Experimental (EXFOR) and evaluated (ENDF) databases. Retrieving, plotting, processing of cross section and covariance data

Lecture I.

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International Atomic Energy Agency, Nuclear Data Section

Joint ICTP-IAEA School on Nuclear Data Measurements for Science and Applications
Trieste, Italy, 19-30 October 2015

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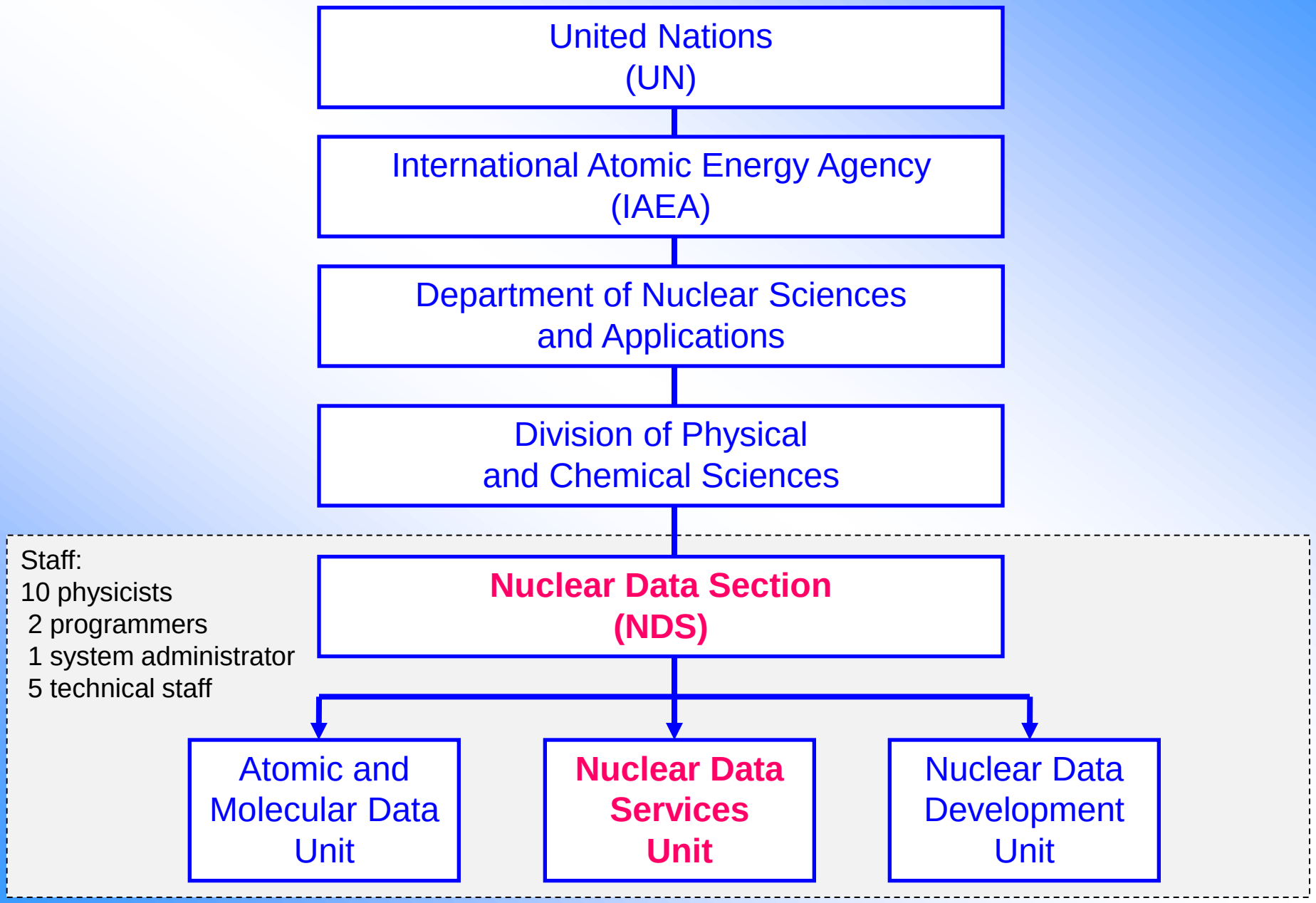
Introducing IAEA Nuclear Data Services

Our Internet Address

http://www-nds.iaea.org

Our Postal Address:
Nuclear Data Section,
International Atomic Energy Agency
Vienna International Centre,
P.O. Box 100, A-1400 Vienna,
Austria

Our Place in the Organizational Structure



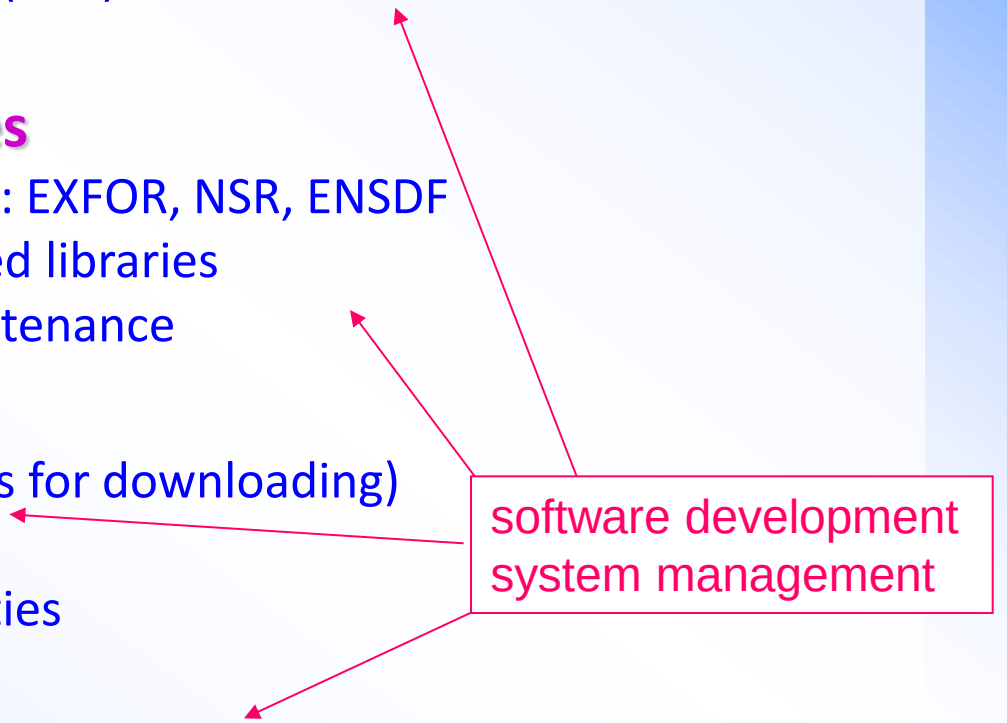
The Mission of NDS

The IAEA Nuclear Data Section (NDS)

- provides **nuclear data services** to scientists worldwide (data libraries, bibliographies and related materials) through Internet, CD-ROM and other media
- produces **new databases** through its data development programme
- assists developing countries through **technology transfer** activities

NDS Main Activity /nuclear part/

- **International cooperation**
  - Network of Nuclear Reaction Data Centres (NRDC)
  - Network Of Nuclear Structure And Decay Data Evaluators (NSDD)
  - software and database exchange with NNDC (USA)
- **Producing new data**
  - Coordinated Research Projects (CRP)
  - Data Development Projects
- **Getting data into databases**
  - compilation and data exchange: EXFOR, NSR, ENSDF
  - collect evaluated and specialized libraries
  - database and master files maintenance
- **Data dissemination**
  - Internet (Web systems, archives for downloading)
  - CD/DVD-ROMs
  - requests from users' communities
- **Technology transfer**
  - "Mirror-sites" (Brazil, India, China)
  - Workshops



Nuclear Data

- Traditional classification and major (general purpose) libraries

	Bibliographical	*Experimental*	*Evaluated*
Nuclear Reactions	**CINDA** Computer Index of Nuclear Reaction Data	**EXFOR*** Experimental Nuclear Reaction Data	**ENDF** Evaluated Nuclear Data File
Nuclear Structure	**NSR** Nuclear Science References	**XUNDL** Experimental Unevaluated Nuclear Data List	**ENSDF**** Evaluated Nuclear Structure Data File

Product of International Networks:
* NRDC Nuclear Reaction Data Center
** NSDD Nuclear Structure and Decay Data

- Specialized nuclear data libraries (examples)

	Experimental	*Evaluated*
Nuclear Reactions	**IBANDL** Ion Beam Analysis Nuclear Data Library	*- ENDF formatted* - **IRDFF** International Reactor Dosimetry and Fusion File - **FENDL** Fusion Evaluated Nuclear Data Library - many more

- Nuclear data in various formats

- Software generating data

~50 years of regular activity and international co-operation in: data formats, exchange, storage, validation; partially in: software, Internet access, data processing, etc.

Our Front Page

IAEA Nuclear Data Services - Windows Internet Explorer provided by IAEA

https://www-nds.iaea.org/ IAEA Nuclear Data Services

International Atomic Energy Agency
Nuclear Data Services
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Search Go

Hot Topics » ENDF/B-VII.1 • TENDL-2012 • JENDL-4 • IBANDL **News »** Damage cross section database extended by SS-316 and Eurofer

Request
CD/DVD with documentation, data, codes, etc.

Quick Links
- ADS-Lib
- Atomic Mass Data Centre
- CINDA
- Charged particle reference cross section
- DROSG-2000
- DXS
- EMPIRE-3.2
- ENDF Archive
- ENDF Retrieval
- ENDF-6 Codes
- ENDF-6 Format
- ENDVER
- ENSDF
- ENSDF ASCII Files
- ENSDF programs
- EXFOR
- Electron and Photon Interaction Data
- FENDL
- Fission Yields
- GANDR

NEW
Prepro-2015 - ENDF/B Pre-Processing Codes [page]
IRDFF - International Reactor Dosimetry and Fusion File v1.05 [page]
CD/DVD-ROMs available for on-line downloading [page]

Main | All | Reaction Data | Structure & Decay | by Applications | Doc & Codes | Index | Events | Links | News

EXFOR Experimental nuclear reaction data
LiveChart of Nuclides Interactive Chart of Nuclides
CINDA Nuclear reaction bibliography
ENDF Evaluated nuclear reaction libraries
ENSDF evaluated nuclear structure and decay data (+XUNDL) **
NSR Nuclear Science References *

NuDat 2.6 selected evaluated nuclear structure data **
RIPL reference parameters for nuclear model calculations
IBANDL Ion Beam Analysis Nuclear Data Library
Charged particle reference cross section Beam monitor reactions
PGAA Prompt gamma rays from neutron capture
FENDL Fusion Evaluated Nuclear Data Library
Photonuclear cross sections and spectra up to 140MeV
IRDFF International Reactor Dosimetry and Fusion File
NAA Neutron Activation Analysis Portal
Safeguards Data recommendations, August 2008
Medical Portal Data for Medical Applications
Standards
- Neutron cross-sections, 2006
- Decay data, 2005

*Database at the IAEA, Vienna **Database at the US NNDC

IAEA Nuclear Data Section

IAEA-NDS Mission, Staff and more | A+M Atomic and Molecular Data | Meetings Workshops | Newsletters | Coordinated Research Projects | Nuclear Reaction Data Center Network | Nuclear Structure & Decay Data Network | Technical Documents INDC Reports Publications | Computer Codes

Mirrors

Partners

Events «2:3»

Joint ICTP-IAEA School on Nuclear Data Measurements for Science & Applications in collaboration with n_TOF/CERN
October 19-30, 2015
AGH (Giambiagi Lecture Hall), Trieste, Italy

12th International Topical Meeting on Nuclear Applications of Accelerators (AccApp'15)
November 10-13, 2015
Marriott Wardman Park Hotel, Washington, DC, USA

Last Updated: 22-October-2015 (1)

Web design: V.Zerkin, IAEA, 2008

Our Web Mirrors and Partners

Our CD-ROMs distribution

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Search Go

Hot Topics » ENDF/B-VII.1 • TENDL-2012 • JENDL-4 • IBANDL **News** » 50 year anniversary of NDS, June 2014

Request
CD/DVD with documentation, data, codes, etc.

NDS-IAEA CD-ROM distribution - Windows Internet Explorer provided by IAEA

https://www-nds.iaea.org/cdroms/ NDS-IAEA CD-ROM ...

International Atomic Energy Agency
Nuclear Data Services
Section Données Nucléaires, AIEA

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Nuclear Data on CD/DVD-ROMs

Select products from the list below

#	Product	Issued	Title [Link] Comment [Download]
1	**ADS v-2.0**	Dec-2008	Application Library for Accelerator Driven Systems [page]
2	**EMPIRE-3.2.2 Portable for Windows**	Jan-2014	System of codes for nuclear reaction calculations and nuclear data evaluation [screen-shots] Download (zip, 753Mb) Required code: 6731 Refresh Enter code: Go!
3	**ENDF libraries**	Aug-2013	30 Evaluated Data Libraries including ENDF/B-VII.1, JEFF-3.2, JENDL-4.0u2, CENDL-3.1, ROSFOND-2010
4	**EPDL97**	Mar-2002	Photon and Electron interactions Download (zip, 58Mb)
5	**EXFOR-CINDA for Windows**	Apr-2013	Database (MS-Access) and retrieval system (Java-2). Portable. [screen-shots] Download (zip, 247Mb)
9	**INDL-TSL**	May-2005	Thermal Neutron Scattering Library [page] [archive] Download (zip, 53Mb)
22	**RIPL-2**	Mar-2003	Reference Input Parameter Library for theoretical calculations of nuclear reactions (does not supersede RIPL-1) [page]
23	**WIMSD**	July-2008	Software and Data to Plot and Compare Neutron Nuclear cross sections from WIMS-D Library files [page] Download (zip, 167Mb)
24	**YAVSHITS**	Feb-2002	Theoretical evaluation of neutron and proton induced fission cross-sections for Pb-Pu targets in energy range 20-200 MeV [archive] Download (zip, 175Kb)

Send requests to:

Nuclear Data Section
International Atomic Energy Agency
Vienna International Centre,
P.O.Box 100, A-1400 Vienna,
Austria

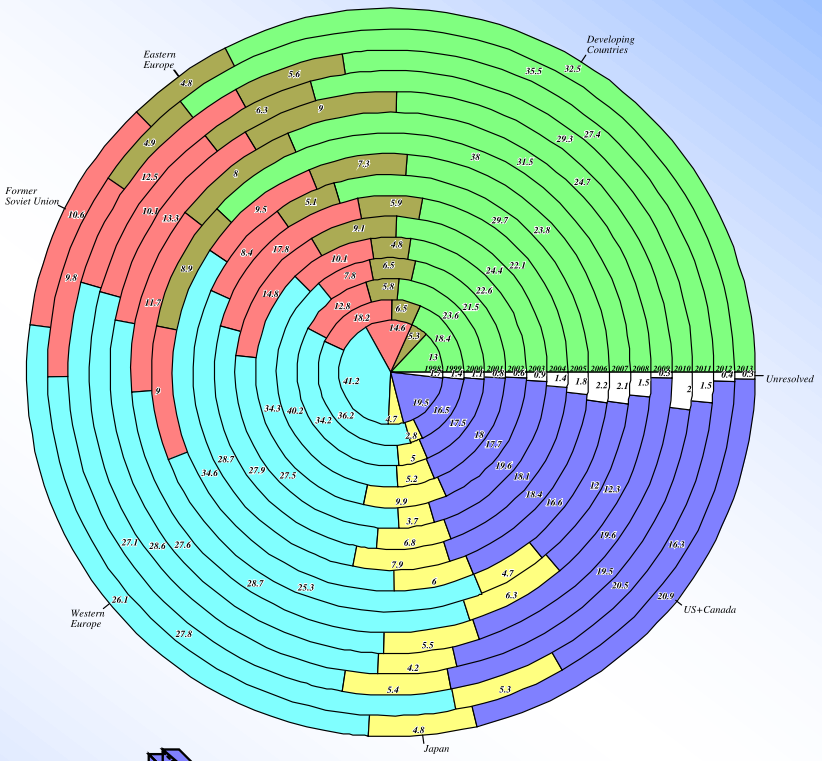
Tel: (+43 1) 2600-21725
Fax: (+43 1) 26007
e-mail: nds.contact-point@iaea.org

Markup product(s) and
Send e-mail
Please, remember to include your postal address:

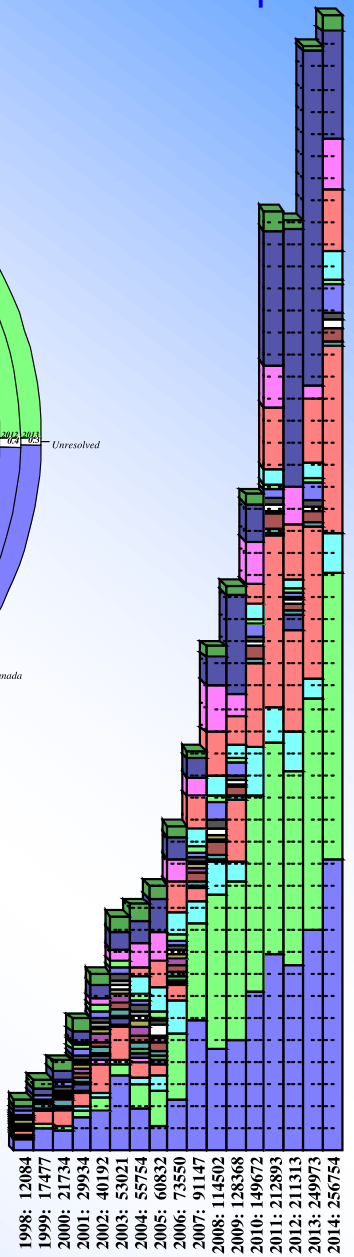
Hard copies of documents are available on request.

NDS Web Statistics

Geographical distribution (%)



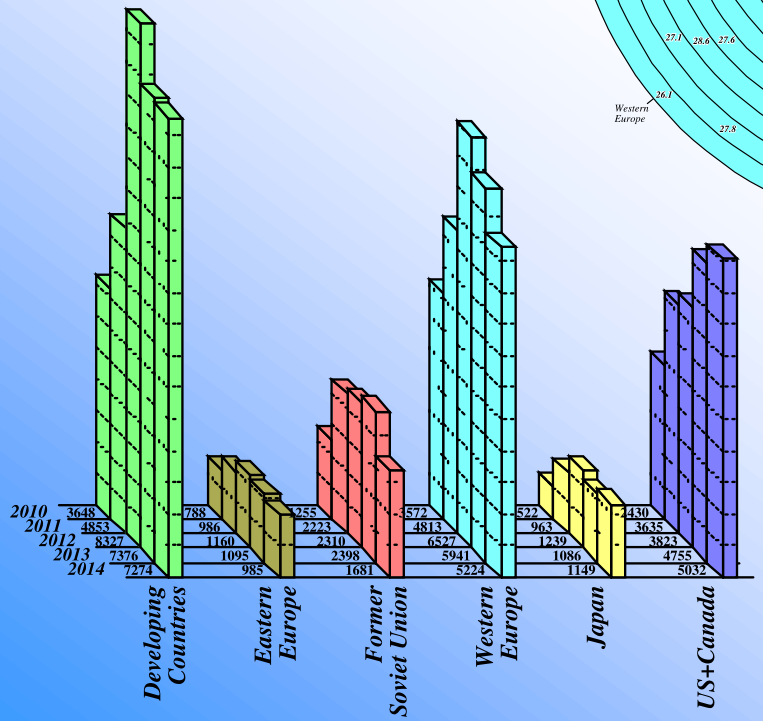
Total per Year



Average per Month*

*2012: 10 Months of service

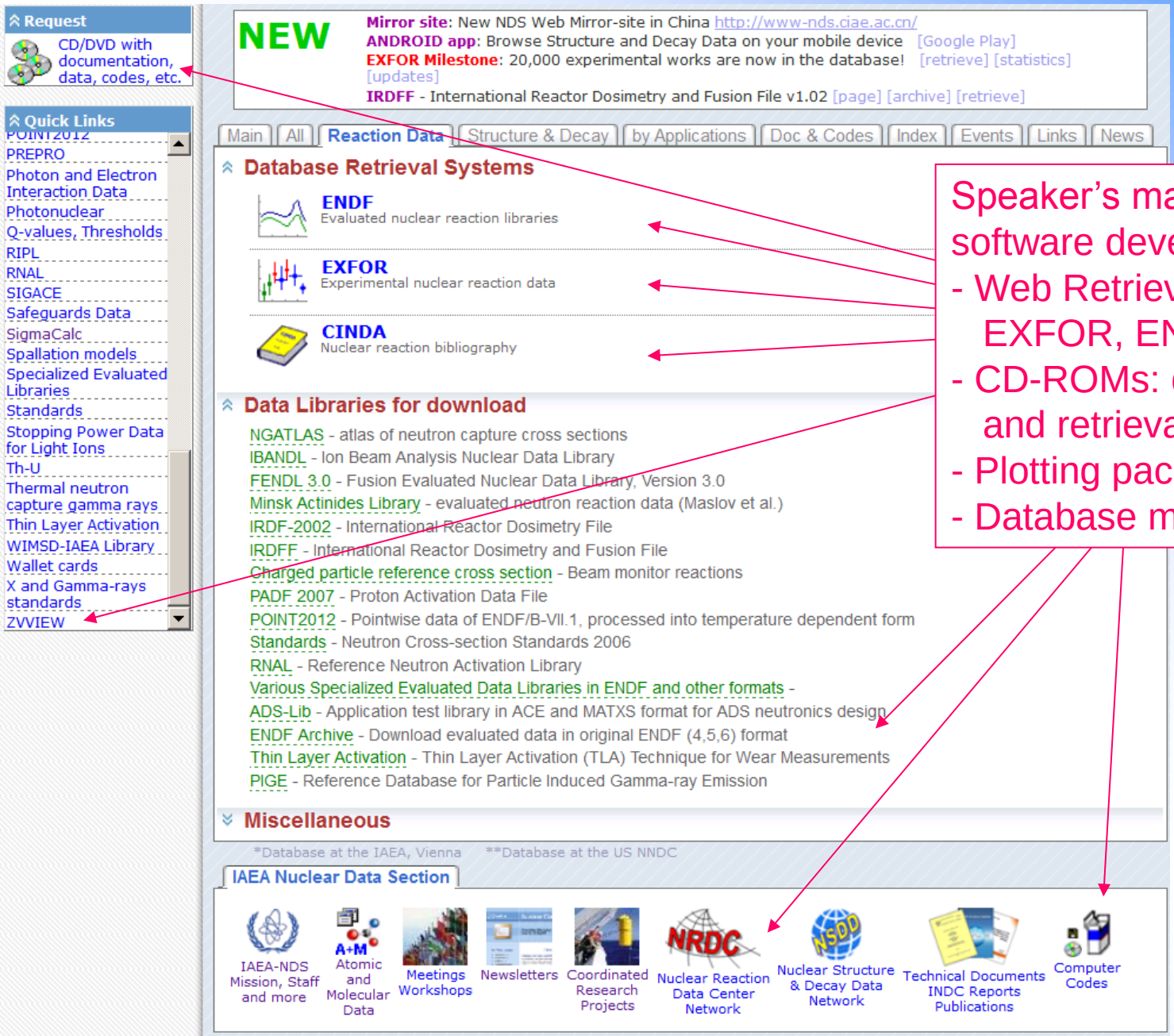
*2013: 11 Months of service



Service	Comment
Computer Codes	
Documents	
OtherData	
IBANDL	
PGAA	
PhotoNuclear	
RIPL	Theory
FENDL	Fusion
Masses	
IRDF	Dosimetry
Thermal Capture	
Wallet Cards	
Med.Radioisotope.Prod.	
NGAtlas	Activation
RNAL	
ENSDF	Structure
MIRD	Medical
NuDat/LiveChartNucl	
CINDA+NSR	Bibliography
EXFOR	Experimental
ENDF	Energy

Tabs by data types.
1) Structure and Decay Data

2) Nuclear Reaction Data



Speaker's main activity is software development:

- Web Retrieval Systems EXFOR, ENDF, CINDA
- CD-ROMs: databases and retrieval systems
- Plotting package ZVView
- Database maintenance

Tab: by Applications
Category: Reactor Physics

Main | All | Reaction Data | Structure & Decay | **by Applications** | Doc & Codes | NDS-Internal | Index | Events

Reactor Physics (particle transport, fuel cycle, transmutation, shielding)

