

Status of BROND-3 library (May 2013)

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- BROND and ROSFOND libraries ;
- Uncertainties and covariancies for main reactor materials;
- Revised evaluations for Pu-241;
- Revised evaluations for structural materials;
- Updating the activation library BROND-3A;

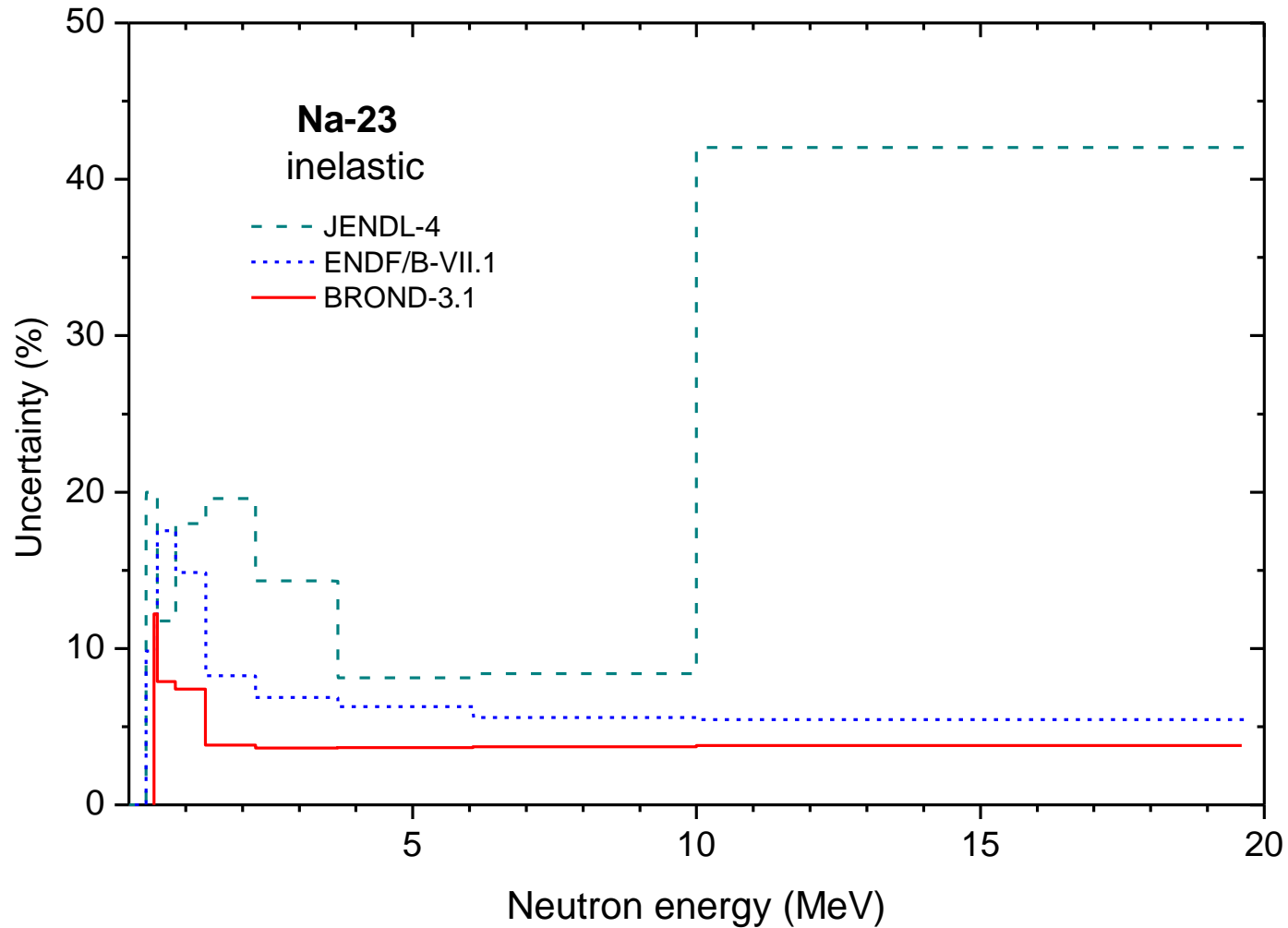
BROND-3 and ROSFOND-2010

- i) The general purpose BROND-3 library includes about 120 nuclides, evaluations of which differ from other libraries. For practical applications and for the new group-constant preparation, in particular, other data libraries are used widely for nuclides unavailable in BROND-3.
- ii) The more complete ROSFOND-2006 library was assembled at the IPPE in 2006. The library contains 654 nuclides used in various reactor projects. About two thirds of them are the general purpose files and a one third presents the activation files needed for the analysis of residual activations of reactor material. Additionally the library includes 20 files related to the slow-neutron scattering data for the important composite materials.
- iii) The updated version of the library named ROSFOND-2010 includes some revisions and corrections found in the previous version. However, covariances are not included in the library until now.
- iv) The updated BROND-3 files included covariances were prepared during the last year for about 30 most important reactor materials and the 8 dominant minor actinides. We are planning now to prepare the updated version of ROSFOND-2013 that will include these files as well as some revised evaluations from the activation data library BROND-3A .

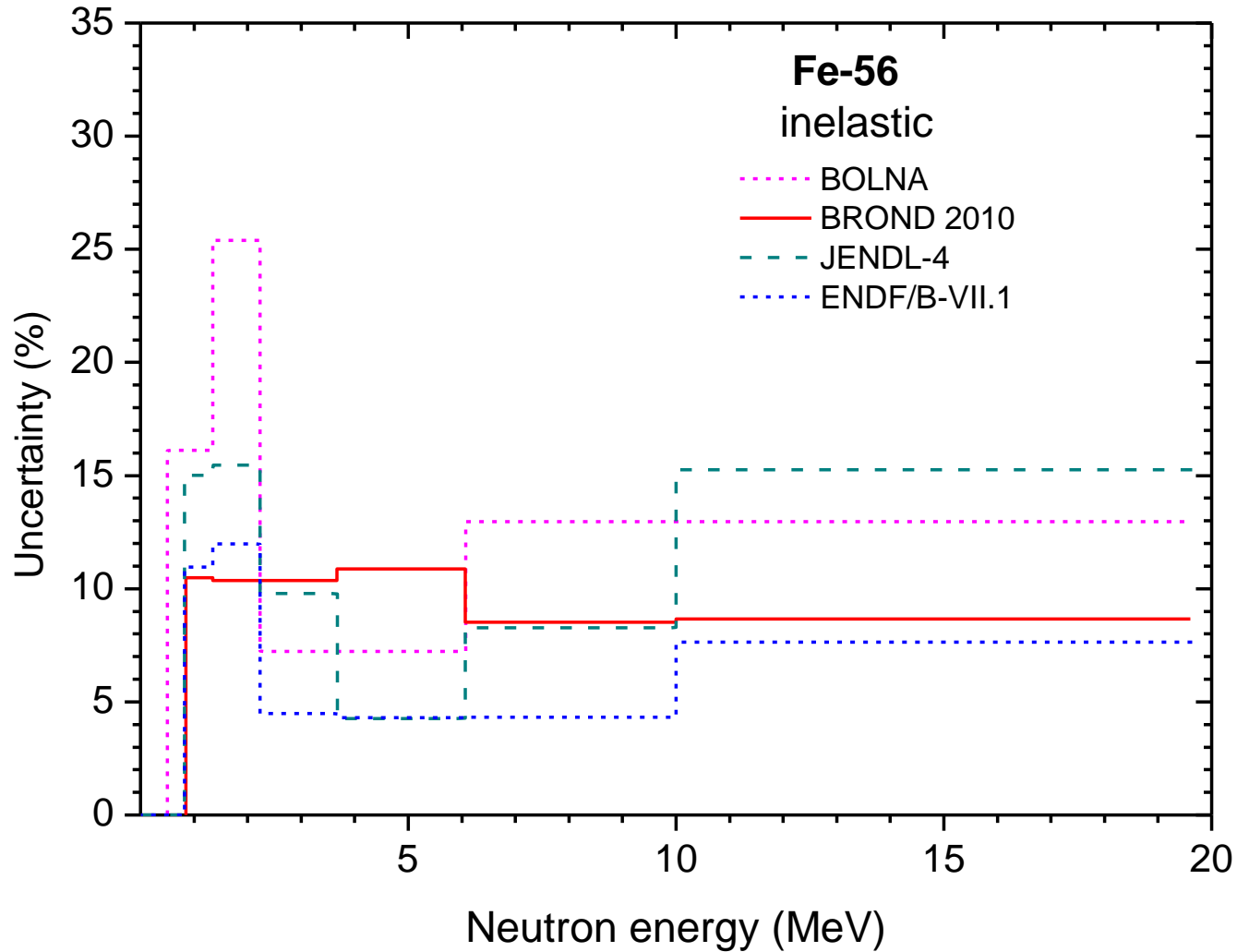
Uncertainties and covariancies for main reactor materials

