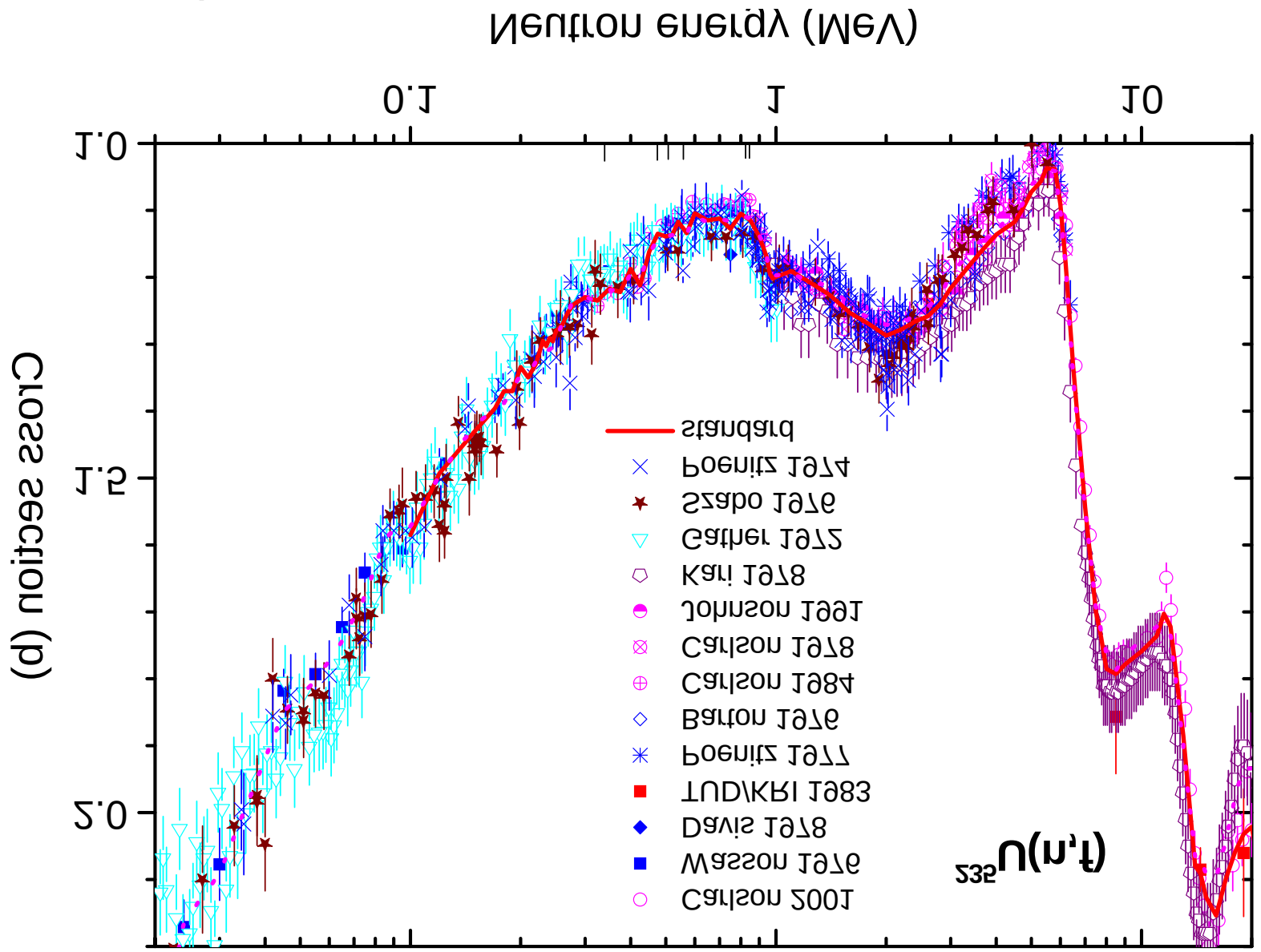
Covariances of fission cross sections and nubar for actinides

A.V.Ignatyuk, E.V.Gai

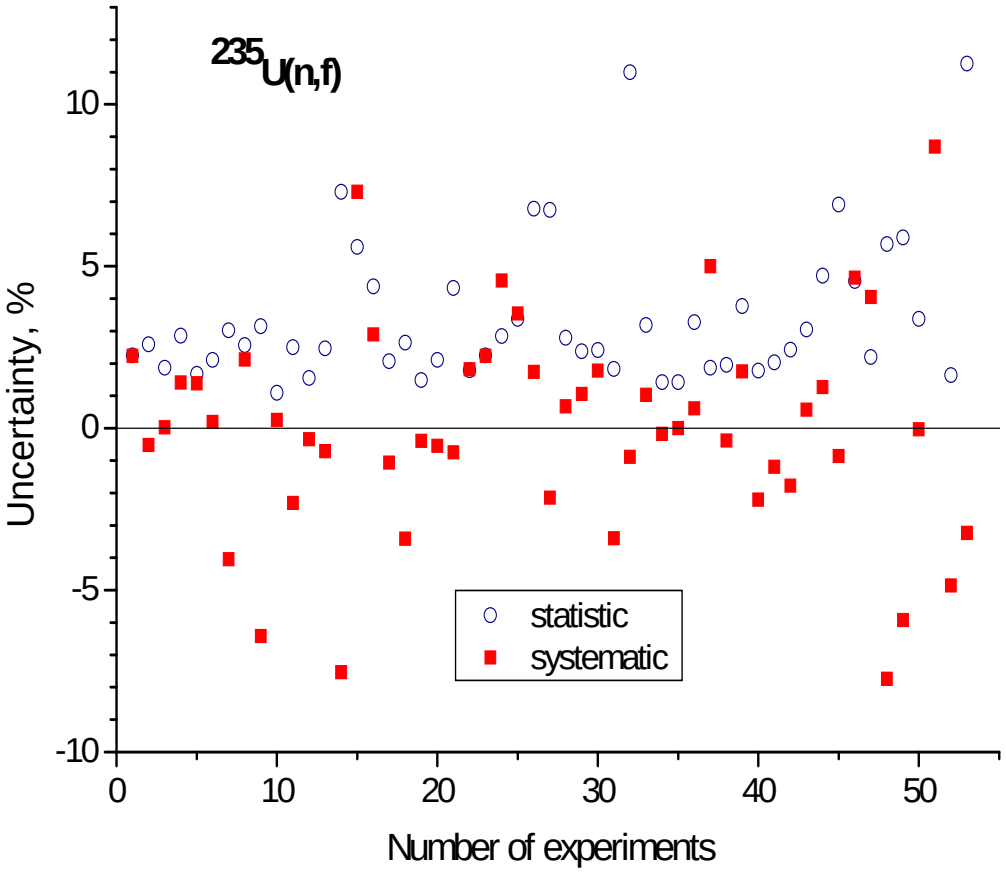
Institute for Physics and Power Engineering, Obninsk

