New features of NDS Web systems

Viktor Zerkin

International Atomic Energy Agency, Nuclear Data Section

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International Network of Nuclear Reaction Data Centres

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Topics:

1. Experts' EXFOR data corrections
2. EXROR statistics by year of main publications
3. Additional EXFOR output format
4. Access to common EXFOR-NSR PDF database
5. GND (XML) output from web-ENDF
6. Running GRUCON via web
7. Text search in EXFOR
8. Inverse reactions in EXFOR (A73),
   inverse kinematics in IBANDL Web interface

1. EXFOR data correction system
(re-normalization system)

A82. Zerkin (Continuing action) Continue development of a new database encompassing correction factors and relevant comments for suspect/erroneous data (X4-evaluated) presented in WP2010-19; keep NRDC informed about conclusions of discussions on new database.

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
10. Extend Web interface to use experts' correction-database

2014

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:

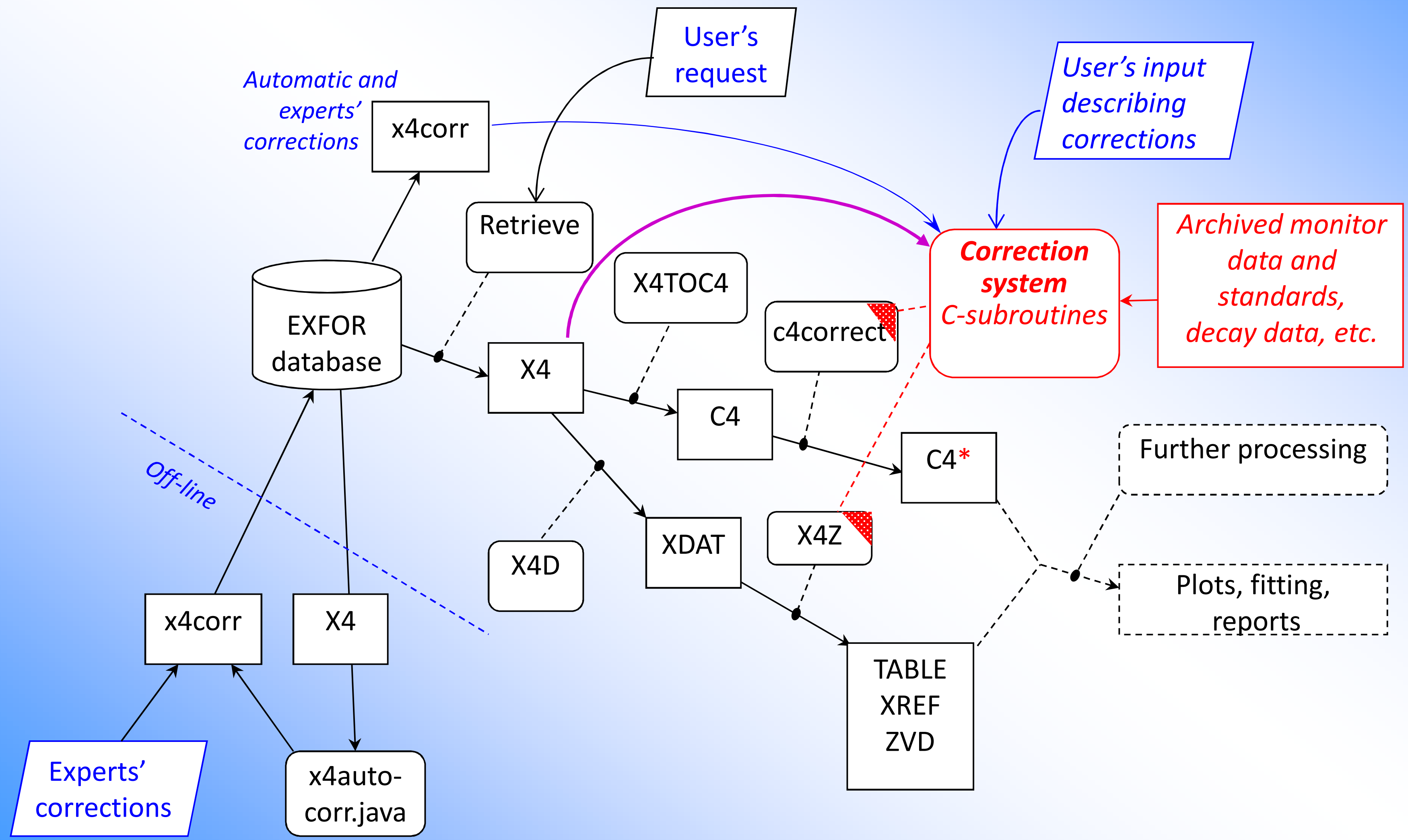
- archive of old monitors
- library of “recommended” monitors (standards)
- software, database, information, Web support
- participation of nuclear data experts

Correction System: Paradigm

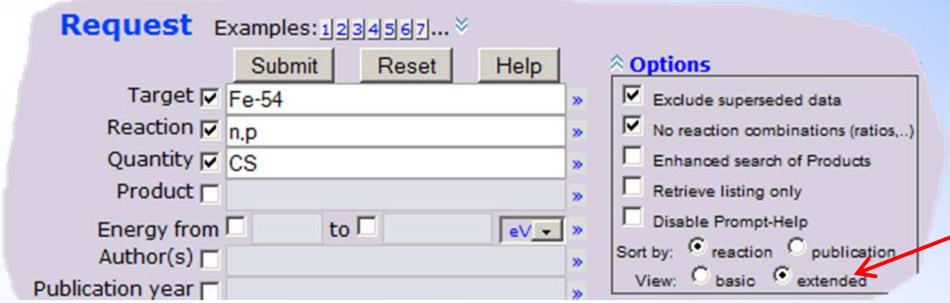
- **We <u>DO NOT</u> change EXFOR data.**
  We re-normalize output from EXFOR system.
  i.e. we modify data extracted from EXFOR:
  - computational format C4
  - TABLE, XREF (NNDC computational formats)
  - XDAT (intermediate format used for plotting)

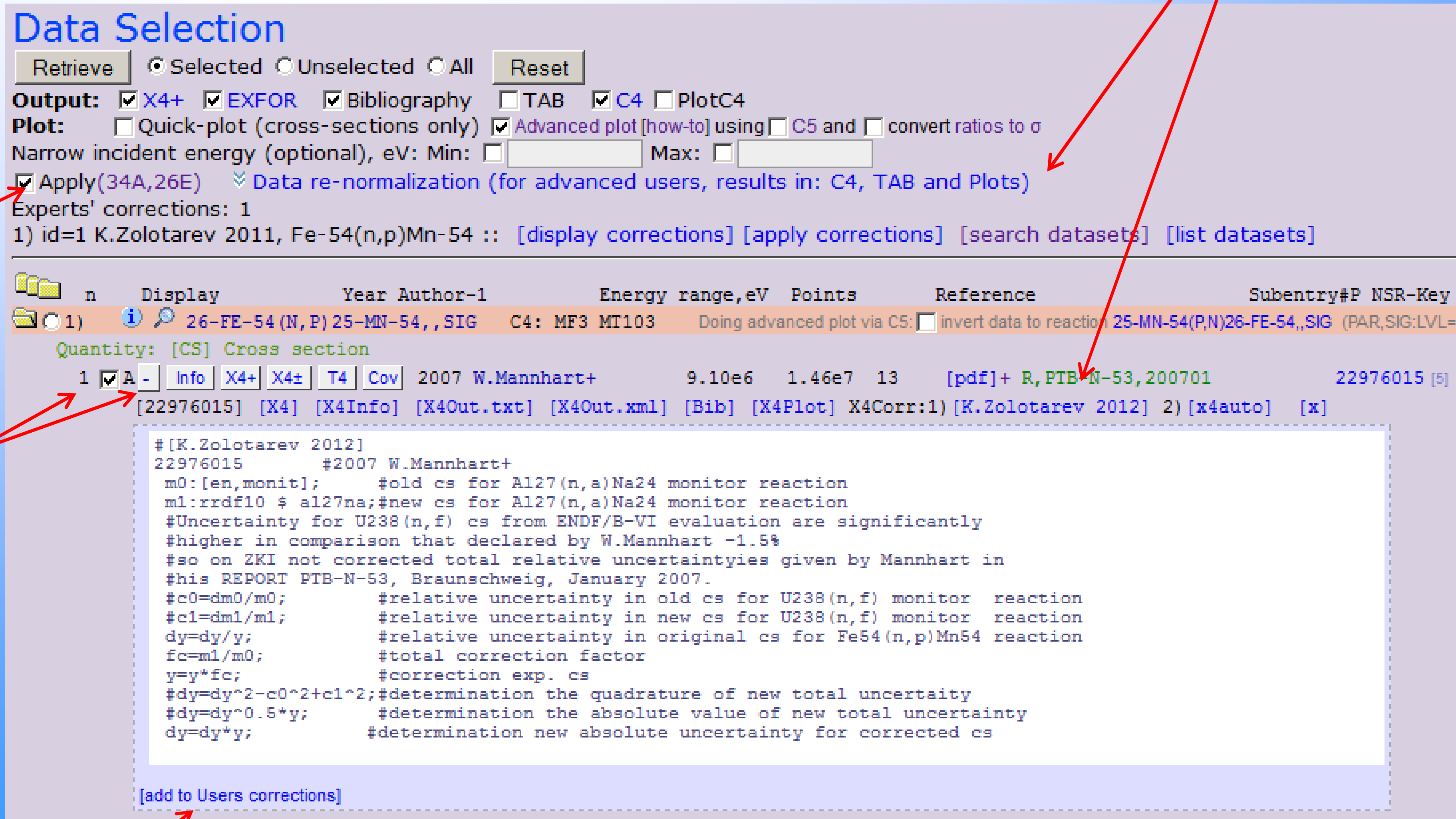
    Results can be plotted as:
    - Quick plots
    - Advanced plots … + comparison to evaluated data (ENDF)

Software structure and data flow



Implementation





Implementation

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(34A,26E) Data re-normalization (for advanced users, results in: C4, TAB and Plots)

☐ Auto corrections:

☑ User's corrections

```
#[K.Zolotarev 2012]
22976015       #2007 W.Mannhart+
 m0:[en,monit];     #old cs for Al27(n,a)Na24 monitor reaction
 m1:rrdf10 $ al27na;#new cs for Al27(n,a)Na24 monitor reaction
 #Uncertainty for U238(n,f) cs from ENDF/B-VI evaluation are significantly
 #higher in comparison that declared by W.Mannhart -1.5%
 #so on ZKI not corrected total relative uncertaintyies given by Mannhart in
```

Examples:
[1][2][3][4]
[5][6][7][8]
[9] [ZK]
[help]
[doc]

☐ Experts' corrections:

Input your own Monitor data

Experts' corrections: 1

1) id=1 K.Zolotarev 2011, Fe-54(n,p)Mn-54 :: [display corrections] [apply corrections] [search datasets] [list datasets]

n Display Year Author-1 Energy range,eV Points Reference Subentry#P NSR-Key

1) 26-FE-54(N,P)25-MN-54,,SIG C4: MF3 MT103 Doing advanced plot via C5: ☐ invert data to reaction 25-MN-54(P,N)26-FE-54,,SIG (PAR,SIG,LVL=0)

Quantity: [CS] Cross section

1 ☑ A - Info X4+ X4± T4 Cov 2007 W.Mannhart+ 9.10e6 1.46e7 13 [pdf]+ R,PTB-N-53,200701 22976015 [5]

[22976015] [X4] [X4Info] [X4Out.txt] [X4Out.xml] [Bib] [X4Plot] X4Corr:1) [K.Zolotarev 2012] 2) [x4auto] [x]

```
#[K.Zolotarev 2012]
22976015       #2007 W.Mannhart+
 m0:[en,monit];     #old cs for Al27(n,a)Na24 monitor reaction
 m1:rrdf10 $ al27na;#new cs for Al27(n,a)Na24 monitor reaction
 #Uncertainty for U238(n,f) cs from ENDF/B-VI evaluation are significantly
 #higher in comparison that declared by W.Mannhart -1.5%
 #so on ZKI not corrected total relative uncertaintyies given by Mannhart in
 #his REPORT PTB-N-53, Braunschweig, January 2007.
 #c0=dm0/m0;         #relative uncertainty in old cs for U238(n,f) monitor  reaction
 #c1=dm1/m1;         #relative uncertainty in new cs for U238(n,f) monitor  reaction
 dy=dy/y;            #relative uncertainty in original cs for Fe54(n,p)Mn54 reaction
 fc=m1/m0;           #total correction factor
 y=y*fc;             #correction exp. cs
 #dy=dy^2-c0^2+c1^2;#determination the quadrature of new total uncertainty
 #dy=dy^0.5*y;       #determination the absolute value of new total uncertainty
 dy=dy*y;           #determination new absolute uncertainty for corrected cs
```

[add to Users corrections]

Implementation

Output Data

Format	*Data* *(Size)*
EXFOR Interpreted	X4+ (25Kb) 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 (18Kb) zip (6Kb)
Bibliography	html (6Kb) BibTeX (2Kb)
Computational	
C4	C4 (2Kb) C4.ZIP (1Kb) LST (128Kb)

Advanced Plotting: LST (1Kb)

Select experimental data for plotting...

Go to		*Quantity type*	*#Plots*
σ (E)	SIG	Cross section data	1

Go to plot evaluated data...

ENDF Retrieve evaluated data and plot...

