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DATE: November 28, 1949

TO: E. P. Blizard

FROM: Grace McCammon

SUBJECT: Neutron Flux Measurements in Water Tank Over the Thermal Column

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SUBJECT: Neutron Flux Measurements in Water Tank Over the Thermal Column

The purpose of this experiment was to determine the neutron flux at various positions on the bottom of a water tank over the thermal column of the Oak Ridge Pile. The tank was centrally placed over the column without any shutters or shielding on bottom of the tank. To facilitate safe working conditions, lead bricks and cadmium sheets were placed around the outside of the tank to cut out neutron scattering. The graphite plug in the center of the column was removed.

The water tank is made of 1/2 inch aluminum and is 60½" x 60½" x 6'. The water in the tank is at a depth of approximately 5½ feet. A wood frame was made by crossing two pieces of wood to act as a holder on which to expose foils. This frame was adjustable to allow various positions to be measured. It was made so that it would fit into the tank with just enough clearance to allow moving it in and out of the tank. A north and south cross piece could be moved from the center to the east or west side of the tank. Lucite strips were made with foil slots and were attached to the bottom of this north and south traverse piece. The foil slots on these lucite pieces were so located that the following points could be measured on a traverse. These points are given in centimeters away from center toward the north and south side of tank.

64.92 cm. south
57.30 " "
49.68 " "
42.06 " "
34.44 " "
15.34 " "
7.62 " "
Center
7.62 cm. north
15.34 " "
34.44 " "
42.06 " "
49.68 " "
57.30 " "
64.92 " "

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These distances on the north and south traverse were measured directly thru the center of tank, 30.48 cm. to the east of center, and 30.48 cm. to the west of center. This made a total of 3 traverses measured with 15 positions on each traverse.

Small (1 cm^2) gold foils, 5 mils thick, were used to measure the activity. They were exposed at a distance of 0.9 cm. away from the bottom of the tank. A complete traverse (15 foils) was exposed simultaneously for 15 minutes. Two or more runs were made in each position and a weighted average was found. All runs were normalized to a nominal pile power of 4000 kw. The foils were counted on an upright mica window counter. They were all counted in the same position, which was very close to the tube.

Some large gold foils (6.35 cm. x 4.0 cm.), 5 mils thick, were exposed in the water tank to check the cadmium ratio. The ratio was found to be so large ($\sim 10^6$) that it was concluded that essentially all the neutrons were thermal. Large foils were exposed in the standard pile in order to arrive at calculations of the flux as compared to the standard pile. The calibrating foil was placed in slot 1 of the standard pile giving a ratio

$$\frac{\text{nv (thermal)}}{\text{activity (thermal)}} = .9106$$

A ratio of large and small foil activity was determined to be

$$\frac{\text{Large foil activity}}{\text{Small foil activity}} = 11.87$$

Upon applying these ratios to the thermal activity of each position measured, the thermal flux was determined. Attached are graphs and a table giving the flux distribution and flux values for each traverse measured across the tank.

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TABLE #1

Neutron Flux/cm^2/sec ~~on~~ 0.9 cm up from Bottom of Water Tank Over Thermal Column

North & South Traverse in cm.	Neutron Flux/cm^2/sec		
	Center	30.48 cm. West of Center	30.48 cm. East of Center
64.92 S	5.996×10^6	5.071×10^6	4.342×10^6
57.30 S	7.836×10^6	6.955×10^6	6.157×10^6
49.68 S	8.041×10^6	8.888×10^6	8.060×10^6
42.06 S	1.324×10^7	1.099×10^7	1.014×10^7
34.44 S	1.668×10^7	1.346×10^7	1.246×10^7
15.34 S	5.933×10^7	2.069×10^7	1.877×10^7
7.62 S	7.200×10^7	2.266×10^7	2.077×10^7
Center	6.508×10^7	2.386×10^7	2.126×10^7
7.62 N	7.122×10^7	2.248×10^7	2.045×10^7
15.34 N	6.069×10^7	2.046×10^7	1.883×10^7
34.44 N	1.740×10^7	1.309×10^7	1.286×10^7
42.06 N	1.332×10^7	1.106×10^7	1.054×10^7
49.68 N	8.194×10^6	9.034×10^6	8.431×10^6
57.30 N	8.191×10^6	7.558×10^6	6.472×10^6
64.92 N	6.113×10^6	5.266×10^6	4.667×10^6