- Method for an estimation of unrecognized errors;
- Uncertainties and covariances for fission cross sections ;
- Uncertainties averaged over the Cf-252 neutron spectrum;
- Uncertainties for the fission-neutron multiplicities (nubar);
- Conclusions.

Selected experimental data for the U-235(n,f) cross section in comparison with the recent standard evaluation



The unrecognized error-estimation method



i) The total amount of works considered is 107 (about 10 thousands exp. points), 53 works are left after selection.

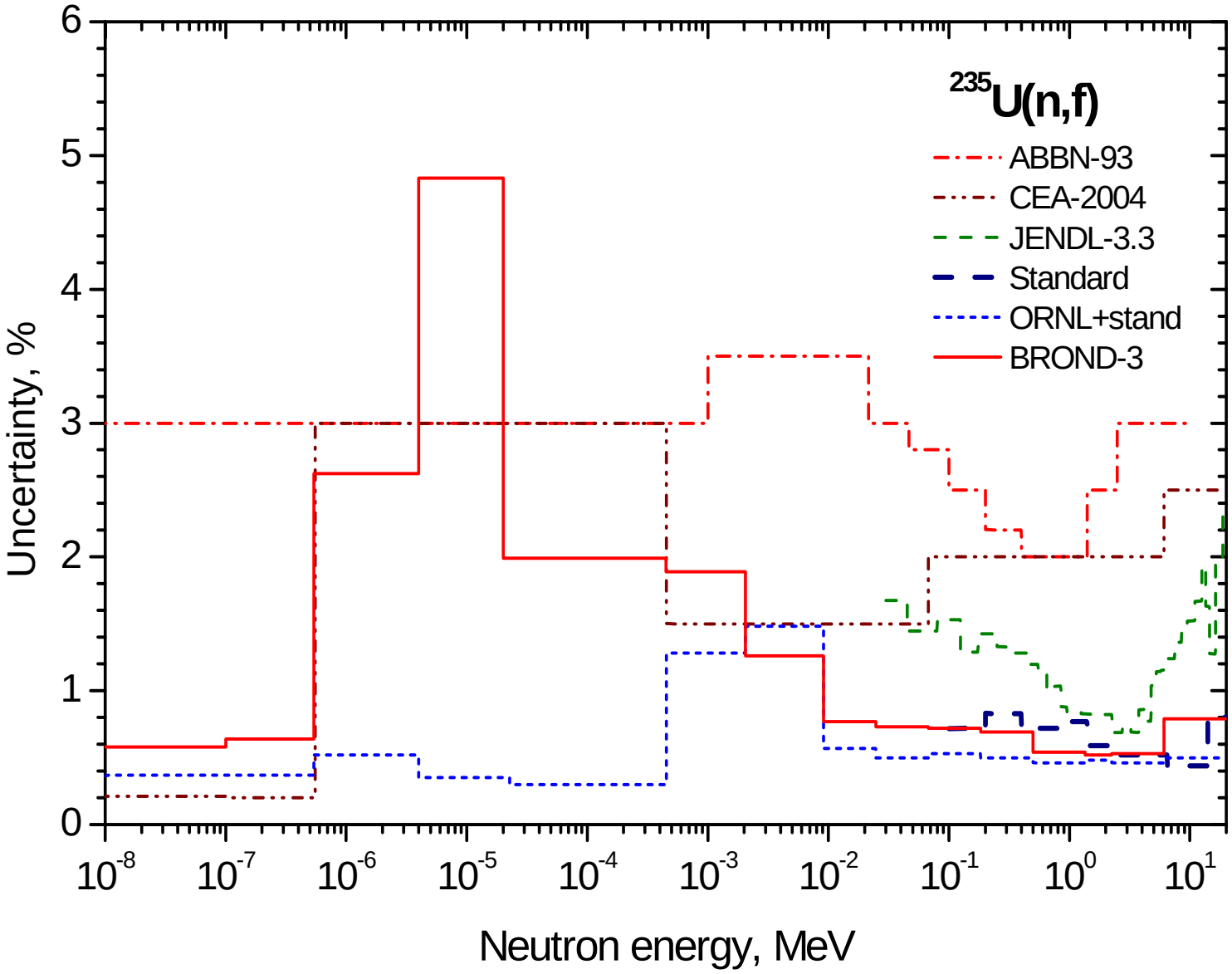
ii) All data are fitted by the optimal Pade parameterization.

iii) A distribution of each work data around a shifted individual description estimates an average statistical error of this work.

