News in EXFOR-ENDF-PDF databases and tools

Viktor Zerkin
International Atomic Energy Agency, Nuclear Data Section

Technical Meeting NRDC-2021 of the International Network of Nuclear Reaction Data Centres,
WebEx, 4 - 7 May 2021

Content

I. Online news

- Main news in Web EXFOR-ENDF-CINDA-IBANDL systems
- JSON in Web EXFOR, ENDF, ZVView
- News in Web Mirror-sites
- EXFOR: online versioning of Entry/Subentry; PRELIM data online; "evaluators' flags" system
- ENDF: MF8/MF457 radioactive decay data online plot, JSON, html-comparison; plotting running GROUPIE code online
- Web-ZVView: new options, online smoothing

II. Integrated databases

- CINDA = old CINDA + current EXFOR + NSR(2018)
- EXFOR-NSR PDF database

III. EXFOR off-line *\/Modernization of "CD-ROM" packages, pilot projects/*

- X4Lite package: database + retrieval code + converters to X4+, C5, JSON, XML
- API: automatized access to nuclear data
- Extension of EXFOR-Relational with data points using JSON (hybrid implementation)

IV. Other news for EXFOR compilers

Concluding remarks

Part I.

News in NDS Web systems

Main online news. Summary

1. EXFOR

1) systematic/statistical/partial uncertainties in C5, R33, x4web:Cov
2) public online versioning of Entry/Subent
3) new output of datasets: JSON-X4, JSON-FY
4) PRELIM files in EXFOR Web database
5) “evaluators’ flags” system

2. ENDF

1) radioactive decay data (MF8.MT457): output to JSON, plot, comparison
2) plotting groupwise data running on the fly: GROUPIE (725 groups)
3) new and updated evaluated libraries in the ENDF database:

1.	*JENDL/DEU-2020*	*Deuteron Reaction Data File, Japan, 2020*
2.	*FENDL-3.2-beta*	*Fusion Evaluated Nuclear Data Library, IAEA, 2021*
3.	*UKDD-12*	*UK Decay Data Library, 2012*
4.	*TENDL-2015.s60*	*TALYS-based Nuclear Data Library (selected materials), 2015*
5.	*ADS-HE*	*High energy library for accelerator driven systems, IAEA, 2013*
6.	*ADS-2.0*	*Accelerator driven systems nuclear data library, IAEA, 2008*
7.	*JENDL/PD-2016.1*	*Photonuclear Data File 2016 revision 1, Japan, 2020*
8.	*JENDL/ImPACT-2018*	*JENDL LLFP Transmutation Cross Section File, Japan*
9.	*INDEN-2020-beta*	*evaluations produced by International Nuclear Data Evaluators Network (coord. by the IAEA)*
10.	*IAEA-PD-2019*	*IAEA-Photonuclear Data Library, 2019*
11.	*W3000*	*Proton activation cross section data on W (up to 3 GeV), KIT, Germany, 2012*
12.	*CENDL-3.2*	*Chinese evaluated neutron data library, issued in 2020*
13.	*TENDL-2019*	*TALYS-based Evaluated Nuclear Data Library, 2019*
14.	*IRDFF-II*	*International Reactor Dosimetry and Fusion File, IAEA 2019*

3. IBANDL

1) quarterly updates since V.Semkova has left IAEA

4. Web-ZVView

1) output plotted data: JSON + Table
2) online smoothing

Usage of JSON in EXFOR, ENDF, ZVView

JSON = JavaScript Object Notation //form for data based on: name/value pairs + ordered lists of values; can be used as an "IT framework" for nuclear data formats; simpler then XML; supported and used by modern programming languages and IT systems; popular among young generation

Why JSON?
Easy for programming.

API = Application Programming Interface

EXFOR

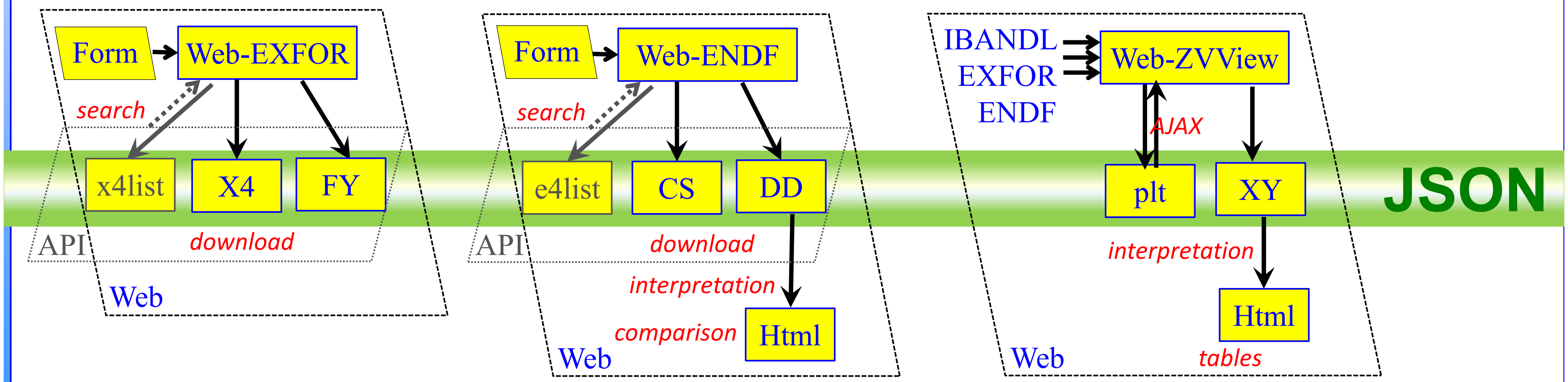
- JSON-X4: Datasets + Dictionaries; 3 versions with diff. set of Keywords, ~stdOut
- JSON-FY: Datasets, computational values (~C5), coop. with NNDC
- x4list: list of Datasets generated by search in online database (API)

ENDF

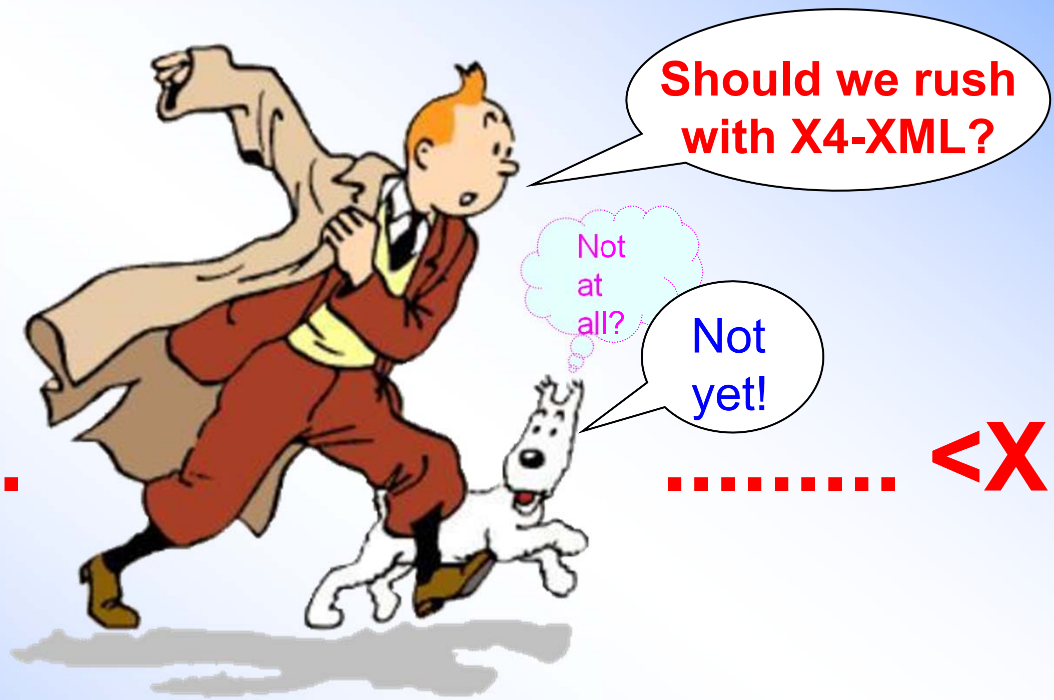
- JSON-CS: cross sections (MF3) with uncertainties (from MF33) for ENDF, PENDF
- JSON-DD: radioactive decay data (MF8.MT457)
- e4list: list of Datasets generated by search in online database (API)

Web-ZVView

- JSON-XY: copy of plotted data (for selected area)
- JSON-plt: plotted data – for implementation of Marker via AJAX -> Html-5



2019: JSON! JSON!! JSON!!!
2009: XML! XML!! XML!!!



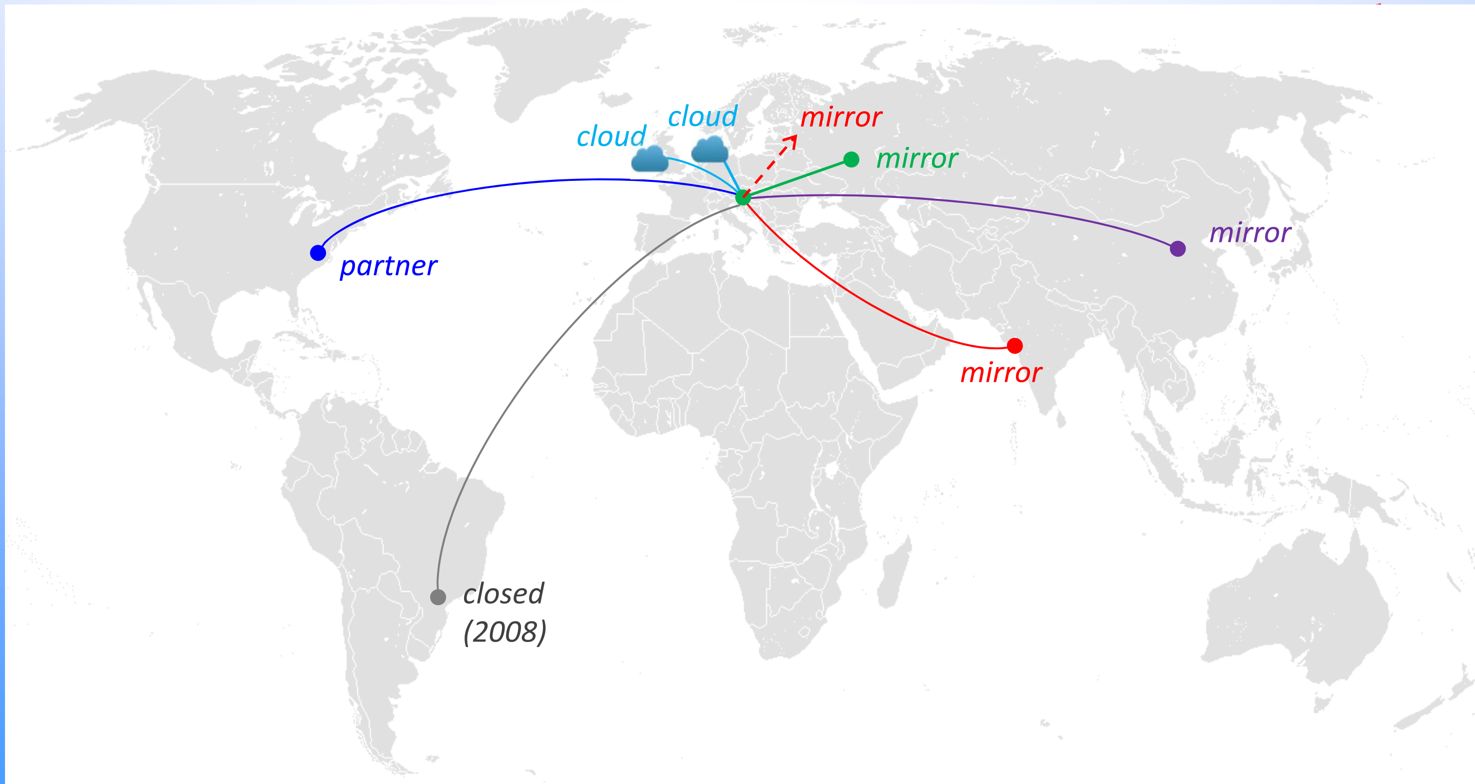
EXFOR.... .... <XML/>

2012, IAEA-Consulting Meeting
"Further Development of EXFOR":
EXFOR = stable format + output to XML, JSON, etc.