Requested corrections

```
22976015       #2007 W.Mannhart+
 m0:[en,monit];      #old cs for Al27(n,a)Na24 monitor reaction
 m1:rrdf10 $ al27na;#new cs for Al27(n,a)Na24 monitor reaction
 #Uncertainty for U238(n,f) cs from ENDF/B-VI evaluation are significantly
 #higher in comparison that declared by W.Mannhart -1.5%
 #so on ZKI not corrected total relative uncertaintyies given by Mannhart in
 #his REPORT PTB-N-53, Braunschweig, January 2007.
 #c0=dm0/m0;         #relative uncertainty in old cs for U238(n,f) monitor  reaction
 #c1=dm1/m1;         #relative uncertainty in new cs for U238(n,f) monitor  reaction
 dy=dy/y;            #relative uncertainty in original cs for Fe54(n,p)Mn54 reaction
 fc=m1/m0;           #total correction factor
 y=y*fc;             #correction exp. cs
 #dy=dy^2-c0^2+c1^2;#determination the quadrature of new total uncertaity
 #dy=dy^0.5*y;       #determination the absolute value of new total uncertainty
 dy=dy*y;           #determination new absolute uncertainty for corrected cs
```

Correction protocol

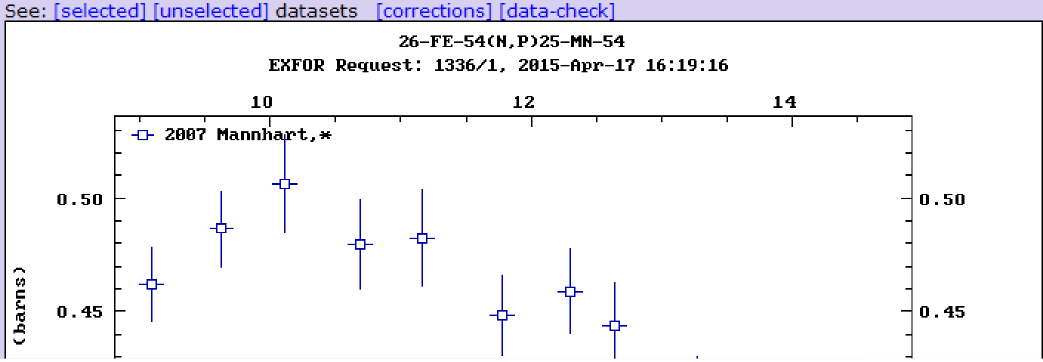
Applied corrections. Datasets: 1

1) EXFOR:#22976015 Ref:W.Mannhart,ET.AL. (07) Corrected_Points:13 yFactor_Ave:0.991189 yFactor_Min:0.960426 yFactor_Max:1.02993

22976015 M0:[EN,MONIT]; M1:rrdf10$al27na; dY=dY/Y; Fc=M1/M0; Y=Y*Fc; dY=dY*Y;

See used monitors: [plot]

See: [selected] [unselected] datasets [corrections] [data-check]



ENDF Find and add to the plot evaluated data

Select data for plotting [all] [none]

1) 26-FE-54(N,P)25-MN-54,,SIG

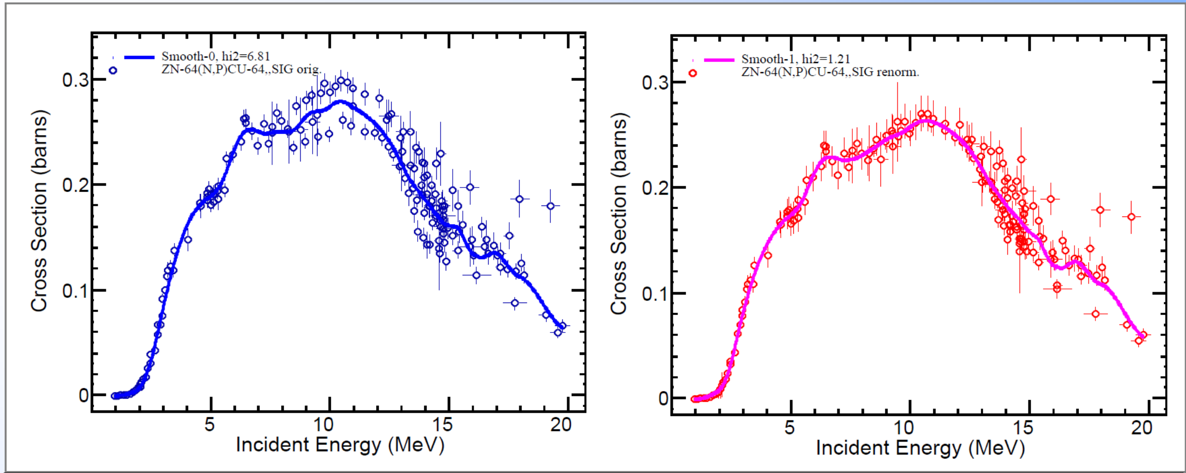
2) Use my data [example]

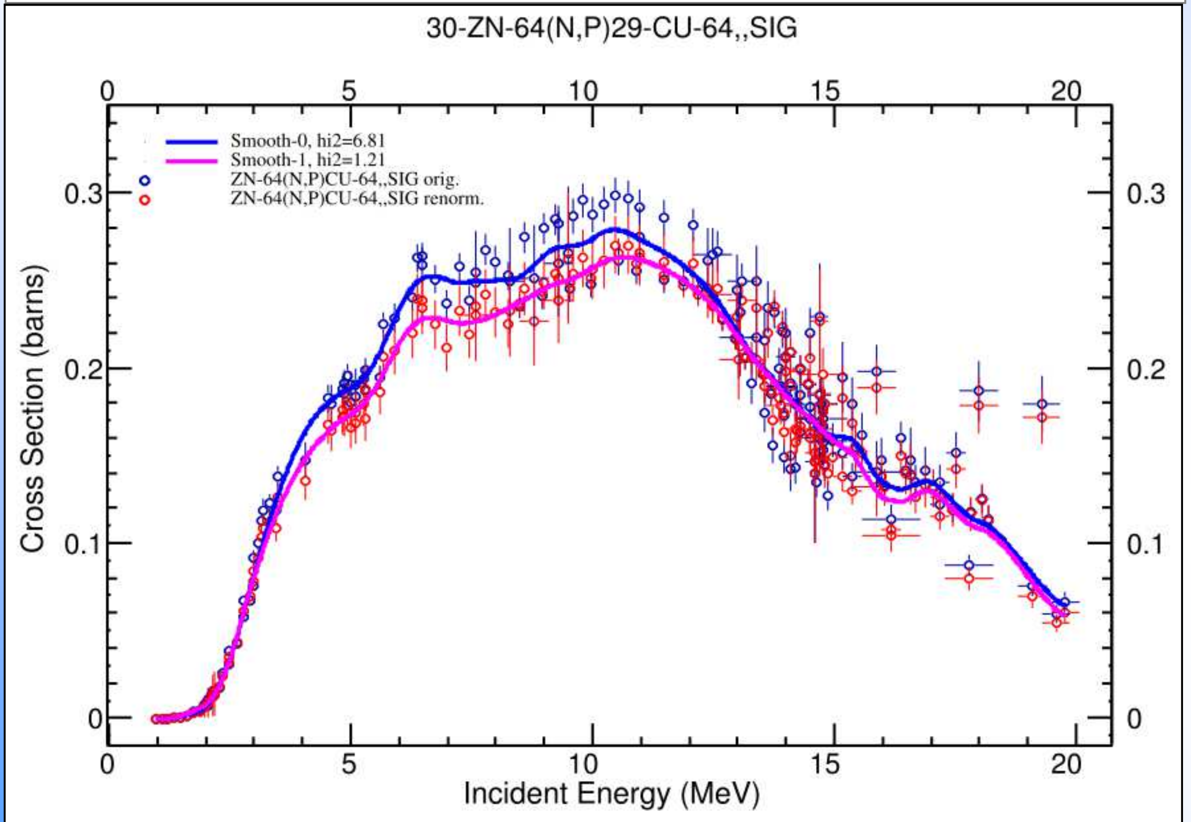
See: plotted data (2Kb)

Example of expert's corrections results

Before

After





2. EXROR statistics by year of main publications

Request #997
Access-Level=2
EXFOR by year of main publications.
Now: 2015-04-20,12:52:06
EXFOR: 2015-03-16,14:43:35
EXFOR Summary as [graphics]

Projectile: ALL

Publication year :				
1940:4	1941:4	1942:2	1943:1	1944:12
1950:77	1951:139	1952:97	1953:163	1954:141
1960:285	1961:352	1962:369	1963:414	1964:374
1970:521	1971:499	1972:481	1973:506	1974:469
1980:462	1981:435	1982:431	1983:432	1984:391
1990:335	1991:339	1992:269	1993:267	1994:291
2000:234	2001:249	2002:291	2003:255	2004:315
2010:291	2011:329	2012:275	2013:240	2014:162

Total: years:81(1935-2015); entries:21738

Projectile: Neutron

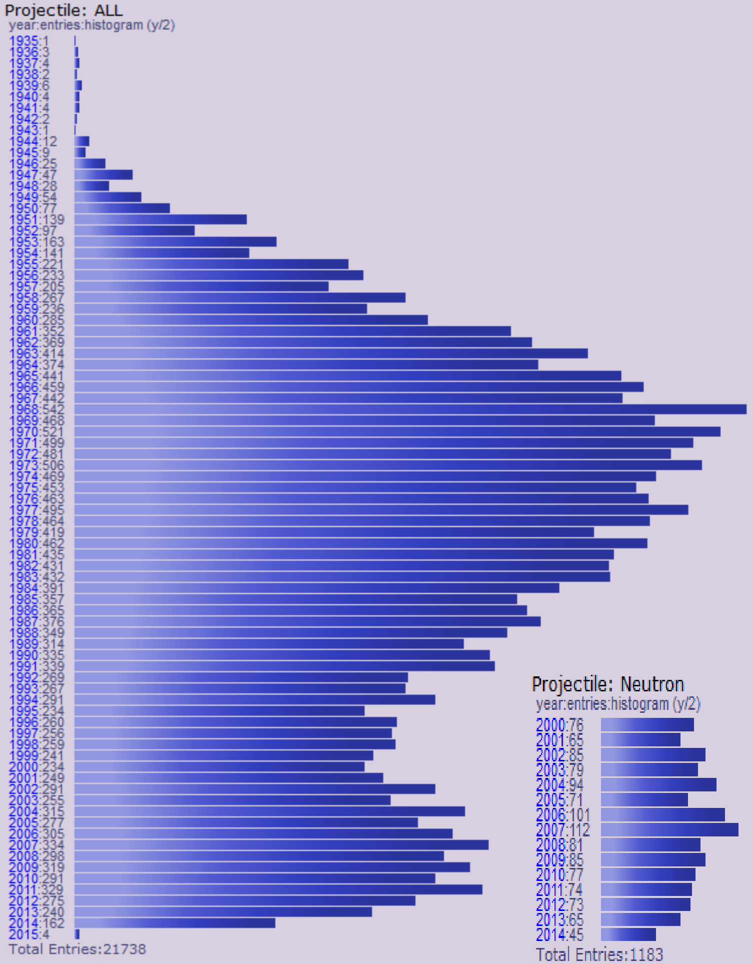
Publication year :				
1940:3	1941:4	1942:2	1943:1	1944:12
1950:61	1951:97	1952:63	1953:115	1954:89
1960:154	1961:212	1962:197	1963:219	1964:177
1970:313	1971:282	1972:284	1973:259	1974:250
1980:205	1981:179	1982:190	1983:185	1984:172
1990:143	1991:143	1992:116	1993:86	1994:126
2000:76	2001:65	2002:85	2003:79	2004:94
2010:77	2011:74	2012:73	2013:65	2014:45

Total: years:80(1935-2014); entries:10230

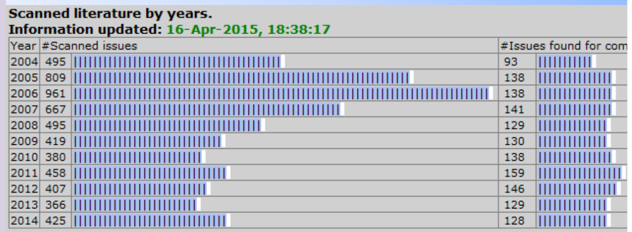
Projectile: Charged particles

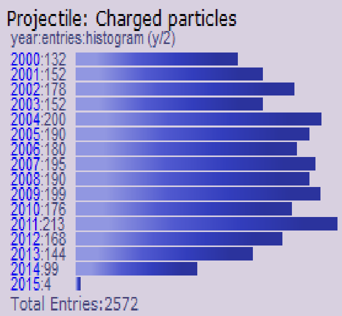
Publication year : Number of Entries									
							1937:1		
1940:1						1946:2	1947:3	1948:8	1949:16
1950:14	1951:36	1952:32	1953:42	1954:45	1955:47	1956:75	1957:66	1958:61	1959:65
1960:103	1961:116	1962:127	1963:160	1964:150	1965:124	1966:139	1967:142	1968:166	1969:172
1970:161	1971:171	1972:161	1973:174	1974:175	1975:143	1976:153	1977:178	1978:178	1979:176
1980:200	1981:196	1982:183	1983:189	1984:172	1985:146	1986:151	1987:162	1988:155	1989:147
1990:163	1991:148	1992:129	1993:149	1994:129	1995:116	1996:140	1997:127	1998:151	1999:133
2000:132	2001:152	2002:178	2003:152	2004:200	2005:189	2006:180	2007:195	2008:190	2009:199
2010:176	2011:213	2012:168	2013:144	2014:99	2015:4				

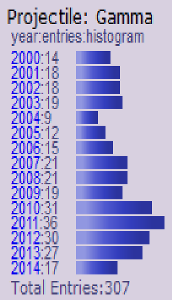
Total: years:72(1937-2015); entries:9240

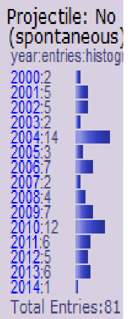


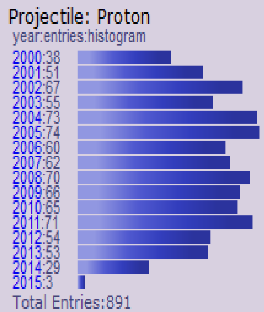
Available in authorized mode as extension of Web retrieval system: /servlet/X4sSearch5?yy

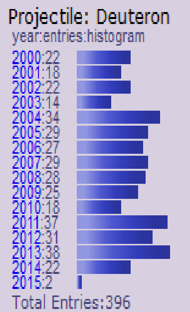


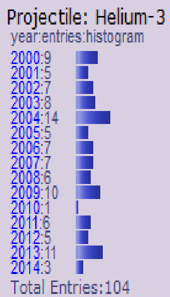


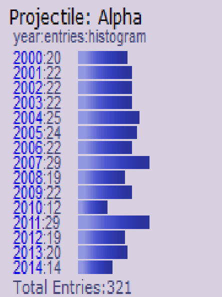












3. Additional output format

Output Data

Format	Data (Size)
EXFOR Interpreted	X4+ (28Kb) 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 (37Kb) zip (6Kb)
Bibliography	html (3Kb) BibTeX (1Kb)