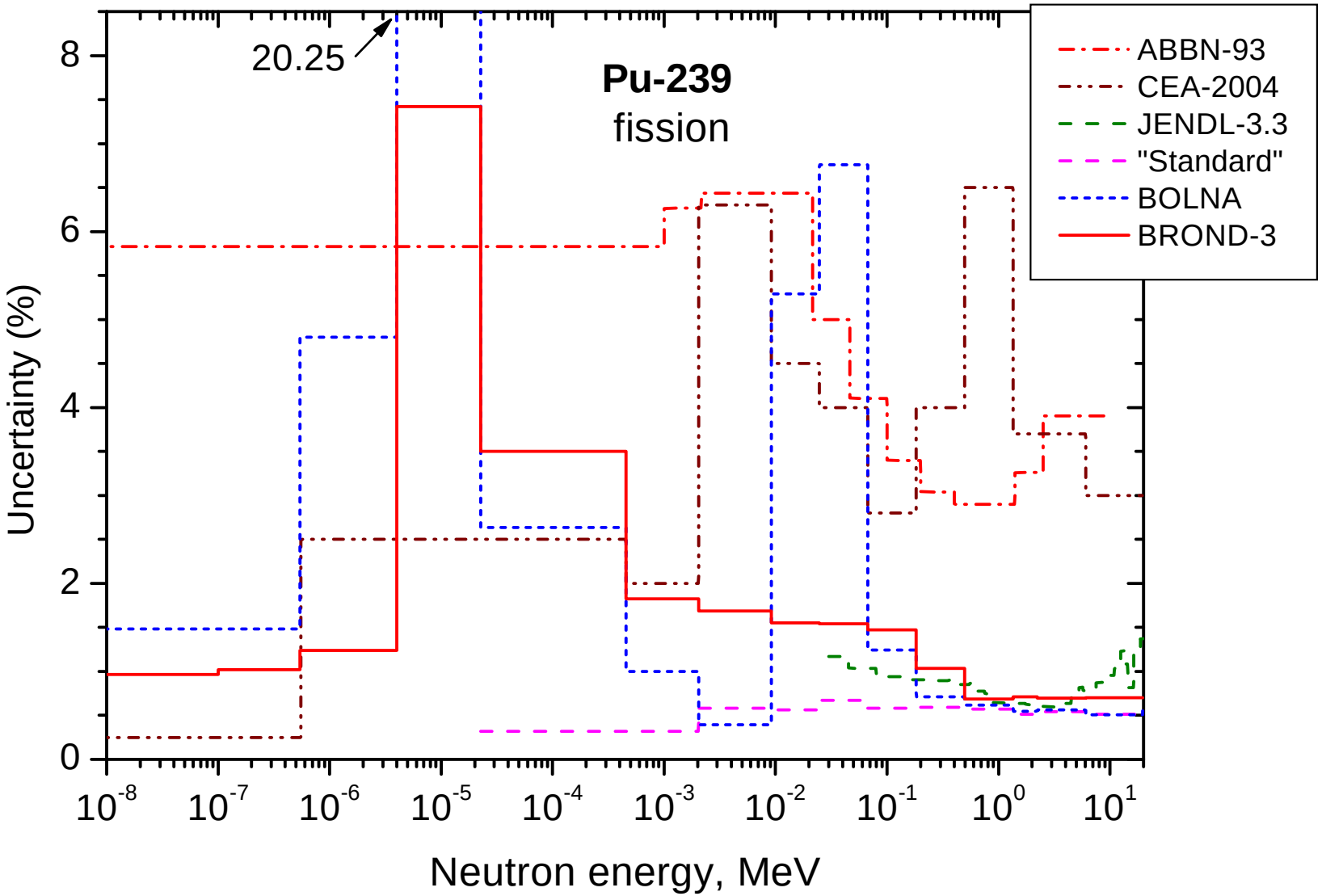
iv) A shift of individual data set concerning the common fitted curve estimates a systematic error of the work.

v) A width of the systematic error distribution estimates a general uncertainty of all data.

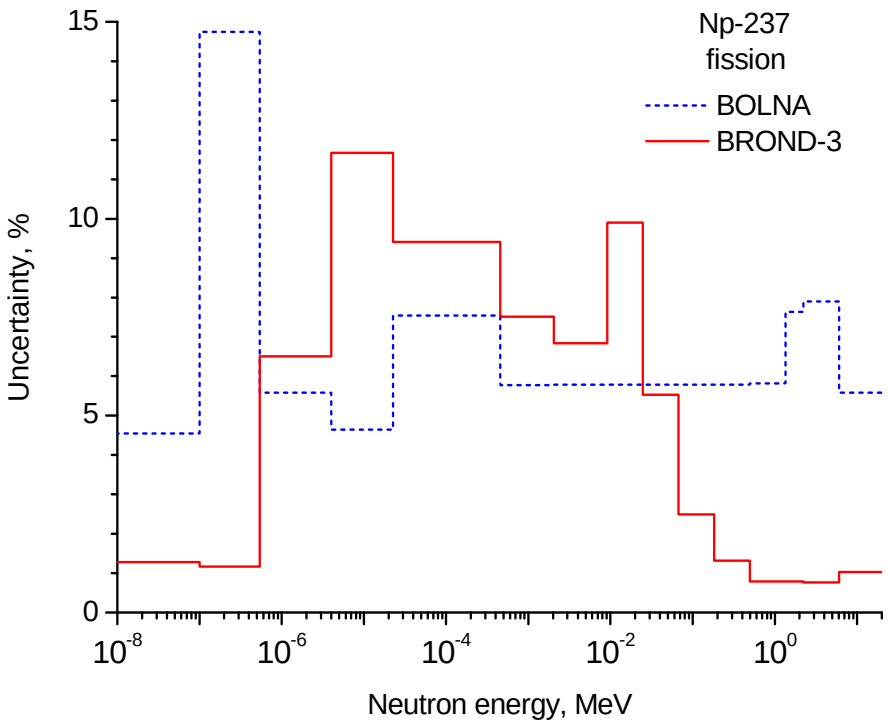
Evaluated uncertainties for the U-235(n,f) cross section

