

Data assessment on cross section data for $^{11}\text{B}(\text{p},\text{p})^{11}\text{B}$ backscattering up to 5 MeV

S. Tietz and M. Mayer

Max-Planck-Institut für Plasmaphysik, Boltzmannstr. 2, 85748 Garching, Germany

All known publications connected to proton backscattering from 11-boron have been sifted. If not yet included in IBANDL they have been taken from EXFOR and converted to IBANDL. The largest measurement series was done by M. Chiari et al. [6], which allow us to compare all previous data with their measurements. A complete list can be found at the end in table 1.

The data from Mashkarov et al. [9] and Dejneko et al. [10] at about 120° are compared in Fig. 1. Both data sets are from the same group, but published in different papers. The Mashkarov data were published in the laboratory system. According to the original publication, the Dejneko cross-section data are in the laboratory system, while the scattering angle is given in the center-of-mass system and is 124° (which converts to 119.4° lab angle). This results in disagreement of both data sets, as can be seen in the upper panel of Fig. 1. Assuming that the Dejneko data actually are in the center-of-mass system results in a much better agreement with the Mashkarov data, as can be seen in the lower panel of Fig. 1. It is therefore assumed that the original publication of Dejneko is erroneous, and the data are in the center-of-mass and not in the laboratory system.

A comparison of the measurements at 120° is shown in figure 2. The Mashkarov [9] and Chiari [6] data agree very well. There is also good agreement with the Dejneko [10] data, if we assume that the published data are in the center-of-mass system (see above). The angles 150° and 155° are shown in figure 3. Symon's and Treacy's data [2] agree with Chiari's data [6] over most of the energy range, but the dip at 3.1 MeV is missing. This is probably due to the relatively large energy step of 0.1 MeV. Tautfest's and Rubin's measurement [1] is 10% lower than Chiari's.

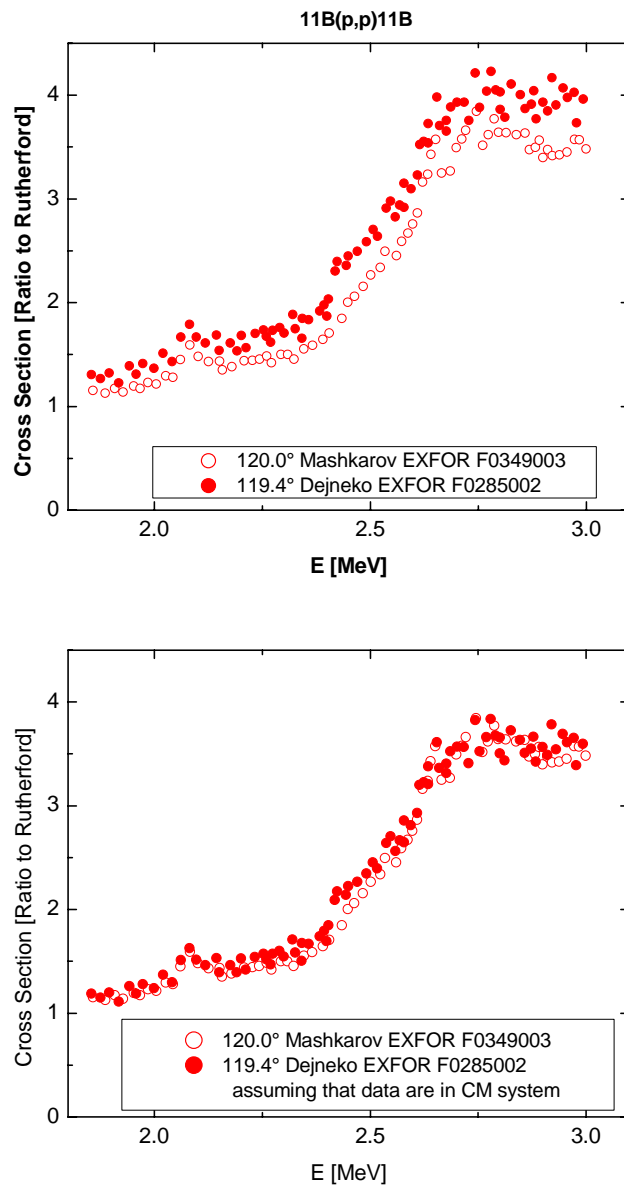


Fig. 1: Comparison of the Mashkarov [9] and Dejneko [10] data at about 120°. The upper figure shows the data as published, the lower figure assumes that the Dejneko data are in the center-of-mass system and have been erroneously assigned to the laboratory system in the original publication.

