Provide a list of erroneous and suspicious outliers by using various statistical approaches (A51)

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WP2016-A51

1. EXFOR checking ("post-SG30" activities)

The Data Bank works to maintain the highest level of quality in its databases.

Verification methods developed within "WPEC Subgroup 30" have been implemented at the Data Bank to further improve the quality of EXFOR:

1.1 In-depth review of all threshold reaction cross-sections

"*Statistical Verification and Validation of the EXFOR database: (n,n'), (n,2n), (n,p), (n,α) and other neutron-induced threshold reaction cross-sections*" by A.Koning, NEA/DB/DOC(2014)3

New… "*Statistical Verification and Validation of the EXFOR database: (n,gamma), (n,n'), (n,2n), (n,p), (n,α) and other neutron-induced threshold reaction cross-sections*" by A.Koning, NEA/DB/DOC(2016)X

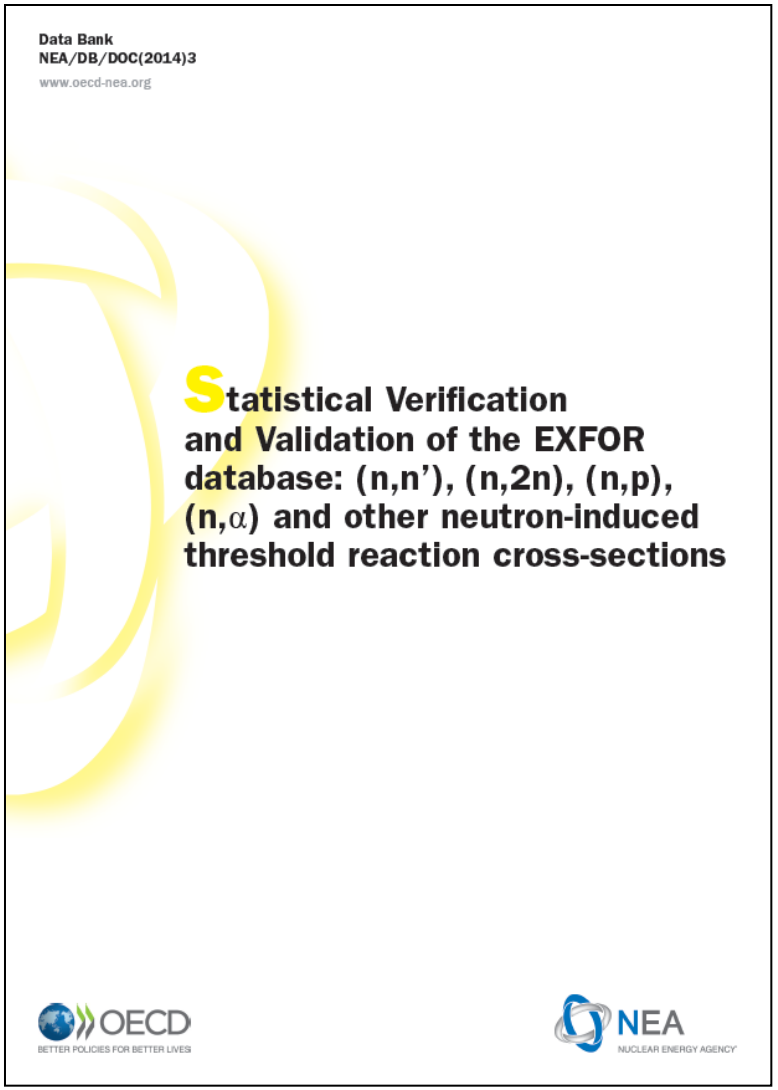
1.2 Implementation of cross-checking with evaluated data

New… "*Verification of the databases EXFOR and ENDF*", by Berton G, Damart G., Cabellos O., Beauzamy B., Soppera N., Bossant M., ND2016

1.1 In-depth review of all threshold reaction XSs

An efficient review system and associated strategy were developed to systematically compare more than 10 000 cross-section data sets from EXFOR with the corresponding values in the main evaluated nuclear data libraries, including JEFF.

- The review initially covered all neutron-induced threshold and activation reactions such as (n,n'), (n,2n), (n,p) and (n,α) (NEA, 2014).
- The resulting statistical information showed various **interesting trends in the data**, including a list of **suspicious data sets** for which the cross-section values deviate greatly from the major evaluated nuclear data libraries and/or other measurements.
- The original publications associated with these data have also been systematically checked.



http://www.oecd-nea.org/databank/docs/2014/db-doc2014-3.pdf

Scoring classes… the strongest deviations

T3. Automatically compared with libraries: strong deviations
The subentry contains probably not the reaction and data measured by the author, and the associated publication has not (yet) been checked by the reviewer. **The quantities have central values and uncertainties which are strongly deviating from other measurements, libraries and/or calculations.**

R3. Paper reviewed: strong deviations
The subentry contains certainly the reaction and data measured by the author, since the associated publication has been checked by the reviewer. **The quantities have central values and uncertainties which are strongly deviating from other measurements, libraries and/or calculations.**

E3. Error: subentry contains other quantity or wrong values - strong deviations.
The subentry contains reaction and data that do not agree at all with other measurements, libraries and/or calculations. The associated publication has been checked by the reviewer, and often the values found are wrong. Sometimes, no origin of the value or alternative meaning for the value could be found. **Action: further analysis, confirmation and correction by Data Centres.**

See **WP2013-19**, "*Proposal to introduce a Quality Score in EXFOR",* E. Dupont, A.J. Koning, N. Otsuka

Table. Total number of neutron-induced *cross section* subentries available in XC4 format, compared in this work, and scoring in reviewing classes. EXFOR status: August 17 2015.

Reaction	All	Compared	F < 5	T1	T2	T3	N1	N2	N3	R1	R2	R3	E1	E2	E3	Reviewed
(n,tot)	4528	4421	4390	2187	963	0	816	450	0	0	0	0	0	0	0	
(n,el)	871	852	846	446	225	0	112	67	0	0	0	0	0	0	0	
(n,non)	375	365	364	213	100	0	32	20	0	0	0	0	0	0	0	
(n,n')	229	151	149	52	12	4	49	5	12	6	3	8	0	0	0	y
(n,n')m	255	248	242	57	30	1	92	18	9	16	6	19	0	0	0	y
(n,n')n	3	3	2	0	1	0	0	0	0	0	2	0	0	0	0	y
(n,2n)	1643	1600	1593	378	126	30	331	48	20	408	202	53	2	2	0	y
(n,2n)g	384	377	376	70	20	8	80	24	4	105	35	27	2	0	3	y
(n,2n)m	712	701	691	109	26	6	154	55	5	214	83	47	1	0	2	y
(n,2n)n	42	41	33	7	3	3	5	5	0	3	5	10	0	0	0	y
(n,3n)	94	83	78	17	9	0	34	11	0	6	4	2	0	0	0	y
(n,3n)g	8	6	4	3	0	0	0	3	0	0	0	0	0	0	0	y
(n,3n)m	19	16	16	6	4	0	1	4	0	1	0	0	0	0	0	y
(n,f)	1229	1153	1127	515	131	112	267	68	56	0	0	0	0	0	0	
(n,na)	53	53	36	23	9	0	4	2	0	9	6	0	0	0	0	y
(n,na)g	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	y
(n,na)m	15	14	12	3	1	0	1	2	0	7	0	0	0	0	0	y
(n,na)n	4	4	4	1	0	0	1	0	0	2	0	0	0	0	0	y
(n,2na)	20	5	5	2	3	0	0	0	0	0	0	0	0	0	0	y
(n,np)	75	196	136	52	12	0	60	41	0	21	9	1	0	0	0	y
(n,np)g	5	16	11	3	1	0	7	2	0	2	1	0	0	0	0	y
(n,np)m	16	62	45	12	5	0	20	16	0	8	1	0	0	0	0	y
(n,n2a)	8	8	8	3	0	0	5	0	0	0	0	0	0	0	0	y
(n,nd)	6	6	5	3	0	1	1	0	0	0	1	0	0	0	0	y
(n,nt)	28	1	0	0	1	0	0	0	0	0	0	0	0	0	0	y
(n,4n)	34	32	32	8	4	0	10	7	0	3	0	0	0	0	0	y
(n,4n)g	3	3	3	1	0	0	2	0	0	0	0	0	0	0	0	y
(n,2np)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	y
(n,n'$_1$)	726	337	317	170	24	1	112	9	7	6	1	6	0	0	1	y
(n,n'$_2$)	0	105	96	51	14	2	28	6	2	0	2	0	0	0	0	y
(n,n'$_3$)	0	44	31	14	8	1	12	8	1	0	0	0	0	0	0	y
(n,n'$_4$)	0	25	17	9	10	0	2	4	0	0	0	0	0	0	0	y
(n,n'$_5$)	0	18	16	12	2	0	1	1	0	1	0	1	0	0	0	y
(n,n'$_6$)	0	17	15	5	6	0	3	3	0	0	0	0	0	0	0	y
(n,n'$_{>6}$)	0	65	42	15	28	0	9	13	0	0	0	0	0	0	0	y

