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Erroneous E-LVL values (CP-D/1043)

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Agenda

Purpose	To reflect what is really reported
Process	Extraction and confirmation
Results	Unit
	Heading
	Values in Data and Common sections
	REACTION
	EN-SEC
Statistics of errors	Counting
	Result
Summary	

Agenda

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Purpose

Extraction — Selecting the data whose E-LVL value is more than 5% away

Confirmation — Comparing EXFOR and the original paper

Modification — Modifying if correction is really necessary

To Reflect what is really reported by experimenter

Agenda

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Table 1: Number of E-LVL values for each reaction and incident particle

Reactions, Projectile	Number of E-LVL values (Fraction (%))	Fraction of experiments in EXFOR (%)
Proton	273 (29)	20
Deuteron	270 (29)	9
Helium-3	143 (15)	3
Neutron	117 (13)	46
Helium-4	96 (10)	8
Gamma ray	24 (3)	6
Triton	9 (1)	1
Spontaneous Fission	1 (0)	3
Total	933 (100)	100

There were **933**[1] E-LVL values more than 5% far from any values registered in ENSDF

[1] If the same subentry had multiple E-LVL values in the Data or Common sections, they were counted separately.

EXFOR is built on the cooperation of various data centers.

Table 2: Number of suspicious E-LVL values per data center/projectile

Center / projectile	O	E	F	2	D	A	1	4	C	M	T	L	3	S	K	R
Number of E-LVL values (Fraction (%))	439 (47)	138 (15)	106 (11)	56 (6)	36 (4)	30 (3)	28 (3)	26 (3)	25 (3)	12 (1)	11 (1)	11 (1)	8 (1)	5 (1)	1 (0)	1 (0)
Fraction of experiments in EXFOR (%)	10	5	6	15	8	5	19	7	10	4	1	1	8	1	0	0

It became clear that there were some cases that needed to be corrected.

Table 3: Number of data with and without correction

Decision	Number of E-LVL values
Not necessary (N)	470
Necessary (Y)	412
Not necessary but not certain (N?)	34
Necessary but not certain (Y?)	2
Data source unknown (?)	15
Total	933

Table 4: Number of coding errors

Correction point	Number of errors
Unit	159
Heading	90
Number in Data	60
Number in Common	54
REACTION	48
EN-SEC	5
Total	416

There were a total of **416** pieces that needed to be fixed. It became clear that there were various modifications.

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The first is a correction regarding **units**. In EXFOR, ”keV” and ”MeV” are used as the units of E-LVL.

#/Legend

E-LVL	E-LVL	ANG-CM	DATA-CM	DATA-ERR
MEV	MEV	ADEG	MU-B/SR	MU-B/SR
1.073	1.081	10.299	2.3545	1.2282
1.073	1.081	12.704	1.9657	0.8674
1.073	1.081	17.733	1.2678	0.7995
1.073	1.081	20.127	1.944	1.0378
1.073	1.081	22.975	1.1746	0.5752
1.073	1.081	35.533	0.9705	0.3534
1.073	1.081	37.944	0.564	0.2448
1.073	1.081	45.704	0.3412	0.1737
1.073	1.081	50.393	0.46	0.2641
140.5	142.6	2.845	802.18	
140.5	142.6	5.55	1311.	
140.5	142.6	7.83	1436.	
140.5	142.6	10.232	963.57	
140.5	142.6	12.973	381.03	
140.5	142.6	15.701	255.7	

Figure 1: EXFOR:F1146.007

In the current EXFOR, **MeV** is used as the unit for E-LVL values.

