Status of the BROND/ROSFOND project

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- BROND and ROSFOND libraries;
- Status Brond-3.1 library;
- Some examples of uncerainties;
- Verification with benchmarks

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BROND-3.0 and RUSFOND-2010

i) The general purpose BROND-3.0 library includes about 120 nuclides, evaluations of which were performed by Russian scientist. For practical applications and for the new group-constant preparation, in particularly, other data libraries are used widely for nuclides unavailable in BROND-3.0. The draft version of this library was prepared in 2006/2007, but a verification of it was not finished.

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. Covariances were not included in this library in spite of existence the corresponding evaluation for some original files.

BROND-3.1 library

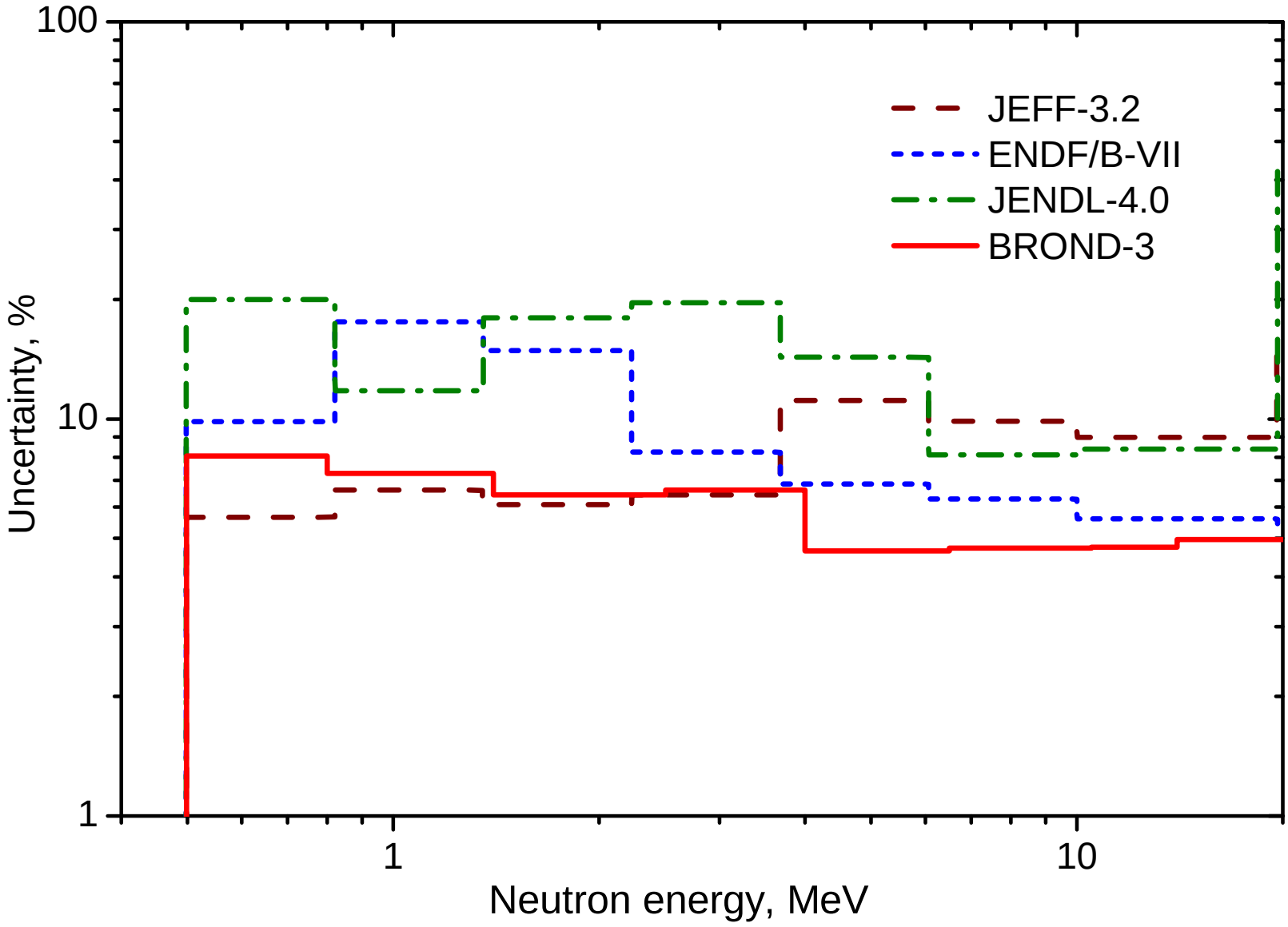
The main activity of the Russian Nuclear Data Center (CJD) in 2014 was connected with a completion of the BROND-3.1 library formation. The ROSFOND-2010 library was taken as the basis one, but for many nuclides the neutron inelastic scattering and capture cross sections, as well as the secondary gamma-production cross-sections were revised. The fission cross sections and the delayed neutron yields were also updated for some minor actinides.

