

REACTION Sum

(N. Otsuka and O. Schwerer, 2018-03-28, Memo CP-D/954)

Note added to WP2018-28

Two questions:

1. Shall we introduce a new modifier when the quantity is for the natural sample divided by the isotopic abundances of the target isotopes contributing to the reaction, or use the existing generic modifier FCT?
2. Shall we use the reaction sum when the quantity is partial for unresolved two secondary energies from several product nuclides, about it (e.g., by using SF3=X)?

The EXFOR Formats Manual 6.8 mentions “*the reaction combination formalism is not used for certain frequently occurring sums, ratios, and products for which specific quantity codes have been introduced (see LEXFOR, Ratios, Sums, Products).*”. The appendix of this memo summarises questionable REACTION sums reviewed by us with proposed corrections when necessary. We found the following two cases are not trivial:

1. **Elemental cross section divided by the sum of the isotopic abundances of the contributing target isotopes:**

Example: 31622.009

The authors measured ^{195m}Pt production from $^{\text{nat}}\text{Pt}+n$ reaction, and report the $^{\text{nat}}\text{Pt}(n,x)^{195m}\text{Pt}$ elemental cross section divided by the isotopic abundance of ^{196}Pt and ^{195}Pt which contributes to the ^{195m}Pt production through (n,2n) and (n,n') channels respectively.

The current coding

(78-PT-196(N,2N)78-PT-195-M,,SIG,,A)+(78-PT-195(N,INL)78-PT-195-M,,SIG,,A)

is wrong.

The reported cross section is still related with the elemental cross section by an energy independent constant, and therefore it can be expressed by

(1) (78-PT-0(N,X)78-PT-195-M,,SIG,,FCT)

with free text such as “Elemental cross section divided by the sum of isotopic abundances of ^{195}Pt and ^{196}Pt ”.

However another option could be to introduce a new modifier XX expressing “divided by the sum of the isotopic abundances of target in REACTION” like

(2) (78-PT-195(N,INL)78-PT-195-M,,SIG,,XX)+(78-PT-196(N,2N)78-PT-195-M,,SIG,,XX).

We found that 14 subentries in 3 entries (21609, 21999 and 31622) adopt this normalization.

2. Cross section for sum of two partial reactions which are not separated experimentally (e.g., due to insufficient energy resolution):

Example: 30656.003

The author measured ~412 keV gamma productions from $^{nat}\text{Fe}+n$ reaction. The authors relate it with $^{54}\text{Fe}(n,n')^{54}\text{Fe}$ (411.5 keV) $^{56}\text{Fe}(n,2n)^{55}\text{Fe}$ (411.7 keV).

The current coding

(3) (26-FE-54(N,INL)26-FE-54,PAR,DA,G,A)+(26-FE-56(N,2N)26-FE-55,PAR,DA,G,A)

may be simplified to

(4) (26-FE-0(N,X)0-G-0,PAR,DA)

if we leave assignment of the reaction process to users.

Appendix: Sum of REACTION codes reviewed (2018-03-26)

(The subentry number with underline shows the actual correction depends on our conclusion on two open questions summarized in this memo.)

Subentry	REACTION	Proposed correction	Remark
10484.009	(28-NI-58(N,X)27-CO-57,,SIG)= ((28-NI-58(N,N+P)27-CO-57,,SIG)+ (28-NI-58(N,D)27-CO-57,,SIG))	Delete the right hand side.	
10484.010	(50-SN-112(N,X)49-IN-111,,SIG)= ((50-SN-112(N,N+P)49-IN-111,,SIG)+ (50-SN-112(N,D)49-IN-111,,SIG))	Delete the right hand side.	
10832.002	(105-DB-262(0,F)MASS,CUM,FY,,FCT)+ (100-FM-256(0,F)MASS,CUM,FY,,FCT)	Ok	Impurity of the sample.
<u>14151.014</u>	(26-FE-54(N,INL)26-FE-54,PAR,SIG,G,A)+ (26-FE-56(N,2N)26-FE-55,PAR,SIG,G,A)	Use (26-FE-0(N,X)0-G-0,PAR,SIG). E1=1408.1 keV and E2=1408.4 keV -> E=1408.1 keV.	Defined as an elemental cross section. Unresolved two gamma transitions characterized by two gamma energies under E1 and E2. The elemental cross section could be the only correct coding because data include energies high enough for higher threshold energy reaction such as $^{57}\text{Fe}(n,3n)^{55}\text{Fe}$ and $^{58}\text{Fe}(n,4n)^{55}\text{Fe}$.
<u>20245.005</u>	(7-N-14(N,X)0-G-0,PAR,DA)= ((7-N-14(N,T)6-C-12,PAR,DA,G)+ (7-N-14(N,A)5-B-11,PAR,DA,G))	Use (7-N-14(N,X)0-G-0,PAR,DA).	Unresolved two gamma transitions characterized by a single gamma energy under E.
20668.010	((74-W-183(N,N+P)73-TA-182-G,,SIG)+ (74-W-183(N,D)73-TA-182-G,,SIG))= (74-W-183(N,X)73-TA-182-G,,SIG)	Delete the left hand side.	