Results - Unit

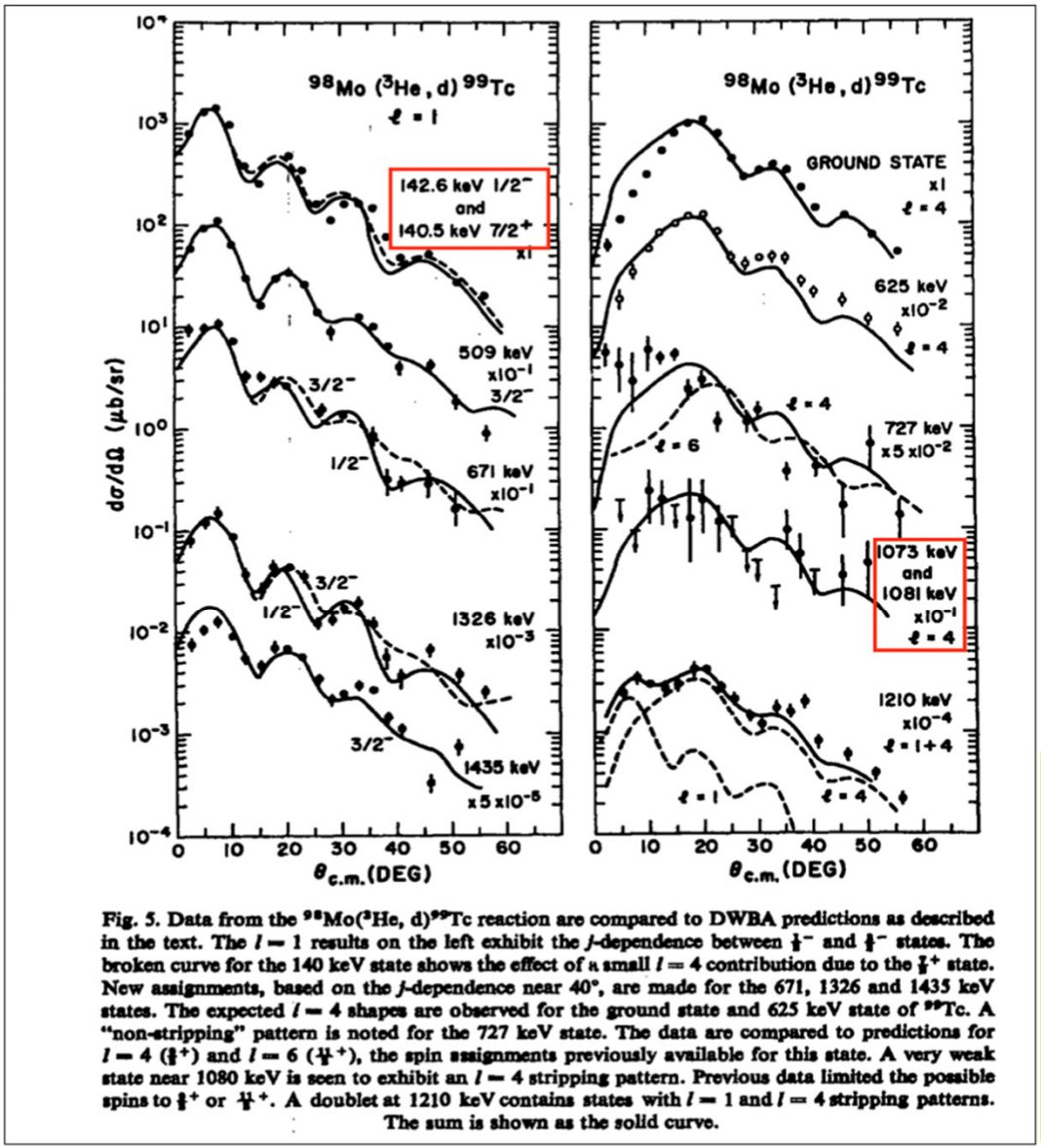

Fig. 5. Data from the ^{98}Mo(^{3}He, d)^{99}Tc reaction are compared to DWBA predictions as described in the text. The $l = 1$ results on the left exhibit the j-dependence between $\frac{1}{2}^-$ and $\frac{3}{2}^-$ states. The broken curve for the 140 keV state shows the effect of a small $l = 4$ contribution due to the $\frac{7}{2}^+$ state. New assignments, based on the j-dependence near 40°, are made for the 671, 1326 and 1435 keV states. The expected $l = 4$ shapes are observed for the ground state and 625 keV state of ^{99}Tc. A "non-stripping" pattern is noted for the 727 keV state. The data are compared to predictions for $l = 4$ ($\frac{9}{2}^+$) and $l = 6$ ($\frac{11}{2}^+$), the spin assignments previously available for this state. A very weak state near 1080 keV is seen to exhibit an $l = 4$ stripping pattern. Previous data limited the possible spins to $\frac{9}{2}^+$ or $\frac{11}{2}^+$. A doublet at 1210 keV contains states with $l = 1$ and $l = 4$ stripping patterns. The sum is shown as the solid curve.

The E-LVL is described as 1073 keV, 1081 keV, 140.5 keV, and 142.6 keV, and "**keV**" is used as the unit.

Figure 2: Data referenced in F1146.007

The above can be summarized as shown in Table 5.

Table 5: Fix of F1146.007

Item	Current	Modified
Unit	MeV	keV
Data	1.073	1073
Data	1.081	1081

It is necessary to revise the unit of EXFOR from **MeV** to **keV**.

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The second is a correction regarding **headings**.

One of the mistakes in the heading is that the outgoing energy (”**E**”) should have been used, but ”**E-LVL**” is used.

	#/Legend		
EN	E-LVL	DATA	DATA-ERR
MEV	KEV	NO-DIM	NO-DIM
14.	232.	-0.20	0.03
14.	265.	0.57	0.06
14.	1030.	-0.44	0.13
14.	1111.	0.63	0.06
14.	1221.	0.21	0.06
14.	1395.	0.22	0.27
14.	1658.	0.52	0.17
18.	232.	-0.28	0.04
18.	991.	-0.76	0.11
18.	1111.	0.55	0.04
18.	1289.	0.63	0.13
18.	1426.	0.66	0.21

Figure 3: EXFOR:O2158.008

In the current EXFOR, heading is ”**E-LVL**”.

