

BOOK88R

Notes:

"P&W 5297" on front

Blank pages: page opposite page 1, 1, 79-99, 101, 111, 166, 170, 191, 279-300

- paperclip at top of inside front cover sheet
- page 6 has 1 (8.5x11) graph sheet attached
- page 101 has 4 typed (8.5x11) sheets stapled to it
- pages 121/122 have paperclip at top
- page 138 has calendar sheet (2/3/63) paper clipped at top
- the following pages have 1 or (2) drawing attached to each page: 157, 194, 199, 200, 204, 206(2), 207, 208, 209, 211, 213, 214, 217, 218, 221, 223(2), 224, 225, 227, 228, 229(2), 230, 231, 232(2), 233(2), 235(2), 236, 237, 239, 240, 243, 245, 247, 248, 250, 254(2), 257(2), 258(2), 259, 270, 272(2), 273(2), 275(2), 276, 277(2)
- page 158 has 2 small sheets clipped at top
- pages 182/183 have calendar sheet (7/6/65) between pages
- page 192 has yellow post-it note on it
- page 251 has calendar sheet (6/30/65) and 1 pink half sheet clipped at top
- page 261 has (8.5x11) sheet glued to it
- pages 264/265 have 1 (8.5x11) sheet between pages
- page 270 also has 1 small sheet clipped at top

Scanned by:

Sheila Finch

RSICC /Oak Ridge National Lab.

September 2, 1999

~~CONFIDENTIAL~~ J E McKenna

SOME INSTRUCTIONS FOR USE OF THIS NOTEBOOK

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

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

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

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

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

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

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

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

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

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

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

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

~~CONFIDENTIAL~~

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As Directed ORNL CO
10-23-92
BY CG-DAR-1

OAK RIDGE NATIONAL LABORATORY
OPERATED BY
UNION CARBIDE NUCLEAR COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION

10-9-20

UCB

POST OFFICE BOX P

OAK RIDGE, TENNESSEE

C. M. Hopper

NOTEBOOK NO. 5297

J. T. Thomas

Assigned to: A. D. Callahan

Department: Physics Div.

Location: Bldg. 9213

Date: July 12, 1957

DECLASSIFIED

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

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

Do not use scrap paper.

Be sure to record all personal conferences.

This notebook must be returned to Laboratory Records-Bldg. 4500 when completed or upon termination of assignee.

Subject: This document consists of 306 pages, of 1 copies, Series A Page 91

DECLASSIFIED

By Authority of:

CG-DAR-1

(Classification Guide, notice, etc.)

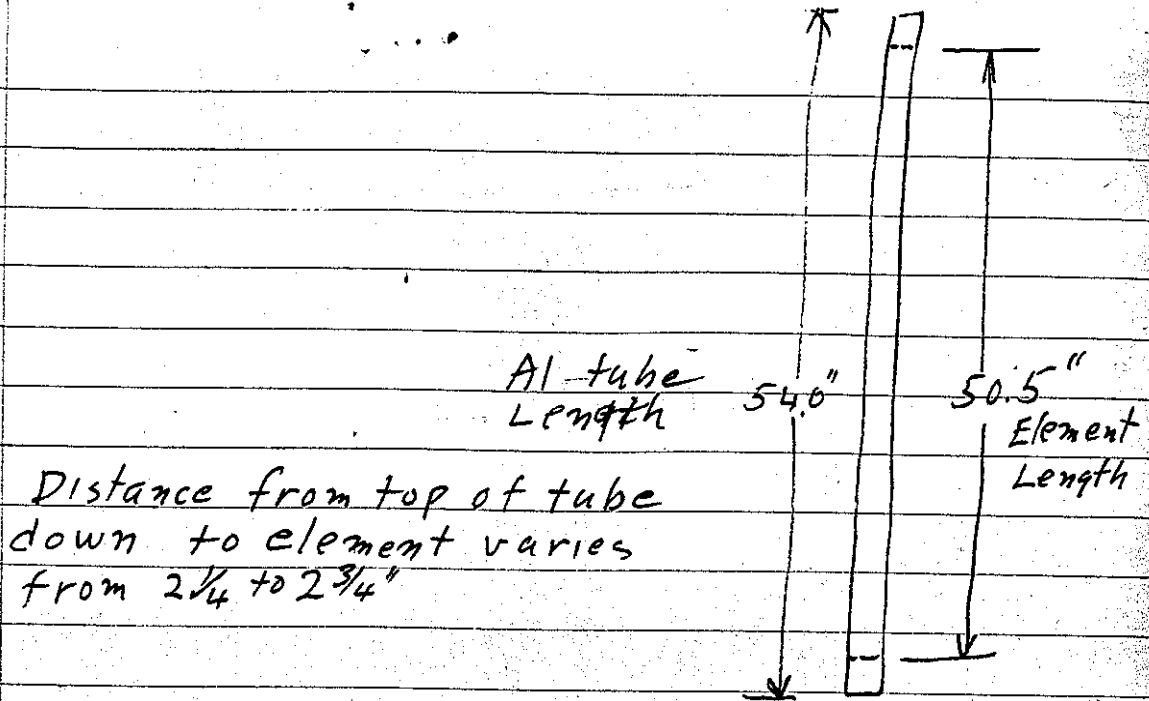
Arvon S. Gust 10-23-92
ORNL Classification Officer

(Derivative Declassifier Name, Title, Date)

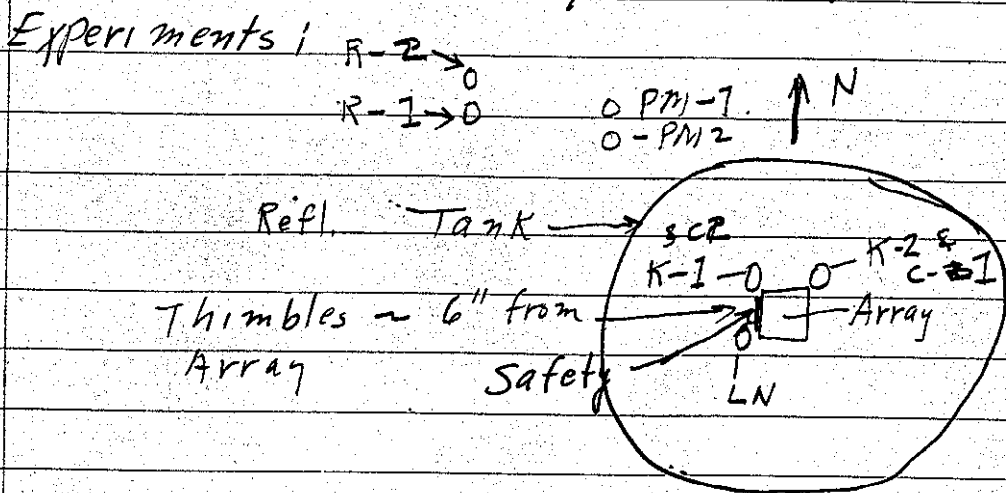
Betty Fay Clock 10-26-92
(Person making change) (Date)

INV 63
INV 68
INV 83
INV 88
INV 89
INV 90
INV 92
INV 94
INV 95
INV 96
INV 97
INV 98
INV 99
11-15-90/BFC
11-15-89/L
8-5-91/BFC
8-24-88/L

[Redacted]



Instrument Arrangement for Kiwi-B Experiments



1/2
C
#

KIWI - B Fuel Elements

3

Expt # 1

START-UP CHECK LIST	
Equipment Checked by	RKR
Instrument and Safeties Checked by	RKR
"Source In" Checked by	RKR
Emergency Equipment in Control Room	
Red Light On by	RKR
Start-Up OK'd by	RKR
Time	
Date	3-22 1962

8" safety installed adjacent to Array.

Square Array of Elements using plastic strip ~ .31" thick as spacers between Al element container tubes.

Part A

Background count with 3 rows of 8 elements. Safety up.

Water = 30.8 cm (side scale) at top of plastic table. Then filled to 172

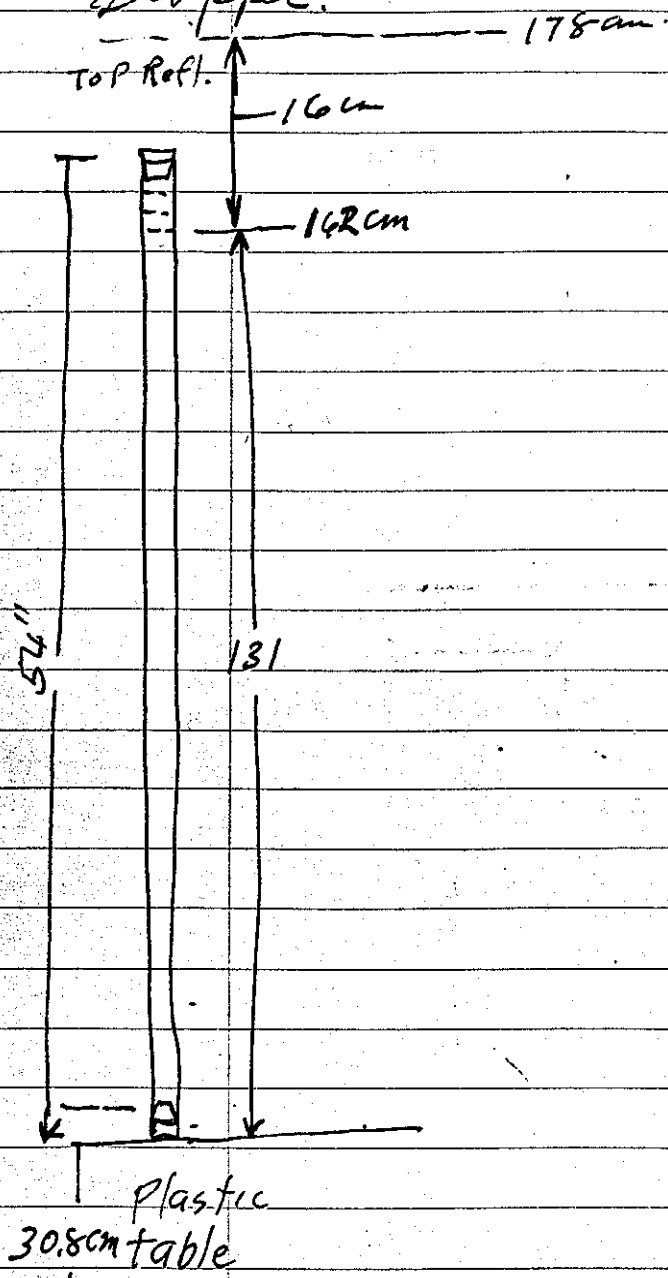
10 min counts

C-1	C-2
185	45
182	47

After above expt. it was found that about 1/2 of the fuel tubes leaked, it was decided to replace plastic stopper with #3 rubber stopper.

4

We also checked to see that all elements to be used henceforth are 50.5" long and that it is against the bottom rubber stopper.



Expt 1 Part B.

5.

square Array (6x8 elements) at 0.31"

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personnel Check by <u>RKR</u>
Instrument and Safety Checked and <u>OK</u>	<u>RKR</u>
"Source In" Checked by <u>✓</u>	<u>✓</u>
Emergency Equipment Checked by <u>✓</u>	<u>✓</u>
Red Light On by <u>RKR</u>	<u>✓</u>
Start-Up OK'd by <u>RKR</u> Time <u> </u>	PI Date <u>3-23-62</u>

Water at 178 cm.

10 min. Counts

C ₁	C ₂
252 .724	66 .697
av. 735	av. 73
233 .785	61 .754

183

Expt 1 Part C

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personnel Check by <u>RKR</u>
Instrument and Safety Checked and <u>OK</u>	<u>RKR</u>
"Source In" Checked by <u>✓</u>	<u>✓</u>
Emergency Equipment Checked by <u>✓</u>	<u>✓</u>
Red Light On by <u>RKR</u>	<u>✓</u>
Start-Up OK'd by <u>RKR</u> Time <u> </u>	PI Date <u>3-26-62</u>

Same Lattice Pitch (sq. - 0.31") but Array now has (10x10) 100 elements. safety up

Filled to ~ 87 cm. Multiplication indicated system would be crit. full. Drained so as to obtain more M⁻¹ data.

3-26-62

Expt I Part D

Pers
Libb
RK
JK

1:15 PM.

Same Pitch (8x8) 64 elements.
Safety up, start adding H₂O
water at 175 cm.

10 min counts

c-1	c-2
307,396	122,377
266,69	125,99

Part E

2:30 PM

Square array (9x9) 81 elements.
Safety up, adding H₂O.

Att ~ 158 cm the system was too
reactive to continue. Dumped H₂O
to remove source from battery

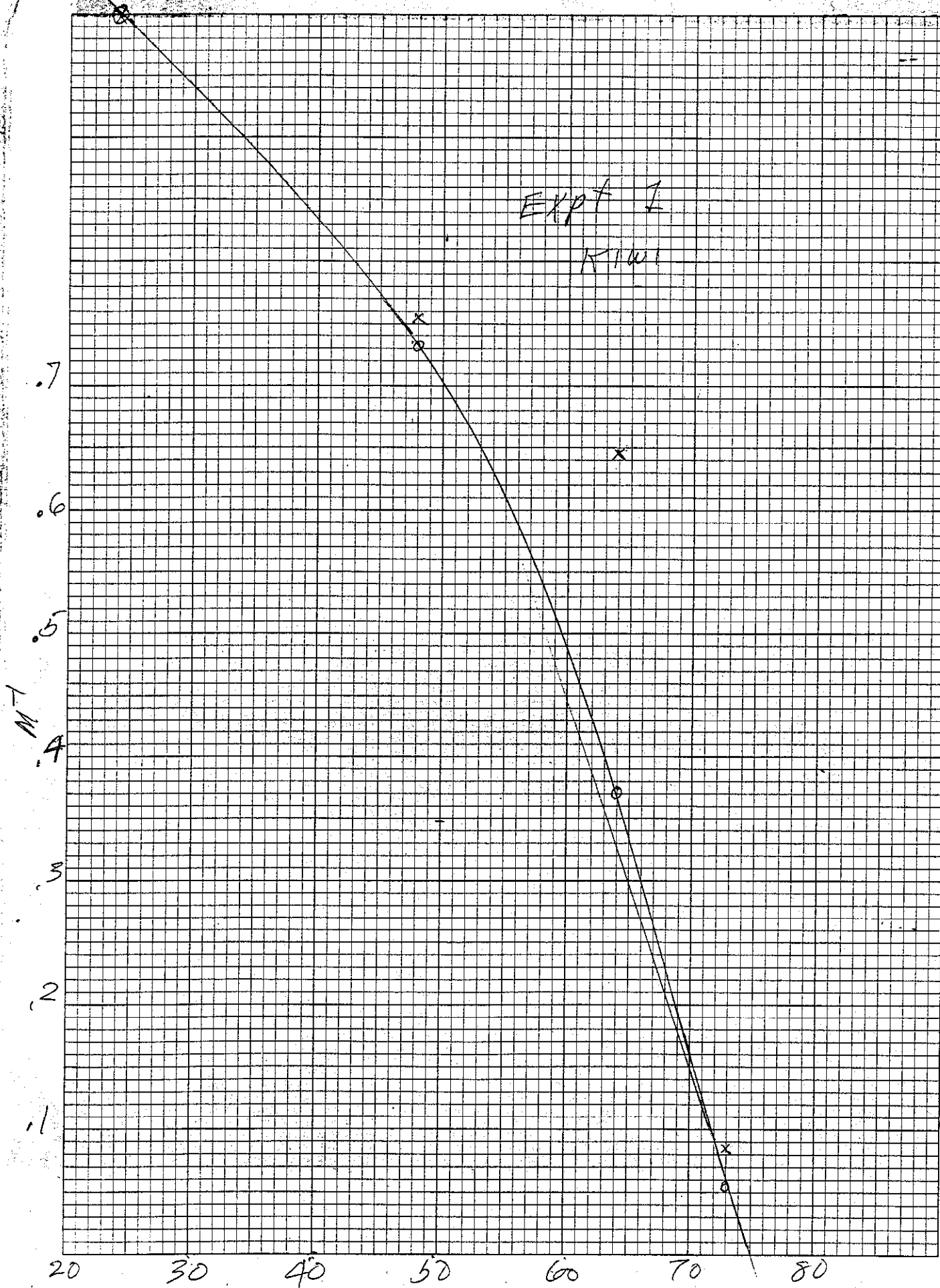
Part F

Removed 2 elements from each
corner. Total Now 73

10 min counts

c-1	c-2
2186,084	855,054
2201	820

EXPT I
RTM



Expt. I Part G

7

Personnel

Libby Johnson

RK Reedy

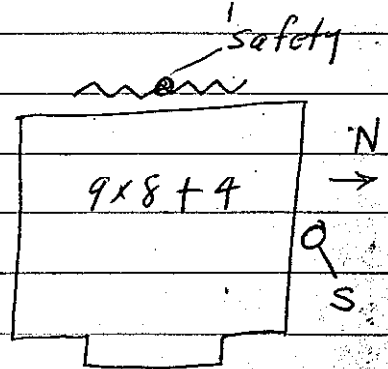
JK Fox

START-UP CHECK LIST	
Equipment Checked by <u>PKR</u>	Personnel Check by <u>PKR</u>
Instrument and Safeties Checked and Reset by <u>PKR</u>	
"Source In" Checked by <u>JCF</u>	Source No. <u>M-43</u>
Emergency Equipment in Control Room Checked by <u>✓</u>	
Red Light On by <u>PKR</u>	AM
Start-Up OK'd by <u>JKF</u>	Time <u> </u> Date <u>3-27-62</u>

Safety up

Put source on moveable drive

Made previous array more nearly square (see sketch). Total of 76 elements in array.



sub-crit flooded.

Part H

"

"

"

Added 2 more elements to Array

Now, $9 \times 8 + 6 = 78$ total

sub-crit. when full

8
3-27-62

Expt I
Part I

L. J.
RKR
JKF.

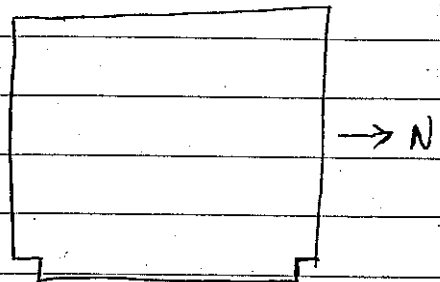
Added 3 more elements; now $9 \times 9 = 81$

@rit. at 155.6 cm.

Part J

Removed two corner elements
from E face

Total now 79



sub-crit. when full.

@rit. No. 80 ± 1 element.

L. J.
RKR
JKF

3-27-62

Expt I

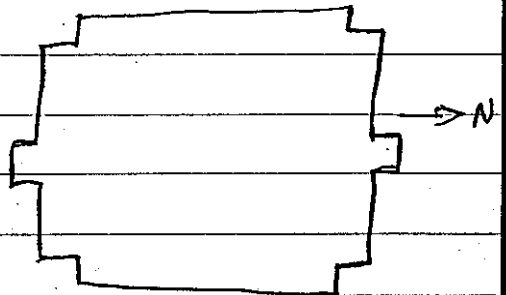
9

Part K

Replaced two remaining corner elements
at centers of N and S faces. Same total
Number = 79

Crit. at 163.5 cm H₂O

Crit No. = 79 ± 1



Part L

Removed center element from Array
Total now 78

Sub-crit when flooded

3-27-62

Lg
RKR
JKF

Expt #2 Part A

3:40 PM

Lattice
Square Array S.T.S. spacing = ~~0.31~~ 0.42"
9 x 8 = 72 total no. Elements

spacers made up by adding 0.11"
strips to 0.31" strips between each
row.

Just crit. flooded

Expt. #2, Part B

START UP CHECK LIST	
Equipment Checked by	RKR
Instrument and Safety checked and	RKR
"Source In" Checked by	<input checked="" type="checkbox"/>
Emergency Equipment	<input checked="" type="checkbox"/>
Red Light On by	RKR
Start Up OK'd by	JKF

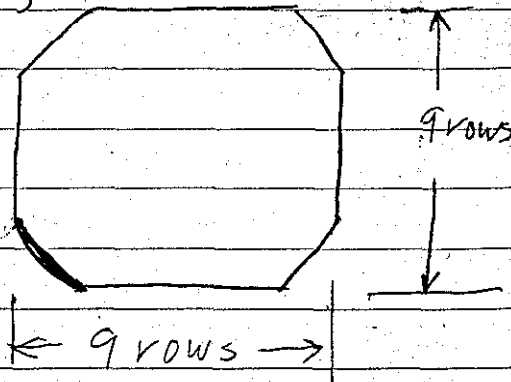
S.T.S. = 0.41

AM. 3-28-62

Lg
RKR
JKF

Made above Array more cylindrical
by removing corners &
partially filling 9th row.
Total 69 elements

slightly sub-crit.
when flooded.



Lg
RKR
JKF

92

Lg
RKR
JKF

M

L.G.
PKR
JKF

3-28-62

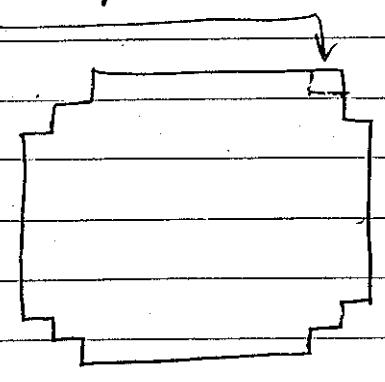
Expt 2 Part C

9:25 AM

Added 1 element to Array in NW corner as in sketch

Total now 70

Crit at 167.3 cm



Crit. No. = 70 ± 1

Expt 3 Part A

L.G.
PKR
JKF

0.535"

~~11~~ Square Lattice at S.T.S. = 0.54"

3-28-62

Made by adding thin strips to above combination. Safety Blade moved in closer to side of array.

Loading $8 \times 9 = 72$ total elements.

Crit at 139 cm

Dropping safety caused very sharp drop on LN
(Equiv. to #10 in P)

Measured overall size for $9 \times 9 = 11.84$ vs
 11.88 (calculated value)

∴ Each spacing is .005" less than 0.54 or
0.535"

L.J.
PKR
JK7

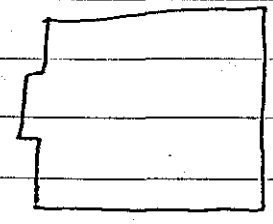
FW 12-29-62

Expt 3 Part B

F.W.
L.J.
PKR
JK7

Removed 5 element; Now $8 \times 8 + 3 = 67$ total

Not crit. flooded



Expt 3 Part C

F.W.
L.J.
PKR
JK7

START UP CHECK LIST	
Equipment Checked by	PKR
Instrument and Safeties Checked and OK'd by	PKR
"Source In" Checked by	JK7
Emergency Equipment in Control Room	<input checked="" type="checkbox"/>
Red Light On by	PKR
Start-Up OK'd by	JK7
Time	8:30 AM 3-29 1962

safety
up

Added two elements to above array. Total now 69.

crit. at 14.4 cm

@crit. No. 69 ± 1

F.W
L.J.
RKR
JKF.

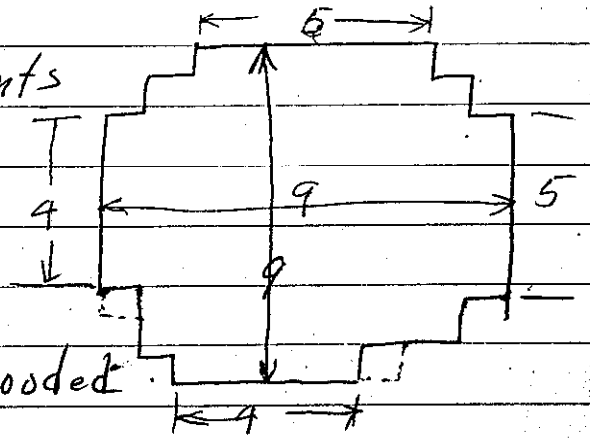
3-29-62

Expt. 3 Part D

13

Moved elements away from corners to increase ρ vs No.

Total now 67 elements



Slightly sub-crit. flooded.

Crit. No. = 68 ± 1

3-29-62

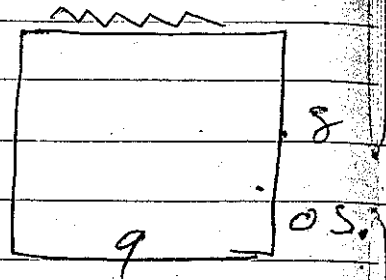
L.G., F.W.

PKR
JK7

1:20 PM

Expt 4 Part A

Square Lattice at 0.62" S.T.S
spacing. Loading = $8 \times 9 = 72$ elements.
Safety up, source 17.



Crit. at 157.5 cm

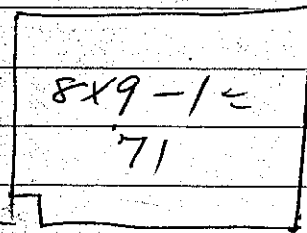
3-29-62

L.G., F.W.

PKR
JK7

EXPT 4 Part B

Removed one element from above
array. Safety up
So. 17



very, very slightly sub. crit

When flooded

Crit No. 71 ± 1

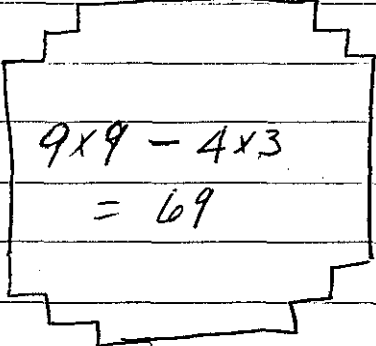
3-29-62

Expt. 4, Part C

15

Lg.
F.W.
RKR
JKF

Removed elements from
corners as shown.
Total now 69. Safety up,
So. in.


$$9 \times 9 - 4 \times 3 = 69$$

Crit. at 163 am

Crit. No. = 69 ± 1

FW 163-30-62 Expt 5 Part A
C.C.

10¹⁵ AM Square Lattice S.T.S. spacing 1.02"
10x10 = 100 element array

START-UP CHECK LIST	
Equipment Checked by	<u>JK7</u>
Instrument and Safeties Checked and	<u>JK7</u>
"Source In" Checked by	<u>JK7</u>
Emergency Equipment in Control Room	<input checked="" type="checkbox"/>
Red Light On by	<u>JK7</u>
Start-Up OK'd by	<u>JK7</u>
Time	<u>3-30-62</u>

safety up

Very Little M⁻¹ at flooded

FW 3-3-62 Part B
L
PKR
JK7

Added elements to total of
144 (12x12). So m., Safety up

Fairly high multiplication when
flooded.

3-
F
L
PKR
JK7

Fu
L
PKR
JK7
3-30
225

3-30-62

FW
L. J
PKR
JK7

Expt 5 Part C 17

2"

Added a row on each side. Now
 $13 \times 13 = 169$. Safety up, So in.

1P

Crit. at 127

Expt. 5 Part D

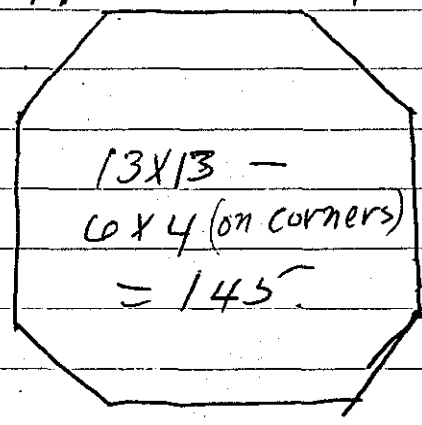
FW
L. J
PKR
JK7

Removed 6 elements from each
corner. Total 145

3-30-62

Safety up, So in.
Scrams set.

2:25 PM



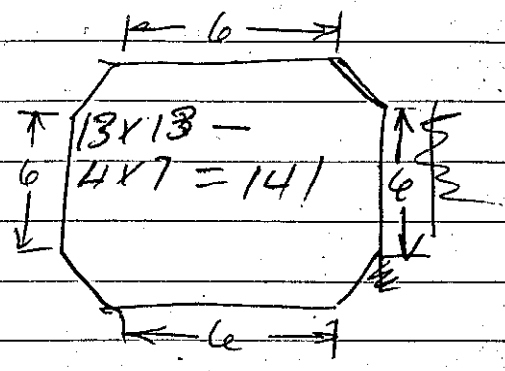
Crit. at 157.3

3-30-62
L. J.
FW
PKR
JK7

Expt 5, Part E

3:12 PM. Removed one element from each corner. Total now 141

Safety up, so in.
Scrams Reset.



Slightly sub-crit. flooded

3-30-62 Part F

L. J.
PKR
JK7

Added two elements to opposite corners. Total now 143

Safety up, so in., Scrams set

Crit. at 1.64.5 cm

Crit. No. 142 ± 1

4
F
L
PK
JK

FW
L. J
PKR
JKZ

EXPT 6, Part A 19

START-UP CHECK LIST	
Equipment Checked by	PKR
Instrument and Safeties Checked and	PKR
"Source In" Checked by	JKZ
Emergency Equipment in Control Room Checked by	✓
Red Light On by	PKR
Start-Up OK'd by	JKZ
Date	4-2-62

Safety up

Square Lattice with S.T.S. spacing = 0.11
Total in 14x14 = 196

Crit. at ~ 90 m

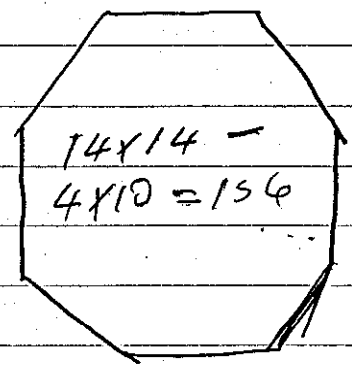
4-2-62

Part B

FW
L. J
PKR
JKZ

Removed 10 elements from each corner, Total now = 156
Safety up, scrams set

Crit at 119.5



4-2-62

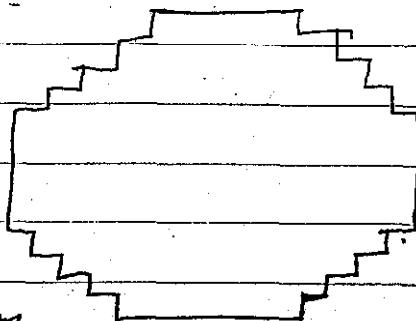
Expt G Part C

L.J.
F.W.
RKR
JK7

$$S.T.S. = 0.11$$

Removed 27 elements. Now have
13 x 13 with 10 off each corner = 129
Safety up, 50 in, screws set

L.
RKR
JK7



Quite sub. crit. when
flooded.

4-2-62

Expt G Part D

L.J.
RKR
JK7

Added 8 elements - 2 on each
corner at their center. Outline now
very nearly cylindrical. Total 137
Safety up; 50 in; screws set.

3:20 PM

Appreciably sub. crit. if flooded

4-2-62

Expt. 6 Part E

21

L.J.
RKR
JK7

Added 4 more elements on corner. Total 141.

safety up. 30. in. screws set.

cut. at 149 in

cut no. 139 ± 2

row

to

l

FW22 4-3-62

Expt. 7

Part A

L.J.
PKR
JK7

K-1, K-2,
PM-2, PM-1
17 TRIP.C.

START UP CHECK LIST	
Equipment Checked by	PKR
Instrument and	Reset PKR
"Source In" Checked by	PKR
Emergency	PKR
Red Light On by	JK7
Start-Up On by	JK7
4-3-62	

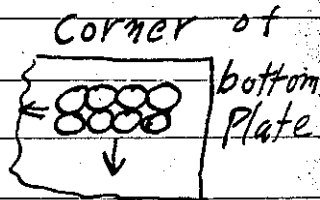
Safety up

4-
FW
L.J.
PKR
JK7

K-
PM-
17
CTR

Square lattice with element tubes in contact. Elements held in position by holes drilled in a 4" thick flexiglas plate:

No. in array = $14 \times 14 = 196$

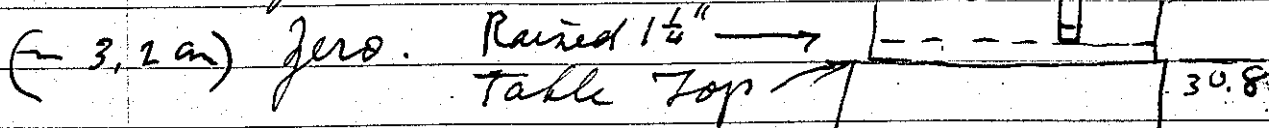


Very sub. crit when flooded

$$\begin{array}{r} \text{Top of tube} = 137.2 \\ (30.8 + 3.2 + \sim 1.0) \quad \underline{35} \\ 172.2 \end{array}$$

$$\begin{array}{r} \text{Fuel top} = 128.4 \approx 165 \\ + 36.5 \\ \underline{164.9} \end{array}$$

Fuel zero = $30.8 + 3.2 + 2.5 = 36.5$ cm



4-
L.J.
FW
PKR
JK7
350

4-4-62

EXPT. 7 Part B - 23

FW
L.J.
RKR
JK7

Took four corners off and added
2 rows each way, Contact spacing
16x16 - 4x10 from corners = 216

K-1, K-2
PM-1, PM-2
17 trip
circuit

START UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personnel Check by <u>JK7</u>
Instrument and Safeties Checked and	<u>RKR</u>
"Source in" Checked by <u>JK7</u>	
Emergency Equipment in Control Room checked by <u>JK7</u>	
Red Light On by <u>RKR</u>	
Start-Up OK'd by <u>JK7</u>	PM Date <u>4-4-62</u>

safety up.

very little m⁻¹ at flooded

EXPT. 7 Part C

4-4-62

L.J.
F.W.
RKR
JK7

Added to above: now 18x18 - 4x10 = 284
total.

3:50 PM.

Scram out, safety up, so in

Small m⁻¹ at flooded ~ 180 cm

No appreciable lag was noted
due to water flowing in between
elements too slowly

4-5-62²⁴
LJ
PKR
JK7

Expt 7 Part D

Added to above array: now
 $19 \times 19 - 4 \times 10 = 329$

START UP CHECK LIST	
Equipment Checked by	PKR
Instrument and Safety Checked and	PKR
"Source In" Checked by	JK7
Emergency Equipment	PKR
Red Light On	PKR
Start-Up OK by	JK7

Safety up

K-1, K-2,
P-M1, PM-2
in trip circuit
Inst. respond to
source

9 AM

crit at 166.8 cm

Expt 7 Part E

4-5-62
LJ
FW
PKR
JK7

Removed 2 elements at corners
Total now 319

Safety up: Scram set, nuts on,
source in. Red light on.

1:30 AM

crit at 173.2 cm

crit no. 318 ± 2

4
Fu
LJ
PKR
JK7
K-
PM
17
CIV

4-
Fu
LJ
PKR
JK7

4-6-62
F.W.
L.J.
PKR
JK7.

Expt 8 Part A 25

Repeat of Expt. #3 using

START-UP CHECK	
Equipment Checked by <u>PKR</u>	check by <u>PKR</u>
Instrument and Safeties Checked and	<u>PKR</u>
"Source In" Checked by <u>JK7</u>	
Emergency Equipment in Control Room checked by <input checked="" type="checkbox"/>	
Red Light On by <u>PKR</u>	AM
Start Up OK'd by <u>JK7</u>	PM Date <u>4-6-62</u>

Safety up

IP

K-1, K-2,
PM-1, PM-2
in trip
circuit.

Elements of more const. U^{235} content. All of same type (same hole size, etc), Total No. = 64

170

crit at 141 cm.

Part B

4-6-62
F.W.
L.J.
PKR
JK7

Removed 2 corner elements. Total now 67.

Instr. and safeties still as above

slightly sub crit flooded ~10¢

crit no. 68 ± 1 as before

FW 26-6-62
L.P.
RKR
PK7

Expt #8 Part C

Replaced 25 central elements
(Outs. Rest., Safety up, so in)
Used #17 series light elements
Total in array 68.

slightly sub-crit flooded.

L.P.
RKR
PK7

Expt. 8 Part D

K-1, K-2,
PM-1, PM-2
in trip.
Circuit.

START-UP CHECK LIST	
Equipment Checked by	RKR Personnel Check by RKR
Instrument and Safeties checked and Reset by	RKR
"Source In" Checked by	PK7
Emergency Equipment in Control Room Checked by	✓
Red Light On by	RKR 9:45 AM
Start Up OK'd by	PK7 Date 4-9-62

Safety up

Replaced (36) additional elements of
series #19 with elements of series 17 & 45
to decrease U²³⁵ loading. Also added
2 elements. Total now = 70
9x9 - 3x3 - 1x2

very very slightly sub-crit.

Out No. 70

FW
L.P.
RKR
PK7

K-
PM
1

FW
L.P.
RKR
PK7

K-
PM
in

FW.
L.J.
RKR
JKF

4-9-62 Expt. #9 ; Part A - 27

Square lattice using 0.85" S.T.S.
spacing between elements.
10x10 - 4 elements total

K-1; K-2
PM1, PM-2
in circuit

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personnel Check by <u>L.J.</u>
Instrument and Safeties Checked and Set by <u>RKR</u>	
"Source In" Checked by <u>JKF</u>	Source No. <u> </u>
Emergency Equipment in Control Room Checked by <u> </u>	
Red Light On by <u>RKR</u>	Time <u> </u>
Start-Up OK'd by <u>JKF</u>	PM Date <u>4-9-62</u>

Safety
up

Crit at 128.4 cm

Part B

FW
L.J.
RKR
JKF

K-1, K-2
PM1, PM-2
in trip circuit

START-UP CHECK LIST	
Equipment Checked by <u>JKF</u>	Personnel Check by <u> </u>
Instrument and Safeties Checked and Set by <u> </u>	
"Source In" Checked by <u> </u>	Source No. <u> </u>
Emergency Equipment in Control Room Checked by <u> </u>	
Red Light On by <u>K</u>	Time <u> </u>
Start-Up OK'd by <u>JKF</u>	PM Date <u>4-9-62</u>

Safety
up

Removed 8 elements, total 88
10x10 - 4x3 = 88

slightly sub-crit when flooded.

P

ded

L 28
K
P
JK7

Expt 9 Part C

K-1, K-2
PM1, PM2
in trip
circuit.

START-UP CHECK LIST	
Equipment Checked by <u>JK7</u>	Personnel Check by <u>JK7</u>
Instrument and Safeties Checked and OK'd by <u>JK7</u>	
"Source In" Checked by <u>JK7</u>	
Emergency Equipment on Control Room Standby	
Red Light On by <u>JK7</u>	
Start-Up OK'd by <u>JK7</u>	Date <u>195</u>

Safety
Up.

Added one element, 10x10 -
3x3 + 1x2 = 89

just crit at 161.6

crit 89.89 ± 1

overall across array

E-W - Top 16 1/16

" " bot 16 1/16

N-S - Top 16 1/32

N-S bot 16 1/32

Av. meas spacing 0.85

FW.
LJ
JK7.

Expt. 10 Part A - 29

K-1, K-2
PM1, PM-2
in trip
circuit.

START-UP CHECK LIST	
Equipment Checked by JK7	Check by JK7
Instrument and Safeties checked and	JK7
"Source In" Checked by JK7	Source No.
Emergency Equipment Control Room checked by	
Red Light On by JK7	AM
Start-Up OK'd by JK7	PM Date 4-11-1962

Safety up

Hexagonal array with S.T.S. spacing
= 0.50" / Four full rings + 2 centered
on each face in 5th ring! $61 + 6 \times 2 = 73$.

crit at 133, 2

Expt 10 Part B

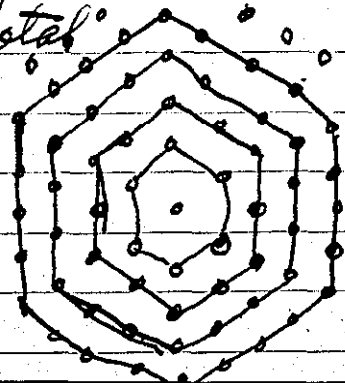
K-1, K-2
PM1, PM-2
in trip
circuit

START-UP CHECK LIST	
Equipment Checked by ✓	Check by JK7
Instrument and Safeties checked and	PKR
"Source In" Checked by JK7	Source No.
Emergency Equipment Control Room checked by ✓	
Red Light	AM
Start-Up OK'd by JK7	PM Date 1962

Safety up

Removed 6 elements; now have four
full rings + 3 centered on 2 faces!
 $61 + 3 \times 2 = 67$ total

sub-crit flooded



Log 30
F.W.
PKR
JK7

Expt 10 Part c

K1, K-2
PM-1, PM-2
in trap

START UP CHECK LIST	
Equipment Checked by <u>PKR</u>	General Check by <u>✓</u>
Instrument and Safeties Checked and <u>✓</u>	by <u>✓</u>
"Source In" Checked by <u>✓</u>	Source No. <u> </u>
Emergency Equipment in Control Room Checked by <u>✓</u>	
Red Light On by <u>JK7</u>	
Start-Up OK'd by <u>JK7</u>	Time <u> </u> PM Date <u>4-11-62</u>

Safety up

L.J.
PKR
JK7
K6K
PM-1,
in trap

Added two elements: 4 rings +
4 x 2 centered in outer ring
Total 69

sub-crit flooded

Part D

L.J.
F.W.
PKR
JK7

START-UP CHECK LIST	
Equipment Checked by <u>PKR</u>	General Check by <u>PKR</u>
Instrument and Safeties Checked and <u>✓</u>	by <u>✓</u>
"Source In" Checked by <u>✓</u>	Source No. <u> </u>
Emergency Equipment in Control Room Checked by <u>✓</u>	
Red Light On by <u>✓</u>	
Start-Up OK'd by <u>JK7</u>	Time <u>2:00 PM</u> Date <u>4-11-62</u>

Safety up

F.W.
PKR
JK7

K1, K-2,
PM-1, PM-2
in trap

Added two elements centered on
5th face
now: 4 ring + 5 x 2 = 71 elements

crit at 153.0 cm

crit No. = 70 ± 1

F.
JK7

EXPT # 11

31

L.P.
PKR
JKF

START-UP CHECK LIST	
Equipment Checked by <u>PKR</u>	Personnel Check by <u>PKR</u>
Instrument and Safeties Checked and Verified by <u>PKR</u>	
Source In <input checked="" type="checkbox"/> Checked by <u>PKR</u>	Source No. <u> </u>
Emergency Equipment in Cont. of Room Checked by <u>PKR</u>	
Red Light On by <u>PKR</u>	Time <u>8:30</u> AM
Start-Up OK'd by <u>JKF</u>	Date <u>4-12-62</u>

Safety up

K-1, K-2
PM-1, PM-2
in trap C.

Part A

Hexagonal Array with 5 TS. Spacing = 0.63"
Four complete rings + 4 x 2 centered on each
of four sides in fifth ring. Total = 69

cut. at 135.5

Part B

F.W.
PKR
JKF

START-UP CHECK LIST	
Equipment Checked by <input checked="" type="checkbox"/>	Personnel Check by <input checked="" type="checkbox"/>
Instrument and Safeties Checked and Verified by <input checked="" type="checkbox"/>	
Source In <input checked="" type="checkbox"/> Checked by <input checked="" type="checkbox"/>	Source No. <u> </u>
Emergency Equipment in Cont. of Room Checked by <input checked="" type="checkbox"/>	
Red Light On by <input checked="" type="checkbox"/>	Time <u> </u> AM
Start-Up OK'd by <u>JKF</u>	Date <u>4-12-62</u>

Safety up

K-1, K-2
PM-1, PM-2
in trap

Removed two elements centered
on E face of 5th ring. Total = 67

cut at 156.5

cut No. = 66 ± 1

32
F.W.
RKR
JK7.

Expt # 12 Part. A

K-1, K-2
PM1, PM-2
in trip C

Equipment Checked by	RKR	Personnel Check by	RKR
Instrument and Safeties Checked and OK'd by	RKR		
"Source In" Checked by	✓	Source No.	
Emergency Equipment in Control Room Checked by	✓		
Red Light On by	✓	Time	11:00 AM
Start-Up OK'd by	JK7	PM Date	4-12-62

Safety up

L.
PK
JK
K-1,
PM-1,
m x

strip sand.
with .31 +
2 x .11

Hexagonal array at S.T.S spacing = .75
Four complete rings + 3x2 on
face of 5th ring centered. Total = 67

31
22
53

sub-crit flooded

Part B

F.W.
RKR
JK7.

K-1, K-2,
PM-1, PM-2
~~strip~~ in trip.

START-UP CHECK LIST			
Equipment Checked by	RKR	Personnel Check by	RKR
Instrument and Safeties Checked and OK'd by	RKR		
"Source In" Checked by	JK7	Source No.	
Emergency Equipment in Control Room Checked by	✓		
Red Light On by	✓	Time	1:10 PM
Start-Up OK'd by	JK7	PM Date	4-12-62

Safety up

L.
PK
JK
K-1s
PM-1,
m x

Same 2
elements 2nd-
moved in
11-B

Added two elements to fourth
face of 5th ring; 61 + 4x2 = 69

Crit. at 154.0 cm

Crit NO. = 68 ± 1

Expt. 13, Part A 33

L. J.
PKR
JKF.

Safety up

START-UP CHECK LIST	
Equipment Checked by <u>PKR</u>	Personnel Check by <u>PKR</u>
Instrument and Safeties Checked and <u>Reset</u>	<u>✓</u>
"Source In" Checked by <u>✓</u>	Source No. <u> </u>
Emergency Equipment in Control Room checked by <u>✓</u>	
Red Light On by <u>PKR</u>	Time <u>8:50</u> AM
Start-Up OK'd by <u>JKF</u>	PM Date <u>4-13-62</u>

K-1, K-2
PM-1, PM-2
in trap

Hexagonal Array with S.T.S. $\approx 0.26''$
5 complete rings + 5 on each face of the
6th ring. Total = 121

cut at 108.8 cm.

Part B

START-UP CHECK LIST	
Equipment Checked by <u>✓</u>	Personnel Check by <u>✓</u>
Instrument and Safeties Checked and Reset by <u>✓</u>	
"Source In" Checked by <u>✓</u>	Source No. <u> </u>
Emergency Equipment in Control Room checked by <u>✓</u>	
Red Light On by <u>PKR</u>	Time <u>8:50</u> AM
Start-Up OK'd by <u>JKF</u>	PM Date <u>4-13-62</u>

Safety up

L. J.
PKR
JKF.
K-1, K-2
PM-1, PM-2
in trap

Removed 2 from each corner of out-
side ring. Total = 109

cut at 139.0 cm.

L. J.
RKR
JK7

Expt 13 Part C

K-1, K-2
PM-1, PM-2
in trip

START-UP CHECK LIST	
Equipment Checked by <input checked="" type="checkbox"/>	Personnel Check by <input checked="" type="checkbox"/>
Instrument and Safeties Checked and Tested <input checked="" type="checkbox"/>	
"Source In" Checked by <input checked="" type="checkbox"/>	
Emergency Equipment in Control Room Checked by <input checked="" type="checkbox"/>	
Red Light On by <input checked="" type="checkbox"/>	Air
Start-Up OK'd by <u>JK7</u>	Date <u>4-13-1962</u>

Safety up

Removed 3 elements, one from each alternate face. Total = 106

crit at 154.

Part D

L. J.
RKR
JK7.
K1, K-2
PM-1, PM-2
in trip

START-UP CHECK LIST	
Equipment Checked by <input checked="" type="checkbox"/>	Personnel Check by <input checked="" type="checkbox"/>
Instrument and Safeties Checked and Tested <input checked="" type="checkbox"/>	
"Source In" Checked by <input checked="" type="checkbox"/>	
Emergency Equipment in Control Room Checked by <input checked="" type="checkbox"/>	
Red Light On by <input checked="" type="checkbox"/>	Air
Start-Up OK'd by <u>JK7</u>	Date <u>4-13-1962</u>

Safety up

Remove one element from two faces. Total 104

slightly sub-crit flooded

crit. No. 104 ± 1

F.
L.
R.
JK
K-1
PM-
in
CU
F.
R.
JK
K-1
PM-
in

F.W.

L. J.
RKR
JK7

Expt. 14 ; Part A

K-1, K-2
PM-2, PM-1
in trip
circuit

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personnel Check by <u>RKR</u>
Instrument and Safeties Checked and Reset by <u>RKR</u>	
"Source In" Checked by <u>RKR</u>	Source No. <u> </u>
Emergency Equipment in Control Room checked by <u>✓</u>	
Red Light On by <u>RKR</u>	AM <u> </u>
Start-Up OK'd by <u>JK7</u>	Time <u> </u> Date <u>4-16-62</u>

Safety up

Hexagonal Array with S.T.S. $\approx 0.06''$
7 complete rings - 169.

very little m-1 at flooded

Part B

F.W.

L. J.
RKR
JK7

K-1, K-2,
PM-1, PM-2
in trip

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personnel Check by <u>JK7</u>
Instrument and Safeties Checked and Reset by <u>JK7</u>	
"Source In" Checked by <u>JK7</u>	Source No. <u> </u>
Emergency Equipment in Control Room checked by <u> </u>	
Red Light On by <u>RKR</u>	AM <u>1:45</u>
Start-Up OK'd by <u>JK7</u>	Time <u> </u> Date <u>4-16-62</u>

Safety up

Hexagonal array with 9 rings, Total = 271

	c1		c2		
2 2/3 in dia.	5377	}	6257	flooded	
	5589		6567		645
	5372		6547		
	5450				

L. 36
RK
JK

Expt 14, Part C

K-1, K-2
PM1, PM2 in
trip.

START-UP CHECK LIST	
Equipment Checked by <u>JK</u>	Personnel Check by <u>JK</u>
Instrument and Safeties Checked and Reset by <u>JK</u>	
"Source In" Checked by <u>JK</u>	Source No. _____
Emergency Equipment in Control Room Checked by <u>JK</u>	
Red Light On by <u>JK</u>	AM _____
Start-Up OK'd by <u>JK</u>	Time <u>8:30</u> Date <u>4-17-62</u>

Safety up

Added 7 elements to each face on
42, Total now 313

slightly sub-critical flooded

L. 37
RK
JK

Part D

K-1, K-2
PM1, PM2
in trip.

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personnel Check by <u>RKR</u>
Instrument and Safeties Checked and Reset by <u>RKR</u>	
"Source In" Checked by <u>JK</u>	Source No. _____
Emergency Equipment in Control Room Checked by <u>JK</u>	
Red Light On by <u>RKR</u>	AM _____
Start-Up OK'd by <u>RKR</u>	Time _____ Date <u>4-17-1962</u>

Safety up

Added three more elements
Now total = 316

crit at 172.2 cm

Crit No. 316 ± 2

EXPT 15 Part A

37 T

up

JTT
L.F.
F.G.W.
R.K.R

START-UP CHECK LIST	
Equipment Checked by <u>R.K.R.</u>	Personnel Check by <u>R.K.R.</u>
Instrument and Safeties Checked and Reset by <u>R.K.R.</u>	
"Source In" Checked by <u>R.K.R. JTT</u>	Source No. <u>M-93</u>
Emergency Equipment in Control Room Checked by <u>R.K.R.</u>	
Red Light On by <u>R.K.R.</u>	Time <u>1:30</u> AM
Start Up OK'd by <u>R.K.R. JTT</u>	PM Date <u>4-18-62</u>

K-1 K-2
PM-1 PM-2
in tube
after set.

