

Compilation of Experimental Data for Standard Cross Sections Evaluation

Memo CP-D/699 (V. Semkova, N.Otsuka, 2011-05-18)

Neutron cross section standards are important for measurements and evaluations of neutron cross sections. They are regularly re-evaluated. Last re-evaluation was completed at 2006. It was based at the GMA database of the results of measurements assembled by Wolfgang Poenitz (W.P. Poenitz, S.E. Aumeier, Report ANL/NDM-139 (1997)) updated with new results available to 2004. It includes the data available from the EXFOR database, the literature, or obtained as private communications from the authors. Comprehensive information regarding the last neutron cross-section standard evaluation is available at: <http://www-nds.iaea.org/standards/>. We considered important that EXFOR database should contain information for all standard cross section measurements. But this is not a case at present. A list of data (and corresponding articles) included in the GMA database but still has not been compiled in EXFOR was prepared. The table below contains the references with indication of the Data Centres responsible for the compilation. NDS can provide pdf copy for some of the articles.

Numerical data used in the standard evaluation are given in the text file at

<http://www-nds.iaea.org/standards/LastResults/GMDATA-21Oct04.CRD>

in input format for GMA data preparation code DATA. Description of the format is given in the ANL/NDM-139 report (<http://www-nds.iaea.org/standards/Reports/ANL-NDM-139.pdf>). Vladimir Pronyaev (Pronyaev@ippe.ru) may help in case of problems of understanding of format. Because the data had not been received from authors directly, compilers should indicate the source of data under STATUS. (Below a new STATUS code PENTZ is introduced). The attention should be paid, that GMA uses so-called “primary measured quantities” (e.g. ratio of cross sections if measurement was done relative other reaction) in the evaluation, which often are not last result presented by the authors (e.g. absolute cross section). Also, the components of uncertainties needed for generation of covariances matrices of uncertainties of experimental data in cases when they are not given by the authors can be assigned on the basis of the experts’ estimation.

Example

STATUS (PENTZ) Data extracted from W.P. Poenitz’s data collection (ANL/NDM-139).

	Reference	Centre (# indicates data set number in GMDATA-21Oct04.CRD)
1	Renner, C. (1978) PhD thesis, Universidade de São Paulo, Brazil.	NDS Missing in EXFOR: LI6(N,A) (#202)
2	J.R. Lemley, G.A. Keyworth, and B.C. Diven, "High Resolution Fission Cross Section of Uranium-235 from 20 to 100 keV", Nucl. Sci. Eng. 43 , 281-285 (1971).	NNDC Missing in EXFOR: U5(N,F)/LI6(N,A) (#244)
3	F. Corvi, (1983) personal communication, $^{235}\text{U}(n,f)/^6\text{Li}(n,\alpha)$.	NEA DB Missing in EXFOR: U5(N,F)/LI(N,A) (#531)
4	W.P. Poenitz, BNL-NCS-51388.	NNDC Missing in EXFOR: LI6(N,A) (#702)
5	W.P. Poenitz and J.W. Meadows, (1976) unpublished, $^6\text{Li}(n,a)/^{235}\text{U}(n,f)$.	NNDC Missing in EXFOR: 6LI6(N,A)/U5(N,F) (#250)
6	C. Wagemans, G. Coddens, H. Weigmann, R. Barthelemy, "Measurement of the $^{239}\text{Pu}(n,f)$ cross section from thermal up to 30 keV neutron energy". Annals of Nuclear Energy , 7 (9) , 495,1980.	NEA DB (EXFOR 21704) Missing in EXFOR: PU9(N,F)/LI6(N,A) (#547)
7	J.F. Barry, "Cross Section for the Reaction $^6\text{Li}(n,\alpha)t$ ", in Proceedings of a Conference on "Neutron Cross Section Technology", Washington, D. C., March 22-24, 1966, p. 763.	NEA DB (EXFOR 20893) Missing in EXFOR: LI6(N,A)/U5(N,F) (#288)
8	W.P. Poenitz, J.W. Meadows, "The $^6\text{Li}(n,a)$ Cross-Section" in the Proceedings of a Panel Neutron Standard Reference Data, Vienna, 20-24 November 1972, p. 95, IAEA, Vienna, 1974, STI/PUB/371, ISBN 92-0-031074-5.	NNDC Missing in EXFOR: LI6(N,A) (#241)
9	W.P. Poenitz, "Relative and Absolute Measurements of the Fast-Neutron Fission Cross-Section of Uranium-235", Nucl. Sci. Eng. 53 , 370-392 (1974).	NNDC (EXFOR 10333) Missing in EXFOR: U5(N,F)/LI6(N,A) (#561)
10	R.L. Macklin, "Gold Neutron Capture Cross Section from 100 to 2000 keV", Nucl. Sci. Eng. 79 , 265-268 (1981).	NNDC (EXFOR 12720) Missing in EXFOR: AU(N,G)/LI6(N,A) (#313) AU(N,G)/U5(N,F) (#314)
11	R.L. Macklin, J. Halperin, R.R Winters, "Gold neutron-capture cross section from 3 to 550 keV", Phys. Rev. C 11, C1270, 1975.	NNDC (EXFOR 10432) Missing in EXFOR: $^{197}\text{Au}(n,g)/^6\text{Li}(n,a)$ (#312)
12	H, Condé, S. Schwarz and N. Starfelt, A method for the absolute measurements of fast neutron flux with a large	NEA DB (EXFOR 20112)

	liquid scintillator”, Arkiv för fysik 29 , 45, 1965.	Missing in EXFOR: LI6(N,A) (#198)
13	A.A Bergman, A.I. Isakov, IU. P. Popov, and F.L. Shapiro, “MEASUREMENTS WITH THE SLOWING-DOWN-TIME NEUTRON SPECTROMETER EMPLOYING LEAD. EXCITED LEVEL OF THE He ⁴ NUCLEUS”, - (1957) Zh. Eksp. Teor. Fiz. 33 , 9; English translation in Soviet Physics - JETP 6 , 6,1958	CJD (EXFOR 41272) Missing in EXFOR. LI6(N,A)/B(N,A) (#160)
14	H.G. Silk, B.O. Wade, Harwell Report, AERE-M 2366 (1970)	NEA DB
15	J.W. Meadows, in the Proceedings of a Symposium on Neutron Standards and Flux Normalization, 129 (1971)	NNDC Missing in EXFOR. LI6(N,A) (#707)
16	W. Becker, A.J. Deruytter, J. Wartena, in the Proceedings of a Symposium on Neutron Standards and Flux Normalization, 125 (1971)	NNDC