FENDL-2.1 - Fusion Evaluated Nuclear Data Library, Version 2.1
WIMSD-IAEA Library - multigroup data library for the WIMS-D code
Minsk Actinides Library - evaluated neutron reaction data (Maslov et al.)
NuDat 2.5 - selected evaluated nuclear structure data **
ENDF - Evaluated nuclear reaction libraries
MENDL-2 - Russian cross-section data library for transmutation and activation of materials irradiated by neutrons with energies up to 100 MeV. Yu.N. Shubin et al.
Fission Yields - Fission Product Yield Data for the Transmutation of Minor Actinide Nuclear Waste
Fission Yields Report - Doc: Fission Product Yield Data for the Transmutation of Minor Actinide Nuclear Waste
ADS-Lib - Application test library in ACE and MATXS format for ADS neutronics design
IRDF-2002 - International Reactor Dosimetry File

Atomic and molecular data for fusion research

Ion Beam and Thin Layer Activation Analysis

Dosimetry reactions

Activation analysis

Nuclear Medicine

Neutron Source Reactions

*Database at the IAEA, Vienna **Database at the US NNDC

Nuclear Reaction Databases
EXFOR, ENDF, CINDA

Nuclear Reaction Databases

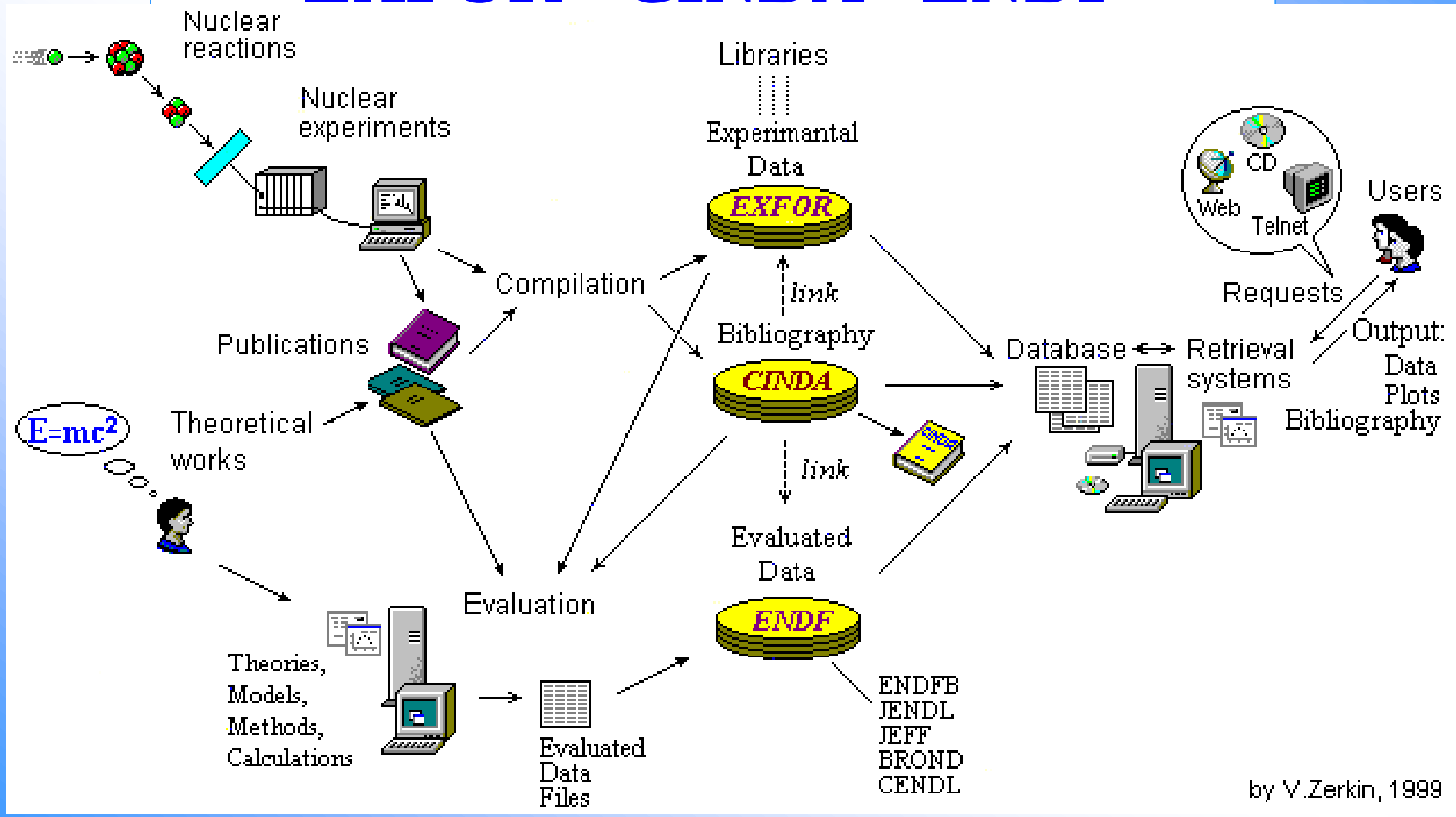
Database	*Contents*	*Size (January-2003)*	*Size (October-2015)*
EXFOR	contains experimental nuclear reaction data for incident neutrons, charged particles and photons	13,500 Entries 97,000 Data sets 400 Mb ASCII-text	21,058 Entries 162,807 Data sets 610 Mb ASCII-text
CINDA	contains bibliographical references to experimental nuclear reaction data and to calculations, reviews, compilations and evaluations of neutron reaction and spontaneous fission data	266,000 Lines 40,500 Publications 32,500 Blocks 37 Mb ASCII-text	561,540 Lines 91,897 Publications 291,180 Blocks 109 Mb ASCII-text
ENDF	is a collection of evaluated data libraries	~300 Mb ASCII (5 basic libraries)	>30 Gb ASCII (47 libraries)

EXFOR data library (EXFOR: EXchange FORmat)

- 1970 : agreed format and established exchange between USA, NEA, IAEA, USSR
- contains data from ~21,000 experiments (~$21bn)
- NRDC: 13 nuclear data centres contribute ~500 new Entries every year
- since 2005: global data library with central maintenance in the IAEA (NDS)
- Master File (610Mb), 52 Dictionaries (2.6Mb), 2 Manuals (400 pages)
- Distribution (EXFOR, X4+, C4, C5, XML, Html, plots): Web, CD/DVD ROM
- Databases: MySQL, MS-Access, SyBase
- Software: C, Java (GUI-Applications, Servlets), Fortran
- Connection (import-export) to other databases: ENDF, CINDA, NSR

Nuclear Reaction Databases

EXFOR - CINDA - ENDF



Formats of nuclear data in EXFOR and ENDF systems.

EXFOR: format for exchange and store experimental data. Flexible ("human readable"), developed to be convenient for compilers. The system offers several "interpreted" (X4+, X4±, X4XML) and "computational" formats (C4, C5, C5M, TABLE, XREF, etc.) for different user needs.

ENDF-6: format to store and exchange evaluated data. Fixed and well-defined, ("computer readable"), developed to be convenient for programming (Fortran). The system offers "interpreted" and XML (GND) output formats.

```
ENTRY            41323   20050902
SUBENT        41323001   20050902
BIB                  7         12
INSTITUTE   (4RUSMIF)
REFERENCE   (J,AE,50,(5),350,198105) M
            (J,SJA,50,325,1981)  ENGLI
AUTHOR      (V.E.ZHITAREV,A.M.MOTORIN,
TITLE       .INTERACTION CROSS SECTION
             WITH COLD NEUTRONS
FACILITY    (REAC)
ERR-ANALYS  (EN-ERR)    WAVE-LENGTH RES
                        TIMES 100 (IN P
HISTORY     (19981121C)  + +  COMPILED
            (20050902A)  . .  Correcte
                         Data-heading
ENDBIB              12
COMMON               3          3
EN-ERR      TEMP        TEMP-ERR
PER-CENT    DEG-C       DEG-C
   3.         22.         3.
ENDCOMMON            3
ENDSUBENT           19
SUBENT        41323002   20050902
BIB                  5          8
REACTION    (13-AL-27(N,TOT),,SIG)
SAMPLE      .ALUMINIUM MONOCRYSTAL, PU
             96 MM, DENSITY 2.70 GRAM/
             MACROCRISTALLINE ALUMINIU
             THICKNESS 50 MM, DENSITY
ERR-ANALYS  (DATA-ERR) NO INFORMATION
STATUS      (TABLE)  DATA ARE TAKEN FR
HISTORY     (19981121T)  + + CONVERTED
ENDBIB               8
NOCOMMON             0          0
DATA                 3          8
WVE-LN      DATA        DATA-ERR
ANGSTROM    B           B
 1.3000E+01 1.9300E+00 1.3000E-01
 1.4000E+01 2.1200E+00 9.0000E-02
 1.5000E+01 2.2500E+00 8.0000E-02
 1.6000E+01 2.3800E+00 7.0000E-02
 1.7000E+01 2.5400E+00 6.0000E-02
 1.8000E+01 2.6100E+00 6.0000E-02
 1.9000E+01 2.8200E+00 8.0000E-02
 2.0000E+01 3.1500E+00 6.0000E-02
ENDDATA             10
ENDSUBENT           23
ENDENTRY             2
```

```
ENTRY            41323   20050902
  SUBENT        41323001   20050902
    BIB                  7         12
      INSTITUTE   (4RUSMIF)
      REFERENCE   (J,AE,50,(5),350,198105) MAIN REFERENCE, DATA ARE GIVEN
                  (J,SJA,50,325,1981)  ENGLISH TRANSLATION
      AUTHOR      (V.E.ZHITAREV,A.M.MOTORIN,S.B.STEPANOV)
      TITLE       .INTERACTION CROSS SECTIONS OF CERTAIN METALS
                   WITH COLD NEUTRONS
      FACILITY    (REAC)
      ERR-ANALYS  (EN-ERR)    WAVE-LENGTH RESOLUTION DELTA-LAMBDA/LAMBDA
                              TIMES 100 (IN PERCENT)
      HISTORY     (19981121C)  + +  COMPILED AT THE CJD + +
                  (20050902A)  . .  Corrected at the CJD + +
                                 Data-heading "EN" changed to "WVE-LN"
    ENDBIB              12
    COMMON               3          3
      EN-ERR      TEMP        TEMP-ERR
      PER-CENT    DEG-C       DEG-C
         3.         22.         3.
      ENDCOMMON            3
    ENDSUBENT           19
  SUBENT        41323002   20050902
    BIB                  5          8
      REACTION    (13-AL-27(N,TOT),,SIG)
      SAMPLE      .ALUMINIUM MONOCRYSTAL, PURITY 99.99 PC, THICKNESS
                   96 MM, DENSITY 2.70 GRAM/CM3 AND
                   MACROCRISTALLINE ALUMINIUM, PURITY 99.99 PC,
                   THICKNESS 50 MM, DENSITY 2.70 GRAM/CM3
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      STATUS      (TABLE)  DATA ARE TAKEN FROM TABLE 1 OF MAIN REF.
      HISTORY     (19981121T)  + + CONVERTED FROM SUBENT 88023002
    ENDBIB               8
    NOCOMMON             0          0
    DATA                 3          8
      WVE-LN      DATA        DATA-ERR
      ANGSTROM    B           B
       1.3000E+01 1.9300E+00 1.3000E-01
       1.4000E+01 2.1200E+00 9.0000E-02
       1.5000E+01 2.2500E+00 8.0000E-02
       1.6000E+01 2.3800E+00 7.0000E-02
       1.7000E+01 2.5400E+00 6.0000E-02
       1.8000E+01 2.6100E+00 6.0000E-02
       1.9000E+01 2.8200E+00 8.0000E-02
       2.0000E+01 3.1500E+00 6.0000E-02
    ENDDATA             10
  ENDSUBENT           23
ENDENTRY             2
```

EXFOR Logic

EXFOR Interpreted: X4+, XML, X4±

EXFOR data: http://www -
Data retrieved from the EXI

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SUBENT           41323001
BIB                  7
INSTITUTE    (4RUSMIF)
             #(4RUSMIF) Mo
REFERENCE    (J,AE,50,(5),
             (J,SJA,50,32
             # (J,AE,50,(5),
             # (J,SJA,50,32
AUTHOR       (V.E.ZHITAREV
TITLE        .INTERACTION
              WITH COLD NE
FACILITY     (REAC)
             #(REAC) React
ERR-ANALYS   (EN-ERR)    WE
                         TI
HISTORY      (19981121C)
             (20050902A)

ENDBIB              12
COMMON               3
EN-ERR       TEMP        TE
PER-CENT     DEG-C       DE
3.           22.          3.
ENDCOMMON            3
ENDSUBENT           19
SUBENT           41323002
BIB                  5
REACTION     (13-AL-27(N,T
             #(13-AL-27(N,T
             #       Proce
SAMPLE       .ALUMINIUM MO
              96 MM, DENSI
              MACROCRISTAL
              THICKNESS 5(
ERR-ANALYS   (DATA-ERR) NO
STATUS       (TABLE)  DATA
HISTORY      (19981121T)
ENDBIB               8
NOCOMMON             0
DATA                 3
WVE-LN       DATA        DA
ANGSTROM     B           B
13.          1.93        0.
14.          2.12        0.
15.          2.25        0.
16.          2.38        0.
17.          2.54        0.
18.          2.61        0.
19.          2.82        0.
20.          3.15        0.
ENDDATA             10
ENDSUBENT           23
ENDENTRY             2
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                 <author ii="2">A.M.MOTORIN</author>
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```

- EXFOR file
  - ENTRY 41323 1981, V.E.Zhitarev+ last-updated: 2005-09-02
    - SUBENT 41323001 last-updated: 2005-09-02
      - BIB #bibliographic and descriptive information
        - INSTITUTE
          - (4RUSMIF) #Moscow Inst.of Engineering Physics, Moscow, Russia
        - REFERENCE
          - (J,AE,50,(5),350,198105) #Jour: Atomnaya Energiya, Vol.50, Issue.5, p.350 (1981), Russia
            MAIN REFERENCE, DATA ARE GIVEN
          - (J,SJA,50,325,1981) #Jour: Soviet Atomic Energy, Vol.50, p.325 (1981), USA
            ENGLISH TRANSLATION
        - AUTHOR
          - (V.E.ZHITAREV, A.M.MOTORIN, S.B.STEPANOV)
        - TITLE
          - .INTERACTION CROSS SECTIONS OF CERTAIN METALS WITH COLD NEUTRONS
        - FACILITY
        - ERR-ANALYS
        - HISTORY
      - COMMON 3x1 #Constant parameters
        - Legend

EN-ERR	Uncertainty in incident projectile energy	PER-CENT	per-cent
TEMP	Sample temperature	DEG-C	degrees Celsius, Centigrade
TEMP-ERR	Error in sample temperature	DEG-C	degrees Celsius, Centigrade

        - Data

EN-ERR	TEMP	TEMP-ERR
PER-CENT	DEG-C	DEG-C
3.0	22.0	3.0

    - SUBENT 41323002 last-updated: 2005-09-02
      - BIB #bibliographic and descriptive information
        - REACTION
          - (13-AL-27(N,TOT),,SIG)
            #Target:AL-27 #Projectile:N #Reaction:N,TOT #Process:TOT:Total #Quantity:,SIG:CS:C
        - SAMPLE
          - .ALUMINIUM MONOCRYSTAL, PURITY 99.99 PC, THICKNESS 96 MM, DENSITY 2.70 GRAM/CM3 AND MACROCRISTALLINE ALUMINIUM, PURITY 99.99 PC, THICKNESS 50 MM, DENSITY 2.70 GRAM/CM3
        - ERR-ANALYS
        - STATUS
        - HISTORY
      - NOCOMMON
      - DATA 3x8
        - Legend

WVE-LN	Wave length of incident particle	ANGSTROM	Angstroms
DATA	Cross section 13-AL-27(N,TOT),,SIG	B	barns
DATA-ERR	Error in value of quantity, defined under ERR-ANALYS	B	barns

        - Data

WVE-LN	DATA	DATA-ERR
ANGSTROM	B	B
13.0	1.93	0.13
14.0	2.12	0.09
15.0	2.25	0.08
16.0	2.38	0.07
17.0	2.54	0.06

ENDF-6 File

MF1:MT451

```
 1.302700+4 2.674975+1          1          0          0          11325 1451    1
 0.000000+0 0.000000+0          0          0          0          61325 1451    2
 1.000000+0 1.500000+8          1          0         10          71325 1451    3
 0.000000+0 0.000000+0          0          0        519        2781325 1451    4
 13-Al- 27 LANL,ORNL  EVAL-FEB01 M.B.Chadwick+,Derrien+             1325 1451    5
 CH97,CH99            DIST-DEC06                    20111222        1325 1451    6
----ENDF/B-VII.1      MATERIAL 1325                                 1325 1451    7
-----INCIDENT NEUTRON DATA                                         1325 1451    8
------ENDF-6 FORMAT                                               1325 1451    9
FILE 2                                                             1325 1451   10
  MT=151 Resonance parameter evaluation was done by Derrien,       1325 1451   11
Leal, Guber, Larson, and Wright using the multilevel R-matix       1325 1451   12
analysis code SAMMY [La98].  The resonance evaluation were done    1325 1451   13
in the energy range from 0 to 850 keV. This evaluation includes    1325 1451   14
a new format to permit the representation of the resonance spin    1325 1451   15
channel. It is defined according to AJ=-J or AJ=+J, which allows   1325 1451   16
to distinguish the J values formed through s = 1 +/- 1/2 channel   1325 1451   17
spin. This new feature has been included in the SAMMY and NJOY     1325 1451   18
codes.                                                             1325 1451   19
```

MF3:MT107

```
 1.302700+4 2.674975+1          0          0          0          01325 3107    1
-3.130330+6-3.130330+6          0          0          1        551325 3107    2
         55          2                                           1325 3107    3
 3.247353+6 0.000000+0 3.737299+6 1.00000-20 3.831701+6 2.74704-131325 3107    4
 4.250000+6 5.30733-13 4.500000+6 2.800000-8 4.638899+6 1.439246-61325 3107    5
 4.642115+6 1.491115-6 4.644190+6 1.525042-6 4.750000+6 3.734485-61325 3107    6
 4.816437+6 5.720716-6 5.000000+6 1.338863-5 5.162467+6 5.232525-51325 3107    7
 5.203278+6 6.509141-5 5.250000+6 8.108130-5 5.500000+6 1.510831-41325 3107    8
 5.750000+6 7.650010-4 5.854713+6 1.071438-3 5.905648+6 1.202420-31325 3107    9
 6.000000+6 1.388819-3 6.250000+6 3.092500-3 6.259604+6 3.199230-31325 3107   10
 6.336474+6 4.085623-3 6.500000+6 6.128615-3 6.584409+6 7.645751-31325 3107   11
 6.745307+6 1.063930-2 6.750000+6 1.073750-2 6.788358+6 1.168665-21325 3107   12
 6.970626+6 1.637794-2 7.000000+6 1.718703-2 7.011499+6 1.747035-21325 3107   13
 7.040546+6 1.819278-2 7.066688+6 1.880816-2 7.250000+6 2.222500-21325 3107   14
 7.500000+6 2.752540-2 7.750000+6 3.516000-2 8.000000+6 4.102736-21325 3107   15
 8.250000+6 4.672000-2 8.500000+6 5.545099-2 9.000000+6 7.136449-21325 3107   16
 9.500000+6 8.250093-2 1.000000+7 8.920986-2 1.050000+7 9.752141-21325 3107   17
 1.100000+7 1.074600-1 1.150000+7 1.135838-1 1.200000+7 1.180572-11325 3107   18
 1.300000+7 1.249807-1 1.400000+7 1.225093-1 1.500000+7 1.094648-11325 3107   19
 1.600000+7 9.457170-2 1.700000+7 7.665716-2 1.800000+7 6.203867-21325 3107   20
 1.900000+7 5.000433-2 2.000000+7 3.851000-2 2.000001+7 0.000000+01325 3107   21
 1.500000+8 0.000000+0                                           1325 3107   22
 0.000000+0 0.000000+0          0          0          0          01325 3  099999
```

ENDF Interpreted

Interpreted ENDF file

AL-27(N,A)NA-24,SIG MAT=1325 MF=3 MT=107 Library: ENDF/B-VII.1

(n,a) cross section

QM = -3.13033E+06 eV
QI = -3.13033E+06 eV

Interpolation table:

55	2

Cross section table:

eV	barns	eV	barns	eV	barns
3.247353+6	0.000000+0	3.737299+6	1.00000-20	3.831701+6	2.74704-13
4.250000+6	5.30733-13	4.500000+6	2.800000-8	4.638899+6	1.439246-6
4.642115+6	1.491115-6	4.644190+6	1.525042-6	4.750000+6	3.734485-6
4.816437+6	5.720716-6	5.000000+6	1.338863-5	5.162467+6	5.232525-5
5.203278+6	6.509141-5	5.250000+6	8.108130-5	5.500000+6	1.510831-4
5.750000+6	7.650010-4	5.854713+6	1.071438-3	5.905648+6	1.202420-3
6.000000+6	1.388819-3	6.250000+6	3.092500-3	6.259604+6	3.199230-3
6.336474+6	4.085623-3	6.500000+6	6.128615-3	6.584409+6	7.645751-3
6.745307+6	1.063930-2	6.750000+6	1.073750-2	6.788358+6	1.168665-2
6.970626+6	1.637794-2	7.000000+6	1.718703-2	7.011499+6	1.747035-2
7.040546+6	1.819278-2	7.066688+6	1.880816-2	7.250000+6	2.222500-2
7.500000+6	2.752540-2	7.750000+6	3.516000-2	8.000000+6	4.102736-2
8.250000+6	4.672000-2	8.500000+6	5.545099-2	9.000000+6	7.136449-2
9.500000+6	8.250093-2	1.000000+7	8.920986-2	1.050000+7	9.752141-2
1.100000+7	1.074600-1	1.150000+7	1.135838-1	1.200000+7	1.180572-1
1.300000+7	1.249807-1	1.400000+7	1.225093-1	1.500000+7	1.094648-1
1.600000+7	9.457170-2	1.700000+7	7.665716-2	1.800000+7	6.203867-2
1.900000+7	5.000433-2	2.000000+7	3.851000-2	2.000001+7	0.000000+0
1.500000+8	0.000000+0				

Page generated by program 'endf' written by R.E.MacFarlane , 8 April 1998, *ryxm@lanl.gov*

Tabulated σ, pointwise, 273K

```
#LIBRARY     ENDF/B-VII.1
#REACTION    AL-27(N,A)NA-24,SIG
#NUCLEUS     Al-27
#MF          3
#MT          107
#EN-MIN      3.24735e+06
#EN-MAX      1.5e+08
#E,eV         Sig,b          Interpolation
 3.24735E+06 0              Lin-Lin
 3.7373E+06  1E-20          Lin-Lin
 3.8317E+06  2.747E-13      Lin-Lin
 4.25E+06    5.3073E-13     Lin-Lin
 4.5E+06     2.8E-08        Lin-Lin
 4.6389E+06  1.43925E-06    Lin-Lin
 4.64212E+06 1.4914E-06     Lin-Lin
 4.64419E+06 1.52504E-06    Lin-Lin
 4.75E+06    3.73449E-06    Lin-Lin
 4.81644E+06 5.72072E-06    Lin-Lin
 5E+06       1.33886E-05    Lin-Lin
 5.16247E+06 5.23252E-05    Lin-Lin
 5.20328E+06 6.50915E-05    Lin-Lin
 5.25E+06    8.10813E-05    Lin-Lin
 5.5E+06     0.000151083    Lin-Lin
```

Section: Summary Original data

Tabulated Data:

Points: 55

Energy (eV)		
Min 3.24735e+06	Max 1.5e+08	Reset
From 3.24735e+06	To 1.5e+08	Get data: Submit

Calculation of Cross Section for a Single Energy:

Energy (eV) =	10e6	Calculate
Cross Section (b) =	0.0892099	

C4: computational format

presents EXFOR data using MF-MT convention from ENDF

Proj.	Target	M	MF	MT	PXC	Energy	dEnergy	Data	dData	Cos/LO	dCos/LO	LVL/HL	dLVL/HL	I78	Refer (YY)	EntrySubP
1	9019		69000			1.4830+7	150000.0	1.3600-8	1.2000-9	0.939692		1.9	1.5900+7	100000.0	E2A.Takahashi,ET.AL. (83)	21875 42
1	9019		69000			1.4830+7	150000.0	4.1600-8	2.0000-9	0.939692		1.9	1.5700+7	100000.0	E2A.Takahashi,ET.AL. (83)	21875 42
1	9019		69000			1.4830+7	150000.0	9.3400-8	3.0000-9	0.939692		1.9	1.5500+7	100000.0	E2A.Takahashi,ET.AL. (83)	21875 42
1	9019		69000			1.4830+7	150000.0	2.1200-7	5.0000-9	0.939692		1.9	1.5300+7	100000.0	E2A.Takahashi,ET.AL. (83)	21875 42
1	9019		69000			1.4830+7	150000.0	3.8400-7	6.0000-9	0.939692		1.9	1.5100+7	100000.0	E2A.Takahashi,ET.AL. (83)	21875 42
1	9019		69000			1.4830+7	150000.0	5.8700-7	8.0000-9	0.939692		1.9	1.4900+7	100000.0	E2A.Takahashi,ET.AL. (83)	21875 42
1	9019		69000			1.4830+7	150000.0	7.5100-7	9.0000-9	0.939692		1.9	1.4700+7	100000.0	E2A.Takahashi,ET.AL. (83)	21875 42

COLUMNS	NAME	MEANING
1- 5	Prj	Projectile ZA (e.g. neutron =1, proton =1001)
6- 11	Targ	Target ZA (e.g. 26-Fe-56 = 26056)
12	M	Target metastable state (e.g. 26-FE-56m = M)
13-15	MF	MF (ENDF conventions, plus additions)
16- 19	MT	MT (ENDF conventions, plus additions)
20	P	Product metastable state (e.g. 26-FE-56M = M)
21	X	EXFOR status
22	C	Center-of-mass flag (C=center-of-mass, blank=lab)
23- 94	.....	8 data fields (each in E9.3 format)
23- 31	Energy	Projectile incident energy
32- 40	dEnergy	Projectile incident energy uncertainty
41- 49	Data	Data, e.g., cross section, angular distribution, etc.
50- 58	dData	Data uncertainty
59- 67	Cos/LO	Cosine or legendre order
68- 76	dCos/LO	Cosine uncertainty
77- 85	LVL/HL	Identified by columns 95-97 (e.g.,level E, half-life)
86- 94	dLVL/HL	Identified by columns 95-97 (e.g.,level E, uncertainty)
95- 97	I78	Identification of data fields 7 and 8 (e.g., LVL=level, HL=half-life, etc.).
98-122	Refer	Reference (first author and year)
123-127	ENTRY	EXFOR accession number
128-130	Sub	sub-accession number
131	P	Multi-dimension table flag (Pointer)

Nuclear data dissemination

Web retrieval system: main way of data dissemination. Available via Internet from the IAEA and Mirror-sites.

