Output of IAEA EXFOR Web retrieval system

V.Zerkin, IAEA-NDS, 04/10/2007

IAEA-NDS Nuclear Reaction Data Web retrieval system includes EXFOR, ENDF and CINDA retrieval systems providing world wide various types of services: data search, presentation, plotting, comparison, etc. Data presentation is one of important part of the system that is oriented to end-user needs – it should be convenient for user to observe and to use by various applications. This paper describes the main formats of data, used in the IAEA-NDS EXFOR Web retrieval system and lists the programs working with the data.

EXFOR Web retrieval system generates pages with data/information presented in:
1. Original EXFOR format (X4)
2. Extended EXFOR format (EXFOR+)
3. Bibliography, BibTeX
4. DAT – intermediate format
5. TABLE, BIB and XREF
6. T4 format
7. C4 format
8. Extended C4
9. R33 format
10. Plots: static and interactive, quantities, with and without evaluated data
11. ZVView-input
12. ZVView-output
    System also provides
13. On-line help (shows contents of the whole database)
14. Information-pages (explaining and summarizing properties of selected data)

Main part of the system uses Java-Servlets technology accessing relational database via JDBC drivers, but for producing data in various output formats some external programs are used extensively. These programs are written on Fortran and C by various people through years; some of them are really complex, others are just trivial reformatting; usually they called via bash scripts from Java-Servlets.

EXFOR retrieval system works as multi-step process. Basically, steps are: Data Request → Select → Output. Output data became available immediately after Request and Search from the Selection-page (see Appendix.1) and also on the following steps.

Fig.1 illustrates sequence of actions, data types and flows in the system. Process of producing data in a new output format - R33 is show as an example describing the chain of actions (programs), intermediate data and description files (dictionaries) are used.
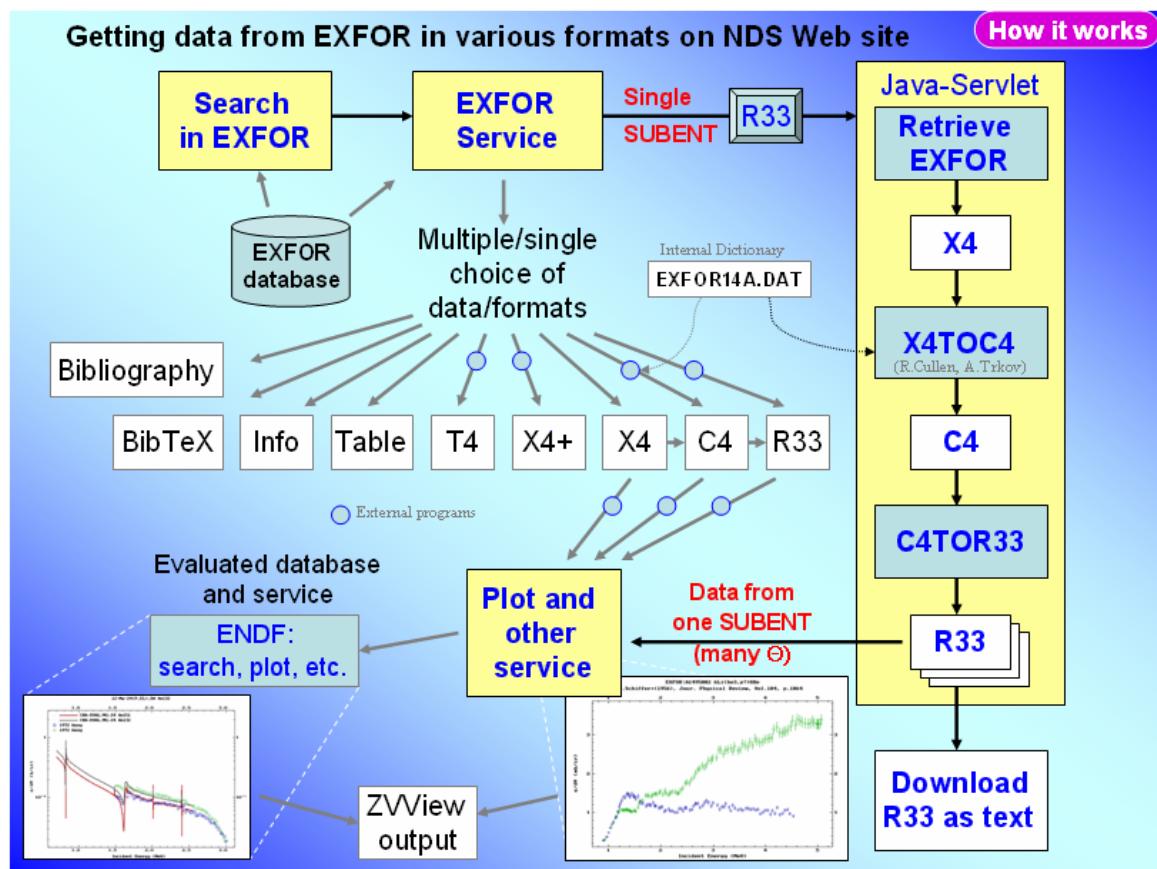
Fig.1 Data and programs in the system

1. Original EXFOR format (X4)

This is basic format of the system. Data in EXFOR format can be obtained for selected list of experimental tables as one file and also as one file for single subentry file (which also includes subentry-1) or entry; presented as plane text file, also available in zipped form.

2. Extended EXFOR format (EXFOR+)

Basic ideas:
- ✓ Similar appearance to original EXFOR format with some extensions
- ✓ Explanation of codes for keywords
- ✓ Reference: Volume, Pages, Publisher, etc. are given explicitly;
- ✓ DOI, URL (link to Web-Journal), NSR-Key are given
- ✓ Data are not broken by 6 columns per line
- ✓ Data are aligned and given in a human-readable format

Data in "EXFOR+" format are available for single dataset and for selected list of datasets; implemented since October 2006. See comparison of EXFOR vs. EXFOR+ on Appendix.2.

3. Bibliography

Bibliography is presented as html-page and also in BibTeX format ("BibT$_E$X is a tool for formatting lists of references. The BibTeX tool is typically used together with the LaTeX document preparation system", sited from http://en.wikipedia.org/wiki/BibTeX). Presents list of authors, title, description of data source (reference is given explicitly, e.g. journal name, volume, page, etc.). BibTeX formatted output is implemented in October-2006; Available only for data selection.

4. DAT

This is an important intermediate format. Although, data in this format are never shown to end-user, it is used to present experimental data of many quantities and many applications, including data for human reading and plotting; contains some bibliographical information; data section has 6 columns: X, +dX, -dX, +dY, -dY in standard units; see an example in Appendix-3.

5. TABLE, BIB and XREF

These are formats which were used in CSISRS (NNDC, USA) EXFOR storage and retrieval system working on Alpha/VMS. They were implemented for backward compatibility and providing a comfortable transaction period from VMS to the new system for US regular users. Implemented since 2004, rarely used nowadays. Conversion from X4 is done by two steps process:
1) EX4D.C   converts X4 to DAT
2) EX4Z.C   converts DAT to TABLE and XREF
3) EX4B.C   converts XREF to BIB

6. T4

Tabulated cross sections with short bibliography. Implemented for single datasets only. This format is intended to be used for human reading and fast straight forward access to the data of single experimental work. Columns and units are dependant of contents of dataset. Implemented since 2005. X4 to T4 conversion is done by two steps process:
1) EX4D.C   converts X4 to DAT
2) DAT2TAB.C   converts DAT to T4

6. C4

Computational format containing tabulated tabular data with very limited bibliography. This format was originated by R.Cullin and used in many applications; has ENDF MF, MT numbers and can be used for comparison to evaluated data. Implemented for collections of datasets. X4 to T4 conversion is done by one step operation:
1. X4TOC4.FOR   converts X4 to C4, written by R.Cullen, maintained by A.Trkov
         Uses additional files:
   a) EXFOR14A   EXFOR reaction - MF/MT equivalence table
   b) EXFOR24A   EXFOR column header to computation format output column table

c) EXFOR25A   EXFOR units to standard unit conversion table
2. x4exfor14a.java   expands existing EXFOR14A dictionary by similar data, but with another incident particles, from current EXFOR database (before: EXFOR14A: ~270 lines, converted datasets from EXFOR ~33%; after: ~850 lines, converted ~50%)
3. PLOTC4.FOR   converts C4 to PS, written by R.Cullen

C4 is used for extended plotting under NDS Web retrieval system – EXFOR and EXFOR-ENDF, also - as an intermediate format for conversion to other formats, like R33, PNT, TABLE, etc.

