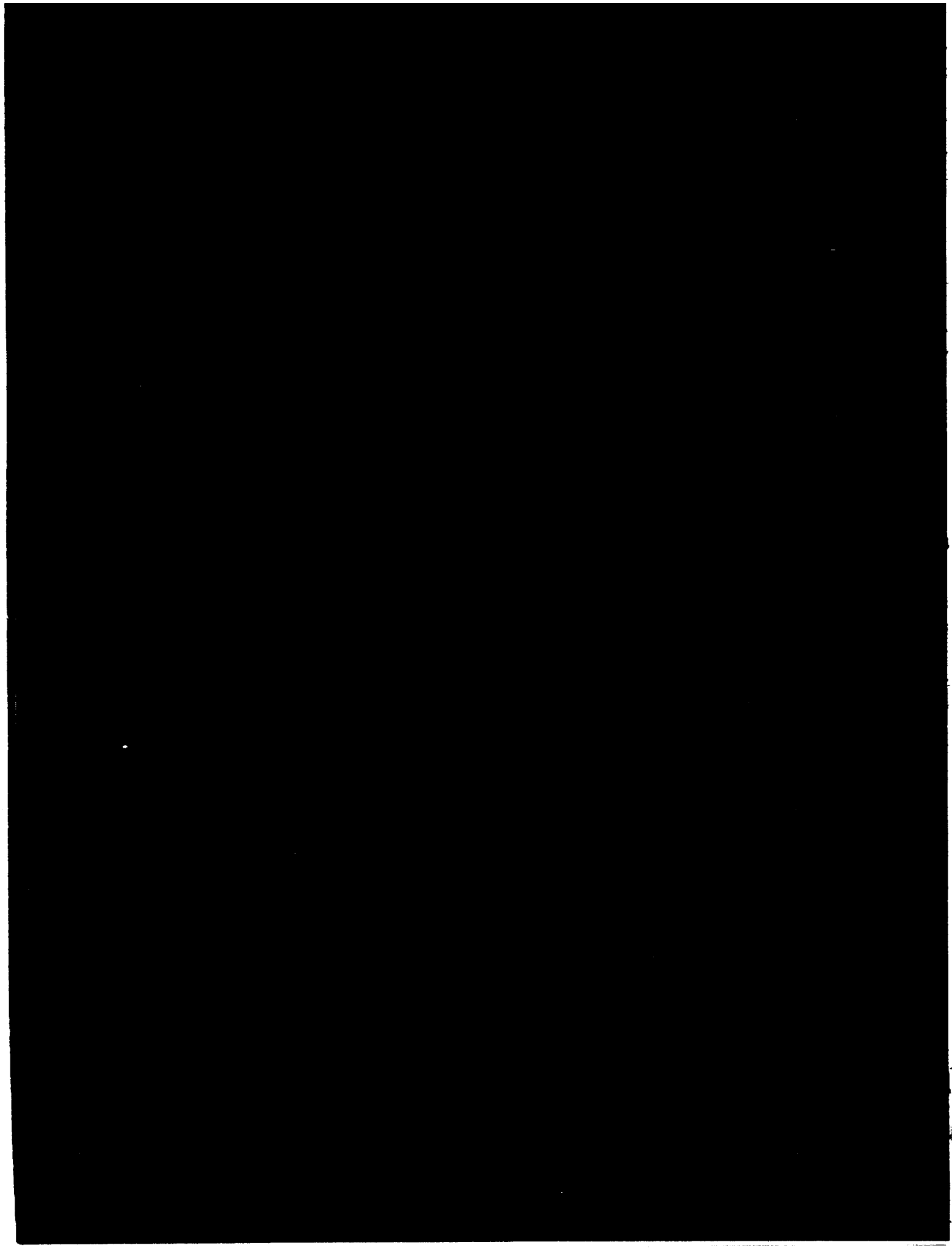

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LAMS-908

Series A

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FAST PLUTONIUM REACTOR EXPERIMENTAL FACILITIES

Work done by:

D. B. Hall
J. H. Hall
A. H. Spano

Report written by:

J. H. Hall

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FAST PLUTONIUM REACTOR EXPERIMENTAL FACILITIES

This report is issued to make known to interested members of the laboratory the experimental facilities which the fast reactor has available. The schematic plan view of the reactor illustrates the experimental holes with the exception of the vertical holes, which ports are located on top of the reactor. Tables IA and IB give the U^{235}, U^{238} and Np^{237} fission activities in various regions, describe the sizes, uses, etc. of the holes and in the regions where there is no thermal neutron contribution give reasonable estimates of the total flux and effective energy existing in these regions. The fluxes were estimated by a method discussed in LAMD-125 and are stated with an error of $\pm$ 20 percent. With the completion of additional surveys supplements to this report will be issued. At the present time it is estimated that in the 63" position in the uranium hole, 8 percent of the neutrons have energies above 1.4 Mev, 24 percent have energies between 0.6 Mev and 1.4 Mev and 68 percent have energies below 0.6 Mev. Table II gives the U^{235} activity as a function of position in tangential hole No. 1.

