reg I Pos	I	N	II	III	IV
0.0	505	327055	202,713	69750	22290	46040
"	"	322715	201,660	69900	22240	45690
40	636	321488	202349	64840	22830	44580
IC3 = 0.5 "	"	329069	210024	67440	23140	45920
80	500	355435	226168	46890	29350	38610
"	"	365892	233162	47570	29810	39880
120	550	393047	250597	37600	37060	28310
"	"	381471	243458	34240	36020	27760
140	450	371164	237770	32500	36800	20660
"	"	377155	240756	33420	37160	20420
160	400	386338	249428	33010	39750	15430
"	"	406496	263404	34380	41200	16100
180	350	417631	271693	34590	42070	11740
"	"	418969	271163	35200	42010	11770
200	300	418355	275444	35460	41740	8210
"	"	420197	276212	35870	42250	8150
220	250	411784	276912	37870	42520	~~8~~ 5290
"	"	407045	273234	37060	41900	5770
240	200	379738	264878	38960	39190	3950
"	"	370262	259168	37620	37970	3870

Rot Pos	Reg θ	I	N	II	III	IV
260	150	336282	250750	40850	35550	2610
"	"	333482	249380	39220	35000	2690
"	"	331379	248034	39030	34730	2620
280	100	300179	245186	42480	32950	1890
"	"	296456	242364	42600	32800	1930
"	"	293554	239770	41290	32380	1840
320	50	264223	245,343	50940	31060	1,140
"	"	278109	258199	53990	32680	1190
"	"	292034	269905	56410	34150	1260
360	0.0	273360	293794	67550	35820	910
"	"	275328	296644	68550	35420	950
"	"	279153	299800	69220	36560	970
320	50	314592	302078	65810	38010	1260
"	"	306527	296740	63810	36980	1240
"	"	306844	294765	63290	37340	1270
280	150	409238	305234	55180	40670	2230
"	"	413596	309069	55620	40770	2290
"	"	418004	313361	56290	41710	2340
240	250	479352	322176	48480	46530	4340
"	"	478246	322424	48250	46030	4460
200	350	504945	324623	42720	49670	9410
"	"	502516	323391	42400	50000	9370
180	450	505092	326779	41660	51760	13470
"	"	513507	333047	42250	53070	13760
170	525	497039	322626	40880	51390	16140
"	"	491356	319070	40560	51120	15870
160	550	484657	315520	40310	50820	18250
"	"	477596	309904	39740	49430	17910

Rot. Pos.	C_N^{IV} [5194]	Rot Pos.	C_N^{IV}
0	.1178		
40	.1140	200	.01505
[illegible]	.08871	180	.02144
120	.05895	170	.12592
[illegible]	4462	160	.03002
160	3194	120	.05651
[illegible]	.02249	80	.08710
200	.01543	40	.1111
[illegible]	.01091	0.0	.1145
[illegible]	.007739	-20	.1066
[illegible]	5506	-10	.1110
[illegible]	4051	0.0	.1146
[illegible]	2400		
[illegible]	.001641		
320	2197		
[illegible]	3840		
[illegible]	.007090		

Rot. Pos'	Reg I Pos	I/N	II/N	III/N	IV/N	C_N^{I} [.155]	C_N^{II} [.6281]	C_N^{III} [.19
0	505 ~~add'n~~	1613 1606	344 345	1100 1102	2271 2268	1.036	2167	.2122
"	"	1600	3465	1103	2266			
40	636	1556 1561	3205 3207	1128 1115	2204	1.007	2014	.2147
"	"	1566	3210	1163	2186 2194			
80	500	1572 1570	2072 2058	1298 1288	1706	1.013	1293	.2481
"	"	1568	2048	1278	1710 1708			
120	550	1568 1567	1500 1494	1479 1480	1130	1.010	9384	.2850
"	"	1566	1488	1480	1140 1135			
140	450	1560 1563	1366 1377	1548 1545	8690	1.008	8649	.2976
"	"	1567	1388	1543	848 859			
160	400	1548 1545	1322 1314	1593 1579	6186	.996	8253	.3041
"	"	1542	1305	1563	6112 615			
180	350	1538	1273 1285	1548 1548	4321	9948	8071	.2981
"	"	1543 1542	1298	1548	4340 433			
200	300	1518 1520	1284 1292	1515 1521	2981	9806	8115	.2929
"	"	1521	1298	1528	2950 297			
220	250	1485 1488	1367 1361	1535 1534	2091	960	1361	.2954
"	"	1490	1356	1533	2112 210			
240	200	1434 1431	1472 1462	1480 1473	1491 149	9232	9183	.2837
"	"	1428	1452	1465	1493			
260	150	1342	~~1629~~	1418	1041 106			
"	"	1337 1338	1572 1572	1403 1407	1079	8632	9874	.2710
"	"	1336	1573	1400	1056			
280	100	1224	1732	1343 1349	7710			.2598
"	"	1223 1223	1758 1740	1353	7962 780	789	1093	
"	"	1223	1724	1350	7673			
320	50	1077 1079	2078	1266	4645	496		
"	"	1077	2093 2085	1267 1264	4608 4462		131	.2438
"	"	1082	2090	1265	4668			
360	0	930 930	2300	1217 1111	3097	600	145	.2140
"	"	928	2310 2308	1195	3202 316			
"	"	933	2313	1222	3242			

Rot Pos	Reg I Pos.	Reg I / N	Reg II / N	Reg III / N	Reg IV / N	C_N^I	C_N^{II} [.6281]	C_N^{III}
320	50	1042	2180	1258	4170	~~6722~~	1354	2421
"	add 10 "	1033	2150	1246 1257	4179 4230	~~6664~~ 6700		
"	"	1041	2138 2156	1267	4308	~~6716~~		
280	150	1341	1807	1333	7306	~~8652~~ 25	1132	2560
"	"	1338	~~1800~~ 1802	1320 1329	7408 7393	~~863~~ 8620		
"	"	1334	1797	1332	7466	~~8606~~		
240	250	1488 1485	1505 1501	1445	1347 1365	~~460~~ 959	9428	2766
"	"	1483	1497	1427 1436	1383	~~9568~~		
200	350	1557 1555	1317 1313	1530 1538	2898 2897	~~1005~~ 1003	8247	2962
"	"	1553	1310	1545	2897			
180	450	1545 1543	1315 1295	1583 1587	4122 4127	4954	8134	3057
"	"	1542	1268	1593	4132			
170	525	1541 1540	1267 1270	1593 1597	5003 499	4935	7977	3076
"	"	1539	1272	1602	4973			
160	550	1536 1539	1277 1280	1595 1595	5784 ~~7825~~ 578	9929	8040	3072
"	"	1541	1282	1595	5779 ~~373~~			
120	600	1533 1530	1464 1468	1542 1552	1088 1088	987	9221	2989
"	"	1528	1472	1563	1088			
80	636	1523 1521	1980 1967	1367 1370	1670 1677	9812	1235	2542
"	"	1518	1952	1372	1685			
40	550	1531 1531	3001 3007	1121 1120	2135 214	4877	1886	2157
"	"	1530	3005	1118	2156			
0.0	500	1529 1529	3270	1074	2201 2205	9864	2073	2080
"	"	1524	3280 330	1080 1080	2222			
"	"	1535	3340	1102	2241			
"	"	1526	3270	1074	2238			
-20	"	1523 1521	3365	1148 1148	2050 2053		2123	2211
"	"	1518	3395 338	1148	2056			
-10	"	1523	3380 3375	1115 1113	2159 2137		2120	2144
"	"	1520	3360	1112	2115			
0	"	1527	3320 3317	1084 1118 1100	2210		2083	2119
"	"		3315	~~1088~~	2204 2207			

Pot Pos.	Reg. I	I	W	II	III	IV
120	600	458910	299515	43840	46490	32580
"	"	467319	305748	45020	47780	33250
80	636	451664	296582	58690	40520	49560
"	"	449324	295974	57810	40610	49880
40	550	442692	289239	86800	32410	61770
"	"	432080	282452	84810	31610	60930
0.0	500	447819	292999	95850	31470	64480
"	"	474602	311493	102070 ~~2070~~	33640	69230
"	"	495942	323036	107950	35620	72400
"	"	487192	319321	104340	34030	71470
-20	500	483621	317792	106940	36510	65160
"	"	482863	317743	107720	36500	65340
-10	500	481756	316467	107240	35280	68350
"	"	484850	318958	107110	35460	67460
0.0	500	487046	318826	105840	34630	70470
"	"	488451	321317	106500	34810	70830
40	600	523617	343100	101370	44260	63450
"	"	549104	358658	105170	45980	65060
-30	"	503324	330633	106190	40660	63900
"	"	486546	319384	102510	39250	61690
"	"	489194	320706	103570	39180	61910

4^{15} PM Zero checked on Reg I counter. Counter is just touching wall when selsyn reads 989 i.e. 11 units below zero.

1-25-1960

Exp # 29 SKF LWG CC

Sample # 7-1 taken net 111.0 g

Purpose: foil Exposure Bare # 28 or 33 $1\frac{1}{2}$" below ¢ cd covered # 28 or 33 $1\frac{1}{2}$" above ¢
Inst checked OK
Source in Inst Response OK

11^{58} AM Reached desired Power level and started timing foil Exposure.

12^{48} IC-3 = 1.4×10^{-8} IC-4 = 3.7×10^{-9}

12^{58} Dump Soln

Temp #11 - 19.6° fuel
~~12 - 22.2~~
14 19.4 Reg IV
15 19.6 D_2O

Sample # 7-2 taken After Exposure

Vol of Soln:
1. 25.63 in 2.75" s.s. slab ≈ 70.0 l
2. 114" of 3/4" pipe 0.83
Total vol. = 70.83 l

1-27-60

Exp # 30 JKF LWG CC

9^{00} AM Sample # 8-1 taken Net 90.02 g

Purpose foil Expoxure Bare # 41 Pos 1.5" Below Center Cd Covered # 51 1.5" Above center

9^{15} Inst Checked OK

10^{24} Source in Inst Response OK

10^{25} start feeding Soln into system

	Soln Ht	Control Rod	
10^{43}	17.801	2.70	Slightly Super Crit
10^{48}	17.820	20.86	Pos Per
~~10^{55}~~	~~17.811~~	~~1.87~~	~~Slightly Pos~~

10^{52} Reached Desired Power levelle And Started timing Foil Exposure

17.811 1.33

$IC-3 = 2.4 \times 10^{-8}$ $IC-4 = 2.4 \times 10^{-9}$

11^{37} 17.815 0.83

$IC-3 = 2.3 \times 10^{-8}$ $IC-4 = 2.4 \times 10^{-9}$

11^{52} Dump Soln

11^{53} ~~turn~~ start Emerg Exhaust fan Rm # 113

11^{57} AM ~10 r against tank (storage)

11^{58} start Mixing Soln in Slab tank

12^{42} stop Mixing

12^{55} Sample # 8-2 taken Net 70.06 g

Had difficulty with Antenna rotator motor failure. Lost one week before a better motor was installed.

Note: zero of rotating counter is at selsyn reading of -1

stor
ce

2/3/60 Counters unconnected (with Cd covers)
4 10 pm System made critical to see if counters count

Crit with Reg I counter at 554 (center)
and ~~Reg~~ Rot. pos. of 129. Solu selsyn = 21.04
~~So~~ Control blade out, lift position = 6.99"
~~Note~~

Rot. Pos	Reg I		Reg I	N	II	III	~~IV~~	
			IC-4 = .02				~~Logs~~	
129	554		1069	59531	2650	390	20	1 min count
"	"		1217	61386	2740	440	40	"
"	"	4 20 pm	1162	63232	2890	370	30	"
"	"		1162	65303	2910	430	30	"
"	"	4 22 pm	2465	138230	5900	890	—	2 min "
"	"	4 24 pm	2665	149195	6360	990	60	"

O.D of Cd. covered counter is ~ .410"

Expt #31 2-4-60
LWG, C.C. J.R.F.

2 min counts — Horizontal Traverse - 235 fission ctr cd - covered. New rotator motor was installed. Vertical lift. pos. 7.04"

Rot Pos	Reg I Pos	Reg I	N	Reg II	Reg III	Reg IV
		IC-4 = .2, .3				
99	500	27901	1643537	66720	12040	1300
"	"	30243	1772454	71330	13140	1370
"	"	33119	1953679	80150	15230	1510
10^{05} AM 120	539	32425	1881895	77590	12550	980
"	"	32,858	1,918,705	78920	12570	960
140	460	34865	2023287	83750	11640	610
10^{16} AM "	"	35207	2034356	84380	11860	650
160	400	36507	2030140	83770	9960	380
10^{25} AM "	"	36852	2044627	84840	~~9010~~ 10010	400
180	340	24266	1277699	51370	6380	150
"	"	23609	1251738	50570	5110	120
200	280	23147	1111484	44260	3850	60
10^{42} AM "	"	26747	1178664	46830	4920	70
"	"	25171	1211888	48600	4120	90
220	240	23179	1043864	40460	2820	40
10^{59} AM "	"	23295	995,988	38470	3160	40
"	"	20984	943983	36280	2540	40
240	200	23511	977347	36370	2580	30
11^{08} AM "	"	23391	961402	35960	2230	20
"	"	22456	945095	35240	2220	30
260	160	31446	1201635	43720	2790	30
"	"	31974	1238642	44790	2460	30
"	"	32663	1245384	45500	2490	20
280	120	30527	1102227	38990	2300	20

Rot Pos	Reg I Pos	Reg I	N	Reg II	Reg III	Reg IV
280	120	30054	1085844	38390	2870	20
11 30 AM "	"	31218	1104491	39900	1800	20
300	80	31142	1033466	36100	1660	—
"	"	31692	1055137	36300	1530	10
"	"	32012	1072397	36680	1670	10
320	60	33869	1101508	37730	1590	30
11 50 AM "	"	32659	1053893	36290	1480	10
"	"	31099	1013015	34370	1390	10
340	80	30478	1014888	34560	1420	10
"	"	28825	973231	32630	1430	10
"	"	28163	935460	31030	1280	0
280	50	28483	894128	31230	1530	0
"	"	27515	869132	29890	1590	10
"	"	26538	845355	29370	1400	20
100	500	21088	1247392	49320	9050	960
"	"	21674	1302005	51480	9370	940
140	460	25415	1504064	62660	8750	440
1 00 PM "	"	23923	1414866	58800	8250	450
"	"	23715	1391978	57750	8070	430
180	340	27034	1428039	58000	5900	170
"	"	27891	1473803	59040	6130	160
"	"	29099	1516985	61420	6350	210
220	240	33106	1470564	56800	4460	60
"	"	33714	1491935	58030	4370	80
"	"	33787	1509451	58020	4320	80
260	160	30178	1157510	41770	3120	40
"	"	27837	1071833	38280	2100	20
1 40 PM "	"	26732	1036318	37570	2080	30

Rot. Pos	Reg I pos	Reg I	N	II	III	IV
300	80	29317	968191	33040	3060	10
"	"	30167	1005735	34570	1560	10
"	"	30828	1032889	35430	1630	20
340	90	30249	1032950	34860	1690	10
"	"	30568	1035844	35480	1430	20
"	"	30497	1039953	34970	1480	10
280	60	32552	1034486	34520	1810	30
"	"	32119	1021772	35880	1770	20
"	"	31856	1008453	35440	1800	20
170	500	16531	971739	~~39990~~ 39790	4160	110
2 50/pm "	"	16834	985505	40070	4300	100
"	"	17619	1022241	41450	4470	150

Reg I counter reads zero when cd. covered counter in against wall of Reg I

Expt 31

		Reg I N	Reg II N	Reg III N	Reg IV N
1099	500	.01697	.0406	.00733	.0007920
1089	"	.01706 170	0 ~~.0411~~ 4025 4062	.00742 752	.0007730 78
"	"	.01695	0.410	780	.0007730
1120	539	.01724	.04125	667 661	.000521 510
[illegible]	"	.01712 172	4115 4120	655	.0005010
1140	460	.01723 173	414 415	577 581	.0003020 311
"	"	.01732	416	584	.0003200
1160	400	.01796 180	4125 4137	470 490	.0001872 192
"	"	.01802	415	489	.0001956
1180	340	.01898 190	402 403	.00499 453	.0001170 .0001065
	"	.01886	404	408	.0000960
200	280	.02085	398	347 3882	.0000540
	"	.02270	397 399	4175	.0000594
	"	.02080 215	401	400	.0000743
220	240	.02220	387 386	270 285	.0000383
"	"	.02340 226	386 386	317	.0000402
"	"	.02220	384	249	.0000424
240	200	.02415	374 374	265	.0000308
"	"	.02430	374	232 244	.0000208
"	"	.02375 2406	373	235	.0000318
260	160	.02415	364 367	232	.0000250
"	"	.02580 2605	362 367	.001988 2103	.0000242
"	"	.02626	3575	200	.0000160
280	120	.02780 2792	354 3531	209 212	.0000183
"	"	.02768	354	264	.0000184
"	"	.02828	3523	163	.0000181
300	80	.03012	349 345	1605	
"	"	.0301	344	145 1537	.00000948
"	"	.02993 3004	342	1557	.00000934
320	60	.0307 309	3425	1443 1424	.0002700
"	"	.0310	344 3433	1405	.00000968
340	80	.0300 298	340 338	1396 1434	.00000987
"	"	.0296	333	1470	.000103

Reg III correction for
instrument adjustment = 1.221

Reg III Correction =

Expt 31

at Pos.	Reg I Pos.	RI/N	RII/N	RIII/N	RIV/N
340	80	0301	.0332	.001370	0
280	50	0319	0 3495	001712 1732	0
"	"	0317 317	.0344 3470	.00183 0	0000 1267
"	"	0314	0 3475	.001655	0000 1420
1002	500	0 1690 1679	0 3955 3955	.00 7260 725	.000 7700
"	"	0 1667	0 3960	.00 7210	0007230
40	460	0 1690 1676	0 4165	5820 5817	0002925
"	"	0 1692	0 4155 4155	5830	0003180
"	"	0 1705	04150	5800	0003090
80	340	0 1894 1901	04060	4130 4159	0001190
"	"	01892	0 4005 4038	4160	0001085
"	"	01917	0 4050	4188	0001384
220	240	02250	03860 3865	3030 2970	0000 408
"	"	02240 2249	03890	2930	0000 536
"	"	02234	03845	2860	0000530
60	160	02610	03610	2695 2222	0000346
"	"	02400 2517	03570 3603	1960	0000187
"	"	02580	03630	2010	0000290
300	80	03030	03415	3130 2054	0000 1831
"	"	03000 300	03440 3428	1432	0000 99.6
"	"	02970	03430	1580	0000 194
340	90	02930	03372	1640	00000 967
"	"	02950 2938	03420	1380 1445	0000 193
"	"	02933	03363	1423	0000 96.2
280	50	03145	03530	1750	0000290
"	"	03140 3147	03512 3519	1733 1750	0001 196
"	"	03157	03515	1785	0001 198
170	500	01700	0 4100 4135	4280	0001 133
"	"	01708 1710	0 4070	4365	0001 1015
"	"	01723			

96 [2]-5-60 Expt. 32 A Gilley, Rohr, Fox

omit

Vertical Traverse

Rot. Position 160 ; Reg I pos. 5[1]5

All ctr Cd - covered

IC-4 ~ .2

Vert. Pos.	Reg I	Nor.	Reg II	Reg III	Reg IV
11[30] 0.42	14835	1,272,500 (2 min)	34690	5790	230
"	15467	1,334890	35300	4048	280
"	32343	2,781,749 (4 min)	75,760	8750	600
"	3[?]6,681	3,077,640	85500	9770	720
1.00	35727	2867985	86000	8540	470
"	34866	2800950	83470	8130	450
2.00	32751	2389460	78540	8000	450
12[20] "	32164	2356795	78170	7970	380
3.00	29,108	1,993,590	71890	8270	310
12[32] "	30389	2079213	74270	7540	360
4.00	28224	1828998	68080	7130	330
12[45] "	28370	1837115	69110	7080	330
12 pm 5.00	29910	1857958	71930	7470	320
12[58] pm "	29536	1851711	73040	7300	340
6.00	33010	1997297	79710	8110	340
1[10] pm "	32992	1996185	80090	8110	300
7.04	35548	2123956	86370	9260	390
1[22] pm "	36473	2173114	88850	10900	360
8.00	35053	2096930	84300	8560	340
"	35995	2162762	87470	8920	340
9.00	38436	2321702	91950	9470	330
2[04] "	36772	2224170	88540	9100	340
10.00	40845	2507280	97,160	10,600	430
"	43068	2676960	103,640	10500	390
11.00	42257	2653600	98720	9880	370
"	41687	2649100	96800	10340	370

Expt #32A Ccl-covered V

Vert. L. Pos.	Reg I / N	Reg II / N	Reg III / N	Reg IV / N	
.42	1166	2725	~~455~~	181	
"	1158 1170	2645 272	303	210	210
"	1163	2725	3145 310	216	
"	1192	2778	3175	234	
1.00	1246 1246	3000 299	2980 294	164	163
"	1245	2980	2904	161	
2.00	1370 [illegible]	3286 330	3360 337	188	175
"	1364	3315	3380	161	
3.00	1460 1461	3610 359	4150 390	156	165
"	1461	3575	3630	173~~3~~	
4.00	1544 1544	3723 374	390 388	180~~4~~	180
"	1544	376	385	179~~5~~	
5.00	1610 1603	387 391	404 400	172~~4~~	178
"	1595	3945	394	18~~46~~	
6.00	1653 1653	399 405	406 406	170~~8~~	160
1 10/pm "	1652	411	406	150~~4~~	
7.04	1672 1675	4065 407	436 418	184	175
"	1678	4090	402	166	
8.00	1670 1668	4020 403	4085 410	162	160
"	1665	4050	4125	157	

Gilley
[illegible]

Expt 32 - Cd-covered Vertic

Vert Pos	Reg I/N		Reg II/N		Reg III/N		Reg IV/N	
8.30	1650	1650	398	397	434	443	165	155
〃	1651		396		451		149	
7.50	1668	1658	404	403	470	463	158	157
〃	1648		401		456		155	
6.50	1675	1665	406	409	457	451	203	185
〃	1655		411		445		169	
4.50	1584	1577	385	387	415	427	177	190
〃	1570		388		438		201	
2.50	1433	1436	349	347	382	377	220	195
〃	1438		346		372		179	
1.60	1305	1303	317	317	346	343	226	211
〃	1300		316		340		198	

#11 – 22.3°, #12 – 22.4°; #14 – 21.9°; 15 – 22.3

...rt Pos.	Reg I	Nor.	Reg II	Reg III	Reg IV
11.84	47038	3126300	—	10660	370
"	46457	3103980	107,670	10660	360
"	45159	3040700	106310	11090	380
10.50	32442	2072000	77450	7880	—
"	31525	2001500	74420	8320	270
9.50	37231	2300800	89080	9830	350
"	38085	2344900	92080	9720	330
8.50	35020	2122500	84520	9210	350
"	34471	2088500	82710	9420	310
7.50	33744	2021900	81580	9500	320
"	33032	2004800	80410	9130	310
6.50	35463	2116500	85940	9660	430
"	36218	2186458	89810	9730	370
4.50	35841	2263200	87040	9380	400
"	35071	2232100	86440	9790	450
2.50	44308	3092715	107980	11800	680
"	43279	3010778	104,250	11200	540
1.50	41583	3187860	101050	11040	720
"	42127	3240400	102400	11020	640

Expt 32B

Expmt — an attempt to determine cause of vertical traverse of Expt 32A not being symmetrical about center vertically. Rot and ~~Reg~~ I counter same as above: 160 & 515. Added extra cd blade in region four.

Crit with fuel at 20.90"

Lift Pos	Reg I	Nor.	Reg II	Reg III	Reg IV
11.86	40185	2580300	93,420	10,390	340
11	* 44509	2895030	102,210	10260	340
11	47729	3119400	112,290	11670	530
11	48625	3195100	112,570	11330	390

Crit with fuel at 21.85

Lift Pos	Reg I	Nor.	Reg II	Reg III	Reg IV
10.50	40323	2501267	95860	9990	350
11	40405	2488700	95610	9800	380
11	40346	2494700	96840	9970	330
11	40737	2504200	97090	10440	360
11	40849	2527400	96310	9790	360

Removed extra poison in Reg IV

Crit at 19.84"

Lift Pos	Reg I	Nor.	Reg II	Reg III	Reg IV
11.86	42232	2,885,430	97000	9880	360
11	36847	2527700	84680	8580	310
11	37106	2531720	85570	8630	320
11	36426	2513030	84000	8490	330
11	36084	2481966	84040	8390	260

Changed "control rod from out to in position

crit at 19.84"

Lift Pos	Reg I	Nor.	Reg II	Reg III	Reg IV
11.86	35704	2321750	81590	8280	400
	34644	2318750	85890	12460	330
	33882	2297640	79970	7980	280
	36572	2380200	84440	8640	350

* had to lower fuel ht to ~ 20.80 because of drift.

Lift Pos	Reg I /N	Reg II / N	Reg III / N	Reg IV / N	crit ht		
11.86	1557 1547	362 356			20.90		
"	1537	353 356 357			"		
"	1530 1521	360 356			20.80		
"	1523	352			"		
10,50	1610	3835			21,85		
"	1625	3845			"		
"	1617 1620	3885 385			"		
"	1625	3875			"		
"	1616	3810					
11,84	.1463	336			19,04		
"	.1458	335			"		
"	1465 1458	3398 336					
"	1450	3343					
"	1453	3390					
11.86	~~1537~~	3515			19.84		
"	1494	~~3705~~					
"	1474 1504	3480					
"	.1537	3550 352					
"	1491	3530					
"	1489	3480					

Lift pos	Reg I	Nor	Reg II	Reg III	Reg IV
11.86	34398	2307100	81420	8390	310
11	33425	2,244,200	78080	7800	260

Temp readings:

Reg	Ctr No.	1^{00} PM	120	1^{45}	2^{15}	3^{30}	3^{40}	4^{05}
II	11	910/22.7	—	.897	.866	.848	.814	.804
I	12	905/22.6	.927	944	948	.942	.918	.924
IV	14	910/22.7	.927	.900	.910	.910	.921	.921
III	15	910/	.916	.918	.913	.910	.905	.903

2/9/60

1^{45} PM System made crit at Seln ht = 18.99 with counters III & IV lowered to bottom and rotated toward out side.

2/9/60

3^{20} PM System made crit at Selsyn = 17.80 with counters II and IV completely removed and with control blade all way in. Region I and III were heated with cal rod and Fuel and D_2O were warmed with pumps. (prior to critical)

		#	mv
~3^{50} PM	II	11	1120
	III	15 ~~[illegible]~~	1173

2

Omit

Lift Pos	Reg I / N		Reg II / N	
7.50	1735	173	.417	.4165
"	1712		.416	
8.50	.1700	1697	.410	
"	.1693		410	.410
9.50	.1625	1637	400	.398
"	.1650		.396	
10.50	.1602	1603	.382	383
"	1600		.384	
"	1607		.384	
7.00	.1702	1697	.414	.416
"	.1693		.4155	
7.50	.1703	1698	.413	413
"	.1693		.4125	
10.00	1640	1644	388	380
"	1648		372	
11.00	—		~~409~~	
"	1623	1622	.366	366
"	1620		.366	
11.88	~~1745~~		.349	
"	.1586		.350	346
"	1657	1571	.3435	
"	1471		.341	

2/9/60

Exp. 32-C

The purpose of this experiment is to correct the assymmetry of the flux in exp. 32 due to reactor being "more" than full. Crit ht. = 18.03 ; Control blade = 3.10

2 min.-counts

Pos	Reg I	N	Reg II	Control Blade
5.0	13570	772600	32240	3.10
"	12903	754590	31410	"
5	12830	754385	30890	2.50
	12130	716631	29390	"
9.5	11892	731563	29280	1.42
3 47 PM	1155 mv 28.9°C		1.1237 28.4°C	
9.5	12030	728409	28870	1.42
0.50	13552	845899	32290	99.72 (-.28)
"	14288	892816	34290	"
"	14725	915825	35180	"
00	16685	980339	40560	6.17
"	17743	1047786	43550	"
4 05 PM	1.1251 {28.1°c		1.1105 27.8°c	Reg III = 1.0605 26.5°c
7.50	17436	1023364	4224	5.4
"	16386	967188	39890	"
0.00	14485	883152	34240	1.69
"	14124	896366	33340	"
11.00	~~16449~~	~~846952~~	~~34620~~	-.28
"	16838	1037270	37990	"
"	18237	1124951	41140	"

In order to get a point with counters at 11.88, D_2O was drained back to selsyn reading of 74.58 (from ~80)

11.88	~~22961~~	~~1315484~~	~~45960~~	-.28
"	23257	1464513	51140	[D_2O drained to 74.47]
"	17338	1060492	36410	

2/9/60

Lift. Pos.	Reg I	Nor	Reg II
11.88	155788	1060036	36150
% Temp	1098		1090

2/10/60

Reg	Couple #	mV	°C
II	11	1.069	26.7
I	12	1.071	
IV	14	1.041	
III	15	1.042	

2 - 10 - 60 Exp # 32 - D

Rotating position of II = 161 Cross, Fox, Gilley
Position of I = 515

Lift. Pos.	Reg I	N	Reg II
10^{05} AM 11.92	17557	1211001	41130
"	18037	1218477	42020
11.01	15996	982989	35870
10^{17} "	15217	873170	31740
"	13093	837288	30130
"	12916	841404	30400
"	13347	864091	31230
10^{32} AM 10.00	12656	799113	29840
"	13268	761912	59730
"	13011	814793	89920
"	14061	889346	32580
"	14536	921417	34530
10^{52} 9.00	18218	873600	34660

Note added 2/11/60: Reg I data not good; see note, p 104

11^{15} AM Shut down to check on spread in data. Discovered source drive motor had been left on and was probably throwing in counts.

Start again. Crit fuel ht = 18.01 (selsyn reading)

11^{33} AM 9.00	18830	1060986	40480
"	19827	1057501	40860
"	17380	1035150	40250

Note: Discriminator on amplifier I was changed from 12 to 18.

Lift Pos	I	N	II	I/N	II/N
9.00	11531	914315	35260	1261	387
"	11408	898735	34260	1286	382
"	11214	890797	34520	1258	387
"	11034	849302	33570	1269	386
"	10808	860628	33270	1256	386
"	12716	818753	34760		395
12 35 pm "	10721	831591	32040		3
8.00	14097	1079939	42860	1.695	
"	18045	1135994	45290	1.590	
"	15646	1182846	46420	1.324	
"	15718	1232982	49250	1.275	
1 03 pm 9.00	18188	1445970	56150	1.258	
"	~~21912~~ 21512	1475434	57720	1.46	
"					

2 30 pm Reg I was giving poor statistics, therefore shut down to investigate. Counter #1 was found to have poor ground and was repaired and reassembled

Exp. 32-E

Vertical Traverse Cd-covered

2/11/60 Reg. I counters put back in reactor and checked for transients due to operation of print-out counters. No transients were found this time.

Note: discriminator on amp. #1 was re-set at 12. (see p 103)

Crit ht selsyn = 18.01 ; D_2O selsyn = 82.0

Rotating pos selsyn = 161, center selsyn = 515

8 45 AM Temp.: # 11 or Reg II } - 1061 mv ; # 12 Reg I } - 1086 mv ; # 14 Reg IV } - 1137 mv ; # 15 Reg III } - 1081 mv

~~11.78~~

	I	N	II
~~9 30 11.78~~			
9 03 11.78	18382	1,215,254	42990
"	19382	1289984	43820
"	19647	1318831	44730
11.00	18655	1203655	43320
9 13 AM "	17379	1135204	40260
10.00	14475	901408	33290
"	14764	930443	34150
9.00	15437	953463	36430
9 30 AM "	15921	976335	37340
8.00	16570	989761	38760
"	16625	1005973	39500
7.04	16693	1003416	39470
"	16898	1012162	39780
9 45 AM 6.00	17655	1052193	42670
"	17914	1080244	42600
9 50 AM #11 - 1100 mv (27.5°C) ; #12 - 1110 mv ; #14 - 1.1345 mv ; #15 - 1097 mv			
5.00	19012	1169045	45310
"	20208	1220394	47010
4.00	21821	140167	51670
"	22750	144444	53510

Exp. 32-E (cont.)