News in Web Mirror-sites

EXFOR-ENDF-CINDA Web system on:

- IAEA-NDS http://www-nds.iaea.org/exfor/ → *IT-dep.* → cloud servers /functioning
- NNDC, USA http://www.nndc.bnl.gov/exfor/ partner /functioning
- BARC, India http://www-nds.indcentre.org.in/exfor/ mirror /re-opened
- CNDC, China http://www-nds.ciae.ac.cn/exfor/ mirror /frozen
- Atomstandard, Russia http://www-nds.atomstandard.ru/exfor/ mirror /functioning
- PNPI, Russia http://www.pnpi.spb.ru/ org-mirror /plan
- VirtualBox http://localhost:5055 private-mirror/trial
- IPEN, São Paulo, Brazil http://www-nds.ipen.br/ old-mirror /closed



1.4 EXFOR news

EXFOR history of data versions

1.Became public on request from SG50
2.Comparison text within a line
3.Comparing only selected items

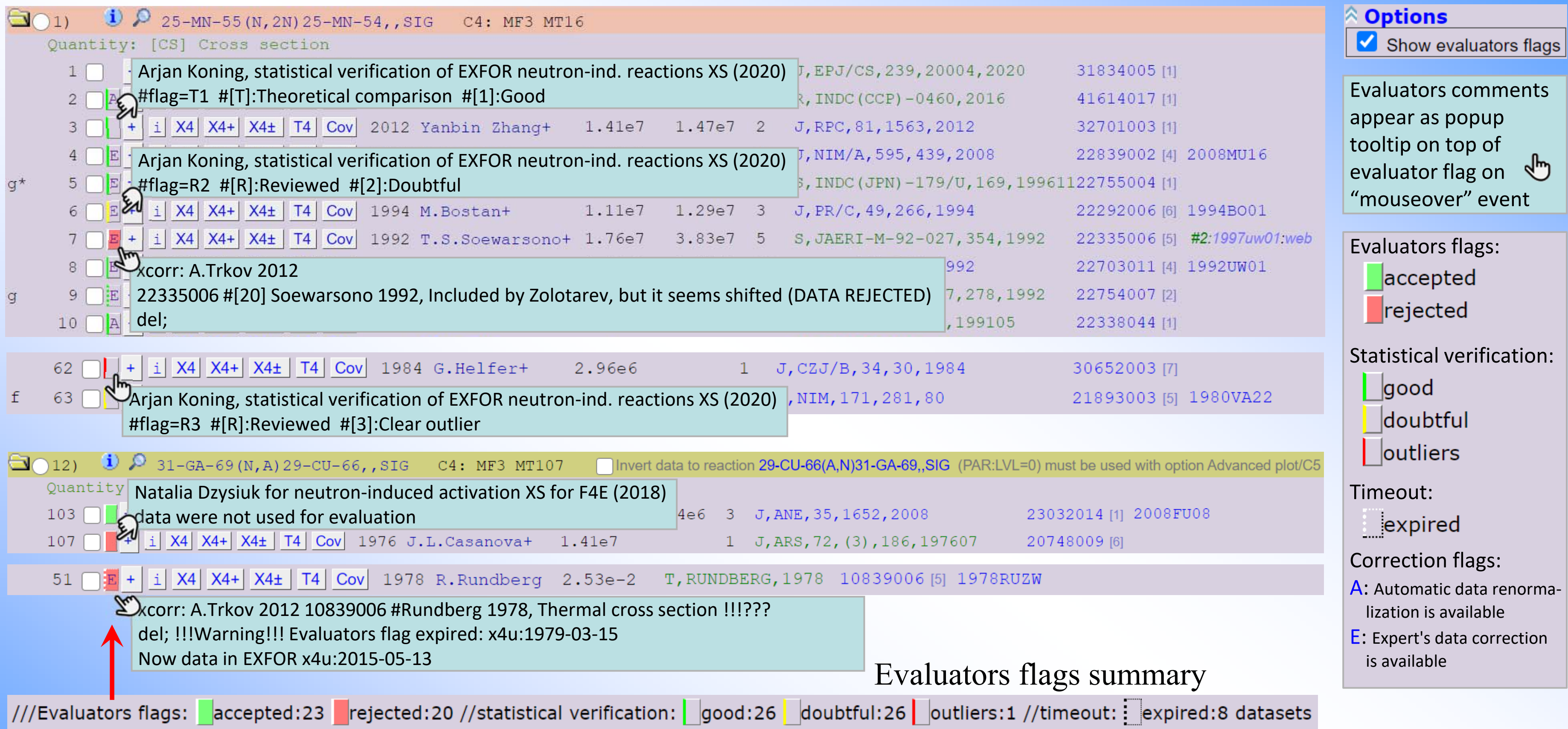
Access to PRELIM data via EXFOR Web retrieval system

1. *Since 2019 PRELIM files are stored in EXFOR database with temporary Entry number (Y series).*
2. *PRELIM data are immediately available via EXFOR Web retrieval system for search, presentation in output formats, conversion to other formats, plotting, comparison with other experimental and evaluated data, etc.*
3. *This feature can be used for various cross check of data: PRELIM-PRELIM and PRELIM-TRANS, such as: search of duplications of the 1st Reference, versions-history, etc.*

EXFOR online. Evaluators' flags system

/under development/

Evaluator indicates which datasets were selected/unselected from evaluation process and describes reasons. This information (evaluator's flags) is submitted to NDS to be shared with other evaluators. Optionally, the system can also include and operate with "statistical verification scores" indicating difference between a dataset and other experimental/evaluated data.

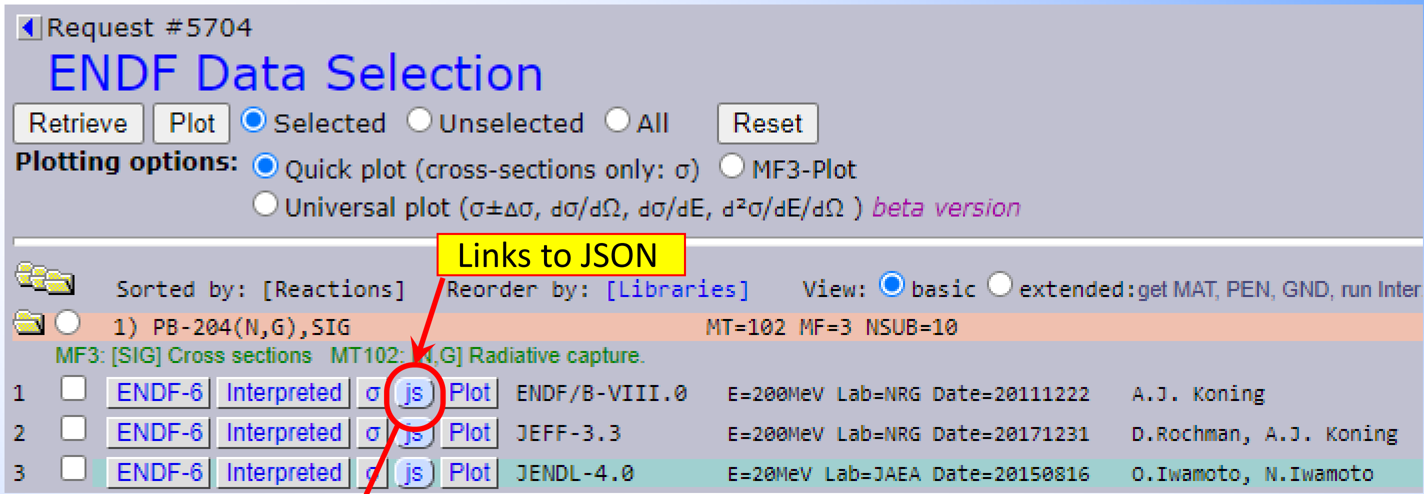


Source of currently available evaluators flags

id	File Name	Datasets	Type	Title
0	Erwin-Alhassan_2018.yaml	166	select	Erwin Alhassan for protons on Co59 and Cd111 (2018)
1	Natalia-Dzysiuk_2018.yaml	1,768	select	Natalia Dzysiuk for neutron-induced activation XS for F4E (2018)
2	Natalia-Dzysiuk_2019.yaml	570	select	Natalia Dzysiuk for neutron-induced activation XS on Ni isotopes (2019)
3	Natalie-Gaughan_2019.yaml	90	select	Natalie Gaughan for proton induced reactions (2019)
4	Arjan-Koning_2020.yaml	19,145	stat-ver	Arjan Koning, statistical verification of EXFOR neutron-ind. reactions XS (2020)
5	trkov2013mn55n2n.txt	21	x4corr	x4corr: A.Trkov 2012
6	capote2010mn55ng.txt	42	x4corr	x4corr: D.Smith and R.Capote 2010
7	Sjoestrand-2018-09-07.txt	3	x4corr	x4corr: H.Sjoestrand 2018, Ni59(n,*)

1.5 ENDF online news

ENDF online news: JSON for CS (MF3+33)



Array:{Energy, Sigma, dSigma} from MF3+MF33 for ENDF, PENDF

JSON


```
{
 "format":"WebEndfTabSect-0.1"
,"now":"2021-03-29T22:16:49.000Z"
,"program":"E4sGetTabSect, by V.Zerkin, IAEA-NDS, ver.2020-02-11"
,"datasets": [
  { "id":"13657869" ,"FILE":"PENDF"
   ,"dataType":"Cross section"
   ,"LIBRARY":"ENDF/B-VIII.0"
   ,"TARGET":"PB-204" ,"TEMP":293.16
   ,"NSUB":10 ,"MAT":8225 ,"MF":3 ,"MT":102
   ,"REACTION":"PB-204(N,G)PB-205,SIG"
   ,"COLUMNS":["E,eV","Sig,b","dSig,b","Int,interpolation-law"]
   ,"defaultInterpolation":"Lin-Lin"
   ,"nPts":16359
   ,"pts":[
        {"E":1.0e-5      ,"Sig":33.2400067 ,"dSig":1.66436 }
       ,{"E":1.103037e-5 ,"Sig":31.6494412 ,"dSig":1.58473 }
       ,{"E":1.216691e-5 ,"Sig":30.1349856 ,"dSig":1.5089  }
       ,{"E":1.342055e-5 ,"Sig":28.692998  ,"dSig":1.4367  }
```

ENDF online news: JSON for MF8:MT457

1) BR-88(DECAY,CAY),RNP MT=457 MF=8 NSUB=4

MF8: [RNP] Radioactive decay data MT457: [DECAY] Radioactive decay data.

1 ENDF-6 Interpreted js plot ENDF/B-VIII.0 Lab=BNL Date=20111222 Conversion from ENSDF

Links to JSON

JSON


```
{ "format":"Endf_MF8_MT457-v0.1",
  "now":"2021-03-10T16:49:06.595Z",
  "program":"EndfSect457, by V.Zerkin, IAEA-NDS, ver.2021-01-08",
  "id":"8931886"
 ,"dataType":"Radioactive decay data","datTyp":"e6mt457"
 ,"Library":"ENDF/B-VIII.0" ,"EDATE":" EVAL-NOV05","AUTH": " Conversion from ENSDF"
 ,"HSUB1":"----ENDF/B-VIII.0","MAT":852 ,"NSUB":"4" ,"Nucleus":"Br-88"
 ,"MF":8 ,"MT":457,"ZA":35088,"AWR":87.16876
 ,"T12s":16.29 ,"dT12s":0.06,"T12":16.29 ,"dT12":0.06 ,"uT12":"s"
 ,"Ebeta":1702.089 ,"dEbeta":50.94862 ,"uEbeta":"keV"
 ,"Egamma":3133.758 ,"dEgamma":57.90383 ,"uEgamma":"keV"
 ,"Ealpha":16.32917 ,"dEalpha":0.0 ,"uEalpha":"keV"
 ,"Spin":2.0,"Parity":"minus","LISO":0,"LIS": 0
 ,"nDecayModes":2,"nRadTypes":5
 ,"DecayModes":[ {"i":1 ,"RTYP":"1" ,"txRTYP":"Beta-"
    ,"DecayQ":8975.33, "dDecayQ":4.106 ,"uDecayQ":"keV"
    ,"Branching":0.9342 ,"dBranching":0.0018 }
  ,{"i":2 ,"RTYP":"1.5" ,"txRTYP":"Beta- --> n"
    ,"DecayQ":1922.25, "dDecayQ":3.18 ,"uDecayQ":"keV"
    ,"Branching":0.0658 ,"dBranching":0.0018
   }
 ]
 ,"RadTypes":[{"i":1 ,"STYP":"0" ,"txSTYP":"Gamma"
    ,"AveDecayEne":3133.8, "dAveDecayEne":57.904 ,"uAveDecayEne":"keV"
    ,"DiscreteSpectrum": {"Normalization":1.0 ,"dNormalization":0.0
      ,"nPts":146 ,"PtsTyp":"line"
      ,"PtsUnit": [ {"E":"keV"} ,{"dE":"keV"} ,{"RI":"no-dim"} ,{"dRI":"no-dim"} ]
      ,"Pts": [
        {"i":1  ,"E":125.9 ,"dE":0.3  ,"RI":3.35E-4 ,"dRI":1.3631E-4,"RTYP":"1" }
. . . . . . . . . . .
       ,{"i":15 ,"E":775.28,"dE":0.06 ,"RI":0.67    ,"dRI":0.05     ,"RTYP":"1"
        ,"RICC":9.27E-4,"dRICC":1.3E-5,"RICK":8.22E-4,"dRICK":1.2E-5,"RICL":8.88E-5,"dRICL":1.3E-6}
. . . . . . . . . . .
       ,{"i":146,"E":7000.0,"dE":0.6  ,"RI":0.002948,"dRI":2.9799E-4  ,"RTYP":"1" }
       ]
      ,"Legend": [
         {"RICC":{"any":"Total internal conversion coefficient"}}
        ,{"RICL":{"any":"L-shell internal conversion coefficient"}}
        ,{"RICK":{"any":"K-shell internal conversion coefficient"}}
        ,{"RTYP":{"1":"Beta-"}}
       ]
     }
```

ENDF online news: comparing decay data

ENDF Data Selection

Retrieve ◉ Selected ○ Unselected ○ All Reset

Sorted by: [Reactions] Reorder by: [Libraries] View: ◉ basic ○ extended:get MAT, PEN, GND

1) BR-88(DECAY,CAY),RNP MT=457 MF=8 NSUB=4

MF8: [RNP] Radioactive decay data MT457: [DECAY] Radioactive decay data.