The maximum power available is 40 kilowatts. It is preferable, however, to not operate for longer than one hour at powers exceeding 25 kilowatts in order to avoid over-heating of the uranium tamper. The power equilibrium temperatures in the 63" position in the uranium hole are $(25 + 4 \times \text{No. of KW})^{\circ}$ C with a 20° C drop to the 58" position. Thus the type of material to be irradiated governs the power level unless auxiliary cooling for the sample is provided.

The graph which shows the thermal fluxes and cadmium ratios in the thermal column is self-explanatory. It is planned to survey the thermal column using boron absorbers to determine the fractions of neutrons in the region from epi-thermal to about 100 ev as a function of position from the aluminum cube face.

TABLE IA

Facility	Use B: Beam I: Irradiation	Max. Size of Sample	Distance from Floor	Depth of Hole	Description	Position	Neutron Spectrum Fissions/sec-gm-watt Np^{237}: Effective threshold = 0.6 Mev U^{238}: Effective threshold = 1.4 Mev U^{235}	Np^{237}	U^{238}	nv/watt	$E_{Eff.}$ (Mev)
Uranium Hole	B or I	0.90"	41"	63"	Hole extends horizontally through shield on center line of reactor to 1" from edge of active material region. A volume of uranium 8" x 8" x 11" surrounds hole to lead shield.	63" in	6.6×10^5	2.8×10^5	2.7×10^4	1.7×10^8	0.4
						58" in	1.8×10^5	3.6×10^4	3.8×10^3	4.4×10^7	0.3
						0" in	60.2	42.4	3.6	1.5×10^4	0.4
Thorium Hole	B or I	0.65"	41"	85"	Same as uranium except a volume of thorium 6" diam. x 11" surrounds hole to lead shield.	85" in	6.3×10^5	2.5×10^5	2.2×10^4	1.6×10^8	0.4
						82" in	3.0×10^5	7.5×10^4	5.2×10^3	7.3×10^7	0.3
Steel Hole	I	0.55"	41"	63"	Same as uranium except volumes of U 8"x8"x5" and of Fe 8"x8"x6" surround hole to lead shield. Not suitable for beam work because of wall proximity.	Approximately same as U and Th holes. Not measured.					
Tangential Holes	I	1) 0.80"	45-1/2"	135"	Holes go completely through reactor tangentially to active material region on the corners of a 9" x 9" area section. Rabbit will be available some day.	1) 67" in	3.8×10^5	1.0×10^5	1.0×10^4	9.5×10^7	0.3
		2) 0.80"	45-1/2"	135"		2) 67" in	3.8×10^5	1.0×10^5	1.0×10^4	9.5×10^7	0.3
		3) 0.70"	36-1/2"	135"		3) 67" in	3.5×10^5	8.6×10^4	6×10^3	8.5×10^7	0.3
		4) 0.80"	36-1/2"	135"		4) 67" in	3.5×10^5	8.6×10^4	6×10^3	8.5×10^7	0.3
Thermal Column											
Removable Section	B or I	varies	41"	76"	8 removable graphite stringers each 4-1/4" x 4-1/4" x 76". One stringer has holes (with plugs) 3" x 2" i.d. spaced at 8" intervals.	See attached graph.					
Transverse Holes (3)	B or I	2" x 2"	33"	135"	2" x 2" holes extending transversely through thermal column.						