Lift. Pos.	I	N	II	I/N	II/N
10:07 AM 3.00	23154	1531949	53900		
"	23848	1564076	55260		
2.00	23380	1660041	54120		
"	23043	1647287	53940		
10:20 Soln. selsyn had risen	to ~18.10 and	was adjusted	to 18.00		
1.00	27398	2144442	62990		
	D_2O lowered	to selsyn	reading	= 80.9	{system slightly super at this position with blade in
1.00	29710	2328659	68630		
10:30 AM	D_2O lowered	to selsyn	reading =	79.15 ;	~ Crit
1.00	31864	2470299	73130		
1.50	32059	2385802	75010		
"	32129	2385996	78570		
3.50	22638	1493024	54070		
"	22286	1461995	52770		
5.50	20692	1248881	48330		
"	20001	1210993	47190		
10:55 AM	#11 - 1.101 mv ;	#12 - 1.113 mv ;	#14 - 1.139	; #15 - 1.0965	
7.50	19400	1171275	45900		
"	19171	1152157	44330		
9.50	18923	1178046	43640		
"	19063	1184916	43470		
11:12 AM 11.50	19449	1313318	43650		
"	19057	1295471	43520		
"	19042	1287670	43710		

Expt 32 E

Lift Pos	Reg I / N	Reg II / N	
11.78	.01512	.0354	.0345
"	.01502 .0150	.0340	
"	.01489	.0339	
11.00	.01530 .01540	.0360	
"	.01532	.0354	.357
10.00	.01605 .01594	.03695	.368
"	.01586	.0367	
9.00	.01620 .01626	.0382	.382
"	.01631	.03825	
8.00	.01675 .01664	.03915	.392
"	.01653	.03930	
7.04	.01663 .01667	.03935	.393
"	.01670	.0393	
6.00	.01679 .01668	.04053	.400
"	.01657	.0394	
5.00	.01626 .01641	.03875	.384
"	.01656	.0385	
4.00	.01557 .01564	.0369	.370
"	.01575	.03705	
3.00	.01511 .01518	.0352	.3525
"	.01525	.0353	
2.00	.01407 .01403	.0326	.327
"	.01398	.03275	
1.00	.01277 .01283	.0294	
"	.01277	.0295	.295
"	.01290	.0296	
1.50	.01344 .01345	.0315	.322
"	.01347	.03295	
3.50	.01515 .01520	.0362	.362
"	.01524	.0361	
5.50			

Lift Pos.	Reg I / N	Reg II / N	
5.50	.01655 .01654	.387	.389
"	.01653	390	
7.50	.01657 .01660	.392	.388
"	.01664	.385	
9.50	.01605 .01607	.379	.373
"	.01610	367	
11.50	.01482	.3325	
"	.01472 .01474	336	.336
"	.01478	3395	

1/11/60 Exp. 33

Crit fuel Selsyn = 17.83, D_2O = 73.64
Blade in.
Normalizer counter (used in Exp. 22) connected to #2 pre-amp. Chamber placed in center of "Island".

#2	N		2/N
863940	1061664	2 min counts	8 ~~##~~ 138
912610	1137212	"	8025
	1155143		
938470	1164799		8057
933970	1169837		7984
935940	1169228		8005
907500	112670		8054
894800	1112507		.8043
			av. .804

1/12/60 Normalizer Counter in center of Reg IV
#2 pre amp used. pre amp insulated from equipement

9 30 AM Crit selsyn reading (soln) = 17.84
" " " D_2O = 75.66

Control blade all way in. Reg II cd-covered counter in system near bottom.

data not good

Reg IV counts	Norm.	IV/N	5 min counts
34490	3478224	9916	
26810	3063154	8752	
32410	2775291	1168	
23520	2719234	865	
27650	2760794	1001	
25690	2886592	8899	
28350	3041916	9319	

9 31 AM

 2/12/60

10^{22} AM

	IV	N	IV/N
	28580	3156709	

It was discovered that the clock timer was throwing in counts into #2 amplifier. Amp. output has been changed to printout timer.

		~~32991~~	
no good see page 109	32991	3371986	978
	30691	3430467	895
	40719	3463528	1176
	30834	3527844	875
	38466	3611019	1065
	32184	3616679	890

2/12/60 Amplifier settings:

11^{09} AM

#	Gain	RT.	Disc.	HV
I	16	.2μs	12	
II	16	.2μs	10	
III	16	.2μs	13	
IV	4	.2μs	30	1500+ Volts

12^{15} PM NOTE: The amplifier discriminator setting on II was found to not be "correct" for the normalizer chamber being used and was changed to 20

2/12/60

	IV	N	IV/N	no good
12:25 PM	29939	3911648	7653	See note below
	29992	3834905	782	
	27722	3820327	726	
	29481	3816820	772	
	29023	3838836	756	
	28250	3850884	734	
	28500	3876899	735	
	28554	3942643	724	
	29959	3996573	750	
	29415	4046517	727	

1:45 PM Shut down. Discovered normalizer counter had shifted so that center of counter was only 1 7/8" from outside wall instead of in center of region. Counter recentered and ~~[illegible]~~ attached more rigidly.

Re normalization of region IV

	IV	N	IV/N
2:00 PM	64199	3480721	1844
	64305	3464575	1856
	63933	3489103	1832
	64378	3517863	1830
	65308	3541639	1840
	65911	3574443	1840

ave = .01840

2/12/60

Reg I normalization

4-235 chamber placed in center of region I

	Reg I	N	I/N	
2^{55} AM	896679	1247,905	.719	2 min counts
	887055	1233710	.719	
	899625	1251049	.719	
	933938	1297067	.720	
	88949	1236894	.719	
			ave .719	

3^{20} PM Normalization of Reg III 4-235 chamber placed in center of Reg III through vent hole.

	Reg III	N	III/N
	276777	1251743	2208
	299576	1357644	2205
	270622	1226440	2206
	280557	1274400	2201
3^{30} PM	266083	1199477	2218
			ave = .2208

Normalization of Reg II with 4-235 chamber placed in center of vent hole.

	Reg II	N	II/N
4^{10}	75608	1243548	.604
	79563	1315316	.605
	78423	1300646	.603
	74512	1240061	.601
4^{20} pm	75950	1258537	.603
			ave .0603

$$\mathrm{II}/\mathrm{I} = \frac{.0603}{.719} = .08386$$

$$\mathrm{III}/\mathrm{I} = \frac{.2206}{.719} = .3071$$

$$\mathrm{IV}/\mathrm{I} \quad \frac{.0184}{.719} = .02559$$

Av. of this and previous determination on pages 43, 44 & 45

2/15/60 Samples taken to look for collodial suspensions in following way:
one sample #9-1 taken without stirring;
~ 1 liter flushed out then
one sample #9-2 taken (still without stirring;
then pump turned on to mix soln.

Soln ht in storage tank measured (from inside bottom of tank)
9^{30} AM Soln ht = 24.95 {after samples above were taken
Vol. in system at this point = 68.59 liters.
Sample #9-3 taken after mixing and after measurement of ht. above. Pipes flushed before sampling.
Note: Amount of solution taken from storage due to the ~~to~~ two flushings above was 1195 gm

Note: Selsyn for Lift being used for drive position indicator for reflector radial traverse. Selsyn = 11.76 when disconnected from Lift mechanism

2/15/60 Exp. 34

Radial traverse in uppermost tube of bottom reflector.

Counter position selsyn reads 0.05 when center of active chamber is 0.875"? inside reactor (measured from outside of outside wall). See page 114

2 ^{15} pm	Reflector chamber position	Dist C/L	Reflector counts	Normalizer counts	C/N	Counts normalized to Exp. 24
taken 1 min counts	22.0	.7	122877	453,518	.2709 x1.391	
	"		124269	462398	.2687 2694	.375
	"		125765	467760	.2688	
2 ^{20}	24.00	2.7	99810	465801	.2143 2134	.297
	"		97930	461123	.2124	
	26.0	4.7	57998	465587	.1246 1250	.174
2 ^{24} pm	"		58219	464100	.1254	
	29.0	7.7	56045	461471	.1214 1214	.169
	"		55947	461057	.1214	
2 ^{30} pm	32.0	10.7	71123	459761	.1547 1546	.215
	"		71919	465406	.1545	
	35.0	13.7	65233	519167	.1256 1258	.175
	"		67557	535961	.1260	
	39.0	17.7	20592	524329	.03927	.0545
	"		20519	525291	.03906 3917	
2 ^{40} pm 2 min counts	42.0	20.7	7243	1050192	.006891	.00980
	"		7542	1047474	.00720 7045	
	37.0	15.7	97173	1065358	.09121	.127
	"		100273	1103313	.09088 9105	

2/15/60

Exp. 34 (Cont.)

Reflector chamber pos.	DIST C/L	Reflector counts	Normalized counts	C/N		
33.0	11.7	83761	559433	.1497		.208
"		82812	554299	.1494	1496	
2 55 pm 27.0	5.7	61128	533810	.1145	1146	.159
"		59565	519101	.1147		
2 58 pm 23.0	1.7	129212	520009	.2484	2480	.345
"		129893	524793	.2475		
20.0	-1.3	125394	527431	.2377	2383	.331
"		126255	528610	.2389		
18.0	-3.3	73907	533305	.1386	1387	.193
"		74202	534564	.1387		
16.0	-5.3	61281	542821	.1129	1140	.159
"		63034	547655	.1151		
3 10 pm 14.0	-7.3	73247	557972	.1313	1318	.183
"		74575	564110	.1322		
11.0	-10.3	89642	574020	.1561	1566	.218
"		91356	581273	.1571		
8.00	-13.3	70101	582245	.1204	1202	.167
"		69693	581177	.1199		
3 20 PM 5.00	-16.3	62975	1180729	.0533	533	.0741
"		63897	1200716	.0532		
1.0	-20.3	5020	1229414	.00408	406	.00565
"		5049	1250407	.00404		
6.0	-15.3	103148	1272600	.0811	811	.113
"		104282	1288248	.0810		
10.0	-11.3	95112	641557	.1482	148	.206
"		94323	637001	.148		

2/15/60

	Ref. Chamber pos.	Ref. Counts	Normalizer counts	C/N		
3^{38} PM	~~12.0~~	~~97160~~	~~620903~~			
	12.0 −9.3	97160	620903	.1564		.218
	"	95710	612064	.1563	1564	
	17.24.3	74025	612508	.1210	1215	.169
	"	77675	638826	.1220		
	21.0 −.3	170774	651459	.262	.262	.364
3^{46} pm	"	171078	652700	.2621		
	31.0 +9.7	100150	656711	.1525	1523	.212
	"	100954	663263	.1521		

To obtain normalized (relative to exp. 24) count-rate in region V see notes in HFIR Folder

$\chi^{V} = \frac{C^{I}}{C_N^{I}}$; where C^{I} is normalized (to BF_3) count rate of "regular" chamber and C_N is normalizing (fission) chamber count rate at same point.

Then the count rate normalized to Exp. 24 is

$C_\eta = \frac{\chi^{V}}{1.776} C_{actual}$ where C_{actual} is experimental count rate normalized to BF_3

$C_\eta = 1.391\ C_{actual}$

2/16/60

8^{30} am A recheck of selsyn reading corresponding to counter position gave following results (for exp. 34)

Selsyn ↔ Tip of counter is "at"
42.31   end of tube.

The guide tube extends 0.80" beyond the out of the outside wall of reactor

Midpoint of counter at 43.0
selsyn at 42.31
.69

add .7" to readings Expt 34

With counter in middle position

9^{09} am Counter changed to middle position in bottom reflector. Selsyn = 41.85" when counter tip is at end of guide tube. (for exp. 35)

Expt 35

Horizontal Traverse in middle position of bottom reflector

2/16/60

Counter Selsyn	Dist from zero *	Dist. from C/L	Ref counts	Norm. counts	C/N	Count rate Normalized to Exp. 24 (x 1.391)
					~~1365~~	
22	23.15"	1.15	87388	640266	.1365	.183
"	"		87043	650855	.1337	
"	"		85772	650885	.1317	
"	"		83369	634426	.1314 .1313	
"	"		85459	653429	.1308	
24	25.15	3.15	92152	662044	.139 139	.193
"	"		91543	660654	.1385	
26	27.15	5.15	93909	673250	.139 139	.193
"	"		95718	694804	.138	
28	29.15	7.15	82117	683591	.120 120	.167
"	"		81158	677412	.120	
30	31.15	9.15	61030	665198	.0917 916	.127
"	"		60499	661734	.0914	
33	34.15	12.15	32852	692836	.0474 480	.0668
"	"		35064	721811	.0486	
36	37.15	15.15	31348	1471091	.0213 214	.0298
"	"		31693	1478290	.0214	
39	40.15	18.15	9724	1479021	.00657 662	.00921
"	"		9765	~~1469484~~ 1465484	.00667	
35	36.15	14.15	40393	1433562	.0282	.0392
"	"		39688	1410805	.0281 282	

* "Zero" is the outside of the outside wall and "distance" refers to center of active chamber

Exp. 35 (cont.)

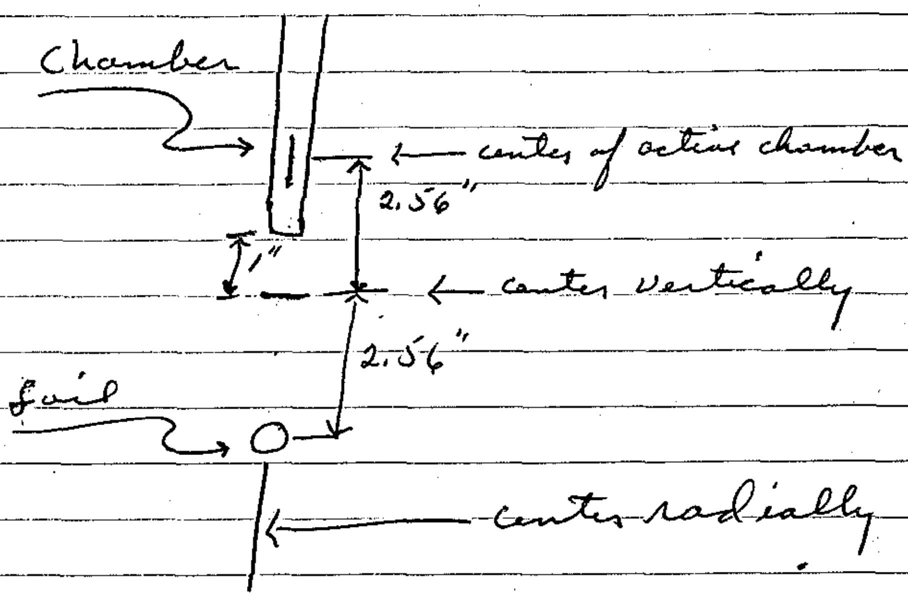
Counter Position	Dist from zero		Ref. Counts	Normalized counts	C/N		
31	32.15		52600	696725	.0754		.1047
"	"	10.15	52526	698082	.0752	753	
27	28.15	6.15	92291	699330	.13197		.18360
"	"		91734	698241	.131	132	
23	24.15	2.15	93275	709910	.131	131	.1822
"	"		94968	724865	.131		
20	21.15	-.85	96779	739782	.131	131	.1822
"	"		96166	736197	.131		
18	19.15	-2.85	100888	735965	.137		
"	"		102334	738582	.139	138	.1920
"	"		102469	742967	.138		
17	18.15	-3.85	105937	759175	.139		
"	"		107628	770311	.140	139	.193
"	"		108612	782723	.139		
16	17.15		106410	779151	.137	137	.191
"	"	-4.85	104241	765869	.136		
14	15.15	-6.85	87674	765993	.114	114	.159
"	"		89289	779265	.1145		
11	12.15	-9.85	55102	813842	.06770		.0949
"	"		56435	830032	.06799	682	
"	"		57927	848346	.06828		
8	9.15		52965	1637171	.03235	326	.0453
"	"	-12.85	52367	1601004	.0327		
4	5.15	-16.85	13667	1622447	.00843	843	.00117
"	"		14070	1670703	.00842		

Counter position	Dist from zero	Ref counts	Norm counts	C/N		
10	11.15 −10.85	92977	1724759	.0539	.0748	
"	"	93313	1735399	.0538 538		
13	14.15 −7.85	87223	875628	.0996 1001	.139	
"	"	88009	875032	.1006		
12 PM 15	16.15 −5.85	112093	875439	.1280 1281	.178	
"	"	112540	877250	.1282		
19	20.15 −1.85	120748	881814	.1368 1371	.191	
"	"	121583	884501	.1374		
21	22.15 .15	116101	891101	.1303 1304	.181	
"	"	116694	894438	.1305		
25	26.15	126488	800740?	~~.1579~~ (?)	{apparently print-out failed to print out 9 on normalizer.	
"	" 4.15	127790	908476	.1407 1405	.195	
"	"	128869	917884	.1403		
19	20.15 −1.85	124575	910615	.1368 1369	.190	
"	"	122688	895942	.1369		
20	21.15 −.85	116968	878848	.1331 1332	.185	
"	"	119155	893992	.1333		
23	24.15 2.15	123532 ~~123932~~	918618	.1344		
"	"	124301	824699	~~(?)~~ 1342	.187	
12 PM "	"	126299	942924	.1339		

2/16/60

$3^{\underline{30}}$ PM Lower reflector traverse chamber (4-235) moved to lowest of the 3 positions.
Discovered lift selsyn had burned out.

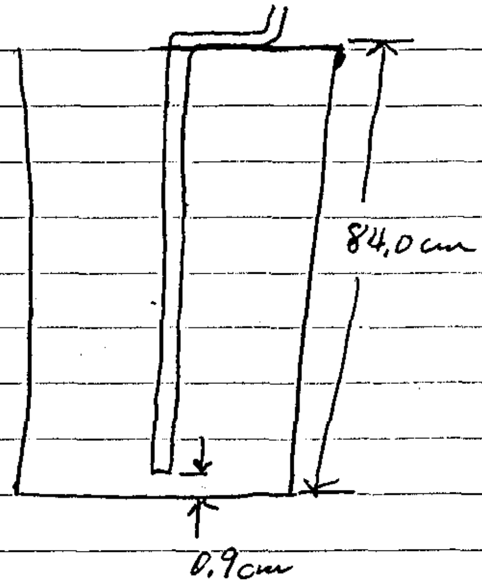
Au foil # 19 was placed in center region along with Reg I chamber in the following manner:



Description of foil # 19:
1.11 cm dia.; 5 mil thick

Wt.: 0.2411 gm
0.2412

Rezero of center chamber



2/17/60 zero of traverse chamber in lowest position in bottom reflector.

$11^{\underline{09}}$ AM Selsyn = 44.99 when tip of chamber coincides with end of guide tube.

Exp. 36. Radial traverse in lowest guide tube in bottom reflector.

~~Counter position~~ $12^{\underline{20}}$ PM crit and begin pos. period to obtain power level.

Counter position	Dist. from zero	Reflector counts	Norm. counts	C/N (BF3)	Normalized to Exp. 24 X 1.391
					.0358
22.0	-2.00	14862	581022	2558	
〃		14904	583421	2553 .02570	
〃		14797	569073	2600	
24.0	0.0	14570	561221	2596	.0359
〃		14217	~~59677~~ 559677	2540 .02581	
〃		15308	586324	2611	
〃		15443	598420	2580	
26	2.0	31866	1183559	2692 .02687	.0375
〃		31008	1155876	2682	
28	4.0	30705	1137960	2698 .02714	.0378
〃		31273	1145913	2729	
$1^{\underline{30}}$ PM 30	6.0	28510	1155457	2467 2464	.0343
〃		28636	1163514	2461	
34.0	10.0	15473	1179165	1312 1306	.0182
〃		15422	1185104	1301	
36	12.0	9361	1196339	7826	
		9139	1204656	7587	

Counter position	Dist. from zero	Reflector counts	Norm. counts	C/N (BF_3)	Normalized to
					.0107
36	12.0	9413	1213345	7724 7760	
39	15.0	3928	1232353	3188 .003207	.00446
"		3998	1244579	3212	
"		4116	1278052	3221	
35	11.0	12487	1241487	1005	.01398
"		12335	1227303	1005	
27	3.0	34377	1251745	2746	.0382
"		34407	1251252	2750	
32	8.0	25346	1253936	2021	.0280
"		25362	1260313	2012	
23	-1.0	32018	1272676	.02515 2530	.0352
"		32606	1280466	2546	
20	-4.0	32064	1306843	2454 2439	.0339
"		32133	1326377	.02423	
18	-6.0	28284	1336182	2117 2128	.0296
"		28691	1341007	2139	
16	-8.0	22981	1348102	1704 1692	.0235
"		22759	1355600	1679	
14	-10.0	13975	1362825	1025	.0144
"		14257	1364478	1035 1045	
10	-14.0	4624	1329420	348	.00481
"		4449	1305792	3459 3407	
"		4521	129566	3490	
8.28	-15.72	2810	1286075	2185	.00314
"		2939	1280990	2294 2256	
"		2925	1277230	2290	

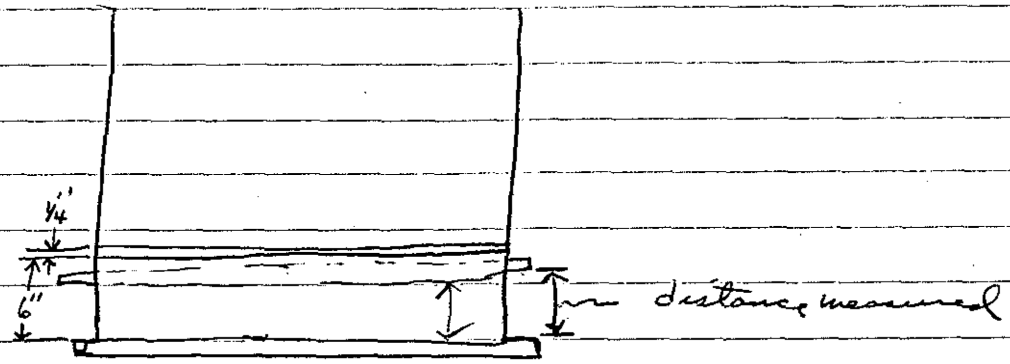
Exp. 36 (cont)

Counter position	Dist from zero	Reflector counts	Normalized counts	C/N(BF3)	Normalized to Exp. 24
12	-12.0	8247	1334445	.00618	.00858
"		8316	1350618	.00616 617	
15	-9.0	17718	1339616	.01323	.0184
"		17692	1340578	.01319 1321	
19	-5.0	31237	1342586	.02327	.0324
"		31824	1345338	.02365 2346	
21	-3.0	35005	1372210	.02551	.0354
"		35625	1399793	.02545 2548	
@ 3pm 25	1.0	36000	1363811	.02639	
"		36476	1359822	.02682 2653	.0369
"		35664	~~1391783~~ 1351783	.02638	

Total counts on counter #1 in center region with foil for total time of exposure = 190,509,910.
Total exposure time was 170.25 min.
[for locations and descriptions of counter + foil see page 120]
Power level ≅ 0.2 on IC-4

Measurements on ~~the~~ bottom reflector traverse guidetubes after exp. 36:

measurements were taken as per diagram



		guide tubes	
results:	Top	middle	lower
East side	5 5/16" 5.32	3 1/64" 3.02	19/64" .296
West "	5 5/16"	2 13/16" 2.81	.275" ave. .285"

∴ Using average values, the center of chambers were

Upper

5.32
.16
5.48 up from bottom plate

$\frac{1}{2}h = 8.85$
6.25
15.10

hence is ~~9.52~~" 9.62 below center

Middle

2.91
.16
3.07 up from bottom plate

hence ~~11.93~~" 12.03 below center

Lower

.285
.16
.445 up from bottom plate

hence ~~14.55~~" 14.65 below center

2/19/60 Temp. control for experimental room raised
4 PM to 84 to raise ~~room~~ room temp for
temp coefficient measurement. D_2O left in
reactor along with water in Reg's I + IV over
(long) weekend. One 375 watt infrared lamp
placed near center of fuel in storage slab
approx 12" away

8:30 AM
2/23/60 Temp. measurements

Couple #	Reg	mv	Temp
11	II	~~1.097~~	
12	I	1.123	27.8 ~~28.1~~
13	Slab	1.35	33.4
14	IV	1.213	30.3
15	III	~~1.098~~	

9:15

Couple #	Reg	mv	Temp	10:00 AM
11	II	~~1.125~~	fuel not up	1.188
12	I	1.125	28.1	1.147
13	Slab	1.204	30.0	—
14	IV	1.174	29.3	1.140
15	III	1.098	27.5	1.119

2/23/60 Exp. 37

Temp coefficient

$10^{\underline{50}}$ D_2O selsyn = 75.53, Fuel selsyn = 18.04

Control blade selsyn = 0.0 (all way down)

There are two bare BF_3 counters in system,

Reg II + III. Both are sitting on bottom

[above conditions were for period but log N not calibrated hence not used]

$11 \frac{30}{Am}$ Temp. couple # mv Temp

11	1.128
12	1.138
13	
14	1.147 ~~1.16~~
15	1.105

$11 \frac{30}{AM}$ D_2O selsyn = 75.53, Fuel selsyn 17.854

control blade selsyn ~~0.0~~ 99682 (all way in)

~~BF~~ System Crit

There are BF_3 counters in Reg II + III near bottom

[no period here — adjusting log N instruments]

$12^{\underline{30}}$

	mv
11	1.134
12	1.144
13	.
14	1.180
15	1.115

2/23/60

1 20 PM System made crit. ~~Same conditions essentially~~
D_2O = 75.53 , Fuel = 17.88 , Blade = 99682

Pos. period
D_2O = 75.53 , Fuel = 18.018 , Blade = 99682

IC-3 | IC-4
T = 96.65 ; P = 6.47×10^{-4} | T = 97.4 ; P = 6.43×10^{-4}

1 23 PM Temp

couple #	mv	°C
11	1.110	
12	1.125	
13		
14	1.150	
15	1.100	

1 35 PM Repeat of pos. period : Fuel selsyn = 18.013
IC-3 | IC-4
T = 98.2 ; P = 6.38×10^{-4} | T = 100.3 ; P = 6.28×10^{-4}

Temp 1 35 PM

#	mv
11	1.094
12	1.150
14	1.122
15	1.107

2 00 PM IC-3 & IC-4 checked - slightly off

2/23/60 Exp. 37 (cont.)

IC-3 & IC-4 recalibrated

Repeat of pos period

D_2O = *75.98 , Fuel = 18.020 , Blade = 99682

IC-3: T = 102.1 , $P = 6.20 \times 10^{-4}$ IC-4: T = 103.0 , $P = 6.16 \times 10^{-4}$

3:15 Temp	#	mV	°C
	11	1.124	
	12	1.144	
	14	1.171	
	15	1.113	

~~refer to above~~ { Repeat ; Fuel ht 18.02
D_2O *75.91

IC-3: T = 101.3 , P = 6.24 IC-4: T = 101.3 , P = 6.24

356 PM. Temp

11 – .1116
12 – .1140
14 – .1174
15 – .1110

IC-3 & IC-4 checked; span essentially correct, slightly off 10^{-8} mark

4:13 pm Repeat of pos. period after recalibration of IC-3 & IC-4

D_2O = 75.92 , Fuel = 18.014 , Blade 99682

IC-3: ~~T = 101.3 , P = 6.24~~ T = 103.4 , P = 6.15 IC-4: T = 105.2 , P = 6.07

4:20 PM Temp	#	mV
	11	1.119
	12	1.150
	13	
	14	1.172
	15	1.114

* D_2O reads ~1–1.5" high

2/23/60

4 $\frac{25}{pm}$ Temp. control set at 76 for room 113

2/24/60 Preceding Exp. 37 the D_2O selsyn became inoperative. After repair the zero was found to be different such that it read approx 74.5 instead of 73.5 when full.

After Exp 37 (but next day) selsyn became inoperative again and was repaired. Selsyn was set this time so that selsyn reads ~73.5 when full [but vent empty].

2/24/60 ~9^{00} Fuel soln fed too high and some solution got in top reflector water above ~~sol~~ fuel and above D_2O.

12^{45} Check of thermocouples by putting them together in a beaker of water {see Calibration opposite page 132

#	mV	(Repeat)	°C	Temp. by Thermometer
11	1.0475	1.0480		is 26.0°C
12	1.0450	1.0435		
14	1.040	1.0384		{1.04 mv = 26.0°C by ~~Hand book Curve~~
15	1.0325	1.0315		

2/25/60 Exp. 38
~~2/24/60~~ Second Temp. Coefficient measurement

~~10~~ 10^{55} AM IC-3 + IC-4 calibrated

9^{15} Fuel at 18.01 D_2O at 74.9
System crit with blade at 99790.
(Blade at 99682 when down against limit]

9^{15}

Temp	11	12	14	15
	.930	942	.960	.933
	.931	939	.962	.931
	23.2 °C	23.3 °C	23.9	23.2

9^{20} Check on Blade calibration

Crit Pos.	Period Position	Δh	T	ρ	$\rho/\Delta h$
99790	2.60	4.70	190.1; 186.8	3.72 3.77	$.798 \times 10^{-4}$ in.$^{-1}$
49790	1.04	3.14	~~1314~~ 1379; 1390	.589, .584	$.187 \times 10^{-4}$ in.$^{-1}$

4 rezeros of blade gave a selsyn reading of
24.68 when blade is 28.8" above fuel bottom.
The above results do not fall on previous curve
(Exp. 13) and do not appear consistent. Reason uncertain.
Using the above blade zero the points ($\rho/\Delta h$) are to be plotted
on previous curve at 4.37 and 3.59" respectively.

N

2/24/60 Calibration of Thermocouples

Thermo couple readings in mv with couples together in beaker of water

	II 11	I 12	IV 14	III 15	ave. m.v.	Curve	Thermom
1 20 PM	1.037	1.033	1.050	1.0255	1.036	25.95	26.0
1 45	1.0155	1.0135	1.020	1.0078	1.015	25.4	25.8
2 05	1.0045	1.0015	1.0250	1.0240	1.014	25.4	25.5
2 15	1.0015	.9995	1.0238	.9948	1.005	25.1	25.4
2 30	.9950	.9940	1.0210	.9900	1.000	25.0	25.2
3 20	.9870	.9838	1.020	.9760	.992	24.8	25.0

[illegible] COMPARISON OF THERMOCOUPLES

1.037	1.016	1.005
1.033	1.014	1.002
1.050	1.020	1.025
1.026	1.008	1.024
4)4.146 (1.036	4) 4.058 (1.015	4)4.056 (1.014

1.0020	.9950	.9870
.9995	.9940	.9838
1.0238	1.0210	1.0200
.9948	.9900	.9760
4) 4.0201 (1.005	4)4.0000 (1.000	4)3.9668 (.9917

Results of calibration:

II ± .1 °C of average
I +0, −.2°C of average
III ± .2°C, "
IV +.2, −0 of average

Thermocouples were placed close together in beaker of water. Right most column of temp. reading are by thermometer. Left column of temperature readings are taken from thermocouple curve.

2/25/60

1:00 PM. A determination of the position of the tips of the counters above the fuel bottom corresponding to a selsyn reading (lift) of 1.00" gave

Reg I	Reg II	Reg III	Reg IV
0.41"	1.00"	0.92"	0.94"

Pos. period with blade to check calibration:

Fuel	Crit Blade	Period Blade
~~18.04~~	~~14.22~~	
18.65	0004	6.54

IC-3: T = 180.7 ; P = 3.88 × 10⁻⁴   IC-4: T = 178.5 ; P = 3.93 × 10⁻⁴

Check of Reproducibility of Control Blade near lower end by recording crit. blade position, then moving blade and returning blade to crit position to see if system is still crit.

	Crit blade	moved to	Comment
	~~3.32~~		
3:45 pm	2.77	Limit then back	Crit.
	"	"	"

4:15 · Pos. period to check control blade

Fuel	Crit blade	Per. blade
18.67	99737	5.12

Note

4:25 pm System scrammed by photomultiplier although instrument was on scale! [low level trip]

Exp. 39

Litt selsyn = 7.00

Rot pos	Reg I pos	Reg I	N	II	III	IV
0.0	0.0	307542	78681	1197820	1039480	91930
"	"	326064	81845, ~~818165~~	1236670	1069870	~~10~~ 138010
"	"	383069	83688	1267320	1079430	140520
"	"	372144	86334	1288120	1096410	110870
"	"	347189	82061	1196930	943590	74770
0.0	0.0	1498791	64189	924620	1108950	1893740
		1467354	63276	910260	1092490	—
		1252573	61273	885760	1057230	1515740
		1207881	60905	876270	1035990	1057520

The above counts were a preliminary check out of BF_3 chambers

Note: From the end of tube of BF_3 chamber to center of active chamber is 1 7/8".

3/25/60. The real error in blade calibrations is probably due to photo neutrons building up differently due to different procedures.

2/26/60 Concerning Inconsistances in Control blade Calibration Checks

A check of control blade movement against selsyn reading shows the selsyn to be "tracking" properly when going up, certainly near bottom of stroke, but not tracking properly going down. Therefore, this probably accounts for the blade calibration checks not checking. ~~Since~~

Since the motion of the blade was up in exp. 38, the indicated rise of 1.08" is very propably correct. This is further substantiated by the fact that the negative period as indicated by the instruments prior to movement of blade to obtain critical was very small.