20668.013	((74-W-184(N,N+P)73-TA-183,,SIG)+ (74-W-184(N,D)73-TA-183,,SIG))= (74-W-184(N,X)73-TA-183,,SIG)	Delete the left hand side.	
20668.018	((74-W-186(N,N+P)73-TA-185,,SIG)+ (74-W-186(N,D)73-TA-185,,SIG))= (74-W-186(N,X)73-TA-185,,SIG)	Delete the left hand side.	
20922.003	(12-MG-0(N,X)11-NA-24,,SIG)= ((12-MG-24(N,P)11-NA-24,,SIG,,A)+ (12-MG-25(N,D)11-NA-24,,SIG,,A)+ (12-MG-26(N,T)11-NA-24,,SIG,,A))	Delete the right hand side.	All stable Mg isotopes appear.
<u>21295.004</u>	(58-CE-140(N,G)58-CE-141,PAR,SIG,,A)+ (58-CE-142(N,G)58-CE-143,PAR,SIG,,A)	Use (58-CE-0(N,G),PAR,SIG). E-LVL1, E-LVL2 -> E-LVL.	$^{140}\text{Ce}(n,\gamma_0)^{141}\text{Ce} + ^{142}\text{Ce}(n,\gamma_1)^{143}\text{Ce}$ characterized by two level energies under E-LVL1 and E-LVL2. (The data set measured at LANL was in 10737 but deleted following a request from an author.)
<u>21609.017</u>	(62-SM-148(N,P)61-PM-148-M,,SIG,,FCT)+ (62-SM-149(N,X)61-PM-148-M,,SIG,,FCT)	Use (62-SM-0(N,X)61-PM-148-M,,SIG,,FCT).	Elemental cross section divided by the sum of isotopic abundances of the contributing target isotopes (Michel, 2015-10-08).
<u>21609.018</u>	(62-SM-148(N,P)61-PM-148-G,,SIG,,FCT)+ (62-SM-149(N,X)61-PM-148-G,,SIG,,FCT)	Use (62-SM-0(N,X)61-PM-148-G,,SIG,,FCT).	Same as 21609.017.
<u>21609.020</u>	(64-GD-154(N,P)63-EU-154,,SIG,,FCT)+ (64-GD-155(N,X)63-EU-154,,SIG,,FCT)	Use (64-GD-0(N,X)63-EU-154,,SIG,,FCT).	Same as 21609.017.
<u>21609.021</u>	(64-GD-156(N,P)63-EU-156,,SIG,,FCT)+ (64-GD-157(N,X)63-EU-156,,SIG,,FCT)	Use (64-GD-0(N,X)63-EU-156,,SIG,,FCT).	Same as 21609.017.
<u>21609.022</u>	(66-DY-160(N,P)65-TB-160,,SIG,,FCT)+ (66-DY-161(N,X)65-TB-160,,SIG,,FCT)	Use (66-DY-0(N,X)65-TB-160,,SIG,,FCT).	Same as 21609.017.
<u>21999.004.2</u>	(12-MG-25(N,P)11-NA-25,,SIG,,FCT)+ (12-MG-26(N,X)11-NA-25,,SIG,,FCT)	Use (12-MG-0(N,X)11-NA-25,,SIG,,FCT).	The Table III foot note mentions that the elemental cross section divided by the sum of isotopic abundances of the contributing target

