^{157}Pm β^- decay 1994WiZZ,1997Gr09,1996Gr20

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 132, 1 (2016)	4-Dec-2015

Parent: ^{157}Pm: E=0.0; J$^\pi$=(5/2$^-$); T$_{1/2}$=10.56 s *10*; Q(β^-)=4381 *8*; %β^- decay=100.0

^{157}Pm produced by spontaneous fission of ^{252}Cf (1994WiZZ) and neutron-induced fission of ^{235}U (1992Sh32), both with isotope separation. γ singles (1994WiZZ,1992Sh32) and $\gamma\gamma$ coincidences (1994WiZZ) measured, and scheme given by 1994WiZZ.

^{157}Sm Levels

The lowest log *ft* value is 5.6 which suggests (1998Si17) that this is an allowed β- transition; however, in a more complete decay scheme, this value might be increased significantly. Since this β- branch is to a level with J^π=(3/2$^-$), the log *ft* values suggest J^π=(1/2,3/2,5/2)$^-$ for the ground state of ^{157}Pm, which agrees with the (5/2$^-$) assignment based on the analogy with ^{153}Pm (1990Ja11).

E(level)[†]	J$^\pi$[‡]	E(level)[†]	J$^\pi$[‡]	E(level)[†]	E(level)[†]
0.0[&]	(3/2$^-$)	694.29[c] *7*	(7/2)[@]	1674.0 *4*	2600[#]
52.393[&] *10*	(5/2$^-$)	800[#]		1694.48 *24*	2700[#]
125.747[&] *14*	(7/2$^-$)	850[#]		1800[#]	2800[#]
160.586[a] *12*	(5/2$^+$)	1180[#]		1900[#]	2900[#]
216.425[a] *14*	(7/2$^+$)	1293.64 *9*		2000[#]	3000[#]
348.636[b] *15*	(5/2$^-$)	1362.82 *15*		2100[#]	3100[#]
353.80 *4*		1421.84[d] *4*	(3/2$^-$)	2200[#]	3200[#]
426.210[b] *21*	(7/2$^-$)	1466.39 *24*		2300[#]	3300[#]
571.29[c] *3*	(3/2)[@]	1478.05[d] *8*	(5/2$^-$)	2400[#]	
621.39[c] *4*	(5/2)[@]	1580[#]		2500[#]	

[†] From least-squares fit to γ energies.

[‡] From 1994WiZZ and based on expected band structure and Nilsson states. For ^{159}Gd, also with N=95, the review of 1990Ja11 lists the lowest energy Nilsson states as 5/2[521] at 0 keV, 5/2[642] at 67 keV, 5/2[523] at 146 keV, 1/2[521] at 507 keV, 11/2[505] at 682 keV, and 3/2[651]+3/2[402] at 744 keV. Because the supporting data are not available, only the first three J^π values were adopted in the Adopted Levels, Gammas datatset.

[#] Pseudo levels, which are artificially introduced levels, the placement and number of which is quite arbitrary and merely indicates that in those energy regions a certain amount of β-feeding is required to fit the measured spectrum.

[@] Band assignment assumes π=+.

[&] Band(A): 3/2[521] band.

[a] Band(B): 5/2[642] band.

[b] Band(C): 5/2[523] band.

[c] Band(D): Possible 3/2[651] band.

[d] Band(E): 3/2[532] band.

β^- radiations

E(decay)	E(level)	Iβ^-[†‡#]	Log *ft*	Comments
(1081 *8*)	3300	0.2	5.5	av Eβ=373.0 *33*
(1181 *8*)	3200	0.4	5.4	av Eβ=414.0 *33*
(1281 *8*)	3100	0.4	5.5	av Eβ=455.6 *34*
(1381 *8*)	3000	0.4	5.6	av Eβ=497.7 *34*
(1481 *8*)	2900	0.4	5.7	av Eβ=540.2 *35*

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^{157}Pm β^- decay 1994WiZZ,1997Gr09,1996Gr20 (continued)

β^- radiations (continued)