The compiled version of the BROND-3.1 library includes of 372 files of isotopes from hydrogen to curium for the neutron energy range from thermal to 20 MeV. Covariances are included for about 140 files. All files were checked for the ENDF-6 format correspondence and were transformed with the ENJOY code to the “ace” format widely used at the various benchmark calculations.

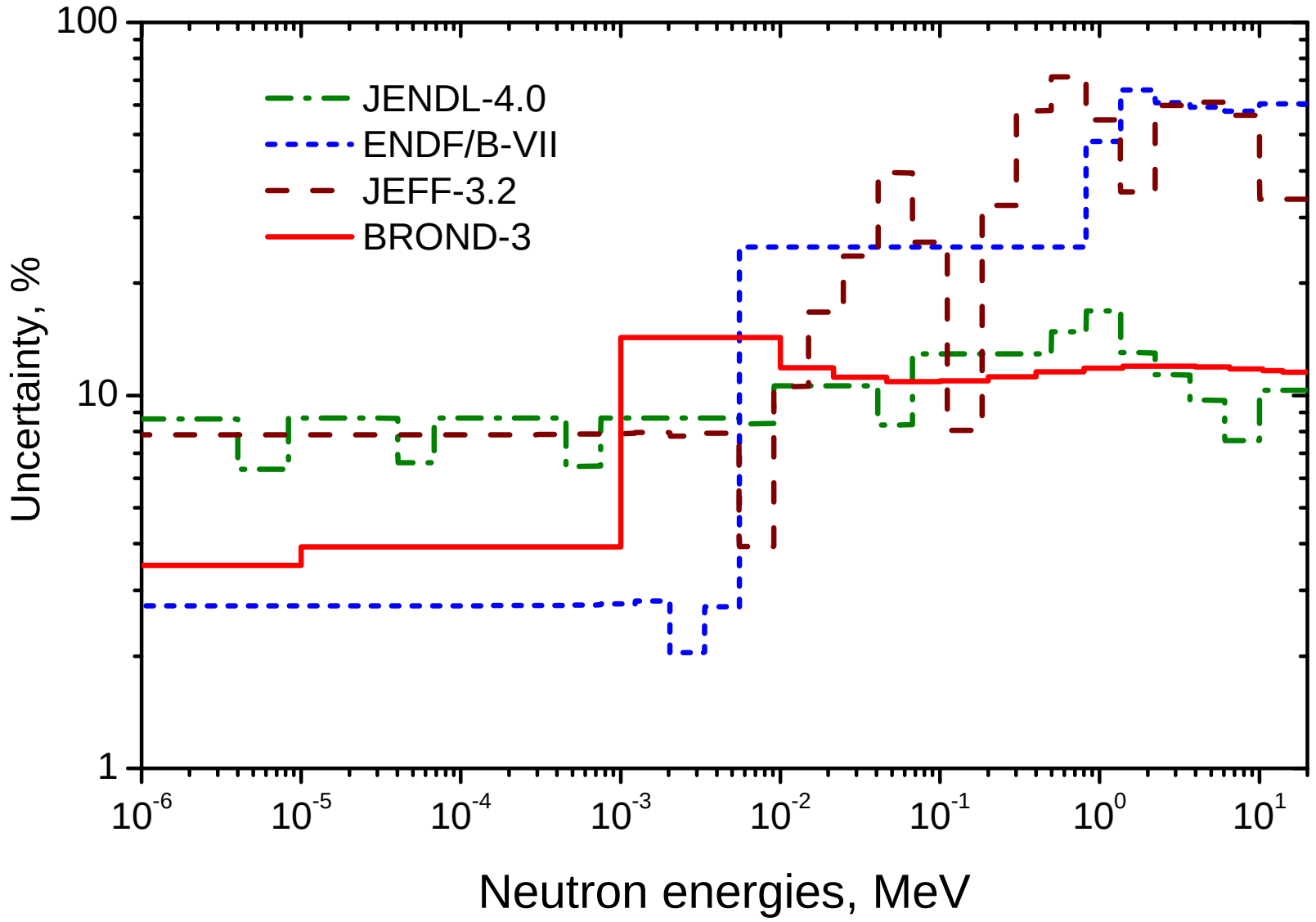
BROND-3.1 (cont.)