Hexagonal array in contact: 12 rings
Total = ~~547~~ ⁴⁶⁹ elements.

2 main counts	C-1	C-2
flooded:	6981	594
	6951	580

System sub critical when flooded:

EXPT 15 Part B

START-UP CHECK LIST	
Equipment Checked by <u>R.K.R.</u>	Personnel Check by <u>R.K.R.</u>
Instrument and Safeties Checked and Reset by <u>J.B.</u>	
"Source In" Checked by <u>J.B. R.K.R.</u>	Source No. <u>M-93</u>
Emergency Equipment in Control Room Checked by <u>R.K.R.</u>	
Red Light On by <u>R.K.R.</u>	Time <u>3:50</u> AM
Start Up OK'd by <u>R.K.R. JTT</u>	PM Date <u>4-18-62</u>

added one ring to the above; now
have ~~12~~ ¹³ rings. total of ~~547~~ ⁵⁴⁷ elements.

2 main counts	C-1	C-2
flooded:	8434	1275
	8309	1332

System sub critical when flooded.

Pont C

JTT
LB
F.G.W
R.K.R

START-UP CHECK LIST	
Equipment Checked by <u>R.K.R.</u>	Personnel Check by <u>L.B.R.K.R.</u>
Instrument and Safeties Checked and Adjusted by <u>R.K.R.</u>	
"Source In" Checked by <u>R.K.R.</u>	<u>M-3</u>
Emergency Equipment in Control Room Checked by <u>R.K.R.</u>	
Red Light On by <u>R.K.R.</u>	
Start-Up OK'd by <u>R.K.R.</u>	Time <u>2:30</u> AM Date <u>4-19-1962</u>

P19-1-2
K-1-2.
in Trip
softly up.

Add one ring to "Pont B" now have
¹⁴ 15 rings. Total of ⁶³¹ ~~721~~ elements.

Amis counts

flooded	C-1	C-2
	12450	3452
	12420	3508

System sub crit when flooded.

L
F.R.
JK
K-
PM-
in

L
R
JK
K
PM
in

L.J.
F.W.
RRR
JK7

Expt. 15 Part D - 39

START-UP CHECK LIST	
Equipment Checked by <u>RRR</u>	Personnel Check by <u>ALJ</u>
Instrument and Safeties Checked and <u>RRR</u>	
"Source In" Checked by <u>JK7</u>	Source No. _____
Emergency Equipment in Control Room Checked by <u>✓</u>	
Red Light On by <u>RRR</u>	AM _____
Start-Up OK'd by <u>JK7</u>	PM Date <u>4-23-1962</u>

Safety up

X-1, X-2,
PM-1, PM-2
in trip C.

Closed packed hexagon with 16 on each
face. Total 721 ; or 15 rings

2 min count	C-1	C-2
when flooded.	11553	7400
	11542	7414

Part E

L.J.
RRR
JK7

START-UP CHECK LIST	
Equipment Checked by <u>RRR</u>	Personnel Check by <u>RRR</u>
Instrument and Safeties Checked and Reset by <u>RRR</u>	
"Source In" Checked by <u>✓</u>	Source No. _____
Emergency Equipment in Control Room Checked by <u>✓</u>	
Red Light On by <u>✓</u>	AM _____
Start-Up OK'd by <u>JK7</u>	PM Date <u>4-23-1962</u>

Could not
use safety
blade due to
structure

K-1, K-2
PM-2, PM-1
in trip

Close packed hex. with 16 rings -
 $6 \times 3 = 799$ elements, (3 out of each corner)

crit at 175.4 cm (~ 13 cm top)
refl.

40
L. J.
PKR
JK7.

Expt 15

Part F

L. J.
PKR
JK7
K-1
PM-1,
in 1

K-1, K-2
PM-1, PM-2
in trip

START-UP CHECK LIST	
Equipment Checked by	PKR Personnel Check by PKR
Instrument and Safeties Checked and Reset by	PKR
"Source In" Checked by	Source No.
Emergency Equipment in Control Room checked by	✓
Red Light On by	PKR AM
Start-Up OK'd by	JK7 in Date 4-24-62

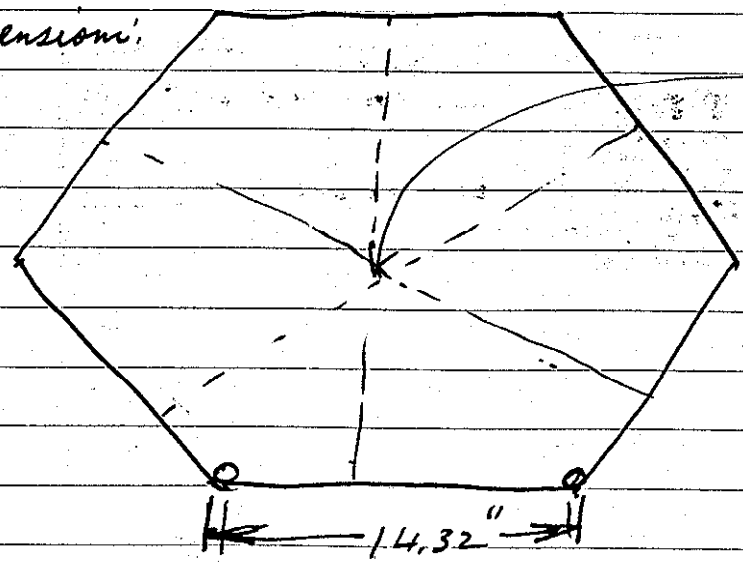
safety out

Removed 3 elements from alternate corner. Rechecked table top reading: 31 cm.

Out at 181 cm.

Crit No. = 796 ± 3

Measured dimensions:



A v. 24.42"
of 3 meas.
across flats

Av. of meas. across
a face near mid plane

F. J.
PKR
JK7
K-1,
PM-1,
in

Expt. 16

Part A 41

L.J.
F.W.
PKR
JKF

K-1, K-2
PM-1, PM-2
in trip

START-UP CHECK LIST	
Equipment Checked by <u>PKR</u>	Check by <u>PKR</u>
Instrumentation checked by <u>PKR</u>	Source No. <u>PKR</u>
Emergency Equipment in Control Room Checked by <u>PKR</u>	Red Light On by <u>PKR</u>
Start-Up OK'd by <u>JKF</u>	Date <u>4-25-62</u>

Safety ~~Out~~
Out

Hexagonal array using S. to S distance
~ 1.12". Total = array 127

Out at 142.5 u

Part B.

Removed 4 elements from corner

F.W.
PKR
JKF

K-1, K-2
PM-1, PM-2
in trip

START-UP CHECK LIST	
Equipment Checked by <u>PKR</u>	Personnel Check by <u>PKR</u>
Instrumentation and Safety Checked and Reset by <u>PKR</u>	Source No. <u>PKR</u>
Emergency Equipment in Control Room Checked by <u>PKR</u>	Red Light On by <u>PKR</u>
Start-Up OK'd by <u>JKF</u>	Date <u>4-25-62</u>

Out at 153.8

42
F.W.
RKR
TKT

K-1, K-2
PM-1, PM-2
in trip

Expt. 16 Part C

Equipment Checked by	<input checked="" type="checkbox"/>	by	<input checked="" type="checkbox"/>
Instrument ok	<input checked="" type="checkbox"/>		
Source in place	<input checked="" type="checkbox"/>		
Emergency alarm	<input checked="" type="checkbox"/>		
Red Light	<input checked="" type="checkbox"/>		
Set-Up OK'd by	RKR	Date	4-25-62

Removed 2 elements at corner
Total now = 121

Out at 163 cm

Part D

Removed 2 more elements
Nothing else changed. Total = 119

Equipment Checked by	<input checked="" type="checkbox"/>	by	<input checked="" type="checkbox"/>
Instrument ok	<input checked="" type="checkbox"/>		
Source in place	<input checked="" type="checkbox"/>		
Emergency alarm	<input checked="" type="checkbox"/>		
Red Light	<input checked="" type="checkbox"/>		
Set-Up OK'd by	RKR	Date	4-25-62

Out out, flooded

Out, No. = 120 ± 1

L.
RKR
TKT
K-1
PM-1
in

Fu
LJ
RKR
TKT
K-1
PM-1
in

L. J.
PKR
JK7

Expt. 17

Part A 43

K-1, K-2
PM-1, PM-2
in trip

START-UP CHECK LIST	
Equipment Checked by <u>PKR</u>	Personnel Check by <u>JK7</u>
Instrument and Safeties Checked and Reset by <u>PKR</u>	
"Source In" Checked by <input checked="" type="checkbox"/>	Source No. _____
Emergency Equipment in Control Room Checked by <input checked="" type="checkbox"/>	
Red Light On by <u>PKR</u>	Time <u>8:25</u> AM
Start-Up OK'd by <u>JK7</u>	PM Date <u>4-26</u> 19 <u>62</u>

~~Safety~~ up.

Elements in rows with each in contact in the row. 1" spacer between rows. Row 36 elements long (~30.5") Total of 8 rows (288 el)

Began fert period at ~ 70-80 cm. Dumped water.

Part B

FW,
LJ
PKR
JK7

K-1, K-2,
PM-1, PM-2
in trip

START-UP CHECK LIST	
Equipment Checked by <input checked="" type="checkbox"/>	Personnel Check by <input checked="" type="checkbox"/>
Instrument and Safeties Checked and Reset by <input checked="" type="checkbox"/>	
"Source In" Checked by <input checked="" type="checkbox"/>	Source No. _____
Emergency Equipment in Control Room Checked by <input checked="" type="checkbox"/>	
Red Light On by <input checked="" type="checkbox"/>	Time _____ AM
Start-Up OK'd by <u>JK7</u>	PM Date _____ 19 <u>62</u>

Safety up.

Removed 2 rows, now have 216 elements in 6 rows

near cut at ~ 70-80 cm. Dumped.

F. U. 1
PKR
JK7

Expt 17 Part C

K-1, K-2
PM-1, PM-2

START-UP CHECK LIST	
Equipment Checked by <input checked="" type="checkbox"/>	Personnel Check by <input checked="" type="checkbox"/>
Instrument and Safeties (checked and Reset by <input checked="" type="checkbox"/>	
"Source In" Checked by <input checked="" type="checkbox"/> Source No. _____	
Emergency Equipment in Control Room checked by <input checked="" type="checkbox"/>	
Red Light On by <input checked="" type="checkbox"/>	AM _____
Start-Up OK'd by <u>JK7</u>	Time _____ PM Date <u>4-26</u> 19 <u>62</u>

Safety up

Now have 4 rows only

Route sub-cut when flooded

FW
PKR
JK7

Part D

K-1, K-2, PM-1
PM-2 in trap

START-UP CHECK LIST	
Equipment Checked by <input checked="" type="checkbox"/>	Personnel Check by <input checked="" type="checkbox"/>
Instrument and Safeties (checked and Reset by <input checked="" type="checkbox"/>	
"Source In" Checked by _____ Source No. _____	
Emergency Equipment in Control Room checked by <input checked="" type="checkbox"/>	
Red Light On by <input checked="" type="checkbox"/>	AM _____
Start-Up OK'd by <u>JK7</u>	Time _____ PM Date <u>4-26</u> 19 <u>62</u>

Safety up

Added 1/2 row in center
Now 4 1/2 rows. (102 sl)

cut at 100.5 ^{(2" up the} _{table)}

Crut No. = 153 ± 6

Expt 18 Part A 45

F.W.

L.J.

PKR

JK7

START UP CHECK LIST	
Equipment Checked by <u>PKR</u>	Person Checked by <u>FW.</u>
Instrument and Safety checked and	<u>PKR</u>
"Source In" checked by <input checked="" type="checkbox"/>	_____
Emergency Equipment (noted Down) checked by <input checked="" type="checkbox"/>	_____
Red Light On by <input checked="" type="checkbox"/>	AM
Start-Up OK'd by <u>JK7</u>	Date <u>4-20</u> 19 <u>62</u>

Safety up

K-1, K-2

PM-1, PM-2

in Trip

Eleven rows of elements in contact [30 elements in each row]. Nominal 1" spacing between rows filled with "foam glass". Foam glass held down by ~475 lb. of lead on top of 1" plexiglas plate covering array. Foam glass slabs vary in thickness from ~.87" to ~1.01"

no appreciable increase in count when flooded!

C_1	C_2	
1414	73	at flooded.
1250	55	
1332	64	

K-1, K-2 did not increase at all when flooded

L.J 46
F.W.
JK7

Expt 18 Part B

L.J
F.W.
JK7

K-1, K-2
PM-1, PM-2
in trap

START UP CHECK LIST	
Equipment Checked by: JK7	by JK7
Instrument and Safety	
"Source In" Lib	
Emergency	
Red Light	
Start Up OK'd by: JK7	4-27-62

Safety up

K-1,
PM1,

17:

Added 4 rows. Total now 15.

	C ₁	C ₂	
2 min.	3083	63	flooded.
	3157	45	
	<u>3125</u>	<u>54</u>	

K-1, K-2, did not show any increase at floodcell

22

Av. meas. distance between rows = $1.00 \pm .01$

Av. length of row = 30.4"

L. J.
RKR
RKR
OKF.

Expt # 19

Part A-47

K-1, K-2
PM1, PM2
in trip.

START UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Person to Check by <u>RKR</u>
Instrument and Safety Checked and OK'd by <u>RKR</u>	
"Source In" checked by <u>✓</u>	Source On <u>✓</u>
Emergency Stop/Reset/Control Room checked by <u>✓</u>	
Red Light Off by <u>RKR</u>	
Start-Up OK'd by <u>RKR</u>	Time <u>12:15</u> PM Date <u>4-30-62</u>

Safety up

Substituted barated polyurethane for
foamglas" between rows of expt 18.
Total of 13 rows with 36 elements in
each row. 12 slots of barated polyurethane.

No increase of K-1, K-2 when flooded

	<u>C₁</u>	<u>C₂</u>
2 min	1115	81
	1171	89

No appreciable M⁻¹.

L. J. 48
F. W.
RKR
JKT.

Expt. 19

Part B

F. W.
RKR
JKT.

K-1, K-2,
PM-1, PM-2
in trip C.

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personnel Check by <u>PK7</u>
Instrument and Safeties Checked and Reset by <u>PK7</u>	
"Source In" Checked by <input checked="" type="checkbox"/>	Source No. _____
Emergency Equipment in Control Room Checked by <input checked="" type="checkbox"/>	
Red Light On by <u>RKR</u>	AM _____
Start-Up OK'd by <u>PK7</u>	Time _____ Date <u>5-2-1962</u>

Safety up

K-1,
PM-1,
in

Removed Borated polyurethane
from ^{between} 2 rows on each side of array
used in Part A. Polyurethane now
between 9 rows across center section of
array. (8 slab of polyurethane)

Crit. at $\frac{141 \text{ cm.}}{107}$

F. W.
RKR
JKT.
K-1
PM-1
+

The polyurethane 1" slabs were enclosed in
polyethylene bags. It was found after the
above expt. that about 1/2 of the bags had
leaked in an appreciable amount of water

F.W.
RKR
JK7

Expt 20

Part A - 49

K-1, K-2
PM-1, PM-2
in trip C.

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personal Check by <u>Fw</u>
Instrument and Safeties Checked and Reset by <u>RKR</u>	
"Source In" Checked by <u>✓</u>	Source No. <u> </u>
Emergency Equipment in Control Room Checked by <u>✓</u>	
Red Light On by <u>RKR</u>	Time <u>10:44 AM</u>
Start-Up OK'd by <u>RKR</u>	PM Date <u>5-2-62</u>

Safety up

13 rows of 36 elements with 8 slabs of 1" polyurethane (no. boron) between the 9 center rows of elements.

cut at $\frac{100}{34}$ am.

Dropped safety at cut. Worth ~ 1-2 dollars.

F.W.
RKR
JK7

K-1, K-2,
PM-1, PM-2 in
trip C.

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personal Check by <u>Fw</u>
Instrument and Safeties Checked and Reset by <u>RKR</u>	
"Source In" Checked by <u>✓</u>	Source No. <u> </u>
Emergency Equipment in Control Room Checked by <u>✓</u>	
Red Light On by <u>RKR</u>	Time <u> </u>
Start-Up OK'd by <u>RKR</u>	PM Date <u>5-2-62</u>

Safety up

Added 2 slabs of polyurethane to each side of above array, now 13 slabs between 14 rows of elements.

C₁
5612
5691

C₂
257
253

Counter flooded

→ Appreciable M⁻¹ shown on K-1, 17 → 68

F.W. 50
RKR
JKF

Expt. 21 Part A

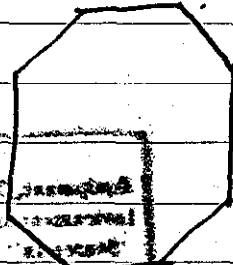
safety out

K-1, K-2
PM-1, PM-2
in trip c.

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	hook by <u>F.W.</u>
Instrument and S...	
"Source In" checked by <u>JKF</u>	
Emergency Equipment	
Red Light On by <u>RKR</u>	
Start-Up OK'd by <u>JKF</u> time	PM Date <u>5-3 1962</u>

1.20" S.T.S spacing in square
lattice array. Octagonal in out-
line with basic 23x23 row (seven
complete rows across center). 36 elements
out of each corner leaving 385 elements
in array.

Some m' but quite sus-
cort when flooded



L. 7.12 - 0.6 0.8

R
J
K-
PM-
in

Ass
F
R
J
K-
PM

7.2

Expt 21 Part B

51

RKR
OKT

K-1, K-2
PM-1, PM-2
in Trip.

START-UP CHECK LIST	
Equipment Checked by	RKR Personnel Check by RKR
Instrument and Safeties Checked and Reset by	RKR
Source In Checked by	<input checked="" type="checkbox"/> Source No. _____
Emergency Equipment in Control Room Checked by	<input checked="" type="checkbox"/>
Red Light On by	RKR
Start-Up OK'd by	RKR Time _____ PM Date 5-4 1962

Added 9 more elements to each of four corners, rounding the periphery. Total now 421

	C ₁	C ₂	etc. flooded
2 min.	39,601	8,275	
	39,545	8,218	
Assume background =	3,000	1,500 500	.098
	.074		
	$L_n = .00044$		

FW.
RKR
OKT.

Part C

K-1, K-2
PM

START-UP CHECK LIST	
Equipment Checked by	RKR Personnel Check by RKR
Instrument and Safeties Checked and Reset by	<input checked="" type="checkbox"/>
Source In Checked by	<input checked="" type="checkbox"/> Source No. _____
Emergency Equipment in Control Room Checked by	<input checked="" type="checkbox"/>
Red Light On by	RKR
Start-Up OK'd by	RKR Time _____ AM Date 5-4 1962

Added 19 more elements. Total now 440. Rounded 24x24 with 34 elements out of each corner. Almost perfect cylinder in outline.

7 flooded!	C ₁	C ₂	$L_n = .00060$
	121,974	21,520	
	123,762	21,756	.037
	.0245		

Part D

Added 12 more elements. Total

452

START-UP CHECK LIST	
Equipment Checked by <input checked="" type="checkbox"/>	Personnel Check by <input checked="" type="checkbox"/>
Instrument and Safeties Checked and Reset by <input checked="" type="checkbox"/>	
"Source In" Checked by <input checked="" type="checkbox"/>	Source No. <input type="checkbox"/>
Emergency Equipment in Control Room Checked by <input checked="" type="checkbox"/>	
Red Light On by <input checked="" type="checkbox"/>	
Start-Up OK'd by <u>JKZ</u>	Time <u>AM</u> Date <u>4-4 1962</u>

RK
OK
K-1,
PM-1,
m i

C₁
203688
~~205209~~
.0145

C₂
36108
36438
.022

Ln = 00093

Part E

START-UP CHECK LIST	
Equipment Checked by <input checked="" type="checkbox"/>	Personnel Check by <input checked="" type="checkbox"/>
Instrument and Safeties Checked and Reset by <input checked="" type="checkbox"/>	
"Source In" Checked by <input checked="" type="checkbox"/>	Source No. <input type="checkbox"/>
Emergency Equipment in Control Room Checked by <input checked="" type="checkbox"/>	
Red Light On by <input checked="" type="checkbox"/>	
Start-Up OK'd by <u>JKZ</u>	Time <u>AM</u> Date <u>5-4 1962</u>

Added 12 more elements. Total 464
24x24 with 28 out of each corner.

C₁
146126

C₂
146148 flooded

Ln = 001

Expt 2 / Part F

RKR
JK7

2
K-1, K-2
PM-1, PM-2
in Trip.

START-UP CHECK-LIST	
Equipment Checked by <u>RKR</u>	Personal Check by <u>JK7</u>
Instrument and Safeties Checked and Reset by <u>RKR</u>	
"Source In" Checked by <u>✓</u>	Source No. _____
Emergency Equipment in Control Room Checked by <u>✓</u>	
Red Light On by <u>RKR</u>	AM _____
Start-Up OK'd by <u>JK7</u>	Time _____ PM Date <u>5-7-62</u>

3

Added 16 elements to corner. Now have total of 480.

~~Very, very slightly out-cut.~~
Just cut after ~ 4 mi.

Crit No. 480 ± 5

64

RKR
JKF

Expt. 22

Part A

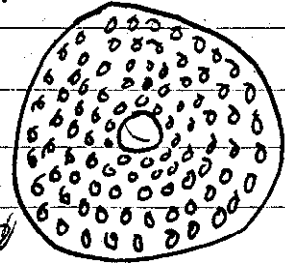
K-1, K-2,
PM-1, PM-2
in trip C.

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personnel Check by <u>RKR</u>
Instrument and Safeties Checked and Ready by <u>RKR</u>	
"Source In" Checked by <u>✓</u>	Source No. <u> </u>
Emergency Equipment in Control Room Checked by <u>✓</u>	
Red Light On by <u>RKR</u>	AM <u> </u>
Start-Up OK'd by <u>RKR</u>	Time <u> </u> PM Date <u>5-7-62</u>

Source in
~ center of
log.

109 2nd Bake elements 5^{1/2}"^(measured) long in graphite log. Log sits on grating (1") on top of plastic table.
Graphite log 52" long.

Observed air escaping from holes long after log was flooded



	C_1	C_2	
2 min	8305	2639	etc flooded
	8377	2743	
	.0156	.0067	

JKF
K-1,
PM-1
1m

FW.
PKR
OK?

Expt. 22 Part B 55

K-1, K-2
PM-1, PM-2
in trip C.

START UP CHECK LIST	
Equipment Checked by	PKR Personnel Check by PKR
Instrument and Safeties checked and Reset by	PKR
"Source In" Checked by	✓ Source No.
Emergency Equipment Control Room Checked by	✓
Red Light On by	AM
Start Up OK'd by	PKR Date 5-8-1962

Removed 100 inner rings - $\frac{109}{84}$ elements

2 min	C ₁	C ₂	flooded
	1658	542	
	1494	486	
	.078	.034	

Part C

Removed 24 more elements. Total left 60

2 min	C ₁	C ₂	flooded
	592	151	
	331	130	
	.24	.13	

Part D

Removed 30 elements. Total now 30

	<u>C₁</u>	<u>C₂</u>
	239	54
	245	58
	.545	.32

P.K.C.
8K7

5-8-62

Expt. 22 Part E

K-1, K-2
PM-1, PM-2
- lig

Removed all elements from graphite log. All holes left by removal of elements filled with water:

	C ₁	C ₂
2 min	82	18
	91	18

Part F

All fuel elements out. Top of log has stopper in fuel element holes to trap air. Also have tape around outside seams.

	C ₁	C ₂
2 min	124	19 } flooded
	138 } 130	20 } 18
	118	11

F-4
P.K.C.
8K7
K-1,
PM-1
m

F-4
P.K.C.
8K7
K-1,
PM-1

E x p t 23

Part A - 57

F.W.

PKR
JK7

K-1, K-2,
PM-1, PM-2
in trip

START UP CHECK LIST	
Equipment Checked by	PKR
Instrument and Controls Checked and Reset by	JK7
"Source In" Checked by	PKR
Emergency Equipment in Control Room Checked by	JK7
Red Light On by	PKR
Start Up OK'd by	JK7
Time	Date 5-9-62

Preliminary expt. using hexagonal array with S.T.S = ~~650~~⁶⁴⁸ Oxide 2nd bake elements used. Irregular outline with 48 elements to test for delayed air escape. NO appreciable trapped air was noted.

Part B

F.W.
PKR
JK7

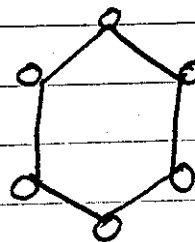
K-1, K-2,
PM-1, PM-2

Equipment Checked by	JK7	Checked by	JK7
Instrument and Controls Checked and Reset by	JK7		
"Source In" Checked by	JK7	Source No.	
Emergency Equipment in Control Room Checked by	JK7		
Red Light On by	JK7	AM	
Start Up OK'd by	JK7	Time	Date 5-9-62

4 rings about center + 1 element in each corner of 5th ring. Total 67 elements

Appreciable M^{-1} at 68.5 cm

Dumped H₂O



58

FW
RKR
JKF

Expt. 23

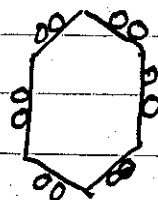
Part C

5-A
R
JKF

START-UP CHECK LIST	
Equipment Checked by <input checked="" type="checkbox"/>	Personnel Check by <input checked="" type="checkbox"/>
Instrument and Safeties Checked and Reset by <input checked="" type="checkbox"/>	
"Source Is" Checked by <input checked="" type="checkbox"/>	Source No. _____
Emergency Equipment in Control Rooms Checked by <input checked="" type="checkbox"/>	
Red Light On by <input checked="" type="checkbox"/>	AM _____
Start-Up OK'd by <u>JKF</u>	Date <u>5-9-62</u>

K-1, K-2, PM-1
PM-2 in trip

3 rings about center + 2 on each face : $37 + 12 = 49$



crit at ~ 97.8 Gm

FW
RKR
JKF
K-1
PM-1
in

Part D

Removed 6 elements, 1 from each face. Total now 43
Inst. as before.

moderately sub. crit flooded.

5-9-62
FW
RKR
PKT

Part E

Added one element to array.
Total now 44.

cut at 146.5 cm.

cut No. 44 ± 1

FW
RKR
PKT

Expt. 24. Part A

K-1, K-2
PM-1, PM-2
in trip

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	check by <u>RKR</u>
Instrument and Safeties checked and	
"Source In" Checked by <u>K</u>	
Emergency Equipment in Control Room checked by	
Red Light On by <u>RKR</u>	
Start Up OK'd by <u>RKR</u>	PM Date <u>5-10-1962</u>

40 elements in hexagonal array with
S.T.S. = .84" 3 rings + 3 on alternate
faces.

sup. cut flooded

60

F.W.
PKR
JKF

Expt 24 Part B

K-1, K-2
PM-1, PM-2
in trip

START-UP CHECK LIST	
Equipment Checked by	PKR Personal Check by <input checked="" type="checkbox"/>
Instrument and Safeties checked and	<input checked="" type="checkbox"/>
"Source In" Checked by	JKF
Emergency Equipments in Control Room checked by	<input checked="" type="checkbox"/>
Red Light On by	PKR
Start Up OK'd by	JKF AM 5-10-62

Added 2 elements to array.
Now total = 42

Int-cut flooded

PKR
JKF

K-1, K-2
PM-1, PM-2
in trip

START-UP CHECK LIST	
Equipment Checked by	PKR Personal Check by <input checked="" type="checkbox"/>
Instrument and Safeties	<input checked="" type="checkbox"/>
"Source In" Checked by	JKF
Emergency Equipments	<input checked="" type="checkbox"/>
Red Light On by	PKR
Start Up OK'd by	JKF AM 5-11-62

Added 2 elements total
now = 44.

cut at 154.5

Crit NO. 43 ± 1

L.F.
JKF

Expt. 25

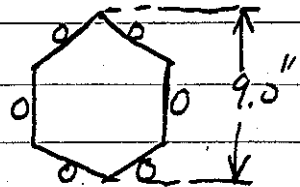
Part A

K-1, K-2
PM-1, PM-2
in trip

START-UP CHECK LIST	
Equipment Checked by <u>JKF</u>	Personnel Check by <u>JKF</u>
Instrument and Safeties Checked and Reset by <u>KJ</u>	
"Source In" Checked by <u>—</u>	Source No. <u>—</u>
Emergency Equipment in Control Room Checked by <u>✓</u>	
Red Light On by <u>✓</u>	AM
Start-Up OK'd by <u>JKF</u>	Time <u>—</u> Date <u>5-11-1962</u>

Hex. Array with S.T.S. \approx .40", Total of 43 elements in Array.

crit at 123 μ



L.F.
JKF

Part B

START-UP CHECK LIST	
Equipment Checked by <u>✓</u>	Personnel Check by <u>✓</u>
Instrument and Safeties Checked and Reset by <u>✓</u>	
"Source In" Checked by <u>✓</u>	Source No. <u>1</u>
Emergency Equipment in Control Room Checked by <u>✓</u>	
Red Light On by <u>✓</u>	AM
Start-Up OK'd by <u>JKF</u>	Time <u>—</u> Date <u>5-11-1962</u>

~~Removed~~ Removed 3 elements, Total = 40

Sub-crit flooded

Out no. = 41 \pm 1

Expt 26 Part A

F.W.
PKR
OKTK-1, K-2, PM-1, PM-2
on trip

START-UP CHECK LIST	
Equipment Checked by <u>PKR</u>	Checked by <u>PKR</u>
Instrument and Safeties Checked and	<u>PKR</u>
"Source Is" Checked by <input checked="" type="checkbox"/>	
Emergency Equipment in Control Room Checked by <input checked="" type="checkbox"/>	
Red Light On by <input checked="" type="checkbox"/>	
Start-Up OK'd by <u>PKR</u> Time _____	PM Date <u>5-11-62</u>

Hex. array of 73 elements with S.T.S. = .25

near cut at 81.5 cm

Part B

Removed one element from each
face. Total now 67. Did not
shut down.

cut at ~ 92 cm

Part C

Removed 6 elements, Now have 61 in true hexagon. Did not shut down

crit at 126.5

=.25

Part D

Removed 3 elements, Now have 58. Did not shut down

appreciably sub. crit flooded

h.

Crit No. = 59 ± 1

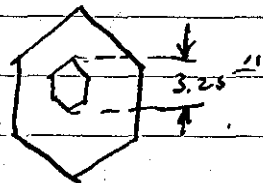
64
F.W.
RKR
JK7

Expt. 27 Part A

K-1, K-2, PM-1
PM-2 in trap

START-UP CHECK LIST	
Equipment Checked by <u>JK7</u>	Personnel Check by <u>JK7</u>
Instrument and Safeties Checked and Reset by <u>JK7</u>	
"Source In" Checked by <u>JK7</u>	Source No. <u> </u>
Emergency Equipment in Control Room Checked by <u>JK7</u>	
Red Light On by <u>JK7</u>	Time <u>3:40</u> PM Date <u>5-11-62</u>
Start-Up OK'd by <u>JK7</u>	Time <u>3:40</u> PM Date <u>5-11-62</u>

Same spacing as in Expt 26 (0.25") but removed seven elements from center. Total in array = 66
Hole diam. ~ 3.25 across points



crit at 107.5 cm

RKR
JK7

Part B

K-1, K-2
PM-1, PM-2
in trap

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personnel Check by <u>JK7</u>
Instrument and Safeties Checked and Reset by <u>RKR</u>	
"Source In" Checked by <u>JK7</u>	Source No. <u> </u>
Emergency Equipment in Control Room Checked by <u>JK7</u>	
Red Light On by <u>RKR</u>	Time <u>AM</u> Date <u>5-14-62</u>
Start-Up OK'd by <u>JK7</u>	Time <u> </u> Date <u>5-14-62</u>

Removed 4 elements from periphery
Total now 62

crit at 138.5

Part

START-UP CHECK LIST

Equipment Checked by JKF and Check by JKF

Instrument and Supplies Checked and JKF

"Source In" Checked by JKF and Source No. JKF

Emergency Equipment Checked by JKF

Red Light On by JKF AM

Start-Up OK'd by JKF Date 5-14 1962

RRR
JKF

K-1, K-2,
M-1, PM-2
in trap

Removed 2 elements, total now 60
slightly sub-crit flooded.
crit. No. 60 ± 1

Expt. 28 Part A

START-UP CHECK LIST

Equipment Checked by RRR and Check by RRR

Instrument and Supplies Checked and RRR

"Source In" Checked by RRR and Source No. RRR

Emergency Equipment Checked by RRR

Red Light On by RRR AM

Start-Up OK'd by JKF Date 5-14 1962

F.W.
RRR
JKF

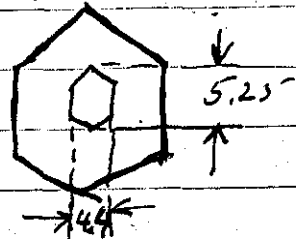
K-1, K-2
PM-1, PM-2

Same spacing but enlarged hole in
center by removing 2nd ring. Total out of
center 19. Total in array = 66
3 rings - 6

7 loaded
counters

C1
3407
3352 / 1020
335'

C2
242
228 / 80
30



FR
JK

Added 6 more elements
Did not shut down

Sunt Flooded }	<u>C₁</u>	<u>C₂</u>
	10,285	730
	10292	743
	.102	.092

Part C

RK
JK

START-UP CHECK LIST	
Equipment Checked by <u>RKJ</u>	Personnel Check by <u>RKJ</u>
Instrument and Safeties Checked and Reset by <u>RKJ</u>	
"Source Is" Checked by <u>RKJ</u>	Source No. _____
Emergency Equipment in Control Room Checked by <u>✓</u>	
Red Light On by <u>RKJ</u>	AM _____
Start-Up OK'd by <u>RKJ</u>	Time <u>5-14</u> PM Day <u>1962</u>

K-1, K
8 PM
JK

Added 6 more elements,
Total = 78

Out at ~ 146.5 a

F.W.
RKR
OK?

Expt 28 Part D

Removed 2 elements, Total now 76
Did not shut down (Drained part of
water). Rounded outline
Appreciably sub-crit flooded

$$\text{Crt NO.} = \frac{77.21}{75} \pm 1$$

RKR
OK?

Expt 29 Part A

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personnel Check by <u>JK?</u>
Instrument and Safeties Checked and Reset by <u>RKR</u>	
"Source In" Checked by <u>JK?</u>	Source No. _____
Emergency Equipment in Control Room checked by <u>✓</u>	
Red Light On by <u>RKR</u>	AM _____
Start-Up OK'd by <u>JK?</u>	Time _____ PM Date <u>5-15-62</u>

K-1, K-2, PM-1
3 PM-2 in
sup. c.

Hexagonal array with elements in
contact. Total of 109 elements
Dia. $\approx 9''$

Moderate M^{-1} when flooded.

68
F.W.
RKR
JKF

Expt. 29

Part B

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personnel Check by <u>RKR</u>
Instrument and Safeties Checked and Reset by <u>F.W.</u>	
"Source In" Checked by <u>✓</u>	Source No. _____
Emergency Equipment in Control Room Checked by _____	
Red Light On by <u>RKR</u>	AM _____
Start-Up OK'd by <u>JKF</u>	Time _____ PM Date <u>5-15-62</u>

K-1, K-2
PM-1, PM-2
in trip

~~increased~~ Operated elements .005"
using Cellophane flexible strips. 109
elements in array.
Sub Cril.

Train Counts

C-1	C-2
4355	412
4287	438

Expt 29 Part C

F.W.
RKR
JKF

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personnel Check by <u>F.W.</u>
Instrument and Safeties Checked and Reset by <u>F.W.</u>	
"Source In" Checked by <u>✓</u>	Source No. _____
Emergency Equipment in Control Room Checked by <u>✓</u>	
Red Light On by <u>RKR</u>	AM _____
Start-Up OK'd by <u>JKF</u>	Time _____ PM Date <u>5-15-62</u>

K-1, K-2,
PM-1, PM-2
in trip

increased S.T.S. spacing to (.841")
109 elements in. Rounded array.
Ar. meas spacing = .065

wiring

cut at 127.2 cm

Expt 29 Part D

69

Tightened array so that av. spacing
near $\bar{0.058}''$ (assuming av dia. of elements
is $0.77''$)

slightly sub-crit flooded

Crit no. at $0.055''$ separation = 109 ± 5

15 elements S.T.S in contact = $11.45''$

Av. Dia $\approx 0.775''$

70
F.W.
RKR
OKF.

Expt 30 Part A

K-1, K-2,
PM-1, PM-2 in
Trip C.

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personnel Check by <u>FW</u>
Instrument and Safeties Checked and Reset by <u>RKR</u>	
"Source In" Checked by <u>✓</u>	Source No. <u> </u>
Emergency Equipment in Control Room Checked by <u>✓</u>	
Red Light On by <u>✓</u>	AM <u> </u>
Start-Up OK'd by <u>RKR</u>	PM Date <u>5-16 1962</u>

Hex. array of 2nd lake elements with
spacing = 11.10 in. Total in array =
109

Began to get fast M⁻¹ at ~ 78 cm
D dumped water

Part B

F.W.
RKR
OKF

K-1, K-2, PM-1
PM-2 in
Trip.

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personnel Check by <u>RKR</u>
Instrument and Safeties Checked and Reset by <u>FW</u>	
"Source In" Checked by <u>✓</u>	Source No. <u> </u>
Emergency Equipment in Control Room Checked by <u>✓</u>	
Red Light On by <u>RKR</u>	AM <u> </u>
Start-Up OK'd by <u>RKR</u>	PM Date <u>5-16 1962</u>

Removed 18 elements. Now have 91 in
a hexagon.

Out at ~ 77.5 cm

Part C

71

Removed 18 elements, Total now 73.
Did not shut down

crit at 91 am.

Part D

Removed 12 elements, Total now 61

crit at 119.5

Part E

Removed 6 elements, Now 55
in array

sub-crit, but high M^{-1} when
flooded.

72

5/16/62

Expt. 30 Part F

Added 2 elements. Total 57. Did not shut down

Out at 148.7 u

Out No. = 50 ± 1

EXPT 31 Part A.

L.P.
PKR
SK7

K-1, K-2, PM-1
PM-2 in trip

START-UP CHECK LIST	
Equipment Checked by <u>PKR</u>	Personnel Check by <u>SK7</u>
Instrument and Controls Checked and Properly	<u>PKR</u>
Source in "On" position	<input checked="" type="checkbox"/>
Emergency Equipment in Control Room Ready	<input checked="" type="checkbox"/>
Red Light On by <u>PKR</u>	
Start-Up OK'd by <u>SK7</u> Time <u>AM</u> Date <u>5-17-1962</u>	

Hexagonal array of 22nd tube elements with spacing ≈ 1.25 " (using 1" wide strips). Hex. outline with 9/1 elements.

Out at 119.4

Part B

Removed 6 elements from corners of hexagon. Did not shut down. Drained part of H₂O only. Total 85-

Crit at 137 cm.

Part C

Removed 3 elements as above
Total 82

Crit at 155.4

Crit No. = 81 ± 1

74 $\frac{1}{2}$ Element Expts.

Expt. 32

Part A

LJ
FW.
PKR
JK7.

START-UP CHECK LIST	
Equipment Checked by <u>PKR</u>	Checked by <u>FW.</u>
Instrument and Safeties Checked and	<u>PKR</u>
"Source In" Checked by <u>JK7</u>	Case No. _____
Emergency Equipment _____	and Rooms Checked by <u>JK7</u>
Red Light On by <u>PKR</u>	Time _____
Start-Up OK'd by <u>JK7</u>	PM Date <u>5-17-66</u>

Hexagonal array of $\frac{1}{2}$ length 2nd
oak elements. STS. = 1.10". Total
in array 73.

(Top of fuel = 99) Element zero on side scale = 34 cm

cut at 90.5 cm

Part B.

Removed $6\frac{1}{2}$ elements, Total 67
Drained part of water, did not shut down

cut at 100.9

Part C

Removed 2 elements. Did not shut down. Total 65

out no. 66 ± 1

Expt 33 Part A

Hex array of 1/2-elements (2nd Bake) at STS=0.60
Total n = 46

Lif
RRR
JKF

K-1, K-2, PM-1,
PM-2 in
trip

START-UP CHECK LIST	
Equipment Checked by <u>RRR</u>	Personnel Check by <u>Lif</u>
Instrument and Safeties Checked and Reset by <u>Lif</u>	Source No. <u> </u>
"Source In" Checked by <u>✓</u>	Emergency Equipment in Control Room Checked by <u>✓</u>
Red Light On by <u>RRR</u>	Start-Up OK'd by <u>JKF</u> Time <u> </u> AM
	Date <u>5-18-1962</u>

slightly sub out flooded

Expt. 33 Part B

Put in $1 - \frac{1}{2}$ element. Total now
47. Did not shut down - only drained
part of water.

Crit. at 98.0 cm.

$$\text{Crit No.} = 46\frac{1}{2} \pm \frac{1}{2}$$

L. 7.
PKR
JK7

K-1, K-
PM-1, PM
in the

FU
PK
JK

K-1, 1

PM-2

Aug

Expt. 34

Part A 77

L. J.
RKR
JKT

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personnel Check by <u>RKR</u>
Instrument and Safeties Checked and Reset by <u>LJ</u>	
"Source In" Checked by <u>L</u>	Source No. _____
Emergency Equipment in Control Room Checked by <u>L</u>	
Red Light On by <u>RKR</u>	AM _____
Start Up OK'd by <u>RKR</u>	Time _____ PM Date <u>5-18-62</u>

K-1, K-2
PM-1, PM-2
in trip

Hex. array of $\frac{1}{2}$ elements (2nd fake) with STS = .25"
Total in array = 67

cut at 92.5 um.

Part B

F.W.
RKR
JKT

START-UP CHECK LIST	
Equipment Checked by <u>RKR</u>	Personnel Check by <u>RKR</u>
Instrument and Safeties Checked and Reset by <u>RKR</u>	
"Source In" Checked by <u>✓</u>	Source No. _____
Emergency Equipment in Control Room Checked by <u>L</u>	
Red Light On by <u>RKR</u>	AM _____
Start Up OK'd by <u>RKR</u>	Time _____ PM Date <u>5-18-62</u>

K-1, K-2, PM-1
PM-2 in
trip.

Removed 2 elements from above. Total 65

cut 101.3 um

cut no. = 64 ± 1

Expt 35

Part-A

L.F.
F.W.
PKR
JK7

START UP CHECK LIST	
Equipment Checked by	PKR
Instrument and Safety Checked by	JK7
"Source In" Checked by	PKR
Emergency Equipment Checked by	✓
Red Tag: On by	PKR
Start Up OK'd by	JK7
Date	5-21-62

K-1, K-1, PM-1

PM-2 in Trip

Hex. array of $\frac{1}{4}$ length 2nd fake
elements at STS = 0.60" Total No. pcs = 64
Adjusted water feed rate.
@rit at 71.0 cm.

Top of element
63.2 cm (right glass)

Part B

Removed 2 per. Total = 64.
Did not shut down between parts A & B

Apparently sub. cut at flooded

@rit No. = 65 ± 1 pcs.

9/62

South End

Purpose: To determine whether ≈ 2500 Roved elements, arranged in close-packed hexagonal array, are critical when surrounded by ≈ 6 in. reflector.
A copy of the experimental procedure written by D W Magnuson (4 pages) is attached to p. 101 of this notebook for reference.

9/2/62

(Day D-41962)
The frame was disassembled and mounted on the split tables. 405 tubes were placed in the rack on the movable table - in the frame - and 434 fuel tubes + 1 open tube (for source and μ counter) on the fixed table. Measurements indicated that the thin support strips on the front of the frames was about $\frac{1}{2}$ that specified on the print. Also, bowing of these strips was observed. Therefore the frames were unlabeled and returned to the shops for correction.

9/5/62

Frames returned to 9213 and the initial load (shown) reentered.

 $\frac{1}{2}$ " BF

C₁ located, with source, in "empty" tube in center

1" BF

C₂ " against angle frame, back, fixed table

 \approx " BF

C₃ & C₄ in A1 base beneath array. "

Gruit

Experimental Procedure for Unmoderated Reflected Experiments with Aluminum-Cased Fuel Rods

Purpose

The purpose of this series of experiments is to determine the critical number of aluminum-cased fuel rods when reflected if this number is less than 2500 fuel rods. An extrapolation of moderated experiments to zero moderation indicates a number greater than 2000. The calculated value is approximately 2400.¹

Experimental Equipment

The Split Table Apparatus in the South Wing of Bldg. 9213 will be used for these experiments. On each table will be placed an aluminum angle frame, Dwg. No. D-4192, each capable of holding 1247 fuel rods horizontally in a hexagonal close-packed array. When the tables are brought together, a nearly perfect hexagon of fuel rods is made. These frames have 8 in. legs so that large pieces of polyethylene reflector can be placed under and around the fuel rods and so that the frames can be bolted to a 1/4 in. aluminum plate. This plate is supported by 5 rows of 3 in. square aluminum tubing which are on top of the Split Table Apparatus.

Some solenoid-operated valves in the pneumatic control system of the Split Table Apparatus have been replaced with types that do not leak in order to improve the reliability of operation. Another improvement eliminated the sudden stop at the end of the stroke for normal separation by using the tables apart limit switch to cut off and vent the reverse air pressure at about 2 in. from the end of the stroke. The table velocity in the reverse direction is

1. W. Mee, private communication, April 11, 1962.

limited by a needle valve in the exhaust air line set so that it takes 27 sec to fully separate the tables. However, ^{on scram,} the table moves 1 in. in 170 milliseconds and 8-1/2 in. in 1 sec. This initial response is adequate. The closure velocities have not been changed from the original design in which the rate of approach over the last 16 in. of closure changes by a factor of 25 from 11 in./min to 0.44 in./min. This motion requires 7-1/2 min to complete.

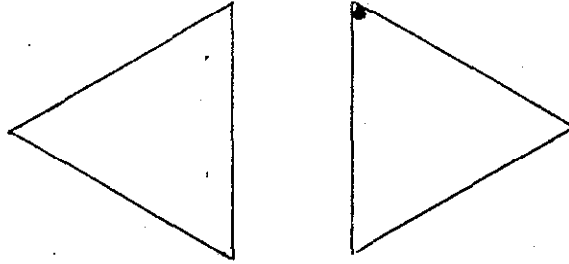
The nuclear instrument^{ation} will consist of 4 BF₃ counting channels, 4 BF₃ ion chambers and 2 scintillation channels. The two linear ion chamber channels and the scintillation channels are connected to the safety circuits. The other two ion chambers have logarithmic amplifiers.

The four counting channels will be used to make neutron source multiplication measurements as fuel rods are added. One BF₃ counter, 1/2 in. O.D. and a neutron source will be placed in an aluminum tube in the array, ^{so that additional fuel rods can be added} without changing the source or counter positions. A 1 in. O.D. BF₃ counter will be placed at the lower edge of the assembly and the other two, 2 in. O.D. BF₃ counters, will be placed below the assembly in 8 in. O.D. paraffin housings. If necessary the paraffin housing can be removed to increase the counting rate.

Experimental Procedure

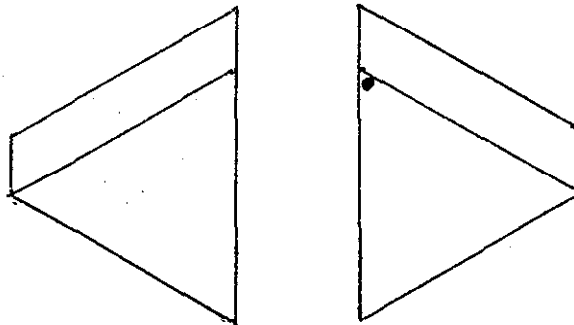
Unreflected Experiments - A preliminary set of experiments will be performed to place the elements in the frames unreflected and to measure the neutron source multiplication as this is done. After each step counting rates will be measured with tables apart and together and reciprocal counting rates will be plotted before the next step.

1) A triangular pattern of 435 fuel rods will be placed in each frame. (This number is subcritical when flooded.) The neutron source and 1/2 in. O.D. counter will be placed in an empty tube at the apex of the triangle on the fixed table.



° Source and Counter Position

2) Seven rows, 203 fuel rods, will be added to each table making a total of 1276 when together.



° Source and Counter Position.

- 3) Seven additional rows will be added. The total will be 1682.
- 4) Seven additional rows will be added. The total will be 2088.
- 5) The final rows will bring the total to 2497.

Reflected Experiments - The previous steps will be followed having a permanent reflector around the frame. If the multiplication curve extrapolates to a critical size, then the next addition may be correspondingly smaller than the above experiments.

An alternate method for obtaining the reflected multiplication to avoid handling the rods would be to add reflector to each fully loaded half frame with tables separated. This should be done in steps with no more than 1/8 of the reflector added to each half for each increment. The bottom reflector should constitute the first step with two counters located directly below the assembly. If the multiplication predicts criticality, the number of fuel rods in the array should be reduced before proceeding further. ^{the assembly is ~~fully~~} If a fully reflected and subcritical, the multiplication curve can be obtained when unstacking the array.

