

Status of Subgroup 7: Multigroup Cross Section Processing

U.S.A. Activities
R. E. MacFarlane, LANL
R. W. Roussin, ORNL
J. E. White, ORNL

Summary of NJOY91

This report covers the status of the NJOY processing system following the NJOY91 workshop held at the NEA Data Bank during April 1992. NJOY91 version 34 was the operating edition of the code system before the workshop. There are several modifications since the release of NJOY91.13 (official version available from RSIC) which have physics impact. A tabulation of the relative importance of the various modifications is available from either the NEA Data Bank or RSIC. It was the consensus of the attendees at the NJOY user group meeting that institutions adopt NJOY91. The migration to NJOY91 will be painful for some groups because of changes to GENDF and MATXS which affects the creation of working libraries.

The following processing problems were identified at the NJOY91 workshop. They are:

F-19 (n,2n) can not be properly processed by NJOY91. The problem is combining both outgoing particles which are given in two subsections.

More work needs to be done for Monte Carlo processing. Be-9, H-2, and ORNL evaluations with laboratory Legendre representations create problems.

Improvements are needed in the resonance reconstruction accuracy on short-word computers. Current procedures allow 7 digits of accuracy on a VAX or Sun and only 6 digits on an IBM mainframe.

New developments planned in NJOY91 processing:

The implementation of the probability table method for MCNP Monte Carlo processing.

Plotting capability will be modernized to generate the PostScript format directly.

Processed libraries announced since the last meeting.

Several cross section libraries have been developed at LANL. They are described in Table 1 which is taken from MacFarlane's presentation at the NJOY91 Workshop.

Table 1: ENDF/B-VI and VI.1 materials that have been processed into various libraries at Los Alamos. The notation "30×12" means 30 neutron groups and 12 photon groups.

Library	Groups	Materials/Version	Application
matxs10	30×12	117 (Rev. 1)	General purpose
matxs11	80×24	95 (Rev. 1)	Fast reactors
matxs12	69×24	140 (Rev. 1)	WIMS library (includes fission products)
matxs13	187×24	32 (Rev. 0)	Thermal library (55 thermal groups)
matxs14	175×42	32 (Rev. 1)	Fast reactor data testing (T=300K)

Activities at RSIC

A preliminary multigroup library, containing 37 nuclides in the VITAMIN-J energy group structures, was generated by RSIC during 1990 using a combination of NJOY89.46 and NJOY89.72. These results have been used for ORNL contributions to CSEWG fast reactor data testing activities. In addition, the four isotopes of Fe have been used for investigations of the impact of ENDF/B-VI data on LWR dosimetry studies. A parallel effort is in process at RSIC to develop a multigroup library similar to VITAMIN-J but more suitable for reactors with graphite moderators. For convenience, this latter library will be referred to as the Reactor Shielding Library (RSL92). There are 197 neutron groups and 42 gamma-ray groups in RSL92. The VITAMIN-J neutron group boundaries are a subset of RSL92 and there are 30 thermal groups with 3.05 eV as the upper boundary of the thermal range. When processing is complete for Th-232 and five isotopes of Pu, RSL92 will contain 45 nuclides. NJOY91.13 operating on a Cray is presently being used for the RSL92 development.

The four Fe isotopes were re-generated in the VITAMIN-J group structure with NJOY91.27 which includes a correction for the so-called "NAPS=1" error in the RECONR module. Recalculation of neutron transmission through steel is underway to assess the impact of this change.

RSIC is presently implementing NJOY91 on an IBM RISC System/6000 computer to reduce costs associated with computer resource requirements needed to meet the international cooperation commitments resulting from the absence of direct sponsorship.

Summary of interface codes

Three interface codes are now in use. They are SMILER, NSLINK, and TRANSX-2.

ORNL has developed a new AMPX77 module named SMILER, which is a significant improvement over the original MILER code. Features of SMILER include:

- More efficient direct access I/O

- Neutron, gamma-ray production, and gamma-ray interaction data are translated in a single pass

- Properly treats revised GENDF files with compact data structures

- Reads both BCD and binary input files.

SMILER, a critical byproduct from the development of RSL92, is needed to translate NJOY91 produced GENDF files into AMPX master interface format. SMILER will be included in the pending release of AMPX77 this summer. SMILER can also execute in a stand-alone mode.

NSLINK is a code system which links NJOY to SCALE. NSLINK, developed at Delft University of Technology, The Netherlands, uses MILER to convert GENDF to the AMPX master format.

TRANSX-2, which has basically the same capabilities as the earlier version, is more reliable and portable. TRANSX-2 is used to prepare transport tables from nuclear libraries in MATXS format that is produced by the later versions of NJOY91.

Future Plans

LANL processed libraries will be available from RSIC. MATXS10 is already available as part of the TRANSX-2 code package.

The ORNL (175n,42g) library in AMPX format will be available subsequent to the release of AMPX77 this summer.

RSIC will package a new official version of NJOY91 as soon as the changes are provided. NJOY91.38 was received by RSIC on May 19, 1992.

Tentative plans are to convene a meeting of subgroup 7 members in conjunction with the Evaluation Methodology Conference at Brookhaven National Laboratory October 12-16, 1992.