Our method of the unrecognized error estimation is based on a priory equal reliability of all available experimental data, of course excluding proved erroneous results. However, the systematic and statistic uncertainties of each experimental work are determined in accordance with the observed distribution of data. Some initial description of data is required at the beginning and deviations from it can be considered as the selective values of uncertainties. The averaged deviation of experimental data from the approximating function is regarded for each analyzed work as its systematic error and the deviations of experimental points from the approximant shifted on the systematic error are regarded as the statistical errors.

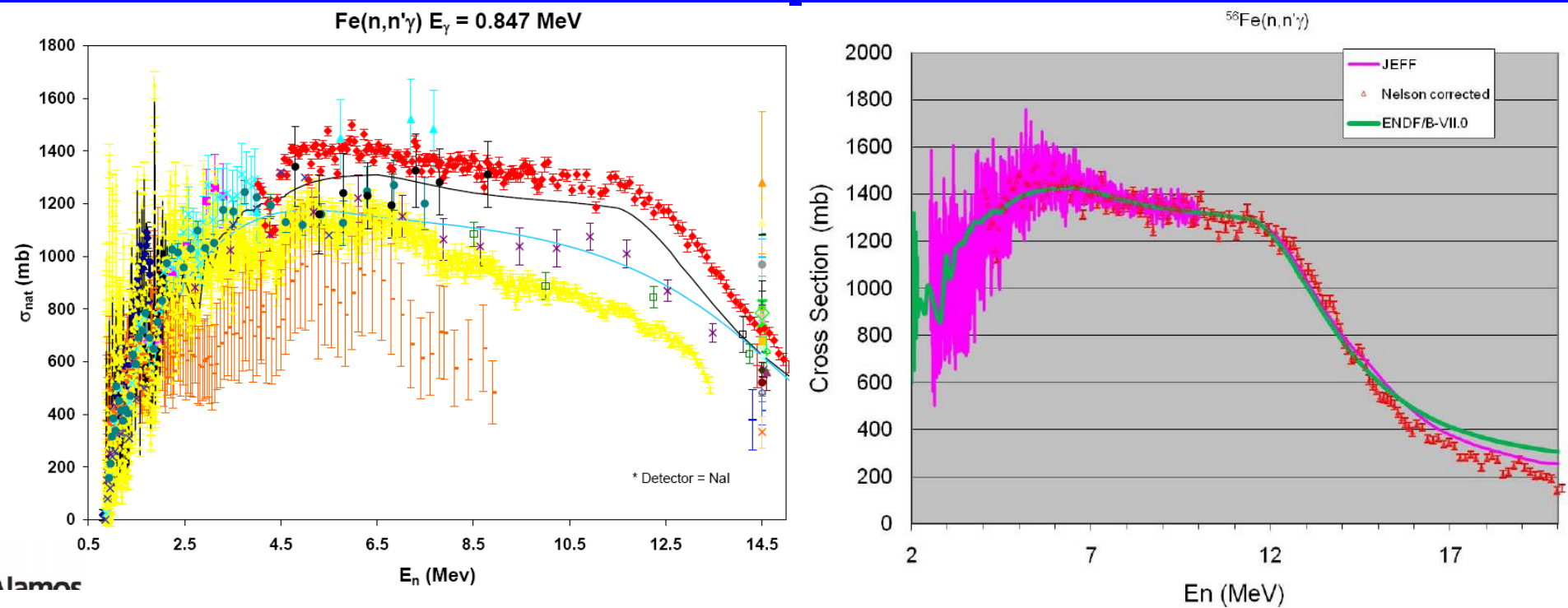
Uncertainties of the inelastic scattering evaluations for ^{23}Na



