The Abdus Salam
International Centre for Theoretical Physics

United Nations
Educational, Scientific and
Cultural Organization

IAEA
International Atomic Energy Agency

2141-32

Joint ICTP-IAEA Workshop on Nuclear Reaction Data for Advanced Reactor Technologies

3 - 14 May 2010

Nuclear Data Service Provided by the IAEA

ZERKIN V.
IAEA
Vienna
Austria

Introduction to IAEA Nuclear Data Services.

Nuclear Reaction Databases and Retrieval Systems

Viktor Zerkin

IAEA Nuclear Data Section, Vienna, Austria

Joint ICTP-IAEA Workshop on Nuclear Reaction Data for Advanced Reactor Technologies
Trieste - Italy, 3 - 14 May 2010

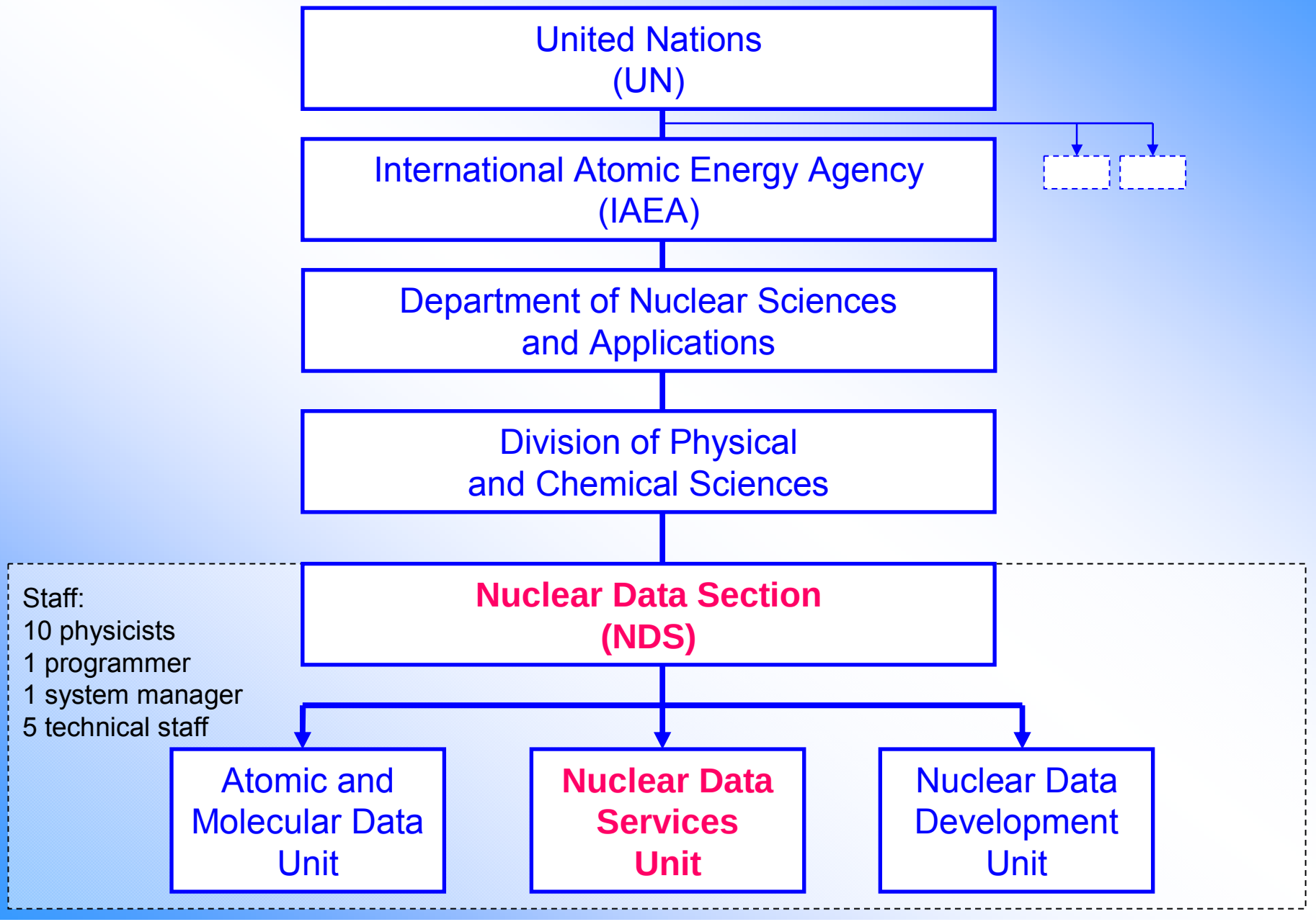
Our Internet Address

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



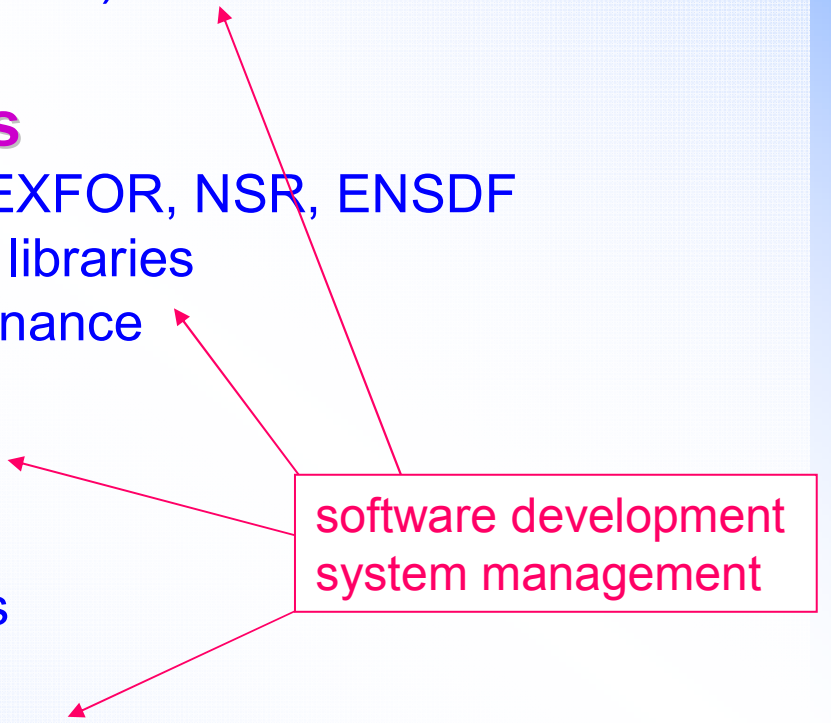
The Mission of NDS

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

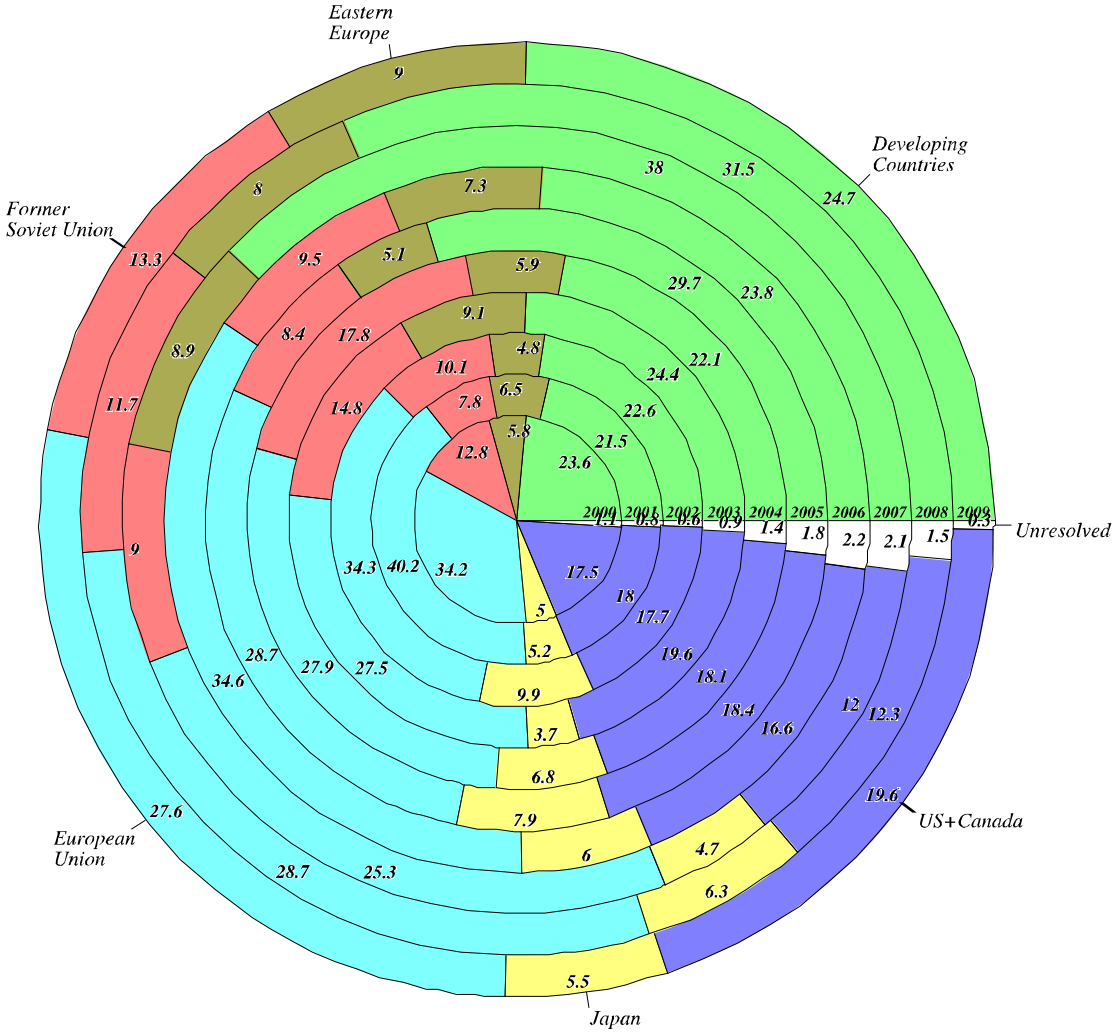
NDS Main Activity (nuclear part)

- **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
  - CD-ROMs
  - requests from users' communities
- **Technology transfer**
  - "Mirror-sites" (India, Brazil)
  - Workshops

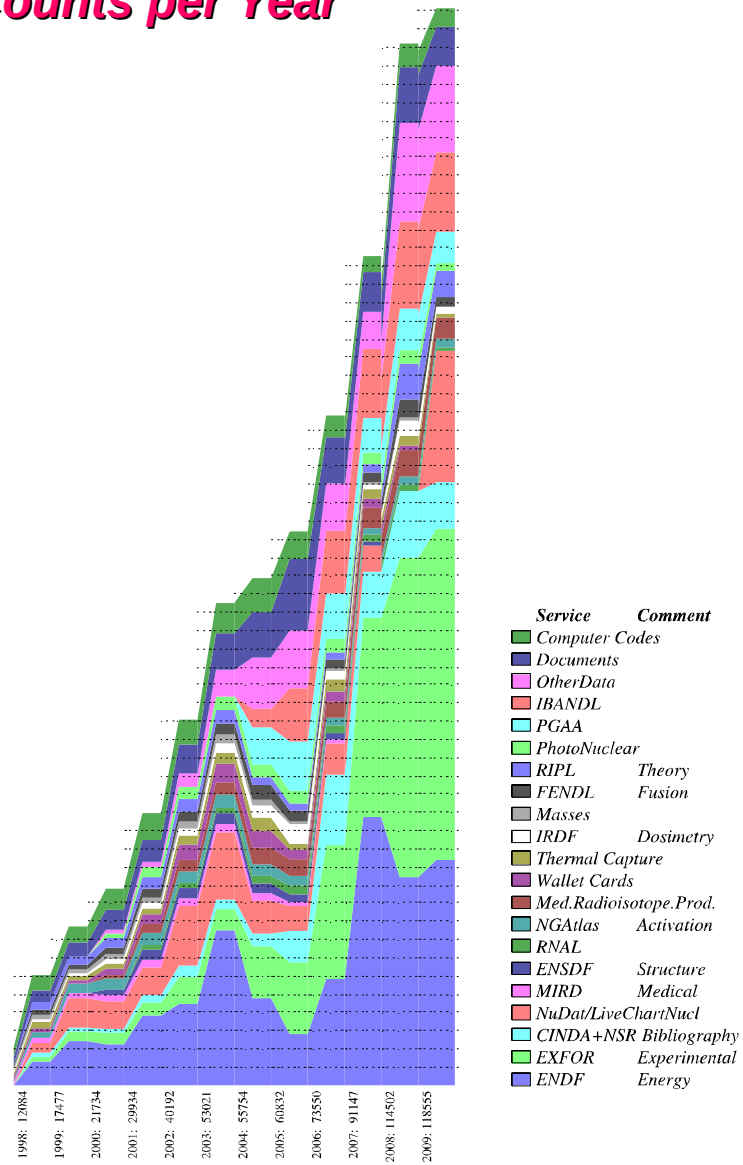


Nuclear Data Services: Web Statistics

Geographical Distribution (%)