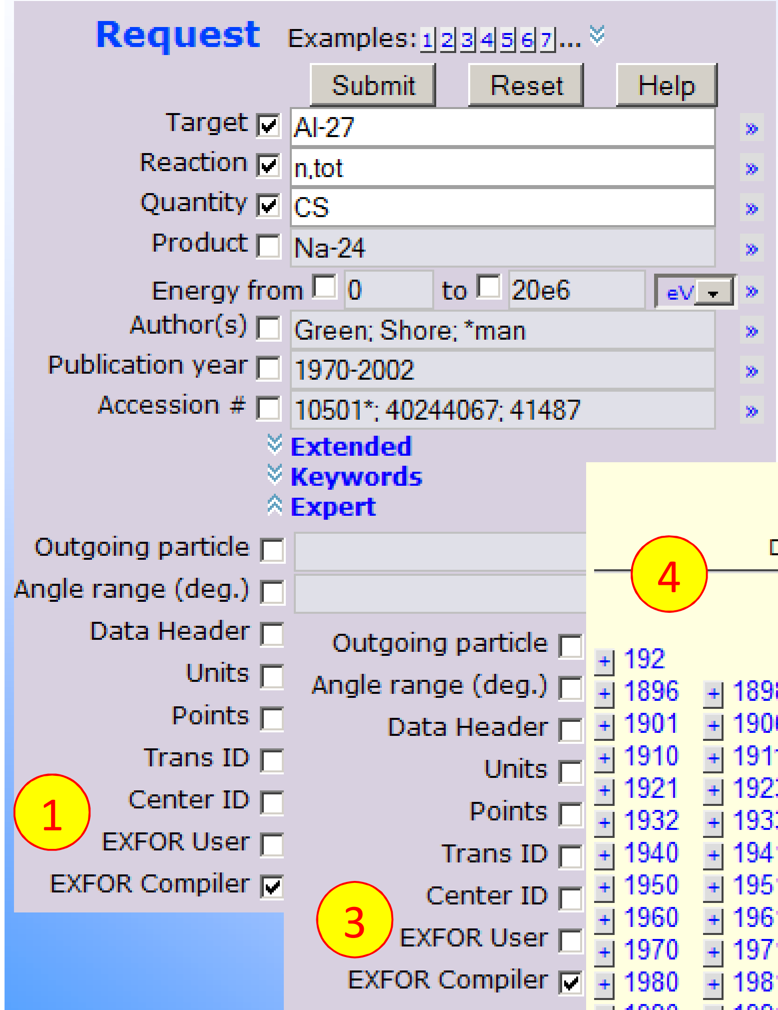
- "Summarizes" X4Out format combining columns, unifying units
- Based only on EXFOR Dictionaries and rules (no connection to C4, ENDF:MF/MT)

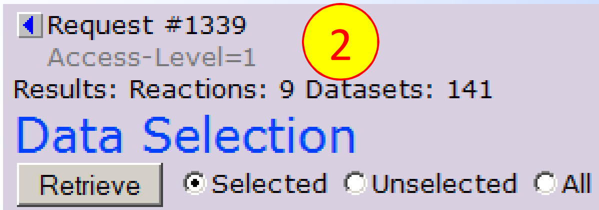
```
#---EXFOR Request #1448
#---EXFOR Generalized Computational Output---
#==============================================================================
#DATASET        A1495002
#NOW            2015/04/22:06:53:57
#SUBENT         A1495002   20140226
#ENTRY          A1495      20140226
#AUTHOR1        J.P.Schiffer+
#YEAR           1956
#X4REF1         J,PR,104,1064,1956
#REFERENCE1     Jour: Physical Review, Vol.104, p.1064 (1956)
#REACTION       3-LI-6(HE3,P)4-BE-8,PAR,DA
#D4REAC         R0#
#C4Reaction     (HE3,P)PAR,DA
#ReactionType   DAP
#Quantity       Partial differential cross section d/dA
#IndVarFamCode  [0 234      ]
#ExpectedUnits  [B/SR]
#xVariables     3
#+              Y = Y(X1,X2,X3)
#Proj-ZA     2003
#Targ-ZA     3006
#Prod        4-BE-8
#Prod-ZA     4008
#computDATA  201         8           12
#Data:CM     Error       EN          Error       LVL         Error       ANG         Error
#B/SR        B/SR        EV          EV          EV          EV          ADEG        ADEG
 0.0002792   5.584e-5    898200.     6000.       0.          -0.         150.        -0.
 0.0002869   5.738e-5    903200.     6000.       0.          -0.         0.          -0.
 0.000303    6.06e-5     926600.     6000.       0.          -0.         0.          -0.
 0.0003591   7.182e-5    958800.     6000.       0.          -0.         150.        -0.
 0.0003805   7.61e-5     963800.     6000.       0.          -0.         0.          -0.
 0.0004884   9.768e-5    1.001e6     6000.       0.          -0.         0.          -0.
 0.0006113   0.00012226  1.033e6     6000.       0.          -0.         0.          -0.
 0.0006104   0.00012208  1.042e6     6000.       0.          -0.         150.        -0.
 0.0006884   0.00013768  1.061e6     6000.       0.          -0.         0.          -0.
```

4. Access to common EXFOR-NSR PDF database

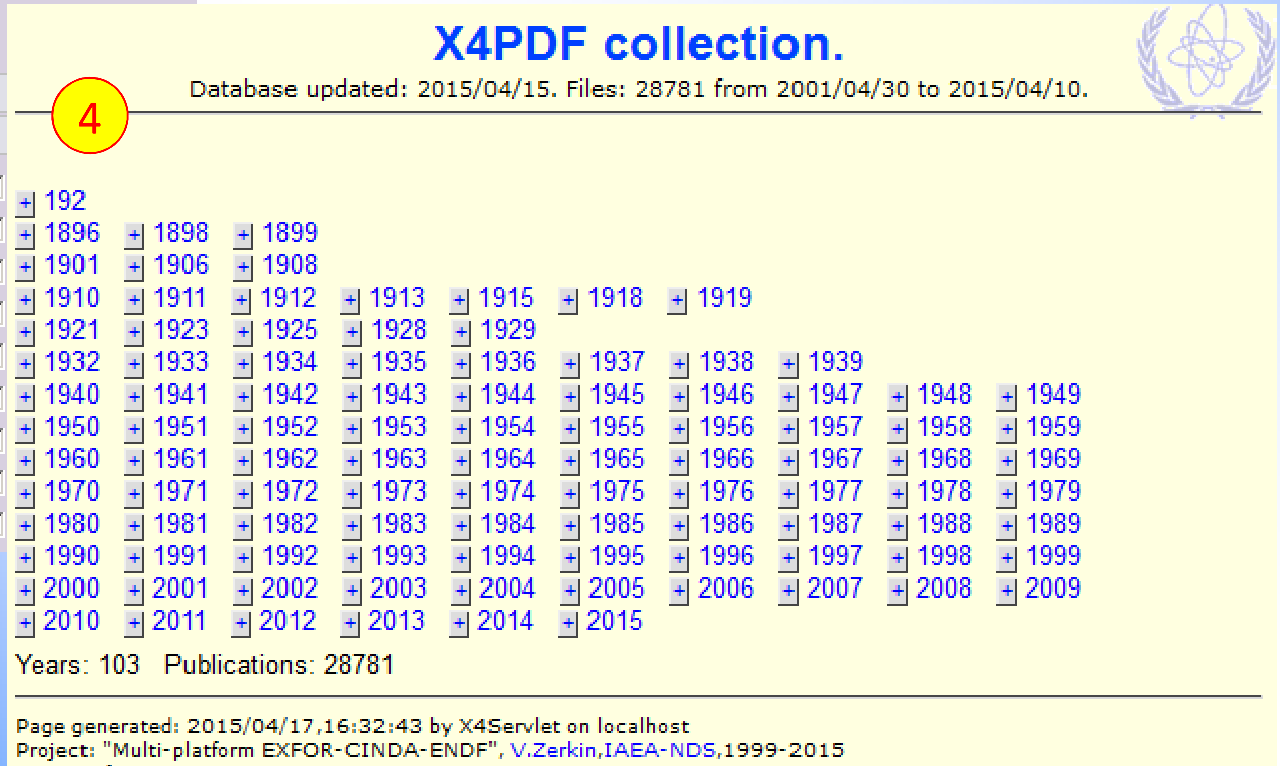
/for authorized users only/

PDF collection at NDS: since 2005 (WP2005-14 , Memo CP-D/426)
Since 2012 NNDC (J.Totans and B.Pritychenko) contribute PDF's from NSR to common PDF-library





PDF database:	
Total:	28,871
EXFOR:	18,686
NSR:	17,409
NSR only:	5,222



Access to common EXFOR-NSR PDF database. Cont.

5

X4PDF collection.

Database updated: 2015/04/15. Files: 28781 from 2001/04/30 to 2015/04/10.

1945

1. J,DOK,48,583,1945 Jour: Doklady Akademii Nauk, Vol.48, p.583 (1945) [pdf] EXFOR: 41258
   On the Absorption of Fast Neutrons by Heavy Nuclei
   M.G.Meshcheryakov
2. J,PR,67,199,1945 Jour: Physical Review, Vol.67, p.199 (1945) [pdf] Web: http://publish.aps.org/abstract/PR/v67/p199
3. J,PR,67,202,1945 Jour: Physical Review, Vol.67, p.202 (1945) [pdf] Web: http://publish.aps.org/abstract/PR/v67/p202
4. J,PR,68,240,1945 Jour: Physical Review, Vol.68, p.240 (1945) [pdf] EXFOR: 11138 DOI: 10.1103/PhysRev.68.240
   COLLISION CROSS SECTIONS FOR 25-MEV NEUTRONS.
   R.Sherr
5. R,LA-266,1945 Rept: Los Alamos Scientific Lab. Reports, No.266 (1945) [pdf] EXFOR: 12519
   ABSORPTION AND FISSION CROSS SECTIONS OF 49 IN THE NEUTRON ENERGY RANGE. 0.01EV TO 100EV.
   E.E.Anderson, E.D.Mcdaniel, R.B.Sutton, L.S.Lavatelli

Not referenced from EXFOR

6. N,NSR-1945BR04 [pdf]
   NSR: 1945BR04 [pdf] NSR-Reference: Helv.Phys.Acta 18, 351 (1945)
   Prufung der Fermischen Theorie des β- Zerfalls durch Messung der Wahrscheinlichkeit von K-Einfang und e^+-Emission des 6, 7 h Cadmium
   H.Bradt, P.C.Gugelot, O.Huber, H.Medicus, P.Preiswerk, P.Scherrer
7. N,NSR-1945BR05 [pdf]
   NSR: 1945BR05 [pdf] NSR-Reference: Helv.Phys.Acta 18, 405 (1945)
   Der Zerfall des UZ und die UX_2-UZ-Isomerie
   H.Bradt, P.Scherrer
8. N,NSR-1945BR06 [pdf]
   NSR: 1945BR06 [pdf] NSR-Reference: Helv.Phys.Acta 18, 256 (1945)
   Die metastabilen Zustande der Silberkerne Ag^{107} and Ag^{109}
   H.Bradt, P.C.Gugelot, O.Huber, H.Medicus, P.Preiswerk, P.Scherrer, R.Steffen

Year: 1945 Publications: 8

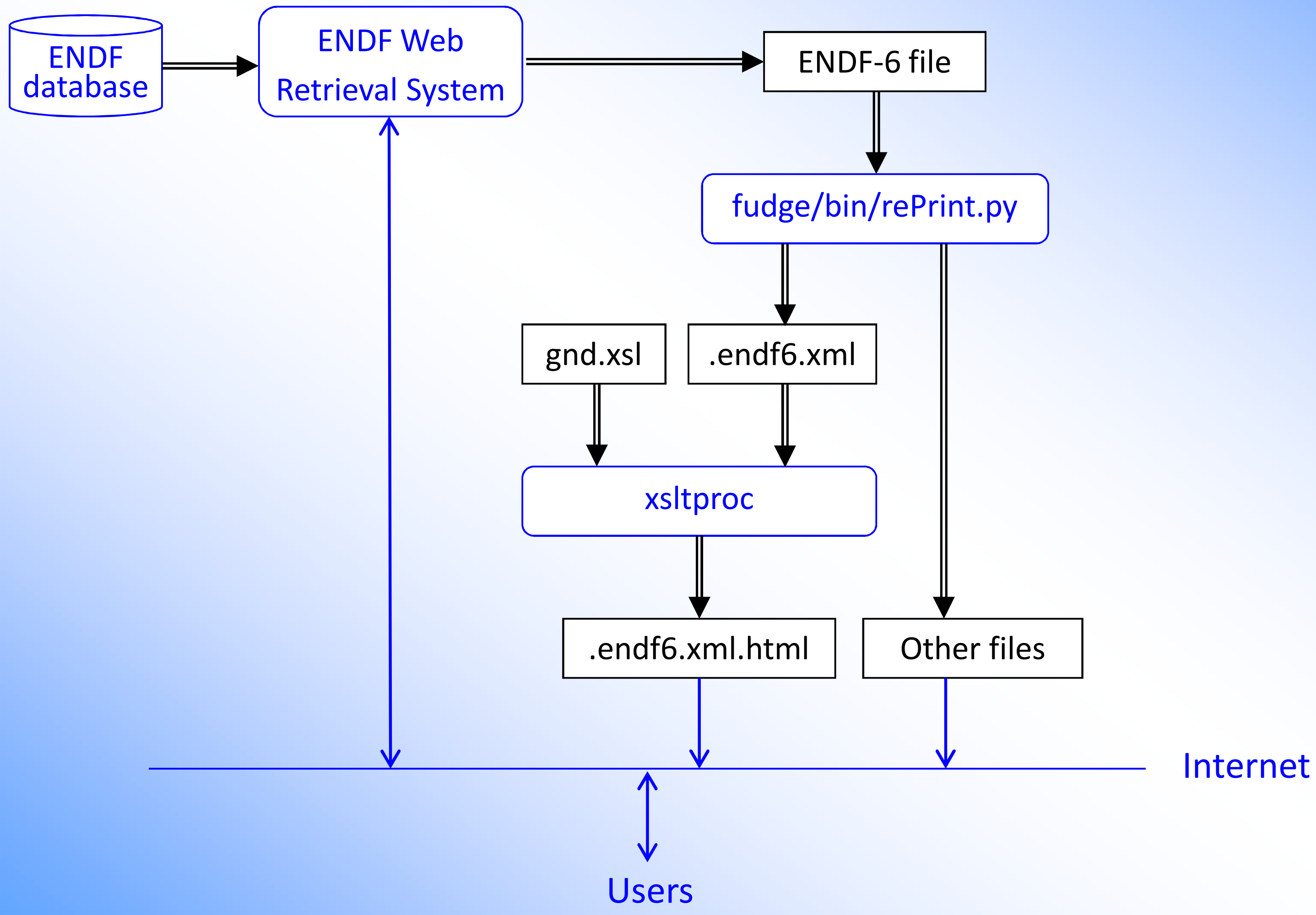
Page generated: 2015/04/17,16:39:03 by X4-Servlet on localhost [fwd:nds121.iaea.org]
Project: "Multi-platform EXFOR-CINDA-ENDF", V.Zerkin, IAEA-NDS, 1999-2015

5. GND (XML) output from web-ENDF

using LLNL package Fudge

NNDC: http://www.nndc.bnl.gov/endf

IAEA: http://www-nds.iaea.org/endf



Retrieval steps

Parameters: Submit Reset

Target ☑ Al-27 »