Uncertainties of the inelastic cross-section evaluations for ^{56}Fe

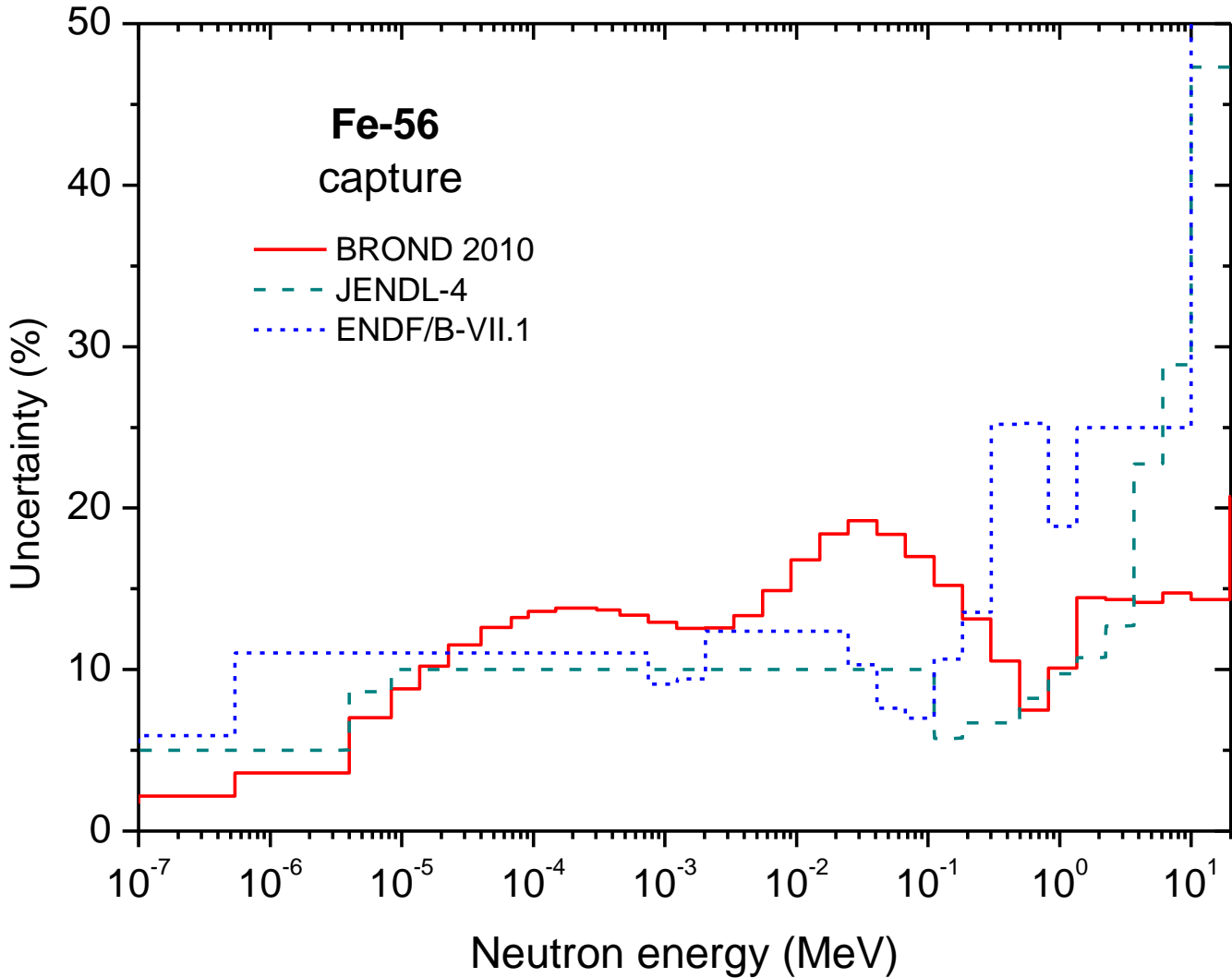


Uncertainties of the inelastic cross-section evaluations for ^{56}Fe



These plots are taken from the report LA-UR-12-24825 by R.Nelson. It seems that the total inelastic-scattering cross sections are shown in some cases, but the gamma-yields for $2+$ level are shown for other cases. The difference between these two cross-sections is about 8%.

Uncertainties of the capture cross-section evaluations for ^{56}Fe



Uncertainties of the capture cross-section evaluations for ^{56}Fe

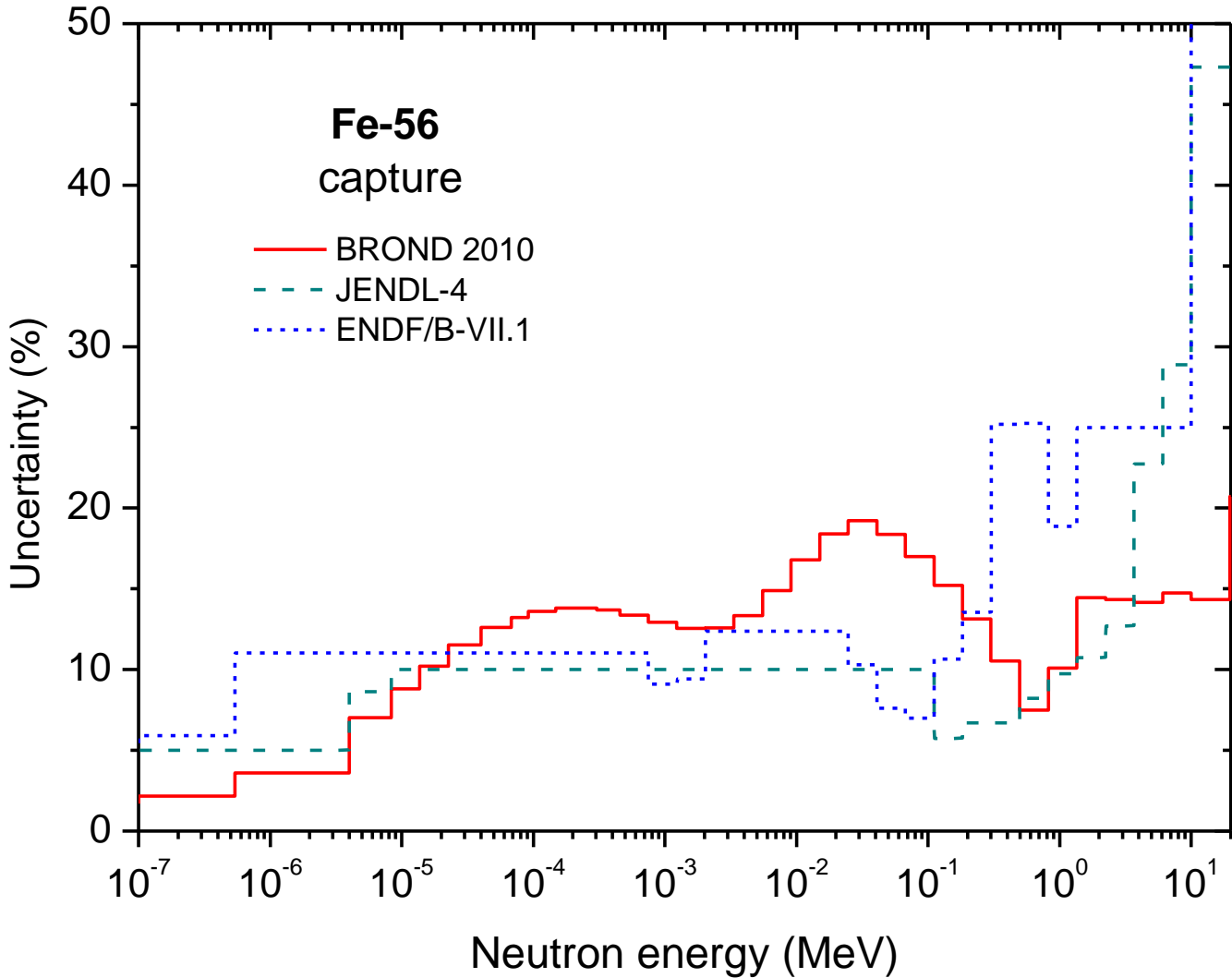
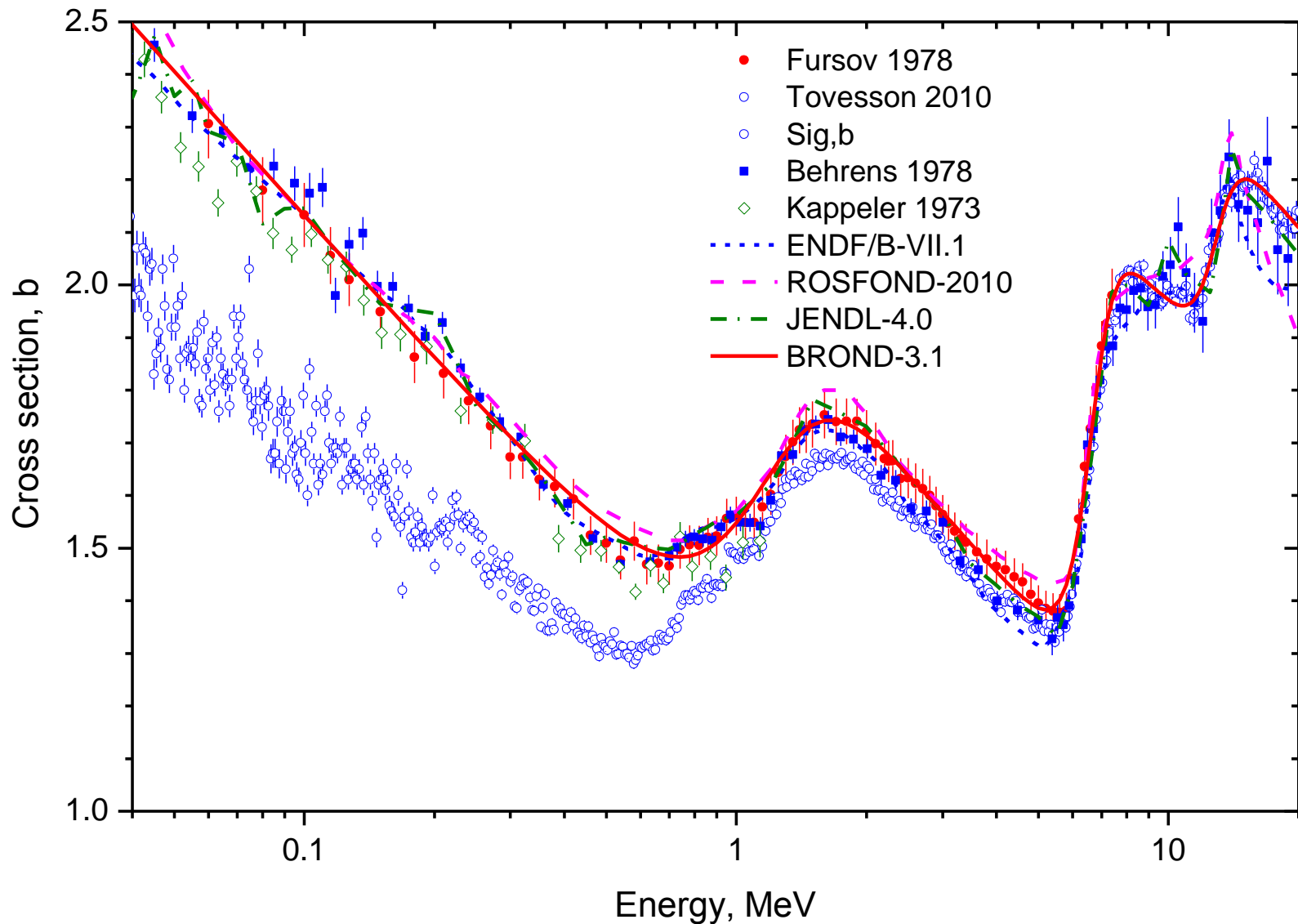