6. Extended C4

This is C4 with comments having # in the 1-st column of the text file. Used at first in EXFOR retrieval system for cases, where conversion X4 to T4 was not possible in order to give to non-professional users C4 file with some explanation of the contents (like headers of columns).

Nowadays extended C4 is used also as format for storage full EXFOR library for data processing (see WPEC group SG30 activity:
http://www.nea.fr/html/science/wpec/SG30/).

```
Latest file "C4-2007-09-26.zip", size 71Mb, unzipped: 890Mb.
Summary of the contents:     EXFOR(IAEA-DB) C4
Last updated:                24-Sep-2007    26-Sep-2007
Total Number of ENTRY:       17492
Number of ENTRY with data:   16790          11327
Total Number of SUBENT:      142658
Number of SUBENT with data:  112740
Number of Datasets:          125209         64431 (~51%)
```

Full EXFOR in C4 format is produced by non-interactive retrieval program:
1. x4retr2.java   reads EXFOR database (MySQL, Access, etc.) by Entries, converts them to extended C4 by calling X4TOC4 program.
   Compiled version of the program x4retr2.jar (ready to use) together with full EXFOR database is distributed on IAEA CD-ROM "EXFOR-CINDA" for applications.

Since June 2007, full EXFOR in extended C4 format is available from IAEA-NDS Web site: http://www-nds.iaea.org/x4toc4-master/ ; file "readme.txt" explains some specific details of full C4 file (see Appendix-10).

7. R33 format

In EXFOR Web retrieval system angular distributions can be presented in R33 format (with following plotting and additional service). This format is used by a community of users working in the "ion beam analysis" field (they collect and use IBANDL - Ion Beam Analysis Nuclear Data Library – "result of merging SigmaBase and NRABASE. It contains most of the available experimental nuclear cross-sections relevant to Ion Beam Analysis", see:

).

X4 to R33 conversion is done via C4 as intermediate format (see Fig.1). One EXFOR subentry can be appear in several R33-files.

1. X4sGetR33.java   Servlet runs external software, provides interface to data
2. X4TOC4.FOR   converts X4 to C4 (R.Cullen)
3. r33out.java   Utility converting C4 to R33
4. x4level.java   Reading levels to convert Energy level to Level-number
5. x4mass.java   Reading masses-file, calculation of Q-value

8. Plots

Several types of plots are implemented in the retrieval system (see Appendix-12.):

a) Simple cross-sections and advanced plots (cross-sections, angular distributions, emission spectra, double differential cross-sections)
b) Experimental and evaluated data separately and together
c) Static pictures (GIF and PS), interactive on Web (sensitive GIF) and local application under browser

These tasks are implemented using several data formats and following programs and big packages:

1. EndVer-package (FORTRAN, A.Trkov) many calculations and conversions; data in formats: C4, PNT (experimental points), ENDF, PENDF, CUR (evaluated curves)
2. PREPRO-package (FORTRAN, R.Cullen); called by EndVer-scripts; works mainly with ENDF data;
3. PNTDAT.C   converts PNT to DAT
4. EX4Z.C   converts DAT to ZVD
5. CURZVD.C   converts CUR to ZVD

8. ZVView input

The main plotting program used in the system is a multiplatform program ZVView (written on C). The program accepts data of several types and in several formats (see): including TABLE, XREF, ENDF-MF3 and so-called universal format. It reads also "control-file" with description and initial state of plot and actions to be done. Several input files can be placed in one "container-file" called ZVD formatted file. This single file is used to send data over the Internet to user's PC instruction Web browser to run helper-application (ZVView), which should be configured in the user's system. Structure of container is the following:

```
#!zvview.exe
#begin file1-name/format
. . . input-file in known format . . .
#end file-name/format
#begin file2-name/format
. . . input-file in known format . . .
#end file2-name/format
. . . . . . . . . . . . .
```

Working with formats TABLE and XREF ZVView "understands" EXFOR accession numbers, authors, dates of publications, etc.

9. ZVView output

ZVView can work in non-interactive generates pictures in GIF, PCX, PS, EMP formats and interactive modes on the user's screen. Web retrieval system runs ZVView mostly in non-interactive mode creating plot in GIF format for direct display by user's Web browser. ZVView is instructed to perform some actions (like zoom, resize, changing scales: lin/log), imitating interactive work via Internet under Web browser. It is also instructed to produce human-readable text file with copy of input data in column format (see Appendix-13.).

Fig.2 Request page

Fig.3 Data selection page

EXFOR+

```
REQUEST         886001    20070402         3      180154
ENTRY             13725    19990810   19991101   20050926         0000
SUBENT         13725001    19990810   19991101   20050926         0000
BIB               10         13
INSTITUTE  (1USARPI,1USAKAP)
           #(1USAKAP) Knolls Atomic Power Laboratory, Schenectady, NY, USA
           #(1USARPI) Rensselaer Polytechnic Institute, Troy, NY, USA
REFERENCE  (J,NSE,128,61,1998)
           # (J,NSE,128,61,1998) Journ.: Nuclear Science and Engineering, Vol.128, p.61 (1998)USA
           #+      #NSR=1998DA26 #URL=http://www.ans.org/pubs/journals/nse/vv-128
AUTHOR     (Y.DANON,C.J.WERNER,G.YOUK,R.C.BLOCK,R.E.SLOVACEK,
           N.C.FRANCIS,J.A.BURKE,N.J.DRINDAK,F.FEINER,J.A.HELM)
TITLE      Neutron Total Cross-Section Measurements and Resonance
            Parameter Analysis of Holmium, Thulium, and Erbium
FACILITY   (LINAC,1USARPI)
           #(LINAC) Linear accelerator
           #(1USARPI) Rensselaer Polytechnic Institute, Troy, NY, USA
INC-SOURCE (PHOTO) Enhanced thermal target: water-cooled tantalum.
METHOD     (TOF) Flight Path 14.97 m.
           #(TOF) Time-of-flight
DETECTOR   (GLASD) lithium glass detector, enriched to 95% 6Li.
           #(GLASD) Glass detector
STATUS     Data received on diskette from J.A.Burke, June 1999.
           (APRVD) Approved by J. Burke, 10 August 1999.
HISTORY    (19990701C)
ENDBIB            13
NOCOMMON          0          0
ENDSUBENT         16
SUBENT         13725015    19990702   19991101   20050926         0000
BIB                6          8
REACTION   1(68-ER-0(N,0),,EN)
           2(68-ER-0(N,G),,WID)
           3(68-ER-0(N,EL),,WID)
           #(68-ER-0(N,0),,EN)   Quantity: [RP] Resonance energy
           #(68-ER-0(N,G),,WID)  Quantity: [RP] Resonance width
           #(68-ER-0(N,EL),,WID) Quantity: [RP] Resonance width
           #          Process: [EL] Elastic scattering
ANALYSIS   (MLA) Multi-level analysis using SAMMY code.
ASSUMED    (ASSUM,68-ER-0(N,G),,WID)
CORRECTION Corrected for paramagnetic scattering.
ERR-ANALYS (DATA-ERR) 1-sigma errors calculated by SAMMY.
STATUS     Data taken from Table VI of article.
ENDBIB             8
NOCOMMON          0          0
DATA               7          8          7
DATA       1DATA-ERR  1DATA      2DATA-ERR  2DATA      3DATA-ERR  3ASSUM
EV         EV         MILLI-EV   MILLI-EV   MILLI-EV   MILLI-EV   MILLI-EV
-40.4                                        395.3      0.3        92.
0.4595     0.0001     87.12      0.16        0.2694     0.0006
0.5834     0.0002     86.2       0.33        0.2472     0.0009
5.9936     0.0006     104.9      2.1         20.71      0.3
7.9                                          0.71       0.03       96.
7.93       0.002      98.82      4.5         0.16       0.005
9.389      0.001      88.3       2.          9.2        0.14
15.567     0.003      76.8       4.1         2.63       0.1
ENDDATA           20
ENDSUBENT         33
ENDENTRY           2
ENDREQUEST         1
```

