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FENDL/A-MCNP and FENDL/A-VITJ_E

The processed neutron activation cross-section data files of the FENDL project

Version 1.1 of March 1995
generated by F.M. Mann et al.

Summary documentation by

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Abstract: This document summarizes a neutron activation cross-section database processed in two formats as generated by F.M. Mann within the project of the Fusion Evaluated Nuclear Data Library (FENDL): in continuous energy format as used by the Monte Carlo neutron/photon transport code MCNP; and in 175 group multigroup format with VIT-E weighting spectrum, as used by the transmutation code REAC*2/3. The data are available from the IAEA Nuclear Data Section online via INTERNET by FTP command, or on magnetic tape.

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username:	NDSOPEN for FTP file transfer
username:	FENDL for FTP file transfer of FENDL data files

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This data library should be cited as follows:

> F.M. Mann, "FENDL/A-MCNP and FENDL/A-VITJ_E, the processed neutron activation cross-section data files of the FENDL project, version 1.1 of March 1995", summary documentation: A.B. Pashchenko, H. Wienke and S. Ganesan, report IAEA-NDS-168 Rev. 3 (International Atomic Energy Agency, February 1996).

FENDL/A-MCNP and FENDL/A-VITJ_E

The processed neutron activation cross-section data files of the FENDL project

Version 1.1
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As part of FENDL a neutron activation cross-section data library has been established under the acronym FENDL/A-1.1 (see Ref. 1). The evaluations for about 12 000 activation reactions for 636 nuclides were selected from different existing activation data files. The data are in pointwise, continuous energy format, i.e. any resonance parameters contained in the original data files have been converted to cross section data. This data library has been processed further by F.M. Mann, Hanford Westinghouse Company, into two modes presented in the following sublibraries:

- FENDL/A-MCNP version 1.1: data processed into continuous energy format as used by the Monte Carlo neutron/photon transport code MCNP;
- FENDL/A-VITJ_E version 1.1: VITAMIN-J 175 multigroup data (ASCII) weighted with the VITAMIN-E neutron weighting spectrum for use by the transmutation code REAC*2/3.

These data libraries are indexed, together with the description of the processing, in the report F.M. Mann et al [Ref. 2]. (Note: "FENDL/PA-1.1" as used by F.M. Mann in Ref. 2 is the same as "FENDL/A-1.1".)

The files are available from the IAEA Nuclear Data Section online through INTERNET. The file transfer via INTERNET can be performed by FTP command to the address:

IAEAND.IAEA.OR.AT or
161.5.2.2.

The user should go to the sublibrary

'[FENDL.ACTIVATION.PROCESSED.MCNP]'

to obtain the MCNP compatible processed activation data.

Because of the large size (96 Megabytes) of the MCNP processed files the resulting processed library was divided into 8 sections:

1. Isotopes of elements	1-H to 21-Sc
2. Isotopes of elements	22-Ti to 22-Zn
3. Isotopes of elements	31-Ga to 39-Y
4. Isotopes of elements	40-Zr to 46-Pd
5. Isotopes of elements	47-Ag to 52-Te
6. Isotopes of elements	53-I to 62-Sm
7. Isotopes of elements	63-Eu to 62-Lu
8. Isotopes of elements	72-Hf to 84-Po

The ASCII files 'actxs1.zz' contain pointers and continuous energy cross-section values for MCNP. The data suffix used is '.66y' for those targets in the ground state and '.67y' for those targets in isomeric state. The use of different suffixes follows the convention established by Los Alamos National Laboratory (LANL).

The ASCII files 'xsdir.zz' contain directory information for MCNP and indexes of reactions are given in 'out.zz' ASCII files. The section suffix '.zz' indicates the range of isotopes in the above data sets: HSC, TIZN, GAY, ZRPD, AGTE, ISM, EULU, HFPO.

The subdirectory

'[FENDL.ACTIVATION.PROCESSED.VITJ_E]'

provides the multigroup data in REAC format in 175 group structure. The resulting processed library in ASCII format, which has a size of 53109 blocks, was also divided in to 8 sections 'zz.175'. The '.zz' is a section suffix indicating the range of isotopes in the cross section set: CEEU, GAMO, GDLU, H1ZN, HFOS, IRPO, SBLA, TCSN. Index of reactions is in CROSS175.OUT file.