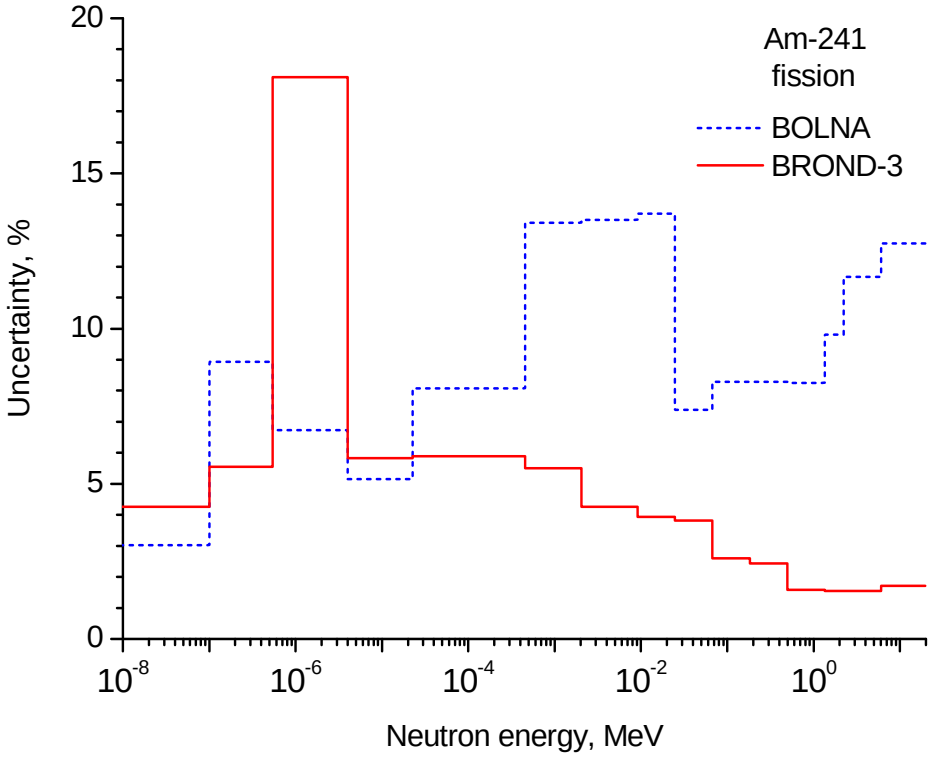


Uncertainties of the fission cross-section evaluations for ^{239}Pu



Uncertainties of the fission cross-section evaluations for ^{237}Np and ^{241}Am

