Problems in FENDL-3.0

Chikara Konno[1], Masayuki Ohta[1], Saerom Kwon[1], Kentaro Ochiai[1], Satoshi Sato[1]

[1]Fusion Research and Development Directorate, Japan Atomic Energy Agency

A new version of Fusion Evaluated Nuclear Data Library (FENDL), FENDL-3.0 was released from IAEA in 2012. FENDL-3.0 has the following features; 1) extension of the neutron energy range of neutron-induced reactions from 20 MeV to more than 60 MeV, 2) activation data libraries for proton- and deuteron-induced reactions up to more than 60 MeV. We carried out the benchmark tests of the general-purpose data library for neutron-induced reactions in FENDL-3.0 with the integral experiments at JAEA/FNS, JAEA/TIARA and OKTAVIAN. We also tested the MATXS files of FENDL-3.0 with a simple calculation model and compared KERMA and DPA data included in the ACE and MATXS files of FENDL-3.0 with those in other nuclear data libraries. In this symposium we present the following problems in FENDL-3.0 found out in our study.

1) ^{16}O data above 20 MeV

   At the last symposium we pointed out that the ^{16}O data above 20 MeV caused a drastic overestimation of measured neutron fluxes above 10 MeV in the concrete shielding experiment with 40 and 65 MeV neutrons at JAEA/TIARA. The ^{16}O data above 20 MeV in FENDL-3.0 should be replaced with those in JENDL/HE-2007.

2) MATXS files above 20 MeV

   The most MATXS files in FENDL-3.0 have no energy-angular distribution data for the non-elastic scattering reaction. This causes a drastic underestimation of calculated neutron fluxes. The most MATXS files in FENDL-3.0 should be re-generated with the NJOY code adequately patched.

3) KERMA and DPA data included in the ACE and MATXS files

   We compared KERMA and DPA data included in the ACE and MATXS files of FENDL-3.0 with those in JENDL-4.0, ENDF/B-VII.1 and JEFF-3.2. As a result, the following problems were found out.

   i) ^{1}H : No increase with the decreasing neutron energy in low neutron energy. This is due to a NJOY bug.

   ii) ^{13}C, ^{15}N, ^{18}O, ^{31}P, ^{34}S, ^{36}S, ^{41}K, ^{50}Cr, ^{52}Cr, ^{53}Cr, ^{54}Cr, ^{58}Fe, ^{70}Ge, ^{72}Ge, ^{73}Ge, ^{74}Ge, ^{76}Ge, ^{138}La, ^{139}La, ^{175}Lu, ^{176}Lu, ^{185}Re, ^{187}Re, ^{195}Pt, ^{196}Pt, ^{198}Pt, ^{204}Pb, ^{206}Pb, ^{207}Pb : No increase with the decreasing neutron energy in low neutron energy. This is due to the older version (99.364) of NJOY used for processing FENDL-3.0, except for ^{15}N, reasons for which are not specified yet. These data should be re-processed with the latest version of NJOY, NJOY99.396 or NJOY2012.8.

   iii) ^{32}S, ^{33}S, ^{39}K, ^{40}K, ^{209}Bi : Drastically large KERMA and DPA data (only KERMA data for ^{39}K and ^{40}K) in low neutron energy. This is due to huge helium production cross section data in low neutron energy. It is required to check if the huge helium production cross section data in the low neutron energy are correct. If necessary, the helium production data for these nuclei in FENDL-3.0 should be revised.