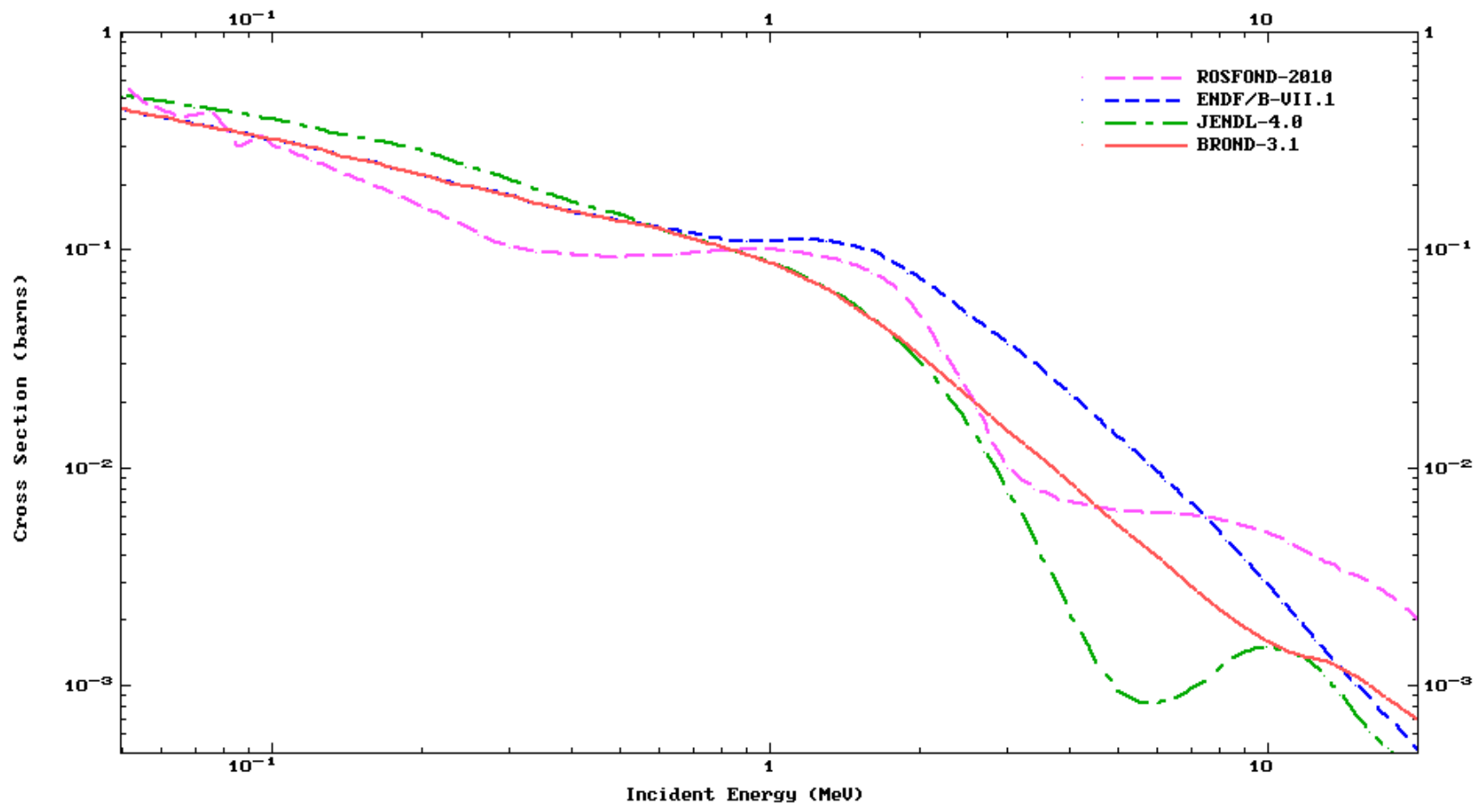
Table I. SG26 Summary Target Accuracies for Fast Reactors.

