WP2017-20

EXFOR data sets for neutron standard evaluations (including NRDC 2016 A30)

(N. Otsuka, 2017-05-16, Memo 4C-3/409)

1. NRDC 2016 A30 (Continuing action to NNDC)

I checked the status of the GMA data sets reserved for assessment by NNDC to close this item. I found Tables 1 and 2 of J.W. Meadows, C,70ANL,,129,1970 must be added to EXFOR 10148, and they should supersede EXFOR 10148.002 and 003. See **Appendix 1** of this memo for more details about my assessment.

2. Digitized NIST ^{235}U(n,f) cross sections for deletion (EXFOR 13995.002)

The ^{235}U(n,f) cross sections published in Figs.1 to 3 of C,88MITO,,1037,1988 are digitized and compiled in EXFOR 13995.002. I found all data sets are compiled in 10595.002, 10950.002 (but in a different group structure), 10971.002, 10987.002, 12848.002-003 and 12924.002. I suggest deletion of the digitized data set.

The group structure adopted in 10595.002 is different from the group structure adopted in the 88MITO article. The data set published in the 88MITO article is also tabulated in Table A.III of Nucl. Sci. Eng. 81(1982)196 (with point-wise partial uncertainties), and I propose addition of this Table A.III data set to EXFOR 10595 as an alternative result of 10595.002.

3. Digitized NIST ^{235}U(n,f) cross sections for clarification (EXFOR 14048.002)

The ^{235}U(n,f) cross sections published in Fig.10 of S,INDC(NDS)-146,61,1983 are digitized and compiled in EXFOR 14048.002. It looks similar to the data set received from the author and compiled in EXFOR 10987.002. Their relation must be clarified by communicating with the author (A.D. Carlson).

4. NIST ^{235}U(n,f) cross sections renormalized (EXFOR 12848.002-003, 12924.002)

EXFOR 12848.002, 12848.003 and 12924.002 provide ^{235}U(n,f) cross sections reported by A.D. Carlson et al. They are renormalized by himself withd Vladimir Pronyaev in the GMA input file by adoption of n-p scattering data in ENDF/B-VII (GMA #508, #509 and #1025). I wonder if we should add the GMA data sets in EXFOR (GMA #509 provides five more data points than EXFOR 12848.003) which supersede the abovementioned three subentries.

I also want to know if we can adopt S,IAEA-TECDOC-0335,467,1985 as a reference of EXFOR 12924 (which was compiled from a preprint which bibliography is unknown).

These questions must be clarified by communicating with the author.

5. New ^{238}U(n,f) cross sections from LANL WNR

A new ^{238}U(n,f) cross section data set was measured at LANL WNR, and published in Table 4.6 of Zchariah W. Miller's thesis (University of Kentucky, 2015). This must be newly compiled by NNDC.

6. ^{235}U(n,f) cross sections from TUD/KRI collaboration

It has been known that there are several versions of the absolute fission cross sections measured by the collaboration between Technical University of Dresden (TUD) and Khlopin Radium Institute (KRI). See also "open problems" in p198 of INDC(NDS)-438 p198. Some data sets have been already superseded, but there are still several versions for the ^{235}U(n,f) cross sections at 2.6, 4.5, 8.5, 14.7 and 18.8 MeV. Various versions of the data points are summarized in **Appendix 2** of this memo.

- **30558.002:** This looks very similar to the 41013.003 except for the neutron energy (8.7 MeV in 30558.002, 8.46 MeV in 41013.003). This 30558.002 data set was published as 1.801 b at 8.5 MeV in Table 2 of J,SJA,55,656,1983, and then the incident energy was changed to 8.7 MeV in J,IP,21,344,1985 (as compiled in 30558.002). Then the incident energy was further changed to 8.46 MeV in C,88MITO,,145,1988. I propose to supersede 30558.002 by 41013.003.

- **30559.002:** This looks very similar to 41013.003. Must be superseded.

- **41012.003:** This is explicitly superseded by 41012.004 in the source article (C,88MITO,,145,1988). I propose to supersede 41012.003 by 41012.004.

- **41012.004:** Cross sections at the same energies are published in C,91JUELIC,510,1991 and compiled in 22304.002 and 006. This 1991 article does not cite the 41012 article (C,88MITO,,145,1988) explicitly, and this could be the reason why the 1988 data set has not been superseded yet by the 1991 data set. However the abstract of the 1991 article mentions that "The comprehensive program of absolute fission cross-section measurements at the Technical University Dresden (TUD) in collaboration with the Khlopin Radium Institute Leningrad (KRI) was completed in 1990", this would imply that the 1991 article is the final report of the TUD/KRI collaboration. I propose to supersede 41012.004 by 22304.002 and 006.

Note that the GMA input also adopts the 22304.002 and 006 data set (= GMA#598, #590-#593).