			isotopes.
<u>21999.006.2</u>	(14-SI-28(N,P)13-AL-28,,SIG,,FCT)+ (14-SI-29(N,X)13-AL-28,,SIG,,FCT)	Use (14-SI-0(N,X)13-AL-28,,SIG,,FCT).	Same as 21999.004.2.
<u>21999.007.2</u>	(14-SI-29(N,P)13-AL-29,,SIG,,FCT)+ (14-SI-30(N,X)13-AL-29,,SIG,,FCT)	Use (14-SI-0(N,X)13-AL-29,,SIG,,FCT).	Same as 21999.004.2.
<u>21999.010.2</u>	(22-TI-46(N,P)21-SC-46,,SIG,,FCT)+ (22-TI-47(N,X)21-SC-46,,SIG,,FCT)	Use (22-TI-0(N,X)21-SC-46,,SIG,,FCT).	Same as 21999.004.2.
<u>21999.011.2</u>	(22-TI-47(N,P)21-SC-47,,SIG,,FCT)+ (22-TI-48(N,X)21-SC-47,,SIG,,FCT)	Use (22-TI-0(N,X)21-SC-47,,SIG,,FCT).	Same as 21999.004.2.
<u>21999.012.2</u>	(22-TI-48(N,P)21-SC-48,,SIG,,FCT)+ (22-TI-49(N,X)21-SC-48,,SIG,,FCT)	Use (22-TI-0(N,X)21-SC-48,,SIG,,FCT).	Same as 21999.004.2.
<u>21999.022.2</u>	(38-SR-86(N,2N)38-SR-85-M,,SIG,,FCT)+ (38-SR-84(N,G)38-SR-85-M,,SIG,,FCT)	Use (38-SR-0(N,X)38-SR-85-M,,SIG,,FCT).	Same as 21999.004.2.
<u>21999.024.2</u>	(38-SR-88(N,2N)38-SR-87-M,,SIG,,FCT)+ (38-SR-86(N,G)38-SR-87-M,,SIG,,FCT)	Use (38-SR-0(N,X)38-SR-87-M,,SIG,,FCT).	Same as 21999.004.2.
22200.003	(6-C-12(N,A)4-BE-9,,DA,,LEG/FCT)+ (6-C-12(N,N+2A)2-HE-4,,DA,A,LEG/FCT)	Use (6-C-12(N,A)4-BE-9,PAR,DA,,LEG) Add E-LVL=0.	
22200.004	(6-C-12(N,A)4-BE-9,,SIG,,FCT)+ (6-C-12(N,N+2A)2-HE-4,,SIG,,FCT)	Merge into 003.	The 0th order coefficient of the Legendre expansion.
30069.003	(40-ZR-91(N,2N)40-ZR-90-M,,SIG,,A)+ (40-ZR-90(N,INL)40-ZR-90-M,,SIG,,A)	Use (40-ZR-0(N,X)40-ZR-90-M,,SIG).	Zr ⁹¹ (n,2n)Zr ^{90m} +Zr ⁹⁰ (n,n')Zr ^{90m} is printed, but without an explanation about the normalization. It is not clear why the 005 data set is coded as an elemental cross section even though Pb ²⁰⁷ (n,n')Pb ^{207m} +Pb ²⁰⁸ (n,2n)Pb ^{207m} is printed.
30438.004	(24-CR-52(N,P)23-V-52,,SIG,,A)+ (24-CR-53(N,N+P)23-V-52,,SIG,,A)	Use (24-CR-0(N,X)23-V-52,,SIG).	The original compiler explicitly mentions "sum weighted by natural isotopic abundance" in TRANS.3029. No explanation in the 77 KIEV article.

30438.005	(24-CR-53(N,P)23-V-53,,SIG,,A)+ (24-CR-54(N,N+P)23-V-53,,SIG,,A)	Use (24-CR-0(N,X)23-V-53,,SIG).	Same as 30438.004.
30438.009	(40-ZR-90(N,P)39-Y-90-M,,SIG,,A)+ (40-ZR-91(N,N+P)39-Y-90-M,,SIG,,A)	Use (40-ZR-0(N,X)39-Y-90-M,,SIG).	Same as 30438.004.
30438.010	(40-ZR-91(N,P)39-Y-91-M,,SIG,,A)+ (40-ZR-92(N,N+P)39-Y-91-M,,SIG,,A)	Use (40-ZR-0(N,X)39-Y-91-M,,SIG).	Same as 30438.004.
30438.013	(40-ZR-90(N,A)38-SR-87-M,,SIG,,A)+ (40-ZR-91(N,N+A)38-SR-87-M,,SIG,,A)	Use (40-ZR-0(N,X)38-SR-87-M,,SIG).	Same as 30438.004.
30443.002	(46-PD-0(N,X)45-RH-105,,SIG)= ((46-PD-105(N,P)45-RH-105,,SIG,,A)+ (46-PD-106(N,N+P)45-RH-105,,SIG,,A)+ (46-PD-106(N,D)45-RH-105,,SIG,,A))	Use (46-PD-105(N,P)45-RH-105,,SIG)+ (46-PD-106(N,X)45-RH-105,,SIG,,RAB).	Existence of RAB actually does not change the definition a lot because the isotopic abundance of ¹⁰⁵ Pd and ¹⁰⁶ Pd are close.
<u>30500.004</u>	(48-CD-111(N,G)48-CD-112,PAR,SIG,,A)+ (48-CD-113(N,G)48-CD-114,PAR,SIG,,A)	Use (48-CD-0(N,G),PAR,SIG).	The source article (thesis) is not available. Cd(n, γ_{0+1}) characterized by the lower and upper limit of the level energies under E-LVL-MIN and E-LVL-MAX?
30531.002	(3-LI-0(N,X)2-HE-6,,SIG)= ((3-LI-6(N,P)2-HE-6,,SIG,,A)+ (3-LI-7(N,D)2-HE-6,,SIG,,A))	Delete the right hand side.	All stable Li isotopes appear.
<u>30594.016</u>	(29-CU-0(N,X)0-G-0,PAR,DA)= ((29-CU-65(N,INL)29-CU-65,PAR,DA,G,A)+ (29-CU-63(N,N+P)28-NI-62,PAR,DA,G,A))	Delete the left hand side.	Unresolved three gamma transitions characterized by a single gamma energy under E.
<u>30656.003</u>	(26-FE-54(N,INL)26-FE-54,PAR,DA,G,A)+ (26-FE-56(N,2N)26-FE-55,PAR,DA,G,A)	Use (26-FE-0(N,X)0-G-0,PAR,DA).	Defined as the elemental cross section by the authors. Unresolved two gamma transitions characterized by two gamma energies under E.
<u>30656.011</u>	(28-NI-60(N,INL)28-NI-60,PAR,DA,G,A)+ (28-NI-62(N,INL)28-NI-62,PAR,DA,G,A)	Use (28-NI-0(N,INL)28-NI-0,PAR,DA,G).	Same as 30656.003.
30813.003	(26-FE-56(N,P)25-MN-56,,SIG,,A)+	Use (26-FE-56(N,P)25-MN-56,,SIG)+	⁵⁶ Fe(n,p) is printed with “This

