

Present Status of JENDL Project (May 2004)

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1 Organization of Japanese Nuclear Data Committee

The current organization of Japanese Nuclear Data Committee is following:

- **Subcommittee on Nuclear Data**
High Energy Nuclear Data Evaluation WG,
Evaluation and Calculation System WG,
FP Nuclear Data Evaluation WG,
Evaluation WG on Astrophysics.

- **Subcommittee on Reactor Constants**
Reactor Integral Test WG,
Shielding Integral Test WG,
Standard Group Constants WG,
Medium and High Energy Nuclear Data Integral Test WG.

- **Subcommittee on Nuclear Fuel Cycle**
Decay Heat Evaluation WG,
WG on Nuclide Generation and Depletion,
Fission Yield Evaluation WG.

- **Standing Groups**
ENSDF Group,
JENDL Compilation Group,
CINDA Group
Group on Atomic, Molecular and Nuclear Data for Medical Use,
Editorial Group of “Nuclear Data News”,
High Priority Request List Group.

Total number of the committee members is 112 in 2004. Nuclear Data Center, JAERI plays a role of the secretariat.

2 JENDL General Purpose File

JENDL-3.3 was released in May 2002. The JENDL-3.3 file contains neutron-induced reaction data for 335 nuclides and 2 elements. The reliability of JENDL-3.3 has been investigated through various kinds of benchmark calculations. The results of the benchmark calculations showed good performance of JENDL-3.3 for many types of reactor cores. After the release of JENDL-3.3 the discussion for the next version of the general purpose file was started in Japanese Nuclear Data Committee. In the discussion the outline of JENDL-4 was proposed.

- (1) **Scope:** To solve current concern on nuclear energy development such as high burn-up, MOX fuels utilization, evaluations of burn-up credit and their safety assessments. It also includes medical and fundamental scientific applications such as BNCT (Boron Neutron Capture Therapy), medical use of accelerator and nuclear synthesis in astrophysics.
- (2) **Incident particles and maximum energy:** In addition to neutron-induced reaction, charged particle-, photon-induced reaction and spontaneous fission process are considered. Standard maximum energy is 20 MeV, but it will be extended when needed.
- (3) **Contents:** To be enriched in the quality of actinides and FP nuclides. The numbers of covariance data, the types of fission product yields, secondary gamma production data and charged particle spectra will also be enriched. Total number of included nuclides, however, is not going to largely exceed that of JENDL-3.3.

The detail of JENDL-4 has not been fixed yet. However, we consider JENDL-4 project as an integrated nuclear data system including not only JENDL-4 file but also group constants for utilization of JENDL-4. The confirmation of accuracy or reliability will be provided with JENDL-4. At present the project is expected to continue for five years.

3 JENDL Special Purpose File

In addition to the general purpose file, some special purpose files have been developed in JAERI.

JENDL High Energy File

JENDL High Energy File 2004 was released this March. It includes high energy neutron- and proton-induced reaction data for 66 nuclides. The maximum energy of the incident particle is 3 GeV. This file is intended to be used for the design of high energy proton accelerator and R & D of ADS system.

The nuclides included in the file are listed below:

^1H , $^{12,13}\text{C}$, ^{14}N , ^{16}O , $^{24,25,26}\text{Mg}$, ^{27}Al , $^{28,29,30}\text{Si}$, $^{39,41}\text{K}$, $^{40,42,43,44,46,48}\text{Ca}$, $^{46,47,48,49,50}\text{Ti}$,
 ^{51}V , $^{50,52,53,54}\text{Cr}$, ^{55}Mn , $^{54,56,57,58}\text{Fe}$, ^{59}Co , $^{58,60,61,62,64}\text{Ni}$, $^{63,65}\text{Cu}$, $^{64,66,67,68,70}\text{Zn}$,
 $^{90,91,92,94,96}\text{Zr}$, ^{93}Nb , $^{180,182,183,184,186}\text{W}$, $^{196,198,199,200,201,202,204}\text{Hg}$.

The high energy file was primarily intended to include the data for about 120 nuclides. The released 2004 file contains about a half of the intended data. The data of other nuclides will be included successively.

The file for IFMIF (International Fusion Material Irradiation Facility) project whose maximum energy is 50 MeV will be produced from the high energy file.

JENDL Photonuclear Data File

JENDL Photonuclear Data File 2004 was released this March. It includes photo reaction data for 68 nuclides. The maximum incident energy is 140 MeV.