Measurements show the lower edge of blade to be 0.5" above bottom of reflector region (II) when against lower limit switch (hence selsyn reading of 99682 corresponds to 0.5" above bottom in exp. 38)

Exp. 40

12^{40} Selsyn repaired and set so that Selsyn = 0.01" at lower limit switch.

Fuel	Crit. Blade	Period Blade	T IC-3	T IC-4	ρ	ρ
17.996	0.01	7.50	118.7	118.7	5.5×10^{-4}	5.5×10^{-4}
17.978	0.01	4.00	292	290	2.54	2.56

Exp. 40

2/26/60

$1^{\underline{25}}$ Temp. for crit. conditions: Fuel = 18.01, D_2O = 76.27, Blade 0.01 [all way down] and Bare BF_3 counters in II + III (attached); Rot. pos = 164, Lift = 7.42:

11	12	14	15
.928 mv	.946 mv	.965 mv	.929 mv
23.2	23.6	24.1	23.2
			av. 23.5

$2^{\underline{50}}_{pm}$ Further checks on Blade calibration

Time	Crit fuel ht.	Crit Blade Position	Period Blade Position	
	17.89	4.50	~~6.52~~ 7.50	
	17.91	4.50	9.50	← reactivity changed during period was slightly sub at 4.50 afterwards
$4^{\underline{00}}_{pm}$	17.91	4.50	11.0	

2/29/60

System crit with following conditions:

9^{30} D_2O = 74.8 [~1" in vent], Fuel = 17.89", blade = .02 and blade selsyn reads .01 when against lower limit switch. Two BF_3 counters in system, Reg II + III against bottom [disconnected] correspond to rotation pos. of 164

Temp readings

	II 11	I 12	IV 14	III 15
9^{30}	.882	.891	.886	.881
	.882	.891	.879	.877

9^{30} IC-3 Calibrated

IC-4 inoperative

9^{45} Check of period & reactivity corresponding to raising blade 1.08" from down position (as in exp. 38). Conditions same as immediately above except blade moved from .02 to 1.09

T_{IC3} = 700 sec, $\rho = 1.13 \times 10^{-4}$

Blade returned to .02. approx crit, very slight drift up.

10^{00} Temp

.880 .891 .883 .878

10^{15} Adjust to crit, with blade at .02, ~~using~~ by lowering D_2O slightly. [to 73.4]

Raised blade to 1.09 for period again

T_{IC3} = 800 sec., $\rho = 1.0 \times 10^{-4}$

10^{26} Lowered blade to .02, just crit. after ~5 min.

Exp. 41

10^{35} To check reproducibility of blade over longer stroke blade raised to ~6" and lowered back to .02 just crit after ~5 min

10^{35} Temp 11 12 14 15

Temp	11	12	14	15
	.880	.894	.887	.878

Since crit conditions seem inconsistent with results in exp. 38, a determination of the worth of the control blade for 1.09" was made. Now an evaluation of the reactivity corresponding to raising solution from 17.89 to 18.01 is to be made

D_2O = 74.5 (~1" up in vent), Fuel = 18.03 blade = .02
counters in II + III still at 164 at bottom

Ic-3 Calibrated

11^{30}

Temp	11	12	14	15
	869	895	890	879

Results of blade calibration (above, 1.09"), for two periods
$T^{1st}_{IC3} = 700$ sec. ; $\rho = 1.13 \times 10^{-4}$; $T^{2nd}_{IC2} = 800$, $\rho = 1.0 \times 10^{-4}$
Reactivity corresponding to raising fuel from 17.89 to 18.01 above =; T = 214 sec, $\rho = 3.35 \times 10^{-4}$

1^{15} To determine effect of moving counters in II + III from rot. pos 164 to 0.0 (with chambers against bottom).

D_2O = 74.5 , blade = 0.02 , Fuel = 17.92
crit.

		II	I	IV	III
1^{30} PM	Temp	11	12	14	15
		.880	.898	.886	.874
		.883	895	.883	.875

1^{45} Recheck of period corresponding to raising blade to 1.09 (from crit conditions above)

$T_{1.05} = 754$ $\quad \rho = 1.05 \times 10^{-4}$

2^{17} After draining ≈ 1.5" fuel reconnected counters as in Expt 40 for recheck on crit conditions:

II	I	IV	III
11	12	14	15
868	897	882	870
870	895	882	870
21.7	22.4	22.0	21.7

av 21.8

Crit. with following conditions

$D_2O = 74.38$, Fuel = 17.90", blade = .02

The above results are not consistent with the crit conditions on page 134 (assuming positive temp. coefficient), i.e. system is now too reactive.

To see what effect trapping air under top of fuel cover might have, fuel drained ≈ 2" then brought back to 17.90, with other conditions remaining the same. Actually selsyn fluctuates between 17.896 and 17.899 – just crit.

3^{00} P.M. Fuel ht. raised, selsyn fluctuates between 17.916 and 17.925; purpose: to obtain worth of small fuel measurement error at this ht. $T = 1247$; $\rho = .648 \times 10^{-4}$

3^{30} Drained out all of fuel and brought back up Fuel Crit ht 17.91, D_2O – 74.47 Blade 00.02

I – 895, II .891 III .874 IV 881 22.0

4:00 PM. Drained fuel & D_2O. Wedged control blade outward ~ 1/2 in. from wall of D_2O annulus. Blade was ~ 1/2 in from wall; now ~ 1.0 from wall

Another check to look for reason we are not getting consistent results from exp. to exp. consisted of getting crit with following conditions

4:00 D_2O = 74.5, Fuel 18.035, blade = .02 then lowering D_2O ~ 2" and then filling back to 74.6. The result was to get a positive period (see below) indicated possibly air trapping under top of D_2O region.

3/1/60 D_2O selsyn = 73.33 at 9^{30}. Reason why selsyn reads less than 74.6, which was left overnight, not known

9^{40} System made crit with counters back in reg. III + I to check out counters
D_2O = 73.847, Fuel = 18.216 to 18.226, blade = 56

10 ~~00~~ Counter in reg. II not operating properly
Shut down to check
D_2O raised till selsyn reads 80.095". Also piece of yellow tape placed on monometer tube at level of D_2O

Two samples taken of ~~dilution~~ reflector water from reg. II + III
10-1 + 10-2

3/1/60 3^{20} pm	Sample 10-1, Reg II Reg. # 593071 (bottle 9)	Sample 10-2 Reg III Reg. 593072 (bottles 10, 11, 12, 13, 14, 15)

3/2/60 Exp. 42 Cross, Gilley

$1^{\underline{00}}$ Pm Purpose: to see if the change in reactivity due to lowering and raising D_2O as found previously ~~and~~ can be reproduced and to make checks of on reproducibility of worth of control blade.

There are no counters in reactor. D_2O has been left up essentially full over night At D_2O selsyn reading of 73.58 region not quite full, upon adding small "jog" selsyn went to 76.08"

Crit conditions: {Top plate is off. blade has been removed and replaced

$D_2O = 76.098$, Fuel = 17.89, Blade = .02

$1^{\underline{37}}$ Pm For pos. period, blade raised to 1.09

$T_{103} = 1050$, $P =$: $T_{104} = 1116$, $P =$.

$1^{\underline{48}}$ Pm Lowered blade back to .02, just crit after ~7 min

$1^{\underline{46}}$ Pm

	II	I	III	III
Temp.	11	12	14	15
	.823 mv	.833	.859	.828

$2^{\underline{00}}$ Raised blade to 4.00". No changes made in fuel or D_2O although D_2O now reads 76.15, possibly warming up.

$T_{103} = 245$, $T_{104} = 241$

$2^{\underline{07}}$ Blade lowered to .02, slightly sub. ~~from~~

Control blade Displacement from .02 necessary to attain crit = 0.34

Temp $2^{\underline{15}}$	11	12	14	15
	829	829	859	827

2^{28} blade lowered to .02 and system made crit again with fuel. D_2O now reads 76.26. Fuel selsyn reads 17.898 at crit.

2^{38} D_2O drained back to ~ 70, then refilled to 76.26 – just crit

3^{00} Drained D_2O again, to ~~75~~ 71.7, then refilled to 76.26 – just crit

3^{15} pm Repeat of pos. period with blade at 4.00 (raised from .02) D_2O = 76.28, Fuel = 17.90

T_{1c-3} = 430

3^{50} pm System made crit with D_2O = 73.48, Fuel = ~~17.94~~ 17.93, blade = .02

T_{1c3} = 287

pos. period by raising blade to 4.00

4^{00} pm blade lowered to .02, slightly sub. Blade raised to .60 to make it crit. Note: fuel selsyn = 17.928

4^{10} Shut down

4^{15} Solution and D_2O drained back to 6.00 and 60.33 respectively to be left over night to check on any valve leaks. Marks were put on sight glasses.

Exp 43-i BF_3 chambers

Vertical traverse; rotating pos = 161

Reg. I counts at 504 (in center)

D_2O = 79.70, Fuel = 18.01

Vert pos	I	N	II	III
3 1/… 11.78 ~~11.78~~	1541157	23801	512540	804610
"	1559310	24030	518610	815530
11.0	1600776	23339	547760	817660
"	1557624	22568	503340	792570
10.0	1489245	21093	495770	773180
2 3/3 pm "	1433985	20316	480390	———
"	1407613	20216	477290	742450

3 3/0 Lift selsyn became inoperative (Does not reproduce.)

Shut down

3-4-60 Took sample from D_2O system Reg No. 593073 for Fluorometric and D_2O assay

Vertical Traverse
Exp. 43-B BF3 chambers, bare

3/7/60 rotating position* = 161, Reg I selsyn = 509
Fuel = 17.93
See notes on p. 148 for chamber positions corresponding to lift position
Log W = .05 on IC-4

Lift pos	I	N	II	III
10 30/ 11.78	4513526	148720	2394180	3261800
"	4429978	139398	2262880	3142810
	Power level lowered to IC-4 = .008			
10 45/ 11.78	1314865	24948	491190	777970
"	1324106	25015	492250	782080
11.00	1345466	23814	481980	773720
"	1274923	22320	458970	735520
10 55/AM 10.00	1374558	23583	494530	793740
"	1338902	22480	495570	768130
11 05/ 9.00	1425273	23217	506350	820820
"	1391252	22799	499760	804820
8.00	1441973	22967	509620	832480
"	1463975	23787	521220	847670
7.00	1504282	23273	523530	855070
"	1533330	23378	522370	854170
6.00	1522319	23765	533220	873610
"	1628926	25611	570140	929960
5.00	1608040	26025	569990	933880
"	1585496	25924	572120	934520
11 26/ 4.00	1594894	27189	573510	947430
"	1653614	28465	589920	977270
3.00	1563599	27910	567380	944770
"	1565247	27961	568860	944790

* See note p. 147

3/7/60

Lift pos.	I	N	II	▭
2.00	1492676	28280	552840	923840
"	1533845	29294	570460	954650
1.00	1388568	29253	546710	905330
"	1390196	29141	542260	900900
1.50	1418639	28216	535010	894340
"	1369436	26956	516060	861710
2.50	1429322	25507	512500	858620
"	1390076	24749	496130	831280
3.50	1442052	23970	509650	848810
"	1465079	24618	527390	877610
4.50	1526606	24875	542190	896330
"	1538057	24770	539500	891340
5.50	1566646	24235	543180	897040
"	1586686	25045	553500	911530
6.50	1663639	25413	576850	943910
"	1660054	25977	581620	952880
7.50	1676638	26011	584910	956480
"	1689502	26991	599640	978640
8.50	1685623	27100	598570	970490
"	1702582	27269	605190	980850
9.50	1698176	27713	605480	977580
"	1727375	28419	614160	994950
10.50	1688980	28840	603560	977760
"	1690806	29031	601320	975720
11.50	1644678	29275	588130	942900
"	1692842	29717	593030	950720

Exp. 43-B

Lift	I/N	II/N	III/N
4.50	61.37 61.73	21.79 21.79	36.03 36.01
"	62.09	21.78	35.98
5.50	64.64 63.99	22.41 22.26	37.01 36.70
"	63.34	22.10	36.39
6.50	65.46 64.68	22.70 22.54	37.14 36.91
"	63.90	22.37	36.68
7.50	64.45 63.52	22.49	36.77 36.52
"	62.59	22.21 22.35	36.26
8.50	62.19 62.31	22.08 22.14	35.81 35.89
"	62.43	22.19	35.96
9.50	61.27 61.02	21.84 21.69	35.27 35.14
"	60.77	21.61	35.01
10.50	58.56 58.40	20.93 20.78	33.90 33.76
"	58.24	20.71	33.61
11.50	56.17 56.57	20.08 20.02	32.20 32.10
"	56.96	19.95	32.00

3/7/60 Exp. 43-B

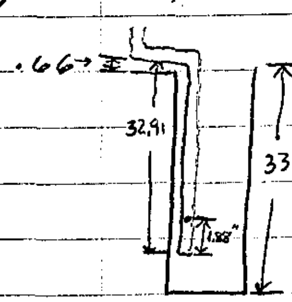
Lift	I/N	II/N	III/N
11.78	52.70 52.82	19.69 19.69	31.18 31.22
"	52.93	19.68	31.26
11.00	56.50 56.80	20.24 20.40	32.49 32.72
"	57.11	20.55	32.95
10.00	58.28 58.90	20.97 21.07	33.65 33.90
"	59.55	21.16	34.16
9.00	61.39 61.20	21.81 21.87	35.35 35.33
"	61.02	21.92	35.30
8.00	62.78 62.16	22.18 22.05	36.25 35.94
"	61.54	~~35.60~~ 21.91	35.63
7.00	64.63 65.11	22.49 22.41	36.74 36.62
"	65.58	22.34	36.53
6.00	64.05 63.83	22.44 22.35	36.75 36.53
"	63.60	22.26	36.31
5.00	61.78	21.90 21.98	35.88 35.97
"	61.15 61.47	22.06	36.05
4.00	58.66 58.38	21.09 20.91	34.84 34.58
"	58.09	20.72	34.33
3.00	56.01 55.99	20.32 20.30	33.85 33.82
"	55.97	20.27	33.78
2.00	52.78 52.57	19.54 19.50	32.66 32.62
"	52.35	19.47	32.58
1.00	47.47 47.59	18.69 18.65	30.95 30.94
"	47.70	18.60	30.92
1.50	50.27 50.54	18.96 19.05	31.69 31.84
"	50.80	19.14	31.96
2.50	56.03 56.10	20.09 20.07	33.66 33.62
"	56.16	20.05	33.58
3.50	60.15 59.83	21.26	35.41
"	59.51	21.42 21.34	35.64 35.49

Note: after exp. 43-B it was discovered that the orientation of Reg II counter was off due to repair work on chamber before experiment. The orientation was such that the chamber was 103° from zero when selsyn read zero.

Reg I normalized by div. power nor. counter by value in center: ~ 65 instead of value used in expt 44 B.

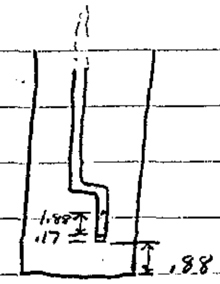
3/7/60 A recheck of height of counters relative to selsyn reading was made (BF_3)

I/



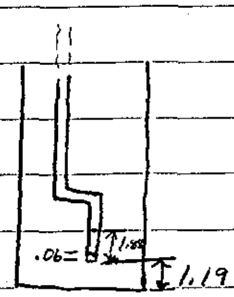
This is drawing corresponding to Selsyn = 1.00" for #I. It follows that height of center of active chamber is 2.70" above bottom at this selsyn reading

II/



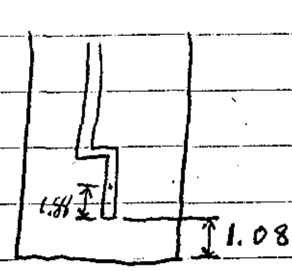
Drawing at left corresponding to Reg II at selsyn reading of 1.00 {measurement of .17 is due to plastic coating on bottom}.
It follows that center of active chamber of Reg II is 2.93" above bottom when selsyn reads 1.00

III/



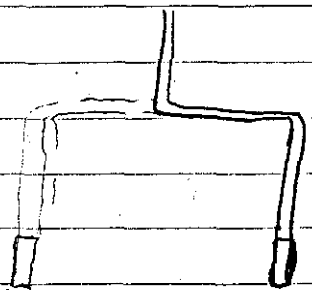
Drawing at left corresponds to Reg III at selsyn reading of 1.00. Distance of center of active chamber above bottom is 3.13

IV/



Reg. IV counter at selsyn reading of 1.00. Distance of center of active chamber above bottom is 2.96"

Recheck of diameter of rotation of chambers II & III



#II counter	$\leftarrow 4\frac{25}{32} \rightarrow$	$\leftarrow$ 3" down from sleeve
	$\leftarrow 4\,6/8 \rightarrow$	$\leftarrow$ 15 3/4 down from sleeve
# 3 counter	$\leftarrow 7.5 \rightarrow$	$\leftarrow$ 2 7/8" down
	$\leftarrow 7\,7/16 \rightarrow$	$\leftarrow$ 9 3/4 "
	$\leftarrow 7\,3/8 \rightarrow$	$\leftarrow$ 15 1/4 "

Exp. 44-A

Bare BF_3 radial traverse at Center

3/8/60 Reg I selsyn zeroed with chamber just against wall ~~[illegible]~~ — center is at selsyn reading of 512

Lift ht. = 7.02 i.e. selsyn reading (see notes p 148)

Crit with D_2O = 73.49, Fuel = 18.01*

Reg I	Rot	I	N	II	III	IV
		10^{-4}	~ .009			
10.0 12^{45} pm	360	1031444	30916	802160	974450	12830
"	"	1053988	31642	813370	993330	12880
40	300	1203085 ~~216001~~	29861	707930	951270	16710
"	"	1179737	28592	689770	926670	16370
80	260	1399310	28899	585920	970420	—
" 1^{00} pm	"	1468398	29871	613250	2009650 ?	27290
"	"	1529824	31171	630730	1052130	28950
120	220	1671199	30728	519630	1100600	53150
"	"	1587720	28478	490070	1038480	50260
150	200	1703984	28662	467170	1071470	69880
" 1^{10} pm	"	1722728	28817	472400	1082930	71210
180	180	1796296	29042	458170	1126050	104320
"	"	1798391	29585	465270	1132760	104690
200	160	1846313	29120	455540	1143450	149290
"	"	1832660	29122	455320	1135810	148450
240	140	1854137	28936	458540	1124590	201560
"	"	1845613	28472	455980	1119560	201150
		power lowered to ~ .005				
240	140	1154690	16675	270520	681220	116150
280	120	1173988	16304	279970	662470	151580
"	"	1148391	15980	275100	650980	148560

* new monometer installed (no float) and zeroed.

Full reading ~ 17.95

Reg I	Rot	I	N	II	III	IV
320	102	1148168	15726	285780	610440	188010
"	"	1156669	15264	281620	607500	187230
361	80	1102958	14629	312880	544800	229480
"	"	1063025	13859	299980	525360	219900
400	41	928727	12279	381170	388650	265220
" 2:00 PM	"	461529	12576	392150	400990	273530
450	0.0	933890	12226	487940	331900	309200
"	"	873509	11702	467320	313610	292280
"	"	1205276	16453	735270	501910	472000
500	60	$\boxed{1109855?}$	$\boxed{1505?}$	544580	721880	404090
" 2:20 PM	"	1460974	19993	508760	673960	375160
"	"	1412477	19196	491010	650750	360800
540	140	1710520	23022	354520	915750	152070
"	"	1792430	24136	376080	965970	161410
480	200	1379836	18409	295790	698860	45200
"	"	1319879	17227	279330	663870	42590
430	260	1269507	16943	339240	580750	15710
"	"	1287031	17391	344860	590740	15920
380	300	1230052	16397	396760	534390	9060
" 2:48 PM	"	1222857	16274	394610	531980	9090
300	322	1221788	16846	424430	529570	7620
"	"	1276284	17426	441160	553840	7920
240	360	1157957	16366	421950	517350	6570
"	"	1129491	15898	414160	506610	~~4063~~ 6320
200	340	1054229	15168	396630	483910	6310
	"	1022786	14593	379550	464380	5920

44-A

	Reg I	Rot	I	N	II	III	IV
Reg	140	240	955960	14770	283350	536270	17340
	" 3:13 pm	"	989596	15474	281860	542070	17340
0.0	80	180	846665	14804	231740	591930	48080
"	"	"	831449	14892	224830	583050	48320
40	40	140	689522	14497	222070	580840	93630
"	"	"	693995	14306	224110	587410	95630
80	0.0	100	526744	14712	260580	565040	169420
"	"	"	496770	14314	258460	545530	164120
"							
120							
"							
150							
" 1:10 PM							
180							

" The plot of the above data shows a good deal of
200 scatter in Reg. I. A check of reproducibility of position
" of counter one showed some variation, especially in
240 the direction perpendicular to the direction of
" travel. A new guide was assembled consisting of two
3"x1"x1/10" pieces of plexiglas with two 1/4" plexiglas placed between
240 them (plus shims) placed on top of center cylinder. This serves
280 as a guide both in the direction of travel and vertically.
" After installing guide, Reg I counter centered and zeroed. Selsyn = 513 at center and 9999 when chamber just touches wall

Control blade guide installed.

Exp. 44-A

Reg I	Rot pos	Reg I N	Reg II N	Reg III N	Reg IV N
500	60	~~737~~			
"	"	731 734	254 255	3371	18.76
"	"	736	256	3390 33.80	18.79 18.88
540	140	743 743	154 153	3977	6.605
"	"	742	156	4002 39.90	6.687 6.644
480	200	750 758	1605 161	38.72	2.455
"	"	766	162	38.53 38.63	2.472 2.464
430	260	780	200	3427	.9273
"	"	740 745	198 199	3396 34.12	.9154 .9214
380	300	750 751	242	3259	.5525
"	"	752	242 242	3270 32.65	.5586 .5555
300	322	726 729	252	3143	.4523
"	"	732	253 253	3178 31.61	.4544 .4532
240	360	708 70.7	258	31.61	.4014
"	"	706	259 25.9	3186 31.70	.3975 .3995
200	340	695 69.7	261	3190	.4160
"	"	700	2601 26.1	31.82 31.86	.4058 .4109
40	240	648 64.4	192	3630	.1174
"	"	640	182 18.7	3503 35.68	.1121 .1148
80	180	572 565	1563	3998	3.247
"	"	558	151 15.4	3915 39.57	3.245 3.246
40	140	476 480	153	4006	6.458
"	"	4849	1566 15.5	4105 40.56	6.683 6.575
0	100	3580 35.2	1771	3840	11.52
"	"	3470	1805 17.9	3810 38.25	11.46 11.49
"					
"					

Exp. 44-A Radial traverse, Bare ~~[illegible]~~ BF_3 chambers

Reg I Pos.	Ref Pos.	I/N		II/N		III/N		IV/N	
[illegible]	360	3335	333	2595	258	3153	3145	415	411
[illegible]	11	333		2570		3140		407	
[illegible]	300	403	408	2372	239	319	321	560	564
[illegible]	11	413		241		324		572	
[illegible]	240	485	489	203	203	336	33.7	—	
[illegible]	11	492		205		–		914	920
11	11	491		202		337		928	
[illegible]	220	544	550	169	171	361	36.3	1730	1740
11	11	558		172		365		1765	
[illegible]	200	595	59.7	163	164	374	375	244	2455
[illegible]	11	598		164		3757		247	
[illegible]	180	618	613	1575	157	3877	386	3592	356
[illegible]	11	608		1572		3828		3538	
[illegible]	160	634	631	1565	156	3926	391	5127	5110
[illegible]	11	629		1563		3900		5098	
[illegible]	140	~~641~~	670	1584	160	3886		6960	7000
[illegible]	11	648		1602		3932	395	7064	
11	11	693		1622		4085		6965	
280	120	720	719	1717	172	4063	407	9297	9295
11	11	718		1722		4073		9296	
320	100	731	743	1815	183	3882	393	1195	1210
11	11	757		1845		3981		1226	
361	80	754	760	214	215	3724	375	1568	1575
11	11	767		216		3791		1587	
400	40	756	760	310	311	3165	317	2160	2165
11	11	765		312		3188		2175	
450	0	764	755	399	39.9	2715	270	2529	251
11	11	746		399		2679		2497	
11	11	~~732~~		~~4469~~	?	~~3051~~		~~2869~~	

Exp. 44-B

3/10/60

Radial traverse with Bare BF_3 chambers

Lift position 7.02 (center vertically of active chambers)

$D_2O \cong 73.63$, Fuel = 17.98

IC-4 = .005

Reg I	Rot	I	N	II	III	IV
5.13	0.0	1266349	15663	672190	430390	386,530
5.13 10^{07}	0.0	1230227	15112	645620	415740	390790
" 10 AM	"	1240749	15606	651550	421820	395410
"	"	1260721	16041	661020	430300	402710
"	"	1288312	16048	671120	437370	410101
"	"	1319390	16789	690290	452210	423560
"		1369829	17477	718010	468870	437550
" 10^{25}	"	1358306	17404	711580	464190	436330
"	"	1310474	16755	683770	447100	417760
"	"	1277108	16172	662350	432650	403470
"	"	1246036	15509	647200	422270	394250
		Note: above counts in reg. I are to be used as normilization counts for BF_3 chambers.				
540	40	1241105	15581	499770	490300	337100
"	"	1222338	15087	488790	481560	331120
480	80	1357691	16972	379600	631690	262050
"	"	1464598	18629	410210	686440	285950
440	120	1648172	21306	372540	839830	192140
" 10^{42} AM	"	1694846	22337	384000	868230	199400
400	160	1009273	12586	204370	501190	56090
"	"	971669	12032	197540	483160	54160
360	200	1025300	12861	215350	487110	28140
"	"	1090318	13846	229840	518600	30260

44-B (cont.)

Reg. I	Rot	I	W	II	III	IV
300	240	1090132	13851	262430	487340	15490
" 11^{08}	"	1071347	13901	259420	480300	15240
260	280	1049083	13553	303040	444790	8530
"	"	1076556	13993	310920	454060	8720
"	"	1084335	13956	312630	460550	8930
210	320	1013019	13419	341490	422740	5750
"	"	976402	12756	326680	405980	5430
160	360	934292	12752	336520	404450	4820
"	"	1026716	14197	375080	451920	5530
100 11^{27} AM	280	1016810	16178	359610	527940	10020
"	"	1009942	16036	354230	520020	10020
40	240	810178	15700	292400	549460	17070
"	"	812344	15782	291830	548600	—
"	"	813480	15842	292200	550760	17300
0.0 11^{40} AM	200	664159	15947	264660	607980	35300
"	"	680447	16561	268190	614790	36290
60	140	888329	15749	259390	681170	100380
"	"	890257	16022	258370	632390	102110
120	100	1044548	15884	297520	602440	186510
"	"	1040144	16101	296470	601380	186620
180	50	1059609	14742	411640	468480	288820
"	"	1057251	14824	409140	465250	285630
240 12^{00} AM	0.0	1039490	13771	529850	353260	325350
"	"	1041118	13606	529400	353040	325340
320	100	1207882	15345	286330	581290	178290
"	"	1148164	14593	273450	555650	170490
380 12^{10} AM	160	1164604	14285	230440	577250	65810
"	"	1145808	14273	224240	560550	63400

Exp. 44-B Radial traverse after installing guide

Reg I	I/N	II/N	III/N	IV/N	Rot. Pos.
513					0,0
	8084	4291	2747	2467	"
	8130	4272	2751	2585	"
	7950	4174	2703	2533	"
	7861	4120	2682	2510	"
	8026	4181 ±	2725	2555	"
	786 79.34	4111 41.3	2693 27.01	2522 25.19	"
	784	4108	2682	2503	"
	780	4089	2667	2507	"
	782	4080	2668	2493	"
	7895	4095	2675	2495 Omitted	"
	8015	4173	2722	2542	"
389	796	3205	3145	2163	41
	~~810~~ 803	3243 322	3193 317	2194 218	"
380	800 793	2235	372 371	1544 1540	81
	786	220 222	3685	1535	"
340	774	1748	398	9018 8969	120
	757 767	1720 ~~2263~~ 1734	384 393 39.66	8920	"
310	802 799	1623	3982	4456 4479	160
	796	1640 1632	4015 3999	4501	"
300	797 793	1675 1668	3787 3766	2188 2187	200
	788	1660	3745	2185	"
300	787 779	1895 1880	3518 349	1118 1107	240
"	770	1865	346	1096	"
260	774 771	2233 223	328	6293 6307	280
"	768 773	222	324 327	6231	"
~~[illegible]~~ "	777	224	330	6398	~~320~~ "
210	~~755~~ 764 761	2545 251	315 317	4284 4270	320
"	766	2562	3182	4256	"
160	733 728	2638 2640	3171 318	3779 3837	360
"	~~[illegible]~~ 723	2642	3183	3895	"

Exp. 44-B

Reg I	Rot. Pos	Reg I / N	Reg II / N	Reg III / N	Reg IV / N
100	280	628	222	326	6193
"	"	631 63.0	221 222	325 326	6248 .6221
40	240	516	1863	350	1087
"	"	515 51.9	1848 18.52	3475 34.8	— 1.090
"	"	527	1845	347	1092
0.0	200	4165	1658	381	2213
"	"	411 41.4	162 16.4	371 37.6	2191 2202
60	140	561 55.9	1647	401 39.8	6373 6.373
"	"	556	1613 16.30	395	6373
120	100	658 65.2	1873 18.69	379 37.7	1174 11.67
"	"	646	1863	3735	1159
180	50	719 71.6	279 27.8	318 31.5	1959 19.43
"	"	713	276	312	1926
240	0	755 76.0	3845	2565 25.80	2362 2374
"	"	765	389 38.7	2595	2390
320	100	787 78.7	1865 18.70	379 38.0	1161 11.65
"	[illegible]	787	1875	381	1168
380	160	815 80.9	1614 16.42	406 39.4	4606 4.524
"	"	802	1570	3925	4441
420	180	807 81.3	1575 15.92	3842 38.78	3164 32.02
"	"	819	1608	3915	3240
513	220	815	1763 m	3695 m	1621
"	"	794 80.3	1700 m	3565 m	1558
		8079	1738	3640 m	1587

Reg I Rot		I	N	II	III	IV
420	180	1156002	14335	225760	550140	45370
"	"	1166763	14243	229210	558280	46140
513	220	1222641	14993	264760	554250	24310
"	"	1270036	15999	272130	570750	24630
"	"	1305001	16152	280830	587970	25640
Temp 12^{25} pm		#11, 1037	#12, 1080	#14, 1110	#15 1020	
12^{24} pm		Shut down				

3-11-60

Expt 44 C

Reg. I counter in center of Reg IV

IC4 -.035 Fuel - 1802, D_2O - 7337

normalizer i.e. Reg I chamber, in Reg IV

#1 chamber in Reg. IV	Normalizer (power level)	IV/N	#1 in IV	Norm	IV/N
267291	108888	2455	272955	116503	2342
275251	112293	2451	279296	119328	2340
279360	115112	2427	277004	119216	2323
281643	117508	2396	281718	121512	2319
285660	119268	2395	279846	121289	2307
283466	118787	2386			
281832	118202	2384			
280299	117141	2392			
277373	117241	2365			
272580	115543	2359			
268773	114011	2357			
269236	114956	2342			

Note!
10^{00} am 3/11/60
It was found that background counts on counters were

#I	II	III	IV
4500 c/m	1400	160	7

~~High voltage~~

 3/11/60

Amplifier settings: BF_3 chambers {settings have not been changed from previous BF_3 traverses.

	Gain	Risetime	PDL
I	16	0.8	9
II	16	0.8	8
III	16	0.8	30
IV	16	0.8	8

[change in Reg I PDL made on 3/17/60, p. 168]

High voltage for I & III = 1650
" " " II & IV = 1650 also but meter reads 1500

9^{48} The above counts (p. 155) show drift. Shut down. Reg I, II, III had spurious background count as shown on 155

Normalizer (i.e. Reg I chamber) in Reg. IV

	I	N (power)	II	III	IV
10^{55} AM	491,298	230531	2849410	4136890	385980
	490079	231662	2840470	4151840	386320
	491094	232965	2838830	4157960	387070
	438919	209820	2817670	4148160	384970
	491182	235104	2828550	4156520	387220
	471028	224080	2715990	4109660	368220
	457195	221267	2669660	4086650	361430
	449173	217361	2618070	4061110	353690
	443904	215158	2591610	4045180	348990
	459751	220423	2648300	4089410	359150
	473312	229497	2709380	4135460	371870
11^{25}	469093	226462	2678860	4108180	368190
	464039	224191	2655730	4096990	364460
	461639	223602	2639840	4097340	362520
	462243	223568	2639520	4097340	362610
	463632	224836	2639270	4102180	363100

een changed
revious - BF_3
rses.

n RaI PDL -
3/17/60, p. 168

eads 1500

!. Shut
s shown

5980
320
7070
34970
87220
168220
361430
353690
348990
359150
371870
368190
364460
362520
362610
363100

3/11/60

Exp. 44-C

Data for second series of counts

I/N	I/IV
~~2131~~	1272
~~2115~~	1268
2108	1268
2091	1140
2089	1268
2102	1279
2066	1265
2066	1270
2062	1271
2085	1280
2062	1272
2071	1274
2069	1273
2064	1273
2067	1274
2062	1276
2056	1275

I/N shows slight trend down in early counts, then seems to level.