	(26-FE-57(N,X)25-MN-56,,SIG,,A)	(26-FE-57(N,X)25-MN-56,,SIG,,RAB).	value includes also the cross-section of $^{57}\text{Fe}(n,n'p)$ reaction” in the foot note. $^{56}\text{Fe}(n,p)^{56}\text{Mn}\sim 100\text{ mb.}$ $^{57}\text{Fe}(n,np)^{56}\text{Mn}\sim 1\text{ mb.}$
31459.010	((22-TI-49(N,N+P)21-SC-48,,SIG,,A)+ (22-TI-48(N,P)21-SC-48,,SIG,,A))= (22-TI-0(N,X)21-SC-48,,SIG)	Use (22-TI-48(N,P)21-SC-48,,SIG)+ (22-TI-49(N,X)21-SC-48,,SIG,,RAB).	The authors mention “obtained taking the natural abundance of ^{48}Ti isotope”.
31459.011	((26-FE-57(N,N+P)25-MN-56,,SIG,,A)+ (26-FE-56(N,P)25-MN-56,,SIG,,A))= (26-FE-0(N,X)25-MN-56,,SIG)	Use (26-FE-56(N,P)25-MN-56,,SIG)+ (26-FE-57(N,X)25-MN-56,,SIG,,RAB).	The authors mention “determined taking the abundance of ^{56}Fe isotope.”
31509.002.2	((12-MG-25(N,N+P)11-NA-24,,SIG)+ (12-MG-25(N,D)11-NA-24,,SIG))= (12-MG-25(N,X)11-NA-24,,SIG)	Delete the left hand side.	
31509.003	((12-MG-26(N,T)11-NA-24,,SIG)+ (12-MG-26(N,N+D)11-NA-24,,SIG)+ (12-MG-26(N,2N+P)11-NA-24,,SIG)) =(12-MG-26(N,X)11-NA-24,,SIG)	Delete the left hand side.	
31516.005	((28-NI-58(N,N+P)27-CO-57,,SIG,,FIS)+ (28-NI-58(N,D)27-CO-57,,SIG,,FIS))= (28-NI-58(N,X)27-CO-57,IND,SIG,,FIS)	Use (28-NI-58(N,X)27-CO-57,,SIG,,FIS).	
31524.007	((22-TI-46(N,P)21-SC-46-M,,SIG,,A)+ (22-TI-47(N,X)21-SC-46-M,,SIG,,A))= (22-TI-0(N,X)21-SC-46-M,,SIG)	Use (22-TI-46(N,P)21-SC-46-M,,SIG)+ (22-TI-47(N,X)21-SC-46-M,,SIG,,RAB).	The authors mention “ $\sigma(^{46}\text{Ti}(n,p))+0.9\sigma(^{47}\text{Ti}(n,np))$ ” .”
31528.007	(13-AL-27(N,X)12-MG-26,PAR,DA,G)= (13-AL-27(N,N+P)12-MG-26,PAR,DA,G)+ (13-AL-27(N,D)12-MG-26,PAR,DA,G)	Delete the right hand side.	
<u>31622.009</u>	(78-PT-196(N,2N)78-PT-195-M,,SIG,,A)+ (78-PT-195(N,INL)78-PT-195-M,,SIG,,A)	Use (78-PT-0(N,X)78-PT-195-M,,SIG,,FCT).	Authors confirmed the cross section is the elemental cross section divided by the sum of the isotopic abundances of ^{195}Pt and ^{196}Pt (~ 0.6). (Luo, 2018-02-28).
<u>32509.007</u>	(41-NB-93(N,X)0-G-0,PAR,DA)=	Delete the right hand side.	Unresolved three gamma

