

Zero and negative values coded under the headings PARITY, EN, ERR-T and DATA-ERR in the EXFOR library (A47)

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According to Action A47 of NRDC2024 meeting, Viktor Zerkina checked whole EXFOR data base to find Subents, where zero and negative values of PRT(parity), EN(incident particle energy), DATA-ERR(data uncertainty), ERR-T(total uncertainty) are given. As result - 4 files were produced for these four cases -volume 125 bytes; 13458 bytes; 601482 bytes; 6081034 bytes, respectively.

In Table 1 there is statistics of these suspicious Entries for all areas. The total number of Entries for analysis is 387, the total number of Subents is essentially higher.

Table 1.Number of Entries in files produced by Viktor Zerkina.

(**green** –corrected; **yellow** – checked, comments in Tables 2-5)

Area	PARITY	EN	ERR-T	DATA-ERR
1	1	7	10	69
2	1	7	33	46
3	-	-	10	12
4	-	1	5	8
A	-	4	5	3
C	-	4	4	21
D	-	1	22	33
E	-	-	11	27
F	-	-	1	6
G	-	-	1	1
K	-	-	-	4
I	-	-	-	6
M	-	-	-	8
O	-	-	4	6
S	-	-	-	2
T	1	-	-	1
V	-	-	-	1
All areas	3	24	106	254

I started analysis of these suspicious data Subents listed in the files received from Viktor Zerkina. Results of this analysis are given in four Tables 2-5, respectively for these 4 cases.

Relevant articles (Tables of data, Figures with plotted data) and archival files (initially compiled data, where it's available) were checked for the Subents listed in the Tables. Proposed correction, comments and questions are given in 4th column of these Tables. Checking of data received from authors is most problematic.

This analysis is finished for two cases (PARITY and EN) - in Tables 2 and 3. For Subents of Table 4 (ERR-T) and Table 5 (DATA-ERR) the analysis was finished only for area 4.

Also I made corrections of all Subents for area 4 in trans.4217 and trans.4218 (both are final, **green colour** in the Tables 1, 3-5).

Subents of Table 3 (EN) in **blue colour** contain data of astrophysical factor S0 (SF6-SF8 = ,SIG,,SFC) at zero energy, derived from directly measured data. These Subents could be discussed at EXFOR Workshop2024.

Questions for discussion:

What is right presentation of such data?

What does mean EN=0? May be it's thermal point, analogously to SIG0 (cross-section at thermal point 0.0253 eV)?

Can the derived value at the zero EN be presented together with the directly measured data in one Subent or it's better in separate Subent?

Can these derived value at the zero EN be moved in ADD-RES lines (additional results)?

When EN=0. could be used (what data type, reaction)?

Proposals:

- 1) Discuss rules of compilation of astrophysical factor for zero energy at EXFOR Workshop2024.
- 2) Discuss correction of negative and zero values of ERR-T and DATA-ERR at EXFOR Workshop2024.
- 3) Check Subents listed in Tables 2-5 in responsible centers and correct if possible, taking into account comments in 4th column of Tables 2-5.
- 4) Insert in codes checking EXFOR transes (CHEX, Janis trans checker, some new code) these checking options: parity =0., EN < or = 0., ERR-T < or = 0., DATA-ERR < or =0.

Table 2. PARITY (PRT in SF6 of REACTION)

N	Entry	Subents	Proposed correction
1	14709	011	PTY -> L (momentum l, see S.Mughabghab's Atlas)
2	22602	002	PTY -> L (momentum l, see S.Mughabghab's Atlas)
3	T0246	008	Zero parity value -> blank, see Table 1

Table 3. EN (Entry for area 4 was corrected already – green colour.)