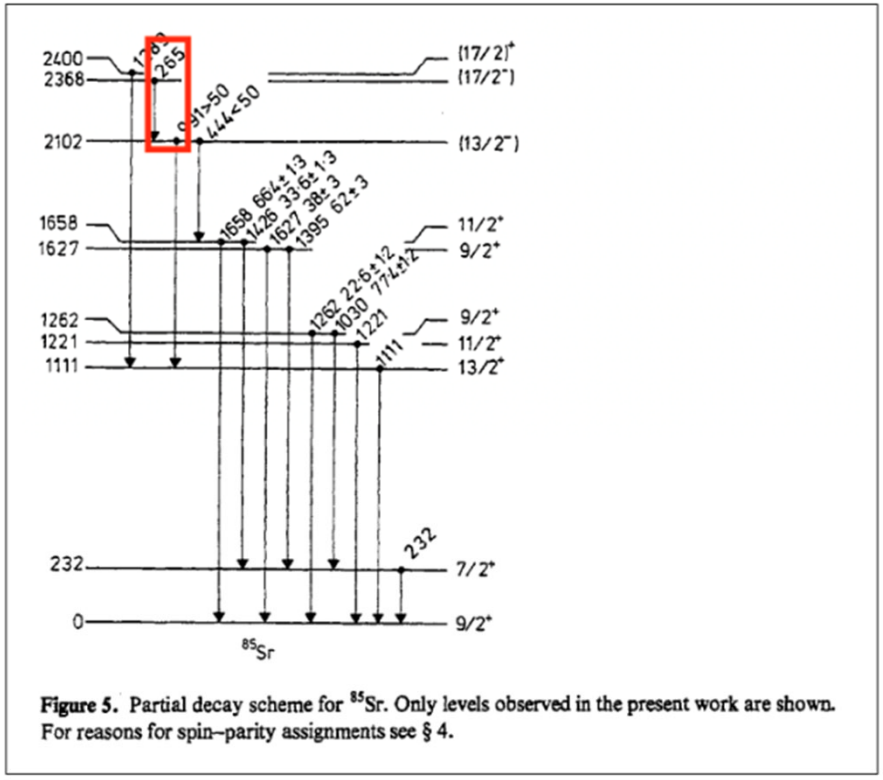

Figure 5. Partial decay scheme for ^{85}Sr. Only levels observed in the present work are shown. For reasons for spin–parity assignments see § 4.

Figure 4: Data referenced in O2158.008 (1)

The arrows are written from the excitation energy 2368 keV to 2102 keV, indicating that the value of 265 keV is not E-LVL.

Table 4. Results of the angular distribution and polarisation measurements with the ^{82}Kr(α, xn)^{84,85}Sr reactions.

Nucleus	E_γ[a] (keV)	E_α = 14 MeV Relative intensity	a_2[b]	a_4[b]	$P(90°)$	Relative intensity
^{84}Sr	793	—	—	—	—	1000 ± 40
	974	—	—	—	—	354 ± 14
^{85}Sr	232	—	0·03 ± 0·04	0·03 ± 0·05	−0·20 ± 0·03	—
	265	120 ± 5	0·30 ± 0·03	−0·11 ± 0·04	0·57 ± 0·06	280 ± 11
	444	<200	—	—	—	<200
	991	≈190	—	—	—	233 ± 9
	1030	240 ± 9	−0·66 ± 0·02	0·03 ± 0·03	−0·44 ± 0·13	—
	1111	1000 ± 40	0·32 ± 0·03	−0·09 ± 0·03	0·63 ± 0·06	1000 ± 40
	1221	500 ± 20	−0·90 ± 0·02	0·11 ± 0·02	0·21 ± 0·06	—
	1262	70 ± 4	−0·45 ± 0·08	−0·05 ± 0·09	—	—
	1289	—	—	—	—	171 ± 7
	1395	140 ± 7	−0·67 ± 0·03	0·04 ± 0·04	0·22 ± 0·27	—
	1426	110 ± 5	0·43 ± 0·04	−0·11 ± 0·04	—	92 ± 4
	1627	87 ± 9	—	—	—	—
	1658	220 ± 9	−0·93 ± 0·03	0·21 ± 0·06	0·52 ± 0·17	179 ± 7

[a] For accurate γ-ray energies see Arnell *et al* (1977) and Lederer and Shirley (1978).
[b] Corrected for finite solid angle.

Figure 5: Data referenced in O2158.008 (2)

The value of E_γ is 265 keV, indicating that the value of 265 keV is the observed **γ-ray energy**.

the data registered in the LiveChart which is one of the interactive charts of ENSDF.

#	Nuclide	Initial Level E_x[keV]	Initial Level J^π order	Initial Level $T_{1/2}$	Final Level E_x[keV]	Final Level J^π order	E_γ [keV]	I_γ (rel) [%]	Mult.
1	$^{85}_{38}Sr_{47}$	231.79 *4*	7/2+	0.21 ns *5*	0.0	9/2+	231.77 *5*	100	M1+E2
2	$^{85}_{38}Sr_{47}$	238.79 *5*	1/2-	67.63 min *4*	231.79 *4*	7/2+	7.00 S *6*		[E3]
3	$^{85}_{38}Sr_{47}$	238.79 *5*	1/2-	67.63 min *4*	0.0	9/2+	238.78 *5*		M4
98	$^{85}_{38}Sr_{47}$	2351.74 *9*	(7/2)+ *3*		231.79 *4*	7/2+	2120.2 *3*	66 *6*	
99	$^{85}_{38}Sr_{47}$	2351.74 *9*	(7/2)+ *3*		0.0	9/2+	2351.7 *2*	47 *4*	
100	$^{85}_{38}Sr_{47}$	2367.1 *3*	(17/2)-	1.2 ns *4*	2102.06 *23*	13/2-	265.1 *3*	100	E2
101	$^{85}_{38}Sr_{47}$	2400.1 *3*	(17/2)+	2.25 ps *21*	1111.46 *21*	13/2+	1288.8 *3*	100	E2

Figure 6: Livechart : Sr-85

In Sr-85, there was a transition with Eγ of 265 keV. This transition has an initial level of 2367 keV and a final level of 2102 keV.

The above can be summarized as shown in Table 6.

Table 6: Fix of O2158.008

Item	Current	Modified
Heading	E-LVL	E

The heading of EXFOR needs to be changed to ”**E**” instead of ”**E-LVL**”.

There were other headings errors, such as data that reversed the incident energy **EN** with **E-LVL**.

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Results - Values in Data and Common sections

E-LVL values different from the values in the paper

The third is the correction regarding **values in Data and Common sections**.

Some E-LVL values of Date and Common sections in EXFOR were different from those in the paper.