Reaction	All	Compared	F < 5	T1	T2	T3	N1	N2	N3	R1	R2	R3	E1	E2	E3	Reviewed
(n,abs)	156	25	17	6	7	7	1	3	1	0	0	0	0	0	0	y
(n,g)	5360	5282	4970	2590	426	734	984	195	333	498	287	12	0	0	0	y
(n,g)g	339	325	298	150	27	26	70	25	23	61	30	0	0	0	0	y
(n,g)m	549	543	461	248	78	27	116	54	15	159	55	1	0	0	0	y
(n,g)n	28	22	16	2	6	1	4	9	0	0	0	0	0	0	0	y
(n,p)	1835	1817	1771	469	144	22	296	91	11	483	288	9	1	2	1	y
(n,p)g	198	193	179	35	6	0	42	13	0	59	33	1	0	4	1	y
(n,p)m	438	434	410	81	20	0	68	44	0	146	71	0	1	4	0	y
(n,p)n	12	12	9	0	1	0	1	5	0	4	1	0	0	0	0	y
(n,d)	33	32	29	13	8	0	4	5	0	1	1	0	0	0	0	y
(n,d)g	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	y
(n,d)m	3	3	2	0	0	0	0	3	0	0	0	0	0	0	0	y
(n,t)	147	138	127	59	18	0	31	20	0	3	7	2	0	0	0	y
(n,t)g	21	7	3	1	5	0	0	1	0	0	0	0	0	0	0	y
(n,t)m	26	19	14	0	15	0	1	3	0	0	0	1	0	0	0	y
(n,t)n	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	y
(n,h)	60	15	5	4	1	0	4	4	0	2	0	5	0	0	0	y
(n,h)m	6	4	4	4	0	0	0	0	0	0	0	1	0	0	0	y
(n,a)	1119	1103	1035	346	118	12	181	64	3	223	149	6	2	0	1	y
(n,a)g	87	86	75	24	4	0	11	3	0	23	21	0	0	0	0	y
(n,a)m	209	208	189	41	15	0	40	10	0	61	41	0	0	0	0	y
(n,a)n	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	y
(n,2a)	5	5	4	0	4	0	1	0	0	0	0	0	0	0	0	y
(n,2p)	34	5	1	0	4	0	0	0	0	1	0	9	0	0	0	y
(n,2p)m	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	y
(n,pa)	6	5	5	1	0	0	1	2	0	1	0	0	0	0	0	y
(n,t2a)	2	2	1	0	0	0	1	1	0	0	0	0	0	0	0	y
(n,xn)	17	12	10	2	2	0	2	1	0	3	0	2	0	0	0	y
(n,xg)	690	527	325	26	128	151	9	80	133	0	0	0	0	0	0	y
(n,xg)m	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	y
(n,xp)	89	54	51	16	8	0	12	4	3	5	2	4	0	0	0	y
(n,xd)	23	7	5	1	2	0	4	0	0	0	0	0	0	0	0	y
(n,xt)	37	22	20	10	6	1	4	0	0	0	0	1	0	0	0	y
(n,xh)	9	3	1	0	1	0	1	1	0	0	0	0	0	0	0	y
(n,xa)	165	135	124	66	23	7	19	15	1	2	1	1	0	0	0	y
(n,x)	326	157	145	83	31	0	27	14	0	2	0	0	0	0	0	y
(n,x)g	24	9	9	4	4	0	1	0	0	0	0	0	0	0	0	y
(n,x)m	96	25	22	13	8	1	0	1	2	0	0	0	0	0	0	y
(n,x)n	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	y
Total	23541	22271	21084	8744	2899	1158	4187	1567	641	1864	988	216	9	14	9	

1.1 In-depth review of all threshold reaction XSs

This work has showed:

- Most of the experimental data were compiled correctly in the EXFOR database
- Few compilation mistakes (that have since been corrected)

On going and future work:

- Other non-threshold cross-sections such as (n,f), (n,tot) and (n,el) and (n,non)
- Other quantities such as angular distributions, spectra, gamma productio, fission quantities, ….
- Data for other projectiles: proton,…

1.2 Cross-checking with evaluated data

1.2.1The past …

- **Methodology**

  Based on distances/ranking of EXFOR-ENDF and ENDF-ENDF

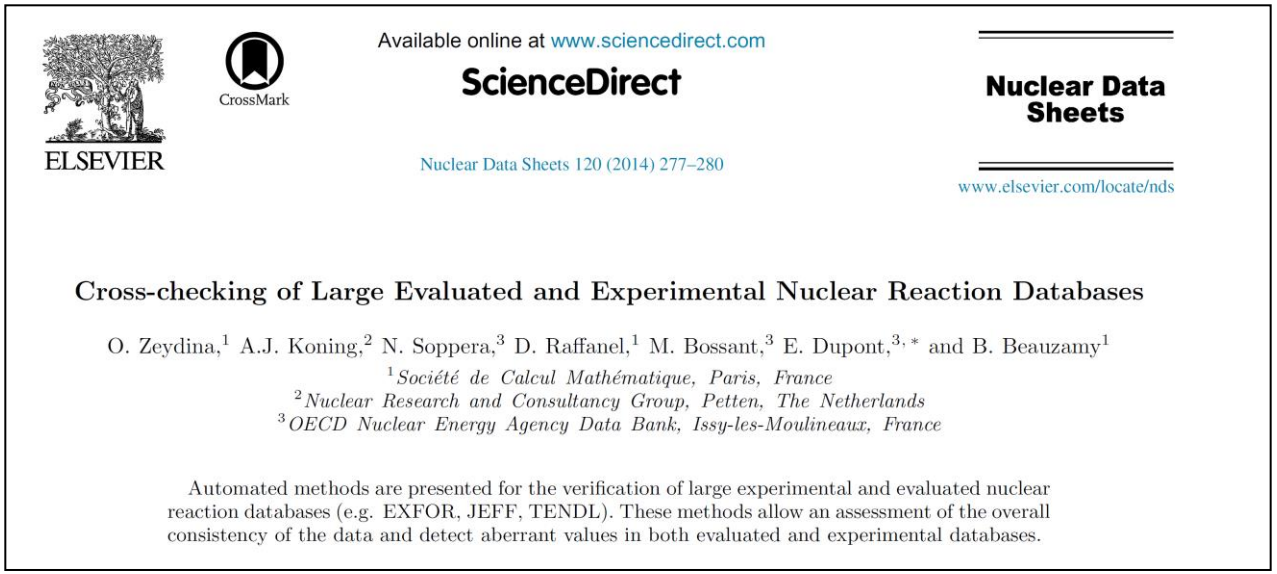
- **Outliers**

  "There is no evidence, on the basis of numerical comparisons only, that **outliers** represent "bad" data"

- **Helping ND evaluators**

  "The fact that such data deviate significantly from other data of the same reaction may, however, be **helpful to nuclear data evaluators** who focus on one or a few isotopes and may wish to discard such data after a thorough analysis"

Method developed to cross check evaluated and experimental data in databases in order to detect aberrant values.



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Cross-checking of Large Evaluated and Experimental Nuclear Reaction Databases

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Automated methods are presented for the verification of large experimental and evaluated nuclear reaction databases (e.g. EXFOR, JEFF, TENDL). These methods allow an assessment of the overall consistency of the data and detect aberrant values in both evaluated and experimental databases.

1.2.2 New…Collaboration with *Société du Calcul Mathématique –SCM* (2015-2016).

1.2.1 SCM*: ENDF-EXFOR method

- **ENDF-ENDF method**: “The absolute distance between the two libraries describing the same reaction is calculated as the integral of the difference between continuous functions. The relative one is deduced by dividing the absolute difference by the average of compared values. The final mean distance is the average of mutual distances.

- **ENDF-EXFOR method**: The absolute distance between a curve and a set of points is taken as the average of all differences of two cross-sections corresponding to the same abscissa (energy).

- **Classification of nuclear reactions**: in order to rate available nuclear reactions according to quality of their representation, a special indicator, combining the absolute and relative distances is implemented:

$$Ind = (log_{10}\, abs)^{norm} \times rel$$

- **Remark:** this indicator is able to rate the reactions only between themselves, that is to indicate the best and the worst representation among the considered ones.

