

International Collaboration in Measurement of Differential Nuclear Data for Energy Applications in the Frame of the NEA Nuclear Science Committee

STATUS REPORT ON THE PLANNED ILC ON INELASTIC SCATTERING CROSS SECTIONS OF 238U

H. Weigmann, IRMM, Geel, Belgium

Despite many measurements which have been done in the past on the inelastic scattering cross section of 238U, discrepancies are still important, and data are lacking in certain energy regions [1]. Therefore, it has been proposed by the NEA Nuclear Science Committee that an Inter-Laboratory Collaboration should be organized on this subject. The present status with respect to this proposal is that (1) a meeting of experts in the field is planned to be held during the Gatlinburg Conference, and (2) an experiment on inelastic scattering at low energies ($E < 0.22$ MeV) has been performed at IRMM, Geel.

1) The meeting during the Gatlinburg Conference is planned to be held in room D on Wednesday, May 11, at 2:00 p.m. The following persons are planning to participate:

- Dr. M. Baba, Tohoku University
- Dr. J.A. Harvey, ORNL
- Dr. Y. Kanda, Kyushu University (possibly replaced by a colleague)
- Prof. G. Kegel, University of Lowell
- Dr. D.C. Larson, ORNL
- Dr. D.L. Smith, ANL
- Dr. H. Weigmann, IRMM

The meeting is intended to discuss the following points:

- On the basis of the conclusions of IEC subgroup 4, to pinpoint the problems in the existing data,
- to specify the experimental effort required to improve the data base,
- to possibly identify laboratories best equipped to meet the needs for experimental work.

2) The experiment performed at IRMM, Geel, was especially designed to improve the data base on the inelastic scattering from the first excited state at 45 keV at low incident energies, where data were very sparse: below 100 keV neutron energy there was only one precise measurement at 82 keV [2] carried out at ORELA with an iron filtered incident neutron beam. The Geel experiment utilizes a 30 m flight path of the GELINA white neutron source. The experimental layout is shown in Fig. 1. The technique employed is similar to the ORELA one, but this time the iron filter is placed in the scattered beam. Scattered neutrons with energies corresponding to the windows (e.g. at 22.9, 81.5, 137.3 and 168.5 keV) in the iron cross section are transmitted through to the detector. These will, besides elastically scattered neutrons, also include neutrons inelastically scattered from the 238U sample at incident energies of 68.2, 126.6, 182.4 and 213.6 keV. The measurement of the inelastic scattering cross section is thus done relative to the elastic scattering cross section at the same secondary energy. It is to be noted that the measurement is done under an angle of 90 degrees, thus the result is dependent on the assumed angular distributions; these have been estimated with the aid of a Hauser-Feshbach statistical model calculation.

The results from the present measurement are shown together with data from the literature in Fig. 2.

References:

1. M. Salvatores, Proc. Conf. on Nuclear Data for Science and Technology, Jülich 1991; Springer Verlag, Heidelberg 1992.
2. R.R. Winters, N.W. Hill, R.L. Macklin, J.A. Harvey, D.K. Olsen and G.L. Morgan, Nucl. Sci. Eng. 78 (1981) 147.

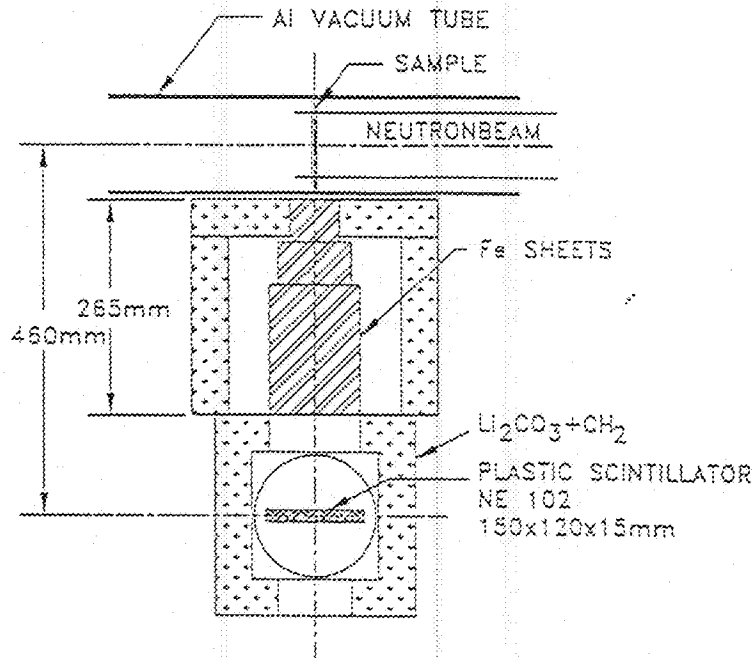


Fig. 1: Schematic layout of the detector and sample

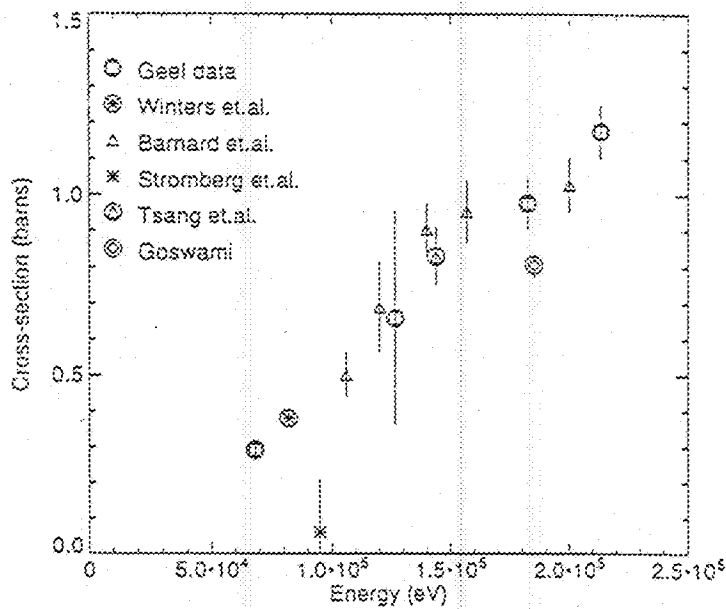


Fig. 2: Measured values of the inelastic scattering cross section to the 44.9 keV level in ²³⁸U