The nuclides included in the file are listed below:

^2H , ^3He , $^{6,7}\text{Li}$, ^9Be , $^{10,11}\text{B}$, ^{12}C , ^{14}N , ^{16}O , ^{19}F , ^{23}Na , $^{24,25,26}\text{Mg}$, ^{27}Al , $^{28,29,30}\text{Si}$,
 ^{31}P , $^{40,48}\text{Ca}$, ^{46}Ti , ^{51}V , ^{52}Cr , ^{55}Mn , $^{54,56}\text{Fe}$, ^{59}Co , $^{58,60}\text{Ni}$, $^{63,65}\text{Cu}$, ^{64}Zn , ^{90}Zr ,
 ^{93}Nb , $^{92,94,96,98,100}\text{Mo}$, ^{133}Cs , $^{152,154,155,156,157,158,160}\text{Gd}$, ^{181}Ta , $^{182,184,186}\text{W}$,
 ^{197}Au , $^{196,198,199,200,201,202,204}\text{Hg}$, $^{206,207,208}\text{Pb}$, ^{209}Bi , $^{235,238}\text{U}$, ^{237}Np .

The data of other nuclides intended to be included will be taken from the evaluated data by KAERI group. Total number of the nuclides included will be about 150.

JENDL PKA/KERMA File

The file is intended to include the spectra of primary knock-on atoms (PKA) and KERMA factors. These data will be created from the file for the IFMIF project.

JENDL (α ,n) Reaction Data File

The data file of (α ,n) reactions were released in February 2003. The file contains the data for the following 13 nuclides:

$^{6,7}\text{Li}$, ^9Be , $^{10,11}\text{B}$, $^{12,13}\text{C}$, $^{14,15}\text{N}$, $^{17,18}\text{O}$, ^{19}F , ^{23}Na .

At first it is expected to contain the data of total 32 nuclides. It becomes now difficult to complete the whole evaluations.

JENDL Actinide File

Actinide data in JENDL-3.3 are being reevaluated to resolve the inconsistencies with PIE data and other benchmark test results. The results of the reevaluation will be reflected in JENDL Actinide File. In these reevaluation

process, it is recognized that experimental data are not enough for making a reliable evaluated file. These data include thermal cross sections, resonance parameters, capture cross sections and the ν values of Am and Cm isotopes. New experimental data are truly needed.

Other JENDL Special Purpose Files

Fusion File, Activation Cross Section File, Dosimetry File and FP Decay Data File are also developed as JENDL Special Purpose Files in Japan. The first version of each file has been released already. The revision of those files has not been scheduled yet.

4 Other Activities relating to Nuclear Data

1) 2003 Symposium on Nuclear Data

The 2003 Symposium on Nuclear Data was held at Tokai Research Establishment, JAERI on 27th and 28th of November 2003. Total of 121 persons attended the symposium. In the oral session, 18 papers were presented. Topics of this year are ADS related nuclear data, nuclear data needs for next generation reactors and future JENDL plan. In the poster session, 26 papers were presented. The proceedings of the symposium will be published as a JAERI-Conf report.

As the first attempt, tutorial session on nuclear data was held at the day before the symposium in order to give the information of nuclear data evaluation work to young engineers and scientists in nuclear technology field. In the session, evaluation work and processing evaluated nuclear data were presented. Total of 48 persons attended the session. Most of the participants seemed to have good feeling for the session and wanted to have a similar tutorial session again in next year.

2) Development of CONDUCT System for Advanced Reactors

This work is a part of a project on MA nuclear data measurements for advanced nuclear reactor, which is funded by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). Main part of the work is development of the detector system to measure the cross section of Np and Am nuclides. This is a five year project starting from 2002. The measured cross section will be obtained in the 4th year. The evaluation and compilation of the measured data will be performed the 5th year. The evaluated data will be included in a JENDL file.

The CONDUCT (Combined System for Nuclear Data Utilization, Calculation and Transfer) system is an integrated software system functioning on Internet. This system consists of three parts: system control part, retrieval and

plotting part, and processing and utilization part. System control part manages nuclear database and application programs. Nuclear database is intended to contain the latest evaluated nuclear data and measured data from EXFOR database. The data retrieval and plotting part provides the numerical data with tables and/or figures that are produced from the stored data in interactive way according to the user's request. The processing and utilization part provides the tools that create data libraries needed for reactor application codes such as MVP, MCNP, ANISN, DOT, ORIGEN2 and so on from the evaluated nuclear data, and that make criticality and shielding benchmark calculations. The results of the calculation are provided with tables and figures.

In the two years' work, basic functions of the system have been discussed and the prototype system has been installed.