Use of branch code M+ or (M) without an isomer code in REACTION SF4

(N. Otsuka, 2021-09-08, Memo CP-D/1023)

This paper proposes a new action to NNDC to fix the remaining errors (C1762.002 and T0196.031).

The branch code M+ and (M) may be in REACITON SF5 only when the product nuclide coded in REACTION SF4 has an isomer code (usually -G but can be -M). See also LEXFOR "Independent and Cumulative Data". I found 50 REACTION codes violating this rule in EXFOR Master 2021-08-17, and summarized my proposals of corrections in the appendix of this memo.

In the appendix, removal of M+ or (M) is proposed systematically when (1) there is no indication of an isomeric state (e.g., "g") in the cross section table or figure, (2) the metastable state half-life is shorter than 10% of the ground state half-life, and (3) the isomeric transition probability of the metastable state is 100%. (The conditions (2) and (3) would be bit too strong.)

Addition to Memo CP-D/1023

C1762.002
`(37-RB-CMP(A,X)39-Y-87,M+,TTY,,(PHY))`
must be
`(37-RB-CMP(A,X)39-Y-87-G,M+,TTY,,(PHY))`

T0196.031
`(46-PD-106(3-LI-6,X)47-AG-103,M+,SIG)`
must be
`(46-PD-106(3-LI-6,X)47-AG-103,,SIG)`

Proposals on corrections of REACTION codes coded with SF5=M+ or (M) without an isomer code in SF4

HLg: Half-life of the ground state
HLm: Half-life of the metastable state
ITm: Isomeric transition probability from the metastable state to the ground state
HLm2: Half-life of the second metastable state
ITm2: Isomeric transition probability from the second metastable state to the ground state
HLm/HLg and HLm2/HLg: Half-life ratio

Subentry	REACTION	Proposed correction	HLg (sec)	HLm (sec)	HLm/ HLg	ITm (%)	HLm2 (sec)	HLm2/ HLg	ITm2 (%)
12866.062	(37-RB-85(N,G)37-RB-86,M+,SIG,,SPA)	Remove M+ in SF5.	1.61E+06	6.10E+01	3.79E-05	100			
12866.063	(37-RB-85(N,G)37-RB-86,M+,RI)	Remove M+ in SF5.	1.61E+06	6.10E+01	3.79E-05	100			
12866.172	(71-LU-176(N,G)71-LU-177,M+,SIG,,SPA)	Add -G to SF4.	5.74E+05	1.39E+07	2.42E+01	22.7			
12866.173	(71-LU-176(N,G)71-LU-177,M+,RI)	Add -G to SF4.	5.74E+05	1.39E+07	2.42E+01	22.7			
30063.011	(79-AU-197(N,G)79-AU-198,(M),SIG)	Remove (M) in SF5. (It is known that the m/g ratio is close to zero.)	2.33E+05	1.96E+05	8.41E-01	100			
30501.005	(52-TE-130(N,G)52-TE-131,M+,SIG)	Add -G to SF4.	1.50E+03	1.20E+05	8.00E+01	25.9			
30755.012	(38-SR-86(N,2N)38-SR-85,M+,SIG)	Add -G to SF4.	5.60E+06	4.06E+03	7.25E-04	86.6			
A0026.094	(82-PB-0(P,X)21-SC-46,M+,SIG)	Remove M+ in SF5.	7.24E+06	1.88E+01	2.60E-06	100			
A0026.101	(82-PB-0(P,X)37-RB-84,M+,SIG)	Remove M+ in SF5.	2.84E+06	1.22E+03	4.30E-04	100			
A0026.112	(82-PB-0(P,X)51-SB-122,M+,SIG)	Remove M+ in SF5.	2.35E+05	5.30E-04	2.26E-09	100	2.51E+02	1.07E-03	100
A0148.024	(26-FE-0(A,X)25-MN-52,M+,SIG)	Add -G to SF4 (confirmed by Rolf Michel, 2021-08-17)	4.83E+05	1.27E+03	2.63E-03	1.78			
A0209.017	(27-CO-59(D,X)21-SC-46,M+,SIG)	Remove M+ in SF5.	7.24E+06	1.88E+01	2.60E-06	100			
A0210.013	(27-CO-59(HE3,X)25-MN-52,M+,SIG)	Add -G to SF4 (confirmed by Rolf Michel, 2021-08-17)	4.83E+05	1.27E+03	2.63E-03	1.78			
A0644.006	(27-CO-59(A,N+A)27-CO-58,M+,SIG)	Remove M+ in SF5.	6.12E+06	3.28E+04	5.36E-03	100			
A0695.004	(41-NB-93(P,N+A)40-ZR-89,M+,SIG)	Use X in SF3. Add -G to SF4.	2.82E+05	2.50E+02	8.87E-04	93.77			
A0711.002	(46-PD-0(D,X)47-AG-103,M+,SIG)	Remove M+ in SF5.	3.94E+03	5.70E+00	1.45E-03	100			
A0711.003	(46-PD-0(P,X)47-AG-103,M+,SIG)	Remove M+ in SF5.	3.94E+03	5.70E+00	1.45E-03	100			

