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ENDVER

(Version 2001-8)

The ENDF File Verification Support Package

by

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Abstract: Experimental and evaluated nuclear reaction data are compiled world-wide in EXFOR and in ENDF format, respectively (see documents IAEA-NDS-1 and IAEA-NDS-10). The ENDVER package can be used to convert EXFOR data into computational C4 format, display them and compare graphically with the contents of a specified evaluated data file. The package also contains utilities to retrieve selected materials from a master library in ENDF format, extract cross sections (including differential and double differential data) and output them in two-column PLOTTAB "curves" format.

The program package is available upon request cost free from the IAEA Nuclear Data Section.

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This computer code package should be cited as follows: Andrej Trkov, Program ENDVER, report IAEA-NDS-77, Rev.0, August, 2001.

ENDVER

(Version 2001-8)

Compare graphically evaluated data in ENDF-6 format and
Experimental data which is EXFOR format

Introduction

Enclosed is the documentation for package ENDVER. The package is designed to plot evaluated data from the ENDF formatted files and experimental data, which are in EXFOR format.

The ENDVER package includes,

- i. Directory CharTab - contains "plotch" program that writes text using the graphical interface from the PLOT4 code.
- ii. Directory Documents - Contains manuals for the codes X4TOC4 , PLOT4 and ENDVER.
- iii. Directory IBMPC - Contains codes for use on an Windows/Dos platform (See the Readme file).
- iv. Directory LINUX - Codes for use on a Linux platform (See the Readme file).
- v. Directory TESTDATA- EXFOR and ENDF test case for 14-Si -28.

The directory structure within the IBMPC & LINUX directories is set up for immediate use, just copy the appropriate codes to a directory on your root directory i.e. c:/Endver and follow instructions in the "Readme.txt" file for processing the EXFOR and ENDF data.

To change the input files for the preprocessing codes edit the "Prepro.bat" file.

If you wish to recompile the codes then follow the instructions in the "Readme.txt" file under "Installation".

The enclosed documentation is up to date as of August 2001. The program documentation on the comment cards at the beginning of the programs and the translation dictionaries are continuously updated. Before using this program the user is advised to consult the comment cards at the beginning of the program and the translation dictionaries for the latest documentation.

Contents of the ENDF Verification Codes "ENDVER"

The package consists of the following codes and modules:

GETZAM is a simple utility for retrieval of selected materials from a master library in ENDF format.

MRGMAT is a utility to merge evaluated data files into a single library. Unlike MERGER of the PrePro codes, MRGMAT is material oriented. It will replace entire material files (without checking individual reactions) and produce an output library file sorted by MAT in ascending order.

ENDTAB is a retrieval code to extract cross sections (including Differential and double differential ones) from ENDF files. The output is written in two-column PLOTTAB "curves" format. The code uses the DXSEND package to do the retrieval.

SIXTAB converts correlated energy/angle distributions in ENDF MF6 Law-1 representation into tabulated Law-7 representation. Note that the output file is intended for plotting and not as a substitute for the original file, since the conversion process is not complete or exact.

X4TOC4 converts EXFOR data into computational C4 format for plotting purposes.

C4SORT sorts EXFOR data in computational format by MAT/MF/MT numbers and the incident particle energy of the first point of a data set. This is convenient when plots are produced with the PLOT4 code.

PLOT4 plots EXFOR data in computational format and compares them with the corresponding data in an ENDF file, if requested. Differential and double differential data can also be compared. The code uses the DXSEND package to do data retrieval from ENDF files.

DXSEND is a package of routines for retrieving cross sections from an ENDF file. Cross sections from MF3 as well as double differential cross sections from MF4,5,6 are processed.

STARPLOT is a graphical interface package to produce PostScript files from the graphics programs.

Install.bat is a Dos batch procedure to install the ENDF Verification codes.

PrePro.bat is a sample Dos batch procedure to pre-process ENDF files before tabulation and plotting.

Installation Instructions

Copy the distribution package on the root directory on which the ENDF Verification codes subdirectory "ENDVER" is to be created.

The executable code for Windows is provided in the "ENDVER\exe\" subdirectory. To force re-compilation of the source code simply delete the "ENDVER\exe\" subdirectory. For recompilation it is assumed that the Lahey Fortran 95 is available. If not, modify the "Install.bat" procedure.

To initiate the installation procedure you can either click on the "install.bat" icon in the "ENDVER\Sources\" subdirectory or activate the same procedure from a Dos window. The procedure will generate the executables, copy them to the "ENDVER\exe\" subdirectory and copy the required data and standard input files to the "ENDVER\X4toC4\" and "ENDVER\PlotC4\" subdirectories, respectively.

Note: To cleanup the working directories X4toC4 and PlotC4 it is merely necessary to delete these two directories and to run the "install" procedure, which will create the two directories and copy the necessary data and input files from the "Inputs" subdirectory. The executable codes will not be affected unless the "exe" directory is deleted as well.

ENDF File Comparison With EXFOR Data

A. Process the EXFOR data

A.1. Make X4toC4 the default directory.

A.2. Make an exfor file for the selected material. You may use EX-II Access or otherwise. Save the file to "X4.DAT".

A.3. Run X4TOC4 to generate EXFOR data in computational format on "C4.DAT".

```
i.e.  cd X4TOC4
      .. /EXE/X4TOC4
```

A.4. Run C4SORT to sort the EXFOR data in C4 format. A sample input is provided, but if aliases for ZA designations are required, a keyword-oriented input should be prepared (see instructions for C4SORT).

```
i.e.  .. /EXE/C4SORT
```

A.5. Copy file "C4.DAT" to the PLOT4 directory.

A.6. Make PlotC4 the default directory.

```
i.e.  copy C4.DAT .. /PLOT4
```

B. Process the ENDF data

Make "plotc4" the default directory. The tasks listed below are executed automatically by the "PrePro.bat" batch procedure. It is assumed that the PrePro executable codes are available on "D:\PREPRO\". Change the SET command in PrePro.bat if necessary.

B.1. Extract the specified basic ENDF file for the selected material (specified by its ZA designation) using the GETZAM code.

B.2. Run LINEAR to linearise the cross sections.

B.3. Run RECENT to reconstruct the resonance parameters.

B.4. Run SIGMA1 to Doppler broaden the cross sections.

B.5. Run ACTIVATE to generate partial excitation cross sections from MF3/9.

B.6. Run SIXPAK to convert MF6/MT51-90 (if present) into MF4 and MF14 equivalent representation. Note that this conversion is exact, since the discrete inelastic scattering is a two-body reaction.

B.7. Run MERGER to insert MF4/MT51-90 (if present) and to remove MF5/MT51-90 from the file.

B.8 Run LEGEND to convert MF4 data to tabular representation.

B.9 Run SIXTAB to convert MF6 data to tabular representation.

The final file is written to ENDF.DAT file.

Note 1: All intermediate ENDF files have extension *.OUT and can be deleted.

Note 2: Input files for PrePro codes have the extension *.INP and can be deleted. Be careful not to delete PLOT4.INP file.

Note 3: Steps B.6. to B.8 are necessary when discrete inelastic cross sections are represented in MF6 Law 2, which does not have a tabular equivalent in is not processed by SIXTAB.

```
i.e.  cd PLOT4
      ../EXE/PREPRO d:\e6lib 14028
```

C. Run PLOT4

C.1. Run PLOT4.

C.2. View the plots on "plot.ps" with a PostScript viewer.

```
i.e.  ../EXE/PLOT4
      START PLOT.PS
```