CD-ROM database retrieval systems. Standalone systems for three OS (Windows, Linux, Mac). Include databases and software. Available for downloading.

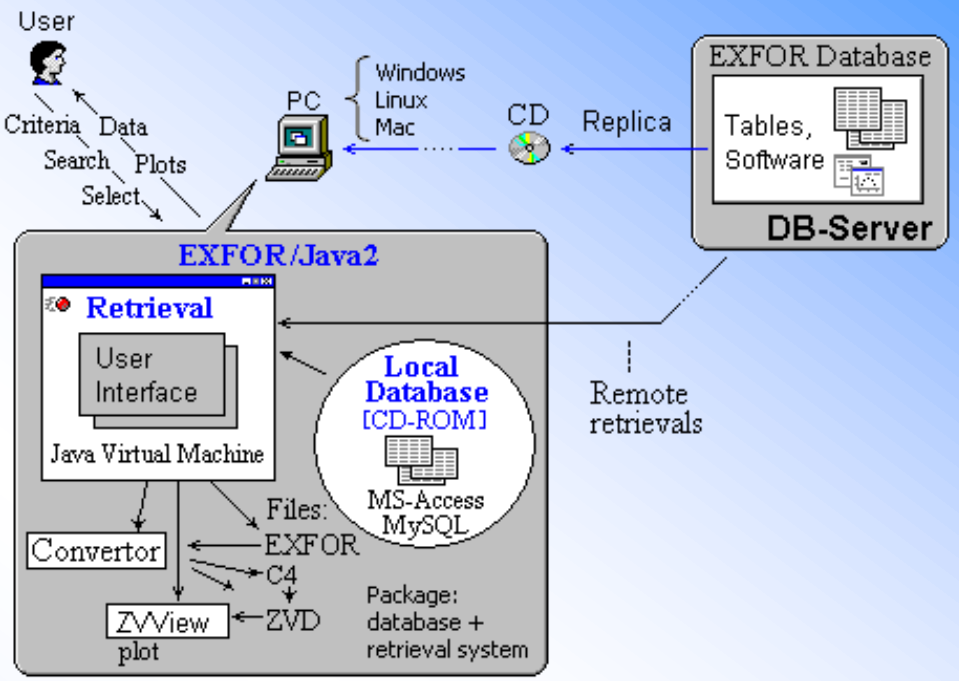
Archives: data for downloading; can be sent by post on CD/DVD to a user upon request.

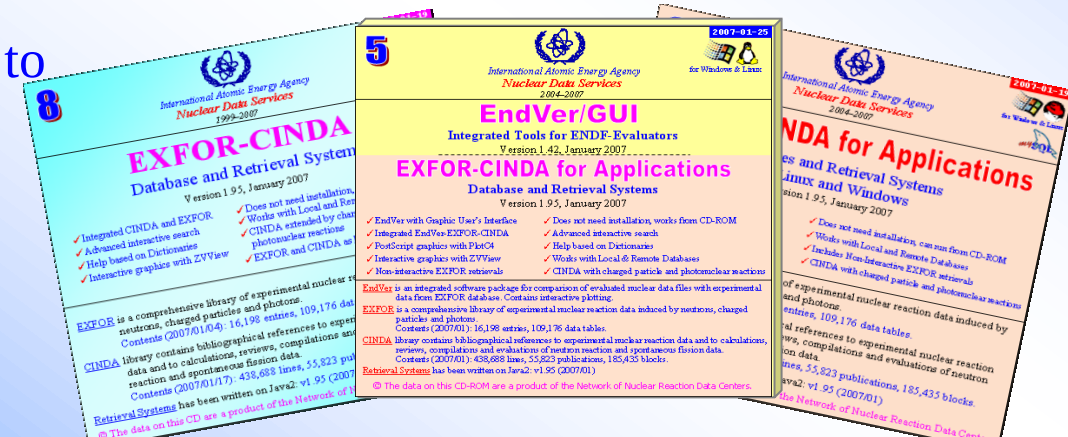
Basic principals of the IAEA-NDS nuclear data IT systems

- **Maximum of platform independency**
  - operating systems: Linux, Windows, Mac
  - relational databases (MySQL, Access, SyBase)
  - programming languages: C, Java, SQL, Javascript, Fortran
- **Free of charge components**
  - Apache, Tomcat, MySQL, Linux
- **Full integration of components**
  - no need for installation (can work from CD/DVD-ROM)
  - automatic configuration of Web-Servlets
  - encapsulated graphics

NDS CD-ROM Database Retrieval Systems

- Full database on your PC
  - For Windows, Linux and Mac
  - Does not need installation
  - Can run from CD-ROM (database server and Java JVM running from CD)
  - Can work with remote databases
  - Integrated EXFOR and CINDA
  - Help with Dictionaries
  - Advanced search (+users' SQL)
  - Interactive plotting with ZVView
  - EndVer/GUI with integrated PrePro and EXFOR
  - Includes non-interactive retrievals to build new user's applications
  - Used by Applications: Empire, EndVer, GANDR, expandable…

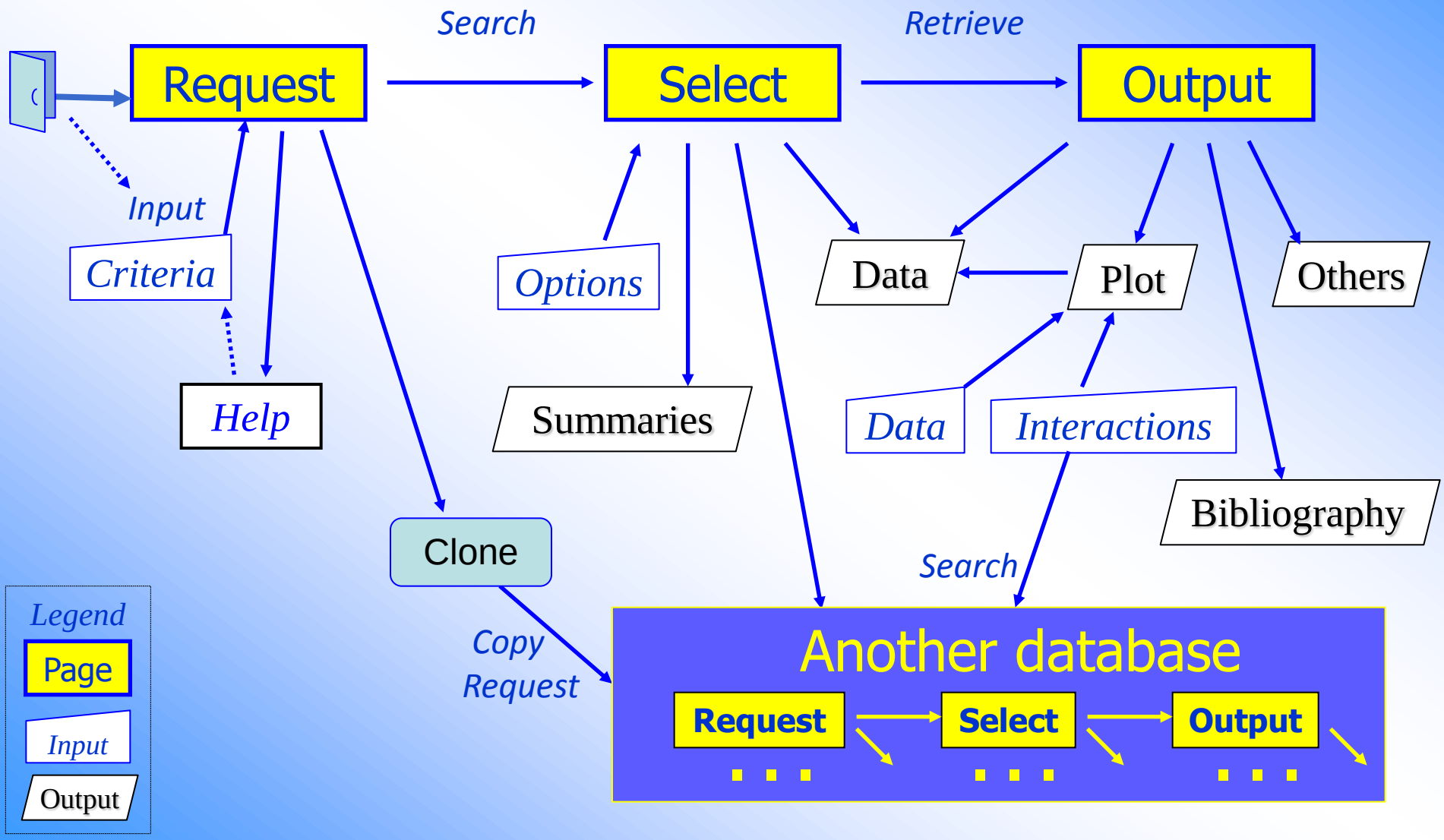




EXFOR-ENDF
Web Retrieval System

Web interface to EXFOR and ENDF databases.
Search, retrieve and process data by various programs.
Platform for integrating various software.

Data flow and 3 major steps user's interactions



EXFOR Request Page

Help » Manual PDF | Lexfor | NNDC-Help | Output | Plot+ | R33 Databases » ENDF | CINDA | IBANDL CD-ROM » EXFOR-CINDA | CD-Catalog

Experimental Nuclear Reaction Data (EXFOR)

Database Version of October 06, 2015

Software Version of 2015.10.23

News

2015/03 New. Inverting reaction data using detailed balance. Example: $^{13}C(\alpha,n)^{16}O \rightarrow {}^{16}O(n,\alpha)^{13}C$
2014/12 New. Text search in extended EXFOR [instructions/examples]
2014/07 New. Database of expert's corrections to EXFOR data on Web. Examples: Fe-54(n,p); Mn-55(n,2n), (n,g)
[History]

The EXFOR library contains an extensive compilation of experimental nuclear reaction data. Neutron reactions have been compiled systematically since the discovery of the neutron, while charged particle and photon reactions have been covered less extensively.
The library contains data from 21058 experiments (see statistics and recent updates).
EXFOR Reference Paper: Nucl. Data Sheets 120(2014)272

Use Help, Examples, Dynamic sections

Search: Go ?

Examples of requests: 1 2 3 4 5 6 7 ...
1 Cross section σ(E) More examples...

Request Submit Reset Help

Target Al-27 ?
Reaction n,tot
Quantity CS
Product Na-24
Energy from 0
Author(s) Green; S
Publication year 1970-20(
Accession # 10501*;
Extend
Keywor
Expert

13-Aluminium {Del} Element → Isotope [Disable me]
Al-25 Al-26 Al-26-G Al-27 Al-28 Al-CMP Al-OXI

Submit Reset

Options

Exclude superseded data
No reaction combinations (ratios,..)
Enhanced search of Products
only
-Help
publication
extended

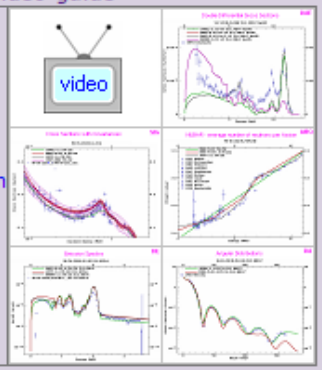
-Fields
User's Input
t:
CINDA ENDF

Tip of the day: video-guide

How-to video-guide
- Plot EXFOR-ENDF double differential cross-sections

Advanced plotting
- Cross sections
- Angular distribution
- Emission spectra
- Double differential
- NUBAR

Default
- Map



Note:
- all criteria are optional (selected by checking ☑)
- selected criteria are combined for search with logical AND
- criteria separated in a field by ";" are combined with logical OR
- criteria starting with "^" will be used as logical NOT
- wildcards (*) and intervals (..) are available

Statistics of usage: visits: 1685, data search: 2824, since 18-Dec-2014

Important: "Examples", "More examples..."

Examples of requests: 1 2 3 4 5 6 7 ...

Less examples...

1 Cross section σ(E)
2 Angular distributions dσ/dΩ
3 Emission spectra dσ/dEout
4 Double differential cross section d²σ/dΩ/dEout
5 Corrections data from EXFOR Ex.1 ZK1 ZK2 AT1 RC1
6 Search by outgoing particles: [α+γ] P,XG (P,XG),DA
6+ Search data for IBANDL: $^{12}C(\alpha,\alpha)^{12}C$, θ=167°
7 Enhanced search by product with filtering product coded as ELEM/MASS for quick plot
8 Search by wildcards in full reaction code
9 Ratios converted to cross sections (C4)
10 NUBAR: average number of neutrons per fission PR DL ^DL
11 Constructing a covariance matrix from EXFOR uncertainties
12 Extended listing of references (authors, title, DOI, NSR, Web)
13 EXFOR - CINDA sequential search N,F
14 Automatic re-normalization (output data and plots)
15 Find data: [digitized] from plots, [not digitized], [from table] [experimental data only] [not empty datasets] [empty]
16 Search by authors using aliases Ex.2
17 Fission spectra b Thick target neutron spectra
c Delayed neutrons d Kerma factor
18 Invert reaction using detailed balance $^{13}C(\alpha,n)^{16}O \rightarrow {}^{16}O(n,\alpha)^{13}C$

Examples fill in the form by parameters

Request Submit Reset Help

Target ☑	Al-27	?
Reaction ☑	n,tot	?
Quantity ☑	CS	?
Product ☐	Na-24	?
Energy from ☐ 0 to ☐ 20e6	eV	?
Author(s) ☐	Green; Shore; *man	?
Publication year ☐	1970-2002	?
Accession # ☐	10501*; 40244067; 41487	?

Extended

Options

- ☑ Exclude superseded data
- ☐ No reaction combinations (ratios,..)
- ☐ Enhanced search of Products
- ☐ Retrieve listing only
- ☐ Disable Prompt-Help

Sort by: ◉ reaction ○ publication
View: ○ basic ◉ extended

Ranges (Z,A)

Reaction Sub-Fields

Feedback and User's Input

Clone Request: CINDA ENDF

Tip of the day: video-guide

Submit

Search data in EXFOR-database

EXFOR Select Page

Retrieve: go to the next step

Request #2829
Results: Reactions: 9 Datasets: 141

Data Selection

Retrieve | Selected | Unselected | All | Reset

Output: X4+ EXFOR Bibliography TAB C4 PlotC4

Plot: Quick-plot (cross-sections only) Advanced plot [how-to] using C5 and convert ratios to σ

Narrow incident energy (optional) eV: Min: Max:

Apply(1A or and Plots)

Output options

Select Datasets

Search by Reaction

Go to NSR

Search by Author

Go to Web - journal

	n	Display	Year	Author-1	Energy range,eV		Points	Reference	Subentry#P	NSR-Key
	1)	13-AL-27(N,TOT),,SIG C4: MF3 MT1								
		Quantity: [CS] Cross section								
	1	+ Info X4+ X4± T4 Cov	2010	A.Matic+				+	02	
	2	+ Info X4+ X4± T4 Cov	2009	F.Atchison+	2.00e-7		1	+ J,NIM/A,608,144,2009	23102002	2009AT04
	3	+ Info X4+ X4± T4 Cov	2008	M.Mazari+	1.30e7	1.62e7	7		30037003	
*	4	+ Info X4+ X4± T4 Cov	1994	G.Rohr+	2.50e5	2.00e7	49709	+ C,94GATLIN,,215,199405	22331004	
	5	+ Info X4+ X4± T4 Cov	1993	R.W.Finlay+	5.29e6	6.00e8	474	+ J,PR/C,47,237,9301	13569008	1993FI01
g*	6	+ Info X4+ X4± T4 Cov	1993	W.Abfalterer+	5.00e6	7.00e6	514	+ J,PR/C,47,1033,1993	14184002	1993AB03
	7	+ Info X4+ X4± T4 Cov	1991	J.R.Morales+	1.76e7	1.98e7	2	+ J,NIM/A,300,312,1991	30764004	1991MO09
	8	+ Info X4+ X4± T4 Cov	1990	L.Koester+	1.97e3		1	+ J,ZP/A,337,341,1990	22217010	1990KO34
	9	+ Info X4+ X4± T4 Cov	1988	J.Franz+	1.60e8	5.75e8	22	+ J,NP/A,490,667,88	22117005	1988FR23
	10	+ Info X4+ X4± T4 Cov	1987	M.Ohkubo	9.84e3	9.35e5	1010	+ R,JAERI-M-86-193,1987	21926003	
	11	+ Info X4+ X4± T4 Cov			7.12e2	7.88e4	927		21926004	
	12	+ Info X4+ X4± T4 Cov	1981	V.E.Zhitarev+	2.05e-4	4.84e-4	8	+ J,AE,50,(5),350,198105	41323002	
	13	+ Info X4+ X4± T4 Cov	1980	D.C.Larson+	2.00e6	8.06e7	685	+ C,80BNL,,277,8007	12882005	
	14	+ Info X4+ X4± T4 Cov	1979	L.Koester+	1.26e0	5.19e0	2	+ J,ZP/A,292,(1),95,1979	21660015	1979KO26
	15	+ Info X4+ X4± T4 Cov	1977	R.B.Royer+	1.86e2		1	+ J,NIM,145,245,1977	12661004	1977RO35
	16	+ Info X4+ X4±					20	+ W,WAYMIRE,19761108	20671002	
	17	+ Info X4+ X4±					7	+ J,NP/B,92,269,197506	10403005	

Get data in various formats

EXFOR Output Page

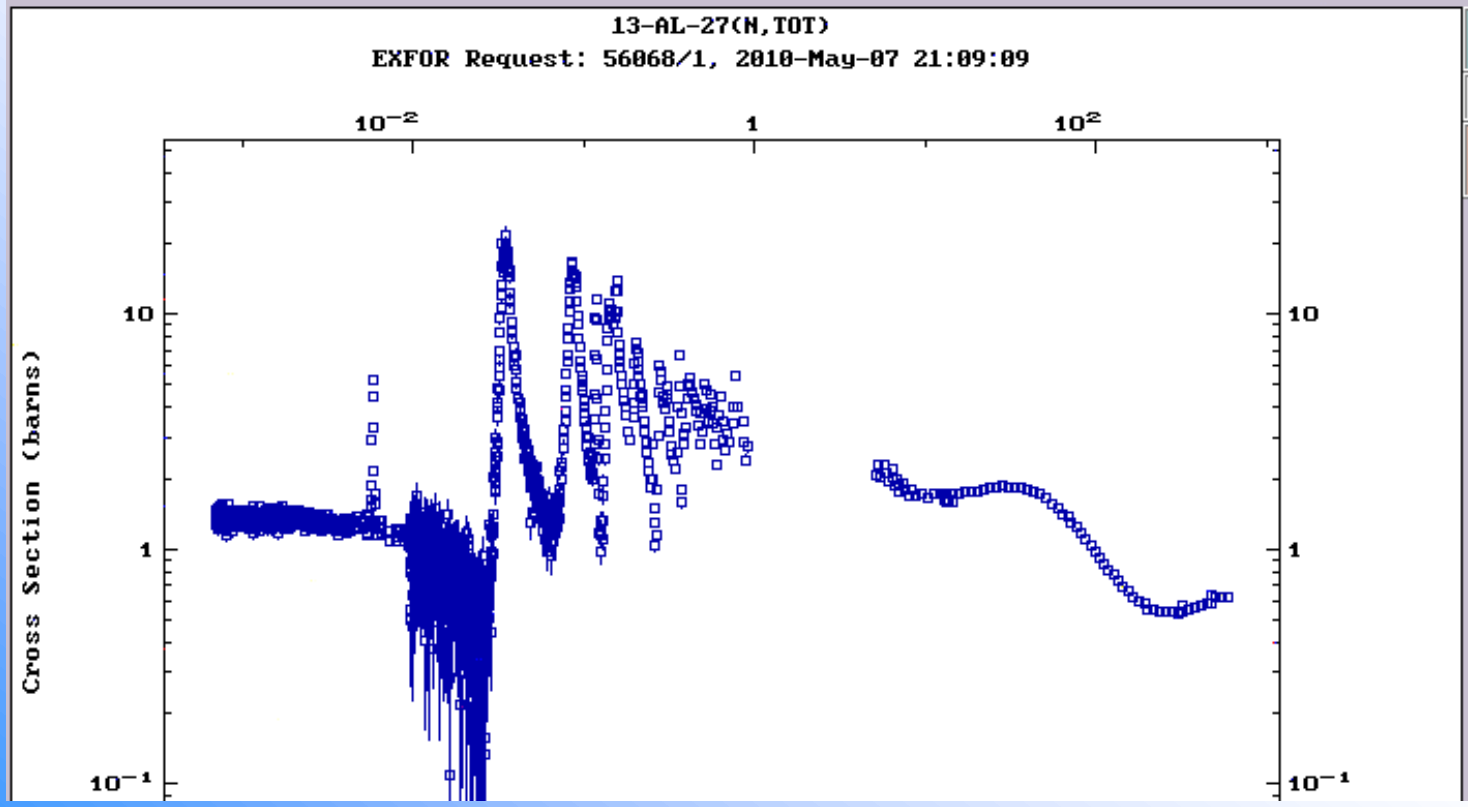
EXFOR Request #56068/1816

Output Data

Format	Data (Size)
EXFOR	Text (212Kb) ZIP (34Kb) Generate: X4±
Bibliography	html (15Kb) BibTeX (5Kb)
Computational	
C4	C4 (315Kb) C4.ZIP (23Kb) LST (99Kb)

Output data

Search similar evaluated data (go to ENDF)



ENDF Find and add to the plot evaluated data

1) 13-AL-27(N,TOT),,SIG

2) Use my data [example]

See: plotted data (194Kb)

Get plotted data

ENDF

Search "similar" data →

ENDF Select Page

Plot data

Request #2776

ENDF Data Selection (Plot for EXFOR Request #56068)

Retrieve | Plot | ◉ Selected ○ Unselected ○ All | Reset

Plotting options: ◉ Quick plot (cross-sections only: σ)

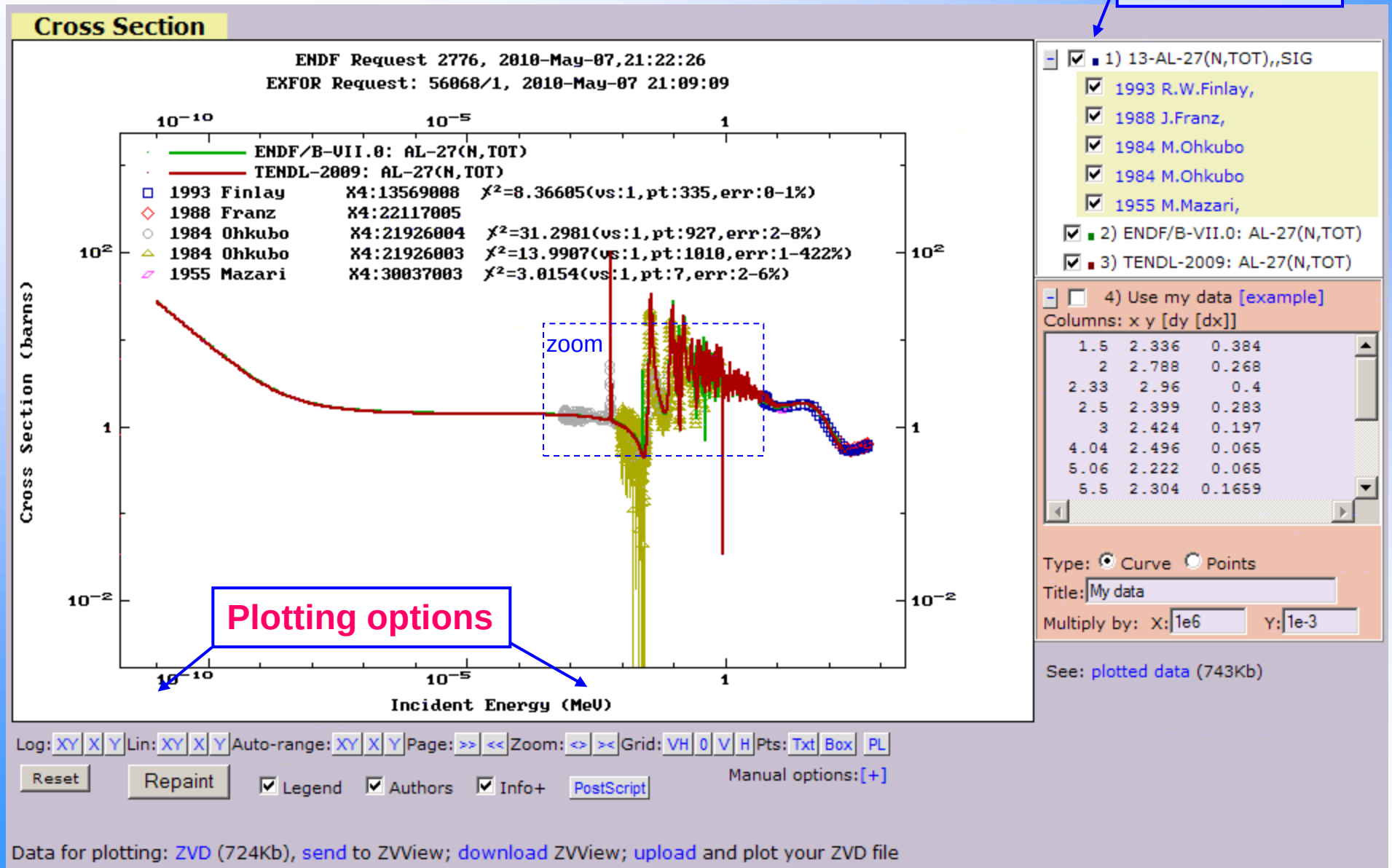
Sorted by: [Reactions] Reorder by: [Libraries] View: ◉ basic ○ extended

1) AL-27(N,TOT),SIG MT=1 MF=3 NSUB=10

MF3: [SIG] Cross sections MT1: [N,TOT] Neutron total cross sections.

