The Abdus Salam
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United Nations Educational, Scientific and Cultural Organization

IAEA
International Atomic Energy Agency

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Joint ICTP-IAEA Workshop on Nuclear Data for Analytical Applications

21 - 25 October 2013

Introduction to the IAEA Nuclear Data Services

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Introduction to the IAEA Nuclear Data Services

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International Atomic Energy Agency, Nuclear Data Section

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International Atomic Energy Agency

Nuclear Data Services

Provided by the Nuclear Data Section

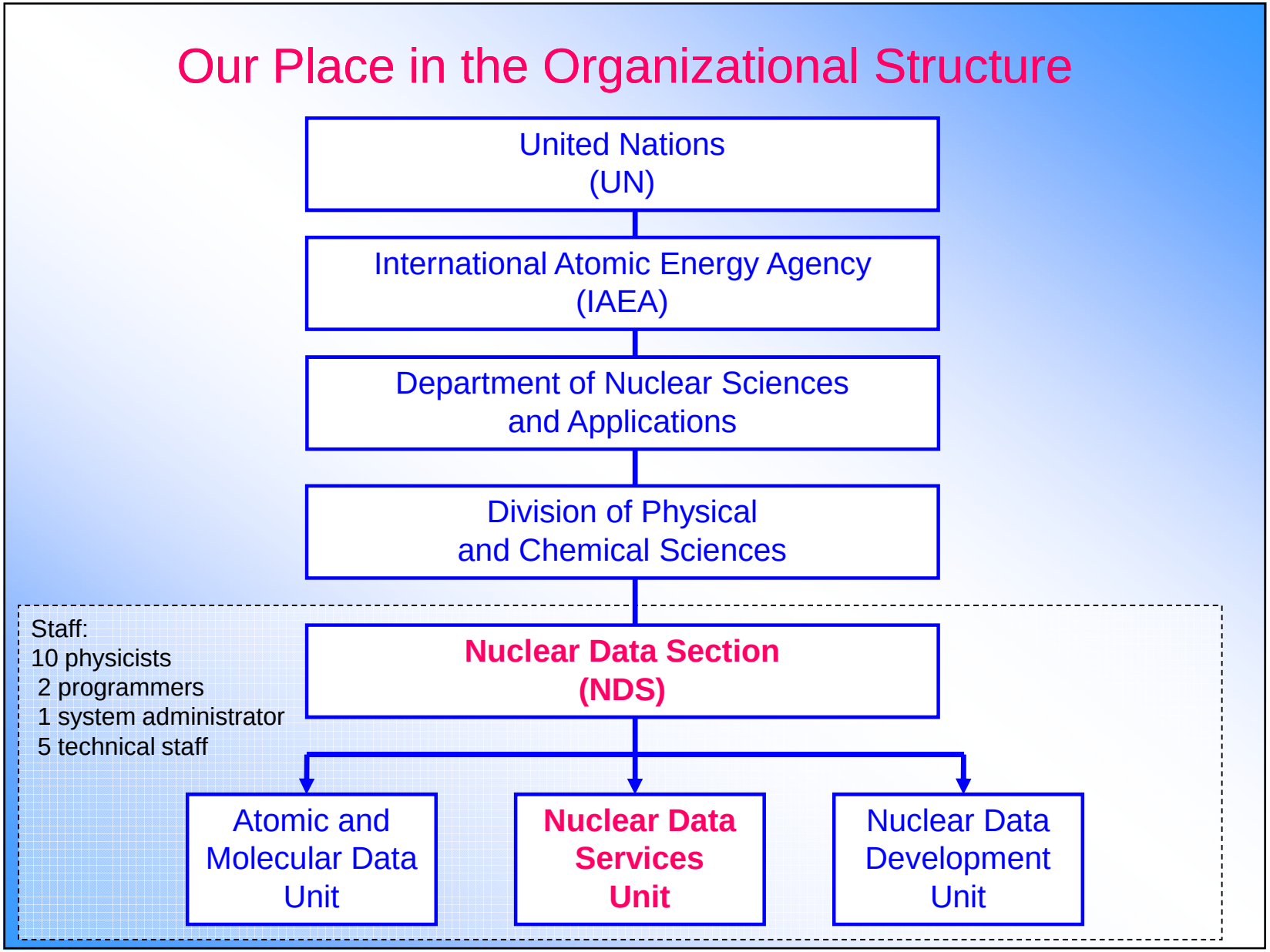
Our Internet Address

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



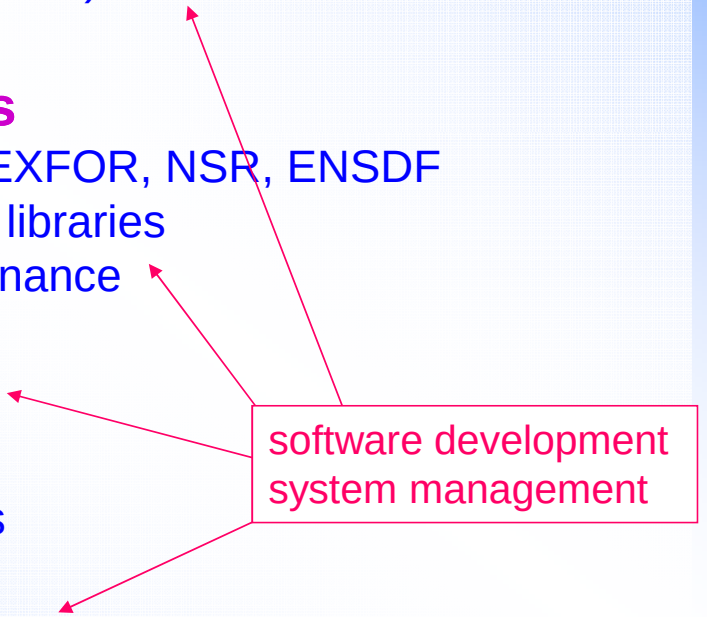
The Mission of NDS

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" (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

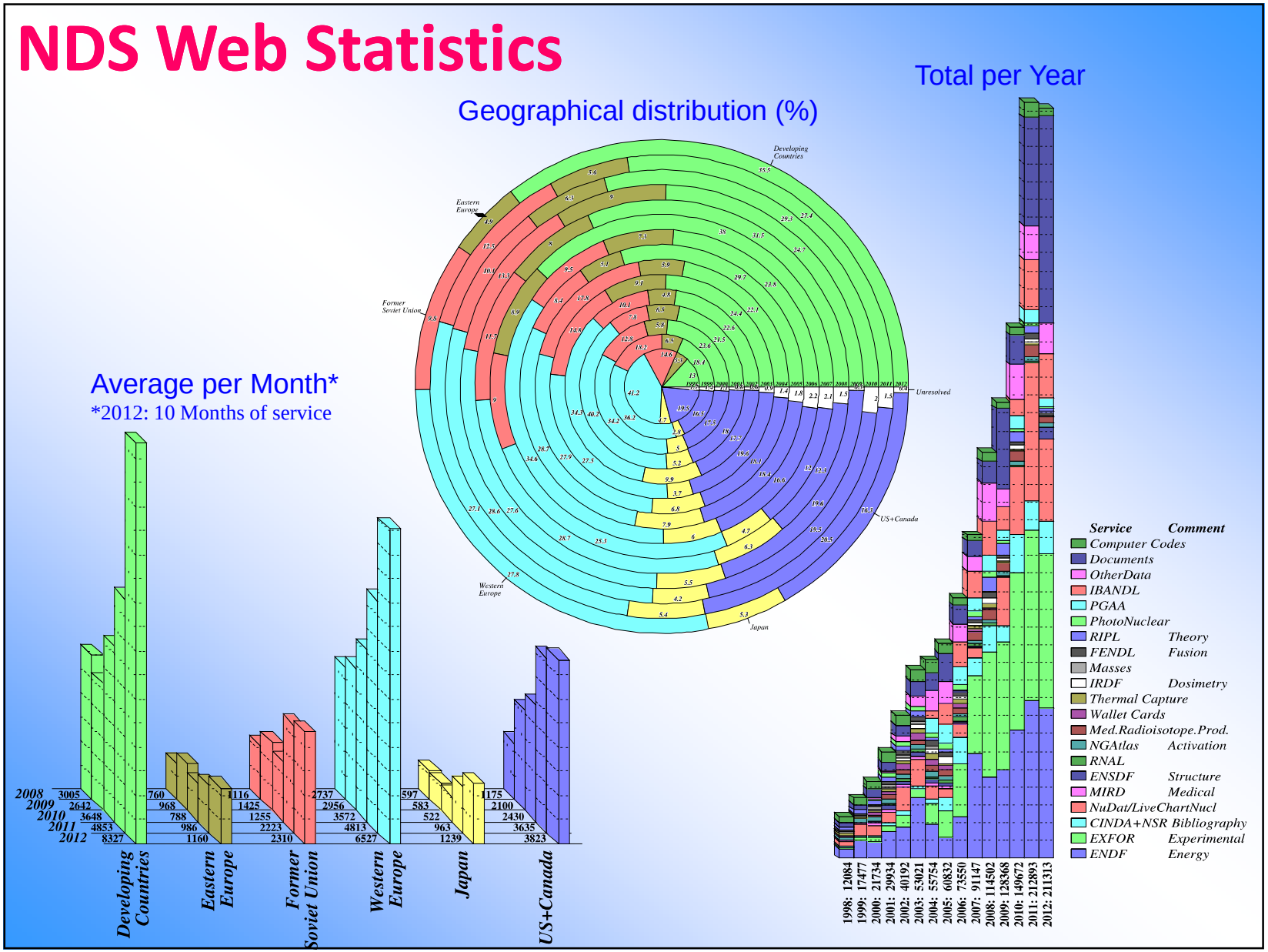
- Nuclear data in various formats

- 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.

