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Neutron total cross sections for bismuth and uranium have been measured in a good geometry transmission experiment, using a time-of-flight instrumentation.[1,2] The source of neutrons was the stripped deuteron beam of the 184-inch synchrocyclotron. The results are shown in Fig. 1. Uncertainties are shown in terms of standard deviations, due to counting statistics only, and to energy channel width.

The distribution of values indicates a "dip" in cross section in the vicinity of 60 Mev for the two elements, similar to results first obtained by Taylor and Wood for lead.[3,4,5]

Absolute values of the cross section may be in error by a constant estimated to be ± 0.2 barn because of beam intensity variations. Inasmuch as such a constant would be added to all the points for an element, it would not affect the variation of cross section with energy.

The energy scale was calibrated by time-of-flight of gamma rays. The time-of-flight of a neutron or photon could be measured with a probable error of $\pm 0.2 \times 10^{-8}$ seconds, including the effect of neutron production time (this leads to a resolution of 5×10^{-11} seconds per meter at the flight distance of 43.7 meters). At 90 Mev the absolute value of the quoted energy seems to be in error by not more than ± 2 Mev.

We wish to thank Prof. H. F. York for suggesting this technique and Prof. L. W. Alvarez, under whose guidance this work was carried out, for valuable suggestions; also James Vale, Lloyd Hauser and the cyclotron crew for much cooperation. Thanks are due also to Robert Silver and John Leahy whose help at times of runs was particularly welcome, and to Vern Ogren and Don Paxon, both of whom rendered expert electronics assistance in many ways.

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References

1. University of California Radiation Laboratory Report, UCRL-1952.

2. W. I. Linlor and B. Ragent, Bull. Amer. Phys. Soc., 28, 16 (1953), Abstract D2.

3. A. E. Taylor and E. Wood, Phys. Rev., 87, 907 (1952).

4. A. E. Taylor and E. Wood, Phil. Mag., 44, 95 (1953).

5. B. Ragent and W. I. Linlor, Bull. Amer. Phys. Soc., 28, 16 (1953), Abstract D3.

Figure Caption

Fig. 1 The variation with energy of the neutron total cross section for bismuth and uranium, measured by time-of-flight instrumentation. The errors shown are standard deviations based on total counts and on energy channel width.