Isotope	Cross-Section	Energy Range	Current Accuracy (%)	Target Accuracy (%)	BROND (%) averaged Cf
U238	σ_{inel}	6.07 \div 0.498 MeV	10 \div 20	2 \div 3	6.34
	σ_{capt}	24.8 \div 2.04 keV	3 \div 9	1.5 \div 2	7.50
Pu241	σ_{fiss}	1.35MeV \div 454eV	8 \div 20	2 \div 3 (SFR,GFR,LFR) 5 \div 8 (ABTR,EFR)	2.93
Pu239	σ_{capt}	498 \div 2.04keV	7 \div 15	4 \div 7	4.86
Pu240	σ_{fiss}	1.35 \div 0.498 MeV	6	1.5 \div 2	1.43
	ν	1.35 \div 0.498 MeV	4	1 \div 3	0.56
Pu242	σ_{fiss}	2.23 \div 0.498 MeV	19 \div 21	3 \div 5	3.38
Pu238	σ_{fiss}	1.35 \div 0.183 MeV	17	3 \div 5	5.21
Am242m	σ_{fiss}	1.35MeV \div 67.4keV	17	3 \div 4	4.58
Am241	σ_{fiss}	6.07 \div 2.23 MeV	12	3	2.57
Cm244	σ_{fiss}	1.35 \div 0.498 MeV	50	5	3.37
Cm245	σ_{fiss}	183 \div 67.4keV	47	7	2.53
Fe56	σ_{inel}	2.23 \div 0.498 MeV	16 \div 25	3 \div 6	5.74
Na23	σ_{inel}	1.35 \div 0.498 MeV	28	4 \div 10	7.56

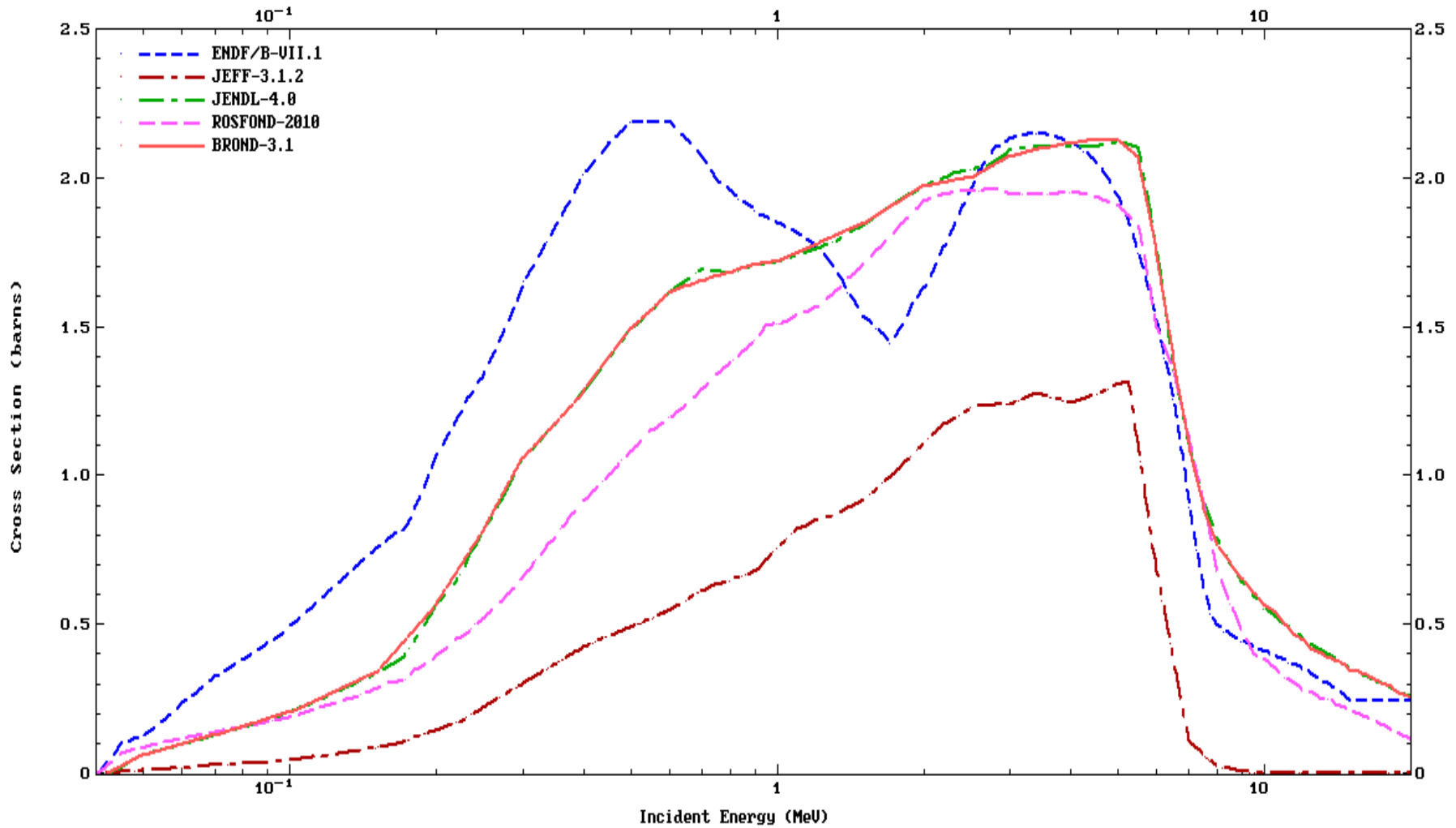
Experimental data for the fission cross section of ^{241}Pu compared with the recent evaluations



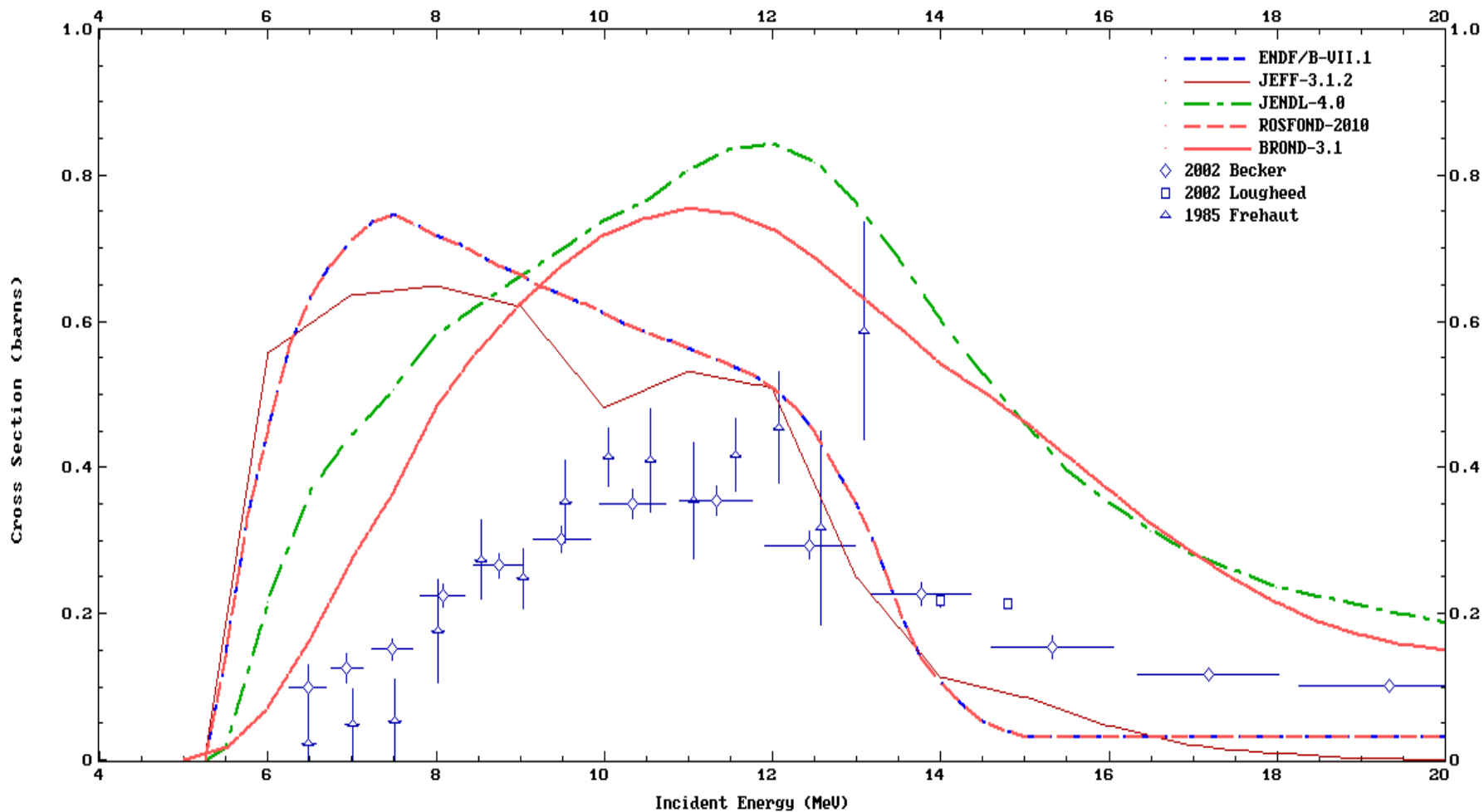
Current evaluations for the neutron capture cross section of ^{241}Pu