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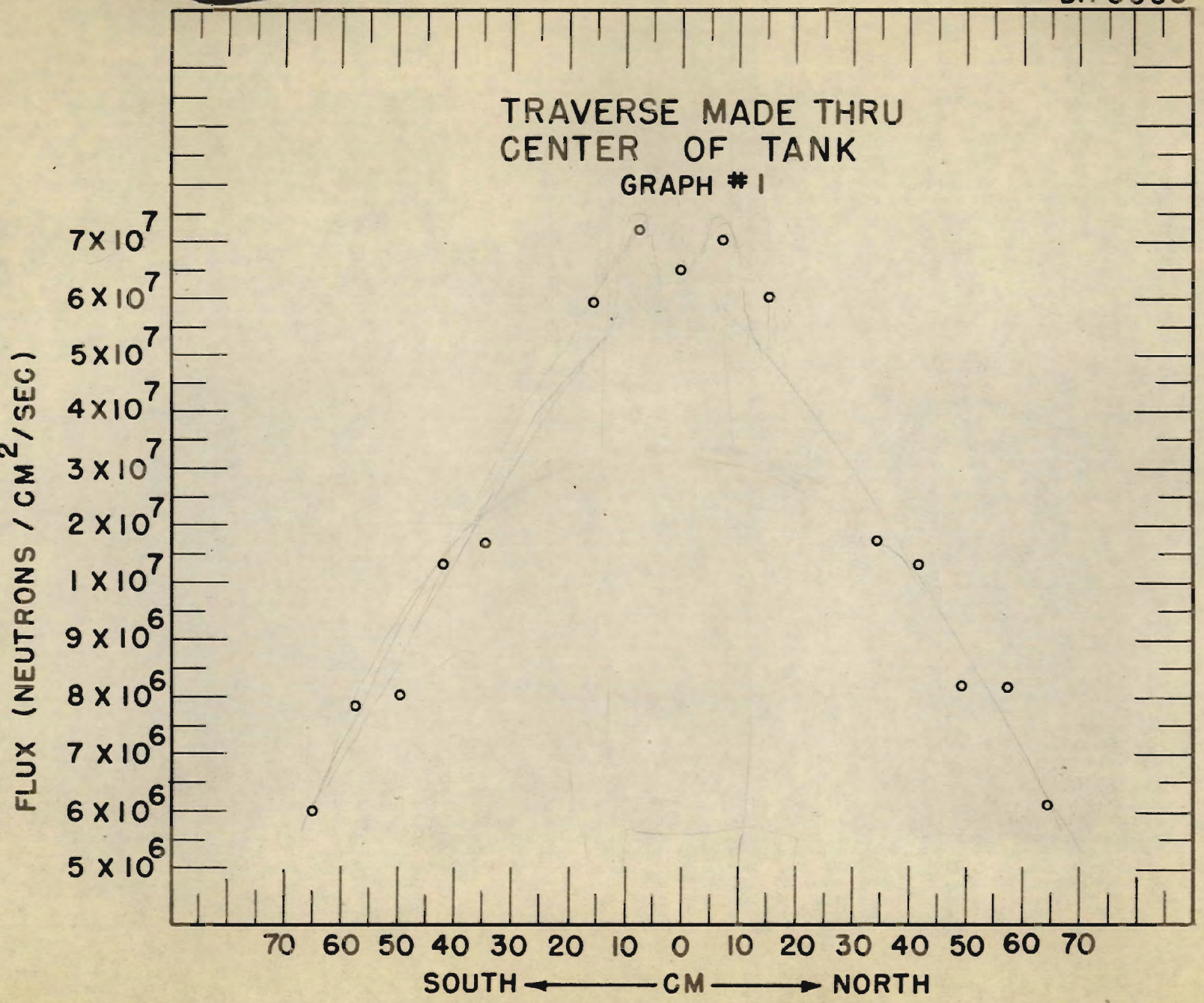
Dr. 8053