#/Legend			
E-LVL	ANG-CM	DATA-CM	ERR-S
MEV	ADEG	MB/SR	PER-CENT
0.00	14.8	0.85	5.0
0.00	18.2	0.30	10.0
0.00	25.1	0.18	11.0
0.00	30.1	0.32	8.0
0.00	36.0	0.29	5.0
0.00	42.0	0.179	3.0
0.00	47.7	0.042	18.0
0.00	53.5	0.022	8.0
0.00	59.3	0.021	19.0
0.00	64.9	0.049	11.0
0.00	70.5	0.046	5.0
0.00	76.0	0.029	14.0
0.00	81.5	0.013	30.0
0.00	86.7	0.0069	21.0
3.61	15.1	0.28	10.0
3.61	18.3	0.30	10.0
3.61	25.3	0.21	11.0
3.61	30.3	0.13	13.0
3.61	36.4	0.077	10.0

Figure 7: EXFOR:C0925.016

The current EXFOR describes data with E-LVL of 0.0 MeV (Ground State) and **3.61 MeV**.

Results - Values in Data and Common sections 22 / 45

E-LVL values different from the values in the paper

Table 8. Differential Cross Sections For $^{12}C(p,t)^{10}C$, E_p = 61 MeV

c.m. Angle (deg)	Cross Section c.m. (mb/sr)	Statistical Uncertainty (%)
	Ground State	
14.8	0.85	5
18.2	0.30	10
25.1	0.18	11
30.1	0.32	8
36.0	0.29	5
42.0	0.179	5
47.7	0.042	18
53.5	0.022	8
59.3	0.021	19
64.9	0.049	11
70.5	0.046	5
76.0	0.029	14
81.5	0.013	30
86.7	0.0069	21
	3.36-MeV Level	
15.1	0.28	10
18.3	0.30	10
25.3	0.21	11
30.3	0.13	13
36.4	0.077	10
42.4	0.065	8

Figure 8: Data referenced in C0925.016

the data for Ground State and **3.36 MeV** cross sections, and the value of **3.61** was not found.

Results - Values in Data and Common sections 23 / 45

E-LVL values different from the values in the paper

#	Nuclide	E_x [keV]	J^{π} order	Band	$T_{1/2}$	$T_{1/2}$ [s]	Decay modes BR [%]	Isospin
1	$^{10}_{6}C_{4}$	0.0	0+		19.290 s *12*	19.290 *12*	ec β+ 100	1
2	$^{10}_{6}C_{4}$	3353.7 *6*	2+		107 fs *17*	107E-15 *17*	IT 100	
3	$^{10}_{6}C_{4}$	5220 *40*			225 keV *45*	2.0E-21 *4*		
4	$^{10}_{6}C_{4}$	5380 *70*			300 keV *60*	1.5E-21 *3*		
5	$^{10}_{6}C_{4}$	6580 *20*	(2+)		190 keV *35*	2.4E-21 *4*		

Figure 9: Livechart : C-10

There was a value of **3353 keV**, which is close to the **3.36 MeV** value described in Figure 8, but there was no value close to the **3.61 MeV** value described in EXFOR.

E-LVL values different from the values in the paper

The above can be summarized as shown in Table 7.

Table 7: Fix of C0925.016

Item	Current	Modified
Data	3.61	3.36

It is necessary to revise the E-LVL values of EXFOR from **3.61** to **3.36**.

Results - Values in Data and Common sections
LVL-NUMB

The third is the correction regarding **values in Data** and **Common sections**.

In the paper, only the number of the excited level (**LVL-NUMB**) was written, but in EXFOR, there existed data with the value of the excitation energy (**E-LVL**)

#/Legend

EN	EN-RSL	E-LVL	E-LVL	DATA	ERR-S
MEV	MEV	MEV	MEV	MB	MB
1.3470e+01	1.7500e-01	0.0000e+00		2.2200e+01	4.4000e+00
1.3470e+01	1.7500e-01	1.0710e+00		1.2700e+01	4.0000e+00
1.3470e+01	1.7500e-01	1.7020e+00	1.8230e+00	9.8000e+00	3.6000e+00
1.3930e+01	7.5000e-02	0.0000e+00		1.7700e+01	3.1000e+00
1.3930e+01	7.5000e-02	1.0710e+00		1.0500e+01	2.8000e+00
1.3930e+01	7.5000e-02	1.7020e+00	1.8230e+00	1.5400e+01	2.7000e+00

ENDDATA
ENDSUBENT 18
ENDENTRY

Figure 10: EXFOR:21672.004

The current EXFOR describes data with **E-LVL** of 0.0 MeV and 1.071 MeV, 1.702 MeV, and 1.823 MeV.

Results - Values in Data and Common sections 26 / 45
LVL-NUMB

Table 3. Comparison between Hauser-Feshbach and experimental angle-integrated cross sections

Transition group	Neutron energy E_n (MeV)	Hauser-Feshbach cross section σ_{HF} (mb)	Experimental cross section σ_{EXP} (mb)
$^{24}Mg(n, \alpha_{0,1})^{21}Ne$	13.19	32.13	37.8±3
	13.93	26.92	37.0±2.2
	14.33	24.93	33.3±2.2
$^{24}Mg(n, \alpha_2)^{21}Ne$	13.19	17.03	23.7±3
	13.93	15.10	16.7±2.5
	14.33	14.25	16.5±3.2
$^{24}Mg(n, \alpha_{3,4,5})^{21}Ne$	13.19	27.83	32.3±6
	13.93	25.23	27.9±5
	14.33	24.14	28.3±4.4
$^{25}Mg(n, \alpha_0)^{22}Ne$	13.93	2.51	1.4±0.3
	14.33	2.27	1.7±0.4
$^{25}Mg(n, \alpha_1)^{22}Ne$	13.93	12.06	4.4±0.4
	14.33	10.82	5.1±0.7
$^{25}Mg(n, \alpha_2)^{22}Ne$	13.93	16.67	8.9±0.7
	14.33	15.03	6.1±0.9
$^{26}Mg(n, \alpha_0)^{23}Ne$	13.47	18.60	22.2±4.4
	13.93	18.15	17.7±3.1
$^{26}Mg(n, \alpha_1)^{23}Ne$	13.47	6.92	12.7±4.0
	13.93	6.82	10.5±2.8
$^{26}Mg(n, \alpha_{2,3})^{23}Ne$	13.47	24.74	9.8±3.6
	13.93	24.70	15.4±2.7

Figure 11: Data referenced in 21672.004

The table does not contain any **level energy values**, only α_0、 α_1、 $\alpha_{2,3}$ using the **level numbers**.