E(decay)	E(level)	$I\beta^{-\dagger\ddagger\#}$	Log *ft*	Comments
(1581 *8*)	2800	2.6	5.0	av Eβ=583.1 *35*
(1681 *8*)	2700	0.6	5.8	av Eβ=626.4 *35*
(1781 *8*)	2600	0.9	5.7	av Eβ=670.1 *35*
(1881 *8*)	2500	1.0	5.7	av Eβ=714.0 *36*
(1981 *8*)	2400	1.4	5.7	av Eβ=758.2 *36*
(2081 *8*)	2300	0.9	6.0	av Eβ=802.6 *36*
(2181 *8*)	2200	0.9	6.0	av Eβ=847.2 *36*
(2281 *8*)	2100	1.0	6.1	av Eβ=892.0 *36*
(2381 *8*)	2000	0.9	6.2	av Eβ=937.0 *36*
(2481 *8*)	1900	1.0	6.2	av Eβ=982.1 *37*
(2581 *8*)	1800	1.1	6.3	av Eβ=1027.3 *37*
(2687 *8*)	1694.48	1.9	6.1	av Eβ=1075.2 *37*
(2707 *8*)	1674.0	1.5	6.2	av Eβ=1084.5 *37*
(2801 *8*)	1580	1.7	6.2	av Eβ=1127.3 *37*
(2903 *8*)	1478.05	1.6	6.3	av Eβ=1173.8 *37*
(2959 *8*)	1421.84	11.0	5.5	av Eβ=1199.5 *37*
(3018 *8*)	1362.82	1.4	6.4	av Eβ=1226.4 *37*
(3087 *8*)	1293.64	2.3	6.3	av Eβ=1258.1 *37*
(3201 *8*)	1180	2.0	6.4	av Eβ=1310.2 *37*
(3531 *8*)	850	0.9	6.9	av Eβ=1461.9 *37*
(3581 *8*)	800	0.8	7.0	av Eβ=1484.9 *37*
(3687 *8*)	694.29	0.9	7.0	av Eβ=1533.7 *37*
(3760 *8*)	621.39	0.8	7.1	av Eβ=1567.3 *37*
(3810 *8*)	571.29	0.5	7.3	av Eβ=1590.4 *37*
(3955 *8*)	426.210	3.5	6.5	av Eβ=1657.4 *37*
(4032 *8*)	348.636	12.5	6.0	av Eβ=1693.3 *37*
(4165 *8*)	216.425	4.5	6.5	av Eβ=1754.4 *37*
(4220 *8*)	160.586	6.8	6.4	av Eβ=1780.2 *37*
(4255 *8*)	125.747	6	6.4	av Eβ=1796.4 *37*
(4329 *8*)	52.393	≈12	≈6.2	av Eβ=1830.3 *37* LOGFT,IB From $I_{\beta-}$(0+52+125)=27.3% *22* (1996Gr20) and $I_{\beta-}$(125)=6% *3*, a reasonable $I_{\beta-}$(0)/$I_{\beta-}$(52) ratio gives $I_{\beta-}$(0) ≈ 8% with log *ft* ≈ 6.3 and $I_{\beta-}$(52) ≈ 12% with log *ft* ≈ 6.2.
(4381 *8*)	0.0	≈8	≈6.3	av Eβ=1854.6 *37* LOGFT,IB From $I_{\beta-}$(0+52+125)=27.3% *22* (1996Gr20) and $I_{\beta-}$(125)=6% *3*, a reasonable $I_{\beta-}$(0)/$I_{\beta-}$(52) ratio gives $I_{\beta-}$(0) ≈ 8% with log *ft* ≈ 6.3 and $I_{\beta-}$(52) ≈ 12% with log *ft* ≈ 6.2.

† The β- intensity distribution, as a function of the excitation energy, has been reported (1997Gr09) from total absorption γ spectra (TAGS), independent of the placements of γ-rays in the scheme. These results are shown, in part, as pseudolevels with no depopulating γ rays; these levels have a total β- feeding of 20%. Since γ′s from these levels will populate the lower lying levels, the $I_{\beta-}$ computed from intensity balances for known γ rays will not be accurate, especially for the values of a few percent or less. The energies of the pseudolevels (1997Gr09) are chosen, often equally spaced, to represent the levels in an energy range, and do not represent actual levels. Where the pseudolevels are equally spaced, this range is half of the distance to the adjacent levels; and where a pseudolevel is between discrete levels, the range is between these levels. log *ft*′s are not given for the pseudolevels since they may represent the feeding of several actual levels.

‡ The Iβ- values to the levels which are depopulated by γ′s, are from a combination of the TAGS results and the intensity balances. Due to the incompleteness of the γ-ray portion of the decay scheme, no uncertainties of given for $I_{\beta-}$ or the log *ft*′s.

\# Absolute intensity per 100 decays.

^{157}Pm β^- decay 1994WiZZ,1997Gr09,1996Gr20 (continued)

$\gamma(^{157}Sm)$

Iγ normalization: estimated to give approximate agreement of the I$_{\beta-}$ values and γ intensities for levels at 348, 426, and 1421 keV.

