

Lawrence Berkeley National Laboratory

Recent Work

Title

NEUTRON TOTAL CROSS SECTION FOR BISMUTH AND URANIUM BETWEEN 45 AND 160 MeV

Permalink

<https://escholarship.org/uc/item/5r87j1z0>

Authors

Linlor, W.
Ragent, B.

Publication Date

1953-08-05

UNCLASSIFIED

UNIVERSITY OF CALIFORNIA

Radiation Laboratory

Contract No. W-7405-eng-48

NEUTRON TOTAL CROSS SECTION FOR BISMUTH AND
URANIUM BETWEEN 45 AND 160 MEV

W. I. Linlor and B. Ragent

August 5, 1953

Berkeley, California

DISCLAIMER

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor the Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or the Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof or the Regents of the University of California.

Standard Distribution, Series A:

Declassification Officer
Publication Officer
Patent Department
Information Division

1-6
7
8-9
10

NEUTRON TOTAL CROSS SECTION FOR BISMUTH AND URANIUM BETWEEN 45 AND 160 MEV

W. I. Linlor and B. Ragent

Radiation Laboratory, Department of Physics
University of California, Berkeley, California

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.

This work was sponsored by the United States Atomic Energy Commission.

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.