I/IV gave no trend.

~~Normalizer~~ may ~~have drifted~~.

1/05 Reg I chamber, as normalizer, centered in vent hole of Reg III.

Reg I Counter	Normalizer (~~mag~~ power)	IV	Reg I ch / N	I/IV
1,328,803	53,062	85000	25.04	15.63
1324758	53272	84510	24.86	15.47
1321572	53217	85420	24.83	15.47
1319834	53383	84850	24.72	15.55
1325449	52999	85100	25.01	15.57
1325037	53020	84320	24.99	15.71
1326337	53187	84360	24.94	15.72
1323074	52466	84200	25.12	15.71
1321994	53299	83520	24.80	15.83
1307356	52367	83360	24.96	15.68
1304982	52939	83560	24.65	15.62

ave. = 24.90 ave. = 15.63

Reg I Counter placed back in center of Reg. I

1276968	15608	23120	81.81	55.23
1295300	15880	23940	81.57	54.10
1325743	16520	25170	80.25	52.67
1324242	16410	25160	80.70	52.43
1360929	16894	25810	80.55	52.70
1379046	16992	26270	81.16	52.49
1386347	16973	26600	81.67	52.12
1385593	17240	24810	80.30	51.68
1396918	17217	26870	81.13	51.98
1403641	17267	27010	81.29	51.97
1418370	17590	27720	80.63	

ave. = 81.00

	Reg I	Nor	IV	Reg I/N	I/IV
3/11/60	140 1875	17312	27010	8097	5190

$3^{\underline{00}}$ P.M. Reg I counter placed in center of Reg II vent (also centered vertically)

Reg I	Norm. (power)	IV	I/N	I/IV
280755	36076		7782	
278236	35536		7829	
276560	35028		7895	
272722	35063		7777	
275460	35438		7773	
273065	34807		7845	
272684	35021		7786	
270277	34634		7803	
276073	35184		7846	
276213	35483		7784	
277879	35574		7811	
277650	36277		7653	
278828	35997		7745	
278304	36118		7705	
279151	36061		7741	
		av.	7.785	

3/15/60

2^{00} pm Cd covered BF_3 counters installed in I, II, III & IV
~~Reg I counter selsyn zeroed when cd covered counter just touches wall~~ Reg I selsyn reads 499 when chamber at center and 998 when chamber just touches wall

Exp. 45

Cd-Covered BF_3 counters Vertical traverse

Reg I selsyn = 499 ; Rot. pos selsyn = 160 ; Fuel sel. = 18.80 ; D_2O = 79.90

Lift pos	I	N	II	III	
11.78 3^{00} PM	193010	270986 ?	597710	157320	See note p. 160
″	188899	206796	594130	157660	
″	189585	204840	577130	153470	
″	182818	204452	581750	152070	
11.02	207297	215115	640300	170040	
3^{15} ″	210238	219839	646990	172680	
10.00	208188	208858	646930	176500	
″	210692	207500	646260	176060	
9.00	179724	182722	586470	160210	
″	176155	181039	581460	159640	
8.00	178688	177011	571340	161920	
″	178818	178958	573270	164750	
7.00	176112	178032	574040	165780	
″	178073	181095	576160	167930	
6.00	118669	63710	213390	59230	
″	115332	61239	204720	56970	
5.00	77068	40506	133980	37170	
″	66044	34855	114330	31420	

Exp. 45

3/15/60

Lift	I	N	II	III
4.00 3 pm	67391	34265	110160	30090
"	63621	33976	108000	29840
3.00	70634	39626	121080	33030
"	70311	39929	121250	32920
2.00	74319	40922	116940	31670
"	77124	42047	115350	32130
1.00	83042	45562	112800	31360
"	84838	45333	112510	31580
2.50	70464	40236	115250	32110
"	67744	38078	111770	30170
4.50	53034	28650	98160	25280
"				

It was discovered that Reg I counter had been lowered against the guide above the center cyl. and counter was bent considerably, hence Reg I counts not good

Counter was straightened and put back in center of region

After straightening the counter was .09" higher at a given selsyn reading

Exp. 45 Vertical traverse

Lift position	I/N	II/N	III/N
11.78	7122 ?	2206 ?	?
"	9134	2873	7624
"	9256 .9110	2818	7492
"	8942	2845	7438
11.02	9636 .9600	2976	7902
"	9563	2943 2960	7854 7878
10.00	.9967 1.006	3097 3104	8450
"	1.0154	3115	8486 8468
9.00	.9835	3211	8768 .8789
"	.9734 .9784	3212 3.212	8810
8.00	1.0094 1.0046	3227	9146 .9178
"	.9994	3205 3.216	9209
7.00	.9893	3225	9308
"	.9834 9864	3181 3202	9271
6.00	1.862	3349	9296
"	1.882	3342	9302
5.00	1.902	3307	9175
"	1.894	3279	9010
4.00	1.966	3214	8781
"	1.872	3178	8782
3.00	1.782	3055	8334
"	1.760	3036	8244
2.00	1.816	2856	7739
1.00	1.834	2743	7641
"	1.822	2475	6883
2.50	1.751	2864	7980
"	1.779	2935	7923
4.60			

3/16/60

Exp. 46

Vertical traverse: Cd-covered BF_3 chambers

Rot. pos. 160

Lift	I	N	II	III
.80	103289	126054	326050	86410
"	100390	123659	318240	85050
2.00	82131	86827	254660	67910
" .9 3/	74060	78105	229300	61120
3.00	102290	103520	327020	88640
"	105706	107258	337810	91280
4.00	97049	95830	321810	86060
"	91755	91979	308150	82760
5.00	80416	81054	279040	74500
"	76895	77615	267780	71480
6.00	82423	70652	255490	66340
"	77103	70778	250520	65210
7.00	78310	68949	245150	63620
"	87140	68312	242720	62430
8.00	93736	71550	254050	65220
"	92797	74406	261050	67260
9.00	99652	83946	290110	73170
"	93506	83963	287840	73020
"	94769	84276	285810	73700
"	101949	85457	291730	75250
10.00	117115	112779	362350	93950
" 10 3/	126293	122771	388880	102360
"	132991	128138	407620	106050
11.00	137973	147674	440810	113470
"	140207	148677	442740	114060
"	139017	151471	450450	115790

Shift.	I	II	III	IV
11.78 10 3/ Am	150817	176073	492930	127170
"	153466	175534	491300	126010
"	148160	169052	472680	120970
10.50	118704	123670	382620	98350
"	112773	119615	368240	94670
"	106355	119530	368110	93930
8.50	89584	95551	318500	83960
"	85368	91608	305340	79380
"	88273	91753	301950	79640
7.50	85714	87302	291440	77850
"	86254	86496	289790	77210
"	84681	85431	286580	76630
6.50	85149	88733	298560	80180
"	86613	90743	303601	81600
"	89108	93111	312750	84450
5.50	96841	102611	339710	92380
"	101317	105225	344530	94840
"	102989	106327	348790	96180
"	102808	104843	341550	94080
3.50	129071	142350	432000	121060
"	137202	152974	461160	129270
"	126507	139502	427690	118670
1.50	152516	182020	477490	135130
"	148312	182957	474640	134280
" 11 3/ Am	149082	182204	472020	134170

11^{25} Shutdown.

Exp. 46

Dist	I/N	II/N	III/N	Dist	I/N	II/N	III/N
.8	.8191	2586	6852	8.50	9375	3333	8787
.8	.8122 8157	2574 2580	6881 6866	"	9318 9347	3333 3333	8665 8726
2.00	.9459	2932	7821	"	9620	3291	8680
"	.9482 9471	2935 2934	7825 7823	7.50	9818	3338	8917
3.00	.9881	3159	8564	"	9972 9900	3350 3347	8926 8922
"	.9855 9868	3149 3154	8510 8537	"	9912	3354	8969
4.00	1.0127	3358	8980	6.50	9596	3364	9036
"	.9978 1003	3350 3354	8997 8989	"	9544 9557	3345 3355	8992 9030
5.00	9921	3442	9191	"	9570	3358	9069
"	9907 9914	3450 3444	9209 9200	5.50	9437	3311	9004
6.00	1.1166 1.128	3616	9389	"	9629	3274	9013
"	1.0893	3538 3577	9213 9301	"	9685 9639	3280 3292	9045 9010
7.00	1.1357	3550	9227	"	9806	3259	8977
"	1.2756 1.206	3553 3552	9138 9182	3.50	9069	3034	8507
8.00	1.310	3551	9115	"	8969	3014	8452
"	1.247 1.279	3508 3530	9039 9077	"	9068 9035	3065 3038	8506 8488
9.00	1.187	3455	8715	1.50	8379	2623	7423
"	1.1136	3428	8696	"	8104	2594	7341
"	1.1245	3391 3422	8745 8740	11 3/4 "	8183 8222	2590 2602	7365 7376
"	1.192	3414	8805				
10.00	1038	3213	8330				
"	1028 1034	3167 3186	8340 8315				
"	1037	3180	8276				
11.00	9343	2985	7684				
"	9430 9371	2977 2978	7674 7666				
"	9174	2973	7642				
11.78	8544	2799	7221				
"	8743 8689	2799 2797	7180 7184				
"	8761	2795	7153				
10.50	9598	3093	7952				
"	9427 9307	3078 3083	7910 7906				
"	8898	3080	7858				

omit

3/16/60

Repeat of Reg I
(Vertical, Cd-covered)

2^{00} pm Reg I shows considerable scatter especially in center portion of travel. Counter was coated (after this was discovered) with grease to increase insulation from water.

Counts below are for purpose of determining if this will lessen scatter

Lift	I	N	I/N	
11.78	111620	130721	853	.8472
	115749	135346	855	
	119996	142685	841	
	126407	149604	845	
	124264	147649	842	
7.00	104323	105576	1.007	1.005
	103661	102759	1.009	
	~~102853~~	~~101680~~	~~1.011~~	
	100500	100984	.9952	
	~~100625~~	100396	1.002	

Counts seem consistent, continue traverse

2^{37} pm	8.00	103275	104175	.9913	.9829
	"	104574	107309	.9744	
	"	104582	106332	.9830	
	9.00	109949	113622	.9676	.9847
	"	114882	115798	.9920	
	"	120947	121593	.9947	

3/16/60

	Lift	I	N	I/N	
	10.00	124744	134171	.9290	
	"	125432	135177	.9278	.9280
2 50 pm	"	127265	137220	.9274	
	11.00	145192	165364	.8780	
	"	139652	157296	.8878	.8894
	"	137502	152231	.9032	
	10.50	127505	140625	.9068	
	"	125135	139229	.8987	.9112
	"	126939	136748	.9282	
3 03 pm	8.50	114093	103445	1.103	1.081 ?
	"	100965	99332	1.016	
	"	109072	97044	1.123	
	7.50	101094	91979	1.099	1.063 ?
	"	94643	91511	1.034	
	"	95393	90285	1.056	
	6.00	102520	89589	1.144	?
		183770	91247	2.013	
		98403	92564	1.063	
		94040	94346	.9967	
		96034	96813	.9919	.981
		96275	98947	.9727	
		100171	101874	.9833	
		99727	101953	.9781	
		102648	104814	.9793	
	5.00	110519	115344	.9582	.9636
3 30 pm	"	112980	116398	.9706	
	"	110924	115311	.9620	

3/16/60

	Lift	I	N	I/N	
	4.00	122155	130958	.9328	
	"	123629	130847	.9448	.9408
	"	118577	125459	.9448	
	3.00	120608	136538	.8833	
	"	122598	138579	.8845	.8849
	"	122305	137878	.8869	
	2.00	121114	145566	.8319	
	"	117110	141233	.8292	.8299
	"	115578	139471	.8287	
	1.00	144464	187171	.7718	
	"	155822	201720	.7724	.7634
	"	152409	204312	.7460	
3 55 P.M.	1.50	150036	192967	.7775	
	"	158429	200262	.7911	.7893
	"	161726	202287	.7994	
	3.50	126605	139476	.9075	
	"	125072	139881	.8941	.8997
	"	126219	140586	.8977	
	5.50	101828	105581	.9644	
	"	98868	102107	.9682	.9646
	"	95347	99180	.9613	
	6.50	92558	94884	.9754	
	"	92893	94197	.9861	.9808
4 18 P.M.	"	91899	93686	.9809	
	7.50	94427	96819	.9752	
	"	97341	98217	.9910	.9799
	"	97699	100359	.9734	

 3/16/60

Since repeat points (going up) seem lower this repeat was made by raising left and lowering to 7.00

	Lift	I	N	I/N	
	7.00	97697	98719	.9896	
	"	96827	98676	.9812	.9842
$4\frac{25}{pm}$	"	95787	97553	.9818	
approached going up →	9.00	117493	123337	.9526	
	"	121873	127788	.9536	.9473
	"	124128	132647	.9357	

$4\frac{35}{pm}$ Shut down

Temp at ~ 3:30 pm:

#12	#14	#15
1000	1129	1091

Exp. 47
Radial traverse: Cd-Covered BF_3 Chambers

9:00 Guide for Reg I counter was reinstalled and counter "re-youed". Selsyn = 999.41 when counter touches wall and selsyn = 445 at center.

Not good — See page 168

Lift selsyn = 7.00

Reg I	Rot	Reg I	N	Reg II	Reg III	Reg II
						Log N = .04
509	52	179206	166608	574740	289080	—
						Log N = 1
509	52	313211 ?	308880	987390	520000	
"	"	300088	298602	941320	498310	
"	"	294841	291716	912880	482810	counter in Reg I
445 $\frac{10\,43}{44}$	90	294768	294894	938920	430300	giving same
"	"	~~319496~~ 315494 ?	293539	929540	426450	difficulty as
"	"	315969	291076	923070	422610	before
"	"	284766	287787	905360	414920	
"	"	280292	287302	—	—	
"	"	279132	284172	—	—	
"	"	272720	280624	—	—	
"	"	304049	313291	—	—	
"	"	464504	361532			
"	"	355753	352753			
"	"	345477	344031			
		314082	330502			
		319585	328427			
		316199	331409			
		310123	326071			

Because of bad counts we shut down. Rohrer found counts being thrown ~~to~~ into Reg I counter. Discriminator setting to be adjusted (see below)

$3^{\underline{00}}$ PM Counter replaced in Reg I and re-zeroed. Selsyn = 999.50 when counter touches wall. Since stroke is same as before, center corresponds to selsyn reading of 454.

~~Exp. 47 continued~~

~~Reg I Rot~~

~~510 40~~ Discriminator setting on Reg I amplifier changed to 12 (from 9 as per page 156).

5964
5987

20

Counts to check Reg I after Discriminator changed to 12

3/17/60

Reg I/N

608		
604		
602		
598		
597		
599	143741	240048
597	143715	240655
591	141111	238421
597	144227	241414
602	146231	242779
594		
592	144864	244789

3/18/60

Exp. 47

Radial traverse; Cd-covered BF_3 chambers

Lift = 7.00 Fuel ≈ 22.2 ; D_2O ≡ 81

Reg I	Rot	I	N	II	III	IV
510	41	86282	144382	493310	250610	11510
" 8 45/AM	"	79547	132990	452990	230540	10510
"	~~80~~ "	78893	131659	434660	227980	10090
"	"	77609	129177	417560	220280	10300
"	"	75487	125707	408490	216510	9900
480	80	138967	239759	791430	364470	10410
"	"	133561	231662	765440	352850	9910
440	120	173999	300826	977020	375740	5400
"	"	191477	328549	1048790	408070	5950
280	140	317291	480532	1455550	516140	5260
"	"	232451	357190	1105500	382730	3680
"	"	225541	348120	1074140	371940	3720
240	160	259,182	381,155	1160980	358100	2660
"	"	264596	391707	1192070	367000	2790
200	180	298775	412543	1225230	—	1870
"	"	305478	~~30~~ 422136	1242840	332590	1820
"	"	302686	416266	1227160	328860	1850
160 9 35/	200	328465	423646	1215760	284940	1300
"	"	332422	426589	1223630	286600	1280
120	240	376973	450748	1226720	219740	770
"	"	369991	444993	1214050	216820	740
"	"	368074	443389	1209300	215500	770
80 10 45/AM	280	358850	414196	1112280	153410	460
"	"	366419	424301	1130840	156030	450

Reg I	Rot	I	N	II	III	IV
~~40~~	~~320~~					
40	320	387337	425778	1114150	132020	360
"	"	387727	428019	1125280	133390	350
999.50	320	379666	387580	1014870	118400	320
"	"	373035	381170	994050	116820	300
0.00	300	347948	367532	966800	120240	330
	"	366799	387530	1004660	125950	340
320	260	318334	527376	1388470	223560	670
"	"	326055	540959	1416080	229080	720
360	220	300466	513387	1395830	294290	1120
"	"	298143	508420	1386750	291480	1040
400	190	245700	434752	1224860	314910	1590
"	"	234408	415106	1185300	303370	1480
460	150	170866	311438	926580	306290	2520
"	"	167071	305338	911010	301700	2560
490	120	123841	226217	682970	266710	3760
"	"	127971	232349	703740	275180	3880
260 10 43/AM	90	104271	168106	507610	232370	5730
"	"	97369	157789	475750	215900	5080
220	50	93533	144755	440220	227580	9550
"	"	97028	148841	454980	535330	10070
180 11 00/AM	100	157159	221390	678300	289800	5840
"	"	156089	220987	676850	289200	5770
100	140	220369	263925	076410	276660	2780
"	"	225664	271732	787650	283130	2880
50 11 10/AM	180	248776	276924	778130	209710	1210
"	"	241748	268268	762240	204320	1110
-10	210	235135	244755	683320	~~300320~~ 146000	600
"	"	241590	252398	697400	151120	600
11 25		Shut down				

Exp. 47

	Reg I	Rot	I/N	II/N	III/N	IV/N
	510	41	598	3416	1735	7920
	"	"	598	3406 3.321	1734	7902
570	"	"	599	3302	1731 1.72	7740 .7892
	"	"	601 .5994	3232	1705	7973
	"	"	601	3249	1722	7875
	480	80	579 .5777	3301 3.302	1520 1.522	4342 .4309
540	"	"	5765	3303	1523	4277
	440	120	5783 .5805	3248 3.22	1249 1.246	1795 1803
500	"	"	5828	3192	1242	1811
	280	140	6600	3029	1074	1094
340	"	"	6507 .6525	3094 3.05	1071 1.071	1030 1064
	"	"	6470	3085	1068	1068
	240	160	6799 .6776	3045 3.04	9395 .9378	6978 .007050
300	"	"	6754	3043	9360	7122
	200	180	7242 .7249	2969		4533
260	"	"	7236	2944 2.95	7878 .7889	431 .004429
	"	"	7271	2947	7900	4444
	160	200	7750 .7771	2860 2.865	6725 .6722	3068 .003034
220	"	"	7792	2869	6718	3000
	120	240	8363	2721	4874 .486	1708
180	"	"	8314 .832	2728 2.72	4872	166 .001702
	"	"	8301	2726	4860	1737
	80	280	8643 .864	2685 2.67	3703 .3689	1111 .001086
140	"	"	8635	2665	3676	1061
	40	320	9097 .9077	2616 2.62	3100 .3108	8454 .0008315
100	"	"	9058	2629	3116	8177
10	999.50	320	9795 .9780	2618 2.61	3054 .3059	824 .0008065
	"	"	9785	2607	3064	789
60	0.00	300	9467 .9466	2631 2.61	3270 .3260	898 .0008875
	"	"	9465	2593	3249	877
380	320	260	6036 .6032	2632 2.62	4238 .4237	1270 .001301
			6027	2617	4235	1331

Exp. 47

	Reg I	Rot	I/N	II/N	III/IIN	IV/IIIN	
	~~360~~	~~220~~	~~300466~~	~~513387~~	~~1395836~~	~~294290~~	~~1120~~
	360	220	5853 .5858	2718 2723	5732 5733	2181 .002113	
420	"	"	5863	2727	5733	2045	
	400	190	5651 5649	2817 2835	7243 7275	3657 .003611	
460	"	"	5646	2854	7308	3563	
	460	150	5486	2975 2979	9834 9857	8092 .008238	
520	"	"	5472 5479	2983	9881	8384	
	490	120	5474	3019 3024	1179 1182	1662 .01666	
550	"	"	5507 .5491	3029	1184	1669	
	260	90	6202	3019 3017	1382 1375	3408 .03313	
320	"	"	6170 6186	3015	1368	3219	
	220	50	6461 .6490	3041 3049	30419	6597 .06682	
280	"	"	6518	3057	3596	6767	
	180	100	7100 .7082	3063 3063	1308 1308	2637 .02624	
240	"	"	7063	3062	1308	2611	
	100	140	8350 .8327	2942 2920	1048 1045	1053 .01056	
160	"	"	8304	2898	1041	1059	
	50	180	8984 .8997	2810 2824	7573 .7594	4369 .004253	
110	"	"	9009	2841	7615	4137	
50	-10	210	9606	2791 2777	~~7435~~ 5964 .5975	2451 .02414	
	"	"	9572 .9589	2763	5987	2377	

Exp. 47-B

3/18/60 Check on Normalizer

	I/N	II/N	III/N	IV/N		
2 pm	5638	3193	~~3193~~ 9055			
	5612	3181	9025			
	5605	3186	9016			
	5532	3156	8940			
	5531	3163	8937			
	5569	3132	8965			
	5573	3089	8927			
	5632	3035	9015			
	5599	3042	9019			
	5604	3023	8986			
	5585	3020	9009			
	5556	3081	8997			
	5538	3058	8926			

The data in exp. 47 shows some inconsistencies when plotted, namely in that repeat points tend to fall below 1st points. To check on whether or not normalizer (power) has drifted since 3/16/60 counts in Regs II, III + IV are to be taken at rotation position of ~~170~~ 160 and lift position of 7.00, to be compared to ratios in Exp. 44

	I	N	II	III	IV
0 pm	82189	145758	465430	131990	
	88191	157136	499890	141830	
	90334	161154	513450	145300	
	90301	163231	515060	145980	
	90058	162802	514970	145530	
	90706	162852	510140	146000	
	91498	164168	507220	146570	
	92095	163478	496290	147390	
	91947	164205	499560	148060	
	92787	165581	500550	148800	
	92861	166241	502050	149770	
	92494	166452	512960	149770	
2^{42} pm	93413	168669	515920	150560	

From above counts, Reg II is different from corresponding counts in Exp. 46 (~9%) but Reg III counts essentially agree. Reg I does not agree because of change of PDL.

3/17/60 3$^{30}_{PM}$ A check of the operation of Reg I counter mechanically after above exp. showed counter to drag on guide and thereby be displaced. This could account for the scatter in the data in Reg I. Guide has been removed.

3/21/60 Exp. 47-B

Repeat of cd-covered BF_3 Radial traverse

Reg I counter in center at 445

Reg I	Rat	I	N	II	III	IV
509	40	82864	152784	535580	274680	12660
"	"	76839	143460	503480	252720	11740
	"	74090	141044	491490	247610	11440
460	80	119889	229774	772040	358340	9730
" 9 30/hr	"	123067	234403	780420	366710	9950
420	120	167440	326579	1062640	411170	5800
"	"	160163	315199	102004	393410	5550
380	140	186071	361759	1148500	395050	3820
"	"	181500	353175	1117190	384930	3810
320	160	206587	387310	1197430	366650	2700
"	"	200580	378984	1162530	355960	2560
280	170	217246	389443	1180420	336840	2150
"	"	222715	404312	1216400	349340	2190
240	180	239883	410150	1224060	331200	1850
"	"	241981	411444	1224350	332150	1940
200	200	251137	407140	1181010	~~1110~~	1070
"	"	245191	398409	1161630	268160	1220
"	"	249746	405461	1173810	271340	1150
160	220	267490	407808	1144860	230790	900
"	"	275432	418862	1174770	238480	920
120	240	337253	485191	1326210	237270	810
" 10 20/hr	"	345864	491995	1326470	241040	800

3/17/60

Reg I	Rot	I	N	⊠	III	IV
80	260	361874	484996	1276250	202700	650
"	"	360206	485904	1290700	202990	620
40	280	358018	456514	1176000	—	—
"	"	358224	459814	1203060	168420	490
"	"	358984	457840	1179060	168350	—
0.0	300	313968	385050	983460	125380	370
"	"	307825	381348	1000750	124410	350
-50	320	312512	373024	971110	113840	—
"	"	309333	368785	961370	112360	300
20	260	147437	216885	609470	87410	250
"	"	148287	192284	547180	77040	240
80	220	145917	204959	608230	111890	440
"	"	142713	200409	592690	109460	400
160	180	139740	223412	684190	169920	900
"	"	140539	223218	687190	181470	910
240	160	114399	207508	656690	190470	1360
"	"	116073	210757	664010	191600	1410
320	140	101847	204753	660610	217030	2180
"	"	101773	204856	655600	214380	2070
380	120	79214	165747	537830	197620	2680
"	"	74459	156405	504020	186170	2450
440	80	128777	276679	827400	404200	11490
"	"	136257	289928	859050	424180	11890
500	40	100169	209898	620100	344710	1630
"	"	100904	210991	624500	346110	1678

Exp. 47-B

drift	Reg I	Rot	I/N	II/N	III/N	IV/N
omit because of drift	509	40	5423	3505	1797	8286
570	"	"	5356 5344	3509 3499	1761 1771	8183 8193
	"	"	5253	3484	1755	8111
520	460	80	5217 5234	3359 3344	1557 1560	4234 4239
	"	"	5250	3329	1564	4245
480	420	120	5127 5104	3254 3245	1258 1253	1776 1768
	"	"	5081	3236	1248	1760
440	380	140	5145 5138	3175 3169	1092 1091	1056 1068
	"	"	5130	3163	1090	1079
380	320	160	5333 5313	3090 3079	9465 9428	6971 6862
	"	"	5293	3067	9392	675
340	280	170	5578 5543	3031 3020	8648 8644	5520 5468
	"	"	5508	3008	8639	5416
300	240	180	5845 5863	2984 2977	8075 8074	4510 4610
	"	"	5881	2970	8072	4710
260	200	200	6169	2900	—	287
	"	"	6154 6160	2915 2903	6730 6711	306 292
	"	"	6159	2894	6692	284
220	160	220	6559 6566	2807 2806	5659 5676	221 2203
	"	"	6574	2804	5693	219.6
180	120	240	6961 6995	2732 2714	4890 4894	1669 1647
	"	"	7029	2696	4898	1626
140	80	260	7461 7437	2631 2643	4179 4178	1276 .001276
	"	"	7413	2656	4177	1275
100	40	280	7790	2575	—	—
	"	"	7790 7807	2616 2588	3662 3669	1065
	"	"	7841	2575	3677	—
60	0.0	300	8153 8112	2554 2589	3255 3259	—967 .000939
	"	"	8071	2624	~~3046~~ 3262	—917
10	-50	320	8378 8382	2604 2606	3050 3048	—
	"	"	8387	2607	3046	.000813

[redacted]

47 B

	Reg f	Rot	I/N	II/N	III/N	IV/N
80	20	260	7719	2811 2828	4030	115
	"	"	7711 .7715	2845	4006 .4018	125 .00120
140	80	220	7118	2967	5459	214
	"	"	7120 .7119	2957 .2962	5461 .5460	199 207
220	160	180	6255	3062	7605	403
	"	"	6296 .6275	3078 .3070	8131 .7868	408 .00406
300	240	160	5513	3165	9180	655
	"	"	5506 .5510	3149 .3157	9089 .9134	669 .00662
380	320	140	4974	3226	1059	106
	"	"	4968 .4971	3200 .3213	1047 1.053	101 .0104
440	380	120	4780	3245	1192	161
	"	"	4760 .4770	3222 .3234	1190 1.191	156 .0159
500	440	80	4654	2990	1460	415
	"	"	4699 .4676	2963 .2977	1463 1.462	410 .0413
560	500	40	4770	2954	1642	776
	"	"	4782 .4776	2959 .2957	1640 1.641	.0795 .086

3

47-C

Lift = 7.00 ; Rot. = 160
Reg I = 445

Reg I 445

	I/N	II/N	III/N
	5015	344	937
	502	342	934
	492	343	929
	494	340	930
	491	337	924
	492	336	923
	490	331	915
	490	331	913
	4906	331	910
	484	329	908
	484	328	903
	486	330	914
4''	489	327	911
	486	322	911
	484	317	911
	492	317	913
	489	318	910
4 19	478	323	905
	480	326	898
4 22	478	326	906
	480	319	904
	483	318	898
	480	318	905
	478	298	904
	479	318	904

ave = 483

ave = 320

ave = 906

445

3/21/60

47-C

The previous data (47-B) is still not good. To see if counts-rate has drift at start up or over period ~30-45' min and check count rate of Reg I at center (which has been checked physically) with previous data

	Rot	I	N	II	III	Rot Pos
3^50 PM	160	72771	145135	500020	135980	Selsyn = 160 Reg I - centered at 445
	"	74839	149003	510840	139240	
3^53	"	74980	152184	522660	141470	
	"	76389	154594	527040	143790	
4^56	"	75035	152743	515880	141230	
	"	74498	151187	507420	139570	
	"	73738	150208	497440	137460	
	"	72648	148187	490810	135330	
0^3	"	71981	146694	485640	133570	
4^07 PM	"	71175	147164	485140	133710	
	"	71527	147687	484870	133530	
	"	70968	145837	481640	133430	
4^11	"	71423	146061	478250	133050	
	"	71080	146232	470500	133200	
	"	70946	146686	466140	133720	
4^15	"	72210	146838	465160	134020	
	"	72078	147279	469280	134080	
4^19	"	71242	148895	482250	134780	
	"	71713	149304	486930	134190	
	"	72054	150477	491590	136540	
	"	72072	150109	478950	135730	
	"	73335	151689	482440	136340	Reg I moved out to 280 then back to 445 to check reproducibility
4^27 PM	"	71010	147718	470480	133870	
	"	71909	150287	4480090	135970	
4^32		73204	152757	485970	138100	

47-D

3/22/

Purpose: A further attempt to determine possibly drifts in counters, especially Reg I. Reg I counter is in center of region (selsyn = 445, Lift = 7.00). Rot. position = 160

	I	N	II	III	
10^{33} AM	167127	333932	1145640	322200	850
	165527	336091	1146690	324130	
	161130	331997	1117660	318400	
	156071	325814	1082990	308360	
10^{41}	158642	332390	1096000	311660	
	158567	335850	1098330	313540	
	159737	340133	1101610	316580	
10^{46} AM	161084	342338	1100710	316840	
	159381	339846	1092100	313810	
10^{49}	157730	338036	1079880	310530	
	155302	334142	1067890	307100	
	152918	329096	1062220	305390	
10^{59}	150884	326398	1041560	298220	
	148436	321768	1026330	293140	
	146902	317487	1010300	290790	
	142551	310669	992530	282080	
11^{01}	139794	304927	976980	277250	
	136906	301084 ~~303086~~	964600	272380	
	137974	301330	966480	275660	
	139820	304981	969440	276130	
	141816	309384	975490	279900	
11^{11}	143109	313535	991260	284230	

41-D

	I/N	II/N	III/N	
10^{33}	500	343	964	
	493	341	964	
	485	336	959	
	479	332	946	
10^{41}	477	329	937	
	472	326	933	
	469	324	930	
10^{46}	470	321	925	
	469	321	923	
10^{49}	466	319	918	
	464	319	919	
	464	322	927	
10^{59}	462	319	913	
	461	318	910	
	462	318	915	
	458	319	908	
11^{07}	458	321	909	
	454	320	904	
	457	321	915	
	458	318	905	ave = 910
	458	315	904	
11^{11}	456	316	906	
	459	316	912	
	455	313	907	
11^{17}	455	312	910	ave = 457
	455	310	904	
	458	312	913	312
	459	312	918	
	456	312	917	
[illegible]	455	313	914	

	I	N	[illegible]	III
	145576	316768	1003100	289050
	147006	322731	1012780	292998
1 16	150312	330039	1031840	300560
	154280	339112	1052010	306880
	159058	347486	1084400	317580
	161863	352644	1103000	323950
11 23 AM	158364	346676	1084380	318030
11 24	151697	332946	1045370	304400

Exp. 48

3/22/60

1^{30} Purpose: ~~After~~ To determine ratio of count rate of Reg I counter bare after Discriminator change to count rate before. hence Cd-cover removed from counter

Note: When Cd-cover was removed several drops of H_2O were found to have ~~crept~~ gotten under cover

Reg I counter centered in Reg I

	I	N	I/N
1^{45} pm	2007613	43333	4632
	1324898	28710	4614
	1310746	28780	4554
	1306711	28730	4548
1^{52}	1285768	27905	4607
	1268341	27991	4530
	1242703	27580	4506
	1261288	28161	4479
	1257269	28192	4460
	1256262	28242	4448
2^{01} pm	1243002	28025	4434
	1237014	27508	4496
	1227880	27319	4496
2^{06} pm	1219801	27339	4461
	1214565	26885	4517
	1208221	26855	4490
	1205955	26903	4482
	1204274	27012	4457
	1203418	27023	4453

ave = 4472

$\frac{80.17}{4472} = 1.79$

Exp. 49

3/22/60

3^{00} pm Purpose: To determine effect of water under Cd-cover of Reg. I counter. Counter was dried and Cd-put back on, then counter was put back in center of Reg I.