1	☑	ENDF-6	Interpreted	σ	Plot	ENDF/B-VII.0	E=150MeV Lab=LANL,ORNL Date=DIST-DEC06	M.B.Chadwick+,Derrien+
2	☐	ENDF-6	Interpreted	σ	Plot	JEFF-3.1	E=150MeV Lab=LANL Date=090105	M.B.CHADWICK & P.G.YOUNG
3	☐	ENDF-6	Interpreted	σ	Plot	JENDL-3.3	E=20MeV Lab=TIT,JAERI Date=20010713	Y.HARIMA,H.KITAZAWA,T.FUKAHORI
4	☐	ENDF-6	Interpreted	σ	Plot	JENDL-3.3	E=20MeV Lab=TIT,JAERI Date=20010713 T=300	Y.HARIMA,H.KITAZAWA,T.FUKAHORI
5	☐	ENDF-6	Interpreted	σ	Plot	ENDF/B-VI	E=150MeV Lab=LANL Date=20011108	M.B.CHADWICK & P.G.YOUNG
6	☐	ENDF-6	Interpreted	σ	Plot	ENDF/B-VI	E=150MeV Lab=LANL Date=20010926 T=300	M.B.CHADWICK & P.G.YOUNG
7	☐	ENDF-6	Interpreted	σ	Plot	ROSFOND-2008	E=150MeV Lab=IPPE Date=DIST-DEC07	IGNATYUK A.V.
8	☐	ENDF-6	Interpreted	σ	Plot	ROSFOND-2010	E=150MeV Lab=IPPE Date=DIST-DEC07	IGNATYUK A.V.
9	☐	ENDF-6	Interpreted	σ	Plot	CENDL-3.1	E=20MeV Lab=CNDC,JNDC Date=DIST-DEC09	B.S.YU, S.CHIBA, Y.HARIMA
10	☐	ENDF-6	Interpreted	σ	Plot	JEF-2.2	Lab=ECN Date=920101	EC BLANKET TECHNOLOGY, TASK B2
11	☐	ENDF-6	Interpreted	σ	Plot	JEFF-3.0	E=150MeV Lab=LANL Date=DIST-APR02	M.B.CHADWICK & P.G.YOUNG
12	☐	ENDF-6	Interpreted	σ	Plot	JENDL/HE-2007	E=3000MeV Lab=SIT.SHIMZ Date=REV1-	K. Kosako
13	☐	ENDF-6	Interpreted	σ	Plot	JENDL/HE-2004	E=3000MeV Lab=KAERI Date=REV1-	Y. Lee
14	☐	ENDF-6	Interpreted	σ	Plot	FENDL/E-2.1	Lab=CDN-ENEA Date=EVAL-FEB97	FABBRI,MASETTI,ORSI,REFFO,TRKOV
15	☐	ENDF-6	Interpreted	σ	Plot	TENDL-2008	E=20MeV Lab=NRG Date=REV1-	A.J. Koning and D. Rochman
16	☑	ENDF-6	Interpreted	σ	Plot	TENDL-2009	E=200MeV Lab=NRG Date=REV1-	A.J. Koning and D. Rochman
17	☐	ENDF-6	Interpreted	σ	Plot	CENDL-2	Lab=CNDC/TIT Date=950817	B.YU, S.CHIBA, Y.HARIMA ET AL

ENDF Output Page: interactive plotting with Web ZVView



ENDF Request Page

Help » ENDF-6 Format | Plot+ Databases » Medical | NGAtlas | RIPL | FENDL | IRDF-2002 | IRDFF | EXFOR | CINDA

Evaluated Nuclear Data File (ENDF)

Database Version of September 02, 2015

Software Version of 2015.09.02 Old interface is [here]

News & History

2015/09 New libraries:
1) EPICS-2014: Electron and Photon Interaction Cross Sections, 2014 [page]
2015/04 New libraries:
1) TENDL-2014: TALYS-based Evaluated Nuclear Data Library, 2014 [page]
2) FENDL-3.0 Fusion Evaluated Nuclear Data Library, 2015 [page]

Core nuclear reaction database contain recommended, evaluated cross sections, spectra, angular distributions, fission product yields, photo-atomic and thermal scattering law data, with emphasis on neutron induced reactions. The data were analyzed by experienced nuclear physicists to produce recommended libraries for one of the national nuclear data projects (USA, Europe, Japan, Russia and China). All data are stored in the internationally-adopted ENDF-6 format maintained by CSEWG. See database summary [here].

Standard Request

Examples: 1 2 3 4 5 6 7 Go to: Advanced Request; ENDF-Explorer

Examples of requests:
1 Cross section: MF3
2 Angular distributions: MF4
3 Energy distributions of secondary particles: MF5
4 Product energy-angle distributions: MF6
5 Cross sections for production of radioactive elements: MF10
6 Search for production cross section (includes MF6/MT5/Law=0)
7 Covariances of neutron cross sections: MF33
8 Covariances for production of radioactive nuclei: MF40
9 Covariances for energy distributions of secondary particles: MF35

Libraries: All Selected Check Reset

Major Libraries
1) ENDF/B-VII.1 (USA,2011)
2) JEFF-3.2 (Europe,2014)
3) JENDL-4.0u2 (Japan,2012)
4) CENDL-3.1 (China,2009)
5) ROSFOND-2010 (Russia,2010)
6) BROND-2.2 (Russia,1992)

Special Libraries
Archival
Derived

Tip of the day

Submit Reset

Parameters:

Target Fe-54 »
Reaction n,el »
Quantity da »

More Parameters...

Submit

Options:

Sort by: Reactions Evaluations

Clone Request: EXFOR CINDA

Feedback: Comments/Questions?

Note:
- all criteria are optional (selected by checking)
- selected criteria are combined for search with logical AND
- criteria separated in a field by ";" are combined with logical OR
- wildcards and intervals are available
- pointwise libraries contain reconstructed resonances using parameters from MF=2 and applied Doppler broadening at a given temperature.

Submit

Search data in ENDF-database →

ENDF Select Page

Request #24

ENDF Data Selection

Retrieve | Plot | Selected | Unselected | All | Reset

Plotting options: Universal plot (σ±Δσ, dσ/dΩ, dσ/dE, d²σ/dE/dΩ) *beta version*

Sorted by: [Reactions] Reorder by: [Libraries] View: basic extended: get MAT, PEN, GND, run Inter: resonance integrals, etc.

1) FE-54(N,EL),DA MT=2 MF=4 NSUB=10

MF4: [DA] Angular distributions of secondary particles MT2: [N,EL] Elastic scattering cross section for incident particles

1	ENDF-6	Interpreted	Plot	ENDF/B-VII.1	E=150MeV Lab=LANL,ORNL Date=20111222	M.B.Chadwick,P.G.Young,D.Hetrick
2	ENDF-6	Interpreted	Plot	ENDF/B-VII.0	E=150MeV Lab=LANL,ORNL Date=20011108	M.B.Chadwick,P.G.Young,D.Hetrick
3	ENDF-6	Interpreted	Plot	JEFF-3.2	E=200MeV Lab=NRG Date=090105	A.J. Koning
4	ENDF-6	Interpreted	Plot	JEFF-3.1.2	E=200MeV Lab=NRG Date=090105	A.J. Koning
5	ENDF-6	Interpreted	Plot	JEFF-3.1	E=200MeV Lab=NRG Date=090105	A.J. Koning
6	ENDF-6	Interpreted	Plot	JENDL-4.0	E=20MeV Lab=JNDC Date=20090904	S.IIJIMA,H.YAMAKOSHI

Single plot

Get ENDF-6 Section

Get Interpreted ENDF-6 Section (endf2htm, by MacFarlane)

Extended view

Sorted by: [Reactions] Reorder by: [Libraries] View: basic extended: get MAT, PEN, GND, run Inter: resonance integrals,

1) FE-54(N,EL),DA MT=2 MF=4 NSUB=10

MF4: [DA] Angular distributions of secondary particles MT2: [N,EL] Elastic scattering cross section for incident particles

1	MAT	GND	PEN	Inter	Info	Summary	ENDF-6	Interpreted	Plot	ENDF/B-VII.1	E=150MeV Lab=LANL,ORNL Date=20111222
2	MAT	GND	PEN	Inter	Info	Summary	ENDF-6	Interpreted	Plot	ENDF/B-VII.0	E=150MeV Lab=LANL,ORNL Date=20011108
3	MAT	GND	PEN	Inter	Info	Summary	ENDF-6	Interpreted	Plot	JEFF-3.2	E=200MeV Lab=NRG Date=090105
4	MAT	GND	PEN	Inter	Info	Summary	ENDF-6	Interpreted	Plot	JEFF-3.1.2	E=200MeV Lab=NRG Date=090105

Get MAT file

Produce XML files

Run program Inter

Get PEN file: reconstructed resonances with applied Doppler broadening at the room temperature

Plot

Retrieve data from ENDF-database →

ENDF Output Page

ENDF Request #31 (15)

Output Data

Format	*Data (Size)*
ENDF	Text (312Kb) ZIP (81Kb)

. .

Extended Plotting:

Step 1. Check/select data for plotting...

#	*Library*	*Nuclide*	*Prepare...*	*Status*	**Prepared data*
1) ☑	ENDF/B-VII.1	FE-54 id=57355		-Ready-	PEN (17Mb) LST
2) ☑	JEFF-3.2	FE-54 id=96397		-Ready-	PEN (48Mb) LST

*PEN: Processed evaluated data suitable for plotting - pointwise, 293K; made using PREPRO codes

Step 2. Go to plotting...

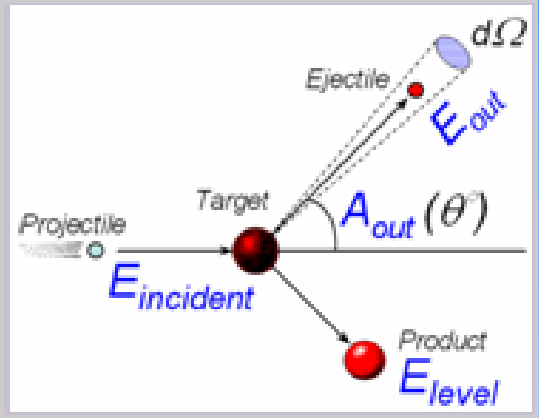
Go to plot	*Quantity type*	*MF#*	*#Plots*
dσ/dΩ (θ)	Differential data with respect to angle	MF4	460

Or EXFOR **Search/select/add experimental data to the plot...**

dσ/dΩ(θ) *Filtering data* → **Select datasets for plotting**

ENDF-Request #31

Advanced Plotting



Plot Selected Reset

Libraries:

- [x] ENDF/B-VII.1:FE-54 (EvalID=57355)
- [x] JEFF-3.2:FE-54 (EvalID=96397)

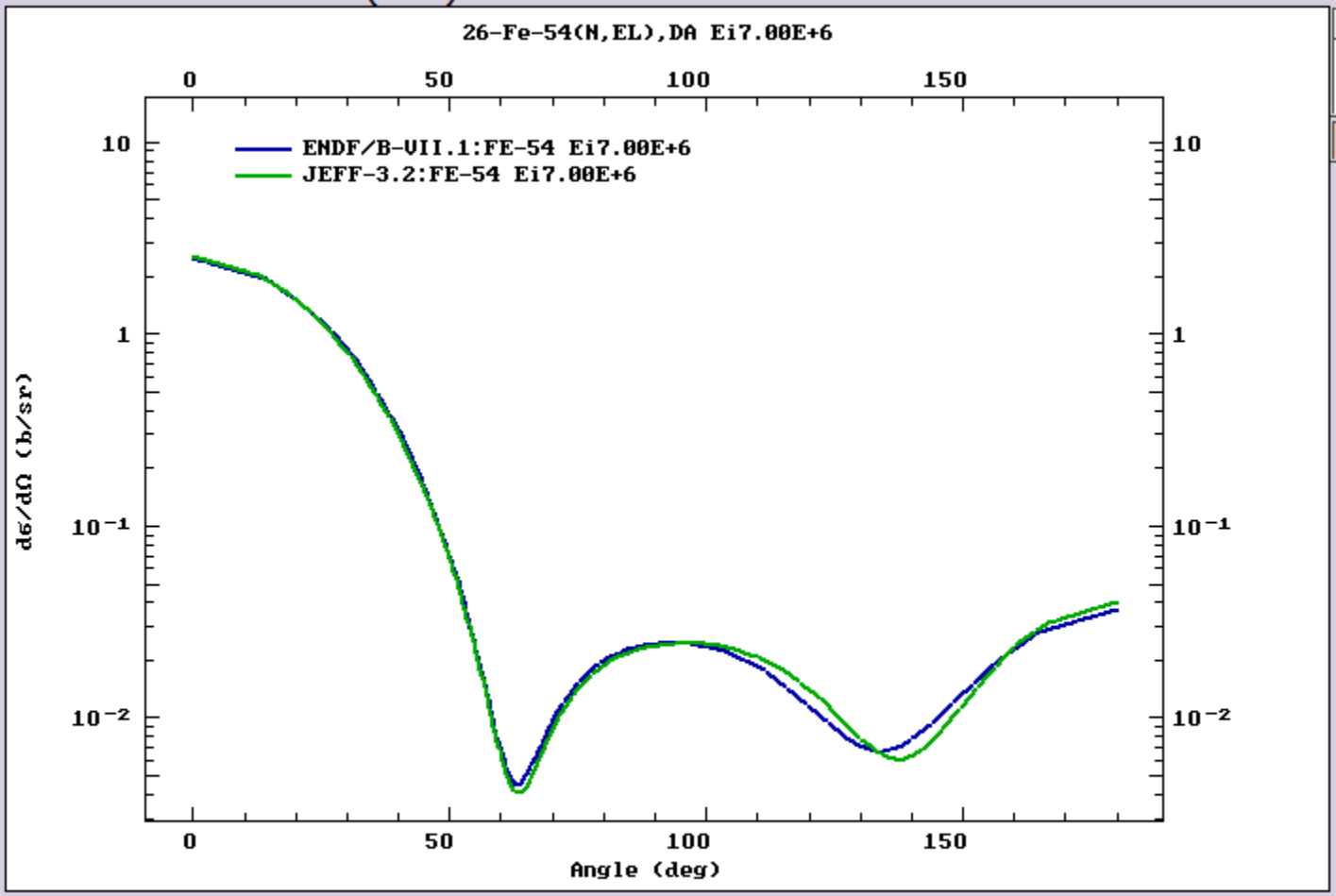
Differential data with respect to angle: MF4: dσ/dΩ (θ)

#	Index (plot)	Exp. points	E-Inc (eV)	Ang-Out (deg.)	ELv/E-Out (eV)	Target	Target ZA	Projectile ZA	Product ZA	Quantity (MF)	Reaction (MT)
FE-54(N,EL)FE-54-L0,DA											
1	☐ 1	0	1.000E-5			Fe-54	26054	1	1	4	2
2	☐ 3	0	2.530E-2			Fe-54	26054	1	1	4	2
3	☐ 4	0	1.000E+0			Fe-54	26054	1	1	4	2
4	☐ 5	0	2.000E+2			Fe-54	26054	1	1	4	2
5	☐ 6	0	1.000E+3			Fe-54	26054	1	1	4	2
6	☐ 7	0	2.000E+3			Fe-54	26054	1	1	4	2
7	☐ 8	0	5.000E+3			Fe-54	26054	1	1	4	2
8	☐ 9	0	1.000E+4			Fe-54	26054	1	1	4	2
9	☐ 10	0	2.000E+4			Fe-54	26054	1	1	4	2
10	☐ 11	0	4.581E+4			Fe-54	26054	1	1	4	2
11	☐ 12	0	4.669E+4			Fe-54	26054	1	1	4	2

Plot dataset of angular distributions

EXFOR-Request #-1 ENDF-Request #31

Selected Plots: #404(405)



Select data for plotting [all] [none]

1) ENDF/B-VII.1:FE-54 Ei7.00E+6

2) JEFF-3.2:FE-54 Ei7.00E+6

3) Use my data [example]

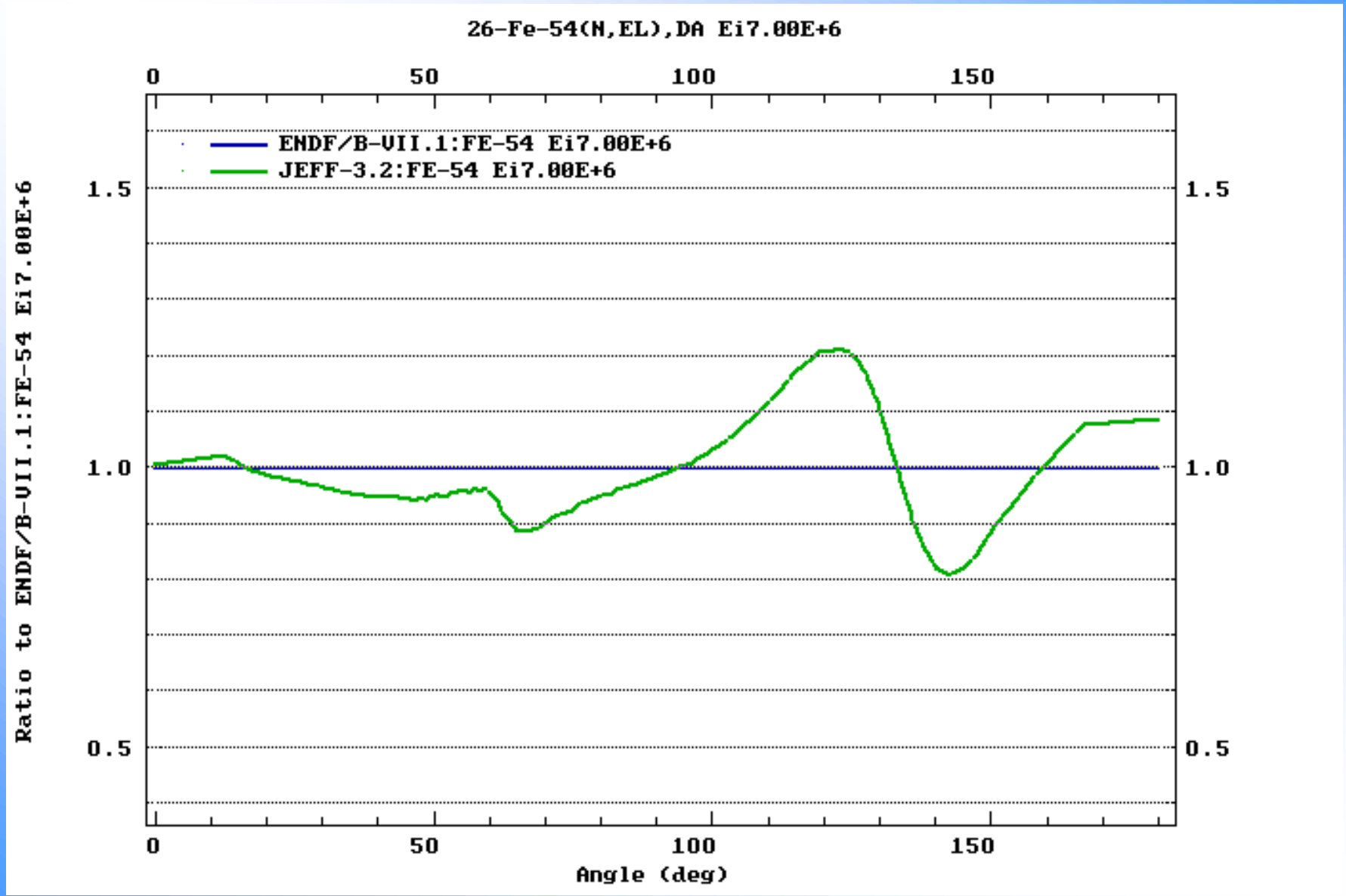
See: plotted data (5Kb)

Log: XY | X | Y Lin: XY | X | Y Auto-range: XY | X | Y Page: >> | << Zoom: <> | >< Grid: VH | 0 | V | H Pts: Txt | Box | PL | Print

Reset | Repaint | Legend | Authors | Info+ | PostScript | Manual options:[+] | Clipboard: Copy

Shift legend:x=0 y=0 Split:0 1:xy;2:y Plot data or ratio:0 0:data; 1:ratio to dataset-1; 2:ratio to 2-nd, etc.