The special attention in the new library was devoted to the cross-section uncertainty matrixes, which were absent in the previous Russian libraries. The analysis of uncertainties for the most cases was performed on the basis of the unrecognized-error estimation method, developed at IPPE in the last years. Along with a consistent consideration of statistical errors of experimental data the method allows to determine some systematic uncertainties, usually underestimated by the authors of data, and to establish also some implicit correlations of data. An account of systematic uncertainties is an important feature of new BROND evaluations.

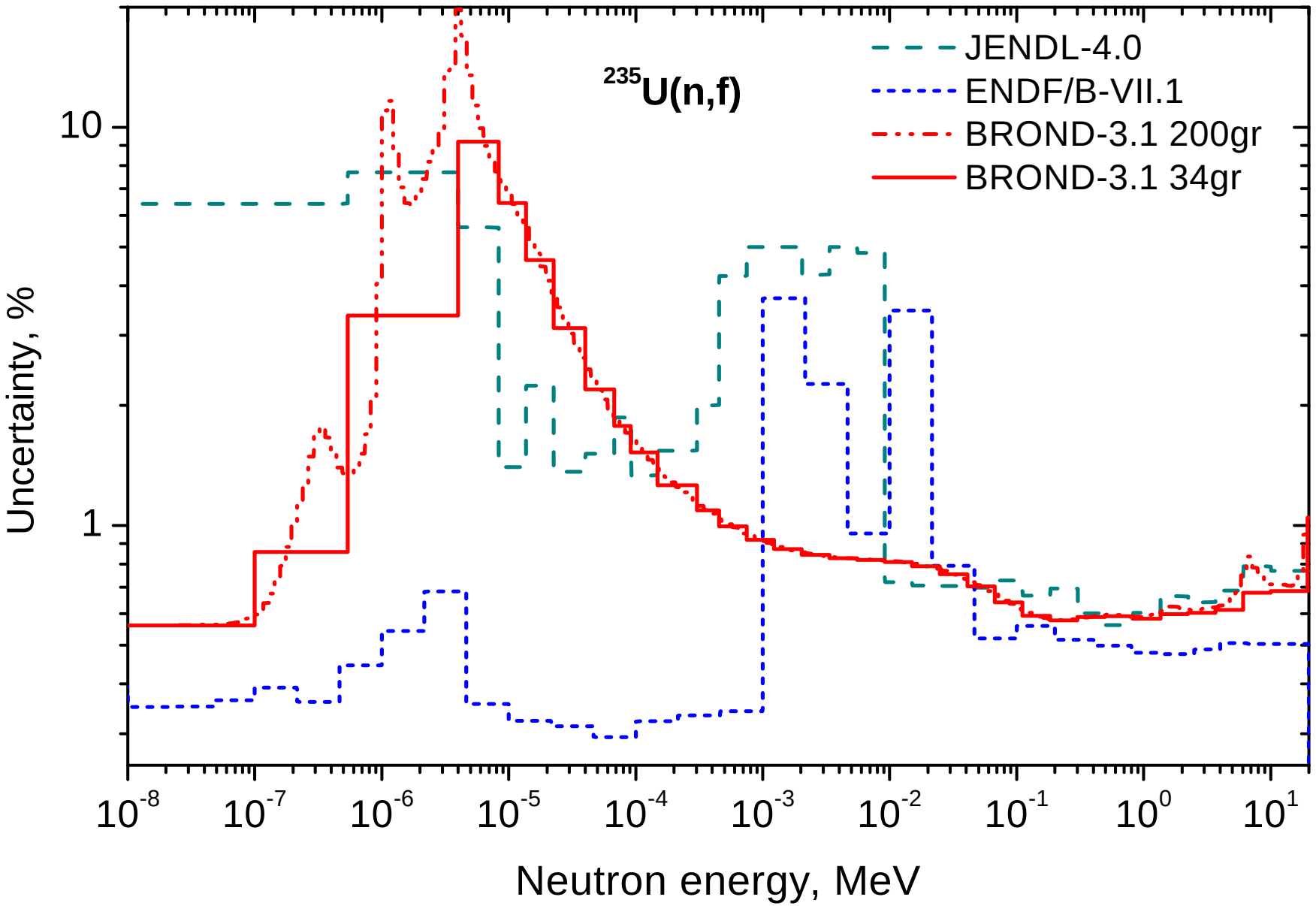
Uncertainties of the inelastic scattering evaluations for ^{23}Na