Dale W. Magnusson
May 2, 1962

Date Time	Conditions (No reflector)			Table Separation	1350 002 1.1x10	1350 002 1.1x10
	Fixed	Movable	Total		PHS 200	PHS 200
5/4/62	Fixed	Movable	Total	53	260	410
1:45 P	434	435	869	53	250	400
	434	435	869	0	310	550
				0	300	600
4:00 P	637	638	1275	53	260	680
4:20 P	"	"	"	0	670	1230
5/7/62 8:00 A	637	638	1275	53	240	620
				53	240	580
Instrument Check on				5/7/62	Source 10 uCi	
PM-1	Low Trip			OK	Alarm Trip OK	
PM-2					Alarm Trip OK	
IC-1	2 10 x 10 ⁻¹⁰			Meter Trip	Fast Trip	
IC-2	2 10 x 10 ⁻¹⁰			Meter Trip	OK 520 counts from (10 in ²)	
IC-3	1 x 10 ⁻¹⁰			Calibration	OK	
IC-4	1 x 10 ⁻¹⁰			Calibration	OK	
IRM				Meter Trip		
8:45 P	"	"	1275	0	660	1190
9:00 P	"	"	"	0	680	1220
9:00 P	840	841	1681	53	390	750
				"	420	730
	"	"	1681	0	1420	1620
				0	1310	1650

	^{c3}	^{c4}	M(c1)	M(c2)	M(c3)	M(c4)
1500 204 244 1X4	1500 204 244 1X4	1500 204 244 1X4				
92(206)+54	102(202)+155					
90 + 156	101 + 244	.392	.247	1.09	0.98	
187(203)+113	209(203)+179	.328	.768	.532	.426	
189 + 170	209 + 201					
179 + 29	197 + 191					
440 + 65	495 + 17					
181 + 78	198 + 100	.417	.161	.552	.505	
183 + 63	198 + 180	.417	.172	.546	.5405	
Preliminary Check on <u>5/2/62</u>						
Room 113 Pressure Differential	<u>Duan</u>					
Red Light On and Personnel Check	<u>CC</u>					
Scrams and Bldg, Alarm Reset	<u>Duan</u>					
Source Inserted	<u>I4 20024</u>					
Safety Withdrawn	—					
Controls Set	—					
Reflector Water	—					
Moderator Water	—					
400 + 60	489 + 237	.149	.083	.222	.204	
400 + 124	488 + 124					
228 + 17	249 + 65	.247	.105	.439	.402	
228 + 67	248 + 28					
623 + 79	679 + 185	.074	.0612	0.161	.147	
622 + 252	678 + 109					

Date & Time	Conditions			Table Separation	C ₁	C ₂	
	Fixed	Movable	Total				
5/7/62							
1120	1043	1044	2087	53	450	860	2
				53	510	800	2
1150			2087	Max 1.0 N.O.S. _{in}	1350 1940	1940 1880	7
1200				1.0 N.O.S. _{in}	1890	1930	.
				Added 203		Extra	
1 ⁵⁶ p	1246	1247	2493	53	1150	800	
		"	"	53	690	840	
2 ⁰⁰ p	"	"	"	1.6 water	2270	2130	7
2 ⁴⁰	"	"	"	1.6 ± .08	2220	2100	
2 ⁵⁵ p			8 pc p-ruffin added, each 12" x 16"				X
3 ²⁰ p	"	"	"	1.85 water ± .009	2370	2280	
3 ⁴⁰ p					2360	2320	
	Dist Check OK			Cables in C ₁ & C ₂ counted			cl
5/8/62	Added two large slabs of (C ₃) _{in} to west face						R
1455				2.0 ± 0.1"	2410	910	8
				2.0 ± 0.1"	2320	940	8
				Covered C ₃ & C ₄ counters			W.
	(Dist check OK)			2.1 water	2350	930	
5/10/62	C ₃ & C ₄ covered with 6" p-ruffin. Both ends of						
1140				2.1 water	2400	2860	
					2420	2880	

	c_3	c_4	$M(c_1)$	$M(c_2)$	$M(c_3)$	$M(c_4)$
	248+100	271+ 84	.208	.120	.403	.368
	248+71	272+92				
	730+70	796+80	.053	.052	.137	.126
	729+38	794+31				
	final rods to each table					
	257+124	281+54				
	254+206	281+250	.144	.118	.390	.355
	789+231	860+124				
	785+212	864+121	.0445	.0473	.127	.116
	x6" thick, to top of last 6 tables. 4 pc on each table.					
	830+112	915+215				
	828+196	912+23	.0423	.0435	.121	.109
	changed, c_1, c_2 $v=1400$. c_3 lower on top of fixed table					
	Removed maffin from top.					
	837+5	977+158	0.0423			
	835+231	979+185				
	with 6" maffin					
	526+147	603+62				
	of away (east & west faces) covered with 6" polyethylene					
	597+2	635+147		Added 1/2" plastic to last tops.		
	598+160	636+197	0.0411			

Instrument Check on 5-11-62 Source 10m/8

PM-1	Low Trip	OK	Alarm Trip	OK
PM-2			Alarm Trip	OK
IC-1	Meter Trip	OK	Fast Trip	OK
IC-2	Meter Trip	OK	Scrammed Table	
IC-3	Calibration			
IC-4	Calibration			
CRM	Meter Trip			

Preliminary Check on 5-11-62

Room 113 Pressure Differential	OK	Done
Red Light On and Personnel Check	OK	Done
Scrams and Bldg. Alarm Reset	OK	Done
Source Inserted		In Fixed Table
Safety Withdrawn	X	
Controls Set	X	
Reflector Water	X	
Moderator Water	X	

Fixed Table 1246 fuel rods reflected on both ends and on side (top and bottom unreflected.) Top has $1\frac{3}{4}$ " of Plexiglass.

Movable Table 1247 fuel rods reflected on both ends and ^{on top} ~~ends~~ (side, top and bottom unreflected)

C₁ in source tube

C₂ located at top of Fixed table

C₃ below assembly (no paraffin between fuel
C₄ " " " (and counters)

12⁰⁵ PM Run tables together to check Multiplication
of system described on previous page

Sign	C1	C2	C3	C4	IC4	EC2
10'	2.170.1"	3180	35780	1574+173	1711+233	3.5x10 ⁻¹² 1.7x10 ⁻¹²
"		3130	35950	1577+45	7716+0	" "

Add paraffin to side of movable table.

1 ⁰⁰ P	10'	2.170.1"	3430	40470	1846+199	2010+1	4.0x10 ⁻¹² 1.9x10 ⁻¹²
1 ²⁰ P	16'	"	3360	40740	1857+241	2011+224	

Remove Paraffin side reflector from
fixed and movable table. Added
Polyethylene reflectors to bottom of
fixed and movable tables

5 ⁰⁰ P	53"	530	79660	122+212	135+208	
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9 May 14, 1962

8 ¹⁰ A	53"	530	17408	120+118	131+120	1x10 ⁻¹² 0.5x10 ⁻¹²
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Instrument Check on May 14 Source 1cmcd

PM-1	Low Trip	OK	Alarm Trip	OK
PM-2			Alarm Trip	OK
IC-1	Meter Trip	Scrammel	Tablet Trip	OK
IC-2	Meter Trip	OK		
IC-3	X Calibration	X		
IC-4	1x10 ⁻¹⁰ Calibration	OK		
CRM	Meter Trip	X		

Preliminary Check on 5-14-62

- Room 113 Pressure Differential down
- Red Light On and Personnel Check C C
- Scrums and Bldg. Alarm Reset C C
- Source Inserted M-230 In Central alum Tube
- Safety Withdrawn ~~_____~~
- Controls Set ~~_____~~
- Reflector Water ~~_____~~
- Moderator Water ~~_____~~

0830	Separation	C_1	C_2	C_3	C_4	
	$2.6 \pm 0.13"$	3290	x34300	286+31	312+25	1500
		3200	x34820	285+171	315+105	

Polyethylene slab added to top of array on fixed table; C_2 moved slightly

0920	53"	520	x8500	121+201	130+203	160
		550	x8200	122+40	132+5	

1025	$2.6 \pm 0.13"$	3370	x84600	290+108	319+164	
		3x50	x85500	292+127	319+149	5715

Added paraffin reflector to side (north & south) 08

1115	53"	650	x9600	130+190	143+137	
		630	x9650	130+158	142+68	

Fully reflected but not together. Added 1" plastic for edge gap of tables at separation, vertical plane.

1212	$6.8 \pm 0.34"$	4820	x61820	396+251	406+41	
		4910	x62410	396+241	405+249	

Moved 1" vertical pieces at interface so that tables could go together.

		c_1	c_2	c_3	c_4
3.12(14)	4990	177660	389+15	426+193	

Adjusted vertical pieces, west face binding

2.25(14)	5130	279250	384+217	423+220	
	.145	X	.259	.206	

	5140	279510	386+170	424+215	
	5150	279980	388+240	425+0	

Removed 406 tubes; 2490-406=2084 total

Removed $\approx 1\frac{1}{2}$ " of reflector between polyethylene

slab and topst tubes. Reflector on top now

$2 \times 0.85 + 1.5 = 7.5$ in away from tubes. c_2 usual

1500	2.7	3610	77780	304+14	337+134	.297
------	-----	------	-------	--------	---------	------

		3630	77250	305+71	336+195	
--	--	------	-------	--------	---------	--

Removed 406 tubes. c_2 on top of any-

fixed table. Total 1611

1600	2.6	2440	65930	240+63	268+1	
------	-----	------	-------	--------	-------	--

		2380	65820	240+187	264+34	.376
--	--	------	-------	---------	--------	------

571576 Conditions as above.

0830	2.6	2510	65170	239+41	267+67	0.375
------	-----	------	-------	--------	--------	-------

		2530	64940	240+114	265+255	
--	--	------	-------	---------	---------	--

406 tubes removed. Total on tables 1275

2570.10	1970	59160	175+10	193+226	0.518
---------	------	-------	--------	---------	-------

	1960	59680	174+105	194+217	
--	------	-------	---------	---------	--

406 tubes removed. Total 869

2.25	25890	46020	99+243	109+40	0.91
------	-------	-------	--------	--------	------

	25410	46500	99+43	109+200	
--	-------	-------	-------	---------	--

The end.

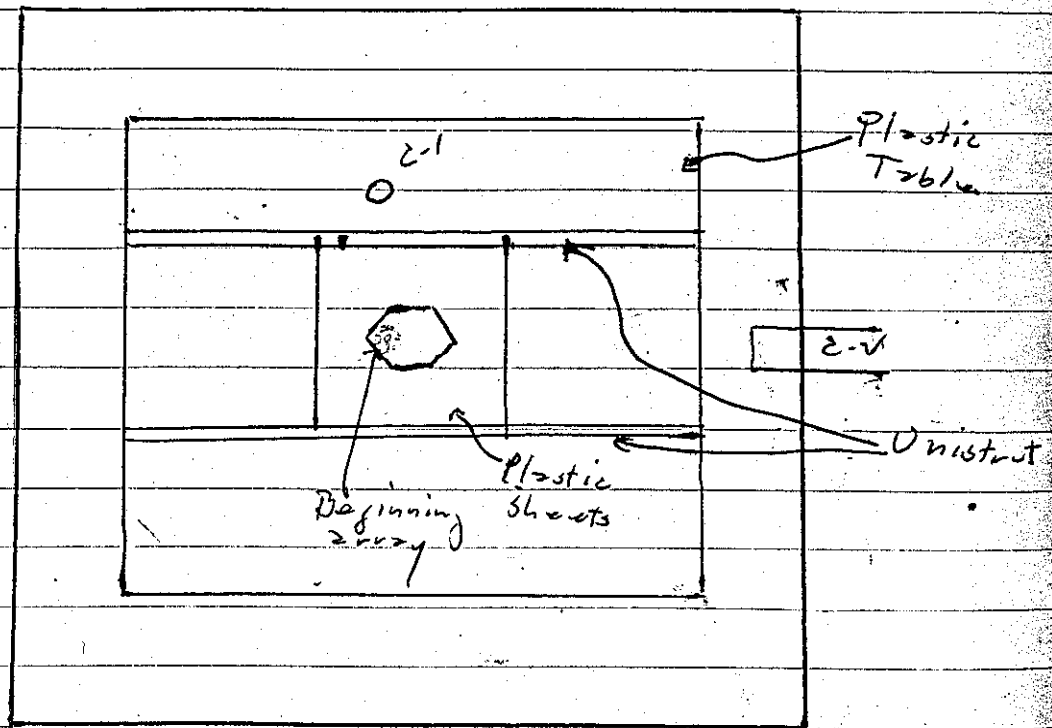
110

P+W Fuel Tubes

4/8/63

Rec'd 165 fuel tubes, inventoried by piece count & book value (CNLM-4286 & -4289).
A few open welds as noted in list attached to this Log, p. 110.

4/10/63 Array to be run first without H₂O in Well, mounted on plastic table. Tubes held in Hex cut to ≈ 4.05 in. across flats, ^{in plastic sheets, top & bottom} (in \approx size of array in contact with 165 tubes. 14" source in center of fuel, spaced top & bottom by Al rods (source can be removed).



Plan View - Well

INSTRUMENT CHECK

113
START-UP RANGE

II	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K	10X15 ⁻¹²	Meter ✓	1"	✓	10X15 ⁻¹²
		Fast ✓	1"	✓	
F	10X15 ⁻¹²	Meter ✓	2"	✓	10X15 ⁻¹²
		Fast ✓	2"	✓	
R-1					
R-2					
PM-1	800	Alarm ✓	Constant	✓	490
PM-2	1200	Low ✓	18"	✓	910
		Alarm ✓	4"	✓	

LOG-N CALIBRATE ✓ OPERATE ✓ SOURCE No. PN-503
 DUMP WELL PROBE LIGHT _____ 5 mg ka & source

START-UP CHECK LIST

Equipment checked by _____ Personnel check by _____

Instruments and safeties checked and reset by _____

Source in checked by _____ Source No. PN-503

Emergency equipment in control room checked by _____

Instruments in "trip" circuit: _____

Red light on by _____ Time _____

Start-up OK'd by _____ Date _____


4/9/63
2.3X10⁶ 4/5/63

COUNTERS

Date 4/12/63

4/12/63

Channel	Detector	Amplifier	Gain	Rise Time	PHS	HV
C-1	2"	Y123801	8X1	0.2 μ s	15	1500
C-2	2"	Y-100303	16X1	0.2 μ s	25	1500
C-3						
C-4						

Source

 (1st min. around source)

Channel	C-1	C-2	(2 min counts)
	13484	8103	
	13738	8102	
	34554	19448	5 min counts
	37584	19455	
	41080	19703	

Geiger in C-1 in difficulty. Replaced with DRNL - Ser. No. 255

As above:

6843	3988	1 min. counts
6944	4011	
6923	4137	
6835	3985	
6790	4098	
6898	3924	
6779		
6859	4024	
1.458 x 10 ⁻⁴	2.485 x 10 ⁻⁴	

	C-1	C-2	
4/11/63			
Add	7657	4202	1 min counts
nd	7650	4261	
ing			
know	7564	4205	
Rel.			
	7752	4163	
	7608		
	7608 (0.896)	4149	
	<u>7654</u> 1.3065×10^4	<u>4156</u> 2.383×10^4 (0.959)	

COUNTERS

Date 4-11-63

Channel	Detector	Amplifier	Gain	Rise Time	PHS	HV
C-1	2"	Y-122801	8x1	0.2 μ S	15	1500
C-2	2"	Y-700300	16x1	0.2 μ S	25	1500
C-3						
C-4						

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10 X 10 ⁻¹²	Meter ✓	2"	✓	10 X 10 ⁻¹²
"	"	Fast ✓	2" 4"	✓	"
K-2	10 X 10 ⁻¹²	Meter ✓	4"	-	10 X 10 ⁻¹²
		Fast ✓	4"	✓	
R-1					
R-2					
PM-1	800 v	Alarm ✓	cont ✓		500 v
PM-2	1200 v	Low ✓	18"	-	900 v
		Alarm ✓	4"	✓	"

LOG N CALIBRATE ✓ OPERATE ✓ SOURCE No. Emp last

DUMP WELL PROBE LIGHT _____

4-11-63 Recheck of last point with 2 rings of pins
Total pins = 18

C-1

C-2

7803

4228

7889

4170

7730

4206

7751

4189

7633

4138

7778

4099

7764 (0.898)

4172 (0.965)

4/10/63 now have 3 rings for a total of 36 pins

C-1	C-2
8208	4080
8180	4026
8408	3979
8378	3967
<u>8858</u>	<u>4018</u>
8386 (0.826)	4214 (1.002)

4 Rings - Total pins = 60

9225	4348
9382	4104
9324	4164
9187	4238
8567	4200
9508	4325
<u>9479</u>	<u>4326</u>
9382 (0.731)	4244 (0.94)

4/11/63 5 rings, total 90 elements (frames in center)

10349	4725
10358	4662
10347	4597
10281	4621
10466	4639
<u>10425</u>	<u>4627</u>
10371 (0.661)	4645 (0.866)

6 rings, total 126 elements

11432	4704
<u>21679</u> ?	4777
11459	4700
11586	4785
11671	4830
<u>11414</u>	<u>4837</u>
11520 (0.595)	4772 (0.843)

164*
165 fuel tubes in hex, empty tubes as spacers

12344	5050
12380	4991
12214	4974
<u>12427</u>	<u>5023</u>
12341 (0.555)	5005 (0.803)

* 1 tube left on shelf.

4/11/63

Put Jy N + C-2 in tubes at east of array,
K-1 + C-1 in tubes at west side (located
on plastic table, source in center of array.
Jy N + K-1 checked. Counters are
below chambers

START-UP CHECK LIST

Equipment checked by RKR Personnel check by RKR-IDC

Instruments and safeties checked and reset by RKR-EJ

Source in checked by RKR Source No. PM-523

Emergency equipment in control room checked by IDC

Instruments in trip circuit: K-1, K-2, PM-1, PM-2

Red light on by EJ Time 1515

Start-up OK'd by RKR-EJ Date 4/11/63

Deployed right glow line.
"Zero" at top of table

335

System sub coil when flooded. ¹⁶⁴ 165 pins.

Tubes with open welds (8) were resealed
prior to use in array with liquid line.
Weights determined before and after
flooding indicated no leaks.

120

4/15/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10X15 ⁻¹²	Meter ✓ Fast ✓		1000 ✓	10X15 ⁻¹²
K-2	10X15 ⁻¹²	Meter ✓ Fast ✓		✓	10X15 ⁻¹²
R-1		—			
R-2		—			
PM-1	840	Alarm ✓	Cont.	✓	000
PM-2	1200	Low Alarm	18	✓	500

LOG N CALIBRATE _____ OPERATE _____ SOURCE No. Ra-f
 DUMP WELL PROBE LIGHT _____

START-UP CHECK LIST

Equipment checked by RKR Personnel check by RKR
 Instruments and safeties checked and reset by EJ
 Source in checked by RKR Source No. PN-563
 Emergency equipment in control room checked by _____
 Instruments in trip circuit: K-1, K-2, PM-1, PM-2
 Red light on by EJ Time 0945
 Start-up OK'd by RKR EJ Date 4/15/63

Zero = 30.5 cm (side scale)
 all tubes (¹⁶⁴ / ~~165~~) in close-packed hexagon.
 H₂O to 121.4 cm (side scale) = 8 1/4 in. measured

4/15/63

C-1

C-2

43530

44314

1 min.

43950

44344

"

4340044047

"

43627 (225)

44205 (226)

Removed eight tubes and elements to
leave a total of 126 (source in center)

H₂O to 121.6 cm (side scale)

39680

36023

1 min.

39500

35619

"

39270

35075

"

3931035548

"

39440 (0.253)

35057 (0.285)

Removed elements to leave a total of 90
(source in center).

H₂O to 121.4 cm (side scale)

32490

30803

1 min.

32290

30835

"

32430

30712

"

3232030811

"

32087 (0.309)

30750 (0.325)

Removed elements to leave a total of 60
(source in center).

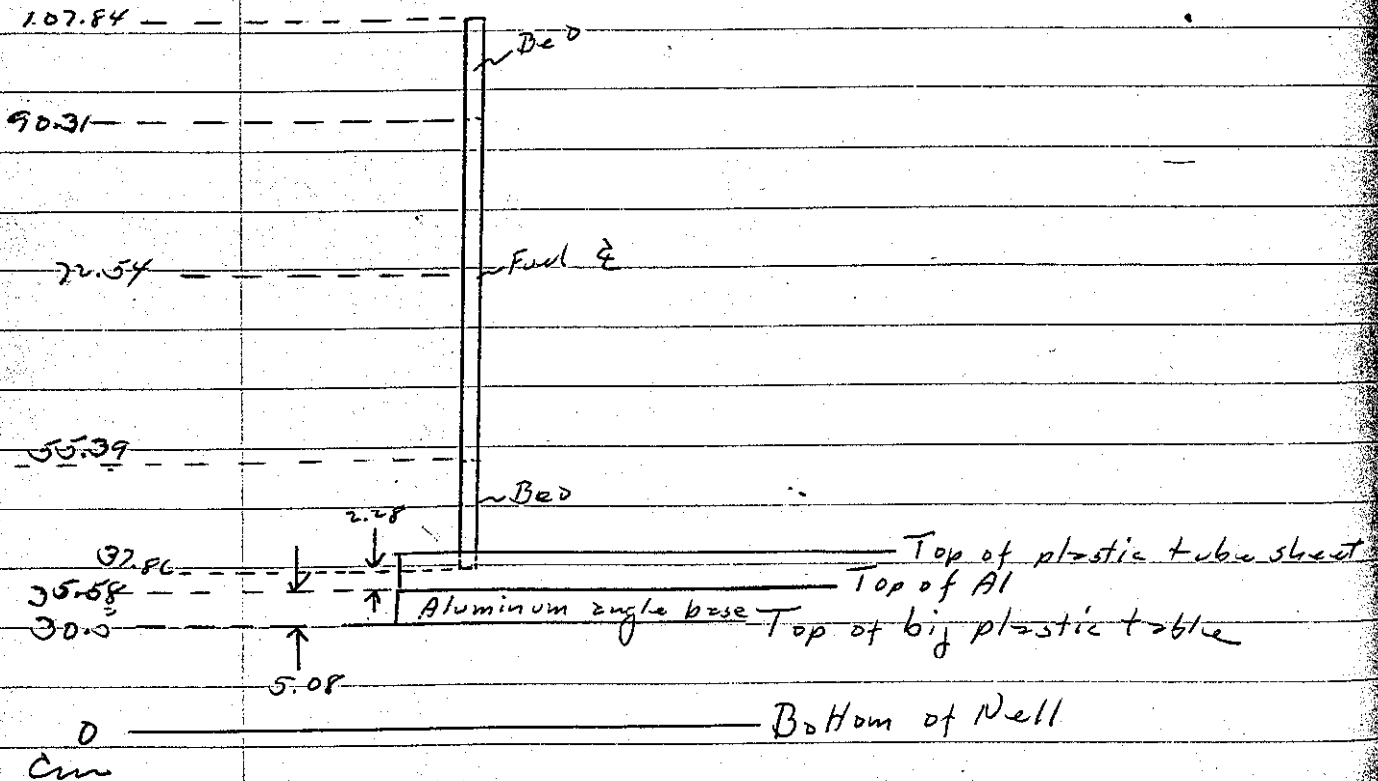
H₂O to 123.2 cm (side scale)

C-1
 28130
 27750
 27760
27860
 27870 (0.359)

C-2
 26416
 26284
 26071
26059
 26207 (0.382)

4/16/63 ^{Hand} Heights for use of plastic tube sheets:
 all diameters in cm side scale on sight glass

123.08 ————— 6" top reflected



Expt. 2
1/4" side-to-side spacing

4/16/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10x15 ⁻¹²	Meter ✓	?	✓	10x15 ⁻¹²
		Fast ✓	?		
K-2	10x15 ⁻¹²	Meter ✓	?-	✓	10x15 ⁻¹²
		Fast ✓	?		
R-1					
R-2					
PM-1	500V	Alarm ✓	Cont.	✓	500V
PM-2	1500V	Low ✓	18"	✓	500V
		Alarm ✓	4"		

LOG N CALIBRATE OPERATE SOURCE No. La-8
 DUMP WELL PROBE LIGHT

START-UP CHECK LIST

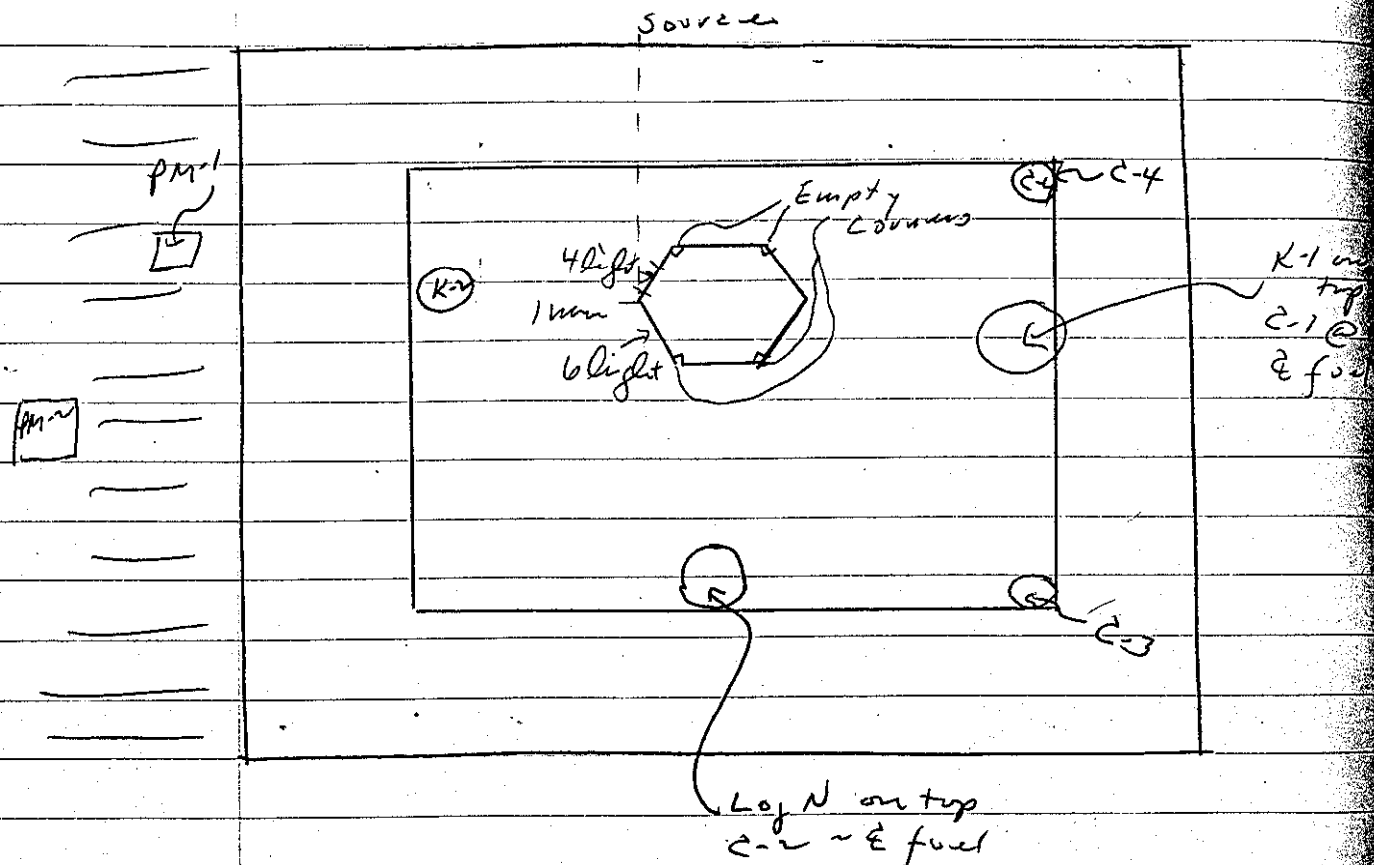
- Equipment checked by RKR Personnel check by IDC
- Instruments and safeties checked and reset by RKR
- Source in checked by RKR Source No. PN-563
- Emergency equipment in control room checked by IDC
- Instruments in trip circuit: K-1, K-2, PM-1, PM-2
- Red light on by RKR Time 1230
- Start-up OK'd by RKR, EQ Date 4/16/63

165 fuel tubes in triangular pattern, hex array (4 corners missing) supported by top and bottom tube sheets. Source on drive on W side.

4/16/63

1258 H₂D @ 124.9. Just critical.

Raised H₂D level to 129 cm. Array insensitive



This arrangement will be used until log note is made.

Expt. 3

125

4/14/63

$\frac{1}{2}$ " Side-to-side Spacing

Full lattice of 145 fuel tubes loaded
as on p. 124.

1550

Start H_2O .

1608

~~Supercritical~~. $H_2O = 76.7$ in (side scale)

Dumped H_2O

1615

Removed outer row of fuel tubes.

126

4/17/63

Expt. 3A
 1/2 in. Side-to-side Spacing
 6 Rings of fuel tubes (total 127)

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	SET	START-UP RANGE
K-1	10X15 ^{-1V}	Meter ✓	?	✓	10X15 ^{-1V}
		Fast ✓	?		
K-2	10X15 ^{-1V}	Meter ✓	?	✓	10X15 ^{-1V}
		Fast ✓	?		
R-1	—				
R-2	—				
PIA-1	800	Alarm ✓	Cont.	✓	500
PM-2	1200	Low ✓	18"	✓	900
		Alarm ✓	3"		
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. <u>Ra8</u>	

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by RKR Personnel check by IDCInstruments and safeties checked and reset by RKRSource in checked by RKR Source No. P.N-563Emergency equipment in control room checked by IDCInstruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by RKR Time 0905Start-up OK'd by RKR:ES Date 4/17/63

107

1008

Source out. H₂O level 80.9 cm. Critical
 Dump

Expt. 3B

4/17/63

Removed 36 tubes - ring 6 - leaving a total of 91
tubes in 5 rings.

1050 fence out. H_2O @ 94.3. Critical.
Dump.

Expt. 3C

Removed 30 tubes (ring 5) - leaving a total of 61
tubes in 4 rings.

1124 H_2O to 123.3 cm. Subcritical.

Expt. 3D

Added a total of 18 tubes, 3 on each
face, symmetrically in ring 5. Now have
a total of 79 tubes.

1258 H_2O to 123.4 cm. Subcritical.

Expt. 3E

Added a total of 6 tubes, 1 to each face.
Now have a total of 85 tubes.

1328 H_2O to 123.3 cm. Subcritical

Expt. 3F

Added a total of 3 tubes, one to each
alternate corner. Now have a total of 88.

1402 H_2O to 123.3 cm. Subcritical.

4/17/63

Expt. 3 E

Added two pins. Now only 1 corner vacant.

Total 90 pins.

1433

Source out. H_2O @ 97.8 cm. Critical.

H_2O level increased to ≈ 102 cm for periods.

Expt. 3 H

Replaced one "heavy" corner pin with #131
(the lightest of the "light" pins. Total 90 pins.

1536

Source out. H_2O @ 99.7 cm. Slightly +.

H_2O to 98.7 cm. Critical

4/18/63

Expt. 4
3/4" side-to-side spacing 91 tubes

129

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10 X 15 ⁱⁿ	Meter ✓	?	✓	10 X 15 ⁱⁿ
		Feet ✓	?		
K-2	10 X 15 ⁱⁿ	Meter ✓	?	✓	10 X 15 ⁱⁿ
		Feet ✓	?		
R-1					
R-2					
PM-1	800	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓	18"	✓	500
		Alarm ✓	4"		
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. Ra-8	
DUMP WELL PROSE LIGHT —					

START-UP CHECK LIST

Equipment checked by RKR Personnel check by EDCInstruments and safeties checked and reset by RKRSource in checked by RKR Source No. PN-563Emergency equipment in control room checked by EDCInstruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by RKR Time 1005Start-up OK'd by RKR-ES Date 4/18/63

Reversed position of K-1 & C-1 (K-1 now below C-1)
and Log N & C-2 in their respective tubes.

4/18/63

1030 Same as ant. H_2O @ 87.9 ^{cm} Supercritical.1032 H_2O @ 87.7 cm. Critical. $Fog N = 0.00$.Raise level for + period. H_2O @ 87.9 cm. H_2O to 88.0 cm.1042 \approx Level @ ≈ 1.0 in $Fog N$. H_2O 87.9. Slightly +1044 H_2O @ 87.9. Subcritical. $K's$ in 3×15^{-9}

EXPT. 4A

Remove 6 corner tubes. Now have a total of 85 pins.

1115 H_2O @ 90.5 cm. + Period1121 $Fog N$ 1.2. H_2O @ 90.4 subcritical.

1124 Drain

EXPT. 4B

Removed 2 fuel pins from opposite faces, adjacent to corners. Total of 83 now in.

1214 Same as ant. + Period. H_2O @ 91.8 cm1221 \approx Level H_2O @ 91.7 cm

EXPT. 4-c.

Removed 4 fuel pins from adjacent sides. Total of 79 pins now in.

1342 Same as ant. + Period H_2O @ 96.3 cm1354 H_2O 95.9 cm just critical.

1356 Drain

Expt. # 4 D

4/18/63

Removed 6 fuel pins from each side
total of 73 pins now in.

14:20

Source out H_2O @ 123.5 Sub critical.

14:21

Drain

Expt. # 4 E

Added 3 pins - (1 pin to every other face)
total of 76 pins now in.

1449

Source out H_2O 123.5 cm. Sub. critical.

1450

Drain

Expt # 4 F

Added 2 pins total of 78 Pin now in.
(On outer ring there are 3 pins in 5 faces
and 2 pins in 1 face).

33

1533

Source out

1536

Slightly subcritical. Drain.

Pins actually in this loading listed.

132

Expt. 5

4/19/63

3/4" spacing - 78 pins

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10 X 15 ^{IN}	Meter ✓	?		10 X 15 ^{IN}
		Fast ✓	?		
K-2	10 X 15 ^{IN}	Meter ✓	?		10 X 15 ^{IN}
		Fast ✓	?		
R-1					
R-2					
PM-1	500	Alarm ✓	Contact		500
PM-2	1200	Low ✓	1P		500
		Alarm ✓			
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE NO. <u>ka-8</u>	

DUMP WELL PROBE LIGHT _____

START-UP CHECK LIST

Equipment checked by RKR Personnel check by RKRInstruments and safeties checked and reset by EJSource in checked by RKR Source No. PN-523Emergency equipment in control room checked by T.O.CInstruments in trip circuit: K-1, K-2, PM-1, PM-2Red-light on by RKR Time 1330Start-up OK'd by RKR, EJ Date 4/19/63

Alternate pins (corners) in 2nd and 3rd ring raised
3" above bottom position. Bottom ends are
free.

4/19/63

1400 H_{ν} @ 131.3 cm. Source still in. Subcritical (vents = level)

1405 Source out. Definitely subcritical.

Log $N \approx 0.25$ max before pulling source (EXPT. 4E)

" ≈ 0.045 " " " " (present)

134

4/22/63

EXPT. #6
1" side to side separation - 79 pins
INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10 X 10 ⁻¹²	Meter ✓	?	✓	10 X 10 ⁻¹²
		Fast ✓	?		
K-2	10 X 10 ⁻¹²	Meter ✓	?	✓	10 X 10 ⁻¹²
		Fast ✓	?		
R-1	—				
R-2	—				
PM-1	800	Alarm ✓	Cont'	✓	500
PM-2	1200	Low ✓	18"	✓	900
		Alarm ✓	4"		

LOG N CALIBRATE ✓

OPERATE ✓

SOURCE No.

Ra-γ

DUMP WELL PROBE LIGHT _____

START-UP CHECK LIST

Equipment checked by RKR Personnel check by F.D.CInstruments and safeties checked and reset by RKRSource in checked by RKR Source No.: PN 563Emergency equipment in control room checked by F.D.CInstruments in trip circuit: K-1 K-2 PM-1 PM-2Red light on by RKR Time 12:35Start-up OK'd by RKR. EJZDC Date 4/22/63

Four rings plus three in each face
on fifth ring.

1310 Source out H_2O 123.5 cm. Sub. critical
 $1/2 \rho N = 13.3$

EXPT. # 6 A

Added 1 pin in each face of ring 5
now have a total of 85 pins.

1336 Source out. H_2O 123.5 cm Sub. crit.
 $1/2 \rho N = 7.4$

Expt. 6 B

Added 4 pins (opposite corners N & S vacant).
now have 89 pins in 5 rings. $1/2 \rho N = 4.0$

1409 Source out. H_2O @ 123.5. Subcritical.

Expt. 6 C

Added 3 pins to corners. now have 91.
pins in 5 complete rings. $1/2 \rho N = 2.25$

1448 Source out. H_2O @ 120.6. Subcritical
extrapolates 54

Expt. 6 D

Added 3 pins to center of alternate
faces. (6th ring) now have 94 pins.

1515 Source out. H_2O @ 99.2. + Period

Expt. 6 E

Replace the last 3 pins (added in 6 D) with
"light" pins.

1540 H_2O @ 98.8 cm. Source out. + Period

4/2/63

1550 $H_2D @ 105.4 \text{ cm.} + \text{period} \approx 224 \text{ rev.}$ 1558 $\text{Tray } N \approx 3.2. \text{ Drain } H_2D \text{ to level.}$ 1600 $\text{Tray } @ 99.4 \text{ cm. Slightly negative.}$
 $K-1 \text{ on } 10 \times 10^{-9}, K-2 \text{ on } 3 \times 10^{-9}$ 1604 $H_2D \text{ to } 99.6 \text{ cm. Slightly } + \text{ period.}$
 $\text{Estimate critical at } 99.5 \text{ cm.}$

Fast Neutron Survey of Fuel Tubes
made by L.C. Johnson, H.P., before work for
day was begun.

N_f (mvem/w)	Detected Distance	Condition Surveyed
2.5	Contact	3/4" Array, No source
70.0	"	" + PN-563 ^{P. 23}
2.3	"	Tray with 20 tubes ^{4/6}
4.6	"	2 Trays, one on top of other
6.3	"	3 Trays, Stacked
6.1	"	Close packed bundle of tubes from 3 trays
~0.3	"	1 tube

DWM calculated, from cross sections &
estimated U^{234} content, & source strength
of 2675 n/sec/tube.

$$7.2 \text{ n/cm}^2/\text{rev} = 1 \text{ mvem/w (P}_0 \text{ energy)}$$

Expt. 6 F

1 in. Side-to-Side Separation
Total of 94 pins.

4/23/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10x15 ⁻¹²	Meter ✓	?		10x15 ⁻¹²
		Fast ✓	?		
K-2	10x15 ⁻¹²	Meter ✓	?		10x15 ⁻¹²
		Fast ✓	?		
R-1					
R-2					
PM-1	800	Alarm ✓	Contact		500
PM-2	1200	Low ✓	18		500
		Alarm ✓	4		

LOG N CALIBRATE

OPERATE

SOURCE No. Ra-2

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by RKR Personnel check by IDC

Instruments and safeties checked and reset by RKR

Source in checked by RKR Source No. PM-563

Emergency equipment in control room checked by IDC

Instruments in trip circuit: K-1, K-2, PM-1, PM-2

Red light on by RKR Time 0830

Start-up OK'd by RKR, SA Date 4/23/63

Have 5 "light" pins, 3 on faces in 6th ring,
2 in corners of 5th ring. Total Pins 94

4/23/63

 $\mu = 3.5 \times 10^{-4}$
 $\rho = 2.49 \times 10^{-4}$

- 0850 ① H_2O @ 120 cm. + period. $T = 30 \checkmark$ (essentially top deflection)
- 0910 H_2O @ 100.5. slightly + period.
- 0915 H_2O @ 100.0. Level.

EXPT. # 6-G

- 4/23/63 (replacing heavy ones) Added 4 light pins to core in 5th ring. Total pins = 94 $\mu = 3.5 \times 10^{-4}$ $\rho = 2.49 \times 10^{-4}$
- 10:25 ② Source out. $H_2O = 123.6$ cm + period. $T = 65 \checkmark$ new.
- 1045 H_2O @ 101.1 cm. slightly subcritical.
- 1047 H_2O @ 101.4 cm. Critical e/

Expt. 6-H

- Removed 1 "light" pin from outside face, moved 2 remaining pins to opposite faces. Now have 93 pins, 8 of which are "light".
- 1110 H_2O to 123.6 cm. Source still in.
- 1115 Remove source. Subcritical.

EXPT. 6-I.

- Same as above except replaced 2 outside lighter pins with 2 heavier pins. Now have 6 light pins - Total pins 93
- 12:38 Source out $H_2O = 123.5$ cm. Sub. Crit.

FEBRUARY 1963						
S	M	T	W	T	F	S
				1	2	
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28		
*	*	*	*	*	*	*

SUNDAY

3

FEBRUARY

34

331

$$\frac{1.4 \text{ cm}}{0.84 \times 10^{-4}} = 1.18 \times 10^4$$

$$1.4 \text{ cm} \times 10^4 = 1.4 \times 10^4 \text{ cm}$$

$$1.4 \text{ cm} \times 10^4 = 1.4 \times 10^4 \text{ cm}$$

4/23/63

Expt. 6-J

All lighter pins replaced with heavy. Now have a total of 93 pins, 7 in on opposite faces in 6th ring.

1404

Source ant. $H_v \odot @ 123.5$, subcritical

Expt. 6-K

Replaced 7 heavy pins in center with 7 light. Added one heavy in outer ring. Total 94.
(cf 6-D)

1448

$H_v \odot = 123.6$ cm, source ant. subcritical.

Expt. 6-L

Replaced the 3 corners of the inner (1st) ring with heavy pins. Now have a total of 94 pins, 4 of which are light.

1525

Source ant. $H_v \odot = 123.5$. Very slightly subcritical

Expt. 6-M

Replace center light with heavy, still 94.
Source ant. $H_v \odot @ 123.5$ cm. Tried less subcrit.
Possibly heaviest of heavy in center would make it

1605

140

Expt. 7

4/24/63

3/4" Lattice - Repeat of Critical #4

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE		SET	START-UP RANGE
			D	R		
K-1	10X15 ⁻¹²	Meter ✓	?		✓	10X15 ⁻¹²
		Fast ✓	?			
K-2	10X15 ⁻¹²	Meter ✓	?		✓	10X15 ⁻¹²
		Fast ✓	?			
R-1	—					
R-2	—					
PM-1	800	Alarm ✓	Contact		✓	500
PM-2	1200	Low ✓	18"		✓	900
		Alarm ✓	4"		✓	
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. <u>Raj</u>	
DUMP WELL PROBE LIGHT _____						

START-UP CHECK LIST

Equipment checked by RKR Personnel check by IDCInstruments and safeties checked and reset by RKRSource in checked by RKR Source No. PN-563Emergency equipment in control room checked by IDCInstruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by EF Time 1305Start-up OK'd by RKR EF Date 4/24/63

Reinstalled the 78 tubes which were present for Expt. 4F in their original locations.
Added #141 to make 3 pins on each face

4/24/63.

in 5th ring and a total of 79 pairs in the lattice. (cf Expt. 4c)

1342 Same as cont. + Period. H_2O @ 95.8 cm.

Added H_2O to 96.0 cm. + Period 175 cm

1358 H_2O @ ~~95.8~~ 96.0 cm. Level (slight +) 3.99×10^{-4}

1402 H_2O @ 95.9 cm. Slight -

1405 Added H_2O to 96.0 cm + period. All demands
 $\approx 10^{-9}$ amp. $T = 369$ sec; $\frac{2.06 \times 10^{-4}}{0.20 \text{ cm}} = \frac{10.3 \times 10^{-4}}{\text{cm}}$

1420 H_2O @ 95.9 cm. Slight neg.

" " 96.0 cm + period

1428 " " 96.0 cm Level

142

EXPT. # 8

4/25/63

3/4" Spacing
INSTRUMENT CHECK

41

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10 X 10 ⁻¹²	Meter ✓	?	✓	10 X 10 ⁻¹²
		Fast ✓	?		
K-2	10 X 10 ⁻¹²	Meter ✓	?	✓	10 X 10 ⁻¹²
		Fast ✓	?		
R-1					
R-2					
PM-1	800	Alarm ✓	Cont.	✓	500
PM-2	1200	Low ✓	18"	✓	900
		Alarm ✓	4"	✓	

LOG-N-CALIBRATE OPERATE SOURCE No. R 8
 DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by RKR Personnel check by F.D.C.

Instruments and safeties checked and reset by RKR

Source in checked by RKR Source No. PN-563

Emergency equipment in control room checked by F.D.C.

Instruments in trip circuit: K1, K2, PM-1, PM-2

Red light on by RKR Time 8:10

Start-up OK'd by RKR, G.J., F.D.C. Date 4/25/63

Replaced middle tube on each face with a "light" one. Total still 79.

0903

Same as ant. H₂O @ 97.2 + Period 99.5 sec 6.34x10⁻⁴

0915

H₂O @ 96.3 cm. Very slight negative.

4/24/63

Expt. 9
1 1/4" spacing

143

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10x15 ⁻¹²	Meter ✓	?		10x15 ⁻¹²
		Fast ✓	?		
K-2	10x15 ⁻¹²	Meter ✓	?		10x15 ⁻¹²
		Fast ✓	?		
R-1					
R-2					
PM-1	800	Alarm ✓	Contact		500
PM-2	1200	Low ✓	18"		900
		Alarm ✓	4"		
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. <u>RK 8</u>	
DUMP WELL-PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by RKR Personnel check by I.D.C.

Instruments and safeties checked and reset by RKR

Source in checked by RKR Source No. PN-563

Emergency equipment in control room checked by I.D.C.

Instruments in trip circuit: K-1 K-2 PM-1 PM-2

Red light on by RKR Time 10:45

Start-up OK'd by RKR E.J. I.D.C. Date 4/26/63

127 full fuel tubes in 6 rings, 3 full tubes
per face in 7th ring. 145 tubes total.

4/26/63

1108

H₂O @ 123.4 cm. led observable multiplication

Expt. 9A

Added the rest of the tubes into the 7th ring. Now have 165 (4 vacant corners).

1320

H₂O @ 123.5. Questionable multiplication

C-1	C-2	(2 min counts)
2000	1550	
2050	1552	
2120	1594	
2110	1577	

(K-2 & C₂ have been set off the table and raised ~1 ft to compensate.) Apparently led increase in lead ground of elements.

Expt. 9D

Moved instruments to port counters in optimum positions, with diameters above. C-1 below K-1, C-2 below L₂N, C-3 on NW part of table. Source in center.

1500

H₂O @ 123.5 cm.

	C-1	C-2	C-3	1 min cts
	41870	74341	6450	
	42180	75780	6580	
	42050	75658	6410	
	41750	75751	6410	
Avg	419620 ^{0.28}	75382 ^{0.133}	6462 ^{0.155}	

4/26/63

Expt. 92

Removed tubes from 7th ring, leaving 126
Tubes.

1530

H₂O @ 123.7 cm.

	C-1	C-2	C-3	MINUTES
9230		17554	1440	
9080		17721	1430 1470	
8990		17814	1460	
9200		18063	1440	
9147	1.09	17748	1442	0.693

Expt. 90

Added 4 elements to each face. Total 150.

1600

H₂O @ 120.5 cm.

	C-1	C-2	C-3	MINUTES
22100		43300	3610	
22000		43224	3460	
22090		42871	3520	
22040		42971	3630	
22057	0.453	43091	3555	0.281

Extrapolates to 181-195 mins @ critical

146

EXPT #10

4/29/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10 X 10 ⁻¹²	Meter ✓	?	✓	10 X 10 ⁻¹²
		Fast —	?		
K-2	10 X 10 ⁻¹²	Meter ✓	?	✓	10 X 10 ⁻¹²
		Fast ✓	?		
R-1	✓				
R-2	✓				
PM-1	800	Alarm ✓	Cont	✓	500
PM-2	1200	Low —	18"	✓	900
		Alarm ✓	5"	✓	
LOG N CALIBRATE ✓		OPERATE —		SOURCE No. <u>R-9 f</u>	
DUMP WELL PROBE LIGHT —					

START-UP CHECK LIST

Equipment checked by RKR Personnel check by F.D.C.Instruments and safeties checked and reset by RKRSource in checked by RKR Source No. PN-563Emergency equipment in control room checked by F.D.C.Instruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by RKR Time 8:30Start-up OK'd by RKR FDC Date 4/29/63

8:55

Repeat of expt. 9D - Total pins = 150
H₂O @ 123.6 Cm

4/29/63

C-1

C-2

C-3

1 MIN. CTS

22010

41328

3300

22100

41390

3250

22300

41417

3310

21930

41706

3280

22085 ^{0.453} _{1.000} ^{Number}

41460 ^{0.241} _{0.562} ^{Number}

3285 ^{0.304} _{0.5245} ^{Number}

148

4/30/63

Expt. 11
3/4" spacing

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE D. RANGE	SET	START-UP RANGE
K-1	10x15 ⁻¹²	Meter ✓	?	✓	10x15 ⁻¹²
		Fast ✓	?	✓	
K-2	10x15 ⁻¹²	Meter ✓	?	✓	10x15 ⁻¹²
		Fast ✓	?		
R-1					
R-2					
PM-1	800	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓	18"	✓	900
		Alarm ✓	0"	✓	
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. Ray	
DUMP-WELL-PROBE-LIGHT —					

START-UP CHECK LIST

Equipment checked by EJ Personnel check by IDCInstruments and safeties checked and reset by EJSource in checked by IDC Source No. PM-563Emergency equipment in control room checked by IDCInstruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by EJ Time 1345Start-up OK'd by EJ / IDC Date 4/30/63

4 complete rings (61 elements) + 4 pins
on east side in 5th ring. Whole array
moved west in grid to put one side of

4/30/63

4th ring adjacent to label slot. Counters still at optimum positions in tubes on of Expt. 5B, etc.

Total of 65 tubes. Same as line at west side of array.

1407

H₂O @ 123.7 cm.

C-1	C-2	LOG IN	C-3	(MIN. CTS)
1670	577	.0022	30	✓
1740	547	.0020	70	✓
1710	545	.0020	50	✓
1590	535	.0020	50	✓
1677		0.596		

Expt. 11A

Added 4 elements symmetrically around E-W₂ in 5th ring. Total now 69

1438

H₂O @ 123.7 cm.

C-1	C-2	LOG-IN	C-3	(MIN CTS)
1900	708	.0020	60	✓
1940	737	.0019	10	✓
1930	738	.0019	10	✓
1908	715	.0020	50	✓
1910	778	.0020	10	✓
1860	750	.0020	30	
1907		0.524	738	1.355

4/22/63

Expt. 11B

Added 4 more elements symmetrically in 5th ring. Total now 73.

1534

H₂O @ 123.7 Cm.

C-1	C-2	LOG-IN	C-3	1 MIN. CTS
3720	1453	.0023	60	✓
3850	1431	.0023	70	✓
3770	1380	.0024	70	✓
3710	1384	.0021	40	✓
<u>3710</u>	<u>1418</u>	.0023	60	✓
3752	1413	.0708		

Expt. 11C

Added 4 more elements to 5th ring as above. Total now 77.

1615

H₂O @ 123.5 Cm.

C-1	C-2	LOG-IN	C-3	1 MIN. CTS
13300	4668	.0026	240	✓
13360	4620	.0028	330	✓
13510	4680	.0028	220	✓
<u>13340</u>	<u>4663</u>	.0028	240	✓
13377	4658	0.0714		

Expt. 11D

5/1/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10X15 ⁻¹²	Meter ✓ Fret ✓	? ?	✓ ✓	10X15 ⁻¹²
K-2	10X15 ⁻¹²	Meter ✓ Fret ✓	? ?	✓ ✓	10X15 ⁻¹²
R-1					
R-2					
PM-1	800	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓ Alarm ✓	18" 4"	✓ ✓	900
LOG-N CALIBRATE ✓		OPERATE ✓		SOURCE No. <u>Ray</u>	
DUMP WELL PROBE LIGHT <u> </u>					

START-UP CHECK LIST

Equipment checked by EJ Personnel check by IDC

Instruments and safeties checked and reset by EJ

Source in checked by IDC Source No. PN-523

Emergency equipment in control room checked by IDC

Instruments in trip circuit: K-1, K-2, PM-1, PM-2

Red light on by EJ Time 0845

Start-up OK'd by EJ, IDC Date 5/1/63

Moved the elements added in (11c)⁽¹⁾ to center of adjacent face and (2) adjacent to vacated corner on same face. Total 27 Pins

0910

H₂O @ 123.7 Cms.

5/1/63	C-1	C-2	LOC-IN	C-3	1 MIN CTS
	14920	5218	.0031	250	✓
	15080	5099	.0035	200	✓
	14980	5048	.0033	200	✓
	14970	5062	.0033	250	✓
	15220	5142	.0033	190	✓

Expt. 11 F

Added one element to 7th ring on SW face. (This face now has 3 pins) Total pins 78.

10:18 H₂O 123.8 Cm. - just slightly subcritical

	C-1	C-2	LOC-IN	C-3	1 MIN CTS
	103910	35923	.009	1250	✓
	103560	36293	.008	1240	✓
	104760	36196	.008	1340	✓
	105460	36161	.0085	1240	✓

Expt. 11 F

Added one pin to 7th ring at approx E of east face. Total now 79 pins.