The FORTRAN and header files to convert the groupwise files to FISPACT and RACC are in the subdirectory

'[FENDL.ACTIVATION.PROCESSED.VITJ_E.PROG]'

Additional information on the processed files may be obtained from

Dr. F.M. Mann
Westinghouse Hanford Company
Mail Stop: HO-36, P.O.Box 1970
Richland, WA 99352, U.S.A.

Fax: 1-509-376-1293
Phone: 1-509-376-5728
E-mail: u1635@c.nersc.gov

Cross-reference

The sublibrary FENDL/A-VITJ_FLAT contains also a VITAMIN-J 175-group version, with the same group structure but computed at the IAEA/NDS with a flat weighting spectrum and cast in ENDF-6 histogram format (see ref. 1).

References

1. A.B. Pashchenko and P.K. McLaughlin, "FENDL/A-1.1, Neutron Activation Cross Section Data Library for Fusion Applications", report IAEA-NDS-148 Rev. 2, IAEA, February 1995.

2. F.M. Mann, D.E. Lessor, L.L. Carter, "Processing of FENDL-PA/1.1", Report WHC-EP-0727, Westinghouse Hanford Company, Richland, Washington, USA, Feb. 1994, (Revised in February 1995).

Attachment

DISTRIBUTION OF THE FENDL LIBRARY

(As recommended at the IAEA Advisory Group Meeting on FENDL,
held in Del Mar, California, 5-9 Dec.1995)

The master copy of the FENDL-1 library resides with the Nuclear Data Section of the International Atomic Energy Agency. To facilitate user access to the library the official copy of FENDL-1 was distributed in February 1996 to the major nuclear data centres in Europe (NEA Data Bank, Paris), Japan (JNDC, Tokai-mura), Russia (CJD,Obninsk) and USA (NNDC, Brookhaven and RSIC, Oak Ridge). As agreed between data centers, sharing common FENDL information, the recipients are receiving now the same products from all above centers. The data are available and may be further distributed to the user community according to the customer service options given below. Each FENDL sub-library will be in a single data set, i.e. Activation, Decay, etc. in the 8 mm tape, 6 mm tape, 4 mm tape or standard 9 track magnetic tape (6250 bpi or 1600 bpi) and CD-ROM options. The interested scientists may request FENDL-1 (or parts of it) directly from the IAEA/NDS or from one of these centers.

Table 1. FENDL CUSTOMER SERVICE OPTIONS

MEDIA	FORMAT	By WHOM
Electronic	FTP	IAEA, NEADB, NNDC
4 mm tape	UNIX TAR	CJD, IAEA, NEADB, NNDC, RSIC
	VAX BACKUP	CJD, IAEA, NEADB, NNDC
	ASCII	NEADB
6 mm tape	UNIX TAR	NEADB
	VAX BACKUP	NEADB
	ASCII	NEADB
8 mm tape	UNIX TAR	NEADB, NNDC, RSIC
	VAX BACKUP	NEADB, NNDC
	ASCII	NEADB
9 track	ASCII	CJD, IAEA
	EBCDIC	CJD, IAEA
CD-ROM	UNIX TAR	RSIC
	ASCII	NEADB

Table notes
1) NNDC will distribute FENDL unprocessed data
2) RSIC will distribute FENDL processed data
3) RSIC offers cost free service to ITER customers

FENDL SUMMARY

FENDL is the evaluated nuclear database for fusion applications. Its present version consists of the following sublibraries for which the documentation and the FTP subdirectory for online service are given below. At the ITER neutronics coordination meeting in San Diego, Feb. 1995, the ITER participants agreed to use FENDL in all design calculations.