Reaction ☑ n,a »

Quantity ☑ SIG »

Extended View

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

1) AL-27(N,A),SIG MT=107 MF=3 NSUB=10

MF3: [SIG] Cross sections MT107: [N,A] Production of an alpha particle, plus a residual. Sum of MT=800-849, if they are

1	☐	MAT	GND	PEN	Inter	Info	Summary	ENDF-6	Interpreted	σ	MF3-Plot	Plot	TENDL-2012	E=200MeV Lab=NRG Date=REV1-
2	☐	MAT	GND	PEN	Inter	Info	Summary	ENDF-6	Interpreted	σ	MF3-Plot	Plot	ENDF/B-VII.1	E=150MeV Lab=LANL,ORNL Date=20111222
3	☐	MAT	GND	PEN	Inter	Info	Summary	ENDF-6	Interpreted	σ	MF3-Plot	Plot	ENDF/B-VII.0	E=150MeV Lab=LANL,ORNL Date=DIST-DEC06
4	☐	MAT	GND	PEN	Inter	Info	Summary	ENDF-6	Interpreted	σ	MF3-Plot	Plot	JEFF-3.2	E=150MeV Lab=LANL Date=090105
5	☐	MAT	GND	PEN	Inter	Info	Summary	ENDF-6	Interpreted	σ	MF3-Plot	Plot	JEFF-3.1.2	E=150MeV Lab=LANL Date=090105

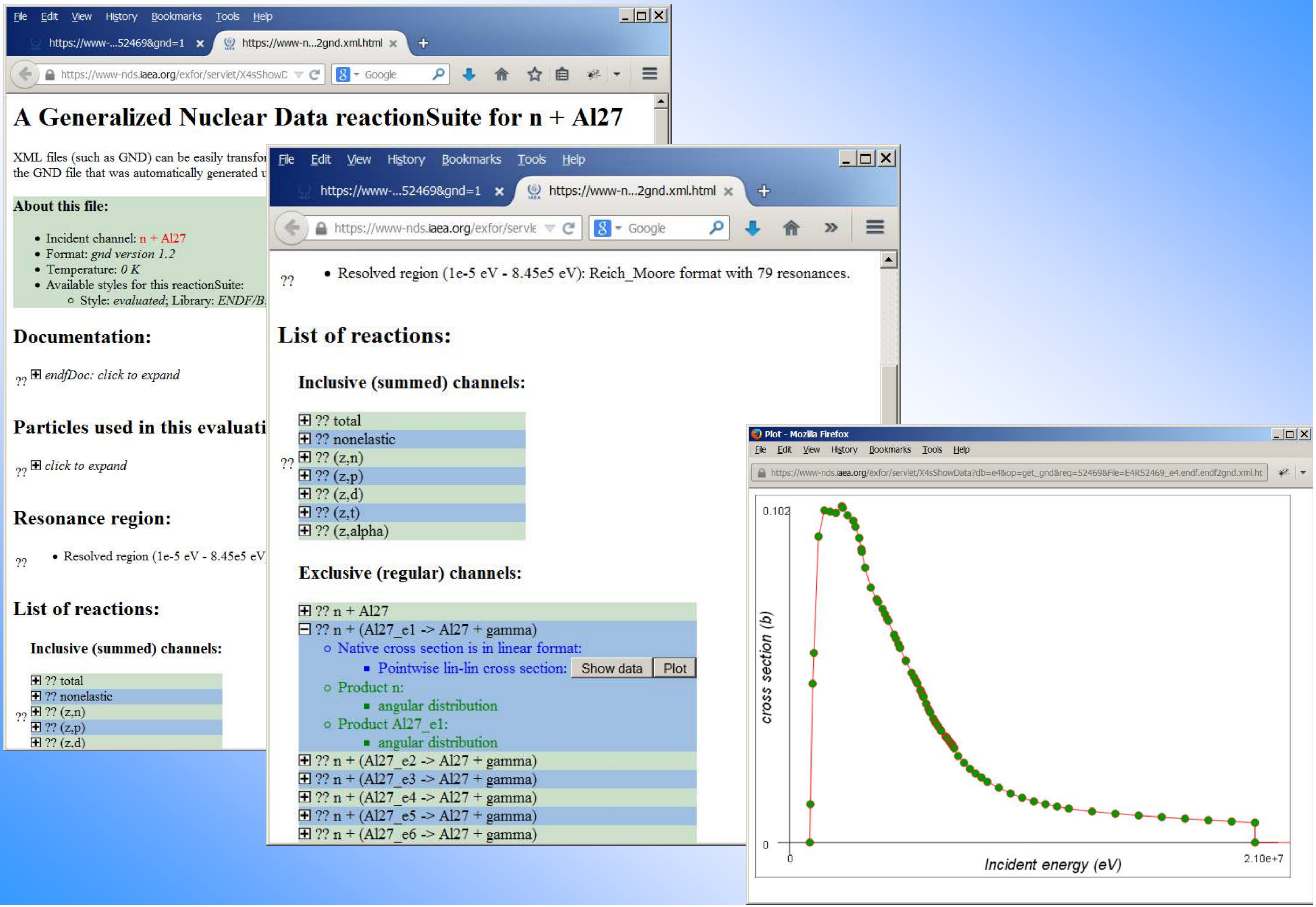
ENDF Web Retrieval System

Conversion ENDF file to GND format.
Request #52469.
MAT: Library="ENDF/B-VII.1" Target="AL-27" MAT=1325 NSUB=10 (N)

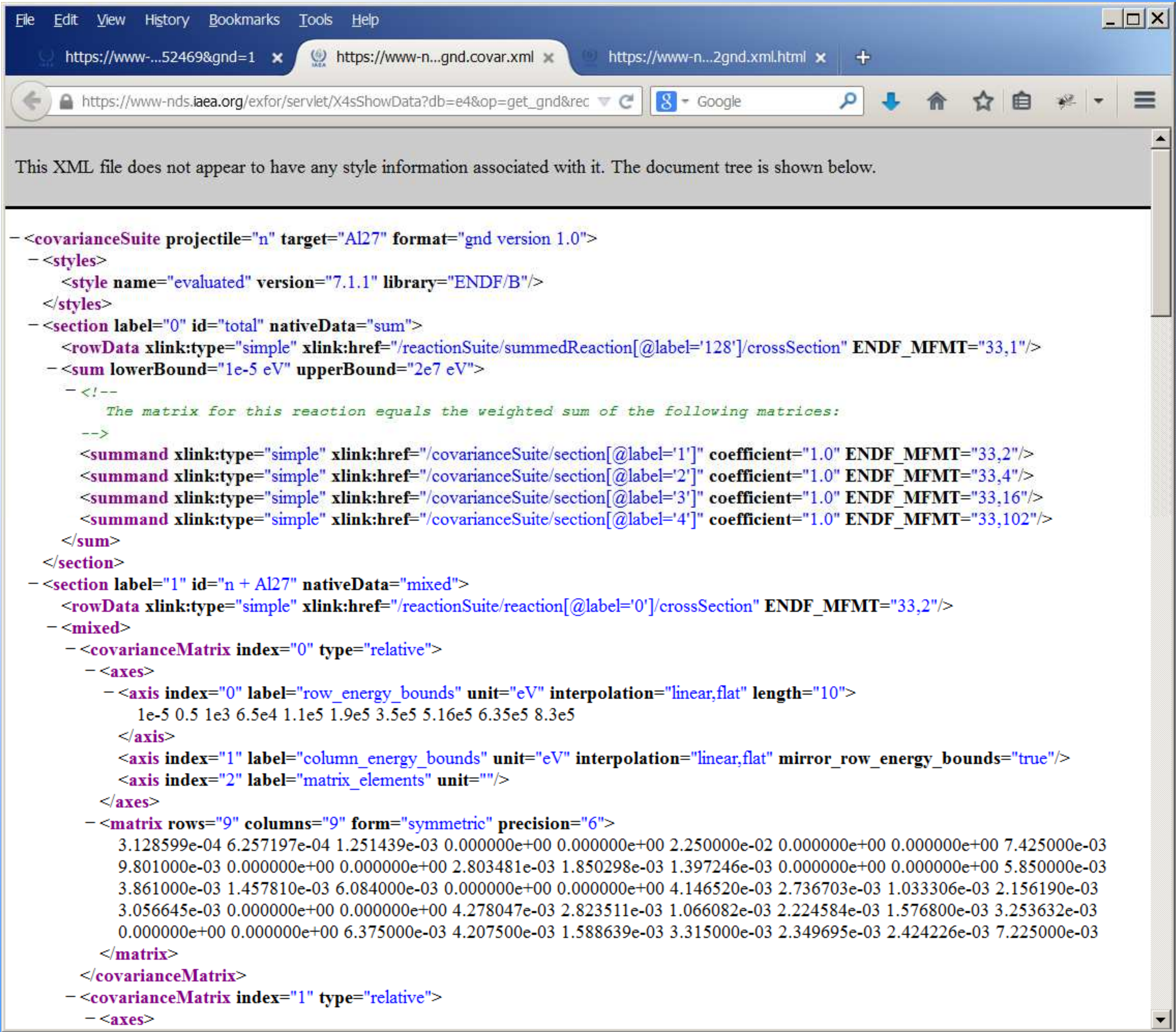
#	File	Comment	Date	Length
1	gnd.endf	Input file	2014/10/28 09:32:46	2,223,045
2	gnd.xml	Main output file	2014/10/28 09:32:56	3,005,026
3	gnd.xml.html	Interpreted output file	2014/10/28 09:33:01	335,479
4	gnd.xml.txt		2014/10/28 09:32:56	3,005,026
5	gnd.covar.xml	Output covariance file	2014/10/28 09:32:56	28,239
6	gnd.noLineNumbers		2014/10/28 09:33:00	2,085,820
7	gnd.orig.noLineNumbers		2014/10/28 09:33:00	2,085,820
8	gnd.orig.noLineNumbers.cleanAndFixed		2014/10/28 09:33:00	2,085,820
9	gnd_cmd.log	Log file	2014/10/28 09:33:01	103
10	gnd_cmd.ttout	Terminal output	2014/10/28 09:33:01	38,417

GND contacts: mattoon1@llnl.gov and beck6@llnl.gov

Display GND output via html



Display gnd.coval.xml via web browser



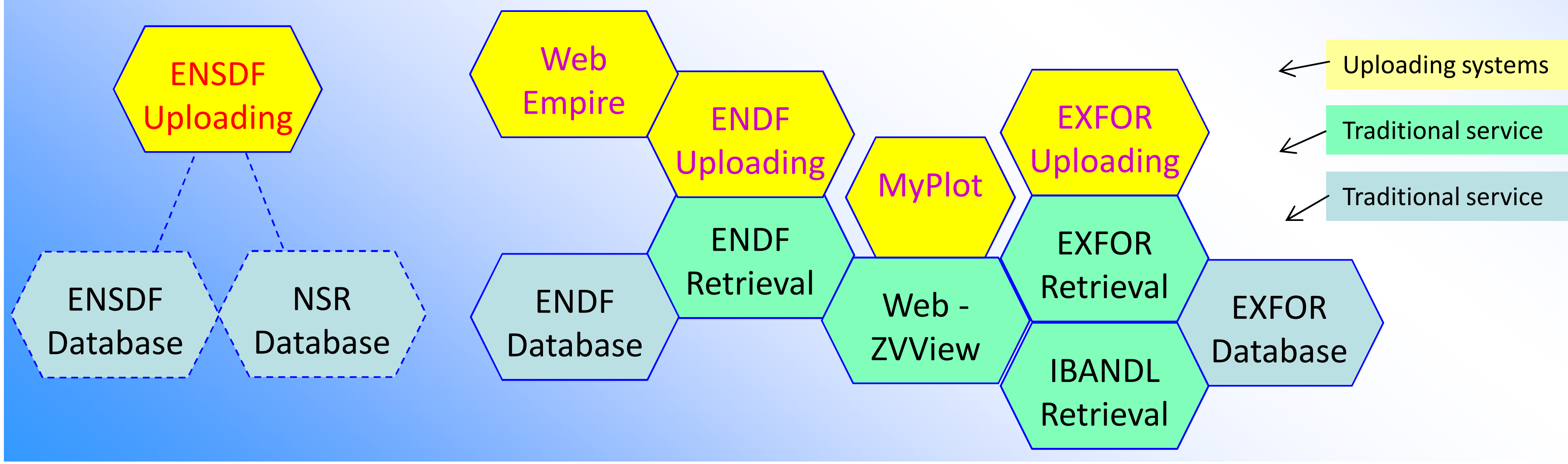
This XML file does not appear to have any style information associated with it. The document tree is shown below.


```
- <covarianceSuite projectile="n" target="Al27" format="gnd version 1.0">
  - <styles>
      <style name="evaluated" version="7.1.1" library="ENDF/B"/>
    </styles>
  - <section label="0" id="total" nativeData="sum">
      <rowData xlink:type="simple" xlink:href="/reactionSuite/summedReaction[@label='128']/crossSection" ENDF_MFMT="33,1"/>
    - <sum lowerBound="1e-5 eV" upperBound="2e7 eV">
      - <!--
          The matrix for this reaction equals the weighted sum of the following matrices:
        -->
        <summand xlink:type="simple" xlink:href="/covarianceSuite/section[@label='1']" coefficient="1.0" ENDF_MFMT="33,2"/>
        <summand xlink:type="simple" xlink:href="/covarianceSuite/section[@label='2']" coefficient="1.0" ENDF_MFMT="33,4"/>
        <summand xlink:type="simple" xlink:href="/covarianceSuite/section[@label='3']" coefficient="1.0" ENDF_MFMT="33,16"/>
        <summand xlink:type="simple" xlink:href="/covarianceSuite/section[@label='4']" coefficient="1.0" ENDF_MFMT="33,102"/>
      </sum>
    </section>
  - <section label="1" id="n + Al27" nativeData="mixed">
      <rowData xlink:type="simple" xlink:href="/reactionSuite/reaction[@label='0']/crossSection" ENDF_MFMT="33,2"/>
    - <mixed>
      - <covarianceMatrix index="0" type="relative">
        - <axes>
          - <axis index="0" label="row_energy_bounds" unit="eV" interpolation="linear,flat" length="10">
              1e-5 0.5 1e3 6.5e4 1.1e5 1.9e5 3.5e5 5.16e5 6.35e5 8.3e5
            </axis>
            <axis index="1" label="column_energy_bounds" unit="eV" interpolation="linear,flat" mirror_row_energy_bounds="true"/>
            <axis index="2" label="matrix_elements" unit=""/>
          </axes>
        - <matrix rows="9" columns="9" form="symmetric" precision="6">
            3.128599e-04 6.257197e-04 1.251439e-03 0.000000e+00 0.000000e+00 2.250000e-02 0.000000e+00 0.000000e+00 7.425000e-03
            9.801000e-03 0.000000e+00 0.000000e+00 2.803481e-03 1.850298e-03 1.397246e-03 0.000000e+00 0.000000e+00 5.850000e-03
            3.861000e-03 1.457810e-03 6.084000e-03 0.000000e+00 0.000000e+00 4.146520e-03 2.736703e-03 1.033306e-03 2.156190e-03
            3.056645e-03 0.000000e+00 0.000000e+00 4.278047e-03 2.823511e-03 1.066082e-03 2.224584e-03 1.576800e-03 3.253632e-03
            0.000000e+00 0.000000e+00 6.375000e-03 4.207500e-03 1.588639e-03 3.315000e-03 2.349695e-03 2.424226e-03 7.225000e-03
          </matrix>
        </covarianceMatrix>
      - <covarianceMatrix index="1" type="relative">
        - <axes>
```