	I	N	I/N
3^{08} PM	79011	173578	4551
	74014	161995	4569
	71029	158694	4475
	71033	155751	4560
	69138	154048	4488
3^{15} pm	70973	157699	4500
	71926	161839	4444
	71729	164096	4371
	72088	165491	4356
	70877	161869	4378
	70067	160368	4368
	70964	162010	4380
	71825	165175	4347
	71611	163548	4378
	71370	164021	4351
	71661	165288	4336
3^{32} pm	72154	166986	4321
	72332	167589	4316
	72915	167663	4348
	74528	173144	4304
	75060	173503	4326
	75511	175153	4311
	75356	176703	4264

3/22/60

	I	N	I/N
	78180	181423	4309
	79238	183098	4327
	78278	180407	4339
$3\frac{54}{pm}$	76370	176993	4314
	74118	170886	4337
	71965	165495	4348
$4\frac{00}{pm}$	71911	167684	4288

avg = 4323.1

3/23/60 Note: Upon removal of counter #3 (Reg III) a small amount of water was found in bottom of Cd cover (~2-3 drops). Exact effect of this on experiments not known.

On removal of Cd counter in reg II was dry. However, Reg IV counter had about 2 drops of H_2O inside the Cd.

3-23-60 Expt 50

Preliminary Bare ended Expt. —
Removed Top and bottom reflector.
Also removed all counters
Added about 3 l of sample reservoir
to inventory at a 92 gm U^{235}/l. &
mixed.

Critical with fuel at 23.54 &
D_2O at 80.6.
It was found that fuel pump stopped
adding at 23.54. After dumping the
D_2O it was found that we were out
of solution.

3-24-60
9 AM Added 4.5 l. fuel at a sp. gr. of 1.2305
to system and mixed.

Rechecked Fuel and D_2O zeros;

D_2O — 56.10
Fuel — 0.0

3-24-60

Expt. 51

Critical Expt. with Both ends bare.
At Crit:

	Reg I	Reg II	Reg III	Reg IV
Heights	24.5"	24.04"	24.02"	24.5"

Dumped Fuel

Expt. 51A Repeat after adjusting Reg I & IV heights:

Crit at

	Reg I	Reg II	Reg III	Reg IV
Height:	24.10"	24.10	24.10"	24.10"
Temps	1.134	1.116	1.140	1.155
	28.3°	27.9	28.5	28.9

Expt 51B

3-24-60

Repeat for radiating gold wire
Crit at

Reg I	Reg II	Reg III	Reg IV
24.10	24.03	24.10	24.10
27.8°	27.4	27.9	28.5

FC-~~4~~ at 10 Time 10 min

Finished at 3.39 PM

3/24/60

Fuel Sample taken before last exp. (51-B)

11-A, to go to cooper

11-B, Req. # 593074

11-C, hold back for possible check

3/29/60 Sample 11-C sent for D/H analysis, see p. 188

3/25/60

Exp 52

Exposure of manganese and Au wire contained in small stainless steel tubes. Wires were ~3 ft. long and placed parallel to and 1/2" from the center-line of the assembly

Wires were irradiated for 30 min at power level of 10 (from chart) on 1-C4. Water ht. in reg. I was 24.1 and 24.2 in III

Exp. 53

Zero of fuel selsyn checked - yeroon selsyn is at zero. D_2O = 56.1 on selsyn at D_2O zero

Reg. I ht = 24.1"

Fuel ht at crit = 24.09. Reg III water is ~1/2" too high - to be lowered.

53-B

~~Removed~~ Lowered H_2O in III to 24.1. Reg I + III are 24.1.

Fuel = 24.08 at crit

1:50 ~~Reg~~ Reg I = 24.2 °C ; Reg II = 23.1 ; Reg III = 23.2

Slab = 23.2 with soln in it.

3/25/60 To make qualitative check on temp. coefficient for HFIR without top and bottom reflector. Reg IV thermocouples moved to Reg I to give temp check.

D_2O selsyn = 80.21, blade out

3[40] Fuel selsyn = 24.04 just crit

Temp

#12	#14	#15	~~#16~~ 13
977 (986)	no reading	928	934 } no soln in slab
24.5°			

3[45] PM ~6" fuel drained then ~~outer~~ Reg I water removed and hotter water added. D_2O and blade same

Temp

time	#12	#15	13
3[50]	1.350	.935	
	33.7°C		
4[08]	1.21	97	935 } no solution in slab
4[15]	1.16	98	
4[20]	1.15	98	
4[25]	114	98	98

4[25] PM Shut down

Note: System essentially level at ~4[05] at Fuel ≅ 23.97.
Reactivity decreased with time as evidenced by repeated small additions of fuel to stay crit. At 4[25] system was approx crit but had small drift down. Fuel ht at 4[25] was 24.06. Thermocouple in II did not work. Over all temp coefficient (direction) therefore doubtful from above data, but Reg I alone seems to have positive coefficient

3/28/60 Entire inventory of D_2O fed into Bare reactor. —
selsyn reading = 83.8 ≈ 27.7" net

Approx. inventory of D_2O:

$$A = \pi(16^2 - 8^2) = 603 \square''$$

$$Vol = 603 \times 27.7 = 16{,}700 \text{ cu in}$$

$$'' = 16{,}700 \times .01639 = 273.8\, l \text{ in reactor}$$

Including D. Vol. total inventory ~ 280 l

~ 92 kg of D_2O removed from manifold
~ 83.6 l

4:00 pm Removed from manifold {@ 92.6 gr/l}

G	20.51	20.37	20.44
T	2.79	2.75	2.69

i.e. 43.3 liters removed; 31.2 @ 92.6 remains

$$\begin{array}{r} 280.0 \\ 83.6 \\ \hline 196.4 \end{array}$$ = liters D_2O left.

177.8 l. required for 18" in reactor

tion
l

3/29/60 To check on reason why ~~D2O~~ D/H ratio for the fuel was lower in the last sample, after small fuel addition at same concentration for reflector savings experiment, a new sample was taken from a 15 liter bottle which had been removed from manifold.

Sample #12-A Dr $\frac{190.0}{20.2}$

Also to be sent Sample # 11-C, see p. 184.

Two samples were taken from D_2O manifold, and ~~Sample~~ ~~1.0~~ 0.5 gm of $Na_2B_4O_7$ was dissolved in sample # 4-D and Sample 3-D was sent as is.

Sample #4-D

G 158.7, including borate

T 20.2

Borate 0.5

Exp. 54 A

[beginning Boron poisioning of Reg III - no Boron this experiment]

3/30/60 concentration ~ 115 gm x/l ; Bottom and top reflectors put back in

D_2O Selsyn = 80

Crit. selsyn = 16.145 { super @ 16.15 / sub @ 16.14 }

#2 Bottle 4.50
2.48
2.02

$\frac{2.02}{4.06} \times 40 = 19.9$ gm salt added to D_2O System

stirring by recirculation

16.98
16.15
.83

Expt 54 B

D_2O selsyn 80.09

Crit. fuel selsyn 16.98

Expt 54 C

#2 Bottle Drained to 1.34 kg.
.44
Amt. left → .90

4.06
.90
3.16

$\frac{3.16}{4.06} \times 40 = 31.1$ gm salt in D_2O

D_2O = 79.85

Crit fuel ht = 17.47

added remainder of contents of Bottle #2 to D_2O system.

54 D

After mixing with ~ 40 gm salt in D_2O system.

D_2O – 79.91

Crit fuel ht. – 19.13"

added to fuel in slab ~ 4 l at 122 gm U/l & mixed for ~ ½ hr.

54 E

D_2O – 81.23

Crit fuel ht 19.41"

Since the effect of fuel addition was negative, the warming up of the fuel while mixing probably more than off-set the small increase in fuel conc.

54 F

3-30-60 Repeat as check on temp & mixing

D_2O – 80.7

Crit fuel ht. 19.27

added to reactor ~ 230 gm soln at ~ 340 gm/l, or ~ 50 gm U and mixed

54 G

D_2O – 80.7

Crit fuel ht. 19.01

2 Batches of dryed $Na_2B_4O_7$ in 1 gal. polyethylene bottles:

#1 gr. 4.28 kg
T .40
net 3.88 kg
contains 40 gm
dry $Na_2B_4O_7$

#2 gr. 4.50
.44
net 4.06 kg
contains 40 gm $Na_2B_4O_7$

Added ~ 300 cm^3 at 340 gm/l & mixed

54 H

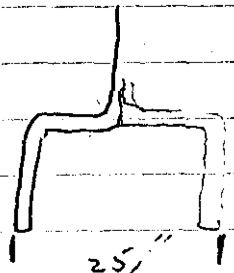
D_2O 80.49
Crit fuel ht. 18.94

Add ~ 1 l at ~ 340 gm/l & mixed

Thermocouple: #12 - Reg I; #15 - Reg III; #14 - Reg IV

54 I
D_2O 80.83
crit fuel ht. 17.61

3/31/60 235 Chambers put back in reactor

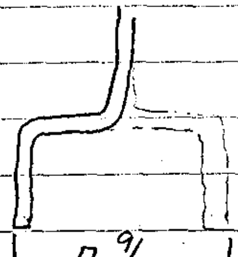


Reg II

4 25/32"

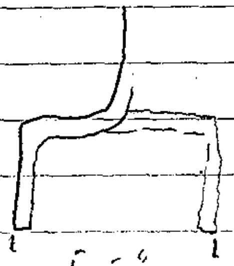
4.781
.36

$$\frac{4.421}{2} = 2.210$$



Reg III

7 9/16



Reg IV

5.5"

4-1-60 Expt 55

Installed fission counter in Reg I - IV

D_2O - 8147

Crit fuel 17.88 counter left at 7.00"

Ref I* Pos.	Rot. Pos	Reg I	N	Reg II	Reg III	Reg IV
513	160	550,037	420,730	52,760	80160	24150
11	11	552669	419988	52,050	78840	23760
11	11	561,486	425946	52760	78620	23750
11	11	564890	430093	53300	80110	24330
11	11	572082	434415	53850	84060	24530
11	11	579227	441354	54630	82960	24560
11	11	587044	448656	55530	82140	24960
11	11	608402	467064	57980	85270	26270

4-1-60

Fuel sample #13A to Cooper 13B to Harna

net wt 110.35 gm 94.1 at.% D

Sample of D_2O for Boron content sent to Lang at X-10 Bldg 3550.

#6-D-1 134.0
20.3
net 113.7 gm.

Adjusted Counter in Reg III

* Reg I selsyn zero = 0.04

4/1/60

Exp. 56

Lift 7.44"

Rot.	Reg I	I	N	II	III	IV
Pos. 0.0	6	140787	273531	98220	35440	61020
" 2^{09} pm	"	149548	288194	103290	37150	63380
"	"	151875	297401	105640	38120	65540
"	"	154443	304600	108560	38830	67020
40	66	241208	310087	89510	46780	67660
"	"	236981	306107	87350	46890	66430
"	"	235271	305142	87350	46780	66160
80 2^{15}	106	269168	299813	54530	54110	49390
"	"	325332	366727	66830	66750	61230
100	146	393459	399509	71430	73490	66120
" 2^{23}	"	407660	411346	74340	75920	68710
120	206	382534	353652	49140	68990	37800
"	"	371933	343693	47340	67330	36580
140 2^{33} pm	246	387790	346747	44260	67960	27740
"	"	390068	347108	44440	68800	27680
160	306	402013	344745	42510	67630	19290
"	"	386174	331315	40680	64290	18420
180 2^{43} pm	346	403352	340052	41670	64480	13760
"	"	407461	343554	41220	64560	13840
200	406	417688	344909	42880	63160	9110
"	"	401420	333801	41640	61310	8740
220	456	396285	328241	42550	57320	5770
" 2^{54}	"	394378	326427	42240	56780	5810
240	486	395309	327206	45000	55330	4160
"	"	396429	329432	45030	55600	4270
260	526	397482	329648	49290	53760	3030
"	"	398141	328482	49710	53710	3060
300	538	389276	320181	57850	49980	1680
"	"	386265	317301	56960	49000	1620

1 196 4/1/60

Rot	Reg I	I	N	II	III	IV
360	506	399935	327880	66380	50500	990
″ 3^{13}	″	400868	329622	66940	50740	990
320	466	396536	325578	~~16~~62410	49940	1330
″	″	391673	321853	62040	49180	1330
280 3^{25}_{PM}	426	387726	321298	52160	51480	2200
″	″	400043	328928	53680	52050	2230
250	386	405089	333737	47060	55490	3750
″	″	405750	334858	48010	55890	—
″	″	403806	333401	~~95420~~ 47410	12060	3600
220	326	393151	327677	42430	56760	5790
″ 3^{40}	″	388402	324256	41690	56190	5800
200	286	357720	305254	37490	55320	8160
″	″	354985	301466	36710	54680	7830
180	246	335289	294715	35190	54610	10840
″ 3^{50}	″	333000	294454	35140	54570	10930
160	206	308379	283644	34560	53540	15260
″	″	306362	282935	34620	53420	14830
140	156	269070	268878	33870	51420	20350
″ 4^{00}	″	262781	262113	33170	50170	20170
120	106	211892	238864	32950	45460	25590
″	″	202915	230065	31650	43590	24460
100	66	161253	213071	32270	39740	27320
″	″	169417	225933	34420	41600	29480
50	36	131946	208582	53870	32100	42710
″	″	128368	202558	51720	30830	41250
0.0 4^{20}_{PM}	6	100681	203252	70530	25340	43490
″	″	108457	218946	76180	26990	47390
″	″	111407	226030	78010	27860	48360

4/1/60

Exp. 56

Rot	~~Rot~~ Reg I	I/N	II/N	III/N	IV/N
		x 0.8264	x 0.5453	x 1.273	x 0.4870
0.0	~~6~~ 2	.5147	.3591	.1295	.2231 .2208
		.5187 .5127	.3583 .3572	.1289 x	.2199
		.5106	.3552	.1281 .1284	~~12~~ .2203
		.5070	.3564	.1274	.2200
40	66	.7770	.2886 .2867	.1508 x	.2181
"	"	.7739 .7740	.2853	.1532 .1532	.2170 .2173
"	"	.7710	.2862	.1533	.2168
80	106	.8975 .8923	.1818 .1820	.1804 .1812	.1647 .1658
"	"	.8871	.1822	.1820	.1669
100	146	.9848 .9879	.1787 .1797	.1839 .1842	.1655 .1663
"	"	.9911	.1807	.1845	.1670
120	206	1.081 1.082	.1389 .1383	.1951 .1955	.1068 .1066
"	"	1.082	.1377	.1958	.1064
140	246	1.118 1.121	.1276 .1278	.1960 .1971	.08000 .07987
"	"	1.123	.1280	.1982	.07974
160	306	1.166 1.166	.1233 .1230	.1961 .1951	.05596 .05577
"	"	1.165	.1227	.1940	.05559
180	346	1.185 1.186	.1225 .1212	.1895 .1887	.04045 .04037
"	"	1.186	.1199	.1879	.04028
200	406	1.211 1.207	.1243 .1245	.1831 .1834	.02641 .02630
"	"	1.202	.1247	.1836	.02618
220	456	1.207 1.208	.1296 .1295	.1746 .1743	.01758 .01769
"	"	1.208	.1294	.1739	.01780
220	486	1.208 1.206	.1375 .1371	.1691 .1689	.01271 .01284
"	"	1.203	.1367	.1687	.01296
260	526	1.206 1.209	.1495 .1504	.1631 .1633	.009192 .009253
"	"	1.211	.1513	.1635	.009315
300	538	1.215 1.216	.1806 .1801	.1560 .1552	.005246 .005175
"	"	1.217	.1795	.1544	.005105

Exp. 56

Rot	Reg E	I/N	II/N	III/N	IV/N	
360	506	1.219	.2024	.1540	.00302	
"	"	1.216 1.218	.2030 .2027	.1539 .1540	.00300	.00301
320	466	1.217	.1916	.1533	.00408	
"	"	1.216 1.217	.1927 .1922	.1528 .1531	.004133	.00411
280	426	1.206	.1623	.1602	.006847	
"	"	1.216 1.211	~~.1682~~ .1632 .1628	.1582 .1592	.00678	.006812
250	386	1.213	.1410	.1662	.01123	
"	"	1.212	.1434	.1669	—	
"	"	1.211 1.212	~~28~~ .1422 .142	— .1666	.01079	.01101
220	326	1.199	.1294	.1732	.01766	
"	"	1.198 1.199	.1285 .1289	.1733 .1733	.01789	.01778
200	286	1.172	.1228	.1812	.02673	
"	"	1.177 1.175	.1217 .1223	.1813 .1813	.02597	.02635
180	246	1.137	.1194	.1853	.0368	
"	"	1.131 1.134	.1193 .1194	.1853 .1853	.0371	.0370
160	206	1.087	.1218	.1887	.0538	
"	"	1.083 1.085	.1223 .1221	.1888 .1888	.0524	.0531
140	156	1.001	.1260	.1912	.07570	
"	"	1.002 1.002	.1265 .1263	.1914 .1913	.07695	.07633
120	106	.8870	.1379	.1903	.1071	
"	"	.8817 .8844	.1375 .1377	.1894 .1899	.1063	.1067
100	66	.7566	.1514	.1864	.1282	
"	"	.7498 .7532	.1523 .1519	.1841 .1853	.1305	.1294
50	36	.6320	.2582	.1538	.2047	
"	"	.6330 .6325	.2552 .2567	.1521 .1530	.2036	.2042
0.0	6	.4952	.3469	.1246	.2139	
"	"	.4956	.3480	.1232	.2164	.2147
"	"	.4920 .494	.3451 .3466	.1232 .1236	.2139	

4/1/60

	Temp		
4 $\frac{00}{PM}$	Reg I (12)	Reg III (15)	Reg IV
	959 (24.0°C)	950 (23.7°C)	996 (25.8)

4/4/60 Check of zero and center selsyn readings in Reg I after exp. (56)

Selsyn = 2 at zero

" = 511 at center

4/4/60

56-A

Purpose: To check on count-rates of all four counters when #I is at 511 and Rot pos. is 160 with Lift at 7.44 & 7.04

Crit → 1st Lift 7.44; D_2O Selsyn = 80.0; Blade out; Fuel Selsyn = 18.11

	I	N	II	III	IV
3 48 pm	285854	228517	29800	46360	13730
	289136	233128	29980	46750	13920
	290884	234741	30240	47210	13760
	288102	233328	29860	46820	13800
	289895	233996	29570	49330	13700
	288294	235350	29640	46800	13530
	291234	235402	29340	46010	13670
	289521	236583	29620	46610	13590
	289725	237919	29770	47320	13680
	292181	241223	29910	46690	13830
	296949	243234	30520	49670	14190
	297405	245816	30730	47970	14170
Lift changed to 7.04					
4 10 pm	294070	245446	30390	48310	14380
	296574	247382	30800	48790	14490
	299284	249296	31110	48900	14590
	303065	254878	31150	49840	14780
	308884	258898	31760	50490	14990
	308136	256680	31970	50560	14840
	295388	246708	30590	48440	14330
	287061	241101	29960	46940	13840
4 28 Shut Down					

8.11

Exp. 56-A

	I/N	II/N	III/N	IV/N
	1250	1304		
	1240	1286		
	1239	1288		
	1234	1279		
	1238	1263		
	1224	1259		
	1237	1246		
	1223	1251		
1.21	1217	1251		
	1211	1240		
	1220	1254		
	1209	1250		
Lift changed to		7.04		
	1197	1237	1967	5855
	1198	1244	1972	5856
ave = 1200	1200	1247	1961	5852
	1190	1222	1955	5798
	1193	1226 ave 1.237	1950 1960	5790 5810
	1200	1246	1969	5781
	1197	1239	1963	5808
	1191	1242	1946	5740

4-5-60 EXP No 57

VOID COEFFICIENT MEASUREMENT

½" Alum tube OD ~~.035~~ .028 wall suspended From Safety Drive. When "Down", Tip is 1⅜" From Bottom – Up Limit switch set so that it moves 9 in. Total Travel. – No Selsyn on Drive.

9^{45} AM Inst. OK.

10^{23} AM Crit Ht with ½" OD Al tube inserted to lower limit switch 1⅜" Above Bottom
D_2O - 80.40" Soln Ht 17.68

10^{30} Raise Void 9" slight neg period
reestablish crit at same power as above in preparation of measuring pos. period for the 9" disp of void.

10^{31} D_2O 80.36 Soln ht 17.99, at this power for 18 x 50 = 900 sec = 15'

10^{31} Insert void to lower limit – 9" void added.
To measure Pos PERIOD 209.7 sec

10^{44} End of Period Soln Ht 17.97
~~Shut~~ down by Dump Soln.

D_2O not dumped or drained between 57 & 58

4-5-60 Exp # 58

Void Coefficient Measurement

1" Al tube OD .035 wall suspended from Safety Drive. When "Down", tip is 1 5/8" from Bottom. — Up limit switch set so that it moves 9 in. total travel.

2^{35} PM	start feeding soln
2^{49}	Level at log N = 0.01 (10^{-11})
2^{55}	D_2O = 80.24 Fuel = 17.54 @ Crit.
	Raise 1" Void to 9", Much more React involved
	Raise Fuel solution to crit again.
3^{05}	Fuel = 17.59
	Lower Void - not ~~to~~ limit (must measure above)
$3^{07 1/2}$	Shutdown by draining fuel.

Measurement 5 3/16" displacement for period 50.4

58

4/6/60

Exp. #59
Run A

6.92 kg of plexiglas ~~were~~ was placed in center cyl. of HFIR in the form of a 3" dia rod 18" long in the center surrounded by 10 pieces of ~~1.25~~ 1.25" dia rod 18" long. Remaining spaced filled with H_2O. H_2O also ~8" above as reflector

Throttle down of fuel feed rate

Soln ht = ~~1.48~~ 0.148
feed 1 min, ht = 2.57"
valve closed some
feed 1 min, ht = 4.00"
valve closed more
feed 1 min, ht = 4.74

9:58 AM D_2O = 80.327
Start feeding Soln into System
9:37 AM Crit ht = 16.953 IC-4 ~.01
Soln ht. raised to 16.998 for pos. period
{system crit ~18 min preceding above period}
T = 130.32 sec. $\rho = 7.09 \times 10^{-4}$
10:55 Drain Soln Down to 9.255" to Remove Small Plastic Rods from Reg I

11:12 AM 3" dia rod positioned in center of reg I.

g

Exp. 59
R44D

T = 121.1
121.9

2	0	F
1	93429	F
2	0	F
1	166851	F
2	0	F
1	291203	F
2	0	F
1	512802	F
2	0	F
1	884103	F
2	1	F
1	1481696	F
2	0	F
1	2461140	F
2	0	F
1	3843021	F
2	0	F
1	66505	F

Plastic

4/6/60

Run B

12^{50} Crit ht. = 17.395 {"at" crit. for 16.6 min} } period too fast see repeat immediately below

Pos period ht = 17.451 T = 86.4 sec.

1^{08} Shut down

Run C ~~Repeat with 3" dia rod in center~~

1^{34} ~ at Crit (Log N = .01)

Crit ht = 17.400 [at crit for 16.6 min] K-4 = .01

Pos period ht = 17.449 : T = 159.6 sec

2^{04} Shut down

Run D

~~Repeat due to "jump" in K-4 trace during last period~~

3^{19} ~ Crit

Crit ht = 17.400

Pos period ht = 17.450

T = 113.4 sec

3^{45} Shut down

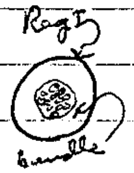
Plastic

Temp Readings

Time	Reg I #16	Reg II #11	Reg III #15	Reg IV #12
2^{40} PM	.948 mv 23.6	.914 22.8	.920 23.0	.974 24.3
3^{18}	.991 mv	.959	.935	.990

Exp # 60

4-7-60 Run A — SwG CC



Void Coefficient continued using polystyrene tubes 18" long, 3/8" ID, 1/16" wall. Rubber stoppers put in top and bottom ends to trap air. 27 tubes were ~~bundled~~ bundled together and positioned in center of ~~—~~ Reg I

2:00 PM Inst Check OK - Source in
Start feeding Soln into system

$D_2O = 80.6$, Fuel = 16.64 just crit

Run B

36 tubes put in bundle in center region

3:50 PM $D_2O = 80.7$ Fuel = 16.31

Exp. 60

4/8/60

Run C

14 tubes (3/8 ID, 1/2 OD) centered in a bundle in center of Reg I

10^{30} D_2O = 80.3, Fuel = 17.16

Run D

40 tubes put in center region
47 polystyrene 1/2" OD, 3/8" ID, 1/16" wall
43 polyethylene 1/2 OD, 3/8, ID 1/16 wall

1^{00} PM D_2O = 80.3, Fuel = 15.09

Run E

2^{00} PM Drained all water from Reg I. Put in tight-fitting bottle of water positioned for top refl. Bottle was filled to about 8-9"!

D_2O = 81.3 Fuel at Crit = 17.51

Run F

4^{00} PM Inserted 24 one in. dia 2S AL Rods 18 in high and finished filling Reg I with water D_2O = 81.48

Crit fuel ht. 15.77

4-11-60

Run G 1#-1" dia al rod inserted in Reg I.
D_2O = 80.90
Crit fuel ht. 15.95

Run H.
8- ~~#~~ 1" dia. al. rods in Reg I
D_2O = 81.0
Crit fuel ht. — 16.73

Run I

20ea - 1" Dia Al Rods in Reg I

D_2O = 81.30
Crit fuel ht = 15.62

Run J
43 polyethylene tubes 3/8" I.D. - 1/2" O.D.
47 " Styrene " " "
No water in Reg I. Top Refl. "on".
Tubes had stoppers in ends!
D_2O - 81.61
Crit fuel ht 14.82"

plexiglas $C_5H_8O_2$
density 1.18-1.20

Polystyrene $[C_8H_8]_n$
density 1.06

For Polystyrene, the equivalent vol. of water displaced by plastic

$$2\left[\frac{V}{M_{H_2O}}\cancel{6.02\times10^{23}}\right] - 8\left[\frac{V\,1.06}{M_S}\cancel{6.02\times10^{23}}\right] = 2\left[\frac{V_d}{M_{H_2O}}\cancel{6.02\times10^{23}}\right]$$

$$\frac{V}{M_{H_2O}} - 4\,\frac{1.06\,V}{M_S} = \frac{V_d}{M_{H_2O}}$$

$$\frac{V}{18} - \frac{4.24\,V}{\cancel{88}\;104} = \frac{V_d}{18}$$

$$V - \overset{.7338}{\cancel{.8672}}\,V = V_d$$

$$V_d = \overset{.266}{\cancel{0.1328}}\,V$$

Since Vol. of plastic in single tube is 1.54 in³,

$$\therefore V_d = \overset{.266}{\cancel{0.1328}}(1.54)$$

$$= \overset{.410}{\cancel{.205}}\ \text{in}^3/\text{tube}$$

Air void volume = ~~1.541~~ 1.987 in³

Hence, equivalent water vol. displaced per tube

is $\dfrac{\cancel{1.541}}{\cancel{.205}}$ $\dfrac{1.987}{\cancel{.205}}$ ~~2.192~~ in³/tube

1.987
.410
2,397

$\boxed{\begin{array}{ll} 47\ \text{tubes} & 112.7\ \text{in}^3 \\ \% & = 24.16 \end{array}}$

per 27 tubes = ~~59.18~~ 64.7 in³ — % void = ~~12.69~~ 13.87

per 36 tubes = ~~78.91~~ 86.3 in³ — % void = ~~16.92~~ 18.50

~~…~~ 14 — 33.55 — % void 7.19

Calculation of Equivelant void of 47 styrene + 43 ethylene tubes

47 polystyrene tubes:

Void = 112.7 in^3 (including displacement and center void)

43 polyethylene tubes:

void = 73.54 (including addition for plastic and removal for center void)

Total void = 186.24 in^3

Total % void = 39.93

Calculation of % void for 43 polyethylene tubes + 47 styrene tubes with no water in region.

V_S = vol of styrene in 47 tubes; V_ε = vol of ethylene in 43 tubes

V_E = equiv. vol of H_2O

$$8\left[\frac{V_S\, 1.06}{104}\right] + 2\left[\frac{V_\varepsilon\,(.92)}{14}\right] = 2\left[\frac{V_E}{18}\right]$$

$$V_E = 0.734\, V_S + 1.18\, V_\varepsilon$$

$$V_S = (1.54)(47) = 72.4$$
$$V_\varepsilon = (1.54)(43) = 66.2$$

$$V_E = 53.1 + 78.1 = 131.2 \text{ in}^3$$

$$\%\ \text{Void} = \frac{464.3 - 131.2}{464.3} = 71.8$$

Equivalent vol of H_2O removed due to displacement by polyethelene

$$2\left[\frac{V}{18}\right] - 2\left[\frac{V(.92)}{14}\right] = 2\left[\frac{V_d}{18}\right]$$

$$V - 1.18V = V_d$$

$$V_d = V(1-1.18)$$

$$= (-.18)V$$

For 43 tubes 18" long
Air void volume = 1.987 in^3 per tube
Vol of plastic = 1.54 in^3 per tube

Equiv H_2O displaced per 43 tubes {vol is added}

$$V_d = (-.18)V$$
$$= -.18(1.54) = -.277 \text{ in}^3 \text{ per tube}$$

$\therefore$ $= (-.277)(43) = -11.9$ in^3 for 43 tubes

$\therefore$ Net H_2O displacement from 43 polyethylene tubes

$$= (1.987)(43) - 11.9$$

85.44
−11.9
73.54 in^3

Run K

Removed polyethylene tubes.
47 polystyrene tubes remaining - Fully Refl.
D_2O 81.92
Crit Fuel ht. 16.01

Run L

Reg I contains: 47 polystyrene tubes 3/8" I.D. x 1/2" O.D.; 2 - 1 1/4" dia. plexiglas rods & 21 3/8 I.D. x 1/2 O.D. polyethylene tubes. Fully refl. D_2O 82.2
Crit Fuel ht. 14.93

Dilutions to ~ 140 gm/l
at 120 gm/l in slab 61.3 l
Added at ~ 340 gm/l 6.1 l or 9.38 kg soln and mixed. This is ~ 14.25" in Y-12 plastic bottle

4-12-60 Sample D_2O taken - 7-D

4-12-60

Expt. 61 A

Preliminary expt with ~ 140 gm/l fuel soln & ~ .037 gm B/l in D_2O

D_2O — 82.28"

Crit fuel ht 17.43

61 B

added ~ 500 cm³ of conc. $Na_2B_4O_7$ (Bottle # 1) and mixed

D_2O — 80.4

Crit fuel ht. 17.20

61-C

2⁰⁰ PM Added ~ 1 l of Conc $Na_2B_4O_7$

And Mixed

crit ht = 17.49"

D_2O = 80.42

61 D

added ~ ½ l of conc $Na_2B_4O_7$

D_2O 80.43

Crit fuel ht 17.86

very nearly full

Total Borate added

2.04 kg soln

gms $Na_2B_4O_7$ $\frac{2.04}{3.188} \times 40 = 21$ gm

4-

11

11

Rot

0.0

"

"

"

"

"

"

"

4-13-60 Expt. ~~[illegible]~~ 61E

Repeat of 61D with Reg I Counter in.

$D_2O \approx 81$

Crit fuel ht 18.33

Add ~ ½ l of 340 gm/l soln. to slab & mixed.