TABLE IB

Facility-Vertical Holes	Use	Max. Size of Sample	Location of bottom of hole from center of active material	Description	Neutron Spectrum Fissions/Sec-GM-Watt				
					U^{235}	Np^{237}	U^{238}	nv/watt	$E_{Eff.}$ (Mev)
1 T	I	0.90"	9-1/8" up; 9.5" radius steel-uranium interface Depth = 107-3/8"	All vertical holes extend from top housing through shield and into tamper regions indicated. Holes 3,4,5,6,7 are in use by D-5.	1.3×10^5	7.4×10^3	240	- -	- -
2 T	I	0.90"	1/4" up: 7.0" radius uranium Depth = 116-1/4"		2.8×10^5	6.7×10^4	4.4×10^3	6.8×10^7	0.3
8 T	I	0.90"	1/2" up; 9.5" radius uranium Depth = 116"		1.4×10^5	2.4×10^4	1.5×10^3	3.0×10^7	0.25
9 T	I	0.90"	9-1/8" up; 9.8" radius steel-uranium interface Depth = 107-3/8"		1.3×10^5	7.4×10^3	240	- -	- -

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TABLE II

Variation of U^{235} Fission Activity with Position in Tangential Hole No. 1

Distance in from West Face (inches)	Fissions/Sec-GM-Watt
59	1.4×10^5
63	2.7×10^5
65.5	3.6×10^5
67	3.8×10^5
67.5 (center)	3.8×10^5
69.5	3.5×10^5
72	2.6×10^5
76	1.7×10^5
78	1.8×10^5
80	1.8×10^5

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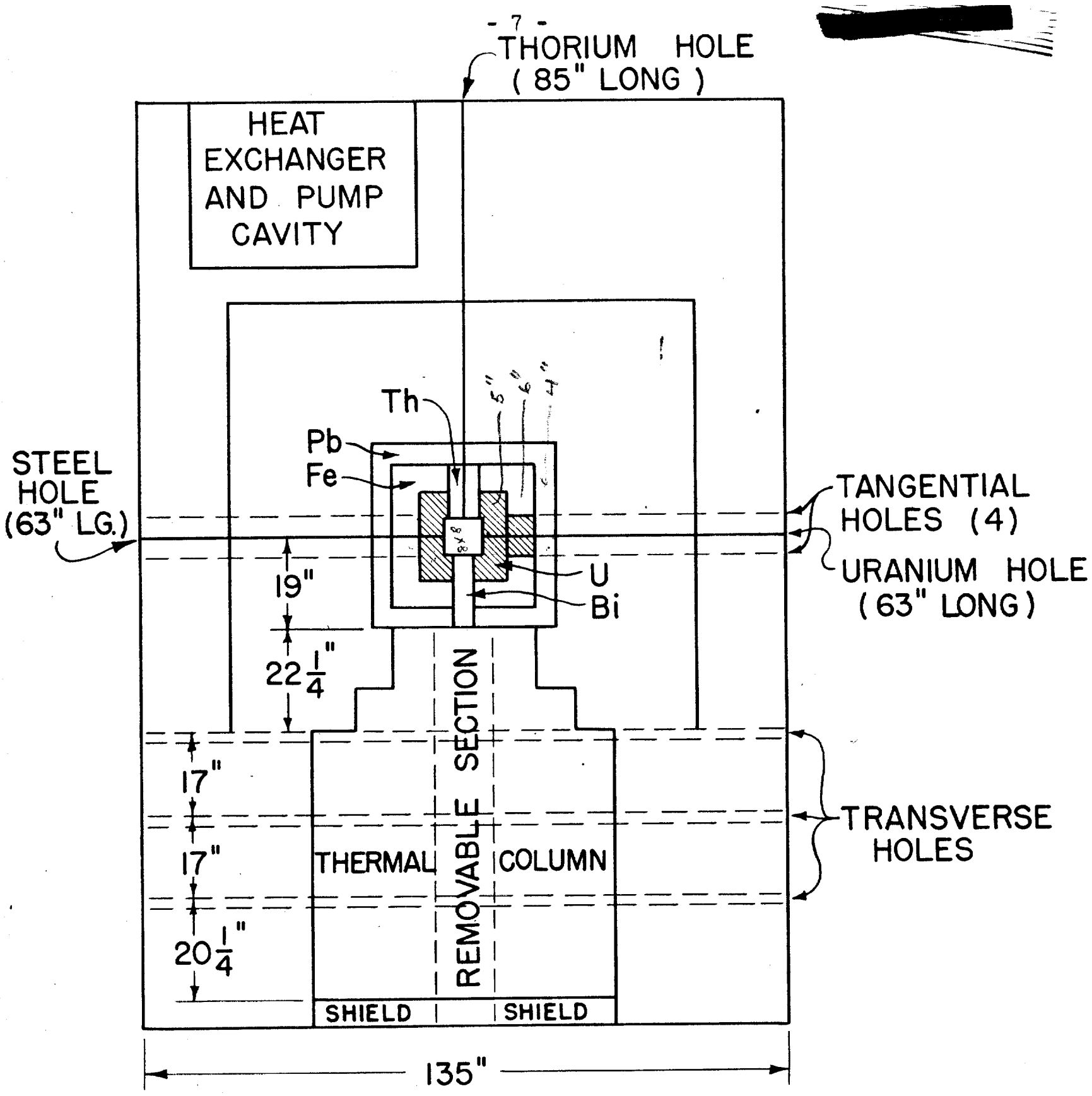

