

Using Nuclear Reaction Databases EXFOR and ENDF

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Nuclear Reaction Databases

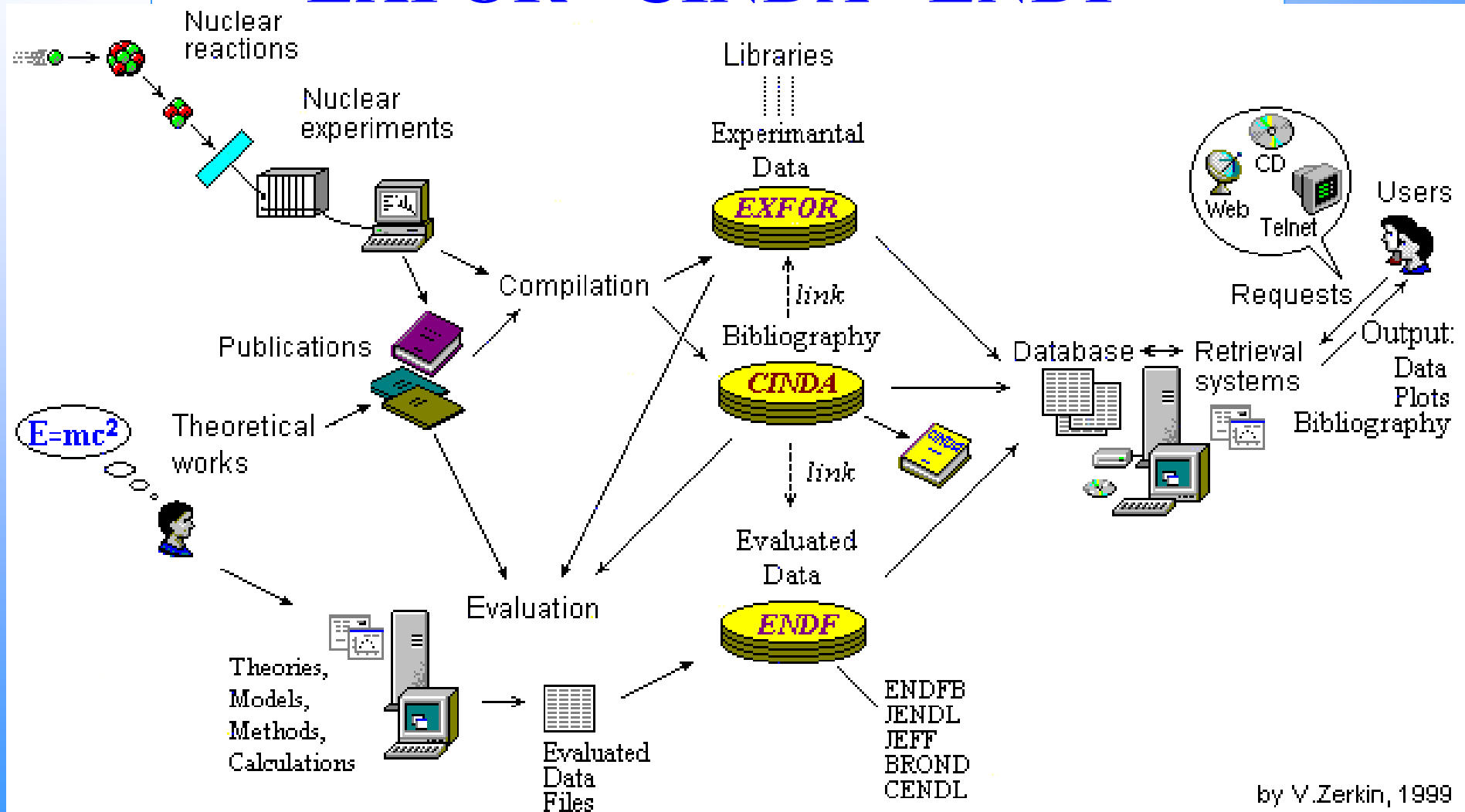
Database	Contents	Size (January-2003)	Size (August-2016)
EXFOR	contains experimental nuclear reaction data for incident neutrons, charged particles and photons	13,500 Entries 97,000 Data sets 400 Mb ASCII-text	21,347 Entries 165,672 Data sets 641 Mb ASCII-text
CINDA	contains bibliographical references 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	567,871 Lines 92,637 Publications 292,065 Blocks 111 Mb ASCII-text
ENDF	is a collection of evaluated data libraries	~300 Mb ASCII (5 basic libraries)	>30 Gb ASCII (50 libraries)

EXFOR data library (EXFOR: EXchange FORmat)