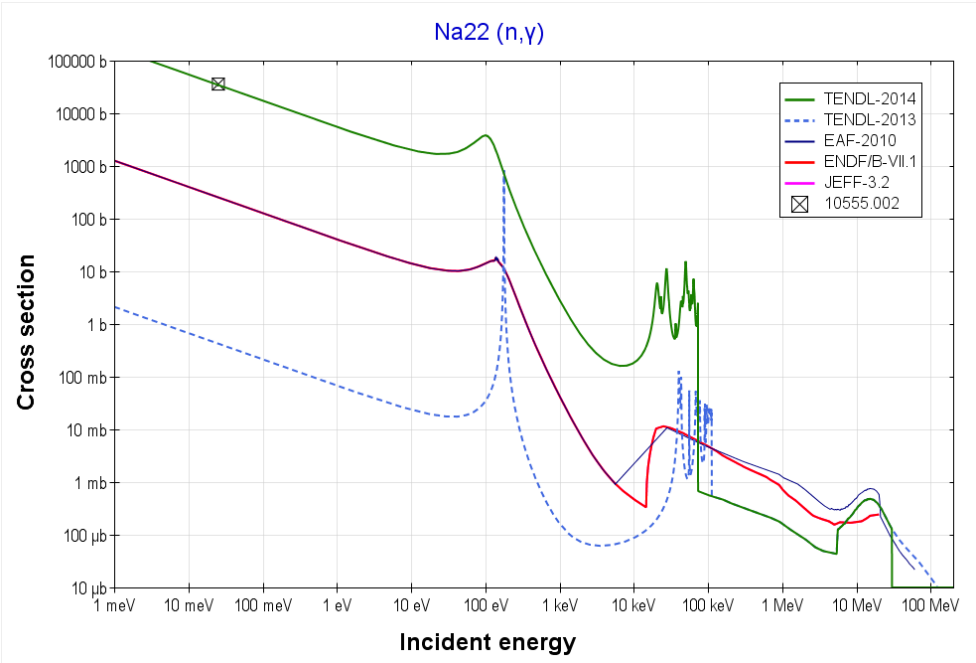
* SCM=Société du Calcule Mathématique

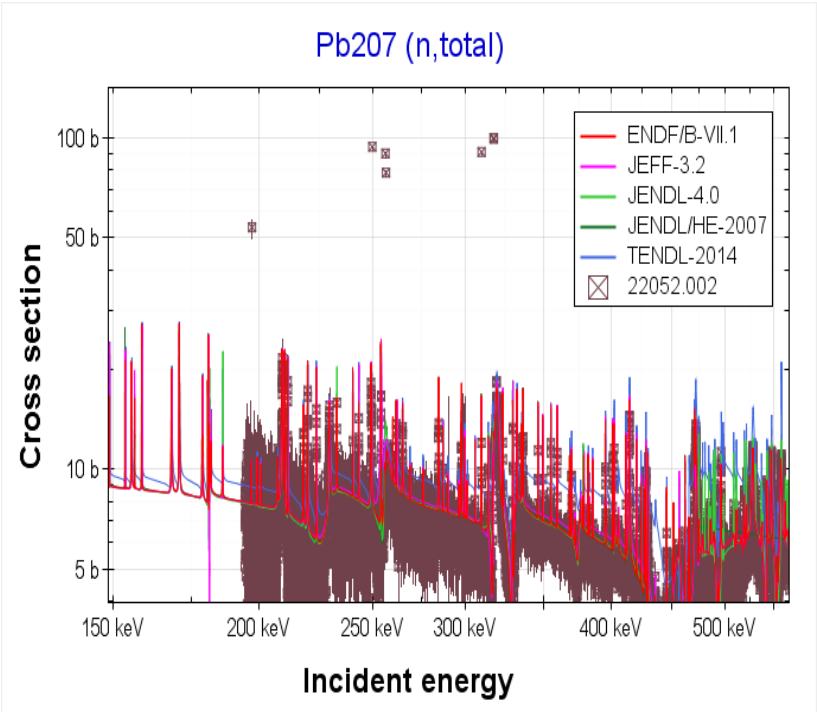
Table 1. Ranking analysis about data quality (Method SCM-2014)

quantile	Reaction title	Rank	Evaluated data	Experimental data
q100	11-NA-22(N,G)11-NA-23,,SIG (1,5) E	1,92	TENDL-13	(1 point)
q100	91-PA-234(N,F),,SIG (1,2) E	1,77		(1 point)
q100	3-LI-6(N,G)3-LI-7,,SIG (2,7) E	1,68		
q100	79-AU-198(N,TOT),,SIG (1,1) E	1,65	(1 libr.)	(1 point)
q100	71-LU-177-M(N,G)71-LU-178-M,,SIG (1,3) E	1,61		(1 point)
q100	45-RH-105(N,G)45-RH-106-M,,SIG,,,RECOM (1,1) E	1,59	(1 libr.)	(1 point)
q100	99-ES-253(N,G)99-ES-254-G,,SIG,,,RECOM (1,6) E	1,48		(1 point)
q100	10-NE-21(N,A)8-O-18,,SIG (1,4) E	1,47		(1 point)
q100	68-ER-170(N,G)68-ER-171,,SIG,,,CALC (1,6) E	1,45	(EAF-10)	(1 point)
q100	80-HG-200(N,G)80-HG-201,,SIG,,,RECOM (1,7) E	1,40	TENDL-13	(1 point)
q100	18-AR-39(N,A)16-S-36,,SIG,,,RECOM (1,4) E	1,40		(1 point)
q100	47-AG-110-M(N,G)47-AG-111,,SIG,,,RECOM (1,1) E	1,38	(1 libr.)	(1 point)
q100	95-AM-243(N,G)95-AM-244-G,,SIG,,,RECOM (1,7) E	1,36		(1 point)
q99	96-CM-248(N,G)96-CM-249,,SIG (1,6) E	1,03		
q99	48-CD-106(N,D)47-AG-105,,SIG (1,5) E	1,02		(1 point)
q95	50-SN-0(N,G),,SIG,,,DERIV (8,2) E	0,653		
q95	52-TE-122(N,G)52-TE-123,,SIG (5,6) E	0,653		(1 point)
q90	8-O-17(N,A)6-C-14,,SIG (2,5) E	0,46		

1.2.1 SCM-2014 method

SCM – 2014 Method				
quantile	Reaction title	Rank	Evaluated data	Experimental data
q100	11-NA-22(N,G)11-NA-23,,SIG (1,5) E	1,92	TENDL-13	(1 point)





Limitations:

- Absolut ranking for all reactions, failed in resonances,…
- No info about uncertainties
- Reduced set of data (no natural elements, only cross-sections, no isomeric reactions, …)

1.2.2 SCM: Verification of the databases

Comparison of EXFOR data and PENDF data, and their standard deviations.

Information for **isotopes and natural elements**

- For natural elements, PENDF is obtained with the MIXER code using the natural abundance of each isotope.

The set of **reactions** analyzed:

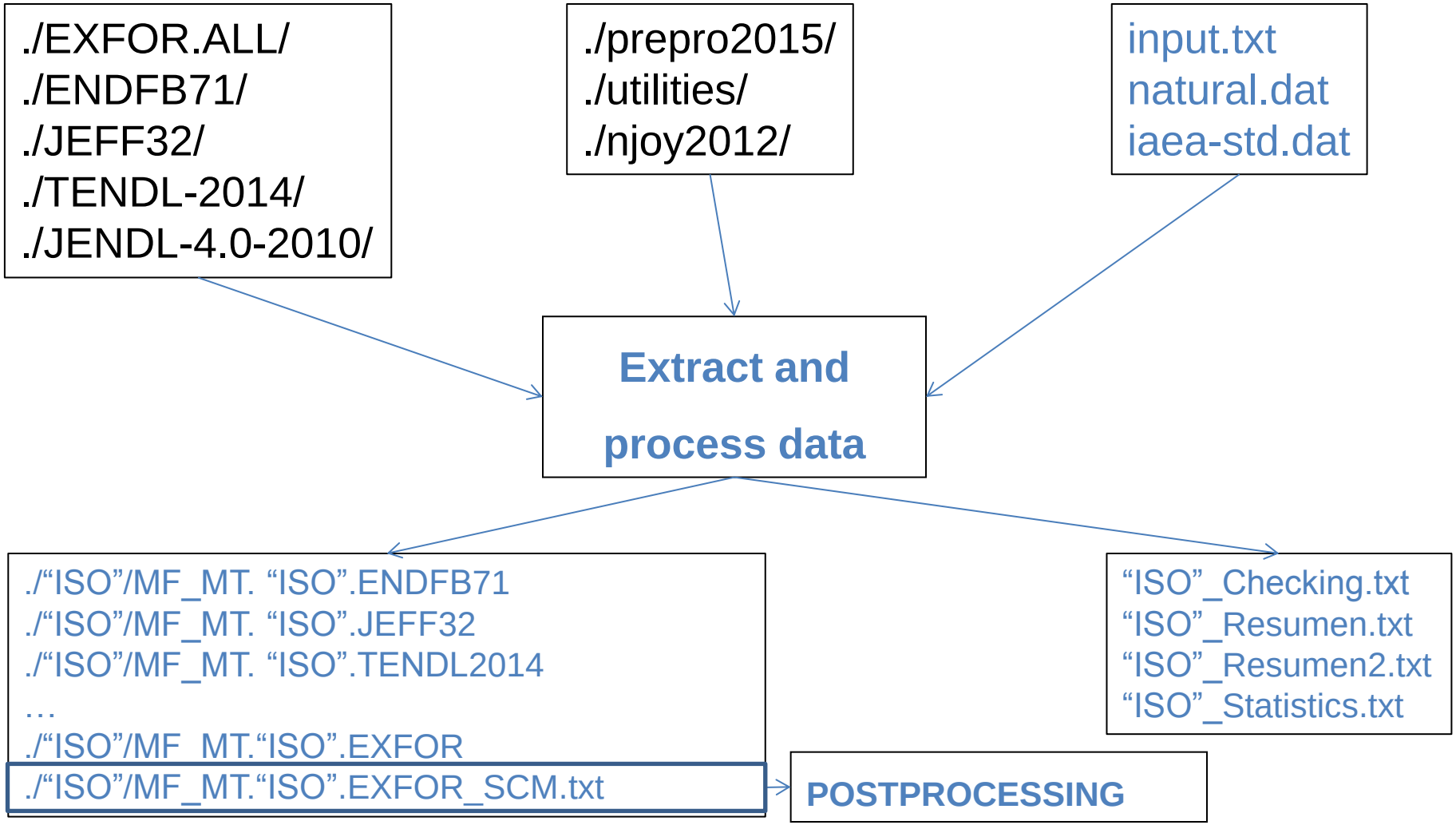
- MF3 for all isotopes and natural elements, except MT51 for natural elements
- MF3/MT251 (mu-bar) processed with MU_MAR.exe program
- MF4/MT2 for isotopes
- MF10 for isotopes

