Data assessment of $^{12}C(p,p)^{12}C$ cross sections from 3.5 to 5 MeV

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Summary

IBANDL (on 1/2/2008) reports only three databases for $^{12}C(p,p)$ differential cross sections in the energy region from 3.5 – 5 MeV. Tosaki data from original publication [1] were transferred to IBANDL without errors.

Second database reported in IBANDL is from Jackson et al.[2]. They reported cross sections from 400 keV up to 4360 keV for several c.m. scattering angles 169.2°, 148.9°, 127.8° and 106.4° that corresponds to 168.2°, 146.3°, 123.8° and 101.7° lab angles. Differential cross sections are reported only in graphical form and in c.m. system. Data for 168.2° and 146.2° are already present in IBANDL. For two other angles 123.8° and 101.7° data from EXFOR (in R33 format) are uploaded now to IBANDL. For all angles, EXFOR data were transferred to c.m. system reported in original publication and compared with figures from original publication. It was found that digitized data from EXFOR are in agreement with data published in original publication.

Third data base reported in IBANDL is recently published data set from Cacciolli et al. [3]. They report proton cross-sections on F, C and Li from 3 to 7 MeV and for 150° scattering angle. Data are presented only in graphical form and are uploaded to IBANDL by authors.

Except those three data bases, two other works where found in EXFOR. In first work Reich et al. [4] report c.m. differential cross sections (barn/sr) for following c.m. scattering angles: 54.7°, 90°, 125.3°, 131.4°, 137°, 140.8°, 149.4° and 164° which corresponds to laboratory angles of 51°, 85°, 121°, 128°, 134°, 137°, 147° and 163°. For 85° there are three different graphs with three different excitation functions with overlapping energy region as can be seen on Fig. 2. Similar is done for 51° where three data bases with overlapping energy region can be found in original publication. For 121° two data bases exist as can be seen on Fig.3. In the original publication data are presented only in the graphical form. All data are digitized and can be found in EXFOR data base. R33 files from EXFOR were compared with data from original publication and errors were detected only in three files. For 85° (lab) in the energy region from 4113-4991 keV cross section value for 4956 keV was different than value in original paper and was removed. Same thing was done for 121° (lab) and energy region from 4114-4923 keV where CS value at 4780 keV differs than published value. Also for 85° (lab) and 1593-5562 keV region CS at 4814 keV was not reported in the original publication and was removed.

In the work of Swint et al. [5], cross sections for elastic scattering of protons from carbon are measured for laboratory angles of 25.5°, 85.2°, 105.2°, 121.2°, 137.5° and 159.5° for incident energies from 4.7 to 12.8 MeV. For two angles (85° and 105°) comparison of R33 files generated from digitized EXFOR data with data from original publications have shown that only few points obviously not belong to original graphs and are removed from R33 files. For 26° digitized CS between 7500-8500 keV do not correspond to data from original publication and this should be corrected. Similar is found for 121° where CS for energies higher than 7500 keV do not correspond to values from original publication.

Experimental data from different publications for same scattering angles are shown on Figs. 1-4. At Fig.1, data for 138° from Ref. [4] and [5] are compared. It can be seen that data from [5] are slightly lower but also position and intensity of 4800 keV resonance is shifted comparing to data from [4]. For 85° Fig.2 shows that in [4] there are 3 data groups which overlap in the region from 4600 to 5000 keV and also differ in CS values and position of CS anomaly around 4800 keV. Data from [5] are shifted for about 20 keV in direction of lower energies comparing to data from [4]. Similar 20 keV shift toward lower energies and difference in intensity around 4800 keV can be seen if we compare CS for 121° from [4] and [5]. Out of this resonant region two data bases are in good

agreement. Around 150° we can compare data from three publications. As can be seen from Fig.4 they are in very good agreement except for the height of 4800 keV resonance.

As a conclusion, there are five available publications about $^{12}C(p,p)$ scattering in the energy range from 3500 – 5000 keV. Available data from three old publications [2,4,5] are given only in the graphical form. Major part of those data is not yet included to IBANDL but is included in EXFOR and is already digitized. R33 files generated from EXFOR will be uploaded to IBANDL data base.