LVL-NUMB

The above can be summarized as shown in Table 8.

Table 8: Fix of 21672.004

Item	Current	Modified
Data	0.0000e+00	0
Data	1.0710e+00	1
Data	1.7020e+00	2
Data	1.8230e+00	3
Heading	E-LVL	LVL-NUMB

We need to change the **E-LVL value** of EXFOR to **the number of the excited level**. In that case, heading should also be modified to **LVL-NUMB** instead of **E-LVL**

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The fourth is the modification of **reactions**.

There were some data that were highly likely to contain reactions other than those described in the paper.

```
SUBENT        R0015008   20040830                20050926
BIB                    3           5
REACTION    (40-ZR-90(A,INL)40-ZR-90,PAR,DA)
            # (40-ZR-90(A,INL)40-ZR-90,PAR,DA)
            # Target:ZR-90 #Projectile:A #Reaction:A,INL  #Process
            # Product: [40-ZR-90]
SAMPLE      Thickness of target was 75 mg/cm**2.
ERR-ANALYS  No error analysis is given by the authors.
            Data errors indicated in graphs by the authors
            were read by compilers.
ENDBIB                 5
COMMON                 2           1          12
             #Legend: 2 x 1 x 12 : data columns * lines * column w
              #EN      Energy of incident projectile, laboratory s
              #E-LVL   Level energy
             #/Legend
EN           E-LVL
MEV          MEV
205.         1.09
ENDCOMMON
DATA                   3          15          12
             #Legend: 3 x 15 x 12 : data columns * lines * column
```

Figure 12: EXFOR:R0015.008

The reaction is an **inelastic scattering reaction** of alpha particles and the residual nucleus is Zr-90.

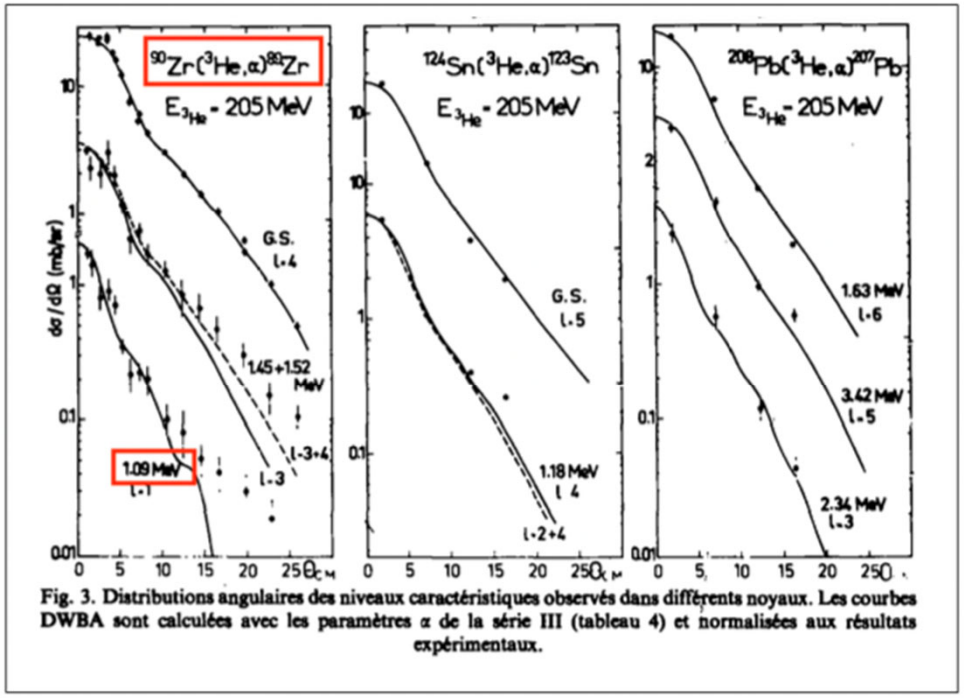

Fig. 3. Distributions angulaires des niveaux caractéristiques observés dans différents noyaux. Les courbes DWBA sont calculées avec les paramètres α de la série III (tableau 4) et normalisées aux résultats expérimentaux.

Figure 13: Data referenced in R0015.008

Figure 13 shows a **(He-3,α) reaction** data, and the residual nuclide is Zr-89.