#	Sel.					Library	Lab/Date	Author
1	☑	ENDF-6	Interpreted	js	plot	ENDF/B-VIII.0	Lab=BNL Date=20111222	Conversion from ENSDF
2	☐	ENDF-6	Interpreted	js	plot	ENDF/B-VII.1	Lab=BNL Date=20111222	Conversion from ENSDF
3	☑	ENDF-6	Interpreted	js	plot	JEFF-3.3	Lab=HAR+WIN Date=291117	A.L. NICHOLS
4	☐	ENDF-6	Interpreted	js	plot	JEFF-3.1	Lab=HAR+WIN Date=261107	A.L. NICHOLS
5	☑	ENDF-6	Interpreted	js	plot	ENDF/B-VI	Lab=INEL,LANL Date=19910612	C.W.REICH,T.ENGLAND
6	☐	ENDF-6	Interpreted	js	plot	JEF-2.2	Lab=NEADB Date=930715	CONVERSION OF ENSDF
7	☐	ENDF-6	Interpreted	js	plot	UKDD-12	Lab=HAR+WIN Date=261107	A.L. NICHOLS

Select data

Output Data

Format	*Data (Size)*
ENDF	Text (177Kb) ZIP (27Kb)

Radioactive decay data MT457(3):
- parallel plain text[0][1][2],
- comparison + selective plotting:[go]

ENDF Radioactive decay data /MF8.MT457/

by V.Zerkin, IAEA-NDS, 2020-2021, ver.2021-02-12 /under development/

⊞ Show all spectra. (Hide) low-intensity lines (≤1%).

(Select)/(unselect) data for plotting. (Plot) data in %: ☑ using normalization: ☑

#1. ENDF/B-VIII.0 Br-88		#2. JEFF-3.3 Br-88	
Nucleus:	Br-88 ZA=35088	Nucleus:	Br-88 ZA=35088
Library:	ENDF/B-VIII.0 NSUB=4 MAT=852	Library:	JEFF-3.3 NSUB=4 MAT=858
AUTH:	Conversion from ENSDF	AUTH:	A.L. NICHOLS
EDATE:	EVAL-NOV05	EDATE:	EVAL-OCT97
Half life:	16.29 ± 0.06(s)	↗Half life:	16.5 ± 0.1(s)
AWR:	87.16876	↗AWR:	87.1688
Isomer number:	LISO=0	Isomer number:	LISO=0
Level number:	LIS=0	Level number:	LIS=0
Spin & Parity:	2-	Spin & Parity:	2-
Ebeta:	1702.089 ± 50.94862 (keV)	↗Ebeta:	1706 ± 35 (keV)
Egamma:	3133.758 ± 57.90383 (keV)	↗Egamma:	4609 ± 70 (keV)
Ealpha:	16.32917 ± 0 (keV)	↘Ealpha:	8.0682 ± 0.965745 (keV)
Decay modes:	2	Decay modes:	2
Radiation types:	5	Radiation types:	5

Legend

#Left	#Right	Ratio of values
Value1	Value2	Value2==Value1
Value1	↗Value2	Value2 > Value1
Value1	↘Value2	Value2 < Value1

ENDF online news: comparing decay data

ENDF Radioactive decay data /MF8.MT457/

by V.Zerkin, IAEA-NDS, 2020-2021, ver.2021-02-12 /under development/

⊞ Show all spectra. (Hide) low-intensity lines (≤1%).

(Select)/(unselect) data for plotting. (Plot) data in %: ☑ using normalization: ☑

#1. ENDF/B-VIII.0 Br-88

Nucleus: Br-88 ZA=35088
Library: ENDF/B-VIII.0 NSUB=4 MAT=852
AUTH: Conversion from ENSDF
EDATE: EVAL-NOV05
Half life: 16.29 ± 0.06(s)
AWR: 87.16876
Isomer number: LISO=0
Level number: LIS=0
Spin & Parity: 2-
Ebeta: 1702.089 ± 50.94862 (keV)
Egamma: 3133.758 ± 57.90383 (keV)
Ealpha: 16.32917 ± 0 (keV)
Decay modes: 2
Radiation types: 5

#M1. Decay mode: RTYP=1 β–
Decay Q=8975.33 ± 4.106 keV
Branching=93.42 ± 0.18 %

#M2. Decay mode: RTYP=1.5 β– → n
Decay Q=1922.25 ± 3.18 keV
Branching=6.58 ± 0.18 %

#R1. Radiation type: STYP=0 γ
AveDecayEne=3133.8 ± 57.904 keV
⊞ DiscreteSpectrum: 146 lines ☐ plot

#R2. Radiation type: STYP=1 β–
AveDecayEne=1701.6 ± 50.949 keV
⊞ DiscreteSpectrum: 58 end-points ☐ plot

#R3. Radiation type: STYP=5 n
AveDecayEne=16.329 ± 0 keV
⊞ ContinuousSpectrum:178 ☐ plot

#R4. Radiation type: STYP=8 disc. e–
AveDecayEne=0.50751 ± 0.084348 keV
⊞ DiscreteSpectrum: 17 lines ☐ plot

#R5. Radiation type: STYP=9 X -rays
AveDecayEne=4.7821e-3 ± 1.0949e-4 keV
⊟ DiscreteSpectrum: 6 lines ☐ plot
Normalization:1 ± 0

#	E, keV	Intensity, %	I/Imax, %	RTYP	TYPE
1	1.59 ± 0.01	1.5601e-3 ± 4.3999e-5	7.34 ± 0.21	1 β-	
2	12.598 ± 0.015	0.010968 ± 4.0524e-4	51.6 ± 1.9	1 β-	
3	12.651 ± 0.015	0.021244 ± 7.5277e-4	100 ± 3.5	1 β-	
4	14.104 ± 0.015	1.524e-3 ± 5.7883e-5	7.17 ± 0.27	1 β-	
5	14.111 ± 0.015	2.9557e-3 ± 1.0999e-4	13.9 ± 0.52	1 β-	
6	14.311 ± 0.015	3.9024e-4 ± 1.3897e-5	1.84 ± 0.065	1 β-	

#2. JEFF-3.3 Br-88

Nucleus: Br-88 ZA=35088
Library: JEFF-3.3 NSUB=4 MAT=858
AUTH: A.L. NICHOLS
EDATE: EVAL-OCT97
↗Half life: 16.5 ± 0.1(s)
↗AWR: 87.1688
Isomer number: LISO=0
Level number: LIS=0
Spin & Parity: 2-
↗Ebeta: 1706 ± 35 (keV)
↗Egamma: 4609 ± 70 (keV)
↘Ealpha: 8.0682 ± 0.965745 (keV)
Decay modes: 2
Radiation types: 5

#M1. Decay mode: RTYP=1 β–
↘Decay Q=8960 ± 40 keV
↘Branching=93.3 ± 0.2 %

#M2. Decay mode: RTYP=1.5 β– → n
↘Decay Q=1920 ± 130 keV
↗Branching=6.7 ± 0.2 %

#R1. Radiation type: STYP=0 γ
↘AveDecayEne=3101.5 ± 299.23 keV
⊞ DiscreteSpectrum: ↗167 lines ☐ plot

#R2. Radiation type: STYP=1 β–
↗AveDecayEne=2392.9 ± 138.65 keV
⊞ DiscreteSpectrum: ↗66 end-points ☐ plot

#R3. Radiation type: STYP=5 n
↘AveDecayEne=8.0682 ± 0.96574 keV
⊞ DiscreteSpectrum: 2 lines ☐ plot

#R4. Radiation type: STYP=8 disc. e–
↗AveDecayEne=0.62757 ± 0.062757 keV
⊞ DiscreteSpectrum: ↗75 lines ☐ plot

#R5. Radiation type: STYP=9 X -rays
↗AveDecayEne=6.7735e-3 ± 6.7735e-4 keV
⊟ DiscreteSpectrum: 6 lines ☐ plot
Normalization:1 ± 0

#	E, keV	Intensity, %	I/Imax, %	RTYP	TYPE
1	0.181 ± 0.00362	5.2267e-4 ± 5.2267e-5	1.78 ± 0.18	1 β-	
2	1.577 ± 0.0315	2.981e-3 ± 2.981e-4	10.1 ± 1	1 β-	
3	12.598 ± 0.252	0.015218 ± 1.5218e-3	51.7 ± 5.2	1 β-	
4	12.649 ± 0.253	0.029435 ± 2.9435e-3	100 ± 10	1 β-	
5	14.11 ± 0.282	7.1232e-3 ± 7.1232e-4	24.2 ± 2.4	1 β-	
6	14.32 ± 0.286	5.5926e-4 ± 5.5926e-5	1.9 ± 0.19	1 β-	

#3. ENDF/B-VI Br-88

Nucleus: Br-88 ZA=35088
Library: ENDF/B-VI NSUB=4 MAT=3552
AUTH: C.W.REICH,T.ENGLAND
EDATE: EVAL-APR90
Half life: 16.5 ± 0.1(s)
↗AWR: 87.24404
Isomer number: LISO=0
Level number: LIS=0
Spin & Parity: 1-
↗Ebeta: 2565 ± 46 (keV)
↘Egamma: 3300 ± 300 (keV)
↗Ealpha: 16.077 ± 0 (keV)
Decay modes: 2
Radiation types: 5

#M1. Decay mode: RTYP=1 β–
↗Decay Q=8970 ± 130 keV
↗Branching=93.63 ± 0.24 %

#M2. Decay mode: RTYP=1.5 β– → n
Decay Q=1920 ± 130 keV
↘Branching=6.37 ± 0.24 %

#R1. Radiation type: STYP=0 γ
↗AveDecayEne=3300 ± 300 keV
⊞ DiscreteSpectrum: ↘164 lines ☐ plot

#R2. Radiation type: STYP=1 β–
↗AveDecayEne=2564.5 ± 46 keV
⊞ DiscreteSpectrum: ↘58 end-points ☐ plot