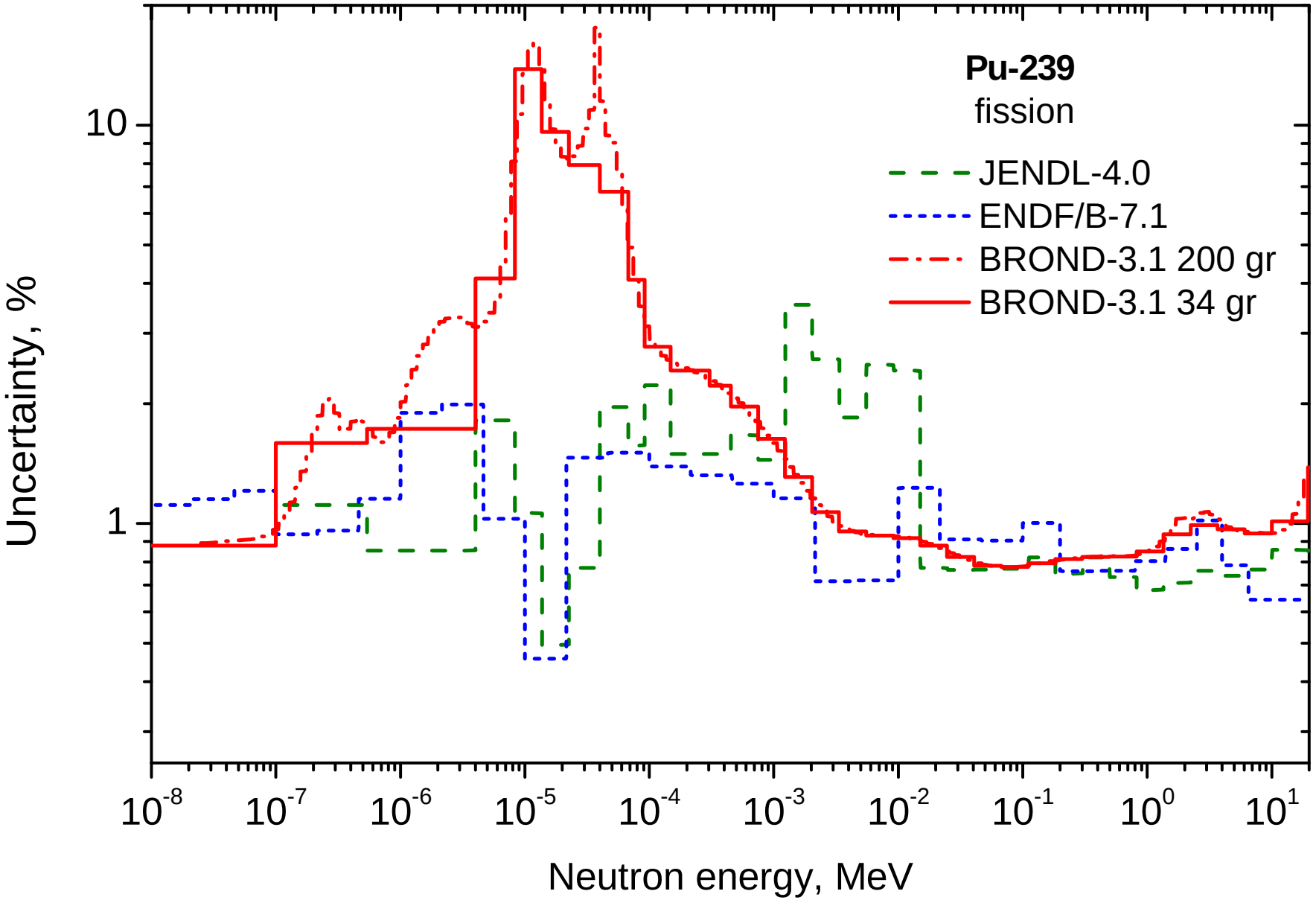
Uncertainties of the neutron capture evaluations for ^{23}Na



