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RANGES IN AIR OF PLUTONIUM FISSION FRAGMENTS AS A
FUNCTION OF THEIR MASS

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RANGES IN AIR OF PLUTONIUM FISSION FRAGMENTS AS AFUNCTION OF THEIR MASS
Preliminary Summary

J. A. Maskel and S. Katcoff

It is possible to effect a partial separation of fission products by taking advantage of the variation in the range of fission fragments as a function of their mass. The same phenomenon can be used to determine the mass numbers of previously unassigned fission products. In the experiments reported here the ranges in air of seven plutonium fission products have been determined and mass numbers have been assigned to two of these. The straggling in the range has been determined for each of these also.

The apparatus consists of a beryllium tube about 8 inches long and one inch in diameter which contains a flat plutonium foil (about 0.1 mg/cm^2 thick) at one end. Starting at about 4 inches from the plutonium, there is a series of 14 zapon films (about $7 \text{ } \mu\text{g/cm}^2$ thick) spaced $1/8$ -inch apart. The tube is ordinarily evacuated to an air pressure of 12.0 cm Hg and then irradiated in a high neutron flux at the center of the Los Alamos "water boiler". The zapon films are so situated that all fission fragments in the mass range being studied, which do not strike the walls of the tube, are stopped in the region of the zapon films. They then diffuse to the nearest film where they remain. Nearly all of the stopping material is air.

After irradiation each zapon film (except the first and last) is radiochemically analyzed for a few fission products. The activities found on each film are corrected to the same solid angle and then plotted against distance of dry air traversed by the fragments, as in Fig. 1. The distance is corrected to 76.0 cm Hg pressure, to 15° C , and account is taken of the

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thickness of zapon traversed. By integrating the area under these curves, integral range curves are obtained, as in Fig. 2. The straight portions of these are extrapolated to zero activity to give extrapolated ranges.

So far, 8 fission products in the heavy group have been investigated. The extrapolated ranges and widths at half height of the differential range curves are listed in the following table. The results for 85 m Ba¹³⁹ are considerably distorted because of diffusion of its 41 sec. λ_e ancestor through, or around, the zapon films; therefore, they are omitted from the table.