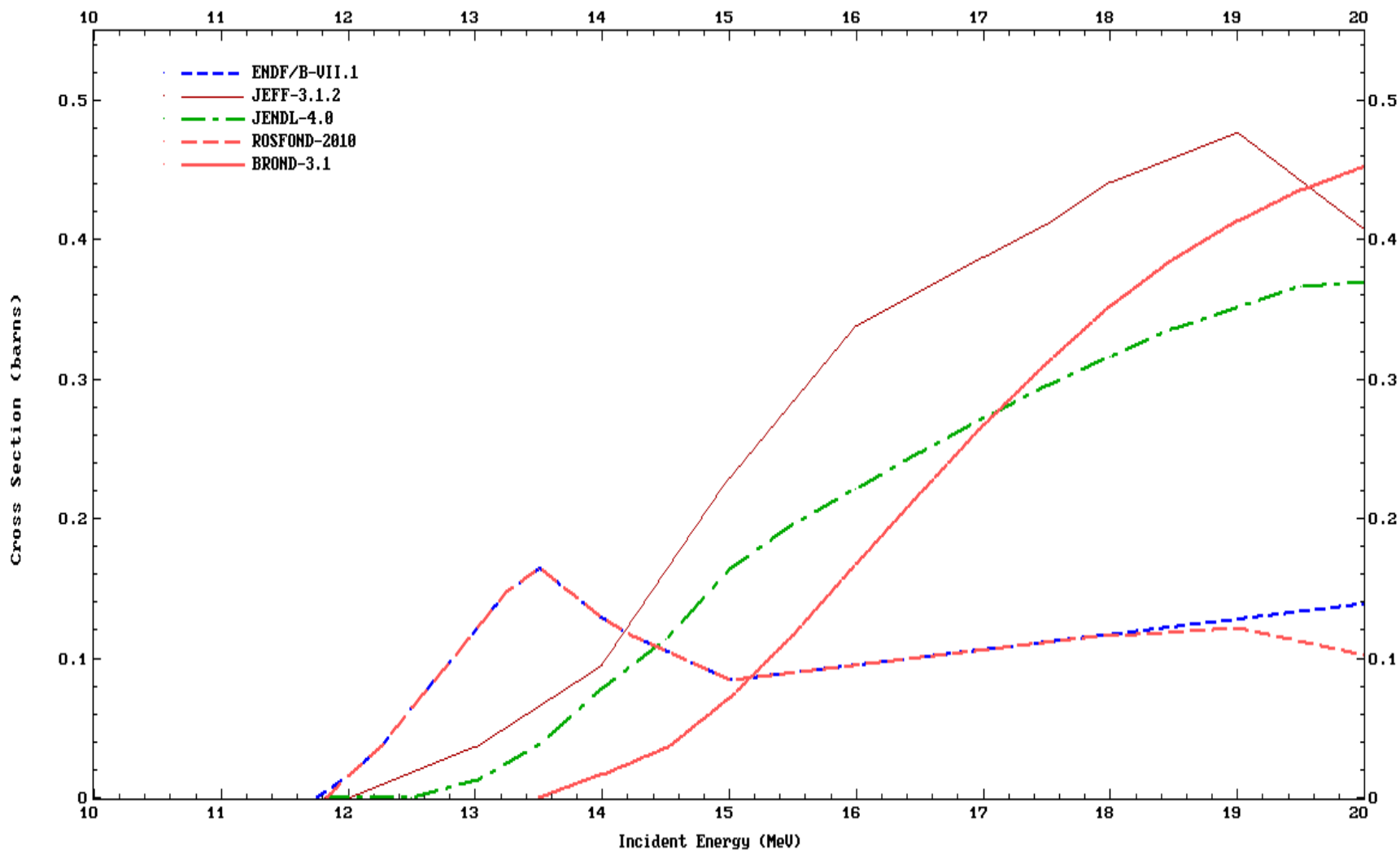
Current evaluations for the inelastic scattering cross section of ^{241}Pu