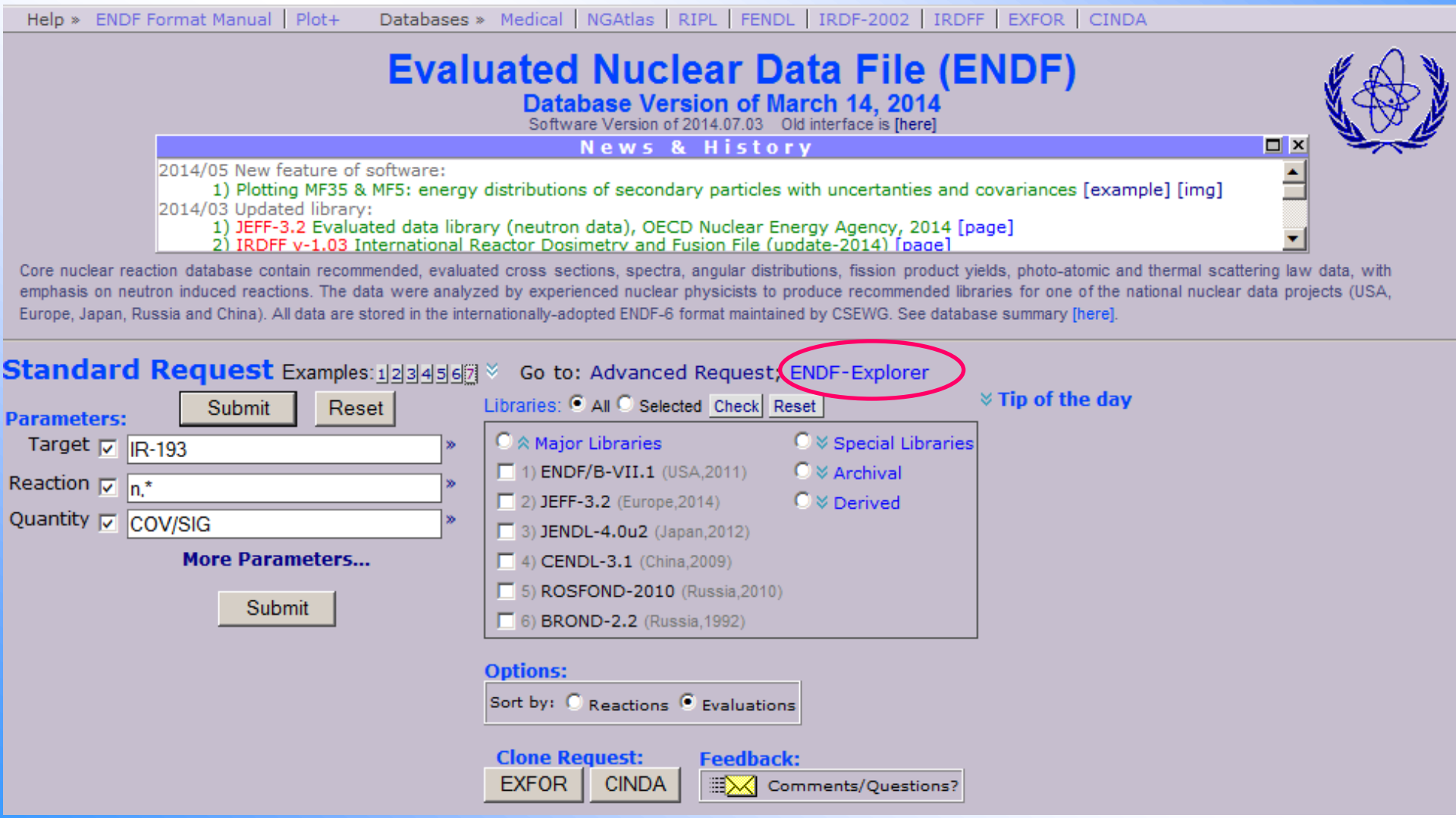
Plotting ratios to selected data



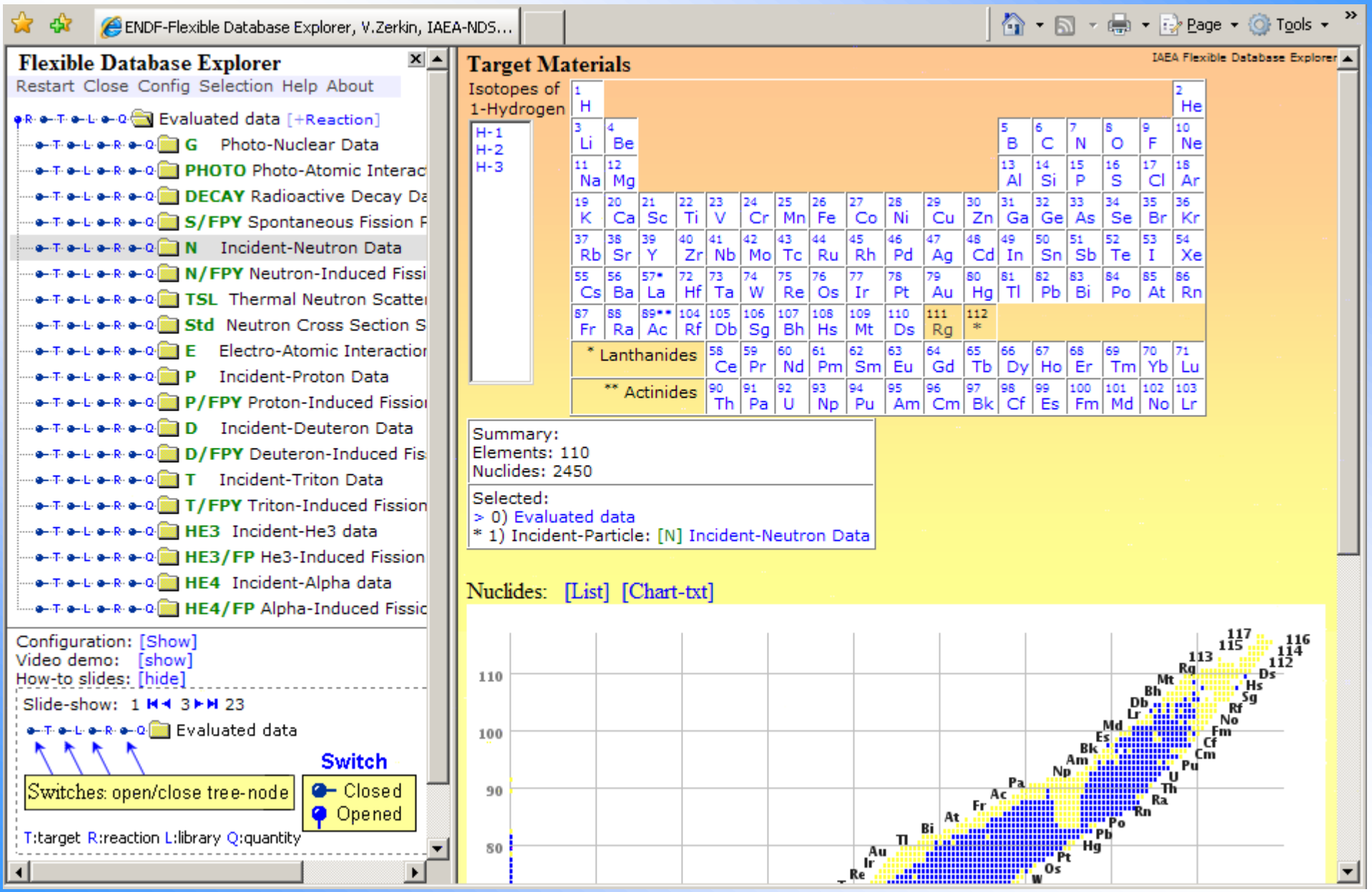
ENDF Request. Alternative search

Direct data search: fill in a form and submit request

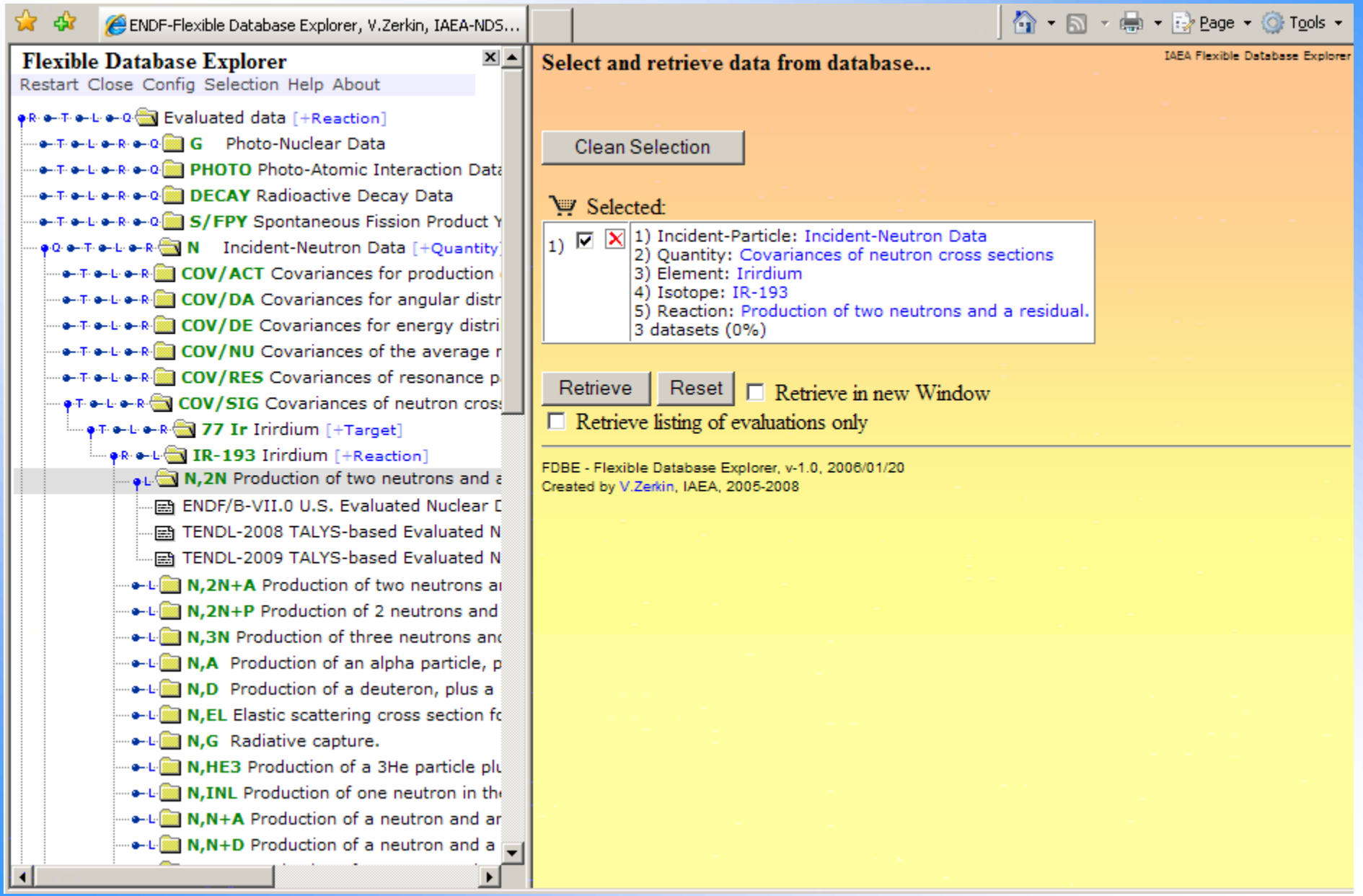
Sequential data search: travel on a database tree /ENDF-Explorer/