EXFOR

```
REQUEST         886001    20070402         3      180154           0  0      0
ENTRY             13725    19990810   19991101   20050926    000013725000    1
SUBENT         13725001    19990810   19991101   20050926    000013725001    1
BIB               10         13                                 13725001    2
INSTITUTE  (1USARPI,1USAKAP)                                    13725001    3
REFERENCE  (J,NSE,128,61,1998)                                  13725001    4
AUTHOR     (Y.DANON,C.J.WERNER,G.YOUK,R.C.BLOCK,R.E.SLOVACEK,    13725001    5
           N.C.FRANCIS,J.A.BURKE,N.J.DRINDAK,F.FEINER,J.A.HELM)  13725001    6
TITLE      Neutron Total Cross-Section Measurements and Resonance 13725001   7
            Parameter Analysis of Holmium, Thulium, and Erbium   13725001    8
FACILITY   (LINAC,1USARPI)                                       13725001    9
INC-SOURCE (PHOTO) Enhanced thermal target: water-cooled tantalum.13725001  10
METHOD     (TOF) Flight Path 14.97 m.                            13725001   11
DETECTOR   (GLASD) lithium glass detector, enriched to 95% 6Li.  13725001   12
STATUS     Data received on diskette from J.A.Burke, June 1999.  13725001   13
           (APRVD) Approved by J. Burke, 10 August 1999.         13725001   14
HISTORY    (19990701C)                                           13725001   15
ENDBIB            13                                             13725001   16
NOCOMMON          0          0                                   13725001   17
ENDSUBENT         16                                           1372500199999
SUBENT         13725015    19990702   19991101   20050926    000013725015    1
BIB                6          8                                  13725015    2
REACTION   1(68-ER-0(N,0),,EN)                                   13725015    3
           2(68-ER-0(N,G),,WID)                                  13725015    4
           3(68-ER-0(N,EL),,WID)                                 13725015    5
ANALYSIS   (MLA) Multi-level analysis using SAMMY code.          13725015    6
ASSUMED    (ASSUM,68-ER-0(N,G),,WID)                             13725015    7
CORRECTION Corrected for paramagnetic scattering.               13725015    8
ERR-ANALYS (DATA-ERR) 1-sigma errors calculated by SAMMY.        13725015    9
STATUS     Data taken from Table VI of article.                  13725015   10
ENDBIB             8                                             13725015   11
NOCOMMON          0          0                                   13725015   12
DATA               7          8                                  13725015   13
DATA       1DATA-ERR  1DATA      2DATA-ERR  2DATA      3DATA-ERR 313725015   14
ASSUM                                                            13725015   15
EV         EV         MILLI-EV   MILLI-EV   MILLI-EV   MILLI-EV   13725015   16
MILLI-EV                                                         13725015   17
-40.4                                        395.3      0.3       13725015   18
 92.                                                             13725015   19
0.4595     0.0001     87.12      0.16        0.2694     0.0006    13725015   20
                                                                 13725015   21
0.5834     0.0002     86.20      0.33        0.2472     0.0009    13725015   22
                                                                 13725015   23
5.9936     0.0006     104.9      2.1         20.71      0.30      13725015   24
                                                                 13725015   25
7.90                                         0.71       0.03      13725015   26
  96.                                                            13725015   27
7.93       0.002      98.82      4.5         0.160      0.005     13725015   28
                                                                 13725015   29
9.389      0.001      88.3       2.0         9.20       0.14      13725015   30
                                                                 13725015   31
15.567     0.003      76.8       4.1         2.63       0.10      13725015   32
                                                                 13725015   33
ENDDATA           20                                             13725015   34
ENDSUBENT         33                                           1372501599999
ENDENTRY           2                                           1372599999999
ENDREQUEST         1                                           Z999999999999
```
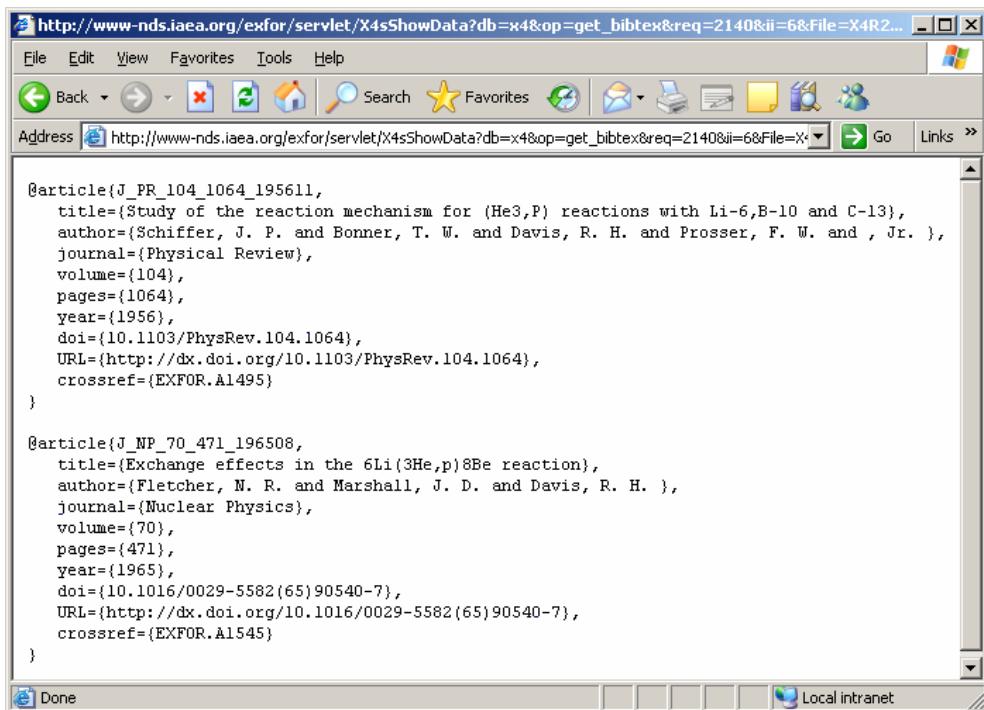
BibTeX

```
@article{J_PR_104_1064_195611,
    title={Study of the reaction mechanism for (He3,P) reactions with Li-6,B-10 and C-13},
    author={Schiffer, J. P. and Bonner, T. W. and Davis, R. H. and Prosser, F. W. and , Jr. },
    journal={Physical Review},
    volume={104},
    pages={1064},
    year={1956},
    doi={10.1103/PhysRev.104.1064},
    URL={http://dx.doi.org/10.1103/PhysRev.104.1064},
    crossref={EXFOR.A1495}
}

@article{J_NP_70_471_196508,
    title={Exchange effects in the 6Li(3He,p)8Be reaction},
    author={Fletcher, N. R. and Marshall, J. D. and Davis, R. H. },
    journal={Nuclear Physics},
    volume={70},
    pages={471},
    year={1965},
    doi={10.1016/0029-5582(65)90540-7},
    URL={http://dx.doi.org/10.1016/0029-5582(65)90540-7},
    crossref={EXFOR.A1545}
}
```