- **1970** : agreed format and established exchange between USA, NEA, IAEA, USSR
- contains data from **~21,000** experiments (**~\$21bn**)
- **NRDC**: 13 nuclear data centres contribute ~500 new Entries every year
- since 2005: global data library with central maintenance in the IAEA (NDS)
- Master File (640Mb), 52 Dictionaries (2.6Mb), 2 Manuals (400 pages)
- Distribution (EXFOR, X4+, C4, C5, XML, Html, plots): Web, CD/DVD ROM
- Databases: MySQL, MS-Access, SyBase
- Software: C, Java (GUI-Applications, Servlets), Fortran
- Connection (import-export) to other databases: ENDF, CINDA, NSR

Nuclear Reaction Databases

EXFOR - CINDA - ENDF



by V.Zerkin, 1999

EXFOR contents (as of 2016-07-01)

#	Code	Quantity	Counts	Percent
1	CS	Cross section data	10906	 51
2	DAP	Partial differential data with respect to angle	4165	 19.5
3	DA	Differential data with respect to angle	4136	 19.3
4	RP	Resonance parameters	1919	 8.98
5	CSP	Partial cross section data	1818	 8.51
6	POL	Polarization data	1104	 5.17
7	FY	Fission product yields	1078	 5.04
8	DAE	Differential data with respect to angle and energy	1019	 4.77
9	MFQ	Fission neutron quantities	482	 2.25
10	SP	Gamma spectra	455	 2.13
11	RI	Resonance integrals	446	 2.08
12	DE	Differential data with respect to energy	373	 1.74
13	TT	Thick target yields	353	 1.65
14	E	Kinetic energies	319	 1.49
15	L	Scattering amplitudes	196	 0.91
16	INT	Cross section integral over incident energy	174	 0.81
17	PY	Product yields	149	 0.69
18	NQ	Nuclear quantities	135	 0.63
19	RR	Reaction rates	93	0.43
20	MLT	Outgoing particle multiplicities	89	0.41
21	TTD	Differential thick target yields	52	0.24
22	CST	Temperature dependent cross section data	30	0.14
23	SQ	Special quantities	16	0.074
24	DEP	Partial differential data with respect to energy	12	0.056
25	TTP	Partial thick target yields	8	0.037
26	COR	Secondary particle correlations	5	0.023

EXFOR contents (cont.)

EXFOR Targets (el.)

#	Target	Counts	Percent
1	U	2507	11.7
2	C	1970	9.22
3	H	1589	7.44
4	Al	1364	6.38
5	Ni	1320	6.18
6	Fe	1279	5.99
7	Pb	1254	5.87
8	Cu	1067	4.99
9	Li	1007	4.71
10	Pu	946	4.43
11	O	936	4.38
12	Be	920	4.3
13	Si	816	3.82
14	Au	809	3.78
15	Th	804	3.76
16	Zr	753	3.52
17	Mg	733	3.43
18	Sn	699	3.27
19	Bi	695	3.25
20	B	682	3.19
21	Zn	681	3.19
22	Ca	660	3.09
23	Mo	641	3
24	Ti	614	2.87
25	Co	604	2.82
26	N	600	2.81
27	Ta	557	2.6
28	Ag	553	2.59

EXFOR Targets

#	Target	Counts	Percent
1	C-12	1387	6.49
2	Al-27	1339	6.27
3	U-235	1270	5.94
4	U-238	1069	5
5	Be-9	873	4.08
6	Au-197	801	3.75
7	H-1	773	3.62
8	Th-232	740	3.46
9	Ni-58	695	3.25
10	Bi-209	692	3.24
11	H-2	682	3.19
12	O-16	672	3.14
13	Pu-239	651	3.04
14	Cu-0	619	2.89
15	Fe-0	602	2.82
16	Co-59	586	2.74
17	Pb-0	585	2.74
18	Pb-208	563	2.63
19	Li-7	559	2.61
20	Li-6	517	2.42
21	Nb-93	514	2.4
22	Fe-56	504	2.36
23	Si-28	465	2.17
24	U-233	436	2.04
25	Ta-181	425	1.99
26	Ni-0	414	1.93
27	N-14	412	1.93
28	Zr-90	405	1.89

EXFOR Incident particles

#	Projectile	Counts	Percent
1	N	10187	47.7
2	P	4247	19.8
3	D	1860	8.71
4	A	1579	7.39
5	G	1283	6.01
6	HE3	677	3.17
7	O	464	2.17
8	C-12	286	1.33
9	O-16	237	1.11
10	T	206	0.96
11	Li-6	196	0.91
12	Li-7	168	0.78
13	He-6	92	0.43
14	Be-9	75	0.35
15	N-14	72	0.33
16	O-18	70	0.32
17	F-19	65	0.3
18	B-11	62	0.29
19	Ne-20	48	0.22
20	Be-7	41	0.19
21	Ar-40	38	0.17
22	C-13	36	0.16
23	Si-28	36	0.16
24	Ca-48	34	0.15
25	He-8	33	0.15
26	Li-8	33	0.15
27	U-238	32	0.14
28	F-17	29	0.13