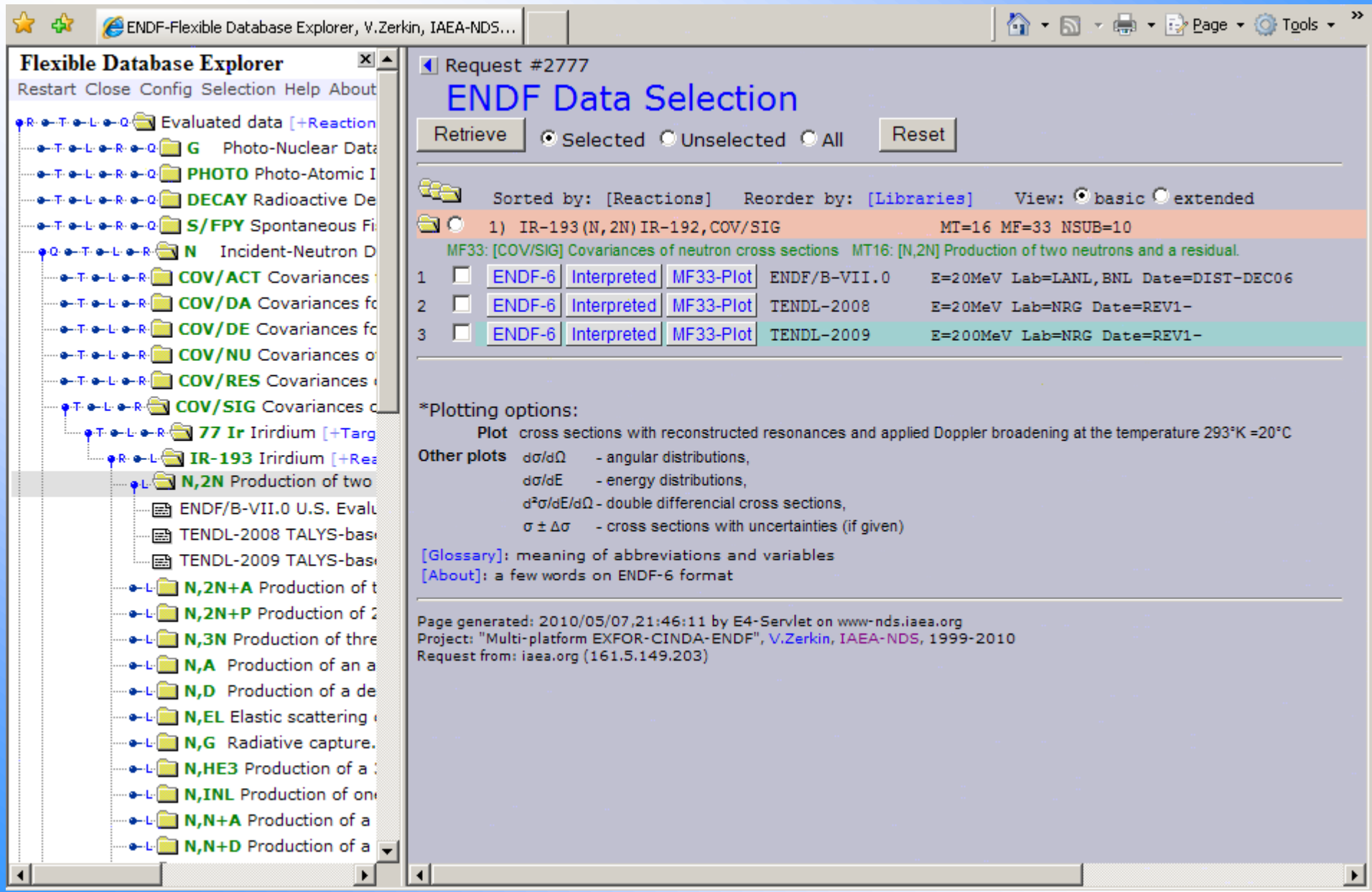
ENDF Flexible Database Explorer



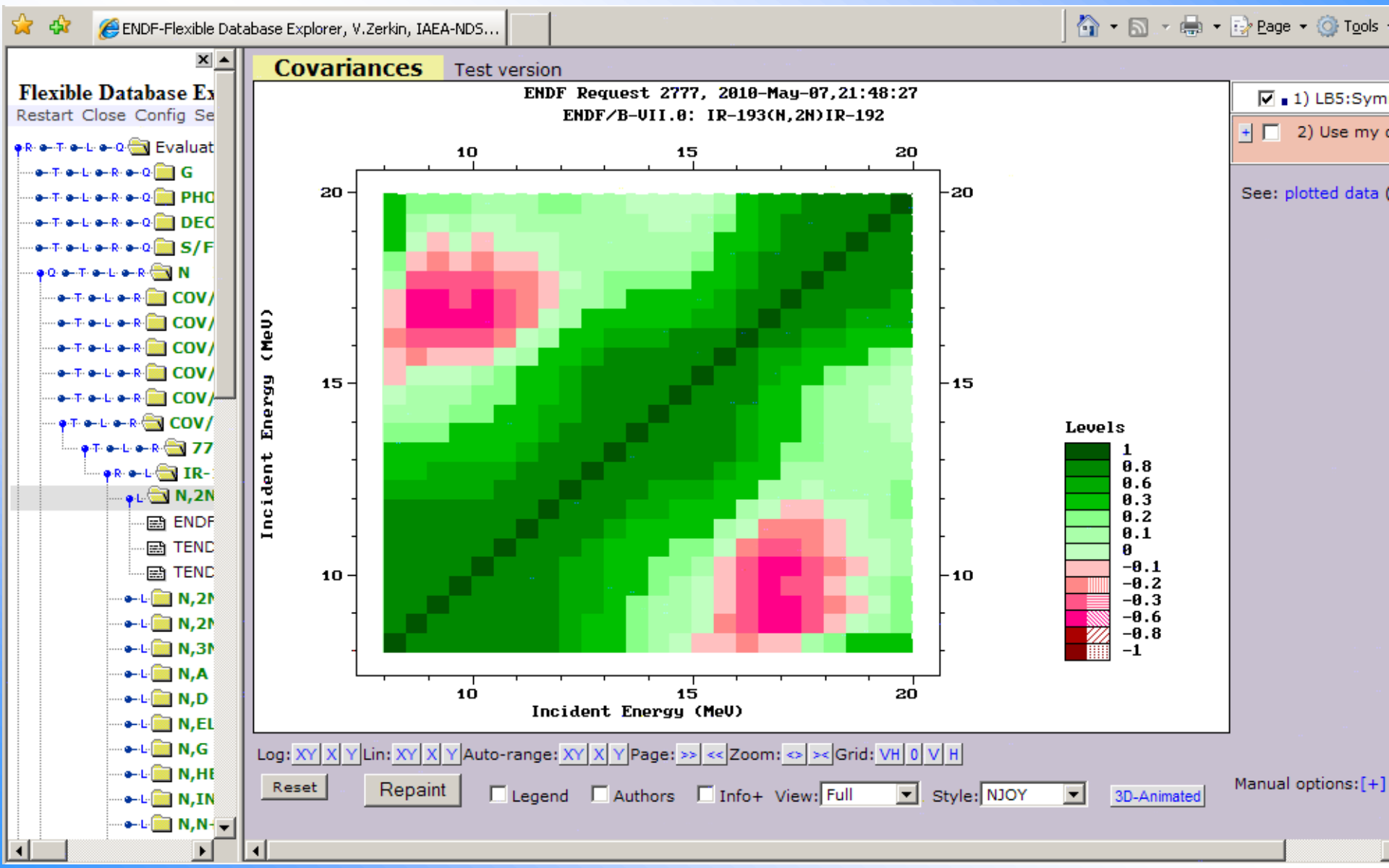
ENDF Explorer: data found



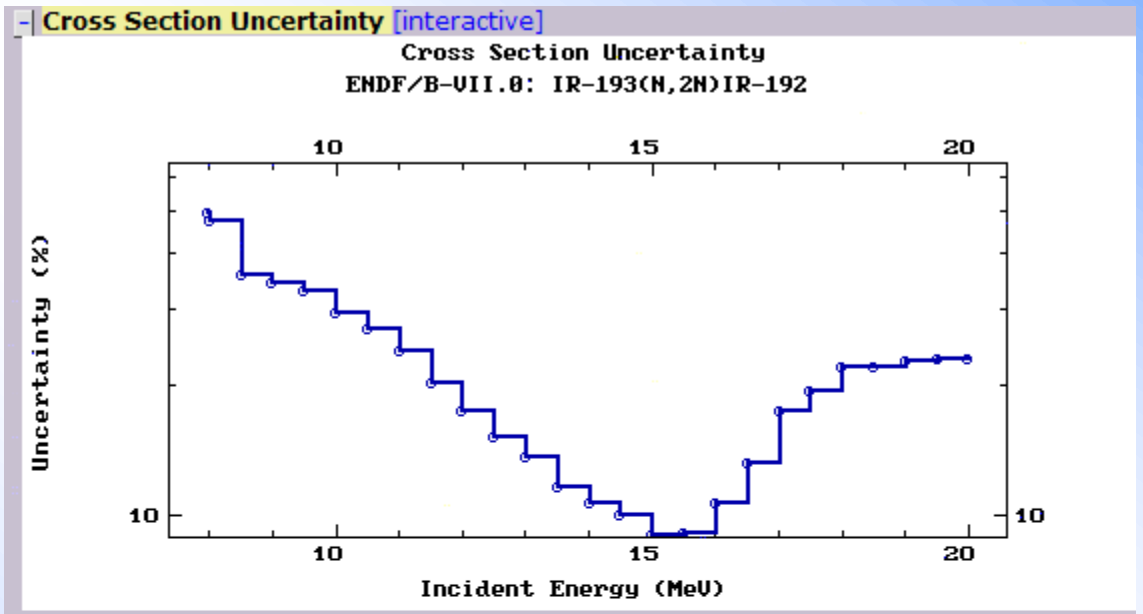
Coming to standard ENDF Select Page

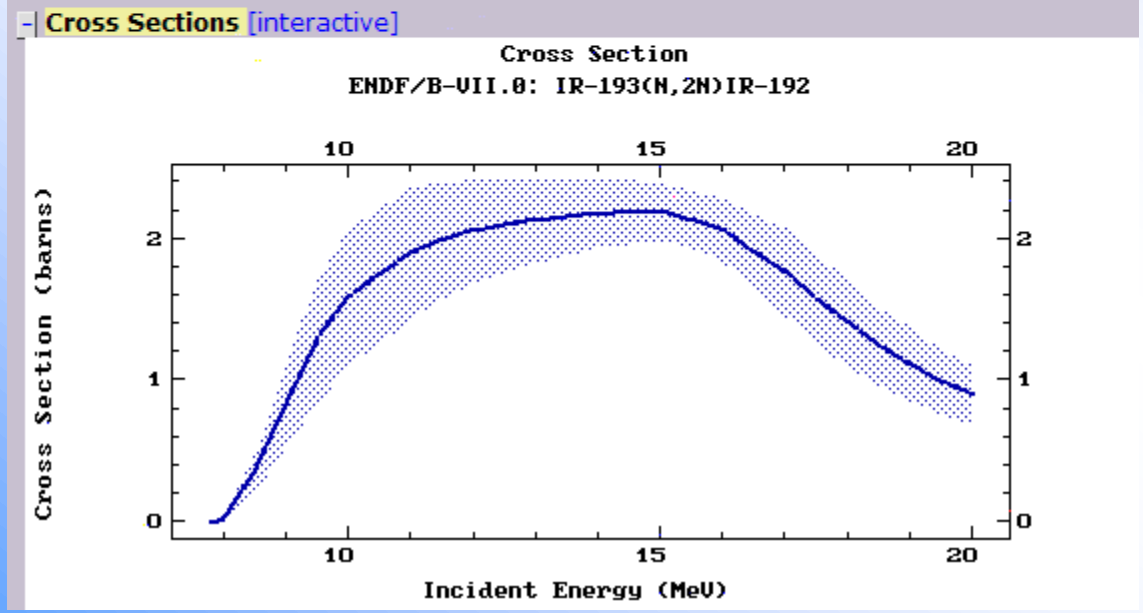


Again ENDF Output Page with interactive ZVView plotting



Display Cross Sections and Uncertainties





Correlation matrix

#ZVView-data-copy: 7-May-2010 22:13:17

#

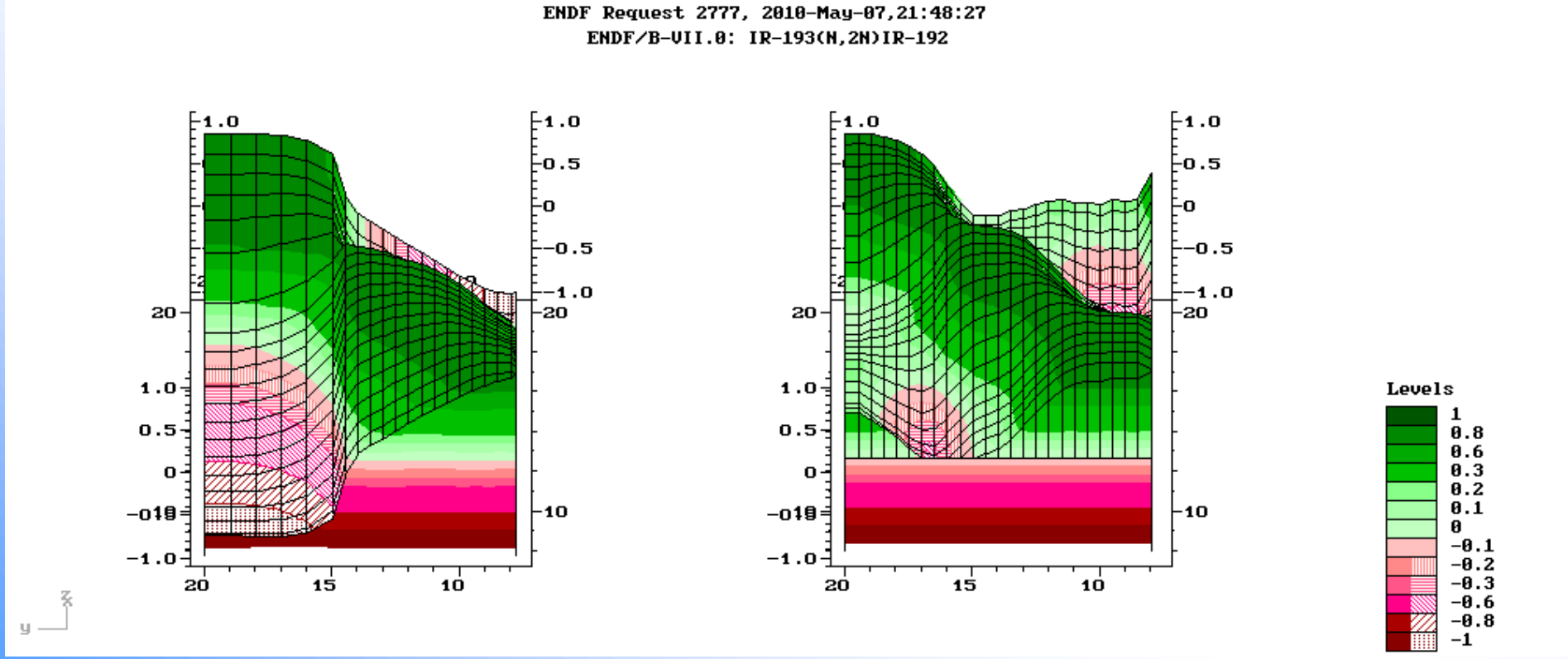
#LB5:Symmetric Matrix

Z(26x26): $Z_{i,j} = Cor(\sigma_{Xi},\sigma_{Yj})*1000$

	X (MeV)																				
Y (MeV)	7.992	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15	15.5	16	16.5	17	17.
7.992	1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	1000	930.6	920.5	926.4	898.3	895.5	866.7	805.2	679.6	529.7	352.7	210.1	101.7	52	-17.93	-85.39	-125.4	-97.66	-12.27	102
8.5	0	930.6	1000	999.4	998.7	992	980.3	943.8	866.1	730	583.1	404.7	257.4	156.3	107.4	27.05	-112	-269.4	-344.3	-309.5	-21
9	0	920.5	999.4	1000	999.4	995.4	984.9	950.7	875.7	743.4	600.1	424.6	278.7	179	130.3	49.66	-93.97	-260.9	-346.6	-318.8	-23
9.5	0	926.4	998.7	999.4	1000	996.5	989	959.1	889.9	763.2	623.2	450.2	305.7	205.7	156.7	76.36	-64.34	-228.8	-315.5	-289.6	-20
10	0	898.3	992	995.4	996.5	1000	996	973.3	912.2	796.1	666	500.7	360	263.3	214.3	133.4	-17.89	-205.1	-318.8	-310.8	-23
10.5	0	895.5	980.3	984.9	989	996	1000	989.8	944.9	846.1	727.6	571.9	436.3	340.7	291.4	211.4	64.16	-124.1	-248.4	-251.3	-18
11	0	866.7	943.8	950.7	959.1	973.3	989.8	1000	981.8	912.9	816.6	679.8	555.3	464.3	415.4	338.2	196.2	2.736	-143.1	-167.2	-12
11.5	0	805.2	866.1	875.7	889.9	912.2	944.9	981.8	1000	973.5	909.6	802.9	697.6	615.5	569.6	498.9	370.6	179.7	12.5	-37.4	-15
12	0	679.6	730	743.4	763.2	796.1	846.1	912.9	973.5	1000	980	916.6	840.9	775.5	736.4	677	566.6	378.6	184.9	101.2	89.
12.5	0	529.7	583.1	600.1	623.2	666	727.6	816.6	909.6	980	1000	977.7	931.2	884.7	854	806.6	710	521.5	303.1	188.5	145
13	0	352.7	404.7	424.6	450.2	500.7	571.9	679.8	802.9	916.6	977.7	1000	986.9	962.5	942.9	910.7	834.6	656.1	423	282.1	209
13.5	0	210.1	257.4	278.7	305.7	360	436.3	555.3	697.6	840.9	931.2	986.9	1000	993.3	983.2	964.1	907.5	744	508.5	352.6	260
14	0	101.7	156.3	179	205.7	263.3	340.7	464.3	615.5	775.5	884.7	962.5	993.3	1000	997.2	987.1	939.2	779.5	538.1	370.7	265
14.5	0	52	107.4	130.3	156.7	214.3	291.4	415.4	569.6	736.4	854	942.9	983.2	997.2	1000	995.7	955.3	801.6	561.7	391.1	280
15	0	-17.93	27.05	49.66	76.36	133.4	211.4	338.2	498.9	677	806.6	910.7	964.1	987.1	995.7	1000	974.7	838.5	608.2	436.4	320
15.5	0	-85.39	-112	-93.97	-64.34	-17.89	64.16	196.2	370.6	566.6	710	834.6	907.5	939.2	955.3	974.7	1000	938.2	766.4	616.6	504
16	0	-125.4	-269.4	-260.9	-228.8	-205.1	-124.1	2.736	179.7	378.6	521.5	656.1	744	779.5	801.6	838.5	938.2	1000	940.4	846	757
16.5	0	-97.66	-344.3	-346.6	-315.5	-318.8	-248.4	-143.1	12.5	184.9	303.1	423	508.5	538.1	561.7	608.2	766.4	940.4	1000	975.3	925
17	0	-12.27	-309.5	-318.8	-289.6	-310.8	-251.3	-167.2	-37.4	101.2	188.5	282.1	352.6	370.7	391.1	436.4	616.6	846	975.3	1000	985
17.5	0	102.2	-218.3	-231.9	-204.5	-237.7	-187.3	-121.3	-15.88	89.5	145.9	209.9	260.8	265	280.8	320.3	504	757	925.6	985	100
18	0	232.8	-97.99	-115	-89.67	-132.7	-91.32	-43.15	37.07	107.8	132.1	163.8	192	180.9	191.1	221.6	399.2	660.3	855	943.2	985
18.5	0	340.4	11.1	-7.856	15.59	-33.54	0.5162	34.56	94.08	136.6	134.9	139.9	148.8	125.4	130.9	153.2	320.2	577.8	784.5	891.4	954
19	0	437.7	118.1	98.15	119.9	67.18	95.14	117.5	159.2	177.2	153.3	134.5	125.5	91.08	92.11	106.2	258.6	504.7	713.4	832.6	912
19.5	0	531.8	225.4	204.6	224.2	168.1	189.1	198.8	221.2	213.4	166.6	123.4	96.14	50.83	47.22	52.25	188	419.2	628.5	759.1	854
20	0	531.8	225.4	204.6	224.2	168.1	189.1	198.8	221.2	213.4	166.6	123.4	96.14	50.83	47.22	52.25	188	419.2	628.5	759.1	854
i	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

IR-193(n,2n)IR-192

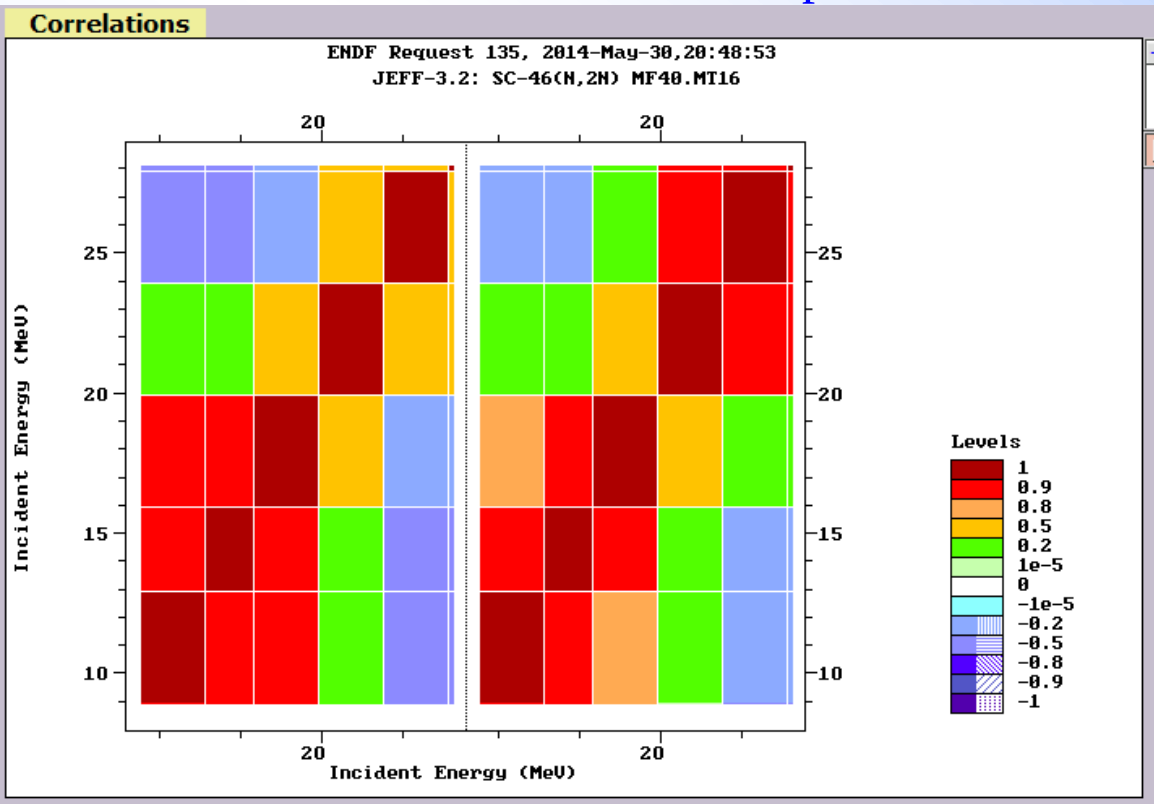
TENDL-2008 vs. ENDF-B/VII.0



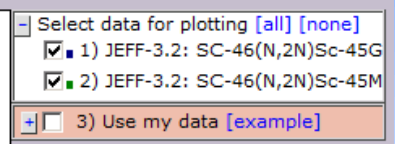
ENDF covariance data: MF33, 35, 40

Web plotting MF40 /MF10.

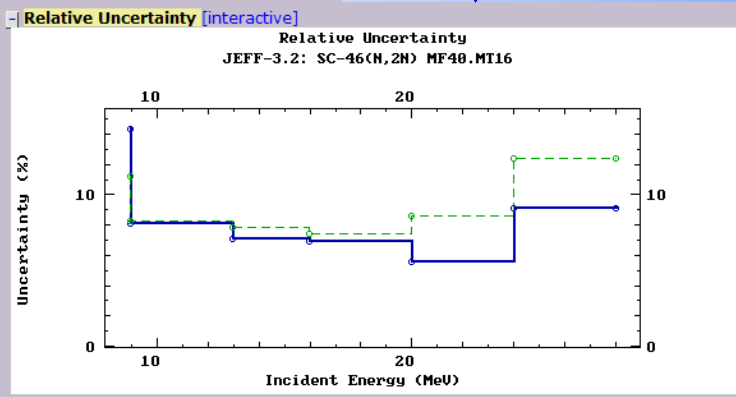
MF40: covariances for production of radioactive nuclei

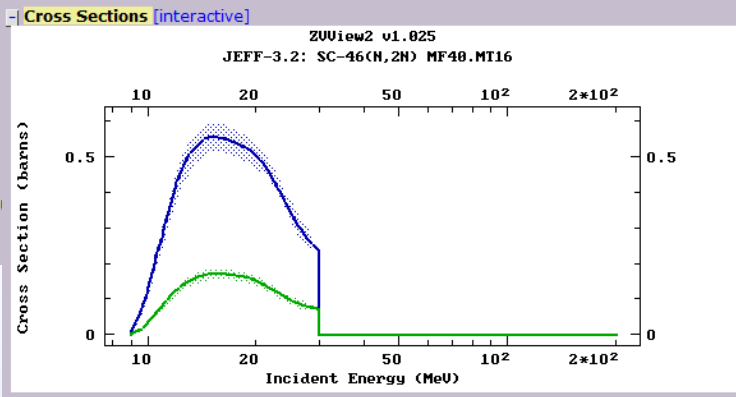


MF40: correlations and covariances

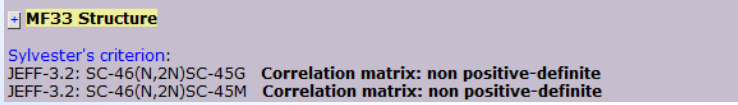


Relative uncertainties

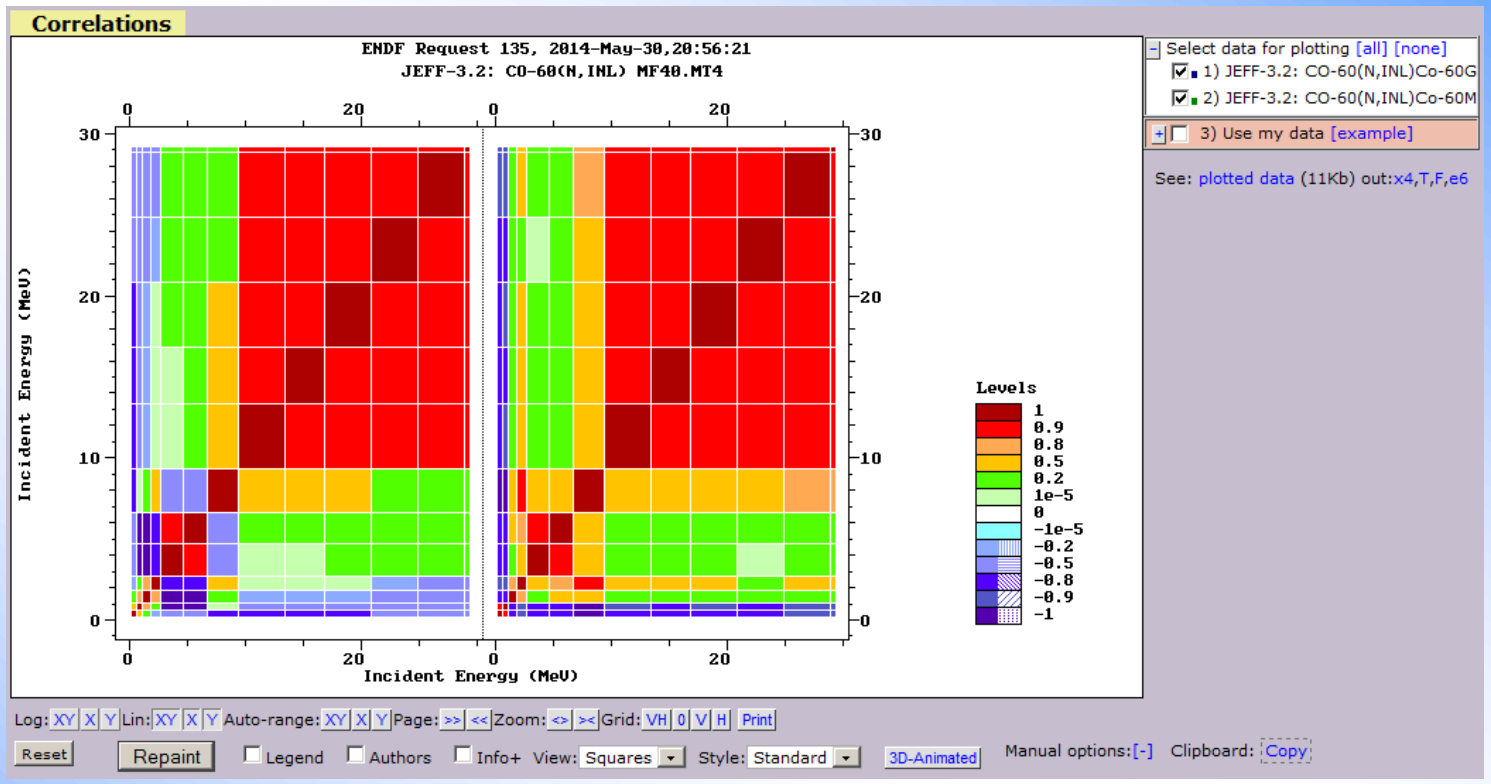


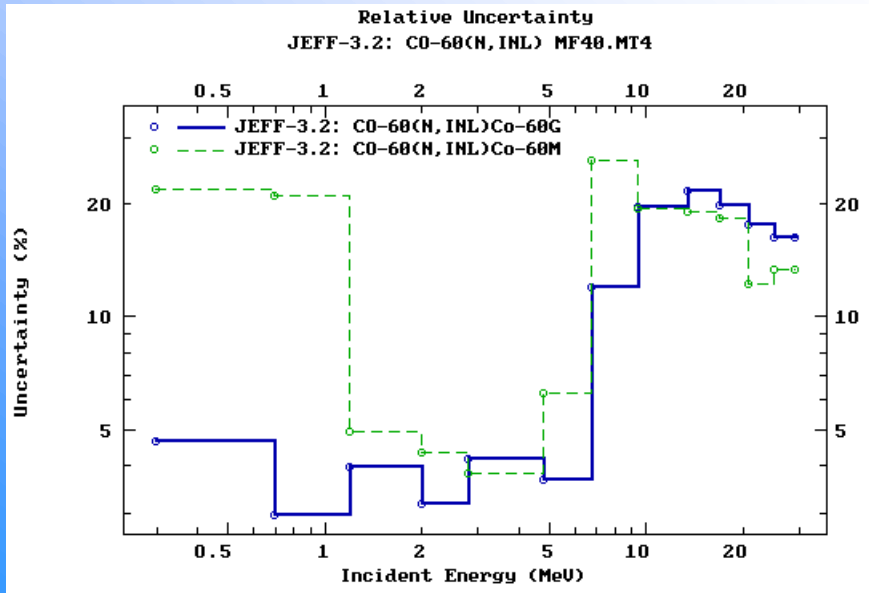


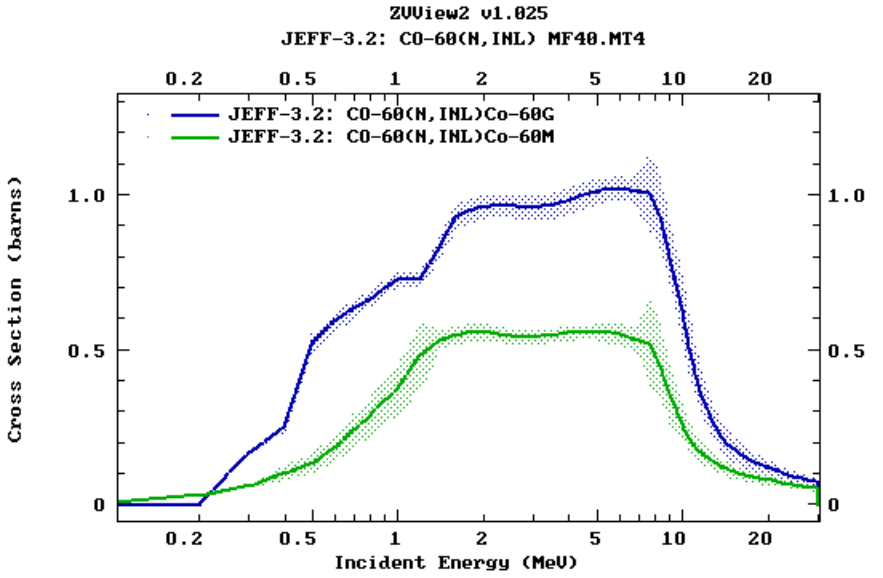
Cross sections with uncertainties



Web plotting MF40/MF10

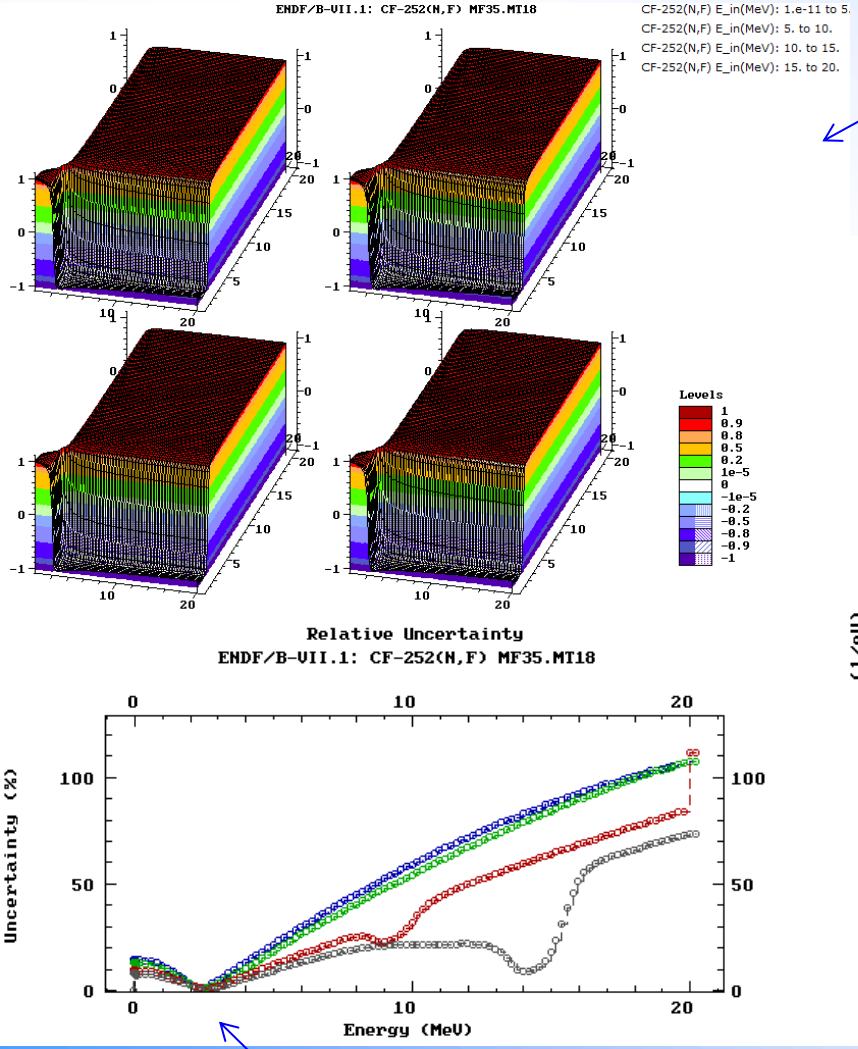






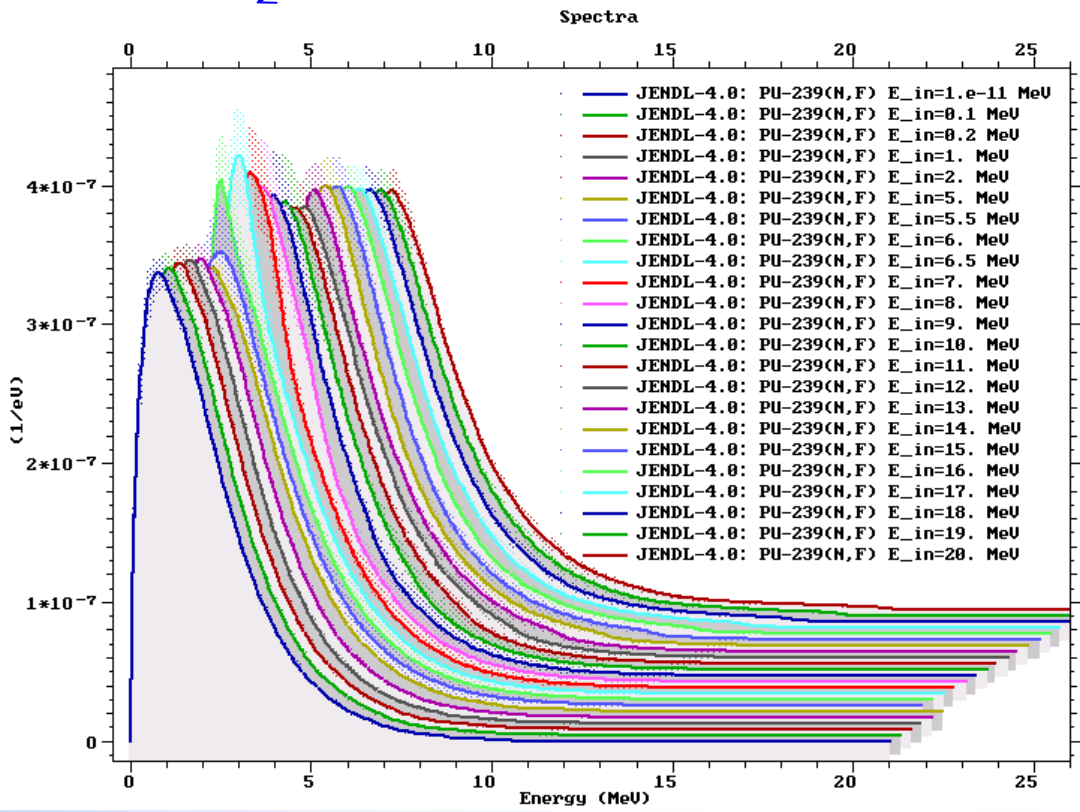
Web plotting MF35/MF5

MF35: covariances for energy distributions of secondary particles



MF35: correlations, covariances

MF5: spectra with uncertainties



Relative uncertainties

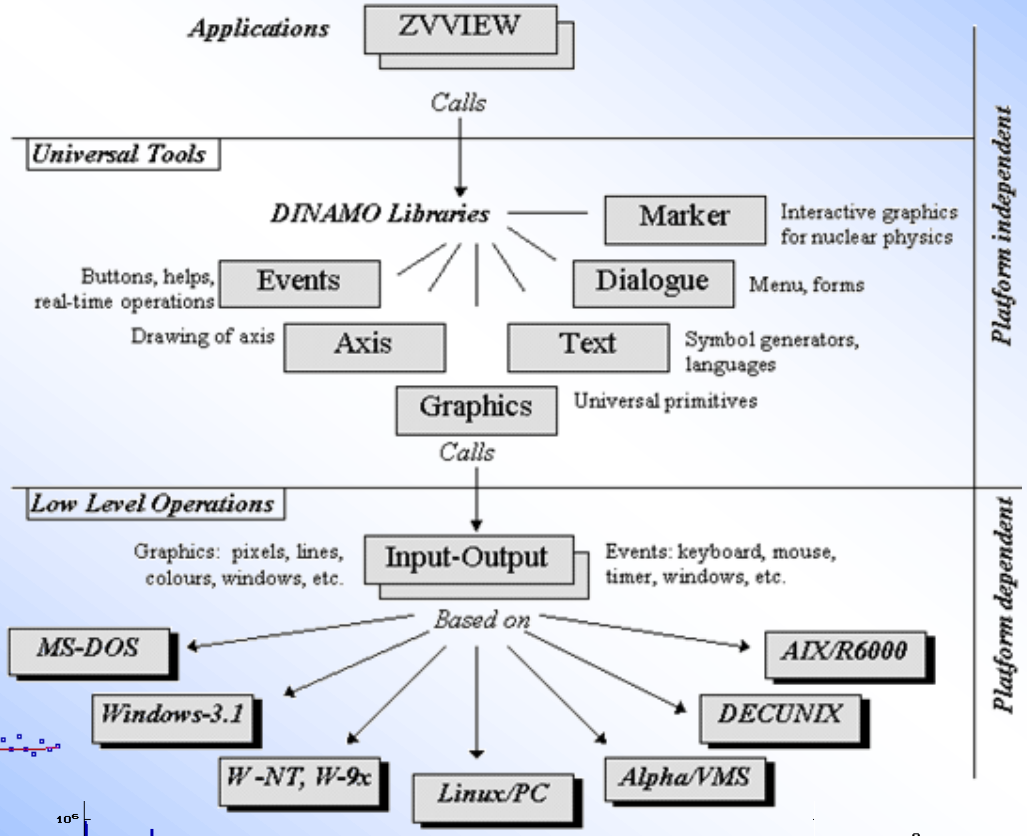
Plotting in EXFOR-ENDF Web Retrieval System

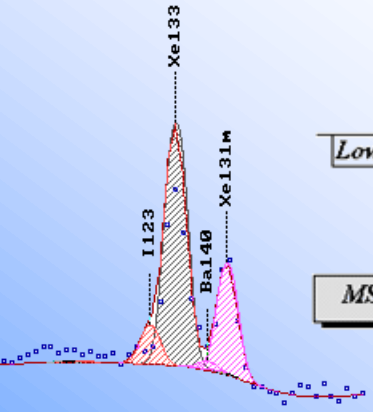
Implemented via using ZVView program running on web server and producing GIF picture on web server. Interactive system offers to user wide range of operations, including drug-and-drop zoom, lin/log scaling, plotting ratios to selected curve, copy/paste data between systems, output to: PS, PDF, animated GIF, Html, ENDF6, Fortran data, etc.