Done   Local intranet

Bibliography-page
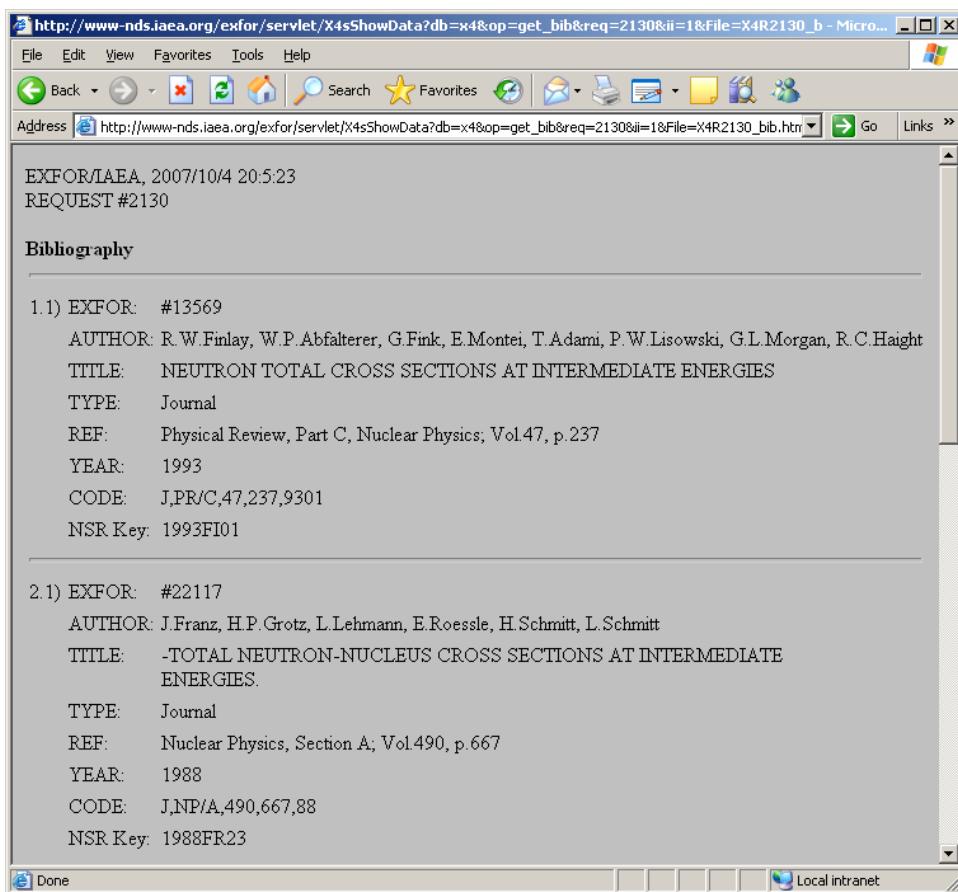
EXFOR/IAEA, 2007/10/4 20:5:23
REQUEST #2130

Bibliography

1.1) EXFOR:	#13569	
	AUTHOR:	R.W.Finlay, W.P.Abfalterer, G.Fink, E.Montei, T.Adami, P.W.Lisowski, G.L.Morgan, R.C.Haight
	TITLE:	NEUTRON TOTAL CROSS SECTIONS AT INTERMEDIATE ENERGIES
	TYPE:	Journal
	REF:	Physical Review, Part C, Nuclear Physics; Vol.47, p.237
	YEAR:	1993
	CODE:	J,PR/C,47,237,9301
	NSR Key:	1993FI01
2.1) EXFOR:	#22117	
	AUTHOR:	J.Franz, H.P.Grotz, L.Lehmann, E.Roessle, H.Schmitt, L.Schmitt
	TITLE:	-TOTAL NEUTRON-NUCLEUS CROSS SECTIONS AT INTERMEDIATE ENERGIES.
	TYPE:	Journal
	REF:	Nuclear Physics, Section A; Vol.490, p.667
	YEAR:	1988
	CODE:	J,NP/A,490,667,88
	NSR Key:	1988FR23

Done   Local intranet

DAT (intermediate format)

```
REQUEST          1853001    20071005        3     113909                0   0    0
DATASET    1
SUBENT     10379007
INSTITUTE  1CANMNA
AUTHOR     I.F.Bubb,
REFERENCE  J,CJP,52,648,197404
DATEREF    1974/04
REACTION   13-AL-27(N,TOT),,SIG
EN-MIN     2.29e+07
EN-MAX     4.415e+07
DATA       5
 1 2.29e+07 0 0 1.88 0.03 0.03
 2 2.91e+07 0 0 1.89 0.02 0.02
 3 3.52e+07 0 0 1.86 0.02 0.02
 4 4.12e+07 0 0 1.85 0.03 0.03
 5 4.415e+07 0 0 1.82 0.02 0.02
ENDDATA    5
ENDDATASET 1
DATASET    2
SUBENT     22117005
INSTITUTE  2GERFRB
AUTHOR     J.Franz,
REFERENCE  J,NP/A,490,667,88
DATEREF    1988/01
REACTION   13-AL-27(N,TOT),,SIG
EN-MIN     1.6e+08
EN-MAX     5.75e+08
DATA       22
 1 1.6e+08 0 0 0.682 0.014 0.014
 2 1.8e+08 0 0 0.617 0.014 0.014
 3 2e+08 0 0 0.562 0.013 0.013
 4 2.2e+08 0 0 0.575 0.013 0.013
 5 2.4e+08 0 0 0.573 0.012 0.012
 6 2.6e+08 0 0 0.545 0.012 0.012
 7 2.8e+08 0 0 0.55 0.012 0.012
 8 3e+08 0 0 0.57 0.012 0.012
 9 3.2e+08 0 0 0.579 0.013 0.013
 10 3.4e+08 0 0 0.574 0.013 0.013
 11 3.6e+08 0 0 0.582 0.015 0.015
 12 3.8e+08 0 0 0.58 0.016 0.016
 13 4e+08 0 0 0.58 0.017 0.017
 14 4.2e+08 0 0 0.609 0.018 0.018
 15 4.4e+08 0 0 0.597 0.018 0.018
 16 4.6e+08 0 0 0.593 0.017 0.017
 17 4.8e+08 0 0 0.641 0.017 0.017
 18 5.01e+08 0 0 0.625 0.014 0.014
 19 5.21e+08 0 0 0.62 0.014 0.014
 20 5.4e+08 0 0 0.629 0.01 0.01
 21 5.59e+08 0 0 0.63 0.013 0.013
 22 5.75e+08 0 0 0.66 0.031 0.031
ENDDATA    22
ENDDATASET 2
ENDREQUEST          1                            Z999999999999
```