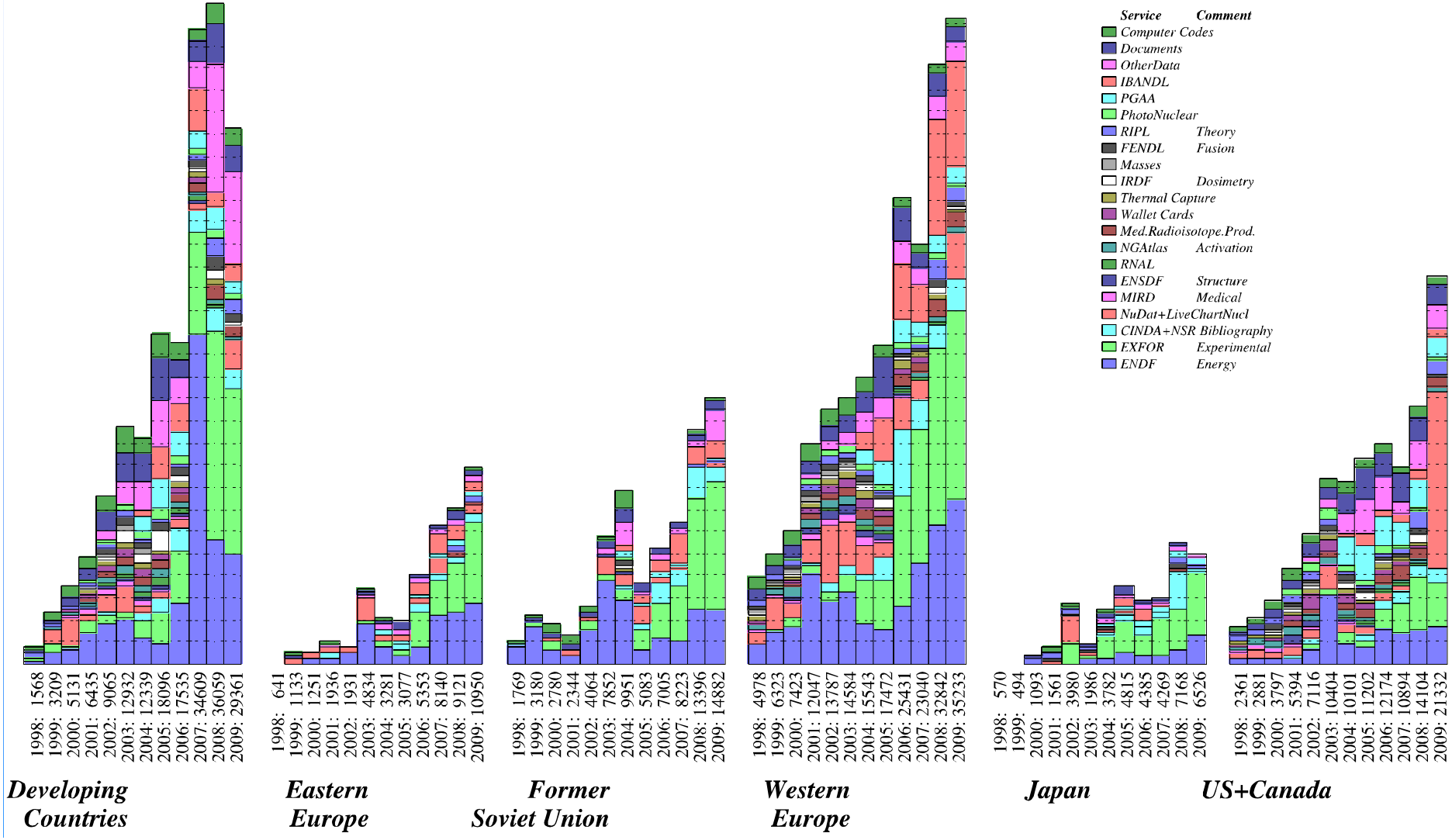


Counts per Year



Nuclear Data Services: Web Statistics

Geographically Distributed Counts

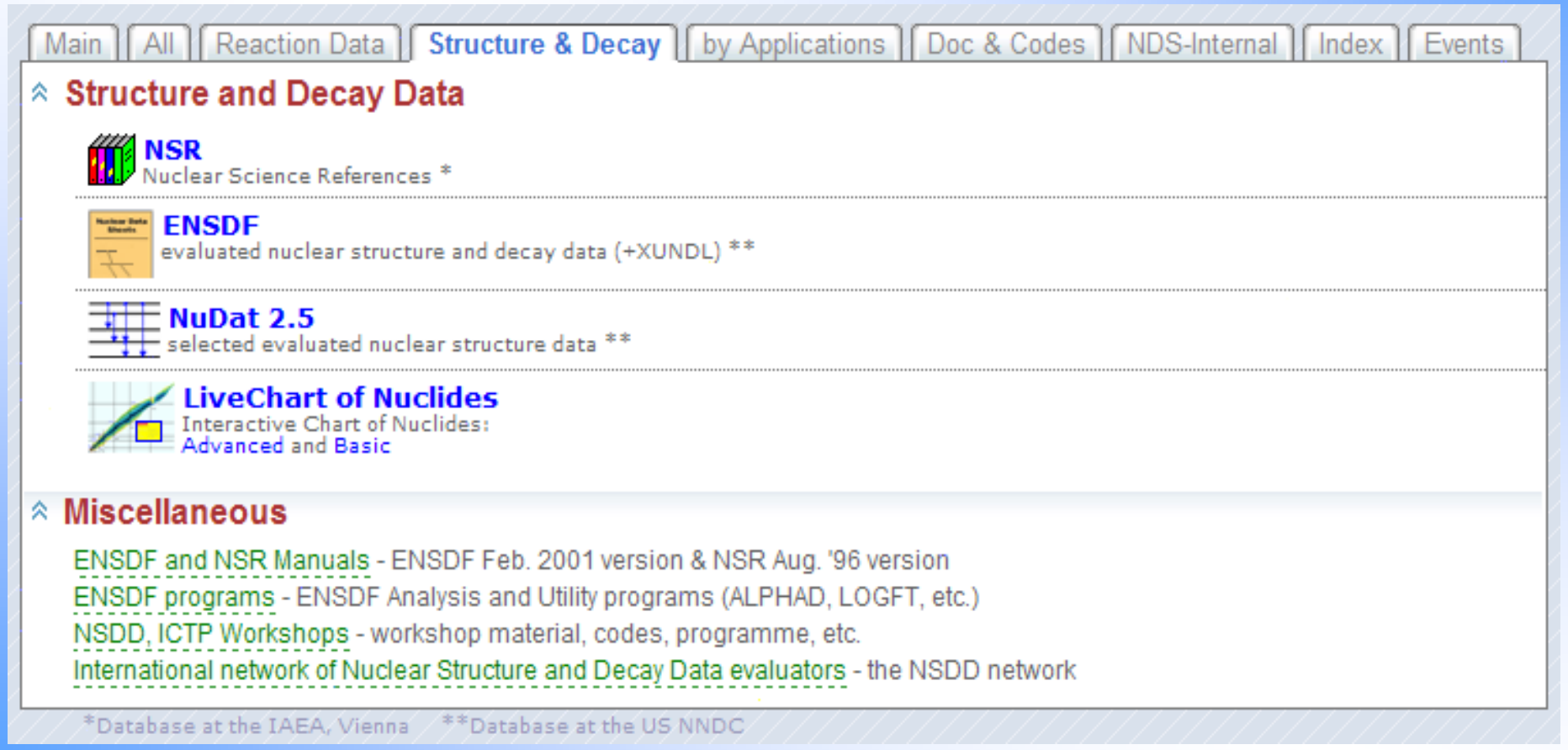


Types of Nuclear Data

- **Bibliographic data** (e.g. CINDA, NSR)
- **Experimental data** (e.g. EXFOR)
- **Evaluated data** (e.g. ENDF)
- **Nuclear reaction data** (e.g. EXFOR, ENDF)
- **Nuclear structure and decay data** (e.g. ENSDF, NuDat)

Our Front Page

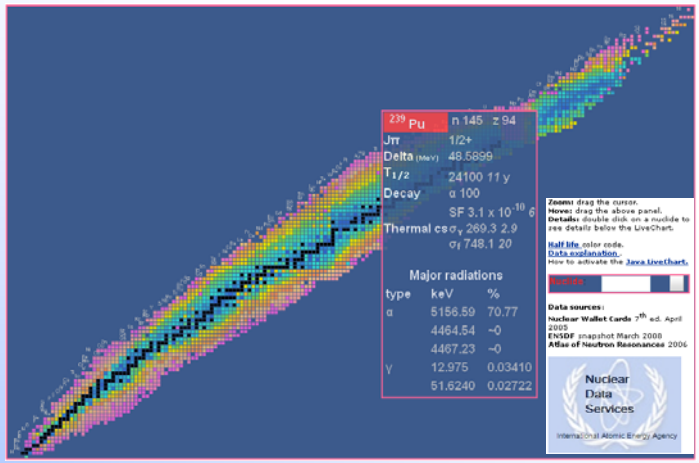
Tab: Structure and Decay Data



Nuclear Structure and Decay: Databases and Web interfaces

LiveChart of Nuclides

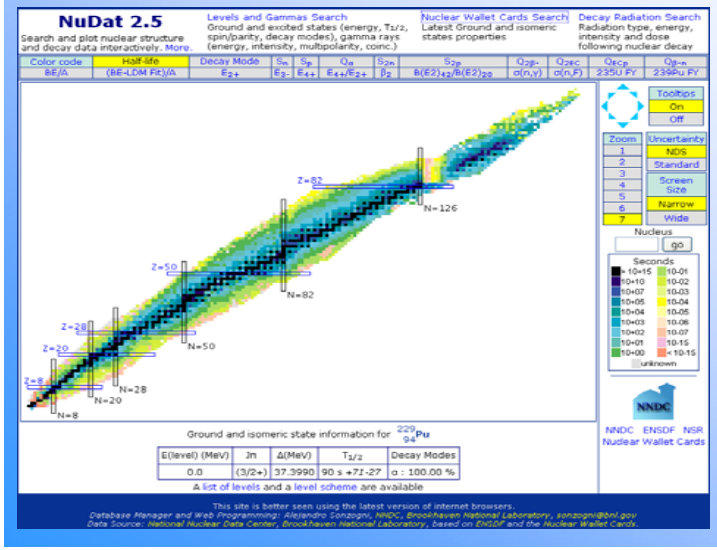
(Marco Verpelli, IAEA, 2006-2009)



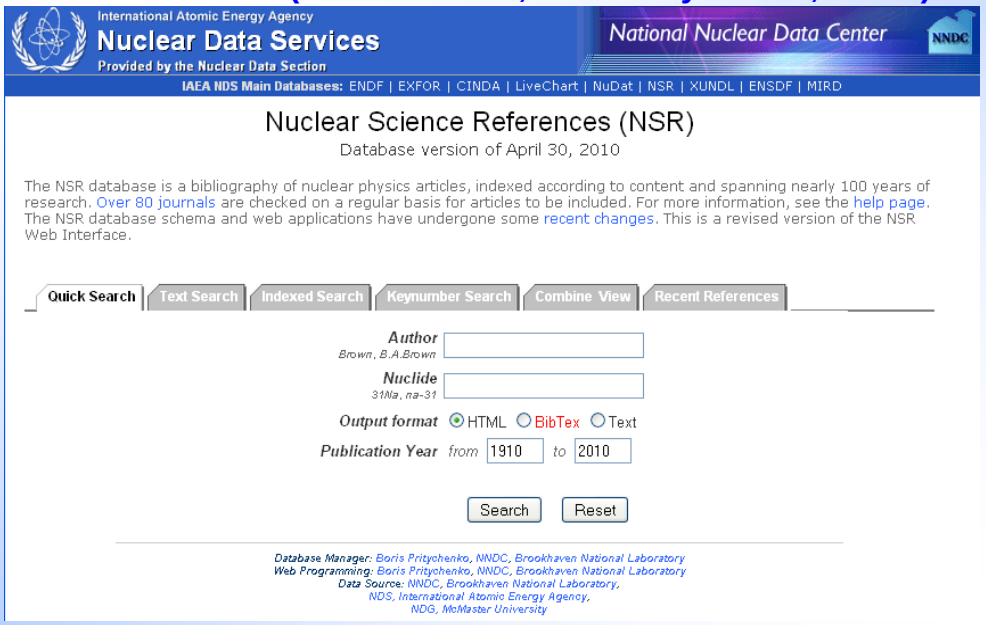
Source: ENSDF Master File

Bibliography, initially oriented to ENSDF evaluators

NuDat2 (Alejandro Sonzogni, NNDC)



NSR (David Winchel, Boris Pritychenko, NNDC)



Tab, Oriented to Application Fields

Databases, Tools, Documents relevant to Selected Application Field

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

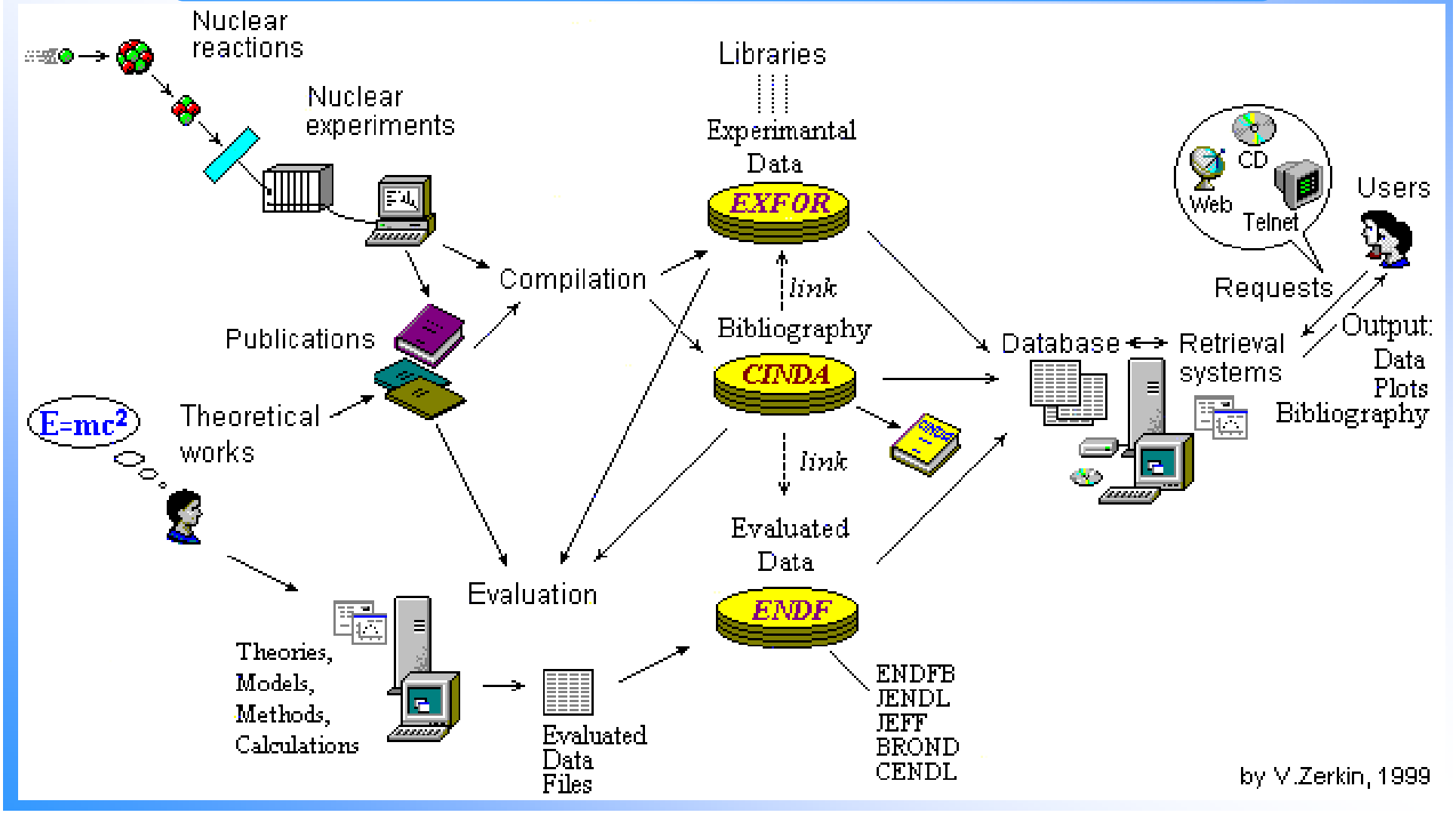
Neutron Source Reactions

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

Nuclear Reaction Data

Nuclear Reaction Databases

EXFOR - CINDA - ENDF

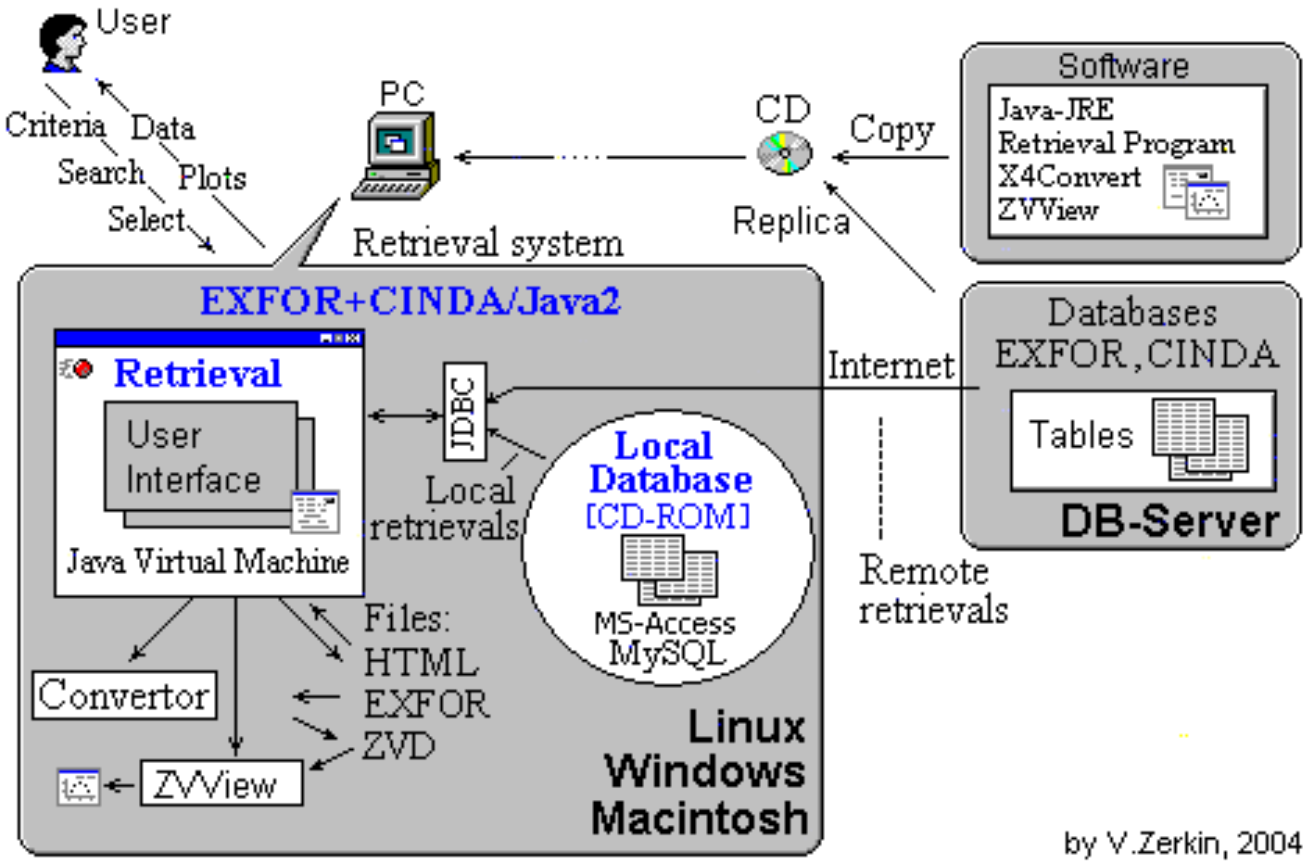


Basic principals of the system

- **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, Linux
- **Full integration of components**
  - no need for installation of CD-ROMs
  - automatic configuration of Web-Servlets
  - encapsulated graphics

IAEA-NDS CD-ROMs

1. **EXFOR-CINDA (MS-Access)**
2. **EXFOR-CINDA for Applications (MySQL)**
3. **EndVer/GUI + EXFOR (MySQL)**
4. **ENDF Libraries**



Features

- ✓ For Windows, Linux, Mac
- ✓ Can run from CD-ROM (no installation)
- ✓ Can work with remote databases
- ✓ Integrated EXFOR and CINDA
- ✓ Help with Dictionaries
- ✓ Advanced search (+users' SQL)
- ✓ Interactive plotting
- ✓ Non-interactive EXFOR retrieval program
- ✓ Integrated PrePro, EndVer, X4TOC4, ZVView
- ✓ Used by Applications: Empire, EndVer/GUI, expandable...