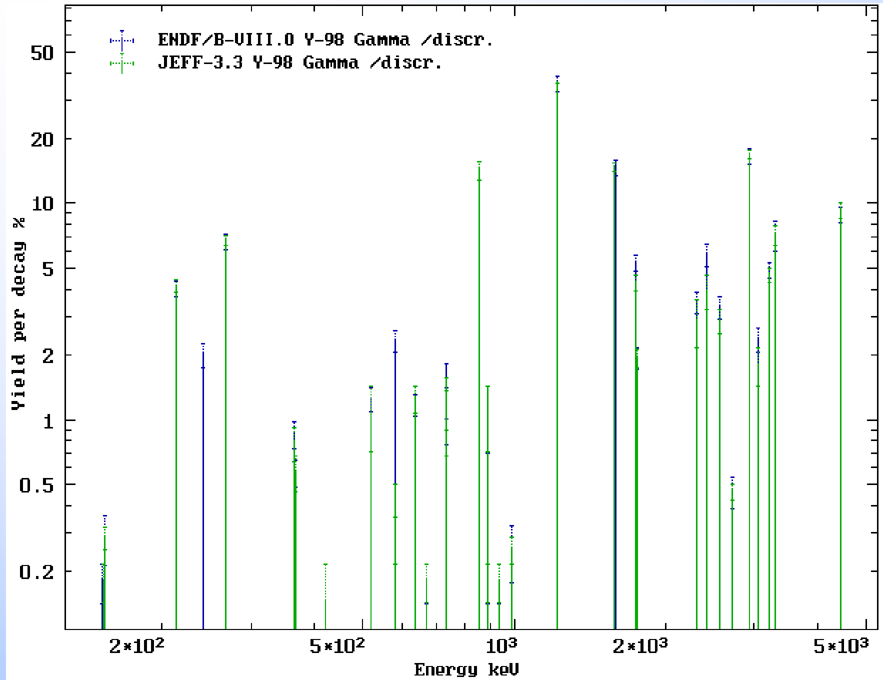
#R3. Radiation type: STYP=5 n
↗AveDecayEne=16.077 ± 0 keV
⊞ ContinuousSpectrum:181 ☐ plot

#R4. Radiation type: STYP=8 disc. e–
↘AveDecayEne=0.48 ± 0.03 keV
⊞ DiscreteSpectrum: ↘5 lines ☐ plot

#R5. Radiation type: STYP=9 X -rays
↘AveDecayEne=4.6e-3 ± 2e-4 keV
⊟ DiscreteSpectrum: ↘4 lines ☐ plot
Normalization:0.0001 ± 0

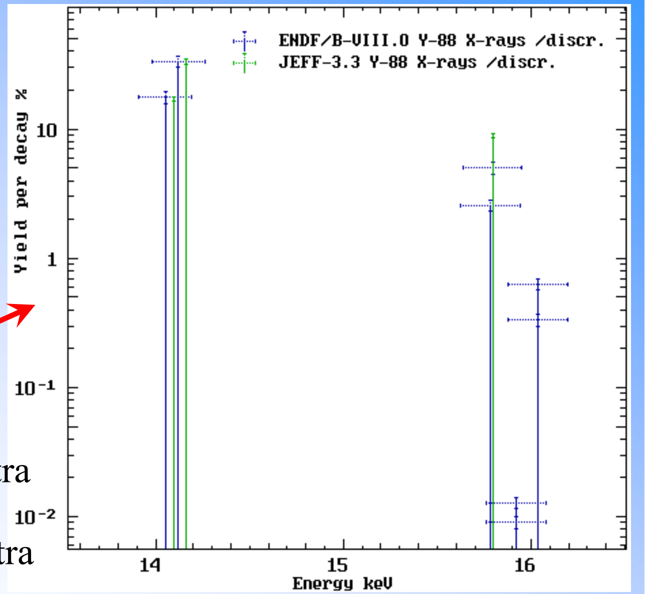
#	E, keV	Intensity, %	I/Imax, %	F
1	1.6383 ± 0.001	8.9e-4 ± 7e-5	4.47 ± 0.35	1
2	12.598 ± 0.001	0.0103 ± 8e-4	51.8 ± 4	1
3	12.651 ± 0.001	0.0199 ± 1.6e-3	100 ± 8	1
4	14.107 ± 0.001	5.2e-3 ± 4e-4	26.1 ± 2	1

ENDF news: decay data plot and comparison

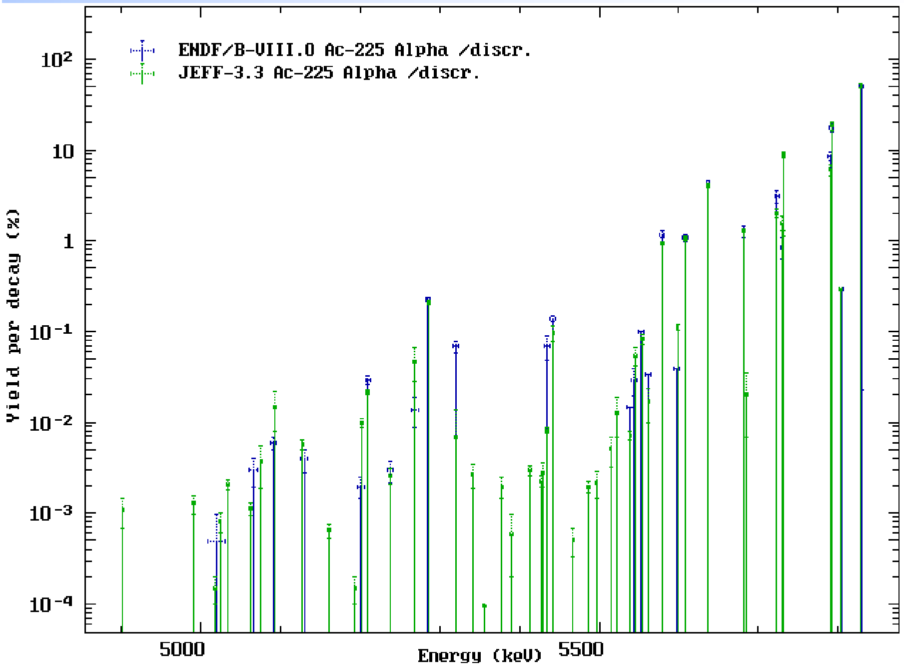


MT457 γ: discrete spectra

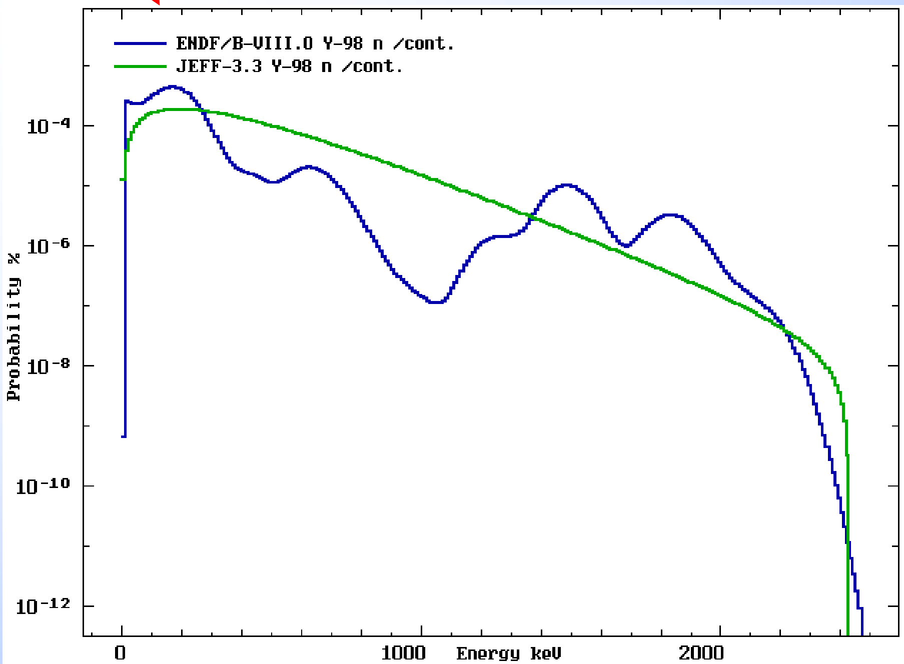
MT457 X-ray
discrete spectra



MT457 α: discrete spectra



MT457 n: continuous spectra



ENDF news: DD plot and comparison with EXFOR

/under development/

Plot data in %: ☐ using normalization: ☐

#1. ENDF/B-VIII.0 Br-88

Nucleus:	Br-88 ZA=35088
Library:	ENDF/B-VIII.0 NSUB=4 MAT=852
AUTH:	Conversion from ENSDF
EDATE:	EVAL-NOV05
Half life:	16.29 ± 0.06(s)
AWR:	87.16876
Isomer number:	LISO=0
Level number:	LIS=0
Spin & Parity:	2-
Ebeta:	1702.089 ± 50.94862 (keV)
Egamma:	3133.758 ± 57.90383 (keV)
Ealpha:	16.32917 ± 0 (keV)
Decay modes:	2
Radiation types:	5

#M1. Decay mode: RTYP=1 β−
Decay Q=8975.33 ± 4.106 keV
Branching=93.42 ± 0.18 %

#M2. Decay mode: RTYP=1.5 β− → n
Decay Q=1922.25 ± 3.18 keV
Branching=6.58 ± 0.18 %

#R1. Radiation type: STYP=0 γ
AveDecayEne=3133.8 ± 57.904 keV
+ DiscreteSpectrum: 146 lines ☐ plot

#R2. Radiation type: STYP=1 β−
AveDecayEne=1701.6 ± 50.949 keV
+ DiscreteSpectrum: 58 end-points ☐ plot

#R3. Radiation type: STYP=5 n
AveDecayEne=16.329 ± 0 keV
+ ContinuousSpectrum:178 ☑ plot

#R4. Radiation type: STYP=8 disc. e−
AveDecayEne=0.50751 ± 0.084348 keV
+ DiscreteSpectrum: 17 lines ☐ plot

#R5. Radiation type: STYP=9 X-rays
AveDecayEne=4.7821e-3 ± 1.0949e-4 keV
+ DiscreteSpectrum: 6 lines ☐ plot

8.4. RADIOACTIVE DECAY DATA (MT=457)

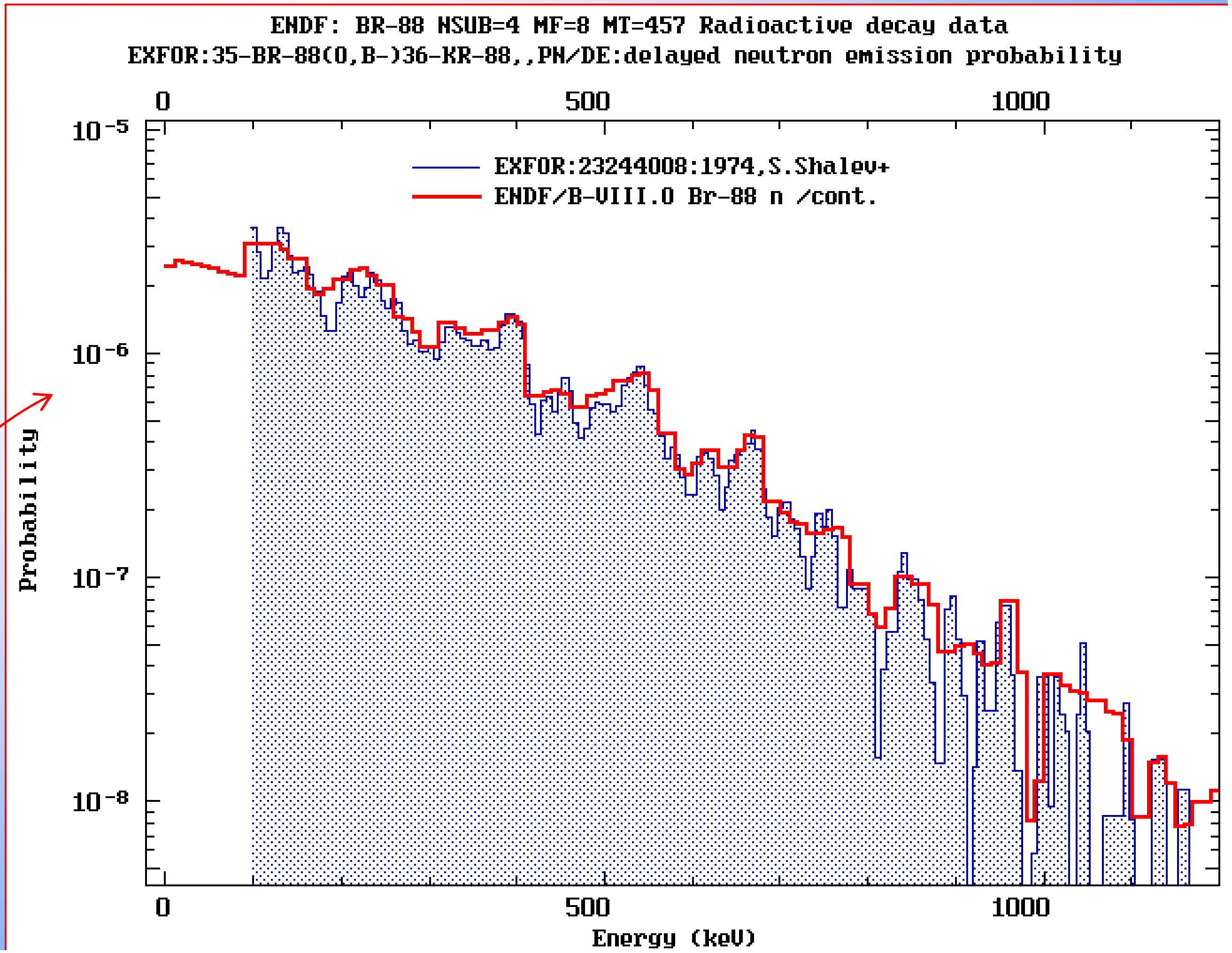
RTYP		Decay Mode
1.5	β^-,n	Beta decay followed by neutron emission (*delayed neutron decay*)