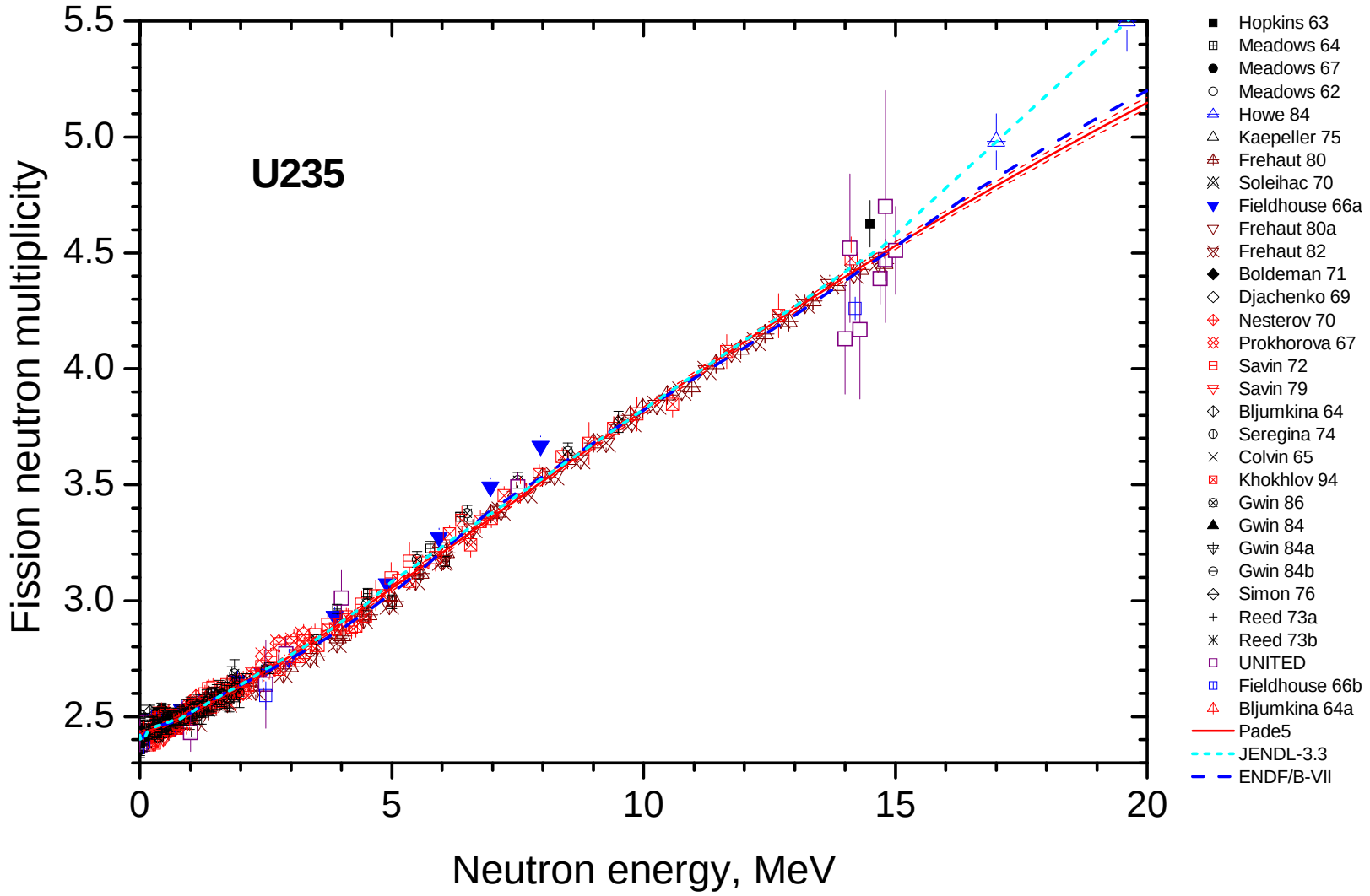




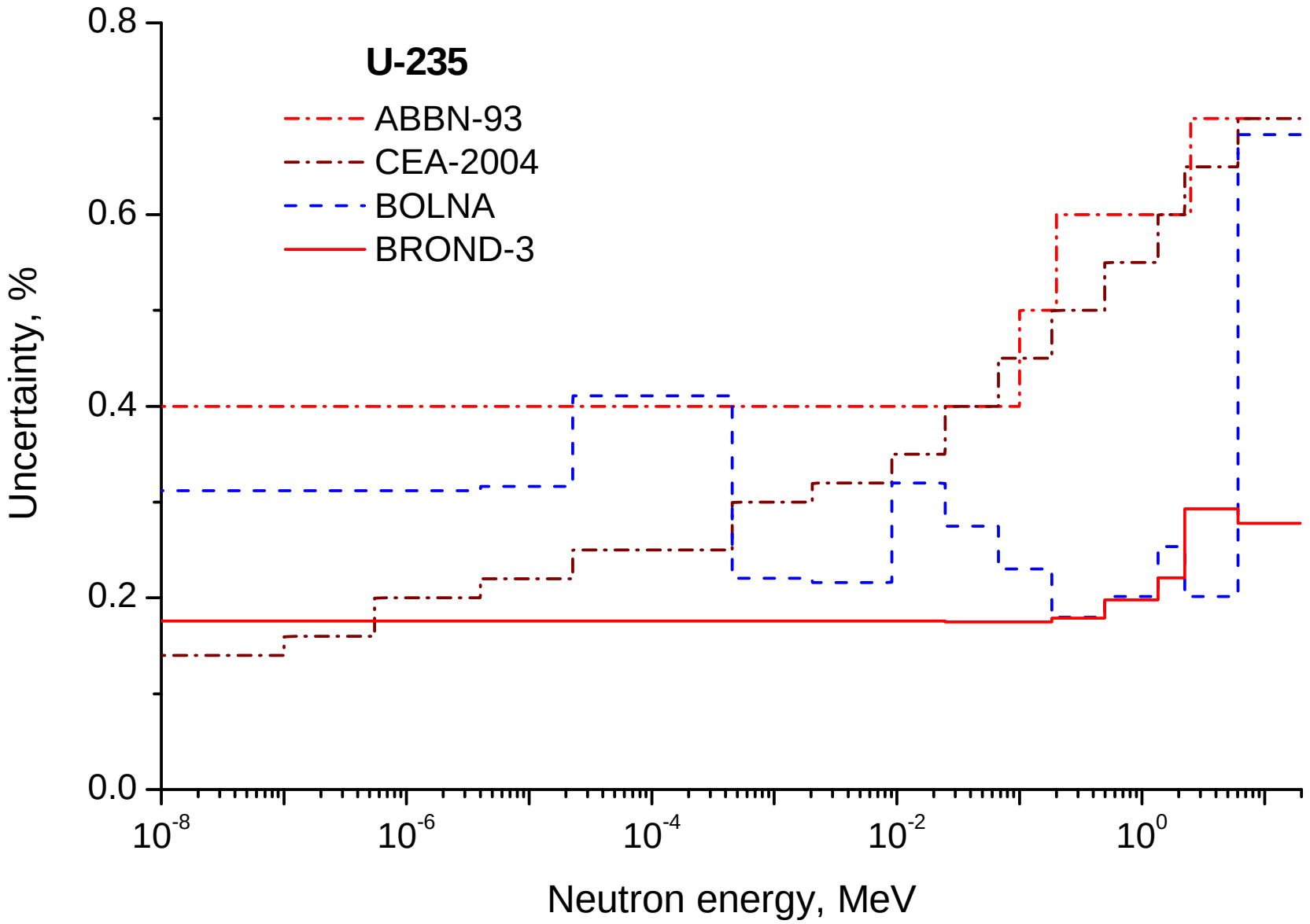
The fission cross sections and their uncertainties averaged over the ^{252}Cf fission-neutron spectrum