#	Nuclide	E_x [keV]	J^π order	Band	$T_{1/2}$	$T_{1/2}$ [s]
1	$^{89}_{40}Zr_{49}$	0.0	9/2+	1	78.41 h *12*	282276 *432*
2	$^{89}_{40}Zr_{49}$	587.82 *10*	1/2-		4.161 min *10*	249.7 *6*
3	$^{89}_{40}Zr_{49}$	1094.91 *18*	3/2-		0.05 ps	50E-15
4	$^{89}_{40}Zr_{49}$	1451.23 *18*	5/2-		3.5 ps	3.5E-12
5	^{89}Zr	1511.79 *17*	(9/2)+		0.53 ps *10*	530E-15 *10*

Figure 14: Livechart : Zr-89

#	Nuclide	E_x [keV]	J^π order	Band	$T_{1/2}$	$T_{1/2}$ [s]
1	$^{90}_{40}Zr_{50}$	0	0+		STABLE	
2	$^{90}_{40}Zr_{50}$	1760.74 *14*	0+ *2*		61.3 ns *25*	61E-9 *3*
3	$^{90}_{40}Zr_{50}$	2186.273 *14*	2+		87.9 fs *21*	87.9E-15 *21*
4	$^{90}_{40}Zr_{50}$	2319.000 *9*	5-		809.2 ms *20*	0.8092 *20*
5	^{90}	2739.29 *5*	(4)-			

Figure 15: Livechart : Zr-90

Livechart shows presence of a level of 1.094 MeV, which is close to the E-LVL value registered in EXFOR, while Livechart does not show such a level of ZR-90

The above can be summarized as shown in Table 9.

Table 9: Fix of R0015.008

Item	Current	Modified
Reaction	40-ZR-90(A,INL)40-ZR-90	40-ZR-90(HE3,A)40-ZR-89

We need to change the **reaction.**

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The fourth is the modification of **EN-SEC**.

```
BIB                 3          12
REACTION    (3-LI-7(P,A)2-HE-4,PAR,DA)
            # (3-LI-7(P,A)2-HE-4,PAR,DA)
            # Target:LI-7 #Projectile:P #Reaction:P,A  #Quantity:PAR,DA:DAP:Partial differential cross section d/dA
            # Product: [2-HE-4]
ERR-ANALYS (DATA-ERR) Errors from graphic bars. No information
            about source of uncertainty
COMMENT     For the Li-7(p,gamma1,2+alpha)He-4 reaction, with
            gamma1,2 transition from the excited initial state to
            the final excited state of Be-8 at 7.56MeV (for gamma1)
            and 13.91MeV (for gamma2) breaking up in two
            alpha-particles.
STATUS      (CURVE) Fig. 4 b,c from Nucl.Phys.,36(1962)597
            # (CURVE) Data read from a curve
HISTORY     (20200122A) SD: SF9=EXP deleted from REACTION code.
            EN-ERR -> EN-ERR-DIG. EN-SEC deleted. ERR-ANALYS,
            STATUS updated.
ENDBIB              12
COMMON               2          1          12
            #Legend: 2 x 1 x 12 : data columns * lines * column width
              #ANG          Angle, laboratory system                  ADEG   angular Degrees
              #EN-ERR-DIG   Digitizing error of incident particle energy  MEV  MeV
            #/Legend
ANG         EN-ERR-DIG
ADEG        MEV
90.         0.013
ENDCOMMON
DATA                 4          27         12
            #Legend: 4 x 27 x 12 : data columns * lines * column width
              #E-LVL      Level energy                                  MEV    MeV
              #EN         Energy of incident projectile, laboratory system  MEV  MeV
              #DATA       Partial differential cross section d/dA       MB/SR  millibarns per steradian
                          #+ 3-LI-7(P,A)2-HE-4,PAR,DA
              #DATA-ERR   Error in value of quantity, defined under ERR-ANALYS  MB/SR  millibarns per steradian
            #/Legend
E-LVL       EN          DATA        DATA-ERR
MEV         MEV         MB/SR       MB/SR
7.56        0.441       0.0027      0.0013
7.56        0.518       0.0026      0.0013
7.56        0.605       0.0048      0.0054
7.56        0.716       0.0330      0.0076
7.56        0.784       0.0710      0.0065
7.56        0.831       0.1449      0.0076
7.56        0.877       0.1883      0.0076
7.56        0.928       0.1263      0.0087
7.56        0.955       0.0068      0.0043
13.91       0.577       0.0088      0.0065
13.91       0.698       0.0283      0.0087
13.91       0.752       0.0369      0.0109
13.91       0.796       0.0412      0.0130
```

Figure 16: EXFOR:F0025.003

EXFOR describes the (p,α) reaction of Li-7. The residual nuclide is He-4.

Abstract: The Li^7+p interaction has been extensively studied and its various products analysed. The results confirm the presence of the well known levels of Be^8 at 2.9, 17.63 and 18.15 MeV and give clear evidence for the existence of the discussed 7.56 MeV level. Three new levels of Be^8 have been discovered at the energies 13.91, 17.9 and 18.0 MeV.
Widths, angular momenta, parities and isobaric spins of several levels have been determined
Some anomalies of the Li^7+p interaction, previously observed by others, are explained.

Figure 17: Data referenced in F0025.003 (1)

Analysing the yields of the α peaks observed in the energy spectra as a function of proton energy, we can obtain the differential cross sections at $\theta = 90°$

[redacted]

for the $Li^7(p,\alpha)He^4$ reaction and for the $Li^7(p,\gamma\alpha)He^4$ reactions involving the 7.56 MeV and 13.91 MeV excited states of Be^8.