	((41-NB-93(N,INL)41-NB-93,PAR,DA,G)+ (41-NB-93(N,2N)41-NB-92,PAR,DA,G))		transitions characterized by a single gamma energy under E.
<u>32509.017</u>	(41-NB-93(N,X)0-G-0,PAR,DA)= ((41-NB-93(N,INL)41-NB-93,PAR,DA,G)+ (41-NB-93(N,2N)41-NB-92,PAR,DA,G))	Delete the right hand side.	Same as 32509.007.
<u>32610.007</u>	(23-V-51(N,X)0-G-0,PAR,DA)= ((23-V-51(N,INL)23-V-51,PAR,DA,G)+ (23-V-51(N,2N)23-V-50,PAR,DA,G))	Delete the right hand side.	Same as 32509.017.
40227.009	(34-SE-82(N,2N)34-SE-81-M,,SIG,,A)+ (34-SE-80(N,G)34-SE-81-M,,SIG,,A)	Use (34-SE-82(N,2N)34-SE-81-M,,SIG).	While small capture cs of ⁸⁰ Se(n,γ) is partly compensated by its bigger isotopic abundance, it is safe to assume that its contribution is smaller than the experimental error of 250 mb. This could be mentioned in free text.
41257.022	(74-W-0(N,X)74-W-185,,SIG,,SPA/FCT)+ (74-W-0(N,X)74-W-187,,SIG,,SPA/FCT)	?	β counting experiment with a strange half-life (1 d).
A0058.004	(40-ZR-91(P,X)0-NN-1,,SIG)= ((40-ZR-91(P,N)41-NB-91,,SIG)+ (40-ZR-91(P,N+P)40-ZR-90,,SIG)+ (40-ZR-91(P,N+A)39-Y-87,,SIG))	Use (40-ZR-91(P,X)0-NN-1,,SIG).	
A0058.010	(40-ZR-94(P,X)0-NN-1,,SIG)= ((40-ZR-94(P,N)41-NB-94,,SIG)+ (40-ZR-94(P,2N)41-NB-93,,SIG)+ (40-ZR-94(P,N+P)40-ZR-93,,SIG)+ (40-ZR-94(P,N+A)39-Y-90,,SIG)+ (40-ZR-94(P,2N+A)39-Y-89,,SIG))	Use (40-ZR-94(P,X)0-NN-1,,SIG).	
A0146.023	(27-CO-59(P,X)25-MN-56,CUM,SIG)= ((27-CO-59(P,N+3P)25-MN-56,,SIG)+ (27-CO-59(P,4P)24-CR-56,,SIG))	Delete the right hand side.	
A0238.002.4	(51-SB-0(A,X)53-I-124,IND,SIG,,EXP)= (51-SB-121(A,N)53-I-124,IND,SIG,,A,EXP)+ (51-SB-123(A,3N)53-I-124,IND,SIG,,A,EXP)	Use (51-SB-0(A,X)53-I-124,,SIG).	See the definition of N in the data reduction equation.