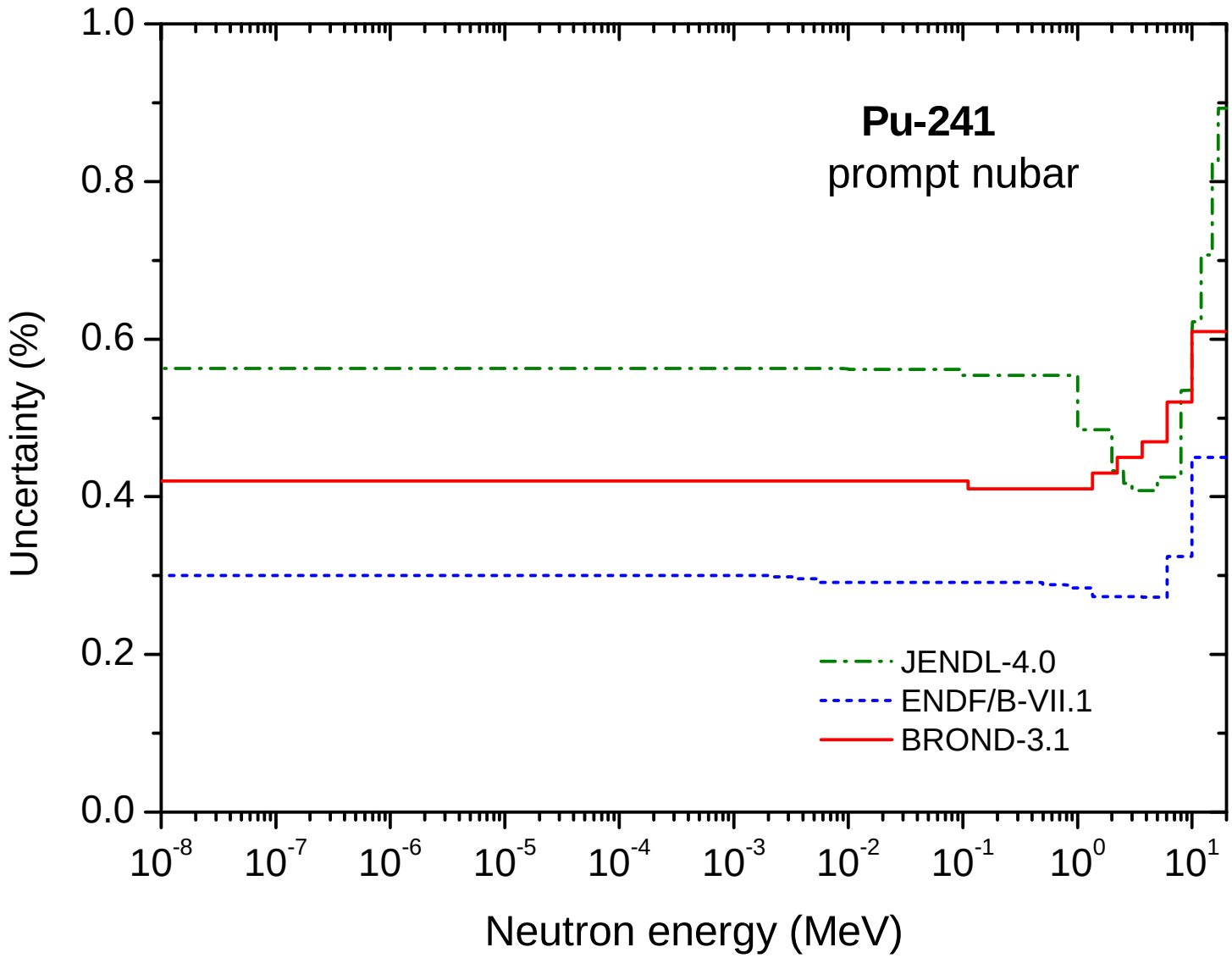
Uncertainties of the fission cross-section evaluations for ^{235}U