Expt. 61F

D_2O - 80.6

11^{00} AM Crit fuel ht. 18.13

Rot pos = 0.00 ; Reg I = 0.00 ; D_2O = ~80 ; Blade out

Lift pos = 7.04

11^{05} AM Check out of Counters

Rot Pos	Reg I Pos	I	N	II	III	IV
0.0	0.0	220867	447262	160140	54680	99980
"	"	223854	456384	161990	55620	100870
"	"	221264	452521	158360	54680	—
" 11^{19} AM	"	216120	450217	157360	54630	98620
"	"	214840	447432	156010	53740	97730
"	"	[176418?	367291?	153900	53140	—]?
"	"	220127	459391	159460	55430	100390
"	"	224170	467115	160520	55750	101060
dif		225723	469929	162480	56220	101780
	11^{32} AM	Shut Down				

To Check on Count-rate of Counters relative to Count rate in Exp. 24

Lift = 7.04, $D_2O \cong 80$; Fuel = 17.95; Blade partway in (no selsyn)
Rot pos = 160; Reg I = ~~512~~ 520

Rot Pos	Reg I Pos	I	N	II	III	IV
160 1^{12} pm	~~512~~ 520	325618	290612	32150	52980	15600
"	"	320028	285207	31540	51600	15290
"	"	346809	307093	34450	55560	16520
"	"	363574	322261	36190	58180	~~16~~ 17510
"	"	37839	333995	37360	60520	17990
"	"	392935	346921	38550	62520	18530
"	"	395627	350739	39320	63200	18650
" 1^{26} pm	"	397268	352828	39370	63520	18760
180	558	397828	354123	38920	62750	13540
"	"	395818	353611	38990	62460	13610
200 1^{37}	530	401878	360717	40470	62100	9320
"	"	412644	367740	41070	63070	9640
220	490	400513	356294	41570	58730	6280
"	"	409378	364647	42600	60040	6490
240	440	410166	365607	45320	57680	4680
"	"	409465	363756	44900	57590	4650
260 1^{45} pm	380	392297	351913	46530	54570	3210
"	"	385517	347949	46400	53870	3290
280	330	381405	346459	51210	52010	2400
"	"	384958	350294	51310	52210	2360

4/13/60

Exp. 61-E

Rot loc	Reg I	I	N	II	III	IV
300	280	366491	341292	55310	50230	1790
"	"	355501	332139	53800	48500	1630
360	230	334096	325957	59870	46590	1040
"	"	324206	315829	58070	44760	960
320 2^{02}	180	295241	305832	52730	43290	1240
"	"	296547	307556	53460	43850	1220
290	130	266507	305632	46170	44230	1860
"	"	264743	302434	45950	43830	1820
260	80	232678	310047	40910	47050	2760
"	"	237554	318170	41810	48020	2890
220	40	195002	319208	36530	51210	5630
"	"	188511	307861	35060	49540	5460
190 2^{20} pm	0.0	144625	324718	35030	55640	10170
"	"	154773	344539	38090	59990	11070
160	60	235444	342902	~~81670~~	61600	18730
"	"	237169	343719	~~5840~~	61290	18620
"	"	240026	345614	~~129910~~	61960	18790
"	"	241707	348086	~~194080~~	62150	19080
"	"	248140	355008	38810	63580	19280
"	"	249209	354840	39310	63920	——
"	"	248788	353858	39030	64150	19340
140 2^{55} pm	100	277539	338773	39380	61320	25760
"	"	273857	332945	37920	60110	24810
120	160	376530	396203	49450	71720	40190
"	"	398337	420255	52940	76460	42880
100	220	440143	426532	60130	76100	56250
"	"	426162	409516	57940	72770	54220

Rot.	Reg. I	I	N	II	III	IV
60	270	441150	412463	89120	64490	78560
"	"	447085	419838	91300	64900	79860
30	320	453591	417344	130730	55790	87680
"	"	464889	426989	133710	56710	89740
0.0	360	478495	435355	151640	50830	92830
"	"	488029	442207	154550	51790	94220
40	400	522507	468006	133800	65900	99070
"	"	536549	479824	137370	67420	102620
80	440	585229	518491	89350	89450	87050
"	"	595814	529417	92540	91560	89120
120	480	640623	565531	72970	106760	59750
"	"	627780	555730	70830	103720	58210
140	520	644673	569452	67660	107110	44940
"	"	678305	590321	70620	111810	47030
160	558	696464	609,337	69,260	112640	33790
"	"	707361	615918	70540	115430	34420

Thermocouples:

14 — .951 23.7

15 — ~~.971~~ 21.2

~~16 — .990~~

13 — .943 after draining

12 — .964 24.1

samples of D₂O taken

8-D & 8-D-1 .054 gm B/ml

Page III Expt 61-E

Pot. Pos	Reg I Pos	I/N		II/N		III/N		IV/N	
		X .8695		X .5738		X 1.340		X .5124	
160	60	7031		1102		1812		5464	
140	100	8191	8208	1162	1151	1810	1808	7603	7527
"	"	8226		1139		1805		7452	
120	160	9502	9489	1248	1254	1819	1815	1020	1020
"	"	9476		1259		1810		1020	
100	220	1031	1036	1409	1412	1819	1802	1318	1321
"	"	1040		1414		1784		1324	
60	270	1069	1067	2160	2167	1563	1554	1904	1903
"	"	1065		2174		1545		1902	
30	320	1086	1088	3132	3132	1336	1332	2101	2102
"	"	~~103~~ 1089		3131		1328		2102	
0.0	360	1098	1100	3481	3488	1167	1169	2132	2131
"	"	1103		3495		1171		2130	
40	400	1116	1117	2858	2861	1408	1407	2116	2127
"	"	1118		2863		1405		2138	
80	440	1128	1127	1723	1736	1725	1727	1678	1681
"	"	1125		1748		1729		1683	
120	480	1274	1132	1290	1282	1887	1878	1056	1052
"	"	1129		1274		1866		1047	
140	520	1131	1140	1188	1192	1880	1887	7891	7929
"	"	1149		1196		1893		7967	
160	558	1143	1146	1136	1141	1848	1861	5545	5544
"	"	1148		1146		1873		5588	

61-E Page II

Rot	Rag I	I/N	II/N	III/N	IV/N	
180	558	1123	1099 .1101	1772 .1769	3823 .3836	
"	"	1119 1121	1102	1766	3848	
200	530	1114	1121 .1119	1721	2583 2602	
"	"	1122 1118	1116	1715 .1719	2621	
220	490	1124	1166 .1167	1648 .1647	1762 1771	
"	"	1123 1124	1168	1646	1780	
240	440	1121	1239 .1237	1577 .1580	1280 1279	
"	"	1125 .1123	1234	1583	1278	
260	380	1114 .1111	1322 .1328	1550 .1549	9121 929	
"	"	1108	1333	1548	9456	
280	330	1100 1099	1477 .1471	1501 .1496	6924 684	
"	"	1098	1464	~~1471~~ 1490	6737 ~~5240~~	
300	280	1073 1072	1620 .1620	~~1440~~ ~~1471~~ 1471	5244 ~~4908~~	507
"	"	1070	1619	1460 .1466	4908	
360	230	1025 1026	1837 .1838	1429	3190	3114
"	"	1026	1838	1417 .1423	3039	
320	180	9653 .9646	1724 .1731	1415 .1420	4054	4010
"	"	9639	1737	1425	3966	
290	130	8720 .8737	1510 .1515	1447 .1448	6086	6052
"	"	8753	1519	1449	6018	
260	80	7506 .7487	1319 .1316	1517 .1513	8903	899 908 898
"	"	7467	1313	1509	9082	
220	40	6109 .6116	1144 .1141	1604 .1606	1763	1770
"	"	6122	1138	1608	1773	
190	0.0	4453 .4473	1078 .1092	1713 .1727	3132	317
"	"	4493	1105	1741	3210	
160	60	6864	~~2384~~	1796	5462	
"	"	6901	—	1783	5417	
"	"	6944	—	1792 .1794	5436	
"	"	6944 ~~6988~~	—	1785	5481	
"	"					
"	"	6988	1093 1100	1790	5430	
"	"	7023	1107	1801	—	

Exp. 61-E

Page 1

I/N	II/N	III/N	IV/N
494	358	122	224
491	355	122	221
489	350	121	—
480	349	121	219
480	349	120	218
480	419 ?	145 ?	— ?
479	347	121	219
479	343	119	216
480	346	120	217

Rot pos 160 8 Ref I pos 520 Expt 61F Lift = 704

1120	1106	1823	5347
1122	1105	1809	5341
1129	1122	1809	5379
1128	1123	1805	~~5433~~ 534
1132	1119 111	1811 1808	5386
1133	1111	1802	5341
1128	1121	1802	5317
1126	1115	1800	5317

ave. = 1127

ave. = 1127

To correct this count rate to midplane vertically mult. by 0.997

4/14/60

Samples of fuel taken

14A 14B

140.7
20.2
120.5

14A to Cooper

14B to Harman; 94.2 at 3 D

 4/14/60

Exp. 62

9 15 am — Calibration of ~~B~~ Counters (U-235) using Reg I counter.

Reg I counter placed in center (vertically and radially) in Reg IV

$D_2O = 80$, Fuel 17.9

I	N	I/N
22965	888127	2585
22617	891026	2538
22547	884414	2549
22550	887343	2541
22548	885355	2546
22305	886124	2517
22224	889077	2499
22509	896887	2509
22812	905392	2519

ave. = .025534

10 30 AM — Reg I counter put in center of Reg III (through vent)

I	N	I/N
129366	456954	2831
130816	463107	2824
131005	466533	2808
128607	452685	2840
123125	436402	2820
119214	422538	2821
117237	415607	2820
115532	410097	2818
113609	403959	2812
112028	395911	2829
109848	392747	2796

~~.2782 ave~~

ave = 0.2820

Reg I Counter placed in center of Reg II

I	N	I/N
33034	454790	7263
33301	459227	7251
33564	458802	7315
33287	455619	7306
33273	456179	7293
33339	455604	7317
32827	451058	7277
33215	455153	7297
33351	455919	7315
33164	455319	7283

ave = .07292

4-14-60
2PM

Normalizing Counter in center of reg I

Nor. Ctr. Reg I	N BF3	I/N
359810	468306	7683
364099	473534	7688
367014	477832	7681
366316	476742	7684
370914	482602	7686
379705	494,341	7681
377272	493037	7652
374399	492036	7649
377806	494144	7644
375632	494439	7597
373654	495299	7544
377044	499849	7543
375057	499493	7509

.7434

4-19-60

Expt. 63

Vertical Traverse using fission ctr

Rot. Pos 162, Reg I pos. center (520)

Lift Pos	Reg I	N	Reg II	Reg III	Reg IV
1.00	368250	419184	37120	66460	20930
" 9 13 AM	372607	428072	37390	66730	21160
"	360106	417376	36140	64970	20830
"	354927	414350	35520	64240	20630
"	359545	418633	36100	64750	—
"	365966	427803	32020	65560	20950
"	373219	435232	37500	66920	21080
"	377534	443831	37940	67710	21540
2.00	417215	438408	40360	71110	21740
"	412575	436023	40340	70500	22110
3.00	446011	434294	43160	73860	22870
"	448375	435415	43620	73980	22690
4.00 9 37 AM	481327	442278	45620	78310	24250
"	489844	451626	46430	79680	24950
4.50	509250	456722	48570	82110	25290
"	514819	462935	49430	83140	25500
5.00	525708	466556	50900	84600	25870
"	530439	469025	51790	86000	26100
5.50	535602	467818	51880	86350	26660
"	529750	462445	51670	85480	25940
6.00	537280	464631	51630	86420	25600
"	541062	467645	52320	86740	25680
6.50	549910	472962	53320	88080	26090
"	558793	479523	53930	88620	26460
	558230	483021	54710	90010	26790

Ω St	I	N	II	III	IV
7.00 10 $^{00}_{am}$	555919	485019	54320	90190	26680
"	556915	484047	54330	90150	26650
7.50	563143	488413	55120	91070	26460
"	569417	491634	55800	91780	26350
8.00	565181	491304	55690	92540	26540
"	563446	489822	54910	90630	26190
8.50	565633	495504	55760	92530	26080
"	573520	501553	55220	92410	26130
9.00	574852	508206	54800	93270	25850
"	575016	509341	55860	94250	25970
9.50	582400	520926	56060	94100	26130
"	576092	513753	55010	92780	25680
10.00	573121	522760	54530	93590	25500
"	590193	536572	56420	95990	26240
11.00	569287	541300	53890	93670	24840
"	568136	540216	54050	93540	24640
11.78	534993	533185	50290	88600	22920
"	522772	520043	49710	87850	22590
"	509040	506607	47620	84530	21880
11.00	537477	509901	——	87710	22940
" 10 $^{37}_{am}$	540347	515921	50860	88750	23350
"	545277	520134	51310	89630	23620
10.00	552897	502952	52760	90170	24120
"	559149	509205	52970	90630	24360
9.00	572739	506393	54930	92540	25640
"	571806	504173	54950	92390	25760
8.50	583147	510034	56090	93920	26730
"	591193	517358	57070	95370	27100

Lift	I	N	II	III	IV
8.00	597087	517332	57780	96100	27350
"	597915	516851	57670	95420	27580
7.50	587668	506759	56860	94570	27260
"	594584	512366	57100	94570	27630
7.00	600752	516119	58580	97070	28410
"	598985	517944	58240	97030	28290
6.50	598839	517726	58030	94760	28900
"	603920	522741	58180	97810	28970
6.00	596599	521532	57900	96080	28820
"	594351	518752	57400	95680	29030
5.50	584716	516039	56960	95680	28910
"	585293	514686	56780	94450	28610
5.00	576750	521984	56390	95310	29230
"	575343	521193	56390	94860	29140
4.00	564359	531136	56520	94570	29350
"	560278	523601	55110	93180	29110
3.00	538337	532032	53200	90140	28850
"	548073	541619	53640	92180	29460
2.00	530497	572132	52940	93170	29560
"	537442	573634	53120	92980	29680
1.00	486029	581781	50140	89010	28050
"	493135	587992	50620	90230	28370

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Expt #63

Reg I Dist. to center	Lift Pos	I/N	II/N	III/N	IV/N	Reg II Dist. to Center
		(X .8695)	X0.5738	X1.340	X0.5124	
	1.00	8785	8854	~~1585~~	4992	
	"	8703	8733	1558	4943	
	"	8627	8658	1566	4990	
	"	8565	8572	1550	4978	
	"	8588	8623	1546	—	
	"	8554	~~7484~~	1532	4897	
6.33	"	8575 8550	8616 8545	1537 1535	4843 4864	6.1
	"	8506	8548	1525	4853	
5.33	2.00	9516 9489	9206 9225	1622 1619	4958 5014	5.
	"	9462	9252	1616	5071	
4.33	3.00	1026 1028	9937 9997	1700 1700	5265 5235	4.
	"	1029	1001	1699	5211	
	4.00	1088 1086	1031 1030	1770 1767	5482 550	3.
3.33	"	1084	1028	1764	5524	
2.83	4.50	1115 1114	1063 1065	1797 1797	5537 552	2.
	"	1112	1067	1796	5508	
2.33	5.00	1126 1128	1090 1097	1813 1823	5544 5555	2.
	"	1130	1104	1833	5569	
1.83	5.50	1144 1144	1109 1113	1845 1847	5699 565	1.
	"	1145	1117	1848	5609	
1.33	6.00	1156 1156	1111 1116	1860 1858	5510 550	1.
	"	1157	1118	1855	5490	
.83	6.50	1162	1127	1862	5516 552	.
	"	1165 1161	1124 1128	1848 1855	5518	
	"	1155	1132	1863	5546	
.33	7.00	1146 1148	1120 1121	1859 1861	5501 550	.
	"	1150	1122	1862	5500	
-.17	7.50	1152 1155	1128 1132	1864 1865	5417 538	-.
	"	1158	1135	1866	5359	

Page II

Expt #63

Reg I	Lift	I/N		II/N		III/N		IV/N		Re[illegible]
-.67	8.00	1150	1150	1133	1127	1883	1870	5410	537	
	"	1150		1121		1850		5347		
-1.17	8.50	1141	1142	1125	1113	1867	1855	5263	524	
	"	1143		1101		1842		5210		
-1.67	9.00	1131	1130	1078	1086	1835	1843	5086	509	
	"	1129		1096		1850		5099		
-2.17	9.50	1118	1120	1076	1073	1806	1806	5016	500	
	"	1121		1070		1805		4998		
-2.67	10.00	1096	1098	1043	1047	1790	1789	4878	488	
	"	1100		1051		1788		4890		
-3.67	11.00	1051	1051	9950	997	1767	1745	4588	457	
	"	1051		1000		1731		4561		
	11.78	1003		9432		1661		4298		
-4.45	"	1005	1004	9559	948	1689	1675	4343	432	
	"	1004		9399		1668		4318		
	11.00	1054		9955		1730		4490		
-3.67	"	1047	1050	9858	988	1720	1726	4525	451	
	"	1048		9865		1723		4541		
-2.67	10.00	1099	1098	1049	1045	1793	1786	4795	479	
	"	1097		1040		1779		4783		
-1.67	9.00	1130	1132	1084	1087	1827	1830	5063	508	
	"	1134		1089		1832		5109		
-1.17	8.50	1143	1143	1100	1102	1841	1842	5240	524	
	" ~~8.00~~	1142		1103		1843		5238		
-.67	8.00	1154	1155	1116	1115	1857	1850	5286	530	
	"	1156		1115		1846		5336		
-.17	7.50	1159	1160	1122	1118	1866	1855	5379	538	
	"	1160		1114		1845		5392		
-0.33	7.00	1164	1160	1135	1130	1880	1876	5504	548	
	" 11:00 am	1156		1124		1872		5460		

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Lift	I/n		II/n		III/n		IV/n	Reg II	
6.50	1156	1156	1120	1116	1869	1870	.5580	556	0.[illegible]
"	1155		1113		1871		5542		
6.00	1144	1145	1110	1108	1842	1843	.5526	556	1.
"	1145		1106		1844		.5590		
5.50	1133	1135	1103	1103	1854	1845	.5602	558	1.
"	1137		1103		1835		5558		
5.00	1105	1104	1080	1081	1825	1823	5599	563	2.
"	1104		1081		1820		5652		
4.00	1062	1066	1064	1058	1780	1780	5525	554	3.
"	1070		1052		1779		5559		
300	1011	1012	1000	995	1694	1697	5441	544	4
"	1012		9903		1701		5430		
2.00	9272	932	9253	9255	1628	1625	5166	517	5.
"	9368		9260		1621		5174		
1.00	8353	837	8618	8615	1530	1532	4821	482	6
"	8386		8608		1535		4825		

Expt 64

4-21-60 Horizontal Traverse using Cd-covered Fission Ctrs Lift = 7.04

Rat Pos	Reg I Pos	Reg I	N	Reg II	Reg III	Reg IV
340	370	27116	1831785	70340	3860	20
" 00/PM	"	27808	1872127	72680	3760	20
"	"	27653	1876526	72510	3890	~~40~~
"	"	27690	1880423	72720	3770	30
"	"	27943	1880824	72650	3820	20
300	400	27414	1899304	74680	4400	30
"	"	27192	1881201	73790	4300	20
260	460	26957	1924413	79010	5610	50
"	"	26862	1927235	79660	5490	30
240	490	27061	1931639	81190	6490	100
"	"	27402	1950455	81910	6590	60
220	520	25496	1853889	79400	7190	70
"	"	25513	1844899	79120	7170	80
200	580	24087	1722357	74640	7840	—
"	"	24125	1716454	73810	7940	100
180 33/	540	21185	1593437	69380	8770	160
"	"	21558	1583501	69110	8560	150
160	480	18978	1440101	62050	9290	230
"	"	19038	1429692	62420	9490	340
140	420	15371	1170488	49950	8800	340
"	"	16217	1216692	51360	9120	360
120	380	14778	1100351	46130	9440	540
"	"	15666	1143729	48470	9860	620
100	340	19450	1351346	58330	13880	1140
"	"					

Exp. 44

Rot Pos	Reg I Pos	I	N	II	III	IV
100	340	21757	1472025	63790	15180	1220
"	"	21456	1458636	63330	14950	1280
80	420	12977	1019420	41310	11610	1510
" 2[10]	"	13391	1056224	43110	12290	1490
70	440	12758	1015329	39990	12210	1830
"	"	12294	971659	38780	12320	1970
100	280	29037	1778897	78170	18060	1490
" 2 3/pm	"	30122	1847705	81820	19030	1550
120	220	35338	1922153	86610	17520	1010
"	"	35366	1929133	86250	17620	1010
140	180	36088	1828944	80980	13900	530
"	"	35793	1816083	79980	14090	540
160	130	33980	164263	70970	10750	280
"	"	35143	1657480	71170	10600	280
180 2 45/pm	80	34568	1528521	64230	8070	130
"	"	34241	1503745	62720	7970	130
200	40	35879	1500325	61540	6610	—
"	"	36131	1514711	61640	6480	90
220	0.0	39709	1602509	64430	5970	—
"	"	39198	1573527	63340	5960	100
240	60	37059	1567635	62450	5130	460
"	"	37734	1573781	62560	4920	—
260	130	42219	1945526	78730	5350	30
"	"	42302	1936136	78060	5790	40
280	190	38885	1965708	78560	4810	40
"	"	40518	2041047	81980	4980	20
300	260	31264	1835291	71390	4090	20
"	"	31181	1813638	71190	3890	20

4/21/60 Exp. 64 Page I

Rot Pos	Pos I	I/N	II/N	III/N	IV/N
		x 0.8695	x 0.5738	x .1340	x 0.5124
340	370	1480	3839	2108	
"	"	1485	~~1473~~ 3882 .03862	2008	
"	"	1473	3863	2072 .002045	
"	"	1472 .01479	3868	2005	
"	"	1485	3862	2030	
300	400	1443 .01444	3932 .03927	2317 .002302	
"	"	1445	3922	2286	
260	460	1401 .01397	4105 .04119	2910 .002879	
"	"	1393	4133	2848	
240	490	1400 .01403	4202 .04201	3359 .003369	
"	"	1405	4200	3379	
220	520	1374 .01378	4282 .04285	3878 .003882	
"	"	1382	4288	3886	
200	580	1400 .01403	4334 .04316	4552 .004588	
"	"	1405	4298	462	
180	540	1329 .01345	4355 .04359	5505 .005454	
"	"	1360	4363	5404	
160	480	~~137~~ 1317 .01324	4309 .04337	6451 .006543	
"	"	1331	4365	6636	
140	420	1312 .01322	4265 .04243	7514 .007503	
"	"	1332	422	7493	
120	380	1343 .01356	4193 .04215	8581 .008599	
"	"	1369	4236	8618	
100	340	1439	4317 .04330	1027 .01027	
"	"	1478 .01462	4333	~~434~~ 1031	
"	"	1470	4341	~~2360~~ 1024	
80	420	1273 .01270	4053 .04068	1139 .01151	
"	"	1267	4082	1163	
70	440	1256 .01260	3939 .03964	1202 .01234	
"	"	1265	3990	1267	

Exp. 64 page 2

Rat Pos	Reg I Pos	I/N	II/N	III/N	IV/N
100	280	1632 .01631	4394	1015	
"	"	1630	4428 .04411	1029 .01022	
120	220	1838 .01836	4506	9115	
"	"	1833	4471 .04479	9139 .009125	
140	180	1973 .01972	4427	7600	
"	"	1970	4404 .04416	7758 .007679	
160	130	2068 .02095	4319	6546	
"	"	2121	4295 .04307	6397 .006471	
180	80	2260 .02268	4200	5277	
"	"	2276	4170 .04185	5299 .005288	
200	40	2391	4102	4406	
"	"	2384 .02388	4071 .04087	4277 .004341	
220	0,00	2477	4019	3724	
"	"	2490 .02484	4024 .04022	3786 .003755	
240	60	2363	3985	3273	
"	"	2397 .02380	3974 .03980	3125 .003199	
260	130	2170	4046	2749	
"	"	2184 .02177	4032 .04039	2990 .002869	
280	190	1977	3995	2446	
"	"	1985 .01981	4016 .04006	2439 .002442	
300	260	1703	3890	2228	
"	"	1718 .01711	3924 .03907	2144 .002186	
320	320	1546	3856	2017	
"	"	1558	3850 .03861	2056 .002054	
"	"	1563 .01555	3877	2091	

Rot Pos Reg I

-320 320

~~Reg I~~ Pos	28589	1848830	71300	3730	30
"	29180	1872156	72080	3850	30
"	29532	1888744	73230	3950	30

Tempr. Reg I - 18.3°; Reg III - 18.8°; Reg IV 18.8, air 18.3°
Slab. 17.7 -

Exp. 65

Radial traverse Cd-covered at midplane
i.e. repeat of exp 64 after tightening cables
Lift = 7.04"

		I	N	II	III
Rot Pos	Reg I				
60 1 15 PM	560	17774	1214201	50450	14670
"	"	19015	1283632	53660	15850
"	"	19146	1305198	54850	16080
"	"	19484	1310030	54380	16650
"	"	20034	1322137	55300	16990
100	520	22259	1479732	64670	15480
"	"	22578	1497632	66080	16960
120	480	26301	1709132	77040	15940
"	"	26862	1737893	78260	16010
140	430	31656	1980074	91290	16100
"	"	31163	1853904	91130	16350
160	380	33949	2034884	94690	14370
"	"	33230	1995007	91510	13680
180	330	34974	1976838	89390	11340
"	"	34989	1871494	88650	11280
200	280	36431	1918139	85090	8960
"	"	35735	1876852	81740	8880
220	230	37003	1807608	76250	6970
"	"	37266	1835925	78160	6990
240	180	40293	1824957	74380	5810
"	"	40414	1831098	74510	5960
260	130	39412	1617638	64360	4470
"	"	38778	1626292	62980	4390
"	"	37479	1607023	61720	4390

Rot. Pos	Reg I Pos	I	N	II	III
280	80	35470	1425549	52940	3320
" 2^{10} PM	"	35935	1448352	53790	3210
300	40	39768	1521118	56030	3020
"	"	40368	1560722	57770	3270
320	0.0	42781	1572209	57520	3100
"	"	42295	1570931	57090	3020
340	50	43285	1667871	60910	3130
"	"	43577	1678144	61450.	3200
300	100	44866	1814740	69620	3800
"	"	45153	1829542	69320	3820
280	150	46591	2028259	81280	5020
" 2^{30} PM	"	47164	2039627	81700	4890
260	200	48368	2249491	93640	6530
"	"	48639	2263723	94650	6370
240	240	49284	2413480	105240	8280
"	"	34959	1809448	74130	6070
"	"	35010	1829502	73970	5880
220	290	33401	1860936	78060	7090
"	"	32586	1846223	77480	7060
200	340	31776	1800148	82330	8780
" 2^{50}	"	31782	1921724	83630	8780
180	390	29446	1888826	84010	10970
"	"	29672	1901109	84780	10930
160	440	26476	1774723	78800	11800
"	"	25754	1744245	78000	11600
140	480	22075	1530284	66880	11840
"	4	21501	1526847	67570	13320

Rot Pos	Reg I	I	IV	II	III
120	520	14391	1188432	50620	11560
"	"	16628	1207476	51510	10650
"	"	16846	1219623	51480	10620
100	570	19044	1344088	57630	13490
"	"	19457	1380397	59410	13810
80	520	26168	1847143	80860	21970
"	"	27292	1887317	84100	22500
60	480	28658	2013142	87860	26100
"	"	28870	2031228	89430	26710
50	450	26091	1855624	79320	24570
"	"	25756	1876490	79890	24710
"	"	26030	1893343	80630	25140

Reg I - 18.8°c Reg IV - 19.3°c Reg III - 18.8°C

Exp. 65 page I

~~R~~ Rot	Reg I	I/N	II/N	III/N
		√.8695	√0.5738	√1.340
60	540	1463	4155	1208
"	"	1480	4179 4174	1234 1245
"	"	1466 1482	4203	1232
"	"	1487	4151	1270
"	"	1515	4183	1285
100	520	1504 1506	4369 4391	1045 1089
"	"	1507	4414	1132
120	480	1538 1542	4507 4505	9327 9269
"	"	1545	4502	9211
140	430	1598 1639	4610 4762	8131 8474
"	"	1680	4915	8818
160	380	1666 1666	4648 4617	7054 6955
"	"	1665	4586	6857
180	330	1768 1819	4521 4629	5735 5881
"	"	1870	4738	6028
200	280	1899 1902	4436 4395	4671 4700
"	"	1904	4354	4730
220	230	2046 2038	4217 4237	3855 3831
"	"	2029	4257	3807
240	180	2207 2207	4075 4072	3183 3219
"	"	2207	4069	3255
260	130	2435 2383	3977 3896	2762 2730
"	"	2384	3873	2699
"	"	2332	3840	2731
280	80	2488 2485	3713 3714	2329 2272
"	"	2482	3714	2216
300	40	2614 2600	3683 3692	1985 2040
"	"	2586	3700	~~1972~~ 2096
320	6.0	2721 2707	3659 3646	1972 1947
"	"	2692	3633	1922

Rot	Reg F	I/N	II/N	III/N
340	50	2595 2596	3652 3657	1876 1892
"	"	2596	3662	1907
300	100	2471 2470	3835 3812	2093 2091
"	"	2468	3790	2088
280	150	2297 2304	4007 4006	2475 2436
"	"	2311	4004	2397
260	200	2147 2148	4163 4172	2903 2858
"	"	2148	4180	2813
240	240	2042	4361	3431
"	"	65% 1932 1962	4097 4167	3355 3333
"	"	1913	4043	3213
220	290	1794 1780	4194 4196	3809 3817
"	"	1765	4197	3824
200	340	57% 1765 1709	4573 4462	4877 4847
"	"	1653	4351	4818
180	390	1558 1559	4449 4454	5810 5779
"	"	1560	4459	5749
160	440	1491 1484	4440 4456	6649 6650
"	"	1476	4472	6651
140	480	1442 1425	4371 4398	7739 8230
"	"	1407	4425	8722
120	520	1379 1379	4260	9730
"	"	1377	4267 4249	8823 9086
"	"	1381	4221	8707
100	570	1416 1413	4287 4296	1004 1002
"	"	1409	4305	1000
80	520	1416 1431	4377 4416	1189 1191
"	"	1446	4456	1192
60	480	1423 1422	4364 4383	1296 1306
"	"	1421	4403	1315

Exp. 45

Page III

~~Reg I~~ Rot	Reg I	I/N		II/N		III/N	
50	450	1406	1384	4274	4264	1324	1323
"	"	1372		4258		1317	
"	"	1375		4259		1328	

Exp. 64

Repeat of Radial traverse (65')

4/25/60

Rot Pos	Reg I Pos.	I	N	II	III
160	340	18648	1312953	55690	8340
"	"	19524	1378348	59010	8770
"	"	19071	1347089	57120	8630
"	"	18797	1336082	56330	8450
"	"	18764	1337984	56440	8450
"	"	18935	1340688	57100	8470
1:19 2 PM "	"	19070	1349728	57070	8500
180	300	20385	1372717	57770	7230
"	"	20825	1377929	57350	7280
200	250	20621	1275040	51580	5520
"	"	22185	1370146	55320	6050
220	200	21535	1246570	48950	4720
"	"	20276	1183242	45750	4260
240	150	41484	2024827	83290	6770
"	"	29309	1481693	58320	4460
"	"	27258	1408451	55650	4510
260	100	28985	1379412	51720	3690
"	"	29158	1372538	51380	3670
280	50	27720	1244308	44210	2750
"	"	27683	1239447	44660	2710
300	0.00	28310	1219110	43130	2540
"	"	27866	1210354	43080	2730
340	40	25225	1135142	38680	2020
" 3:00 PM	"	25494	1147092	40090	2130
320	80	29067	1351687	47930	2590
"	"	29910	1378225	49610	2960

Rot. Pos.	Reg I Res.	I	N	II	III
300	120	32221	1559904	57310	3490
"	"	32397	1568618	57660	3400
280	160	35892	1787489	68110	4560
"	"	35163	1758737	67240	4120
260	200	35875	1905458	75590	5250
"	"	36120	1916158	75770	5300
240	240	37367	2110015	87960	7010
"	"	38592	2170944	92170	7400
220 25/3	280	31983	1956652	81270	7550
"	"	32669	1992489	81900	7490
200	320	29886	1944097	82250	8650
"	"	29715	1944480	82520	8810
180	360	27007	1883954	80950	10130
"	"	26796	1857745	79630	10480
160	400	22775	1685836	72410	10860
"	"	21899	1635892	70020	10510
140	440	17510	1378737	58340	10250
"	"	16479	1303609	54670	9610
120	480	21265	165380	72340	14920
"	"	22748	1749951	76100	15960
100	520	17997	1408793	59900	14270
"	"	16664	1330920	55840	13490
80	560	21182	1633398	69540	18800
"	"	21877	1674610	71010	19170
60	520	29104	2181736	95130	28760
"	"	29534	2213552	97100	29450
80	480	23858	1833802	79280	21490
"	"	23279	1813810	78170	20780

Rot Pos	Reg I	I	w	□	□
100	440	27065	2009352	89460	21190
"	"	26724	1999223	88640	21250
120	400	29863	2128229	96550	20220
"	"	30147	2167228	98140	20380
140	360	34938	2357554	108640	19410
"	"	34507	2296233	105250	18700
160	320	37330	2378741	108340	16160
"	"	37227	2387729	108920	16430

$4\frac{28}{pm}$ Shut Down

4/26/60 Reg II counter removed and was found to be throwing in counts. Repoived

Reg I counter checked and found OK

Exp. 67

Cd-Covered Radial Traverse (repeat of 66 etc.)

