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## Present Status of JENDL High Energy Project

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### 1. Evaluation and General Works for Intermediate Energy Nuclear Data

Evaluation works for the intermediate energy nuclear data (IEND) have been performed through following three path in cooperating with JAERI Nuclear Data Center (JAERI/NDC) and Japanese Nuclear Data Committee (JNDC).

- 1) for neutron induced reactions below 50 MeV
  - The SINCROS-II code system is being expanded, and test evaluations have been performed for  $^{50,52,53,54}\text{Cr}$ ,  $^{54,56,57,58}\text{Fe}$ ,  $^{58,60,61,62,64}\text{Ni}$  and  $^{59}\text{Co}$ . The results of the test evaluations will be reviewed by JNDC.
  - For the lighter mass nuclei, SCINFUL code has been expanded, and test evaluations for  $^{12}\text{C}$  and  $^9\text{Be}$  are in progress.
  - EXIFON code was considered to use for evaluation of  $^{14}\text{N}$  and  $^{16}\text{O}$  and tested. Some modification of the code is planning.
  - The evaluation of  $^1\text{H}$  has been done and it was extended to several GeV.
- 2) for proton induced reactions below 50 MeV
  - The SINCROS-II code system is being expanded, and test evaluations have been performed for  $^{50,52,53,54}\text{Cr}$ ,  $^{54,56,57,58}\text{Fe}$ ,  $^{58,60,61,62,64}\text{Ni}$  and  $^{63,65}\text{Cu}$ . The results of the test evaluations will be reviewed by JNDC.
- 3) for proton and neutron induced reactions up to a few GeV
  - Evaluations for  $^{28,29,30}\text{Si}$ ,  $^{52}\text{Cr}$ ,  $^{58,60}\text{Ni}$  and  $^{63}\text{Cu}$  have been finished by using ALICE-F code and their review works will be done.
  - Evaluations for  $^{27}\text{Al}$ ,  $^{204,206,207,208}\text{Pb}$  and  $^{209}\text{Bi}$  are being performed by ALICE-F.

Improvement and test calculation for Quantum Molecular Dynamics (QMD) Theory have been performed continuously. Comparison of several theoretical codes has been performed and discussed. Research of fission reaction in the intermediate energy region has been started.

Physical quantities included in JENDL High Energy File and its format have been discussed. Total, elastic scattering, total reaction, fission, and isotope and particle production cross sections and their double differential cross sections must be included in the file. Format of the file should be based on ENDF-6 format and a few new MT definition will be newly added, for example, meson productions.

Components of review kit was discussed in order to check evaluated results. They are consist of file check results, graphs comparing with experimental data and evaluation report.

Compilation code, COMPATH, converting calculated results to ENDF-6 format, has

been made. At this moment, the results calculated by NUCLEUS, QMD and ALICE-F can be converted. The convertible code will be enlarged.

Experimental database for charged particle and  $\gamma$ -ray induced reactions, CHESTOR, has been developed. That for neutron induced reaction, NESTOR-2, has been improved.

## 2. JENDL Special Purpose Files Related to Intermediate Energy Nuclear Data

The compilation of following special purpose files for intermediate energy nuclear data are in progress.

### JENDL High Energy Files

The evaluation of data for high energy neutrons and protons has been initiated in JNDC. They will make data files for neutrons and protons up to 50 MeV and about 1.5 GeV.

The former files will be used for the IFMIF project which JAERI participates. The evaluation of neutron data up to 50 MeV has been made for several structural materials. The evaluations of H, C, Cr, Fe, Ni isotopes for neutron and of Cr, Fe, Ni, Cu isotopes for proton have been almost done, and are being reviewed.

The latter files will be used for design of accelerators, transmutation systems of high-level waste and so on. The evaluations of Al, Si, Cr, Ni, Cu, Pb and Bi isotopes were made for neutron and proton induced reactions up to 1 GeV. The neutron nuclear data for hydrogen are also finished. These data will be reviewed.

### JENDL PKA/KERMA File

This file will store the spectra of primary knock-on atoms (PKA) and KERMA factors. The data to be stored are created from the data files up to 50 MeV made for the IFMIF project. A couple of codes to create the file, by using the effective single particle emission approximation, have been developed and tested.

The test compilation has been performed from JENDL Fusion File for the 69 isotope data except light mass nuclei below 20 MeV.

### JENDL Photonuclear Data File

The evaluation has been finished for 46 isotopes;  $^2\text{D}$ ,  $^{12}\text{C}$ ,  $^{14}\text{N}$ ,  $^{16}\text{O}$ ,  $^{23}\text{Na}$ ,  $^{24,25,26}\text{Mg}$ ,  $^{27}\text{Al}$ ,  $^{28,29,30}\text{Si}$ ,  $^{40,48}\text{Ca}$ ,  $^{46}\text{Ti}$ ,  $^{51}\text{V}$ ,  $^{52}\text{Cr}$ ,  $^{55}\text{Mn}$ ,  $^{54,56}\text{Fe}$ ,  $^{59}\text{Co}$ ,  $^{58,60}\text{Ni}$ ,  $^{63,65}\text{Cu}$ ,  $^{90}\text{Zr}$ ,  $^{93}\text{Nb}$ ,  $^{92,94,96,98,100}\text{Mo}$ ,  $^{133}\text{Cs}$ ,  $^{160}\text{Gd}$ ,  $^{182,183,184,186}\text{W}$ ,  $^{197}\text{Au}$ ,  $^{206,207,208}\text{Pb}$ ,  $^{209}\text{Bi}$  and  $^{235,238}\text{U}$  in the  $\gamma$ -ray energy range up to 140 MeV. Their compilation in the ENDF-6 format is in progress.