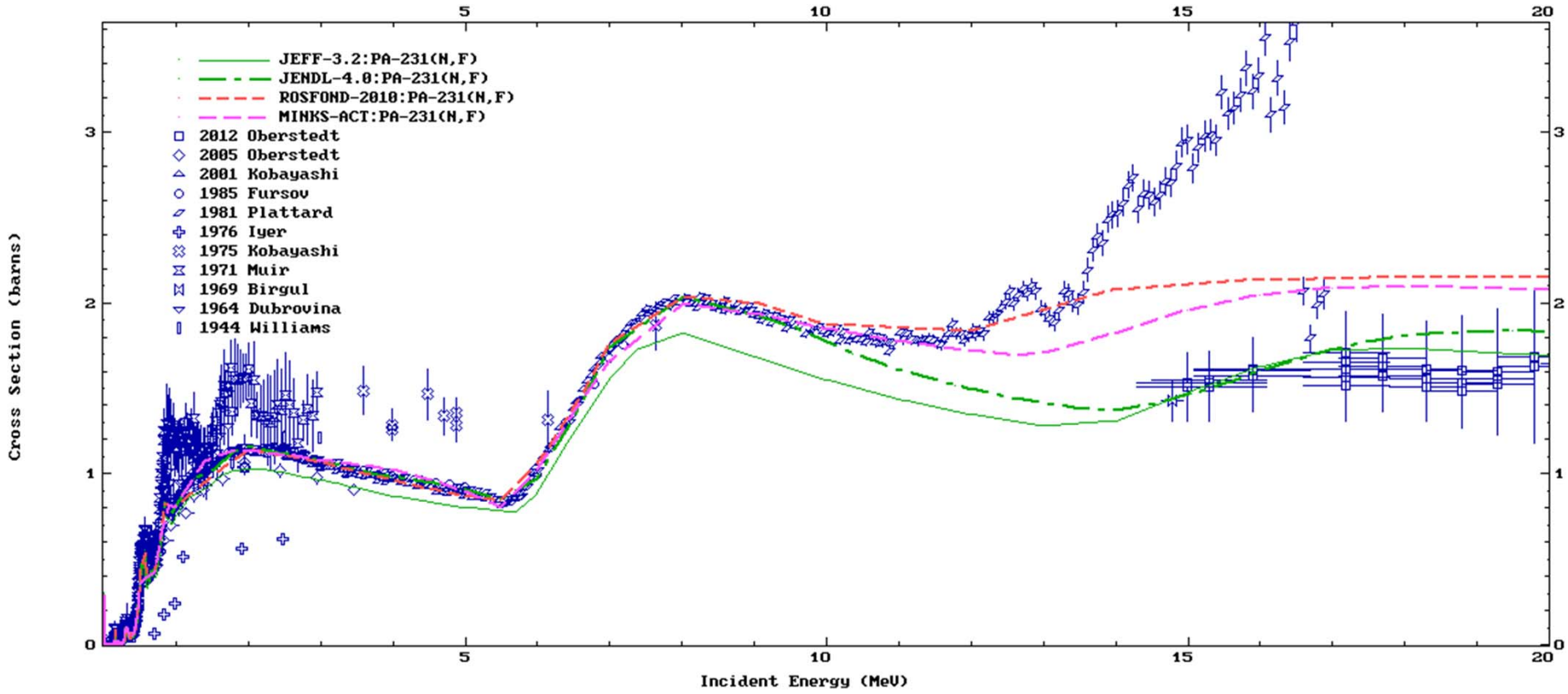
Uncertainties of the fission cross-section evaluations for ^{239}Pu