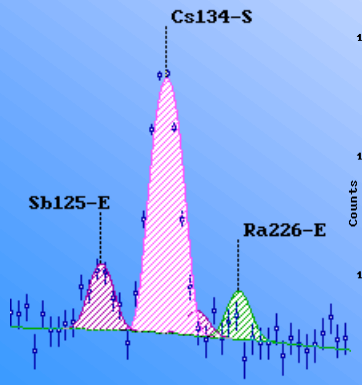
ZVView/DINAMO: interactive plotting system

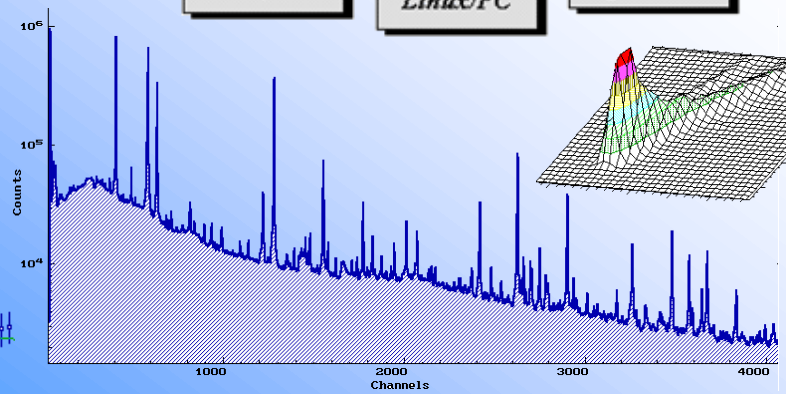
http://www-nds.iaea.org/public/zvview/

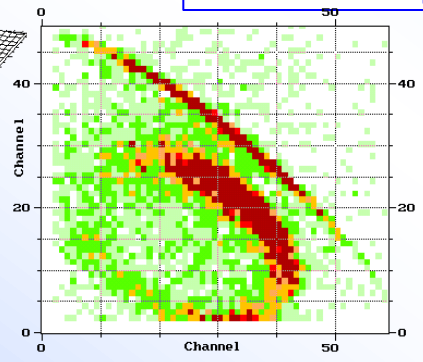
ZVView is a multi-platform program designed for nuclear reactions data evaluators to perform efficient interactive visual analysis of cross section data retrieved from EXFOR and ENDF libraries. Kiev-Vienna, 1993-2015

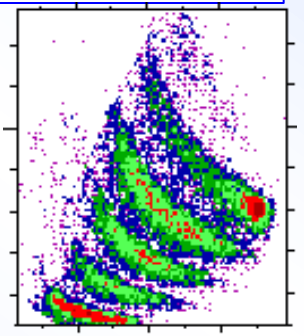












Platforms:

1. MS-Windows
2. Linux (X-Windows)
3. Mac OSX (X11)

Old platforms:

4. Alpha/VMS
5. DEC Unix
6. AIX/R6000
7. Windows-3.1
8. MS-DOS

Output:

1. GUI on the screen (Windows)
2. PostScript (PS, EPS)
3. Enhanced Metafile (EMF)
4. PCX, GIF, Animated-GIF

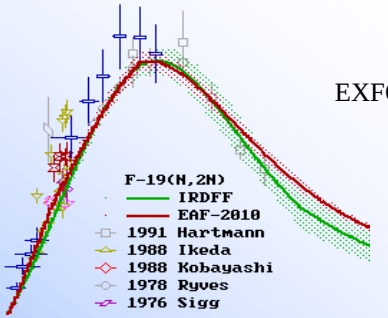
Basic ideas:

1. Language: C
2. Self-made GUI, PS, PCX, GIF
3. Low level API's (MS-Win, X11)
4. Max platform-independency
5. Minimalistic approach

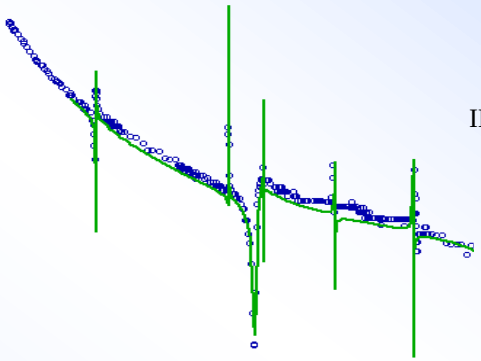
ZVView: interactive plotting program

Features:

- All features inherited from DINAMO;
- Integrated with Empire, EndVer, EXFOR CD-ROMs.
- Web-ZVView: integrated with EXFOR-ENDF database retrieval systems, IBANDL, SigmaCals, LiveChart: can read data from remote archives, can be called as part of external Web service, etc.
- Reads nuclear data formats: TABLE/XREF, ENDF-MF3/MF40/MF33(Law5);
- Can read data from text files(columns): {y}; {x,y}; {x,y,dy}; {x,y,dy,dx}; {x,y,+dy,–dy,+dx,–dx}; {x},{y},z{}
- Understands ENDF interpolation laws, can display ratios to selected curve
- Can do some least squared fitting, displays χ^2 (EXFOR-ENDF)
- Can work with authors: filter data, select, legend etc.

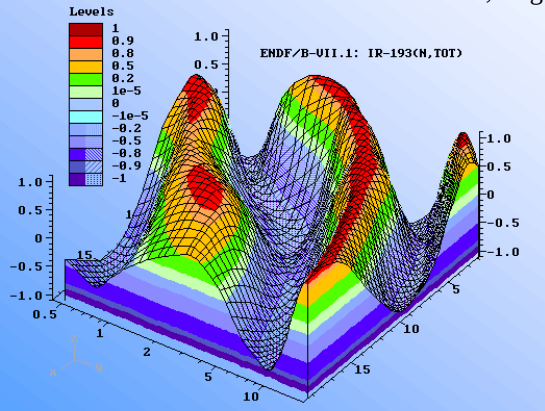


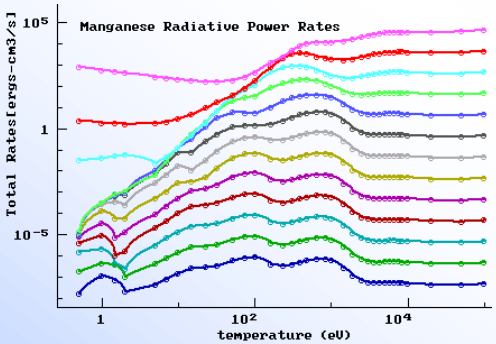
EXFOR+ENDF



IBANDL+SigmaCalc

ENDF/MF33: Web, interactive, Log-Lin, animated





FLYCHK (A+M): Web-Web communication

2009-2015

Web-ZVView

Database Retrieval Systems

- ENDF
- EXFOR

Your data

- ENDF uploading
- EXFOR uploading
- Manual input

Input

IBANDL

FLYCHK

LiveChart

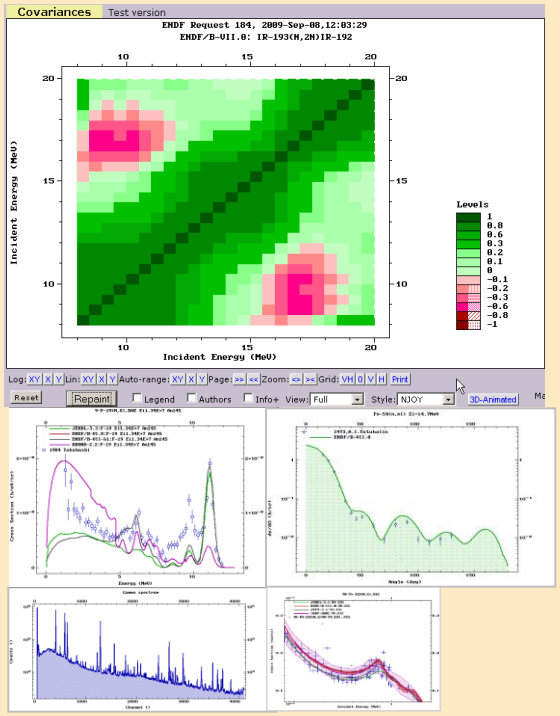
Web-ZVView

Output

Output

Send ZVD file to user's PC

Plots + interactions /Web



Several formats and non-structured data

Input formats:

- Data by columns (X : Y : ΔY)
- Text (matrix, triangle)
- Link to Web-data (archives)
- ENDF file (or MF3/33 Sections)
- ZVD file(s)

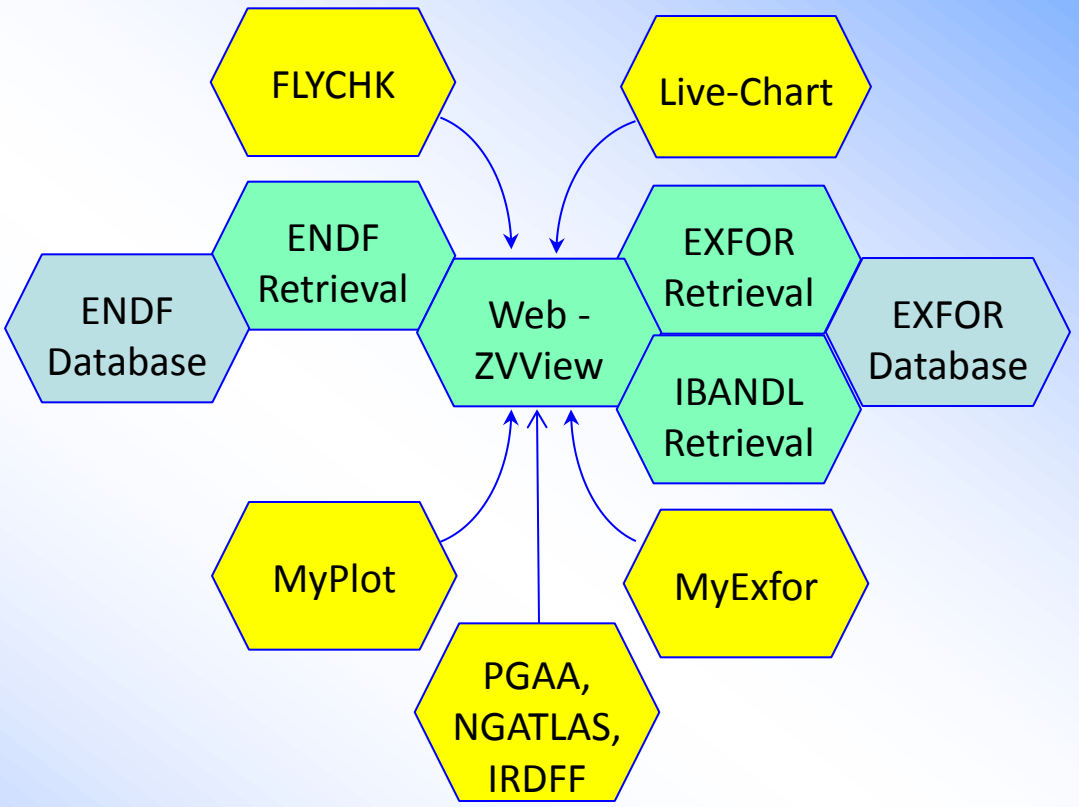
Draft for EXFOR compilation

Data for FORTRAN users

Output formats:

- GIF, EPS, PS, PDF, SVG
- Html (Table)
- Text (columns, triangle)
- EXFOR draft (COVARIANCE)
- ENDF like (MF33 Section,LB5)
- Input for Fortran (+ reading code)

Web mosaic: connections to Web-ZVView

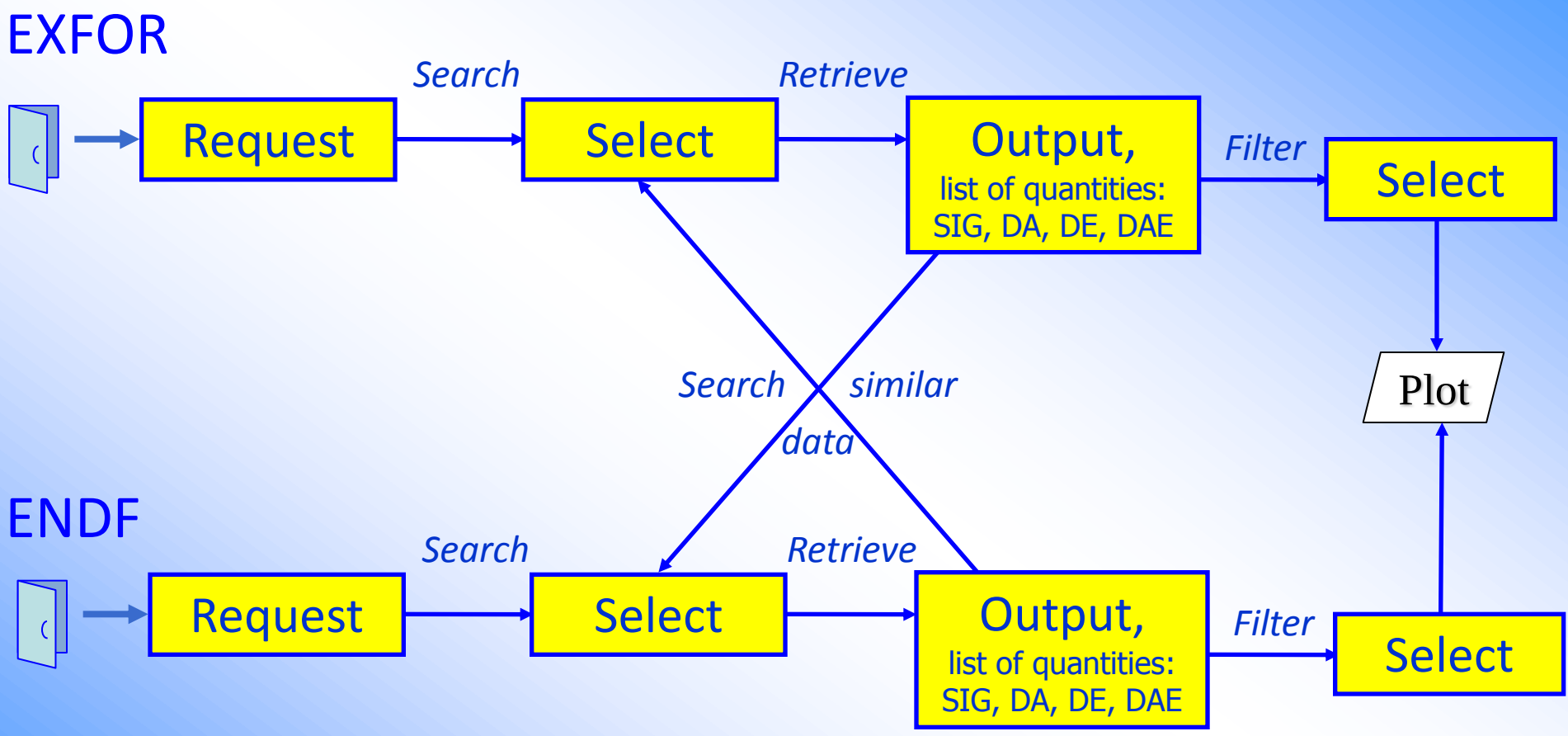


Useful features of Web-ZVView: copy/paste plots (inside Web session), insert text of ZVD file to the form as “my data”, output of plotted data in several formats, ratios, “manual” options, etc.

Types of plotting on our Web

- Quick plot: EXFOR-ENDF, cross sections (XS) only; XS filtered by product ELEM/MASS in EXFOR
- Advanced (Universal) plot: EXFOR-ENDF, MF1,3,4,5,6, using EndVer (A.Trkov); ratios, ratios converted to cross sections, XS ± ΔXS
- Native EXFOR plot: EXFOR only, any quantities
- Special ENDF plotting: MF3*MF6:Low=0 by products, MF10, relative uncertainties, XS with uncertainties (MF3+MF33)
- R33 plot: EXFOR-IBANDL, Web intrerface to IBANDL-SigmaCalc (A.Gurbich, IPPE) data
- PlotC4 (D.E. Cullen): C4 to PS and PS to PDF
- Z(X,Y): MF33, MF35, MF40; correlation matrix constructed on EXFOR uncertainties
- MyPlot: uploaded user's data (input: text columns, arrays, ENDF sections: MF33, MF3+MF33)

EXFOR-ENDF advanced/universal plotting



EXFOR Output Page with advanced plotting

EXFOR Request #26619/39

Output Data

Format	*Data (Size)*
EXFOR Interpreted	X4+ (122Kb) Generate: X4± XML:: v1: X4.xml X4.html v2: X4.xml X4.html
EXFOR Output	X4Out X4Out.xml X4Comp Test: C5 C5M:see:[doc]
EXFOR Original	EXFOR (119Kb) zip (24Kb)
Bibliography	html (13Kb) BibTeX (4Kb)
Computational	
C4	C4 (140Kb) C4.ZIP (12Kb) LST (129Kb)

Advanced Plotting: LST (6Kb)

Select experimental data for plotting...

Select quantity for plotting

Go to		*Quantity type*	*#Plots*	
σ (E)	SIG	Cross section data	2	
dσ/dΩ (θ)	DA(A)	Differential data with respect to angle	41	
↳ OR: Select incident energy range(MeV): Min= 0.8 Max= 14.9 dσ/dΩ (θ)			199	[Reset]
dσ/dΩ (E)	DA(E)	Differential data - energy dependence at fixed angle	2	
↳ OR: Select emission angle range(deg): Min= 0 Max= 150 dσ/dΩ (E)			2	[Reset]
dσ/dE	DE	Differential data with respect to energy	4	
d²σ/dΩ/dE	DA/DE	Differential data with respect to angle and energy	8	

Go to plot evaluated data...

To ENDF

ENDF Retrieve evaluated data and plot...

See: [selected] datasets

ENDF Output Page with advanced plotting

ENDF Request #39 (20)

Output Data

Format	Data (Size)
ENDF	Text (758Kb) ZIP (178Kb)

Extended Plotting:

Step 1. Check/select data for plotting...

#	Library	Nuclide	Prepare...	Status	*Prepared data
1) ☑	ENDF/B-VII.1	F-19 id=57313		-Ready-	PEN (3Mb) LST
2) ☑	EXFOR Request #26619			-Ready-	C4 X4 LST

*PEN: Processed evaluated data suitable for plotting - pointwise, 293K; made using PREPRO codes
C4: Experimental data in computational format (made using X4TOC4 code)

Step 2. Go to plotting...

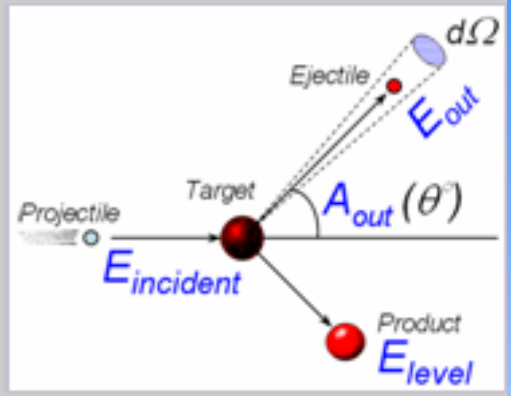
Select quantity for plotting

Go to plot	Quantity type	MF#	#Plots
σ (E)	Cross section data	MF3	2
dσ/dΩ (θ)	Differential data with respect to angle	MF4	41
dσ/dΩ (E)	Differential data - energy dependence at fixed angle	MF4	2
dσ/dE	Differential data with respect to energy	MF5	4
d²σ/dΩ/dE	Differential data with respect to angle and energy	MF6	8

Double differential cross sections

EXFOR-Request #26619 ENDF-Request #39

Advanced Plotting



Plot Selected Reset

Libraries:

- [x] EXFOR - Experimental data
- [x] ENDF/B-VII.1:F-19 (EvalID=57313)

Differential data with respect to angle and energy: MF6: d²σ/dΩ/dE(E-out)

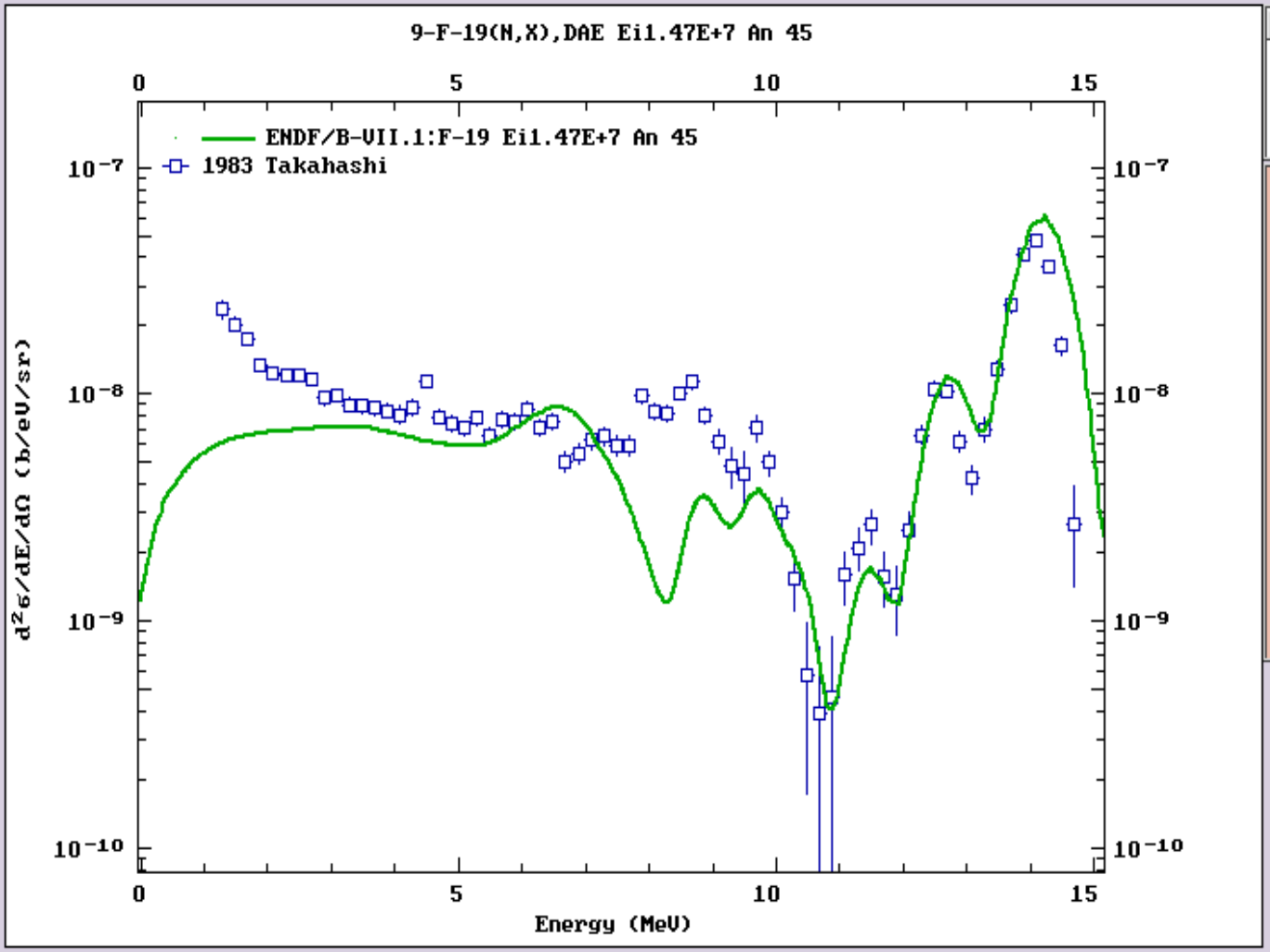
#	Index (plot)	Exp. points	E-Inc (eV)	Ang-Out (deg.)	ELv/E-Out (eV)	Target	Target ZA	Projectile ZA	Product ZA	Quantity (MF)	Reaction (MT)
9-F-19(N,X)0-NN-1,,DA/DE											
1	☐ 1	54	1.345E+7	145.00		F-19	9019	1	1	6	9000
2	☐ 2	57	1.356E+7	135.00		F-19	9019	1	1	6	9000
3	☐ 3	60	1.395E+7	105.00		F-19	9019	1	1	6	9000
4	☐ 4	65	1.425E+7	80.00		F-19	9019	1	1	6	9000
5	☐ 5	67	1.446E+7	65.00		F-19	9019	1	1	6	9000
6	☐ 6	68	1.467E+7	45.00		F-19	9019	1	1	6	9000
7	☐ 7	73	1.480E+7	30.00		F-19	9019	1	1	6	9000
8	☐ 8	74	1.483E+7	20.00		F-19	9019	1	1	6	9000
+1(8)	☐ 58	0	1.483E+7	20.00		F-19	9019	1	1	6	9000

Plot Selected Reset

Plotting double differential cross sections

EXFOR-Request #26619 ENDF-Request #39

Plot #6



Select data for plotting [all] [none]

1) F-19(N,X)0-NN-1,DAE Ei1.47E+7 An 45

1983 A.Takahashi, 21875042

2) ENDF/B-VII.1:F-19 Ei1.47E+7 An 45

3) Use my data [example]

Columns: x y [dy [dx]]

Type: Curve Points

Title: My data

Default: basic units!