CD-ROM
EndVer/GUI + EXFOR for applications

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

EndVer/GUI
and EXFOR-CINDA for Applications

Tools for Evaluator: Databases, Retrieval Systems, Processing, Comparison
Experimental Data and Evaluations, Interactive Plotting.
All on Linux, Windows and Mac using MySQL

Using CD-ROM:

Run the Software Packages from CD-ROM (or from copy on Hard Disk)

	To do:	on Linux:	on Windows:	on Mac (ppc, x86):

1	Run EndVer	`run_endver.sh`	`run_endver.bat`	→ *X11*
				→ *Applications*
				→ *Terminal*
				`run endver-mac ppc.sh`
				`run endver-mac x86.sh`
				`run endver-mac.sh`

2	Run interactive retrieval system	`run_x4cd.sh`	`run_x4cd.bat`	→ *X11* → *Applications* → *Terminal* `run_x4cd-mac.sh`
3	Copy to Hard Drive	`install.sh` *or* `install.sh /x4app`	`install.bat` *or* `install.bat c:\x`	`install.sh`

General description: readme.txt
How to setup and use: setup.txt
IAEA Nuclear Data Services: http://www-nds.iaea.org/

7 **2009-03-31**

International Atomic Energy Agency
Nuclear Data Services
2004–2009

for Windows, Linux, Mac

EndVer/GUI
Integrated Tools for ENDF-Evaluators

Version 1.47, February 2009

- ✓ EndVer with Graphic User's Interface
- ✓ Integrated EndVer – PrePro-2007 – EXFOR
- ✓ PostScript graphics with PlotC4
- ✓ Plotting ENDF Files vs. EXFOR:
  MF4 (DA), MF5 (DE), MF6 (DAE), MF3+33 (SIG)
- ✓ Interactive graphics with ZVView
- ✓ Includes full EXFOR and CINDA databases
- ✓ Test version for Macintosh

EXFOR-CINDA for Applications
Databases and Retrieval Systems
Version 1.99, March 2009

- ✓ Does not need installation, can run from CD-ROM
- ✓ Works with Local and Remote Databases
- ✓ Includes Non-Interactive EXFOR retrievals
- ✓ Integrated CINDA and EXFOR
- ✓ Advanced interactive search
- ✓ Help based on Dictionaries
- ✓ Interactive graphics with ZVView
- ✓ Test version for Macintosh

EndVer is an integrated software package for comparison of evaluated nuclear data files with experimental data from EXFOR database. Contains interactive plotting.

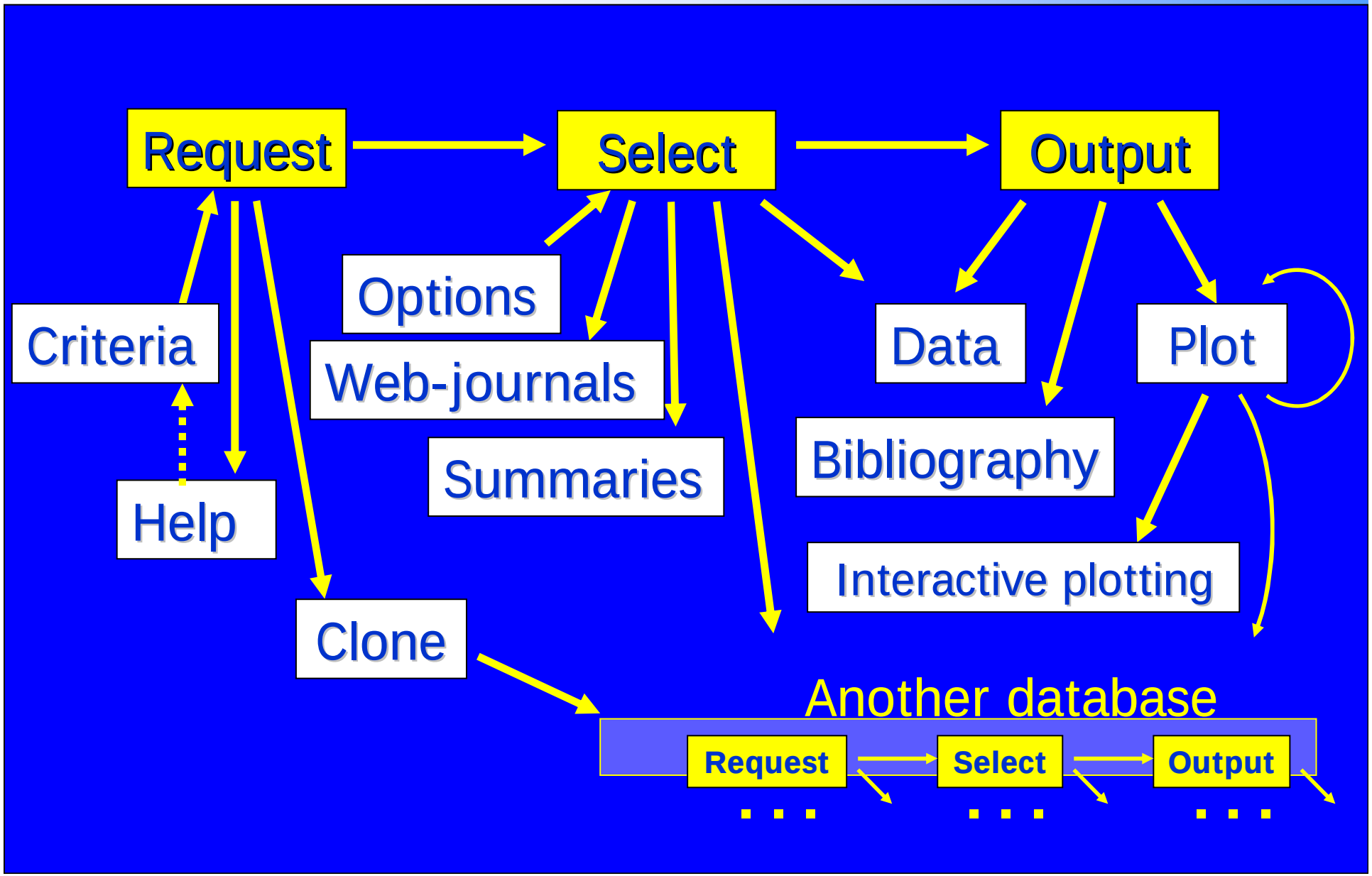
EXFOR is a comprehensive library of experimental nuclear reaction data induced by neutrons, charged particles and photons.
Contents (2009/03/23): 17,775 entries, 120,185 data tables.

CINDA library contains bibliographical references to experimental nuclear reaction data and to calculations, reviews, compilations and evaluations of neutron reaction and spontaneous fission data.
Contents (2009/03/27): 430,886 lines, 59,413 publications, 189,666 blocks

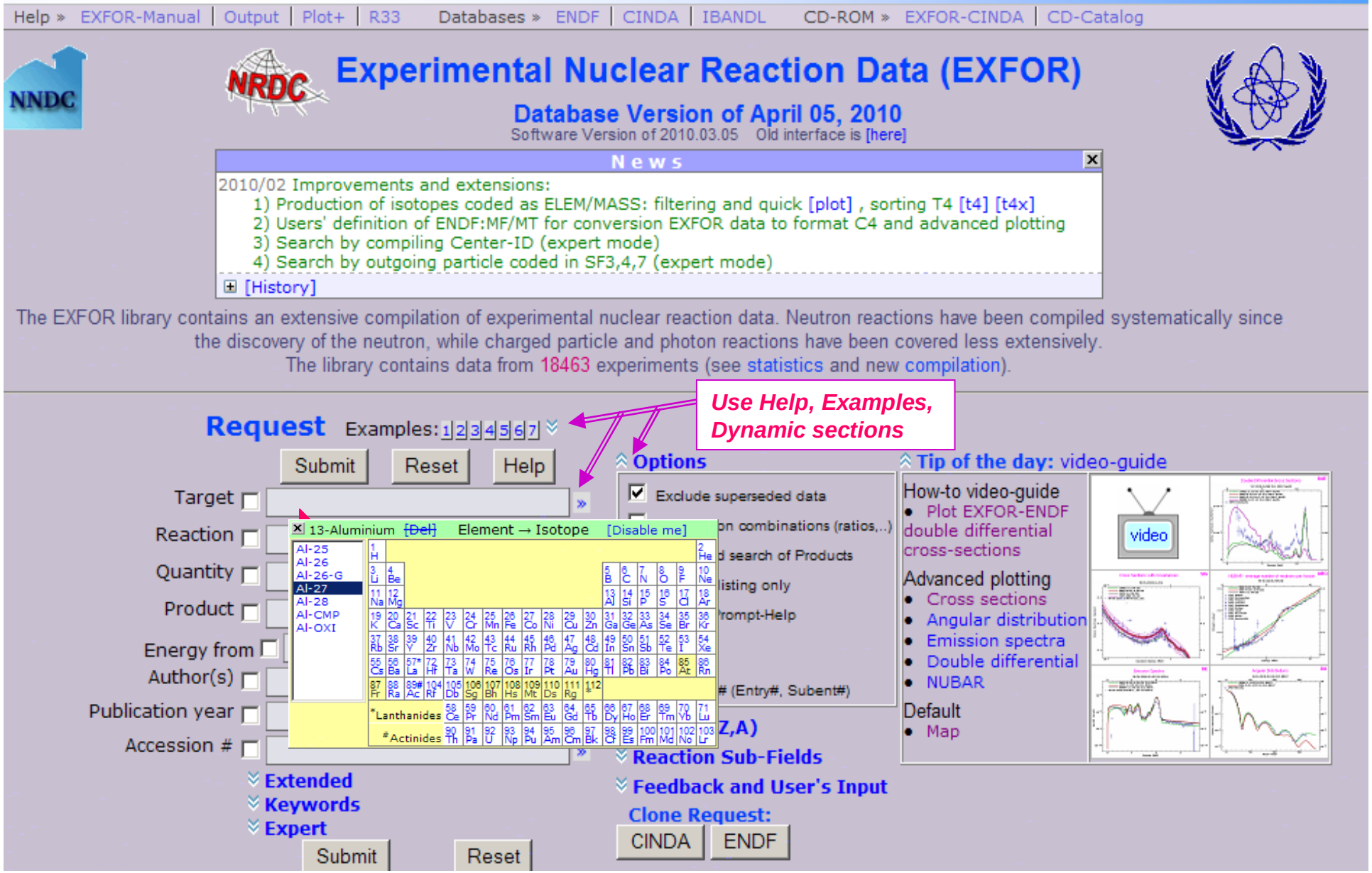
Retrieval Systems has been written on Java2: v1.98 (2008/05)

© The data on this CD-ROM are a product of the Network of Nuclear Reaction Data Centers.

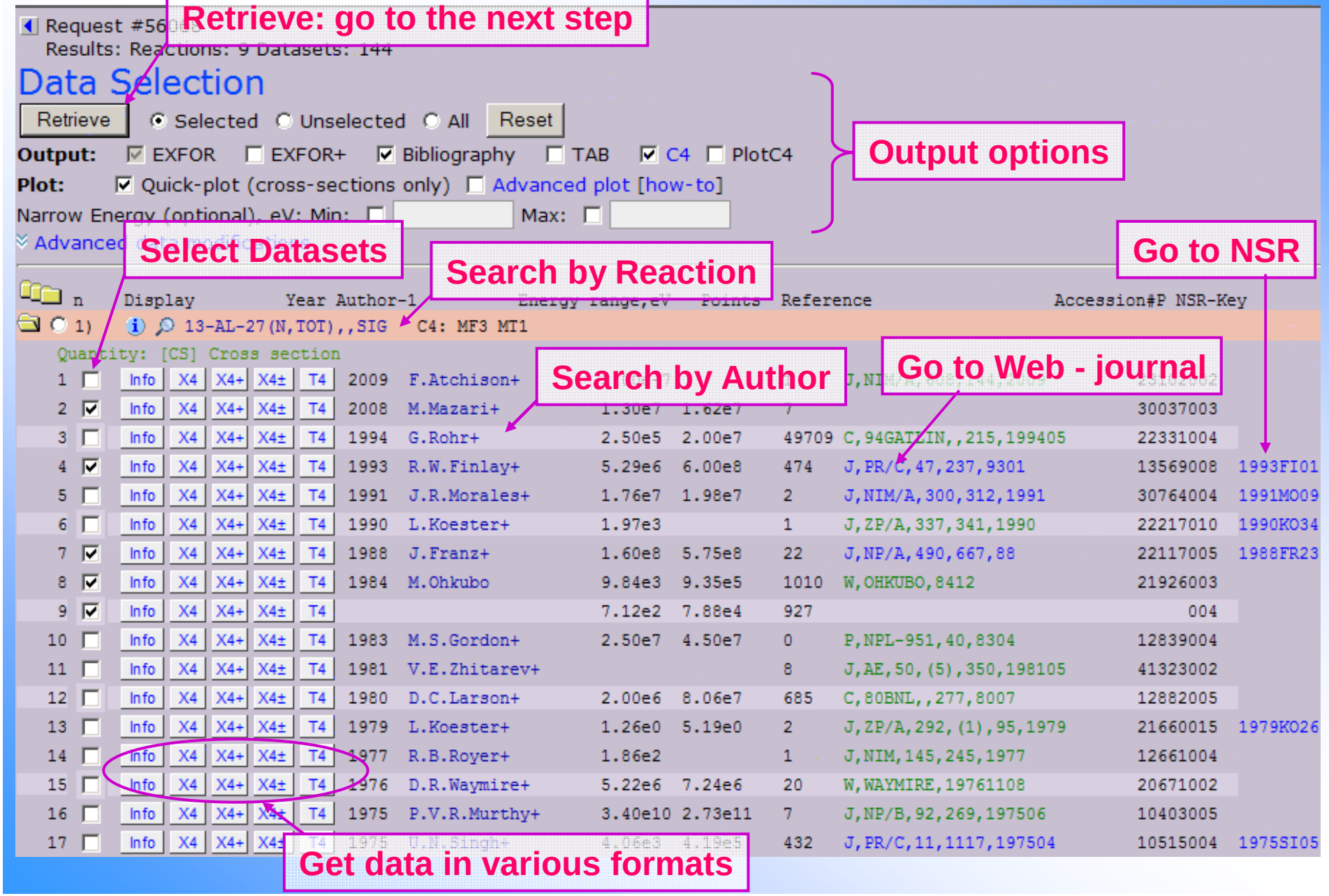
Retrieval System:
main stream of users' interactions



EXFOR Request Form



EXFOR Select Form



Output from EXFOR to other formats

How it works

Search in EXFOR

EXFOR Service

Single SUBENT

R33

Java-Servlet

Retrieve EXFOR

X4

X4TOC4 (R.Cullen, A.Trkov)

C4

C4TOR33

R33

Download R33 as text

EXFOR database

Multiple/single choice of data/formats

Internal Dictionary

EXFOR14A.DAT

Bibliography

Info

BibTeX

Table

T4

X4+

X4±

X4

C4

R33

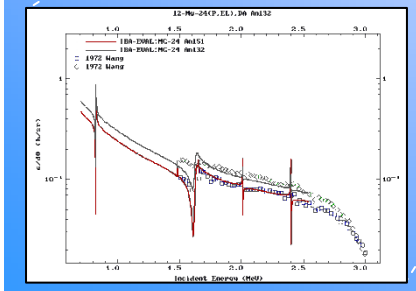
External programs

Evaluated database and service

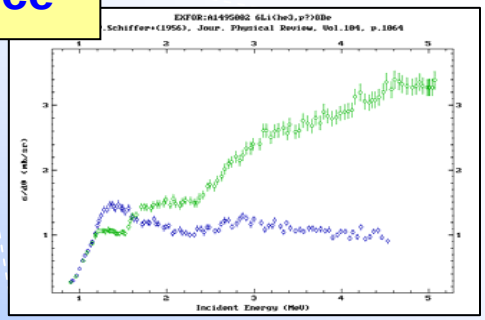
ENDF: search, plot, etc.