A0238.003.3	(51-SB-0(HE3,X)53-I-123,IND,SIG,,,EXP)= (51-SB-121(HE3,N)53-I-123,IND,SIG,,A,EXP)+ (51-SB-123(HE3,3N)53-I-123,IND,SIG,,A,EXP)	Use (51-SB-0(HE3,X)53-I-123,,SIG).	Same as A0238.002.4..
A0284.002	(37-RB-0(HE3,X)39-Y-86-M,IND,SIG,,,EXP)= ((37-RB-85(HE3,2N)39-Y-86-M,IND,SIG,,A,EXP)+ (37-RB-87(HE3,4N)39-Y-86-M,IND,SIG,,A,EXP))	Use (37-RB-0(HE3,X)39-Y-86-M,,SIG).	All stable Rb isotopes appear.
A0284.004	(37-RB-0(HE3,X)39-Y-87-M,IND,SIG,,,EXP)= ((37-RB-87(HE3,3N)39-Y-87-M,IND,SIG,,A,EXP)+ (37-RB-85(HE3,N)39-Y-87-M,IND,SIG,,A,EXP))	Use (37-RB-0(HE3,X)39-Y-87-M,,SIG).	Same as A0284.002.
A0284.005	(37-RB-0(HE3,X)39-Y-85-M,IND,SIG,,,EXP)= ((37-RB-85(HE3,3N)39-Y-85-M,IND,SIG,,A,EXP)+ (37-RB-87(HE3,5N)39-Y-85-M,IND,SIG,,A,EXP))	Use (37-RB-0(HE3,X)39-Y-85-M,,SIG).	Same as A0284.002.
A0284.006	(37-RB-0(HE3,X)39-Y-85,IND,SIG,,,EXP)= ((37-RB-85(HE3,3N)39-Y-85,IND,SIG,,A,EXP)+ (37-RB-87(HE3,5N)39-Y-85,IND,SIG,,A,EXP))	Use (37-RB-0(HE3,X)39-Y-85-G,,SIG)	Same as A0284.002.
A0284.007	(37-RB-0(A,X)39-Y-86-M,IND,SIG,,,EXP)= ((37-RB-85(A,3N)39-Y-86-M,IND,SIG,,A,EXP)+ (37-RB-87(A,5N)39-Y-86-M,IND,SIG,,A,EXP))	Use (37-RB-0(A,X)39-Y-86-M,,SIG).	Same as A0284.002.
A0284.008	(37-RB-0(A,X)39-Y-88,IND,SIG,,,EXP)= ((37-RB-85(A,N)39-Y-88,IND,SIG,,A,EXP)+ (37-RB-87(A,3N)39-Y-88,IND,SIG,,A,EXP))	Use (37-RB-0(A,X)39-Y-88,,SIG).	Same as A0284.002.
A0284.009	(37-RB-0(A,X)39-Y-87-M,IND,SIG,,,EXP)= ((37-RB-85(A,2N)39-Y-87-M,IND,SIG,,A,EXP)+ (37-RB-87(A,4N)39-Y-87-M,IND,SIG,,A,EXP))	Use (37-RB-0(A,X)39-Y-87-M,,SIG)?	Same as A0284.002.
A0299.003	(17-CL-0(P,X)12-MG-28,CUM,SIG,,,EXP)= ((17-CL-35(P,2N+6P)12-MG-28,CUM,SIG,,A,EXP)+ (17-CL-37(P,4N+6P)12-MG-28,CUM,SIG,,A,EXP))	Use (17-CL-0(P,X)12-MG-28,CUM,SIG).	The authors do not specify the target mass number in the figure caption.
A0299.004	(16-S-0(P,X)12-MG-28,,SIG,,,EXP)= (16-S-32(P,5P)12-MG-28,,SIG,,A,EXP)	Use (16-S-0(P,X)12-MG-28,,SIG).	
A0299.005	(19-K-0(P,X)12-MG-28,(CUM),SIG,,,EXP)= (19-K-39(P,4N+8P)12-MG-28,(CUM),SIG,,A,EXP)	Use (19-K-0(P,X)12-MG-28,(CUM),SIG).	
A0299.010	(16-S-0(P,X)11-NA-24,,SIG,,,EXP)= (16-S-32(P,3N+6P)11-NA-24,,SIG,,A,EXP)	Use (16-S-0(P,X)11-NA-24,,SIG).	
A0299.011	(17-CL-0(P,X)11-NA-24,,SIG,,,EXP)= ((17-CL-35(P,5N+7P)11-NA-24,,SIG,,A,EXP)+ (17-CL-37(P,7N+7P)11-NA-24,,SIG,,A,EXP))	Delete the right hand side.	The authors do not specify the target mass number in the figure caption.
A0299.012	(19-K-0(P,X)11-NA-24,,SIG,,,EXP)=	Use (19-K-0(P,X)11-NA-24,,SIG).	

	(19-K-39(P,7N+9P)11-NA-24,,SIG,,A,EXP)		
A0299.015	(17-CL-0(P,X)12-MG-28,,TTY,,CALC)= ((17-CL-35(P,2N+6P)12-MG-28,,TTY,,CALC)+ (17-CL-37(P,4N+6P)12-MG-28,,TTY,,CALC))	Use (17-CL-0(P,X)12-MG-28,,TTY,,(PHY),DERIV).	The authors do not specify the target mass number in the figure caption.
A0299.017	(16-S-0(P,X)12-MG-28,,TTY,,CALC)= (16-S-32(P,5P)12-MG-28,,TTY,,CALC)	Use (16-S-0(P,X)12-MG-28,,TTY,,(PHY),DERIV).	
A0299.018	(19-K-0(P,X)12-MG-28,,TTY,,CALC)= (19-K-39(P,4N+8P)12-MG-28,,TTY,,CALC)	Use (19-K-0(P,X)12-MG-28,,TTY,,(PHY),DERIV).	
A0320.004	(55-CS-133(P,4N+P)55-CS-129,CUM,SIG,,EXP)= ((55-CS-133(P,4N+P)55-CS-129,IND,SIG,,EXP)+ (55-CS-133(P,5N)56-BA-129-G,M+,SIG,,EXP))	Use (55-CS-133(P,X)55-CS-129,CUM,SIG).	
C0018.008	(1-H-2(D,ABS),,SIG,,FCT)= ((1-H-2(D,P)1-H-3,,SIG,,FCT)+ (1-H-2(D,N)2-HE-3,,SIG,,FCT))	Delete.	Can be derived form 005 and 006 mathematically.
C0040.003	(2-HE-4(D,X)1-H-1,,DA)= ((2-HE-4(D,N+P)2-HE-4,,DA,P)+ (2-HE-4(D,P)2-HE-5,,DA))	Delete the right hand side.	
C0040.005	(2-HE-4(D,X)1-H-1,,IPA)= ((2-HE-4(D,N+P)2-HE-4,,IPA)+ (2-HE-4(D,P)2-HE-5,,IPA))	Delete the right hand side.	
D0065.003	((47-AG-107(A,N)49-IN-110-M,,SIG,,A)+ (47-AG-109(A,3N)49-IN-110-M,,SIG,,A))= (47-AG-0(A,X)49-IN-110-M,,SIG)	Delete the left hand side.	All stable Ag isotopes appear.
D0065.004	((47-AG-107(A,2N)49-IN-109,,SIG,,A)+ (47-AG-109(A,4N)49-IN-109,,SIG,,A))= (47-AG-0(A,X)49-IN-109,,SIG)	Delete the left hand side.	Same as D0065.003.
D0065.005	((47-AG-107(A,N+A)47-AG-106-M,,SIG,,A)+ (47-AG-109(A,3N+A)47-AG-106-M,,SIG,,A))= (47-AG-0(A,X)47-AG-106-M,,SIG)	Delete the left hand side.	Same as D0065.003.
D0065.006	((47-AG-107(A,2N+A)47-AG-105,,SIG,,A)+ (47-AG-109(A,4N+A)47-AG-105,,SIG,,A))= (47-AG-0(A,X)47-AG-105,,SIG)	Delete the left hand side. Add SF5=(CUM)?	Same as D0065.003.
D0136.003	(29-CU-63(A,N)31-GA-66,,SIG,,A)+ (29-CU-65(A,3N)31-GA-66,,SIG,,A)	Use (29-CU-0(A,X)31-GA-66,,SIG).	All stable Cu isotopes appear.
D0193.005	(12-MG-25(P,INL)12-MG-25,PAR,DA,,A)+ (12-MG-26(P,INL)12-MG-26,PAR,DA,,A)	Use (12-MG-0(P,INL)12-MG-0,PAR,DA) E-EXC1, E-EXC2 -> E-EXC.	Authors do not assign the two levels to one of the isotopes because e.g. both have levels