EXFOR Reactions

#	Reaction	Counts	Percent
1	N,G	2736	12.8
2	N,EL	2138	10
3	N,F	2024	9.48
4	N,TOT	1712	8.01
5	N,INL	1269	5.94
6	P,X	1229	5.75
7	N,O	1225	5.73
8	N,P	1045	4.89
9	N,A	988	4.62
10	N,2N	967	4.52
11	P,EL	953	4.46
12	P,N	736	3.44
13	D,P	634	2.96
14	P,INL	622	2.91
15	N,X	602	2.82
16	P,G	470	2.2
17	G,N	451	2.11
18	A,EL	441	2.06
19	A,N	395	1.85
20	P,A	378	1.77
21	G,X	351	1.64
22	O,F	345	1.61
23	D,X	344	1.61
24	D,N	339	1.58
25	D,EL	318	1.48
26	A,X	316	1.48
27	N,ABS	314	1.47
28	D,A	256	1.19

Formats of nuclear data in EXFOR and ENDF systems.

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

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

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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) . . Corrected
               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
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               96 MM, DENSITY 2.70 GRAM/
               MACROCRISTALLINE ALUMINIUM
               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
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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
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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
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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±

EXFOR data: <http://www-exfor.iaea.org/>
Data retrieved from the EXFOR database

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ENTRY 41323
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# (J,SJA,50,(5),325,1981) #Jour: Soviet Atomic Energy, Vol.50, p.325 (1981), USA
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# (J,SJA,50,(5),325,1981) #Jour: Soviet Atomic Energy, Vol.50, p.325 (1981), USA
AUTHOR (V.E.ZHITAREV, A.M.MOTORIN, S.B.STEPANOV)