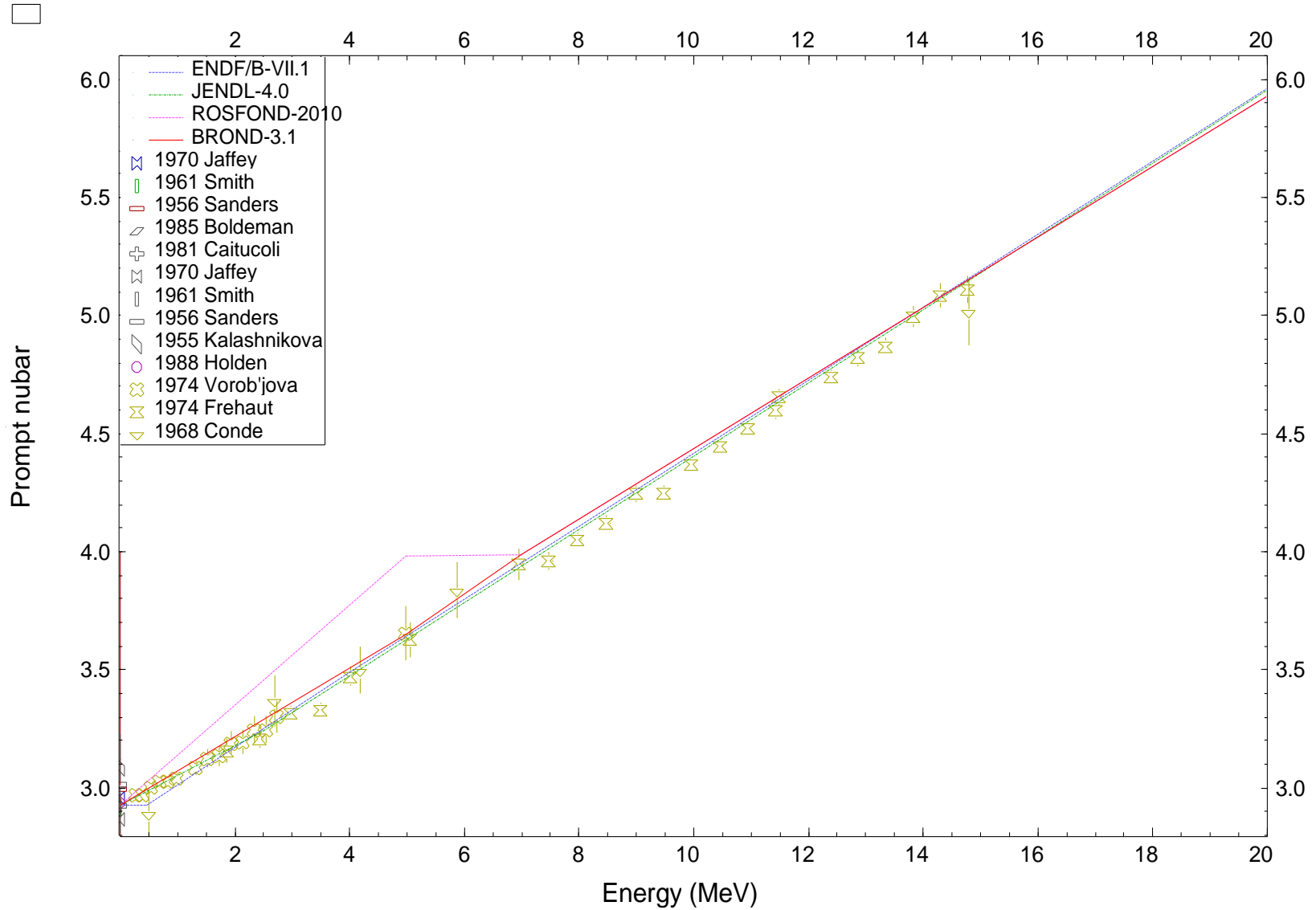
Current evaluations for the $^{241}\text{Pu}(n,2n)$ cross section



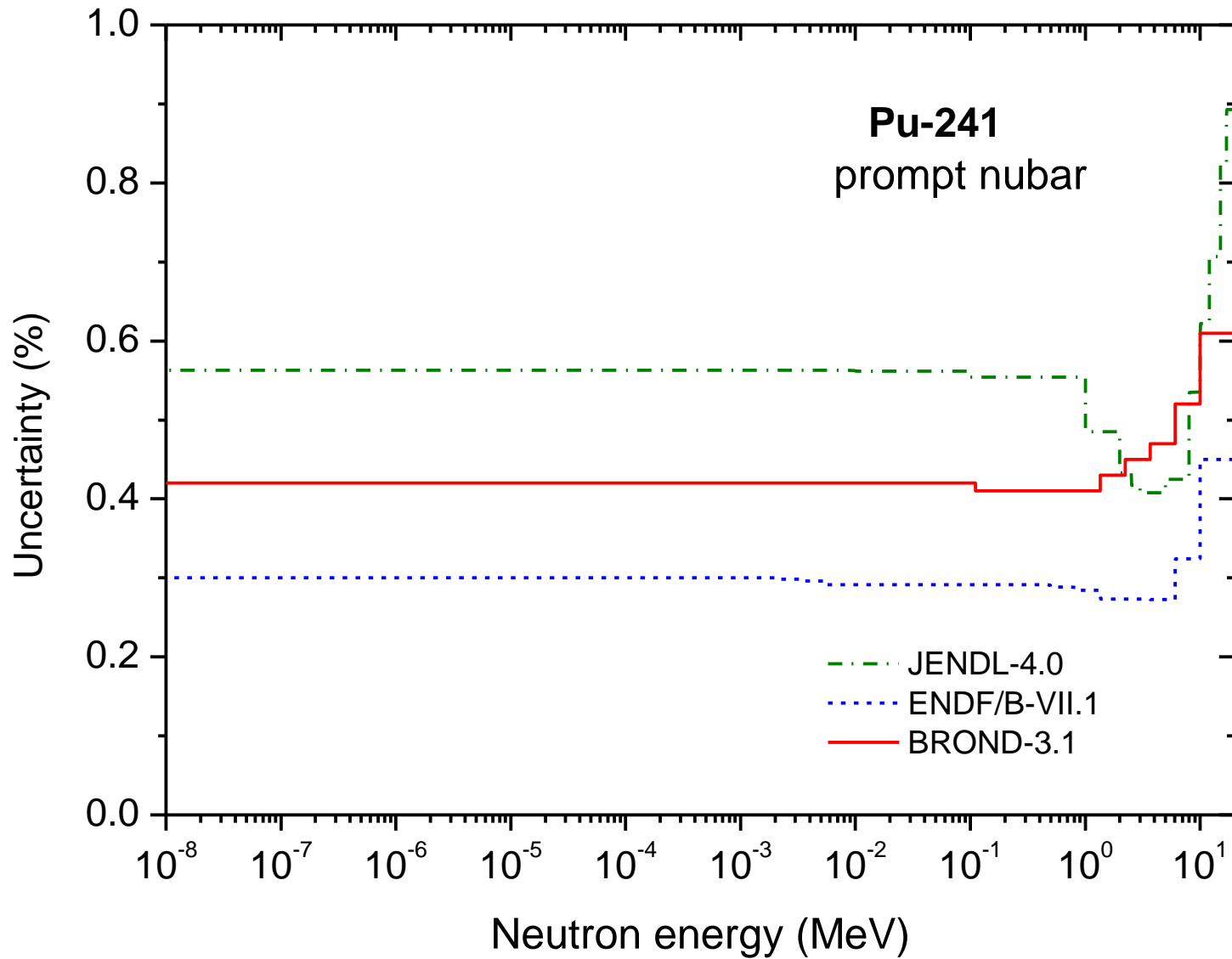
Evaluations for the $^{241}\text{Pu}(n,3n)$ cross section