N	Entry	Subents	Proposed correction/ comment/ question
1	11557	003	EN -> EN-RES, add RES in SF8
2	12629	002	Re-compile this Entry, lot of data are absent on thermal neutron capture.
3	14239	022,035,044	Lines with zero values could be deleted?
4	14316	004,005	Check EN=0. - data for spont. fission or for thermal point? (No data for EN=0. at ENDF/B-VII file for MF=3, MT=18)
5	14570	002	At Fig.7 (data from author correspond to Fig.7) there are no data point at EN=0. It looks like EN (given in data block) is EN-MIN.
6	14687	003	Wrong digitized energy values. See comment for 14688. Check also Subents 002 and 004
7	14688	002	Negative energy of incident neutrons were wrong digitized from figure. Other energy values are also wrong ; first left point is ~ 3.5 eV... 600 , 650 microsec/m velocity neutrons are not of negative energy.... SIG from TOF dependence can be digitized using linear scale of TOF.
8	20603	003,005,007	EN -> EN-DUMMY=0.0253 eV ? (SIG0 is usually CS at 0.0253 eV), see Table 6 of ZN/A,31,115,1976.
9	21660	024-027	EN -> EN-DUMMY=0.0253 eV ? (SIG0 is usually CS at 0.0253 eV), see Table 5
10	21842	024-028,	EN -> EN-DUMMY=0.0253 eV ? DERIVED data . (SIG0 is usually CS at 0.0253 eV, see Table 5)
11	22104	003,005	EN=0. MeV -> EN-DUMMY=0.0253 eV ?
12	22138	006	0. -> 0.55 meV ?
13	22217	002,003	EN=0. MeV -> EN-DUMMY=0.0253 eV ? (SIG0 is usually CS at 0.0253 eV) Add data at 1.970 keV (table 4)
14	23747	002-005	EN: 0. -> 11.7 meV (see page 062002-03); check MONIT value 2.628 in title of Table II; STATUS - only Table II.
15	40429	002,004	Data for EN=0 were corrected as data for SF in trans 4217
16	A0945	004-005	Add DERIV – data were extrapolated to EN=0. EN -> EN-CM ? (SF6=SFC)
17	A1258	002	Irradiation at Ealpha=6.0, 5.48 MeV(initial energy). EXP -> DERIV to EN=0 ? Add other data(Table 3) derived from different energy dependence, add used branching coeffs. EN -> EN-CM ? (SF6=SFC)
18	A1436	002,003	Evaluations, delete these data? (SF6=SFC, data were derived by fitting of others exp.data)
19	A1459	002	Evaluations, delete these data? (SF6=SFC, data were derived by fitting of others exp.data)
20	C0174	003	Add DERIV – data were derived from measured CS to EN=0. (SF6=SFC)
21	C0720	004,007	Value at EN=0. is extrapolation, see Fig. 5-no exp.point, move it in ADD-RES.
22	C1290	002-005	Extrapolated to EN=0. EN -> EN-CM, see Fig.7(SF6=SFC)
23	C2598	006	Add DERIV ? At EN=0 data were derived using asymptotic normalization coefficient (ANC). (SF6=SFC)
24	D0002	006	Columns 1, 2 headings in DATA block has to be swapped: 1: EN->ANG-CM, 2: ANG-CM -> EN Define ref. in STATUS (two refs. in .001)

Table 4. ERR-T (Area 4 Entries were corrected already in trans.4218)