Information processed: the **nominal value** and the **relative error** (in %)

Regarding the **relative error**:

- EXFOR r.e. (%) is taken directly from EXFOR files
- For PENDF:
  - Directly from MF33 using LSTTAB code
  - Processed using ERRORR/NJOY2012 in a LANL188 energy structure

1.2.2 SCM: Verification of the databases



1.2.2 SCM: Verification of the databases

For each ISOTOPE

PENDF (call PREPRO2015 and Utilities)

(LINEAR→ RECENT → SIGMA1 → ACTIVATE → MU_BAR → LEGEND → SIXTAB → DICTIN)

If (COVARANCES) call NJOY

- MF32/33 and MF34(mu-bar)

For K=1, INDX (reactions in EXFOR)

- MF3 and MT51
- MF10
- MF4/MT2

Run LSTAB => ./“ISO”/MF_MT. “ISO”.EXFOR
./“ISO”/MF_MT. “ISO”.ENDFB71

1.2.2 SCM: Verification of the databases

For each natural ELEMENT

For all isotopes with natural abundance

MERGER+MIXER codes

PENDF (call PREPRO2015 and Utilities)

(LINEAR→ RECENT → SIGMA1 → ACTIVATE → MU_BAR → LEGEND → SIXTAB → DICTIN)

If (COVARANCES) call NJOY

- MF32/33 and MF34(mu-bar)

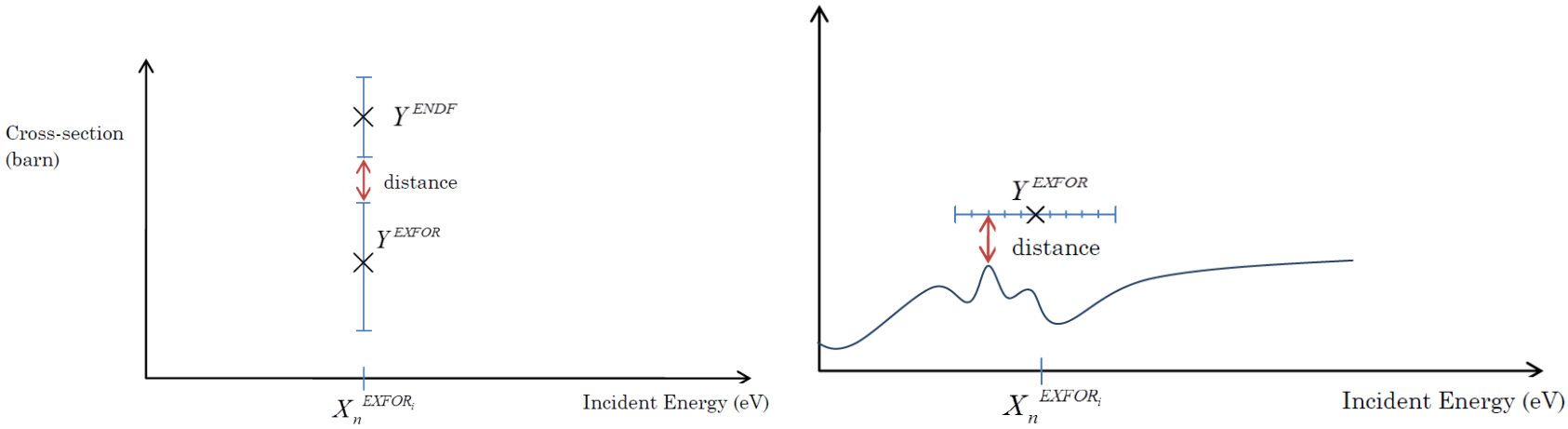
For K=1, INDX (reactions in EXFOR)

- MF3 and MF51
- MF10
- MF4/MF2

Run LSTAB => ./"ISO"/MF_MT. "ISO".EXFOR
./"ISO"/MF_MT. "ISO".ENDFB71

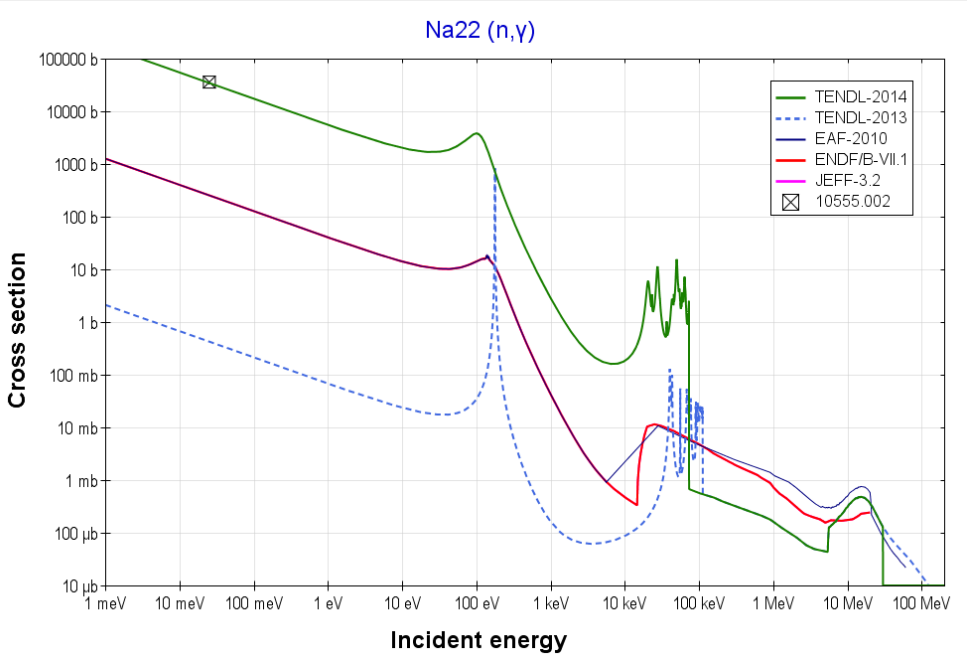
1.2.2 New method: "Ranking value" EXFOR-ENDF

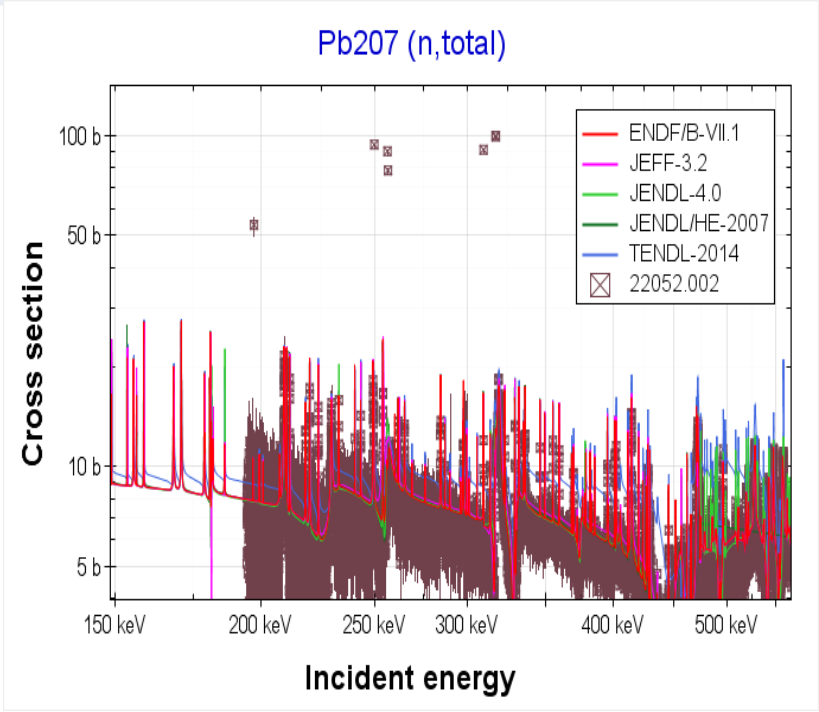
- Definition of "Ranking value" to identify the potential problem in EXFOR or ENDF (JEFF, ENDF, JENDL and TENDL)
  - Distance = max ($Q^{EXFOR/ENDF}_{5\%}$) – min ($Q^{EXFOR/ENDF}_{95\%}$)
  - Ranking:
    - 1: <= 1 times distance/ max ($STD_{EXFOR\_or\_ENDF}$)
    - …
    - 5: >= 8 times distance/ max ($STD_{EXFOR\_or\_ENDF}$)
- Ranking for complete ENTRY(for any particular point for marks "1" and "2" Entries)