ENDF

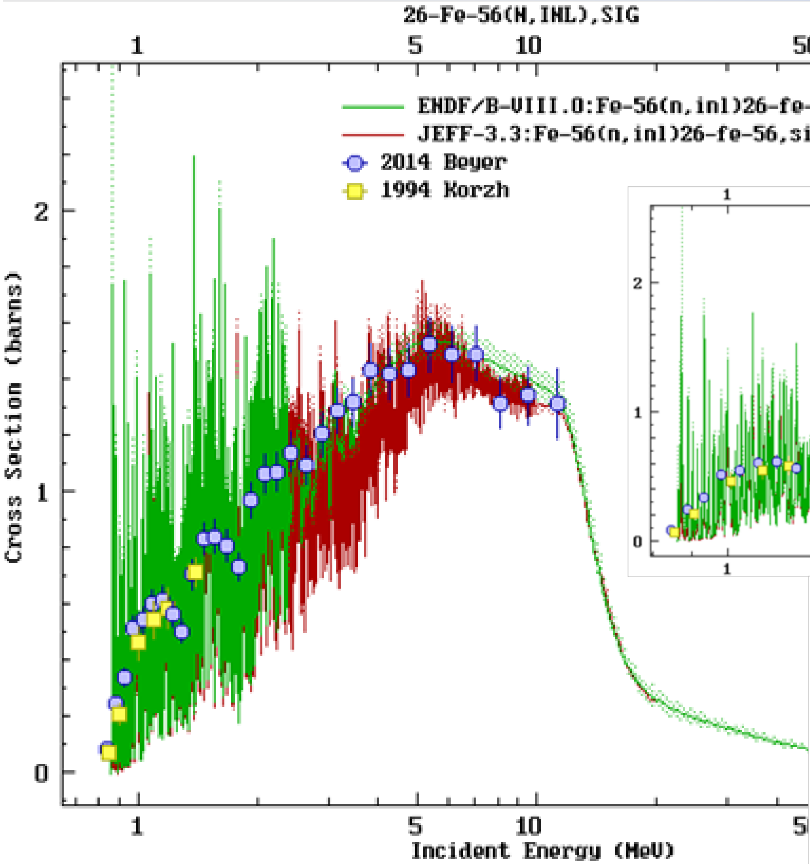
Target	☑	Br-88
Reaction	☑	decay

EXFOR

Target	☑	Br-88
Reaction	☑	0,b-
Quantity	☑	MFQ

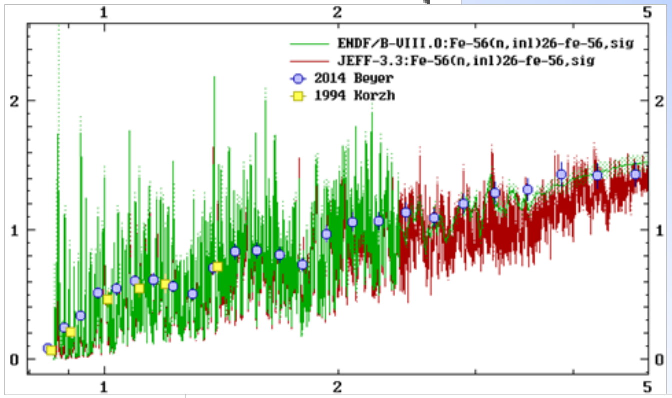


ENDF online news: using GROUPIE online

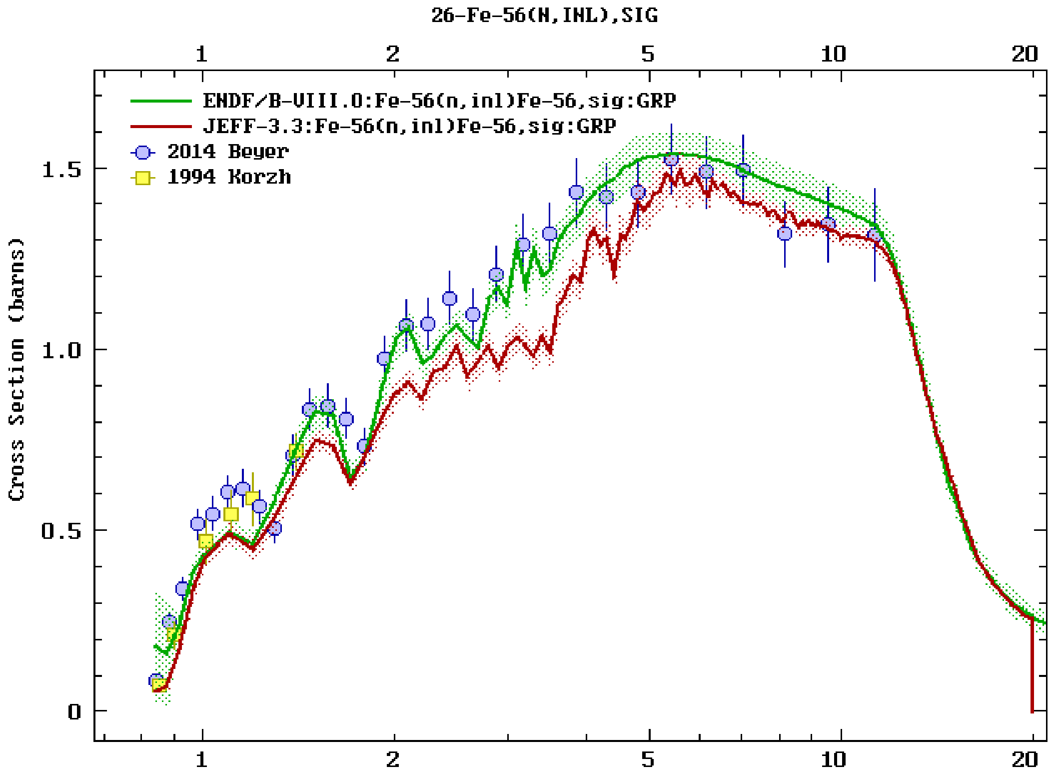


Option under "Universal plot"

Without GROUPIE



After running GROUPIE

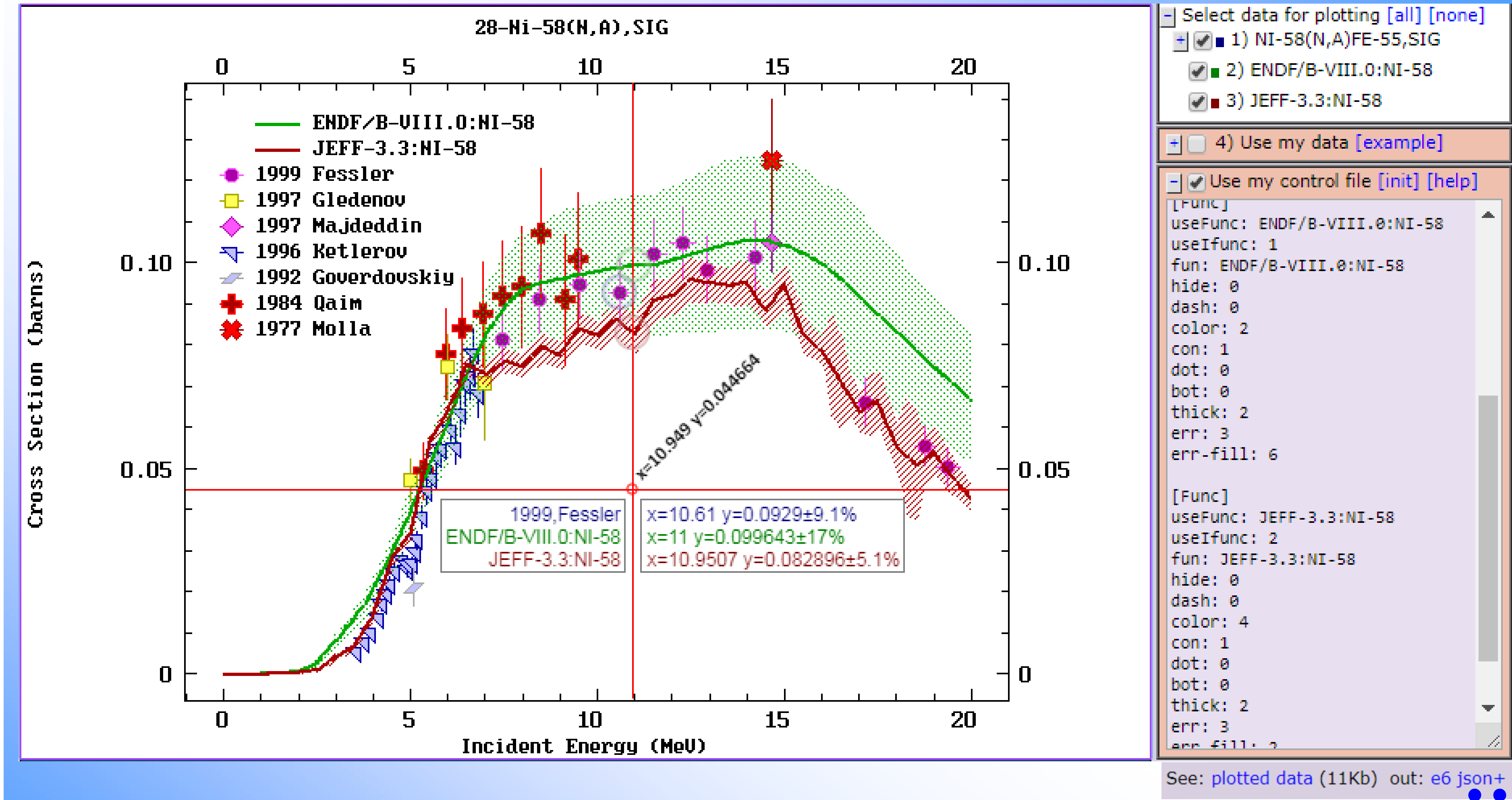


Introduction /written by R.Capote/

Resonance or strongly fluctuating data are very difficult to compare to low-resolution measured or evaluated data (see Fig. above). Therefore, there is an actual need to average data for proper inter-comparison between different evaluations or to low-resolution experimental data (EXFOR). However, data performance in many applications is usually defined by average behaviour rather than by fluctuations. Plotting of group wise data under ENDF Web retrieval system is implemented via running GROUPIE code (D. Cullen, PREPRO codes) online. Default 640 groups were adopted up to 20 MeV (725 up to 60 MeV) to effectively reduce the number of points in the region with fluctuating data while preserving most of low-resolution data structures. PEN linearized files at room temperature were used as input to the GROUPIE code.