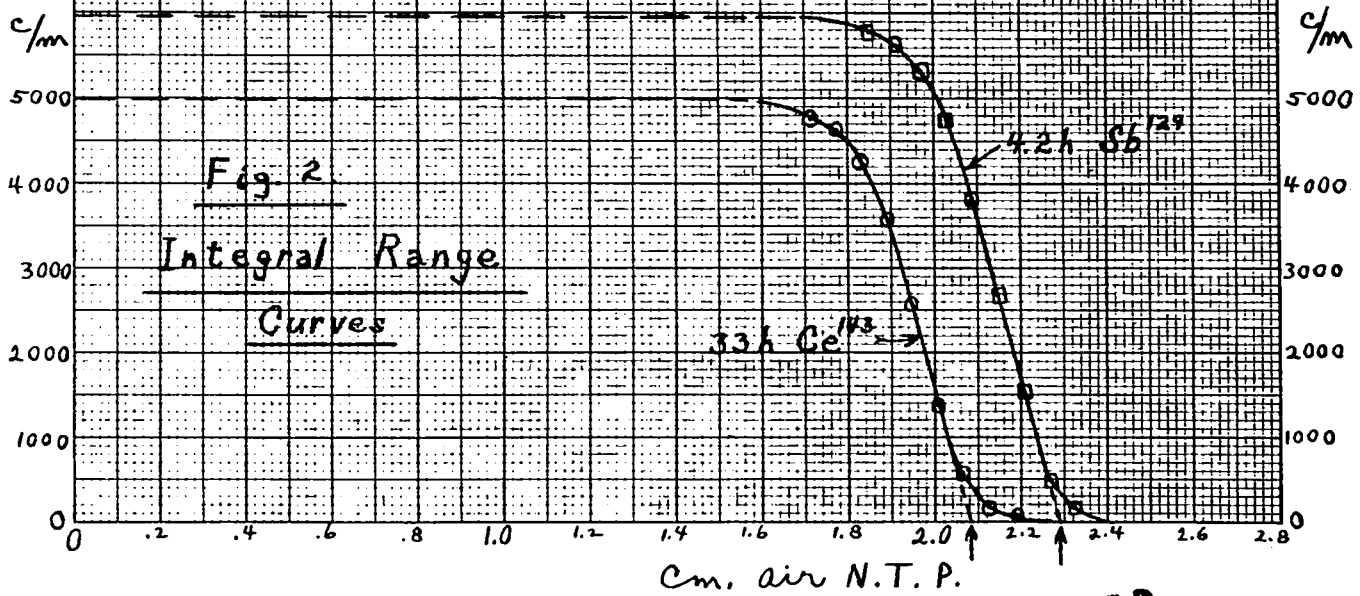
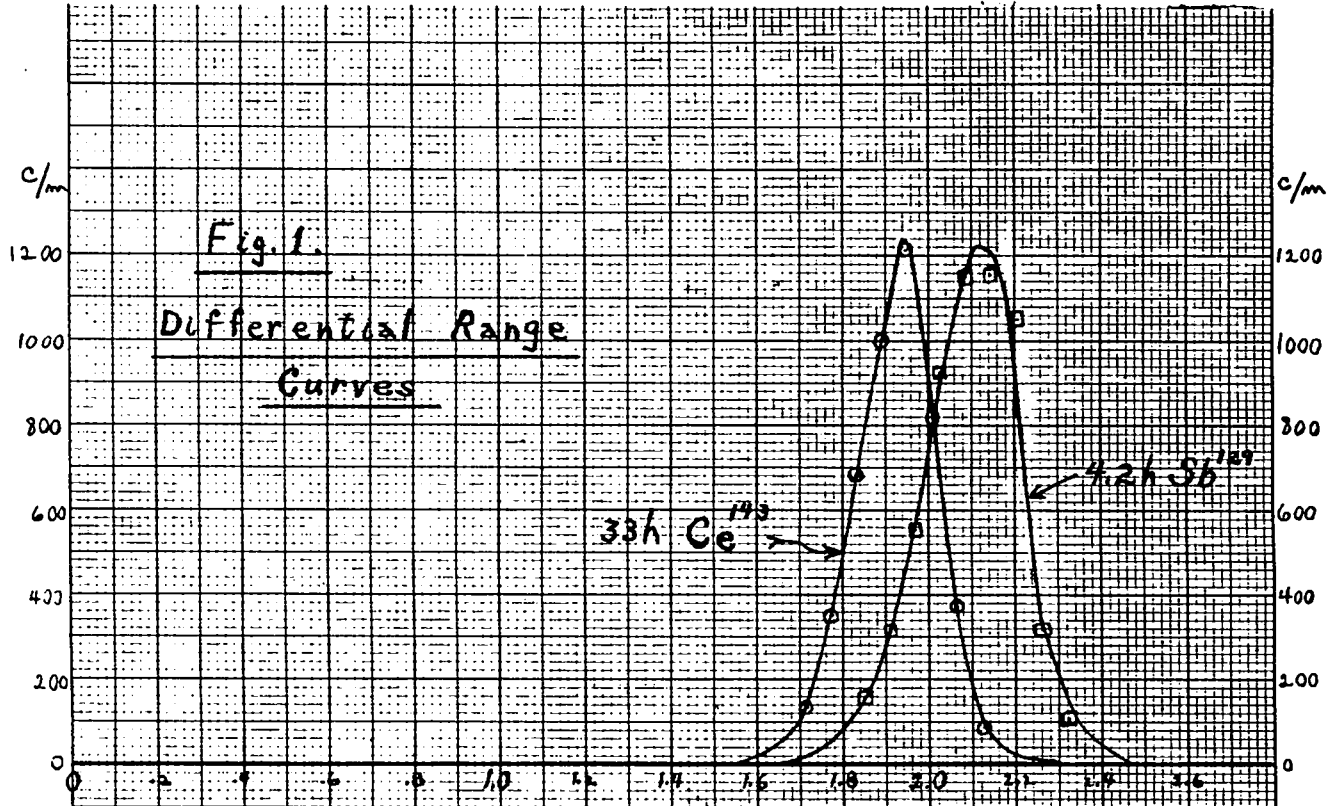
	93 h Sb ¹²⁷	4.2 h Sb ¹²⁹	77 h Te ¹³²	60 m Te ¹³³	43 m Te ¹³⁴	12.8 d Ba ¹⁴⁰	33 h Ce ¹⁴³
Extrapolated Range	2.317 cm	2.296	2.253	2.232	2.210	2.108	2.084
Straggling	13.2%	11.7%	11.9%	10.8%	9.6%	10.4%	11.5%

The results for 60 m Te¹³³ and 43 m Te¹³⁴ were obtained by analyzing for their 22 h I and 54 m I daughters, respectively.