TITLE .INTERACTION CROSS SECTIONS OF CERTAIN METALS WITH COLD NEUTRONS
FACILITY (REAC) Reactor
ERR-ANALYS (EN-ERR) Uncertainty in incident projectile energy
HISTORY (19981121C) 1998-11-21
(20050902A) 2005-09-02
ENDBIB 12
COMMON 3
EN-ERR TEMP PER-CENT
PER-CENT DEG-C
3. 22. 3
ENDCOMMON 3
ENDSUBENT 19
SUBENT 41323002
BIB 5
REACTION (13-AL-27(N,TOT),SIG) #Target:AL-27 #Projectile:N #Reaction:N,TOT #Process:TOT:Total #Quantity:,SIG:CS:Cross section
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) Error in value of quantity, defined under ERR-ANALYS
STATUS (TABLE) DATA
HISTORY (19981121T) 1998-11-21
ENDBIB 8
NOCOMMON 0
DATA 3
WVE-LN DATA
ANGSTROM B
13. 1.93 0
14. 2.12 0
15. 2.25 0
16. 2.38 0
17. 2.54 0
18. 2.61 0
19. 2.82 0
20. 3.15 0
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REFERENCE
  (J,AE,50,(5),350,198105) #Jour: Atomnaya Energiya, Vol.50, Issue.5, p.350 (1981), Russia
  MAIN REFERENCE, DATA ARE GIVEN
  (J,SJA,50,325,1981) #Jour: Soviet Atomic Energy, Vol.50, p.325 (1981), USA
  ENGLISH TRANSLATION
AUTHOR
  (V.E.ZHITAREV, A.M.MOTORIN, S.B.STEPANOV)
TITLE
  .INTERACTION CROSS SECTIONS OF CERTAIN METALS WITH COLD NEUTRONS
FACILITY
ERR-ANALYS
HISTORY
COMMON 3x1 #Constant parameters
Legend
  EN-ERR Uncertainty in incident projectile energy PER-CENT per-cent
  TEMP Sample temperature DEG-C degrees Celsius, Centigrade
  TEMP-ERR Error in sample temperature DEG-C degrees Celsius, Centigrade
Data
  EN-ERR TEMP TEMP-ERR
  PER-CENT DEG-C DEG-C
  3.0 22.0 3.0
SUBENT 41323002 last-updated: 2005-09-02
BIB #bibliographic and descriptive information
REACTION
  (13-AL-27(N,TOT),SIG)
  #Target:AL-27 #Projectile:N #Reaction:N,TOT #Process:TOT:Total #Quantity:,SIG:CS:Cross section
SAMPLE
  .ALUMINIUM MONOCRYSTAL, PURITY 99.99 PC, THICKNESS 96 MM, DENSITY 2.70 GRAM/CM3 AND MACROCRISTALLINE ALUMINIUM, PURITY 99.99 PC, THICKNESS 50 MM, DENSITY 2.70 GRAM/CM3
ERR-ANALYS
STATUS
HISTORY