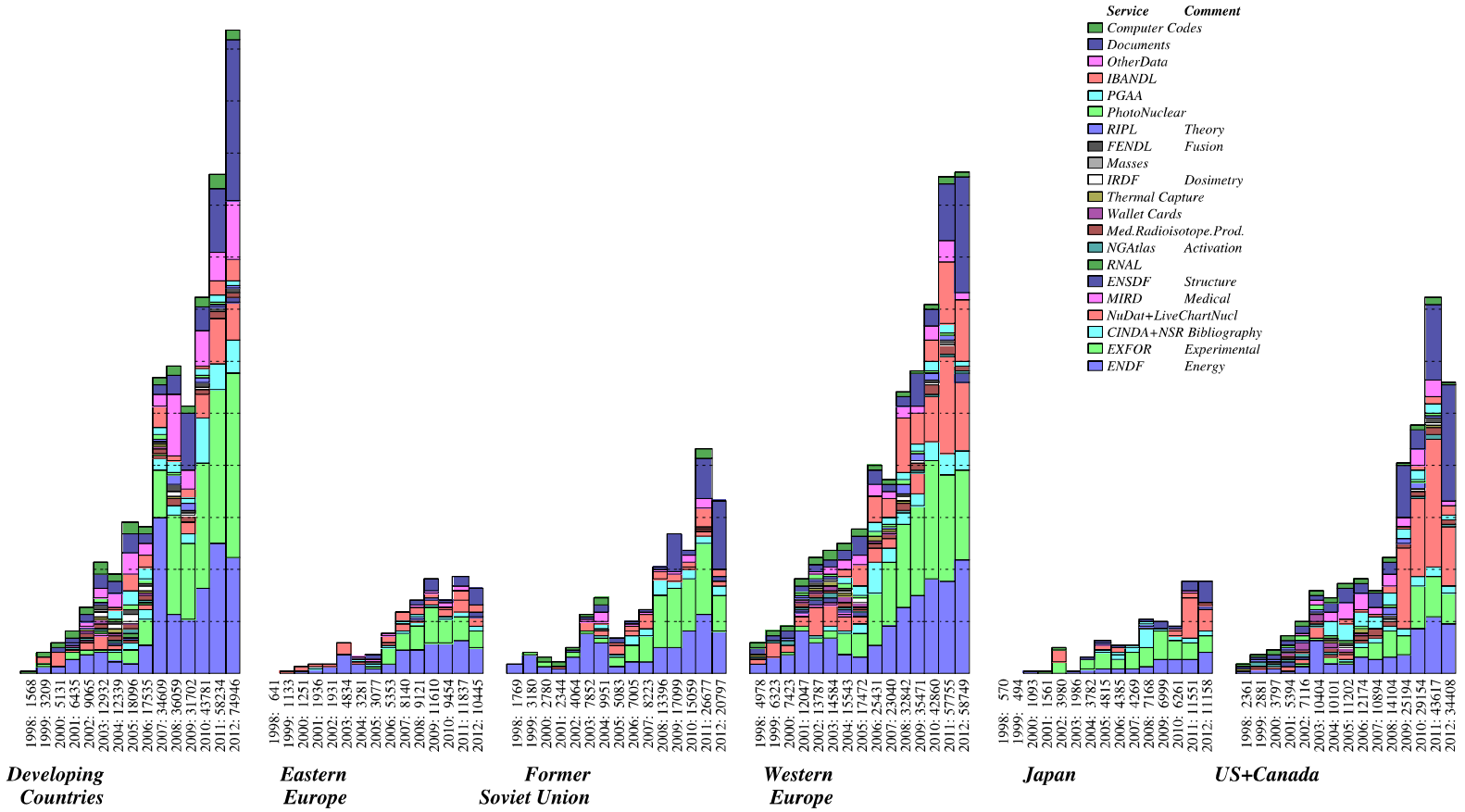
Our Front Page

NDS Web Statistics

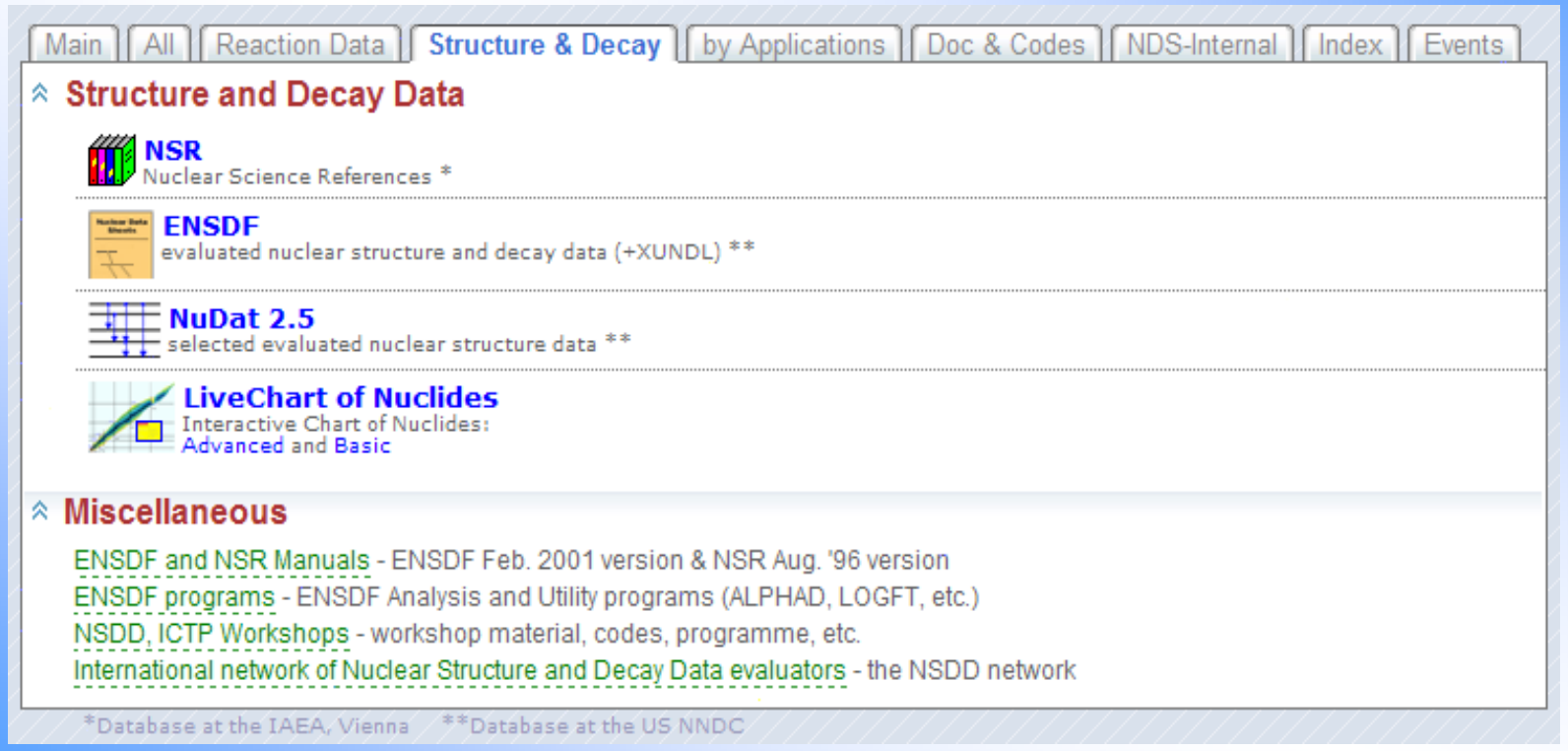


Nuclear Data Services: Web Statistics

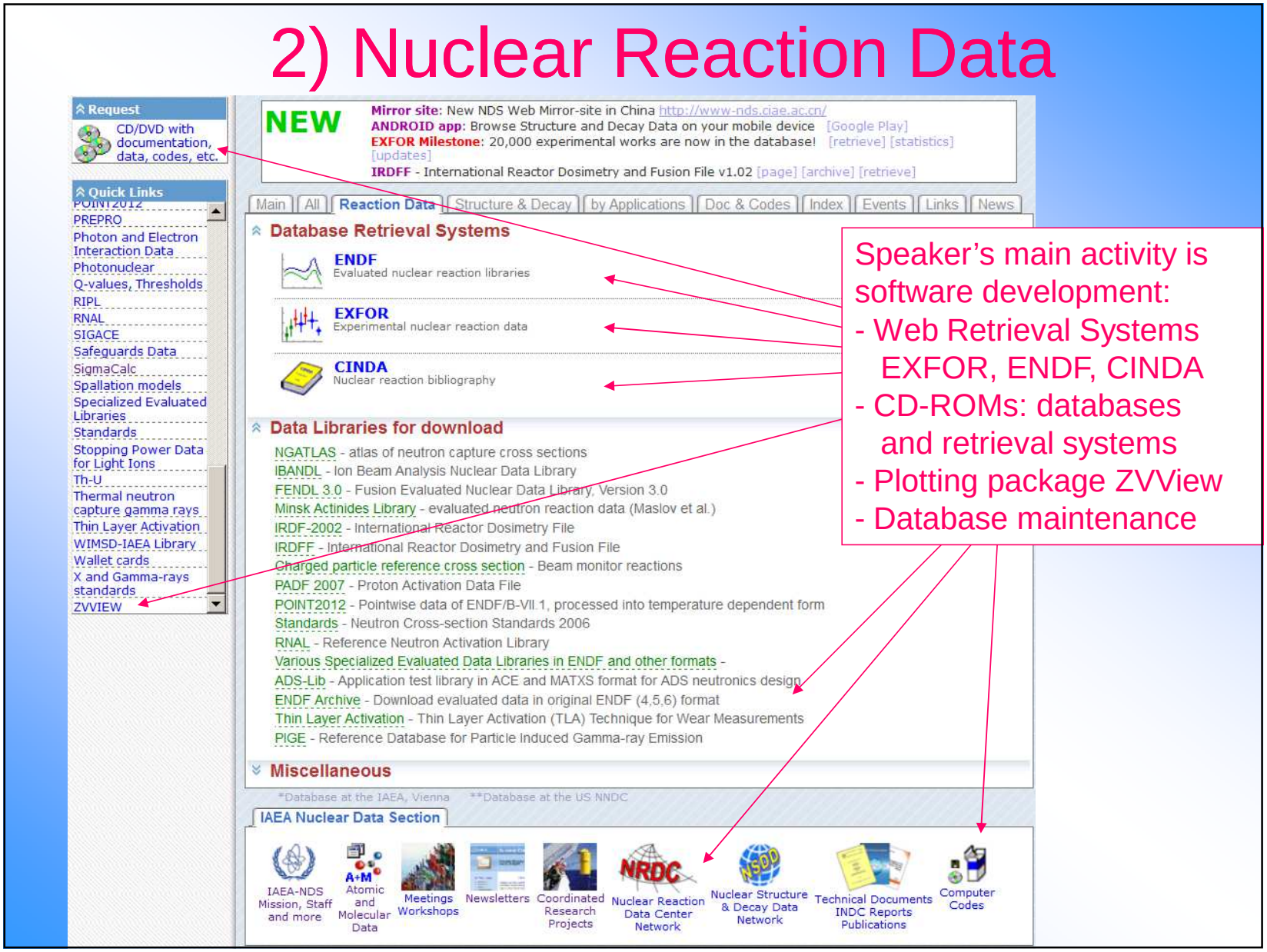
Geographically Distributed Counts



Tabs by data types.
1) Structure and Decay Data



2) Nuclear Reaction Data



Tab with data and tools sorted by Applications

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

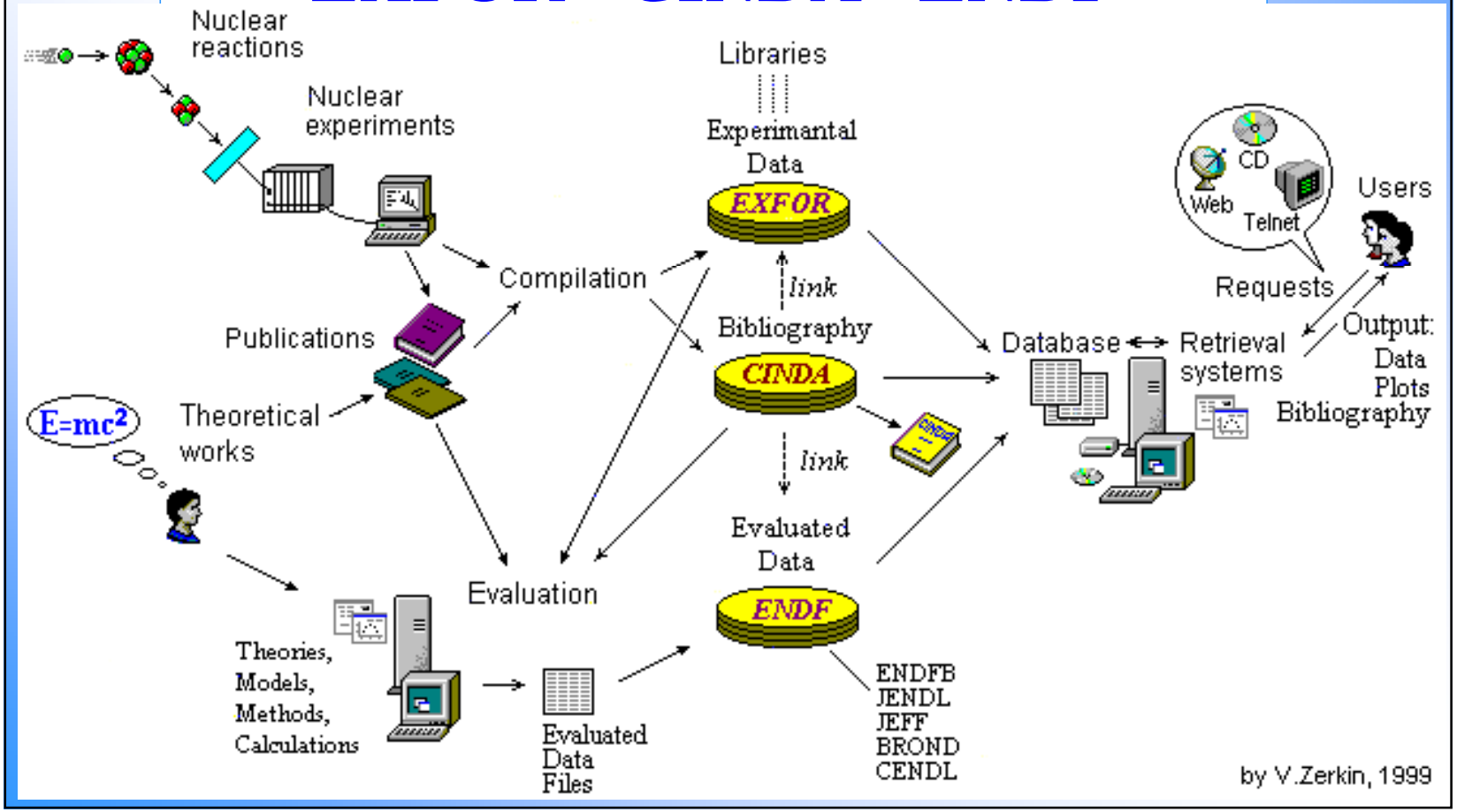
Database	*Contents*	*Size (January-2003)*	*Size (April-2013)*
EXFOR	contains experimental nuclear reaction data for incident neutrons, charged particles and photons	13,500 Entries 97,000 Data sets 400 Mb ASCII-text	19,881 Entries 151,661 Data sets 539 Mb ASCII-text
CINDA	contains bibliographical references 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	549,000 Lines 90,057 Publications 287,062 Blocks 97 Mb ASCII-text
ENDF	is a collection of evaluated data libraries	~300 Mb ASCII (5 basic libraries)	~30 Gb ASCII (43 libraries)

EXFOR: exchange format; EXFOR data library

- 1970 agreed format and established exchange between USA, NEA, IAEA, USSR
- contains data from ~20,000 experiments (~$20bn)
- 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 (540Mb), 52 Dictionaries (2.6Mb), 2 Manuals (400 pages)
- Distribution (EXFOR, X4+, C4, XML, Html, plots): Web, CD/DVD ROM, FTP
- Databases: MySQL, MS-Access, SyBase
- Software: C, Java (GUI-Applications, Servlets), Fortran
- Connection (import-export) to other databases: ENDF, CINDA, NSR

Nuclear Reaction Databases

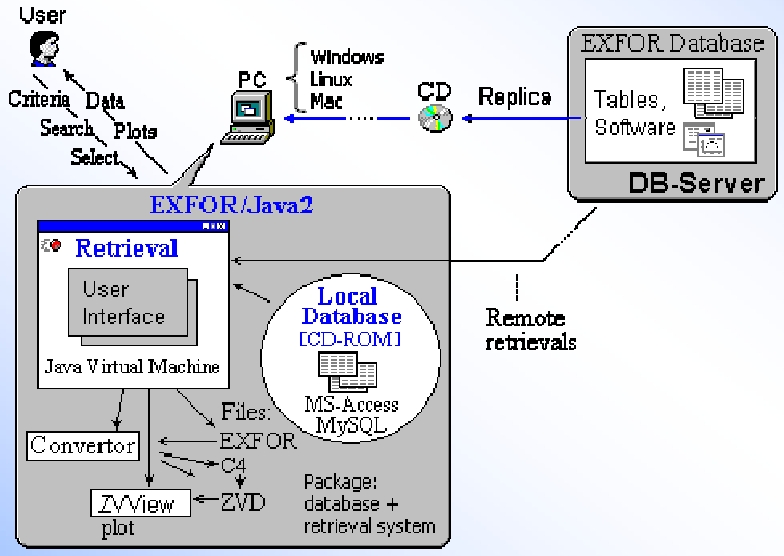
EXFOR - CINDA - ENDF



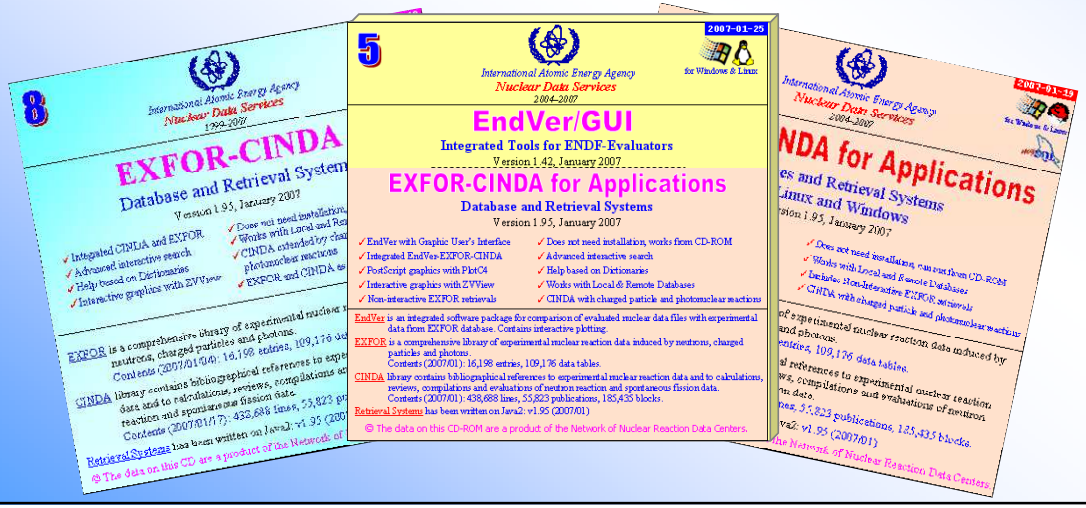
Basic principals of the IAEA-NDS nuclear data IT systems

- **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, Linux
- **Full integration of components**
  - no need for installation (can work from CD-ROM)
  - automatic configuration of Web-Servlets
  - encapsulated graphics

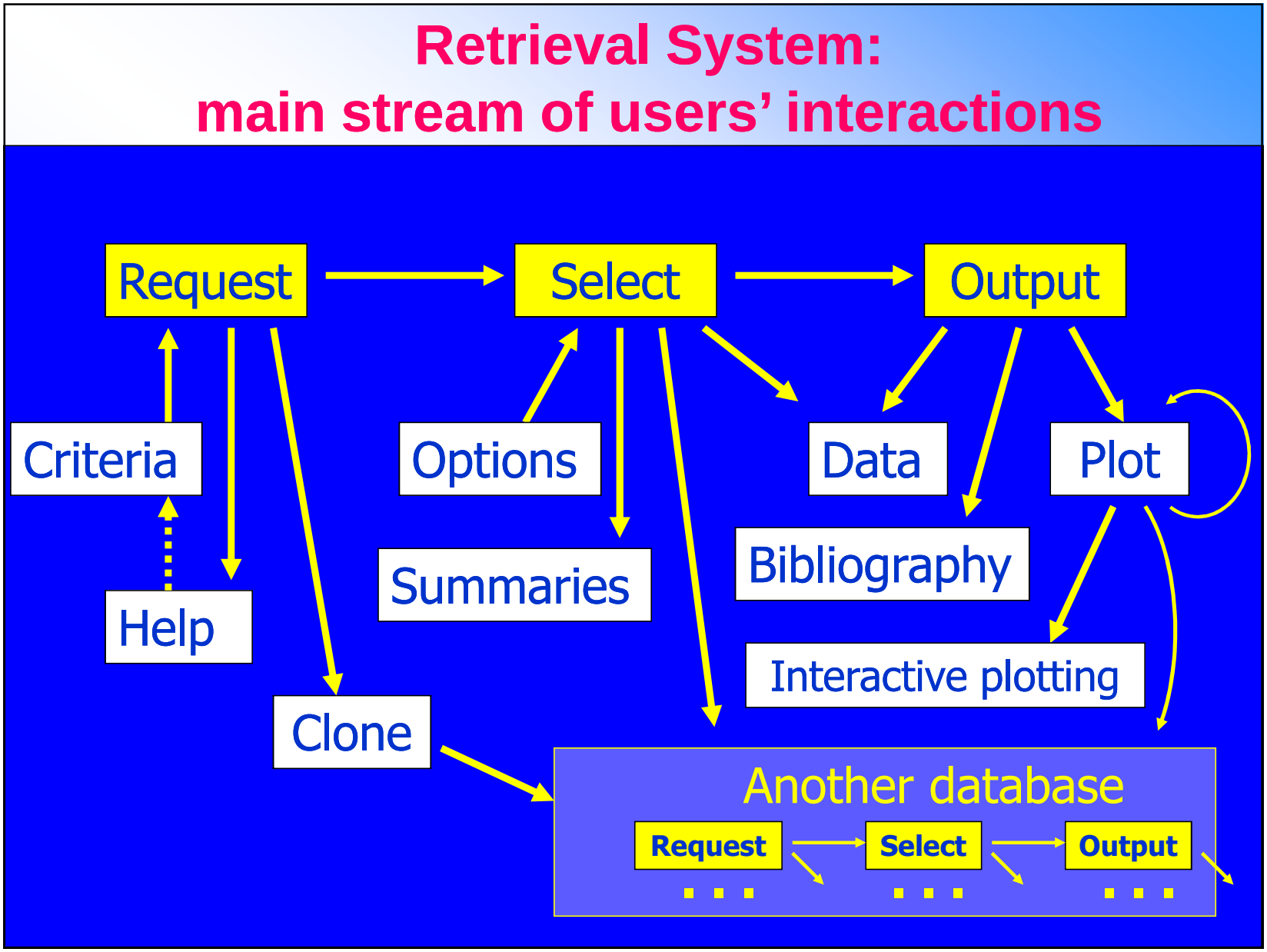
IAEA-NDS CD-ROM Database Retrieval Systems