Multiply by: X: 1 Y: 1

See: plotted data (27Kb)

Log: XY X Y Lin: XY X Y Auto-range: XY X Y Page: >> << Zoom: <> >< Grid: VH 0 V H Pts: Txt Box PL Print

Reset Repaint Legend Authors Info+ PostScript Manual options: [+] Clipboard: Copy Paste

Shift legend: x= 2 y= 5 Split: 0 1:xy;2:y Plot data or ratio: 0 0:data; 1:ratio to dataset-1; 2:ratio to 2-nd, etc.

Data for plotting: ZVD (23Kb), send to ZVView; download ZVView; upload and plot your ZVD file

Native EXFOR plotting

Plotting of EXFOR data with arbitrary selection and grouping column based on EXFOR dictionaries only

Data Selection

Retrieve | Selected | Unselected | All | Reset

Output: X4+ | EXFOR | Bibliography | TAB | C4 | PlotC4

Plot: Quick-plot (cross-sections only) | Advanced plot [how-to] using C5 and converting

Narrow Energy (optional), eV: Min: Max:

Apply | Data re-normalization (for advanced users, results in: C4, TAB and Plots)

n	Display	Year	Author-1	Energy range,eV	Points	Reference
1)	(70-YB-171(N,G)70-YB-172,,SIG,,AV)/(79-AU-197(N,G)79-AU-198,,SIG,,AV)					C4: MF=3

Quantity: [CS] Cross section

1 - Info | X4+ | X4± | T4 | Cov 2000 K.Wisshak+ 3.00e3 2.25e5 18 [pdf]+ J,PR/C

[22499003] [X4] [X4Info] [X4Out.txt] [X4Out.xml] [Bib] [X4Plot] [x]

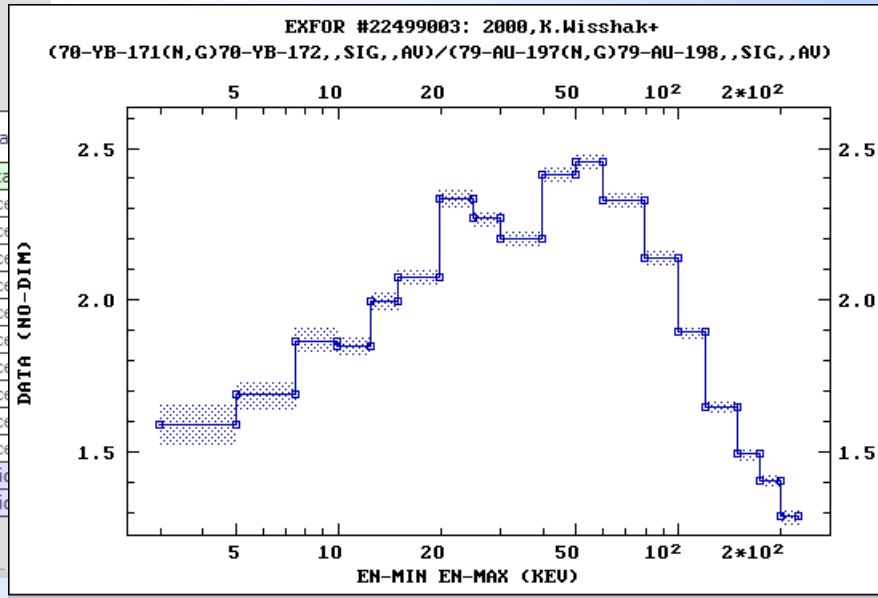
DatasetID=22499003
Author1: K.Wisshak+
Reference1: Jour: Physical Review, Part C, Nuclear Physics, Vol.61, Issue.6, p.065801 (2000)
X4Reaction: (70-YB-171(N,G)70-YB-172,,SIG,,AV)/(79-AU-197(N,G)79-AU-198,,SIG,,AV)
Quantity: Ratio of [Cross section]
Formula: Y = Y(X1)
X4Columns: 13 Data points: 18

EXFOR Data Columns

No.	Plot Y	Plot ΔY	Plot X	Plot ΔX	Group by	Header	Units	What	Given	Values Number	Values Min	Values Max	Wha
1	☑	☐	☐	☐	☐	DATA	NO-DIM	Y.Value		18	1.2893	2.4593	Data
2	☐	☑	☐	☐	☐	ERR-T	PER-CENT	Y.Err+-		9	1.	4.4	Unce
3	☐	☐	☐	☐	☐	ERR-S	PER-CENT	Y.sErr+-		11	0.4	4.3	Unce
4	☐	☐	☐	☐	☐	ERR-2	PER-CENT	Y.pErr+-		1	0.1	0.1	Unce
5	☐	☐	☐	☐	☐	ERR-3	PER-CENT	Y.pErr+-		1	0.2	0.2	Unce
6	☐	☐	☐	☐	☐	ERR-4	PER-CENT	Y.pErr+-		1	0.2	0.2	Unce
7	☐	☐	☐	☐	☐	ERR-5	PER-CENT	Y.pErr+-		1	0.2	0.2	Unce
8	☐	☐	☐	☐	☐	ERR-6	PER-CENT	Y.pErr+-		1	0.2	0.2	Unce
9	☐	☐	☐	☐	☐	ERR-7	PER-CENT	Y.pErr+-		1	0.4	0.4	Unce
10	☐	☐	☐	☐	☐	ERR-8	PER-CENT	Y.pErr+-		1	0.7	0.7	Unce
11	☐	☐	☐	☐	☐	ERR-SYS	PER-CENT	Y.pErr+-		1	0.9	0.9	Unce
12	☐	☐	☑	☐	☐	EN-MIN	KEV	X1.Min	Minimum	18	3.	200.	Inci
13	☐	☐	☑	☐	☐	EN-MAX	KEV	X1.Max	Maximum	18	5.	225.	Inci

Select EXFOR columns and [plot]

Plotting average cross section ratios given with columns EN-MIN, EN-MAX as histogram



Log: XY | X | Y Lin: XY | X | Y Auto-range: XY | X | Y Page: >> | << Zoom: <> | >< Grid: VH | 0 | V | H Pts:

Reset | Repaint | Legend | Authors | Info+ | PostScript | Manual options:

Native EXFOR plotting

n	Display	Year	Author-1	Energy range,eV	Points	Reference
1)	74-W-186(P,X)ELEM/MASS,CUM,SIG C4: MF=3 MT=?					
Quantity: [CS] Cumulative cross section						
1	+ Info X4+ X4± T4 Cov	2004	S.A.Karamian+	2.68e8 6.30e8	106	[pdf]+ J,NIM/
2	- Info X4+ X4± T4 Cov	2003	Yu.E.Titarenko	2.00e8 1.60e9	169	+ R,INDC

[O1021003] [X4] [X4Info] [X4Out.txt] [X4Out.xml] [Bib] [X4Plot] [x]

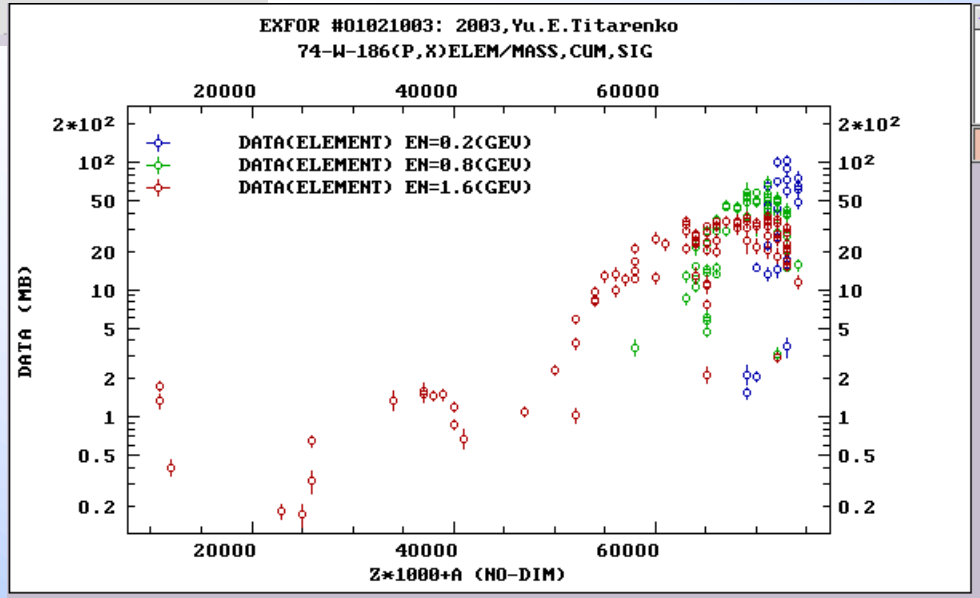
DatasetID=O1021003
Author1: Yu.E.Titarenko
Reference1: Rept: USSR report to the I.N.D.C., No.434, p.65 (2003)
X4Reaction: 74-W-186(P,X)ELEM/MASS,CUM,SIG
Quantity: Cumulative cross section
Formula: Y = Y(X1,X2)
X4Columns: 6 Data points: 169

EXFOR Data Columns

No.	Plot Y	Plot ΔY	Plot X	Plot ΔX	Group by	Header	Units	What	Given	Values Number	Values Min	Values Max	What:Expansion
1	☑	☐	☐	☐	☐	DATA	MB	Y.Value		155	0.172	106.	Data: data
2	☐	☑	☐	☐	☐	ERR-T	MB	Y.Err+-		87	0.023	11.8	Uncertainty: +-err
3	☐	☐	☐	☐	☑	EN	GEV	X1.Value		3	0.2	1.6	Incident energy: e
4	☐	☐	☑	☐	☐	ELEMENT	NO-DIM	X2.Value		33	11.	74.	Product charge
5	☐	☐	☑	☐	☐	MASS	NO-DIM	X2.Value		65	22.	184.	Product mass
6	☐	☐	☑	☐	☐	ISOMER	NO-DIM	X2.Value		2	0.	1.	Product mass

Select EXFOR columns and [plot]

Plotting cumulative cross sections depending from ZA-product when SF4 is ELEM/MASS



Select data
1) DA
2) DA
3) DA
4) Use
See: plotted

Log: XY X Y Lin: XY X Y Auto-range: XY X Y Page: >> << Zoom: <> >< Grid: VH 0 V H Pts: Txt Box PL Print

Reset Repaint Legend Authors Info+ PostScript Manual options:[-] Clipboard: Copy

Web IBANDL calling Web-ZVView

IBANDL - Mozilla Firefox

File Edit View History Bookmarks Tools Help

nds121.iaea.org/exfor2/ibandl.htm

X4/Servlet: Select | EXFOR: Experimental Nucl... | X4/Servlet: Select | IBANDL | IBANDL

IBANDL
Ion Beam Analysis Nuclear Data Library

Nucleus
C-13

Projectile
- p
- d
- ^{3}He
- α
- ^{6}Li
- ^{7}Li

Type of data
- EBS
- NRA
- PIGE
- All

IBANDL
[Summary]

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^{13}C + p

Type of data: ALL View: extended Convert units for plotting: no rr->mb/sr mb/sr->rr Plots: [reset]

No.	Reaction	Angle	Energy(keV)	Pts	Update	X4	Reference	File	Plot
1	^{13}C(p,p0)^{13}C	160	700-2500	451	2013-08-15		SigmaCalc 2.0. File created 21-6-2013	View Save	mb
2	^{13}C(p,p0)^{13}C	163.8°	2600-4990	169	2006-06-23		E. Kashy et al., Phys. Rev. 122(3) (1961) 884 »	View Save	mb
3	^{13}C(p,p0)^{13}C	160°	780-2430	96	2013-05-27		N.P.Barradas et al., to be published »	View Save	rr
4	^{13}C(p,p0)^{13}C	158.4°	450-1620	90	2011-11-22		E.Milne, Phys. Rev. 93 (1954) 762 »	View Save	mb
5	^{13}C(p,p0)^{13}C	146.5°	1630-3310	80	2011-11-22		D.Zipoy et al., Phys. Rev. 106 (1957) 793 »	View Save	mb
6	^{13}C(p,p0)^{13}C	140°	780-2430	97	2013-09-18		N.P.Barradas et al., Nucl. Instr. and Meth. B 316 (2013) 81 »	View Save	rr
7	^{13}C(p,p0)^{13}C	137°	450-1600	93	2011-11-22		E.Milne, Phys. Rev. 93 (1954) 762 »	View Save	mb
8	^{13}C(p,p0)^{13}C	124.1°	1620-3340	97	2011-11-22		D.Zipoy et al., Phys. Rev. 106 (1957) 793 »	View Save	mb
9	^{13}C(p,p0)^{13}C	121.5°	1000-2580	279	2011-08-29	X4	V.A.Latorre+(1966), Jour. Physical Review, Vol.144, p.891 »	View Save	mb
10	^{13}C(p,p0)^{13}C	116°	410-1600	88	2011-11-22		E.Milne, Phys. Rev. 93 (1954) 762 »	View Save	mb
11	^{13}C(p,p0)^{13}C	102.1°	1600-3340	82	2011-11-22		D.Zipoy et al., Phys. Rev. 106 (1957) 793 »	View Save	mb
12	^{13}C(p,p0)^{13}C	85.6°	1610-3340	85	2011-11-22		D.Zipoy et al., Phys. Rev. 106 (1957) 793 »	View Save	mb
13	^{13}C(p,p0)^{13}C	85.6°	1580-4380	75	2011-11-22		H.J.Kim,W.T.Milner and F.K.McGowan Nuclear Data Tables v.A2 (1966) 353 »	View Save	mb
14	^{13}C(p,p0)^{13}C	85.6°	430-1590	92	2011-11-22		E.Milne, Phys. Rev. 93 (1954) 762 »	View Save	mb

Datasets: 13 Reactions: 1 Points: 1423 References: 7

+ Add your dataset in R33 format for plotting

+ References.

Legend:
X4 link to the dataset in EXFOR database retrieval system

Web IBANDL calling Web-ZVView

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File Edit View History Bookmarks Tools Help

nds121.iaea.org/exfor2/ibandl.htm

X4/Servlet: Select | EXFOR: Experimental Nucl... | X4/Servlet: Select | IBANDL | IBANDL

IBANDL
Ion Beam Analysis Nuclear Data Library

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IBANDL
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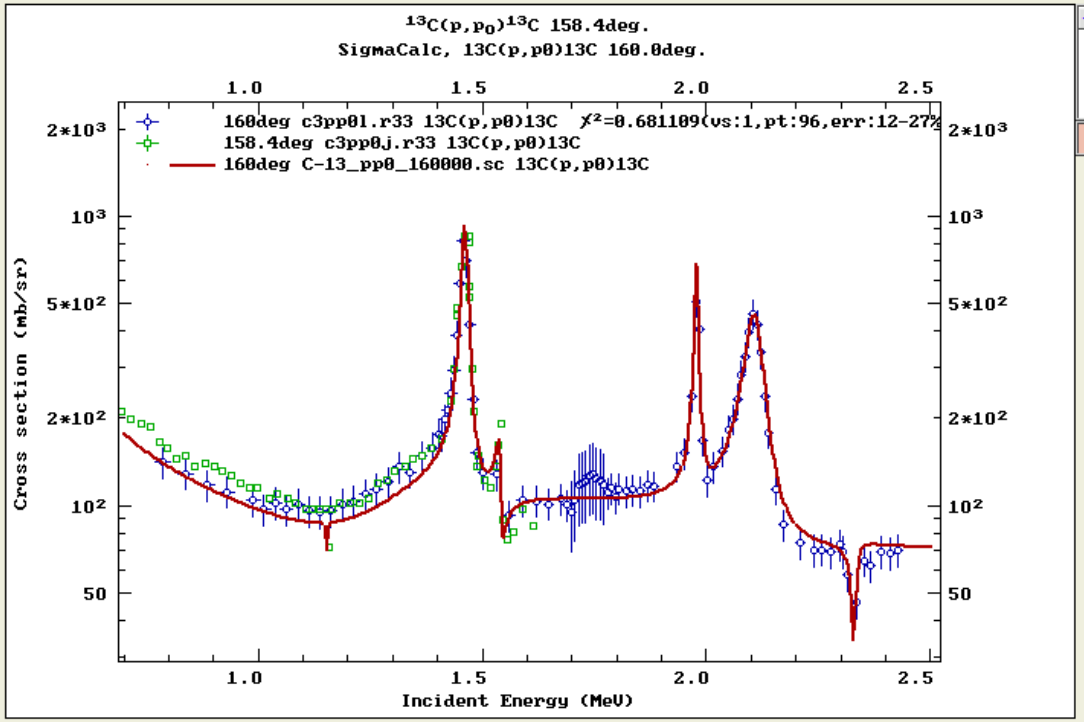
Interactive plotting of IBANDL and SigmaCalc data

1) θ=160° N.P.Barradas et al., to be published
2) θ=158.4° E.Milne, Phys. Rev. 93 (1954) 762
3) θ=160° SigmaCalc 2.0. File created 22-6-2013



Select data for plotting [all] [none]
1) 160deg c3pp0l.r33 13C(p,p0)13C
2) 158.4deg c3pp0j.r33 13C(p,p0)13C
3) 160deg C-13_pp0_160000.sc 13C(p,
4) Use my data [example]

See: plotted data (21Kb)

Log: XY X Y Lin: XY X Y Auto-range: XY X Y Page: >> << Zoom: <> >< Grid: VH 0 V H Pts: Txt Box PL Print

Reset Repaint Legend Authors Info+ PostScript Manual options:[+] Clipboard: Copy

Shift legend:x=0 y=0 Split:0 1:xy;2:y Plot data or ratio:0 0:data; 1:ratio to dataset-1; 2:ratio to 2-nd, etc.

Data for plotting: ZVD (15Kb), send to ZVView; download ZVView; upload and plot your ZVD file

Web IBANDL calling Web-ZVView

IBANDL - Mozilla Firefox

File Edit View History Bookmarks Tools Help

nds121.iaea.org/exfor2/ibandl.htm

X4/Servlet: Select | EXFOR: Experimental Nucl... | X4/Servlet: Select | IBANDL | IBANDL

IBANDL
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IBANDL
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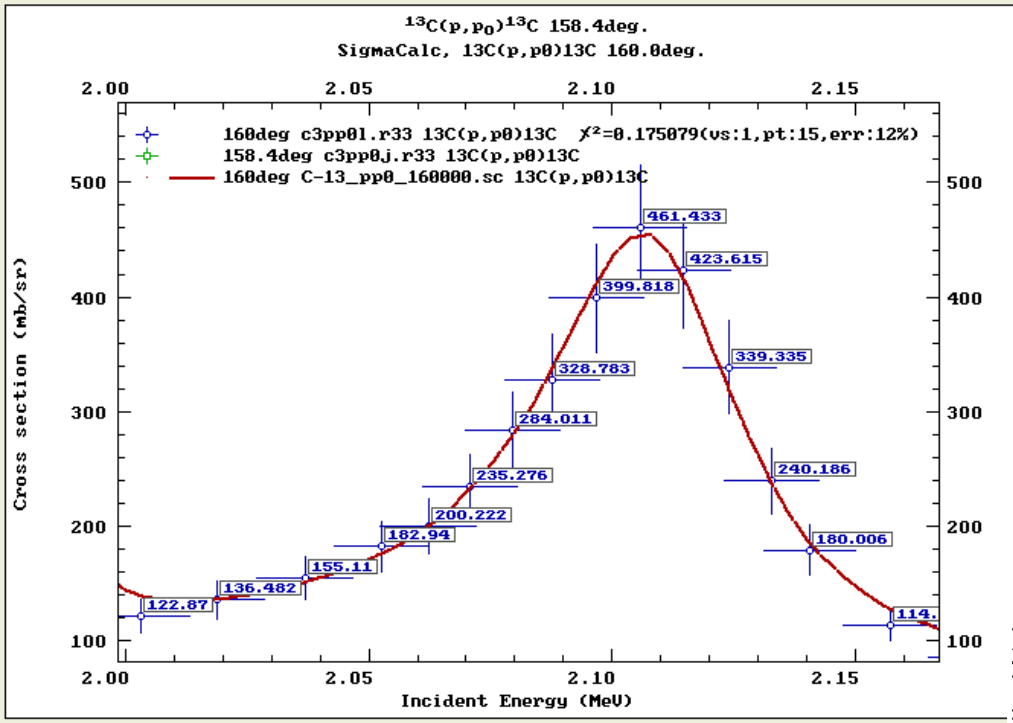
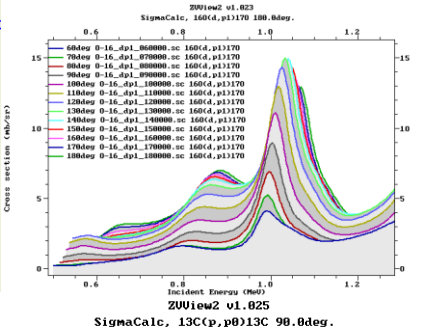


Select data for plotting [all] [none]
1) 160deg c3pp0l.r33 13C(p,p0)13C
2) 158.4deg c3pp0j.r33 13C(p,p0)13C
3) 160deg C-13_pp0_160000.sc 13C(p,
4) Use my data [example]

See: p



Log: XY X Y Lin: XY X Y Auto-range: XY X Y Page: >> << Zoom: <> >< Grid: VH 0 V H Pts: Txt Box PL Print

Reset Repaint Legend Authors Info+ PostScript Manual options:[+] Clipboard: Cop

Shift legend:x=0 y=8 Split:0 1:xy;2:y Plot data or ratio:0 0:data; 1:ratio to dataset-1; 2:ratio

Data for plotting: ZVD (15Kb), send to ZVView; download ZVView; upload and plot your ZVD file

Thank you.