4/27/60 Counters replaced.

$D_2O \cong 80$, Fuel $\cong 17.9$ Lift = 7.04

Recheck of Reg I pos. at center = 498

Rot. Pos	Reg I Pos	I	N	II	III
340 2:50 PM	~~0.6~~ 4	42130	1859 1641112	62500	3640
"	"	41301	19093 1678812	63520	3200
"	"	42613	1979 1730037	65650	3390
"	"	44333	2042 1790937	68070	3440
300	50	44654	2159 1862814	72430	4020
"	"	45658	22032 1895197	73690	4120
-270	100	47739	2488 2099928	85180	5520
"	"	48411	25057 2110612	85530	5450
240	150	47633	2733 2269696	96440	7610
"	"	46315	26320 2199611	93030	7400
220	200	30808	1896 1667786	70420	6390
"	"	29633	1837 1619922	67230	5980
200	250	26526	1776 1572488	67480	7120
"	"	25965	1745 1567627	67230	7050
180	300	22982	1686 1507124	65010	7950
"	"	22450	1651 1479548	63580	7960
160	350	20130	1589 1431320	63550	9310
"	"	20301	1591 1433488	62840	9390
140	400	16770	1407 1286532	56220	9760
"	"	17177	1374 1239232	54840	9820
120	450	12817	1093 1024252	43420	8940
"	"	11512	9835 930491	38720	7890
100	480	8596	7519 725235	29500	6910
"	"	8573	7328 714219	29060	6770

Rot Pos	Reg I Pos	I	N	II	III
80	520	6104	5397 525923	20480	5340
"	"	5820	5013 496347	19300	5260
60	560	24917	22037 1895754	83510	24850
"	"	25158	22188 1907927	83930	25160
80	520	21292	1894 1665839	72330	19600
"	"	20563	18270 1615527	69520	18710
100	480	21914	1934 1696389	75190	17850
"	"	21750	19477 1706988	75700	17880
120	450	24712	2197 1890518	86240	17690
"	"	25644	2256 1933382	88480	18200
140	400	28037	2374 2016613	91930	16080
"	"	28013	2399 2036498	93190	16090
160	350	27043	2208 1898412	84910	12660
"	"	26831	21963 1870125	83370	12500
180	300	29942 ?	19465 1706013	73480	~~11300~~ ?
"	"	25129	18831 1657755	70710	9020
200	250	26533	18357 1621705	67630	7300
"	"	26505	1827 1615804	67730	7430
220	200	28181	17982 1592795	64870	6030
"	"	28100	17873 1585946	63380	5930
240	150	27999	15988 1439154	55330	4390
"	"	26658	15389 1391458	53490	4280
270	100	25404	13493 1239137	45170	2890
"	"	23765	1270 1172846	42400	2760
300	50	33190	1631 1464201	52670	~~3420~~ ?
"	"	33260	16714 1495743	—	3010
"	"	34222	1688 1509036	55110	3020

Rot Pos	Reg 2 Pos	I	W	II	III
340	4	38385	18497 1632652	59210	3040
"	"	39862	1901 1672190	60380	3180
80	520	21553	1944 1704121	73420	19400
"	"	22767	1997 1744359	76320	20180
60	560	21102	1880 1656512	70330	20530
"	"	21402	1898 1669310	70780	20840

Expt 61 Page 4

by 704 i.e. corrected for dead time

Rot. Pos	Reg I Pos	(.8693) Reg I/N		(.5738) Reg II/N		(1.34) Reg III/N	
340	4	~~2244~~		~~3362~~		~~1958~~	
"	"	2143		3324		1674	1690
"	"	2153	2162	3317	3325	1712	
"	"	2171		3333		1680	
300	50	2068	2070	3354	3349	1861	1866
"	"	2072		3344		1870	
270	100	1918	1925	3423	3418	2218	2195
"	"	1932		3413		2170	
240	150	1742	1750	3528	3531	2784	2798
"	"	1759		3534		2811	
220	200	1624	1621	3714	3691	3370	3317
"	"	1617		3669		3264	
200	250	1494	1482	3799	3804	4009	4002
"	"	1471		3809		3994	
180	300	1363	1361	3855	3853	4715	4766
"	"	1359		3851		4821	
160	350	1267	1271	3999	3974	5859	5880
"	"	1275		3949		5901	
140	400	1192	1221	3995	3993	6937	6990
"	"	1250		3991		7147	
120	450	1172	1171	3972	3950	8179	8100
"	"	1170		3934		8022	
100	480	1143	1153	3923	3926	919	9183
"	"	1162		3930		9175	
80	520	1143	1151	3837	3842	1000	1024
"	"	1160		3849		1049	
60	560	1131	1133	3789	3785	1123	1128
"	"	1134		3782		1133	
80	520	1124	1125	3818	3812	1034	1029
"	"	1126		3805		1024	

EXP 67 page II

Rat Pos	Reg I pos	Reg I/N		Reg II/N		Reg III/N	
100	480	1133	1125	3887	3887	9229	9210
11	11	1117		3886		9180	
120	450	1124	1131	3925	3923	8051	8058
11	11	1137		3922		8067	
140	400	1181	1174	3872	3878	6773	6735
11	11	1167		3884		6706	
160	350	1224	1223	3845	3820	5730	5710
11	11	1221		3795		5690	
180	300	~~1538~~	1334	3775	3765	~~5805~~	4789
11	11	1334		3755		4789	
200	250	1445	1448	3684	3696	3976	4010
11	11	1450		3707		4046	
220	200	1567	1570	3607	3576	3353	3335
11	11	1572		3544		3317	
240	150	1751	1742	3460	3467	2745	2765
11	11	1732		3475		2781	
270	100	1882	1876	3347	3342	2142	2155
11	11	1871		3338		2173	
300	50	2034		3229		—	
11	11	1989	2017	—	3246	1801	1795
11	11	2027		3264		1789	
340	4	2075	2085	3201	3189	1643	1655
11	11	2096		3176		1672	
80	520	1108	1124	3774	3798	9979	9995
11	11	1140		3822		10110	
60	560	1122	1125	3740	3735	10920	10950
11	11	1127		3729		10980	

4/29/60 Determination of Dead time Correction for BF_3 Normalizer

1^{st} τ Exp. Normalizer amp. settings unchanged
Sources ~12" apart
$\tau = 1.471 \times 10^{-7}$ min

2^{nd} τ Exp. Repeat
$\tau = 1.464 \times 10^{-7}$ min

3^{rd} τ Exp Repeat
$\tau = 0.858 \times 10^{-7}$ min

4^{th} τ Exp. Amplifier settings (PDL) changed
(see Richards notes)
$\tau = 0.5095 \times 10^{-7}$ min

5^{th} τ Exp. Amplifier settings returned to former values
$\tau = 1.232 \times 10^{-7}$ min

For data and Calculations see folder (Two Source τ Exps.)

4/29/60 The Plateau curve on the BF_3 Normalizer was checked. Chamber was operating on something of a slope (Rohrer has data and Curve). The voltage setting was changed so as to operate on plateau.
Prior to the adjustment the count rate for a given source was ~~330~~ 290,000 and after adjustment count rate was 330,000, for same source

5/2/60

Determination of dead time corrections
by Period method

$3^{\underline{00}}$ pm Periods were obtained for BF_3 normalizer and
Reg I BF_3 miniature counter
Linear portion of data for Normalizer period
sent to K-25 for curve fitting
Plot of Reg I data shows no appreciable
deviation from linearity up to 2 million C/M
Data is in Folder

5/3/60 Period measurement of Reg III counter
Note: Reg II counter also in Reg I connected by jumper
$11^{\underline{15}}$ but counts are not consistent - apparently due to
amplifier
$D_2O = 81$ Fuel 18.8 Blade used for period

5/5/60 $10^{\underline{00}}$ AM Check out of Instruments

Normalizer (BF_3) settings
PDL = 19 Rise time = .2 μs
Gain = 4 HV = 1600

#4 preamp connected to Reg II chamber
#3 preamp " " Reg III "

5/5/60 $1\frac{00}{pm}$ Period run on normalizer to get correction factor

Expt 68

Vertical Traverse Cd-Covered U^{235} fis. ctrs.

$D_2O \sim 80.6$ Fuel = 18.5 Rot Pos = 161

Lift Pos	Reg I	N	Reg III ~~Reg II~~	Reg II ~~Reg III~~	
11.78 $1^{3\%}$	21906	2,275,641	4170 ~~53540~~	53540 ~~4170~~	10^{-4} ~ 3 2 min cts.
"	23672	2477916	4510	58710	"
"	24135	2538116	4650	60330	"
"	24718	2551940	4620	60450	"
11.00	17248	1766827	3410	43700	2 min cts
"	27587	2818530	5330	69050	4 " "
9.60	26757	2553575	5190	67370	"
"	31041	2977110	6210	79330	"
8.00	32873	3033,399	6520	83800	
"	34728	3206225	7000	89180	
6.50	35724	3271240	7220	90930	
"	36613	3335299	7390	92720	
5.00	40684	3813530	8060	103480	
"	43540	4071170	8830	110860	
3.50	34229	3401291	4880	86350	
"	35923	3525672	7040	89450	
2.00	31420	3401171	6190	77140	
"	31349	3477421	6110	78830	
3.00	30554	3150940	5910	76860	
"	30232	3097936	5780	75390	

Lift Pos	Reg I	N	Reg III	Reg ~~IV~~ II	4 min cts
4.50	28492	2722816	5440	71310	"
"	27137	2591733	5150	67680	"
6.00	38339	3472634	7440	95500	"
"	38463	3542570	7640	97840	"
7.50	38401	3421418	7430	95090	"
"	35257	3242229	6900	89930	"
9.00	37699	3482906	7220	94820	"
"	37110	3474929	7340	94630	"
10.50	34290	3360071	6680	86410	"
"	31196	3079685	6100	77910	"

Notes: *Reg IV pre-amp and amp & scaler used with Reg II chamber

Exp. 68

Corrected Values

	Lift. Pos.	Reg I/N	Reg III/N	Reg II/N	Reg I/N	Reg II/N	Reg III/N
E	11.78	9630	1832	2355	x.8695	x.5738	x 1.34
.967	11	9655	1820 1825	2369 2366	.930	2288	.1765
	11	9519 9621	1832	2377			
	11	969	1810	2368			
.987	11.00	976 977	1930 1910	2473 2461	964	2429	1934
	11	978	1891	2449			
x1	9.50	1048 1046	2032 2058	2638 2651	1046	2651	2058
	11	1043	2085	2664			
.987	8.00	1084 1084	2149 2165	2763 2772	1070	2736	2137
	11	1083	2183	2781			
.985	6.50	1092 1095	2207 2211	2779 2779	1076	2737	2178
	~~5.00~~	1098	2215	2779			
.970	5.00	1067 1068	2114 2142	2718 2721	1036	2639	2078
	11	1069	2168	2723			
.979	3.50	1006 1012	2022 2010	2538 2538	991	2485	1968
	11	1019	1997	2537			
.979	2.00	923 913	1820 1788	2268 2268	894	2220	1750
	11	902	1757	2267			
.985	-3.00	970 973	1874 1871	2439 2436			
	11	976	1866	2433	958	2399	1843
x1	4.50	1046 1047	1997 1992	2618 2613			
	11	1047	1987	2609	1047	2613	1992
	6.00	1104 1095	2142 2148	2750 2756			
.979	11	1086	2156	2762	1072	2698	2103
	7.50	1128 1107	2172 2150	2779 2776			
.979	11	1087	2128	2773	1084	2718	2105
	9.00	1082 1075	2073 2093	2722 2723			
.979	11	1068	2112	2723	1052	2666	2049
	10.50	1020	1988	2571			
.987	~~11~~	~~[illegible]~~ 1016	~~1860~~ 1984	~~2493~~ 2551	1003	2518	1958
	11	1012	1981	2530			

5/6/60

Exp. 70

Run "A"

#1 – BF_3 Normalizer

BF_3 minister in Reg I

n waiting

n counting

```
 135160 F
  16000 F
 162254 F
  19974 F
 198703 F
  24296 F
 247639 F
  30192 F
 314554 F
  37008 F
 397025 F
  45296 F
 496056 F
  55332 F
 641510 F
  67534 F
 805935 F
  83470 F
  99746 F
 101332 F
1231364 F
 124255 F
1461476 F
 152789 F
-----------
1531557 F
 162821 F
```

Void Coefficient Measurements

5/6/60 Exp. 69

2^{00} System Crit at Fuel Selsyn = 18.08
and Tad selsyn = 18.40
Blade up and Cd-Covered counters in
Reg II + III ~~at Rot. pos of 340 and lift 7.04~~
lowered to bottom
no void

3^{00} pm 5/6/60 Exp. 70
Run A
IC-3 Calibrated Normalizer and Reg I BF_3
Chamber attached to Print Out scalers
14 polystyrene tubes containing air [rubber stoppers in ends] clustered
in center - Center region filled with H_2O otherwise

Crit fuel Selsyn	17.27	crit	tad Selsyn	18.77
Period Fuel	17.29		Period Selsyn	20.05

3^{30} Leveling to Crit with Tad Selsyn = 18.77
still Crit.

5-9-60

Expt 70 Run A'

Recheck of Run A.
system crit at 17.31" Tadadder 12.99
Tadadder to 14.26" for period. After period moved Tad back to 12.99 and system still crit.

Expt. 70
Run B.

36-$\frac{1}{2}$"OD tubes containing air in Reg I
IC 3 & IC 4 recalibrated | water outside tubes
Crit height 16.38"
& Tadadder at 10.05

Period: liq level 16.41 TA 11.50
not crit at same Tad. height
Crit at Tad = 10.26..

11⁵⁵A Shut down by lowering Tadadder to 99.543
12¹⁰ Insert source
Log N (Red) reads 8×10^{-13}
" (Blue) 1.4×10^{-11}
Both log instruments need lead shielding
add 2" lead on Red log N

Temp. Reg I 16.7
Reg III 17.0°C
Reg IV 17.3
Rea. 18.0

Expt 70
Run B'

Repeat of Run B to check on 8h

Crit 16.39" & Tad = 10.22

Tad. to 11.50 for period

level After Period liq level = 16.40 tA = 10.25

Expt 70
Run C

47 - ½" O.D. x ⅜" I.D. Polystyrene Tubes dry inside

43 - " " Polyethylene " " "

Tubes surrounded by water

Crit at 15.21. & Tadodder - 9.56

Period 15.237 tA 10.80

level After Period liq level - 15.218 tA - 9.79

3²⁸ PM Dump Soln to 9.38

Exp 70 Run D

47 ½" OD x 3/8 ID Polystyrene Tubes } dry inside

43 " " Polyethylene Tubes } and out.

Polyethylene bottle filled with H_2O inserted for center region I top reflector

Crit At liq level = 14.948 tA = 9.25

Period " " = 14.97 " = 10.50

4³⁵ Crit at 14.957 Tad = 9.58

Shut down

5-10-60 Exp # 70

E.R.R. Worked on Soln liq level
9^45 AM Zero checked Approx 0.02"
Calib checked on IC-3-4 By DWM (OK).

Run E

47 - Polystyrene Tubes 1/2" OD x 3/8" ID
43 Polyethylene " " " "
28 of the tubes were filled with H2O
All other + interstitial spaces are in air

System crit at 14.76; Tod at ~~12.15~~ 12.10

For period; Tod. at 13.40; soln ht 14.795
level After Period liq level 14.764 +A 12.10
11^20 Drain Soln to 8.98"

Expt 70 Run F
no water or plastic in reg I
1^30 PM except for top refl. can
system crit 17.59 Tod. at 11.75"
For period raised Tod to 13.00"
2^02 level After Period liq level 17.58 +A 11.82
Drain Soln to 9.95"

Reg III - 17.2°
Reg IV - 18.0

5-11-60 Expt 71 LWG & NF cc

Run A

8 - 1" Dia. Al rods clustered in center of Reg I
crit at 16.61"

Run B

9 10 AM 14 - 1" Dia Al Rods Clustered in Center of Reg 1
Crit Ht = 15.89"

Run C

10 00 AM 20 - 1" Dia. Al Rods randomly spaced in Reg I
crit at 15.56

Run D

24 - 1" Dia. Al rods randomly spaced (Except that space is very nearly full)
Crit at 15.76

Expt 71

Run E

11^{25} To test crit condition with H_2O only in Reg I
Crit at 17.69"

Test for height reading at just zero check very closely.

Temp Readings Reg I 20.2°C
slab 20.11 Reg III 19.2
Reg IV 19.8

5-11-60 Samples of Fuel soln taken
15A, 15B & 15C
L sent to Cooper

Sample of D_2O taken 9-D

Samples 9-D and 15B to Harman

Expt 72
Zero Calibration

Selsyn reading		Ladder ht.	
0.120	99.879	8.45	4.00
0.110	99.651	8.00	3.50
0.097	99.436	7.50	3.00
0.090		7.00	
0.084		6.50	
0.078		6.00	
0.069		5.50	
0.057		5.00	
0.047		4.50	

Expt. 72

5-12-60 Reactor height Calibration

calib. at top!

Fuel selsyn	Jad adder ht
17.66"	3.60"
17.68	4.60
17.69	5.60
17.735	6.60
17.785	7.00
17.855	7.40
17.935	7.80
18.035	8.20
18.11	8.60
18.20	9.00
18.29	9.60

Expt 73-A

5-12-60 Control Rod Calibration

Crit at 18.48 Control Rod at zero.

For period " " " 6.25

Run control rod back "to zero" still crit,

For 2nd period control rod raised to 3.00"

~~Lowered soln to sub. crit.~~

Crit at 18.30 with rod at 3.00"

Raised rod to 7.00" for 3rd period

Lowered " for check on crit position: 4.78

Raised rod from 4.78 to 9.00 for period.

Lowered " crit at 5.10

5-13-60 Exp # 73 - B JRF SwG C

Purpose: Control Rod Calibration

Crit Ht	18.~~18~~ 13"	Control Rod	7.0"
Per Ht	18.13	" "	11.0"

9:22 AM lower control Rod to 7.0"

Crit at 6.68

lower Power level with tad Adder

Crit Ht	17.86	Control Rod	9.0"
Per Ht	17.86	" "	14.0"
Crit Ht After Period	17.86	" "	11.45
Per Ht	17.86	" "	18.00"
Crit at			12.00

lowered Control Rod to 7.0" And leveled with TA Crit Ht 18.11

Per Ht	18.11	Control Rod	10.0"

Crit at 7.08

2" OD. Tadadder Calibration

37.78 cc/in

16A & B taken sent to Harman

$\boxed{\begin{array}{l} 100\ g/L \\ 67\ \cancel{60}\ \frac{D}{D+H} \\ (65 \to 70) \end{array}}$

① $\frac{D}{D+H} = 65 \to 70$

② $0.000275\ \frac{U^{235}\ \text{atom}}{\text{barn cm}}$

$\hookrightarrow$ 100 g/L.

③ ~~B~~ Adjust B
in refl—

9^{00} AM 5-16-60

5-16-60

Expt. 74 A

Test reactivity at near full

Crit. at	17.70	Tod.	~~13.41~~
Pos. Period	17.904	"	14.27
Crit	17.697		13.37

$34 cm^3 \simeq 0.90'' \simeq .2''$

$17 cm^3 \simeq .1''$

74 B

Crit	17.90	~~14.30~~
Pos. Period	18.35	16.28
crit at	17.937	14.50

$67.3 cm^3 \simeq 1.78 \simeq .41$

$16.4 cm^3 \simeq .10''$

1st Period from 17.70" → 17.9" using 50% photo neut.

ρ 2.37×10^{-4} (T = 432)

$\rho/in = 11.85 \times 10^{-4}$

2nd Period from 17.94 → 18.35

$\rho = .652 \times 10^{-4}$ (T = 124)

$\rho/in = 15.9 \times 10^{-4}$

1st Period ρ/Tod-Δh $= 3.39 \times 10^{-4}$

2nd Period ρ/Tod-Δh $= 4.76 \times 10^{-4}$

5-16-60 Added cl of H_2O to fuel soln.

5-17-60

Expt 75A

After adding 6 l. of H_2O and mixing
Test for critical conditions

9^06 Crit Ht 14.61" TA 18.65
Per Ht 14.632 ,, 19.94 T = 207
crit at " 18.66

$\rho_T = 4.26 \times 10^{-4}$; $\rho/_{\Delta TD} = 3.33 \times 10^{-4} \times \frac{1}{.01384} = \frac{2.41}{\cancel{3.28}} \times 10^{-2}$

Drained added 2nd 6 l H_2O & mixed

Tempr. Reg I - 24.1, Reg III 24.1; Reg IV 25.7; Slot 24.5

Expt 75B

After 2nd addition of 6 l. H_2O

10^50 Crit Ht 12.926 TA 12.72
Pos Per. ——— TA 14.00 T = 169 sec
Crit Ht 12.936 TA 12.72
1.28

$\rho = 5.15 \times 10^{-4}$; $\rho/_{\Delta TD} = 4.02 \times 10^{-4} \times \frac{1}{.01384} = \frac{2.90}{\cancel{3.72}} \times 10^{-2}$

75-C

Add 6 l H_2O And Mix (3rd addition
12^45 test for Crit Ht 11.94 TA 18.08

Positive Period T.A. 19.38 T = 144 sec
Crit at 18.06
$\Delta TD = 1.29$
$\rho = 5.65 \times 10^{-4}$

$\rho/_{\Delta TD} = \frac{5.65}{1.29 \times .01384} = 3.16 \times 10^{-2}$ (4.38)

5-17-60

Exp # 75-D

Add 6 l H_2O to soln And Mix [Total of 24l. H_2O]
test for crit Ht

2^{42}	Crit Ht	11.34	+A	6.62
	Pos PER	11.369	T=134sec	7.87
	Crit. at	11.34		6.62

$\rho = 5.98 \times 10^{-4}$

$\frac{\rho}{in} = \frac{5.98 \times 10^{-4}}{.01384 \times 1.25} = 3.46 \times 10^{-2}$ /in fuel

Temp Reg I: 24.7; slab 25.1; Reg III 24.7, Reg IV 25.1

Added ~ 100 gm $Na_2B_4O_7$ to D_2O Refl. & mixed

5-18-60 Expt 76 A

Test on crit condition

9^{36}	Crit Ht	12.44	+A	17.80"
	Per Ht	12.46	+A	19.00"
After Per	Crit Ht	12.44	+H	17.80
9^{50}	Dump soln And D_2O		T = 179	$\rho = 4.77 \times 10^{-4}$

$\rho/in = \frac{4.77}{.01384 \times 1.20} = 2.87$

Added ~ ~~122~~ 212 gms $Na_2B_4O_7$ & mixed

Expt 76 B   Total 372

Crit. Cond. after adding 212 gm.

1[37] PM	Crit Ht	13.755	+ A	11.40
	Per "	13.776	+ A	12.61
	After Per	13.752	+ A	11.34

2[02] Dump soln and D_2O

$T = \cancel{179}\ 211$ sec (4 photos) $\rho = \cancel{4.27}\ 4.20 \times 10^{-4}$

$\rho/in = \frac{4.20}{.01384 \times 1.27} = \cancel{2.39 \times 10^{-2}}$

5-19-60

Expt. 76 C

Crit Condition after adding another 500 gm $Na_2B_4O_7$ Total ~ 812 gm
60
872

With no D_2O in refl. fuel was pumped up to full with only a small increase in Neut. level.

12[33] Cont Exp # 76C

start feeding D_2O into ~~system~~ Reactor

1[09]	Crit Ht	15.245	+ A	20.22
1[21]	Crit Ht	15.246	+ A	15.29
	Per Ht	15.27 $\rho = 3.38 \times 10^{-4}$	+ A	16.50
	level After Period			15.29
				1.21
	Crit Ht	15.245		

1[37] Dump Soln and D_2O

ρ/in fuel = $\cancel{2.44} \times 10^{-2}$ 2.02

Temp. Reg I - 23.7, Reg III - 26.1, Reg IV 25.4

5-20-60

Expt. 76 D

After adding another 1200 gm $Na_2B_4O_7$ & mixing (total 2072)

Preliminary crit ht: 17.19, Dumped D_2O for further mixing.

Crit ht.	17.193	Tad.	15.25
Pos. period	17.21		16.50

level After Period

Crit Ht 17.193 + A 15.25

1[47]. Dump soln and D_2O

$T = 313s$ $\rho = 3.07 \times 10^{-4}$ $\rho/in = \frac{3.07}{1.25 \times .01384} = 1.78 \times 10^{-2}$

5-23-60

Expt. 76E

Added ~ 300 gm $Na_2B_4O_7$ to D_2O & mixed

9[05] Crit ht 17.44 Dumped D_2O for check on mixing

Crit ht. 17.43 Tadder 99936 64

Pos. per. " ~~00080~~ 80

1.44"

Crit. al 99910 — 90

00080 — 80

1.70"

$T = 274 sec$ $\rho = 3.42 \times 10^{-4}$ $\frac{\rho}{in} = \frac{3.42}{1.70 \times .01384} = 1.45 \times 10^{-2}$

 5-23-60

Expt 76 F

Added 300 gm $Na_2B_4O_7$ & mixed

Preliminary crit ht. 17.52 Dumped D_2O for mixing

Crit ht. 17.54 TAP 8.99"

Positive period " 10.50

cut at " 8.87

1.63"

$T = \cancel{278 sec}$ 252 $\rho = 3.38 \times 10^{-4}$ $\frac{\rho}{in} = \frac{2.38 \times 10^{-4}}{1.63 \times .01384} = 1.50 \times 10^{-2}$ $\cancel{1.06} \times 10^{-2}$

5-24-60 Expt. 76 G

Added ~600 gm $Na_2B_4O_7$ to system and mixed.

Preliminary test; not crit full, Dumped D_2O for further mixing

Repeat still not critical full

10^{45} Add 4 l D_2O to D_2O System

Temps. Reg I 22.4, Reg III 22.5, Reg IV 24.2

5-24-60

Expt 76H

after adding 4l ~~pure~~ D_2O to D_2O system & mixing

Sub. crit taken full: Fuel to 20.4

added 4l more D_2O to system

Expt 76I

Test for crit with total of 8l. D_2O added

slightly sub with fuel at 23.49"

added 2l D_2O & mixed.

Expt 76J

Crit. with fuel at 21.4

added 2l D_2O & mixed

Expt 76K

Crit. at 20.7"

5-25-60 Repeat as check of reactivity

crit ht 20.73

added 6l. D_2O & mixed

Expt 76 L

Test for crit. with total of 18 l D_2O added.

Crit at 19.46

Temp Reg I - 22.5, Reg III - 25.1, Reg IV 22.9

Expt 76 M

Test for crit. with total of 28 l D_2O added.

crit. ht. 18.32

Expt. 76 N

Test for crit with total of 34 l D_2O in system

crit at 17.58"

Repeat after dumping D_2O

crit at 17.71

4^{00} PM Reg I selsyn = 510 when counter is at center
= 8 " " " " edge

5-25-60 Sample of fuel taken #17A, 17B
17B sent to Harmann; ~ 70.5 at % D

Sample 10-D-1 82 taken of D_2O
Harman: 99.8 at % D

5-26-60

Expt. 76-O

Test for crit. condition with Cd-covered counter in reactor & same D_2O poison as 74N

Not crit except with source when counter rotated to 340 & Fuel at 23.8"

Added 6 l pure D_2O to system & mixed

17A: 113.7 $\frac{mg\ U}{ml}$ sp gr. 1.226 at 23^0

g/l in mg = 2.35

Exp. 77

5/26/60 Cd-covered 235 Radial traverse

2^{30} Crit ht ≅ 22.8 ; Reg I selsyn = 510 at center and 8 at wall

IC-4 ≅ 8

Rot Pos	Reg I Pos	N	I	II	III	IV
		5 min counts				
~~107~~	~~520~~					
107 (2^{37} pm)	520	3486430	92380	141610	$434^{\times 64}$ + 48	27824
"	"	3490220	90970	141320	$429^{\times 64}$ + 2	27458
130	400	4050280	108510	161940	$415^{\times 64}$ + 27	26587
"	"	4006660	108260	159530	$410^{\times 64}$ + 43	26283
171	305	3927040	117240	149050	273^{+27}	17499
"	"	4108590	123070	156370	$287^{\times 64}$ + 2	18410
210	240	4351950	142320 ~~152740~~	152740	$211^{\times 64}$ + 61	13565
" (~3 pm)	"	4467650	144730	156090	$219^{\times 64}$ + 0	14016
250	165	3916880	141240	124500	135 + 0	8640
"	"	3990040	144520	126320	135 + 20	8660
300	110	3602120	139050	103390	$91^{\times 64}$ + 62	5886
300	115	3425620	131100	98020	85 + 7	5447
346	92	3172920	125770	88390	72 + 54	4662
"	"	3081990	121940	85100	$69^{\times 64}$ + 40	4456
97	460 ~~460~~	3175490	82030	126050	$412^{\times 64}$ + 46	26414
"	"	3408730	88110	135860	441 + 25	28249
104	500	4100490	106360	165510	513 + 41	32873
161	279	4414280	134750	168940	340 + 44	21804
191 (4^{30} pm)	237	4843910	157200	175520	278^{64} + 43	1783

4^{44} pm Shut down

HFIR Exp. 77

Rot Pos.	Reg I Pos	I/N .3745	II/N .4077	III/N 1.186
107	520	.02649 2628	.04062 4056	.007980 7923
"	"	.02607	.04049	.007867
130	400	.02679 2690	.03998 3989	.006564 6562
"	"	.02701	.03980	.006559
171	305	.02985 2990	.03795 3800	.004456 4468
"	"	.02995	.03806	.004480
210	240	.03270 3255	.03509 3501	.003117 3127
"	"	.03239	.03493	.003137
250	165	.03605 3614	.03179 3172	.002205 2188
"	"	.03622	.03165	.002170
300	110 112	.03860 3844	.02870 2866	.001634 1612
"	115	.03827	.02861	.001590
346	92	.03963 3960	.02785 2773	.001469 1457
"	"	.03956	.02761	.001445
97	460	.02583 2584	.03969 3977	.008318 .008302
"	"	.02584	.03985	.008287
104	500	.02594	.04036	.008017
161	279	.03052	.03826	.004939
191	237	.03245	.03623	.003681

Expt 78

Cd-Covered U^{235} Vertical Traverse

Reg I-520, Rot. Pos = 161

5/27/60

Temps Reg I = 22.5°, Reg II = 24.4; Reg III = 24.2°C

Lift Pos	Norm	Reg I	Reg II	Reg III	Reg III
		5 min. counts			
11.77	2997840	71210	99320	$740^{\times 16} + 1$	11840
"	3406370	83710	111020	$208^{\times 64}$	13310
10.50	3802060	94480	135670	$266^{\times 64}$ ~~474 + 13~~	17024
"	3922740	97260	140200	$262^{\times 64}$	16768
9.00	2618850	67090	98210	$185^{\times 64} + 0$	11840
"	2568290	65990	95990	$181^{\times 64} + 32$	11616 ~~11580~~
7.50	2745500	71430	105810	$203^{\times 64} + 12$	13004
"	2955550	76520	113630	219 + 0	14016
6.50	2902940	74040	111780	$210^{\times 64} + 61$	13501
"	2863450	73560	110160	207 + 0	13248
5.00	3568870	87900	132430	248 + 33	15905
"	3588160	88960	133610	250 + 39	16039
3.50	3795160	85840	130820	245 + 7	15687
"	3803750	86450	129910	249 + 48	15984
1.50	3574380	65290	101180	189 + 18	12114
1.50	3197110	58130	90410	169 + 46	10862
1.00	3686320	62590	97340	183 + 54	11766
2.50	2858620	58370	89500	169 + 40	10856
4.00	2540300	59050	88950	167 + 32	10720
5.50	2264480	56640	84950	154 + 53	10037
7.00	2181790	55930	83500	155 + 29	9949
8.50	2267780	58250	84960	161 + 44	10348
10.00	2866530	71530	102350	194 + 1	12417
11.50	3650530	84000	118760	219 + 25	

[redacted]