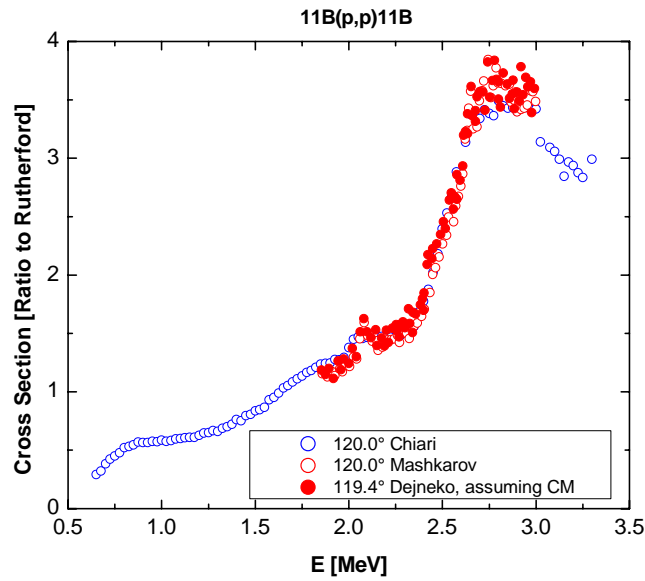


Fig. 2: Comparison of different experimental data for 120°.

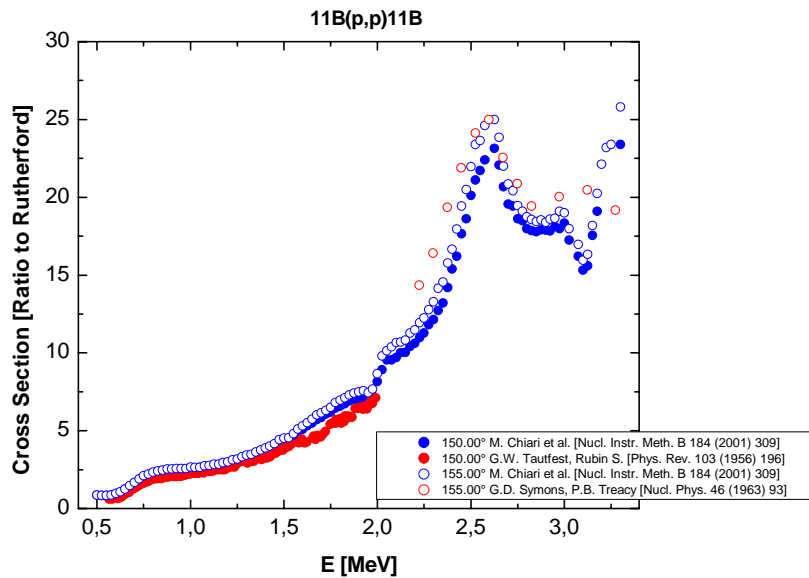


Fig. 3: Comparison of different experimental data for 150° und 155°.

Figure 4 compares measurements by M. Chiari et al. [7], M. Mayer et al. [6], and R.E. Segel et al. [3] for angles between 160° and 165°. Mayer's data have the same shape as Chiari's data, but are consistently about 20% higher. This indicates a problem with the absolute cross-section values, while the individual data points are in agreement to each other. Segel's data are consistent with Chiari's data up to 2 MeV, but at higher energies large discrepancies occur. The minima and maxima are at the same energies, but Segel's data cannot be scaled to Chiari's or Mayer's.

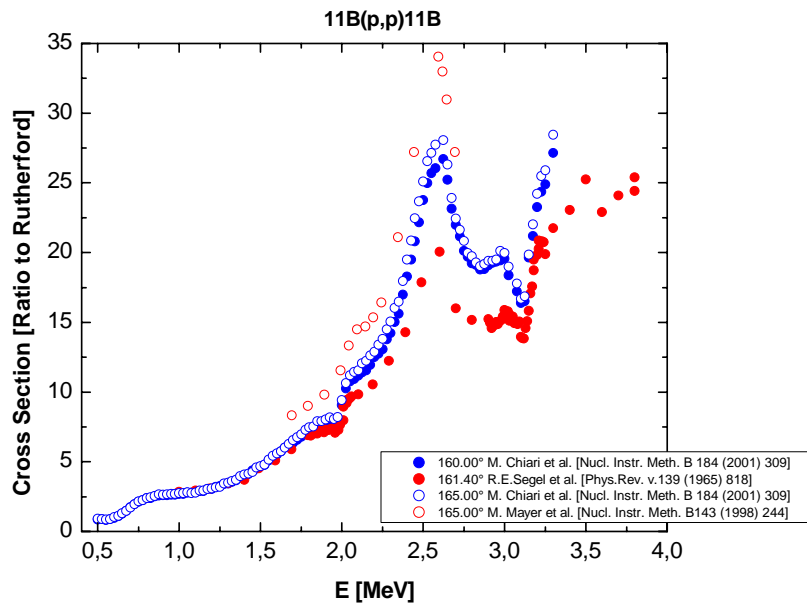


Fig. 4: Comparison of different experimental data for 160°-165°.