1.2.2 New method: Example

SCM – 2014 Method				
quantile	Reaction title	Rank	Evaluated data	Experimental data
q100	11-NA-22(N,G)11-NA-23,,SIG (1,5) E	1,92	TENDL-13	(1 point)





SCM – 2016 Method	Mark - Ranking					
Reaction	#EXFOR points	ENDF/B-VII.1	JEFF-3.2	JENDL-4.0	TENDL-2014	worst point
Na22(n.G)	1	5	5	-	1	5
Pb207(n,tot)	37405	1	1	1	1	4

1.2.2 New method: "Ranking value" EXFOR-ENDF

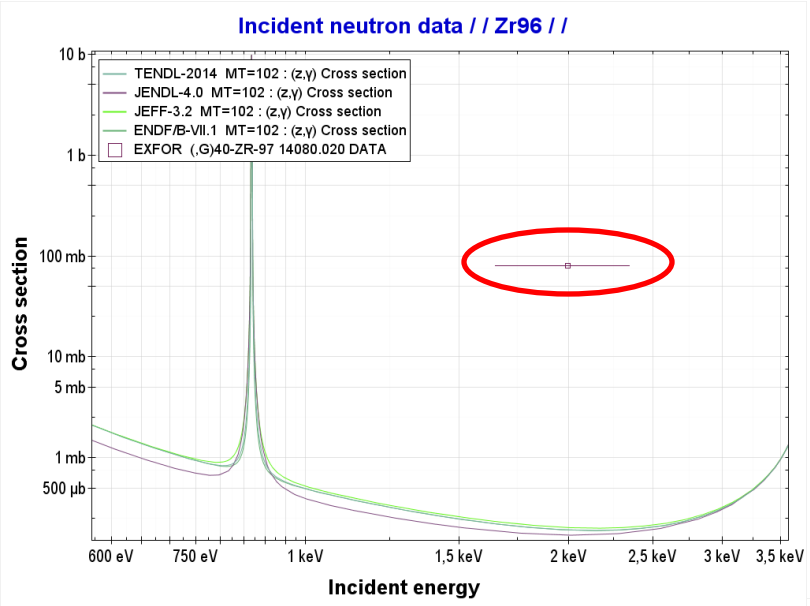
- Distance = max ($Q^{EXFOR/ENDF}_{5\%}$) – min ($Q^{EXFOR/ENDF}_{95\%}$)

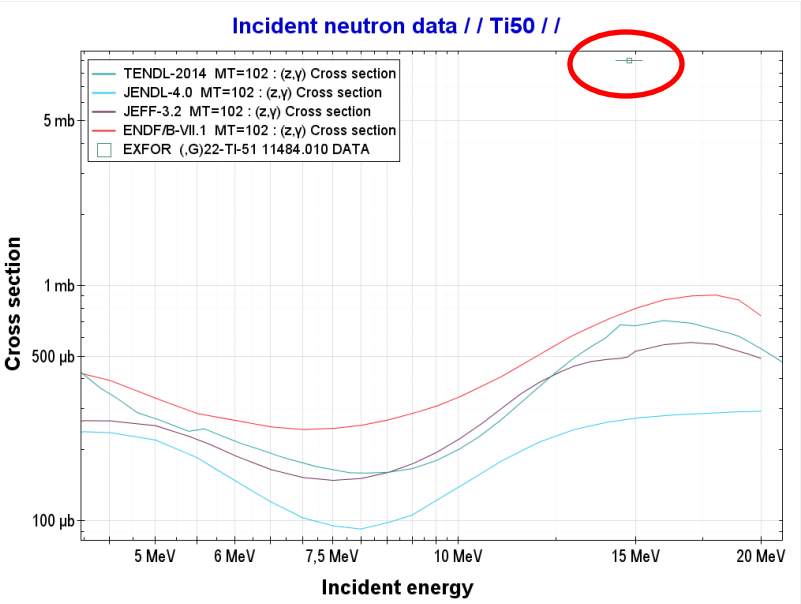
- Ranking: 1, … 5

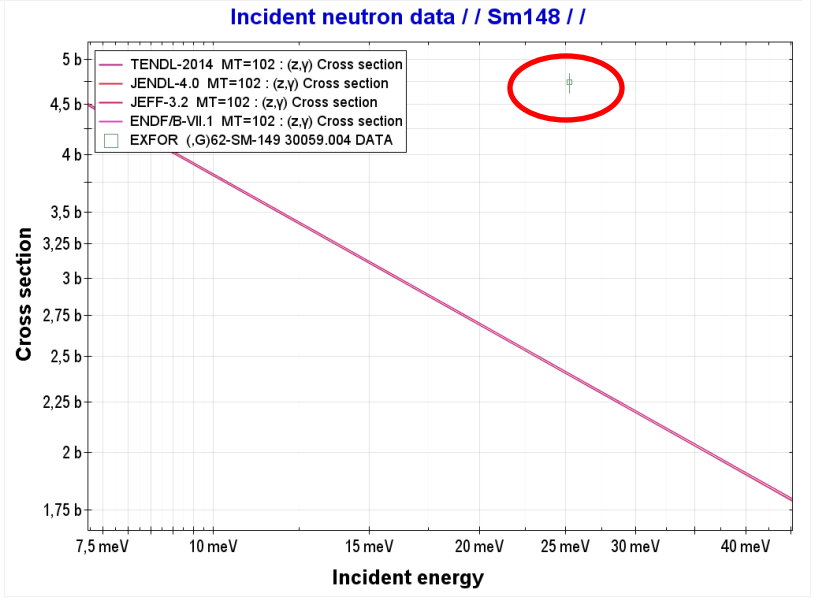
(1… to >= 8 times distance/ max ($STD_{EXFOR\_or\_ENDF}$))

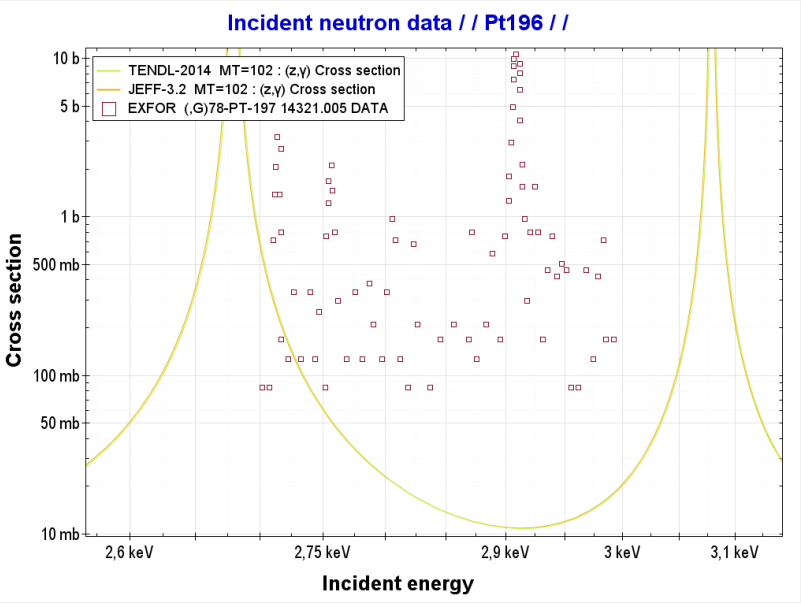
MF3	MF10			
16782	2944			
MF	MT	number of subentries checked	mark >=4 for each evaluator (**visually checked worst outliers**)	ratio
3	1	2415	51	2.11
3	2	808	6	0.74
3	3	121	0	0.00
3	4	434	0	0.00
3	16	2715	12	0.44
3	17	77	0	0.00
3	18	1338	22	1.64
3	22	70	10	14.29
3	24	5	1	20.00
3	28	87	3	3.45
3	37	31	2	6.45
3	102	3193	78	2.44
3	103	2588	14	0.54
3	104	39	0	0.00
3	105	200	7	3.50
3	106	44	11	25.00
3	107	1390	22	1.58
3	108	4	0	0.00
3	111	17	9	52.94
data set with potential problem				X>5
pay attention to this data				1<X<5
				0<X<1