NOCOMMON
DATA 3x8
Legend
  WVE-LN Wave length of incident particle ANGSTROM Angstroms
  DATA Cross section B barns
  DATA-ERR Error in value of quantity, defined under ERR-ANALYS B barns
Data
  WVE-LN DATA DATA-ERR
  ANGSTROM B B
  13.0 1.93 0.13
  14.0 2.12 0.09
  15.0 2.25 0.08
  16.0 2.38 0.07
  17.0 2.54 0.06
```


Nuclear data dissemination

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

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

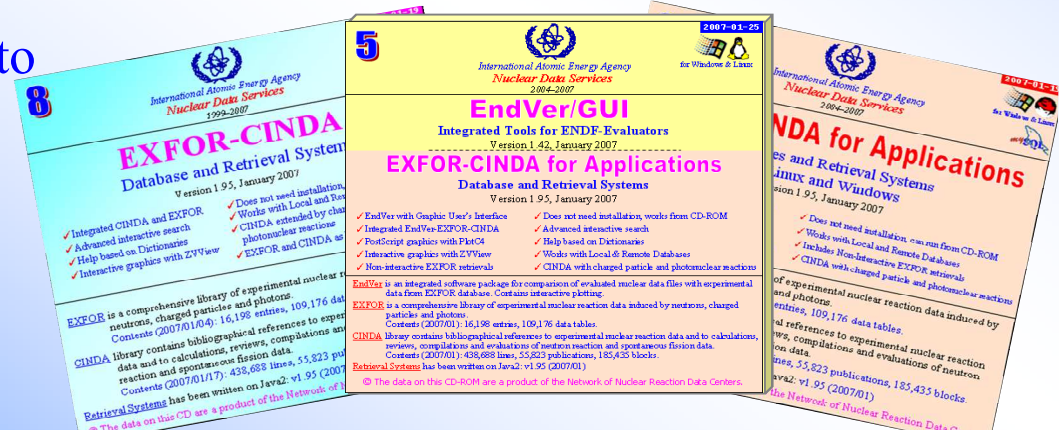
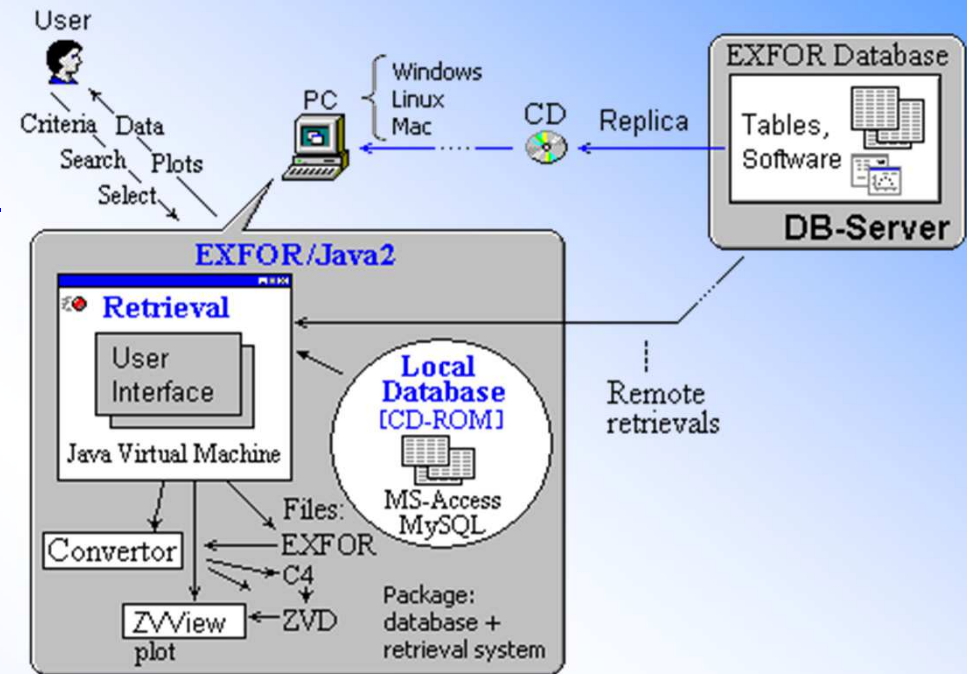
Archives: data for downloading; can be sent by post on CD/DVD to a user upon request.

Basic principals of the IAEA-NDS nuclear data IT systems

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

NDS CD-ROM Database Retrieval Systems

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

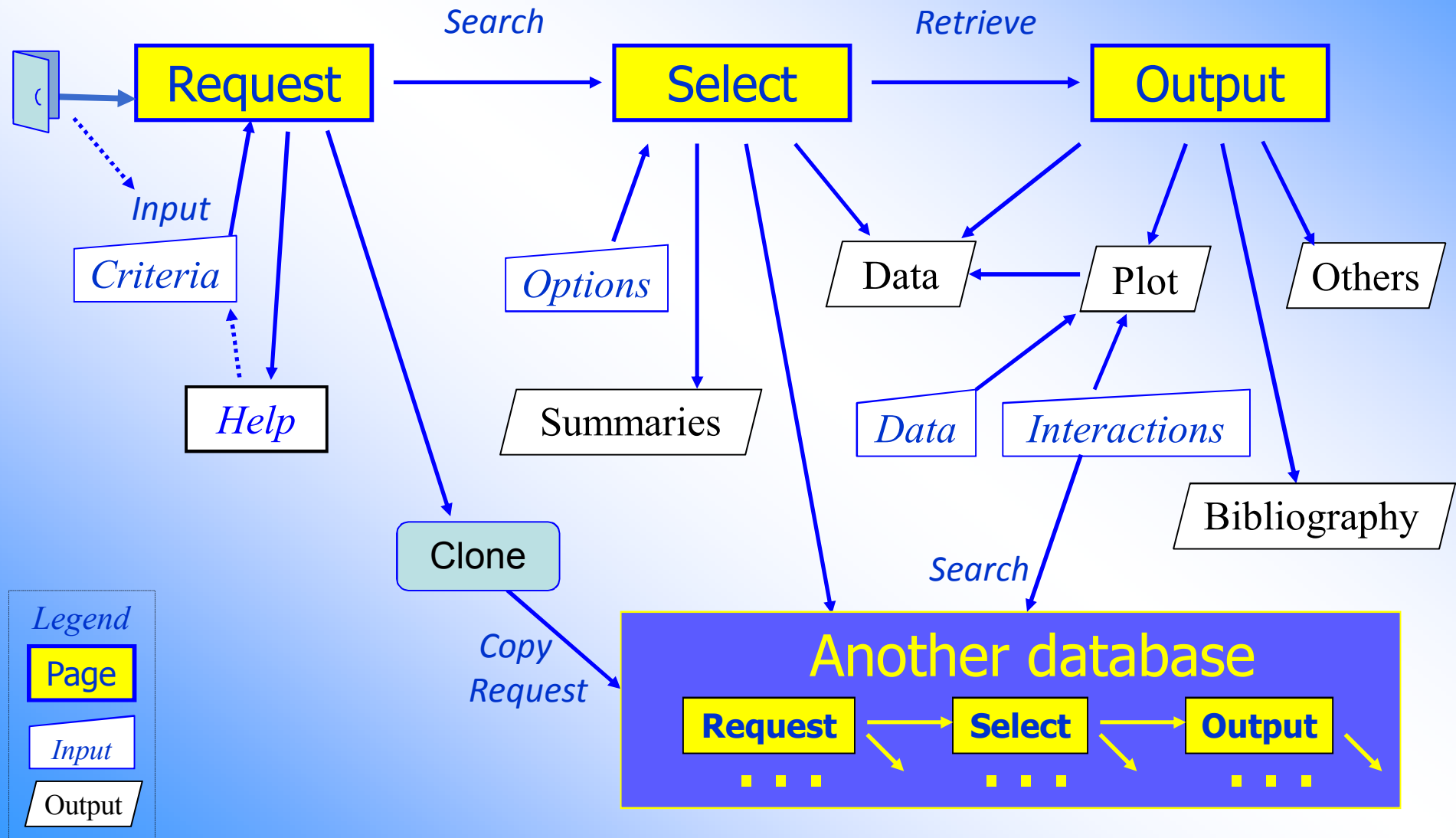


EXFOR-ENDF

Web Retrieval System

Web interface to EXFOR and ENDF databases.
Search, retrieve and process data on Web.

Data flow and 3 major steps user's interactions



EXFOR Request Page

<http://www-nds.iaea.org/exfor/>

<http://www.nndc.bnl.gov/exfor/>

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



Experimental Nuclear Reaction Data (EXFOR)

Database Version of 2016-07-01

Software Version of 2016-06-30



News

2016/03 New. Upload your data for constructing covariance matrix, calculating inverse reaction cross sections, etc. [page]
2016/02 Output links to NSR and Web publication for secondary references of an Entry
2016/01 New. Display original publication of the IAEA INDC Reports (in PDF format)
2015/03 New. Inverting reaction data using detailed balance. Example: $^{13}\text{C}(\alpha,n)^{16}\text{O} \rightarrow ^{16}\text{O}(n,\alpha)^{13}\text{C}$

[History]