Figure 19: Data referenced in F0025.003 (3) (text on pp 602-603)

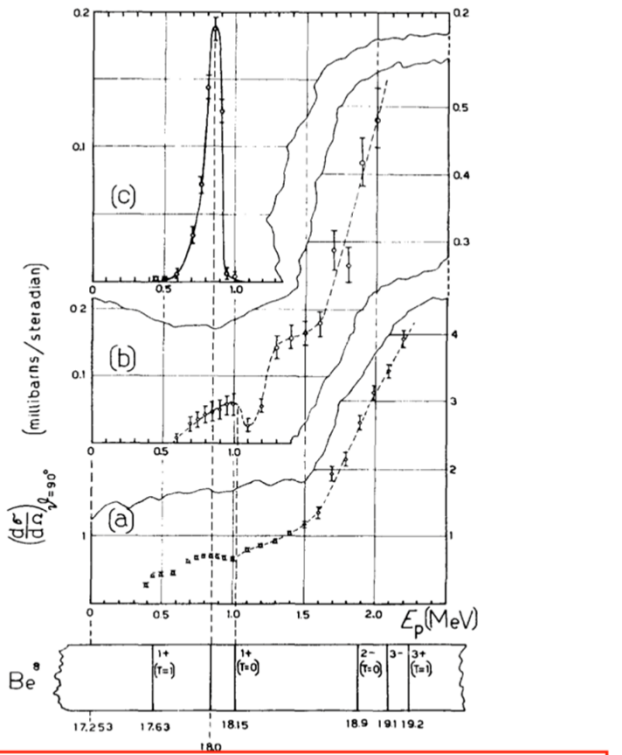

Fig. 4. Differential cross sections at $\theta = 90°$: a) for the $Li^7(p,\alpha)He^4$ reaction, b) for the $Li^7(p,\gamma_2\alpha)He^4$ reaction, with γ_2 transition from the excited initial state to the final excited state of Be^8 at 13.91 MeV breaking up in two α-particles, c) for the $Li^7(p,\gamma_1\alpha)He^4$ reaction with γ_1 transition from the excited initial state to the final excited state of Be^8 at 7.56 MeV breaking up in two α-particles.

Figure 18: Data referenced in F0025.003 (2)

The measurement was made in a reaction where Li-7 was bombarded with a proton to become Be-8 once, and then Be-8 split into two α.

#	Nuclide	E_x [keV]	J^π order	Band	$T_{1/2}$	$T_{1/2}$ [s]
1	$^{4}_{2}He_{2}$	0.0	0+		STABLE	
2	$^{4}_{2}He_{2}$	20210	0+ *2*		0.50 MeV	912.4754301427714E-24
3	$^{4}_{2}He_{2}$	21010	0-		0.84 MeV	543.1401369897449E-24

Figure 20: Livechart : He-4

#	Nuclide	E_x [keV]	J^π order	Band	$T_{1/2}$	$T_{1/2}$ [s]
1	$^{8}_{4}Be_{4}$	0.0	0+		5.57 eV *25*	82E-18 *4*
2	$^{8}_{4}Be_{4}$	3030 *10*	2+		1513 keV *15*	302E-24 *3*
3	$^{8}_{4}Be_{4}$	11.35×10^{3} *15*	4+		3.5 MeV	130.35363287753876E-24
4	$^{8}_{4}Be_{4}$	16626 *3*	2+ *2*		108.1 keV *5*	4.221E-21 *20*

Figure 21: Livechart : Be-8

The authors assured two levels **7.56** and **13.91** MeV, but such levels are unknowns nowadays.

The above can be summarized as shown in Table 10.

Table 10: Fix of F0025.003

Item	Current	Modified
EN-SEC		E-LVL,4-BE-8

The problem can be solved by adding a new entry **(E-LVL,4-BE-8)** in the EXFOR data.

Purpose	To reflect what is really reported
Process	Extraction and confirmation
Results	Unit
	Heading
	Values in Data and Common sections
	REACTION
	EN-SEC
Statistics of errors	Counting
	Result
Summary	

Table 3: Number of data with and without correction

Decision	Number of E-LVL values
Not necessary (N)	470
Necessary (Y)	412
Not necessary but not certain (N?)	34
Necessary but not certain (Y?)	2
Data source unknown (?)	15
Total	933

Table 4: Number of coding errors

Correction point	Number of errors
Unit	159
Heading	90
Number in Data	60
Number in Common	54
REACTION	48
EN-SEC	5
Total	416

To conduct the analysis, we organized the 933 data extracted by the program.

First of all, for the data that needed to be modified, the data with the ”Keyword”
of ”**Unit**”, ”**Heading**”, ”**REACTION**” and ”**EN-SEC**” were considered as one data if the subentries were the same.

#/Legend

ANG	E-LVL	DATA	ERR-S
ADEG	MEV	MB/SR	MB/SR
10.	0.	0.756	0.006
10.	478.	0.005	0.001
10.	659.	0.463	0.004
10.	682.	0.061	0.002
10.	719.	0.062	0.002
10.	887.	0.003	0.001
10.	1028.	0.107	0.002
10.	1118.	0.216	0.003
10.	1279.	0.152	0.003
10.	1437.	0.401	0.004
10.	1514.	0.075	0.003
10.	1628.	0.018	0.001
10.	1701.	0.043	0.001
10.	1787.	0.030	0.001
10.	1865.	0.020	0.001
10.	1960.	0.101	0.002
10.	2043.	0.666	0.005
10.	2089.	0.079	0.002
10.	2155.	0.022	0.002
10.	2198.	0.014	0.002
10.	2247.	0.034	0.002
10.	2317.	0.065	0.002
10.	2384.	0.057	0.002
10.	2410.	0.010	0.002
10.	2510.	1.269	0.007
10.	2830.	0.023	0.002
10.	2873.	0.037	0.002
10.	2935.	0.020	0.003
10.	2974.	0.012	0.001
10.	3009.	0.061	0.002
10.	3049.	0.038	0.002
10.	3110.	0.030	0.002
10.	3157.	0.073	0.008
10.	3175.	0.20	0.09
10.	3235.	0.040	0.002
10.	3403.	0.501	0.005
10.	3573.	0.114	0.004
10.	3655.	0.183	0.004
15.	0.	0.709	0.004

Figure 22: EXFOR:O2445.013

In the current EXFOR, the unit is MeV. In this program, **37** suspicious E-LVL values are extracted

Even though there is **only one ”Unit”** to be modified. We need to prevent this kind of duplication.