Nuclide	BOLNA	(LANL)	BROND-3	
	Sigma, b	Uncert.,%	Sigma, b	Uncert.,%
U-235	1.27	.43	1.27	.48
Pu-239	1.73	.52	1.79	.67
Np-237	1.24	.48	1.35	.74
Am-241	1.20	.50	1.37	1.50
Cm-245	1.77	35	1.74	1.70

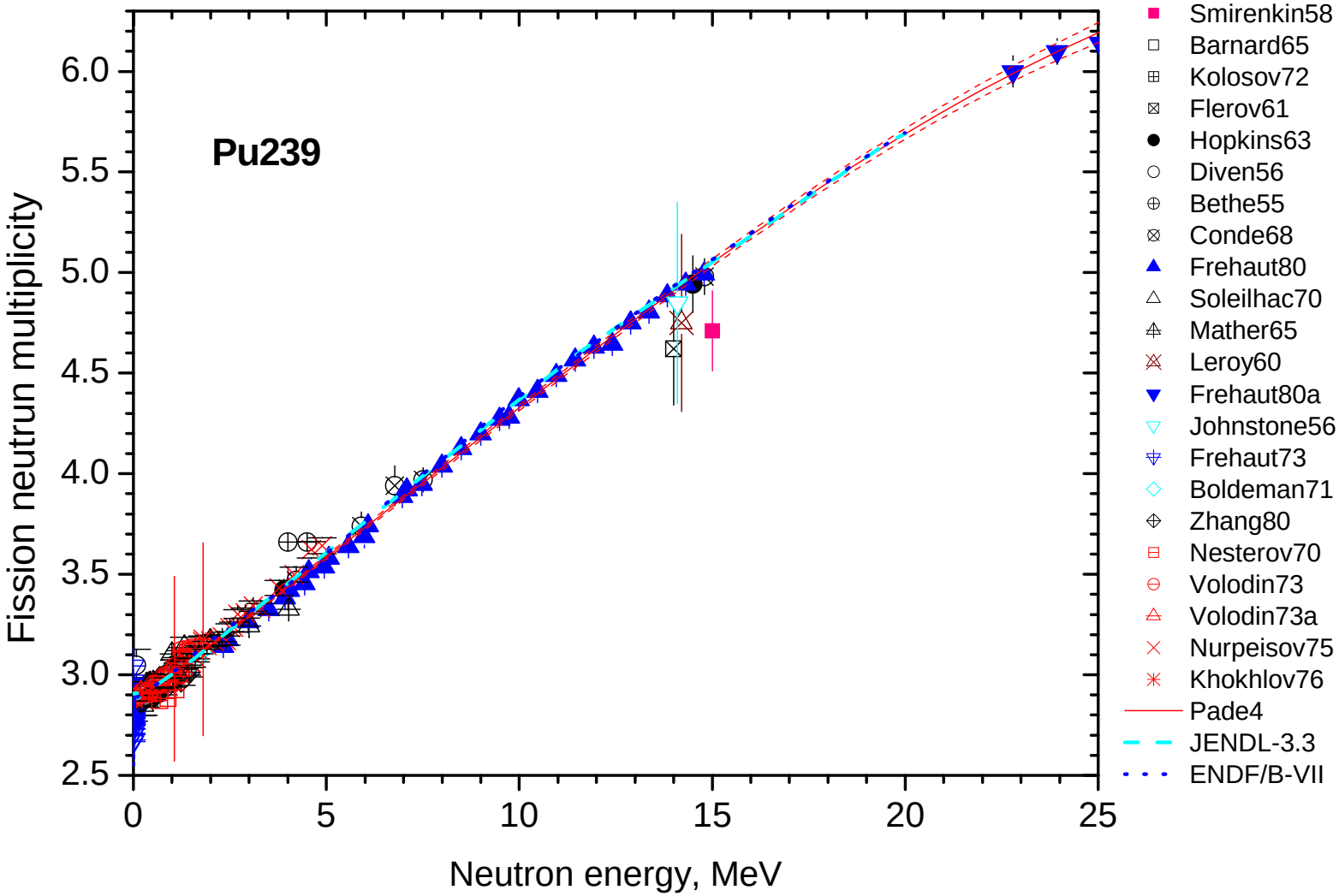
Prompt fission-neutron multiplicities for U-235