1.6 Web-ZVView: plotting news

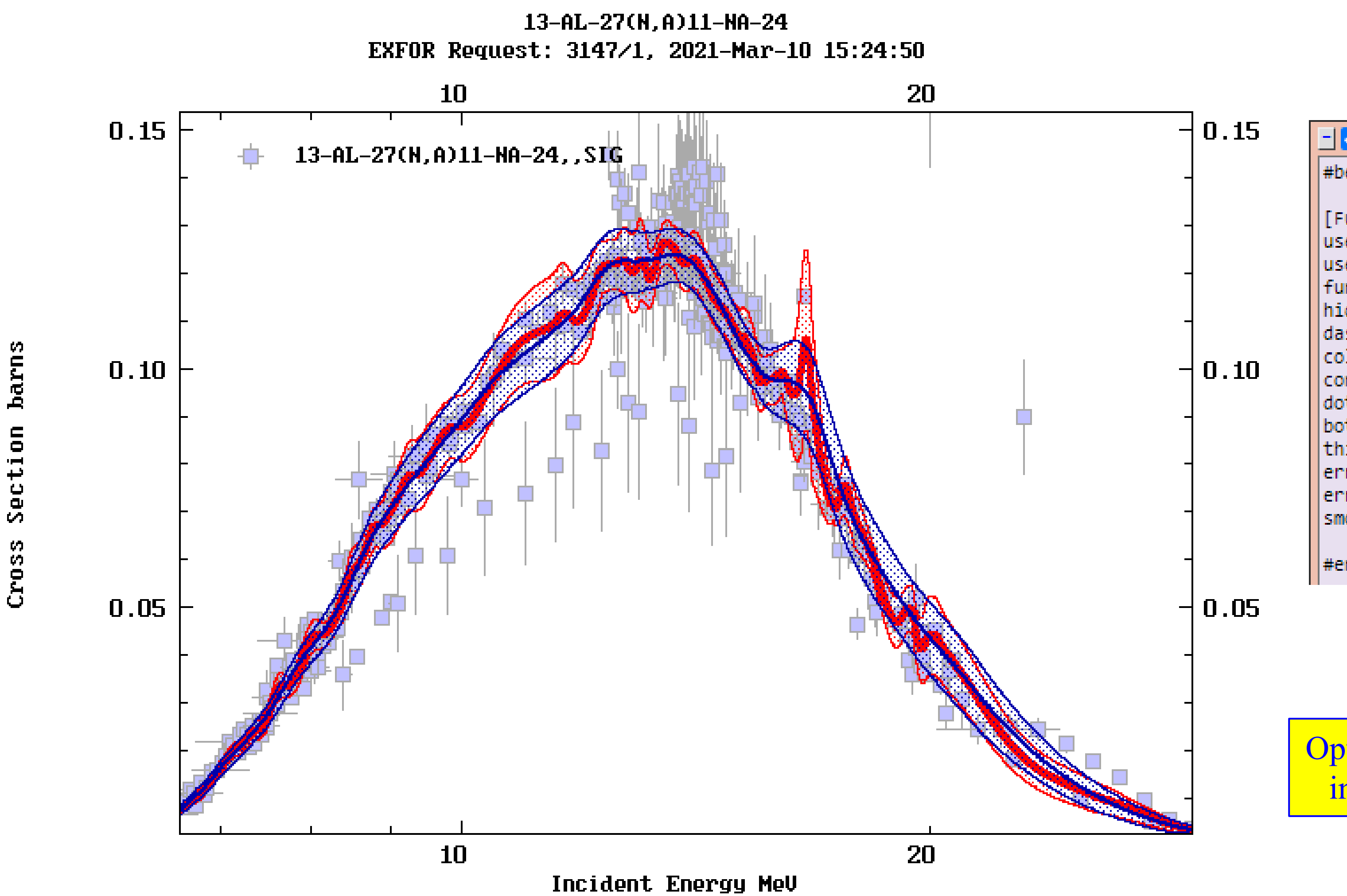
News in Web-ZVView plotting: new options



Implementation: ZVView → JSON

New output: JSON, Table of currently plotted data

News in Web-ZVView plotting: online smoothing



Use my control file [init] [help]

```
#begin control1.tit/c

[Func]
useFunc: 1) X4R3147_x4.tab
useIfunc: 0
fun: 1) X4R3147_x4.tab
hide: 0
dash: 0
color: 7
con: 0
dot: 2
bot: 0
thick: 1
err: 1
err-fill: 0
smooth: 6,2,12,3,3;20,2,1,1,3

#end control1.tit/c
```

Option “smooth” in control file

Smoothing:	smothing [#1],[#2],...	
width:3, polynom x^2, red, thickness:3		[#1] width (~points)
smooth: 3,2,12,3		[#2] polynom degree: 1:x, 2:x^2, 3:x^3
width:6, x^2, magenta, t:2, pipe		[#3] color
smooth: 6,2,13,2,3		[#4] line thickness (1..4)
width:3, x^3, green, t:1, cloud, dash		[#5] display errors (0..3)
smooth: 3,3,10,1,1,2		[#6] solid, dash, etc. (0..3)
two smoothing curves:		[#7] show intervals (0..1)
smooth: 6,2,12,2,3; 3,3,10,1,1,2		

Part II.

Integrated databases

CINDA and PDF

CINDA

Computer Index of Nuclear Reaction Data

Since 2005, CINDA database is extended by photonuclear and charged particle reaction data.
Since 2010, CINDA is regularly extended by the new information from EXFOR and NSR.
Since 2017, import from EXFOR and NSR to CINDA is done fully automatically.
Since November 2018, import from NSR to CINDA is no longer available.
2020: CINDA maintenance migrated from Windows to Linux.

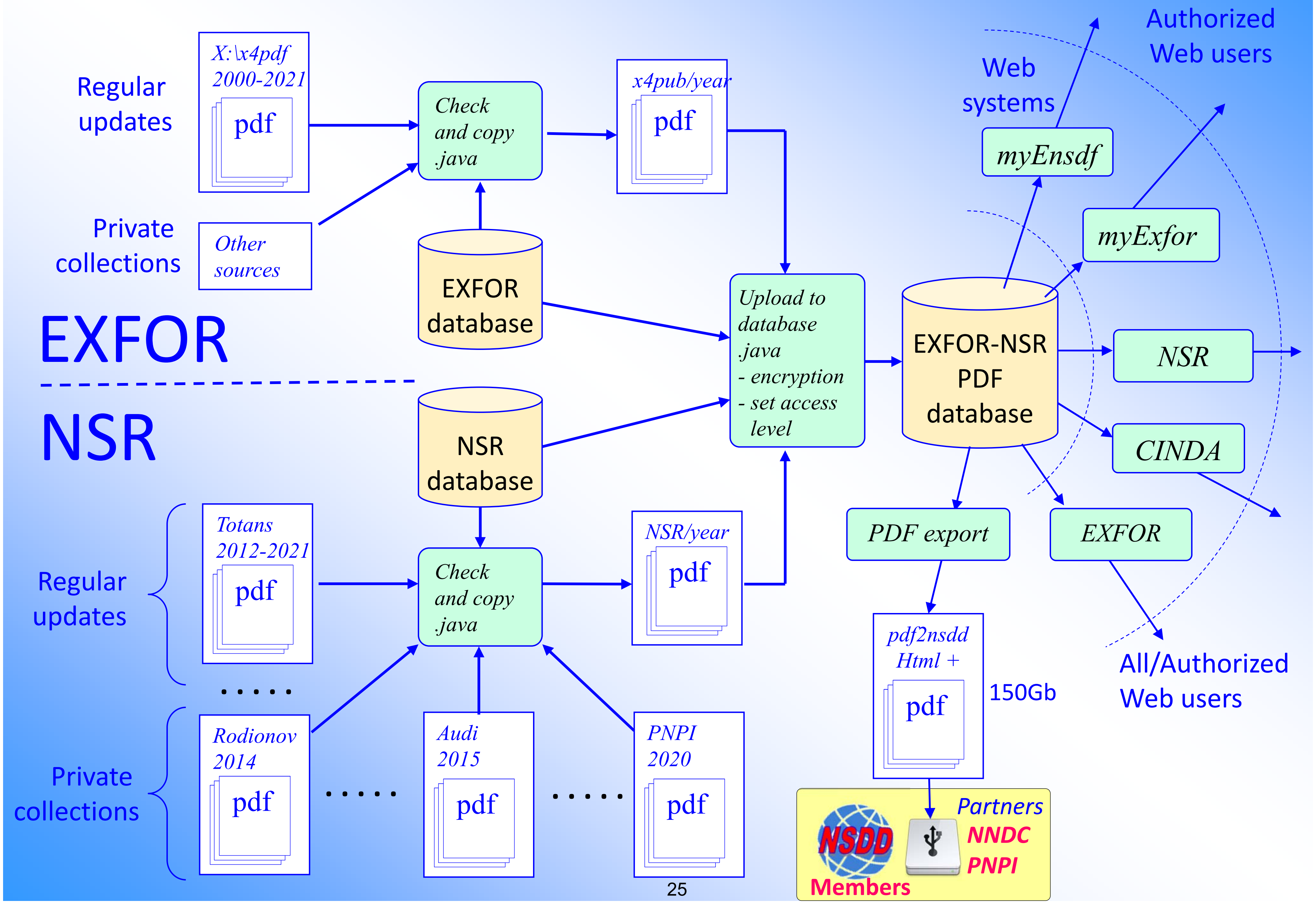
Main purpose of extended of CINDA: make it more useful for search candidates for EXFOR compilation.

2.2 EXFOR-NSR PDF database

- Publications: from 1896 to 2021, 120 years
- Content: 220,437 PDF files from 2000 to 2021 (22 years)
- Coverage: EXFOR 25,933 files (75.7%); NSR 187,154 files (78.5%)
- Web access via: EXFOR, NSR, CINDA, myEnsdf on NDS and NNDC sites

- 2005: EXFOR source papers are systematically stored in the IAEA-NDS PDF archive
- 2011: PDF files are included to EXFOR database (common between NNDC and NDS)
- 2011: EXFOR Web retrieval system provides access to PDF files for authorized users on NNDC and NDS Web sites
- 2012: PDF of original papers of NSR are exchanged between NNDC and NDS, and shared between NSR and EXFOR systems
- 2015: ENSDF evaluators donate their PDF collections to common database: A.Rodionov, G.Shulyak, B.Singh, G.Audi, F.Kondev
- 2015: NSR Web retrieval system provides access to PDF files for authorized users
- 2016: PNPI joines regular exchange of PDF files between NNDC and NDS
- 2016: CINDA Web retrieval system provides access to PDF files for authorized users
- 2016: IAEA-INDC reports are publically opened via Web EXFOR and NSR
- 2019: KINR opens lab reports and conference proceedings of Institute for Nuclear Research (Ukraine)
  Note. Now 2,550 PDF files are public, i.e. ~1% from total 220,437 publications

Functioning of EXFOR-NSR PDF database



Full EXFOR-NSR PDF database

EXFOR-NSR PDF database.

Database updated: 2021-04-30. Files: 220437 from 2000-04-19 to 2021-04-30.

-	-	-	-	-	1896:3	-	1898:4	1899:1	-	[1891-1899]:8
1901:1	1902:2	1903:5	1904:5	1905:4	1906:2	1907:4	1908:2	1909:1	1910:5	[1901-1910]:31
1911:2	1912:1	1913:3	-	-	-	1917:4	1918:2	1919:3	1920:3	[1911-1920]:18
1921:5	1922:4	1923:3	1924:5	1925:2	-	1927:3	1928:11	1929:8	1930:11	[1921-1930]:52
1931:23	1932:22	1933:27	1934:41	1935:50	1936:39	1937:55	1938:50	1939:101	1940:79	[1931-1940]:487
1941:63	1942:30	1943:83	1944:147	1945:52	1946:106	1947:205	1948:186	1949:347	1950:482	[1941-1950]:1701
1951:531	1952:478	1953:589	1954:679	1955:805	1956:885	1957:910	1958:1257	1959:1178	1960:1459	[1951-1960]:8771
1961:1520	1962:1642	1963:1964	1964:1732	1965:1961	1966:2203	1967:2380	1968:2589	1969:2857	1970:3542	[1961-1970]:22390
1971:3973	1972:4794	1973:5455	1974:4444	1975:3864	1976:3844	1977:3572	1978:3596	1979:3468	1980:3510	[1971-1980]:40520
1981:3337	1982:3481	1983:3570	1984:3513	1985:3107	1986:3188	1987:3466	1988:3300	1989:3353	1990:3282	[1981-1990]:33597
1991:2807	1992:3053	1993:3265	1994:4214	1995:3990	1996:3962	1997:3841	1998:4149	1999:4297	2000:4267	[1991-2000]:37845
2001:4560	2002:4832	2003:4492	2004:4808	2005:4998	2006:4288	2007:4964	2008:3987	2009:3871	2010:3631	[2001-2010]:44431
2011:4017	2012:3690	2013:3481	2014:3658	2015:3084	2016:3567	2017:3574	2018:2697	2019:2453	2020:328	[2011-2020]:30549
2021:37										

Years: 120   Publications: 220437

Full volumes: [Conf.proc. & Books] [Theses] [Reports]

Checking mode   //contributions to NSR-PDF

PDF Statistics:

DB	#PDF/#References	#PDF+	Total #PDF+	Todo #PDF
NSR:	187154/238549 ~78.5%	+674 from EXFOR	187828	50721 ~21.3%
EXFOR:	25933/34284 ~75.7%	+1440 from NSR	27373	6911 ~20.2%

Contributions to NSR-PDFs

PDF files: 220,437 from 2000-04-19 to 2021-04-30

Contributions to NSR PDF database as of 2021-04-30

Contributions:

1) 201200_Totans /3401/
2) 201300_Totans /962/
3) 201400_Totans /512/
4) 201500_Totans /584/
5) 201504_Dimitriou /6/
6) 201510_Balraj /257/
7) 201510_Rodionov /2175/
8) 201512_Audi /2539/
9) 201600_Totans /2000/
10) 201603_Rodionov /181/
11) 201603_Shulyak /13012/
12) 201604_Kondev /1066/
13) 201611_PNPI /31538/
14) 201700_PNPI /50565/
15) 201700_Totans /2318/
16) 201700_Zerkin /629/
17) 201703_Shulyak /302/
18) 201705_Kondev /44/
19) 201709_Pritychenko /1182/
20) 201711_Zerkin /844/
21) 201800_PNPI /56293/
22) 201800_Pritychenko /58/
23) 201800_Totans /1040/
24) 201800_Zerkin /406/
25) 201800_Zerkin_JINR /673/
26) 201803_Balraj /1/
27) 201803_Pritychenko_RD /525/
28) 201810_Zerkin_KINR /50/
29) 201900_PNPI /11228/
30) 201900_Totans /873/
31) 201900_Zerkin /357/
32) 201907_Vrapcenjak /1/
33) 201911_Pritychenko /1/
34) 202000_PNPI /37/
35) 202000_Pritychenko /3/
36) 202000_Totans /866/
37) 202000_Vrapcenjak /17/
38) 202000_Zerkin /437/
39) 202101_Totans /7/
40) 202101_Vrapcenjak /208/
41) 202101_Zerkin /8/
42) 202102_Totans /76/
43) 202102_Vrapcenjak /28/
44) 202103_Totans /186/
45) 202103_Zerkin /6/
46) 202104_Totans /196/
47) 202104_Vrapcenjak /28/
48) 202104_Zerkin /5/

Sum: /187731/

Contributors:

1	PNPI	149661	79.7%
2	Shulyak	13314	7.1%
3	Totans	13021	6.9%
4	Zerkin	3415	1.8%
5	Audi	2539	1.4%
6	Rodionov	2356	1.3%
7	Pritychenko	1769	0.9%
8	Kondev	1110	0.6%
9	Vrapcenjak	282	0.2%
10	Balraj	258	0.1%
11	Dimitriou	6	0.003%
	Total	187731	100%

Thanks to external contributors!!!

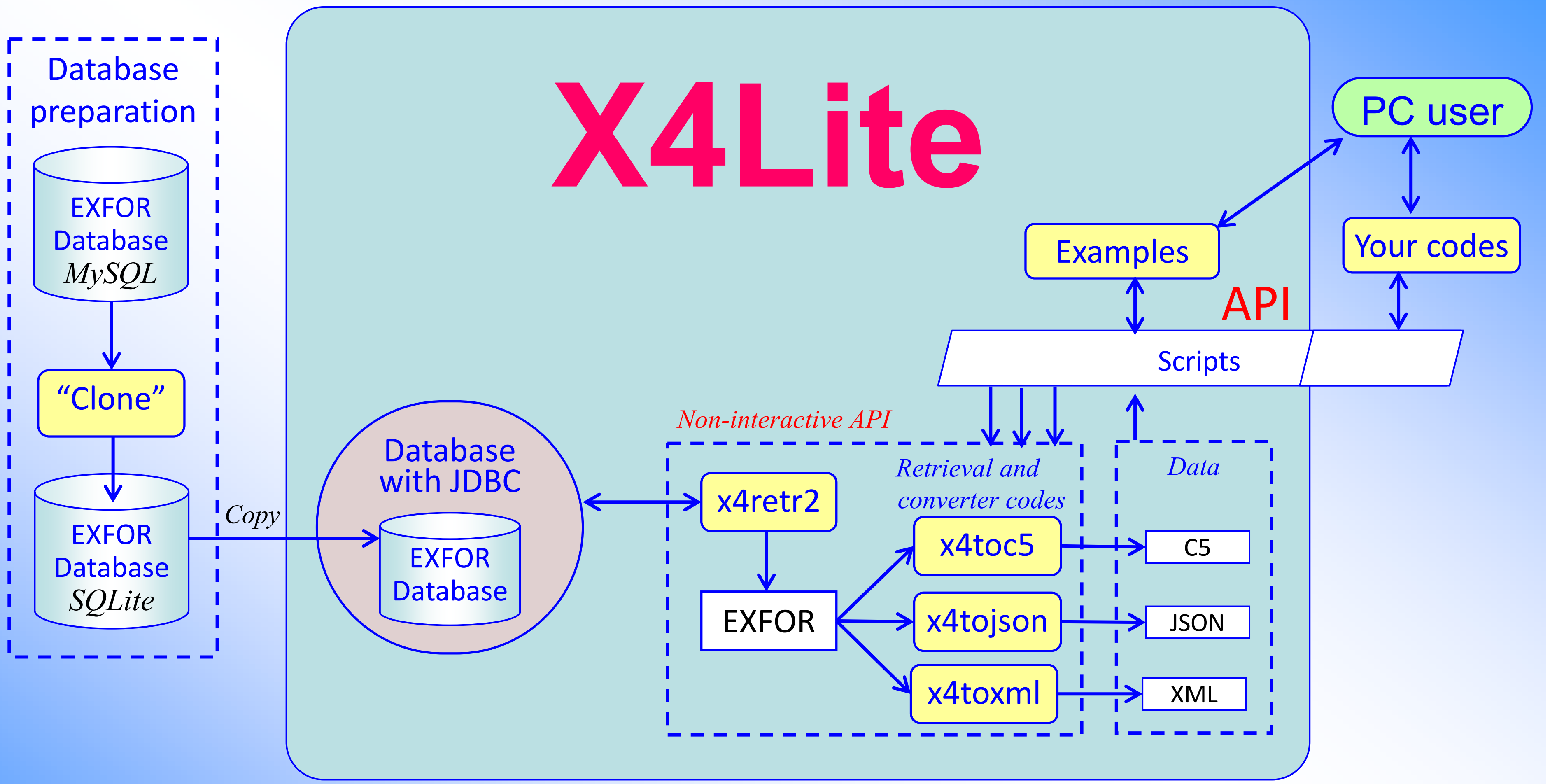
PDF Statistics:

DB	*#PDF/#References*	*#PDF+*	*Total #PDF+*	*Todo #PDF*
NSR:	187154/238549 ~78.5%	+674 from EXFOR	187828	50721 ~21.3%
EXFOR:	25933/34284 ~75.7%	+1440 from NSR	27373	6911 ~20.2%

Part III.

EXFOR off-line news

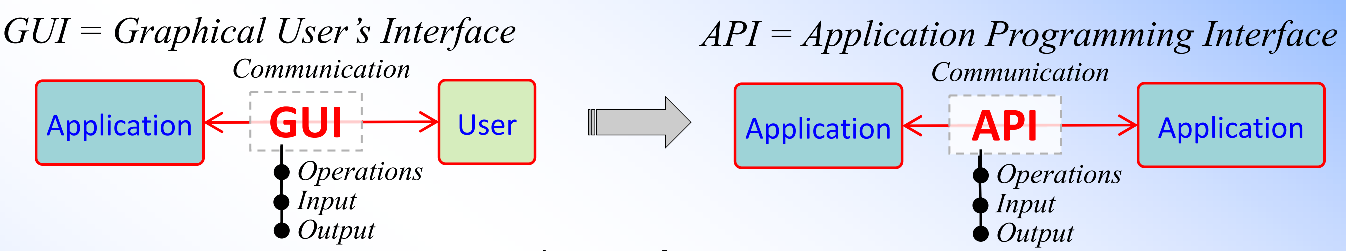
X4Lite: database, retrieval and converter codes



X4Lite preparation is fully automatic. Can be done on regular basis by the IAEA-NDS.

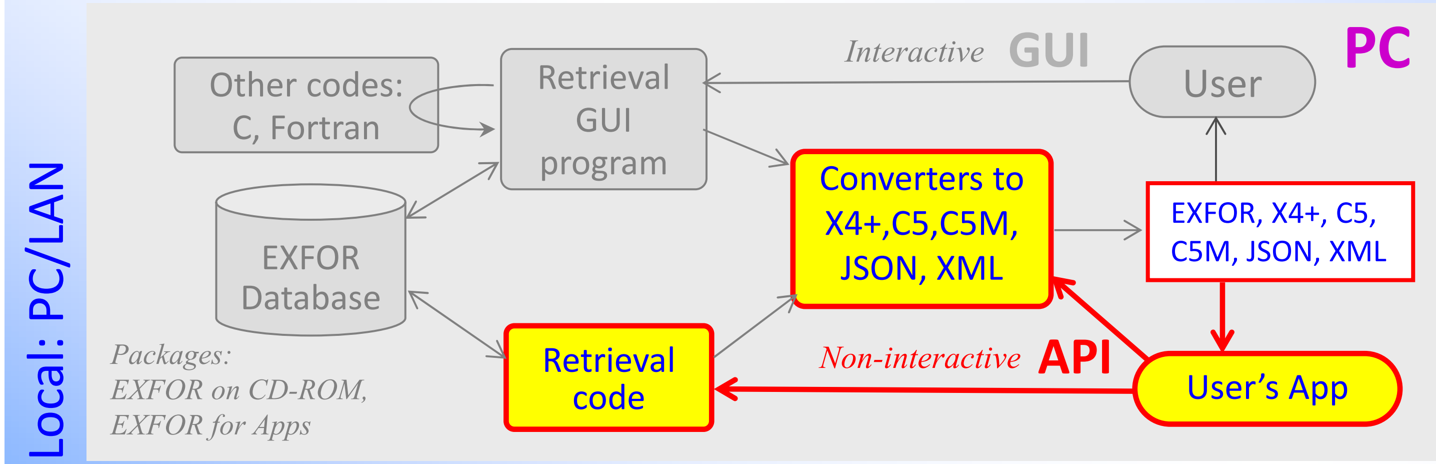
X4Lite. Specialized system for usage under other software packages and containing only
1)EXFOR relational database in SQLite: one file for Linux, Windows, MacOS
2)retrieval code producing list of datasets and/or EXFOR file
3)codes converting EXFOR file to X4+, C5, C5M, JSON, XML
4)Examples of scripts providing data search + retrieval + converting to computational formats

API: automatized access to nuclear data

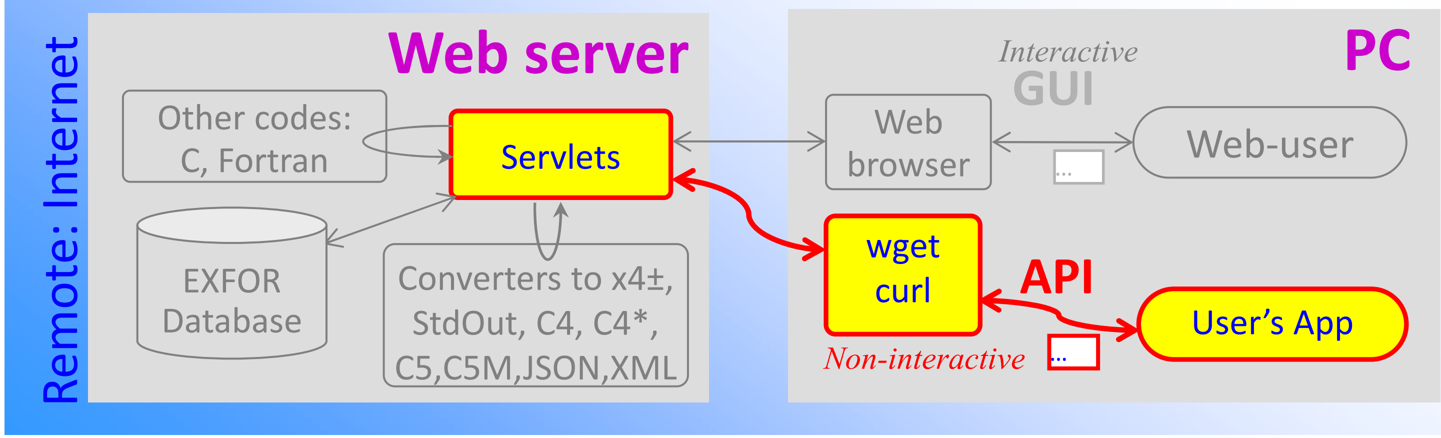


Why API? Is GUI not enough?
Automatization level ↗
Programming skills ↗
Requests for API ↗

Minimalistic API for EXFOR, ENDF:
- data search (parameters)
- get data (format, options)



Accessing EXFOR data from local database.
Fast. Known db-version. Reproducibility. More freedom for Apps.
Old data? Installation? Platform compatibility?



Accessing EXFOR data from remote database via Web.
Always fresh data. No installation. Less to store.
Speed? IT security, IT policy? Database version? Reproducibility?