Generally it can be concluded that all measurements show the same main features in the data, but the different measurements are up to 20% apart from each other.

The oldest measurements (data measured before 1960), i.e. G.W. Tauffest and S. Rubin [1], are 10% lower than the measurements done by M. Chiari et al. [7]. The same observation was already made for the $^{10}\text{B}(p,p)^{10}\text{B}$ backscattering data [8]. This might hint to some systematic error, probably connected with inferiority of their vacuum. In contrast the data taken M. Mayer et al. [6] are 20% higher than the one from Chiari. Last one claimed already that “these discrepancies are essentially systematic, even though there is not a well-defined trend” [7].

The Chiari data are in very good agreement with the Mashkarov/Dejneko data at 120° and lie between all available data at 150-165°. Although further measurements are wishful, especially in order to resolve the conflict between Chiari and Mayer, Chiari’s results are probably a good basis for cross section data for $^{11}\text{B}(p,p)^{11}\text{B}$ backscattering. The stated error of 5% make them suitable. The data were provided in numeric form to IBANDL, so that no additional digitizing errors occurred. Drawback is the large statistical error, which may result in corrugated spectra.

Table 1: Publications with $^{11}\text{B}(p,p)^{11}\text{B}$ backscattering data.

Energy Range (MeV)	Angle in the Lab.(°)	Error	Data Presentation	Reference	IBANDL	EXFOR	Action
0.6-2.0	150	-	Graph	Tautfest/Rubin [1]	data included	C0847002	
2.2-3.2	155	-	Graph	Symons/Treacy [2]	data included	-	
1.0-3.8	89	-	Graph	Segel et al. [3]	<i>data unsuitable for RBS due to angle</i>	F0332008	Data converted from EXFOR to IBANDL
1.0-3.8	161.4	-	Graph	Segel et al. [3]	data included	F0332008	
5.4-7.5	150	-	Graph	Höhn et al. [4]	<i>data unsuitable for RBS due to high energy</i>	F0288003	
0.1-1.2	37.5	-	Graph	Becker et al. [5]	<i>data unsuitable for RBS due to angle</i>	A0413006	
1.7-2.7	165	7%	Graph & Table**	Mayer et al. [6]	data included	O0864003	
0.5-3.3	100	5%	-*	Chiari [7]	data included	O0922003	
0.5-3.3	105	5%	-*	Chiari [7]	data included	O0922003	
0.5-3.3	110	5%	Graph*	Chiari [7]	data included	O0922003	
0.5-3.3	115	5%	-*	Chiari [7]	data included	O0922003	
0.5-3.3	120	5%	-*	Chiari [7]	data included	O0922003	
0.5-3.3	125	5%	-*	Chiari [7]	data included	O0922003	
0.5-3.3	130	5%	-*	Chiari [7]	data included	O0922003	
0.5-3.3	135	5%	Graph*	Chiari [7]	data included	O0922003	
0.5-3.3	140	5%	-*	Chiari [7]	data included	O0922003	
0.5-3.3	145	5%	-*	Chiari [7]	data included	O0922003	
0.5-3.3	150	5%	Graph*	Chiari [7]	data included	O0922003	
0.5-3.3	155	5%	-*	Chiari [7]	data included	O0922003	
0.5-3.3	160	5%	-*	Chiari [7]	data included	O0922003	
0.5-3.3	165	5%	-*	Chiari [7]	data included	O0922003	
0.5-3.3	170	5%	Graph & Table*	Chiari [7]	data included	O0922003	
1.9-3.0	120			Mashkarov [9]	Data missing	F0349003	Data converted from EXFOR to IBANDL
1.9-3.0	120			Dejneko [10]	Data missing	F0285002	Data converted from EXFOR to IBANDL assuming that original data were in CM system
1.8-4.1	137.2			G.B.Andreev [11]	data unsuitable due to arbitrary units	F0136003	

* data provided in numeric form by M. Chiari

** data provided in numeric form by M. Mayer

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