TABLE

```
REQUEST          1853001   20071005        3    113909              0   0    0
PHYSENT              1        0           27 2.2900E+07 5.7500E+08   1   0    0
 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00  1   0    0
 2.2900E+07 0.0000E+00 0.0000E+00 1.8800E+00 3.0000E-02 3.0000E-02  1   1    1
 2.9100E+07 0.0000E+00 0.0000E+00 1.8900E+00 2.0000E-02 2.0000E-02  1   1    1
 3.5200E+07 0.0000E+00 0.0000E+00 1.8600E+00 2.0000E-02 2.0000E-02  1   1    1
 4.1200E+07 0.0000E+00 0.0000E+00 1.8500E+00 3.0000E-02 3.0000E-02  1   1    1
 4.4150E+07 0.0000E+00 0.0000E+00 1.8200E+00 2.0000E-02 2.0000E-02  1   1    1
 1.6000E+08 0.0000E+00 0.0000E+00 6.8200E-01 1.4000E-02 1.4000E-02  1   1    2
 1.8000E+08 0.0000E+00 0.0000E+00 6.1700E-01 1.4000E-02 1.4000E-02  1   1    2
 2.0000E+08 0.0000E+00 0.0000E+00 5.6200E-01 1.3000E-02 1.3000E-02  1   1    2
 2.2000E+08 0.0000E+00 0.0000E+00 5.7500E-01 1.3000E-02 1.3000E-02  1   1    2
 2.4000E+08 0.0000E+00 0.0000E+00 5.7300E-01 1.2000E-02 1.2000E-02  1   1    2
 2.6000E+08 0.0000E+00 0.0000E+00 5.4500E-01 1.2000E-02 1.2000E-02  1   1    2
 2.8000E+08 0.0000E+00 0.0000E+00 5.5000E-01 1.2000E-02 1.2000E-02  1   1    2
 3.0000E+08 0.0000E+00 0.0000E+00 5.7000E-01 1.2000E-02 1.2000E-02  1   1    2
 3.2000E+08 0.0000E+00 0.0000E+00 5.7900E-01 1.3000E-02 1.3000E-02  1   1    2
 3.4000E+08 0.0000E+00 0.0000E+00 5.7400E-01 1.3000E-02 1.3000E-02  1   1    2
 3.6000E+08 0.0000E+00 0.0000E+00 5.8200E-01 1.5000E-02 1.5000E-02  1   1    2
 3.8000E+08 0.0000E+00 0.0000E+00 5.8000E-01 1.6000E-02 1.6000E-02  1   1    2
 4.0000E+08 0.0000E+00 0.0000E+00 5.8000E-01 1.7000E-02 1.7000E-02  1   1    2
 4.2000E+08 0.0000E+00 0.0000E+00 6.0900E-01 1.8000E-02 1.8000E-02  1   1    2
 4.4000E+08 0.0000E+00 0.0000E+00 5.9700E-01 1.8000E-02 1.8000E-02  1   1    2
 4.6000E+08 0.0000E+00 0.0000E+00 5.9300E-01 1.7000E-02 1.7000E-02  1   1    2
 4.8000E+08 0.0000E+00 0.0000E+00 6.4100E-01 1.7000E-02 1.7000E-02  1   1    2
 5.0100E+08 0.0000E+00 0.0000E+00 6.2500E-01 1.4000E-02 1.4000E-02  1   1    2
 5.2100E+08 0.0000E+00 0.0000E+00 6.2000E-01 1.4000E-02 1.4000E-02  1   1    2
 5.4000E+08 0.0000E+00 0.0000E+00 6.2900E-01 1.0000E-02 1.0000E-02  1   1    2
 5.5900E+08 0.0000E+00 0.0000E+00 6.3000E-01 1.3000E-02 1.3000E-02  1   1    2
 5.7500E+08 0.0000E+00 0.0000E+00 6.6000E-01 3.1000E-02 3.1000E-02  1   1    2
ENDPHYSENT                                                  199999999
ENDREQUEST                                               9999999999999
```

XREF

```
REQUEST        1853001   20071005        3     113909           0  0    0
 13-AL-27(N,TOT),,SIG            2.3+07 4.4+07   5 1CANMNA      J,CJP,52,648,197404      7404 I.F.Bubb,        10379007
 13-AL-27(N,TOT),,SIG            1.6+08 5.8+08  22 2GERFRB      J,NP/A,490,667,88        8801 J.Franz,         22117005
```

BIB

```
 BIBFILE        1853001   20071005        3     113909           0   0    0
 BIB            10379007        17                               1   0    1
 INSTITUTE  (1CANMNA)                                            1   0    1
 REFERENCE  (J,CJP,52,648,197404)                                1   0    1
 AUTHOR     (I.F.Bubb,S.N.Bunker,M.Jain,J.W.Leonard,A.McIlwain,  1   0    1
            K.I.Roulston,K.G.Standing,D.O.Wells,B.G.Whitmore)    1   0    1
 TITLE      Neutron Total Cross Sections between 20 and 45 MeV   1   0    1
 FACILITY   (CYCLO) Cyclotron                                    1   0    1
 INC-SPECT  Energy spread less than 2 MeV (FWHM).                1   0    1
 METHOD     (TOF) Time-of-flight.                                1   0    1
 DETECTOR   (SCIN) NE218 liquid scintillator coupled to          1   0    1
             photomultiplier.                                    1   0    1
 STATUS     Data taken from Table I in reference.                1   0    1
 HISTORY    (19740530C)                                          1   0    1
            (19830425A) Converted to REACTION formalism          1   0    1
            (20021206A) Converted to new date formats, lower case. 1  0    1
 REACTION   (13-AL-27(N,TOT),,SIG)                               1   0    1
 MONITOR    Incident flux normalized by shielded monitor counter. 1  0    1
 ERR-ANALYS (DATA-ERR) Data error given is standard deviation.   1   0    1
 ENDBIB            17                                            1   0    1
 BIB            22117005        57                               1   0    2
 REFERENCE  (J,NP/A,490,667,88)                                  1   0    2
 TITLE      -TOTAL NEUTRON-NUCLEUS CROSS SECTIONS AT INTERMEDIATE 1  0    2
             ENERGIES.                                           1   0    2
 AUTHOR     (J.FRANZ,H.P.GROTZ,L.LEHMANN,E.ROESSLE,H.SCHMITT,    1   0    2
            L.SCHMITT)                                           1   0    2
 INSTITUTE  (2GERFRB)                                            1   0    2
            (2SWTVIL) SWISS INSTITUTE FOR NUCLEAR RESEARCH.      1   0    2
```

T4 (cross-sections for students)

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Address http://www-nds.iaea.org/exfor/servlet/X4sGetReacTabl?reqx=2155&subID=22117005&pointer=   Go   Links »

```
#SUBENT      22117005
#AUTHORS     J.Franz, H.P.Grotz, L.Lehmann, E.Roessle,
#+           H.Schmitt, L.Schmitt
#REFERENCE   Nuclear Physics, Section A Vol.490, p.667
#YEAR        1988
#TITLE       TOTAL NEUTRON-NUCLEUS CROSS SECTIONS AT INTERMEDIATE
#+           ENERGIES.
#REACTION    13-AL-27(N,TOT),,SIG
#QUANTITY    Cross section
#Ene,MeV     Sig,mb       dSig,mb
 160         682          14
 180         617          14
 200         562          13
 220         575          13
 240         573          12
 260         545          12
 280         550          12
 300         570          12
 320         579          13
 340         574          13
 360         582          15
 380         580          16
 400         580          17
 420         609          18
 440         597          18
 460         593          17
 480         641          17
 501         625          14
 521         620          14
 540         629          10
 559         630          13
 575         660          31
#END
```

SUBENT 22117005

POINTS: 22

Convert EXFOR to: C4 (see Guide)

Energy (eV)

Min	Max	
1.6e+08	5.75e+08	Reset
From	To	
1.6e+08	5.75e+08	Submit

Done   Local intranet

C4 (main computational format)

```
   1 13027   3   1    2.2900+7        1.880000 0.030000                                                    I.F.Bubb,ET.AL. (74)    10379  7
   1 13027   3   1    2.9100+7        1.890000 0.020000                                                    I.F.Bubb,ET.AL. (74)    10379  7
   1 13027   3   1    3.5200+7        1.860000 0.020000                                                    I.F.Bubb,ET.AL. (74)    10379  7
   1 13027   3   1    4.1200+7        1.850000 0.030000                                                    I.F.Bubb,ET.AL. (74)    10379  7
   1 13027   3   1    4.4150+7        1.820000 0.020000                                                    I.F.Bubb,ET.AL. (74)    10379  7
   1 13027   3   1    1.6000+8        0.682000 0.014000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    1.8000+8        0.617000 0.014000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    2.0000+8        0.562000 0.013000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    2.2000+8        0.575000 0.013000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    2.4000+8        0.573000 0.012000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    2.6000+8        0.545000 0.012000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    2.8000+8        0.550000 0.012000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    3.0000+8        0.570000 0.012000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    3.2000+8        0.579000 0.013000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    3.4000+8        0.574000 0.013000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    3.6000+8        0.582000 0.015000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    3.8000+8        0.580000 0.016000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    4.0000+8        0.580000 0.017000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    4.2000+8        0.609000 0.018000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    4.4000+8        0.597000 0.018000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    4.6000+8        0.593000 0.017000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    4.8000+8        0.641000 0.017000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    5.0100+8        0.625000 0.014000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    5.2100+8        0.620000 0.014000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    5.4000+8        0.629000 0.010000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    5.5900+8        0.630000 0.013000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    5.7500+8        0.660000 0.031000                                                    J.FRANZ,ET.AL. (88)     22117  5
```

