

Present Status of the JENDL Project (May, 2014) WPEC Meeting, Paris, France, 15-16 May, 2014

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Organization of Japanese Nuclear Data Committee

The Japanese Nuclear Data Committee (JNDC) is a research committee for JAEA research activities. Prof. N. Yamano of Fukui University chaired the committee. The committee has two subcommittees: Subcommittee on Nuclear Data and Subcommittee on Reactor Constants. The following listed working groups are those of the last fiscal year (2013.4 – 2014.3).

Subcommittee on Nuclear Data (chaired by H. Harada, JAEA)

- *High Energy Nuclear Data Evaluation WG (chaired by S. Kunieda, JAEA)*
- *ENSDF Group (chaired by H. Iimura, JAEA)*
- *Japanese Nuclear Data Management Network (chaired by Y. Watanabe, Kyushu Univ.)*
- *Advisory Subcommittee on Development of JENDL (chaired by G. Chiba, Hokkaido Univ.)*

Subcommittee on Reactor Constants (chaired by N. Yamano, Fukui Univ. ¹)

- *Reactor Integral Test WG (chaired by G. Chiba, Hokkaido Univ.)*
- *Shielding Integral Test WG (chaired by C. Konno, JAEA)*
- *WG on Evaluation of Nuclide Generation and Decay Heat (chaired by K. Okumura, JAEA)*
- *Covariance Utilization WG (chaired by T. Iwasaki, Tohoku Univ.)*

The Advisory Subcommittee on Development of JENDL was finished on March 2014.

Nuclear Data Evaluation

JENDL-4.0 Updated Files

The JENDL-4.0 Updated Files (JENDL-4.0u) have been produced to take care of errors which were found after the release of JENDL-4.0. The JENDL-4.0u includes the nuclides whose nuclear data partly revised from important and/or trivial error(s). Thirteen files for JENDL-4.0u were released in 2013. Important update was made on items:

- The neutron spectra of K-39, Hg-196,202,204 and Ra-224,225 were modified near the threshold energies to remove a strange dip found on the KERMA factors due to energy imbalance for (n,n'), (n,2n) and (n,3n) reactions, etc.

¹ The chair was switched with K. Okumura, JAEA, on April 2014.

- Inconsistencies of resolved resonance parameters stored in between MF2/MT151 and MF32/MT151 for U-234, Np-237, Pu-238, 242 were removed. The JENDL-4.0u is available from the JAEA web site.²

Benchmarking for fission reactor applications

1) Benchmarking using test files of Gd-157:

Two kinds of test files based on new Gd-157 experimental data acquired in J-PARC³ were prepared for benchmarking. Benchmark calculations were performed for criticality of UO₂ fuel rods in water containing dissolved Gd, and power distribution of LWR fuel assembly including Gd pins^{4,5}. The benchmark results are generally consistent with past benchmark results using JENDL-4.0.

2) Benchmarking using test files of Am-241:

Three kinds of Am-241 test files were prepared according to new experimental data reported by EU⁶. These test files gave a prospect for resolving a known problem of Am-241 concentration dependency in TCA, i.e., Pu-aging problem⁷. The best result for the problem is obtained from the case where the Am-241 capture cross-section was systematically increased under 1eV⁸.

3) Integral testing for Th-232 using KUCA critical experiments:

A comprehensive evaluation of Th-232 using KUCA critical experiments is currently underway⁹. In a zone-type core that has a test region consisting of thorium and graphite cells, six critical experimental data have been acquired with systematically changing C/Th ratios of the test region. Compared with JENDL-3.3, the benchmark results of the criticality using JENDL-4.0 improved with no significant dependency on the C/Th ratios, but the systematic overestimation of Th-loaded cores was still found by 0.3%Δk.

² <http://www.ndc.jaea.go.jp/jendl/j40/update/>

³ A. Kimura, K. Hirose, et al., "Measurement of neutron capture cross section of Gd-157 with the NaI(Tl) spectrometer and the Ge spectrometer in J-PARC/MLF/ANNRI," Proceedings of 2013 Fall Meeting of the Atomic Energy Society of Japan, C02, Sep. 3-5, 2013, Hachinohe Institute of Technology, Japan, in Japanese

⁴ G. Chiba, "Benchmarking using Gd-157 Test Files," JENDL Committee, RIT-4-1-3 (2014), in Japanese.

⁵ JENDL Committee Reactor Integral Test Working Group, "Recent Evaluation Status on Gd-157 Thermal Neutron Capture Cross Section," Nuclear Data News, to be published. (in Japanese)

⁶ C. Lmapoudis et al., "Neutron transmission and capture cross section measurements for ²⁴¹Am at the GELINA facility," Eur. Phys. J. Plus (2013) 128: 86

⁷ G. Chiba, et al. "JENDL-4.0 Benchmarking for Fission Reactor Applications," J. Nucl. Sci. Technol. Vol. 48, No.2, p.172-187 (2011)

⁸ G. Chiba, "Current Status on Am-241 Cross Section," JENDL Committee, RIT-4.-2-1 (2014), in Japanese.

⁹ T. Sano, "Analysis of Integral Experiments for Th-232 (n,γ) Cross Section Using KUCA," Proceedings of the 2013 Symposium on Nuclear Data, Nov. 14-15, 2013, Research Institute of Nuclear Engineering, University of Fukui, Japan, to be published.

New Evaluations

The data which are not updated in JENDL-4.0 are continuously considered to be revised, especially for FP region nuclides. Evaluated results for $^{141,143}\text{Pr}$, $^{121,123-126}\text{Sb}$ and $^{96,98-106}\text{Ru}$ were published^{10,11,12}. The R-matrix analysis for O-16 is in progress. Preliminary results were presented at ND2013 and NEMEA-7/CIELO.

For decommissioning of nuclear power plants, evaluation of activation cross sections was planned for 569 reactions with 309 nuclides and is in progress. Evaluated files for the 246 isotopes from H to Hf have been created. The evaluated data will be released as a special purpose file in the near future.

As the activity of High Energy Nuclear Data Evaluation WG, development of new JENDL Photonuclear Data File is in progress. Evaluation for 181 nuclides has been finished. It will be released in 2014.

Other Activities

2013 Symposium on Nuclear Data

The symposium was held on 14 and 15, November, 2013 at Research Institute of Nuclear Engineering, University of Fukui, Tsuruga-shi, Fukui. There were 64 participants. The symposium was hosted by nuclear data division, Atomic Energy Society of Japan and University of Fukui. Oral presentations were made on the topics of “Progress in neutron cross-section measurement and analysis”, “Application of Nuclear Data”, “Recent topics”, and “Progress in studies of high-energy nuclear reaction”. Totally 37 papers including 23 poster presentations were presented. Proceedings will be published in 2014.

¹⁰ F. Minato, “Evaluation of neutron nuclear data of praseodymium-141 and -143”, *J. Nucl. Sci. Technol.*, 50 (9), 873 (2013).

¹¹ K. Shibata, “Evaluation of neutron nuclear data on antimony isotopes”, *J. Nucl. Sci. Technol.* **51**, 425 (2014).

¹² K. Shibata, “Evaluation of neutron nuclear data on ruthenium isotopes”, *J. Nucl. Sci. Technol.* **50**, 1177 (2013).