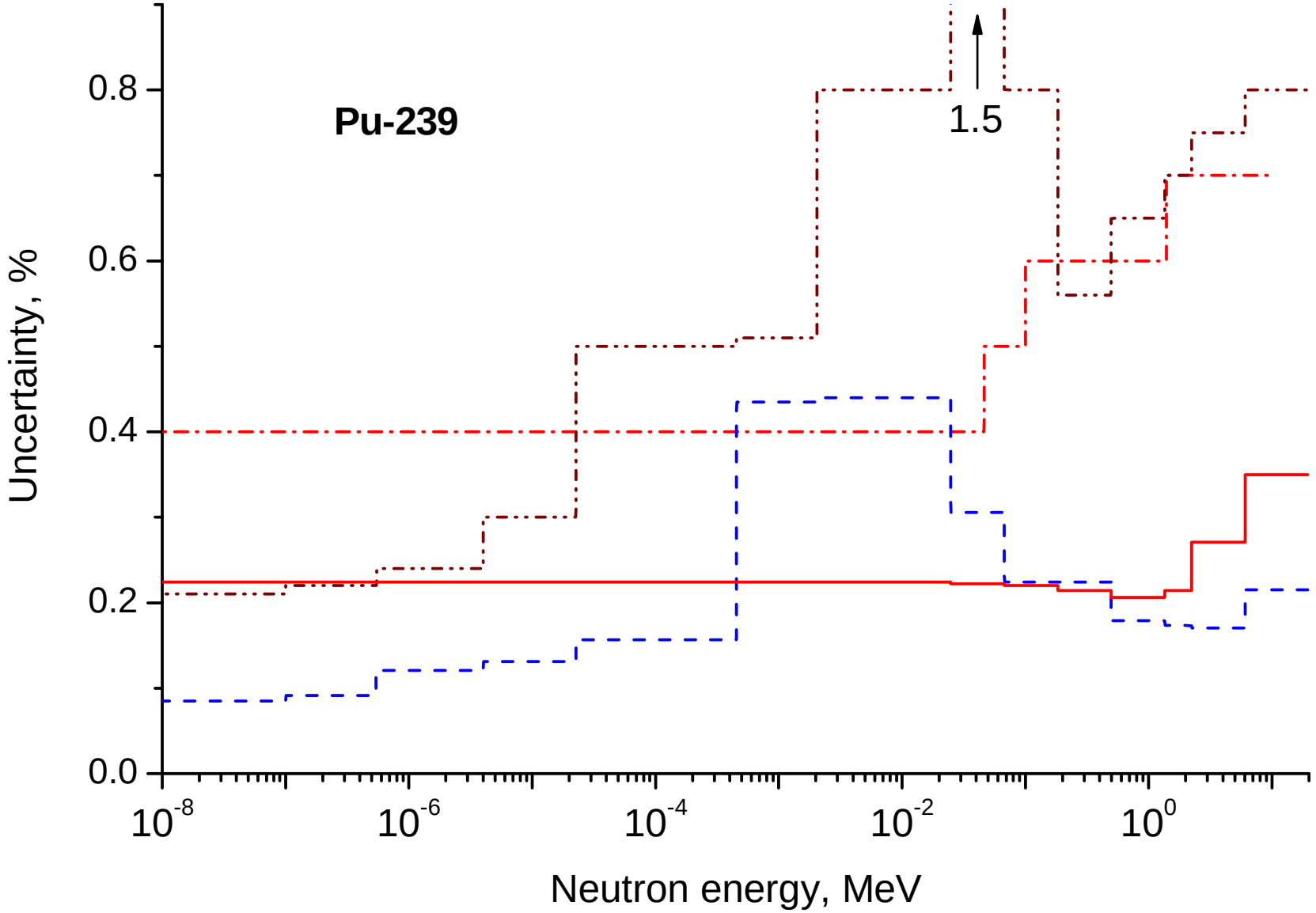
Uncertainties of the fission-neutron multiplicities for U-235



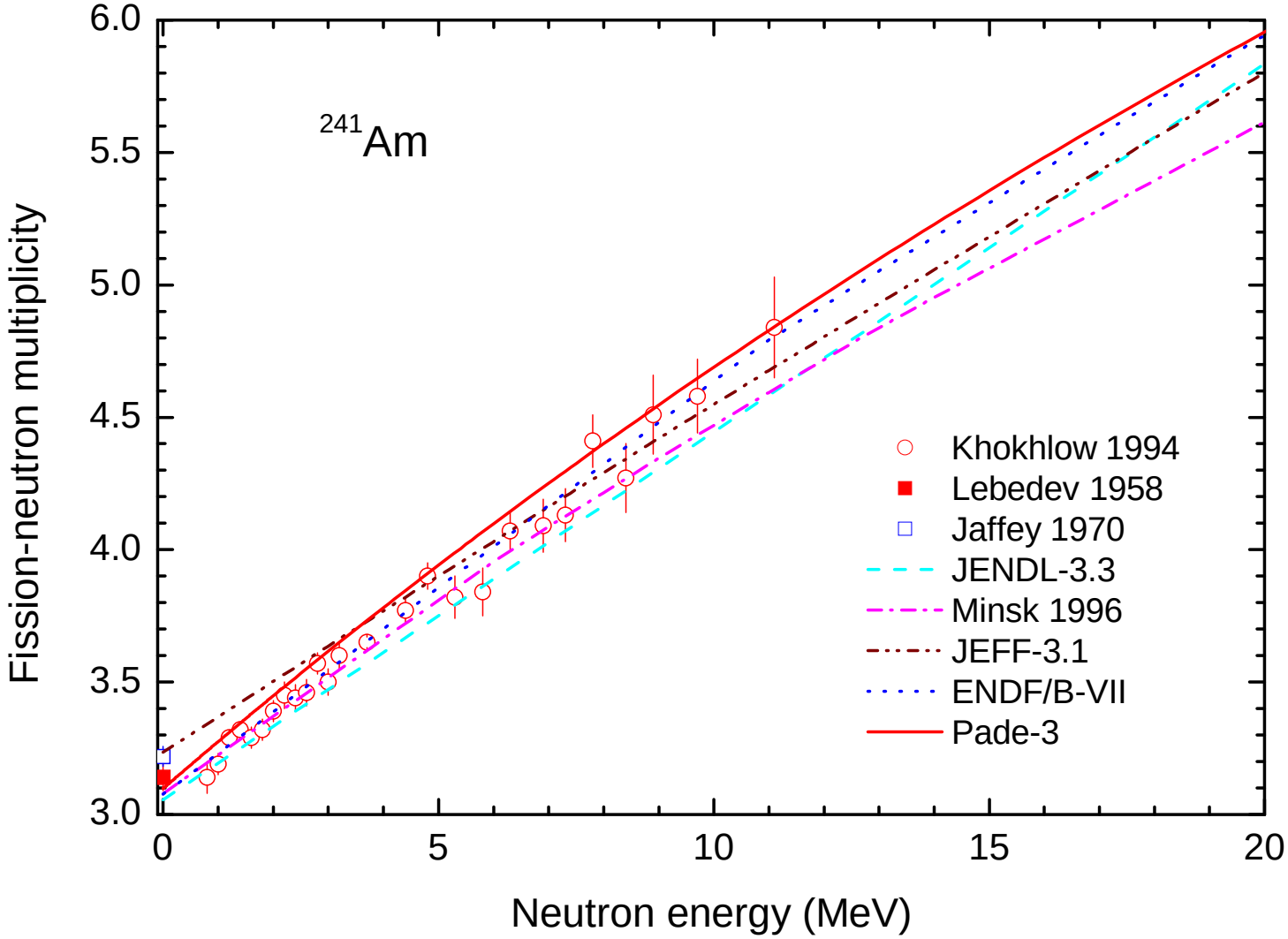
Prompt fission-neutron multiplicities for Pu-239