PLAN OF FAST REACTOR
SHOWING EXPERIMENTAL FACILITIES

SCALE: 1 mm = 1 inch

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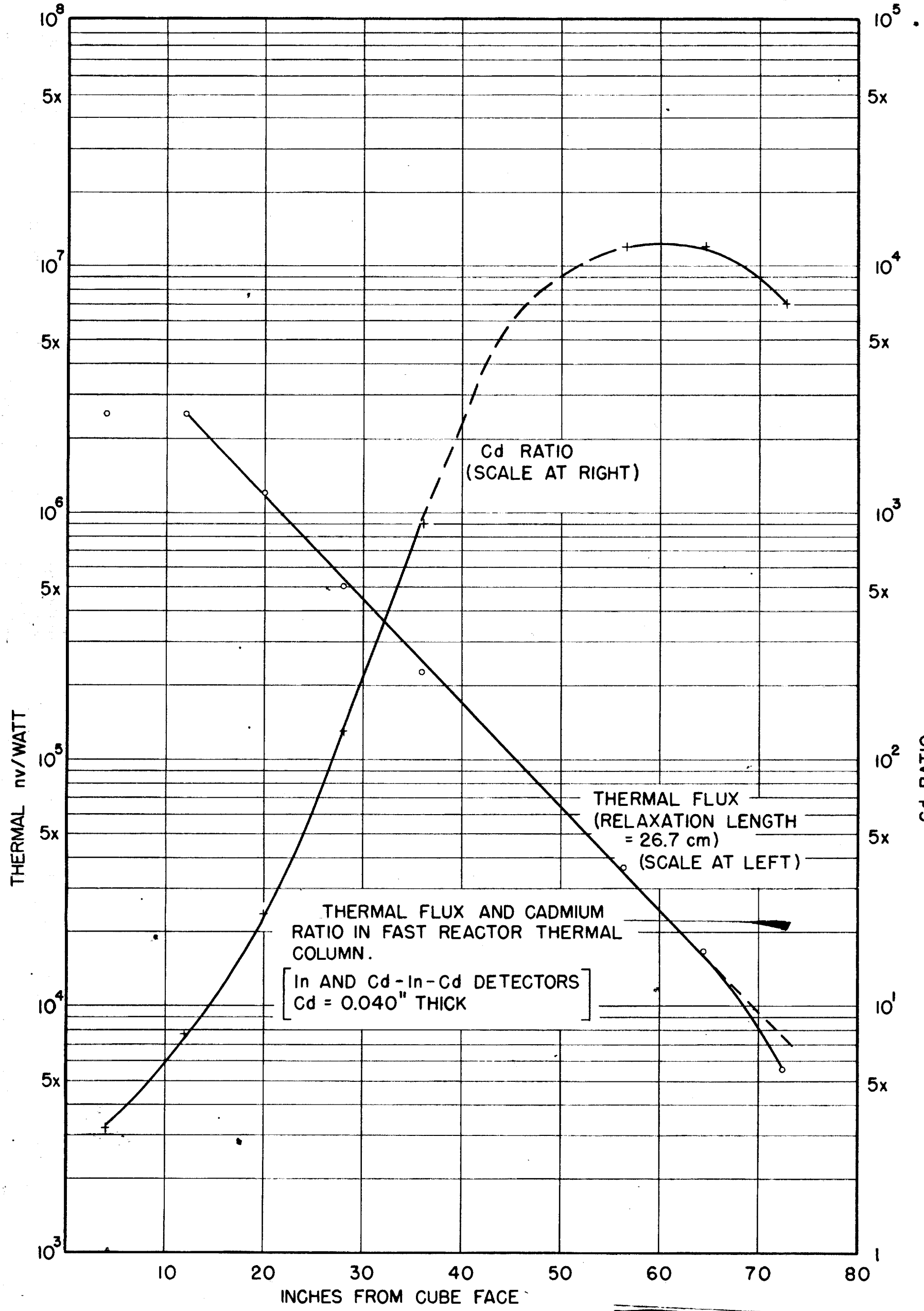

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