N	Entry	Subents	Correction proposed
1	10593	003	EN ANG DATA ERR-T

			MEV ADEG B/SR PER-CENT 2.300000 1.1000E+02 1.0540E-01 0.0000E+00 received on magnetic tape, Smith, 1976/2. Zero value could be replaced by 7.% as in neighboring points?
2	10827	097	E-MIN E-MAX ANG DATA ERR-T MEV MEV ADEG MB/SR MB/SR 14.5 15.0 90. .002 .000 Private comm., Grimes, 1979/11/13. No figure in the article. Could be estimated by partial %-uncertainties given?
3	10867	003	EN EN-RSL ANG-CM DATA-CM ERR-T MEV MEV ADEG MB/SR MB/SR 11.0 0.09 135.41 3.8 E+00 0. E-01 from J.Rapaport, 23 Feb. 1979 Could be estimated by neighboring points? Fig.11- error bars are inside symbol for this point.
4	12928	039	E-MIN E-MAX DATA ERR-T MEV MEV MB/SR/MEV MB/SR/MEV 1.85 2.00 2.50 0.00 Misprint, 0.00 -> 0.8 in this line. Delete right zero digit in DATA and DATA-ERR values– see Table in the article.
5	13500	007	
6	14139	002	
7	14211	005	
8	14347	007,010	
9	14497	002	
10	14521	093	
11	20557	004,006	
12	20572	003,005,007, 009	
13	20955	007,008, 011-013	
14	21683	002	
15	21773	022	
16	21845	002	
17	22030	003	
18	22037	002	
19	22360	029,033	
20	22724	007,008	
21	22741	002,006,007	
22	22794	002-016,018, 020,022-033, 035-045, 047-058, 060-077, 080-083, 085-087, 090-096, 098-103,122	
23	22870	005	
24	22884	017	
25	22961	022	
26	23070	007	
27	23073	004,018	
28	23129	002	
29	23137	002,004-008, 011,012,014, 018,020	
30	23173	002-012	
31	23204	005,017,018	
32	23222	002	Many points!
33	23250	002-004, 006-010, 012-017	
34	23258	011	

35	23292	002-051	
36	23324	002-005	
37	23325	003,004,006,007	
38	23346	018-021,023-027	
39	23392	012,014	
40	23456	005,007	
41	23458	006	
42	23461	014-016	
43	23780	002	For element 38, mass 100, frac.yield(0.1+-0.0%) ERR-T=0.0 in Table III, misprint? Compare with ind.yield 0.006+-0.001% calculated as frac.yield 0.1+-0.0 multiplied by mass yield 6.3+-0.1%, see Table IV. From this calculation ERR-T could be estimated?
44	30470	002	
45	30532	039	
46	30985	006	
47	31461	002	
48	31605	004	
49	32001	019	
50	32625	004	
51	32682	003	
52	32742	002	
53	32774	002	
54	40012	002,004,006	Lines with zero DATA & ERR-T were deleted - they are absent in Tables
55	40518	002	5 lines with zero DATA & ERR-S & ERR-T were deleted
56	40825	004	ERR-T value 0.0 was in initial compilation, was replaced by 0.20 taking into account error bars of these points on a figure in the article.
57	40863	002	ERR-T = 0. mb at En=0.3 MeV was deleted - see comment of compiler.
58	41300	002	ERR-T : 0.000 -> 0.0010 at EN=4.719 MeV taking into account ERR-T values at neighbouring points - 0.0059+-0.0011, 0.0052+-0.0009 (one digit was lost at the right side of this table in the article).
59	A0058	002,008	
60	A0068	004,009,019,024,029,034,039,044,049	
61	A0101	077,078	
62	A0276	020	
63	A1030	004	
64	C1667	002-005	
65	C2200	027	
66	C2221	005	
67	C2279	011	
68	D0754	006	
69	D0796	002	
70	D4046	003	
71	D4055	004	
72	D4141	008	
73	D4167	005	
74	D4173	004	
75	D4189	002	
76	D4209	006	
77	D4228	009	
78	D4231	003	
79	D4333	011	
80	D4368	007	
81	D4369	017	
82	D4376	010	
83	D4397	014	
84	D4401	015	
85	D4407	008	
86	D4409	002,005	
87	D4411	009	
88	D7038	006	

89	D8096	002	
90	E1411	260	
91	E1779	003	
92	E1910	003	
93	E1973	002	
94	E1989	002,004,005	
95	E2110	108	
96	E2117	008,012,013	
97	E2147	003	
98	E2341	002	
99	E2536	013	
100	E2594	002-005	
101	F1459	003	
102	G0038	003	
103	O2476	011	
104	O2480	002	
105	O2526	002	
106	O2544	013	