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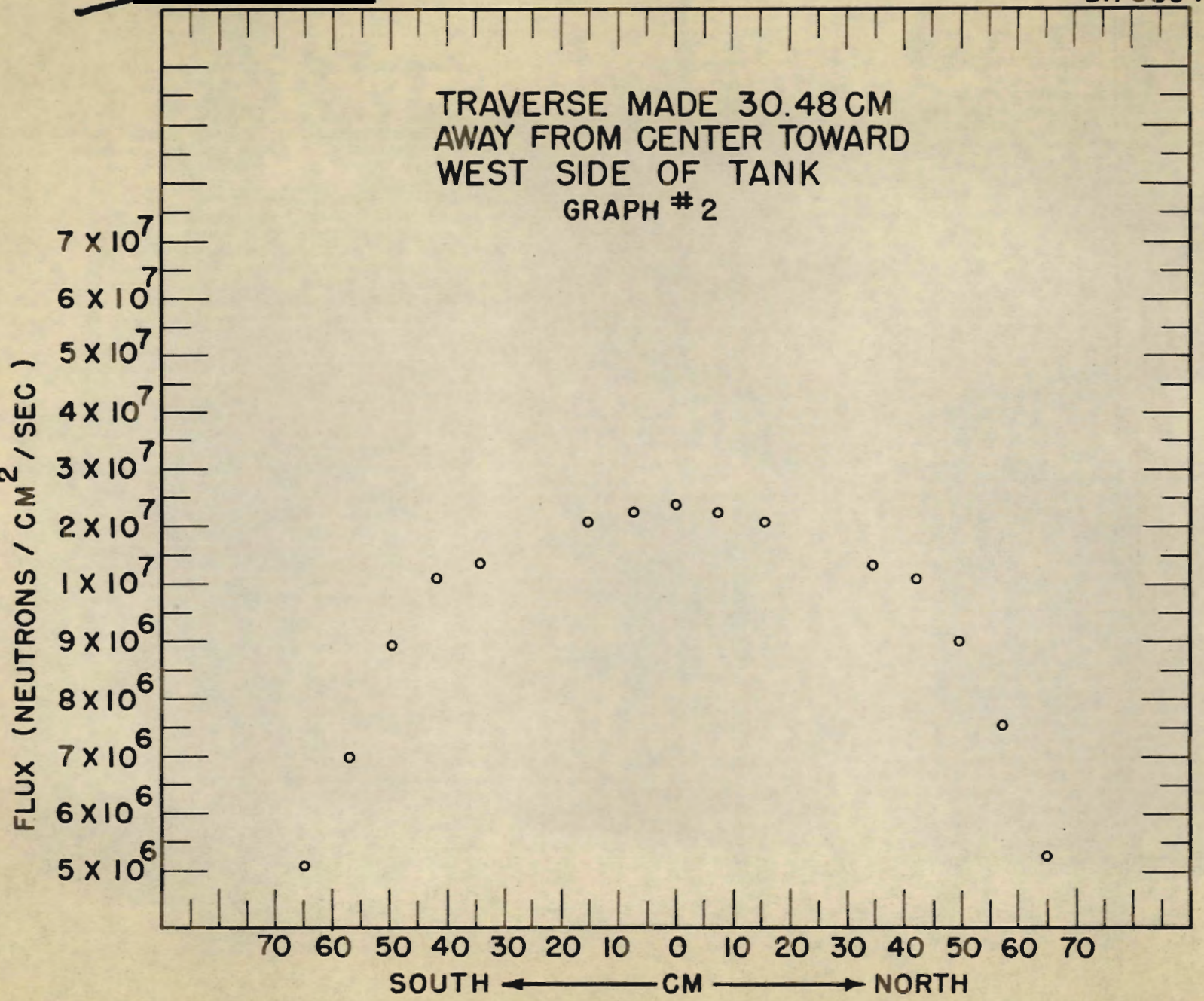