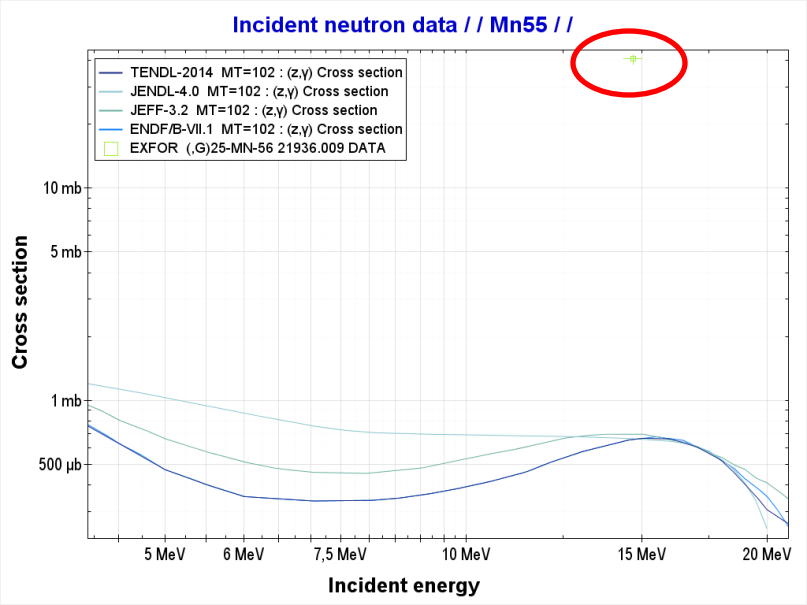
PRELIM results

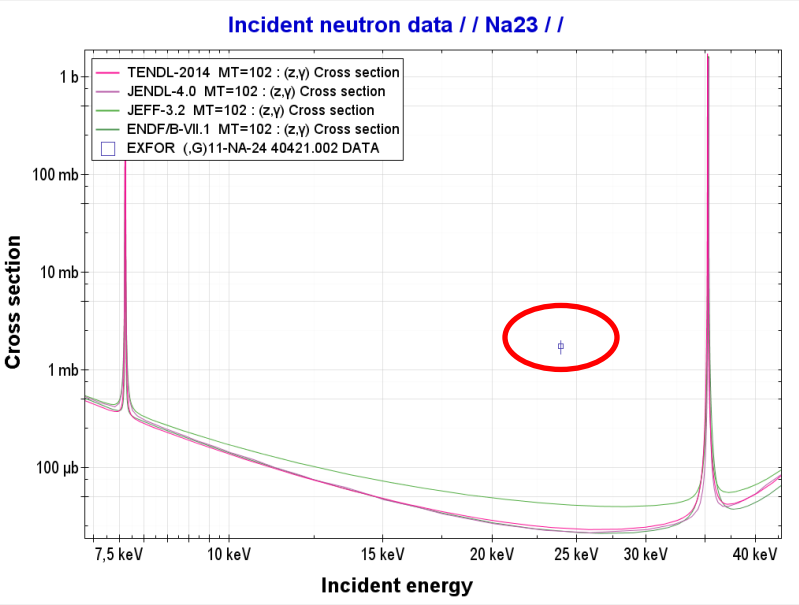


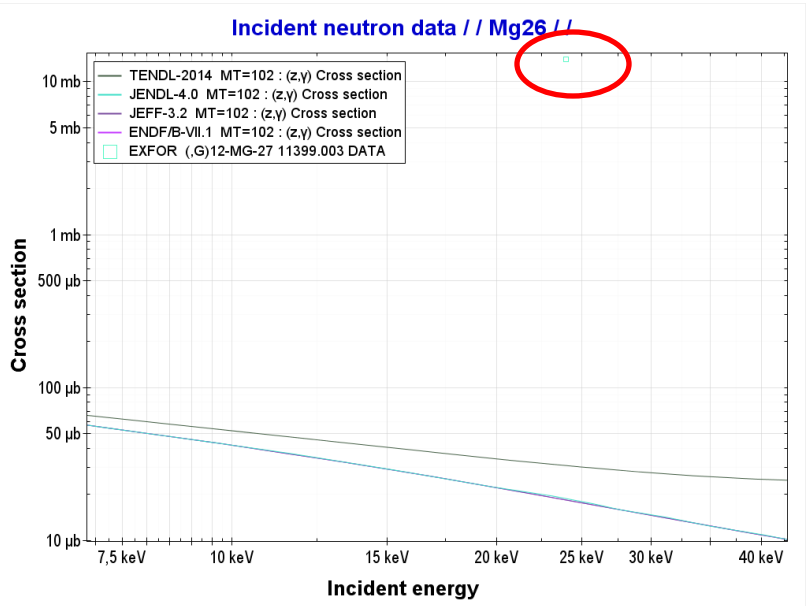


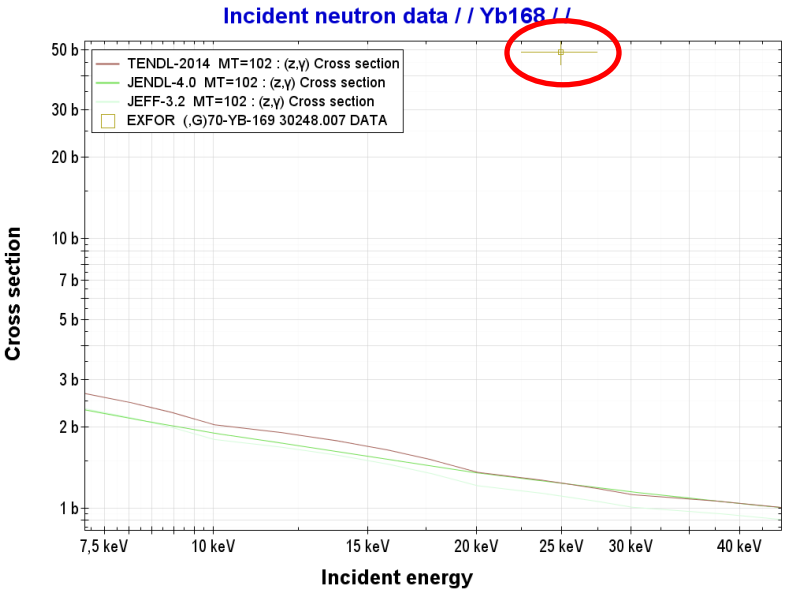




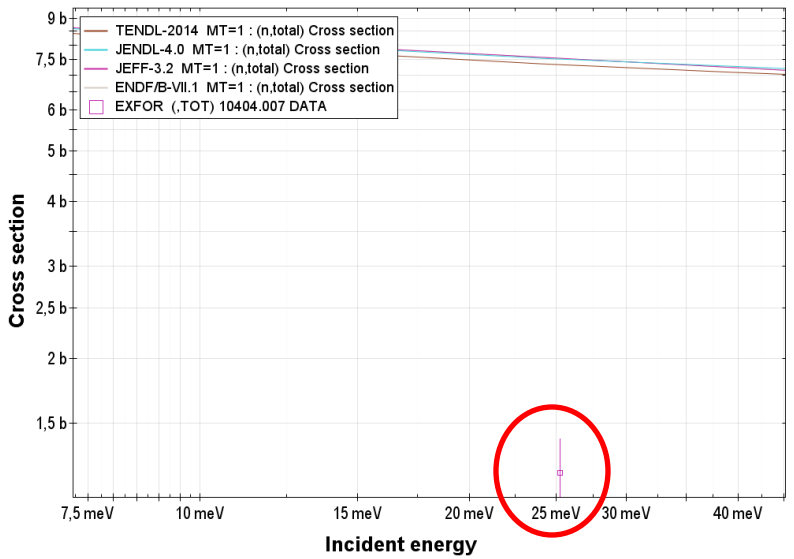




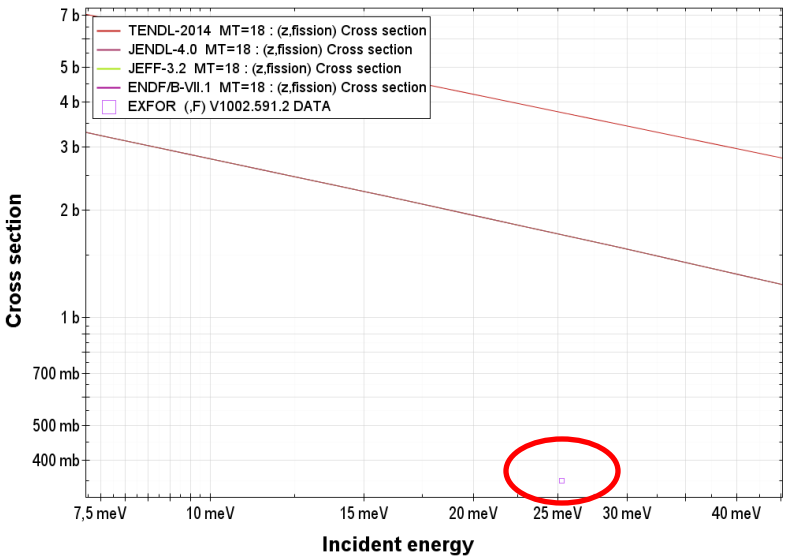




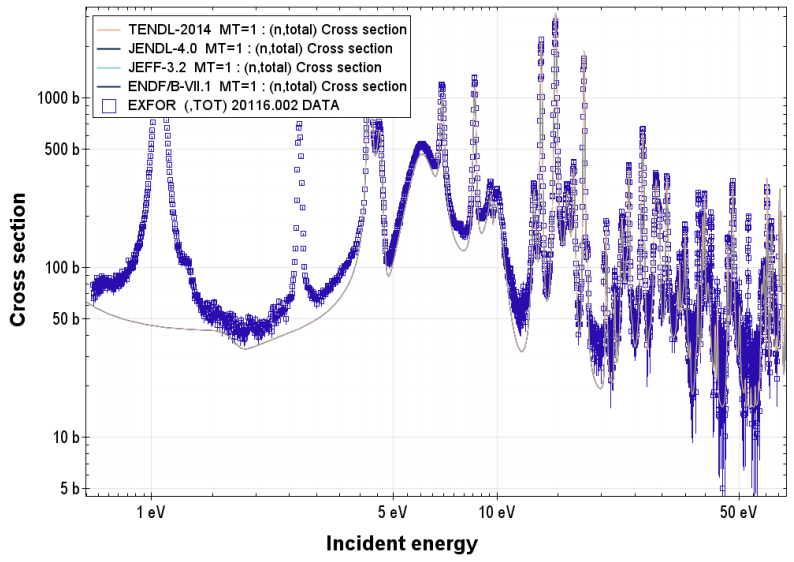
Incident neutron data / / Nb93 / /



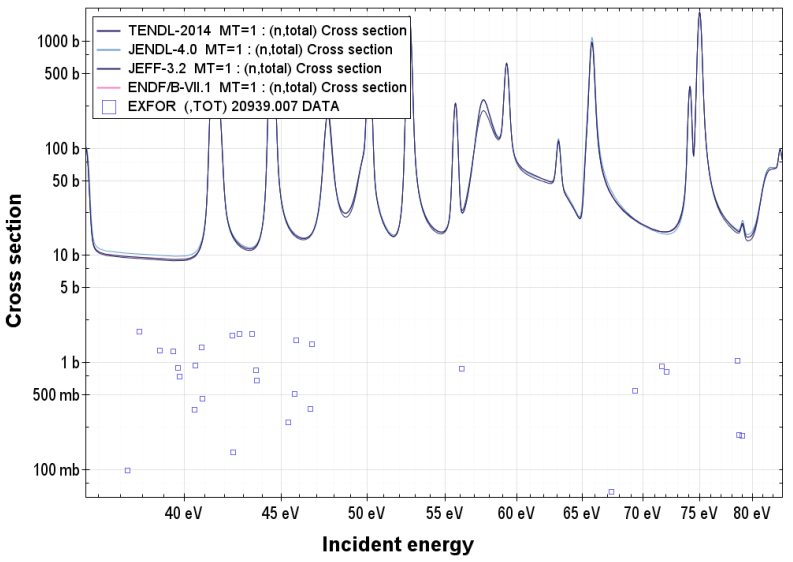
Incident neutron data / / U237 / /



Incident neutron data / / Pu241 / /



Incident neutron data / / Pu239 / /



2. Checking Integral Resonances

- INTER code is used for calculating resonance integrals:

$$RI = \int_{E_{min}}^{E_{max}} \frac{\sigma(E)}{E} dE,$$

- The ENDF files are processed with LINEAR, RECENT, SIGMA1 and ACTIVATE to provide the cross sections in pointwise format.
- LINEAR → RECENT→ SIGMA1→ACTIVATE
- For natural elements, MERGER and MIXER codes are used to combine the pointwise data.

ISO1: LINEAR → RECENT→ SIGMA1→ACTIVATE **ISO2: LINEAR → RECENT→ SIGMA1→ACTIVATE** **…** **…** **ISON: LINEAR → RECENT→ SIGMA1→ACTIVATE**	**→ MERGER→MIXER**

- Input data for INTER are the Lower and Upper limit for Resonance integral given in eV. The default of 100 keV is used if Upper limit is not given in EXFOR.
- EXFOR Data are taken from: https://www-nds.iaea.org/exfor/exfor.htm
- Final REPORT by the end of 2016

2.1. Feedbacks for Integral Resonances

New Feedbacks were added in EXFOR:
https://www-nds.iaea.org/nrdc/error/exfor_err14.html

14110.052	N.Otsuka	Data	EN-MIN:0.5E-08 MeV -> 0.5 eV	N/A	2015-10-27
14110.050	N.Otsuka	Data	EN-MIN:0.5E-08 MeV -> 0.5 eV	N/A	2015-10-27
14110.048	N.Otsuka	Data	EN-MIN:0.5E-08 MeV -> 0.5 eV	N/A	2015-10-27
14110.046	N.Otsuka	Data	EN-MIN:0.5E-08 MeV -> 0.5 eV	N/A	2015-10-27
14110.044	N.Otsuka	Data	EN-MIN:0.5E-08 MeV -> 0.5 eV	N/A	2015-10-27
14110.042	N.Otsuka	Data	EN-MIN:0.5E-08 MeV -> 0.5 eV	N/A	2015-10-27
14110.040	N.Otsuka	Data	EN-MIN:0.5E-08 MeV -> 0.5 eV	N/A	2015-10-27

40170.007	N.Otsuka	REACTION	Add SF8=MSC (RI for individual resonances)	N/A	2015-10-27
40170.007	N.Otsuka	Data	EN-MIN -> EN-RES-ERR; EN-MAX -> EN-RES	N/A	2015-10-27

41275.009	N.Otsuka	Data	EN-MIN and EN-MAX are wrong (c.f. Table 2 of J, SJA, 24, 435, 1968).	N/A	2015-10-27
41275.008	N.Otsuka	Data	EN-MIN and EN-MAX are wrong (c.f. Table 2 of J, SJA, 24, 435, 1968).	N/A	2015-10-27
41275.007	N.Otsuka	Data	EN-MIN and EN-MAX are wrong (c.f. Table 2 of J, SJA, 24, 435, 1968).	N/A	2015-10-27

2.1. Feedbacks for Integral Resonances

Table 3. EXFOR data with problems

k	imat-m	MTs	Reference	entri	RI (b)	DRI(b)	Emin (eV)	Emax (eV)	Naohiko Comment
1	922350	102	YU.V.RYABOV,ET.AL. (68)	41275,005	4,80E-01	0,00E+00	7,40E+00	1,00E+01	α-value is wrongly compiled.