B0020.017	(28-NI-61(P,A)27-CO-58,(M),SIG)	Remove (M) in SF5.	6.12E+06	3.28E+04	5.36E-03	100			
B0038.004	(73-TA-181(P,3N)74-W-179,(M),SIG,,,EXP)	Add -G to SF4.	2.22E+03	3.84E+02	1.73E-01	99.71			
B0041.005	(26-FE-56(P,N+A)25-MN-52,(M),SIG,,,EXP)	Add -G to SF4.	4.83E+05	1.27E+03	2.63E-03	1.78			
B0050.008	(27-CO-59(P,X)27-CO-58,(M),SIG,,,EXP)	Remove (M) in SF5.	6.12E+06	3.28E+04	5.36E-03	100			
B0079.014	(29-CU-63(HE3,X)27-CO-58,M+,SIG)	Remove M+ in SF5.	6.12E+06	3.28E+04	5.36E-03	100			
C0062.010	(24-CR-52(P,N)25-MN-52,(M),SIG)	Add -G to SF4.	4.83E+05	1.27E+03	2.63E-03	1.78			
C1762.002	(37-RB-CMP(A,X)39-Y-87,M+,TTY,,(PHY))	Add -G to SF4.	2.87E+05	4.81E+04	1.68E-01	98.43			
D4052.004	(24-CR-50(A,N)26-FE-53,(M),SIG)	Add-G to SF4.	5.11E+02	1.52E+02	2.97E-01	100			
D4061.005.2	(28-NI-58(D,2A)25-MN-52,(M),SIG)	Add -G to SF4.	4.83E+05	1.27E+03	2.63E-03	1.78			
D4061.006.2	(26-FE-54(3-LI-6,2P)27-CO-58,(M),SIG)	Remove (M) in SF5.	6.12E+06	3.28E+04	5.36E-03	100			
D4288.010	(28-NI-0(D,X)27-CO-58,M+,SIG)	Remove M+ in SF5.	6.12E+06	3.28E+04	5.36E-03	100			
D4290.003	(66-DY-0(P,X)67-HO-161,M+,SIG)	Remove M+ in SF5.	8.93E+03	6.76E+00	7.57E-04	100			
D4290.004	(66-DY-0(P,X)67-HO-159,M+,SIG)	Remove M+ in SF5.	1.98E+03	8.30E+00	4.19E-03	100			
D4290.010	(66-DY-0(P,X)65-TB-156,M+,SIG)	Remove M+ in SF5 ("measured after complete decay").	4.62E+05	8.78E+04	1.90E-01	100	1.91E+04	4.13E-02	100
D4291.003	(66-DY-0(D,X)67-HO-161,M+,SIG)	Remove M+ in SF5.	8.93E+03	6.76E+00	7.57E-04	100			
D4291.004	(66-DY-0(D,X)66-DY-165,M+,SIG)	Add -G to SF4.	8.43E+03	7.54E+01	8.94E-03	97.76			
D4291.010	(66-DY-0(D,X)65-TB-156,M+,SIG)	Remove M+ in SF5 ("after decay of two isomeric states").	4.62E+05	8.78E+04	1.90E-01	100	1.91E+04	4.13E-02	100
D4292.004	(64-GD-0(D,X)65-TB-156,M+,SIG)	Remove M+ in SF5 ("after decay of the isomeric states").	4.62E+05	8.78E+04	1.90E-01	100	1.91E+04	4.13E-02	100
D4292.010	(64-GD-0(D,X)65-TB-152,M+,SIG)	Add -G to SF4.	6.30E+04	2.52E+02	4.00E-03	78.9			
D4292.011	(64-GD-0(D,X)65-TB-151,M+,SIG)	Add -G to SF4.	6.34E+04	2.50E+01	3.94E-04	93.4			
D4293.009	(27-CO-59(P,X)25-MN-52,M+,SIG)	Add -G to SF4.	4.83E+05	1.27E+03	2.63E-03	1.78			
D4295.002	(58-CE-0(D,X)59-PR-142,M+,SIG)	Remove M+ in SF5.	6.88E+04	8.76E+02	1.27E-02	100			
D4296.006	(65-TB-159(D,X)65-TB-156,M+,SIG)	Remove M+ in SF5 ("after nearly coplete decay of the isomeric states").	4.62E+05	8.78E+04	1.90E-01	100	1.91E+04	4.13E-02	100
O0006.055	(90-TH-232(P,F)71-LU-172,M+,SIG)	Remove M+ in SF5.	5.79E+05	2.22E+02	3.83E-04	100			
O0277.114	(26-FE-0(P,X)21-SC-48,M+,SIG)	Delete M+ (No isomer exists).							

O0283.022	(26-FE-0(P,X)21-SC-46,M+,SIG)	Remove M+ in SF5.	7.24E+06	1.88E+01	2.60E-06	100			
O0346.002	(27-CO-59(P,X)27-CO-58,M+,SIG)	Remove M+ in SF5.	6.12E+06	3.28E+04	5.36E-03	100			
O0355.011	(79-AU-197(P,X)43-TC-96,M+,SIG)	Add -G in SF4.	3.70E+05	3.09E+03	8.35E-03	98			
O0842.014	(93-NP-237(P,X)41-NB-95,M+,SIG)	Add -G in SF4 and CUM in SF5 (c.f. article table).	3.02E+06	3.12E+05	1.03E-01	94.4			
O0900.032	(83-BI-209(P,X)79-AU-196,M+,SIG)	Remove M+ in SF5.	5.33E+05	8.10E+00	1.52E-05	100	3.46E+04	6.49E-02	100
O0900.035	(83-BI-209(P,X)35-BR-82,M+,SIG)	Add -G in SF4. (N.B. The author use g+m.)	1.27E+05	3.68E+02	2.90E-03	97.6			
O1099.282	(83-BI-209(P,3N)84-PO-207,M+,SIG)	Remove M+ in SF5.	2.09E+04	2.79E+00	1.33E-04	100			
T0196.031	(46-PD-106(3-LI-6,X)47-AG-103,M+,SIG)	Remove M+ in SF5.	3.94E+03	5.70E+00	1.45E-03	100			