6. Running GRUCON via web

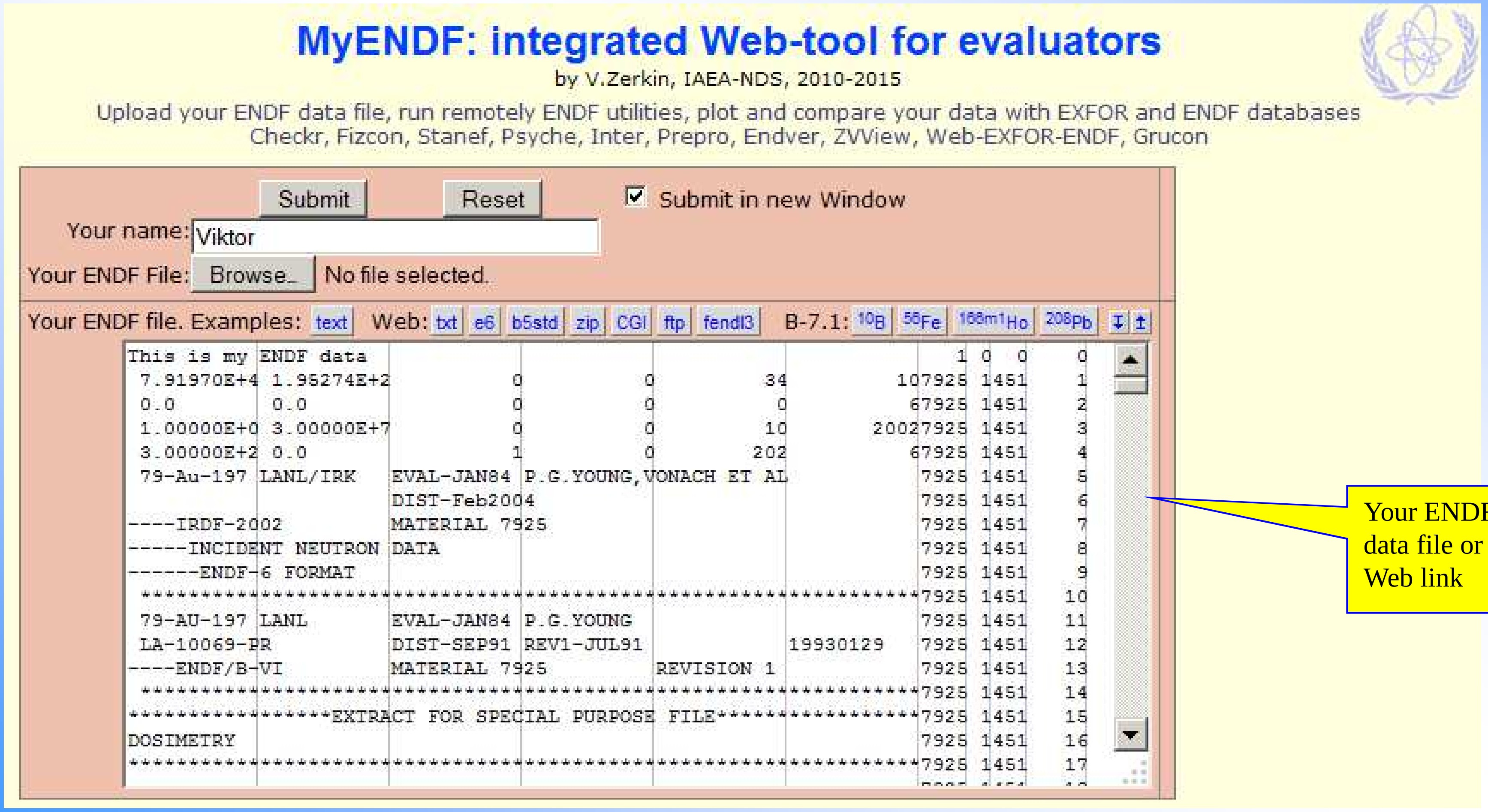
NDS Web server applications

MyPlot	Plotting with Web-ZVView (2009)
MyEXFOR	Uploading System (2010-2014) Zchex, Zorder, Xtract, X4toc4; Web-EXFOR
MyENDF	Uploading System (2010-2015) Checkr, Fizcon, Stanef, Psyche, Inter, Prepro-2015, Endver, Web-EXFOR-ENDF, Fudge, GRUCON* added to Web in 2014
EMPIRE-3.1	Web Interface to Empire /test-version/ (2013)
MyENSDF	Uploading System (2011-2015) Fmtchk, Gtol, Logft, Pandora, Ndspub, Radlst , BrICC, chk_ENSDF, Prepro



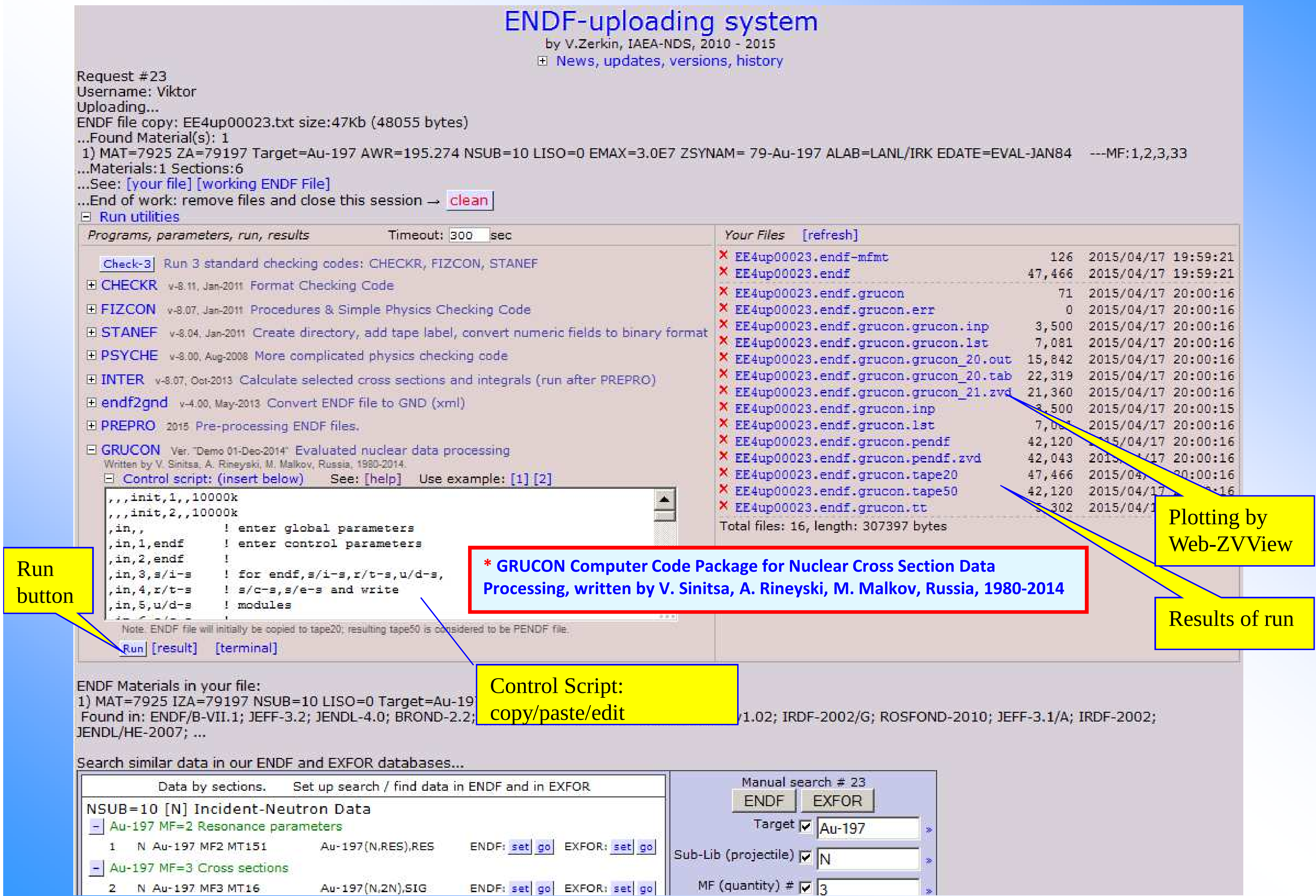
Login to MyEndf and input ENDF file

Login



Your ENDF data file or Web link

Run GRUCON* under MyEndf on Web



7. Text search in EXFOR

Background.

EXFOR database and retrieval system was initially oriented to search by EXFOR Codes (mainly to find numerical data of required types for needed reactions). Sometimes search in "Free text" was also needed but mainly for compilers - they could do it on full EXFOR Master file using text editors, text viewers and other utilities (e.g. grep in Unix); this was not possible for most of users. From another hand, there is a "standard" feature of almost any modern Web page: "text search"; text search is implemented in NSR and Boris Pritychenko (NNDC) several time expressed opinion that it would be good to have this in EXFOR. There is also additional factor – competition from Web search engines: powerful text search by google sometimes very successfully finds references (many times stressed by Stanislav Simakov, NDS).

Concept and implementation

Considered of using three conceptual options:

a) *using grep (to build Web interface)*
b) *using google search ("feeding" google-engine by EXFOR Entries, and call google search limited by our web-site)*
c) *using EXFOR database and self-made software.*

For the moment I decided to use option (c). This choice can be discussed if there are other proposals…

Now the search is based on the matching of text-pattern in EXFOR interpreted text, namely: in descriptive part of original EXFOR text (codes and free text in BIB, COMMON and DATA section, but not numbers) extended by explanation of EXFOR codes and additional information from other databases. Several patterns in different combinations can be used for search with wild cards, with and without fixed order of patterns in EXFOR text. Search can be limited by specific sections of the text (Keywords).

Text search in EXFOR. Concept.

Initial goal.

Search in Free text of EXFOR Master file for Web users

Extended text

Search in Interpreted EXFOR (X4+), i.e. in the text including:

- text of EXFOR original EXFOR (free text and codes)
- text from EXFOR Dictionaries interpreting Codes
- titles, authors, KeyNo, DOI imported from NSR and other databases
- “human” interpretation of EXFOR - additional text patterns for search, e.g. “neutron induced”, “gamma ray”, “elastic scattering”

Note

Numerical information from COMMON and DATA sections is excluded

Text search in EXFOR. Implementation

Several patterns can be used for search in different combinations using wildcards and logical operations. Search can be limited by specifying sections (using ":") of EXFOR text defined by EXFOR structure (Keywords). Reserved symbols are: [*], [&] and [:].

See details: WP2015-33 https://www-nds.iaea.org/nrdc/nrdc_2015/working/wp2015-33.pdf

Search: target:fe-56&neutron induced&reaction: Elastic sc Go »

Sort by: Year Author Entry

View: extended Page: 20 Entries

Text search help is [here].

[Hide] options. [Reset] form.

Request #1333

Text search target:fe-56&neutron induced&reaction: Elastic scattering

Found EXFOR Entries: 71 List: [full] [compact]

Page: 1.

1) 2011, I.C.Sagrado Garcia+, Jour: Physical Review, Part C, Nuclear Physics, Vol.84, p.044619 (2011). EXFOR:23059

Target: Fe-56 , Pb-208

Projectile: N Neutron induced

Reaction: process: [EL] Elastic scattering

Subent:11 Pnt:296 Ene=96MeV An=15-98° Target:Fe-56;Pb-208 Reaction:(n,el);(n,x)

1) [pdf]+ Jour: Physical Review, Part C, Nuclear Physics, Vol.84, p.044619 (2011) DOI: 10.1103/PhysRevC.84.044619 NSR: 2011SA47

Neutron production in neutron-induced reactions at 96 MeV on ^{56}Fe and ^{208}Pb

I.C.Sagrado Garcia, J.F.Lecolley, F.R.Lecolley, V.Blideanu, G.Ban, J.M.Fontbonne, G.Itis, J.L.Lecouey, T.Lefort, N.Marie, J.C.Steckmeyer, C.Le Brun, J.Blomgren, C.Johansson, J.Klug, A.Orhn, P.Mermod, N.Olsson, S.Pomp, M.Osterlund, U.Tippawan, A.V.Prokofiev, P.Nadel-Turonski, M.Fallot, Y.Foucher, A.Guertin, F.Haddad, M.Vatre

2) [pdf]+ Conf: Conf.on Nucl.Data for Sci. and Technology, Nice 2007, Vol.2, p.1035 (2007) DOI: 10.1051/ndata:07433 NSR: 2008SAZM

(n,xn) measurements at 96 MeV

I.C.Sagrado Garcia, G.Ban, V.Blideanu, J.M.Fontbonne, G.Iltis, F.R.Lecolley, J.F.Lecolley, J.L.Lecouey, T.Lefort, N.Marie, J.C.Steckmeyer, C.Le Brun, J.Blomgren, C.Johansson, J.Klug, A.Ohrn, P.Mermod, N.Olsson, S.Pomp, M.Osterlund, U.Tippawan, A.V.Prokofiev, P.Nadel-Turonski, M.Fallot, Y.Foucher, A.Guertin, F.Haddad, M.Vatre

Select and retrieve EXFOR Entries

19) ☑ 1983, R.L.Macklin, Jour: Nuclear Science and Engineering, Vol.83, p.309 (1983). EXFOR:13110

Target: Fe-56
Projectile: N Neutron induced
Reaction: process: [EL] Elastic scattering

Subent:2 Pnt:0 Ene=-1eV Target:Fe-56 Reaction:(n,g);(n,el);(n,tot)

1) [pdf]+ Jour: Nuclear Science and Engineering, Vol.83, p.309 (1983) NSR: 1983MA13
Neutron Capture in the 1.15-keV Resonance of Iron
R.L.Macklin

20) ☑ 1983, S.Mellema+, Jour: Physical Review, Part C, Nuclear Physics, Vol.28, p.2267 (1983). EXFOR:12862

Target: Fe-54 , Fe-56
Projectile: N Neutron induced
Reaction: process: [EL] Elastic scattering

Subent:3 Pnt:257 Ene=11-26MeV An=10-162° Target:Fe-54;Fe-56 Reaction:(n,el)

1) [pdf]+ Jour: Physical Review, Part C, Nuclear Physics, Vol.28, p.2267 (1983) DOI: 10.1103/PhysRevC.28.2267 NSR: 1983ME21
Microscopic and Conventional Optical Model Analysis of Fast Neutron Scattering from ^{54,56}Fe
S.Mellema, R.W.Finlay, F.S.Dietrich, F.Petrovich

Select Entries on the Page: [all] [none]
Go to EXFOR [Request] with selected Entries (2): 13110; 12862

...Pages: 1 2 3 4

Select Entries

Request selected Entries

Link to X4+

EXFOR data: http://nds121.iaea.org/EXFOR/12862
Data retrieved from the EXFOR database version of April 16, 2015.