Appendix 1: GMA data sets assigned to NNDC for assessment (Extraction from CP-D/699)

(GMA# indicates data set number in GMDATA-21Oct04.CRD)

GMA#	Reference	Reaction	En min (MeV)	En max (MeV)	Comment
244	J.R. Lemley+J,NSE,43,281,1971	235U(n,f)/6Li(n,α)	150 eV	95 keV	EXFOR 10120.002 provides the absolute 235U(n,f) cross section from this experimental work covering the same energy range.
702	W.P. Poenitz, BNL-NCS-51388.	6Li(n,α)	Thermal		A value from pre-evaluation by Poenitz and Holden. Not for EXFOR compilation.
250	W.P. Poenitz+,W,POENITZ,1976	6Li(n,α)/235U(n,f)	59.26 keV	541.2 keV	No similar data in EXFOR. The note of the GMA input mentions that the neutron energy was reduced by 0.006-0.004E. It is not clear who introduced this change.
241	W.P. Poenitz+,C,72VIENNA,,95,1972	6Li(n,α)	85.36 keV	591.4 keV	EXFOR 10378.002 (blocked with the 72VIENNA article in CINDA) provides a similar data set but with thinner bins. The GMA input file mentions that the neutron energy was reduced by 0.006-0.004En. It is not clear who introduced this change.
561	W.P. Poenitz,J,NSE,53,370,1974	235U(n,f)	448 keV	644 keV	**EXFOR 10333.004 provides the same data set.**
313	R.L. Macklin,J,NSE,79,265,1981	197Au(n,g)/6Li(n,α)	3.5 keV	95 keV	EXFOR 12720.002 provides absolute 197Au(n,g) cross sections from this experimental work covering the same energy range.
314	R.L. Macklin,J,NSE,79,265,1981	197Au(n,g)/235U(n,f)	105 keV	1.95 MeV	EXFOR 12720.002 provides absolute 197Au(n,g) cross sections from this experimental work covering the same energy range.
312	R.L. Macklin+, J,PR/C,11,1270,1975	197Au(n,g)/6Li(n,α)	15 keV	545 keV	EXFOR 10432.002+003 provides absolute 197Au(n,g) cross sections from this experimental work covering the same energy range.
707	J.W. Meadows, C,70ANL,,129,1970	6Li(n,α)	Thermal		**EXFOR 10148.002 and 003 must be superseded by Tables 1 and 2 of the 1970 article, respectively.** The author mentions that "Some of this material has been presented previously [3-4]. All the data have been reevaluated.", where Ref.[4] is the source article of the EXFOR entry.
?	W. Becker+,C,70ANL,,125,1970				Cannot identify the corresponding data set in GMDATA-21Oct04.CRD. This article reports thermal 6Li(n,tot) cross section from Geel (945 b). The authors mention that its accuracy only a few percent. It seems a preliminary result.

Appendix 2: ^{235}U(n,f) cross sections from TUD/KRI collaboration

En (MeV)	σ (b)	Δσ (b)	Author	Year	EXFOR #	Reference	Source	GMA
1.88	**1.280**	**0.030**	**V.A.Kalinin+**	**1991**	**41112.002**	**J,SJA,71,700,1991**	**Table 2**	**1026**
2.37	**1.270**	**0.030**	**V.A.Kalinin+**	**1991**	**41112.002**	**J,SJA,71,700,1991**	**Table 2**	**1026**
2.6	1.215	0.018	S.S.Kovalenko+	1985	30559.002	J,IP,21,344,1985	Table 1	
2.56	1.215	0.019	I.D.Alkhazov+	1988	41013.003	C,88MITO,,145,1988	Table 5	
2.56	1.238	0.024	I.D.Alkhazov+	1988	41013.004	C,88MITO,,145,1988	Table 5	
2.6	**1.240**	**0.024**	**K.Merla+**	**1991**	**22304.006**	**C,91JUELIC,,510,1991**	**Text**	**591**
4.45	1.057	0.022	I.D.Alkhazov+	1988	41013.003	C,88MITO,,145,1988 R,INDC(GDR)-037,1985	Table 5 Table 5	
4.45	1.093	0.023	I.D.Alkhazov+	1988	41013.004	C,88MITO,,145,1988	Table 5	
4.45	**1.094**	**0.024**	**K.Merla+**	**1991**	**22304.002**	**C,91JUELIC,,510,1991**	**Table 2**	**590**
8.7	1.801	0.043	S.S.Kovalenko+	1985	30558.002	J,IP,21,344,1985	Table 1	?
8.46	1.801	0.041	I.D.Alkhazov+	1988	41013.003	C,88MITO,,145,1988	Table 5	
8.46	1.853	0.043	I.D.Alkhazov+	1988	41013.004	C,88MITO,,145,1988	Table 5	
8.46	**1.855**	**0.044**	**K.Merla+**	**1991**	**22304.002**	**C,91JUELIC,,510,1991**	**Table 2**	**592**
14.7	2.085	0.025	I.D.Alkhazov+	1988	41013.003	C,88MITO,,145,1988	Table 5	
14.7	2.094	0.023	I.D.Alkhazov+	1988	41013.004	C,88MITO,,145,1988	Table 5	
14.7	**2.096**	**0.024**	**K.Merla+**	**1991**	**22304.006**	**C,91JUELIC,,510,1991**	**Text**	**593**
18.8	1.999	0.045	I.D.Alkhazov+	1988	41013.003	C,88MITO,,145,1988 R,INDC(GDR)-037,1985	Table 5 Table 5	
18.8	2.065	0.049	I.D.Alkhazov+	1988	41013.004	C,88MITO,,145,1988	Table 5	
18.8	**2.068**	**0.050**	**K.Merla+**	**1991**	**22304.002**	**C,91JUELIC,,510,1991**	**Table 2**	**587**