

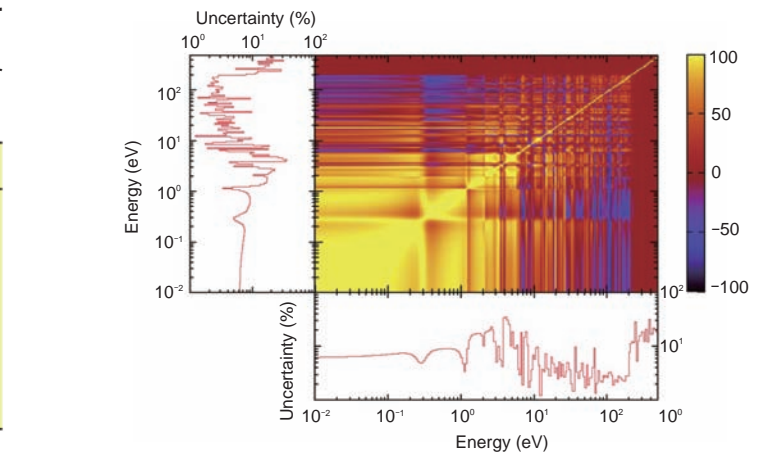
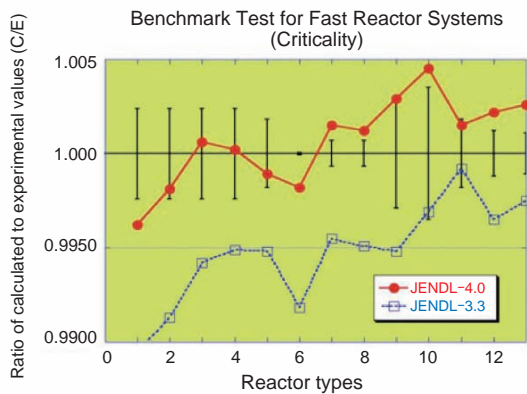
# 8-1 New Nuclear Data Library for Science and Technology

## — General Purpose Japanese Evaluated Nuclear Data Library JENDL-4.0 —

**Table 8-1 Comparison among evaluated nuclear data libraries**

JENDL-4.0 contains more nuclear data than other evaluated data libraries.

Library	JEFF-3.1.1	ENDF/B-VII.0	JENDL-4.0
Developed by	Europe	USA	Japan
Released year	2009	2006	2010
No. of nuclides	381	393	406
No. of nuclides with $\gamma$ -rays	139	206	354
No. of nuclides with covariances	37	26	95



**Fig.8-3 Example of covariance matrices (above)**

The  $^{235}\text{U}$  fission cross section covariance matrix is shown. The diagonal part represents the uncertainties in the cross section. The off-diagonal part shows the correlation between energy regions. Change in the cross section at an energy region affects cross sections in other energy regions.

**Fig.8-4 Example of criticality analysis for fast reactor systems**

The ratio of calculated value (C) to experimental value (E) is shown. A value of 1.0 means good prediction performance. Calculations using JENDL-4.0 show better prediction performance than those using JENDL-3.3.

A new evaluated nuclear data library, JENDL-4.0, has been completed and released. The JENDL-4.0 library contains basic neutron reaction data, and is used in various kinds of nuclear science and technology fields.

The library contains the data of 406 nuclides. Following the release of the JENDL-3.3 library in 2002, users' needs and requests were incorporated into the new library. In particular, the data of minor actinides and fission products, which play an important role in high burnup reactors and disposal of nuclear waste, have been emphasized. Highly requested additional covariance data are also given in the new library, more than in the previous library. Table 8-1 shows a comparison among the main evaluated libraries. The JENDL-4.0 library surpasses other libraries not only in coverage of the nuclides it contains, but also in terms of covariance data and  $\gamma$ -ray production data.

An example of covariance data is shown in Fig.8-3. The figure shows the correlations for the  $^{235}\text{U}$  fission cross section.

The diagonal part indicates the uncertainties in the cross section itself and the off-diagonal part represents the correlation between energy regions. It shows the degree of the effect of a cross-section change in one energy region on the cross-section of another energy region.

Many benchmark tests have been performed to confirm the performance of JENDL-4.0. Fig.8-4 shows the results of tests for fast reactor systems. The ratios of calculated neutron multiplication factors to measured ones are given. A value of 1.0 means good performance. The results with JENDL-4.0 show improved performance.

The JENDL-4.0 library is an open library and can be freely used. The library can be downloaded from the website of the JAEA nuclear data center (<http://www.ndc.jaea.go.jp/index.html>) and other international websites like the IAEA NDS, and OECD/NEA Data Bank. The JENDL-4.0 library is thus expected to be used by researchers and engineers all over the world.

### Reference

Namekawa, M., Katakura, J., Curves and Tables of Neutron Cross Sections in JENDL-4.0, JAEA-Data/Code 2010-017, 2010, 822p.