Table 5. DATA-ERR (Area 4 Entries were corrected already)

N	Entry	Subents	Proposed correction
1	10093	071	
2	10212	004	
3	10267	024,025	
4	10340	006-008	Negative DATA-ERR
5	10449	041	
6	10524	012	
7	10572	004	
8	10582	002,003	
9	10591	091	
10	10631	003,005,007	
11	10686	003	
12	10730	004	
13	10847	002	
14	10883	002	
15	10891	003	
16	10978	002	
17	11216	011	
18	11220	007	
19	11233	007	
20	11358	002	
21	11452	015	
22	11492	021	
23	11495	060,061	
24	11512	003	
25	11520	003	
26	11641	026	
27	11826	002	
28	11905	042,162	
29	12065	004	
30	12144	003	
31	12174	008	
32	12337	009	
33	12432	002	
34	12523	002	
35	12552	002	
36	12553	002	
37	12558	002,003	
38	12757	003	
39	12948	002	
40	13162	006	
41	13168	005	

42	13197	003	
43	13198	002	
44	13517	002	
45	13527	002-013	
46	13530	002-012	
47	13539	003	
48	13742	003,005	
49	13744	011	
50	13760	007	
51	13848	007	
52	13936	003	
53	13945	002	
54	13947	002	
55	14003	003	
56	14027	002	
57	14148	006	
58	14162	003,004,008,009,014, 015,019,020-025, 028-033,035-067, 069,071,073, 075-082,084,085, 088-090,092,096, 098-104,107-109, 113,115,118,119	
59	14209	005	
60	14229	007,016,018,021	
61	14263	026	
62	14315	002	
63	14361	022,041-043,072, 073,081,082,101-103	
64	14481	002	
65	14514	002,003,005	
66	14546	006	
67	14676	005,006,011-020	
68	14720	002	
69	14797	004	
70	20055	003	Delete DATA-ERR value 0. at 10 MeV energy - point at 10 MeV is absent, error-bars are absent, histogram value is given on figure.
71	20332	006	There are no points without error-bars on figures
72	20359	003,006	Delete “-“ in DATA-ERR column- see Fig.4 of NP/A,212,182,1973 Move ref. NIM,108,581,1973 in REL-REF (neutron source details)
73	20370	006,007,012,016,017, 021	
74	20374	014	
75	20726	004	
76	20784	003	Delete “-“ in DATA-ERR column? In Subent 002 STATUS (TABLE)
77	20804	005	
78	20939	006,008,010	
79	21661	002	
80	21747	022	
81	21861	051,061,071,081	
82	21865	005	
83	21986	018,061	
84	22075	008,012,018,145	
85	22077	017,046	
86	22106	031	
87	22157	059	
88	22188	015	
89	22288	002	
90	22296	007	
91	22358	002,004,005	
92	22359	002,005,008	