			near 2.8 MeV. For this reason, it would be better to treat this data set as the elemental cross section.
<u>D0241.013</u>	(29-CU-63(D,INL)29-CU-63,PAR,DA,,A)+ (29-CU-65(D,INL)29-CU-65,PAR,DA,,A)	Use (29-CU-0(D,INL)29-CU-0,PAR,DA). Use E-EXC=0.96 MeV + 1.27 MeV and E-EXC-ERR=0.10 MeV.	Authors say that they “assume” that levels 0.961 and 1.327 MeV (Cu63) and 1.114 MeV (Cu65) contributed to the observed peaks of 0.96 and 1.27 MeV. Note that there is no 1.27 MeV level in either isotope. This should be mentioned in free text.
<u>D0241.015</u>	(30-ZN-64(D,INL)30-ZN-64,PAR,DA,,A)+ (30-ZN-66(D,INL)30-ZN-66,PAR,DA,,A)	Use (30-ZN-0(D,INL)30-ZN-0,PAR,DA). Use E-EXC=0.96 MeV and E-EXC-ERR=0.10 MeV.	
D0646.002	(62-SM-147(P,G)63-EU-148,,SIG,,FCT)+ (62-SM-148(P,N)63-EU-148,,SIG,,FCT)	Ok	Data for an enriched sample.
D0646.004	(50-SN-115(A,G)52-TE-119-M,,SIG,,FCT)+ (50-SN-116(A,N)52-TE-119-M,,SIG,,FCT)	Ok	Same as D0646.002.
D0652.002	(50-SN-115(A,G)52-TE-119-G,,SIG,,FCT)+ (50-SN-116(A,N)52-TE-119-G,,SIG,,FCT)	Ok	Data for an enriched sample.
D0652.004	(50-SN-115(A,G)52-TE-119-M,,SIG,,FCT)+ (50-SN-116(A,N)52-TE-119-M,,SIG,,FCT)	Ok	Same as D0652.004.
D4105.004.1	(22-TI-46(D,2P)21-SC-46,,SIG,,FCT)+ (22-TI-48(D,A)21-SC-46,,SIG,,FCT)	Ok	Data for an enriched sample.
D4105.004.2	(22-TI-46(D,N)23-V-47,,SIG,,FCT)+ (22-TI-47(D,2N)23-V-47,,SIG,,FCT)	Ok	Same as D4105.004.1.
D4105.006.1	(22-TI-49(D,A)21-SC-47,,SIG,,FCT)+ (22-TI-48(D,N+2P)21-SC-47,,SIG,,FCT)	Ok	Same as D4105.004.1.
D4105.006.2	(22-TI-49(D,N+A)21-SC-46,,SIG,,FCT)+ (22-TI-48(D,A)21-SC-46,,SIG,,FCT)	Ok	Same as D4105.004.1.
D4105.007	(22-TI-50(D,N+A)21-SC-47,,SIG,,FCT)+ (22-TI-48(D,N+2P)21-SC-47,,SIG,,FCT)+	Ok	Same as D4105.007.