In Fig. 3, the ranges are plotted against the mass numbers. A straight line has been drawn through the points, in the absence of a better approximation. Masses 132 and 134 were previously unassigned, but it is now obvious from Fig. 3 that they should be assigned to 77 h Te and 43 m Te, respectively. The results reported here should be considered only as tentative because the experiments are still in progress.

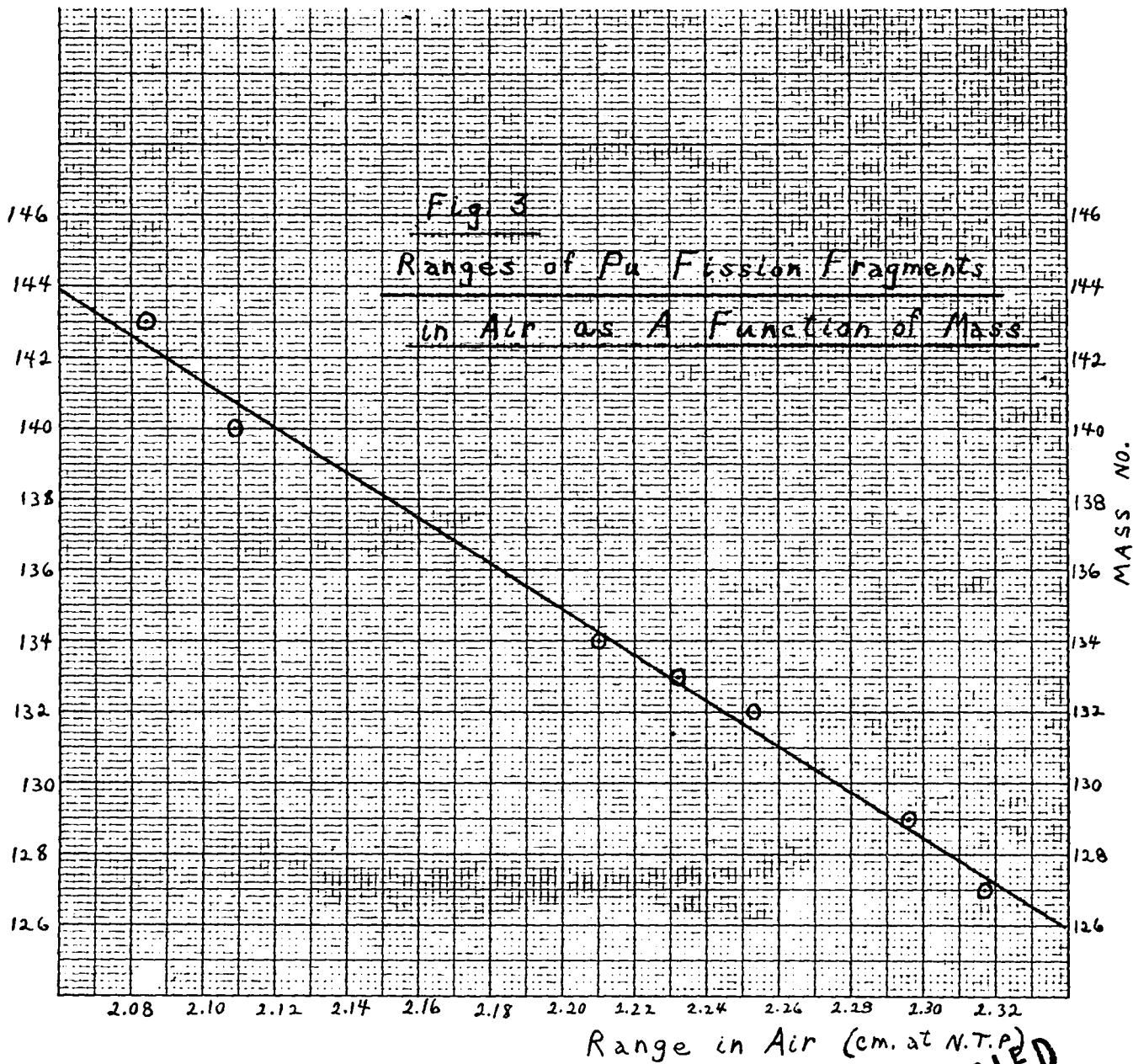
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