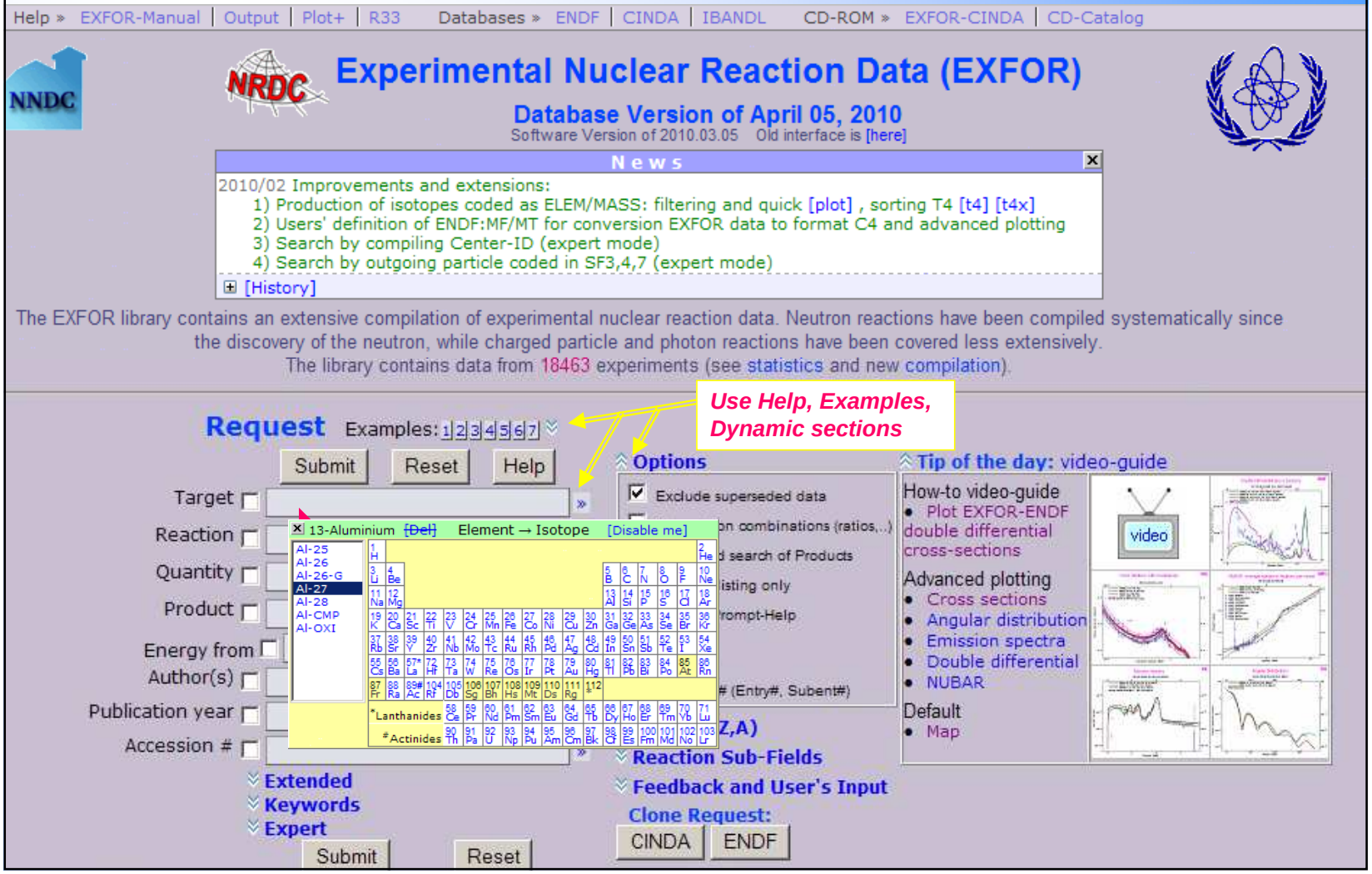
- For Windows, Linux and Mac
- Does not need installation
- Can run from CD-ROM (DBMS on CD)
- Can work with remote databases
- Integrated EXFOR and CINDA
- Help with Dictionaries
- Advanced search (+users' SQL)
- Interactive plotting with ZVView
- EndVer/GUI with integrated PrePro and EXFOR
- Includes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



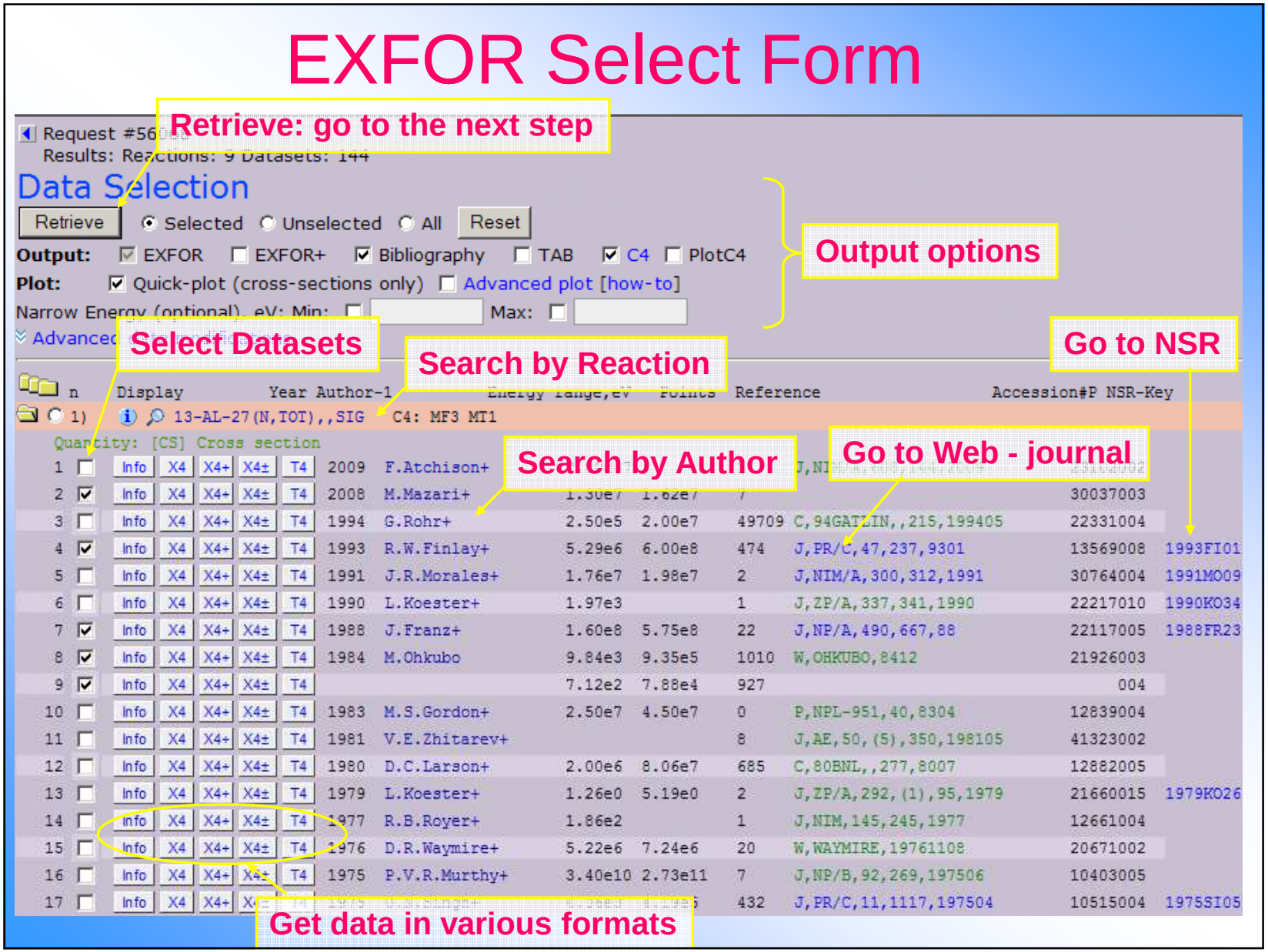
Retrieval System:
main stream of users' interactions



EXFOR Request Form



EXFOR Select Form

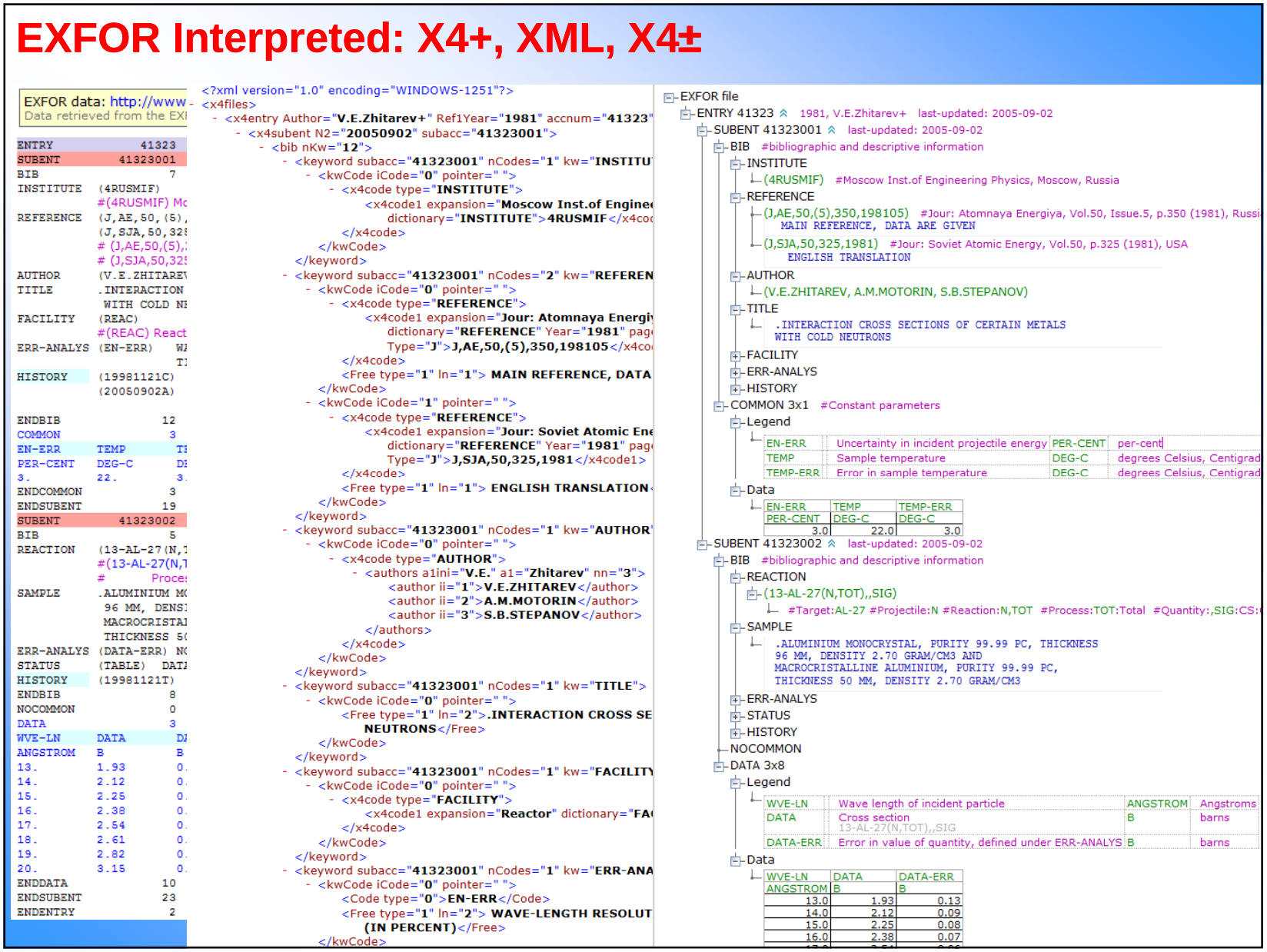


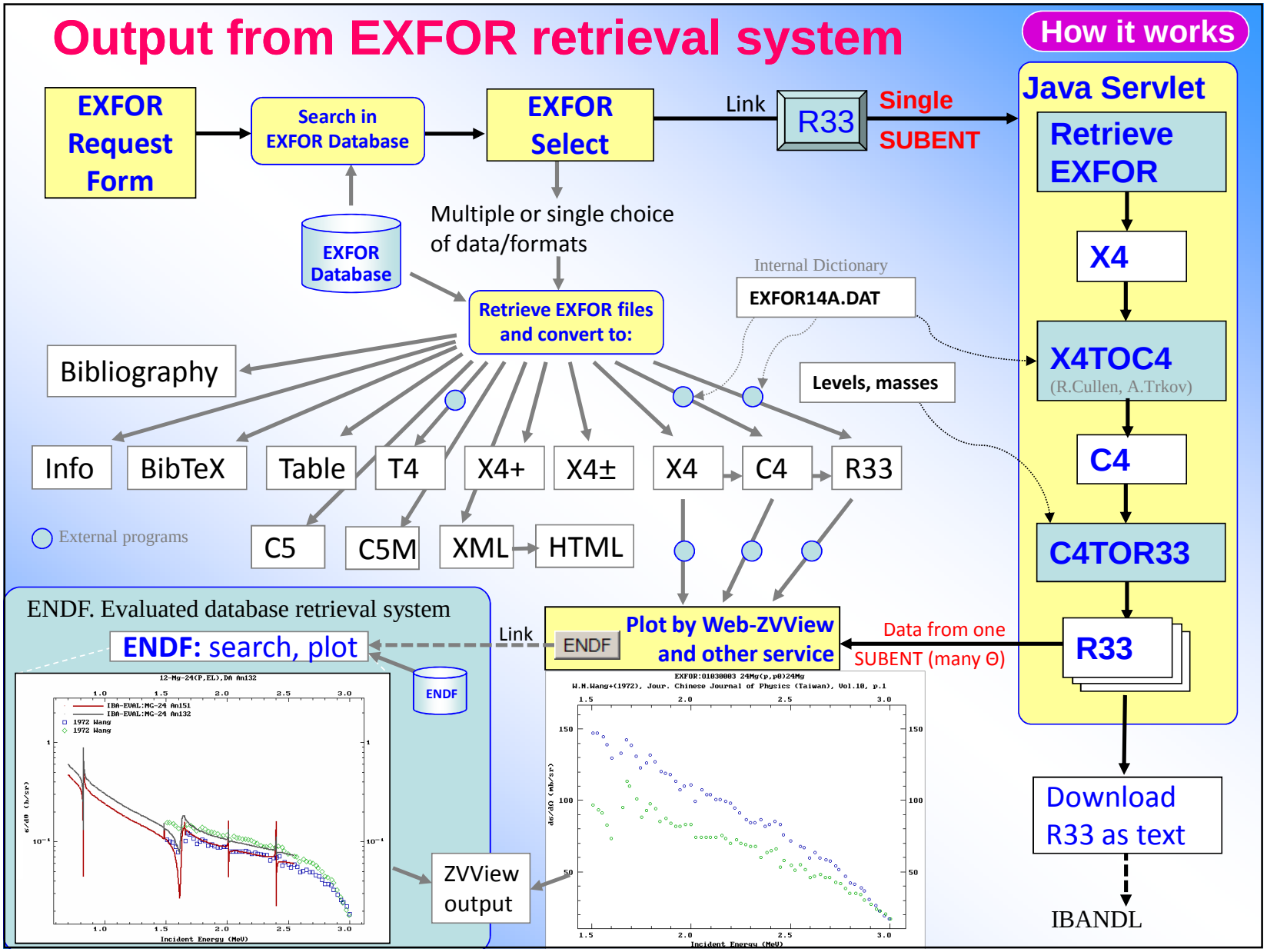
```
ENTRY            41323   20050902
SUBENT        41323001   20050902
BIB                  7         12
INSTITUTE  (4RUSMIF)
REFERENCE  (J,AE,50,(5),350,198105) M
           (J,SJA,50,325,1981)  ENGLI
AUTHOR     (V.E.ZHITAREV,A.M.MOTORIN,
TITLE      .INTERACTION CROSS SECTION
            WITH COLD 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
```