Extension of EXFOR-Relational

1. Currently EXFOR data are stored in relational EXFOR database in BLOBs as part of SUBENT and therefore need to be extracted by an external program.
   a) So, we need retrieval + converter of EXFOR to another formats.
   b) Can we avoid complicated converter code?
   c) Can we store/retrieve data values in rational way? (avoiding BLOBs)
2. Traditionally relational databases have problems to store/manipulate with flexible vector data
3. Now relational DBMS-s offer some functionality to deal with JSON-type fields in the tables.

```
create table x4data_ds (
    DatasetID              varchar(9) not null
   ,ndat                   integer    null
   ,nx                     integer    null
   ,indVarFam              varchar(12) null
   ,yformula               varchar(16) null
   ,absentVars             varchar(12) null
   ,compNotes              varchar(1023) null
   ,reacode                varchar(511) null
   ,PRIMARY KEY            (DatasetID)
)ENGINE=MyISAM DEFAULT CHARSET=latin1;
create table x4data_hdr (
    DatasetID              varchar(9)   not null
   ,typ                    varchar(1)   not null
   ,ihdr                   integer      null
   ,common                 smallint     null default 0
   ,cm                     smallint     null default 0
   ,hdr                    varchar(12)  not null
   ,units                  varchar(12)  not null
   ,rank                   real         null
   ,DataType               varchar(12)  not null
   ,what                   varchar(12)  not null
   ,expansion              varchar (80) null
   ,PRIMARY KEY            (DatasetID,typ,ihdr)
)ENGINE=MyISAM DEFAULT CHARSET=latin1;
create table x4data_dat (
    DatasetID              varchar(9) not null
   ,idat                   integer    null
   ,dat                    json
   ,PRIMARY KEY            (DatasetID,idat)
)ENGINE=MyISAM DEFAULT CHARSET=latin1;
```

Solution: use single JSON cell to store one experimental point as an object with flexible number of data values

1. Using concept of Dataset (sorted EXFOR)
2. To store for every data point both: original EXFOR data and computational data
3. Three new tables for Datasets, Headers and Data: x4data_ds, x4data_hdr and x4data_dat
4. Headers have type "x" and "c" and description of the Data from EXFOR Dictionaries
5. Table x4data_dat has a column with type JSON having one data point as an object in one cell

Extension of EXFOR-Relational

Header of EXFOR DATA

```
--DatasetID:A0626002  pointer=[ ] [0 2 4      ]
--Reac:1-H-1(HE3,EL)1-H-1,,DA Q:[Differential c/s with respect to angle]
--DataLY:27
insert into x4data_hdr(DatasetID,typ,ihdr,common,cm,hdr,units,what,DataType,rank,expansion) values (
 'A0626002','x',0,0,0,'DATA','MB/SR','Y.Value','21',0.1,'Data: data');
insert into x4data_hdr(DatasetID,typ,ihdr,common,cm,hdr,units,what,DataType,rank,expansion) values (
 'A0626002','x',1,0,0,'ERR-T','MB/SR','Y.Err+-','21',0.911,'Data: data /Error/');
insert into x4data_hdr(DatasetID,typ,ihdr,common,cm,hdr,units,what,DataType,rank,expansion) values (
 'A0626002','x',2,1,0,'ERR-S','PER-CENT','Y.sErr+-','21',0.944,'Data: data /Error/');
insert into x4data_hdr(DatasetID,typ,ihdr,common,cm,hdr,units,what,DataType,rank,expansion) values (
 'A0626002','x',3,1,0,'ERR-2','PER-CENT','Y.pErr+-','21',0.955,'Data: data /Error/');
insert into x4data_hdr(DatasetID,typ,ihdr,common,cm,hdr,units,what,DataType,rank,expansion) values (
 'A0626002','x',4,1,0,'ERR-3','PER-CENT','Y.pErr+-','21',0.955,'Data: data /Error/');
insert into x4data_hdr(DatasetID,typ,ihdr,common,cm,hdr,units,what,DataType,rank,expansion) values (
 'A0626002','x',5,0,0,'EN','KEV','X1.Value','41',1.1,'Incident energy: energy');
insert into x4data_hdr(DatasetID,typ,ihdr,common,cm,hdr,units,what,DataType,rank,expansion) values (
 'A0626002','x',6,0,0,'ANG','ADEG','X2.Value','61',2.1,'Angle: angle');
```

Header of Comp. data

```
insert into x4data_hdr(DatasetID,typ,ihdr,common,cm,hdr,units,what,DataType,rank,expansion) values (
 'A0626002','c',0,0,0,'y','B/SR','DATA','21',0.0,'Data: data');
insert into x4data_hdr(DatasetID,typ,ihdr,common,cm,hdr,units,what,DataType,rank,expansion) values (
 'A0626002','c',1,0,0,'x1','EV','EN','41',1.0,'Incident energy: energy');
insert into x4data_hdr(DatasetID,typ,ihdr,common,cm,hdr,units,what,DataType,rank,expansion) values (
 'A0626002','c',2,0,0,'x2','ADEG','ANG','61',2.0,'Angle: angle');
```

```
insert into x4data_dat(DatasetID,idat,dat) values (
 'A0626002',0,
 '{"y":0.5178,"dy":0.04142,"x1":1.9e+06,"x2":30.0
 ,"DATA":517.8,"ERR-T":41.42,"ERR-S":3.0,"ERR-2":2.0
 ,"ERR-3":4.0,"EN":1900.0,"ANG":30.0}'
 );
```

JSON object {
Comp. data: y(x1,x2…)
,EXFOR DATA
}

Example of SQL query extracting data from JSON fields

```sql
SELECT distinct x4data_dat.DatasetID, x4data_dat.idat as iPoint
 ,ENTRY.YearRef1 as Year
 ,concat(ENTRY.Author1Ini,ENTRY.Author1) as Author1
 ,json_extract(x4data_dat.dat,'$.x1') as En
 ,json_extract(x4data_dat.dat,'$.y') as Sig
 ,json_extract(x4data_dat.dat,'$.dy') as dSig
FROM x4data_dat
 inner join REACODE on REACODE.ReacodeID=x4data_dat.DatasetID
 inner join SUBENT on REACODE.SubentID=SUBENT.SubentID
 inner join ENTRY on ENTRY.EntryID=SUBENT.EntryID
where REACODE.fullCode='13-AL-27(N,A)11-NA-24,,SIG'
 and json_extract(x4data_dat.dat,'$.x1')>8e6
 and json_extract(x4data_dat.dat,'$.dy') is not null
order by x4data_dat.DatasetID,x4data_dat.idat
```

DatasetID	iPoint	Year	Author1	En	Sig	dSig
115300032	0	1961	H.W.Schmitt	1.476e+07	0.117	0.008
410480022	12	1989	N.V.Kornilov	8.04e+06	0.0443	0.0011
410480022	13	1989	N.V.Kornilov	8.12e+06	0.0442	0.0011
410480022	14	1989	N.V.Kornilov	8.2e+06	0.0453	0.001
410480022	15	1989	N.V.Kornilov	8.28e+06	0.0479	0.0011
410480022	16	1989	N.V.Kornilov	8.37e+06	0.0491	0.0012
410480022	17	1989	N.V.Kornilov	8.45e+06	0.054	0.0012
410480022	18	1989	N.V.Kornilov	8.57e+06	0.058	0.0015
410480022	19	1989	N.V.Kornilov	8.71e+06	0.0631	0.0015
410480022	20	1989	N.V.Kornilov	8.83e+06	0.0662	0.0017

For discussion

1. Translated from EXFOR: almost 100%

Table Name	Engine	Rows	Data length	Index len...	Update time
x4data_dat	MyISAM	18711910	2.6 GB	363.1 MB	2021-04-29 22:53:44
x4data_ds	MyISAM	176380	17.5 MB	2.7 MB	2021-04-29 22:53:44
x4data_hdr	MyISAM	1415025	92 MB	23.2 MB	2021-04-29 22:53:44

2. Having access to extended EXFOR relational database with data points:
   1) user does not need EXFOR converter software
   2) we can analyse whole database and find some mistakes

Current NDS options for EXFOR off-line data distribution

#	Database	EXFOR	Data storage	Computational data	Search	Comments
1	Relational	Yes	BLOB/Subent	generated on the fly*	SQL	CD-ROMs, X4Apps, X4Lite
2	XC4 file	No**	XC4/Dataset	part of C4		SG30, since 2007, regular
3	XC5 file	No	C5/Dataset	part of C5		NDS/SG50, testing
4	Relational	Yes/No	JSON/exp.point	part of JSON	SQL	Tested, source for user's defined JSON
5	JSON files	No	JSON/Entry	part of JSON		Under development, source for NoSQL db

* C5, XML, JSON, Html, produced by Java codes x4toc5, x4toxml, x4to1json, x4tox4plus

** Optionally distributed: EXFOR by files (Entry per file)

Q: NRDC policy for off-line EXFOR data distribution

Version of Master file (date + web-link to source), acknowledgment database source: NRDC, version of dictionaries if used, licence type (?), authorized as "trusted repackaging", etc.

For discussion

We can analyse whole database to find problems in software, dictionaries and EXFOR

SUBENT:10999004 Pointer:[4]

Example-1

```
Reaction Code:     ((74-W-184(N,G),,WID)/(74-W-184(N,EL),,WID,,G))/(74-W-184(N,TOT),,WID)
Reaction formula:  (A/B)/C
Expected units:    ([EV]/[EV])/[EV]   ==> 1/EV
Data units:         MILLI-EV          ==> EV
```

Mistake in EXFOR. Correct reaction code:

```
Reaction Code:    ((74-W-184(N,G),,WID)*(74-W-184(N,EL),,WID,,G))/(74-W-184(N,TOT),,WID)
```

Example-2

```
SUBENT        41272002   20110519
REACTION   1(5-B-10(N,0),,EN)
           2(5-B-10(N,EL),,WID)
           3(5-B-10(N,A),,WID)
DATA                 3          1
DATA-APRX 1DATA-APRX 2DATA-APRX 3
KEV         KEV         KEV
 2.5000E+02 2.0000E+02 4.0000E+02
ENDDATA              3
```

My program gives <null> expecting code like "EN-RES-APX" in the Dictionary-024 (now does not exists).

Request to add the line to DICT_ARC_NEW.024:

```
 TRA 202105 EN-RES-APX                        32C4000000E     Approximate value of resonance energy
```

Example-3

```
SUBENT        10172050   20001214
REACTION   1(26-FE-56(N,EL),,STF)
           2(26-FE-56(N,0),,D)
DATA                 6          1
EN-MIN     EN-MAX     DATA      1DATA-ERR  1DATA      2DATA-ERR  2
KEV        KEV        NO-DIM     NO-DIM     KEV        KEV
-2.0       187.       1.88    -04.94     -04 25.        5.
ENDDATA              3
```

Program gives <null> expecting "Resonance energy" type header to be given, but finds only "Energy of incident projectile".

ZCHEX generates error message:

```
**  Illegal independent variable             ENERGY                         10172050
```

Similar mistakes are found in 195 Entries (658 SUBENT), see list: x1null.x4.err.txt

Part IV.

Other news for compilers

EXFOR statistics for compilers

This statistics is generated on the content of EXFOR database
independently from EXFOR compilation control systems

https://www-nds.iaea.org/exfor-master/x4compil/

Q: Should we have more formal recommendation to use compiler's initials in the HISTORY

Development of ZCHEX in 2020-2021

A66 Zerkin (Continuing action) Update ZCHEX based on comments from compilers.

Update log:

```
2020-12-04
           - DECAY-DATA: checking DG Abundance given without Energy,
             Energy < 1.keV, Abundance > 2.(200%)
           - debug: allowed multiple appearance of the same correlation
             flags in the ERR-ANALYS codes, e.g. (ERR-4,,,F)
           - INSTITUTE: allowed leading blank in the 2nd, 3rd, etc. lines
           - statistics: output number of warnings and errors
           - define flag "Print warnings" in the command line
```

Demo

1. A5: C4 vs. C5 compounds: 1-H-D2O(N,TOT),,SIG
   Dicttionary209 + ZA, ENDF-MAT ==> Dictionary709
2. C5: dData%, dSys%, dStat%, dOther% 23114002
3. Constructing covariance matrix using dOther, MONT-ERR: 23114002
4. EN given instead of EN-RES: x1null.x4.err.txt

Concluding remarks

1. New directions for data dissemination: JSON, SQLite, API
2. NRDC off-line EXFOR distribution policy
3. New database extensions can be used for improvement of EXFOR content
4. New tasks and new users' communities should lead to universal solutions, applicable for other tasks and communities
5. EXFOR-NSR PDF database: should we try to open public Web access to lab reports

Thank you.