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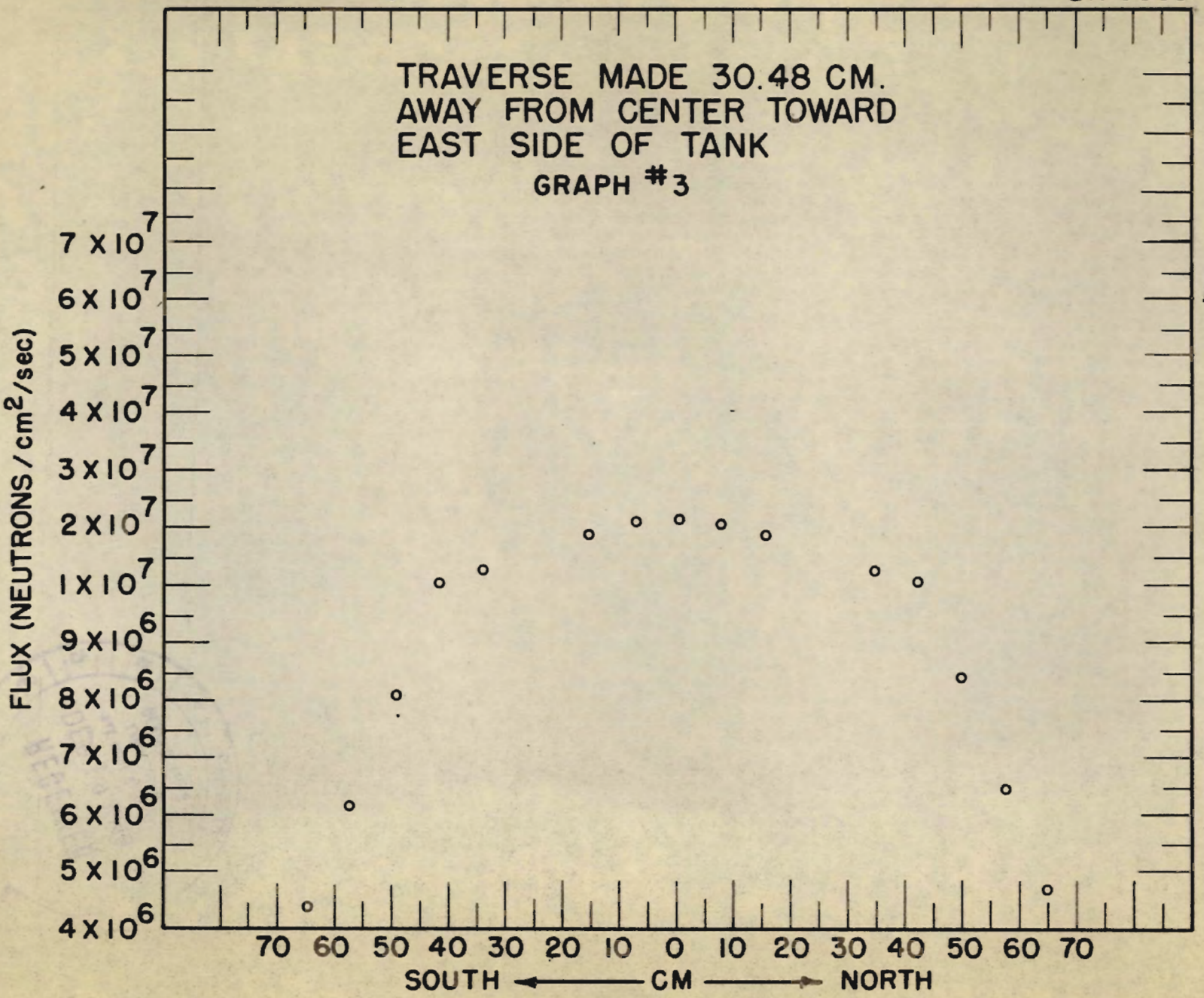


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