EXFOR Logic

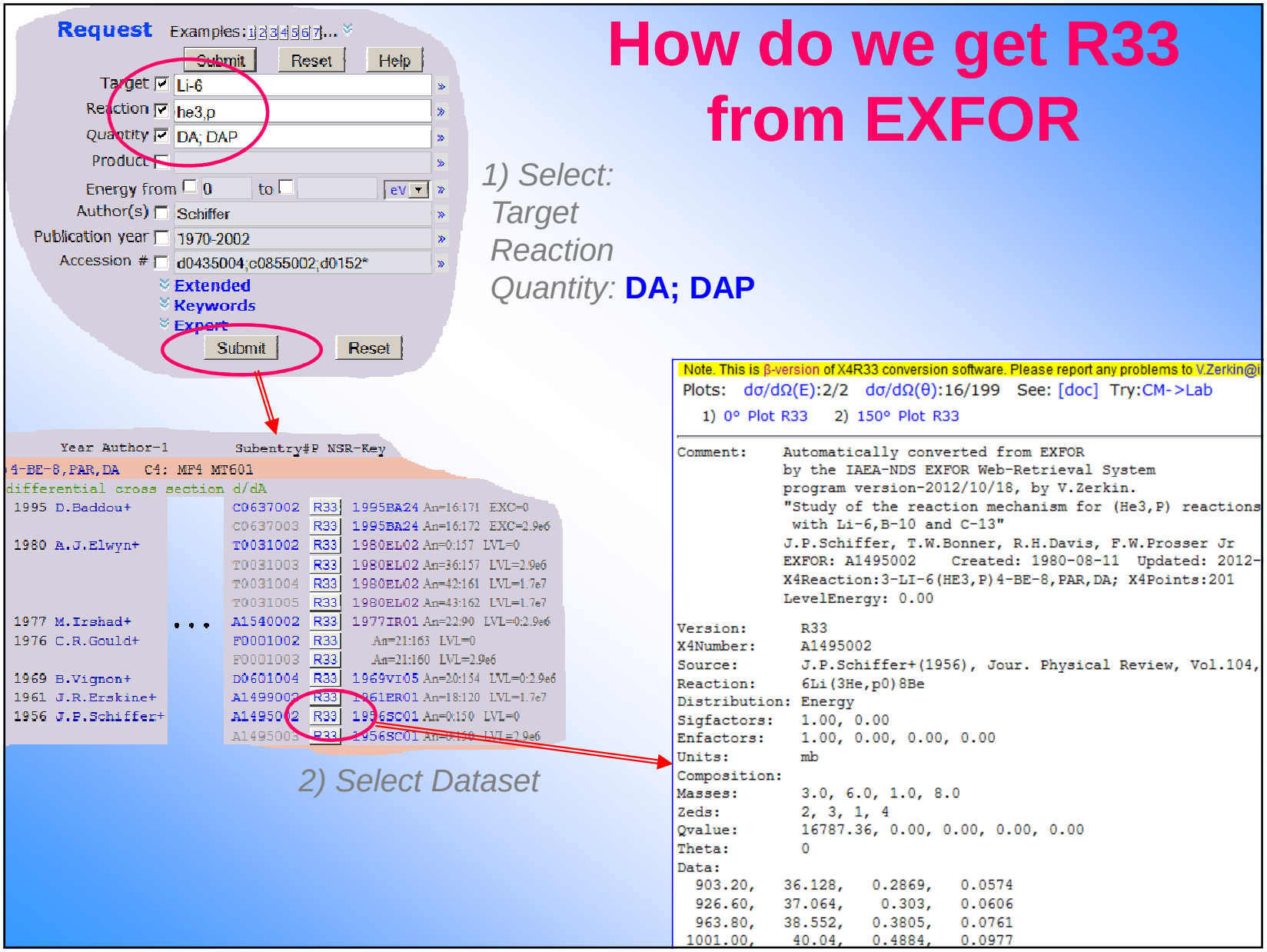
```
ENTRY            41323   20050902
  SUBENT        41323001   20050902
    BIB                  7         12
      INSTITUTE  (4RUSMIF)
      REFERENCE  (J,AE,50,(5),350,198105) MAIN REFERENCE, DATA ARE GIVEN
                 (J,SJA,50,325,1981)  ENGLISH TRANSLATION
      AUTHOR     (V.E.ZHITAREV,A.M.MOTORIN,S.B.STEPANOV)
      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
      ERR-ANALYS (DATA-ERR) NO INFORMATION GIVEN
      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 Interpreted: X4+, XML, X4±




Output from EXFOR retrieval system
How it works
EXFOR Request Form
Search in EXFOR Database
EXFOR Select
Link
R33
Single
SUBENT
Java Servlet
Retrieve EXFOR
X4
X4TOC4
(R.Cullen, A.Trkov)
C4
C4TOR33
R33
Download R33 as text
IBANDL
EXFOR Database
Multiple or single choice of data/formats
Retrieve EXFOR files and convert to:
Internal Dictionary
EXFOR14A.DAT
Levels, masses
Bibliography
Info
BibTeX
Table
T4
X4+
X4±
X4
C4
R33
C5
C5M
XML
HTML
External programs
ENDF. Evaluated database retrieval system
ENDF: search, plot
ENDF
Link
ENDF
Plot by Web-ZVView and other service
Data from one SUBENT (many Θ)
ZVView output

How do we get R33 from EXFOR



EXFOR Output Form

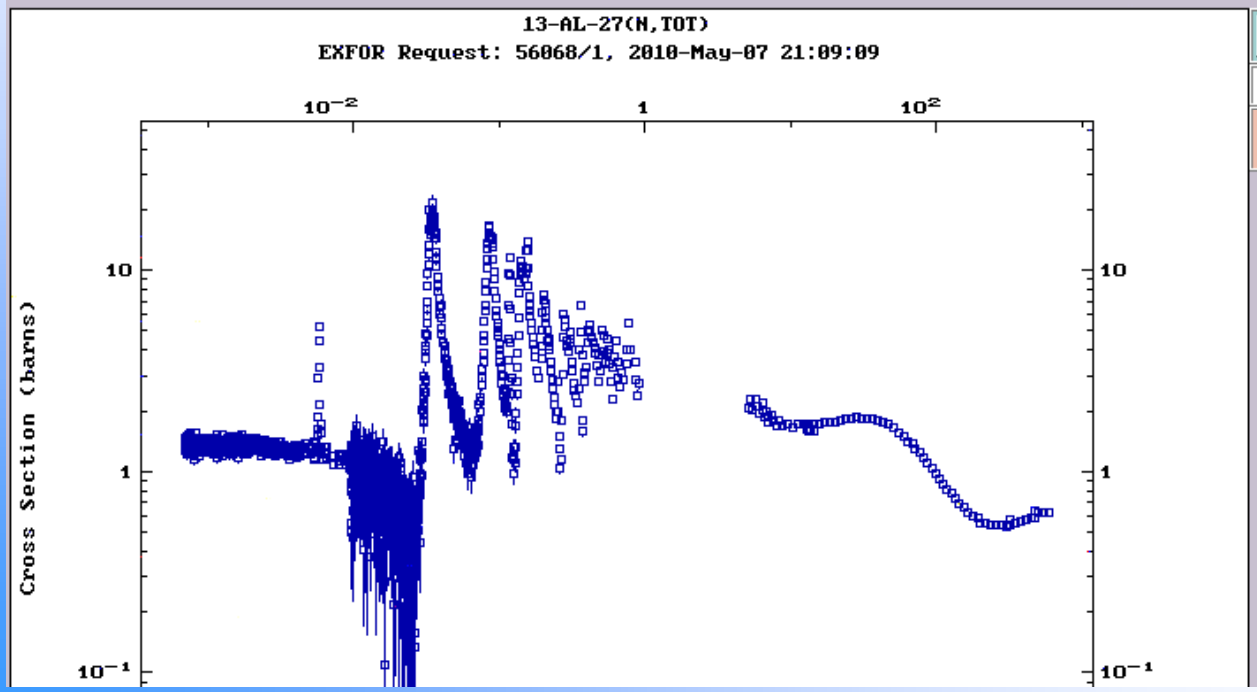
EXFOR Request #56068/1816

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

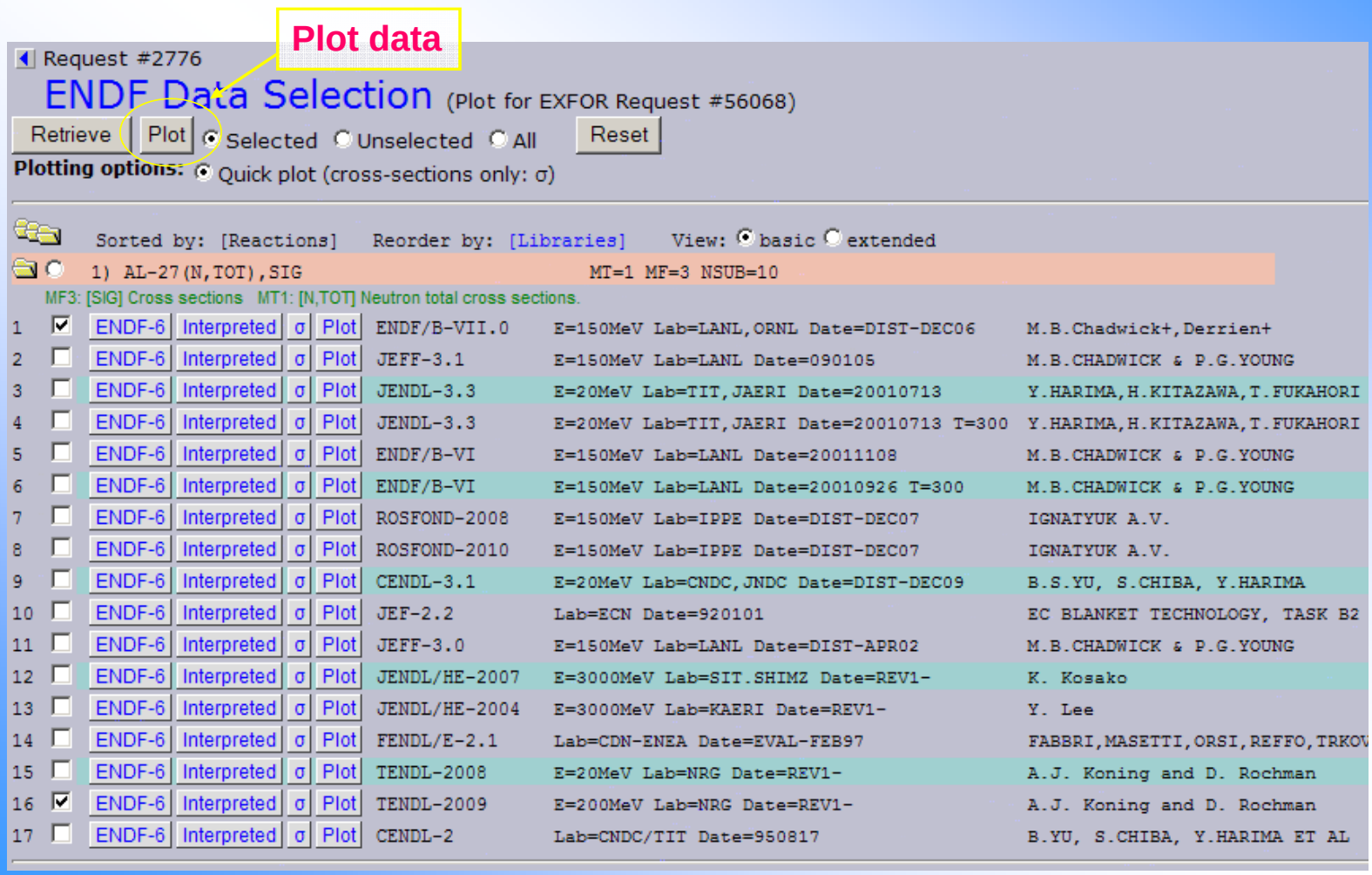
1) 13-AL-27(N,TOT),,SIG

2) Use my data [example]

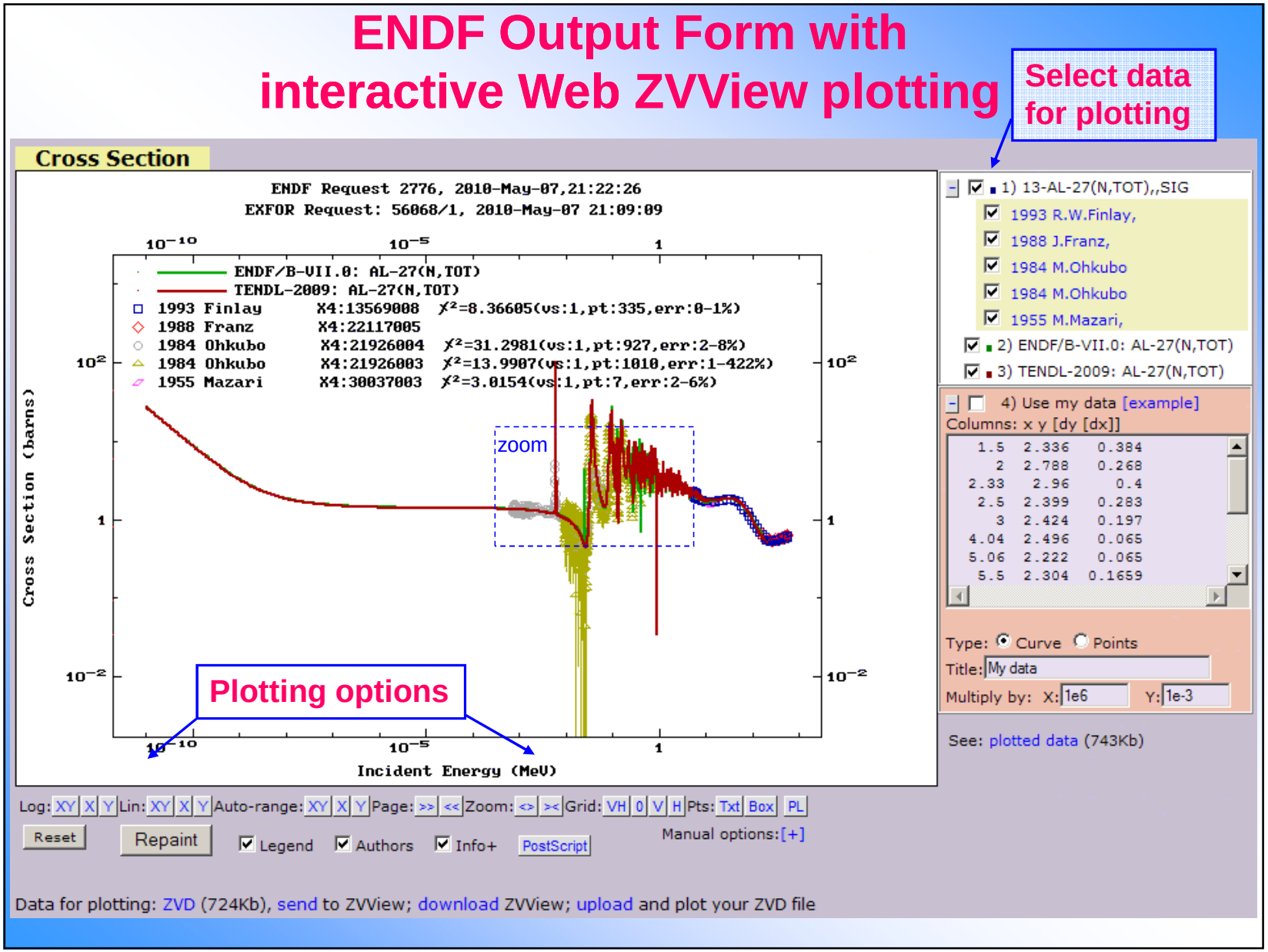
See: plotted data (194Kb)

Get plotted data

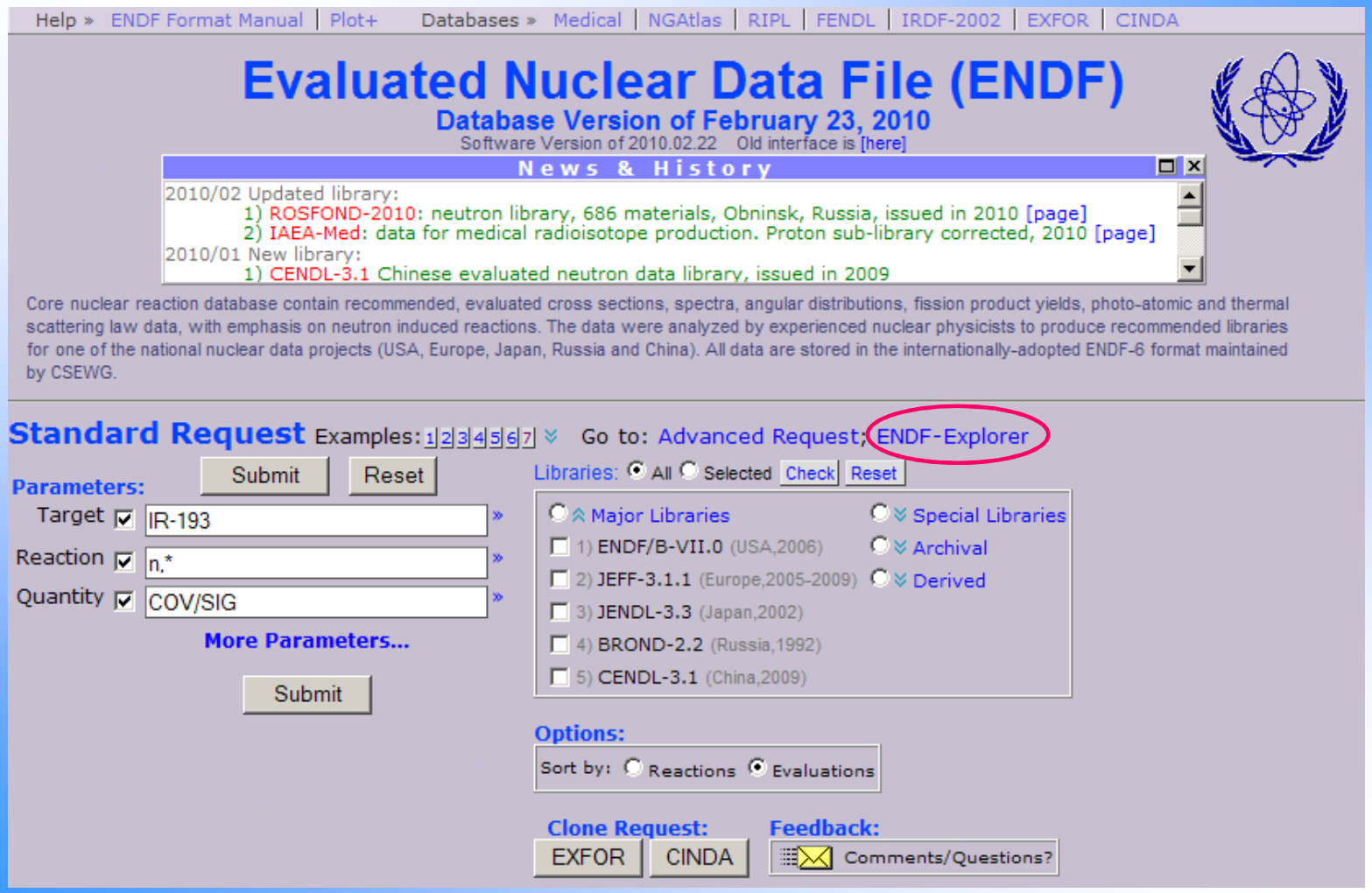
ENDF Select Form



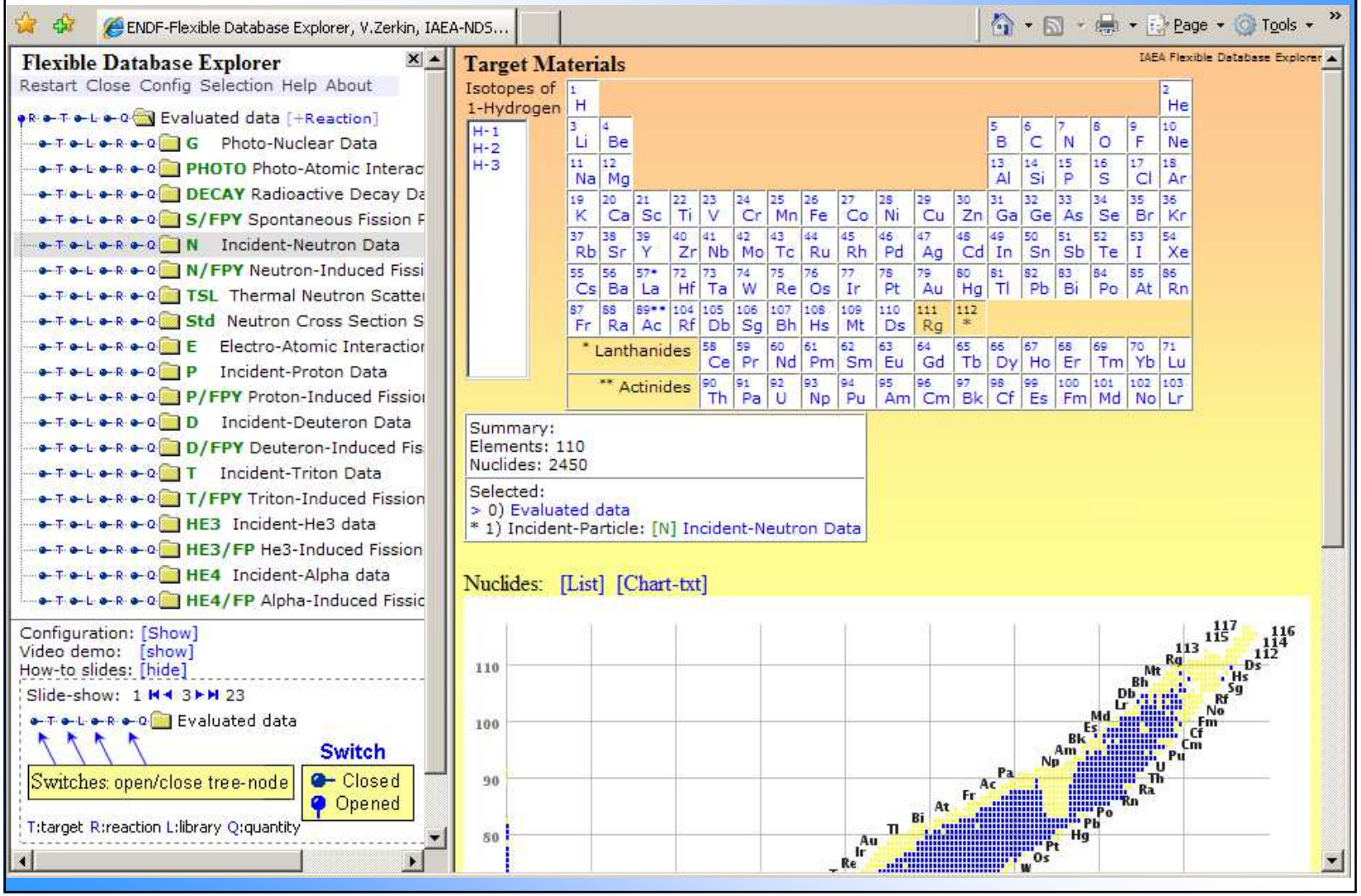
ENDF Output Form with interactive Web ZVView plotting



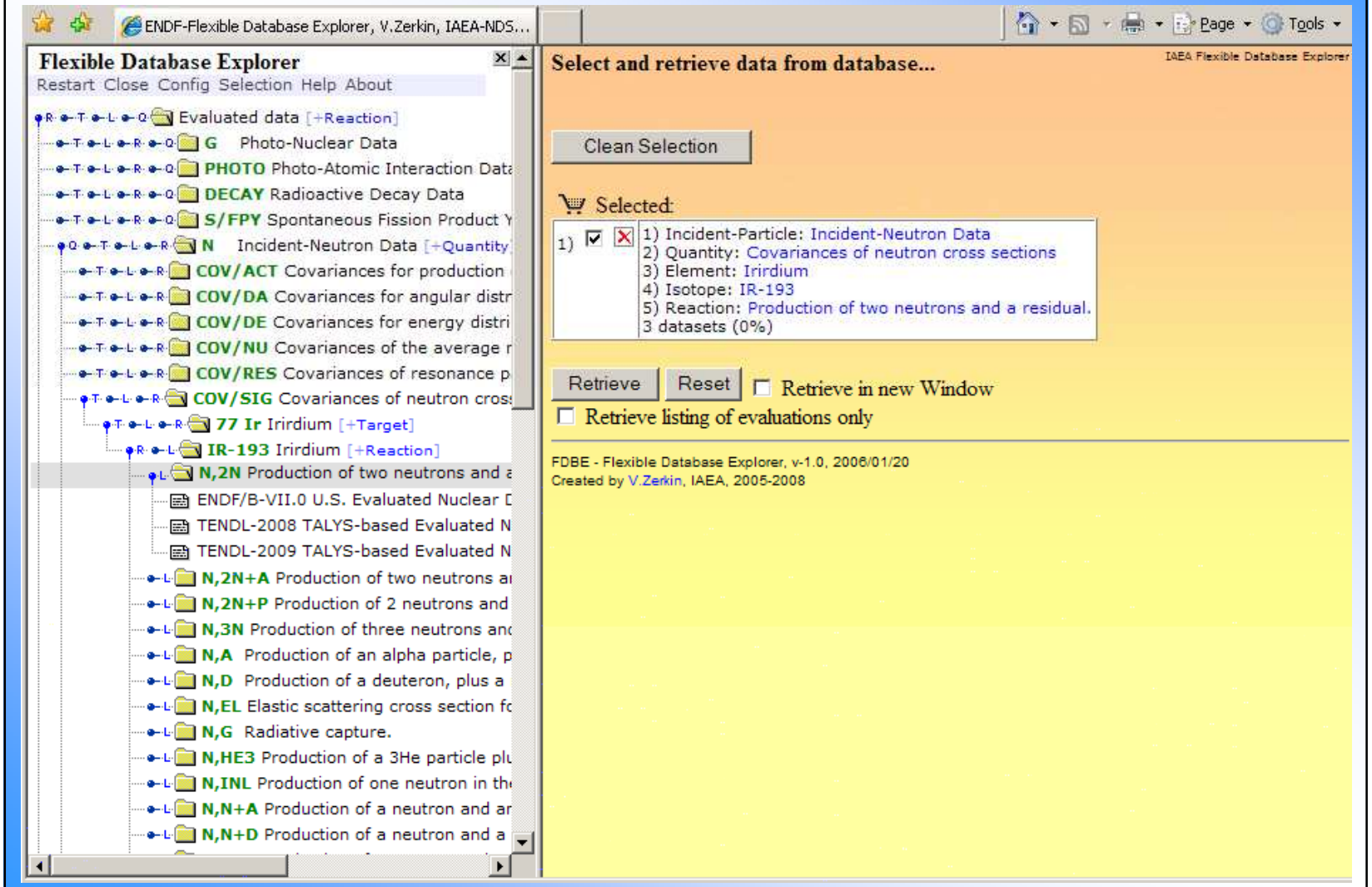
ENDF Request Form



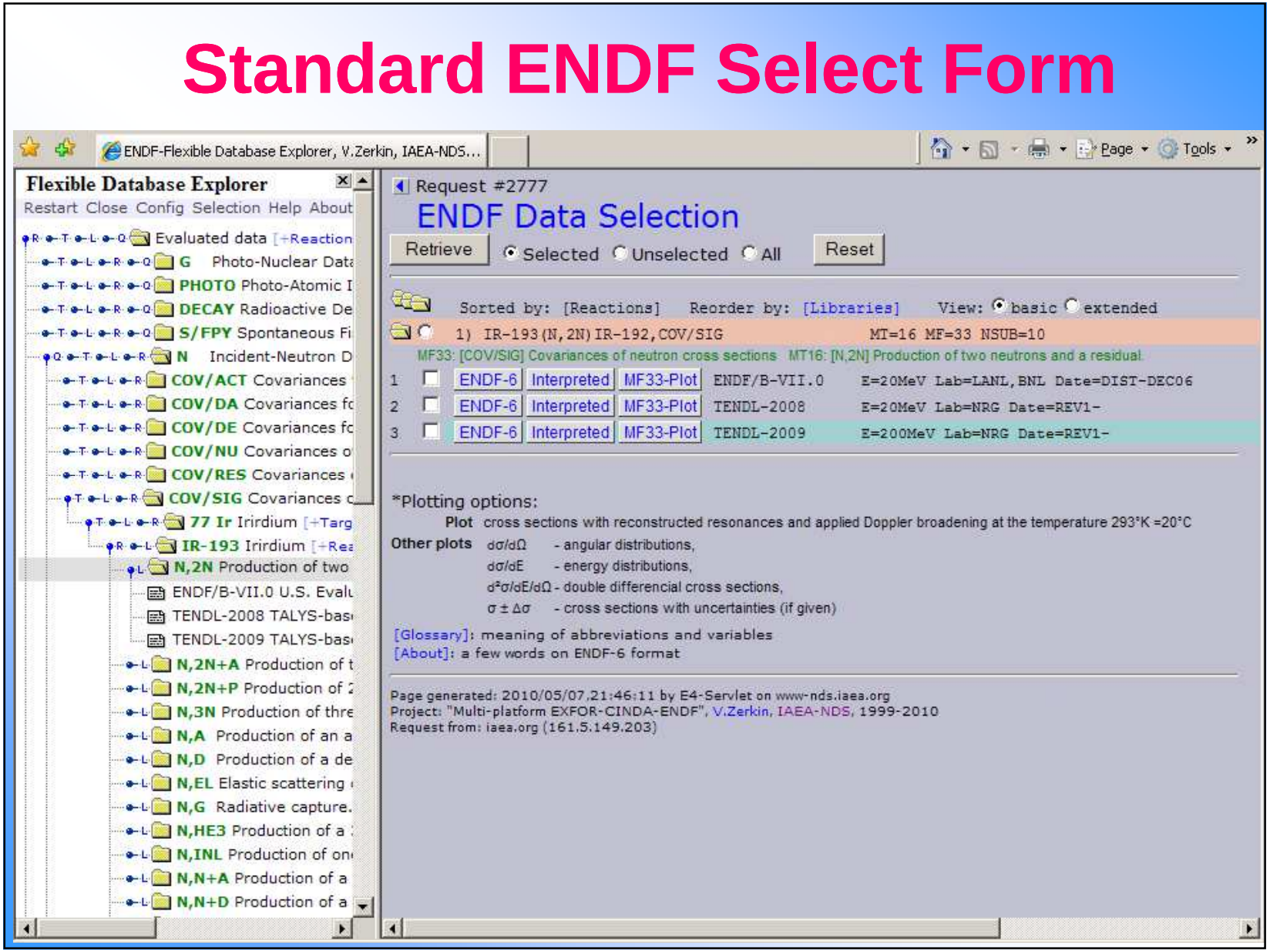
ENDF Flexible Database Explorer



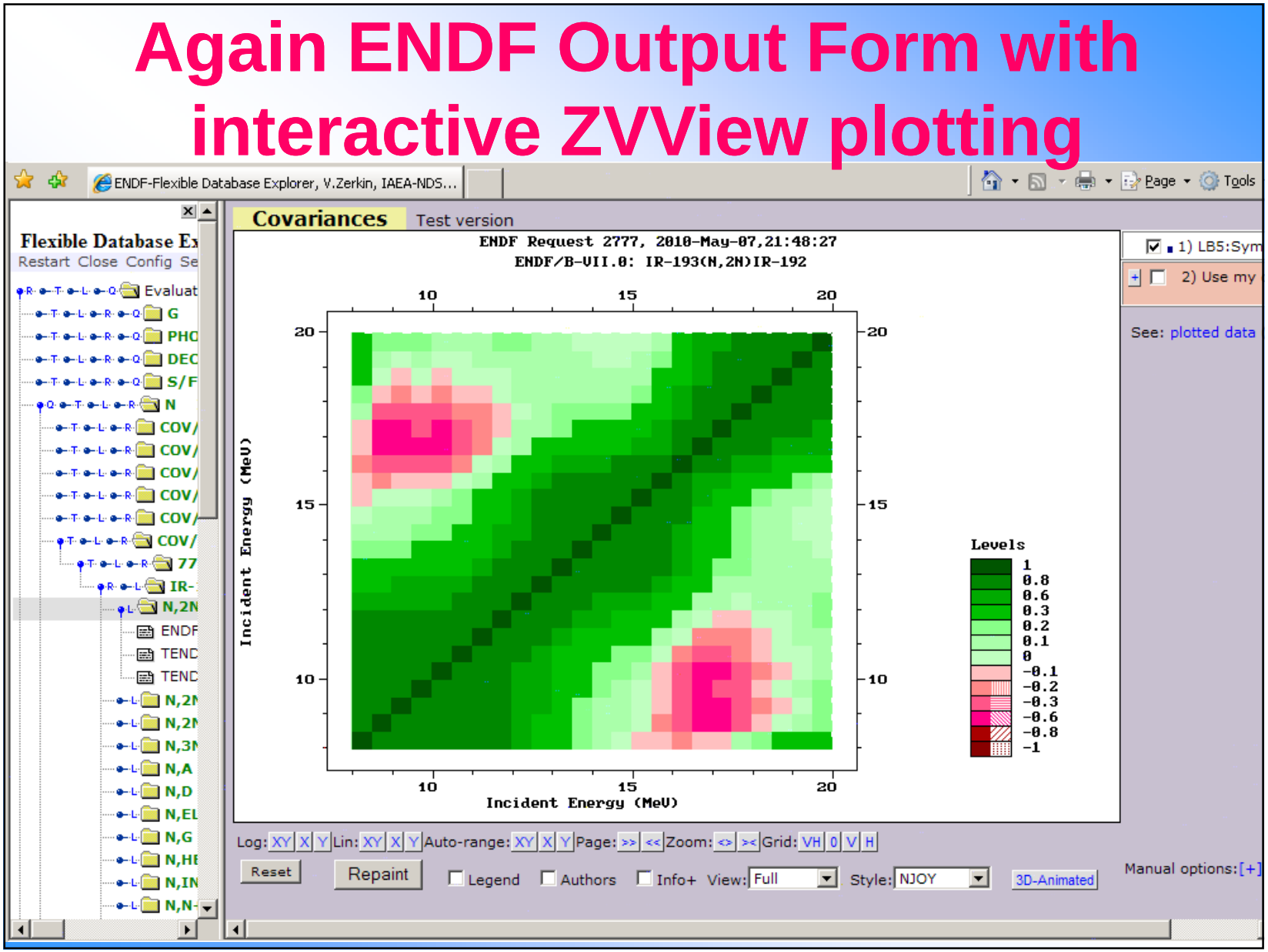
ENDF Explorer: data found



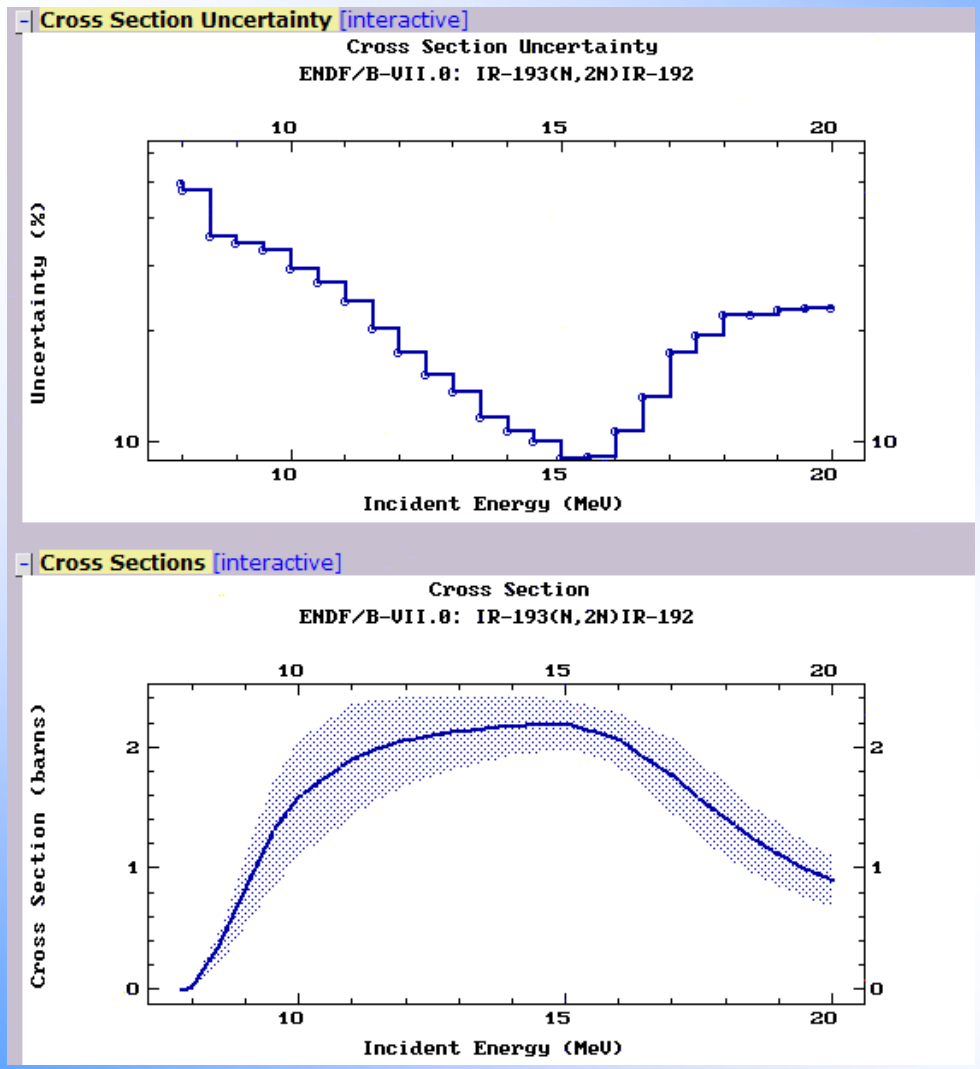
Standard ENDF Select Form