Search by
Entry: 12862
Authors:
S. Mellema
R.W. Finlay
F.S. Dietrich
F. Petrovich

```
ENTRY        12862001    20041213               20050926      0000
SUBENT       12862001    20041213               20050926      0000
BIB                14          39
INSTITUTE    (1USAOHO,1USALRL,1USAFSU)
             #(1USAOHO Ohio University, Athens, OH, United States of America
             #,1USALRL Lawrence Livermore National Laboratory, Livermore, CA, United States of America
             #,1USAFSU) Florida State University, Tallahassee, FL, United States of America
REFERENCE    (J,PR/C,28,2267,198312)
             #(J,PR/C,28,2267,198312) Jour: Physical Review, Part C, Nuclear Physics, Vol.28, p.2267 (1983), USA
             #+     #URL=http://dx.doi.org/10.1103/PhysRevC.28.2267
             #+     #NSR=1983ME21 #DOI=10.1103/PhysRevC.28.2267
             #+     #Title=Microscopic and Conventional Optical Model Analysis of Fast Neutron Scattering from 54,56Fe
             #+     #Authors=S.Mellema, R.W.Finlay, F.S.Dietrich, F.Petrovich
AUTHOR       (S.Mellema,R.W.Finlay,F.S.Dietrich,F.Petrovich)
TITLE        Microscopic and conventional optical model analysis
             of fast neutron scattering from 54,56Fe
FACILITY     (VDGT,1USAOHO)  Tandem Van de Graaff.
             #(VDGT Tandem van de Graaff
             #,1USAOHO) Ohio University, Athens, OH, United States of America
```

Statistics of usage (Google Analytics)

Month Year	Text search	-> Download EXFOR
December 2014	51) 34/9	64) 5/1
January 2015	47) 51/21	55) 25/7
February 2015	50) 44/11	56) 31/2
March 2015	41) 116/31	52) 48/19
April 2015	57) 22/7	65) 4/2

Google Analytics **Custom Report** Jan 1, 2015 - Mar 31, 2015

	Custom Variable (Value 03)	Custom Variable (Value 04)	Pageviews	Users	Avg. Time on Page	Pages / Session	Avg. Session Duration
37.	EXFOR	download:x4pdf	**487**(0.16%)	44(0.11%)	00:02:43	48.70	00:16:42
38.	ENDF	download:Run-Inter	**465**(0.15%)	202(0.52%)	00:01:59	93.00	00:00:03
39.	IBANDL	download:View-R33	**438**(0.14%)	146(0.38%)	00:00:59	219.00	00:00:28
40.	IBANDL	download:Save-R33	**270**(0.09%)	80(0.21%)	00:01:55	54.00	00:12:06
41.	EXFOR	Text-Search	**241**(0.08%)	63(0.16%)	00:02:06	48.20	00:22:38
42.	EXFOR	goto:X4Construct-Covar	**239**(0.08%)	144(0.37%)	00:00:29	0.00	00:00:00
43.	ENDF	Search(ENDF_Explorer)	**234**(0.07%)	37(0.10%)	00:01:02	19.50	00:29:47
44.	ENDF	download:ENDF6-PEN	**222**(0.07%)	117(0.30%)	00:02:01	0.00	00:00:00
45.	EXFOR	download:X4Out.txt	**222**(0.07%)	127(0.33%)	00:01:51	0.00	00:00:00
46.	IBANDL	download:SaveRemoteSC33	**214**(0.07%)	37(0.10%)	00:01:01	0.00	00:00:00
47.	EXFOR	Search(from_IBANDL)	**209**(0.07%)	85(0.22%)	00:01:00	104.50	00:00:15
48.	ENDF	download:Mat2gnd	**170**(0.05%)	107(0.28%)	00:01:29	0.00	00:00:00
49.	EXFOR	Search(from_CINDA)(byLink)	**158**(0.05%)	29(0.07%)	00:01:27	0.00	00:00:00
50.	EXFOR	goto:NSR-Keyno	**149**(0.05%)	83(0.21%)	00:01:49	74.50	00:27:03
51.	EXFOR	download:XML+XSLT	**131**(0.04%)	61(0.16%)	00:01:34	0.00	00:00:00
52.	ZVView	C4Plot	**127**(0.04%)	34(0.09%)	00:01:14	0.00	00:00:00
53.	EXFOR	download:X4+(fromTextSearch)	**122**(0.04%)	27(0.07%)	00:04:03	0.00	00:00:00
54.	IBANDL	Search-Ref	**122**(0.04%)	24(0.06%)	00:01:28	61.00	00:00:01

8. Inverse reactions in EXFOR (A73)

A73. Zerkin, Simakov Assess possibility to provide cross sections derived from the measured cross sections by the detailed-balance relation, and to add the functionality to the NDS web system.

View: extended → “Invert data” → Advanced plot via C5

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(4A) | Data re-normalization (for advanced users, results in: C4, TAB and Plots)

	n	Display	Year	Author-1	Energy range, eV		Points	Reference	Subentry#P	NSR-Key
	1)	6-C-13(A,N)8-O-16,,SIG C4: MF3 MT4 — Doing advanced plot via C5: invert data to reaction 8-O-16(N,A)6-C-13,,SIG (PAR,SIG:LVL=0)								
		Quantity: [CS] Cross section								
*	1	+ Info X4+ X4± T4 Cov	2005	S.Harissopulos+	7.67e5	7.96e6	679	[pdf]+ J,PR/C,72,062801,2005	F0786004 [2]	2005HA69
	2	+ Info X4+ X4± T4 Cov	1993	H.W.Drotleff+	2.79e5	1.06e6	55	[pdf]+ J,AJ,414,735,1993	A0613003 [6]	1993DR08
	3	+ Info X4+ X4± T4 Cov	1989	S.E.Kellogg+	4.50e5	1.04e6	13	[pdf]+ J,BAP,34,1192(E10.5),198904	C0517002 [4]	
*	4	+ Info X4+ X4± T4 Cov	1973	J.K.Bair+	9.97e5	5.40e6	855	[pdf]+ J,PR/C,7,1356,1973	C0489002 [3]	1973BA10
g*	5	+ Info X4+ X4± T4 Cov	1967	K.K.Sekheran+	1.94e6	5.53e6	290	[pdf]+ J,PR,156,(4),1187,1967	D6089002 [1]	1967SE07
	2)	6-C-13(A,N)8-O-16,,SIG,,,EXP C4: MF3 MT4 — Doing advanced plot via C5: invert data to reaction 8-O-16(N,A)6-C-13,,SIG (PAR,SIG:LVL=0)								
		Quantity: [CS] Cross section								
	6	+ Info X4+ X4± T4 Cov	1968	C.N.Davids	4.75e5	7.00e5	10	[pdf]+ J,NP/A,110,619,196803	F0304004 [4]	1968DA05
	3)	8-O-16(N,A)6-C-13,,SIG C4: MF3 MT107 — Doing advanced plot via C5: invert data to reaction 6-C-13(A,N)8-O-16,,SIG (PAR,SIG:LVL=0)								
		Quantity: [CS] Cross section								
	7	+ Info X4+ X4± T4 Cov	1968	B.Leroux+	1.49e7		1	[pdf]+ J,NP/A,116,(1),196,196807	21461002 [6]	1968LE11
*	8	+ Info X4+ X4± T4 Cov	1968	D.Dandy+	7.14e6	1.20e7	11	+ R,AWRE-O-60/68,,6810	21474003 [5]	
	9	+ Info X4+ X4± T4 Cov	1966	A.S.Divatia+	3.92e6	6.49e6	406	[pdf]+ C,66PARIS,1,233,196610	30092002 [6]	
	10	+ Info X4+ X4± T4 Cov	1963	M.Bormann+	1.48e7		1	[pdf]+ J,ZP,174,1,196302	21343010 [1]	
	11	+ Info X4+ X4± T4 Cov			1.23e7	1.95e7	7		21343012 [1]	
*	12	+ Info X4+ X4± T4 Cov	1955	J.Seitz+	3.65e6	4.22e6	26	[pdf]+ J,HPA,28,227,5503	21072002 [5]	

Inverse reactions in EXFOR (A73)

Output Data

Format	*Data (Size)*
EXFOR Interpreted	X4+ (74Kb) 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 (122Kb) zip (20Kb)
Bibliography	html (9Kb) BibTeX (3Kb)
Computational	
C4	C4(C5) (170Kb) C4.ZIP (21Kb) C5 (175Kb) LST (3Kb) -

The cross sections of inverse reaction follow the principle of detailed balance:

$$\sigma_{B(b,a)A} = \sigma_{A(a,b)B}\,\frac{(2j_a+1)(2j_A+1)}{(2j_b+1)(2j_B+1)}\,\frac{p_a^2}{p_b^2}$$

where:

j : spin of a particle;

p : relative momentum in the center-of-mass system

$$Q = (m_a + m_A) - (m_b + m_B)$$

$$E_b = \left(E_a\frac{m_A}{m_a+m_A} + Q\right) / \left(\frac{m_B}{m_b+m_B}\right)$$

$$\Delta E_b = \Delta E_a\left(\frac{m_A}{m_a+m_A}\right) / \left(\frac{m_B}{m_b+m_B}\right)$$

$$\sigma_{B(b,a)A}(E_b) = \frac{(2j_a+1)(2j_A+1)}{(2j_b+1)(2j_B+1)}\,\frac{m_a m_A{}^2}{(m_a+m_A)^2}\,\frac{(m_b+m_B)^2}{m_b m_B{}^2}\,\frac{E_a}{E_b}\cdot\sigma_{A(a,b)B}(E_a)$$

$$\Delta\sigma_{B(b,a)A} = \sigma_{B(b,a)A}\left(\frac{\Delta\sigma_{A(a,b)B}}{\sigma_{A(a,b)B}}\right)$$

Advanced Plotting: LST (1Kb)

Select experimental data for plotting...

Go to		*Quantity type*	*#Plots*
σ (E)	SIG	Cross section data	1

Go to plot evaluated data...

ENDF Retrieve evaluated data and plot...

Advanced plot via C5

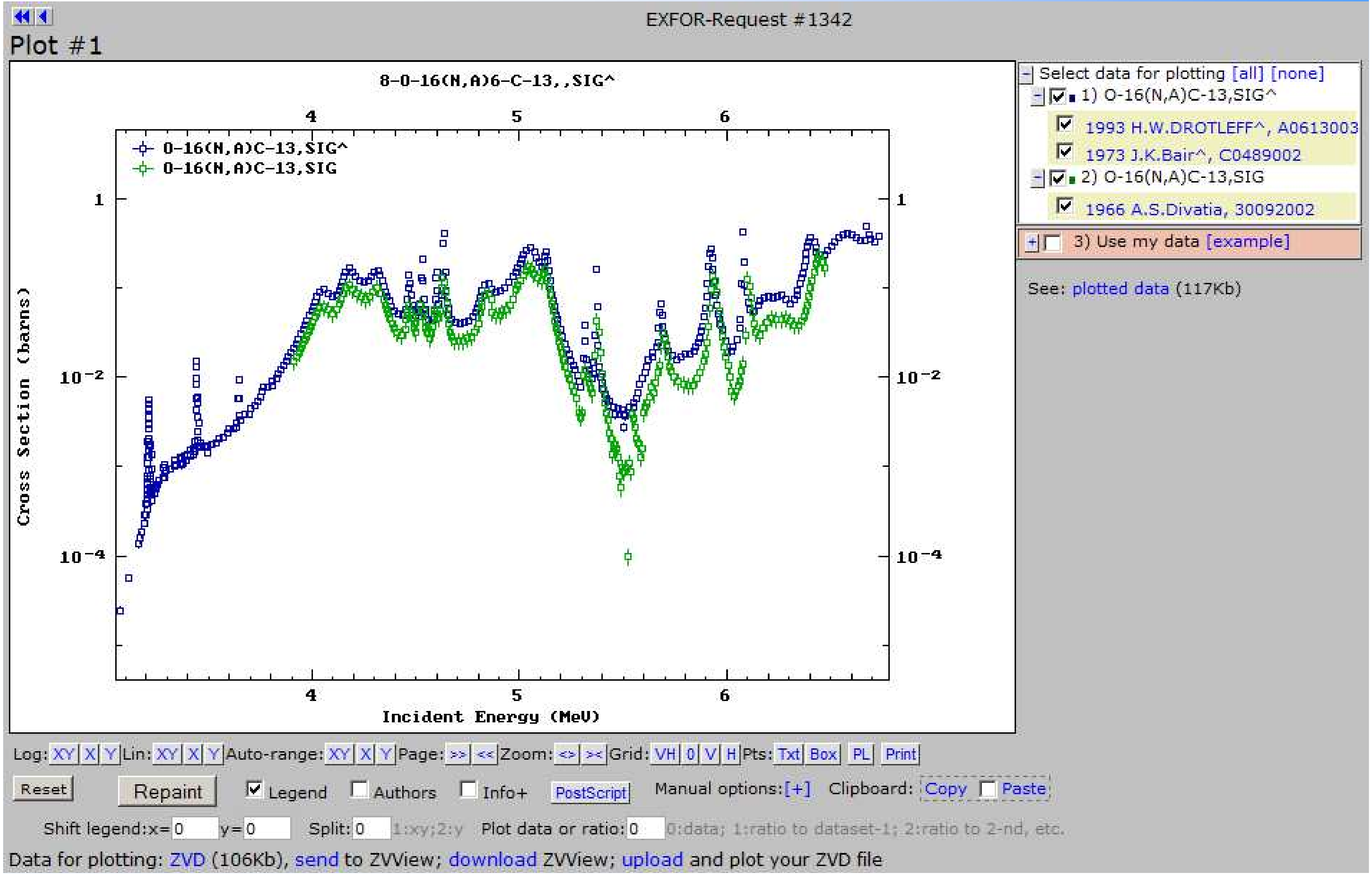
Limitations

```
Convert EXFOR to C5 computational format
Program x4toc5 (version 2015-04-14)
V.Zerkin, IAEA, Vienna, 2010-2015
Running: 2015/04/17:17:03:48 on nds121.iaea.org
        -i: # inverse selected reactions
        -cm2lab  # Try to convert all C.M. to Lab.

==============================================================================
Translation Log
==============================================================================
DATASET   MF  MT   REFERENCE                  REACTION
==============================================================================
30092002  3   107  A.S.Divatia,ET.AL.    (66) 8-O-16(N,A)6-C-13,,SIG
A0613003  3   4    H.W.DROTLEFF,ET.AL.   (93) 6-C-13(A,N)8-O-16,,SIG
        CONVERT INC-ENERGY: C.M. TO LAB K=1.3078132
        DATA CONVERTED TO INVERSE REACTION MFMT=3:107 8-O-16(N,A)6-C-13,,SIG
                E1=(E0*0.76463526 + 2.2153838)/0.94067925 MeV
                SIG1=SIG0*E0/E1*8.457255
            Product:8-O-16        : Level1(MeV)=6.049
                Q(MeV)=2.2153838      Level1-Q=3.833616
                E0_threshold for Level1 (MeV)=5.0136533
                         E1(E0_threshold),MeV=6.4304595
            Product:6-C-13        : Level1(MeV)=3.089
                Q(MeV)=-2.2153838     Level1-Q=5.3043838
                E1_threshold for Level1 (MeV)=5.638887
            Reaction inversion is correct up to E1=5.638887
C0489002  3   4    J.K.Bair,ET.AL.       (73) 6-C-13(A,N)8-O-16,,SIG
        DATA CONVERTED TO INVERSE REACTION MFMT=3:107 8-O-16(N,A)6-C-13,,SIG
                E1=(E0*0.76463526 + 2.2153838)/0.94067925 MeV
                SIG1=SIG0*E0/E1*8.457255
            Product:8-O-16        : Level1(MeV)=6.049
                Q(MeV)=2.2153838      Level1-Q=3.833616
                E0_threshold for Level1 (MeV)=5.0136533
                         E1(E0_threshold),MeV=6.4304595
            Product:6-C-13        : Level1(MeV)=3.089
                Q(MeV)=-2.2153838     Level1-Q=5.3043838
                E1_threshold for Level1 (MeV)=5.638887
            Reaction inversion is correct up to E1=5.638887
==============================================================================
Translation Summary
==============================================================================
ENTRY                   3
SUBENT                  3
DATASETS                3
TRANSLATED DATASETS     3
TRANSLATED DATA POINTS  1316
==============================================================================
```