11:15 H₂O @ 96.6 Cm. + period T₁ source cont

11:22 H₂O @ 96.5 Cm. + period - slight

11:24 H₂O @ 96.2 Cm. - period - slight

Expt. 11 G

Replaced pin added in (11 F) with a "light" one

13:15 Source cont. H₂O @ 96.4 + period

5/1/63

1325 H₂O to 96.5 cm. Critical + pin^o T = 313.0
 1335 H₂O to 96.3 cm. Level. $\gamma_N = 0.95$ (scale)

Expt. 11 H

Moved light element to NW corner of
 7th ring.

1445 same cond. H₂O @ 99.9 cm. just pin^o period. T = 311.1
 1500 H₂O @ 98.4 cm. slightly neg.
 1507 " " 98.6 cm. " positive.

Moved the pin added in 11-E to NE corner
 of 6th ring and added a "beam" pin to
 the SE corner. Now have symmetry around
 E-W & (the light pin has been removed),
 and a total of 75 pins.

154

5/2/63

Expt. 11-I
3/4" Spacing

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE D. NO.	SET	START-UP RANGE
K-1	10x15 ^{-IV}	Meter ✓ F-ct ✓	?	✓	10x15 ^{-IV}
K-2	10x15 ^{-IV}	Meter ✓ F-ct ✓	?	✓	10x15 ^{-IV}
R-1	—				
R-2	✓				
PM-1	800	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓ Alarm ✓	17-18" 3"	✓	900

LOG N CALIBRATE _____ OPERATE _____ SOURCE No. _____

DUMP WELL PROBE LIGHT _____

START-UP CHECK LIST

Equipment checked by RKR Personnel check by RKR

Instruments and safeties checked and reset by EJ

Source in checked by RKR Source No. PM-563

Emergency equipment in control room checked by RKR

Instruments in trip circuit: K-1, K-2, PM-1, PM-2

Red light on by RKR Time 0830

Start-up OK'd by RKR EJ Date 5/2/63

Pins located on well entry p. 153. Total 25.

0855 Same cont. H₂O @ 99.0. + Period T=191.4

0908 Prod. H₂O @ (98.8 cm) ? 29 + reliability 97.8

5/2/63

Moved the 2 pins from 6th ring to 7th ring
at ends of E face.

1002 $H_2D @ 123.8 \text{ cm}$. Source still in.

1023 Source out. Positive $T = 556$

Negative with $H_2D @ 100.7$.

Positive " " @ 102.0

$H_2D @ 101.0$. Level

Expt. 11-K

Moved the 2 pins in the 7th ring
toward each other 1 hole each so that
there is now a space of 2 holes (in 7th ring)
between them.

1313 Source out. $H_2D @ 99.3 \text{ cm}$ + Period $T = 74.9$

$H_2D @ 97.0$. Subcritical - slightly

" 97.1. Slightly positive

Expt. 11-L

Moved 2 pins to 8th ring with 1 hole
between.

1345 $H_2D @ 123.8$. Subcritical

Expt. 11-M

Repeat of 11-F.

1535 Source out. $H_2D @ 96.8 \text{ cm}$. + Period $T = 165.4$

1548 $H_2D @ 96.3$. Level

156

5/3/63

EXPT # 12
3/4" spacing - Replacement
INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10 X 10 ⁻¹²	Meter ✓	?	✓	10 X 10 ⁻¹²
		Fast ✓	?	✓	
K-2	10 X 10 ⁻¹²	Meter ✓	?	✓	10 X 10 ⁻¹²
		Fast ✓	?	✓	
R-1					
R-2					
PM-1	800	Alarm ✓	Control	✓	500
PM-2	1200	Low ✓	18"	✓	900
		Alarm ✓	3"	✓	
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. Empty	
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by RKR Personnel check by I.D.C.

Instruments and safeties checked and reset by RKR

Source in checked by RKR Source No. PN-563

Emergency equipment in control room checked by I.D.C.

Instruments in trip circuit: K-1, K-2, PM-1, PM-2

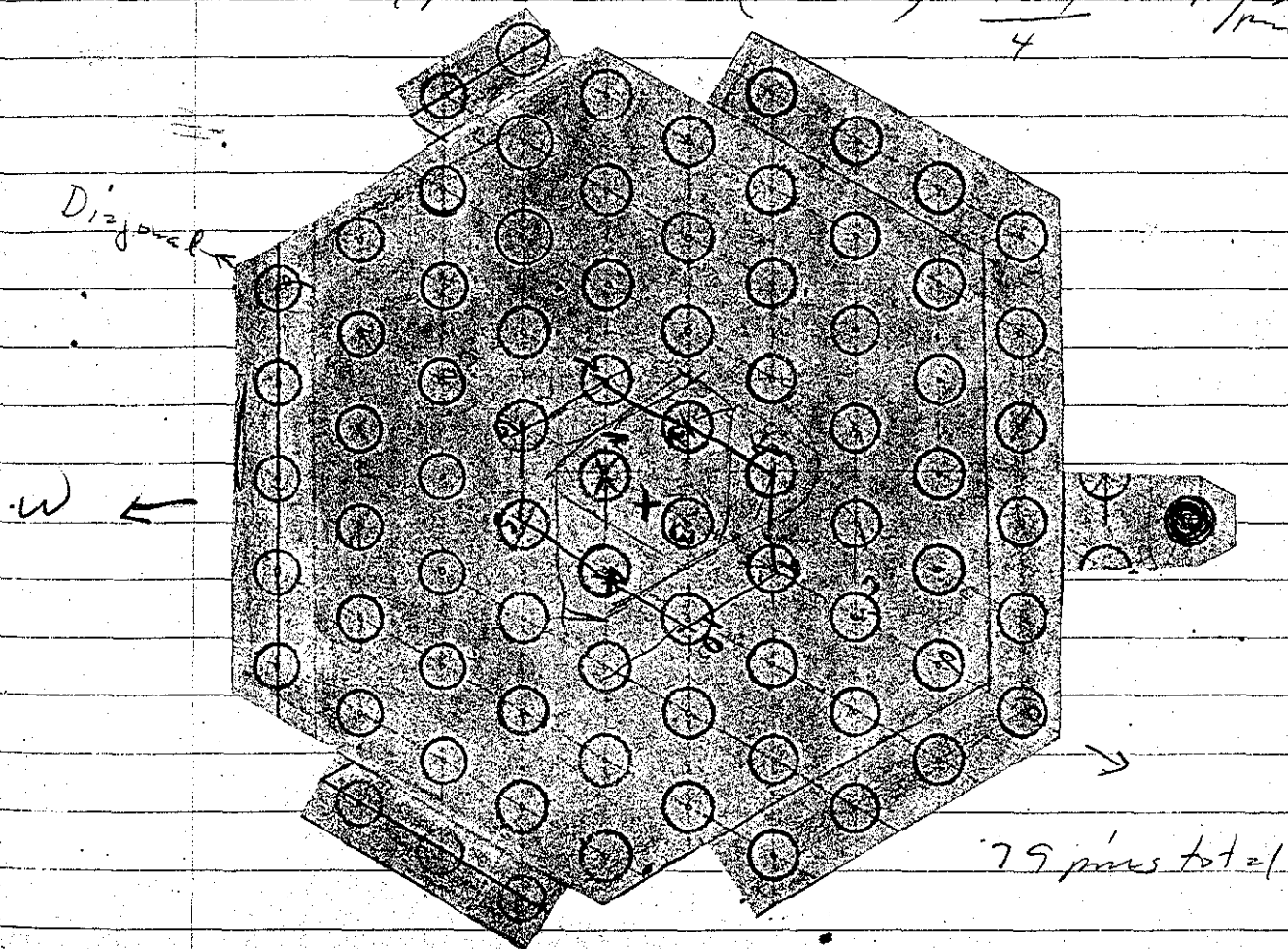
Red light on by RKR Time 2:00 PM

Start-up OK'd by RKR FDC Date 5/3/63

Purpose: to measure effect of replacing light heavy pins with light ones. Pins changed as indicated by list at top of p157 and diagram at bottom of p157. Expt. 12 includes 4 pins replaced,

2/3/63	Pos. No.	Light	Heavy
	1	140	151
	2	138	269
	3	131	275
	4	137	211

2'3.5" source out, H_2O 97.8 cm. + period $T = 155.3$ sec
 140" H_2O @ 97.0; + period: 96.8, key period.
 Interpolated critical 96.9 cm.
 Thickness of pins $\frac{12.6 - 5}{4} = 7.6 \text{ f} = 1.9 \text{ f/mm}$



5/3/43

Expt. 12B

Replaced 6 move pins as indicated by pos.
5 through 10 - diagram, p. 157. Now have 10 lights

<u>Pos. No</u>	<u>Light</u>	<u>Hexagon</u>
5	134	165
6	136	236
7	133	205
8	139	243
9	132	170
10	135	204

1530

Sample cont. H₂O @ 100.8 cm + level T=174°

1540

H₂O @ 98.7 cm Positive.

1543

H₂O @ 98.3 cm Neg

1545.

" " 98.5 cm. Just level.

10 lights in center until 10°

LIGHT	Heavy
1-140	- 151
2-138	- 269
3-131	- 275
4-137	- 211
Expt. 12	
5- 134	165
6- 134 134	165 206
7- 133	205
8- 139	243
9- 132	170
10- 135	208
1530 spent	

$$\begin{array}{r} 20 \\ \underline{5} \\ 187 \end{array}$$

$$\begin{array}{r} 12.6 \\ \underline{5} \\ 7.6 \end{array}$$

5
5

5 - 165 ✓
 4 - 211 ✓
 10 - 204 ✓
 7 - 205 ✓
 2 - 269 ✓
 8 - 243 ✓

7 -	light	- 133	heavy	- 259
2 -		- 136		- 277
8 -		- 139		- 155
5 -		- 134		- 239
4 -		- 137		- 225
10 -		- 135		- 293



1932

Expt. 12 C

5/6/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10X15 ⁻¹²	Meter ✓	?	✓	10X15 ⁻¹²
		Fast ✓	?	✓	
K-2	10X15 ⁻¹²	Meter	?	✓	10X15 ⁻¹²
		Fast	?	✓	
R-1					
R-2					
PM-1	500	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓	18"	✓	900
		Alarm ✓	3"	✓	

LOG N CALIBRATE ✓

OPERATE ✓

SOURCE No.

RKR

DUMP WELL PROSE LIGHT

START-UP CHECK LIST

Equipment checked by RKR Personnel check by IOCInstruments and safeties checked and reset by RKRSource in checked by IOC Source No. PN-563Emergency equipment in control room checked by IOCInstruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by RKR Time 0930Start-up checked by RKR, JG Date 5/6/63

K-1 bypassed because of erratic behavior.

576/43

Replaced the light tubes in nos. 7, 2, 8, 5, 4, & 10 with the original heavy coils. Moved these 6 light tubes to the diagonal as shown in lead in diagram p. 157

<u>No.</u>	<u>Light</u>	<u>Heavy</u>
7	103	259
2	138	277
8	139	155
5	134	239
4	137	225
10	135	293

0958 Same as cont. H_2O @ 99.6 cm + period $T = 136.1 \mu$

1007 H_2O @ 98.2 cm; still somewhat positive.

1009 " " 97.8 cm, negative

1015 " " 98.0 cm, +

Estimate critical @ 97.9 cm

Three lights (10) on diagonal with -15.2μ

7/5/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10 X 10 ⁻¹²	Meter ✓	?	✓	10 X 10 ⁻¹²
		Fast ✓	?	✓	
K-2	10 X 10 ⁻¹²	Meter ✓	?	✓	10 X 10 ⁻¹²
		Fast ✓	?	✓	
R-1					
R-2					
PM-1	800	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓	18"	✓	900
		Alarm ✓	5"	✓	
LOG N CALIBRATE		OPERATE		SOURCE No. <u>Ra-X</u>	
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by RKR Personnel check by EDCInstruments and safeties checked and reset by RKRSource in checked by RKR Source No. M-43Emergency equipment in control room checked by EDCInstruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by RKR Time 0830Start-up OK'd by RKR, EA Date 7/5/63

Tattice is unchanged from Expt. 12 C. Have installed blade (Cd 25 → 32 mil + 63 sheath, painted with glyptal) on most 5-pin face. Heaters are toward most side of hell, one timer on west, the

5/9/63

- allow an east. Added chamber for
 Bedman Fog N to east side of long plastic
 table - moved Fog N toward left (under facing
 west) to make room. Photo of set-up.
- 0845 Tried blade at high multiplication.
 Results is satisfactory. Withdrawn to V.L.
- 0850 Source out. H₂O @ 100.4 cm. + Perms T = 22.2
- 0904 H₂O @ 98.3 cm. Neg. - slightly
- 0907 " @ 98.9 cm slightly +
- 0909 " " 98.6 cm. Essentially level.
- 0910 Start blade in.
- 0912 Blade @ 11.85 in. Add H₂O to compensate.
 " 10.54 " " "
- 0915 H₂O @ 123.8 cm.
- 0920 Blade @ 11.33 level.
- 0923 L L level @ 99.92 in = -0.08 in.
- 0930 H₂O Temp = 76° F. = 24.4°C Glass Hg thermometer
 corresponds to #1 sample of 21.8°C

5/14/63

Expt. 14 *Core data of*
Test of Heaters, Stirrers, T.C.'s for
Temp. Comp.

163

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10 x 15 ⁻¹²	Meter ✓ Fst ✓	?		10 x 15 ⁻¹²
K-2	10 x 15 ⁻¹²	Meter ✓ Fst ✓	?		10 x 15 ⁻¹²
R-1					
R-2					
PM-1	800	Alarm ✓	Contact		500
PM-2	1200	Low ✓ Alarm ✓	18" 4"		900

LOG N CALIBRATE OPERATE SOURCE NO. K-1

DUMP WELL PROBE LIGHT

Backman Lynn - OK

START-UP CHECK LIST

Equipment checked by RKR Personnel check by IDC

Instruments and safeties checked and reset by RKR

Source in checked by RKR Source No. M-43

Emergency equipment in control room checked by IDC

Instruments in trip circuit: K-1, K-2, PM-1, PM-2

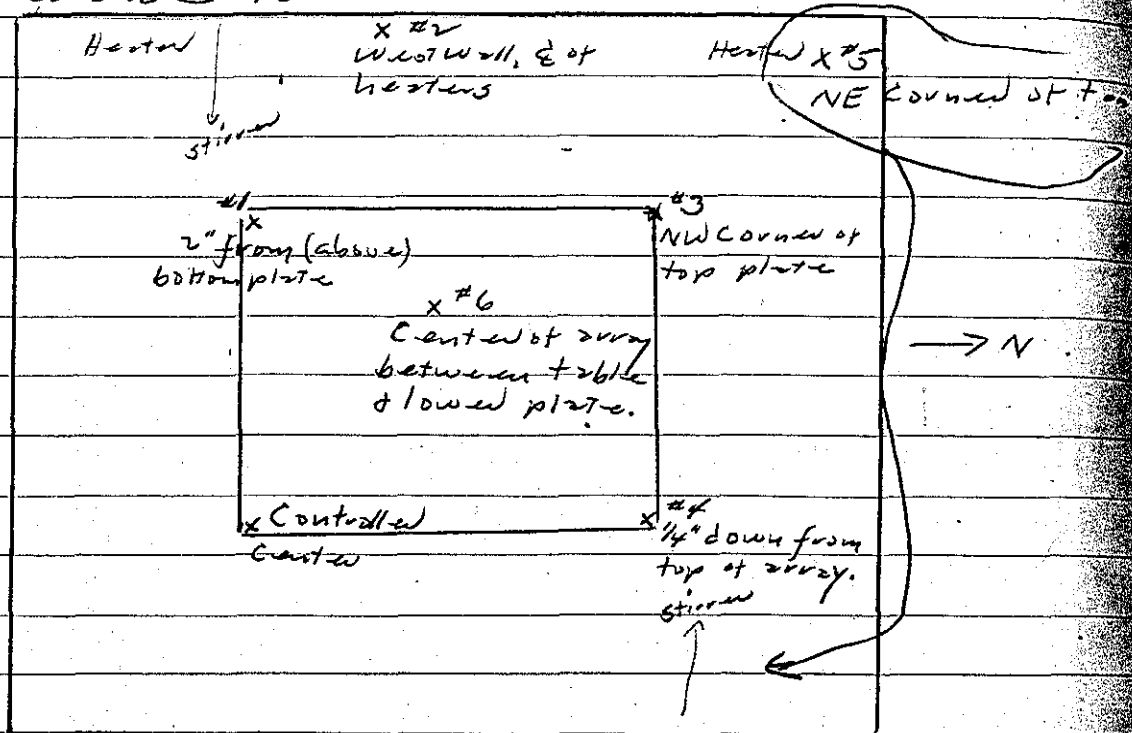
Red light on by RKR Time 1030

Start-up OK'd by RKR, EJ Date 5/14/63

*Thermocouples installed as shown on sketch p. 164.
Printout on recorder. #8 in east storage tank, #9 in room
H₂O @ 129.5. Stirrers on. OK. Heaters on @ 11:29.5 =*

5/14/63

3 min air match. Controller set on 25°C.
 Variac @ 90.



#7 West Storage Tank
 #8 East Storage Tank
 #9 Room Air

34 min (wet) Controller lost stopped heat successfully
 Stirrers off.

1143 Source out. Blade @ 11.325 in. + period
 1147 Start blade in to level. 9.38 in. essentially level
 1152 Blade to LL. Source in. Power to heaters off
 Variac to 0. #1 reading $\approx 26.2^\circ\text{C}$
 Dump H₂O to cool.

Expt. 14A

1204 Start H₂O load.
 1257 Blade @ 11.33 in. H₂O @ 129.7

$T = 203.2 \text{ mm (K)}$ $T = 189.1 \text{ (B)}$

- 1259 Source out. + period #1 Couple $\approx 24^\circ\text{C}$
 1308 Start to level with blade.
 1316 Level with blade @ 10.29 in.
 Hg thermometer $80^\circ\text{F} = 26.7^\circ\text{C}$ #1 Couple $\approx 24^\circ\text{C}$

Expt. 14B

- 1345 Temp $\approx 24^\circ\text{C}$ K-1 = 7 on 10×15^{-12} ; K-2 = 16 on 10×15^{-12}
 source in, blade in, stirrer on, heat on.
 1425 Stirrer off. #1 Couple 29°C
 1430 Source out. Blade @ 9.83 in. + period $T = 80.9 \text{ mm (K)}$
 1440 Blade @ 8.07 in. H₂O @ 129.8 Level.
 Blade in.

Expt. 14C

- 1445 Source in, heat + stirrer on.
 1511 Source out. Blade @ 8.95 in. + period $T = 77.3 \text{ mm (K)}$
 #1 @ 31.6°C $T = 75.1 \text{ (B)}$
 1521 Level with blade @ 7.59 in.
 Many small bubbles noticed on plates + structure.

Expt. 14D

- 1525 Raising temp.
 1556 Blade started out. #1 Couple 35.0°C . Stirrer off. $T = 108.7 \text{ (K)}$
 1600 Source out. Blade @ 7.65 in. + period $T = 101.7 \text{ (B)}$
 1608 Slight neg @ 6.86, slight + @ 6.87 in. for blade. 6.865;
 1610 Down.

INSTRUMENT CHECK

167

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10x10 ⁻¹²	Meter ✓	?	✓	10x10 ⁻¹²
	"	F ✓	?	✓	
K-2	10x10 ⁻¹²	Meter ✓	?	✓	10x10 ⁻¹²
		F ✓	?	✓	
P-1					
P-2					
PM-1	8000	Alarm ✓			500
PM-2	12000	Low ✓			500
		Alarm ✓			

LOG N-CALIBRATE OPERATE SOURCE No. PM-563
 DUMP-WELL-PROBE-LIGHT

START-UP CHECK LIST

Equipment checked by AKR Personnel check by EDC
 Instruments and safeties checked and reset by AKR
 Source in checked by AKR Source No. PM-563
 Emergency equipment in control room checked by EDC
 Instruments in trip circuit: K-1, K-2, PM-1, PM-2
 Red light on by RKR Time 0830
 Start-up OK'd by RKR Date 5/15/63

Expt. 15

0855 Source cont. Blade @ 11.10 in. first period.
 H₂O @ 9.5 in. #1 sample @ 26.6°C
 0907 Level @ 9.12 in.
 Blade in

5/15/63

EXPT. 15A

0945 Source cut, #1 couple 28.7°C + period
Blade @ 10.27 in. H_2O @ 129.8 cm.

0956 Just cut. Blade @ 8.47" #1 couple 28.5°C
 H_2O 129.8 cm.

10:00 Temp. demand about 38°C

EXPT. 15B

11:29 Stirrers off. source cut #1 couple 37.9°C
+ period Blade @ 7.62 in. H_2O @ 129.8 cm.

11:38 Level @ 6.43" #1 couple 37.9°C H_2O 129.8 cm.

11:41 Temp. demand about 40°C . Panes, etc, on.

EXPT. 15C

12:07 H_2O Temp (#1 couple) 41.5°C

12:08 Source cut. Stirrers off. Blade at 7.35 in
for + period.

12:15 Blade 5.97 in. Level. Stirrers turned on.
#1 couple remained at 41.5°C , neutrons constant.

12:18 Source & blade in. Demand $\approx 45^{\circ}\text{C}$

EXPT. 15D

12:55 Stirrers off. Source cut H_2O 129.8 cm
#1 couple 45.5°C Blade @ 6.30" + Period.

13:02 Level @ 45.5°C . ~~Blade @~~

13:12 Blade @ 5.46 in. Level Temp 45.5°C
Stirrers on. Blade moved to Temp. 47.5°C

13:14 #1 couple 47.4°C . Blade @ 5.345 in, slightly neg.
Blade @ 5.355, slightly +. Temp 47.2°C

13:18 " 5.35, " "

9/15/63

1321 Blade 5.34 in. Temp \bar{F} 47.5. Level.

Expt. 15E

Repeat of 15D - stirrer on.

1333 + Percent, blade 6.36. \bar{C} 48.1°C

1340 Level " 5.34 " " 47.9°C

1355 Dmg H₂O.

INSTRUMENT CHECK

-171-

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10 X 10 ⁻¹²	Master ✓	2	✓	10 X 10 ⁻¹²
"	"	Fist ✓	3	✓	"
K-2	10 X 10 ⁻¹²	Master ✓	3	✓	10 X 10 ⁻¹²
		Fist ✓	3	✓	
R-1					
R-2					
PM-1	900 V	Alarm	Cont	✓	500 V
PM-2	1200 V	Low	18	✓	900 V
		Alarm	3	✓	

LOG N CALIBRATE ✓ OPERATE ✓ SOURCE No. Rad
 Beckman Log # ✓
 DUMP WELL PROBE LIGHT ✓

START-UP CHECK LIST

Equipment checked by AKR Personnel check by F.D.C

Instruments and safeties checked and reset by AKR

Source in checked by AKR Source No. PN 563

Emergency equipment in control room checked by F.D.C

Instruments in trip circuit: K-1 K-2 PM-1 PM-2

Red light on by AKR Time 12:05

Start-up OK'd by F.D.C AKR Date 5-16-63

Cypt: -16

12:10 Start up

12:29 #1 Couple 29.8°c Temp. demand 40°c
 H₂O @ 129.8 cm. Blade in.

13:50 Blade @ 7.14 in. for + period. #1 @ 39.9°c

9/14/63

- 1359 H₂O (with stirrer out) is 125.9 cm.
 Found with blade @ 6.15 in. #1 sample 40.0°C
 Removed tube separated from array by one row.

Expt. 16A

- 1405 Blade @ 12.665 in. just pivot. #1 sample 39.8°C
 Constant during pivot, Temp. rising when
 tried to level with blade.
- 1442 Temp 40.5°C, blade @ 9.08, slightly lev.
 9.09 in, slight lev. 9.10 in, level. #1 sample 40.5°C
- 1445 Dump.

Expt. 16B

- Removed tube ~~out~~ from next to corner
 in partial ring on face toward S.E. Replaced
 tube which had been removed in 14A.
- 1400 H₂O Temp 36.0° Blade out. (29.7 in.)
 source out. H₂O @ 130.1 cm. ? 29.165 in.
- 1412 Blade @ 11.67 in. Apparently critical. #1 sample
 @ 35.6°C. $T_{\text{air}} \approx 20.5$
 Must have been subcritical; see Expt. 17

5/20/63

Expt. 17,
(See Diagram, p. 176)

173

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10 x 15 ⁻¹⁰	Motor ✓	?	✓	10 x 15 ⁻¹⁰
		✓	?	✓	
K-2	10 x 15 ⁻¹⁰	Motor ✓	?	✓	10 x 15 ⁻¹⁰
		✓	?	✓	
R-1					
R-2					
PM-1	800	Alarm ✓	Contact	✓	500
PM-2	1200	Alarm ✓	18"	✓	900
		Alarm ✓	4"	✓	

LOG IN CALIBRATE ✓ OPERATE ✓ SOURCE No. R-1

DUMP WELL PROBE LIGHT _____

Deelman - OK

START-UP CHECK LIST

Equipment checked by EJ Personnel check by IOE

Instruments and safeties checked and reset by EJ

Source in checked by IOE Source No. PN-563

Emergency equipment in control room checked by _____

Instruments in trip circuit: K-1, K-2, PM-1, PM-2

Red light on by EJ Time 1300

Start-up OK'd by EJ, IOE Date 5/20/63

Original array restored (i.e., tubes removed for 16B restored). (A+B)

174

9/20/63

- 1325 H₂O @ 129.5 cm.
 1331 Temp. (#1) 23.5°C.
 1340 Source out. Blade @ 11.34 in.
 1345 Blade @ 11.81 in. + Period H₂O @ 129.5 cm.
 Temp (#1) 23.5°C
 1400 Level, Blade @ 10.76 in. Temp. 23.5°C H₂O 129.5 cm.

Expt. 17A

Added a heavy pin to same ring on "odd" pin, but off the CCW face, symmetrically located.

- 1430 H₂O @ 129.5 cm.
 1438 #1 sample @ 23.6°C
 1445 Source out. Blade @ 9.71 in. + period
 H₂O @ 129.5 cm. Temp. @ 23.6°C
 1455 Blade @ 6.98 in, slightly negative
 1500 Blade @ 6.99 in. Level. #1 sample 23.6°C

Expt. 17B

Removed tube in partial ring, same tube as removed in 16B.

- 1526 H₂O @ 129.5 cm. Temp. or #1 sample 23.5°C
 1533 Blade @ 29.165 in. (UL). Source out. Rising slightly ($LgN < 0.05$). Restored source.
 1545 Source out. ($LgN \approx 0.1$) Subcritical. Linen channels make 4 line traces.

Expt. 172

175

5/21/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10X10 ⁻¹²	Meter ✓	7	✓	10X15 ⁻¹²
		✓	7	✓	
K-2	10X10 ⁻¹²	Meter ✓	7	✓	10X15 ⁻¹²
		✓	7	✓	
R-1					
R-2					
PM-1	800	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓	18	✓	800
		Alarm ✓	3		

LOG IN CALIBRATE ✓ OPERATE ✓ SOURCE No. Ra-✓
 DUMP WELL PROBE LIGHT OK

START-UP CHECK LIST

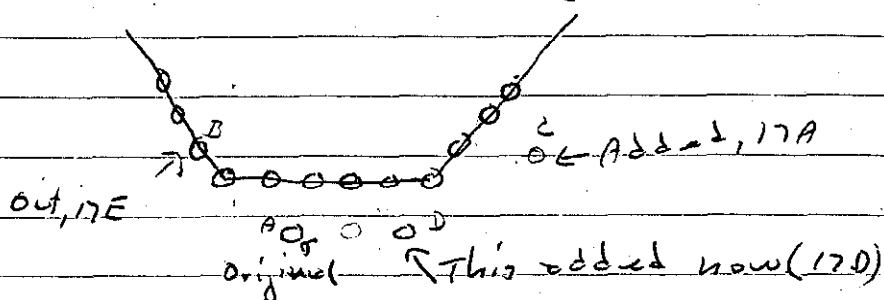
Equipment checked by EJ Personnel check by IDC
 Instruments and safeties checked and reset by EJ
 Source in checked by IDC Source No. PN-523
 Emergency equipment in control room checked by IDC
 Instruments in trip circuit: K-1, K-2, PM-1, PM-2
 Red light on by EJ Time 0830
 Start-up OK'd by EJ IDC Date 5/21/63

Returns to lattice of 17A. K-2 bypassed; meter
 0900 H₂O @ Temp #1, Compu 23.0 °C
 0907 Source out Blade @ 7.78 in. Temp 23.0 °C
 H₂O @ 129.5 cm.

0928 level @ 7.18 in. Temp. 23.0°C H₂O @ 129.5 cm

Expt. 17D

Added a heavy pin to "odd" ring. East side now looks like this:



- 10:00 H₂O @ 129.6 cm. #1 couple ^{22.6} 22.6°C 6.74
- 10:12 Source out, Blade @ 5.20 in. + period H₂O @ 129.6 cm
#1 couple 22.6°C
- 10:27 Level Blade @ 4.78 in. #1 couple 22.6°C H₂O 129.6 cm

Expt. 17E

Removed pin from partial ring.

- 10:52 H₂O @ 129.6 cm. #1 couple 22.5°C
- 10:58 Source out, Blade @ 9.01 in. #1 couple 22.5°C
H₂O @ 129.6 cm.
- 10:14 Blade @ 7.95 in neg. period Blade @ 7.97 in. Pos. period
- 10:15 Blade @ 7.96 in level #1 couple 22.5°C, H₂O 129.6 cm

5/23/63

Expt. 18

177

Pre-Zygo - 3/4" spacing (H₂O in Al can)

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10x15 ^{uV}	High ✓	?	✓	10x15 ^{uV}
		Low ✓	?	✓	
K-2	10x15 ^{uV}	High ✓	?	✓	10x15 ^{uV}
		Low ✓	?	✓	
R-1					
R-2					
PM-1	800	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓	18"	✓	900
		Alarm ✓	3"	✓	

LOG N CALIBRATE OPERATE SOURCE No. Reef
 DUMP WELL PROBE LIGHT Bedman OK

START-UP CHECK LIST

Equipment checked by EJ, IDC Personnel check by IDC
 Instruments and safeties checked and reset by EJ
 Source in checked by EJ Source No. PN-563
 Emergency equipment in control room checked by IDC
 Instruments in trip circuit: K-1, K-2, PM-1, PM-2
 Red light on by EJ Time 1330
 Start-up OK'd by EJ, IDC Date 5/23/63

Purpose - To determine effect of replacing water in the central region of the array with Zygo²². The central pin and the 1st & 2nd rows (19 pins) are in a cylindrical thin-walled (~50 mil) aluminum

2/23/63

can, now filled with water. Around this are 2 more complete rings (outside the can) and three pins regularly spaced on each face in the 5th ring. Total 79 pins, all heavy. Disturbances not moved from previous experiment. Heaters & stirrers have been removed.

14:00

H₂O @ 123.3 bar. crit.

Exp. 18A

add 2 pins, making 4 on opposite faces.
Total now 81.

14:27

Source out H₂O @ 95.3 cm + period

14:32

H₂O @ 94.8 cm, slightly positive

14:35

H₂O @ 94.7 cm, slightly negative
Estimate critical @ 94.75 cm

Exp. 18B

took out 1 pin. Now have 4 pins in one face of ring 5 and 3 pins in each remaining face of ring 5. Total pins 80.

15:41

Source out. H₂O @ 100 cm. + Period

15:52

H₂O @ 97.8 cm. Slightly negative

15:57

" " 97.8 cm " positive

Temp 22.2 °C (glass thermometer - red bulb)

7/24/63

Exp 19

179

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10 X 10 ⁻¹²	Master ✓	?	✓	10 X 10 ⁻¹²
		Fast ✓	?	✓	
K-2	10 X 10 ⁻¹²	Master ✓	?	✓	10 X 10 ⁻¹²
		Fast ✓	?	✓	
R-1	—				
R-2	—				
PM-1	800	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓	18"	✓	500
		Alarm ✓	4"	✓	

LOG IN CALIBRATE ✓ OPERATE ✓ SOURCE No. 208
 Beckman DIC
 DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by EJ IDC Personnel check by IDC

Instruments and safeties checked and reset by EJ

Source in checked by IDC Source No. PN 063

Emergency equipment in control room checked by IDC

Instruments in trip circuit: K-1, PM-1, PM-2

Red light on by EJ Time 1015

Start-up OK'd by EJ, IDC Date 7/24/63

Hooked thermocouples back into multipoint recorder. Moved μ v from location shown on p. 164 to the central oil can, the tip essentially

at the top of the pins and in the center.
 #5 moved to outside of K-1 thimble \approx E of
 array. Other couples still located as of 11/64.
 Nothing else changed from end of 5/23/63.

Repeat of Exp. 18D to determine temperature

10:50 H₂O @ 100.3 cm Temp. #1 couple 22.4°C
 + Period

11:00 H₂O @ 97.8 cm. Slightly negative

11:07 #1 + #2 couples 22.4°C. H₂O @ 97.8 cm
 (Had added H₂O)
 Temp. 22.0°C (Glass thermometer - red bulb)

Exp. 19A

2 yfbs in central Al cylinder to a height
 about 6" above top of pins. Plastic taped
 over top (apparently 2 yfbs has \approx nice vapor
 pressure). #2 couple in 2 yfbs \approx top of pins.
 Installed 2 complete rows of pins outside
 central region. Tot of 61 pins, of which 19
 are in 2 yfbs.

1422: H₂O @ 123.3 cm. Temp. #1 couple 22.3°C #2 couple 24.0°C
 no observed multiplication.

TUESDAY

JUNE 1965							AUGUST 1965						
S	M	T	W	T	F	S	S	M	T	W	T	F	S
			1	2	3	4 5				1	2	3	4 5 6 7
6	7	8	9	10	11	12	8	9	10	11	12	13	14
13	14	15	16	17	18	19	15	16	17	18	19	20	21
20	21	22	23	24	25	26	22	23	24	25	26	27	28
27	28	29	30				29	30	31				
* * * * *							* * * * *						

6

JULY 1965

APPOINTMENTS

- 7 A. M.
- 8 A. M.
- 9 A. M.
- 10 A. M. *Jim Gray*
- 11 A. M. *Ansie*
- 12 Noon
- 1 P. M.
- 2 P. M.
- 3 P. M. *457-2489*
- 4 P. M. *Arthur Brown*
- 5 P. M.
- 6 P. M.

5/24/63

Exp. 19B

Added 19 pins to existing, 3 on each of 5 sides and 4 on the other. Total was 80 pins.

1505

H₂O @ 123.8 cm. #1 angle 22.5, #2 angle ^{23.}23.5
Definitely sub-critical.

Exp. 19C

Added 5 pins. Now have 4 pins on each face (corners vacant) and a total of 85 pins.

15:38

Source out. H₂O @ 58.4 #1=22.7 #2=23.5
#3=23.0

1545

H₂O @ 97.3 cm Level.

Exp. 19D

Removed 1 pin adjacent to vacant corner.
Total of 84 pins.

1556

H₂O @ 123.2 #1=22.2 #2=23.0 #3=23.5
Sub-critical.

182

5/29/63

Exp. 20
3/4" Spacing
INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	STARTUP RANGE
K-1	10X15 - 10'	Meter ✓	?	✓	10X15
		Foot ✓	?	✓	
K-2	10X15 - 10'	Meter ✓	?	✓	10X15
		Foot ✓	?	✓	
R-1					
R-2					
PM-1	800	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓	18"	✓	500
		Alarm ✓	0"	✓	
LOG N CALIBRATE ✓		OPERATE —		SOURCE No. Ray	
DUMP WELL PROBE LIGHT <u>Bedman - DK</u>					

START-UP CHECK LIST

Equipment checked by RKR-EJ Personnel check by IOCInstruments and safeties checked and reset by EJSource in checked by IOC Source No. PN-563Emergency equipment in control room checked by IOCInstruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by EJ Time 1300Start-up OK'd by RKR, EJ Date 5/29/63

A 6.5-in. length of tube was cut from the numbered end of 50 tubes in order to remove the Bed reflector from one end.

929/63 4 complete rings + 3 on 5 faces + 4 on one face.
Tubes in grid with remaining Bed at
bottom. Cut tubes closest with either
cork or rubber stoppers. Total 80 Tubes.

1322 Sample out. + Period $H_2O @ 95.0$ #1 sample
 $21.9^\circ C$.

1329 Level. $H_2O @ 94.7$ cm.

Drain

Exp. 20A

Removed three 4th tubes from the one face,
leaving 79 rims.

1346 Sample out. + Period $H_2O @ 98.0$ cm.
#1 Sample $21.9^\circ C$

1352 96.8 cm H_2O , + period, 96.6 by gauge.
Estimate critical @ 96.7 cm.

Exp. 20B

Removed 1 rim from 1 face, leaving 28 rims on
that face. Total 78 rims.

1470 $H_2O @ 111.0$ cm. Subcritical.

184

7/15/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10X15 ⁻¹ ✓	Meter ✓	?	✓	10X15 ⁻¹ ✓
		Fast ✓	?	✓	
K-2	10X15 ⁻¹ ✓	Meter ✓	?	✓	10X15 ⁻¹ ✓
		Fast ✓	?	✓	
R-1	—				
R-2	—				
PM-1	600	Alarm ✓	Contact		500
PM-2	1120	Low ✓			900
		Alarm ✓	Contact		
LOG N CALIBRATE	✓	OPERATE	✓	SOURCE No.	Ray

DAMP WELL PROBE LIGHT

Sept-21

Blade: LL = 0.01 in, UL = 29.15 in. Wear bottom of blade is approx top of
 short fuel tubes; selsyn reads 16.36 in.

START-UP CHECK LIST

Equipment checked by RKR Personnel check by RKRInstruments and safeties checked and reset by RKRSource in checked by RKR Source No. PM 563Emergency equipment in control room checked by RKRInstruments in trip circuit: R-1, R-2, PM-1, PM-2Red light on by RKR Time 1400Start-up OK'd by RKR, ERR, J Date 7/15/63

Lattice (3/4") reloaded as on p. 157.
 + period with H₂O @ 97.4 cm. (Blade unit) Blade @ 13.90 in.
 at critical.

7/15/63

Langone: To check Reuter - Stelco seal
 chamber, see Log Book - Room 202; Instrument
 & Equipment Record: Page's 190-192:

2 ³⁵/_{PM}

#1 Blade at 16.50" H₂O at 97.4 cm. Pos Per.

② 3 ⁰⁵/_{PM}

shut down.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3X10 ⁻¹¹	Meter ✓	cont	✓	3X10 ⁻¹¹
"	"	Fast ✓	"	✓	"
K-2	3X10 ⁻¹¹	Meter ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	6000	Alarm ✓	"	✓	500 v
PM-2	1200 v	Low ✓	3"	✓	900 v
		Alarm ✓	18"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. Post
 DUMP WELL PROBE LIGHT

21-A

START-UP CHECK LIST

Equipment checked by AKK Personnel check by F.P.C
 Instruments and safeties checked and reset by AKK
 Source in checked by AKK Source No. DN-563
 Emergency equipment in control room checked by AKK
 Instruments in trip circuit: K-1 K-2 PM-1 & 2
 Red light on by AKK Time 8:30 AM
 Start-up OK'd by F.P.C., ERR Date 7-16-63
L.B.F. AKK

Some error on Page 184:

Purpose is to check R. Hoette;
 See Log Book - Room 202; Instrument & Equipment record; Page's 193 - 194

- 9 ³⁵/_{AM} Blade = 29.16" H₂O = 97.8^{cm} Pos Per:
- 9 ⁵⁵/_{AM} System level: H₂O = 97.8" Blade = 13.51"
 #1 Pos Per " " " = 16.50"
- 10 ⁰⁵/_{AM} Level " " " = 13.51"
- 10 ¹⁵/_{AM} Shut down:
- 10:30 after draining ~~water~~ water: array was
 reading & greater than 10 R. at contact: @ 140 ms
 about 3 feet away from top:
- 12:28 array reading 1.5 R @ contact.
- 12:45 Start up, after relocating instruments.
- 1:37 Blade @ 13.48" H₂O = 98.0 cm. Source
 out. Pos period
- 1:47 System level. Blade = 13.20" H₂O = 98.0 cm.
- 1:49 Pos period Blade @ 16.00" H₂O @ 98.0 cm
- 2:12 Neg Period Blade at 12.60" " "
- 2:38 Shut down. Blade (in).

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 X 10 ⁻¹¹	Meter ✓	cont	✓	3 X 10 ⁻¹²
	"	Fast ✓	"	—	"
K-2	"	Meter ✓	"	✓	"
	"	Fast ✓	"	—	"

R-1

R-2

PM-1	600V	Alarm —	cont	✓	500V
PM-2	1200V	Low —	1/2	✓	900V
		Alarm ✓	3	—	"

LOG N CALIBRATE ✓

OPERATE ✓

SOURCE No.

500/603

DUMP WELL PROBE LIGHT _____ 7

21-B

START-UP CHECK LIST

Equipment checked by RKH Personnel check by F.D.C.

Instruments and safeties checked and reset by RKH

Source in checked by RKH Source No. PN 503

Emergency equipment in control room checked by F.D.C.

Instruments in trip circuit: K-1 K-2 PM-1 & 2

Red light on by RKH Time 9:30 AM

Start-up OK'd by F.D.C., RKH Date 7-17-63

L.B.V. F.R.R.

Repeat of Expt 21-21A.

9 ³⁰ AM H₂O = 98.1 cm Blade = 13.09" = Level

~~9 37 AM~~ ^{9 37} AM #1 H₂O = 98.1 cm Blade = 15.00" Pos Per = 6.76¢

~~9 50 AM~~ #2 " " Blade = ^{12.54"}~~12.58"~~ Neg Per = 4.41¢

10 ¹² #3 " " Blade = 15.35" Pos Per = 7.66¢

10 ²⁰ #4 " " Blade = 12.34" Neg Per = 5.56¢

10 ³⁵ #5 " " Blade = 15.64 Pos Per = 8.18¢

10 ⁴⁷ #6 " " Blade = 12.00 Neg Per = 7.56

10 ⁰⁰ AM #7 " " Blade = 15.35" Pos Per = 7.86¢

11 ⁰⁹ AM #8 " " Blade = 12.34 Neg Per = 5.98¢

11 ²⁰ AM shut down.

1:10 PM Start up. After moving Rabbitte chamber closer. (Array was reading 10 R @ Cant.)

1 ³⁰ PM H₂O = 98.3 Blade = 12.80" = Level

1 ⁴⁵ AM #9 H₂O = 98.3 Blade = 15.35" Pos Per =
ave

#10
~~207~~ $H_2O = 98.3 \text{ cm}$ Blade = $12.14''$ $\text{Height} = 3.724$
 p11

#11
 $H_2O = 98.3 \text{ cm}$ Blade = $15.69''$ $\text{Height} = 10.34$

~~25~~ #12
 2 p11 $H_2O = 98.3 \text{ cm}$ Blade = $12.00''$ $\text{Height} = 4.824$

~~36~~
 2 p11 shut down!

192

Rover Reactor Fuel Element.

11-18-65

	No Elements	avg g/v ^{3.25}	wg/length
Yellow End =	81	124.5	52.278
Red End =	43	126.0	51.884
Black Ends =	7	120.0	51.384
" " =	10	127.0	50.356
" " =	4	148.0	48.906

11-18-65

193

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	1"	✓	10×10^{-12}
	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	1"	✓	3×10^{-12}
		Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700 V	Alarm	Cont	✓	500 V
PM-2	1200 V	Low ✓	8"	✓	900 V
	"	Alarm ✓	1"	✓	

LOG N CALIBRATE OPERATE SOURCE No. B-80

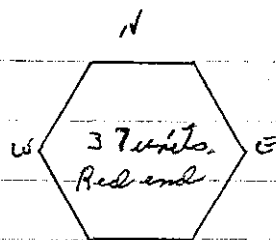
DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKV Personnel check by F.D.C.
 Instruments and safeties checked and reset by AKV
 Source in checked by AKV Source No. M-43
 Emergency equipment in control room checked by F.D.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKV Time 1300
 Start-up OK'd by F.D.C., AKV Date 11-18-65

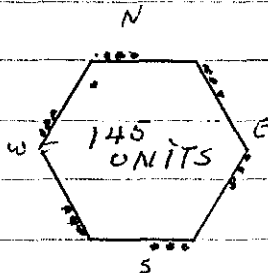
(Top of Table.)
 Water Zero = 32.3 Cm. on side scale.
 Fuel rate - $32.3 - 41.2 = 8.9 \frac{\text{cm}}{\text{min}}$
 Dump valve (4.0") $182.7 - 159.7 = 23 \frac{\text{cm}}{30 \text{ min}}$
 Drain valve (3.0") $159.7 - 143.9 = 15.8 \frac{\text{cm}}{\text{hr}}$ (OVER)

194
11/18/65



13:30 Have a triangular array. 3 rings about center as shown above. Total elements 37. Elements in al. tubes. array separation = 0.0"

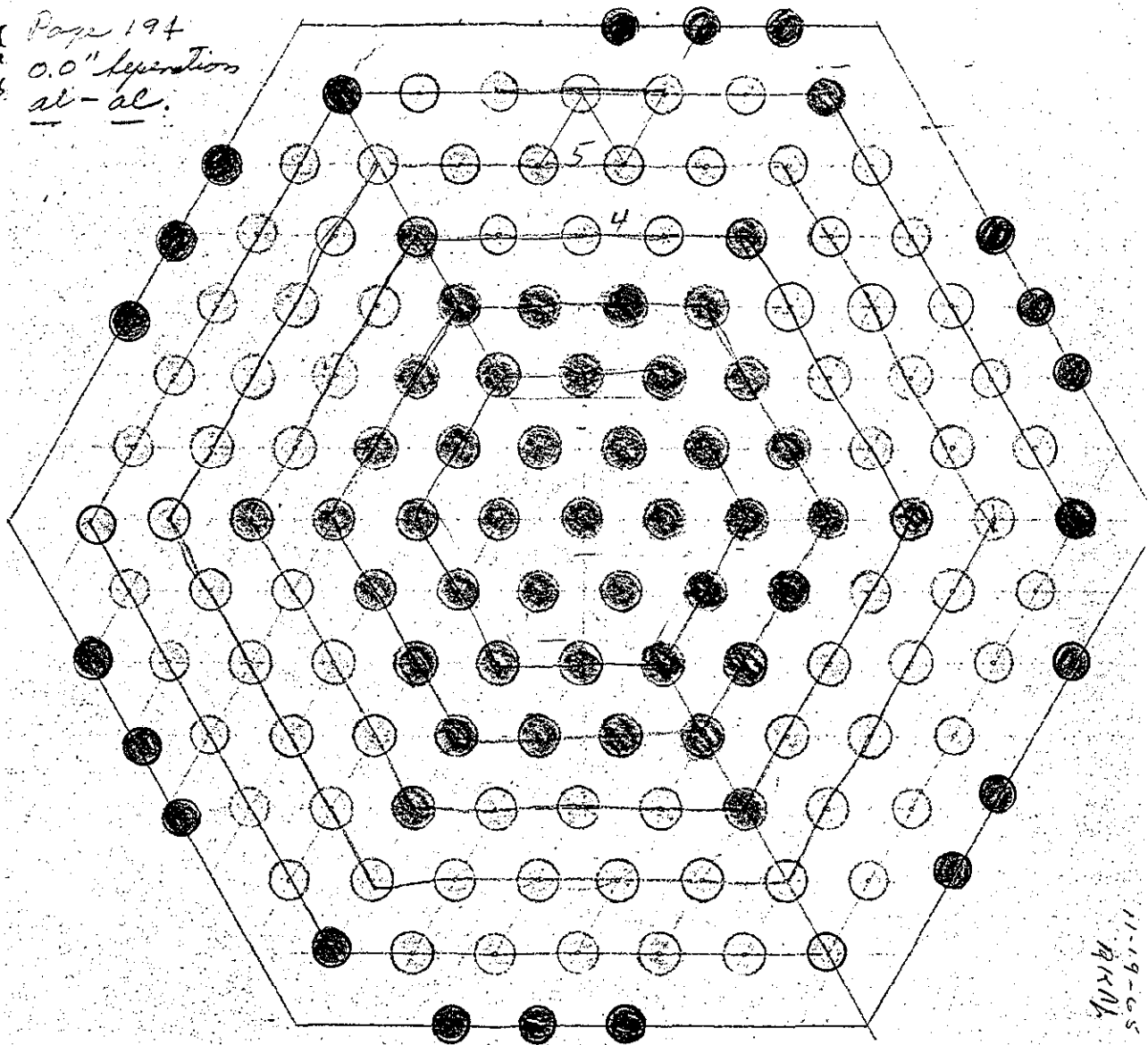
13:55. Water ht = 182.7 cm.
System very sub critical.
Drain.



16:00 Have 6 full rings about center, plus 3 elements on each face in 7th row, as shown above. Total number of elements 145. Separation = 0.0"

Water ht = 182.70 cm
System very sub critical.
Drain.

10 Page 194
11/18 0.0" separations
at-al.



11-19-65
AKM

element
al

11/19/65

195

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 A10 - 12	Meter ✓	1"	✓	10 x 10 - "
	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	1"	✓	3 A10 - 12
	"	Fast -	"	✓	"
R-1					
R-2					
PM-1	700 ✓	Alarm ✓	cont	✓	500 ✓
PM-2	1200 ✓	Low -	12"	✓	900 ✓
	"	Alarm ✓	1"	✓	"

LOG IN CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKK Personnel check by Z.D.C.

Instruments and safeties checked and reset by AKK

Source in checked by AKK Source No. M-43

Emergency equipment in control room checked by Z.D.C.

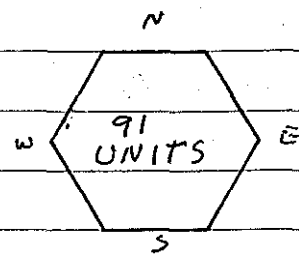
Instruments in trip circuit: K-1-2 PM-1-2

Red light on by AKK Time 1510

Start-up OK'd by Z.D.C. AKK Date 11-19-65

(OVER)

196
11/19/65



15:15 Same triangular array, with 5 rings about center. Total elements = 91. Elements in al. tubes. Separation 0.270". Plastic spacers dimensions = ~~1.00~~ 1.00" x 1" x 40". Water ht = 124.20 cm System just critical. Drains.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	2×10^{-12}	Meter ✓	1"	✓	70×10^{-12}
	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	1"	✓	"
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	cont	✓	500V
PM-2	1200V	Low ✓	12"	✓	900V
	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

11/22/65

197

START-UP CHECK LIST

Equipment checked by AKH Personnel check by F.D.C.

Instruments and safeties checked and reset by AKH

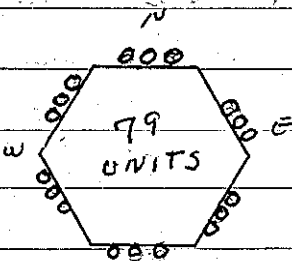
Source in checked by AKH Source No. M-93

Emergency equipment in control room checked by F.D.C.

Instruments in trip circuit: K-1-2 PM-1-2

Red light on by AKH Time 08:10

Start-up OK'd by F.D.C. AKH Date 11-22-65



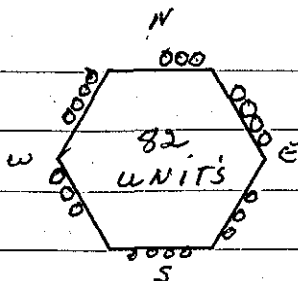
0:810 Hexe triangular³ array with 4 full rings about center, plus 3 elements on each face in fifth row - as shown above. Total elements - 79. Elements in al. tubes. Separation = 0.270". Plastic spacer dimensions = .100" x 1" x 40".

