Indian J, Phys, **43**, 300 (1969)

Absolute photoelectric cross sections of 800keV gamma rays

By M. Raja Rao, K. Parthasaradhi and Swami Jnanananda
The Laboratories for Nuclear Research, Andhra University, Waltair, India.

(*Received January* 11, 1964)

The photoelectric cross-sections of 800 keV gamma rays in Au and Ta are measured by the internal external conversion technique. Theses values are found to be in satisfactory agreement with the recently reported theoretical values of Schmickley & Pratt (1967) within the range of errors.

Direct experimental studies on absolute photoelectric cross-sections are restricted to gamma energies below 662 keV and above 1 meV only. Very accurate theoretical total photoelectric cross-sections are recently reported by Schmickley & Pratt (1967). In the present investigations absolute photoelectric cross-sections of 800 keV gamma rays in Au and Ta are determined for the first time utilising plastic phosphor scintillation detector and employing the internal external conversion technique.

A gamma source ^{134}Cs in liquid form is obtained from the Bhabha Atomic Research Centre, Bombay. Although the gamma ray spectrum from this source is complex, most of the gamma lines are quite weak in intensity, compared to 605 and 766 keV lines. There is another weak line of energy 802 keV very close to 796 keV line. These two lines cannot be resolved by a scintillation spectrometer and for all practical purposes a combination of these lines is treated as a gamma ray of energy 800 keV. Foils of diameter 3/8 inch and thicknesses 14.8 mg/cm^2 (Au) and 17.6 mg/cm^2 (Ta) are used. The experimental details and the method of evaluation of the photoelectron intensity and the gamma ray intensity are described in earlier publications (Raja Rao *et al* 1965, 1968). A well-type plastic phosphor of sufficient depth to detect the photoelectrons is used. The internal conversion coefficient measured by a comparison method by Trehan *et al* (1963) is employed for calculating the gamma intesity.

The obtained experimental total photoelectric cross-sections in Au and Ta are 8.3 ± 1.0 and 5.3 ± 0.6 barns per atom and the corresponding theoretical values of Schmickley & Pratt (1967) respectively are 8.3 and 5.6 barns per atom. It can be seen that there is satisfactory agreement between theory and experiment within the range of errors.

References

Raja Rao, M. & Jnanananda, Swami 1965 *Nuclear Instruments & Methods*, **36**, 261.
Raja Rao, M. K. Parthasaradhi & Jnanananda, Swami 1968 *Current Science* **37**, 401.
Trehan, P. N. French, J. D. & Goodich, M. 1963 *Phys. Rev.* **131**, 2625.
Schmickley R. D. & Pratt, R. H. 1967 *Phys. Rev.* **164** 104.