1. **FENDL/A-1.1** (April 93): neutron activation cross-sections, selected from different available sources, for 636 nuclides, given in four representations:
   - FENDL/A: "point data", i.e. cross-sections as function of energy in ENDF-6 format (see IAEA-NDS-148, Rev. 2, Feb. 1995). FTP subdirectory: ACTIVATION.FENDLA
   - "MCNP": processed into the format for input to the MCNP Monte-Carlo transport code (see IAEA-NDS-168, Rev. 3, Feb. 1996). FTP subdirectory: ACTIVATION.PROCESSED.MCNP
   - "VITJ_E": VITAMIN-J 175 group data, processed for input to the code REAC*2/3 using the VITAMIN-E weighting spectrum (see IAEA-NDS-168, Rev. 3, Feb. 1996). FTP subdirectory: ACTIVATION.PROCESSED.VITJ_E
   - "VITJ-FLAT": VITAMIN-J 175 group data, processed using a flat weighting spectrum (see IAEA-NDS-148, Rev. 2, Feb. 1995). FTP subdirectory: ACTIVATION.PROCESSED.VITJ_FLAT
2. **FENDL/D-1.0** (Jan. 92): nuclear decay data for 2900 nuclides in ENDF-6 format, extracted from ENDF/B-6 and ENSDF (see IAEA-NDS-167, Jan. 1995). FTP subdirectory: DECAY.FENDLD
3. **FENDL/DS-1.0** (Oct. 93): neutron activation data for dosimetry by foil activation. This is identical with file 1 (neutron activation cross-sections) of the International Reactor Dosimetry File IRDF-90 version 2 of Oct. 1993 (see IAEA-NDS-141, Rev. 2, Oct. 1993), given as multigroup data in 640 group extended SAND-2 format, without covariance data. FTP subdirectory: DOSIMETRY.FENDLDS
4. **FENDL/C-1.0** (Nov. 91): data for the fusion reactions D(d,n), D(d,p), T(d,n), T(t,2n), He-3(d,p) extracted from ENDF/B-6 and processed (see IAEA-NDS-166, Jan. 1995). FTP subdirectories: FUSION.FENDLC and FUSION.PROCESSED
5. **FENDL/E-1.1** (Nov. 94): data for coupled neutron-photon transport calculations, including
   - a data library for neutron interaction and photon production for 63 elements or isotopes, selected from ENDF/B-6, JENDL-3, or BROND-2 (see IAEA-NDS-128, Rev. 2, Feb. 1996)
   - a photon-atom interaction data library for 34 elements taken from ENDF/B-6 (see IAEA-NDS-58, Rev. 4, Sept. 1994)

   These are available in three representations:
   - original ENDF-6 format, as above, with resonance-parameters where applicable. FTP subdirectory: TRANSPORT.FENDLE
   - "FENDL/MG" (March 95): VITAMIN-J 175 group data in GENDF and MATXSR format processed by NJOY using the VITAMIN-E weighting spectrum (see IAEA-NDS-129, Rev. 3, Feb. 1996). FTP subdirectory: TRANSPORT.PROCESSED.FENDLMG
   - "FENDL/MC" (March 95): processed into the ACE format needed for input to the Monte Carlo code MCNP4A (see IAEA-NDS-169, Rev. 3, Feb. 1996). FTP subdirectory: TRANSPORT.PROCESSED.FENDLMC

FENDL BENCHMARKS

The FENDL/BENCHMARKS subdirectory contains compiled fusion benchmark descriptions and data, provided by the international community of benchmark specialists, for validation of the above mentioned FENDL libraries.

INTERNET/FTP online access to FENDL files

The FENDL data files can be electronically transferred to users from the IAEA Nuclear Data Section online system through INTERNET. In the NDS open area 'FENDL', a subdirectory was created for each sublibrary. The subdirectory names are given above. The file transfer via INTERNET (unix system) can be performed by 'ftp' command to the address 'iaeand.iaea.or.at' or '161.5.2.2'. The user should logon to the foreign user name 'FENDL'. No password is required. After having logged on, the user can set the definition to any required subdirectory and transfer files as desired. A grand total of 47 (sub)directories with 810 files with total size of nearly 2 million blocks or about 1 Gigabyte (1 block = 512 bytes) of numerical data is currently available on-line.

(96/2/29; app. to 7, 128, 129, 148, 166, 167, 168, 169)