09:33 Water ht = 182.70 cm
System sub critical
Drain.

11/22/65

198

0945



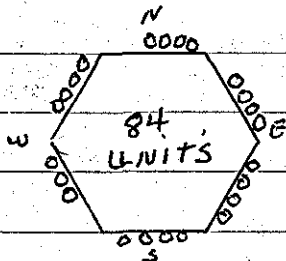
Howe triangular array, with four full rings about center, plus 3 elements on 3 faces and 4 elements on 3 faces in fifth row as shown above.
 Total elements = 82. Elements in al. tubes.
 Plastic spacer dimensions = .100" x 1" x 40". Separation = 0.270"

10:12

Water ht = 182.70 cm

System slightly sub critical

Drain. - $P_{cr} = 117.4 \text{ cm} = 18.7 \text{ f}$



10:30

Howe triangular array, with four full rings about center, plus 4 elements on five faces, and 3 elements on one face in fifth row, as shown above.
 Total elements = 84. Elements in al. tubes.
 Plastic spacer dimensions = .100" x 1" x 40". Separation = 0.270"

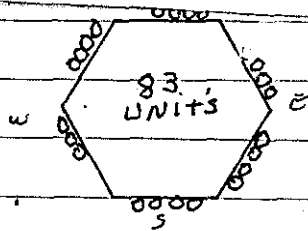
10:58

Water ht = 156.80 cm

System just critical

Drain.

11/22/65



11:00

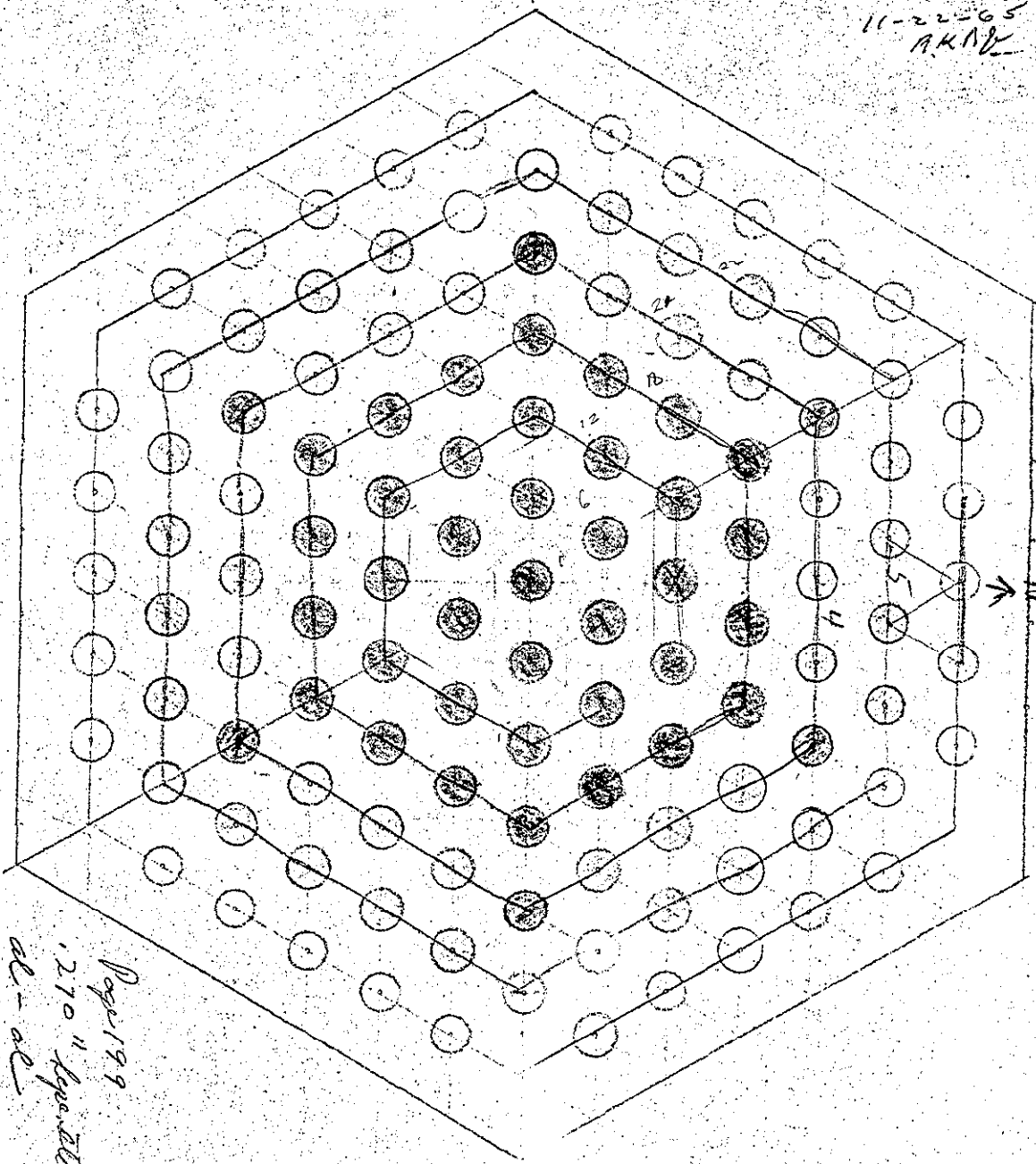
Have triangular array, with four full rings about center, plus 4 elements on four faces, and 3 elements on two faces in fifth row, as shown above. Total elements = 83. Elements in al. tubes. Plastic spacer dimension = .100" X 1" X 40" Separation = 0.270".

11:25

Water ht = 167.0 cm
System just critical
Drain.

11/22/65

11-22-65
M.K.N.V.



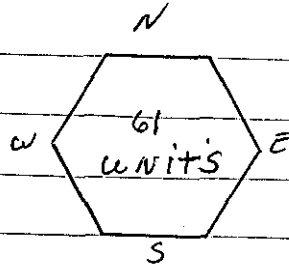
11:00

11
40"

Page 199
270" separation
AL - AL

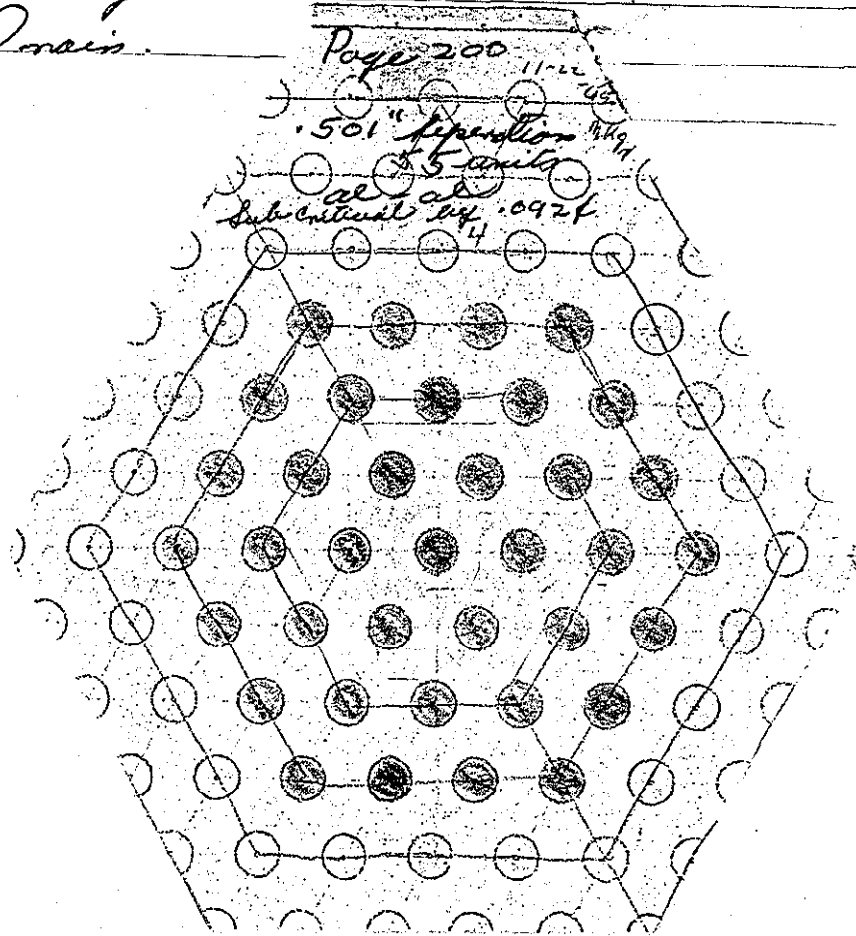
70"

11/22/65
200



14:45 None triangular array - with 4 full rings about center. Total elements 61. Elements in al. tubes. Plastic spacer dimension .300" X 1" X .40". Separation = .501"

15:19 Water ht = 119.70 cm
System just critical
Domain



11/22/65
200

14:45 Hours
above
in at
.300" X 1

el. elem
ments
low

15:19 Water ht
system just
Down.

55
UNITS

15:30 Removed 6 elements. One from each
point of 4th row. Now have a total of 55 elem
Elements in al. tubes. Plastic spoon dimensions
.300" X 1" X 40" Separation = .501"

15:48 Water ht = 182.70 cm
system very slightly sub critical

$$-Per = V = -1412.45 \text{ cm} = .092 f$$

15:53 Down.

11/23/65

201

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	1"	—	10×10^{-12}
	"	Fast ✓	"	—	"
K-2	"	Meter ✓	1"	—	"
	"	Fast ✓	"	—	"
R-1					
R-2					
PM-1	700 V	Alarm ✓	6"	—	500 V
PM-2	1200 V	Low ✓	12"	—	900 V
	"	Alarm ✓	2"	—	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKH Personnel check by F.D.C.

Instruments and safeties checked and reset by AKH

Source in checked by AKH Source No. 14-43

Emergency equipment in control room checked by F.D.C.

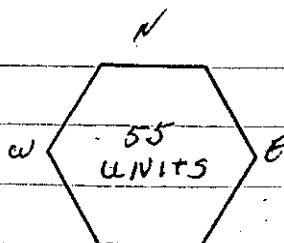
Instruments in trip circuit: K-1-2 PM-1-2

Red light on by AKH Time 0905

Start-up OK'd by F.D.C. AKH Date 11-23-65

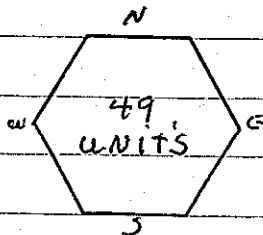
aw:

11-23-65



Triangular array with 3 full rings and one element from each point of fourth ring, which gives a total of 55 units. Elements in al. tubes. Plastic spacers dimension is combination of .100" x 1" x 40" and .300" x 1" x 40" which = .40" separation = .617"

Water ht = 129.30 cm
 System just critical
 Drain.



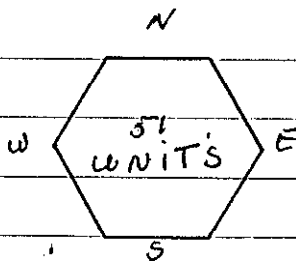
Water temp. 22.5°C
 measured with thermo.

10:50 Triangular array, with 3 full rings, and 2 elements on each face of 4th ring, which gives a total of 49 units. Elements in al. tubes. Plastic spacers dimensions is a combination of .100" x 1" x 40" and .300" x 1" x 40" which = .40" separation = .617"

11:17 Water ht = 182.70 cm
 System sub critical. Drain

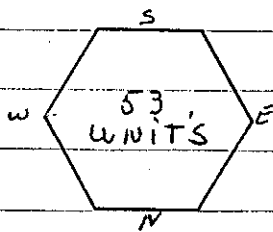
11/23/65

203



12:30 Triangular array with 3 full rings, and 2 elements on four faces of 4th ~~ring~~ ^{ring}, and 3 elements on two faces (N+S) of fourth ~~ring~~ ^{ring}, which gives a total of 51 units. Elements in al. tubes. Plastic spacer dimensions is a combination of .100" x 1" x 40" and .300" x 1" x 40" which = .40" Separation = .617"

12:58 Water at = 182.70 cm
 bytes sub critical.
 Drain.



13:05 Triangular array with 3 full rings, and with 3 elements on 4 faces of 4th ring and 2 elements on 2 faces of 4th ~~ring~~ ^{ring}, total of 53 units. Elements in al. tubes plastic spacer dimension combination of .100" x 1" x 40" and .300" x 1" x 40" which = .40" Separation = .617" over.

204
11/23/65

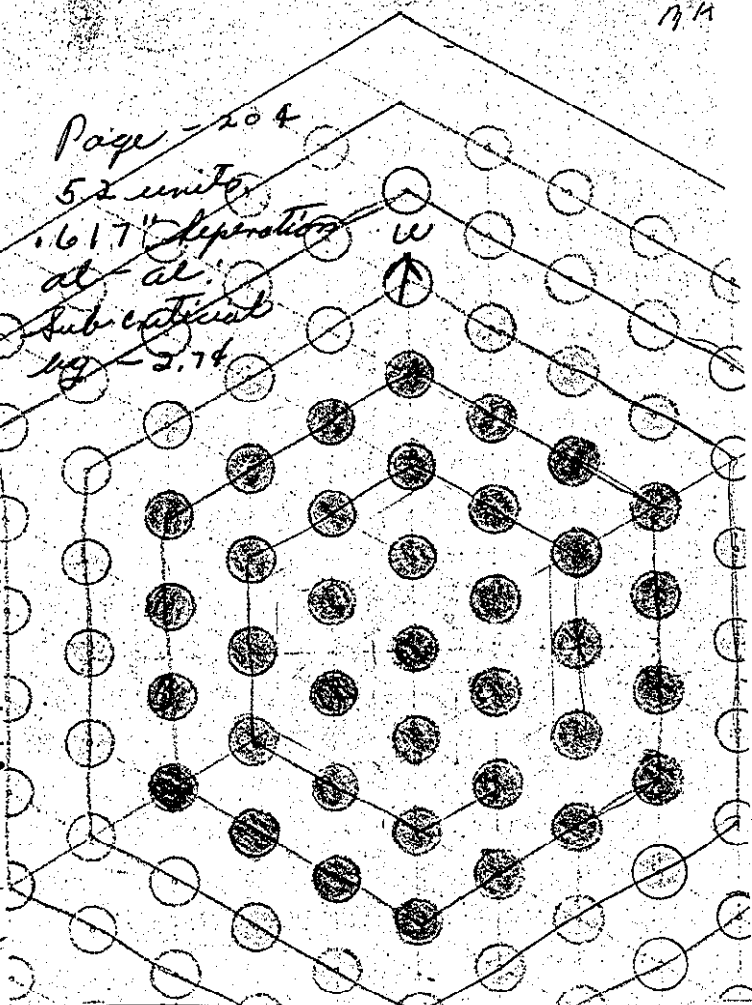
1335 Water wt = 153.2 am
System just critical
Dna

11-23-
74

Page - 204
5.2 units
.617" separation
13:45 Trains at al.
3 elem sub critical
in 1/2
al. test
of .100
Depos

14:12 Water
System
- Per

14:20 Drain



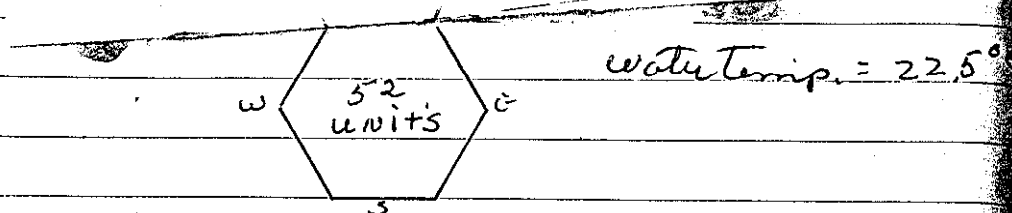
ip = 22.5°

nd
3 faces
ments in
mbination

Summary for .617" separation,
5.3 units super critical
5.2 units sub by -2.74

204
11/23/65

13:05 Wal
kys
Dnd



13:45 Triangular array with 3 full rings and 3 element on 3 faces, and 2 elements on 3 faces in 4th ring. total of 52 units. Elements in al. tubes. Plastic spacers dimension is combination of .100" x 1" x .40" and .300" x 1" x .40" which = .40" separation = .617"

14:12 Water ht = 183.0 cm
System very slightly sub critical
- Per = $\zeta = -517.17 \text{ sec} = -2.7 \text{ d}$

14:20 Drain:

Summary for .617" separation,
53 units super critical
52 units sub by -2.7 d

11/24/65

205

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	1"	✓	10×10^{-12}
	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	1"	✓	"
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	cont	✓	500V
PM-2	1200V	Low ✓	8"	✓	900V
	"	Alarm ✓	1"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by ARK Personnel check by F.P.C

Instruments and safeties checked and reset by ARK

Source in checked by ARK Source No. M-43

Emergency equipment in control room checked by F.P.C

Instruments in trip circuit: K-1-2 PM-1-2

Red light on by ARK Time 0920

Start-up OK'd by F.P.C ARK Date 11-24-65

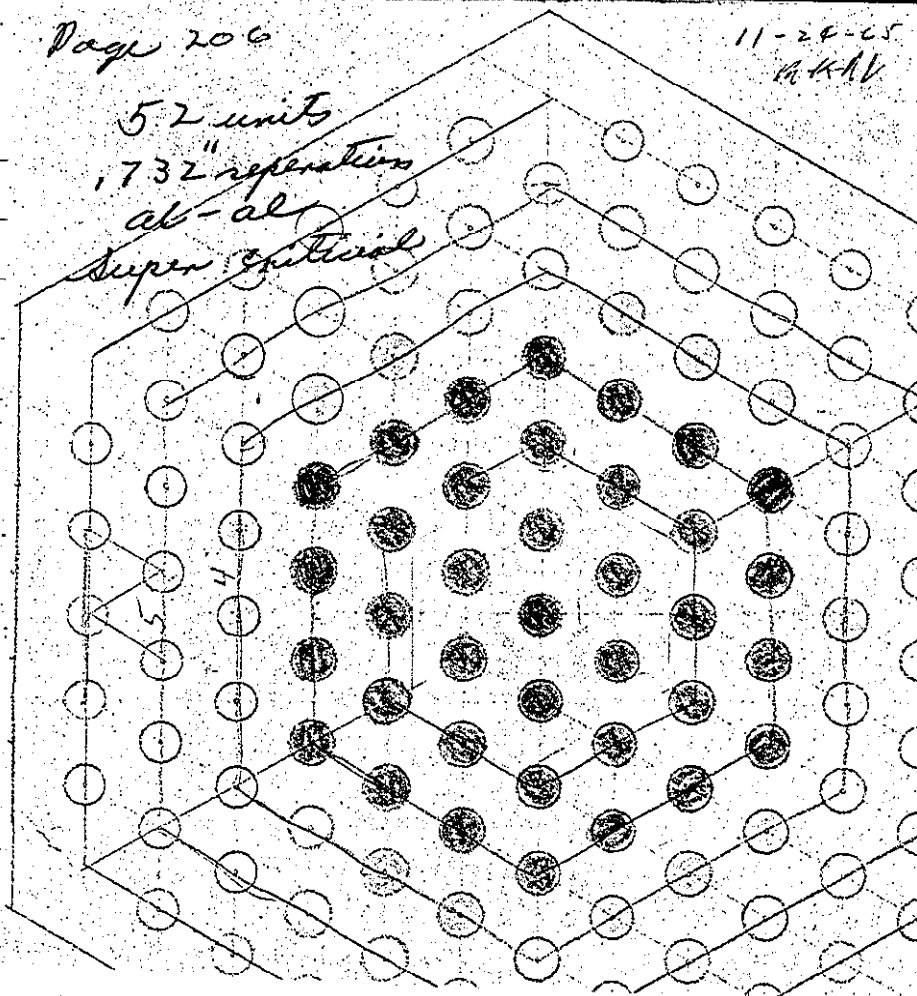
(OVER)

11/24/65
206

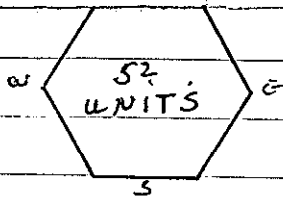
Page 206

11-24-65
M.K.V.

52 units
1732" repetition
ab-ab
Super critical



11/24/65
206

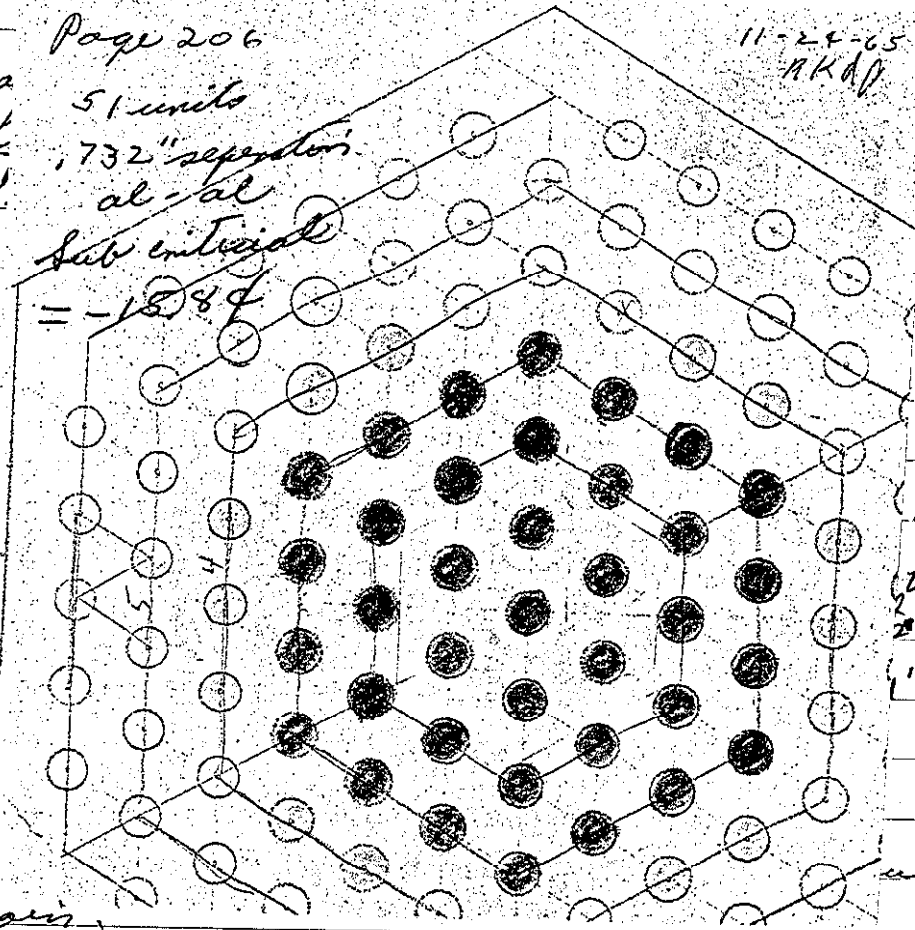


09:30 Same triangular array, with 3 full rings, with 3 elements on three faces and 2 elements on three faces in fourth ring. Total elements 52. Elements in al. tubes. plastic spaces dimensions $\frac{1}{2} \times 1 \times 40$. Separation of units = .732"

Page 206
 W_a 51 units
 h .732" separation
 ϕ al-al
 Sub critical
 $= -18.84$

11-24-65
AKD

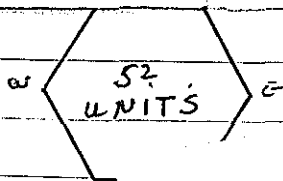
10:15 to
 on
 of
 al.
 &
 u
 10:50
 Davis



3 elements
 on faces
 $\frac{1}{2} \times 1 \times 40$

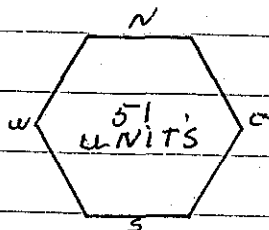
$u = -18$

11/24/65
206



09:30 Some triangular
with 3 elements on
on three faces in
elements 52. E less
plastic spaces dim
Separation of units

Water ht = 159.50 cm
System just critical.
Drain.



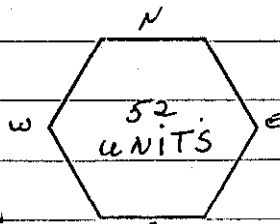
10:15 Triangular array, with 3 full rings, and 3 elements
on two faces, and 2 elements on four faces
of fourth ring. Total elements 51. Elements in
al. tubes. Plastic spaces dimensions $\frac{1}{2} \times 1 \times 40$.
Separation of units = .732"

Water ht = 182.70 cm

System sub critical - Per = -128.21 cm = -15.

10:50 Drain:

11/24/65



13:15

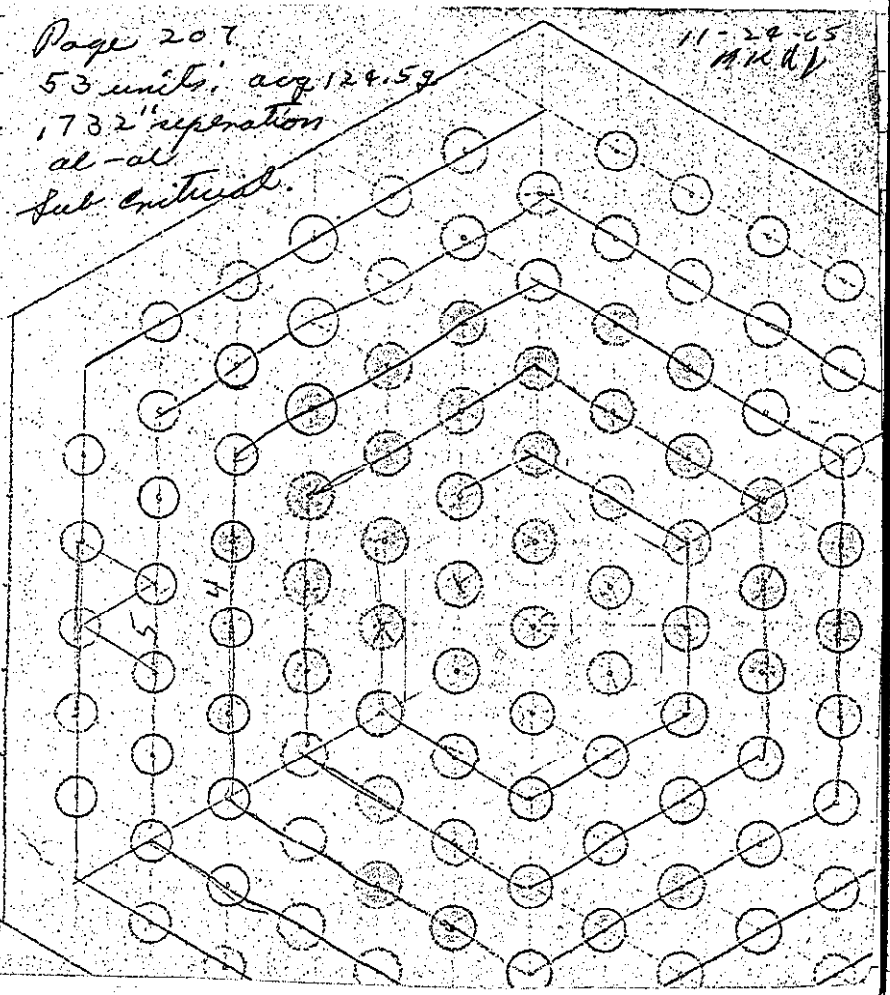
Replaced all red elements with yellow elements
 Triangular array, with 3 full rings, and
 3 element on three faces, and 2 elements on
 three faces in fourth ring. Total elements 52.
 Elements in al. tubes, plastic spacer dimension
 $\frac{1}{2} \times 1 \times 40$. Separation of units = .732"

1336

Water ht = 1
 System su
 Drain.

Page 207
 53 units; avg 124.59
 .732" separation
 al-al
 Sub critical.

11-24-65
M.H.D.



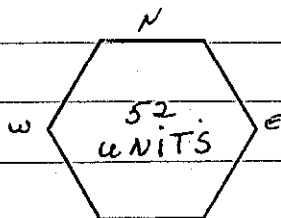
13:55

Triangular a
 with 3 els
 on 2 faces
 Elements in
 $\frac{1}{2} \times 1 \times 40$

1422

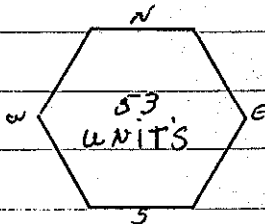
Water ht
 System sub
 Drain.

11/24/65



13:15 Replaced all red elements with yellow elements
 Triangular array, with 3 full rings, and
 3 element on three faces, a elements on
 three faces in fourth ~~ring~~
 Elements in al. tubes
 $\frac{1}{2} \times 1 \times 40$ separation.

13:36 Water ht = 182.70 cm
 System sub critical
 Drain.



13:55 Triangular array - all yellow elements. 3 full rings,
 with 3 elements on four faces and 2 elements
 on 2 faces in fourth ring. Total elements 53.
 Elements in al. tubes. Plastic space dimensions
 $\frac{1}{2} \times 1 \times 40$ separation of units = .732".

14:22 Water ht = 182.70 cm
 System sub critical
 Drain.

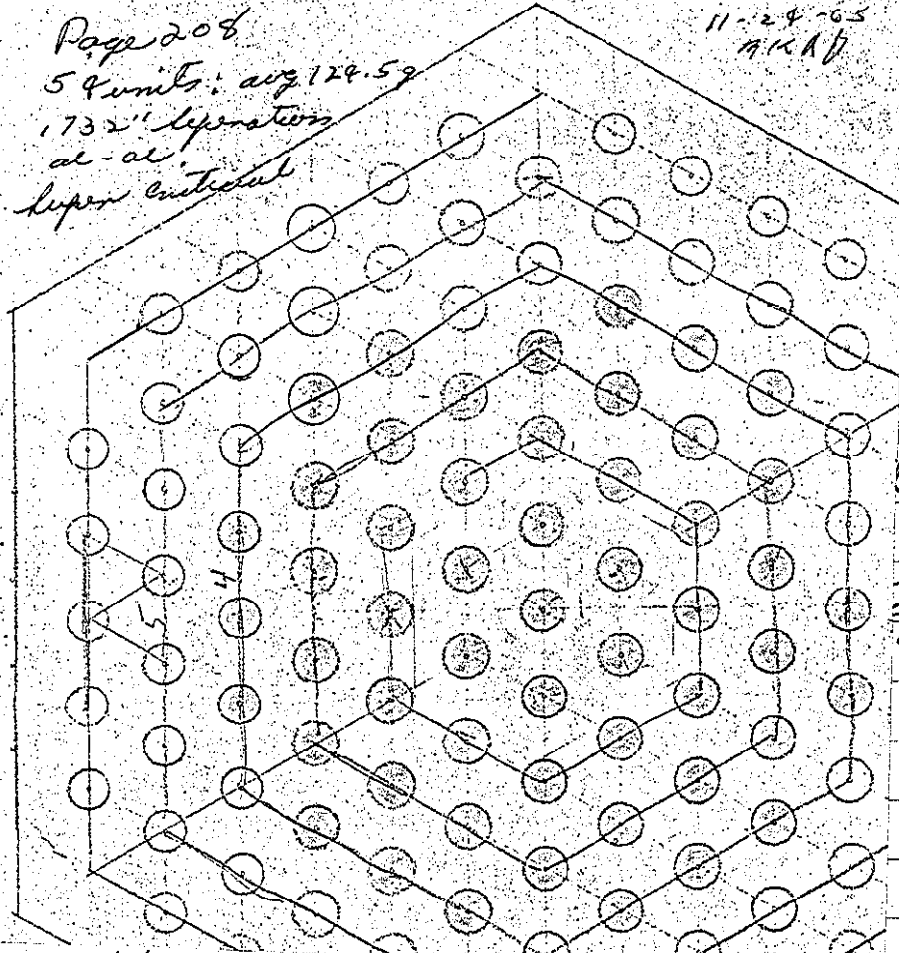
208
11/24/65

Page 208
54 units: avg. 124.59
1732" separation
al-al
Super critical

11-24-65
AKK

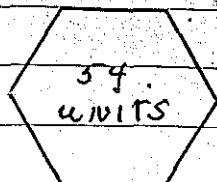
14:30 Triang
rings,
2 diam
Total u
spaces

14:59 Water
system
Drain



separation } 732" separation al-al. all spaces 55 units sub
= 1732" } 54 units super
al-al. } with yellow and red (group 200) 51 units (37 red + 14 yellow)
sub: 52 units (37 red + 15 yellow) super

208
11/24/65



14:30 triangular array. all yellow units. 3 full rings, and 3 elements on first face, and 2 elements on 1 face in fourth ring. Total units 54. Elements in al. tubes. Plastic spacer dimension $\frac{1}{2}$ " x 1" x 40". Separation = .732".

14:59 Water ht = 163.70 cm
System just critical
Drain:

separation }
= .732" }
al-al. }
summary: .732" separation, al-al: all yellow 53 units sub
54 units super.
With yellow and red (type 206) 51 units (37 red + 14 yellow)
sub: 52 units (37 red + 15 yellow) super.



INSTRUMENT CHECK

209

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	1"	✓	10×10^{-12}
	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	1"	✓	"
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	cont	✓	500V
PM-2	1200V	Low ✓	14"	✓	900V
	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKH Personnel check by FIDC

Instruments and safeties checked and reset by AKH

Source in checked by AKH Source No. M-43

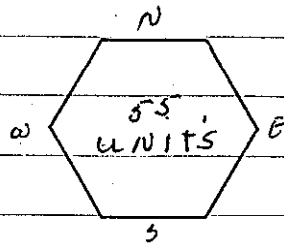
Emergency equipment in control room checked by FIDC

Instruments in trip circuit: K-1-2 PM-1-2

Red light on by AKH Time 10:20

Start-up OK'd by FIDC AKH Date 11-29-65

210
11/29/65



37 rods (in first
3rd ring; 3 yellow
~~units~~ on each
face in 4th ring:

Triangular array - three full rings, and
three units on each face of fourth ring.
total elements 55. Elements in ol. tubes.

Plastic spacer dimensions combination of
 $\frac{1}{2} \times 1 \times 40$ and $.100 \times 1 \times 40 \approx .100$ Separation: $.848$ "

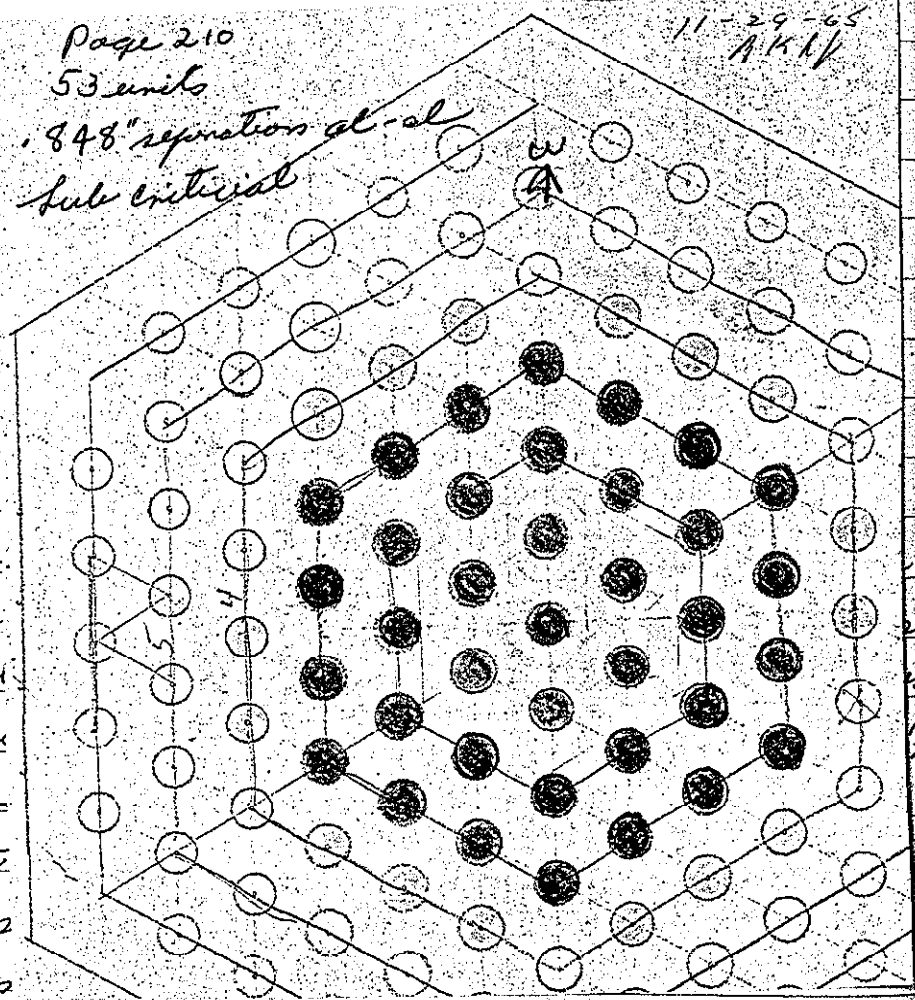
11:00

Water

Page 210
53 units

hepters .848" separation ol. ol
Drain: sub critical

11-29-65
AKK

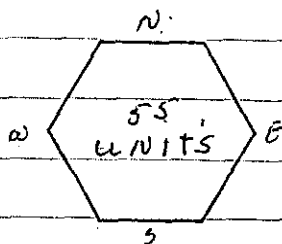


11:05

Triangulo.
units on
of fourth
plastic spa
separation
Water ht
hepters
Drain

x40

210
11/29/65

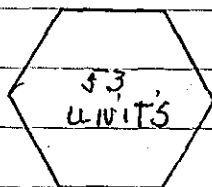


37 mil (in. pint)
3rd ring: 3 yellow
~~units~~ on each
face in 4th ring:

Triangular array - three full rings, and three units on each face of fourth ring. Total elements 55. Elements in al. tubes.

Plastic spacer dimensions combination of $\frac{1}{2} \times 1 \times 40$ and $.100 \times 1 \times 40$ 3.16 " " " " " "

11:00 Water ht = 142.00 cm
system just critical.
Drain:



11:05 Triangular array - three full rings, with three units on four faces and 2 units ^{on} of two faces of fourth ring. Total elements 53. Elements in al. tubes. Plastic spacer dimensions combination of $\frac{1}{2} \times 1 \times 40$ and $.100 \times 1 \times 40$. Separation of units = .948." "600"

Water ht = 182.70 cm
system sub critical
Drain:

11/29/65

211

11-29-65
4205

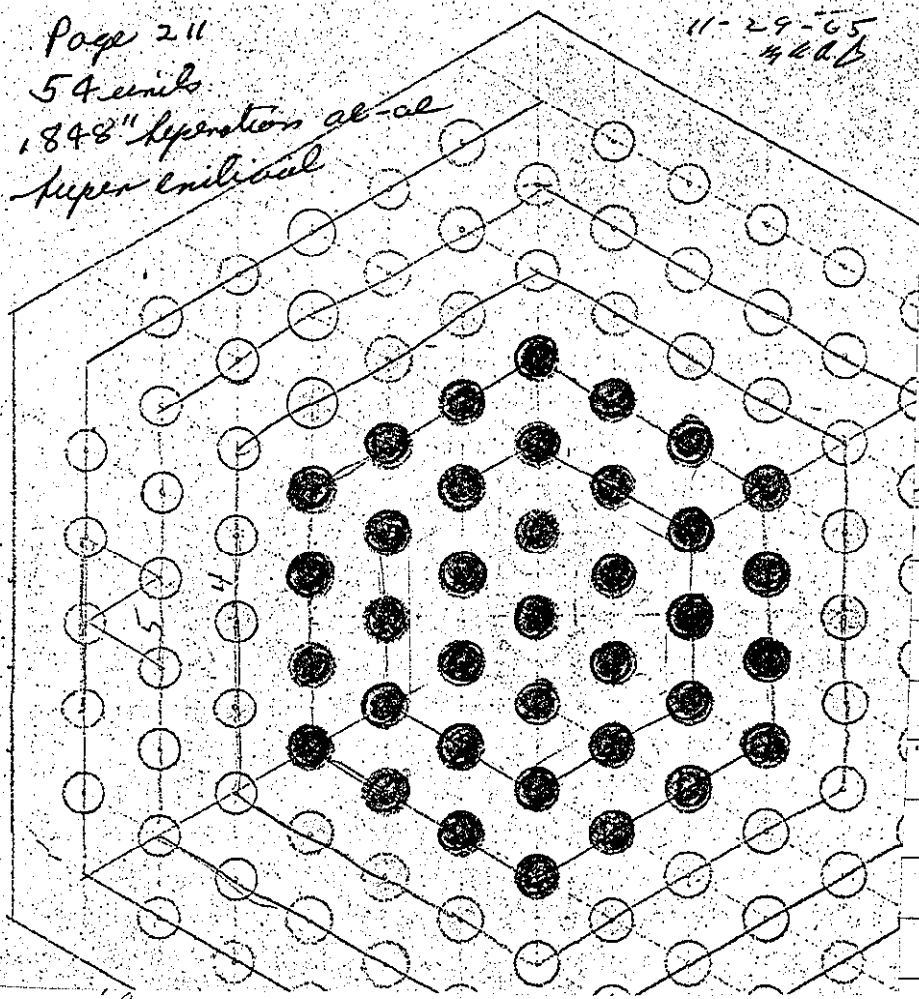
Page 211
54 units
1848" separation al-al
super critical

12:30 Triangular
on fine
fourth in
plastic of
and .100" x 1

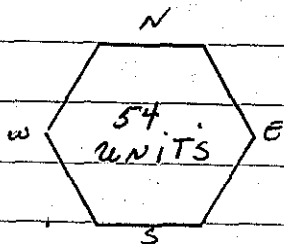
13:09 Water lit.
system of
Dunes.

summers 8
and 16 yellow. Sub.

54 units (37 and 17 yellow super.)



11/29/65



12:30

Triangular array. Three full rings, with 3 units on five faces, and two units on one face in fourth ring. Total units 54. Units in al. tubes plastic spacer dimensions combination of $\frac{1}{2} \times 1 \times 40$ and $100 \times 1 \times 40 \pm .600$ Separation of units = .848"

1309

Water ht = 157.70 cm

System just critical

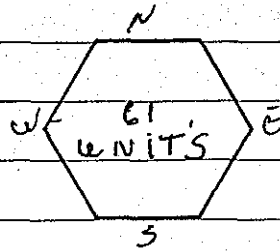
Drawn.

Summary: .848" separation al-al: 53 units (37 red and 16 yellow) sub.

54 units (37 red and 17 yellow) super.

212

11/29/65



14:30 Triangular array. Fair full rings.
 Total units 61 units in al tubes. Plastic space
 dimensions combination of $1/2 \times 1 \times 40$ and $300 \times 1 \times 40$
 Separation of units $1.079''$ $.800''$

1550 Water ht = 182.70 cm
 System sub critical
 Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	10×10^{-12}
	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	cont	<input checked="" type="checkbox"/>	500V
PM-2	900V	Low <input checked="" type="checkbox"/>	14"	<input checked="" type="checkbox"/>	900V
	"	Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

30
11/29/65

213

START-UP CHECK LIST

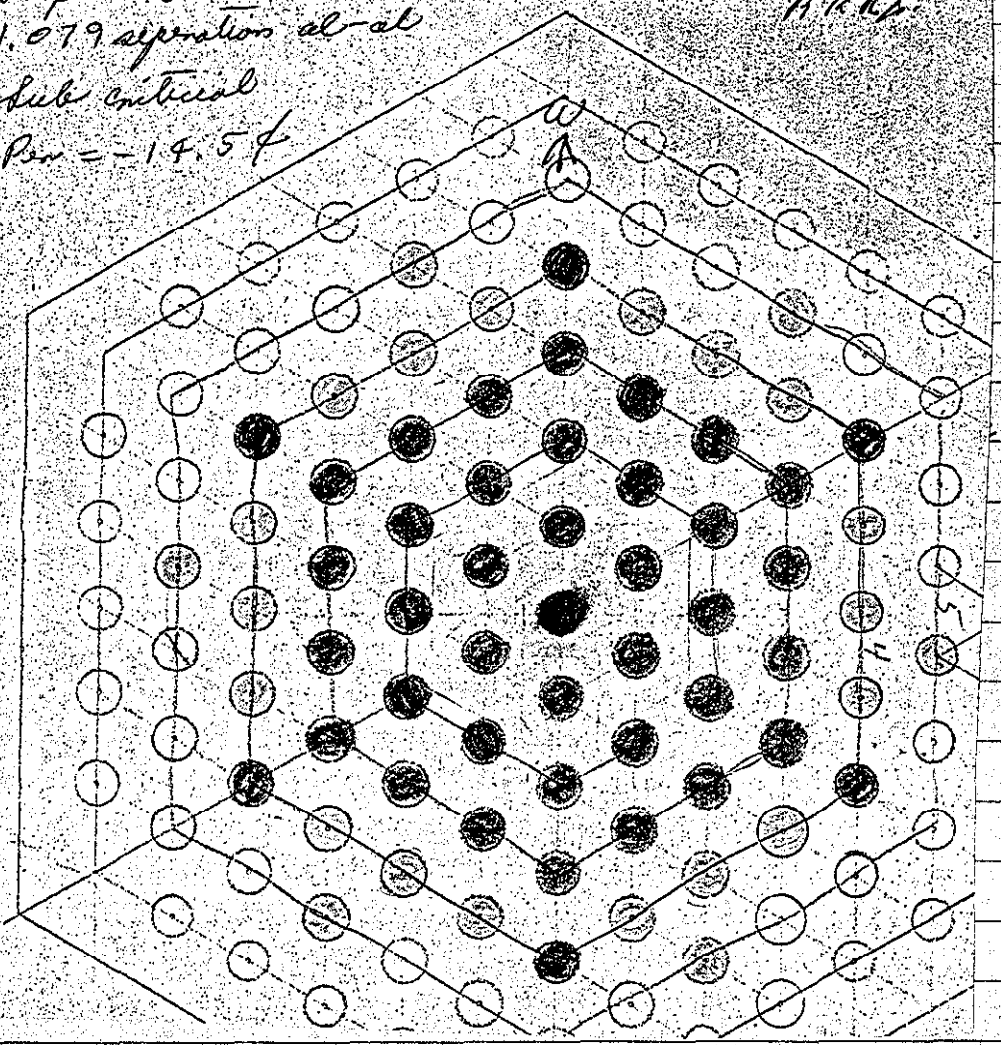
Equipment checked by AKM Personnel check by F.I.R.C.
 Instruments and safeties checked and reset by AKM
 Source in checked by AKM Source No. M-43
 Emergency equipment in control room checked by F.I.R.C.
 Instruments in trip circuit: K-1-2 D19-1-2
 Red light on by AKM Time 0845
 Start-up OK'd by F.I.R.C. AKM Date 11-30-65

Page 213 6 units,
 1.079 separation at-at
 sub critical
 -Pwr = -14.54

11-30-65
 AKM

0845 train
 one
 total
 spec
 and

0921 wait
 hyp
 -Pe
 Proc



11/30/65

213

START-UP CHECK LIST

Equipment checked by AKH Personnel check by F.P.C

Instruments and safeties checked and reset

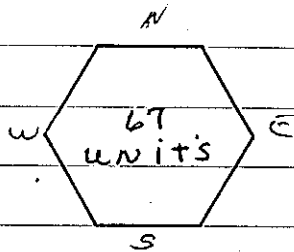
Source in checked by AKH Source No.

Emergency equipment in control room checked

Instruments in trip circuit: K-1-2

Red light on by AKH Time

Start-up OK'd by F.P.C. AKH Date



0845

triangular array. Four full rings - and one unit on each face of fifth ring. Total units 67. Units in al. tubes - plastic spacer dimensions. Combination of $\frac{1}{2}$ " x 1" x 40" and .300" x 1" x 40". Unit separation 1.079 " (see-d)

0921

Water ht = 182.70 cm

System sub critical.

- Per = -134.73 sec = -14.5 d

Drain:

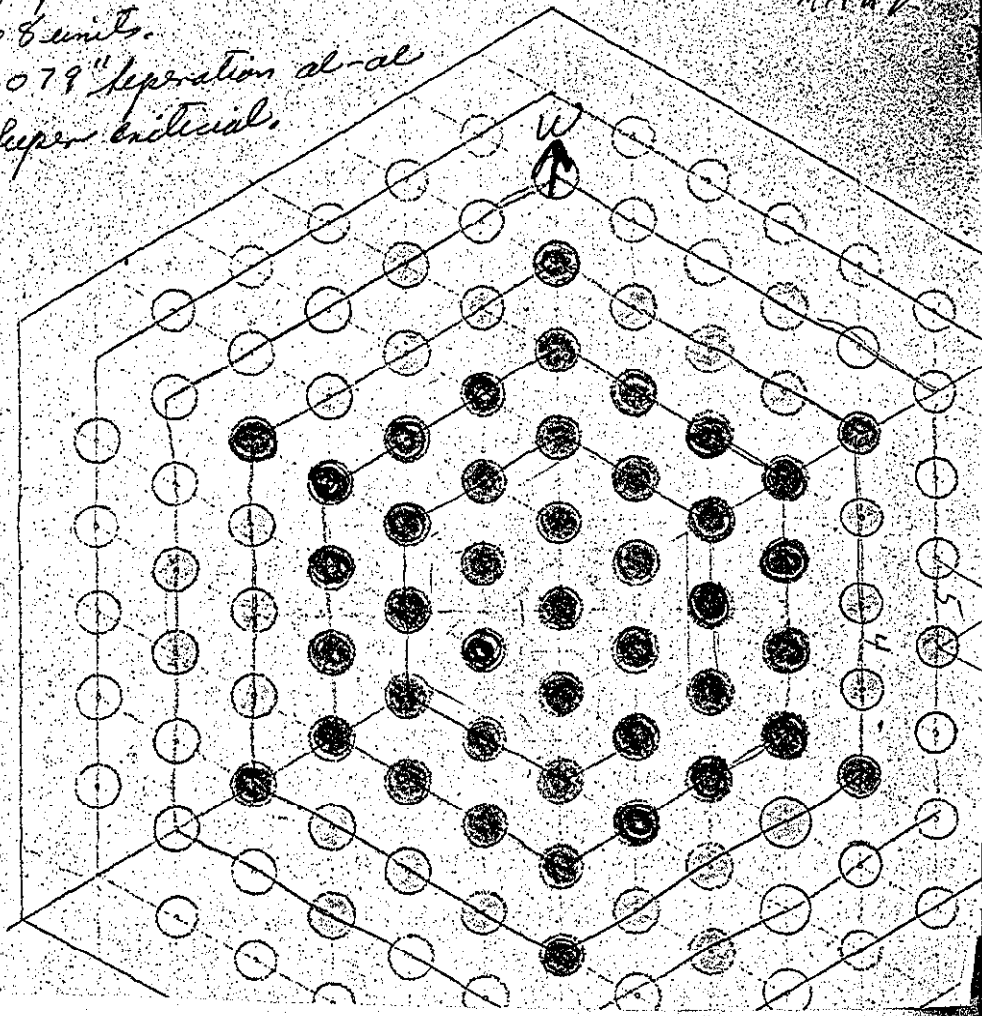
214
11/30/65

Page 214
6.8 units.
1.079" separation al-al
Super critical.