Inverse reactions in EXFOR (A73)

^ flag : inverted (for reactions and authors)

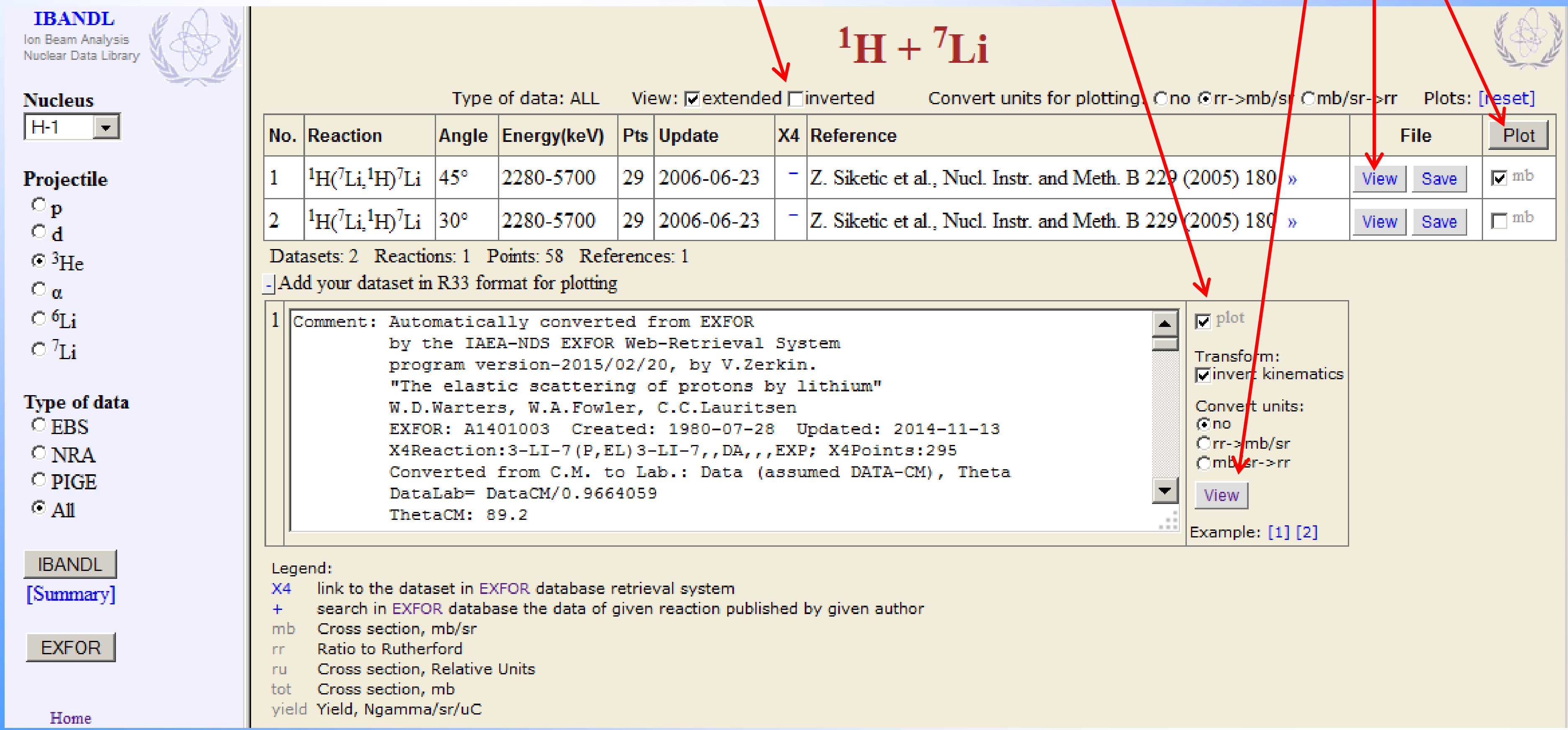


8.2 Inverse kinematics in IBANDL Web interface

/This work done on request and with participation of P. Dimitriou for the IAEA-CRP PIGE/

Flag to transform data to invert kinematics

when presenting data



IBANDL contains angular distributions *dσ/dΩ(θ,E)* for incident charged particle reactions

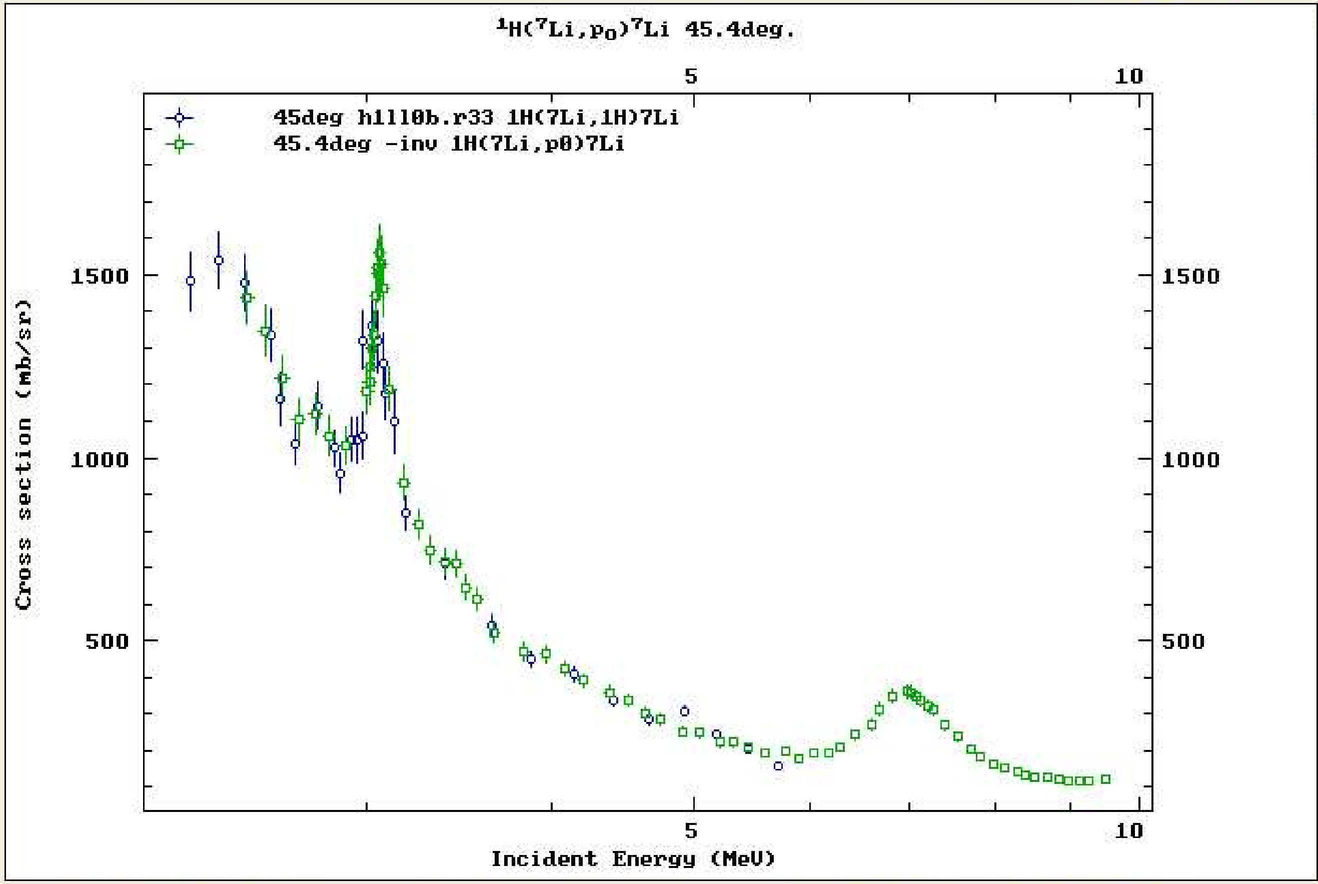
Inverse kinematics in IBANDL Web interface

Welcome to Web-ZVView!

Interactive plotting of IBANDL and SigmaCalc data

1) θ=45° E_1=2.3-5.7MeV Source: Z. Siketic et al., Nucl. Instr. and Meth. B 229 (2005) 180 +

2) θ=45.4° E_1=2.5-9.5MeV Source: W.D.Warters+(1953), Jour. Physical Review, Vol.91, Issue.4, p.917 [inv] Original: ^{7}Li(p,p$_0$)^{7}Li E_1=0.4-1.4MeV φ=45.4° θ=81.1° +



- Select data for plotting [all] [none]
- ☑ 1) 45deg h1ll0b.r33 1H(7Li,1H)7Li
- ☑ 2) 45.4deg -inv 1H(7Li,p0)7Li

+ ☐ 3) Use my data [example]

See: plotted data (6Kb)

Details of calculations

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

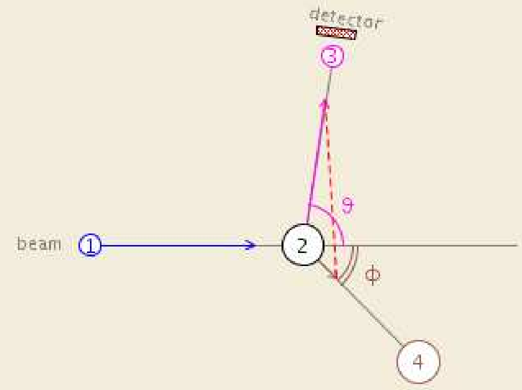
Reset Repaint ☑ Legend ☐ Authors ☐ Info+ PostScript Manual options:[+] Clipboard: Copy ☐ Paste

Shift legend:x= 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 (4Kb), send to ZVView; download ZVView; upload and plot your ZVD file

Inverse kinematics in IBANDL Web interface

Original (direct)



Original (direct)

Reaction: $^{7}Li(p,p_0)^{7}Li$ Qvalue=0 nPoint:71

M1: Incident p M_1=1.007825 E_1=1367.0keV

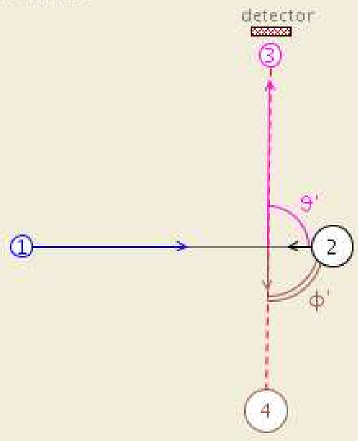
M2: Target 7Li M_2=7.0160046

M3: Scattered p M_3=1.007825 E_3=1070.6keV θ=81.1° σ(θ)=45.1053mb/sr±5.0%

M4: Recoil 7Li M_4=7.0160046 E_4=296.4keV φ=45.4°

C.M.

Center of mass



C.M.