Plot and other service

Data from one SUBENT (many Θ)



ZVView output



X4+: EXFOR-interpreted, 2006

EXFOR data: http://161.5.149.76/EXFOR/A1495.002
Data retrieved from the EXFOR database version of March 06, 2009.

```
ENTRY            A1495    20031013    20040322    20050926        0000
SUBENT        A1495001    20031013    20040322    20050926        0000
BIB                 10          15
TITLE       Study of the reaction mechanism for (He3,P) reactions
            with Li-6,B-10 and C-13
AUTHOR      (J.P.Schiffer,T.W.Bonner,R.H.Davis,F.W.Prosser,Jr.)
INSTITUTE   (1USARIC)
            #(1USARIC) Rice University, Houston, TX, USA
REFERENCE   (J,PR,104,1064,195611)
            # (J,PR,104,1064,195611) Journ.: Physical Review, Vol.104, p.1064 (1956) USA
            #+      #NSR=1956SC01 #DOI=10.1103/PhysRev.104.1064
FACILITY    (VDG)
            #(VDG) Van de Graaff
SAMPLE      Target materials were evaporated on 2-mil foil backing,
            thick enough to stop the He-3 beam yet thin compared
            to the range of the proton groups studied
METHOD      (PHD)
            #(PHD) Pulse-height discrimination
DETECTOR    (SCIN) Thallium-activated CsI crystals mounted on
             DuMont 6291 photomultiplier tubes.
            #(SCIN) Scintillation detector
ERR-ANALYS  (DATA-ERR2)The pulse-height resolution of the detectors
HISTORY     (19800811C) Compilation produced by Arzamas RFNC-VNIIEF
            (20031013U) Last checking has been done.
ENDBIB              15
COMMON               1           3
DATA-ERR2
PER-CENT
4.
ENDCOMMON            3
ENDSUBENT           22
SUBENT        A1495002    20031013    20040322    20050926        0000
BIB                  5          11
REACTION    (3-LI-6(HE3,P)4-BE-8,PAR,DA)
            #(3-LI-6(HE3,P)4-BE-8,PAR,DA)  Quantity: [DAP] Partial differential cross section d/dA
SAMPLE      Metallic Li-6 enriched to 96%. 10 microg/cm2 thick.
ERR-ANALYS  (EN-ERR) Digitizing error
            (DATA-ERR) Digitizing error
            (DATA-ERR1) Some uncertainty in the cross-section was
            introduced by not knowning precisely what fraction of
```

X4±: EXFOR-interactive Tree, 2008

- ENTRY A1495 1956, J.P.Schiffer+ last-updated: 2003-10-13
  - SUBENT A1495001 last-updated: 2003-10-13
  - SUBENT A1495003 last-updated: 2003-10-13
    - BIB #bibliographic and descriptive information
      - REACTION
        - (3-LI-6(HE3,P)4-BE-8,PAR,DA)
      - SAMPLE
      - ERR-ANALYS
      - EN-SEC
      - STATUS
    - COMMON 4x1 #Constant parameters
      - Legend
      - Data

EN-ERR	E-LVL	DATA-ERR	DATA-ERR1
MEV	MEV	MB/SR	PER-CENT
0.0040	2.9	0.012	20.0

    - DATA 3x191
      - Legend

EN	Energy of Incident Projectile, Laboratory System	MEV	MeV
ANG	Angle, Laboratory System	ADEG	Angular Degrees
DATA	Partial differential cross section d/dA	MB/SR	millibarns per steradian

      - Data

EN	ANG	DATA
MEV	ADEG	MB/SR
0.8989	150.0	0.7892
0.9053	0.0	0.9892
0.9216	150.0	0.8881
0.9354	0.0	1.139
0.9518	150.0	1.036
0.9554	150.0	1.135
0.9616	0.0	1.301
0.9804	0.0	1.413
0.9971	150.0	1.271
1.006	0.0	1.625

EXFOR Output Form

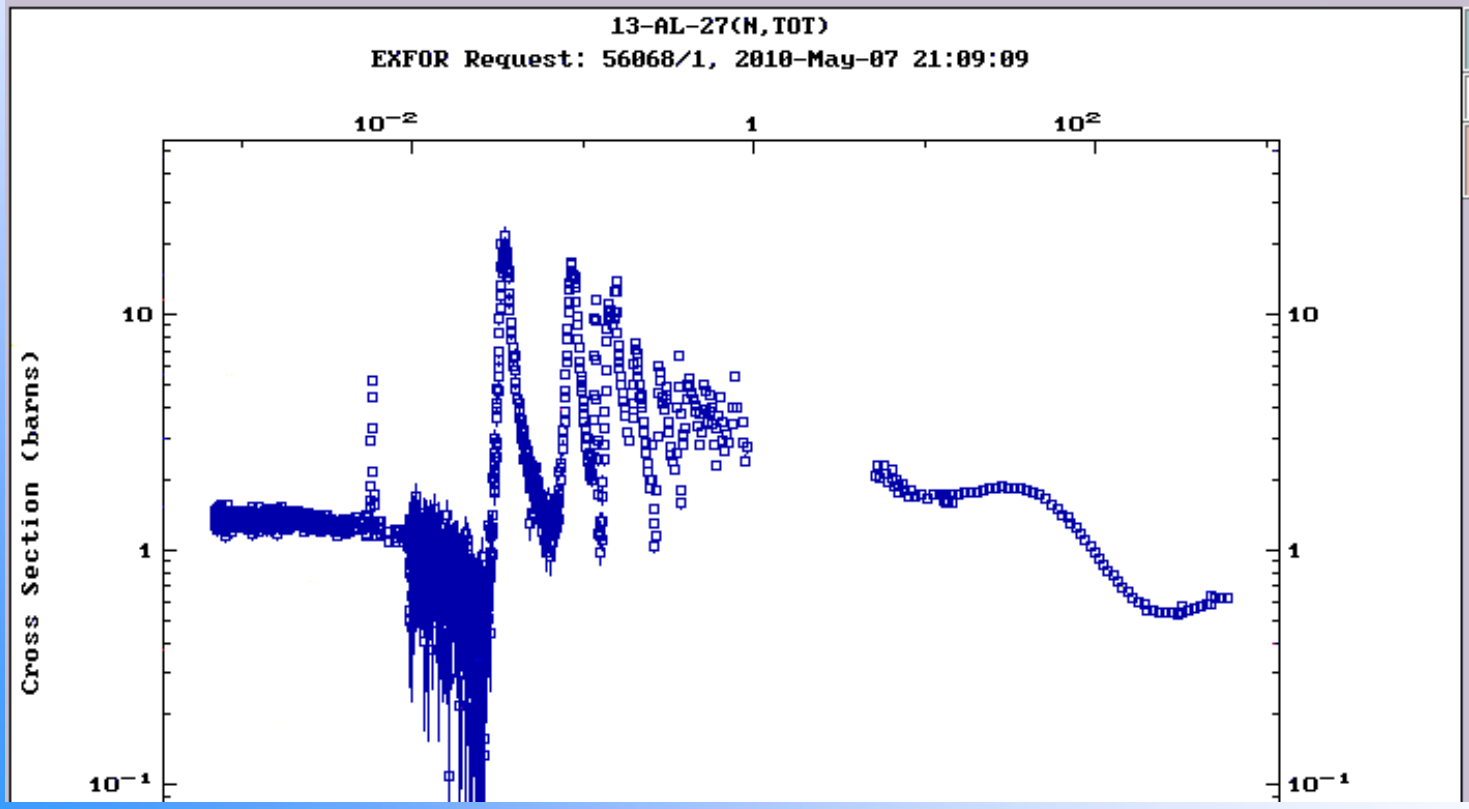
EXFOR Request #56068/1816

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



ENDF Find and add to the plot evaluated data

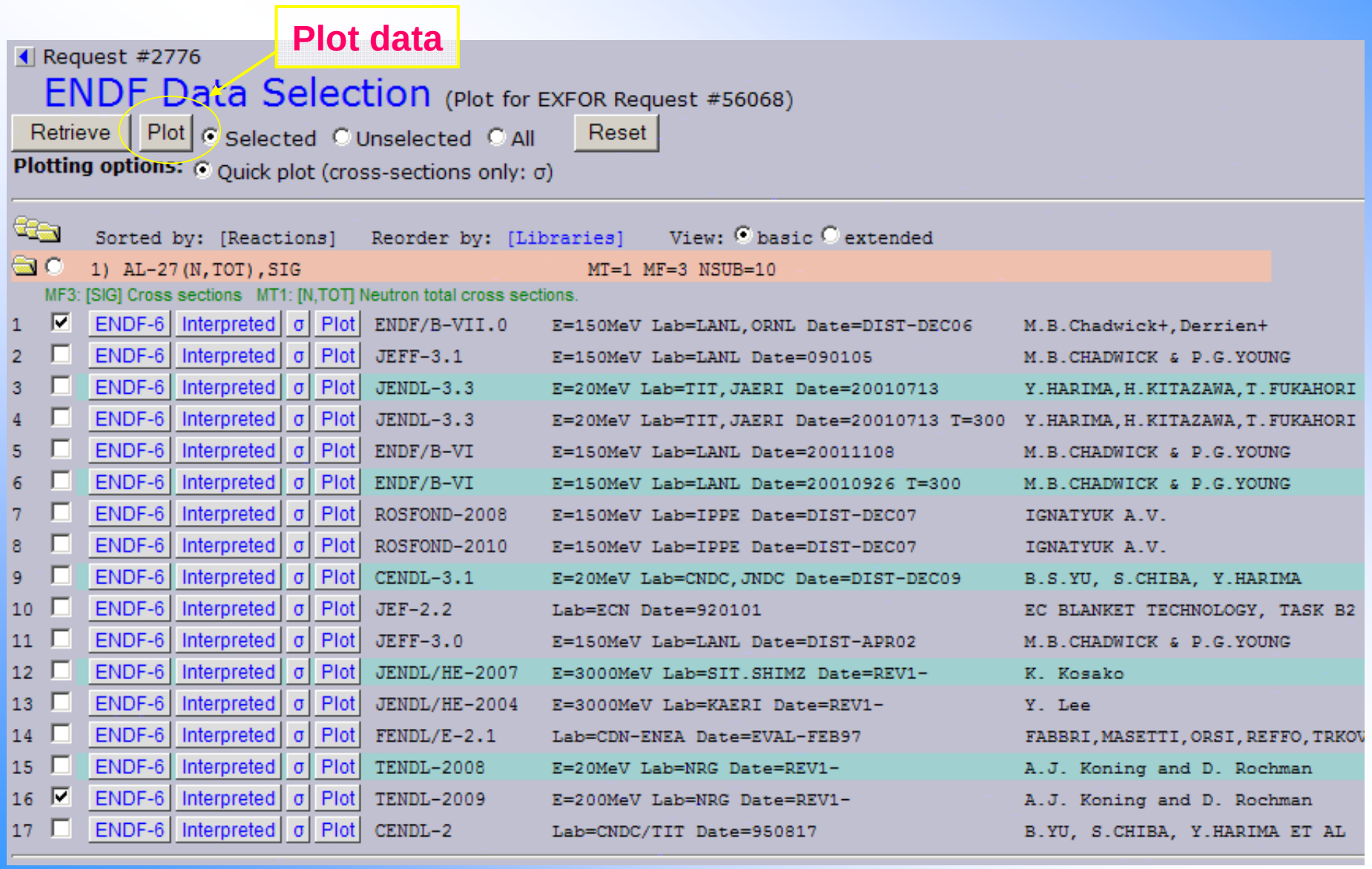
1) 13-AL-27(N,TOT),,SIG

2) Use my data [example]

See: plotted data (194Kb)

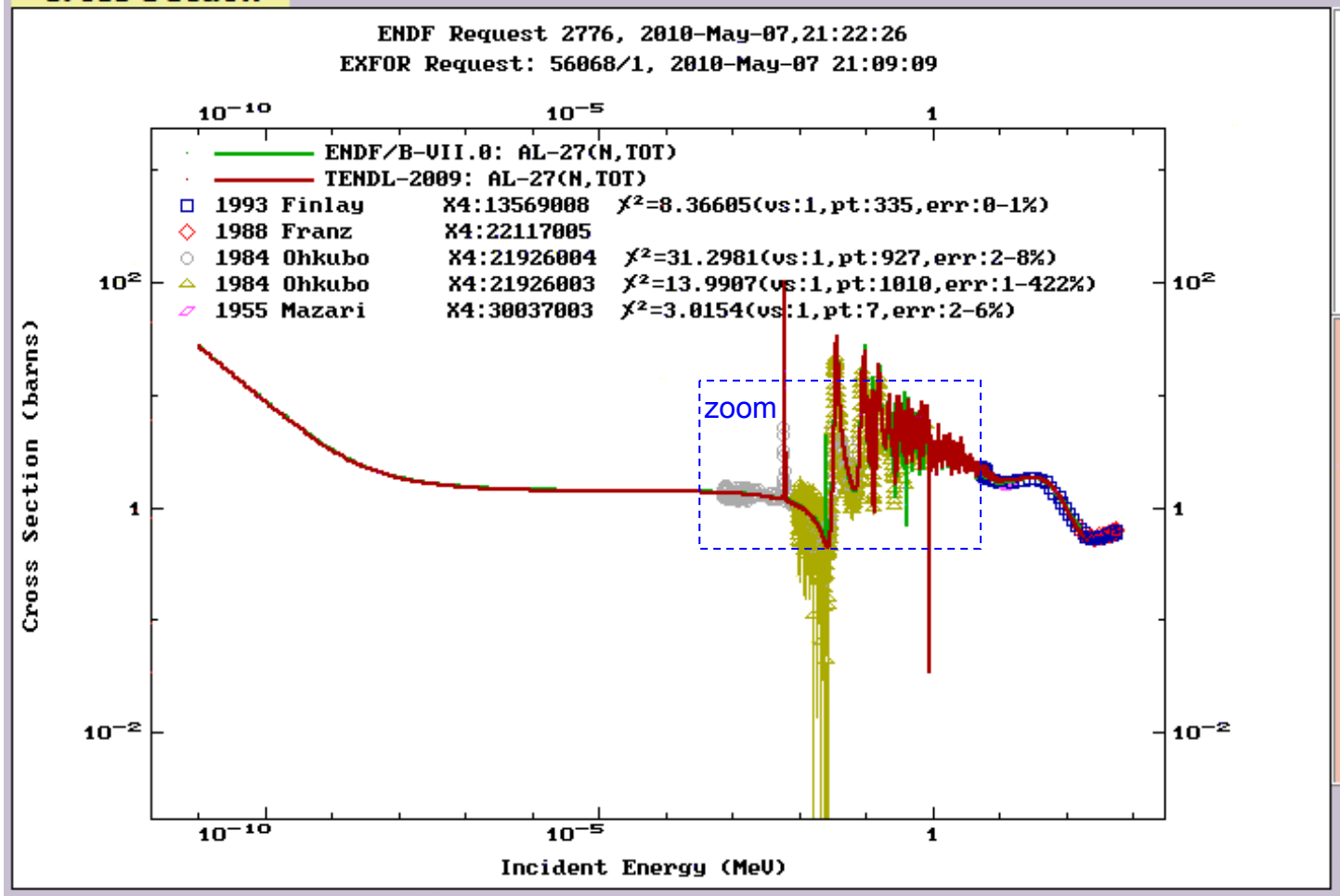
Get plotted data

ENDF Select Form



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 Form with interactive Web ZVView plotting



Select data for plotting

- [x] 1) 13-AL-27(N,TOT),,SIG
  - [x] 1993 R.W.Finlay,
  - [x] 1988 J.Franz,
  - [x] 1984 M.Ohkubo
  - [x] 1984 M.Ohkubo
  - [x] 1955 M.Mazari,
- [x] 2) ENDF/B-VII.0: AL-27(N,TOT)
- [x] 3) TENDL-2009: AL-27(N,TOT)

- [ ] 4) Use my data [example]

Columns: x y [dy [dx]]

	1.5	2.336	0.384
	2	2.788	0.268
	2.33	2.96	0.4
	2.5	2.399	0.283
	3	2.424	0.197
	4.04	2.496	0.065
	5.06	2.222	0.065
	5.5	2.304	0.1659

Type: (•) Curve ( ) Points

Title: My data

Multiply by: X: 1e6 Y: 1e-3

See: plotted data (743Kb)

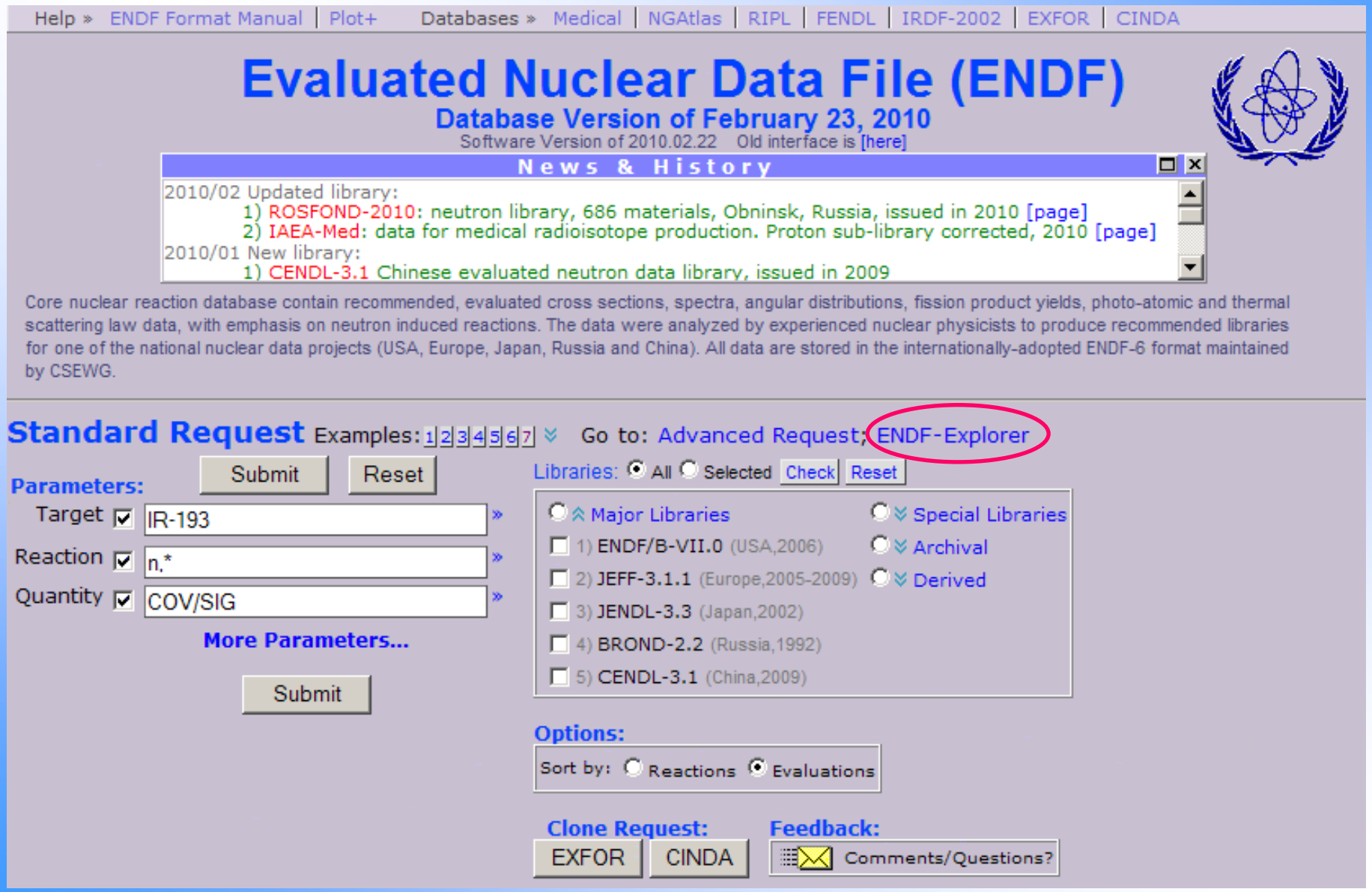
Log: XY X Y Lin: XY X Y Auto-range: XY X Y Page: >> << Zoom: <> >< Grid: VH 0 V H Pts: Txt Box PL