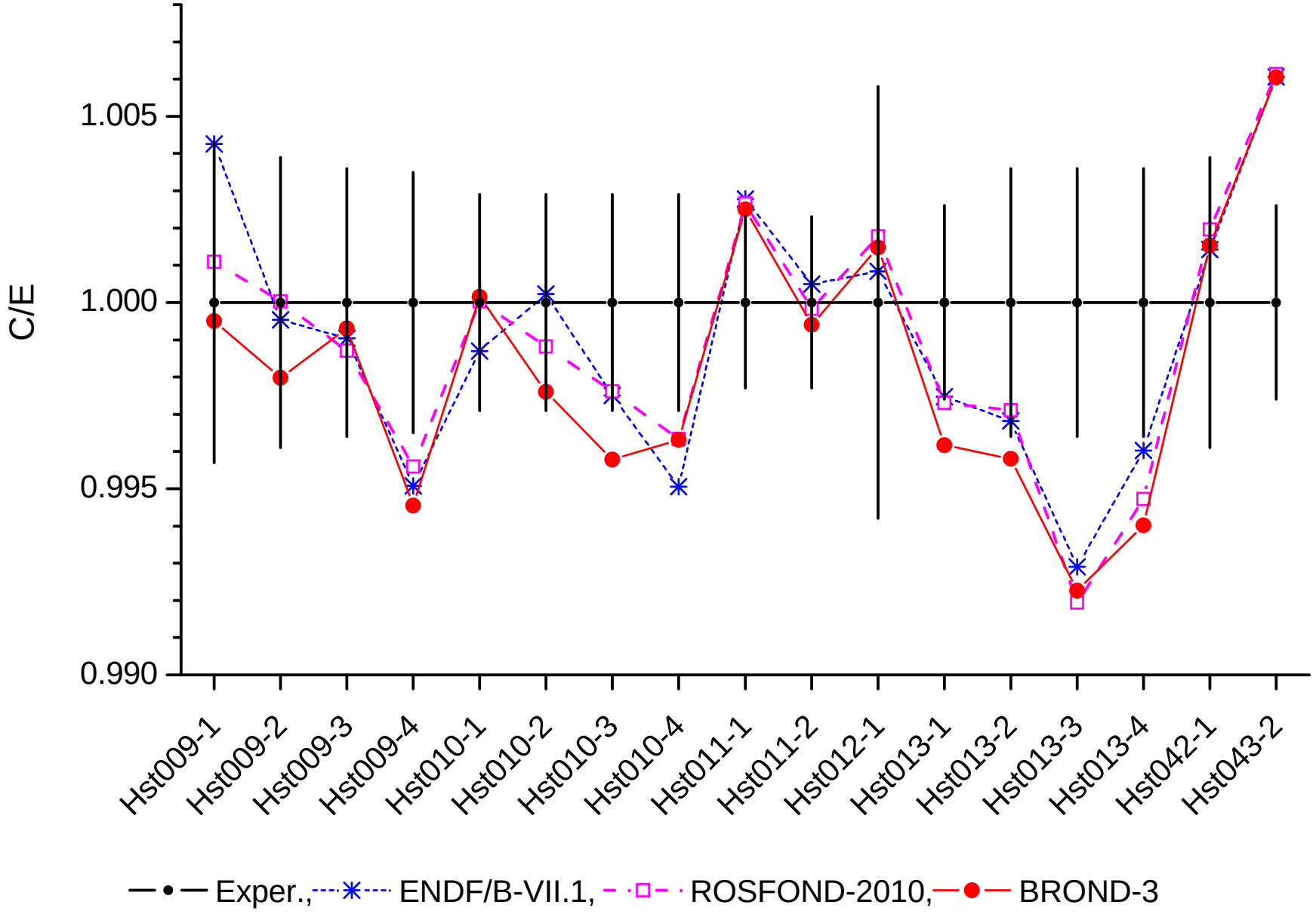
Uncertainties of the evaluated prompt nubar