Extended C4 (C4+) on NDS-Web

```
#FORMAT     C4#
#SUBENT     22117005
#AUTHOR1    J.Franz+
#YEAR       1988
#REF-CODE   J,NP/A,490,667,88
#INSTITUTE  2GERFRB
#TITLE      -TOTAL NEUTRON-NUCLEUS CROSS SECTIONS AT INTERMEDIATE
#+          ENERGIES.
#AUTHOR(S)  J.Franz, H.P.Grotz, L.Lehmann,
#+          E.Roessle, H.Schmitt, L.Schmitt
#REFERENCE  Jour. Nuclear Physics, Section A
#+          Vol.490, p.667
#REACTION   13-AL-27(N,TOT),,SIG
#LDATA      22
#
#SEE_ALSO   Data with Extended Description
#C4-FIELDS:
# Prj Targ M MF MT PXC  Energy  dEnergy  Data      dData     Cos/LO    dCos/LO    ELV/HL   dELV/HL I78 Refer (YY)              EntrySubP
#---><----->o<-><-->ooo<------->< ------->< ------->< ------->< ------->< ------->< ------->< ------->< -><----------------------><---><->o
   1 13027   3   1    1.6000+8        0.682000 0.014000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    1.8000+8        0.617000 0.014000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    2.0000+8        0.562000 0.013000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    2.2000+8        0.575000 0.013000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    2.4000+8        0.573000 0.012000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    2.6000+8        0.545000 0.012000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    2.8000+8        0.550000 0.012000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    3.0000+8        0.570000 0.012000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    3.2000+8        0.579000 0.013000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    3.4000+8        0.574000 0.013000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    3.6000+8        0.582000 0.015000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    3.8000+8        0.580000 0.016000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    4.0000+8        0.580000 0.017000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    4.2000+8        0.609000 0.018000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    4.4000+8        0.597000 0.018000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    4.6000+8        0.593000 0.017000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    4.8000+8        0.641000 0.017000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    5.0100+8        0.625000 0.014000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    5.2100+8        0.620000 0.014000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    5.4000+8        0.629000 0.010000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    5.5900+8        0.630000 0.013000                                                    J.FRANZ,ET.AL. (88)     22117  5
   1 13027   3   1    5.7500+8        0.660000 0.031000                                                    J.FRANZ,ET.AL. (88)     22117  5
#EOF
```