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

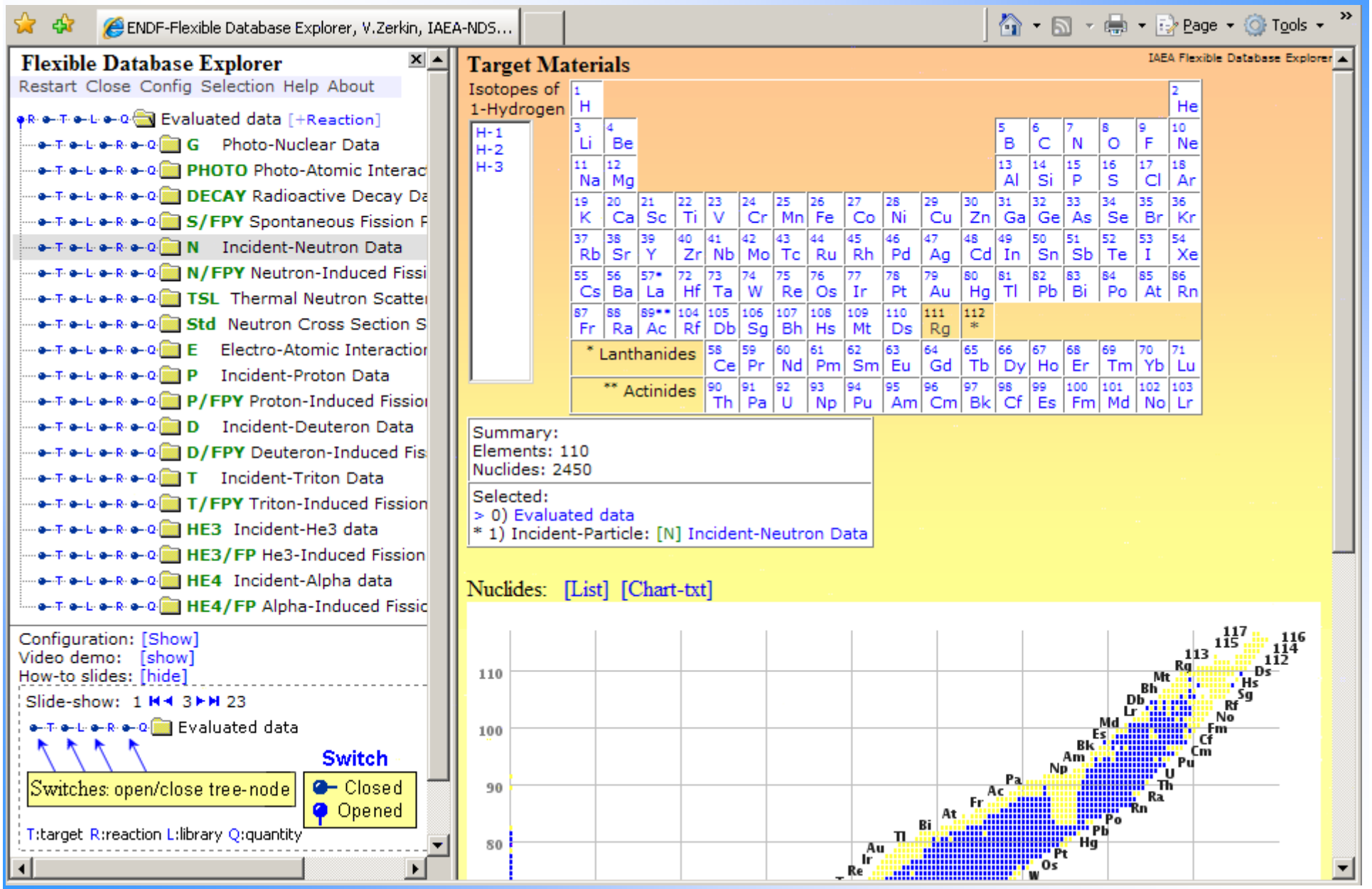
Plotting options

Data for plotting: ZVD (724Kb), send to ZVView; download ZVView; upload and plot your ZVD file