93	22660	002,	
94	22773	021,022,091,092,141, 142	
95	22780	003	
96	22850	007,008	
97	22923	014	
98	22945	032,034	
99	23065	004,005,010-018	
100	23083	005	Zero DATA-ERR values could be deleted?
101	23119	004,005	
102	23124	003	
103	23164	021	
104	23187	005	
105	23209	007,009	
106	23279	015,016	
107	23365	005,009	
108	23400	007	Eres=356.40 error is 0 in Table 7, Misprint in the article?
109	23417	002,003,005,006	
110	23444	005	
111	23445	003	
112	23451	004	
113	23462	008	
114	23724	002	
115	23728	003	
116	30204	002	
117	30358	002	DATA-ERR 3 at 2.01 keV resonance: 0. -> 0.003 eV, see Table 3
118	30395	005	
119	30508	002-005	
120	30623	003	
121	30828	003	DATA-ERR=0(digitized) at 13.34 eV could be deleted? Or re-digitize?
122	30908	002,003	
123	31729	002-006	
124	31816	121,146,147,158	
125	32868	004	
126	33026	004	
127	33167	002	
128	40162	028	DATA-ERR 0.00 -> 0.006 for 9.96 eV energy .
129	40511	002	Line 680 keV deleted (doublet).
130	40474	003	Misprint, 0. -> 8.
131	40653	006	Delete zero DATA-ERR - error bars are absent on fig.10.
132	41021	002,005,007,008	Zero DATA-ERR were deleted - absent on the article.
133	41249	007	Delete zero DATA-ERRs, absent in the article.
134	41553	002	Misprint in data block, 0. -> 0.05 .
135	41741	006	Delete DATA-ERR=0 - absent in Table.
136	A0244	003,006	
137	A0677	002	
138	A1155	003	
139	C0263	007	
140	C0354	002	
141	C0374	002	
142	C0445	004	
143	C0512	002	
144	C0683	003	
145	C0718	005	
146	C0768	002	
147	C0882	007	
148	C1272	005,006	
149	C1469	006	
150	C1613	009	
151	C1680	002	
152	C2154	004	
153	C2159	002	
154	C2240	005	

155	C2308	002	
156	C2336	006,007	
157	C2574	002	
158	C2591	002	
159	C2597	004,006	
160	D0076	010	
161	D0171	003	
162	D0207	004,007	
163	D0493	024	
164	D0579	003	
165	D0620	009,010	
166	D0659	004	
167	D0813	003	
168	D0839	002	
169	D0878	002	
170	D0905	002	
171	D0940	002,003	
172	D0975	002,003	
173	D0991	004,005	
174	D0992	003	
175	D4242	006	
176	D4260	012,014	
177	D4325	021	
178	D5196	002	
179	D6021	019,034	
180	D6058	003	
181	D6065	006	
182	D6112	002-005	
183	D6158	002	
184	D6166	003	
185	D6222	002	
186	D6224	005,009,012,013, 018,019	
187	D6229	002,003	
188	D6235	016,017,019	
189	D6243	004,005	
190	D6245	002,003	
191	D6311	004	
192	D8047	006	
193	E1208	003,004,033,052,061	
194	E1302	012,020,030	
195	E1368	007	
196	E1440	003	
197	E1520	008	
198	E1667	003	
199	E1748	004,005,012,013,039	
200	E1859	004	
201	E1899	027,028	
202	E1922	003,005,017	
203	E2074	004	
204	E2125	027	
205	E2237	016	
206	E2339	003,006,010	
207	E2374	005	
208	E2411	004-033	
209	E2525	002,003	
210	E2550	004	
211	E2551	004,005	
212	E2576	003	
213	E2591	002	
214	E2639	003	
215	E2661	002-013	
216	E2680	002-024	

217	E2708	002-006	
218	E2717	002	
219	E2723	002	
220	F0377	003	
221	F0389	002	
222	F0497	002	
223	F0793	004	
224	F1342	008	
225	F1422	003	
226	G0003	006,007	
227	K2027	003,175,177,178	
228	K2193	002	
229	K2688	004	
230	K2694	002	
231	L0028	009	
232	L0046	011	
233	L0083	002	
234	L0151	004	
235	L0178	008	
236	L0187	004	
237	M0024	002	
238	M0070	020	
239	M0140	002,008,014,016,019	
240	M0305	040	
241	M0978	006	
242	M1028	003	
243	M1036	003	
244	M1037	003	
245	O2139	019	
246	O2170	193,195-210,227, 238,240-243,261	
247	O2349	004	
248	O2458	004	
249	O2550	002,014	
250	O2558	002	
251	S0009	003	
252	S0240	002	
253	T0269	003	
254	V0002	003-008,011-015, 017-023	