Extended C4 (C4+) in "full EXFOR in C4"

```
#C4REQUEST  20070628    112216      20070521
#ENTRY      A0203
#AUTHOR1    V.G.Batij+
#YEAR       1983
#INSTITUTE  (4CCPKFT)
#TITLE      EXCITATION FUNCTIONS (P,N) AND (A,XN) REACTIONS
#+          WITH FORMATION OF TE-119-M,G AND TE-121-M,G
#+          ISOMERIC PAIRS.
#AUTHOR(S)  V.G.Batij, E.A.Skakun, O.A.Rastrepin,
#+          K.A.Baskova, B.M.Makuni, T.V.Chugaj,
#+          L.Ja.Shavtvalov
#DATASETS   6
#
#DATASET    A0203002A
#DATE       19860405
#REACTION   50-SN-116(A,N)52-TE-119-M,,SIG,,,EXP
#PROJ       2004
#TARG       50116
#MF         3
#MT         4
#C4BEGIN    [ 2004 50116   3   4MA ]
#DATA       9
# Prj Targ M MF MT PXC  Energy  dEnergy  Data     dData    Cos/LO   dCos/LO   ELV/HL  dELV/HL I78
#---><----->O<-><-->OOO<-------><-------><-------><-------><-------><-------><-------><------->
 2004 50116   3   4MA  1.9700+7           0.304000 0.039000                                          V.G.BATIJ,ET.AL. (83)    A0203  2A
 2004 50116   3   4MA  2.1100+7           0.430000 0.055000                                          V.G.BATIJ,ET.AL. (83)    A0203  2A
 2004 50116   3   4MA  2.3000+7           0.397000 0.051000                                          V.G.BATIJ,ET.AL. (83)    A0203  2A
 2004 50116   3   4MA  2.4000+7           0.305000 0.040000                                          V.G.BATIJ,ET.AL. (83)    A0203  2A
 2004 50116   3   4MA  2.5000+7           0.239000 0.032000                                          V.G.BATIJ,ET.AL. (83)    A0203  2A
 2004 50116   3   4MA  2.5800+7           0.177000 0.024000                                          V.G.BATIJ,ET.AL. (83)    A0203  2A
 2004 50116   3   4MA  2.6700+7           0.123000 0.018000                                          V.G.BATIJ,ET.AL. (83)    A0203  2A
 2004 50116   3   4MA  2.7700+7           0.084000 0.013000                                          V.G.BATIJ,ET.AL. (83)    A0203  2A
 2004 50116   3   4MA  2.9700+7           0.076000 0.012000                                          V.G.BATIJ,ET.AL. (83)    A0203  2A
#/DATA      9
#/DATASET
#
#DATASET    A0203002B
#DATE       19860405
#REACTION   50-SN-116(A,N)52-TE-119-G,,SIG,,,EXP
#PROJ       2004
#TARG       50116
#MF         3
#MT         4
#C4BEGIN    [ 2004 50116   3   4GA ]
#DATA       9
# Prj Targ M MF MT PXC  Energy  dEnergy  Data     dData    Cos/LO   dCos/LO   ELV/HL  dELV/HL I78
#---><----->O<-><-->OOO<-------><-------><-------><-------><-------><-------><-------><------->
 2004 50116   3   4GA  1.9700+7           0.378000 0.043000                                          V.G.BATIJ,ET.AL. (83)    A0203  2B
 2004 50116   3   4GA  2.1100+7           0.399000 0.045000                                          V.G.BATIJ,ET.AL. (83)    A0203  2B
 2004 50116   3   4GA  2.3000+7           0.290000 0.033000                                          V.G.BATIJ,ET.AL. (83)    A0203  2B
 2004 50116   3   4GA  2.4000+7           0.208000 0.024000                                          V.G.BATIJ,ET.AL. (83)    A0203  2B
 2004 50116   3   4GA  2.5000+7           0.134000 0.015000                                          V.G.BATIJ,ET.AL. (83)    A0203  2B
 2004 50116   3   4GA  2.5800+7           0.105000 0.012000                                          V.G.BATIJ,ET.AL. (83)    A0203  2B
 2004 50116   3   4GA  2.6700+7           0.067000 8.0000-3                                          V.G.BATIJ,ET.AL. (83)    A0203  2B
 2004 50116   3   4GA  2.7700+7           0.047000 6.0000-3                                          V.G.BATIJ,ET.AL. (83)    A0203  2B
 2004 50116   3   4GA  2.9700+7           0.044000 6.0000-3                                          V.G.BATIJ,ET.AL. (83)    A0203  2B
#/DATA      9
#/DATASET
#
#DATASET    A0203003A
#DATE       19860405
#REACTION   50-SN-117(A,2N)52-TE-119-G,,SIG,,,EXP
#PROJ       2004
#TARG       50117
#MF         3
#MT         16
#C4BEGIN    [ 2004 50117   3  16GA ]
#DATA       8
# Prj Targ M MF MT PXC  Energy  dEnergy  Data     dData    Cos/LO   dCos/LO   ELV/HL  dELV/HL I78
#---><----->O<-><-->OOO<-------><-------><-------><-------><-------><-------><-------><------->
 2004 50117   3  16GA  2.0400+7           0.195000 0.022000                                          V.G.BATIJ,ET.AL. (83)    A0203  3A
 2004 50117   3  16GA  2.1800+7           0.324000 0.037000                                          V.G.BATIJ,ET.AL. (83)    A0203  3A
 2004 50117   3  16GA  2.4500+7           0.476000 0.054000                                          V.G.BATIJ,ET.AL. (83)    A0203  3A
 2004 50117   3  16GA  2.5400+7           0.489000 0.055000                                          V.G.BATIJ,ET.AL. (83)    A0203  3A
 2004 50117   3  16GA  2.6200+7           0.482000 0.054000                                          V.G.BATIJ,ET.AL. (83)    A0203  3A
 2004 50117   3  16GA  2.7200+7           0.467000 0.052000                                          V.G.BATIJ,ET.AL. (83)    A0203  3A
 2004 50117   3  16GA  2.8400+7           0.453000 0.051000                                          V.G.BATIJ,ET.AL. (83)    A0203  3A
 2004 50117   3  16GA  3.0400+7           0.404000 0.050000                                          V.G.BATIJ,ET.AL. (83)    A0203  3A
#/DATA      8
#/DATASET
#
#DATASET    A0203003B
#DATE       19860405
#REACTION   50-SN-117(A,2N)52-TE-119-M,,SIG,,,EXP
#PROJ       2004
#TARG       50117
#MF         3
#MT         16
#C4BEGIN    [ 2004 50117   3  16MA ]
#DATA       8
# Prj Targ M MF MT PXC  Energy  dEnergy  Data     dData    Cos/LO   dCos/LO   ELV/HL  dELV/HL I78
#---><----->O<-><-->OOO<-------><-------><-------><-------><-------><-------><-------><------->
 2004 50117   3  16MA  2.0400+7           0.160000 0.021000                                          V.G.BATIJ,ET.AL. (83)    A0203  3B
 2004 50117   3  16MA  2.1800+7           0.271000 0.036000                                          V.G.BATIJ,ET.AL. (83)    A0203  3B
 2004 50117   3  16MA  2.4500+7           0.525000 0.067000                                          V.G.BATIJ,ET.AL. (83)    A0203  3B
 2004 50117   3  16MA  2.5400+7           0.652000 0.083000                                          V.G.BATIJ,ET.AL. (83)    A0203  3B
 2004 50117   3  16MA  2.6200+7           0.689000 0.087000                                          V.G.BATIJ,ET.AL. (83)    A0203  3B
 2004 50117   3  16MA  2.7200+7           0.764000 0.096000                                          V.G.BATIJ,ET.AL. (83)    A0203  3B
 2004 50117   3  16MA  2.8400+7           0.836000 0.090000                                          V.G.BATIJ,ET.AL. (83)    A0203  3B
 2004 50117   3  16MA  3.0400+7           0.816000 0.103000                                          V.G.BATIJ,ET.AL. (83)    A0203  3B
#/DATA      8
#/DATASET
#
#DATASET    A0203004A
#DATE       19860405
#REACTION   51-SB-121(P,N)52-TE-121-G,,SIG,,,EXP
#PROJ       1001
#TARG       51121
#MF         3
#MT         4
#C4BEGIN    [ 1001 51121   3   4GA ]
#DATA       6
# Prj Targ M MF MT PXC  Energy  dEnergy  Data     dData    Cos/LO   dCos/LO   ELV/HL  dELV/HL I78
#---><----->O<-><-->OOO<-------><-------><-------><-------><-------><-------><-------><------->
 1001 51121   3   4GA  5200000.           0.023900 3.7000-3                                          V.G.BATIJ,ET.AL. (83)    A0203  4A
 1001 51121   3   4GA  6100000.           0.051700 7.9000-3                                          V.G.BATIJ,ET.AL. (83)    A0203  4A
 1001 51121   3   4GA  6900000.           0.080000 0.012000                                          V.G.BATIJ,ET.AL. (83)    A0203  4A
 1001 51121   3   4GA  7600000.           0.120000 0.018000                                          V.G.BATIJ,ET.AL. (83)    A0203  4A
 1001 51121   3   4GA  8300000.           0.183000 0.028000                                          V.G.BATIJ,ET.AL. (83)    A0203  4A
 1001 51121   3   4GA  9000000.           0.207000 0.031000                                          V.G.BATIJ,ET.AL. (83)    A0203  4A
#/DATA      6
#/DATASET
```

http://www-nds.iaea.org/x4toc4-master/readme.txt

```
                    Nuclear Data Section (NDS),
            Department of Nuclear Sciences and Applications,
                International Atomic Energy Agency (IAEA),
                    Wagramer Strasse 5, P.O.Box 100,
                        A-1400 Vienna, Austria
                    Tel:(+43 1) 2600-21714; Fax:(+43 1) 26007

                        Full EXFOR in C4 format
        Created 8-May-2007 by Viktor Zerkin, e-mail: V.Zerkin@iaea.org
                    Last updated: 27-September-2007

    --------------------------------------------------------------------------
    Contents:
    1. C4-YYYY-MM-DD.zip (size:~70+Mb) contains:
        1) C4-YYYY-MM-DD.xc4 (size:~1Gb):
            full EXFOR (as of YYYY/MM/DD in the IAEA-NDS) in extended C4 format*
        2) EXFOR14A.DAT (as of YYYY/MM/DD)
    2. dev/ contains: several version of development
    3. readme.txt

    --------------------------------------------------------------------------
    Questions and Answers.

    1.Q: What is extended C4 format?
      A: C4 with identification information:
        a) Identification information is given as comment starting with #.
        b) Information is sorted by Entry-Subentry-Pointer and organized
           as follow:
           #C4REQUEST
                #ENTRY
                    ....ENTRY Information: reference, title, full list of authors,...
                    #DATASET: SUBENTRY-Number+Pointer
                        ....DATASET Information: EXFOR-Reaction, MF, MT,...
                        #DATA
                            ....DATA: C4 lines as is in pure C4 file
                        #/DATA
                        ....
                    #/DATASET
                    ....
                #/ENTRY
                ....
           #/C4REQUEST

    2.Q: How to update software reading C4 to be able to use extended C4?
      A: Add to your code ignoring lines starting with "#";
         or use "filter" - utility, which will read extended C4 and write plain C4

    3.Q: Why full EXFOR database is presented in one C4 file (not by smaller parts)?
      A: One C4 file containing all EXFOR data (although it is huge ~1Gb) seems
         to be preferable, because:
            a) user decides how to organize data for his/her application -
               can easy write software to split full C4-file to parts convenient
               for his applications and store them in appropriate form, e.g.:
               1) index file + directory structure sorting data by EXFOR numbers,
               2) index file + directory structure sorting data by target/reaction,
               3) ENDF-like directory structure: ZAProjectile/ZAMaterial/MF/MT
               4) database
               etc. (full freedom: NDS does not dictate the method of data storage)
            b) no need to provide software for data access (which can be different
               for different applications).

    4.Q: Is there any alternative way to get EXFOR data in C4 format?
      A: NDS provides two "standard" ways/methods to get EXFOR data in C4 format:
            a) via Web EXFOR retrieval system:
               http://www-nds.iaea.org/exfor/
            b) using non-interactive stand-alone Java-utility retrieveing data
               from EXFOR database (MySQL/MS-Access on CD-ROM or remotely), which
               can be called through external script by any application (as it
               is done for Empire and EndVer).
               IAEA-NDS CD-ROMs:
               - "EXFOR-CINDA for Applications" for Linux/Windows/Mac (MySQL)
               - "EndVer/GUI and EXFOR-CINDA for Applications" (Lin/Win/Mac,MySQL)
               - "EXFOR-CINDA Retrieval system for Windows" (MS-Access)

    5.Q: What is the meaning of the fields in the lines #C4REQUEST and #/C4REQUEST ?
      A: These lines mark begin/end of an extended C4-file:
            a) #C4REQUEST N1 N2 N3
               N1 - date of request (date when this C4-file was created)
               N2 - time, when request started
               N3 - date of last update of EXFOR database,
                    from which data were retrieved (source database)
            b) #/C4REQUEST N1 N2 N3
               N1 - number of Entries in this file (start with #ENTRY)
               N2 - number of Datasets in this file (start with #DATASET)
               N3 - total number of datasets in the source EXFOR database

    -End-
```