The EXFOR library contains an extensive compilation of experimental nuclear reaction data. Neutron reactions have been compiled systematically since the discovery of the neutron, while charged particle and photon reactions have been covered less extensively. The library contains data from 21347 experiments (see [statistics](#) and recent [updates](#)).
EXFOR Reference Paper: Nucl. Data Sheets 120(2014)272

Request

Target

Reaction

Quantity

Product

Energy from

Author(s)

Publication year

Accession #

13-Aluminium [De] Element → Isotope [Disable me]

Al-25

Al-26

Al-26-G

Al-27

Al-28

Al-CMP

Al-OXI

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112
H	He	Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl	Ar	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	Cs	Ba	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	Fr	Ra	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr									
													Lanthanides														Actinides																																																																																				

E

K

Expert

Submit

Reset

Options

☒ Exclude superseded data

☐ No reaction combinations (ratios,...)

☐ Exclude evaluated data

ed search of Products

☐ listing only

Prompt-Help

reaction ☐ publication

basic ☒ extended

(Z,A)

n Sub-Fields

ck and User's Input

request:

ENDF

Plotting. See also: [video-guide]

How-to video-guide

Plot EXFOR-ENDF double differential cross-sections

Advanced plotting

Cross sections

Angular distribution

Emission spectra

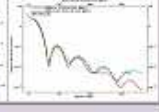
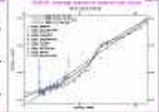
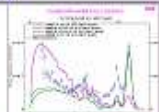
Double differential

NUBAR

Default

Map

video



Use Help, Examples, Dynamic sections

Note:

- all criteria are optional (selected by checking ☒)

- selected criteria are combined for search with logical AND

- criteria separated in a field by ";" are combined with logical OR

- criteria starting with "^" will be used as logical NOT