Again ENDF Output Form with interactive ZVView plotting



Display Cross Section and Uncertainty



Correlation matrix

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

#

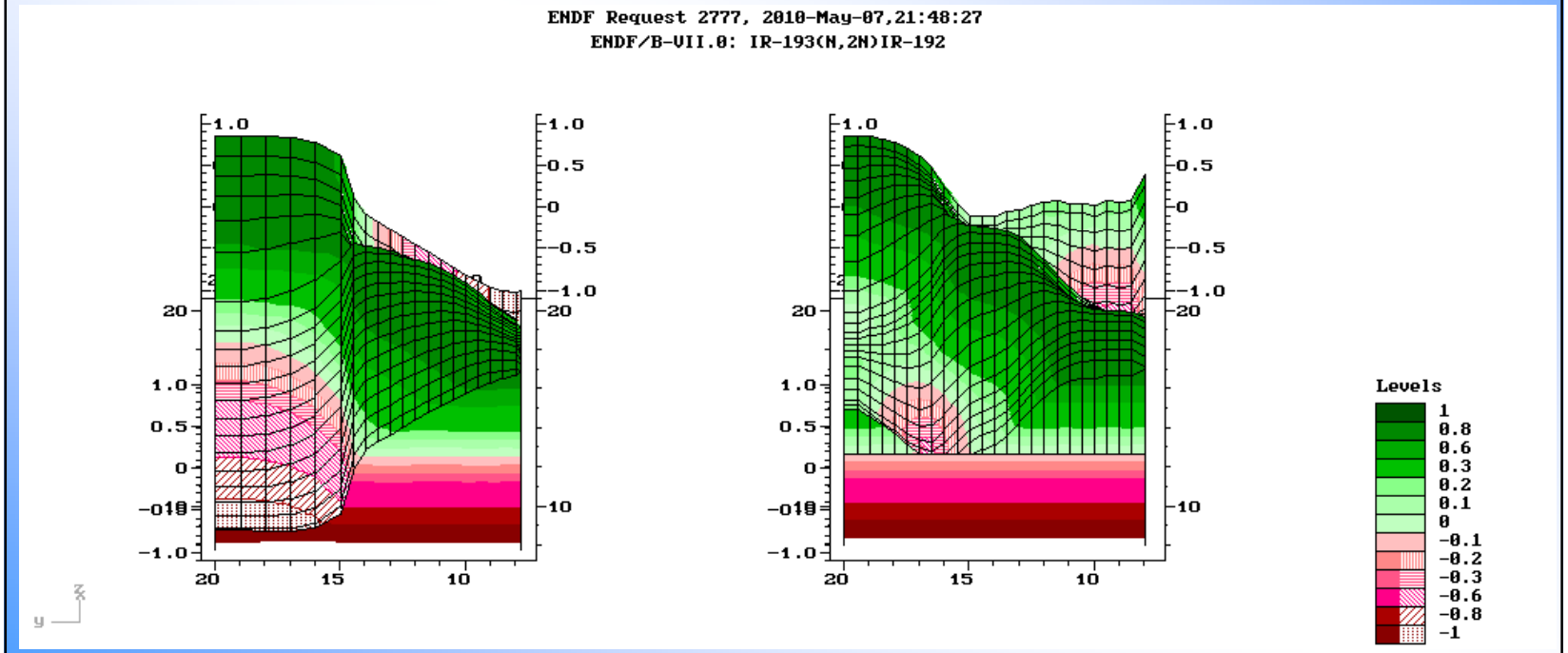
#LB5:Symmetric Matrix

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



EXFOR data correction system
(re-normalization system)

Main ideas:

1) to re-normalize data using old monitors and new standards
2) to re-normalize data using decay data
3) to create a convenient tool for data modifications: multiply data to a factor, correct wrong units, set up uncertainties, delete part of a data set, recalculate data using isotope abundances, etc.

Final goals:

1) to re-normalize data from EXFOR automatically (using EXFOR information)
2) to collect experts' corrections to a database
3) to re-normalize data using experts' corrections database
4) to have Web system offering and implementing automatic, experts' and user's corrections in optional, semi-automatic and interactive modes
5) to generate and distribute renormalized data of whole EXFOR database

EXFOR data correction system
(re-normalization system)

Stages of development

1. Start: November 2009
2. Define concept of the system, basic algorithms
3. Invent syntax describing corrections
4. Define structure and implement programs
5. Collect archive of old monitors used in EXFOR works and modern data
6. Collect corrections applied by experienced evaluators, create database of corrections
7. Create software for automatic re-normalization
8. Create database with corrections
9. Create Web interface for using automatic correction-database

2013

10. Extend Web interface to use experts' correction-database
11. Create software to generate re-normalized XC4 for full EXFOR in C4
12. Start distributing renormalized RXC4 to former SG30 members
13. Etc.

“Manual” and “automatic” corrections

“Manual” corrections are based user’s knowledge and experience – therefore can include subjective judgment.