R33: data and plot

Extended plotting

## Cross sections with covariances
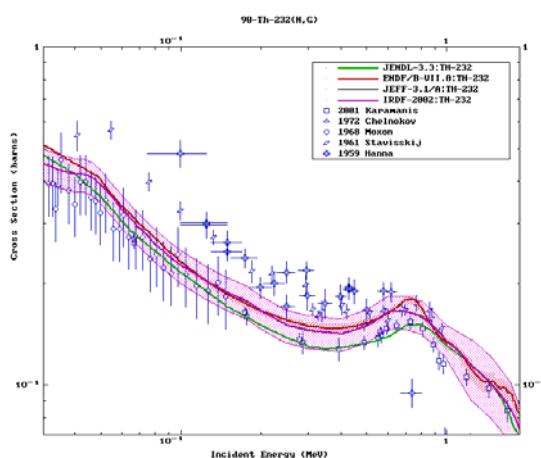
Angular distributions
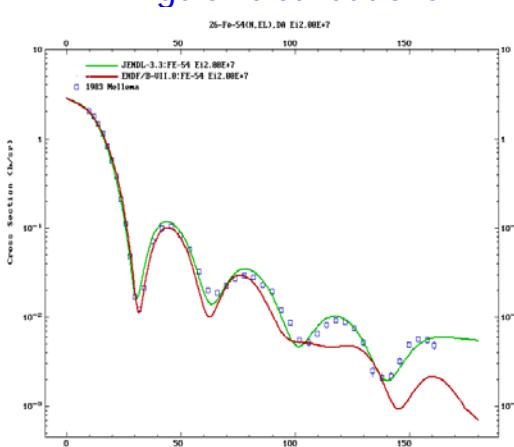
Emission spectra
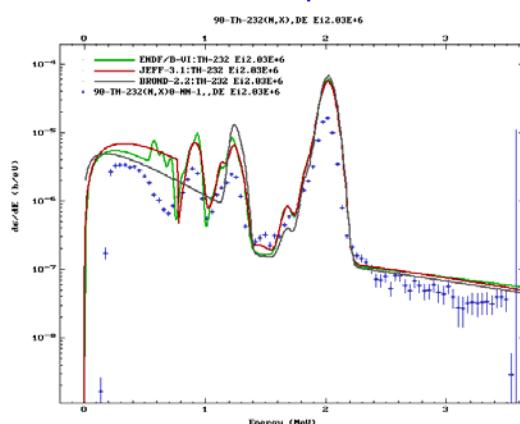
Number of neutrons per fission
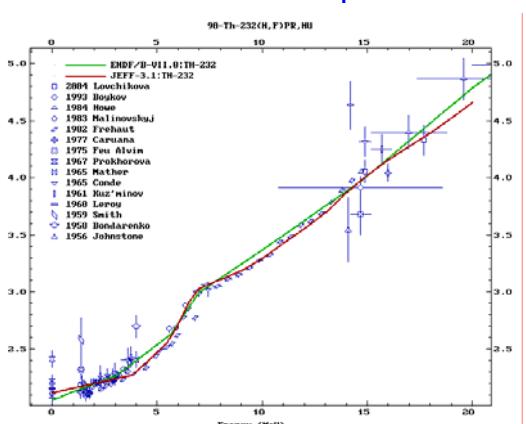
Double differential cross sections
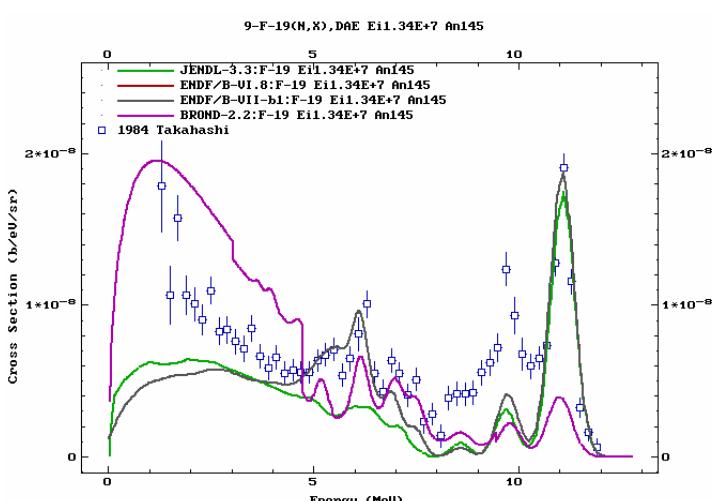
```
#ZVView-data-copy:   9-Oct-2007 15:36:26
#=====================================
#
#name:    9-F-19(N,2N)9-F-18,,SIG
#X.axis: Incident Energy
#Y.axis: Cross Section
#wdata:  4
#ldata:  14
#data...
#          X          +-dX          Y          +-dY  # Comments...
#          MeV         MeV         barns        barns  # Year,Author(s)              ## EXFOR-ID
          13.36          0        0.0255       0.0014  # 1988,Y.IKEDA+               ## 22089002
          13.58          0         0.027       0.0014  # 1988,Y.IKEDA+               ## 22089002
          13.76          0        0.0333       0.0018  # 1988,Y.IKEDA+               ## 22089002
          13.99          0        0.0358       0.0019  # 1988,Y.IKEDA+               ## 22089002
          14.23          0        0.0402       0.0022  # 1988,Y.IKEDA+               ## 22089002
          14.45          0        0.0453       0.0024  # 1988,Y.IKEDA+               ## 22089002
          14.65        0.1        0.0469       0.0016  # 1978,T.B.RYVES+             ## 20867003
          14.69          0        0.0504       0.0027  # 1988,Y.IKEDA+               ## 22089002
          14.96          0        0.0518       0.0028  # 1988,Y.IKEDA+               ## 22089002
          16.06        0.3        0.0646       0.0021  # 1978,T.B.RYVES+             ## 20867003
          16.51       0.25        0.0692       0.0022  # 1978,T.B.RYVES+             ## 20867003
          17.35        0.2         0.076       0.0025  # 1978,T.B.RYVES+             ## 20867003
          18.06       0.19        0.0815       0.0025  # 1978,T.B.RYVES+             ## 20867003
            19        0.19        0.0828        0.004  # 1978,T.B.RYVES+             ## 20867003
//
#--------------------------------------------------------------------------------
#
#name:    ENDF/B-VII.0:F-19
#X.axis: Incident Energy
#Y.axis: Cross Section
#wdata:  3
#ldata:  11
#data...
#          X           Y          +-dY
#          MeV        barns        barns
          11.5       0.0015    0.000184853
            12      0.004545    0.000560106
          12.5        0.014     0.00152555
            13        0.024     0.00261523
          13.5        0.035     0.00381388
          14.1       0.04162    0.00407965
            15       0.05726    0.00561271
            16       0.07329    0.00718399
            18       0.08624    0.00903999
            19       0.09682     0.0116394
            20        0.1026     0.0123342
//
#--------------------------------------------------------------------------------
```