11-30-65
AKH

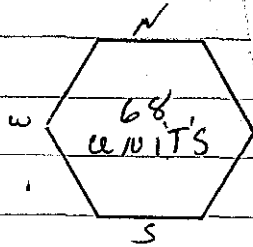
0940 Training
one in
one
Plastic
and 3
Tobes

1005 Water
Kepton
Dross



214
11/30/65

11/30



0940

Triangular array. Four full rings - with one unit on five faces, and 2 units on one face in fifth ring. Units in al. tubes. Plastic spec dimension combination of $\frac{1}{2}$ " x 1" x 40" and .300" x 1" x 40". Unit separation = 1.079".
Total units = 68

130

13

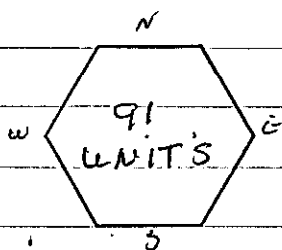
1005

Water ht = 165.30 cm
System just critical
Drain.

18

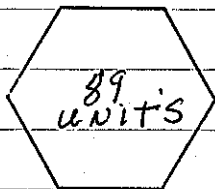
11/30/65

215



1300 Triangular array - Five full rings -
units in al. tubes - Total units 91. Plastic
spacer dimensions combination of $\frac{1}{2}$ " x 1" x 40"
300" x 1" x 40" and 100" x 1" x 40" total of .900"
Unit separation: 1.194"

1325 Water ht = 144.30 cm
hepten just critical
Drain.



15:30 Triangular array - Five full rings
minus 2 units taken from two points
from fifth ring. Plastic spacer
dimensions combination of $\frac{1}{2}$ " x 1" x 40"
300" x 1" x 40" and 100" x 1" x 40" total of .900" total units 89
units in al. tubes. Separation: 1.194"

15:53 Water ht = 155.60 cm
hepten just critical
Drain.

216
12/1/65

121

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
	3×10^{-12}	Meter ✓	1"	✓	10×10^{-12}
	"	Fast ✓	"	✓	"
	"	Meter ✓	1"	✓	"
	"	Fast ✓	"	✓	"
	700 ✓	Alarm ✓	6"	✓	500 ✓
	1200 ✓	Low ✓	14"	✓	900 ✓
	"	Alarm ✓	2"	✓	"
LOG IN CALIBRATE ✓		OPERATE ✓	SOURCE No. B-80		
DUMP WELL PROBE LIGHT ✓					

START-UP CHECK LIST

Equipment checked by AKV Personnel check by F.D.C.

Instruments and safeties checked and reset by AKV

Source in checked by AKV Source No. M-43

Emergency equipment in control room checked by F.D.C.

Instruments in trip circuit: K-1-2 PM-1-2

Red light on by AKV Time 0905

Start-up OK'd by F.D.C. AKV Date 12-1-65

12/1/65

217

88
UNITS

0810 Triangular array - Five full
3 units from three pairs
Total units 88. Units in al.
dimensions combination of
and $.100'' \times 1'' \times 40'' = .900''$ unit

0835 Water ht = 159.70 cm
hepten just critical
Drain.

86
UNITS

0845 Triangular array - Five full rings - Minus five
units from five points in fifth ring. Total
units 88. Units in al. tubes - Plastic spacer dimensions
combination of $\frac{1}{2}'' \times 1'' \times 40''$, $.300'' \times 1'' \times 40''$ and $.100'' \times 1'' \times 40'' = .900''$.
Unit separation = 1.194''

0910 Water ht = 169.95 cm
hepten just critical
Drain.

218
12/1/65

Page 218
85 units
1.194" separation, al-al
sub critical
- $\rho_{eff} = -0.74$

12-1-65
A.L.D.

09:15

T run

six

Total

drum

and

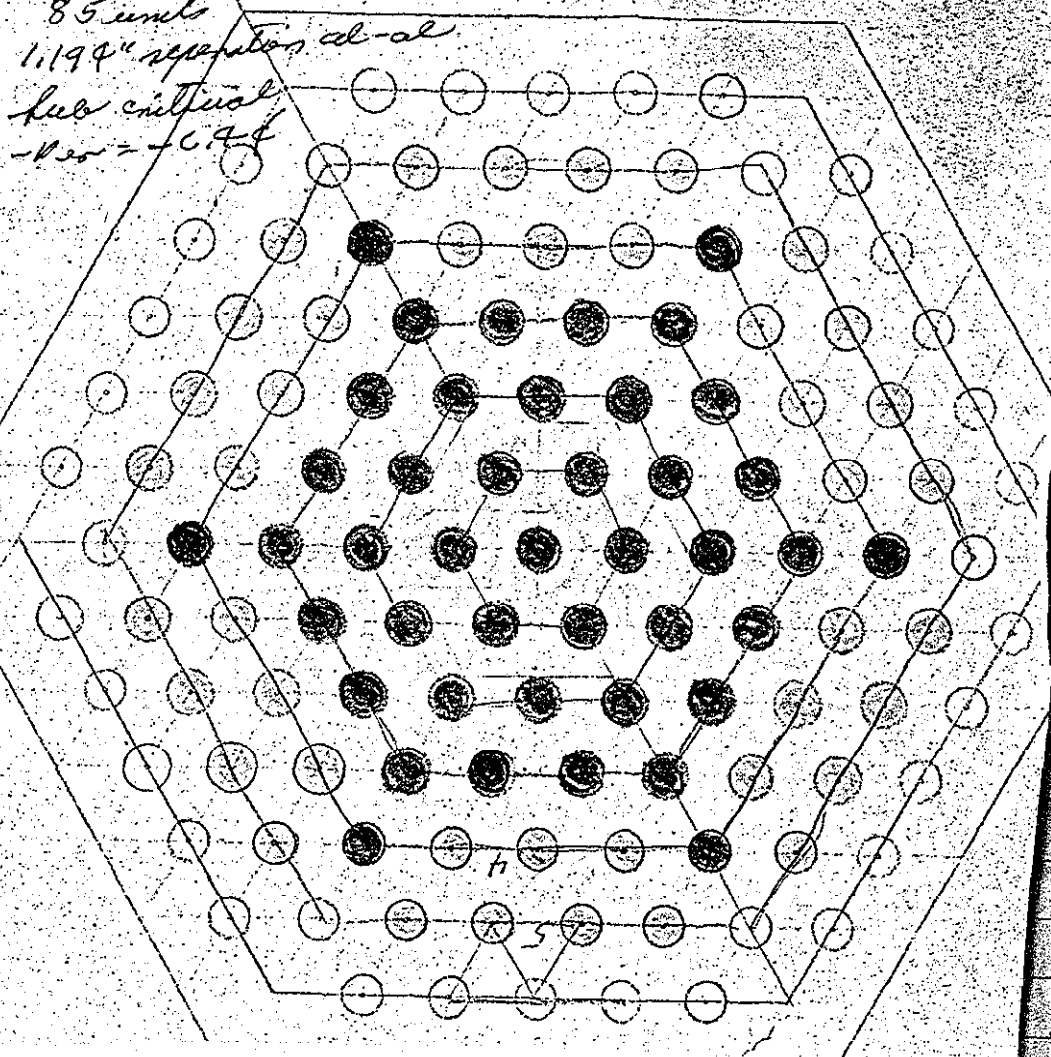
09:30

Water

dep
- P

09:35

Dr



218
12/1/65

85
UNITS

09:15 · Trailing array. Fine full ^{rings} minus
six units from six points in fifth row.
Total units 85. Units in al. tubes. Plastic spacer
dimension combination of $\frac{1}{2}$ " x 1" x 40", 300" x 1" x 40"
and .100" x 1" x 40" = .900". Unit separation = 1.194.

09:30 Water hts = 182.70 cm

Kepten sub critical

- $P_{cr} = -243.38 \text{ cm} = -6.4 \text{ f}$

Water temp
= 22.4 °C

09:35 Drain.

12-2-65

Square array
in all tubes!

INSTRUMENT CHECK

219

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	1"	✓	10×10^{-12}
	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
	"	Fast ✓	"	✓	"
P-1					
P-2					
SM-1	300V	Alarm ✓	cont	✓	500V
SM-2	1200V	low ✓	1.9"	✓	900V
	"	Alarm ✓	2"	✓	"

LOG IN CALIBRATE ✓ OPERATE ✓ SOURCE NO. 13-80

PUMP WELL FROZE LIGHT

START-UP CHECK LIST

Equipment checked by AKH Personnel check by FIDC
 Instruments and safeties checked and reset by AKH.
 Source in checked by AKH Source No. 19-43
 Emergency equipment in control room checked by FIDC
 Instruments in trip circuit: K-1-2 P-1-2
 Red light on by AKH Time 1020
 Start-up OK'd by FIDC AKH Date 12-2-65

over!

220

12-2-65

Square array
al-al124
UNITS

Rectangular
~~square~~ array 11 x 12, Full 11 x 11 with
3 elements at center in 12th row. Plastic
spacer dimension 100" x 1" x 40". Units in al. tubes
Total units 124. Unit separation = .10" al-al

1055 Water ht = 136.00 cm

System just critical
Drain.

121
units

Square array 11 x 11, 121 units. Unit separation
= .10" al-al

1235 Water ht = 153.40 cm

System just critical
Drain.

119
UNITS

Square
Rectangular array - 11 x 11 with 2 corners
missing in eleventh row. Total elements
119. Unit separation = .10" al-al.

1312 Water ht = 162.20 cm

System just critical. Drain.

12/2/65

12-2-65
AAAD

21

Page 221
117 unit
10" separation al-al { 6 cm top reflector.
2.36"

13:20

A

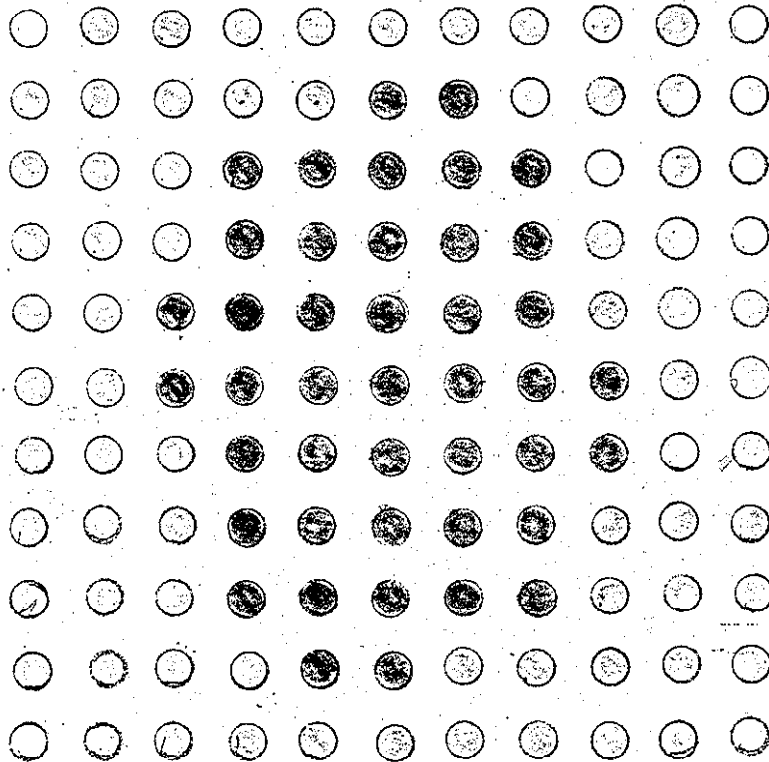
i

v

re

z

R



Missing

17

C4
UNITS

1100

Square array. 8x8 Total elements 64. Elements in
al. tubes. Plastic spacer dimension 300x1"x40"
Unit separation 300" al-al.

1133

Water ht = 182.70 cm
System sub critical
Drain.

12/2/65

117
UNITS

13:20 Square array - 11×11 with 4 corners missing
in eleventh row. Total elements 117.
Unit separation = 10" al. - al.
Water ht = 173.10 cm
System just critical
Drain.

64
UNITS

1100 Square array. 8×8 Total elements 64. Elements in
al. tubes. Plastic spacer dimension .300 x 1" x 40".
Unit separation 1.300" al. - al.

1133 Water ht = 182.70 cm
System sub critical
Drain.

222
12/3/65

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	cont	✓	10×10^{-12}
	"	Fest ✓	"	✓	"
K-2	"	Meter ✓	cont	✓	"
	"	Fest ✓	"	✓	"
R-1					
R-2					
PM-1	700v	Alarm ✓	cont	✓	500v
PM-2	1200v	Low ✓	14"	✓	900v
	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE ✓			OPERATE ✓		SOURCE No. B-80
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by AKM Personnel check by E.D.C
 Instruments and safeties checked and reset by AKM
 Source in checked by AKM Source No. M-93
 Emergency equipment in control room checked by E.P.C
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKM Time 0830
 Start-up OK'd by E.D.C AKM Date 12-3-65

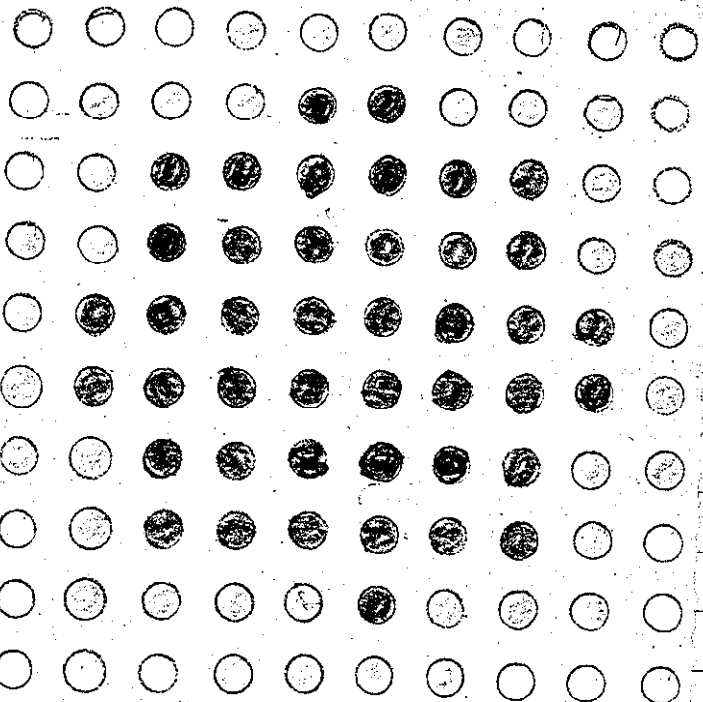
12/3/65

Page 223
80 units.
.20" separation al-al
super critical.

12-5-65
14111

08:45

Square array
elements on
Plastic spacer
.100" x 1" x 40" = .20
Elements in al.



80
d

09:08

Water ht = 1
system just c.
Drain.

09:15

Square array - 8 x 8 - 79 units
on three faces, and three elements on
one face. Total elements 79. Unit separation: .20"

09:40

Water ht = 182.70 cm
system sub critical

~~09:44~~

- Per = - 226.0 cm = - 7.0 f

09:44

Drain



12/3/65

80
UNITS

08:45 Square array - 8×8 with four elements on each face. Total elements 80. Plastic spacer dimensions $.100" \times 1" \times .40"$ and $.100" \times 1" \times .40" = .200"$ Unit separation = $.200"$. Elements in al. tubes.

09:08 Water ht = 162.90 cm
System just critical
Drain.

79
UNITS

09:15 Square array - 8×8 with four elements on three faces, and three elements on one face. Total elements 79. Unit separation = $.200"$

09:40 Water ht = 182.70 cm
System sub critical

~~09:44~~ - $Por = -226.0 \text{ cm} = -7.0 \text{ f}$

09:49 Drain.



12/3/65

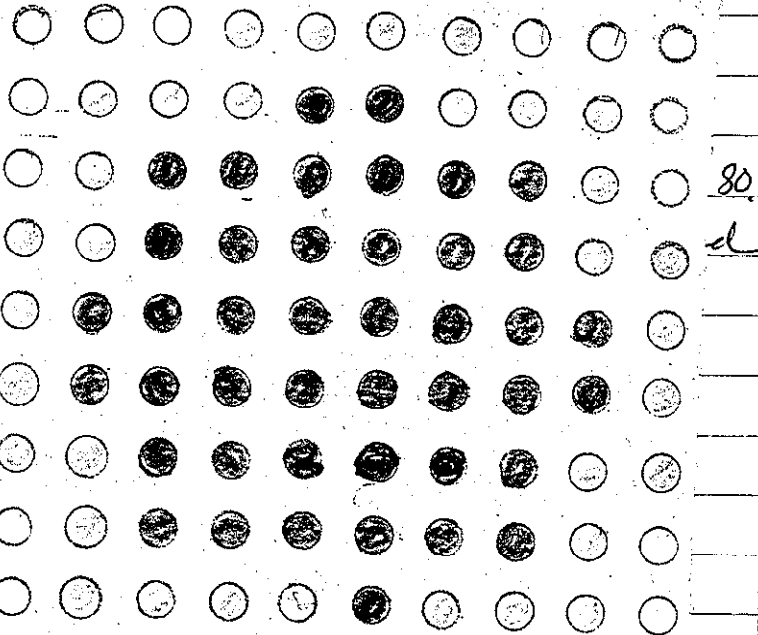
223

12-3-65
AMV

Page 223
80 units.
20" separation al-al
super critical.

08:45 Square array
elements on
Plastic spacer
100" x 1" x 40" = .20
Elements in al-

0908 Water ht = 1
system just c.
Drain.



80
d

09:15 Square array
on three fac.
one face. Total

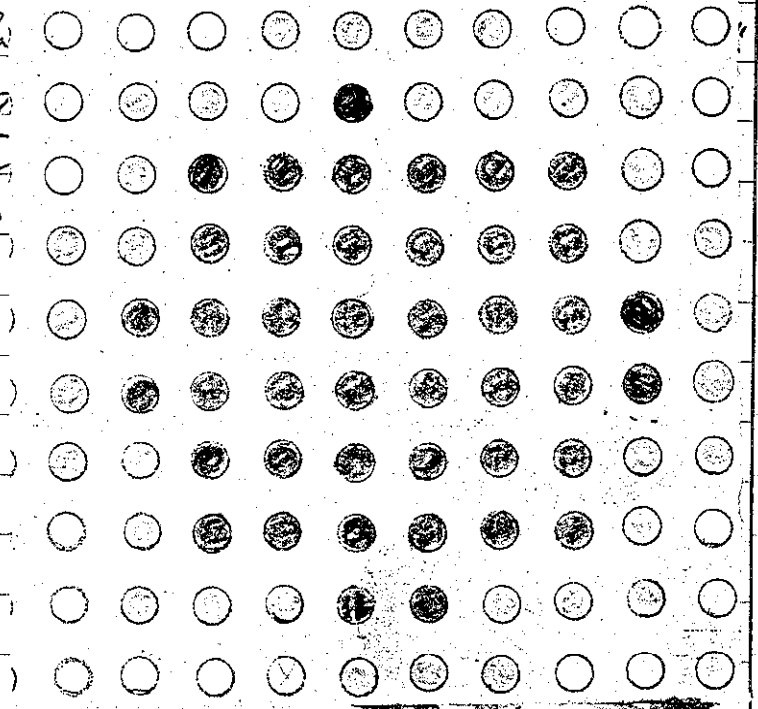
0940 Water ht = 182.7
system sub crit

~~0944~~ - Por = -226.0

0944 Drain-

Page 235
79 units.
20" separation al-al; lab; - Por = 7.04

12-3-65
AMV



224
12/3/65

68
UNITS

12:45 Square array 8x8 with one element on each face. Total 68 units in al. tubes. Plastic spacer dimensions .300" x 1" x 40". Unit separation .300" al-al.

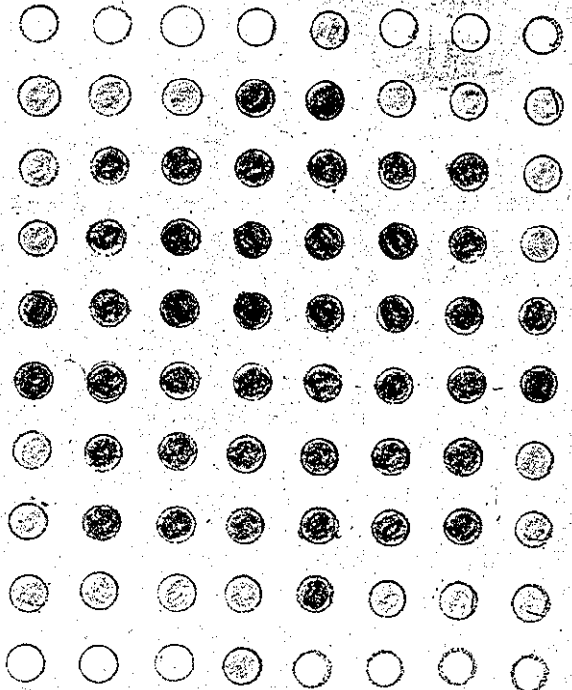
13:10 Water ht = 134.70 cm
Hepten just critical
Drain

Page 224

66 units .30" separation al-al
Super critical.

13:15 Square array - 8x8 on 2 faces. Total units in al. tubes & Unit separation = .

13:31 Water ht = 161.10 cm
Hepten just critical
Drain to ~ 90 cm



224
12/3/65

68
UNITS

12:45 Square array, 8x8 units
element on each face.
Units in al. tubes. Plastic spacers
300"x1"x40". Unit separation

13:10 Water hts = 134.70 cm
Lepten just critical
Down

66
UNITS

13:15 Square array - 8x8 inch one element
on 2 faces. Total elements 64.
Units in al. tubes plastic spacer dim. 300"x1"x40"
Unit separation = 300" al.-al.

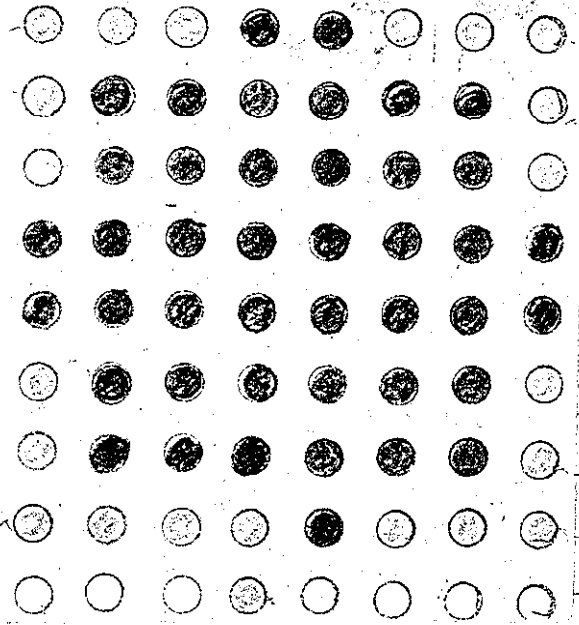
13:31 Water hts = 161.10 cm
Lepten just critical
Down to ~ 90 cm.

12/3/65

225

Page 225
 65 units: 30" separation dial
 sub critical > 25.04
 12-3-65
 AMM

13:35 Square array - 8x8
 one face. Total et
 plastic spacer dim.
 Water ht = 182.70 cm
 13:45 kept on sub critical.



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	2x10 ⁻¹²	Meter ✓	14"	✓	10x10 ⁻¹²
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	14"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	cont	✓	500V
PM-2	1700V	Low ✓	14"	✓	900V
"	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-60
 DUMP WELL PROBE LIGHT

12/3/65

65
UNITS

13:35 Square array - 8x8 with one element on one face. Total elements 65. Units in al. tubes plastic spoon dim. .300"x1"x40. Separation = .300"
Water ht = 182.70 cm

1345 klyten sub critical. 725f

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	2x10 ⁻¹²	Meter ✓	14"	✓	10x10 ⁻¹²
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	14"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	cont	✓	500V
PM-2	1200V	Low ✓	14"	✓	900V
"	"	Alarm ✓	7"	✓	"

LOG IN CALIBRATE OPERATE SOURCE No. B-60
DUMP WELL PROBE LIGHT

12/6/65
226

12

START-UP CHECK LIST

Equipment checked by AKH Personnel check by FIDC

Instruments and safeties checked and reset by AKH

Source in checked by AKH Source No. M-23

Emergency equipment in control room checked by FIDC

Instruments in trip circuit: K-1-2 PCC-1-2

Red light on by AKH Time 0830

Start-up OK'd by FIDC AKH Date 12-6-65

08:40

60
UNITS

Square array - 8 x 8 with four
corners missing - Total elements = 60.
Units in al. tubes. Plastic spacer dimensions
combination of .300" x 1" x 40" and .100" x 1" x 40" = .400"
Unit separation = .450"

0906 Water ht = 132.40 cm
System just critical
Draws.

12/6/65

58
UNITS

09:15 Square array 8 x 8 with four corners missing, plus one adjacent in opposite rows. Total elements = 58. Units in al. tubes plastic spacer dim. Combination of .300" x 1" x 40" and .100" x 1" x 40" = .400" Unit separation = .400"

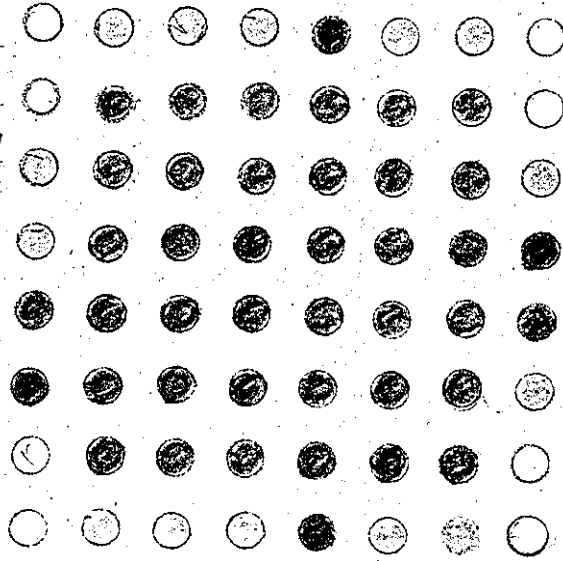
09:40 Water wt = 149.80 gm
System just enters
Drain

12-6-65
AKH

Page 227
56 units
140" separation
sub critical

units
total
plastic
"

09:45 Square array 8 x 8 missing from elements 56. 2 spacer dim. comb .100" x 1" x 40" = .400"



10:10 Water wt = 187.70 gm
System sub critical
Drain

12/6/65

227

58
UNITS

09:15 Square array 8 x 8 unit missing, plus one adjacent. Total elements = 58. plastic spacer dim. combination and .100" x 1" x 40" = .400" unit

ers
te
les
x 40"
0"

09:40 Water ht = 149.80 cm
system just critical
Orvis

56
UNITS

09:45 Square array 8 x 8 with 2 ^{elements} ~~units~~ missing from each corner. Total elements 56 units in al. tubes. Plastic spacer dim. combination of .300" x 1" x 40 and .100" x 1" x 40 = .400" unit separation = .400"

10:10 Water ht = 187.70 cm
system sub critical
Orvis

12/6/65
228

12-6-65

AKKJ

Page 228

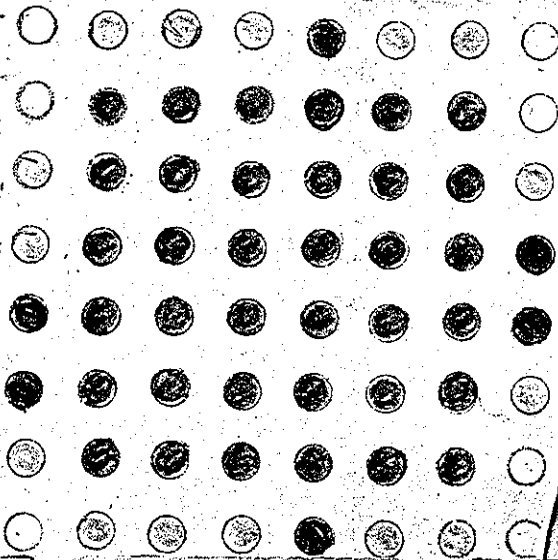
57 units. Separation = 40"

10:15

57
UNITS

Super critical

Square array - 8x8
removed from three
missing from one
57. Elements in al. tube
combination of .300" x 1" x 4
unit separation = .4



10:40

Water ht = 162.80

Hydro just critical
Drain.

54
UNITS

1300 Square array 8x8 with 3 elements
missing from ~~the~~ two corners and
2 elements missing from two corners
total elements = 54. Elements in al. tube
Plastic spacer dimension 1/2" x 1" x 40". Separation 1/2"

1323

Water ht = 149.50 cm

Hydro just critical
Drain.

12/6/65
228

10:15

57
UNITS

Square array - 8x8 with 2 elements removed from three corners and 1 element missing from one corner. Total elements = 57. Elements in al. tubes. Plastic spacer dim. combination of .300" x 1" x 40" and .100" x 1" x 40" = .400" unit separation = .400"

10:40

Water ht = 162.80

heptajet critical
Down.

54
UNITS

1300

Square array 8x8 with 3 elements missing from ~~the~~ two corners and 2 elements missing from two corners. Total elements = 54. Elements in al. tubes. Plastic spacer dimension $\frac{1}{2}$ " x 1" x 40". Spacing $\frac{1}{2}$ "

1323

Water ht = 199.50 cm

heptajet critical
Down.

12/6/65

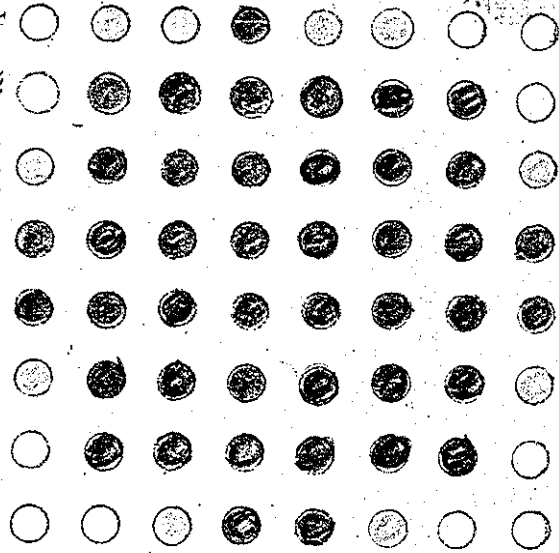
53
UNITS

Page 229

53 units, Separation = .500
just critical

12-6-65
14416

13.145 Square array 8 x 8
 missing from the
 2 elements missing
 Total elements = 53
 Plastic spacer dim 1/4
 1415 Water ht = 162.40
 hepten just critical



12/6/65

53
UNITS

13:45 Square array - 8x8 with 3 elements missing from three corners, and 2 elements missing from one corner. Total elements = 53. units in al. tubes. Plastic spacer dim. 1/2" x 1" x 40" separation = 1/2"

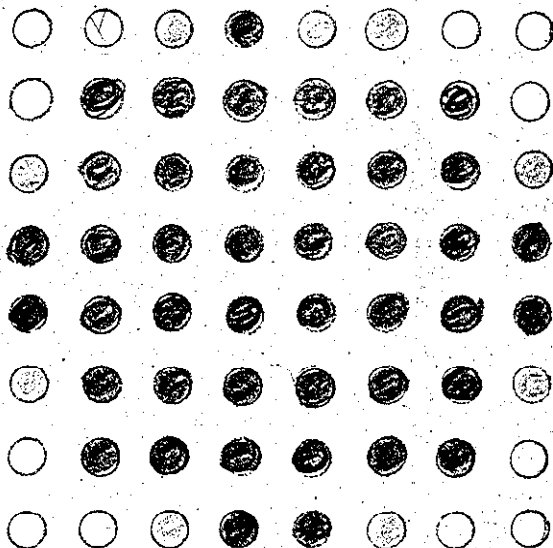
14:15. Water ht = 162.40
hepten just critical
Drain

Page 229
52 units separation = .500
sub. critical

52
UNITS

12-6-65
MEL

14:25 Square array - 8x8 missing from the 4 total elements = 5. Plastic spacer dim water ht = 182.70 hepten sub critical Drain.



12/6/65

53
UNITS

13:45 Square array 8×8 with 3 elements missing from three corners, and 2 elements missing from one corner
Total elements = 53. Units in al. tubes
Plastic spacer dim. $\frac{1}{2} \times 1 \times 40$ separate

14:15 Water ht = 162.40
System just critical
Drain.

52
UNITS

14:25 Square array 8×8 with 3 elements missing from the four corners
Total elements = 52. Units in al. tubes
Plastic spacer dim. $\frac{1}{2} \times 1 \times 40$, Separation $\frac{1}{2}$
Water ht = 182.70

System sub critical
Drain.

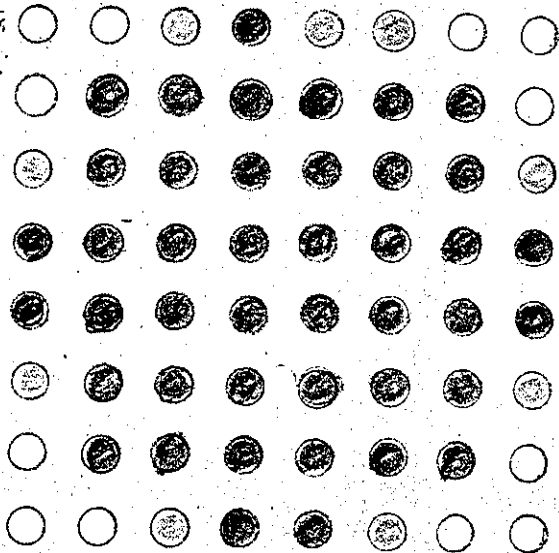
230
12/6/65

12-6-65
AKA

Page 230

52 units separation = .60"
Super critical.

15:45 Square array -
missing from
Total units = 52
Combination of .500"
Unit separation =
Water ht = 161.100
System just critical
Drain:



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 x 10 ⁻¹²	Meter ✓	1"	✓	10 x 10 ⁻¹²
	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	1"	✓	"
	"	Fast ✓	"	✓	"
R-1					
P-2					
PM-1	700V	Alarm ✓	cont	✓	500V
PM-2	1200V	Low ✓	19"	✓	900V
	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE OPERATE SOURCE No.

DUMP WELL PROBE LIGHT 7

230
12/6/65

52
UNITS

15:45 Square array - 8x8 inch 3 elements
missing from the four corners.
Total units = 52 Plastic spacer dim.
Combination of .500"x1"x40" and .100"x1"x40" = .600"
Unit separation = .600"
Water ht = 161.10 cm
System just critical
Drain:

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 x 10 ⁻¹²	Meter ✓	1"	✓	10 x 10 ⁻¹²
	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	1"	✓	"
	"	Fast ✓	"	✓	"
R-1					
P-2					
PM-1	700V	Alarm ✓	cont	✓	500V
PM-2	1200V	Low ✓	19"	✓	900V
	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE OPERATE SOURCE No.

DUMP WELL PROBE LIGHT

12/7/65

231

START-UP CHECK LIST

Equipment checked by AKM Personnel check by F.D.C.

Instruments and safeties checked and reset by AKM

Source in checked by AKM Source No. 14-93

Emergency equipment in control room checked by F.D.C.

Instruments in trip circuit: K-1-2 - PM-1-2

Red light on by AKM Time 0805

Start-up OK'd by F.D.C. AKM Date 12-7-65

51
60

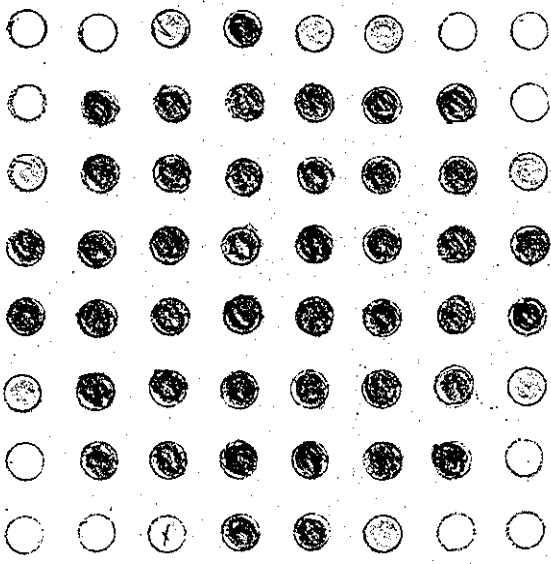
Page 231

12-7-65
AKM

51 units. operation = .60"
Sub critical.

0810 Square array - 8x
missing from 7
elements missing
Total elements 51
space dim. .500"
Unit separation =

0936 Water ht = 182,70 c
kepton sub critical
Power =



instic
0"

12/7/65

231

START-UP CHECK LIST

Equipment checked by AKA Personnel check by E.P.C

Instruments and safeties checked and reset by AKA

Source in checked by AKA Source No. 14-9

Emergency equipment in control room checked by Z

Instruments in trip circuit: K-1-2 PM-1

Red light on by AKA Time 080

Start-up OK'd by E.P.C AKA Date 12-

51
UNITS

0810 Square array - 8x8 with 3 elements missing from three corners, and 4 elements missing from one corner. Total elements 51. Units in al. tubes. Plastic spacer dim, .500"x1"x40" and .100"x1"x40" = .600" Unit separation = .600".

0936 Water ht = 182.70 cm
heater sub critical
Drain.

232
12/7/65

TEMP:
23.2°C
measured with
thermometer

54
units

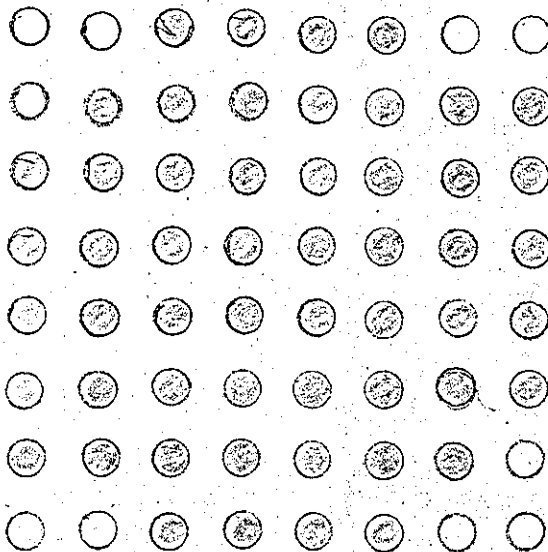
Page 232
54 units, separation = .600"
sub critical

12-7-65
AKH

Square array, all 4
with 3 units missing
and 2 units missing
Total elements = 54. Unit
spacer dim. .500" x 1" x
Unit separation = .6

09:34 Water ht = 182.70 cm

System sub critical
Drain



55
units

(all yellow units)

Page 232
55 units, separation = .600"
just critical

12-7-65
AKH

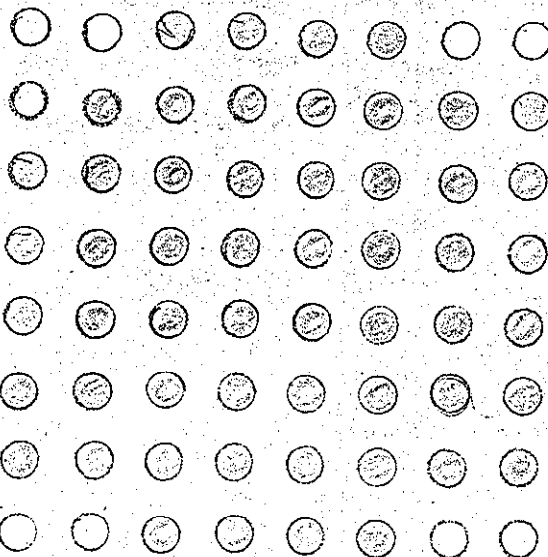
09:40

Square array, all 4
with 3 units missing
and 2 units missing
Total units = 55. Units
spacer dim. .500" x 1" x 4
unit separation = .600"

Water ht = 163.40 cm

10:11

System just critical
Drain



232
12/7/65

TEMP.
23.2°C
measured with
thermometer

54
units

(all yellow units)

Square array, all yellow units 8x8,
with 3 units missing from two corners,
and 2 units missing from two corners.
Total elements = 54. Units in al. tubes. Plastic
spacer dim. .500" x 1" x .40" and .100" x 1" x .40" = .600"
Unit separation = .600".

09:39 Water ht = ^{182.70}~~182.70~~ cm

System sub critical
Drain:

55
units

Page 232
55 units, separation = .600"
just critical

(all yellow units)

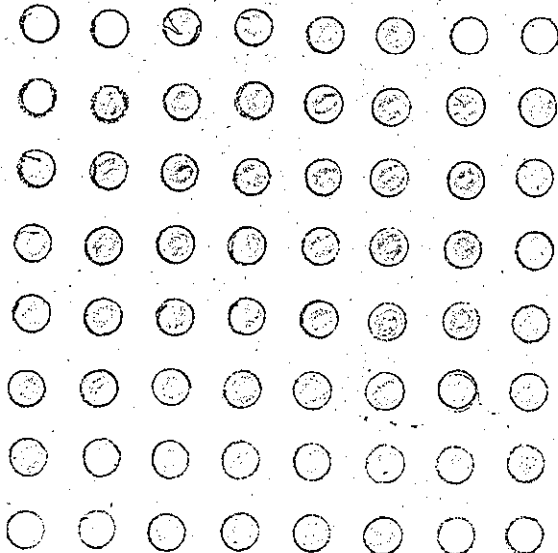
09:40

Square array, all yellow
with 3 units missing
and 2 units missing
Total units = 55. Units
spacer dim. .500" x 1" x .40"
unit separation = .600"

Water ht = 163.40 cm

10:11

System just critical
Drain:



12-7-65
AKV

232
12/7/65

TEMP:
23.2°C
measured with
thermometer

54
units

(all yellow units)

Square array, all yellow
with 3 units missing
and 2 units missing
total elements = 54. Units
spacer dim. .500" x 1" x 4"
unit separation = .60

09:39 Water ht = ~~182.70~~ 182.70 cm

heptas sub critical
Drain.

55
units

(all yellow units)

09:40

Square array, all yellow units 8x8
with 3 units missing from one corner,
and 2 units missing from three corners,
total units = 55. Units in cl. tubes. Plastic
spacer dim. .500" x 1" x 4" and .100" x 1" x 4" = .600"
unit separation = .600"

Water ht = 163.40 cm

10:11

heptas just critical
Drain.

12/7/65

233

1.2 = 7 1/2
H.H.

Page 233

5 1/2 units. Separation = 170"

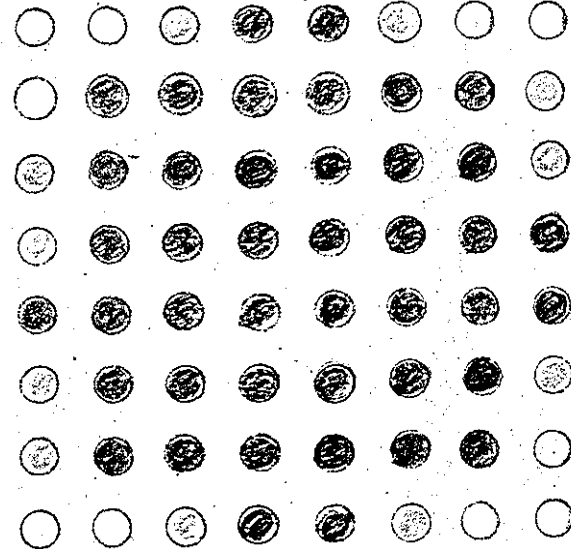
13:05

Square array 8 deep vertical

missing from 7

missing from 7

units in al. tubes



t

ments

54

11x40

"

66
W

5
D

12/7/65

54
UNITS

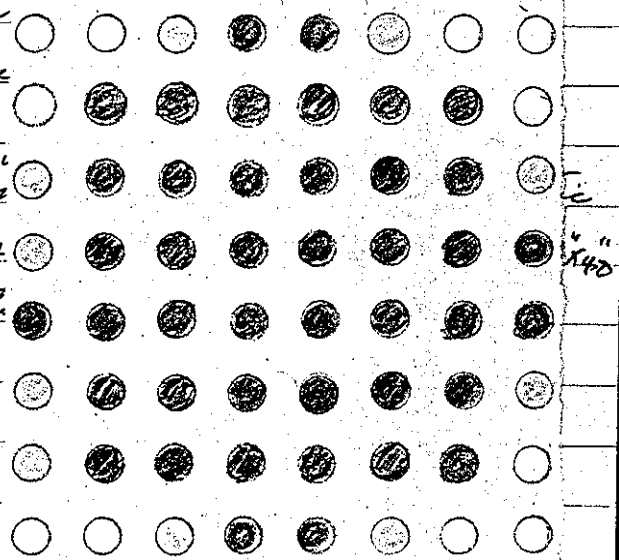
13:05 Square array 8x8 with 3 elements missing from two corners, and 2 elements missing from two corners. Total units = 54 units in al. tubes. Plastic spacer dim. .500" x 1" x .40" .100" x 1" x .40" and .100" x 1" x .40" = .700" unit separation = .700"

13:30 Water ht. = 157.70 cm
system ~~is~~ just critical
Drain.

53
UNITS

Page 233
12-7-65
AM 11
53 units, separation = .70"
6.27 cm Top reflector

13:35 Square array - 8x8 - missing from three 2 elements missing. Total elements 53. Plastic spacer dim. .500" x 1" x .40" = .700" unit separation.
Water ht. = ~~175.0~~ 173.40 cm
system just critical
Drain.



12/7/65

54
UNITS

13:05 Square array 8 x 8 unit
missing from two corners
missing from two corners
units in al. tubes. Plastic sp
.100"x1"x40" and .100"x1"x40" = .700" unit

to
4
"x40"

1330 Water ht = 157.70 cm
system ~~is~~ just critical
Drain.

53
UNITS

1335 Square array - 8 x 8 with 3 elements
missing from three corners, and
2 elements missing from one corner.
Total elements 53. Units in al. tubes, Plastic
spacer dim. .500"x1"x40" .100"x1"x40" and .100"x1"x40"
= .700" unit separation = .700"

Water ht = ~~173.40~~ 173.40 cm

system just critical
Drain.

234
12/8/65

121

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-13	K10 ⁻¹²	Meter ✓	1"	✓	10 K10 ⁻¹²
"	"	Fast ✓	"	✓	"
K	"	Meter ✓	1"	✓	"
"	"	Fast ✓	"	✓	"
PM1	700v	Alarm ✓	cont	✓	500v
PM2	1200v	Low ✓	14"	✓	900v
"	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-80
DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKH Personnel check by Z.P.C.
 Instruments and safeties checked and reset by AKH
 Source in checked by AKH Source No. M-93
 Emergency equipment in control room checked by Z.P.C.
 Instruments in trip circuit: K-12 PM-12
 Red light on by AKH Time 0805
 Start-up OK'd by Z.P.C. AKH Date 12-8-65

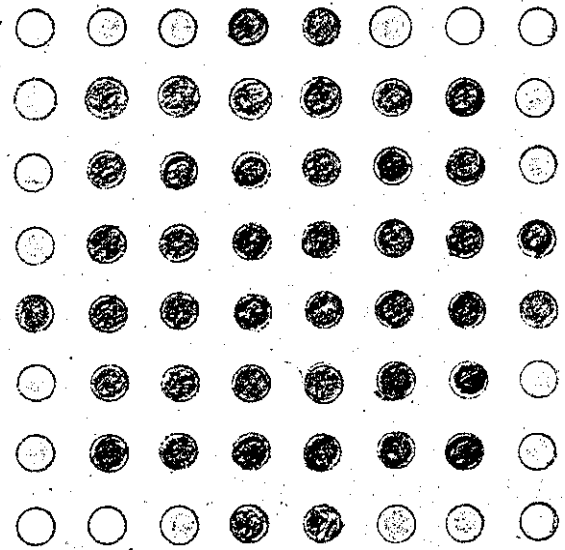
12/8/65

Page 235
58 units, separation = .800"
Super critical

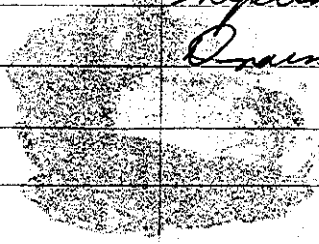
58
UNIT

12-8-65
AKW

0810 Square array 8x8
missing from
1 element missing
units in al. tubes, Plastic
and .300"x1"x40" = .800"



0838 Water ht = 161.10 cm
Septen just critical
Drain.

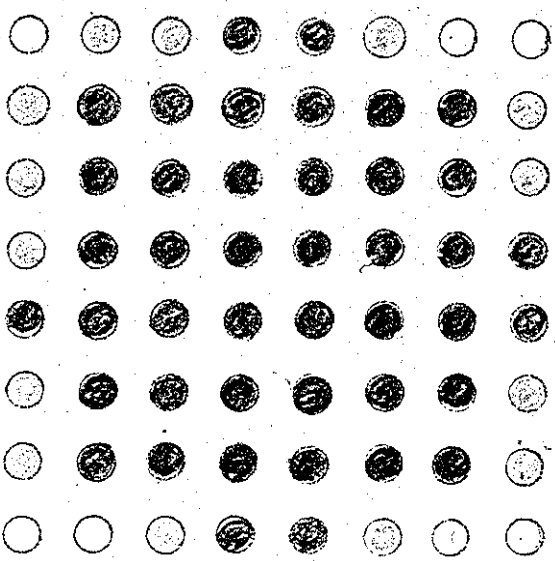


Page 235
557 units, separation = .800"

W

Sub critical
-Per = -8.14 12-8-65
AKW

Square array 8x8
from three corners
from one corner
in al. tubes, Plastic
.300"x1"x40" = .800" Len



1118 Water ht = 183.0 cm
Septen sub critical
-Per = -197.7 cm =
1173 Drain.

mg
mg
Its
nd

12/8/65

58
UNITS

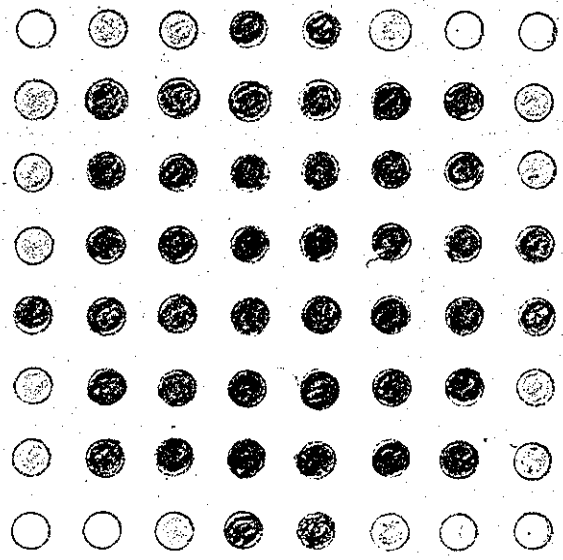
0810 Square array 8x8 with 2 elements missing from two corners, and 1 element missing from 2 corners. Units in al. tubes. Plastic spacer dim. = .500"x1"x40" and .300"x1"x40" = .800" Unit separation = .800"

0838 Water ht = 161.10 cm
Septum just critical
Drawn.



Page 235
557 units, separation = .800"
Sub critical
Per = -8.14 12-8-65
B.H.