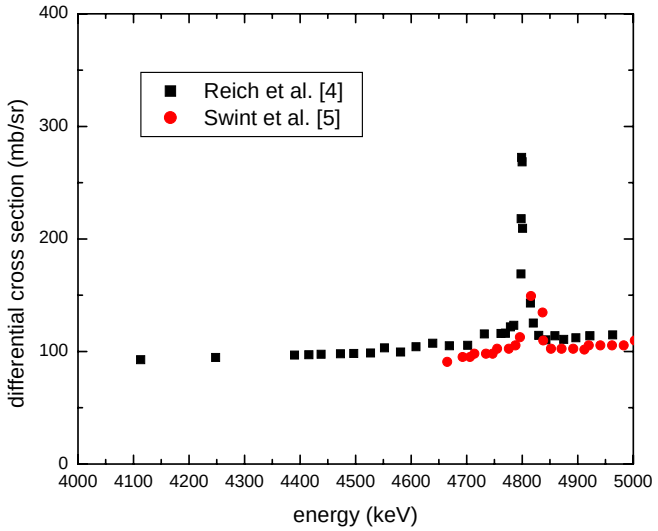

Fig.1. Comparison of CS data from Ref. [4] and [5] for 138°

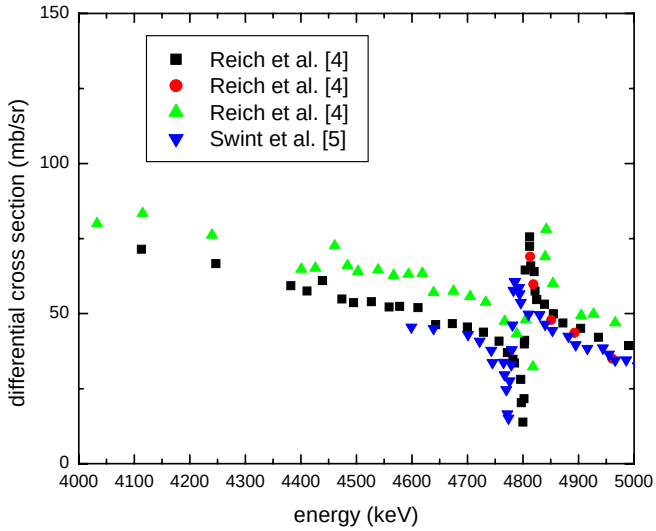

Fig.2. Comparison of CS data from Ref. [4] and [5] for 85°

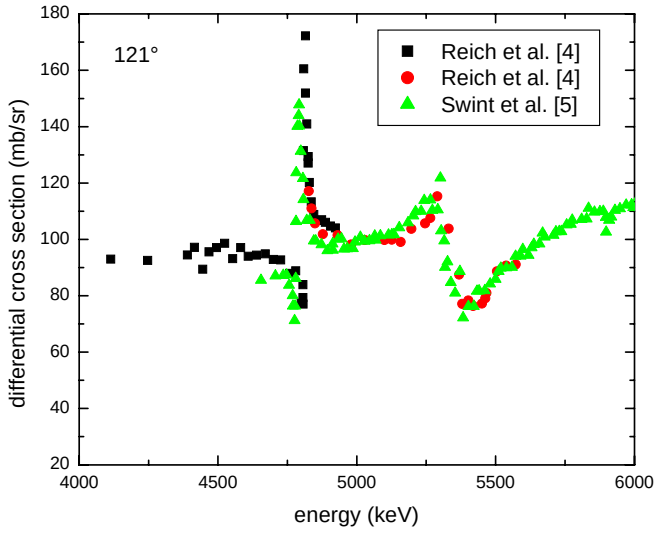

Fig.3. Comparison of CS data from Ref. [4] and [5] for 121°

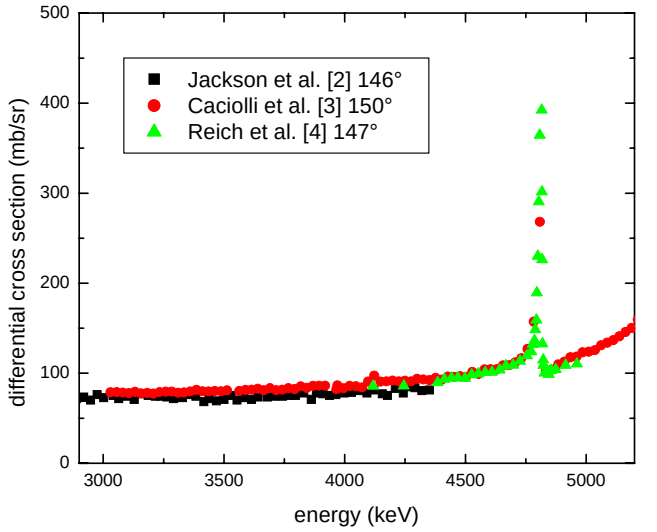

Fig.4. Comparison of CS data from Ref. [2], [3] and [4] around 150°

Angle Lab	energy (keV)	Author	Comment
179.2°	4000-6000	M. Tosaki et al., Nucl. Instr. and Meth. B168 (2000) 543 Ref. [1]	Data in IBANDL are in agreement with data published in original publication.
168.2°	400-4360	H.L. Jackson et al., Phys. Rev. 89 (1953) 365 Ref. [2]	Data from EXFOR already in IBANDL. Data in IBANDL are in agreement with data published in original publication
146°	400-	Ref. [2]	Data from EXFOR already in IBANDL.

	4360		Data in IBANDL are in agreement with data published in original publication
124°	600-4360	Ref. [2]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication
102°	600-4360	Ref. [2]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication
150°	3000-7000	A. Caciolli et al. Ref. [3]	Authors uploaded data to IBANDL without errors
121°	4114-4923	Reich et al., Phys. Rev. 104 (1956) 143 Ref. [4]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication except CS value at 4.78 MeV which is removed
138°	4113-4963	Ref. [4]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication
51°	4117-4965	Ref. [4]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication
85°	4113-4991	Ref. [4]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication except CS value at 4.956 MeV which is removed
128°	4624-4964	Ref. [4]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication
134°	4628-4967	Ref. [4]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication
147°	4117-4962	Ref. [4]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication
51°	4807-5554	Ref. [4]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication
121°	4827-5573	Ref. [4]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication
85°	4813-5549	Ref. [4]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication
163°	4818-5591	Ref. [4]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication
51°	1560-5645	Ref. [4]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication
85°	1593-5562	Ref. [4]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication except for CS at 4814 keV was not in original

			publication and was removed
26°	4662-11590	J.B.Swint et al. Ref [5]	Data from EXFOR not yet uploaded to IBANDL EXFOR data are in agreement with data published in original publication except for CS between 7500-8500 keV where digitized data do not correspond to data from original publication, this should be corrected
85°	4599-12810	Ref. [5]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication except for two CS values at 8443 and 11000 keV where CS values are out of the curves from original publications but not visible on it. Therefore values for those two points are removed from the original R33 files.
105°	4667-11590	Ref.[5]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication except CS value at 5609 keV which do not correspond to the curve from original publication and point is therefore removed
121°	4655-12820	Ref. [5]	Data from EXFOR not yet uploaded to IBANDL EXFOR data are not in agreement with data published in original publication for energies higher than 7500 keV, should be corrected
138°	4665-11480	Ref. [5]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication
159°	4707-12810	Ref. [5]	Data from EXFOR uploaded to IBANDL EXFOR data are in agreement with data published in original publication

Table 1: Comparison between data from original publications and data published in IBANDL

References:

[1] M. Tosaki et al., Nucl. Instr. and Meth. B168 (2000) 543

[2] H.L. Jackson et al., Phys. Rev. 89 (1953) 365

[3] A. Caciolli et al. , Nucl. Instr. And Meth. B249 (2006) 95

[4] Reich et al., Phys. Rev. 104 (1956) 143

[5] J.B.Swint et al., Nucl. Phys. 86 (1966)119