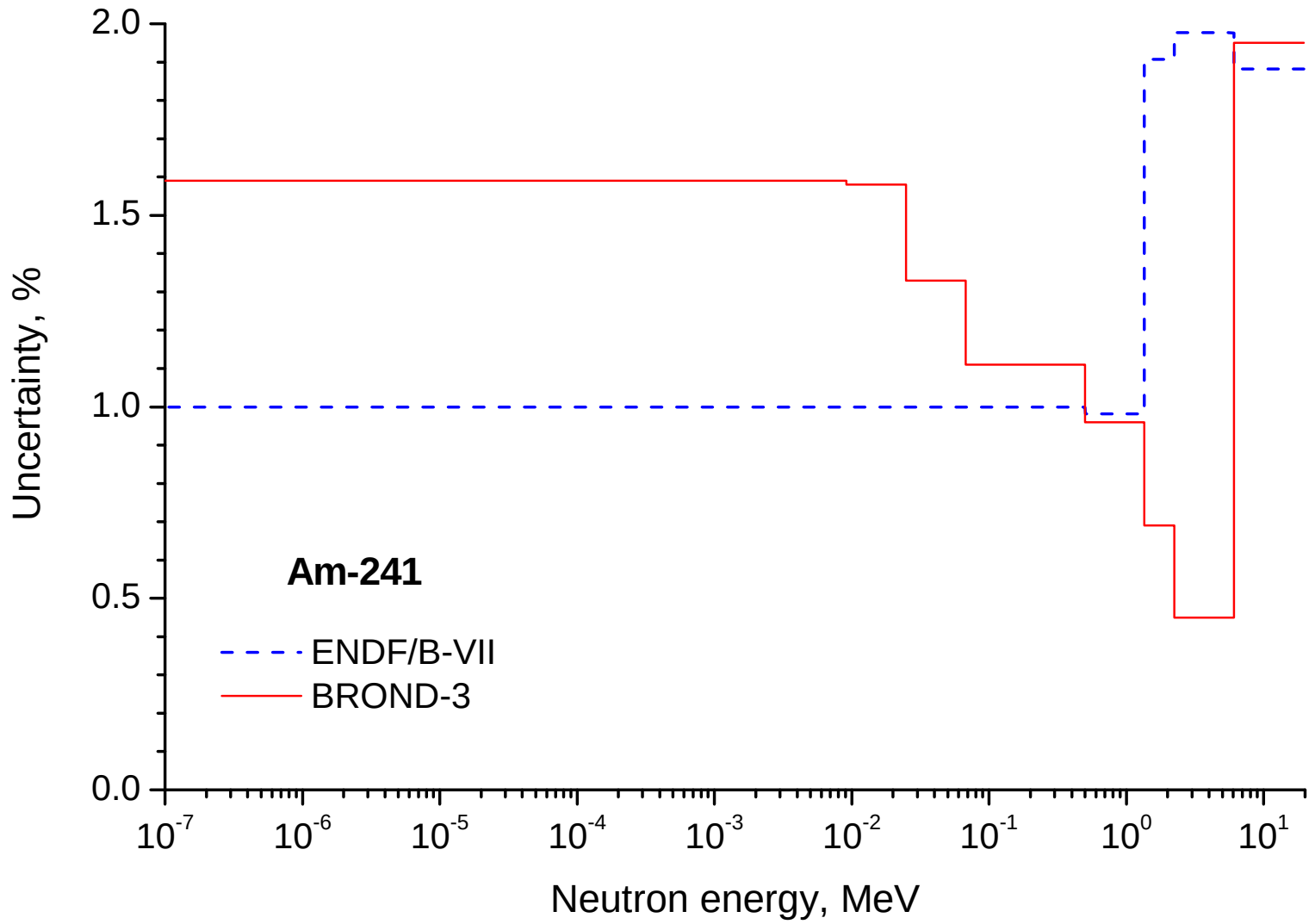
Uncertainties of the fission-neutron multiplicities for Pu-239



Prompt fission-neutron multiplicities for Am-241



Uncertainties of the fission-neutron multiplicities for Am-241



The fission-neutron multiplicities and their uncertainties averaged over the ^{252}Cf fission-neutron spectrum

Nuclide	BOLNA		BROND-3	
	ν–prompt	Uncert.,%	ν–prompt	Uncert.,%
U-235	2.65	.16	2.72	.22
Pu-239	3.17	.15	3.23	.22
Np-237	2.99	1.2	2.97	.59
Am-241	3.43	1.1	3.50	1.3
Cm-245	3.83	3.0	3.88	1.5

Conclusions

- For the main fissile nuclei there is a reasonable agreement between the uncertainties of recent evaluations for the fission cross-sections and the fission-neutron multiplicities;

- For minor actinides the BOLNA uncertainties should be revised at the above-threshold energies for both the cross sections and the neutron multiplicities.