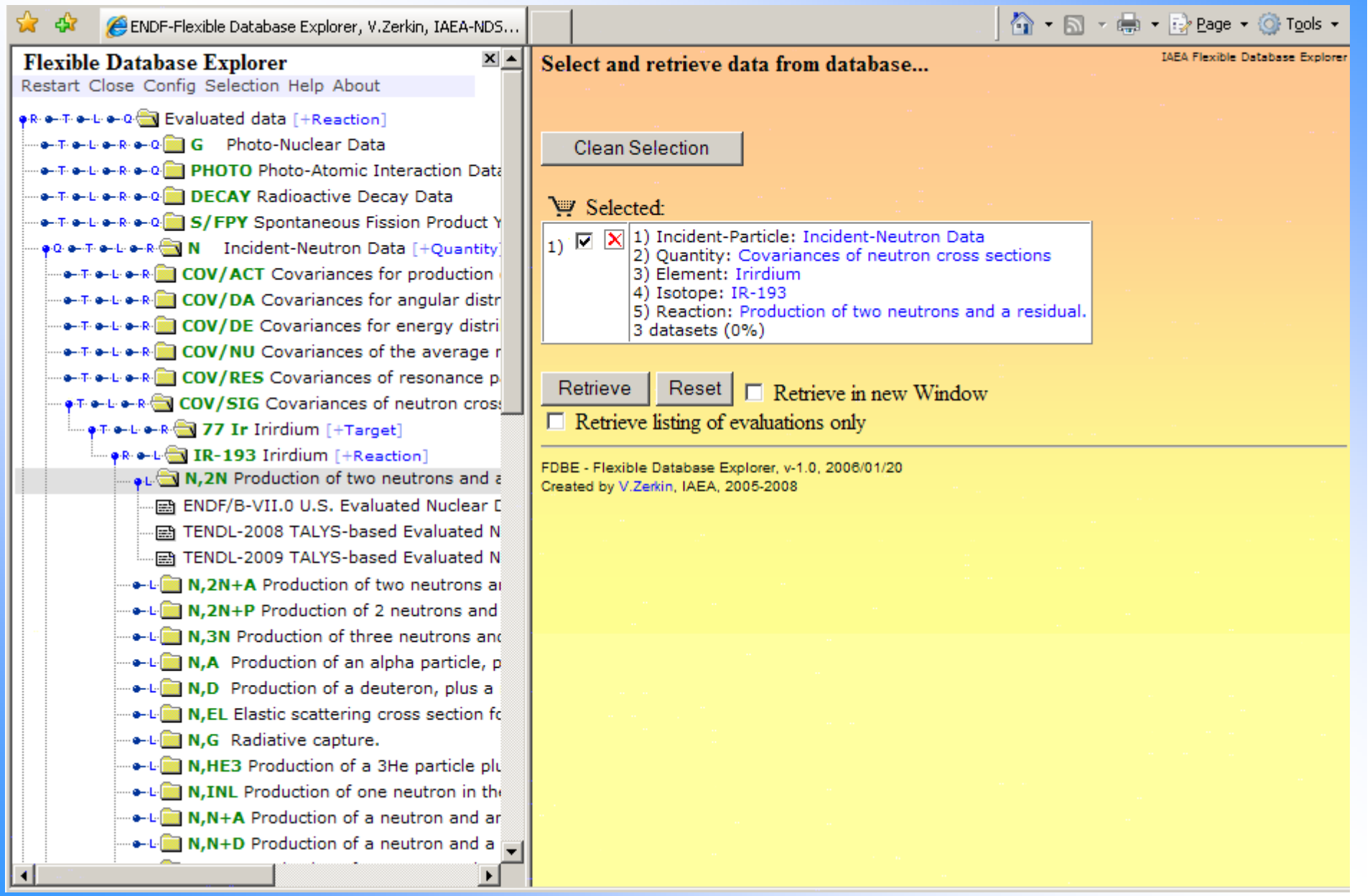
ENDF Request Form



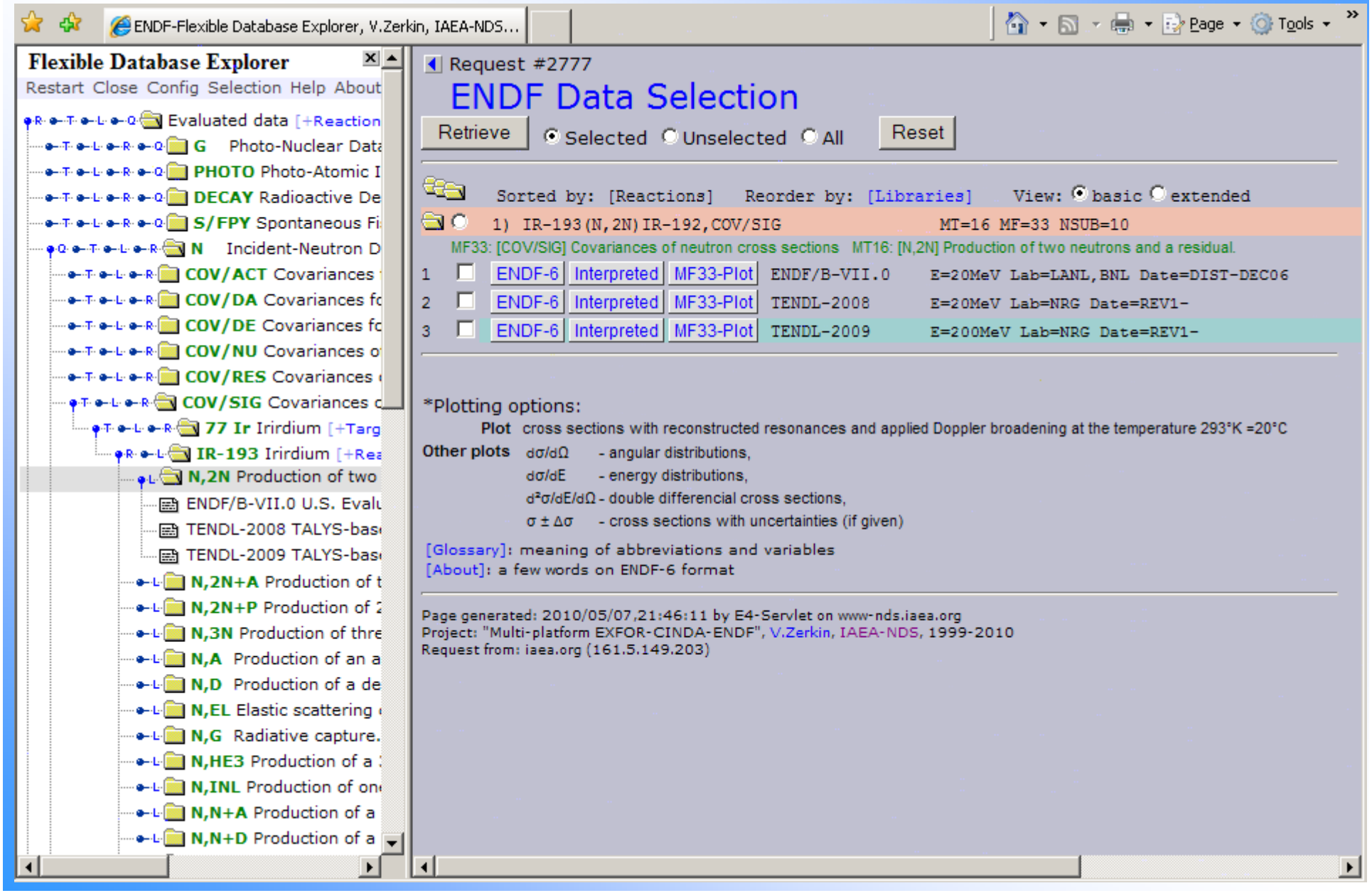
ENDF Flexible Database Explorer



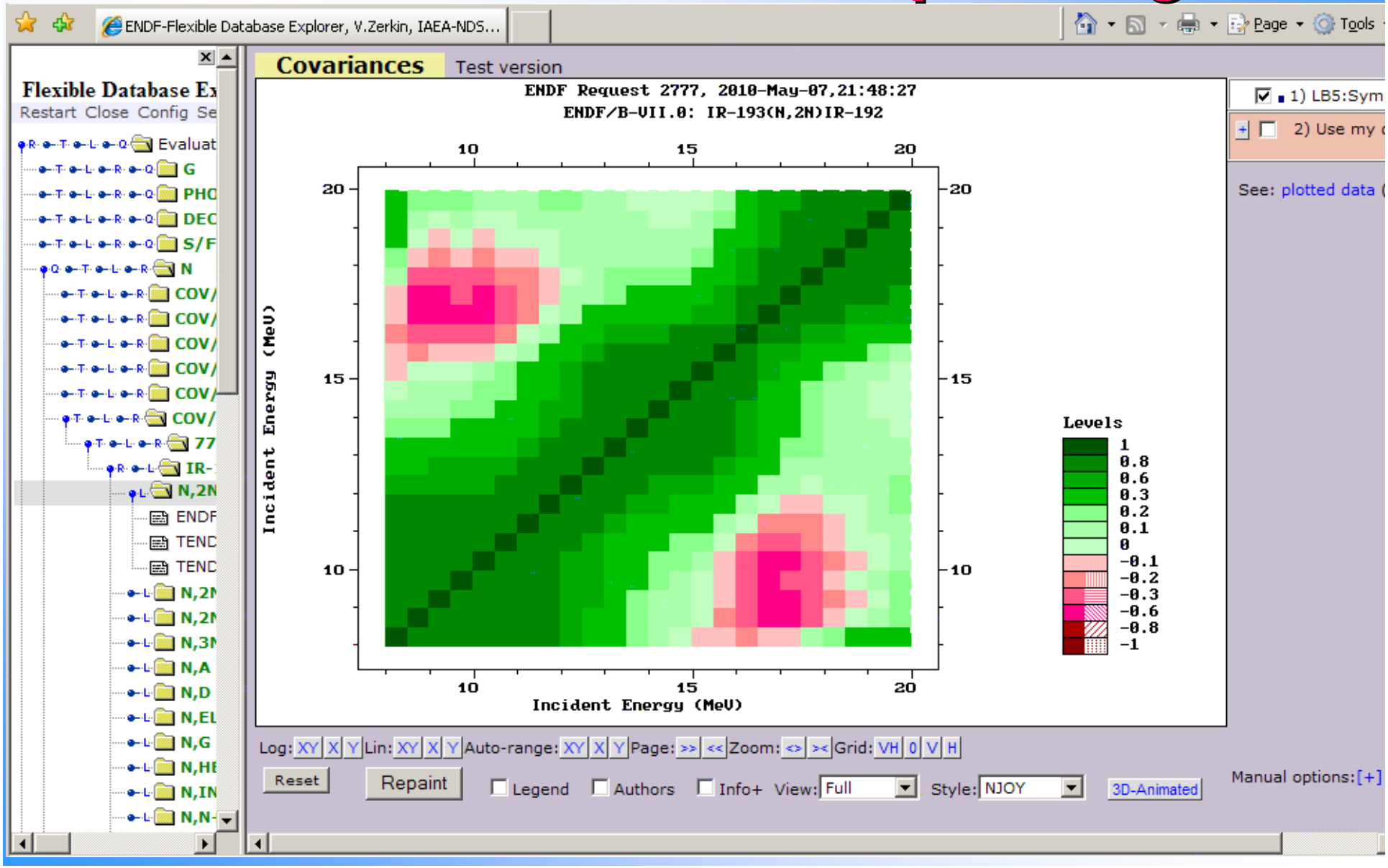
ENDF Explorer: data found



Standard ENDF Select Form

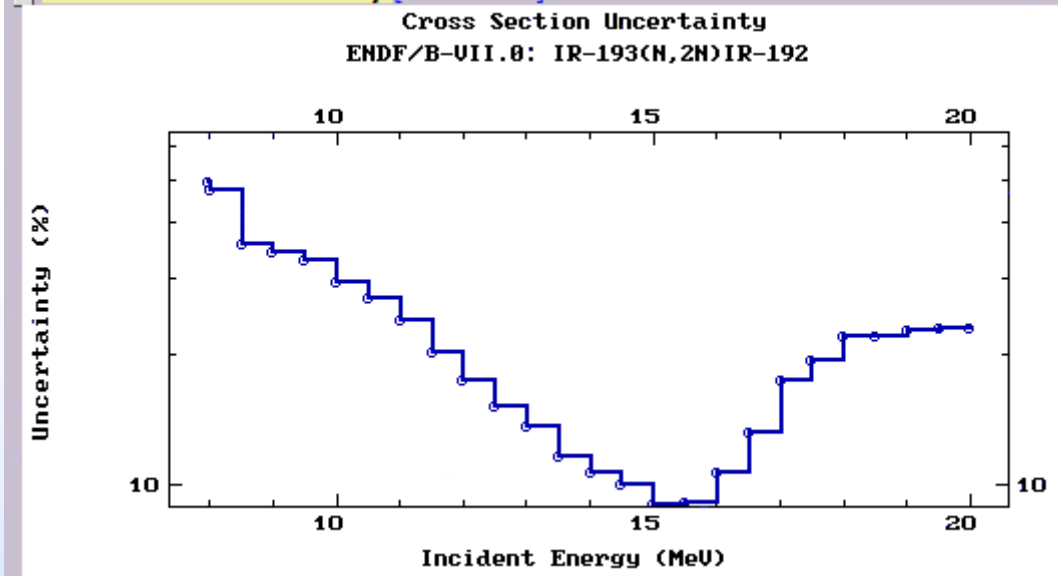


Again ENDF Output Form with interactive ZVView plotting

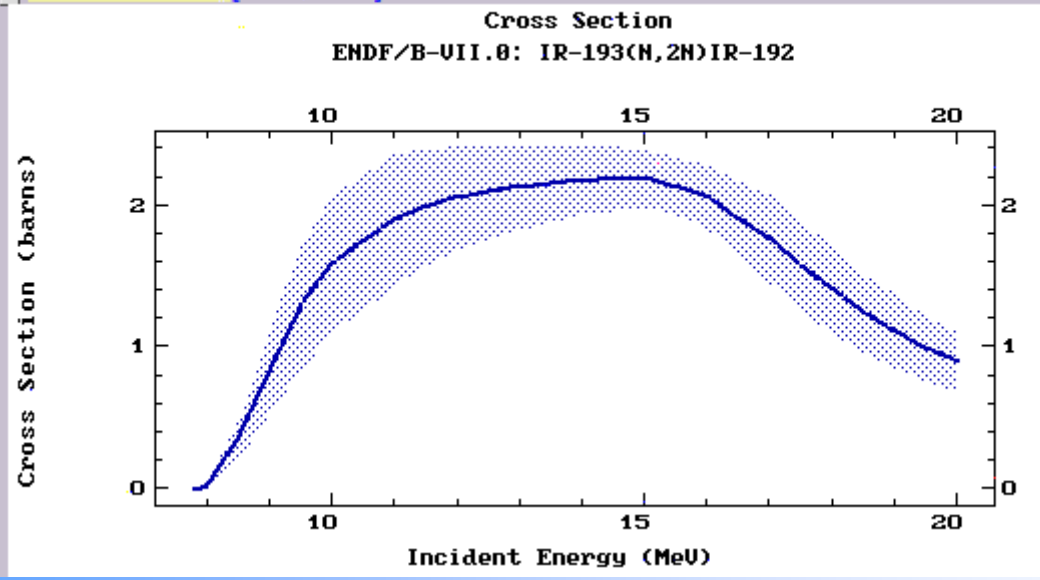


Display Cross Section and Uncertainty

Cross Section Uncertainty [interactive]



Cross Sections [interactive]



Correlation matrix

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

#
#LB5:Symmetric Matrix

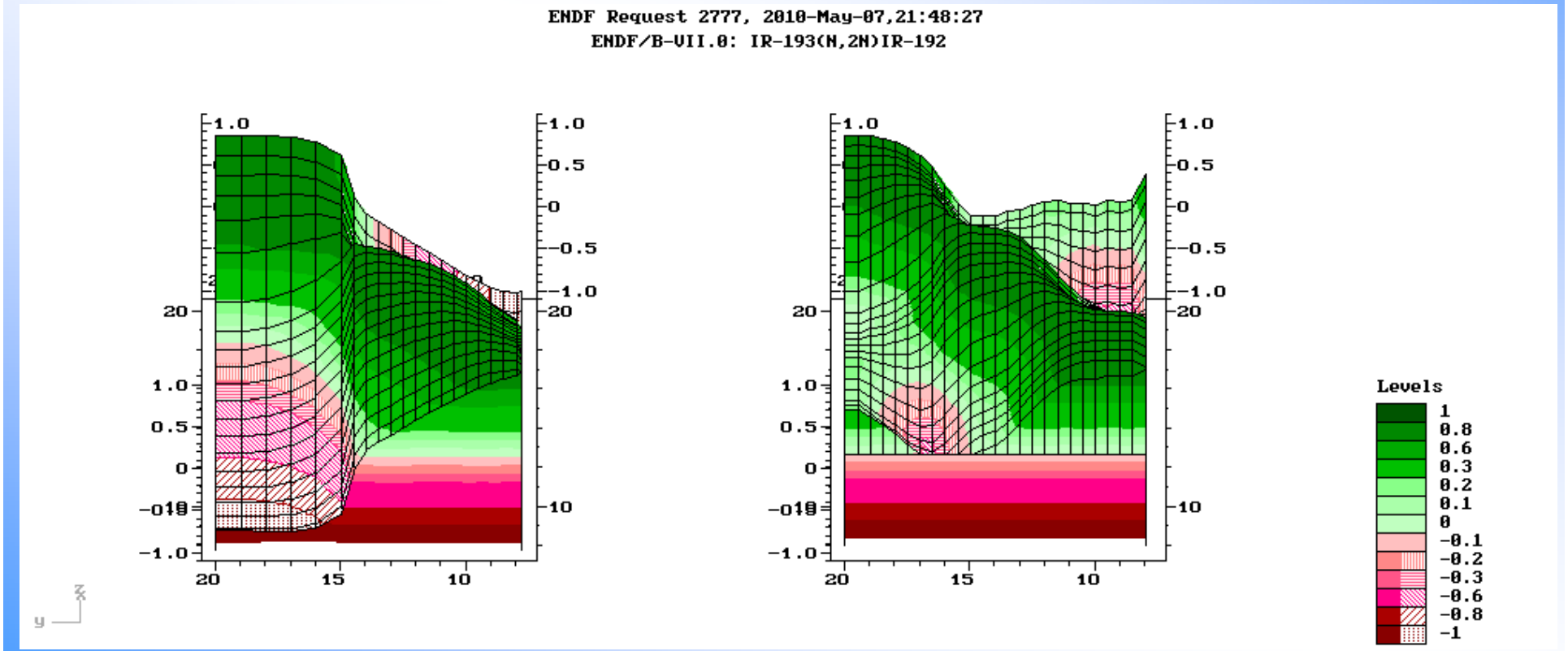
Z(26x26): $Z_{i,j} = Cor(\sigma_{Xi},\sigma_{Yj})*1000$

	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

Animated 3-D display of correlation matrix

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

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



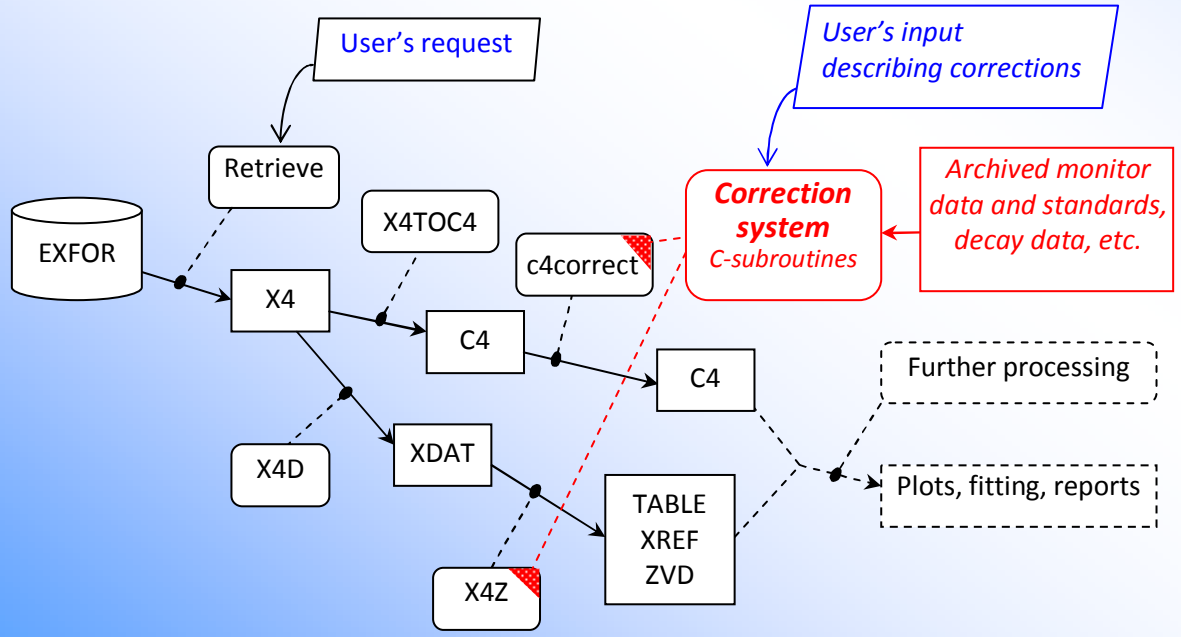
EXFOR Correction System

For the moment, the Correction System is able to perform:

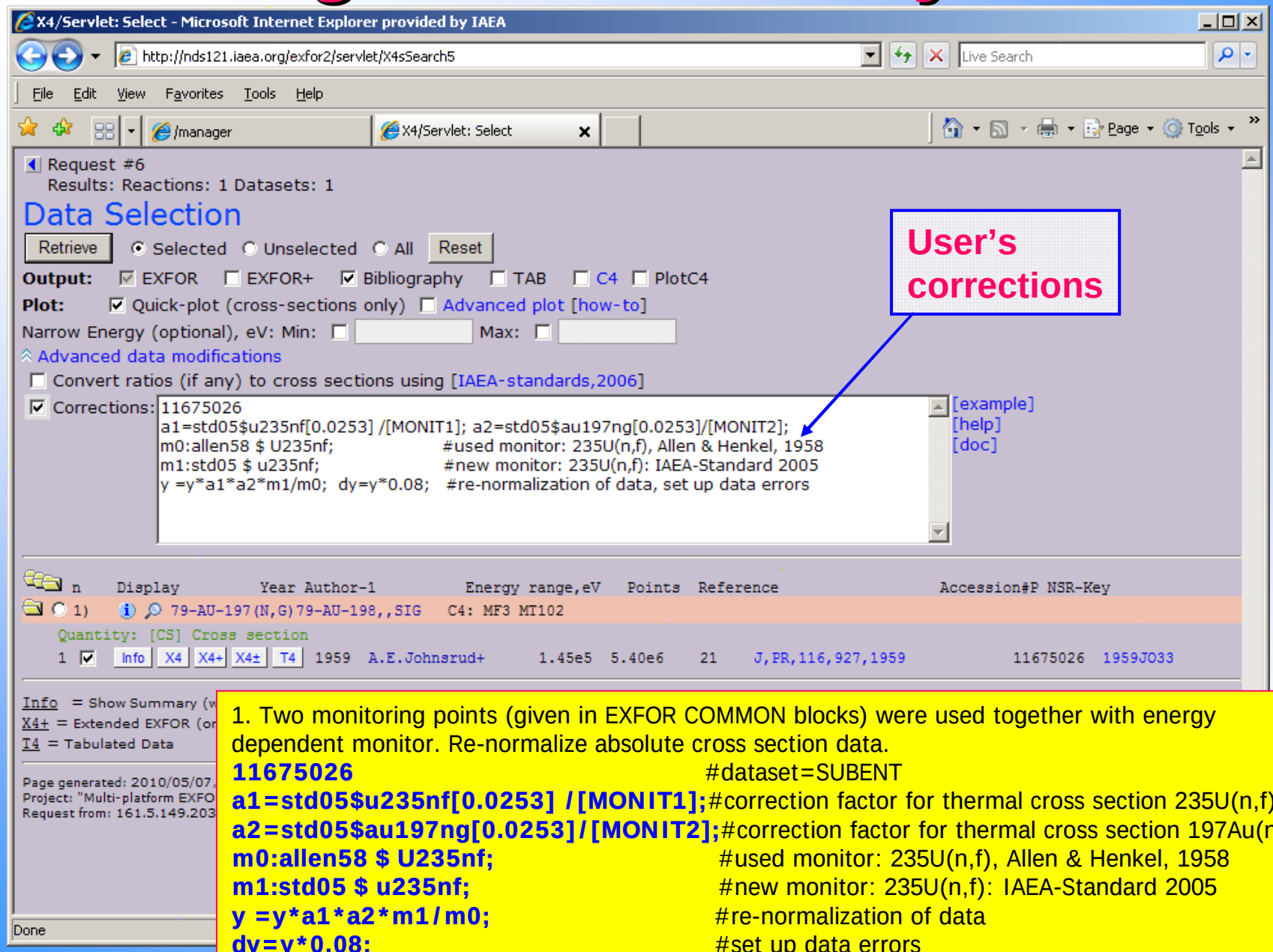
- simple experimental data re-calculation using given factor;
- re-calculate any numbers (including data, energies, angles and their uncertainties) by inter-data expressions using several math operations;
- any manipulations can be limited by an energy range;
- re-normalize data using monitors from archive and recent standards;
- re-normalize data using monitor data coded in EXFOR and recent standards;
- re-normalize data using isotopes abundances and half-lives;
- set up uncertainties if they are not given;
- delete part of a data set;
- convert ratios to absolute numbers;
- calculate ratios to archival monitors and to monitors coded in EXFOR;
- change incident energies;
- correcting wrong units, etc.

Correction System: paradigm

- **We DO NOT change EXFOR data:**
  we renormalize output from EXFOR system,
  i.e. we correct of experimental data in computational formats
- Corrected output:
  - computational format C4
  - TABLE, XREF
  - XDAT (intermediate format used for plotting)
  - Quick plots
  - Advanced plots