We are going to collect database of experts’ corrections.

“Automatic” corrections are based on the information given in EXFOR file: keywords MONITOR and MONIT-REF, monitor data in the DATA and COMMON sections.

This method is objective.

It needs “clever” EXFOR software.

Both methods need:

- archive of old monitors
- library of “recommended” monitors (standards)
- software, database, information, Web support
- participation of nuclear data experts

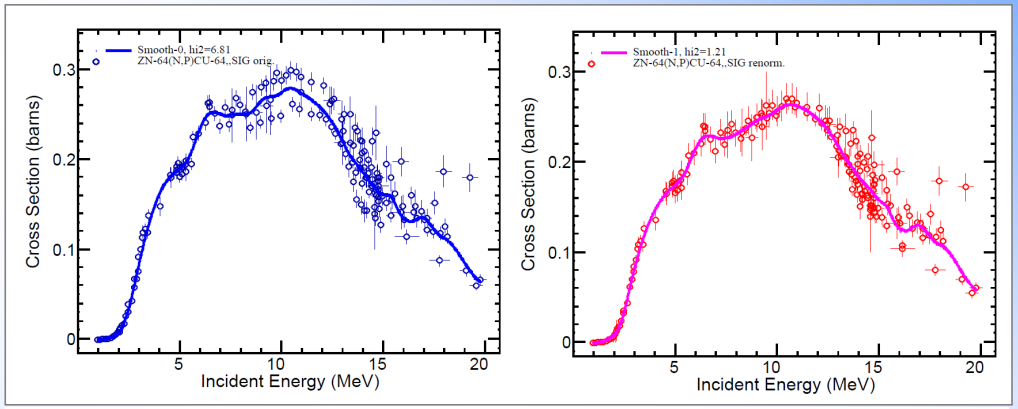
“Manual” corrections

Example of manual corrections (K. Zolotarev, 2011, IPPE, Russia):

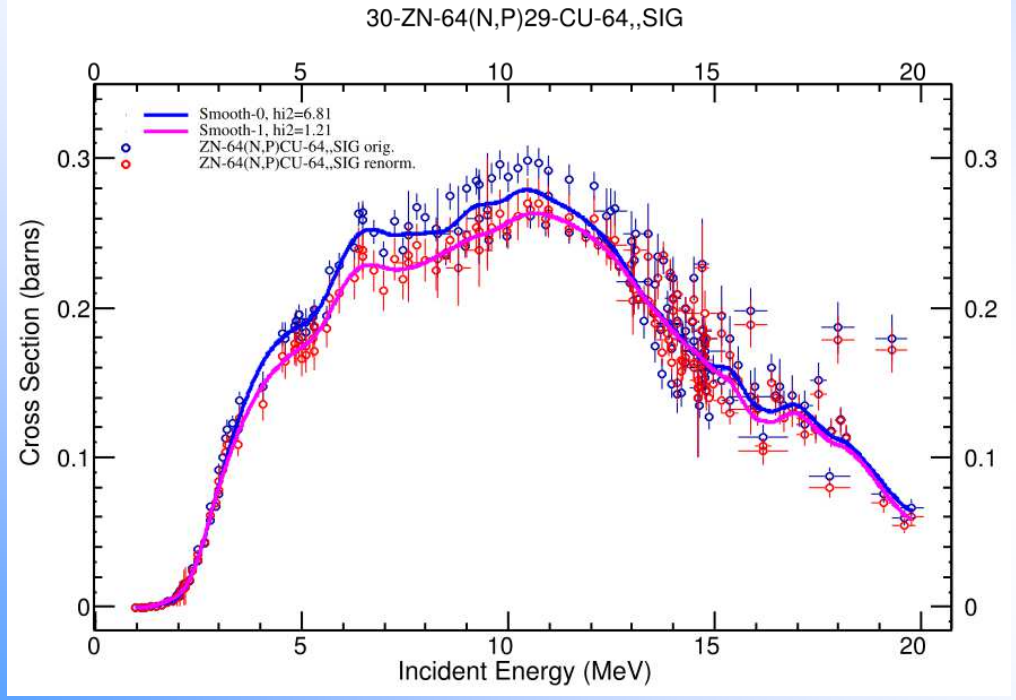
```
10224003                        # 1972 D.C.Santry+
                                #measurements with T(p,n)He3 neutron source
                                #monitor S32(n,p)P32 reaction
a0=0.91582;                     #experimental data were renormalized to the integral of
                                #cross-section calculated from experimental data of Mannhart
                                #and Schmidt 2007 in the overlapping energy
                                #range 1.500 - 3.958 MeV, a0=0.91582
a1=0.0115;                      #error in b+ mode in Cu64 decay     - 1.15%
a2=0.03;                        #error in normalization value       - 3%
a3=0.03;                        #error in angular neutron intensity - 3%
m0: [en,monit];                 #old cs for S32(n,p)P32 monitor reaction
m1: rrdf10 $ s32np;             #new cs for S32(n,p)P32 monitor reaction
c1=dm1/m1;                      #relative error in new cs for S32(n,p)P32 monitor reaction
dy=dy/y;                        #relative uncertainty in original cs for Zn64(n,p)Cu64 reaction
fc=m1/m0*a0;                    #total correction factor
y=y*fc;                         #correction exp. cs
dy=dy^2+c1^2+a1^2+a2^2+a3^2;    #determination the quadrature of new total error
dy=dy^0.5*y;                    #determination the absolute error in new Zn64(n,p) cs