- wildcards (*) and intervals (..) are available

Statistics of usage: visits: 1564, data search: 4144, since 25-jul-2016

Important: “Examples”, “More examples...”

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

Options

- ☒ Exclude superseded data
☐ No reaction combinations (ratios,...)
☐ Enhanced search of Products
☐ Retrieve listing only
☐ Disable Prompt-Help
- Sort by: ☒ reaction ☐ publication
View: ☐ basic ☒ extended

Tip of the day: video-guide

Ranges (Z,A)

Reaction Sub-Fields

Feedback and User's Input

Clone Request:

CINDA

ENDF

Request

Submit

Reset

Help

Target ☒ Al-27 ?

Reaction ☒ n,tot ?

Quantity ☒ CS ?

Product ☐ Na-24 ?

Energy from ☐ 0 to ☐ 20e6 [eV](#) ?

Author(s) ☐ Green; Shore; *man ?

Publication year ☐ 1970-2002 ?

Accession # ☐ 10501*; 40244067; 41487 ?

Extended

Examples fill
in the form by
parameters

Submit

Search data in EXFOR-database

EXFOR Select Page

Retrieve: go to the next step

Request #2829
Results: Reactions: 9 Datasets: 141

Data Selection

Retrieve ☒ Selected ☐ Unselected ☐ All

Output: ☒ X4+ ☒ EXFOR ☒ Bibliography ☐ TAB ☐ C4 ☐ PlotC4

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

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

☐ Apply(1A) **Select Datasets** (for advanced users, results in: C4, TAB and Plots)

Search by Reaction

Go to NSR

n	Display	Year	Author	Energy range, eV	Points	Reference	Subentry#P	NSR-Key
1)	13-AL-27 (N,TOT) , , SIG		C4: MF3 MT1					
Quantity: [CS] Cross section								
1	☐ +	Info	X4+	X4±	T4	Cov	2010 A.Matic+	23102002
2	☐ +	Info	X4+	X4±	T4	Cov	2009 F.Atchison+	23102002 2009AT04
3	☒ +	Info	X4+	X4±	T4	Cov	2008 M.Mazari+	30037003
4	☐ +	Info	X4+	X4±	T4	Cov	1994 G.Rohr+	22331004
5	☒ +	Info	X4+	X4±	T4	Cov	1993 R.W.Finlay+	13569008 1993FI01
6	☐ +	Info	X4+	X4±	T4	Cov	1993 W.Abfaltrer+	14184002 1993AB03
7	☐ +	Info	X4+	X4±	T4	Cov	1991 J.R.Morales+	30764004 1991MO09