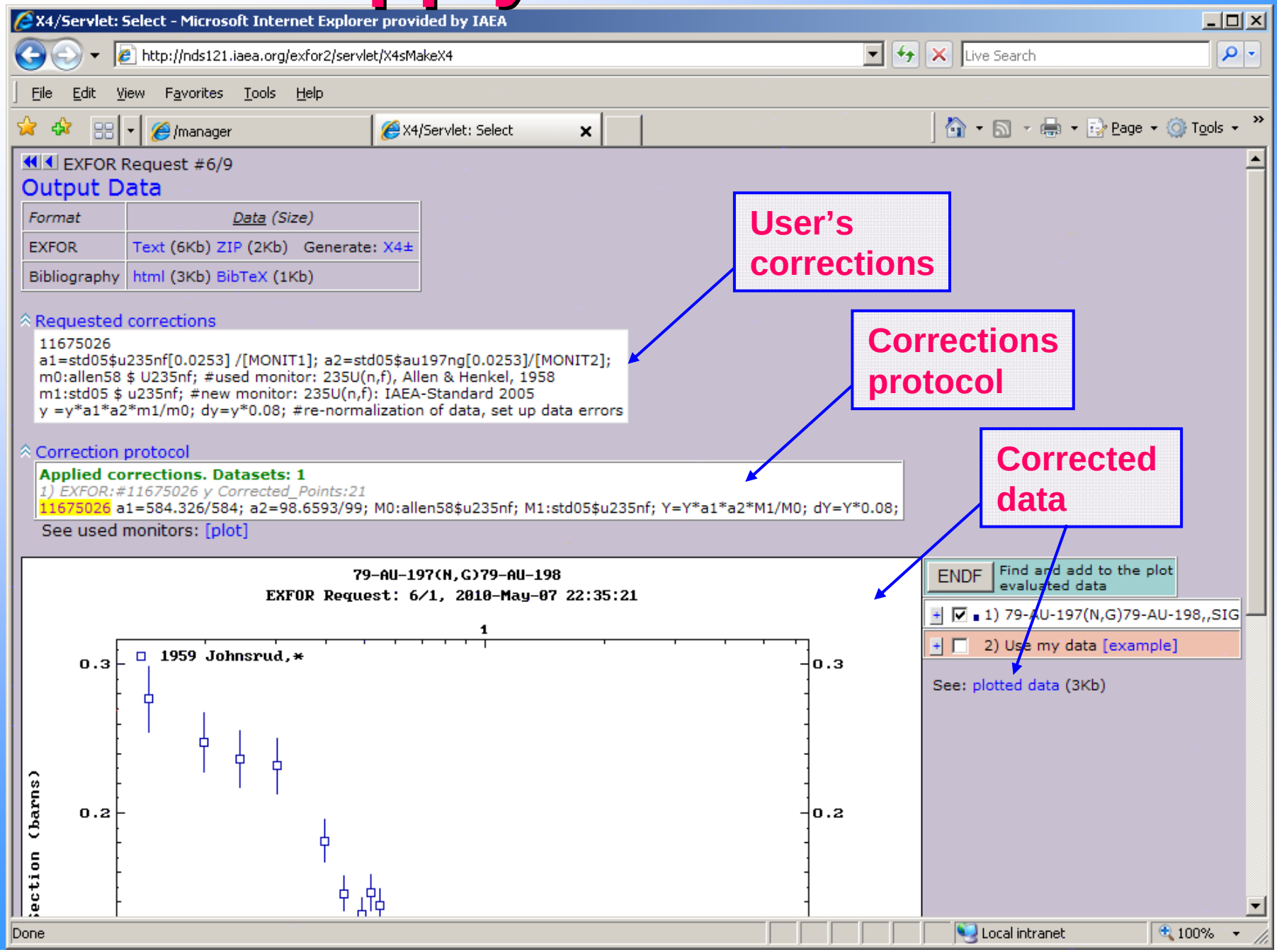
Using Correction System



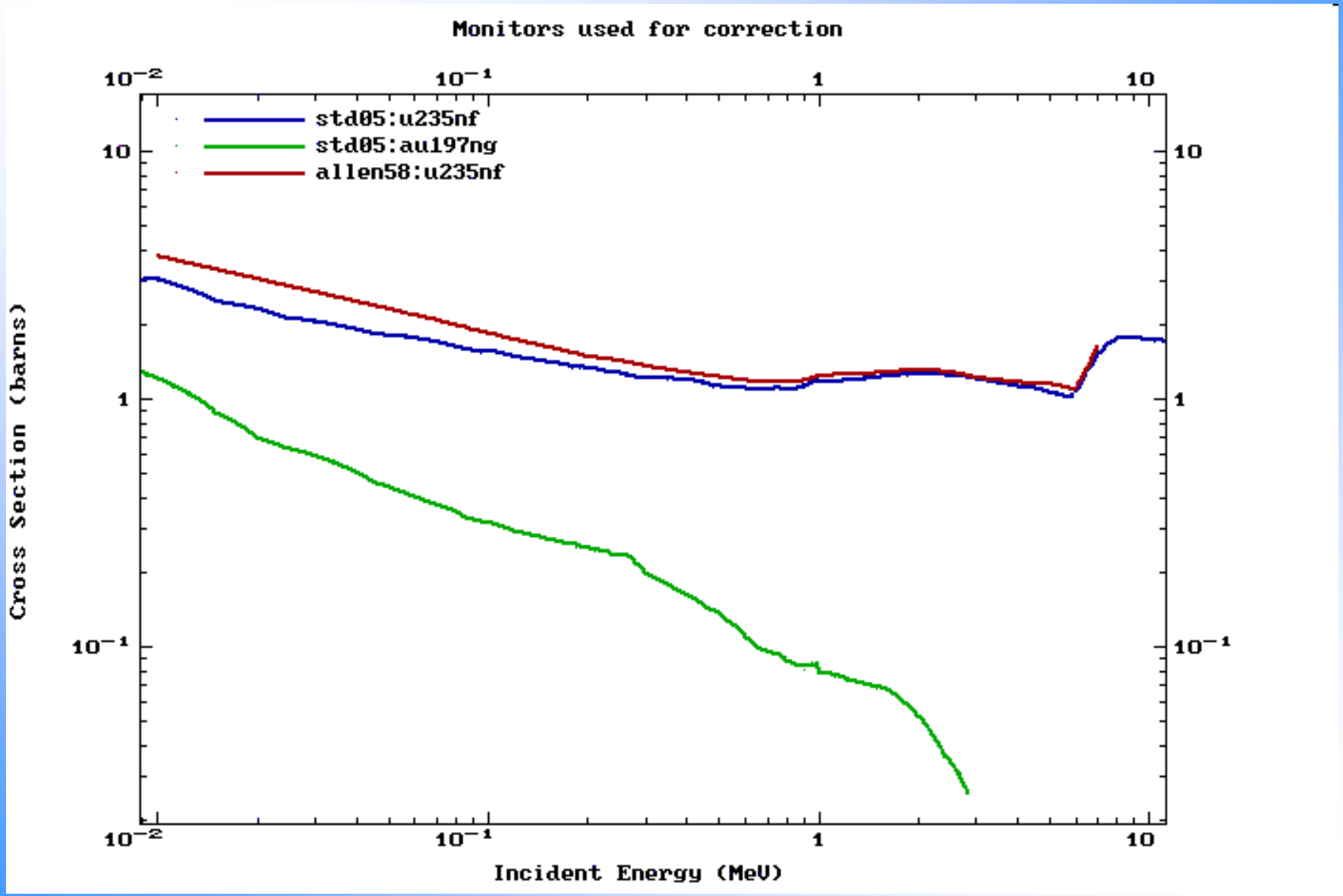
1. Two monitoring points (given in EXFOR COMMON blocks) were used together with energy dependent monitor. Re-normalize absolute cross section data.

```
11675026                                  #dataset=SUBENT
a1=std05$u235nf[0.0253] /[MONIT1];#correction factor for thermal cross section 235U(n,f)
a2=std05$au197ng[0.0253]/[MONIT2];#correction factor for thermal cross section 197Au(n,γ)
m0:allen58 $ U235nf;                #used monitor: 235U(n,f), Allen & Henkel, 1958
m1:std05 $ u235nf;                  #new monitor: 235U(n,f): IAEA-Standard 2005
y =y*a1*a2*m1/m0;                   #re-normalization of data
dy=y*0.08;                          #set up data errors
```

Apply corrections

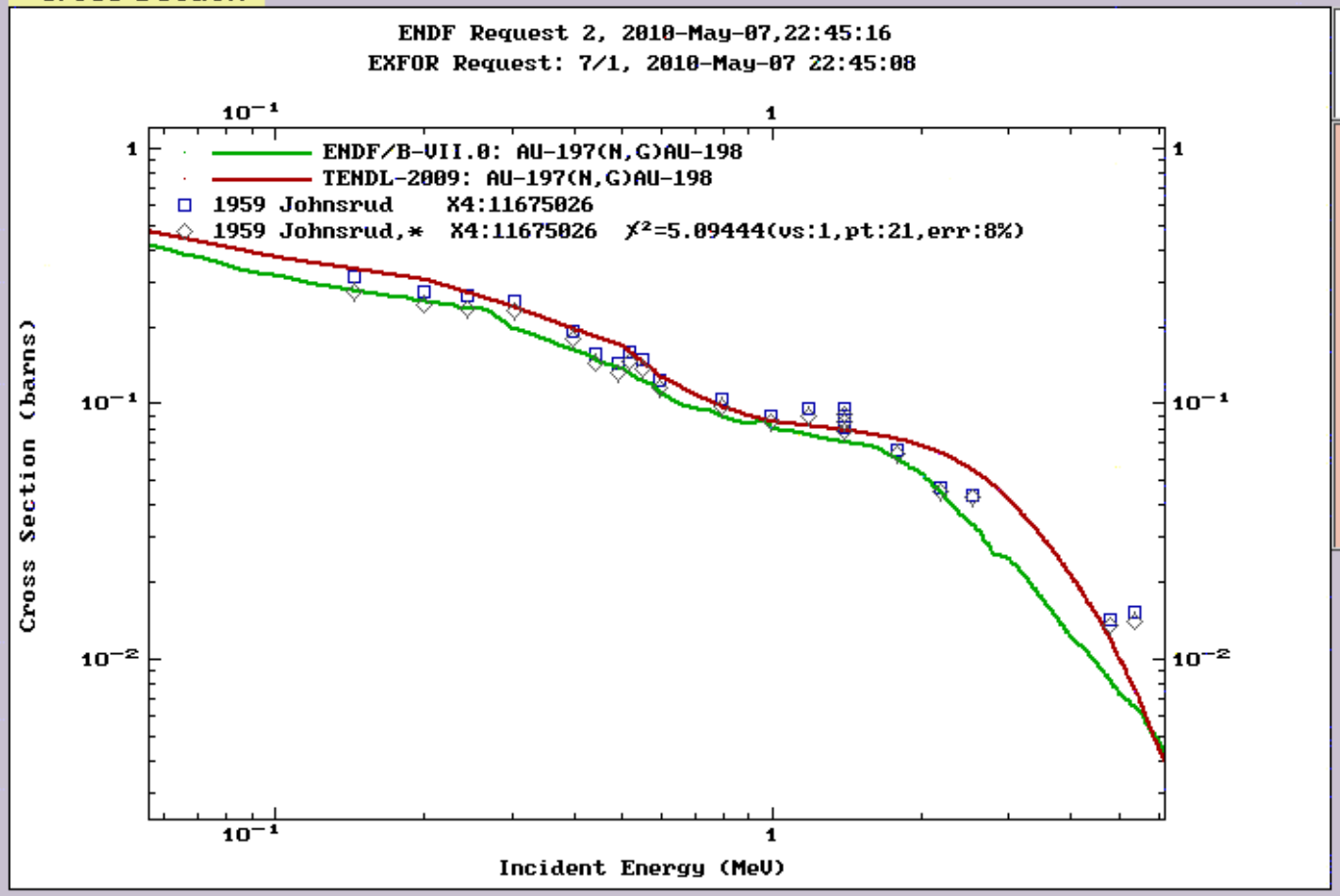


Checking used monitors



Original EXFOR data, corrected data and evaluated data

Cross Section



+ 1) 79-AU-197(N,G)79-AU-198,,SIG
2) ENDF/B-VII.0: AU-197(N,G)AU-198
3) TENDL-2009: AU-197(N,G)AU-198

- 4) Use my data [example]

Columns: x y [dy [dx]]

```
ENDPHYSENT
ENDREQUEST
#end   X4R7_x4.tab/t
#begin X4R7_x4.xre/r
REQUEST              7001   20100
  79-AU-197(N,G)79-AU-198,,SIG
#end   X4R7_x4.xre/r
```

Type: Curve Points
Title: My data
Multiply by: X: 1 Y: 1

See: plotted data (2353Kb)

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

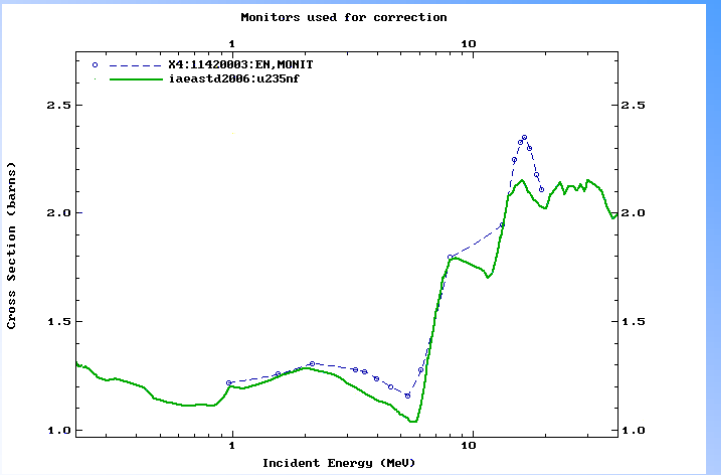
Reset Repaint Legend Authors Info+ PostScript Manual options:[+]

Data for plotting: ZVD (2270Kb), send to ZVView; download ZVView; upload and plot your ZVD file

EXFOR 1142003 25-MN-55(N,G)25-MN-56,,SIG Menlove, 1967

```
SUBENT        11420001     860612
BIB                11          19
INSTITUTE   (1USALOK)
REFERENCE   (J,PR,163,1299,67)
            (C,66WASH,2,746,6603)
AUTHOR      (H.O.MENLOVE,K.L.COOP,H.A.GRENCH,R.SHER)
TITLE       NEUTRON RADIATIVE CAPTURE CROSS SECTIONS FOR NA23,
            MN55, IN115, AND HO165 IN THE ENERGY REGION 1.0 TO 19.4
            MEV.
FACILITY    (VDG)
INC-SOURCE  (P-T) 1.0-2.2 MEV.
            (D-D) 3.3-6.1 MEV.
            (A-BE) 13.3-19.4 MEV.
            (D-T) 13.3-19.4 MEV.
MONITOR     (92-U-235(N,F),,SIG)
DETECTOR    (NAICR)
METHOD      (ACTIV)
STATUS      (SCSRS)
HISTORY     (760715T) TRANSLATED FROM SCISRS
            (820813A) CONVERTED TO REACTION FORMALISM
            (860612A) BIB UPDATE.
ENDBIB             19
NOCOMMON            0           0
ENDSUBENT          22
SUBENT        11420003     860612
BIB                 2           2
REACTION    (25-MN-55(N,G)25-MN-56,,SIG)
DECAY-DATA  (25-MN-56,2.58HR,DG)
ENDBIB              2
NOCOMMON            0           0
DATA                5          17
EN          EN-RSL      DATA        DATA-ERR    MONIT
MEV         MEV         B           B           B
 9.70   -01 1.00    -01 2.80    -03 2.2     -04 1.22
 1.56   +00 1.2     -01 1.94    -03 1.5     -04 1.26
 2.15   +00 1.3     -01 1.89    -03 1.4     -04 1.31
 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 1.735  +01 3.2     -01 7.05    -04 7.1     -05 2.30
 1.844  +01 3.3     -01 5.80    -04 5.5     -05 2.18
 1.939  +01 3.5     -01 4.72    -04 4.8     -05 2.11
ENDDATA            19
ENDSUBENT          26
```

Monitors used for re-normalization

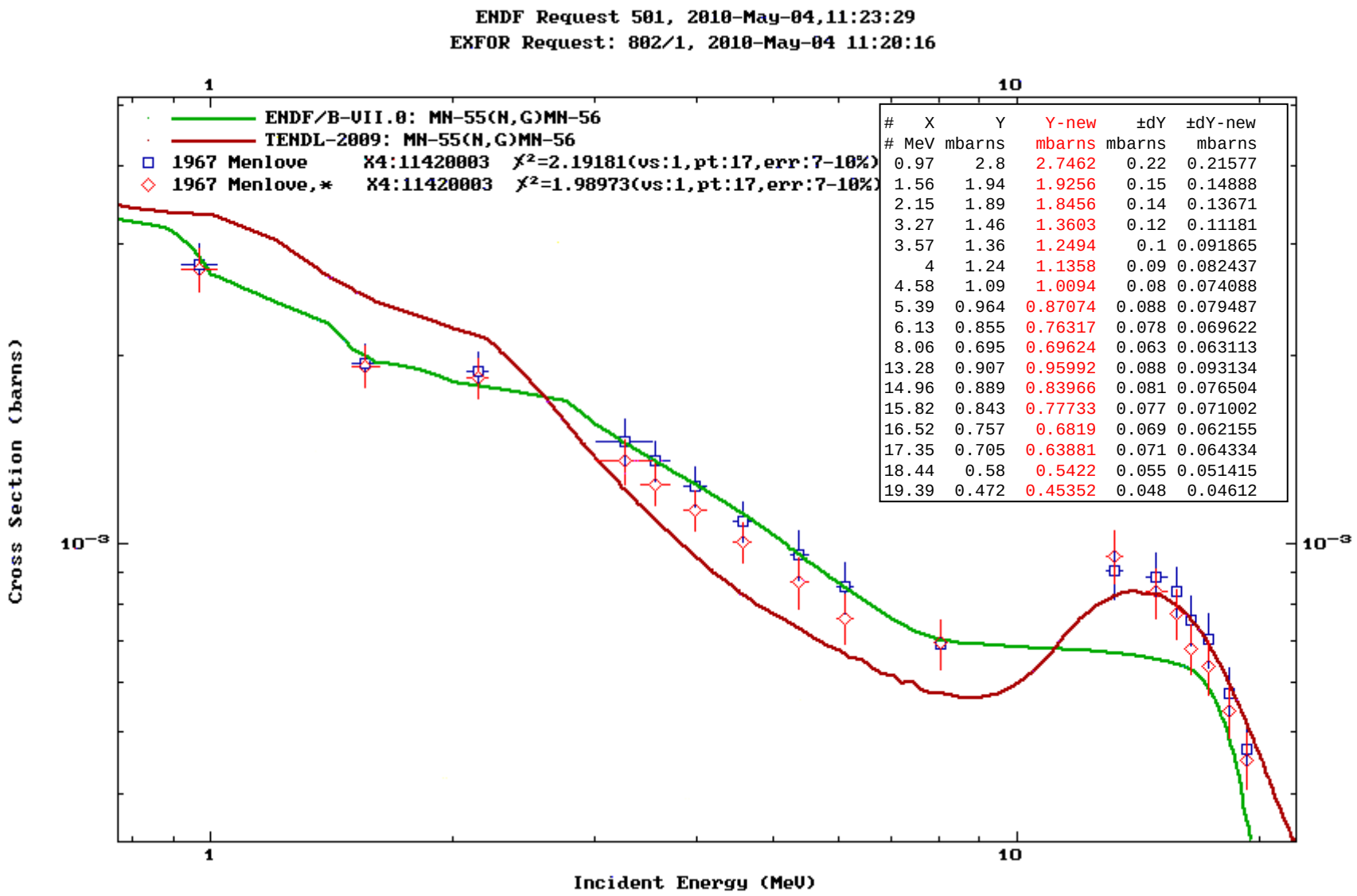


IAEA Standards (2006)

```
#Corrections:
11420003
        m0: [EN,MONIT];
        m1: iaeastd2006 $ u235nf;
        y =y*m1/m0;
        dy=dy*m1/m0;
```