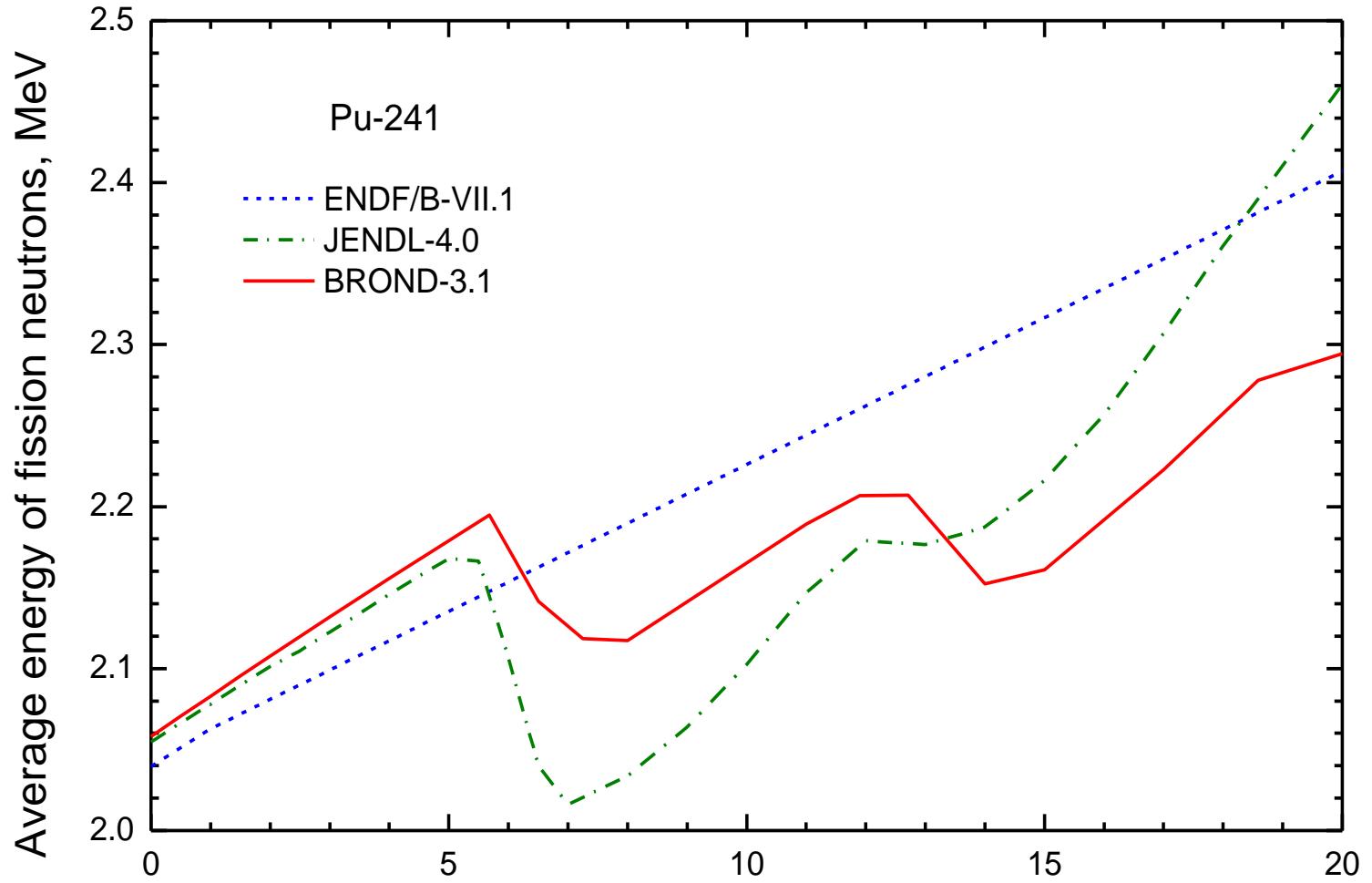
Evaluations for the prompt nuubar of ^{241}Pu



Uncertainties of the evaluated prompt nubar



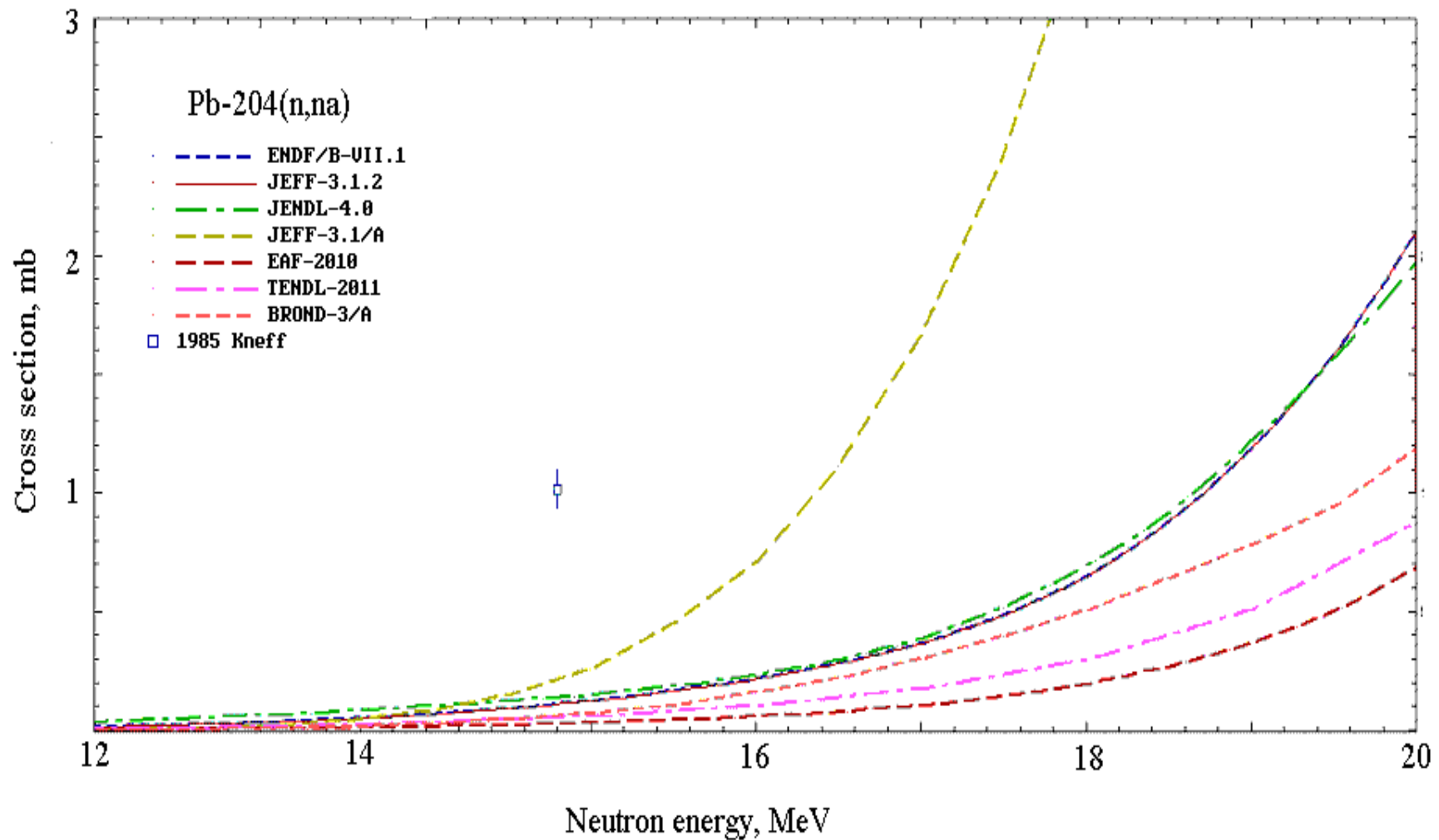
Average energies of the prompt fission neutrons



Revision of the activation library BROND-3A.

- i) The Russian activation data library ADL-3 was created in 1995 and many of its evaluations were included in the FENDL-2A library and the previous versions of the European activation library.
- ii) A reduction of the long-lived residual activity of reactor materials requires nowadays revision of many previous evaluations. In accordance with this task the new evaluations more than 500 threshold reactions have been performed by A.Blokhin and V.Manokhin during the last two years.
- iii) In 2012 the cross sections connected with the activation of the lead and lead-bismuth coolants were revised. Updated evaluations were prepared for about 40 threshold reactions.

Revision of the activation library BROND-3A.



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