2	922350	102	YU.V.RYABOV,ET.AL. (68)	41275,005	1,28E+00	0,00E+00	1,00E+01	1,50E+01	α-value is wrongly compiled.
3	922350	102	YU.V.RYABOV,ET.AL. (68)	41275,005	1,45E+00	0,00E+00	5,00E+00	7,40E+00	α-value is wrongly compiled.
4	882260	1	S.M.Kalebin,ET.AL. (71)	40170,007	1,02E+00	1,30E-01	4,00E-01	3,69E+01	RI for individual resonances
5	882260	1	S.M.Kalebin,ET.AL. (71)	40170,007	5,00E-01	1,80E-01	6,00E+00	2,62E+02	RI for individual resonances
6	882260	1	S.M.Kalebin,ET.AL. (71)	40170,007	9,00E-01	5,00E-01	7,00E+00	2,93E+02	RI for individual resonances
7	882260	1	S.M.Kalebin,ET.AL. (71)	40170,007	1,50E+00	4,00E-01	5,00E+00	2,38E+02	RI for individual resonances
8	882260	1	S.M.Kalebin,ET.AL. (71)	40170,007	5,60E+00	3,00E-01	1,20E+00	8,84E+01	RI for individual resonances
9	882260	1	S.M.Kalebin,ET.AL. (71)	40170,007	6,50E+00	4,00E-01	6,00E-01	5,57E+01	RI for individual resonances
10	942390	102	YU.V.RYABOV,ET.AL. (68)	41275,008	6,70E-01	0,00E+00	1,50E-01	5,00E+00	Emin and Emax are wrong.
11	942390	18	YU.V.RYABOV,ET.AL. (68)	41275,007	2,60E+00	1,56E-01	1,50E-01	5,00E+00	Emin and Emax are wrong.
12	942390	102	YU.V.RYABOV,ET.AL. (68)	41275,008	1,30E-01	0,00E+00	2,05E+01	3,30E+01	Emin and Emax are wrong.
13	942390	18	YU.V.RYABOV,ET.AL. (68)	41275,007	4,30E-01	2,58E-02	2,05E+01	3,30E+01	Emin and Emax are wrong.
14	942390	18	YU.V.RYABOV,ET.AL. (68)	41275,007	9,90E+00	5,94E-01	3,30E+01	4,10E+01	Emin and Emax are wrong.
15	942390	102	YU.V.RYABOV,ET.AL. (68)	41275,008	9,50E+00	0,00E+00	3,30E+01	4,10E+01	Emin and Emax are wrong.
16	942390	18	YU.V.RYABOV,ET.AL. (68)	41275,007	1,60E+00	9,60E-02	7,30E+01	1,00E+02	Emin and Emax are wrong.
17	942390	102	YU.V.RYABOV,ET.AL. (68)	41275,008	2,50E+00	0,00E+00	4,10E+01	6,00E+01	Emin and Emax are wrong.
18	942390	102	YU.V.RYABOV,ET.AL. (68)	41275,008	9,10E+00	0,00E+00	5,00E+00	7,40E+00	Emin and Emax are wrong.
19	942390	18	YU.V.RYABOV,ET.AL. (68)	41275,007	1,26E+01	7,56E-01	5,00E-01	7,40E+00	Emin and Emax are wrong.
20	942390	102	YU.V.RYABOV,ET.AL. (68)	41275,008	1,70E+00	0,00E+00	7,30E+01	1,00E+02	Emin and Emax are wrong.
21	942390	102	YU.V.RYABOV,ET.AL. (68)	41275,008	6,70E+00	0,00E+00	1,00E+01	1,50E+01	Emin and Emax are wrong.
22	942390	102	YU.V.RYABOV,ET.AL. (68)	41275,008	4,30E-01	0,00E+00	3,00E+03	1,00E+04	Emin and Emax are wrong.
23	942390	18	YU.V.RYABOV,ET.AL. (68)	41275,007	1,49E+01	8,94E-01	1,00E+01	1,50E+01	Emin and Emax are wrong.
24	942390	18	YU.V.RYABOV,ET.AL. (68)	41275,007	7,50E+00	4,50E-01	1,00E+02	1,13E+02	Emin and Emax are wrong.
25	942390	18	YU.V.RYABOV,ET.AL. (68)	41275,007	5,70E+00	3,42E-01	4,10E+01	6,00E+01	Emin and Emax are wrong.