EXFOR 1142003 25-MN-55(N,G)25-MN-56,,SIG Menlove, 1967

Applied corrections. Datasets: 1
1) EXFOR:#11420003 Corrected_Points:17
11420003 M0:[EN,MONIT]; M1:iaeastd2006$u235nf; Y=Y*M1/M0; dY=dY*M1/M0;



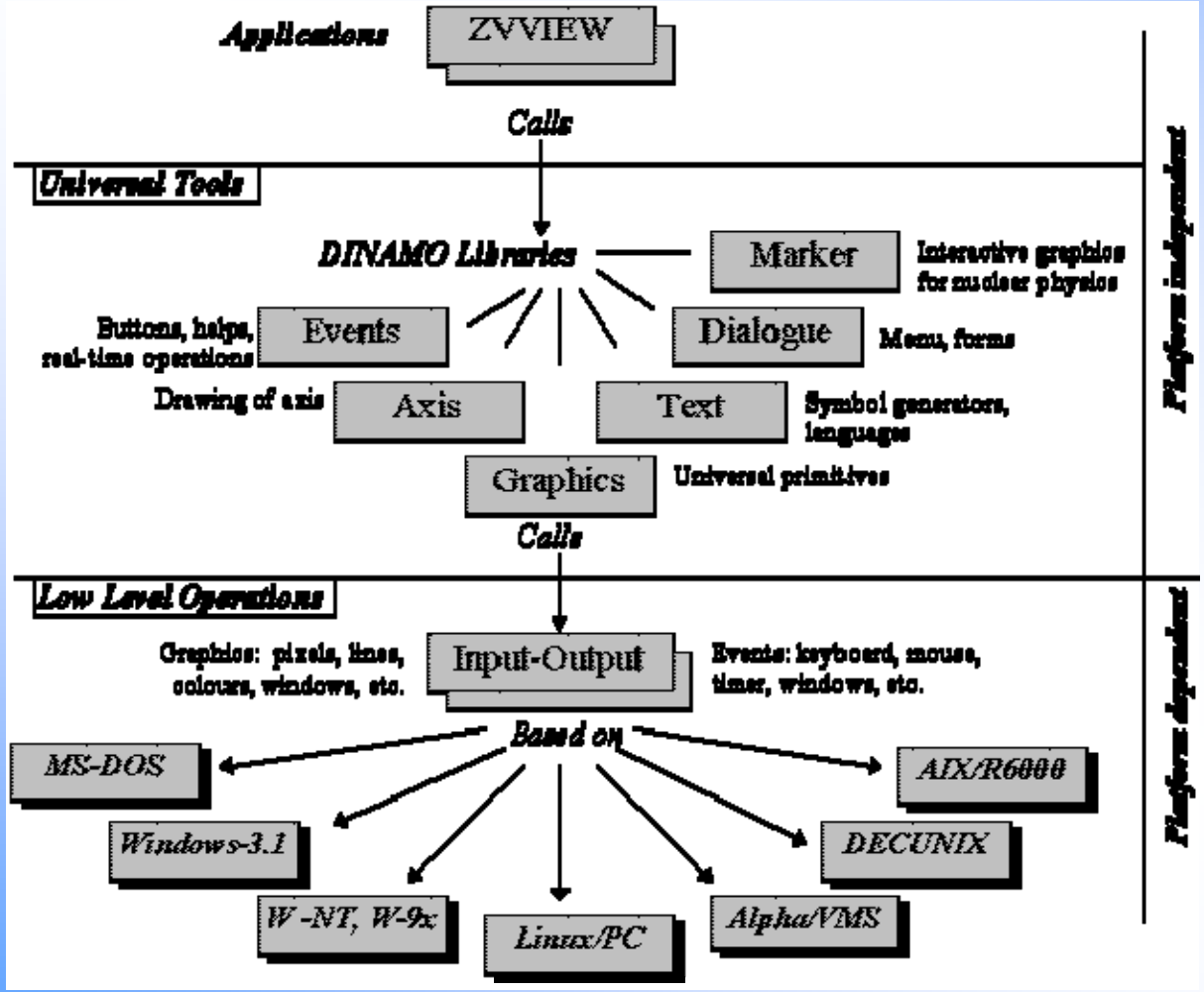
# X	Y	Y-new	±dY	±dY-new
# MeV	mbarns	mbarns	mbarns	mbarns
0.97	2.8	2.7462	0.22	0.21577
1.56	1.94	1.9256	0.15	0.14888
2.15	1.89	1.8456	0.14	0.13671
3.27	1.46	1.3603	0.12	0.11181
3.57	1.36	1.2494	0.1	0.091865
4	1.24	1.1358	0.09	0.082437
4.58	1.09	1.0094	0.08	0.074088
5.39	0.964	0.87074	0.088	0.079487
6.13	0.855	0.76317	0.078	0.069622
8.06	0.695	0.69624	0.063	0.063113
13.28	0.907	0.95992	0.088	0.093134
14.96	0.889	0.83966	0.081	0.076504
15.82	0.843	0.77733	0.077	0.071002
16.52	0.757	0.6819	0.069	0.062155
17.35	0.705	0.63881	0.071	0.064334
18.44	0.58	0.5422	0.055	0.051415
19.39	0.472	0.45352	0.048	0.04612

Interactive plotting package ZVView

by V.Zerkin, Kiev-Vienna, 1993 -2010

ZVView: software package for efficient interactive visual analyses of the nuclear data.
DINAMO*: basic graphics library for creating software applications for nuclear research.

Software Structure



*DINAMO - Copyright © - 1998, Viktor Zerkin, registered: Ukraine, ПА N1539

ZVView / Dinamo: major features

• **Language**	C, ~110.000 lines
• **User interface**	Self-made, low level
• **Multi-platform**	Windows, Linux/X11, Mac, VMS, MS-DOS, ...
• **Many data types**	experimental, theoretical, spectra, ...
• **Many datasets**	flexible array of functions
• **Many input formats**	BNL-Table, Xref, MF3, MF33, etc.
• **Many output formats**	ZVD, table, PCX, GIF, PS, EPS, EMF
• **Multi-language**	English, Russian, French
• **Functions**	Lin/Log, zoom by mouse, scaling, fitting, legend, changing units, 3D animation, scanning points, data comparison, selection of authors, etc.
• **Many regimes**	stand-alone program, Web Browser-helper application, server-side plotting, non-interactive procedure to produce plots, ...
• **Part of packages**	Exfor-Endf Web retrieval system, Empire, EndVer/GUI, EXFOR-CDROM, Web-ZVView, etc.

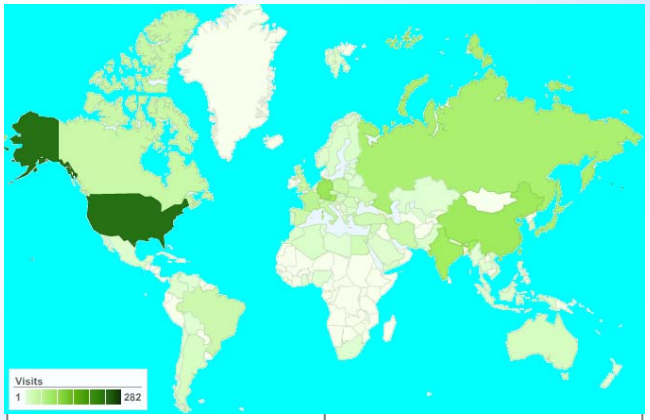
ZVView: 1996-2010

Download: http://www-nds.iaea.org/ndspub/zvview/

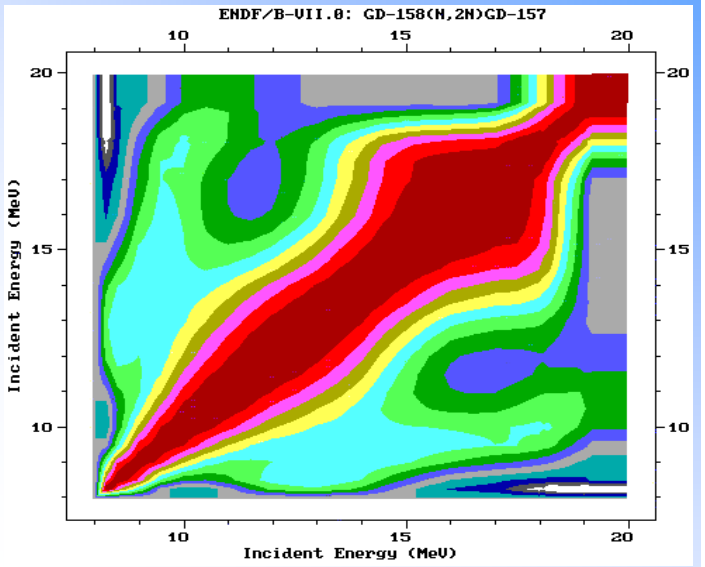
Integrated into:

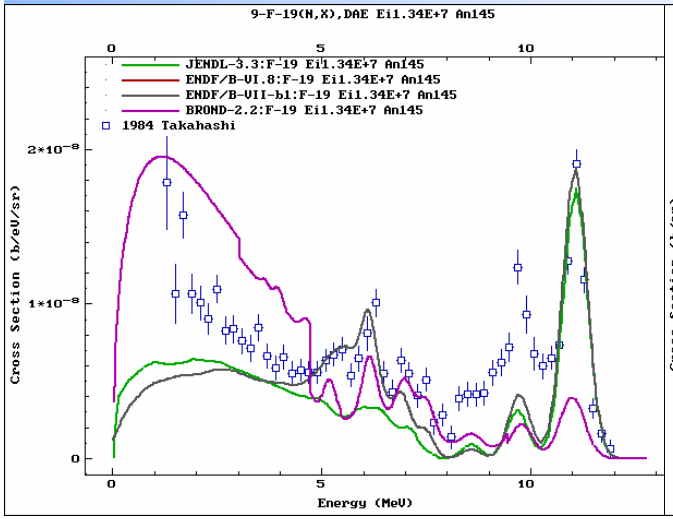
- EXFOR-ENDF Web Retrieval system
- Empire
- Endver/GUI
- EXFOR-CDROM
- PGAA
- NG-Atlas
- FENDL in Pictures
- IRDF-2002
- ENDF-covariance tools
- Web-ZVView

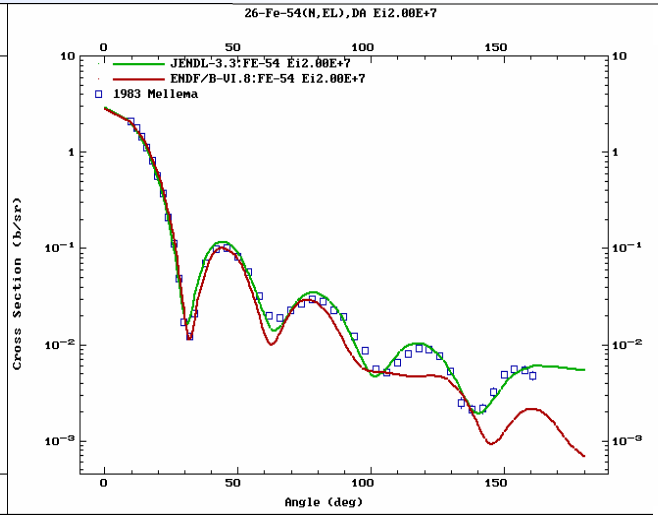
Last 15 Months: 1,528 visits came from 72 countries/territories 698 visitors (by Google Analytics)

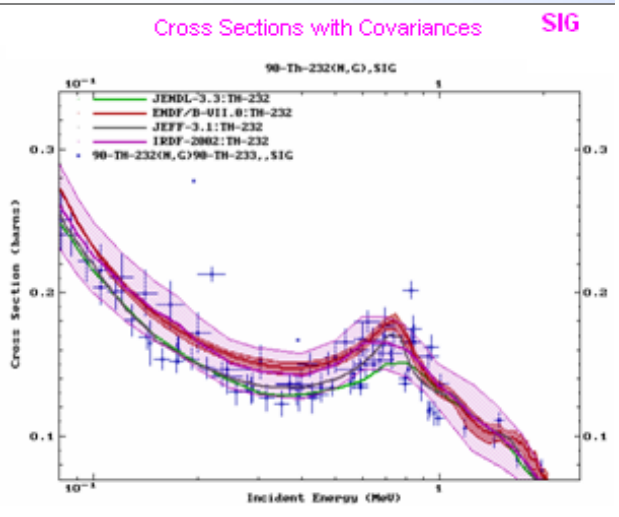


1.	United States	282	6.	Russia	83
2.	Germany	103	7.	Japan	77
3.	China	100	8.	France	54
4.	Austria	99	9.	United Kingdom	39
5.	India	96	10.	Canada	37





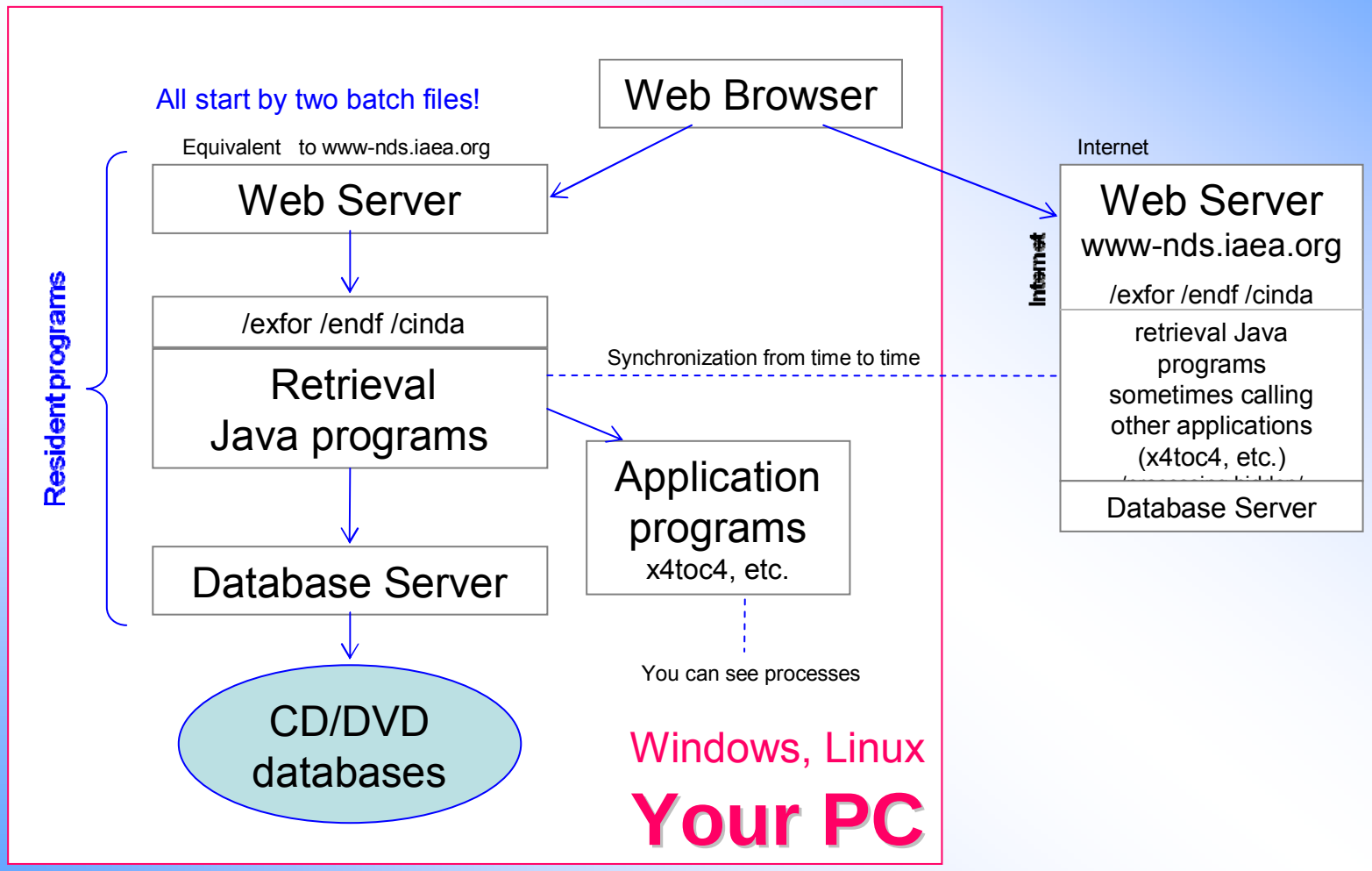




Pilot project:

“Web on your Table”

Complete Web retrieval system running locally



Thank you.