Agenda

Purpose	To reflect what is really reported
Process	Extraction and confirmation
Results	Unit
	Heading
	Values in Data and Common sections
	REACTION
	EN-SEC
Statistics of errors	Counting
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Summary	

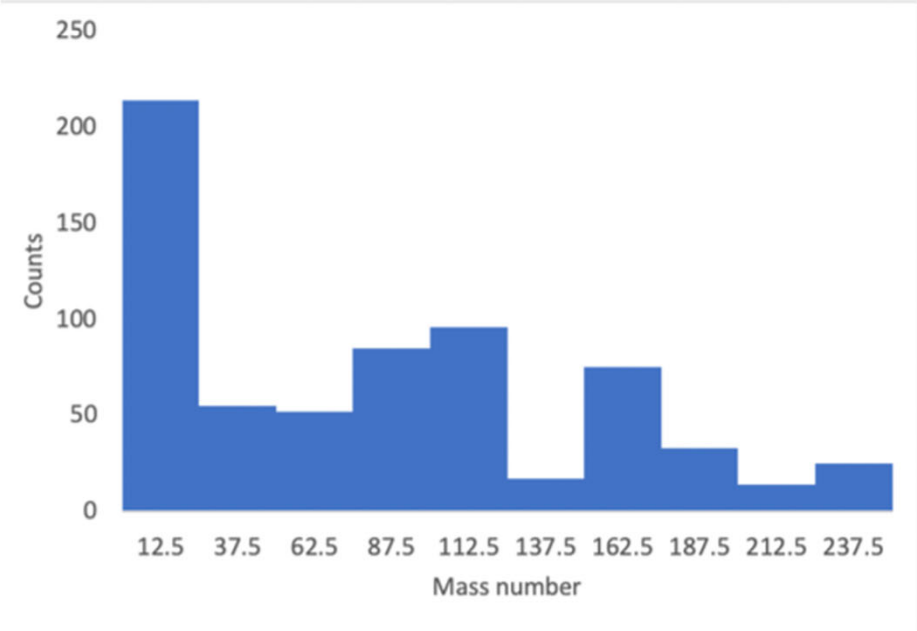

Figure 23: Histogram of items

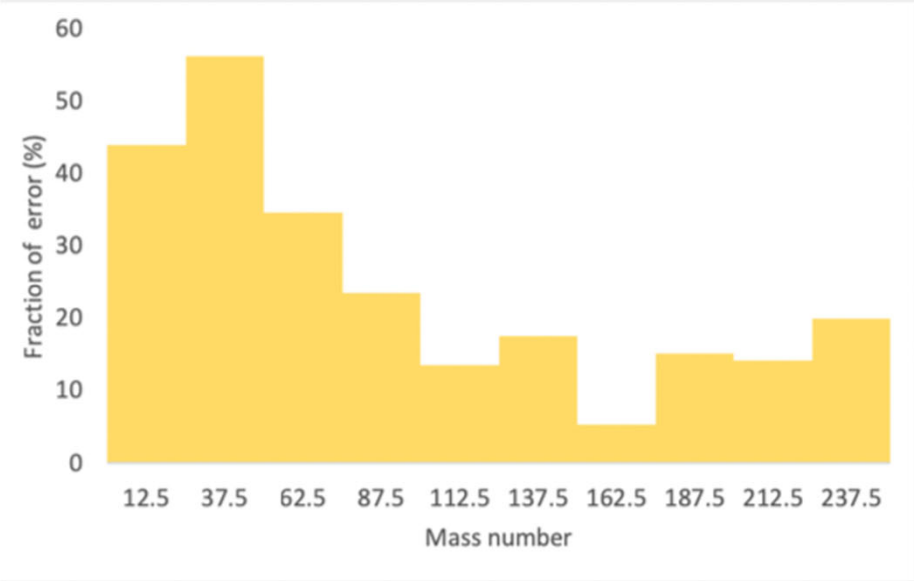

Figure 24: Fraction of error

For the data with mass number up to 75, the percentage of data that need to be corrected is relatively high.

Table 11: Data regarding error range

Allowance	Number of E-LVL values	Number of items	Number of errors	Fraction of error (%)
5%	933	665	195	29.3
10%	691	470	164	34.9
20%	541	362	141	39.0
30%	489	315	119	37.8

Brooding the allowance

- reduces the amount of data extracted by the program
- increases the fraction of error
- reduces the number of items which need to be corrected

Agenda

Purpose	To reflect what is really reported
Process	Extraction and confirmation
Results	Unit
	Heading
	Values in Data and Common sections
	REACTION
	EN-SEC
Statistics of errors	Counting
	Result
Summary	

Summary

We extracted from the EXFOR Master File all values coded under E-LVL for γ, n, d, t, ^{3}He and α induced reaction and spontaneous fission datasets.

The values do not agree within 5% with any level energy in the ENSDF were checked against the source articles.

We found some items requiring corrections.
Typical mistakes are

- wrong unit (e.g., KEV instead of MEV)
- wrong heading (e.g., E-LVL instead of E)
- wrong number (e.g., 3.61 MeV instead of 3.36 MeV)
- level energy not from the source article but from ENSDF etc. (LVL-NUMB must be used)
- wrong REACTION code (e.g., (HE3,A) instead of (A,INL))
- absence of EN-SEC for a level energy of other than the reaction product.