Reaction: $^{7}Li(p,p_0)^{7}Li$ Qvalue=0 nPoint:71

E'_{cm}=1195.3keV

M1: Incident p M_1=1.007825 E_1'=1045.2keV

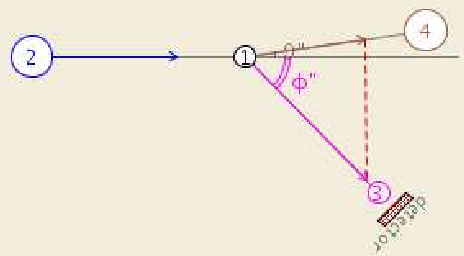
M2: Target 7Li M_2=7.0160046 E_2'=150.1keV

M3: Scattered p M_3=1.007825 E_3'=1045.2keV θ'=89.3° σ'(θ')=43.5874mb/sr±5.0%

M4: Recoil 7Li M_4=7.0160046 E_4'=150.1keV φ'=90.7°

Inverse

Inverse-kinematics



Inverse

Reaction: $^{7}Li(p,p_0)^{7}Li$ Qvalue=0 nPoint:71

M2: Incident 7Li M_2=7.0160046 E_2''=9516.4keV

M1: Target p M_1=1.007825

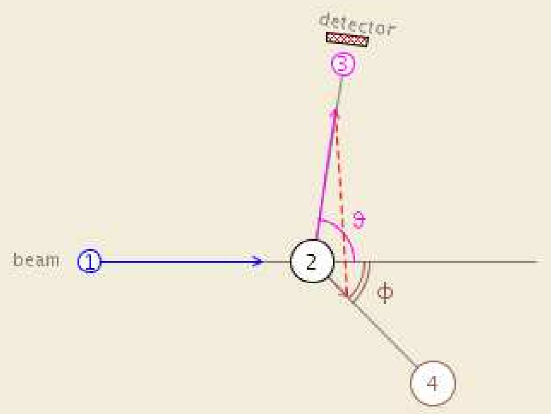
M3: Recoil p M_3=1.007825 E_3''=2063.3keV φ"=45.4° σ"(φ")=122.484mb/sr±5.0%

M4: Scattered 7Li M_4=7.0160046 E_4''=7453.1keV θ"=8.2°

Equivalent to elastic scattering of p on ^{7}Li measurements of recoil nucleus ^{7}Li

Inverse kinematics in IBANDL Web interface

Original (direct)



Original (direct)

Reaction: $^{7}Li(p,p_0)^{7}Li$ Qvalue=0 nPoint:71

M1: Incident p M_1=1.007825 E_1=1367.0keV

M2: Target 7Li M_2=7.0160046

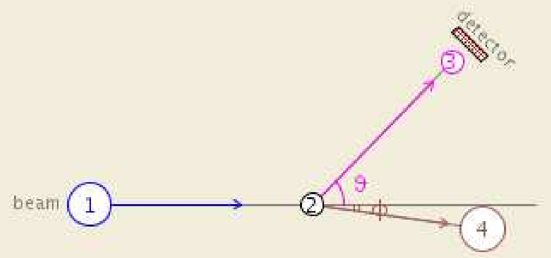
M3: Scattered p M_3=1.007825 E_3=1070.6keV θ=81.1° σ(θ)=45.1053mb/sr±5.0%

M4: Recoil 7Li M_4=7.0160046 E_4=296.4keV φ=45.4°

C.M.

Inverse

Result: inverse-kinematics data presented in R33 format



Result: inverse-kinematics data presented in R33 format

Reaction: $^{1}H(^{7}Li,p_0)^{7}Li$ Qvalue=0 nPoint:71

M1: Incident 7Li M_1=7.0160046 E_1=9516.4keV

M2: Target 1H M_2=1.007825

M3: Ejectile p M_3=1.007825 E_3=2061.1keV θ=45.4° σ(θ)=122.484mb/sr±5.0%

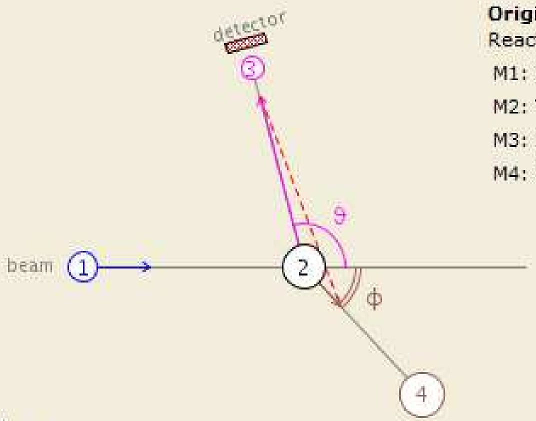
M4: Residual 7Li M_4=7.0160046 E_4=7455.3keV φ=8.2°

Calculations

	Original (lab.): $^{7}Li(p,p_0)^{7}Li$ Q=0							Center of mass								Inverse kinametics						
#	E_1, keV	θ°	σ(θ), mb/sr	φ	σ(φ)	E_3	E_4	E'_{cm}	θ'	φ'	σ'(θ')	E'_1	E'_2	E'_3	E'_4	E_2''	φ''	σ''(φ'')	θ''	σ''(θ'')	E_3''	E_4''
1	358.6	81.1	529.741	45.4	4.35366e6	280.851	77.7494	313.558	89.3	90.7	511.914	274.174	39.3842	274.174	39.3842	2496.4	45.4	1438.52	8.2	164261.	541.3	1955.2
2	368.3	81.1	497.427	45.4	4.08809e6	288.447	79.8525	322.04	89.3	90.7	480.687	281.591	40.4495	281.591	40.4495	2563.9	45.4	1350.77	8.2	154241.	555.9	2008
3	378.5	81.1	450.076	45.4	3.69894e6	296.436	82.064	330.959	89.3	90.7	434.93	289.389	41.5698	289.389	41.5698	2634.9	45.4	1222.18	8.2	139559.	571.3	2063.6
4	388.2	81.1	407.779	45.4	3.35132e6	304.033	84.1671	339.441	89.3	90.7	394.056	296.805	42.6351	296.805	42.6351	2702.5	45.4	1107.33	8.2	126444.	585.9	2116.5
5	398.4	81.1	413.26	45.4	3.39637e6	312.021	86.3786	348.359	89.3	90.7	399.353	304.604	43.7553	304.604	43.7553	2773.5	45.4	1122.21	8.2	128143.	601.3	2172.1
6	407.1	81.1	391.875	45.4	3.22062e6	318.835	88.2649	355.967	89.3	90.7	378.687	311.256	44.7108	311.256	44.7108	2834	45.4	1064.14	8.2	121512.	614.5	2219.6
7	417.8	81.1	382.085	45.4	3.14016e6	327.215	90.5848	365.323	89.3	90.7	369.227	319.437	45.886	319.437	45.886	2908.5	45.4	1037.55	8.2	118476.	630.6	2277.9
8	432.2	81.1	435.468	45.4	3.57888e6	338.493	93.7069	377.914	89.3	90.7	420.813	330.446	47.4675	330.446	47.4675	3008.8	45.4	1182.52	8.2	135029.	652.3	2356.4
9	433.7	81.1	445.21	45.4	3.65895e6	339.668	94.0321	379.226	89.3	90.7	430.227	331.593	47.6322	331.593	47.6322	3019.2	45.4	1208.97	8.2	138050.	654.6	2364.6
10	434.2	81.1	461.032	45.4	3.78898e6	340.059	94.1405	379.663	89.3	90.7	445.517	331.976	47.6872	331.976	47.6872	3022.7	45.4	1251.94	8.2	142956.	655.4	2367.3
11	435.1	81.1	480.354	45.4	3.94778e6	340.764	94.3357	380.45	89.3	90.7	464.189	332.664	47.786	332.664	47.786	3029	45.4	1304.4	8.2	148948.	656.7	2372.2
12	437	81.1	493.156	45.4	4.05299e6	342.252	94.7476	382.111	89.3	90.7	476.56	334.116	47.9947	334.116	47.9947	3042.2	45.4	1339.17	8.2	152917.	659.6	2382.6

1) θ=63.1° E_1=0.4-2.9MeV Source: A.J.Elwyn+(1977), Jour. Physical Review, Part C, Nuclear Physics, Vol.16, p.1744 [inv] Original: $^{6}Li(d,p_1)^{7}Li$ E_1=0.1-1MeV φ=61.3°-46.3° θ=105°

Original (direct)



Original (direct)

Reaction: $^{6}Li(d,p_1)^{7}Li$ Qvalue=4547.4keV nPoint:11

M1: Incident d M_1=2.0141017 E_1=975.0keV

M2: Target 6Li M_2=6.015123

M3: Ejectile p M_3=1.007825 E_3=4394.0keV θ=105.0° σ(θ)=2.65000

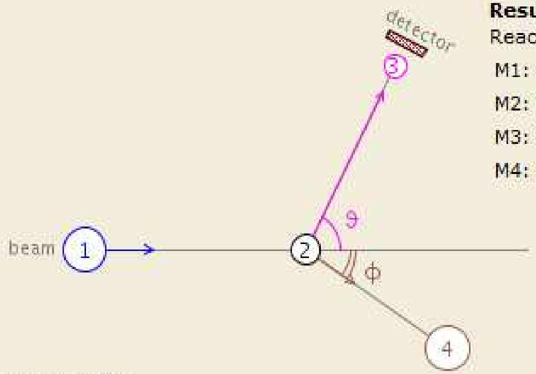
M4: Residual 7Li M_4=7.0160046 E_4=1128.4keV φ=46.3°

$^{6}Li(d,p_1)^{7}Li$

C.M.

Inverse

Result: inverse-kinematics data presented in R33 format



Result: inverse-kinematics data presented in R33 format

Reaction: $^{2}H(^{6}Li,p_1)^{7}Li$ Qvalue=4547.4keV nPoint:11

M1: Incident 6Li M_1=6.015123 E_1=2911.8keV

M2: Target 2H M_2=2.0141017

M3: Ejectile p M_3=1.007825 E_3=5446.3keV θ=63.1° σ(θ)=3.46672r

M4: Residual 7Li M_4=7.0160046 E_4=2013.0keV φ=33.8°

```
Comment:     Automatically converted from EXFOR
             by IAEA-NDS EXFOR Web-Retrieval System (v-2008/11/03)
             "Absolute cross sections for deuteron-induced reactions
              on 6Li at energies below 1 MeV."
             A.J.Elwyn, R.E.Holland, C.N.Davids, L.Meyer-Schuetzmeister,
             J.E.Monahan, F.P.Mooring, W.Ray Jr
             EXFOR: T0134004    Created: 2000-11-21  Updated: 2001-03-30
             X4Reaction:3-LI-6(D,P)3-LI-7,PAR,DA; X4Points:370
             LevelEnergy: 478.00
             Theta groupping interval=3.0 deg.

        ## Transformed to inverse kinematics: 2015-04-17,19:24:38
        ## Orig.File:        li6dp1$9.r33 (direct kinematics)
        ## Orig.Reaction:    6Li(d,p1)7Li
        ## Orig.Masses_amu: 2.0141017, 6.015123, 1.007825, 7.0160046
        ## Orig.Theta:       105.0
        ## Orig.En:          145.0 .. 975.0
        ## Orig.Phi:         61.3 .. 46.3
        ## Calculated: inverse kinematins
        ## Calc.Reaction:    2H(6Li,p1)7Li
        ## Calc.Theta:       67.8 .. 58.5 (Recoil)
        ## Program-version: 2015/03/17

Version:      R33
X4Number:     T0134004
Source:       A.J.Elwyn+(1977), Jour. Physical Review, Part C, Nuclear I
Reaction:     2H(6Li,p1)7Li
Distribution: Energy
Sigfactors:   1.0, 0.0
Enfactors:    1.0, 0.0, 0.0, 0.0
Units:        mb
Composition:
Masses:       6.0, 2.0, 1.0, 7.0
Zeds:         3.0, 1.0, 1.0, 3.0
Qvalue:       4547.4, 0.00, 0.00, 0.00, 0.00
Theta:        63.1
Data:
     433.043    0.00000   0.0633396    0.00000
     543.544    0.00000   0.0995302    0.00000
     785.451    0.00000    0.351321    0.00000
     794.410    0.00000    0.362960    0.00000
     1093.06    0.00000    0.698637    0.00000
     1102.02    0.00000    0.710805    0.00000
     1702.31    0.00000     1.66925    0.00000
     2009.92    0.00000     2.11322    0.00000
     2308.57    0.00000     2.29090    0.00000
     2613.19    0.00000     2.17612    0.00000
     2911.84    0.00000     3.46672    0.00000
EndData:
```

Calculations

	Original (lab.): $^{6}Li(d,p_1)^{7}Li$ Q=4547.4keV							Center of mass								Inverse kinematics							
#	E_1, keV	θ°	σ(θ), mb/sr	φ	σ(φ)	E_3	E_4	E'_{cm}	θ'	φ'	σ'(θ')	E'_1	E'_2	E'_3	E'_4	E_2"	φ"	σ"(φ")	θ"	σ"(θ")	E_3"	E_4"
1	145	105	0.058	61.3	0.657303	3996.7	695.703	108.627	106.9	73.1	0.0590504	81.3785	27.2488	4071.21	584.816	433	67.8	0.0633396	67	0.0831837	4348.1	632.3
2	182	105	0.09	59.9	0.99946	4011.21	718.192	136.346	107.1	72.9	0.0918301	102.144	34.2019	4095.45	588.297	543.5	67	0.0995302	63.1	0.146473	4415.3	675.6
3	263	105	0.31	57.3	3.32075	4045.45	764.953	197.027	107.5	72.5	0.317601	147.604	49.4236	4148.51	595.919	785.5	65.5	0.351321	56.6	0.656984	4555	777.9
4	266	105	0.32	57.3	3.42385	4046.76	766.637	199.275	107.5	72.5	0.327892	149.287	49.9874	4150.47	596.201	794.4	65.5	0.36296	56.4	0.684576	4560	781.8
5	366	105	0.6	54.8	6.20191	4092.	821.397	274.19	107.9	72.1	0.617389	205.411	68.7796	4215.98	605.611	1093.1	64	0.698637	50.7	1.72735	4723.5	916.9
6	369	105	0.61	54.7	6.29947	4093.39	823.006	276.438	107.9	72.1	0.627752	207.094	69.3434	4217.94	605.893	1102	64	0.710805	50.5	1.77102	4728.3	921.1
7	570	105	1.37	51.1	13.434	4189.66	927.739	427.018	108.6	71.4	1.41956	319.902	107.116	4349.61	624.807	1702.3	61.7	1.66925	43	6.64402	5041.1	1208.6
8	673	105	1.7	49.6	16.3212	4240.65	979.746	504.18	108.8	71.2	1.76676	377.709	126.472	4417.08	634.499	2009.9	60.8	2.11322	40.3	10.3753	5196.4	1360.9
9	773	105	1.81	48.4	17.0642	4290.89	1029.51	579.096	109.1	70.9	1.88606	433.832	145.264	4482.59	643.908	2308.6	59.9	2.2909	38.1	13.5864	5345	1510.9
10	875	105	1.69	47.2	15.6695	4342.73	1079.67	655.509	109.3	70.7	1.76542	491.077	164.432	4549.4	653.506	2613.2	59.2	2.17612	36.2	15.4581	5494.9	1665.7
11	975	105	2.65	46.3	24.2084	4394.01	1128.39	730.425	109.5	70.5	2.77457	547.2	183.224	4614.91	662.916	2911.8	58.5	3.46672	34.7	29.1078	5640.4	1818.9

Directions of further development

/discussion/

1. Experts' EXFOR data corrections
2. Text search in EXFOR /preparing for search of “human” phrases/
3. Access to common EXFOR-NSR PDF database /collaboration with NNDC: J.Totans; Web interface in NSR: B.Pritychenko – Action?/
4. Inverse reactions in EXFOR /dealing with excited states of products/, inverse kinematics in IBANDL Web interface /implementation in EXFOR Web system/
5. GND (XML) output from Web-ENDF
6. Running GRUCON via Web /specialized interface/
7. EXROR statistics by year of main publications

Thank you.