Square array 8x8 from three corners from one corner in al. tubes. Plastic .300"x1"x40" = .800". Un



ng
g
ts
nd

1118 Water ht = 183.0 cm
Septum sub critical
Per = -197.7 cm =

1123 Drawn.

12/8/65

58
UNITS

0810 Square array 8x8 with 2 elements missing from two corners and 1 element missing from unit in al. tubes. Plastic spacer and .300"x1"x40" = .800" unit sep

0838 water ht = 161.10 cm
hepten just critical
Drain.

57
UNITS

Square array 8x8 with 2 elements missing from three corners, and 1 element missing from one corner. Total elements = 57. Units in al. tubes. Plastic spacer dims. .500"x1"x40" and .300"x1"x40" = .800". Unit separation = .800".

1118 water ht = 183.0 cm

hepten sub critical

$-P_{cr} = -197.7 \text{ cm} = -8.14$

1173 Drain.

236
12/8/65

67
units

124

12:55 Square array ^{full} 8 x 8 Total elements = 64
units in al. tubes. Plastic spacer dim.
.500" x 1" x 40", .300" x 1" x 40", and .100" x 1" x 40" = .900"
Unit separation = .900"

1321 Water hts = 182.70 cm

System sub con

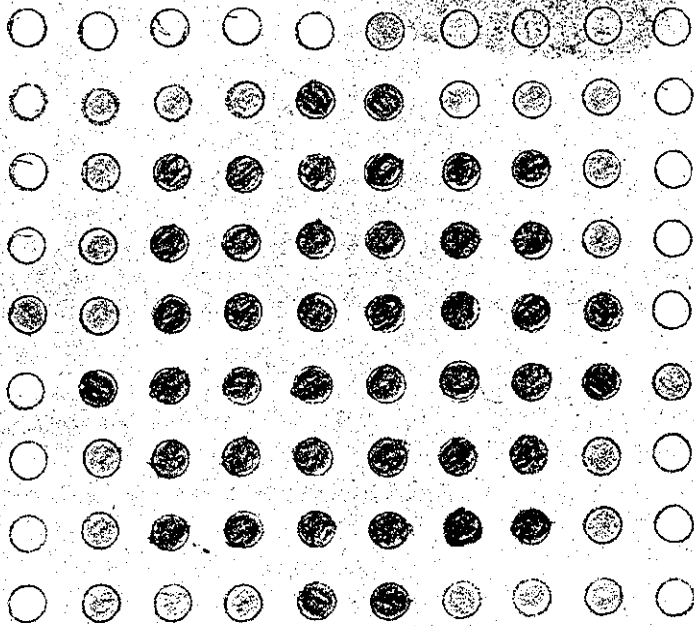
Drain.

Page 236
67 units, .90" separation: al-al
seperentical.

12-8-65
RM

1400 Square array
on three s
in al. tubes - P
.300" x 1" x 40" and

1427 Water hts = 166
System just
Drain.



to

"

236
12/8/65

41
UNITS

12:55 Square array ^{full} 8x8
units in al. tubes - P.
.500"x1"x40", .300"x1"x40", an
Unit separation = .900

13:21 Water ht = 182.70 cm
System sub critical
Drain.

67
UNITS

14:00 Square array - full 8x8 plus 7 elements
on three sides, total elements 67. Units
in al. tubes - Plastic spacer dim. .500"x1"x40"
.300"x1"x40" and .100"x1"x40" = .900" separation = .900"

14:27 Water ht = 166.2 cm
System just critical
Drain.

12/8/65

Page 237

66 units: .90" separation cl-al
keep critical: - Pen = -15.34

12/9-65
A.M.V.

		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
14:30	Square c	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	on 2 s	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	spacer di	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	.100" x 1" x 40	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
1445	Water ht	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Septic su	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	- Pen =	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
1452	Drain	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

ement
Plastic
and
0"

12/8/65

237

66
UNITS

14:30 Square array - full PX 8 plus 1 element
on 2 sides. Total elements = 66. Plastic
spacer dim. .500" x 1" x 40" ~~3.00~~ .300" x 1" x 40" and
.100" x 1" x 40" = .900". Unit separation = .900"

14:45 Water ht = 182.70 cm

Kept sub critical

- $Per = -130.4 \text{ sec} = -15.3 \%$

14:52 Drains

12/9/65
238

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	1"	✓	10×10^{-12}
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	1"	✓	"
"	"	Fast ✓	"	✓	"

700v	Alarm ✓	cont	✓	500v
PM-2 1200v	Low ✓	14"	-	900v
"	Alarm ✓	2"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-80
 DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKV Personnel check by FIDC
 Instruments and safeties checked and reset by AKV
 Source in checked by AKV Source No. M-43
 Emergency equipment in control room checked by FIDC
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKV Time 0805
 Start-up OK'd by FIDC AKV Date 12-9-65

12/9/65

Page 239

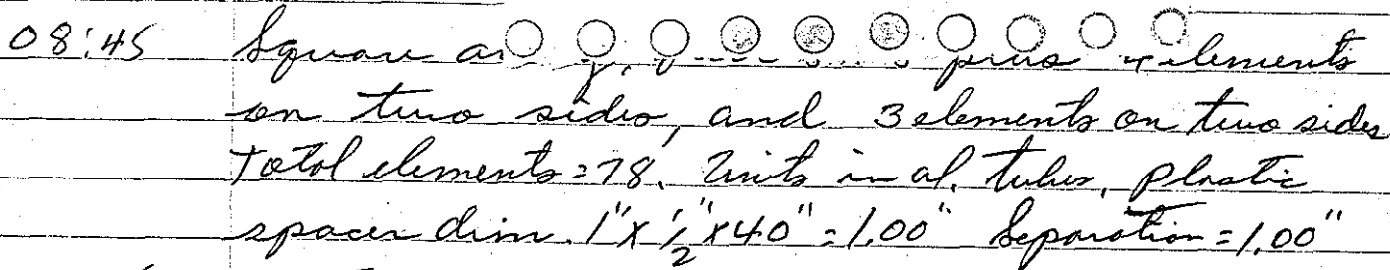
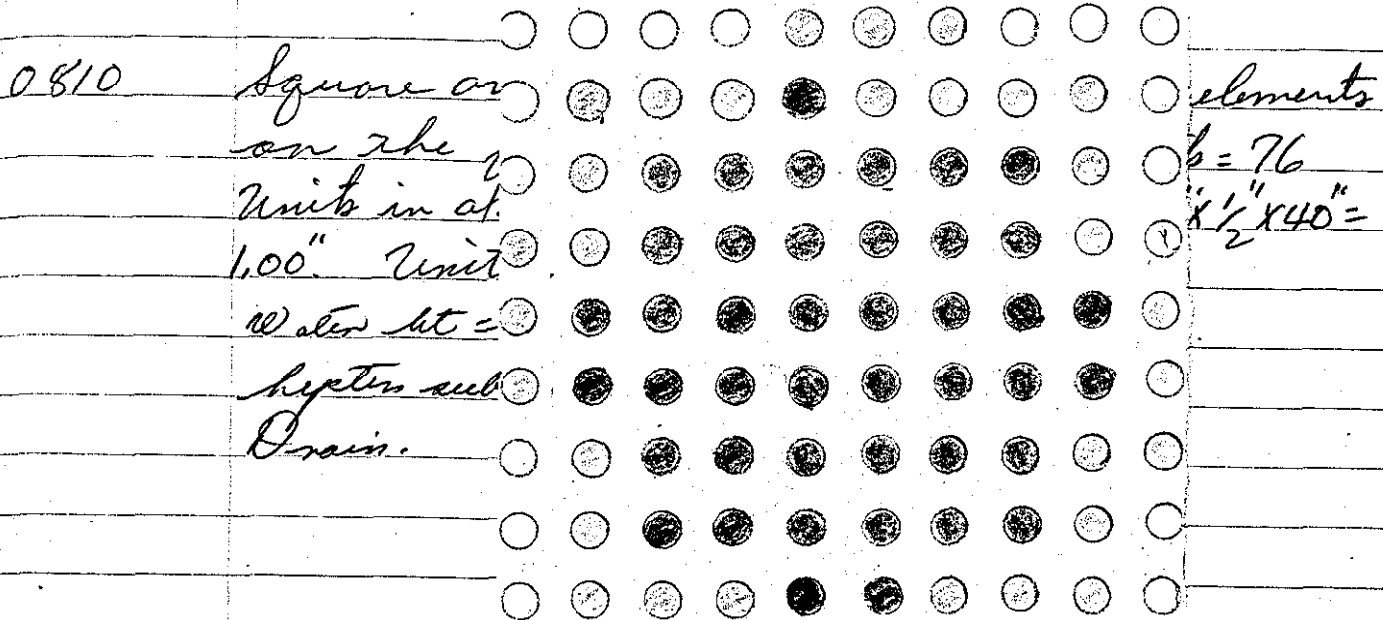
76 units: 1.0" separation, al-al

239

sub critical.

w
↑

12-9-65
HHP



0915
Water ht = 101.30 cm
hepten just critical
Drain to ~ 100 cm

12/9/65

76
UNITS

0810 Square array, full 8×8 ~~is~~ plus 3 elements
on the four sides. Total elements = 76
units in al. tubes. Plastic spacer dim. $1 \times \frac{1}{2} \times 40 =$
 1.00 " Unit separation = 1.00 "

Water ht = 182.70 cm

hytes sub critical

Drain.

78
UNITS

08:45 Square array, full 8×8 plus 4 elements
on two sides, and 3 elements on two sides
Total elements = 78. Units in al. tubes, plastic
spacer dim. $1 \times \frac{1}{2} \times 40 = 1.00$ " Separation = 1.00 "

0915 Water ht = 161.30 cm

hytes just critical

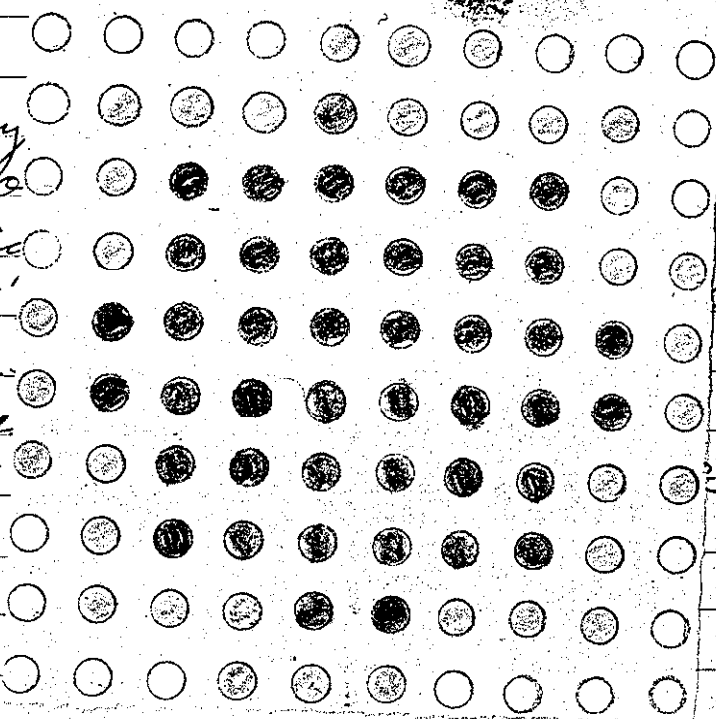
Drain to ~ 100 cm.

240
12/9/65

Page 240
77 units; separation = 1.0" actual
Super critical; w
5.37 cm top up to 1.0"
12/9/65
A. R. V.

0920 Square array
elements and to
on three sides
spacer dim. 1'

0935 Water ht = 1.72r
system just a
Drain.



to
the
" "

240
12/9/65

77
UNITS

0920 Square array, full 8×8 plus 4 elements on one side, and 3 elements on three sides. Unit in al. tubes. Plastic spacer dim. $1" \times \frac{1}{2}" \times 40" = 1.00"$ Separation = $1.00"$

0935 Water ht = 172.50 cm

System just critical
Down

Water Temp = 23.2°C

12/9/65

241

Repeat run - see Page 236

67
UNITS

12:40 Square array, full 8x8 plus 1 element on three sides. Total elements = 67 units in al. tubes - Plastic spacer dim. .500"x1"x40" .300"x1"x40" and .100"x1"x40" = .900" Separation = .900"

13:09 Water ht = 182.70 cm
System sub critical. Water Temp = 23.4°C
Drain.

13:30 Repeat of experiment above, after checking and readjusting spacers.

Water ht = 165.70 cm
System just critical
Drain.

Repeat of 67 units

page 236

 $\frac{1}{4} = 67 \text{ units} = 166.20 \text{ cm}$ $\frac{1}{4} = 67 \text{ units} = 165.70$

50 cm

14:40 Exchanged 8 elements in above array. 2 elements from each corner. These 8 elements were used in the 1" separation array.

15:10 Water ht = 165.70 cm
System just critical. Drain.

12/13/65
242

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	2 X 10 ⁻¹²	Meter ✓	1"	✓	10 X 10 ⁻¹²
"	"	Fast ✓	1"	✓	"
K-2	"	Meter ✓	1"	✓	"
"	"	Fast ✓	1"	✓	"
PM-1	700V	Alarm ✓	Cont	✓	500V
PM-2	1200V	Low ✓	14"	✓	900V
"	"	Alarm ✓	2"	✓	"

LOG-N-CALIBRATE OPERATE SOURCE No. _____

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by RAM Personnel check by F.I.O.C

Instruments and safeties checked and reset by RAM

Source in checked by RAM Source No. M-73

Emergency equipment in control room checked by F.I.O.C

Instruments in trip circuit: K-1-2 PM-1-2

Red light on by RAM Time 1320

Start-up OK'd by RAM F.I.O.C Date 12-13-65

12/13/65

Units acct. of
at tubes.

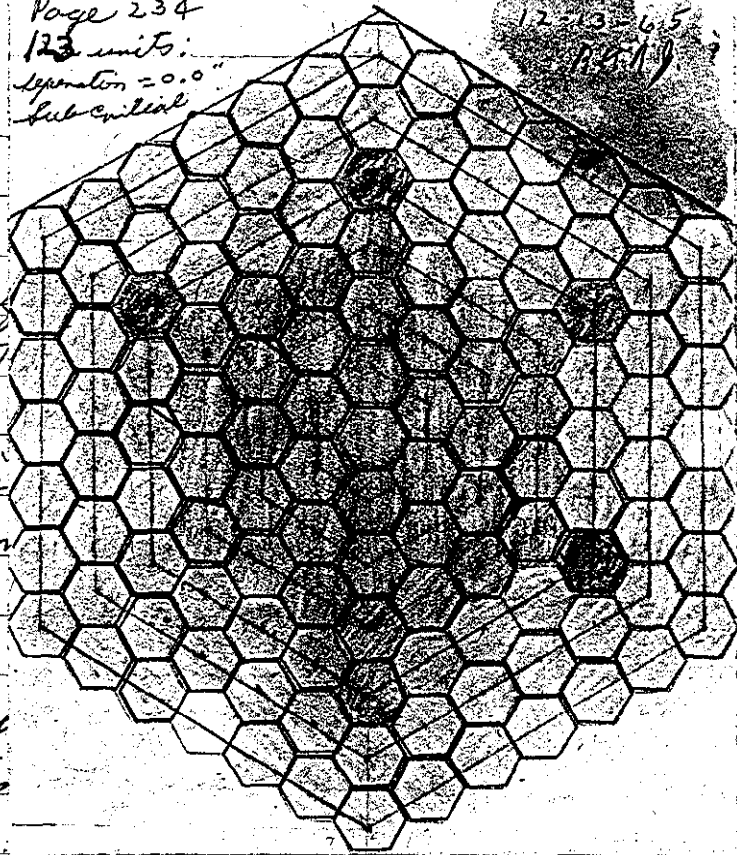
Page 234
123 units:
separation = 0.0"
sub-critical

243

12-3-65
12/13/65

13:25 Training
plus 7
and 6
in si
E. Lerner

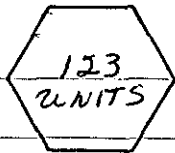
Water
System
Drain



ings,
facs
facs,
tubes
b = 12.3
0"

12/13/65

Units out of
al tubes.



123

13:25 Triangular array - Five full rings,
plus 7 elements on two opposite faces
and 6 elements on the other four faces,
in sixth ring. Elements out of al. tubes
Elements at contact. Total elements = 123
Unit separation = 0.0"

Water ht = 182.70 cm

System very sub critical
Drain.

244

12/17/65

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	SET	START-UP RANGE
K-13 X 10	-12	Meter ✓	2"	✓	10 X 10 - 12
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	1.5"	✓	"
"	"	Fast ✓	"	✓	"

PM-1 700V Alarm ✓ Cont ✓ 500V
 PM-2 900V Low ✓ 10" ✓ 900V
 " Alarm ✓ 5" ✓ "

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROSE LIGHT

START-UP CHECK LIST

Equipment checked by AKM Personnel check by AKM ecc.

Instruments and safeties checked and reset by AKM

Source in checked by AKM Source No. M-93

Emergency equipment in control room checked by RKM

Instruments in trip circuit: K-1-2 PM-1-2

Red light on by AKM Time 1550

Start-up OK'd by ecc-AKM Date 12-17-65

Units out of al tubes.

12-17-65

Triangular array: 61 units. Four full rings; tube sheets: .10" separation; units out of al tubes.

1432 Water ht = 182.50 cm

System sub critical.

1436 Drain water down to 167.50 cm.

For $n = .001$ $K-1 = 10 \times 10^{-12}$ (3%) $K-2 = 10 \times 10^{-12}$ (7%).

1439 Stirrer on

1445 Stirrer off: For $n = .001$, $K-1 = 10 \times 10^{-12}$ (3%)

$K-2 = 10 \times 10^{-12}$

Drain:

Page 245

61 units, separation .10"
sub critical

12-17-65
M.H.K.

1505 added 6 units

four full rings of 67 units

1523 Water ht = 126"

System just

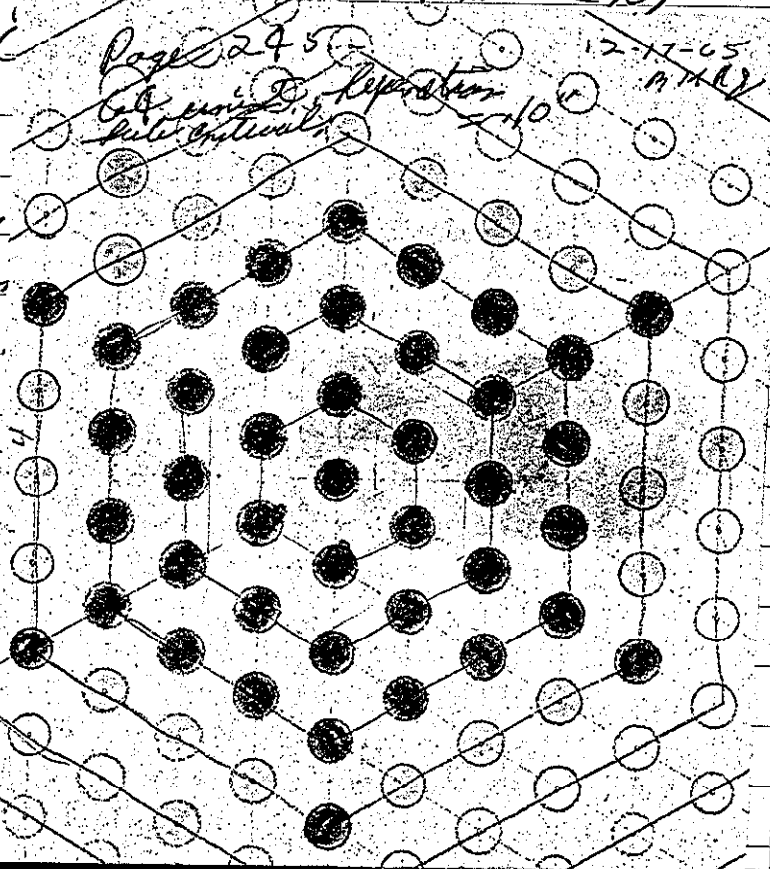
Drain to

Removed three

units.

1548 Water ht = 182

System sub cr



Units out of al tubes.

245

12-17-65

Triangular array: 61 units. Four full rings; Tube sheets: .10" separation; units out of al tubes.

1432 Water ht = 182.50 cm

System sub critical.

1436 Drain water down to 167.50 cm.

Fog $\eta = .001$ $K-1 = 10 \times 10^{-12}$ (3%) $K2 = 10 \times 10^{-12}$ (7%).

1439 Stirrer on

1445 Stirrer off: Fog $\eta = .001$. $K-1 = 10 \times 10^{-12}$ (3%)
 $K2 = 10 \times 10^{-12}$ (7%).

Drain:

1505

added 6 units: one on each face; now four full ring; 6 in fifth ring; total of 67 units.

1523

Water ht = 126.90 cm

System just critical

Drains to ~ 1" below zero.

Removed three unit. Now have 64 units.

1548

Water ht = 182.90 cm

System sub critical.

over



246
12/20/65

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K13	10 ⁻¹²	Meter ✓	4"	✓	10 x 10 ⁻¹²
"	"	Fast ✓	"	✓	"
"	"	Meter ✓	3"	✓	"
"	"	Fast ✓	"	✓	"
PA#1	7000	Alarm ✓	1000	✓	5000
PA#2	12000	Low ✓	18"	✓	9000
"	"	Alarm ✓	4"	✓	"
LOG-N CALIBRATE		✓	OPERATE	✓	SOURCE No. 13-80
DUMP WELL PROBE LIGHT		✓			

START-UP CHECK LIST

Equipment checked by AKH Personnel check by AKH
 Instruments and safeties checked and reset by AKH
 Source in checked by AKH Source No. 12-43
 Emergency equipment in control room checked by AKH
 Instruments in trip circuit: K-1-2 D-17-1-2
 Red light on by AKH Time 0810
 Start-up OK'd by AKH Date 12-20-65

Units out of al tubes.

12-20-65

Triangular array: 65 units: Four full rings.
plus 4 units in 4th ring: separation .10"
units out of al. Page 247

65 units: separation = .10"
Experimental

0903 Water ht = 168.3

system just critical

0905 Stirrer on:

+ Per. $\tau = 586.71 \text{ sec}$

0910 Stirrer off: system

0915 Water ht = 166.5

system just critical

0917 + Per: Water ht

$\tau = 204.3 \text{ sec}$

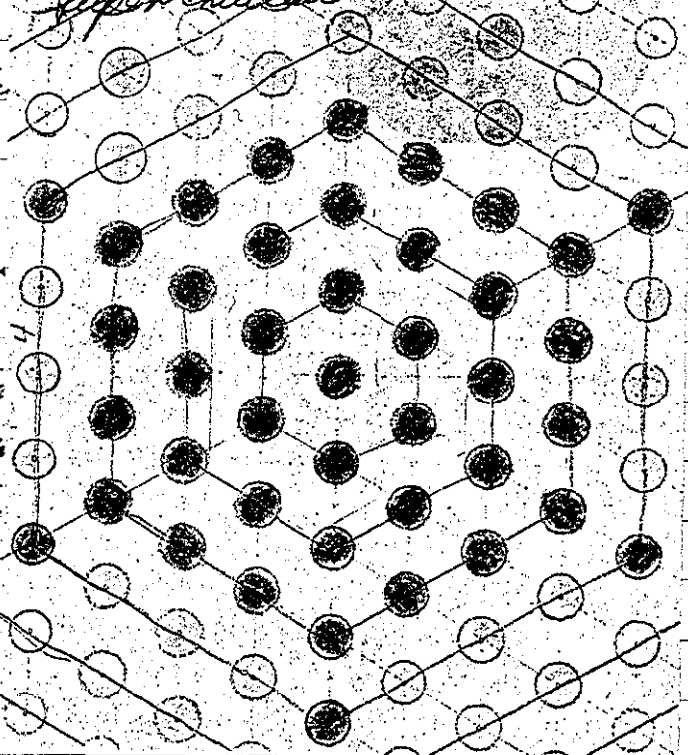
0922 Drain:

Triangular array 45 units. 3 full rings: 6 unit
in 4th ring: separation = .35"

Water ht = 133.70 cm:

system just critical

over.



Units out of al tubes.

12-20-65

Triangular array: 65 units
plus 4 units in fifth
units out of al tubes

0903 Water ht = 168.30 cm
system just critical.

0905 Stirrer on:
+ Per. $\tau = 586.71 \text{ sec} = 2.1 \text{ hr}$

0910 Stirrer off. System still Proc.

0915 Water ht = 166.40 cm
system just critical 1.90 cm
diff critical
ht.

0917 + Per: Water ht = 169.70 cm. $D_h = 3.30 \text{ cm}$
 $\tau = 204.3 \text{ sec} = 5.5 \text{ hr} = 1.6 \text{ hr}$

0922 On in:

Triangular array 45 units. 3 full rings; 8 unit
in 4th ring separation = .35"

Water ht = 133.70 cm

System just critical

over.

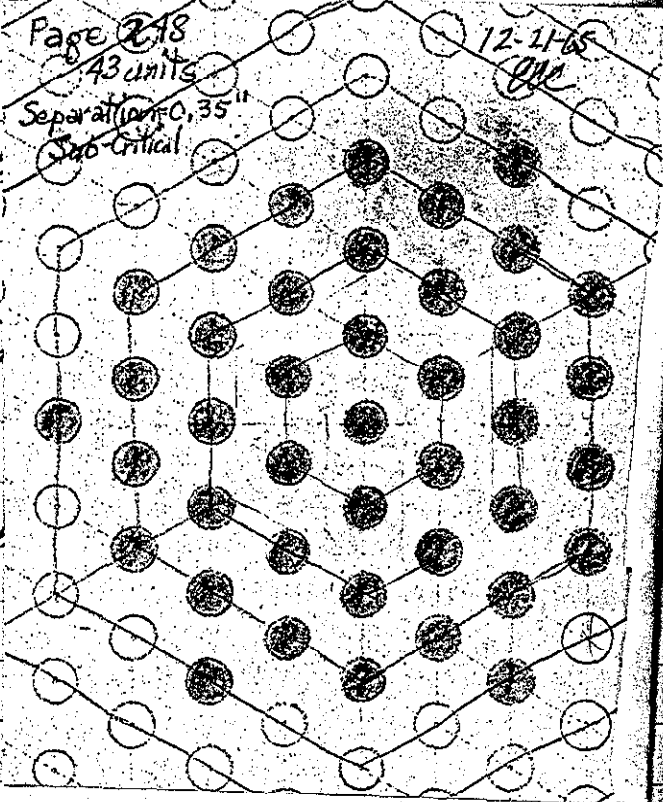
248
12/20/65

Triangular array: 43 units, 3 full ring, 6 units
in 4th ring. Separation = 3.5"

1546 Water ht = 182.
System sub crit
~~Drain~~

1548 Lower in: still

1553 Steamer off.
System still sub
Drain.



248

12/20/65

Triangular array: 43 units, 37
in 4th ring. Separation = 2

1546 Water ht. = 182.20 cm
System sub critical.
~~Drain:~~

1548 Same as: Stepper on:

1553 Stepper off.
System still sub critical.
Drain.

12/21/65

INSTRUMENT CHECK

249

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	4"	-	10×10^{-12}
	"	Fast	"	✓	"
K-2	"	Meter ✓	4"	✓	"
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	cont	✓	500V
PM-2	1200V	Low ✓	15"	✓	900V
	"	Alarm ✓	4"	✓	

LOG N CALIBRATE OPERATE SOURCE No. B-80
 DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKM Personnel check by AKM
 Instruments and safeties checked and reset by AKM
 Source in checked by AKM Source No. M-40
 Emergency equipment in control room checked by AKM
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKM Time 0950
 Start-up OK'd by ACC AKM Date 12-21-65

over

250

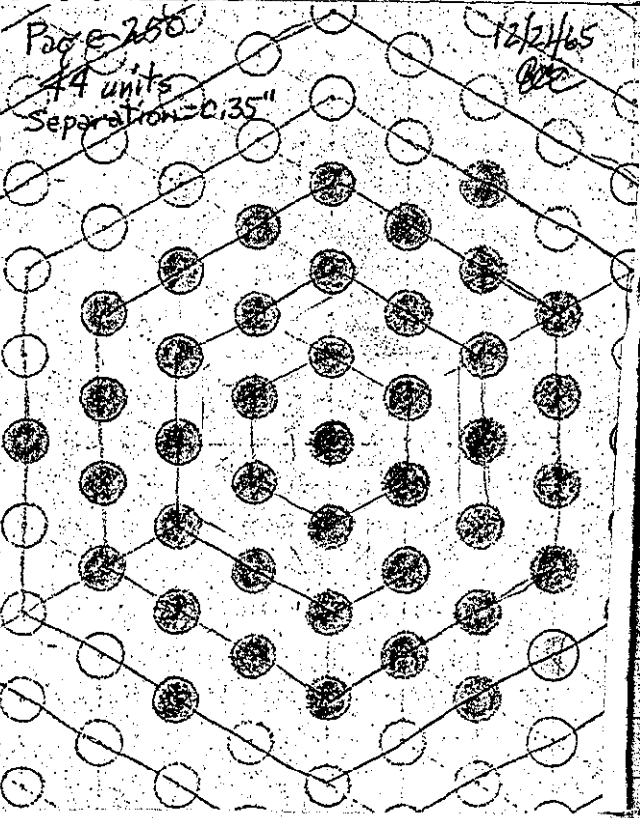
12-21-65

Triangular array: 49 units, 3 full rings: 7 units
in 4th ring. Separation = .35"

Page 250

12/21/65
OC

10 28 Water ht. = 155
system just critical
Drain.



10 38 added $1 \frac{3}{8}$ " x 533
86 gram of B4C.

11 05 Water ht. = 182.30
system sub critical
Drain.

11 10 Removed B4C ~~stick~~

11 36 Water ht. = 154.30 cm $b_h = 1.60$
system just critical

11 38 + Per: Water ht. = 155.90 cm:
 $\bar{v} = 284.66 \text{ cm} = 4.1 \phi = 2.6 \text{ f/cm}$

11 40 Drain: Water temp
= 23.2°C

Water sample taken Reg # 684493

250

12-21-65

Triangular array: 44 units.
in 4 ft ring. Repetition =

10 28 Water ht = 155.85 cm
system just critical
Drain.

10 38 added ⁷ 1 $\frac{3}{8}$ " x 5 $\frac{3}{4}$ " - 30455 tube. with
86 gram of B4C. ⁷ in 4 ft ring.
array same as above.

11 05 Water ht = 182.30 cm
system sub critical
Drain.

11 10 Removed B4C ~~7~~ ^{tube}

11 36 Water ht = 154.30 cm $b_h = 1.60$
system just critical

11 38 + Per: Water ht = 155.90 cm.
 $\tau = 284.66 \text{ m} = 4.1 \phi = 2.0 \phi / \text{m}.$

11 43 Drain:

Water temp
= 23.7 °C

Water sample taken Rep # 684493

1/4/65
66

units out of Alarm. Tubes

251

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	cont	✓	10×10^{-12}
	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	1/2"	✓	"
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	100V	Alarm ✓	cont	✓	500V
PM-2	1200V	Low ✓	14"	✓	900V
	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE ✓ OPERATE ✓ SOURCE No. B-80
 DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKV Personnel check by F.D.C
 Instruments and safeties checked and reset by AKV
 Source in checked by AKV Source No. 1A-93
 Emergency equipment in control room checked by F.D.C
 Instruments in trip circuit: K-1-2 PIV-1-2
 Red light on by AKV Time 0915
 Start-up OK'd by F.D.C AKV Date 1-4-66

(OVER)

JUNE							1965						
S	M	T	W	T	F	S	1	2	3	4	5		
			6	7	8	9	10	11	12				
13	14	15	16	17	18	19	20	21	22	23	24		
25	26	27	28	29	30								

WEDNESDAY

30

JUNE

181

184

1966

SSL SPECTROGRAPHIC REPORT

MATERIAL TYPE		DATE		REQUESTER		BATCH NUMBER		REQUISITION NUMBER					
non. U		12.29.65		Reedy		1		684493					
REPORTING UNIT						REPORTING BASIS						PLATE SHEET NO.	
<input type="checkbox"/> %	<input checked="" type="checkbox"/> µg/ml	<input checked="" type="checkbox"/> Sample as Received				<input type="checkbox"/> Dry Basis		17610					
<input type="checkbox"/> ppm	<input type="checkbox"/> Total µg	<input type="checkbox"/> Metal Basis		<input type="checkbox"/> Ash Basis									
<input type="checkbox"/> Other		<input type="checkbox"/> Other		Watw P. 200 Log 525781									
Ag	<.05	Al	.1	Au	<.2	B	<.1	Ba	<.02	Be	<.01	Bi	<.1
Ca	.16	Cd	<.4	Co	<.05	Cr	.02	Cs	<6	Cu	<.05	Fe	<.2
Hf	<.2	K	<.4	Li	<.02	Mg	<.1	Mn	<.05	Mo	<.02	Na	.25-
Nb	<.2	Ni	<.1	P	<10	Pb	<.1	Pd	<.02	Pt		Rb	<1.5-
Sb	<.4	Si	.15-	Sn	<.05	Ta	<1.5	Th	<.4	Ti	NOTICE .05	U	<3
V	<.02	W	<.8	Zn	<.8	Zr	<.02	The spectrographic analysis on this material was by a semi-quantitative method which gives approximate values only. A specific method for this material is not available at Y-12. Development work will be required.					
Ce		Dy		Er		Eu		Ho		Lu		Yb	
Nd		Pr		Sm		Tb		Y					

252

09:30

Purpose is to try ~~and~~ to repeat critical
1st. Same array as shown on page 250.

1002

Water ht = 155.90 cm
System just critical.

1004

Stirrer on.

1009

Stirrer off:
System still just critical
Water ht = 155.90 cm
Drain to - 0.0 cm.

Water Temp
= 23.2°C

1041

Water ht = 155.90 cm
System just critical

1042

Stirrer on:

1047

Stirrer off:
System still just critical
Water ht = 155.90 cm
Drain.

Water Temp
= 23.5°C

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	1"	✓	10×10^{-12}
	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	$\frac{1}{2}$ "	✓	"
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700v	Alarm ✓	cont	✓	500v
PM-2	1200v	Low ✓	12"	✓	900v
	1"	Alarm ✓	2"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKH Personnel check by FIDC

Instruments and safeties checked and reset by AKH

Source in checked by AKH Source No. 19-23

Emergency equipment in control room checked by FIDC

Instruments in trip circuit: K-1-2 PM-1-2

Red light on by AKH Time 10:00

Start-up OK'd by FIDC AKH Date 1-18-66

AKH

254

1-18-66

Bone units

Page 254

Separation = 0.59"

39 units
sub-critical

Triangular array
+ 2 element in 4
separation = 0.59"

1057

Water ht = 18.3
System sub-crit

1100

Stirrer on. Sa

1105

Stirrer off!
System sub-critical
Drain.

Log $\eta = 0.022$

Page 254

Separation = 0.59"

40 units
sub-critical

1115

added 1 element
3 full rings + 3
separation = 0.59"

1155

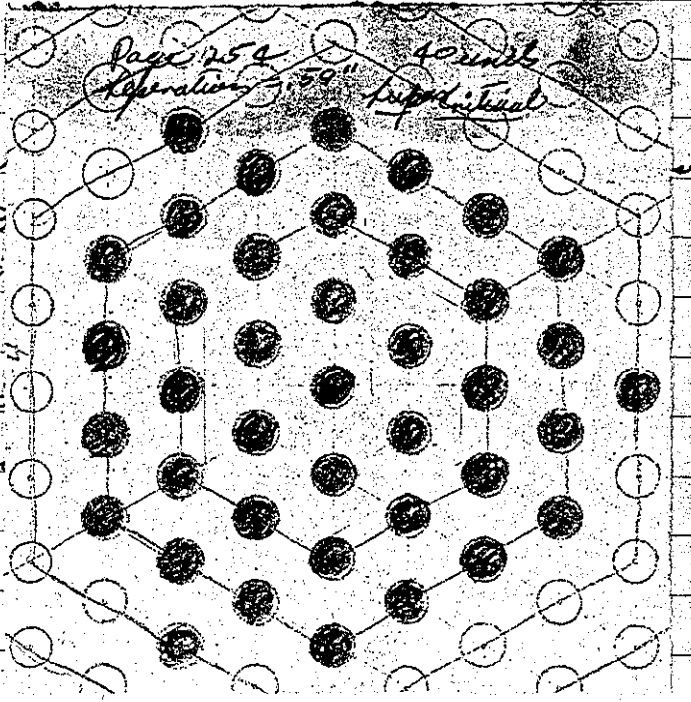
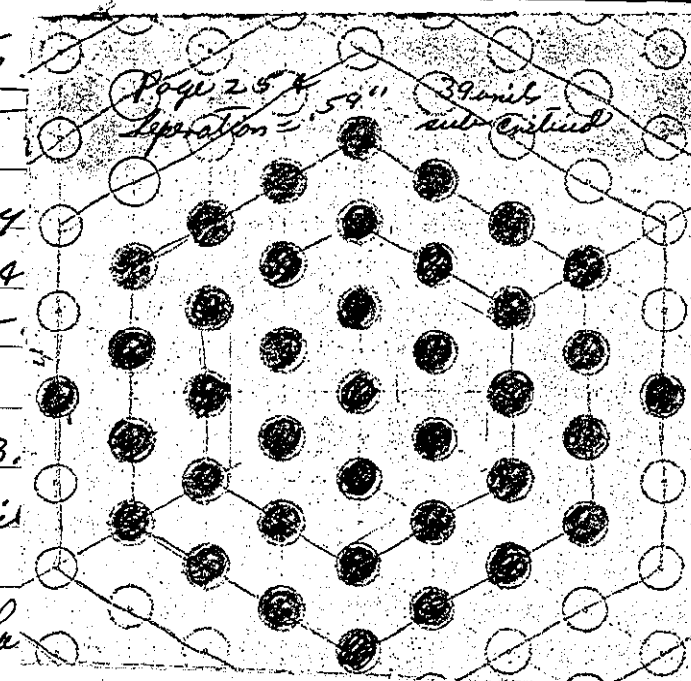
Water ht = 16.0
System just cr

1156

Stirrer on.

1201

Stirrer off!
Water ht = 162.90 cm
System still just critical
Drain.



254

1-18-66

Bone units.

Triangular array: 39 units. 3 full rings.
+ 2 elements in 4th ring.
Separation = 0.59"

1057 Water ht = 183.50 cm; Log $\eta = .0022$
System sub critical

1100 Stirrer on. Same in.

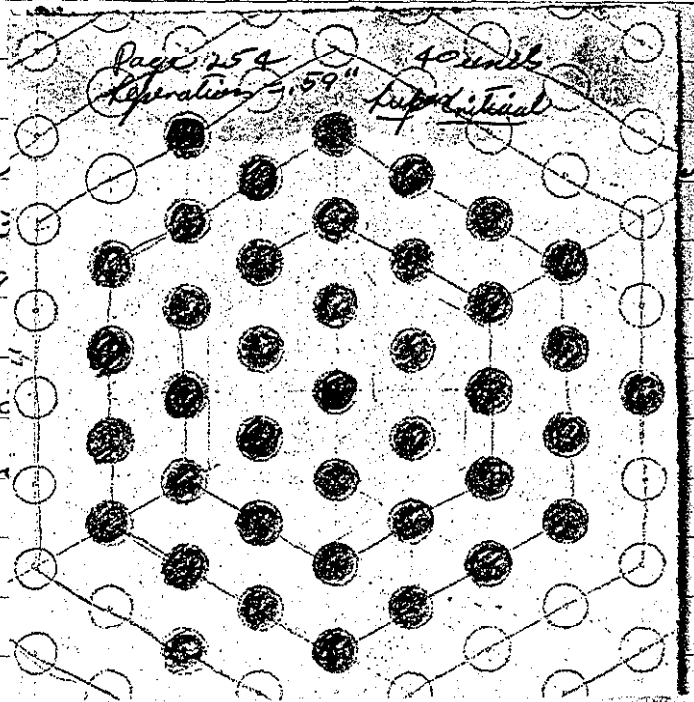
1105 Stirrer off; Log $\eta = .0022$
System sub critical
Drain.

1115 added 1 element
3 full rings + 3
Separation = 0.59"

1155 Water ht = 160
System just cr

1156 Stirrer on;

1201 Stirrer off;
Water ht = 162.90 cm
System still just critical
Drain.



254

1-18-66

Bone units.

Triangular array: 39 units. 3 full rings.
+ 2 elements in 4th ring.
Separation = 0.59"

1057 Water ht = 183.
System sub critical

1100 Stirrer on. Sa

1105 Stirrer off.
System sub critical
Drain.

1115 added 1 element in 4th ring. Now have
3 full rings + 3 elements in 4th ring.
Separation = 0.59" 40 units.

1155 Water ht = 162.90 cm
System just critical.

1156 Stirrer on.

1201 Stirrer off.
Water ht = 162.90 cm
System still just critical
Drain.

1-18-66

255

1254 Same array as described on bottom of page 254. Except now element one in-line; that is points-to-points, not flat-to-flat. Purpose is to see if the ^{alignment} alignment of the element changes critical ht. (The elements ~~are~~ one held in lines with .05" plastic spacers.)

1353 Water ht = 162.90 cm; ^{245.80 cm} system slightly + Pos.
① + Pos. = $T = 630.17 \text{ cm} = 2.04 = 2.5 \text{ f/cm.}$

1403 Water ht = 162.10 cm
system just critical

1404 Stirrer on;

1406 Stirrer off; system slightly + Pos.

1412 Water ht = 161.90 cm
system just critical
Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	1"	✓	10×10^{-12}
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Fast ✓	"	✓	"
P-1					
PM-1	700V	Alarm ✓	Cont	✓	500V
PM-2	1200V	Low -	12"	-	900V
"	"	Alarm -	2"	-	"

LOG N CALIBRATE OPERATE SOURCE No. 13-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AK Personnel check by F.D.C

Instruments and safeties checked and reset by AKK

Source in checked by AKK Source No. M-93

Emergency equipment in control room checked by F.D.C

Instruments in trip circuit: K-1-2 PM-1-2

Red light on by AKK Time 0820

Start-up OK'd by F.D.C AKK Date 1-19-66

1-19-66

Bond

Page 257
Separation = 0.75

DMG
42 units
Super crit

Triangular array: 4
5 element in 4th

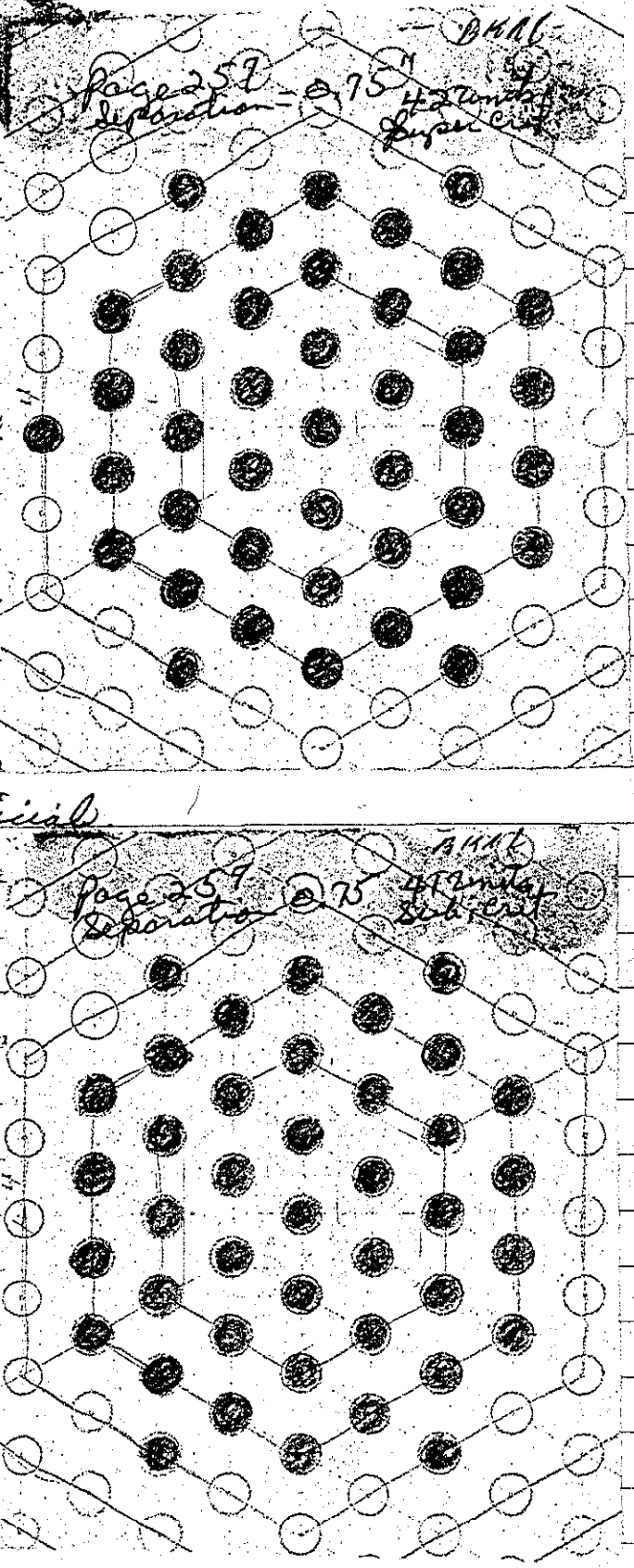
0914 Water ht = 149.90
System just critical
Drain too

0919 Removed 1 unit
have 41 units.

0938 Water ht = 182.80
System sub critical
Drain.

Page 259
Separation = 0.75

DMG
42 units
Sub crit



1-19-66

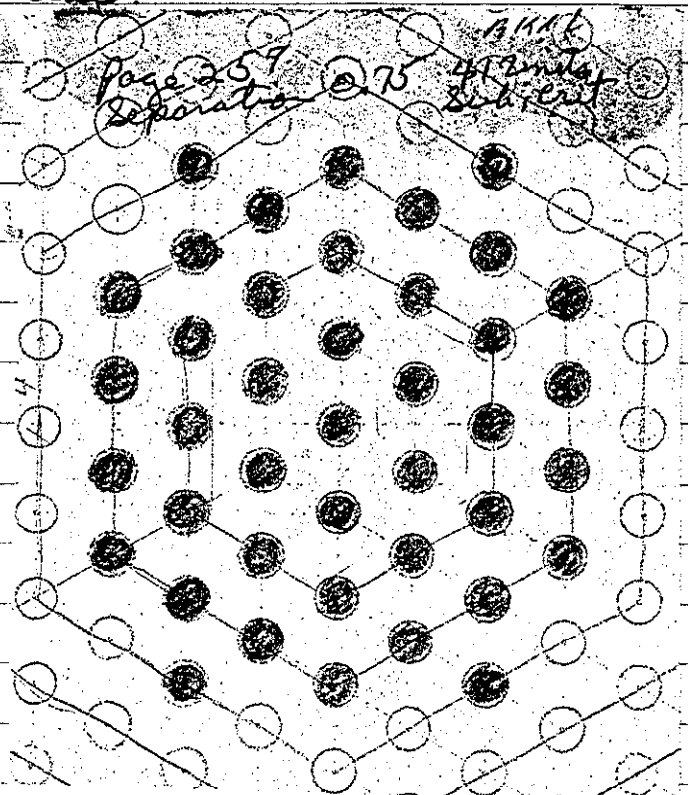
Bond

Triangular array: 42 units 3 full rings +
5 element in 4th ring: separation = 0.75"

0914 Water ht = 149.90 cm.
System just critical.
Drain too ~ 90 cm.

0919 Removed 1 unit in 4th ring: now
have 41 units. Separation = 0.75"

0938 Water ht = 182.80 cm.
System sub critical
Drain



258

1-19-66

Triangular array
9 units in 9ths

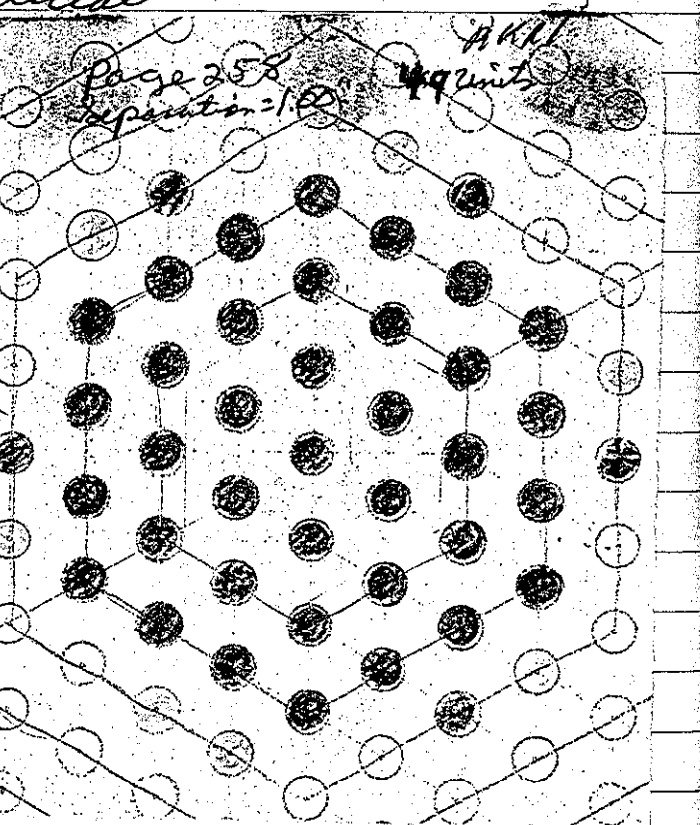
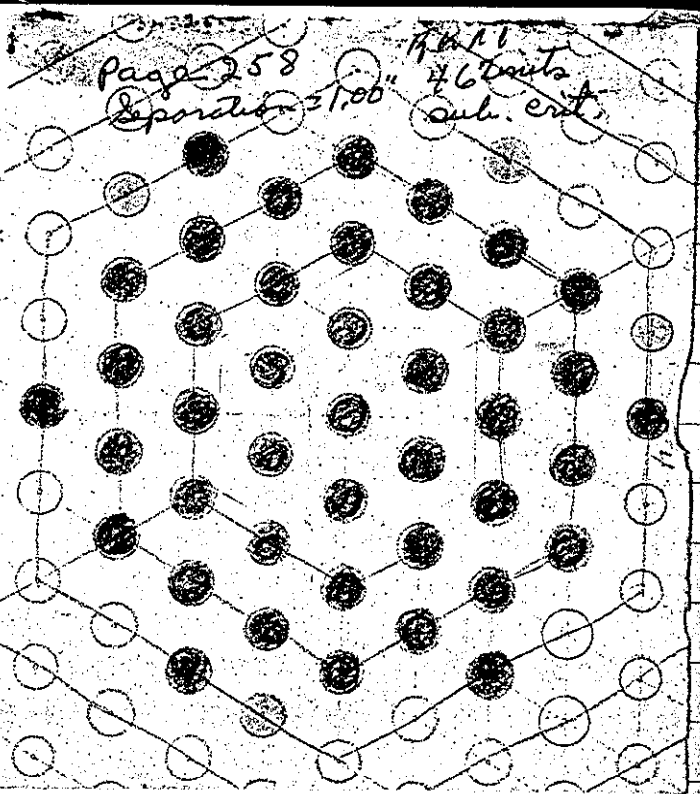
1127 Water ht = 182
System sub c
Drain

1220 added 1 unit
47 units. by

1243 Water ht = 182, 80 cm
System sub critical
Drain

1250 added 2 unit
units. separation

1312 Water ht = 18
System sub crit.
Drain



258

1-19-66

Triangular array: 46 units 3 full ring. +
9 units in 4th ring. Separation = 1.0"

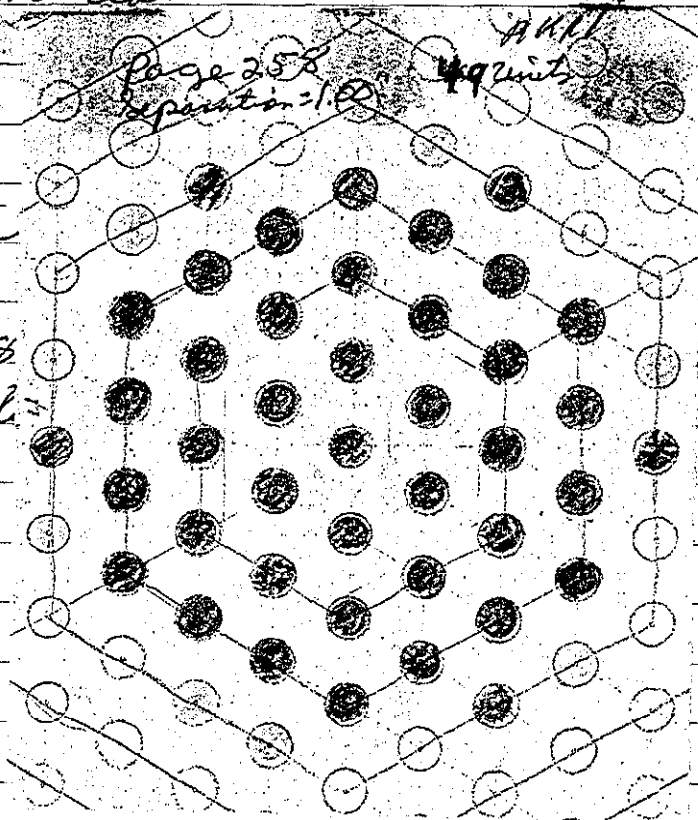
1127 Water ht = 182.80 cm
System sub critical
Drain.