HFIR Exp. 78

Lift Pos	I/N		II/N		III/N	
11.77	.02375	2416	.03313	0329	.003949	.0392
"	.02457		.03258		.003907	
10.50	.02485	2482	.03568	0357	.004477	445
"	.02479		.03574		.004274	
9.00	.02561	2565	.03750	0374	.004521	452
"	.02569		.03737		.004523	
7.50	.02602	2594	.03853	0385	.004736	00 474
"	.02583		.03843		.004742	
6.50	~~.02568~~ ~~.01344~~		~~.03850~~		~~"~~	
	.02551	2560	.03850	0385	.004650	464
"	.02569		.03847		.004627	
5.00	.02463	2471	.03709	0371	.004456	446
"	.02479		.03723		.004470	
3.50	.02261	0227	.03414	0341	.004133	417
"	.02273		.03415		.004202	
1.50	.01826	01820	.02831	0283	.003389	.00339
"	.01818		.02827		.003396	
1.00	.01698		.02640		.003192	
2.50	.02041		.03131		.003798	
4.00	.02324		.03501		.004220	
5.50	.02501		.03751		.004432	
7.00	.02563		.03827		.004559	
8.50	.02568		.03746		.004563	
10.00	.02495		.03570		.004331	

6-1-60

Lift Pos Rot. pos. = 161, Reg I pos = 520

Lift Pos	N	I	II	III		IV	
11.78 2:05 PM	165100	407470	40320	x64 48+20	3092	52+17	3345
"	178430	437110	43360	x64 49+37	3173 ~~313~~	57+48	3696
10.50	191030	498170	50550	56+30	3614	67+20	4308
"	189680	493930	50730	55+54	3574	66+4	4228
9.00	188300	516260	53370	58+59	3771	73+37	4709
"	190090	516900	53400	58+17	3729	71+43	4587
8.00	191230	530380	55580	62+14	3982	75+12	4812
"	197480	546630	56920	61+49	3953	75+29	4829
7.00	196190	539410	57270	62+47	4015	79+12	5068
"	192560	529580	56070	62+32	4006	75+42	4842
6.00	192380	516040	54970	60+45	3885	76+55	4919
"	195660	525930	56040	60+43	3883	76+35	4899
5.00	197010	506540	54600	59+56	3832	75+6	4806
"	194400	496540	53770	57+33	3681	74+55	4791 change to 2 min count
4.00	394190	950600	103800	116+7	7431	x64 143+59	9211
"	407050	887040 ?	107620	116+51	7475	148+22	9494
2.50	409640	870020	96020	108+61	6973	133+23	8535
"	396620	841260	92670	106+53	6837	131+41	8425
1.00	398660	684960	77820	97+51	6259	112+27	7195
"	399690	687640	78200	98+22	6294	114+47	7343
2.00	388810	772620	85320	99+37	6373	124+24	7960
"	384330	400150 ?	84280	96+14	6158	122+7	7815

Exp. 79

Lift Pos	N	I	II	III		IV	
3.50	354600	825100	89860	99+10	6346	126+35	8099
"	343170	797120	86350	97+51	~~6654~~ 6259	121+0	7744
4.50	344850	857720	92490	101+23	6099	128+22	824
" 3^{25} pm	357670	181740	96160	106+43	6827	134+6	8582
5.50	345760	912250	96720	104+50	6706	134+25	8601
"	341080	8959[illegible]0	94550	102+25	6553	131+8	8392
6.50	335400	912900	95640	104+23	6679	134+32	8416
"	333440	905280	94570	104+14	6670	130+23	8343
7.50	341860	945950	97490	106+13	6797	133+22	8534
"	344660	951450	98250	110+51	7091	133+31	8547
8.50	345830	950220	96920	106+11	6795	130+32	8352
"	337770	926010	94730	104+55	6711	127+16	8144
10.00	340050	893980	90250	99+0	6336	120+4	7684
"	340990	899570	90000	99+20	6356	118+50	7602
11.00	352080	887240	87280	99+46	6382	114+4	7300
"	368100	925980	91400	101+12	6476	119+12	7628
11.78	385180	919600	88480	101+36	6800	112+23	7191
" 4^{15} pm	395490	946340	92660	105+12	6732	112+37	7205
~~[illegible]~~ 10.50	399950	1027020	102590	113+29	7261	135+51	8691
"	411610	1051990	105370	118+45	7597	141+11	9035
9.00	403250	1092420	101360	122+37	7845	149+47	9573
"	398880	1081480	110010	119+22	7638	146+49	9393

Z
8099
7744
8214
8582
8601
8392
8416
8343
8534
8547
8352
8144
7684
7602
7300
7628
7191
7205
8691
9035
9573
9393

Exp. 79 page I

X 9674

	Lift	I/N		II/N		III/N		IV/N	
		x0.3623		0.3944		1.148		0.3433	
	11.78	2468	2457	2442	2435	1872	1825	2026	205
	"	2449		~~2419~~ 2430		1778		2071	
	10.50	2608	2606	2646	2660	1892	1888	2255	224
	"	2604		2674		1884		2229	
	9.00	2742	2730	2834	2822	2002	1980	2501	246
	"	2719		2810		1961		2412	
9.62	8.00	2774	2770	2906	.02893	2082	.02040	2517	.0248
	"	2767		2882		2002		2445	
8.62	7.00	2749	2750	2918	0.2915	2046	2055	2583	.0255
	"	2750		2911		2077		2514	
7.62	6.00	2669	2675	2857	2860	2019	.01995	2556	.0253
	"	2687		2864		1984		2503	
6.62	5.00	2554	2554	2771	2767	1945	.01925	2439	.0245
	"	2554		2765		1893		2464	
5.62	4.00	2411		2633	2637	1857	.01845	2336	.0233
	"	~~2179~~		2643		1836		2332	
4.12	2.50	2124	2123	2344	2342	1702	.01715	2083	.0210
	"	2121		2337		1723		2123	
2.62	1.00	1718	1719	1952	1954	1570	.01572	1804	.0182
	"	1720		1956		1574		1837	
3.62	2.00	1987		2194	.2193	1639	.01620	2047	.0204
	"	~~1041~~ ?		2192		1602		2033	
5.12	3.50	2326	2324	2534	2525	1789	.01805	2284	.0227
	"	2322		2516		~~2812~~ 1769	1823	2256	
6.12	4.50	2487		2682	2684	~~2348~~	.01838	2382	.0239
	"	~~5081~~		2688		1908		2399	
7.12	5.50	2638	2630	2797	2782	1939	.01930	2487	.02473
	"	2626		2772		1921		2460	
	1.81								
	1.62	1		1.78		1.62		1.81	

Exp. 79 (cont) page II

	Lift	I/N	II/N	III/N	IV/N
8.12	6.50	2721	2851	1991	2509
	"	2714 2718	2836 .2844	2001 .01996	2502 .02506
9.12	7.50	2767	2851	1988	2496
	"	2760 2764	2850 .2851	2057 .02023	2479 .02488
10.12	8.50	2748	2802	1965	2415
	"	2741 2745	2804 .2803	1986 .01976	2411 .02413
11.62	10.00	2629	2654	1863	2260
	"	2638 2634	2640 .2647	1863 .01863	2229 .02245
2.62	11.00	2519	2478	1812	2073
	"	2515 2517	2483 .2481	1759 .01785	2072 .02073
3.40	11.78	2387	2297	1687	1866
	"	2392 2390	2342 .2320	1702 .01695	1822 .01844
2.12	10.50 ~~7.50~~	2568	2565	1815	2173
	"	2556 2562	2560 .2563	1845 .01830	2195 .02184
.62	9.00	2708	2762	1945	2373
	"	2711 2710	2757 .2760	1914 .01929	2355 .02364
	1.62				

6/2/60 Exp. 80

Purpose: Determine relative counting Efficiency of 235 counters with following Amplifier settings (these are settings for experiments 77, 78, 79, 80, 81)

	Gain	RT	PDL
C-1	32	0.2	10
C-2	32	0.2	15
C-3	32	0.2	15
C-4	32	0.2	15

10^{30} Region I counter (~~and preamp~~) placed in center of reg IV (vertically and radially)

#I Counter (in IV)	Normalizer		I/N
71810	2758340	10 min count	0.02603
80730	3200340	"	0.02522
82860	3346580	"	0.02476
88970	3553860		0.02503
			av 0.02524

See page 264

6/2/60

1^{00} pm Reg I counter placed in center of (vent of) region III

Reg I (in Reg III)	Norm	I/N
169710	2617880 10 min counts	0.06482
185520	2872610	0.06458
173710	2698420	0.06437
		.06459

See page 244

Reg I counter (in Reg II)	Normalizer	
848670	2782960	0.3049
861710	2851660	0.3022
838500	2771810	.0.3025
		.3032

See page 244

6/3/60

Exp. 81

1^{30} pm Radial traverse; bare 235 chambers

Lift pos. = 7.04 Center of Reg I = 514

Instruments checked

Pot Pos	Reg I Pos.	Norm	I	II	III		IV	
			Crit ht	~17.5				
0.0	514	360,200	1007570	256,160	84 ×256	21548 ~~44~~	×256 78+226	1 min counts 20036
"	"	266,840	740,280	183980	×64 231+27	14811	×64 227+29	Power lowered 2 min counts 14557
"	"	226720	629470	156090	×64 193+50	12402	×64 189+4	12100
40	480	226570	627000	133170	172+32	11040	208+27	13339
"	"	225090	624610	132540	173+9	11081	206+25	13209
80	450	218070	602080	87710	126+34	8098	199+49	12785
"	"	221640	610490	88880	127+35	8163	201+31	12895
120	400	227130	622420	74740	100+30	6430	159+3	10179
"	"	228640	623400	74980	99+62	6398	159+15	10191
161	350	222680	604120	65100	71+32	4576	87+39	5607
"	"	451010	1214790	130500	143+27	9179	174+45	4 min counts 11181
181	300	460220	1219710	127540	131+59	8443	128+57	8249
"	"	482800	1278260	133750	136+63	8767	139+14	8910
200	250	441470	1132210	115790	109+54	7032	88+48	5680
"	"	422500	1078450	110670	102+9	6537	86+18	5522
240	200	413290	912710	98020	91+27	5851	41+63	2687
"	"	425040	1040040	100150	97+7	6215	42+42	2730
280	150	420060	860890	88070	99+2	6338	21+34	1378
" 3^{05} pm	"	449370	1024310	93910	107+67	6915	23+61	1533
320	90	750780	1526680	143400	196+32	12576	23+1	1473
"	"	859040	1758980	165430	227+47	14575	25+21	1621
360	50	776460	1343640	144140	203+61	13053	17+47	1135
"	"	725870	1260330	135100	191+37	12261	15+23	983

Pot	Reg I	Norm	I	II	III		IV
					x64		x64
320	0.0	799200	1045080	153720	210+0	13440	22+55
"	"	749070	851840	143950	197+54	12662	21+38
280	60	623450	1122390	130940	145+20 ~~130~~	9300	32+14
"	"	702440	1167390	148070	163+48	10480	37+32
240	140	864910	1940650	202840	191+46	12270	87+52
"	"	893430	1996250	208790	194+44	12460	92+15
200	210	874100	2139110	227700	219+39	14055	173+43
170	280	897950	2311310	253230	265+27	16987	301+47
140	340	941470	2479090	286130	355+11	22731	500+3
100	420	969090	2577390	342560	491+44	31468	789+37
50	500	896300	2397780	471850	158 x256 +23	40471	216 x256 +82
0.0	530	780710	2092610	522060	165 x256 +126	42366	189 x256 +186

[redacted]

Exp. 81 Page I

Rot. Pos.	Reg I Pos.	I/N		II/N		III/N		IV/N	
		x.3623		x.8944		x1.148		x.3433	
0.00	514	~~2797~~		~~744~~		~~5982~~		~~5562~~	
"	"	2774	2775	6894	689	5551	551	5456	0539
"	"	2776		6884		5470		5337	
40	480	2767	2771	5877	588	4872	490	5887	587
"	"	2774		5888		4922		5867	
80	450	2761	2758	4023	402	3713	3695	5863	584
"	"	2754		4010		3683		5818	
120	400	2740	2733	3290	3285	2830	2815	4481	447
"	"	2726		3279		2798		4457	
161	350	2713	2703	2923	291	2054	2045	2518	250
"	"	2693		2893		2035		2479	
181	300	2650	2649	~~2630~~ 2720	277	1834	1825	1792	182
"	"	2647		2770		1815		1845	
200	250	2564	2558	2622	262	1593	157	1286	129
"	"	2552		2619		1547		1306	
240	200	~~2206~~	233	2371	234	1415	144	6501	00646
"	"	2447		2356		1462		6423	
280	150	2049	2164	2096	209	1509	1525	3280	335
"	"	2279		2089		1539		3411	
320	~~4~~90	2033	2043	1910	192	1675	1685	1961	192
"	"	2047		1925		1696		1887	
360	50	1731	1733	1856	186	1680	1685	1462	141
"	"	1735		1861		1689		1354	
320	0.0	1270	1200	1923	192	1681	1685	1830	1834
"	"	1137		1921		1690		1844	
280	60	1800	1730	2100	210	1492	149	3307	334
"	"	1661		2108		1491		3416	
240	140	2243	224	2345	234	1418	140	6497	656
"	"	2234		2337		1394		6607	

55	1463
38	1382
4	2062
2	2400
2	5620
5	5903
43	1115
-47	19311
3	32003
-37	50533
82	55378
184	48570

Exp. 81 page II

Rot. Pos	Reg I Pos	I/N	II/N	III/N	IV/N
		omit			
200	210	2447	2604	1607	1271
170	280	2573	2819	1892	2150
140	340	2633	3038	2414	3399
100	420	2659	3534	3247	5214
50	500	2675	5264	4515	6178
0.0	530	2680	6688	5420	5414

Exp. 81-B

Pos.	Peg & Pos.	I/N	II/N	III/N	IV/N
	515	2914	3491	2980	5048
	"	2888	3447	2969	5616
	"	2844	3414	2881	6403
	"	2813	3395	2914	8553
	"	2791	3364	2897	7956
	"	2633	3348	2903	7671
	"	2761	3333	2881	7545
	"	2749	3307	2818	7079
	"	2744	3291	2840	6852
	"	2724	3289	2844	7339
	480	2709	3070	9006	5275
	r=3				
	"	2673	3029	7982	3292
	"	2667	3022	8131	3660
	"	2678	3026	7974	3974
		2674	3012		

6/6/60 Exp. 81-B

Partial rerun of 81 because of lack of reproducibility in Reg I.

9 AM Instruments checked Ok

Lat. Pos.	Reg I Pos.	Normalized	Reg I	II	III	III	IV	IV
			4 min.	Counts				
20	515	542790	1582070	189500	$252^{\times 44}$+48	16176	$428^{\times 44}$+11	27403
"	"	552660	1596500	190530	~~190~~ 256+15	16414	484+62	31038
"	"	602610	1713840	205770	271+52	17361	602+58	38586
"	"	696860	1959810	236590	317+21	20309	931+20	59600
"	"	706210	1981670	237610	319+48	20444	877+62	56190
"	"	682670	1798070	228570	309+43	19819	818+17	52369
" 10:17 AM	"	685600	1893680	228530	308+38	19750	808+20	51732
"	"	695390	1912140	230020	306+20	19604	769+12	49228
	"	727030	1995560	239340	322+42	20650	778+26	49888
"	"	776150	2114550	255350	345+2	22082	889+69	56965
41	480	789230	2138770	242320	111+2	7106	650+34	41634
11:05 AM	"	772960	2066260	234180	96+26	6170	397+45	25453
"	"	782110	2086120	236370	99+24	6360	447+19	28627
"	"	800940	2145680	242410	99+51	6387	497+26	31834
"	"	829850	2219360	249970	103+60		551+9	

Reg I finally stabilized at count rate of lower curve when plotted of data on 6/3/60 (Exp 81)

Note that lower rate not in center

6/6/60 A recheck of Normalization Exp. 81-C

1^{30} pm

4 min counts

Reg I Counts in Reg II	Normalizer	Reg I/N
265,240	827,710	~~3204~~
247650	784630	3156
231120	736190	3139
? 125590 (225590?)	713470	(3161?)
225450	714580	3158
133,020 (233020?)	734,610	3171
		av. = 0.3157

Reg I in Reg III	norm.	I/N
2^{40} pm 51750	790920	0.06543
105240	1603250	0.06565
111950 ~~1711600~~	1711600	0.06540
117210	1783830	~~9647~~ 0.06570
121970	1848590	0.06598
128660	1964560	0.06549
		av. .06561

Temps: Reg I - 22.3, Reg III - 21.9, Reg IV 23.4

6/7/60

	I/N	II/N	III/N	IV/N
	2917	3047	2138	4046
	2861	2994	2147	2572
	2833	2960	2088	2591
	2796	2924	2065	2517
70	2803	2920	2063	2547
	2776	2902	2017	
	2766	2895	2048	
	2671	2901		
	2752	2879		
	2731	2867		
	2668	2879		
	2754	2878		
	2749	2870		
	2740	28617		
ave	2732			

3.4

6/6/60

	Reg I Counter in Reg III	Norm	I/N
3^{45} pm			
	44410	1828180	0.02429
	43140	1756040	0.02456
	42520	1738490	0.02445
	43850	1805230	0.02429
	46160	1872660	0.02465
			av .02445

6/7/60 8^{00} AM Instruments checked OK
To determine Reg I counter count-rate in center of Reg I (i.e. chamber is centered vertically, not put back on lift at 7.04)

~~Reg I count rate N~~

	Reg I	Norm	II	III		IV	
8^{45} AM	2,726,320	934,580	284790	$78^{\times 256}+17$	19985	$147^{\times 256}+184$	37816
	2840660	992930	297360	$333^{\times 64}+7$	21319	$399^{\times 64}+2$	25538
	2832050	999530	295870	326+15	20879	404+49	25905
	2836510	1014170	296500	327+18	20946	398+56	25528
	2849730	1016560	296930	327+51	20979	404+44	25900
	2936020	1057610	307020	340+0	21760	424+46	27182
	2975630	1075660	311460	339+8	21704	455+1	29121
	2910780	1089380	316050	348+40	22312	482+3	30851
	3121260	1133930	326560	360+12		670+20	
~9^{30}	3103700	1136260	325790	359+31		659+2	
	2978760	1116200	321390	353+39		685+41	
	3079720	1118200	321860	358+12	3	570+11	

Reg I	Norm	II	III	IV
3136920	1140730	327390	359+53	811+58
3205770	1169960	334810	369+17	881+10

Exp. 82 Run

6/8/60 Void Coefficient Measurements

14, 1/2" OD polystyrene tubes filled with air were placed in a bundle in the center of Reg I

11^{00} AM Crit fuel selsyn = 16.87 — selsyn rezeroed (see below)
D_2O selsyn = 80.09
Tad = 995.22
} just crit after ~10 min

Tad moved to (raised) 99400 ~~994.22~~ for period
{ selsyn goes up when tad goes down

11^{25} AM Tad returned to 995.18; just crit

11^{30} AM Shut down

Run B

1^{00} PM Fuel solution selsyn zeroed (~~was not off but .03.05 above~~) no void in center. Also Reg I counter out. Reg II + III Counters at top and rotated 360°.

Solution Selsyn = 17.56"*
D_2O " = 80.92
tad = 99.526
} just crit

1^{10} PM Sol selsyn = 17.61"
tad = 99.40
} for pos period

Leveled after period Tad = 995.55 i.e. just crit

~~* Value too low; 17.59 agrees better with 17.61 for pos. period~~

6/8/60

Run C

36 Polystyrene tubes in close packed bundle in center of reg I

2^{30} PM

Soln Selsyn = 16.31
D_2O Selsyn = ~80
Tad Selsyn = 995.50
} just crit

Soln Selsyn = 16.328
~~tad~~ Selsyn = 994.25
D_2O Selsyn = ~80
} pos period

2^{55} PM Re leveled at Tad = 995.60 i.e. just crit

Run D

47 Polystyrene Tubes & 43 Polyethylene Tubes

3^{45}

Soln Selsyn = 15.13
D_2O selsyn = ~~99.60~~ ~80
Tad selsyn = 99.60
} just Crit

Soln Selsyn = 15.16
D_2O = ~80
Tad selsyn = 99.45
} for pos period

Soln selsyn = ~~15.38~~ ~~14~~ 15.14"
Tad selsyn = 99.60

with air inside tubes & water in between

Expt 82

6/9/60

Run # E

Inst. checked, ok.

47 polystyrene tubes & 43 polyethylene tubes – no water inside or outside (tubes dried)

D_2O 79.89 Fuel ht. at crit 14.76

crit. Tod add 995.81

Positive Period;

Fuel ht 14.82 Tod ad 994.31

Crit after Period;

Fuel 14.79, TD 995.83

994.31

1.52

Run F

47 Polystyrene tubes & 43 polyethylene tubes with 28 of the tubes filled with H_2O (randomly spaced)

Fuel 14.72 TD 996.15 crit

Period; Fuel at 14.76 TD 994.90

Crit after Period 14.74 TD ~~996.20~~ 996.25

994.90

~~1.30~~ 1.35

Expt.

6/9/60

Run G

Only air in Reg I - fully refl.

crit Fuel 16.82 T.D. 996.60

Period: Fuel 16.84 TD 995.35

Crit: Fuel 16.85 TD. 996.60

995.35

1.25

Reg III = 22.5°C, Reg IV = 22.5°.

X

Run H

Reg I ; 47 Polystyrene tubes air inside & outside randomly spaced. % Void = 88.58

Crit fuel ht. 15.67 T.D. 996.60

Pos. Period! 15.69 " 995.45

after period Crit. Fuel ht. 15.67 " 996.70

5.45

1.25

Repeat Expt 82 Run A

6/10/60 14 Polystyrene Tubes filled with air surrounded by H_2O.

10.15

crit fuel ht 16.99 T.D. 997.12.

Pos. period 17.05 " 995.50

crit 17.02 997.12

6/10/68 Expt 83 Run A

8-1" dia al. rods in center
Instr checked, ok.

Crit fuel ht: 16.43 - T.P. 996.96

Pos. period; 1647 TD 995.71
Crit at 16.46 " 997.01

Reg I - 19.3°C, Reg III 23.6°, Reg IV 22.5°

Run B

14-1" dia al. rods centered in Reg I

Crit fuel ht 15.74, TD = 996.92
Pos. period: 15.78, " 995.41

(after period) Crit fuel ht 15.76 " 994.61

Run C

20-1" dia. al. rods centered in Reg I

Crit fuel ht. 15.42" T.D. 996.29
Pos. period 15.44 " 994.79

Crit. at 15.42 " 996.26

Run D

24 rods in reg I

3^{45} pm Fuel soln selsyn = 15.50 } just crit
Tod = 99.650

Fuel selsyn = 15.53 } for pos period
Tod = 99500

Out. Fuel ht 15.50

$$\begin{array}{r} 99447 \\ 99.500 \\ \hline 1.47 \end{array}$$

10-3-60

Preliminary run prior to Foil Fix of Ratio of act. i center of Island to center of the Annulus.

Instr. checked and safety set.
Fuel selsyn zero ~ ~~[illegible]~~ 99.600 ?
Crit. fuel ht. 17.37 D_2O Full
Poz. period 17.40
Drained D_2O to 69.0
One jog on lead caused ~ .2 rise in lvl!
Hence fuel full at ~ 17.40
∴ Fuel zero at ~ -.30"

10-4-60 Fis. Foil Activity Ratio Run

Inst. checked, OK. safetys set.
#2 foil centered in Reg I
#3 foil " " Reg II vertically & Radially
Crit at. 17.~~48~~36 Fuel at 17.48 for approach
IC-3 - .01 , IC-4 - 0.1 for foil activation
Time 20 min.

10-6-60 2nd Foil activation run
using U^{235} and 37% U^{235} foils
Instr. checked & safety set
Crit at 17.34 on selsyn; IC-3 at ~.025

2^{03} PM Shut Down - Dump Soln

10-10-60 Expt # 1

Critical Parameter Studies with fuel in place of H2O in Reg I, Reflected as in Expt. 4 except Reg. I top not reflected. Tad adder tube is connected to Reg. I

Insts. checked & safety set

Crit at 10.81" + 0.30" zero correction.

Expt. 2

Removed End Reflectors. Reg III D_2O + B as in Expt 4. of HFIR. Top refl. can still in place. Side refl. at ~18" high.

Crit at 13.08 + 0.3" = 13.38" Rm Temp ~ 75°F

10-10-60

Expt 3

Drained out all reflectors – system bare except for Al. cans.

15.75 in I.D.

20.70 slightly sub. Uncorrected

20.74 " super. "

Crit. 20.72 + .30 = 21.02" ≈ 53.4 cm.

D_2O zero at 53.1

10-13-60 Sample #18 taken and sent to Cooper (Fuel)

Use previous anal. result. Result of this one not consistent with sp. gr.

105.9 gm U^{235}/liter sp. gr = 1.226

$H/U^{235} = 70.9$

$D/U^{235} = 166.3$

% D in Fuel soln = 70.1

Expt. 4

Added side D_2O + B refl to heigh of Fuel. Reg IV empty — 2.35 g/l

Crit. 13.36 + .3 = 13.66" fuel

D_2O at 66.8 − 53.1 = 13.7" ≈ 34.8 cm.

4 B

Raised D_2O to Full ≈ 71.0

Crit Fuel 13.18 + .3 = 13.48"

system

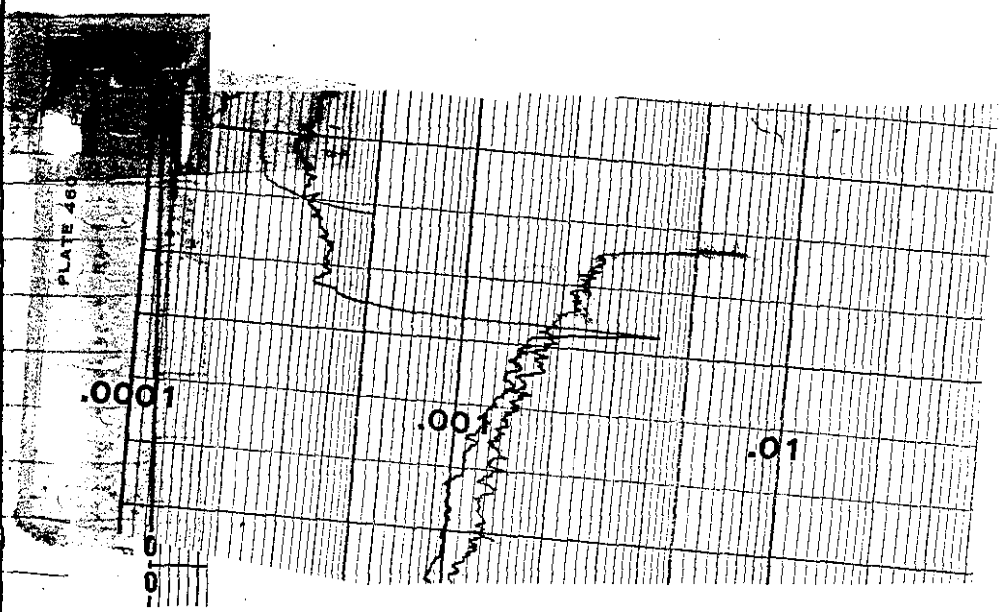
(

ned)
gatio

of

10-11-

10-13-6



ors — system

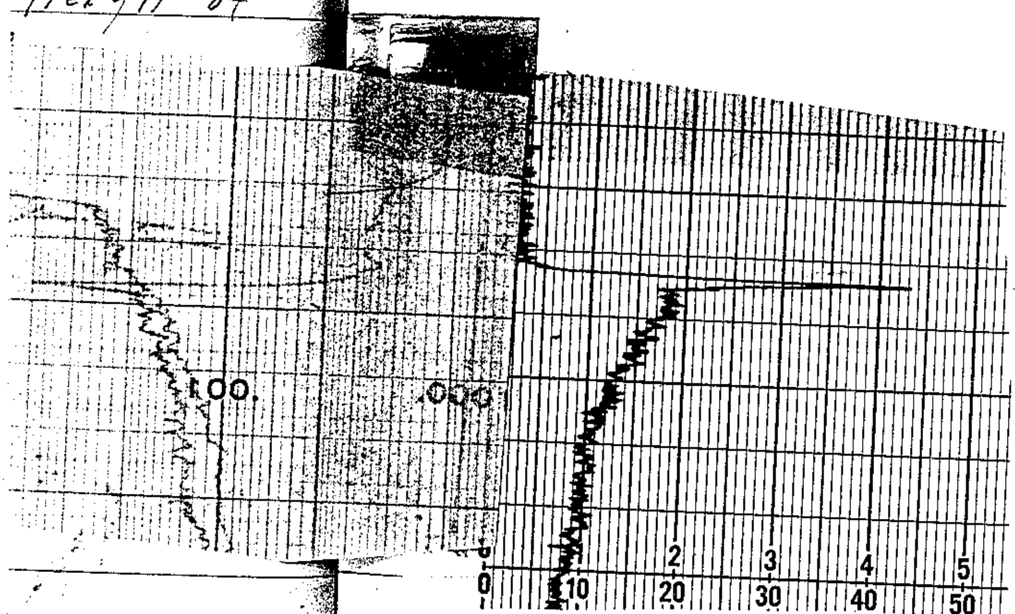
rrected.

3,4 cm.

nce (fuel)
Result q rlim

10-13-(

heigh of



10-11-60

Expt 5

Fuel in Regions I & II, H_2O in Reg. III
(D_2O drained and system washed out)
No. top or bottom refl.

Critical $\begin{cases} H_2O \text{ at } 65.6 - 53.1 = 12.5'' \\ \text{Fuel at } 12.14 + .3 = 12.44'' \approx 31.6 \end{cases}$

HFIR Soln. Assembly Removed from Room

Expt 6

10-13-60

Installed 20" Dia. Ann. Type Al. Cylinder Bare.
" 6" cross safety. Fuel selsyn zeroed

Contact stuck on Fuel Fuel Feed switch causing a sharp rise on all instr. (see attached graph) Experiment stopped for repair of switch. Feed valve remained open when switch was in off position. Contacts to be put in series rather than parallel.

Expt. 6B

Resumed after Repair of Switch, 20" Amm. Type cyl. bare.

Crit at 12,37 = 31.4 cm
.4 bottom correction
31.8

safety lowered slowly, at contact with fuel it caused about a 100 sec. positive period.

Expt. 6C

Same as above except inserted BF_3 counter about 3" from center radially with bottom of counter approx. 1 inch above bottom. Rossi Alpha technic attempt to measure neutron lifetime.

Crit at 12,45"

10-14-60 Expt. 6 D

Same as above
Inst. checked

	Crit at	12.34"	6000 CPM	($4.5 \times (3 \times 10^{-12})$
	Sol ht.	12.39	15000 CPM	" (10×10^{-12})
12^{13} PM	Sol ht	12.40	40,000 CPM	" (3×10^{-11})
12^{15} PM	Dump Soln			

EXP 6E

Moved BF_3 counter – Raised 6".

	Soln Ht	12.352	2000 CPM
3^{33} PM	Soln Ht	12.382	3500 CPM
3^{54} "	Soln Ht	12.393	10,000 CPM
3^{55}	Dump soln		

Salvage Bottles

#1 - 593125 ~ 75 gm soln
#2 - 593126 "
#3 - 593127 "

11-1-60 D_2O Samples taken as follows

Sample #1A - 1B Pure D_2O Drum #1
" #2A - 2B Used D_2O Drum #2
" #3A - 3B Used D_2O (with Poison) Drum #3

11-10-60
Resample of UO_2F_2 - 74-84-3
Reg. 593128 | Item 3 rec. 6-30-58
Gr. 62 gm
$\frac{20}{42}$ gm net

Material to be shipped to Hanford

10-7-60

D_2O sent to ORNL for Recovery:

SRS 9444 584 lb. − 11, net 573

New Drum 204.0* − 99.5 = 104.5

* Tare taken on another identical type drum.

"Note" Entered 3-26-64

Salvage Material $UO_2(NO_3)_2$ from HFIR #1

#3 Shipped to Y-12 on waybill # 109 10-25-60

Req No	593125 (1)	593126 (2)	593127 (3)	(4) Combust Material Dry
Gross wt.	16.80	19.23	15.83	
Ct. wt	3.70	3.07	2.92	
Net wt	13.10	16.16	12.71	
Estimated U	45g	118g	248g	50g

Estimated total 461g

1-18-61

1-18-61 the following Drums of D_2O was shipped to Y-12 for Storage (Mr. Brotherton) Bldg 9204-2

"Note" #1 (7919) Pure D_2O (As Recieved)

Corrected wt 5-7-64

Gr 292.16 lb
\+ 72.83
Net 219.33 lb

84.250 Kg = 185.35 lb
72.83
112.52 lb

there was Possibly a Mistake in orginal wt C.C.

#2 Pure D_2O Drained from System Before Boron was Added 3-28-60

Gr 239.8 lb (Shipped to J.A. Auxier 7-19-...)
\+ 84.15
Net 155.65 lb

#3 D_2O Contaminated with Boron (Distilled At X-10) 0.00024 mg/ml Boron

Gr 474.0 lb
\+ 101.5
Net 372.5 lb

#4 D_2O Contaminated with Boron (Distilled At X-10) 0.00020 mg/ml Boron

Gr 311.0 lb
\+ 98.5
212.5 lb

Charge 4435-70