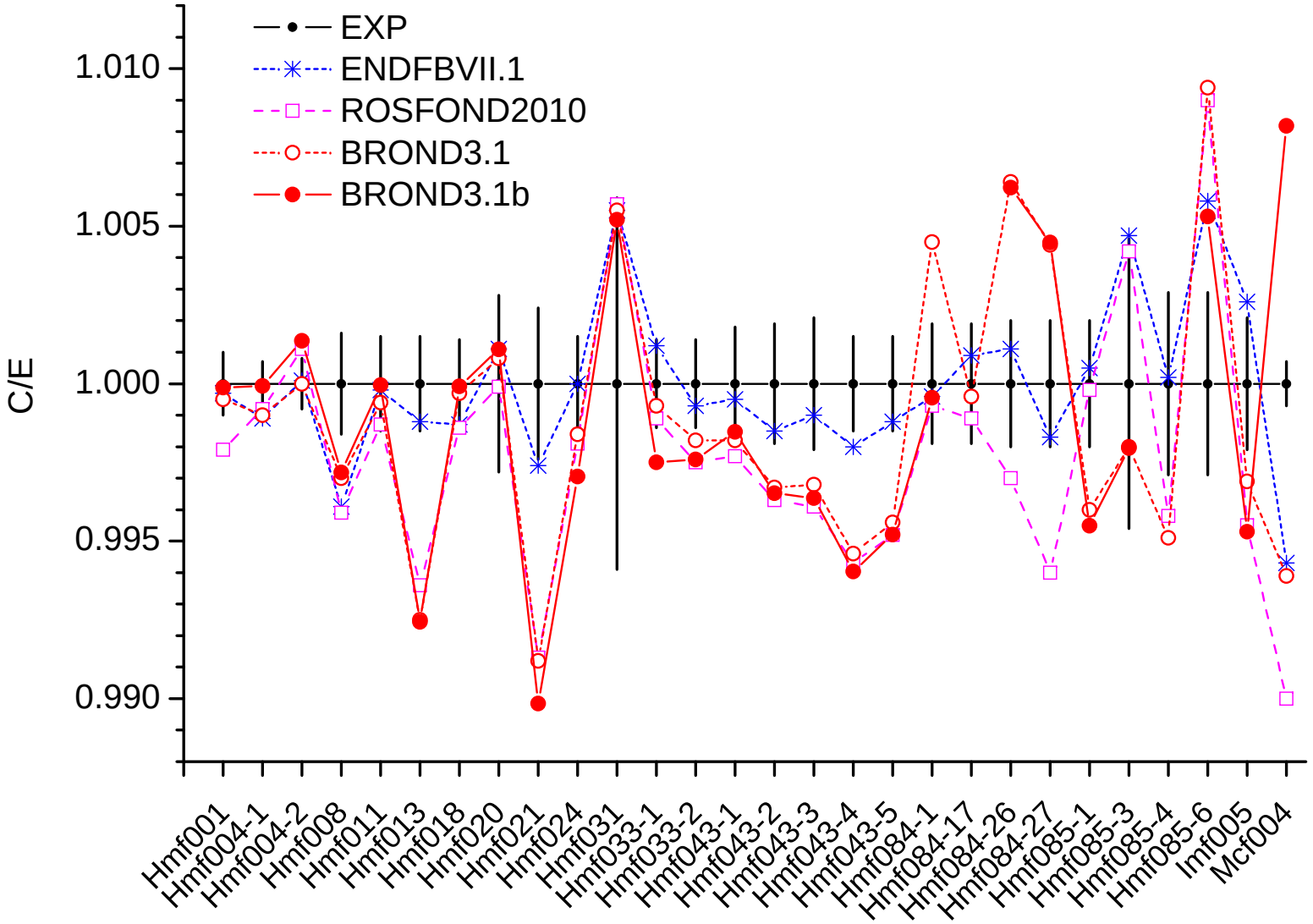
Fission cross-section evaluations for Pa-231



Verification with the thermal benchmarks for U



Verification with the fast-neutron benchmarks for U



Verification with the fast-neutron benchmarks for Pu