	(22-TI-49(D,A)21-SC-47,,SIG,,FCT)		
E2465.005	((98-CF-249(5-B-11,4N)103-LR-256,,SIG,,FCT)+ (98-CF-250(5-B-11,5N)103-LR-256,,SIG,,FCT)+ (98-CF-251(5-B-11,6N)103-LR-256,,SIG,,FCT))	Ok	Data for an enriched sample.
L0162.003	(12-MG-24(G,N)12-MG-23,,INT,,A)+ (12-MG-25(G,2N)12-MG-23,,INT,,A)	?	
L0162.004	(12-MG-24(G,N)12-MG-23,,INT,,A)+ (12-MG-25(G,2N)12-MG-23,,INT,,A)+ (12-MG-24(G,2N)12-MG-22,,INT,,FCT)	?	
L0204.010	(28-NI-58(G,N)28-NI-57,,INT,,A)+ (28-NI-60(G,N)28-NI-59,,INT,,A)	Delete.	Arithmetic sum of data for enriched ⁵⁸ Ni and ⁶⁰ Ni samples (L0204.002 and 004).
<u>M0644.005</u>	((66-DY-162(G,INL)66-DY-162,PAR,DA,,A)+ (66-DY-163(G,INL)66-DY-163,PAR,DA,,A)+ (66-DY-164(G,INL)66-DY-164,PAR,DA,,A))	Use (66-DY-0(G,INL)66-DY-0,PAR,DA).	The target isotopes are not clarified by the authors in the cross section table. Unresolved three inelastic channels characterized by a single level energy under E-EXC.
O0177.003	(92-U-238(D,X)93-NP-239,CUM,SIG)= ((92-U-238(D,N)93-NP-239,,SIG)+ (92-U-238(D,P)92-U-239,,SIG))	Delete the right hand side.	
O0350.013	(12-MG-0(P,X)10-NE-22,,SIG)= ((12-MG-0(P,X)10-NE-22,IND,SIG)+ (12-MG-0(P,X)9-F-22,CUM,SIG))	Use (12-MG-0(P,X)10-NE-22,CUM,SIG).	
O0350.017	(14-SI-0(P,X)10-NE-22,,SIG)= ((14-SI-0(P,X)10-NE-22,IND,SIG)+ (14-SI-0(P,X)9-F-22,CUM,SIG))	Use (14-SI-0(P,X)10-NE-22,CUM,SIG).	
O0350.019	(13-AL-27(P,X)10-NE-22,,SIG)= ((13-AL-27(P,X)10-NE-22,IND,SIG)+ (13-AL-27(P,X)9-F-22,CUM,SIG)+ (13-AL-27(P,X)11-NA-22,CUM,SIG))	Delete.	Arithmetic sum of data for enriched ²⁰ Ne cumulative production and ²² Na production (O0350.022 and 025).
O0350.020	(14-SI-0(P,X)10-NE-22,CUM,SIG)=	Delete.	Delete. Arithmetic sum of

	((14-SI-0(P,X)10-NE-22,IND,SIG)+ (14-SI-0(P,X)9-F-22,CUM,SIG)+ (14-SI-0(P,X)11-NA-22,CUM,SIG))		data for enriched ^{20}Ne cumulative production and ^{22}Na production (O0350.016 and 017).
O0350.022	(13-AL-27(P,X)10-NE-22,,SIG)= ((13-AL-27(P,X)10-NE-22,IND,SIG)+ (13-AL-27(P,X)9-F-22,CUM,SIG))	Use (13-AL-27(P,X)10-NE-22,CUM,SIG).	
O0350.027	(20-CA-0(P,X)18-AR-36,CUM,SIG)= ((20-CA-0(P,X)18-AR-36,IND,SIG)+ (20-CA-0(P,X)19-K-36,CUM,SIG))	Delete the right hand side.	
<u>O0875.031</u>	((17-CL-35(D,P)17-CL-36,PAR,TTY/MLT/DA,G,A)+ (17-CL-35(D,N)18-AR-36,PAR,TTY/MLT/DA,G,A))	Use (17-CL-35(D,X)0-G-0,PAR,PY,,TT/CH,A). (Confirmed by Z.Eleks, 2018-03-02)	Unresolved three gamma transitions characterized by single gamma energy under E.
R0039.007	(29-CU-65(A,N+A)29-CU-64,,SIG,,A)+ (29-CU-63(A,N+2P)29-CU-64,,SIG,,A)	Use (29-CU-0(A,X)29-CU-64,,SIG).	All stable Cu isotopes appear.
S0015.005	(26-FE-57(D,2N)27-CO-57,,SIG,,A)+ (26-FE-56(D,N)27-CO-57,,SIG,,A)	Use (26-FE-0(D,X)27-CO-57,,SIG).	