1220 Added 1 unit to 4th ring. Now have
47 units. Separation = 1.0"

1243 Water ht = 182.80 cm
System sub critical
Drain.

1250 added 2 units
units. Separation

1312 Water ht = 18
System sub critical
Drain.



258

1-19-66

Triangular array: 46 units. 3 full ring. +
9 units in 4th ring. Separation = 1.0"

1127 Water ht = 182.80 cm
System sub on
Drain.

1220 Added 1 unit to
47 units. Sp

1243 Water ht = 182.
System sub on
Drain.

1250 added 2 units to 4th ring. Now have 49
units. Separation = 1.0"

1312 Water ht = 182.80 cm
System sub critical
Drain.

1322 added 9 units to 4th ring. Now have 53 units. Separation = 1.0"

1347 water ht = 147.90 cm

Water Temp. = 23.5°

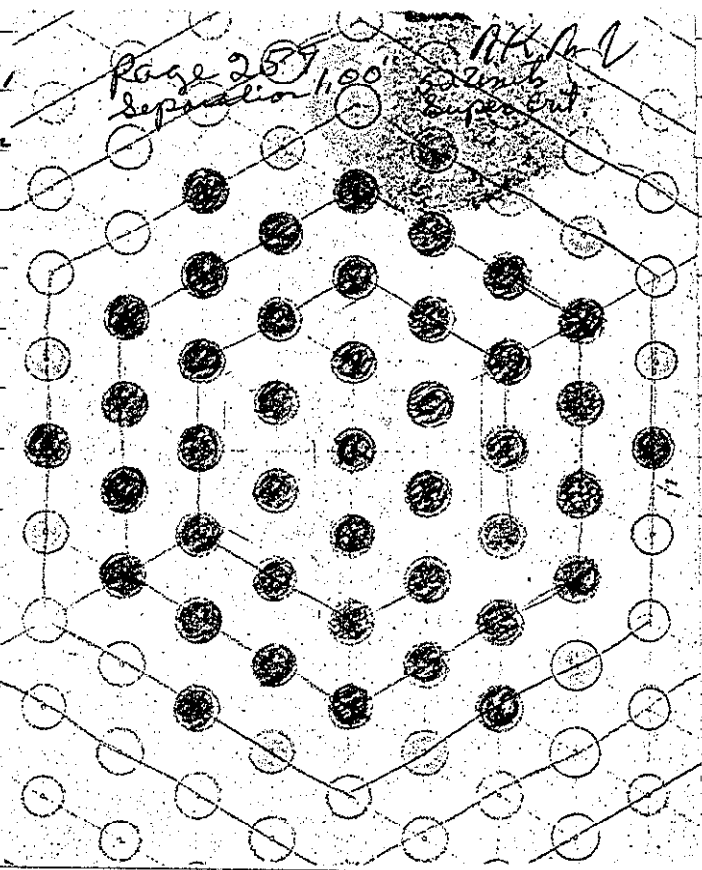
System ~~at~~ just critical.
Drain.

1415 Removed 1 unit from 4th ring. Now have 52 units. Separation = 1.0"

1447 Water ht = 171
System just on
Drain.

Page 257
Separation 1.00"

100 units
Superficial



1322 added 9 unit to 4th ring. Now have 53
units. Separation = 1.0"

1347 Water ht = 147.90 cm

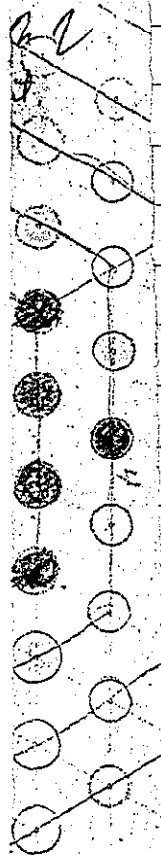
Water Temp.
= 23.5°

System ~~still~~ just critical.
Drain.

1415 Removed 1 unit from 4th ring. Now have
52 units. Separation = 1.0"

1447 Water ht = 171.70 cm

System just critical.
Drain.



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 X 10 ⁻¹²	None ✓	1"	✓	10 X 10 ⁻¹²
"	"	" ✓	"	✓	"
K-2	"	1 Meter ✓	"	✓	"
"	"	Foot ✓	"	✓	"
PA-1	300v	Alarm ✓	cont 14"	✓	500v
PA-2	1200v	Low ✓	14"	✓	900v
"	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE ✓ OPERATE ✓ SOURCE No. 13-801

DUMP WELL PROBE LIGHT _____

START-UP CHECK LIST

Equipment checked by AKH Personnel check by F.O.C

Instruments and safeties checked and reset by AKH

Source in checked by AKH Source No. M-23

Emergency equipment in control room checked by F.O.C

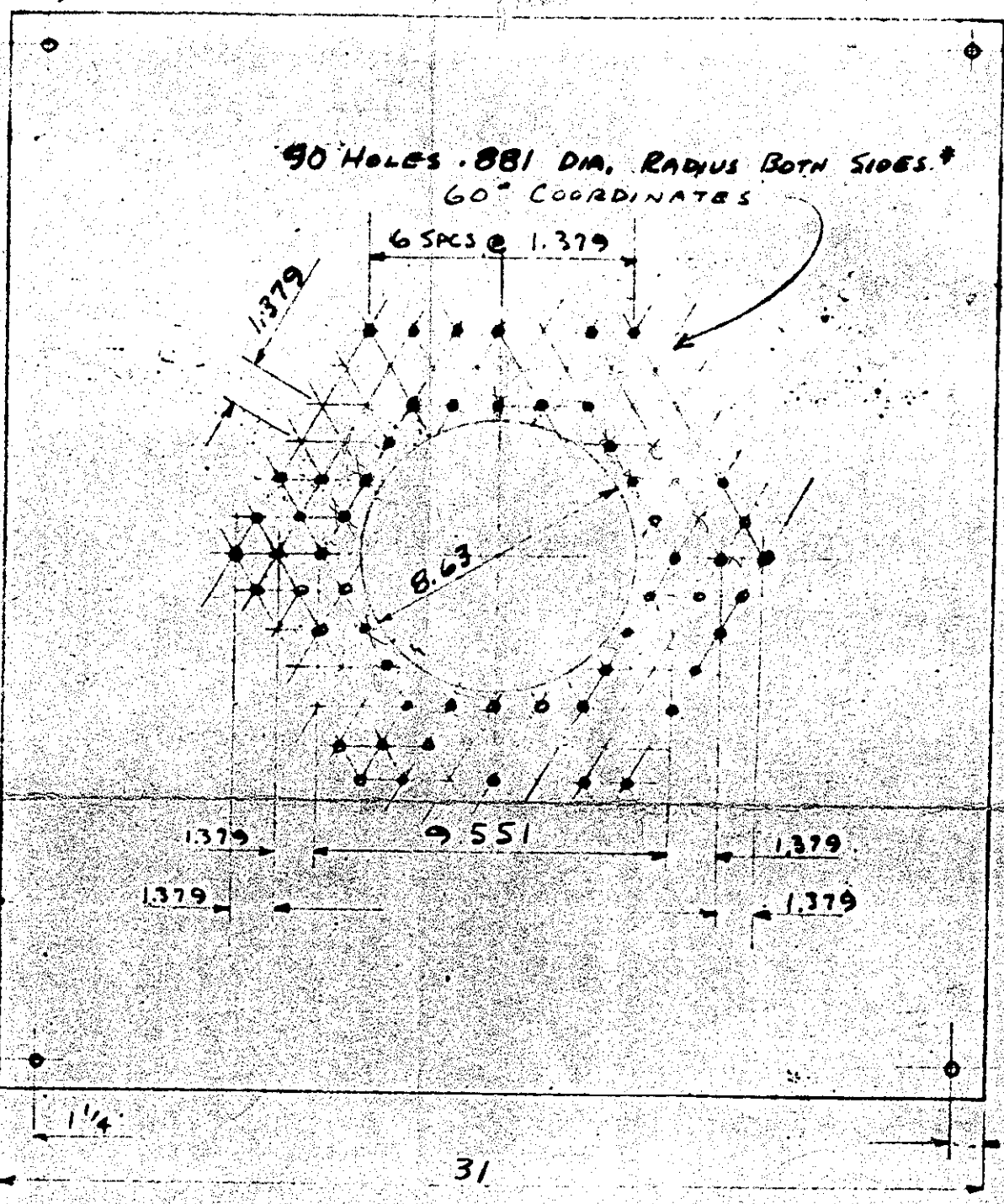
Instruments in trip circuits: K-1-2 PA-1-2

Red light on by AKH Time 1310

Start-up OK'd by F.O.C AKH Date 1-20-66

13/10

9/16 TYPICAL



2 REQ'D - DRILL AT SAME TIME
1/2 PLEXIGLAS * MATCH MARK FOR ORIENTATION

* NO SHARP EDGES IN .881 DIA. HOLES ACCEPTABLE

W.O. A. 30822-80
9213

TUBE SHEETS
"CRUME ELEMENTS"

TUNNELL 12-2-65

42 red, 2 yellow.

1300

Now have 44 unit in a bundle: random operation: ~~bundle~~ bundle is in a tube sheet with a center hole of 8.63" see ~~that~~ drawing attached to this page. Each element is in 2 at tube. The outer tube is 1.425" O.D. X 1.050" I.D. X 47.5" long and the inner tube is 1.00" O.D. X .930" I.D. X 53.5" long. The double tube is a mock-up of shipping container. (See C. Crumley.)

1390

Water ht = 182.8 cm
system very sub critical
Drain.

1400

Added 29 units (brown), to first ring in tube sheet. (spec, this page). Now have 68 units.

Water ht = 91.50 cm.
system super critical
Drain.

over.

1430 Removed 12 units from 1st ring in tube sheet. Now have 56 units.

1452 Water ht = 182.80
System sub critical
Drain.

1457 added 3 units in first ring in tube sheet. Now have 59 units. 44 in center and 15 in first ring.

1520 Water ht = 182.80 cm
System sub critical
Drain.

1525 added 3 units in first ring in tube sheet. Now have 62 units. 44 in center and 18 in first ring. (3 on each face.)

1544 Water ht = 129.10 cm
System just critical
Drain.



total of 61 units.

263

1547 Removed 1 unit in first ring in tube sheet. Now have 61 units. 49 in center and 17 in first ring. 3 on 5 faces and 2 on 1 face.

Water ht = 151.50 cm
System just critical
Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	DISCREPANCY	SET	START-UP RANGE
K1	3×10^{-12}	None	1"	✓	10×10^{-12}
"	"	None	"	✓	"
K2	"	None	cont.	✓	"
"	"	None	"	✓	"
PN 1	700-V	Alarm	cont.	✓	500V
PN 2	1200-V	Low	1"	✓	900V
"	"	Alarm	2"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE NO. B-824
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by AKH Personnel check by F.D.C.

Instruments and safeties checked and reset by AKH

Source in checked by AKH Source No. M-43

Emergency equipment in control room checked by F.D.C.

Instruments in trip circuit: K-1 - 2, PM-1 - 2

Red light on by AKH Time 0800

Start-up OK'd by F.D.C. AKH Date 1-21-66

0800

Removed 1 unit from first ring in tube sheet.
Now have 60 units, 44 in center and 16 in first
ring, 3 on 4 faces, and 2 on 2 faces.

3

Page	No Units	No Rods B+C	ft
263	61	-	151.50

265	63	1	162.50
-----	----	---	--------

266	65	2	160.90
-----	----	---	--------

266	67	3	165.60
-----	----	---	--------

267	69	4	167.50
-----	----	---	--------

267	71	5	169.20 ←
-----	----	---	----------

268	79	9	182.80 sub - 15.2 f
-----	----	---	---------------------

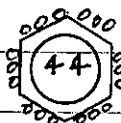
268	71	5	165.00
-----	----	---	--------



total of 50 units

265

0836 Water ht = 182.80 cm
System sub critical.
Drain.

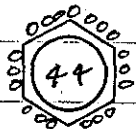


total of 62 units, plus
1-86g B4c rod.

0947 added 2 units to first ring in tube sheet.
Now have 62 units, 44 in center + 18 in
first ring. (3 on each face.). Also added
1- $\frac{3}{8}$ " x $5\frac{3}{4}$ " 304 ss. tube with 86g
of B4c in ~ center of array.

0918 Water ht = 182.80
System sub critical
Drain.

Water Temp.
= 23.8°C



total of 63 units, plus
1-86g B4c rod.

Added 1 unit to above. Now have 63
units. + 1-86g B4c rod.

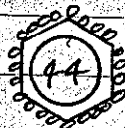
0948 Water ht = 162.50 cm
System just critical.
Drain.



Total of 65 units, plus
2 - B+C rods.

Added 2 units to first ring in tube sheet,
Now have 65 units. Also have added
1 more B+C tube. The 2nd B+C tube
is ~ 1.0" off-center.

1027 Water ht = 160.40 cm
System just critical
On air



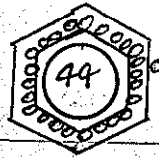
Total of 67 units, plus
3 - B+C rods.

1040 Added 2 units to first ring in tube sheet,
Now have 67 units. Also have added 1 more
B+C tube. The 3rd B+C tube is ~ 1.0" off
center. Total of 23 unit in first ring.

~~1103~~ 1110 Water ht = 165.60 cm
System just critical.

1111 With $\log \eta = .011$, K-2 40% scale ^{on monitor} 3×10^{-12}
put system on plus period. (Check on screen)

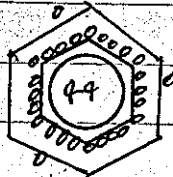
1117 System swamped by K-2



Total of 69 units, 267
plus 4 BqC rods.

1215 added 2 units. 1 to first ring, and 1 to second ring. Now have 69 units. Also added 1 more BqC rod ~ 2.0" from center. Now have 69 units, + 4 BqC rods.

1245 Water ht = 167.50 cm
System just critical
Drain



1255

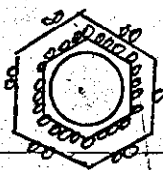
added 2 units to second ring in tube sheet. Now have 71 units. Also added 1 more BqC rod ~ 2.0" from center. Now have 71 units + 5 BqC rods.

water temp
= 23.8°C

1321 Water ht = 169.20 cm
System just critical.
Drain.

all y. 2

268



Total of
79 units, + 9 B+C
rods.

1350 added 8 units to second ring in tube sheet. Now have 79 units. also added 4 B+C rods. Now have 79 units + 9 B+C rods.

1424 Water ht = 182.80 cm.
System slightly sub critical.
- Per = -130.38 cm = -15.2%

1428 Drain:

1505 Removed 8 units from 1st ring: 2 from 2 faces and 1 from 4 faces. and removed 4 B+C rods. 2 from ~1.0" about center, and 2 from ~2.0" about center. Now have 71 units + 5 B+C rods.

1536 Water ht = 165.0 cm Water Temp = 23.8°C
System just critical
Drain:

15" NO:

269

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10 x 10 ⁻¹²	Meter ✓	cont	✓	10 x 10 ⁻¹²
	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	7000	Alarm ✓	cont	✓	5000
PM-2	12000	Low ✓	14"	✓	9000
	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKV Personnel check by E.D.C
 Instruments and safeties checked and reset by AKV
 Source in checked by AKV Source No. M-43
 Emergency equipment in control room checked by E.D.C
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKV Time 1325
 Start-up OK'd by E.D.C AKV Date 1-26-66

over

270

1-26-66

$3.0625 \pm .0625$

pe = 15. " length.

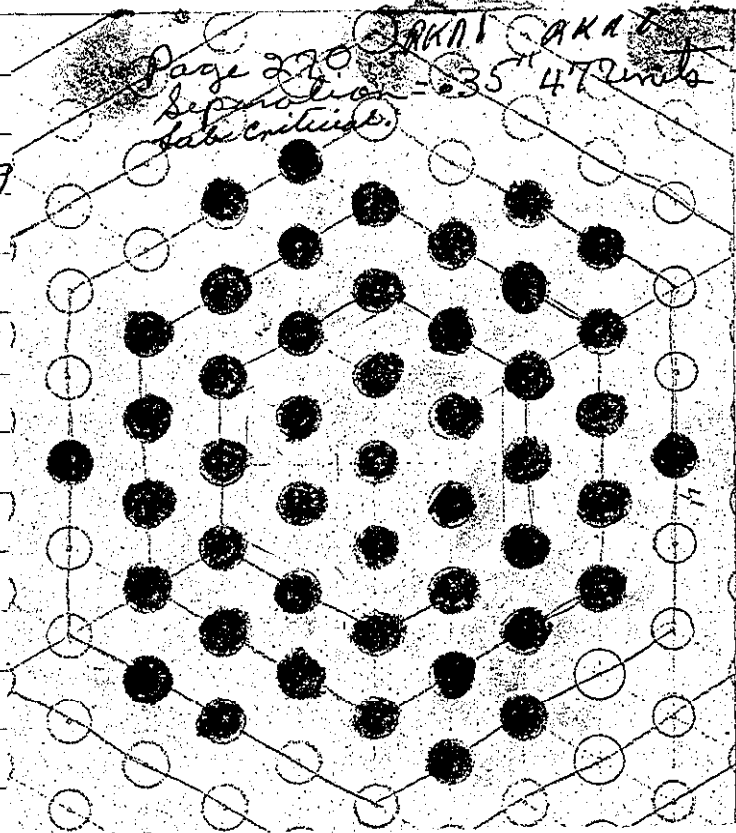
separator = .35"

When water ht = 75.5 cm (side scale) water is at top of elements. 90.74 cm = 6.0" top reflector.

Have 47 units. 3 full rings, + 10 units in 4th ring. (2 on 4 faces, and 1 on 2 faces.

1355

Water ht = 9
System sub
Druis.



270

1-26-66

$3,0625 \pm 0.0625$
pe ≈ 1
When water ht = 74
elements: 90.74 cm

Have 4 units
in 4 rings
2 faces.

1355

Water ht = 92.40 cm
System sub critical
Drain.

3" length

46 plates

Not used

$$\left\{ \begin{array}{l} 8.93 \text{ g} \pm 2\% \end{array} \right.$$

$$\left\{ \begin{array}{l} \text{Last } \underline{98} = \underline{7.80} \pm 2\% \end{array} \right.$$

INSTRUMENT CHECK

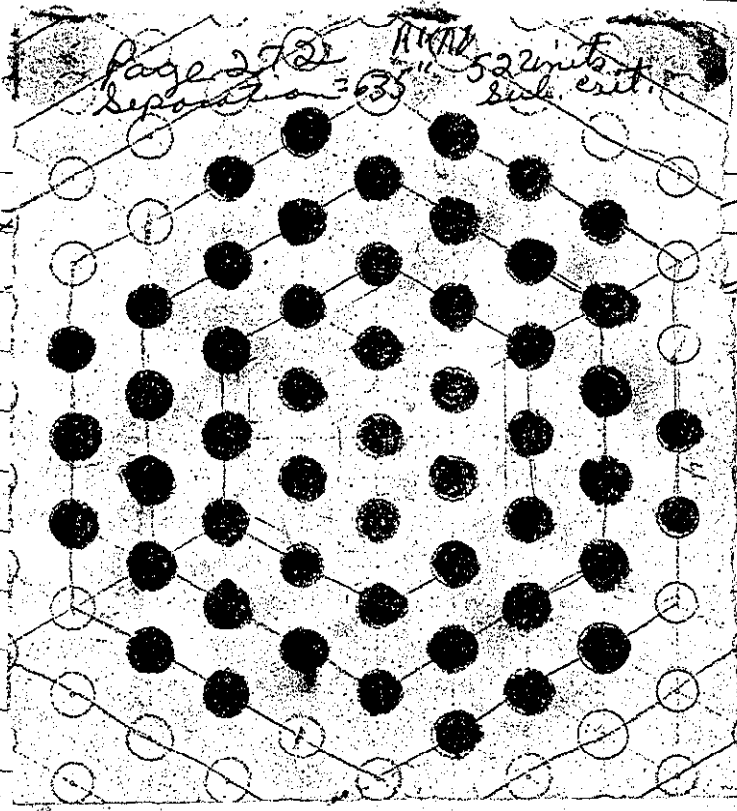
INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	1"	✓	10×10^{-12}
	"	Foot ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
	"	Foot ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	cont	✓	500V
PM-2	1200V	Low ✓	12"	✓	900V
	"	Alarm ✓	1"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-80
 DUMP WELL PROBE LIGHT

START-UP CHECK LIST

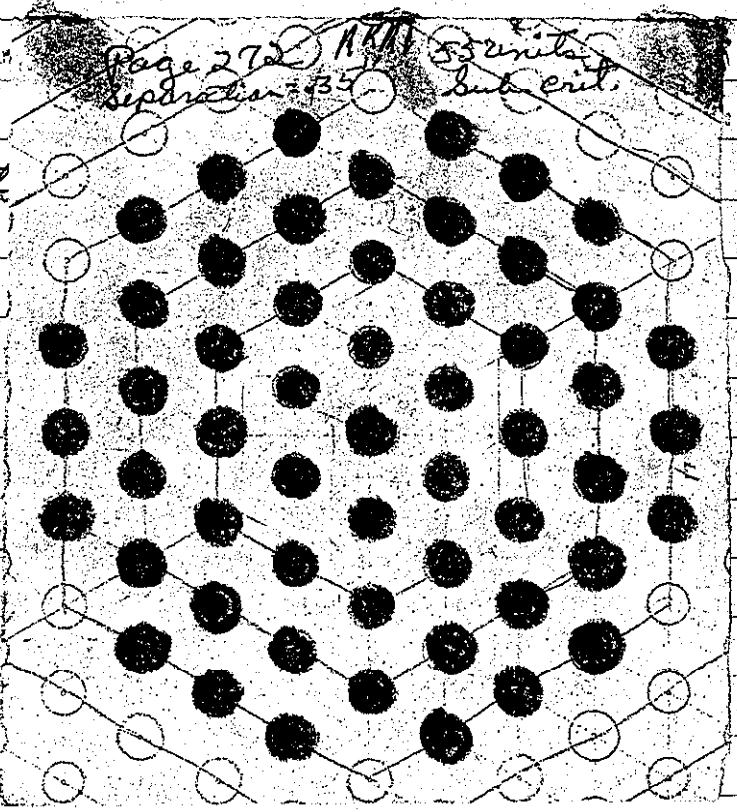
Equipment checked by AKH Personnel check by F.I.C.
 Instruments and safeties checked and reset by AKH
 Source in checked by AKH Source No. M-83
 Emergency equipment in control room checked by F.I.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKH Time 0935
 Start-up OK'd by F.I.C. AKH Date 1-27-66

over



Now have 5
 units in 4th
 3 faces.

1014 Water ht = 9
 System sub
 Drain.



1030 added 3 units
 full rings +
 each face.

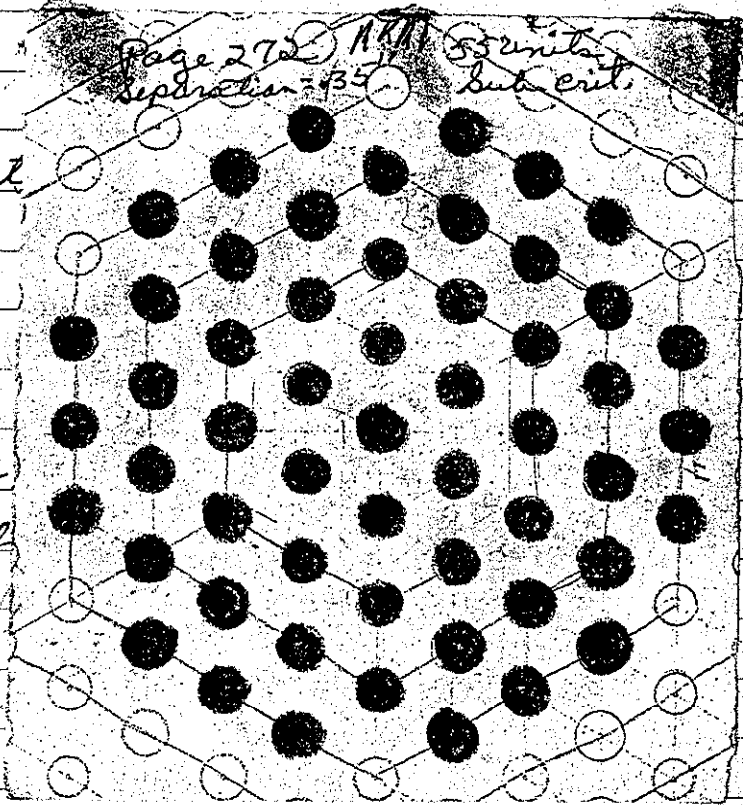
1052 Water ht = 94
 System sub @
 Drain.

Now have 52 units. 3 full ring. + 15 units in 4th ring. (3 on 3 faces and 2 on 3 faces.

1014 Water ht = 94.10 cm
 System sub critical
 Drain

1030 added 3 units full rings + each face.

1052 Water ht = 94
 System sub @
 Drain



Now have 52 units. 3 full ring. + 15
units in 4th ring. (3 on 3 faces and 2 on
3 faces.

10 14 Water ht = 9
System sub
Drain.

10 30 added 3 units. Now have 55 units. 3
full rings + 18 units in 4th ring. 3 on
each face.

10 52 Water ht = 94.30 cm
System sub critical
Drain.

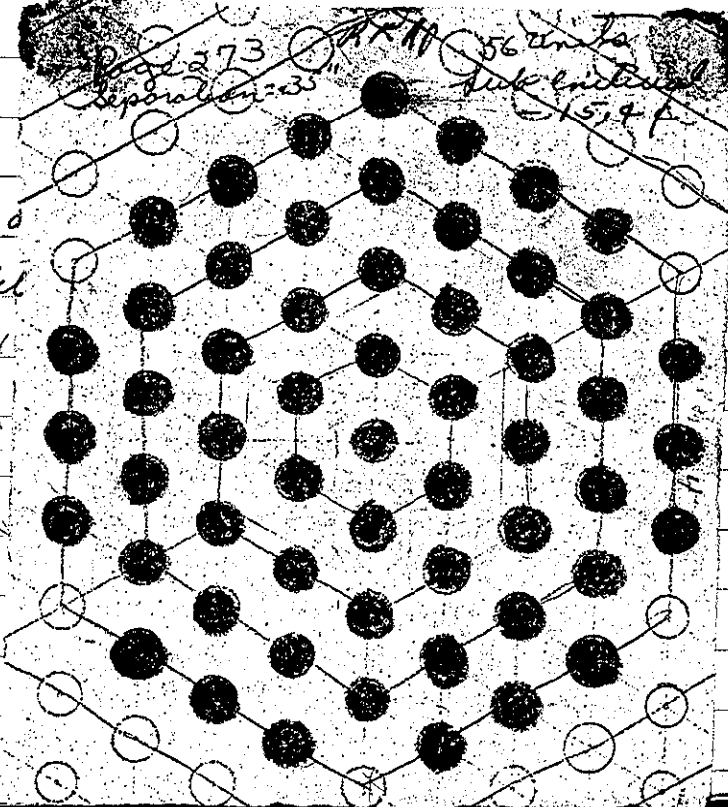
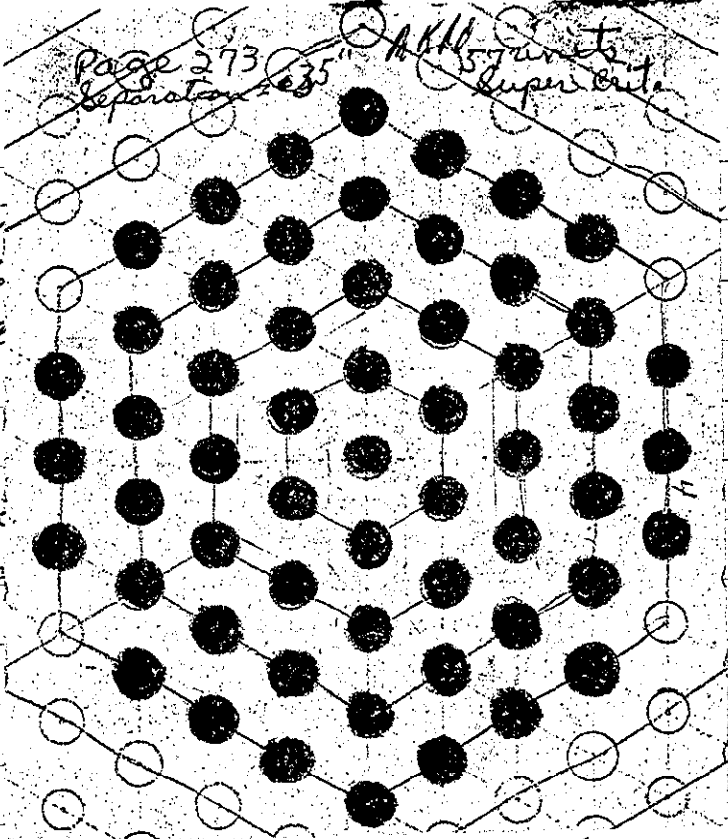
Water Temp
= 23.4°C

1110 added 2 units
 ring + 20 units
 fair and 2 at

1131 Water ht = 80.
 Septer just
 Drain:

1225 Removed 1 unit from point in 4th
 ring. Now have 56 units.

1245 Water ht = 95.0
 Septer sub. crit.
 - Res. = $\tau = -1$
 Drain:

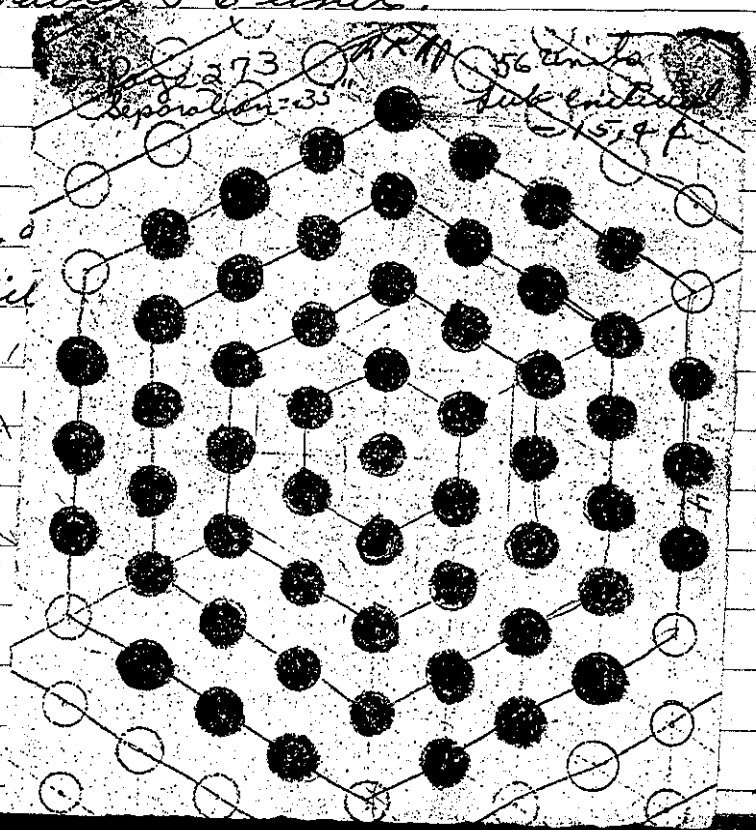


1119 added 2 units. Now have 57 units. 3 full ring + 20 units in 4th ring; 3 on each face and 2 at opposite points.

1131 Water ht = 80.30 cm
 System just critical
 Drain:

1225 Removed 1 unit from point in 4th ring. Now have 56 units.

1245 Water ht = 95.0
 System sub-crit
 - Res. = $\tau = -1$
 Drain:



11 10 added 2 units. Now have 57 units. 3 full
ring + 20 units in 4th ring; 3 on each
face and 2 at opposite points.

11 31 Water ht = 80.0
System just c
Drain:

12 25 Removed 1 unit
ring. Now ha

12 45 Water ht = 95.00 cm: Water Temp.
System sub critical = 23.8 °C
- Pres. = $\tau = -130.38 \text{ sec} = -15.4 \text{ d}$
Drain:

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP NUMBER
	3×10^{-12}	✓	1"	✓	10×10^{-12}
	"	✓	"	✓	"
	"	✓	"	✓	"
	"	✓	"	✓	"
	7000	Alarm ✓	cont	✓	5000
	12000	Alarm ✓	19"	✓	9000
	71	Alarm ✓	2"	✓	"

100 N CHANNELS ✓ SOURCE NO. B-80

SWAP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKK Personnel check by F.O.C.

Instruments and safeties checked and reset by AKK

Source in checked by AKK Source No. M-43

Group equipment for control room checked by F.O.C.

Instruments in this circuit: K-1-2 P19-1-2

Red light on by AKK Time 0825

Start-up OK'd by F.O.C. AKK Date 1-28-66

1-28-66 Separation = .59"

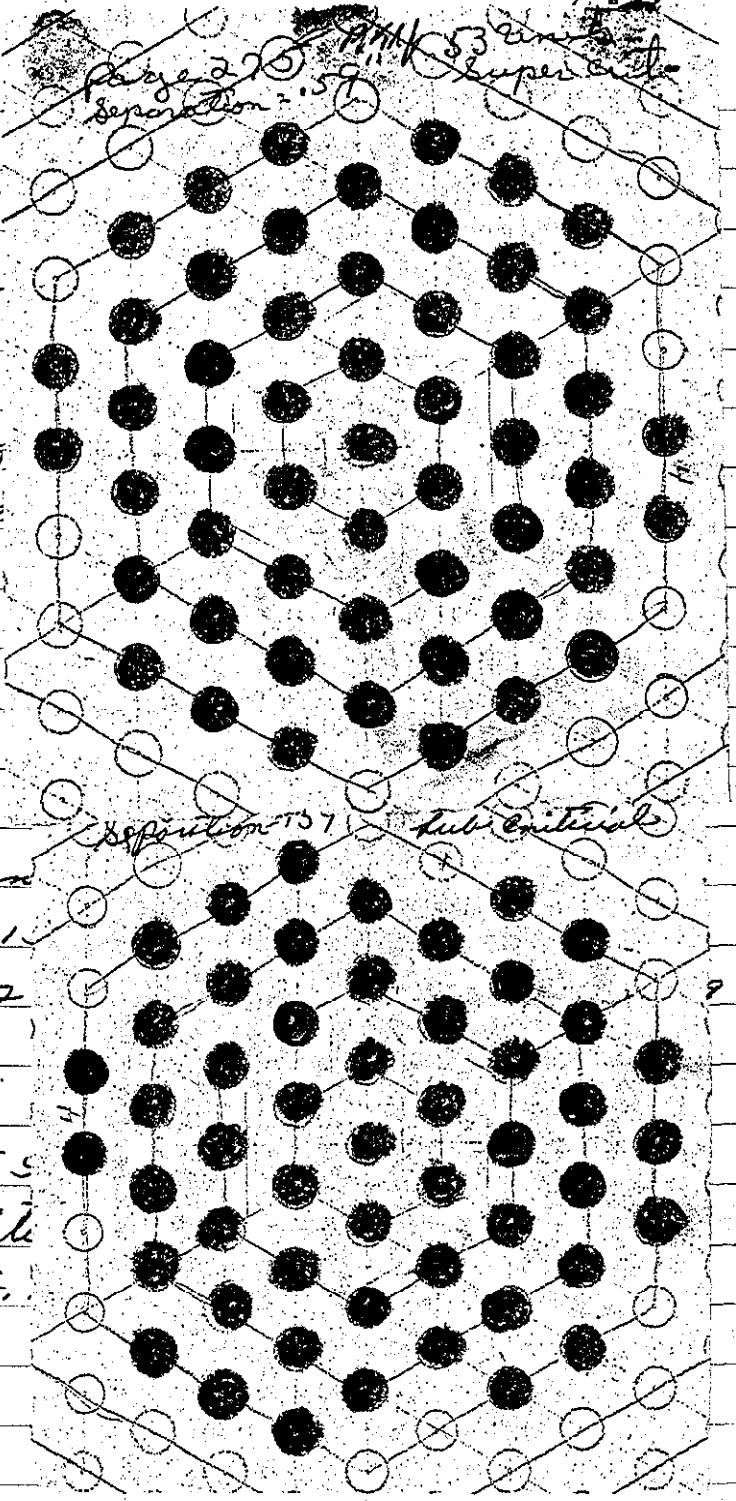
975

0830 Now have 53 units in 4 ft on 2 faces.

0902 Water ht = 79 System just e Drains.

0930 Remained 1 unit 3 full ring + 1 3 faces and 2

0952 Water ht = 95.5 System sub Crit - Per = - - 84.



avg.

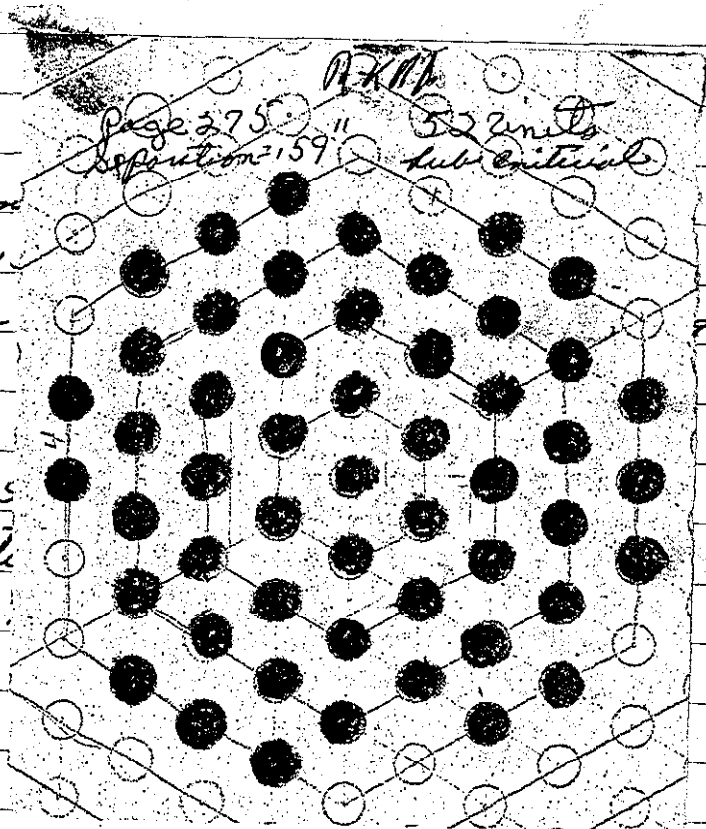
1-28-66 Separation =

0830 Now have 53 units: 3 full rings, + 16 units in 4th ring. 3 on 9 faces and 2 on 2 faces. Separation = .59"

0902 Water ht = 79.40 cm
System just critical
Drains.

0930 Removed 1 unit
3 full ring + 1
3 faces and 2

0952 Water ht = 95.5
System sub Crit
- Per = - - 84.



avg:

1-28-66 Separation =

0830 Now have 53 units in 4 sets on 2 faces.

0902 Water ht = 79.
System just in
Drains.

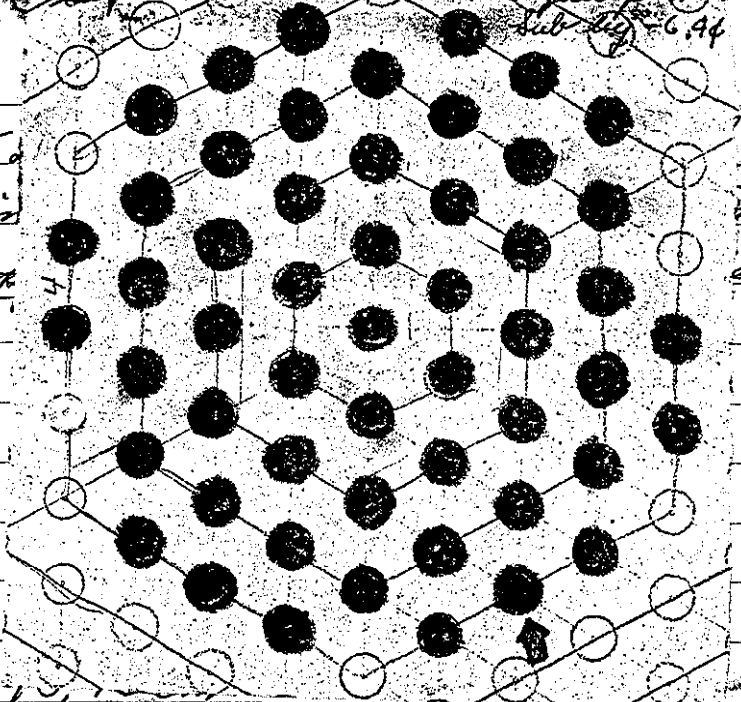
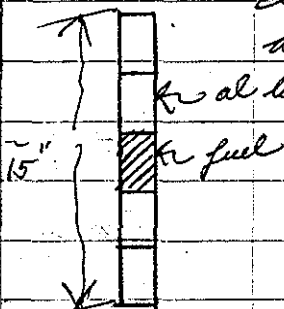
0930 Removed 1 unit. Now have 52 units.
3 full ring + 15 units in 9 st ring, 3 on
3 faces and 7 on 3 faces. Separation = .59"

0952 Water ht = 95.50 cm
System sub critical
- Per = --- 84. sec

away

Page 276
 separation = 1.59" $\Delta h = 2.2$ full limits
 1-3" fuel pins
 sub sig = 6.44

10 20 Now have 5
 1-3" fuel pins
 (incl.) Pins 7
 at left.

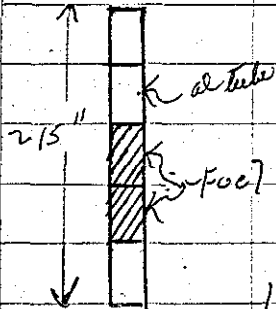


is of
 above

10 48 Water ht = 1.5
 System sub critical
 - Per = $\bar{b} = -244.46 \text{ sec} = -6.44$

10 58 Drains:

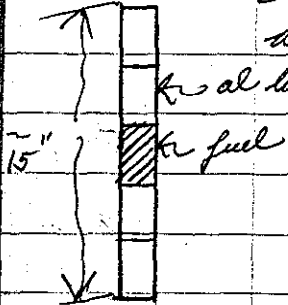
12 20 Same array as above. Eppet now have
 2-3" fuel pins in rd arrow positions.



12:35 Water ht = 84.80 cm $\Delta h = 2.20 \text{ cm}$
 + Per = 227.08 sec = 5.0 f = 2.27 / cm

12:47 Water ht = 82.60 cm = 7.10 cm above
 top of fuel.
 System just critical

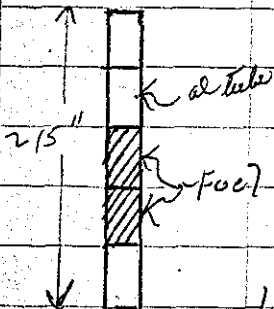
1020 Now have 5 $\frac{1}{2}$ full units, and 1 unit with
 1 - 3" fuel pins (See array diagram for positions of
 unit.) ^(red arrow) Pins placement shown below
 at left.



1048 Water ht = 95.70 cm
 System sub critical
 $-P_{ex} = \bar{P} = -244.46 \text{ mW} = -6.4 \%$

1058 Drain:

1220 Same array as above; Expect now have
 2 - 3" fuel pins in red arrow position.



12:35 Water ht = 84.80 cm $\Delta h = 2.20 \text{ cm}$
 $+P_{ex} = 227.08 \text{ mW} = 5.0 \%$ $= 2.27 \%$ / cm

12:47 Water ht = 82.60 cm $= 7.10 \text{ cm above top of fuel}$
 System just critical

1-31-66

17.750"

277

INSTRUMENT CHECK

INSTRUMENT	SOURCE DISTANCE	SET	START-UP RANGE
K1 3 X 10 ⁻¹²	1"	-	10 X 10 ⁻¹²
"	"	-	"
"	"	-	"
"	"	-	"
FM 700V	Cont	-	500V
FM 1200V	Low	-	900V
"	Alarm	-	"
LOG N CALIBRATE	OPERATE	SOURCE No. B-80	
DUMP WELL FROZE LIGHT			

START-UP CHECK LIST

Equipment checked by AKV Personnel check by F.I.C
 Instruments and safeties checked and reset by AKV
 Source in checked by AKV Source No. M-83
 Emergency equipment in control room checked by F.I.C
 Instruments in trip circuit: K-1-2 PM-12
 Red light on by AKV Time 0935
 Start-up OK'd by F.I.C AKV Date 1-31-66

only.

278

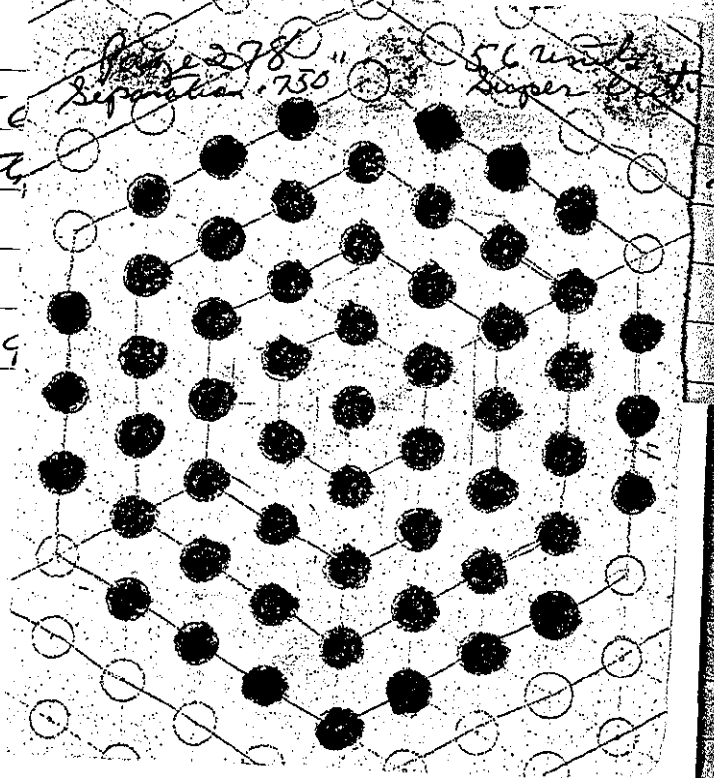
.750" separation

Now have 50
19 units in 4.5"

Page 278
Separation .750"

56 units in 4.5"

1006 Water ht = 79



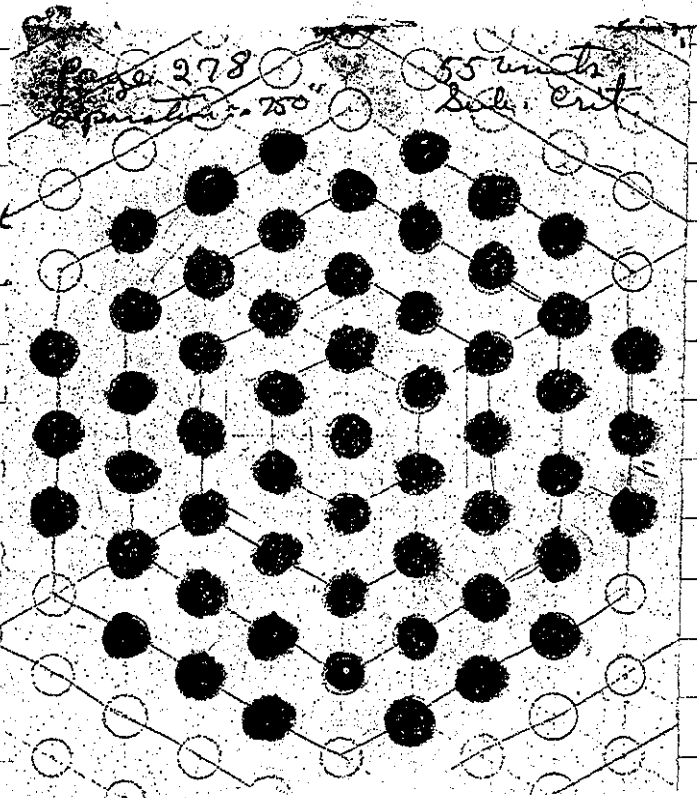
Now have 56 unit. 3 full ring, & 19 units in 4th ring. Separation = 750"

1006 Water ht = 79.7 cm
Septen just critical.
Drain

1200 Removed 1 unit
have 55 units
& 4th ring.

1225 Water ht = 96.
Septen sub cr
Per = -186

1229 Drain



Now have 56 units. 3 full rings, +
19 units in 4th

1006 Water ht = 7.
System just
Drain

1200 Removed 1 unit from 4th ring. Now
have 55 units. 3 full rings + 18 units in
4th ring.

1225 Water ht = 96.0 cm
System sub critical.
 $\Delta Per = -186.87 \text{ sec} = -8.9 \text{ f}$

1229 Drain

[REDACTED]

[REDACTED]



200



1.079

6.111.11

1194