12956003                        #1975 R.Spangler+
m0: [en,monit];                 #old cs for Al27(n,a)Na24 monitor reaction
m1: rrdf10 $ al27na;            #new cs for Al27(n,a)Na24 monitor reaction
a=0.380/0.348;                  #correction to new  511 keV gamma-yield per decay Cu-64
fc=m1/m0*a;                     #total correction factor
y=y*fc;                         #correction exp. cs
dy=dy*fc;                       #correction  abs. uncertainty in renorm. cs
```

Example of “manual” corrections results

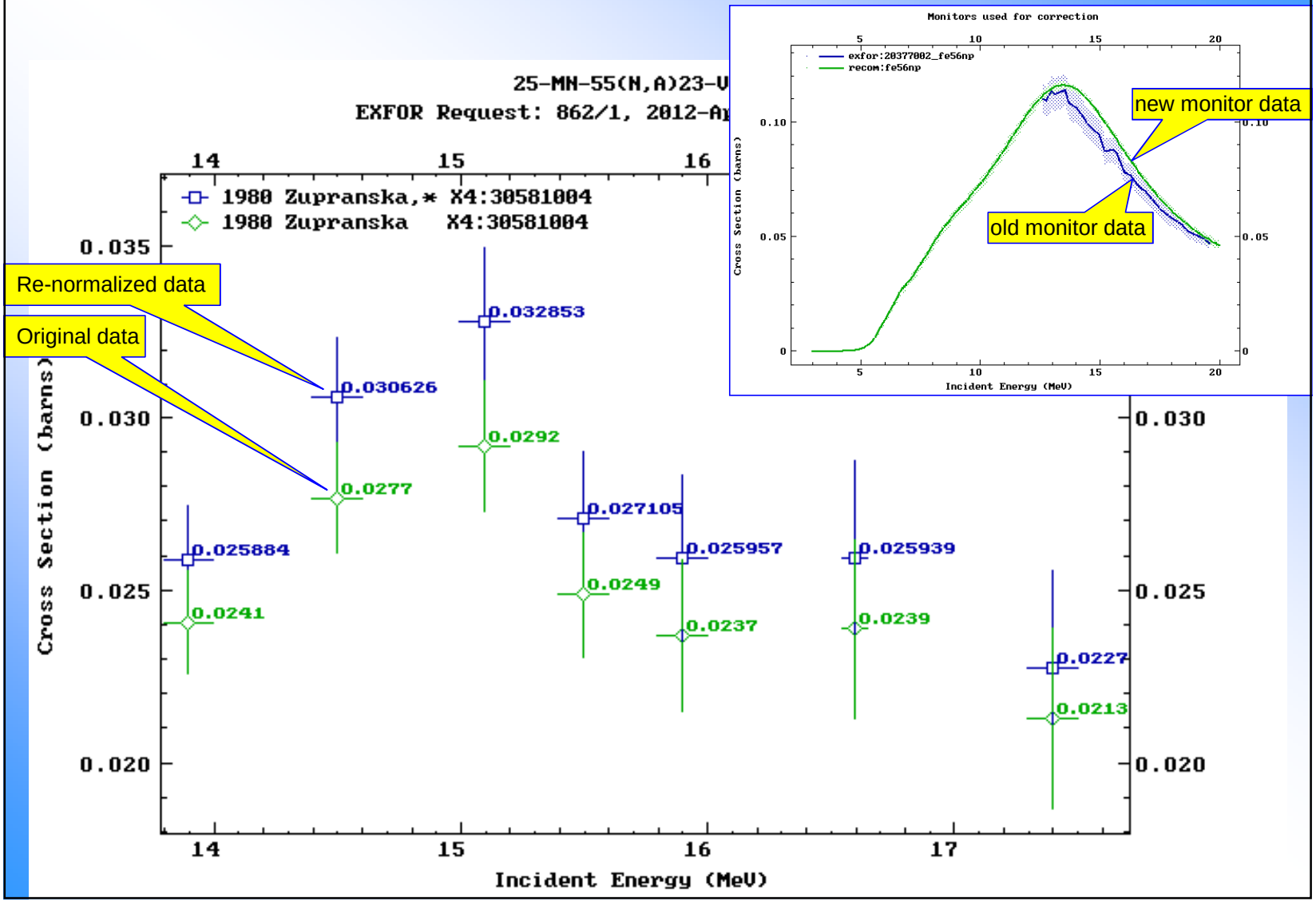
Before



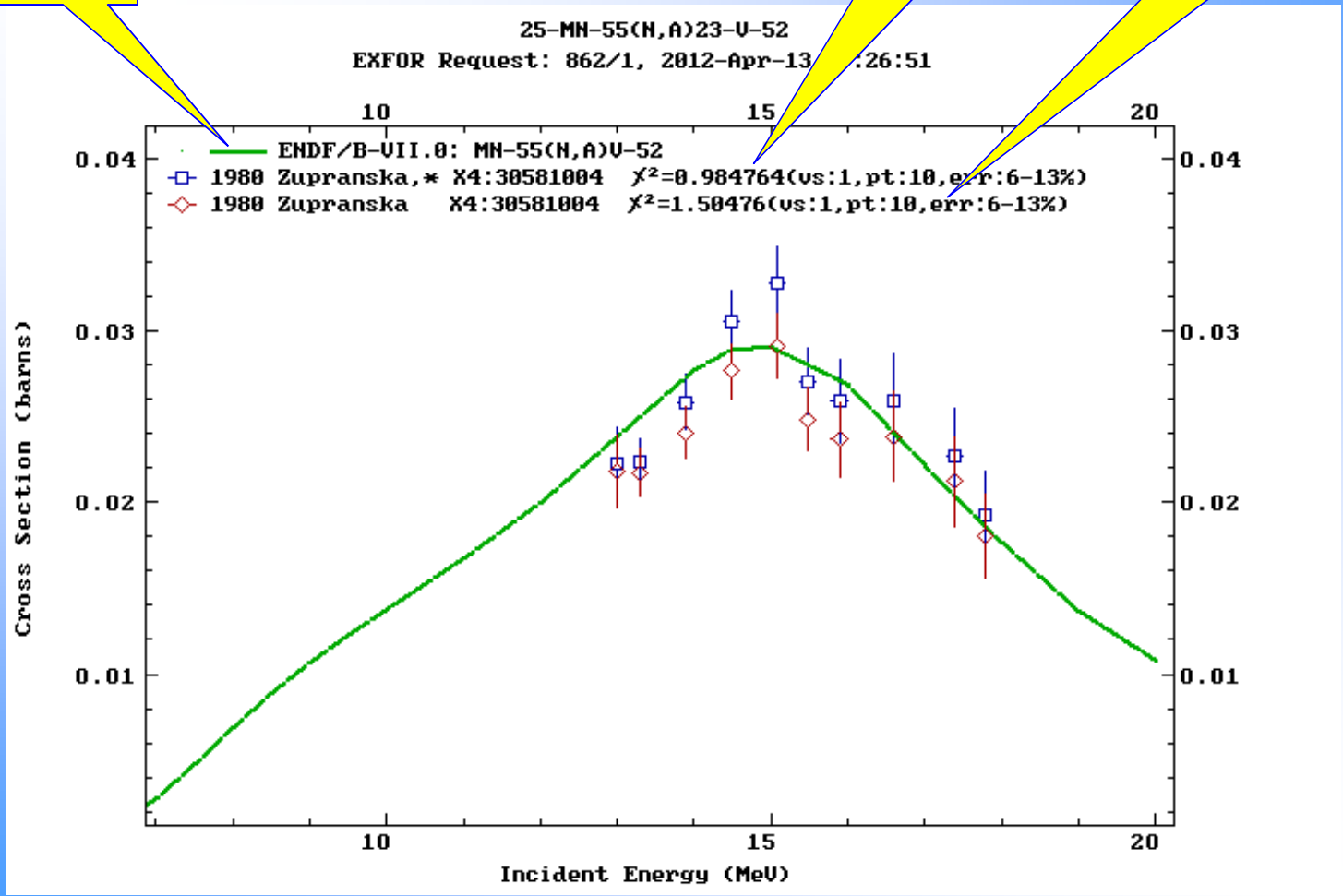
After



Automatic data re-normalization: an example



Automatic data re-normalization: comparing to ENDF



Summary

1. EXFOR Web retrieval system offers data correction service:
   - trivial to use in automatic mode
   - has expert, interactive, semi-automatic modes
   - provides checking of data and monitors
2. Auto-correction database (datasets):
   - ready: 4,230 (6% of all CS data)
   - monitor' renormalization possible: 11,429 (16%)
   - cross-sections: 68,555 (100%); all database: 147,599 datasets
3. Archive of old and new monitors: 43 files today

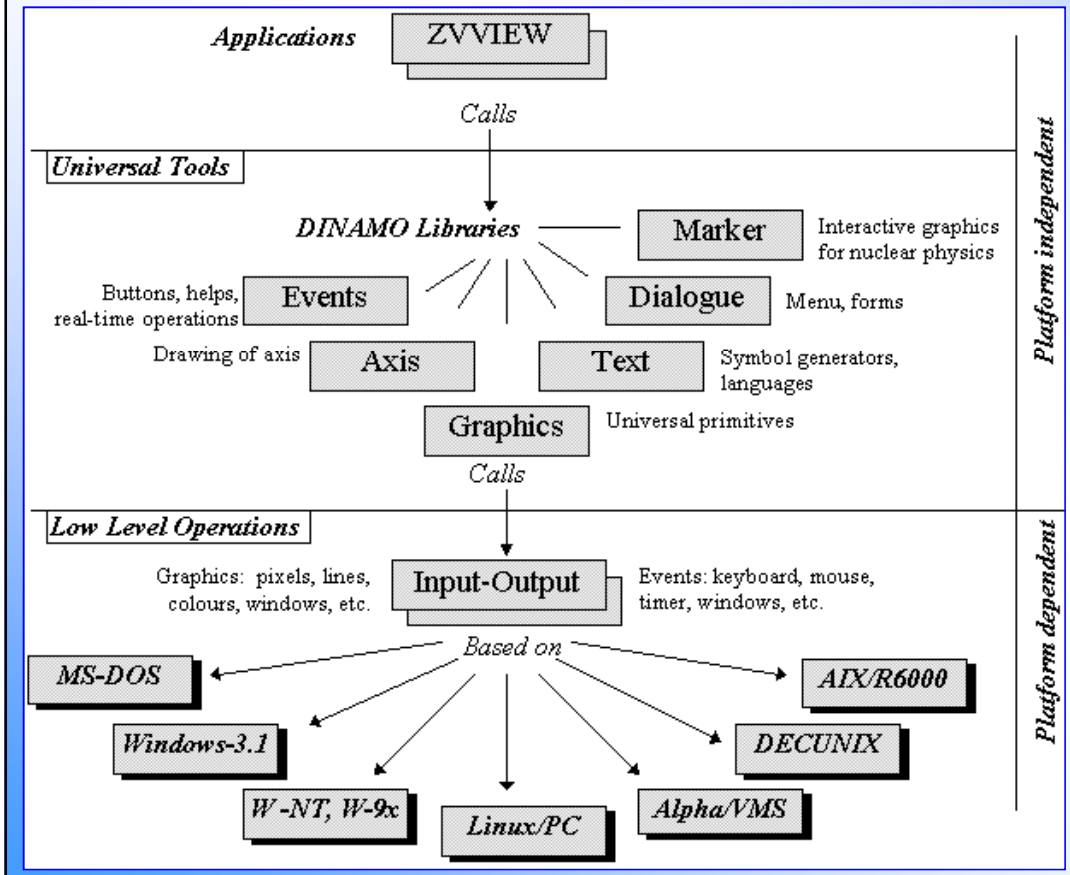
Nuclear Reaction Software Mosaic

- Modularity and robustness
- Re-using modules
- Preserving knowledge

ZVView/DINAMO: interactive plotting

ZVView is a multi-platform software designed for nuclear reactions data evaluators to perform efficient interactive visual analysis of cross section data retrieved from EXFOR and ENDF libraries. Kiev-Vienna, 1993-2013

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



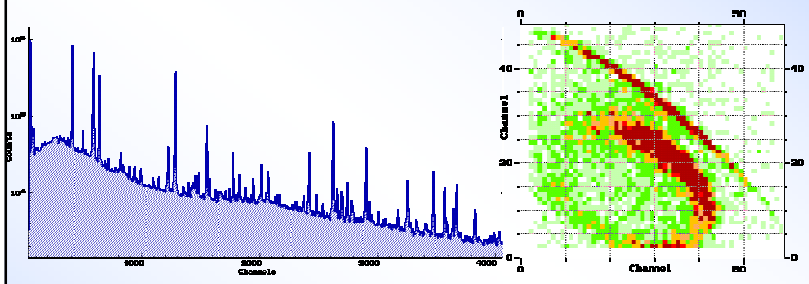
Platforms:
1. MS-Windows
2. Linux (X-Windows)
3. Mac OSX (X11)

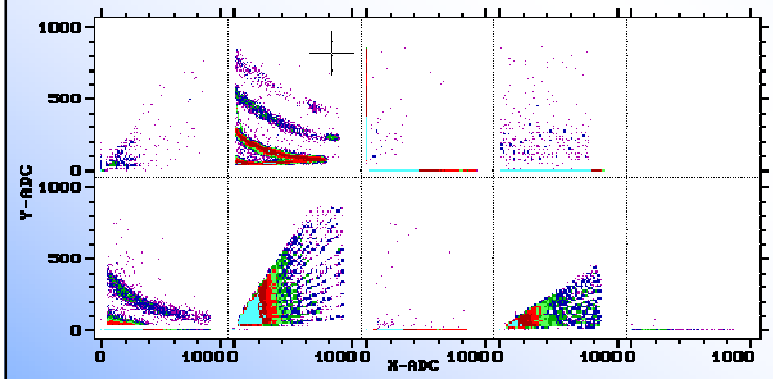
Old platforms:
4. Alpha/VMS
5. DEC Unix
6. AIX/R6000
7. Windows-3.1
8. MS-DOS

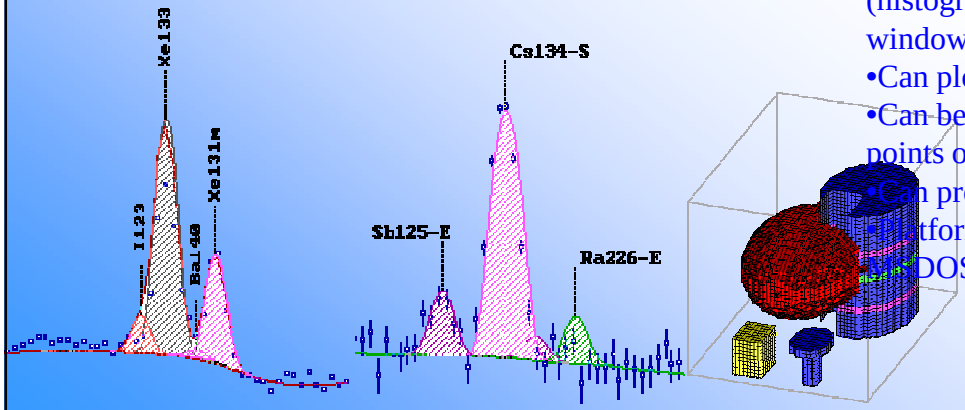
Output:
1. Screen (Windows)
2. PostScript (PS, EPS)
3. Enhanced Metafile (EMF)
4. PCX
5. GIF, Animated-GIF

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

Plotting system on the basis of DINAMO library







DINAMO: universal library of C subroutines for interactive plotting in nuclear research (1993-1999).

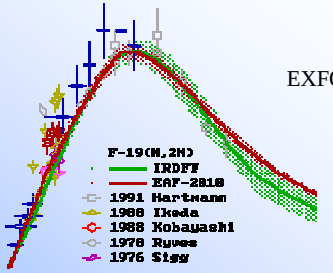