8	☐ +	Info	X4+	X4±	T4	Cov	1990 L.Koester+	22217010 1990KO34
9	☒ +	Info	X4+	X4±	T4	Cov	1988 J.Franz+	22117005 1988FR23
10	☒ +	Info	X4+	X4±	T4	Cov	1987 M.Ohkubo	21926003
11	☒ +	Info	X4+	X4±	T4	Cov		21926004
12	☐ +	Info	X4+	X4±	T4	Cov	1981 V.E.Zhitarev+	41323002
13	☐ +	Info	X4+	X4±	T4	Cov	1980 D.C.Larson+	12882005
14	☐ +	Info	X4+	X4±	T4	Cov	1979 L.Koester+	21660015 1979KO26
15	☐ +	Info	X4+	X4±	T4	Cov	1977 R.B.Royer+	12661004 1977RO35
16	☐ +	Info	X4+	X4±	T4	Cov	1976 D.R.Waymire+	20671002
17	☐ +	Info	X4+	X4±	T4	Cov		10403005

Search by Author

Go to Web - journal

Get data in various formats

EXFOR Output Page

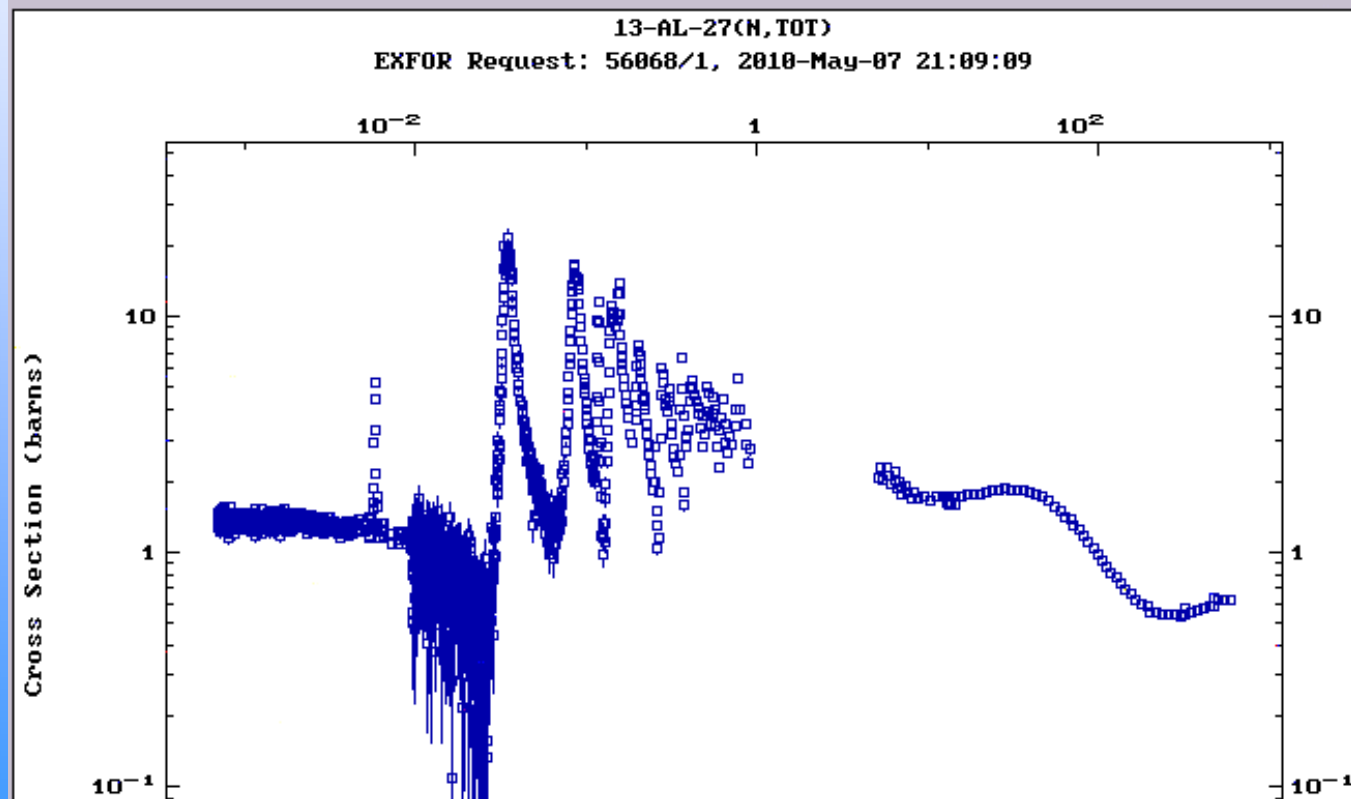
EXFOR Request #56068/1816

Output Data

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

Output data

Search similar
evaluated data
(go to ENDF)



ENDF Find and add to the plot
evaluated data

- ☒ 1) 13-AL-27(N,TOT),,SIG
- ☐ 2) Use my data [\[example\]](#)

See: [plotted data](#) (194Kb)

Get plotted
data

ENDF

Search "similar" data

ENDF Select Page

Plot data

Request #2776

ENDF Data Selection (Plot for EXFOR Request #56068)

Retrieve **Plot** ☒ Selected ☐ Unselected ☐ All

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

Sorted by: [Reactions] Reorder by: [Libraries] View: ☒ basic ☐ extended

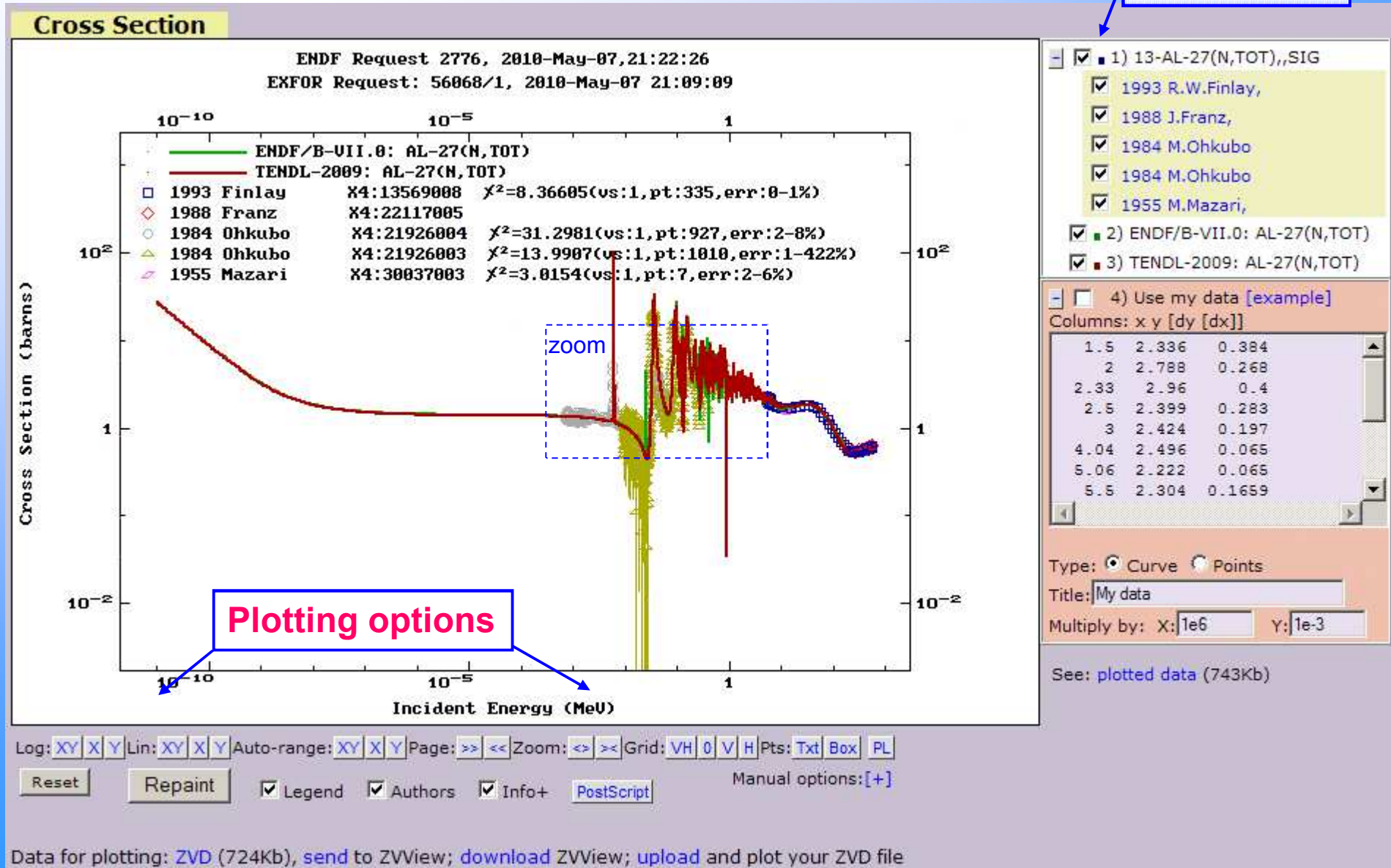
1) AL-27 (N,TOT), SIG MT=1 MF=3 NSUB=10

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

1	☒	ENDF-6	Interpreted	σ	Plot	ENDF/B-VII.0	E=150MeV Lab=LANL, ORNL Date=DIST-DEC06	M.B.Chadwick+, Derrient+
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=TIIT, JAERI Date=20010713	Y.HARIMA, H.KITAZAWA, T.FUKAHORI
4	☐	ENDF-6	Interpreted	σ	Plot	JENDL-3.3	E=20MeV Lab=TIIT, 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/TIIT Date=950817	B.YU, S.CHIBA, Y.HARIMA ET AL

ENDF Output Page: interactive plotting with Web ZVView

Select data for plotting



Thank you.