2.1. Feedbacks for Integral Resonances

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=====================================================================
91-Pa-233, EXFOR data: http://www-nds.iaea.org/EXFOR/V1002.572
REACTION  1(91-PA-233(N,G)91-PA-234,,RI,,LIM,RECOM)
          2(91-PA-233(N,G)91-PA-234-M,,RI,,LIM,RECOM)
          3(91-PA-233(N,G)91-PA-234-G,,RI,,LIM,RECOM)
          4(91-PA-233(N,G)91-PA-234,,RI,,LIM,CALC)
it says:    4(91-PA-233(N,G)91-PA-234,,RI,,LIM,CALC)
it should say:          4(91-PA-233(N,F),,RI,,LIM,CALC)
=====================================================================
50-Sn-124, EXFOR data: http://www-nds.iaea.org/EXFOR/V1001.532

REACTION  1(50-SN-124(N,G)50-SN-125-M,,RI,,LIM,RECOM)
          2(50-SN-124(N,G)50-SN-125-G,,RI,,LIM,RECOM)
          3(50-SN-124(N,G)50-SN-125,,RI,,LIM,CALC)

For: # 2 (50-SN-124(N,G)50-SN-125-G,,RI,,LIM,RECOM) , UNIT is "MB"??
=====================================================================
61-Pm-148M, EXFOR data: http://www-nds.iaea.org/EXFOR/V1002.173

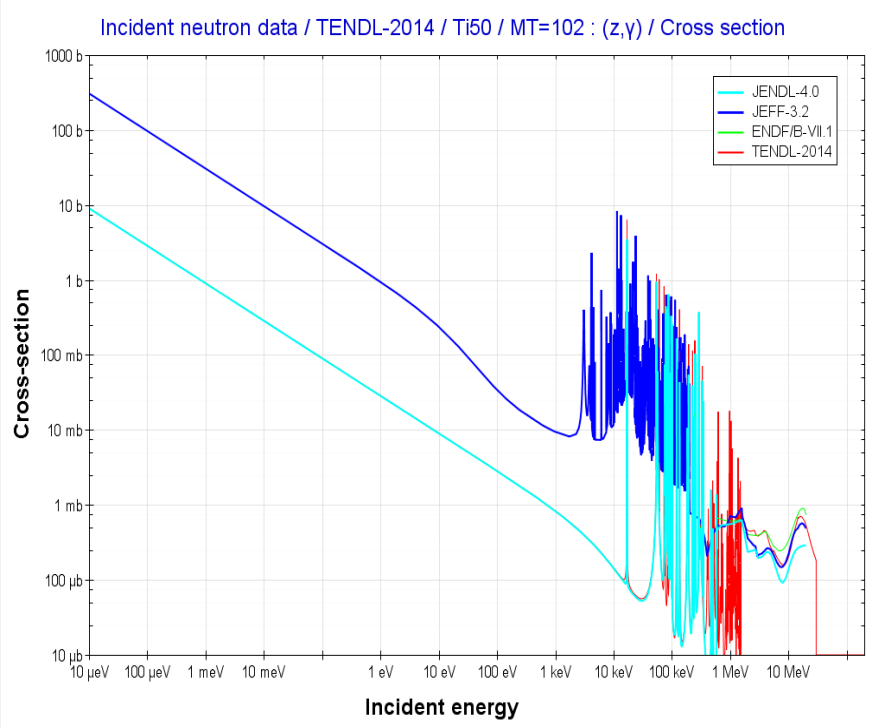
REACTION   (61-PM-148-M(N,G)61-PM-149,,RI,,LIM,RECOM)
E-MIN, 0.0253 eV???
=====================================================================
55-Cs-135, EXFOR data: http://www-nds.iaea.org/EXFOR/V1002.082

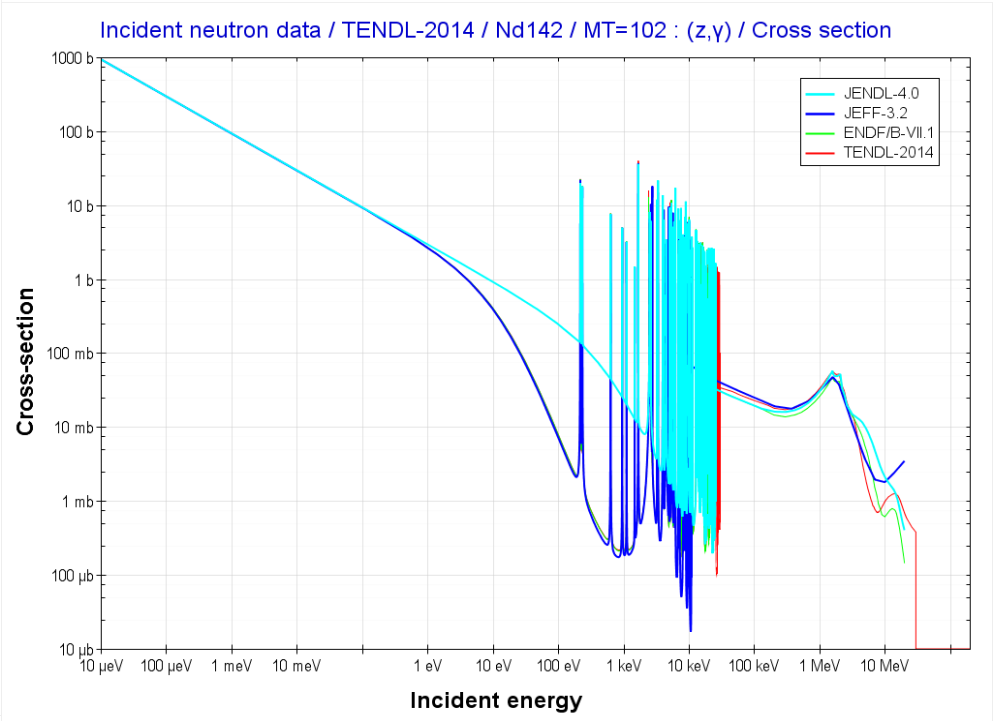
REACTION  1(55-CS-135(N,G)55-CS-136,,RI,,LIM,RECOM)
          2(55-CS-135(N,G)55-CS-136,,RI,,LIM,CALC)
DATA for #2 is "3.0 B" ???
=====================================================================
58-CE-138, EXFOR data: http://www-nds.iaea.org/EXFOR/V1002.126

REACTION   (58-CE-138(N,G)58-CE-139,,RI,,LIM,RECOM)
E-MAX, 10 eV??
=====================================================================
```

2.2. Feedbacks for Evaluations (JEFDOC-1693)

												(C-E)/DE			
k	imat-m	Iso	MTs	Reference	entri	RI (b)	DRI(b)	ENDFB71	JEFF32	JENDL-4.0	TENDL-2014	E71	JF2	JL4	TE4
9	220500	Ti50	102	S.F.Mughabghab (06)	V1001.169	8,30E-02	6,00E-03	8,74E-02	2,43E+00	8,74E-02	9,08E-02	1	392	1	1
26	601420	Nd142	102	S.F.Mughabghab (06)	V1002.148	8,80E+00	5,00E-01	6,09E+00	6,04E+00	8,44E+00	6,10E+00	-5	-6	-1	-5





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