Graphics tools for nuclear research:
- Experiments (online, 1D, 2D histograms)
- Treatment experimental results
- Plotting analytical functions

Features:
- Works with functions: y, y(x), z(x,y)
- Plots many functions
- Data can be given in arrays (I2, I4, R4, R8) and can be calculated on the fly - calibration getx(i), external functions (gamma-lines, Gaussians with background)
- Uncertainties can be given in arrays or calculated: per-cent, sqrt(counts), constant, etc.
- Display regimes: lin/log of x/y, interpolations (histograms/lin-lin), error bars/cloud/pipe, one-many windows, MOV/XOR, etc.
- Can plot maps, contours, 3D and animated 3D of z(x,y)
- Can be used for identify lines for different isotopes, data points of different authors and publications
- Can produce pcx, gif, ps/eps, emf, animated-gif
- Platforms: MS-Windows, Linux, Mac-OSX; old versions: DOS, VMS, DEC-UNIX, RS6000

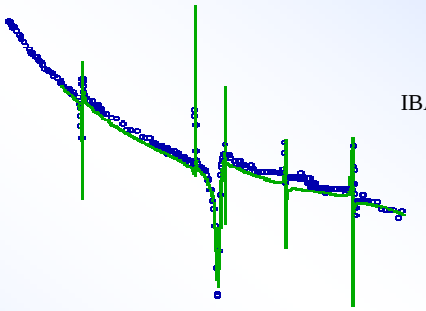
ZVView: interactive plotting program for display and analysis of nuclear data

Features:

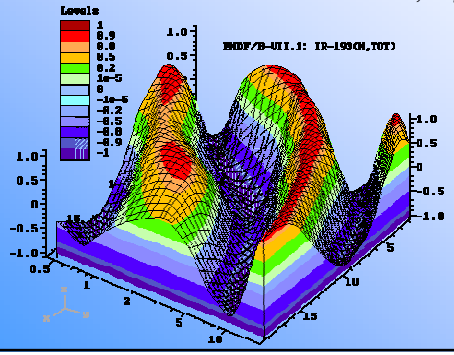
- All features inherited from DINAMO;
- Integrated with Empire, EndVer, EXFOR CD-ROMs.
- Works on Web: integrated with EXFOR-ENDF database retrieval systems, IBANDL, SigmaCals, LiveChart: can read data from remote archives, can be called as part of external Web service, etc.
- Reads nuclear data formats: 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.



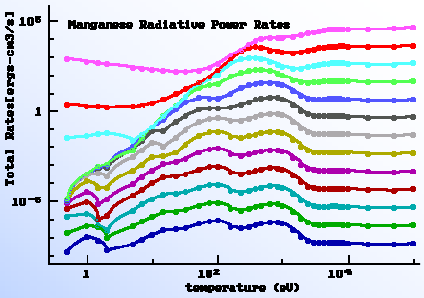
EXFOR+ENDF



IBANDL+SigmaCalc



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



FLYCHK (A+M): Web-Web communication

2009-2013

Web-ZVView

Database Retrieval Systems

- ENDF
- EXFOR

Your data

- ENDF uploading
- EXFOR uploading
- Manual input

Input

IBANDL

FLYCHK

LiveChart

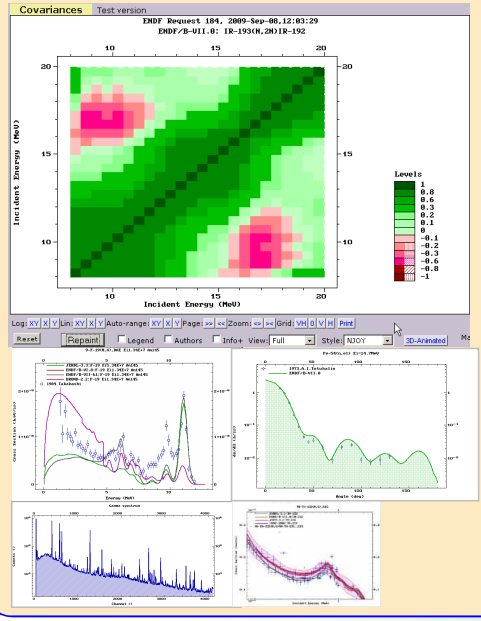
Web-ZVView

Output

Send ZVD file to user's PC

Output

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)

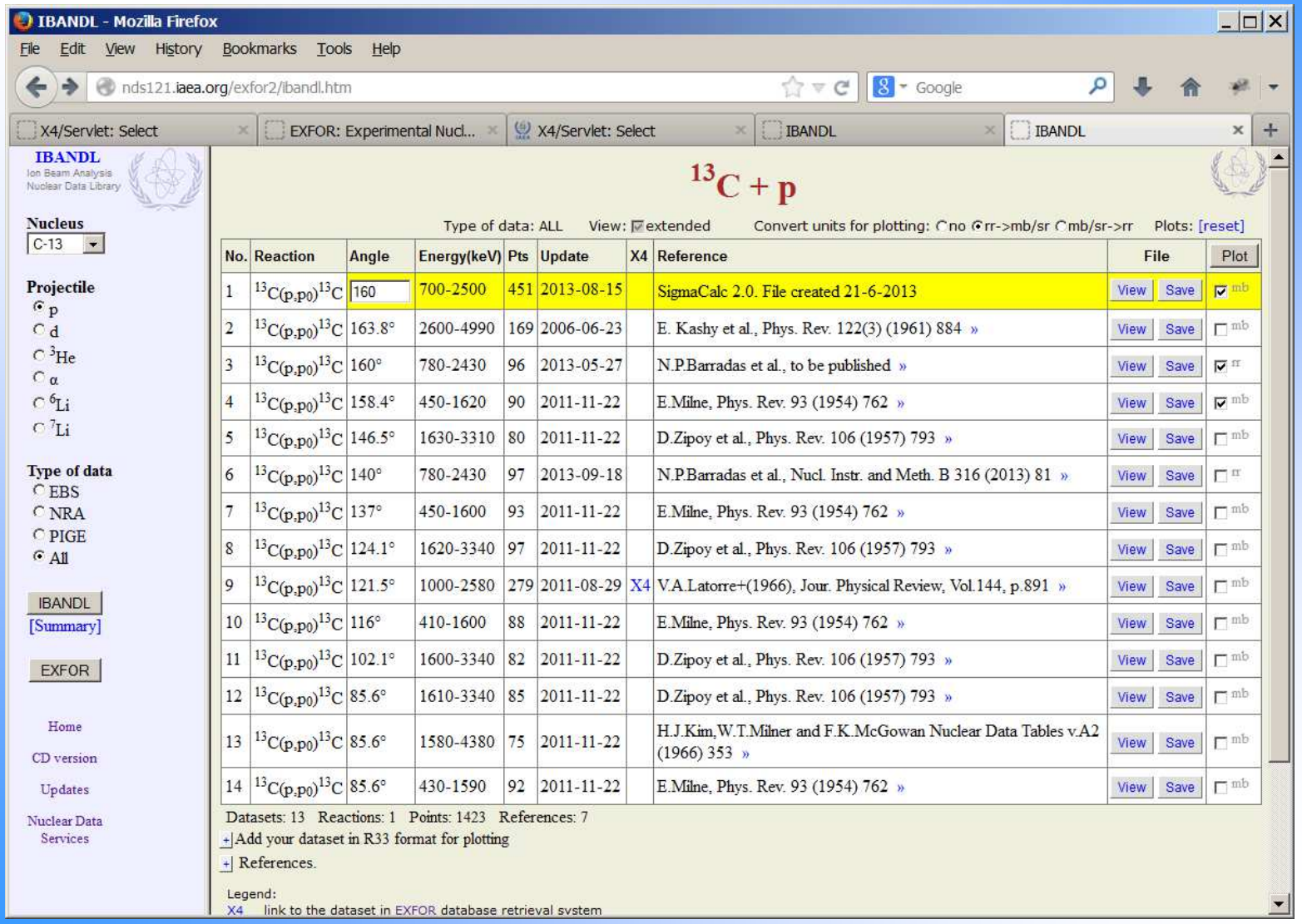
Draft for EXFOR compilation

Data for FORTRAN users

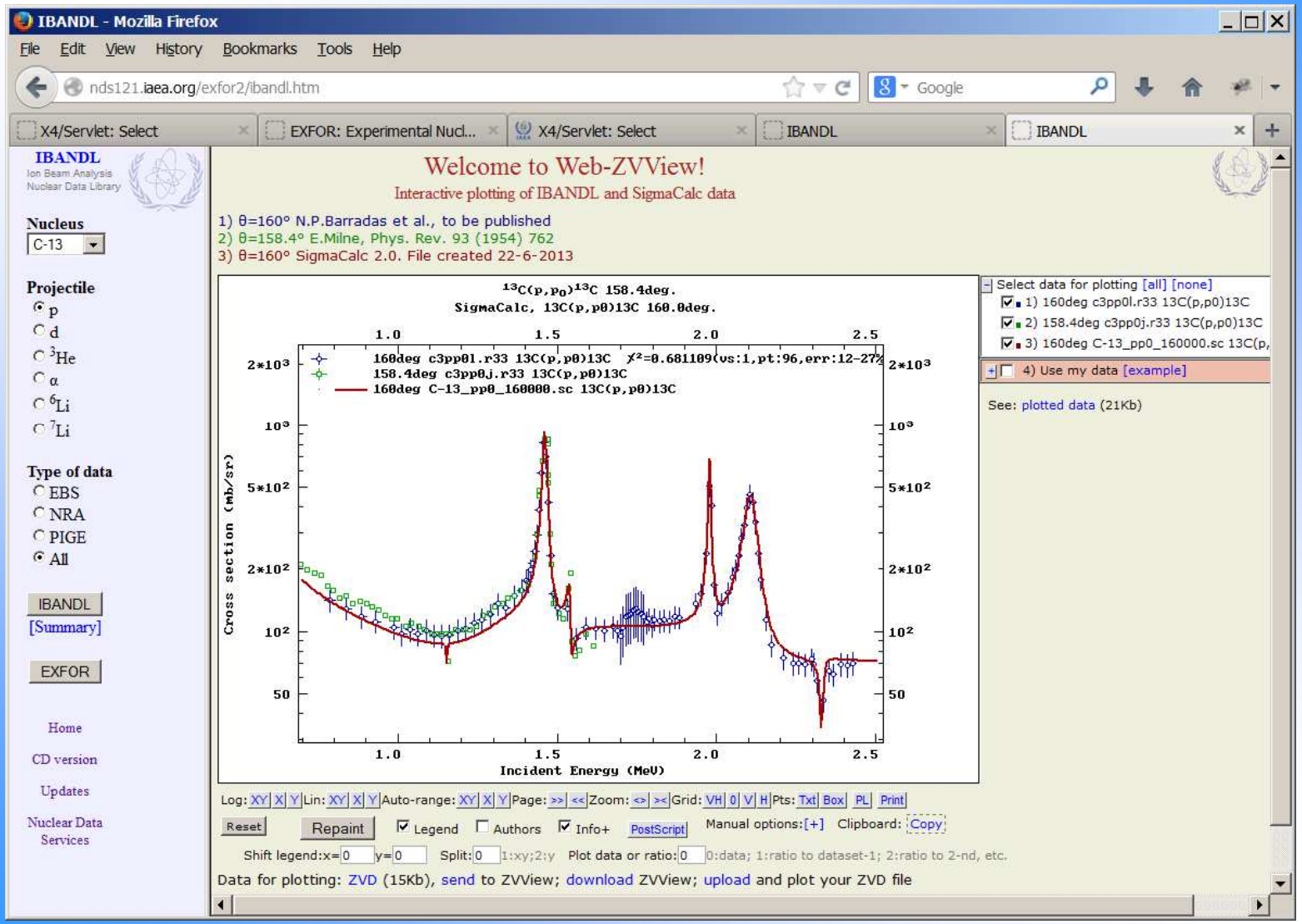
Output formats:

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

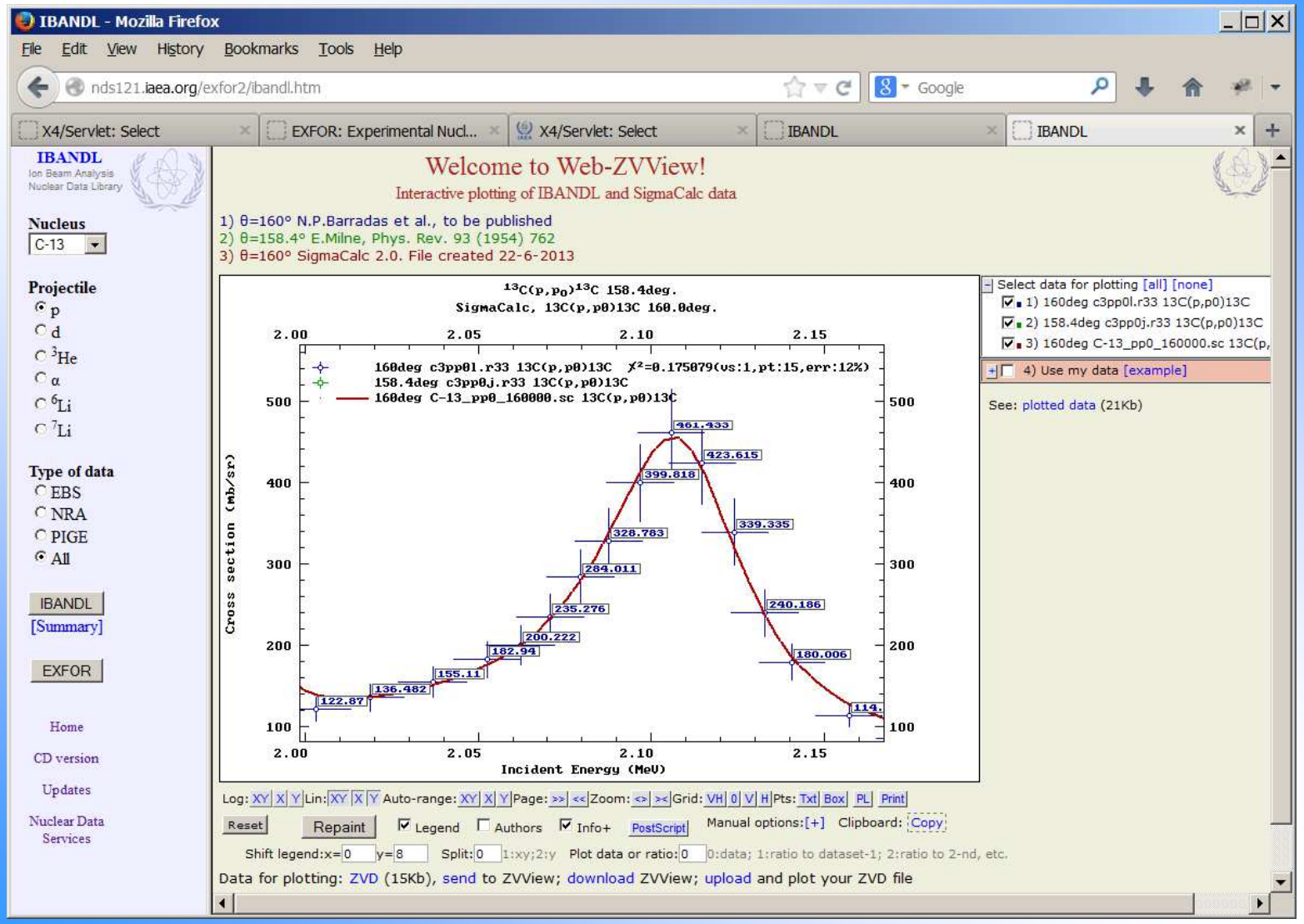
Web IBANDL calling Web-ZVView



Web IBANDL calling Web-ZVView



Web IBANDL calling Web-ZVView



Thank you.