E$_\gamma$ †	I$_\gamma$ †‡&	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.#	α @	Comments
52.395 *11*	4.98 *9*	52.393	(5/2$^-$)	0.0	(3/2$^-$)	(M1,E2)	20 *9*	α(K)=7 *3*; α(L)=10 *9*; α(M)=2.3 *21* α(N)=0.5 *5*; α(O)=0.06 *6*; α(P)=0.00041 *19*
55.837 *17*	0.88 *4*	216.425	(7/2$^+$)	160.586	(5/2$^+$)	(M1,E2)	15 *7*	α(K)=5.8 *19*; α(L)=7 *7*; α(M)=1.7 *15* α(N)=0.4 *4*; α(O)=0.05 *4*; α(P)=0.00034 *16*
72.50 *9*		426.210	(7/2$^-$)	353.80				
73.361 *11*	4.15 *11*	125.747	(7/2$^-$)	52.393	(5/2$^-$)	(M1,E2)	5.8 *17*	α(K)=3.0 *5*; α(L)=2.1 *17*; α(M)=0.5 *4* α(N)=0.11 *9*; α(O)=0.014 *10*; α(P)=0.00017 *6*
90.77 *10*	0.27 *9*	216.425	(7/2$^+$)	125.747	(7/2$^-$)	(E1)	0.358	α(K)=0.301 *5*; α(L)=0.0448 *7*; α(M)=0.00960 *14* α(N)=0.00214 *3*; α(O)=0.000300 *5*; α(P)=1.440×10^{-5} *21*
108.191 *9*	7.65 *17*	160.586	(5/2$^+$)	52.393	(5/2$^-$)	(E1)	0.223	α(K)=0.188 *3*; α(L)=0.0273 *4*; α(M)=0.00585 *9* α(N)=0.001305 *19*; α(O)=0.000185 *3*; α(P)=9.20×10^{-6} *13*
125.73 *4*	1.26 *14*	125.747	(7/2$^-$)	0.0	(3/2$^-$)	(E2)	1.032	α(K)=0.617 *9*; α(L)=0.322 *5*; α(M)=0.0741 *11* α(N)=0.01628 *23*; α(O)=0.00208 *3*; α(P)=2.75×10^{-5} *4*
132.22 *3*	5.59 *23*	348.636	(5/2$^-$)	216.425	(7/2$^+$)	(E1)	0.1290	α(K)=0.1092 *16*; α(L)=0.01559 *22*; α(M)=0.00333 *5* α(N)=0.000745 *11*; α(O)=0.0001067 *15*; α(P)=5.50×10^{-6} *8*
137.39 *4*		353.80		216.425	(7/2$^+$)			
160.61 *3*	100.	160.586	(5/2$^+$)	0.0	(3/2$^-$)	(E1)	0.0761	α(K)=0.0646 *9*; α(L)=0.00908 *13*; α(M)=0.00194 *3* α(N)=0.000435 *6*; α(O)=6.27×10^{-5} *9*; α(P)=3.33×10^{-6} *5*
164.036 *12*	11.7 *4*	216.425	(7/2$^+$)	52.393	(5/2$^-$)	(E1)	0.0719	α(K)=0.0610 *9*; α(L)=0.00857 *12*; α(M)=0.00183 *3* α(N)=0.000410 *6*; α(O)=5.92×10^{-5} *9*; α(P)=3.16×10^{-6} *5*
188.052 *16*	38.7 *12*	348.636	(5/2$^-$)	160.586	(5/2$^+$)	(E1)	0.0498	α(K)=0.0423 *6*; α(L)=0.00589 *9*; α(M)=0.001259 *18* α(N)=0.000282 *4*; α(O)=4.09×10^{-5} *6*; α(P)=2.22×10^{-6} *4*
209.79 *3*	4.22 *19*	426.210	(7/2$^-$)	216.425	(7/2$^+$)	(E1)	0.0372	α(K)=0.0317 *5*; α(L)=0.00438 *7*; α(M)=0.000935 *13* α(N)=0.000210 *3*; α(O)=3.05×10^{-5} *5*; α(P)=1.684×10^{-6} *24*
222.98 *5*	2.15 *16*	348.636	(5/2$^-$)	125.747	(7/2$^-$)	(M1,E2)	0.162 *18*	α(K)=0.130 *23*; α(L)=0.025 *5*; α(M)=0.0056 *11* α(N)=0.00126 *23*; α(O)=0.000177 *22*; α(P)=7.6×10^{-6} *22*
265.619 *24*	7.04 *21*	426.210	(7/2$^-$)	160.586	(5/2$^+$)	(E1)	0.0201	α(K)=0.01711 *24*; α(L)=0.00234 *4*; α(M)=0.000499 *7* α(N)=0.0001122 *16*; α(O)=1.643×10^{-5} *23*; α(P)=9.31×10^{-7} *13*

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^{157}Pm β^- decay 1994WiZZ,1997Gr09,1996Gr20 (continued)

$\gamma(^{157}Sm)$ (continued)

E_γ [†]	I_γ [†‡&]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [#]	α [@]	Comments
296.242 *25*	7.43 *21*	348.636	(5/2⁻)	52.393	(5/2⁻)	(M1,E2)	0.071 *13*	α(K)=0.058 *13*; α(L)=0.01001 *22*; α(M)=0.00219 *9* α(N)=0.000492 *15*; α(O)=7.06×10^{-5} *17*; α(P)=3.5×10^{-6} *11*
300.47 *12*	1.59 *19*	426.210	(7/2⁻)	125.747	(7/2⁻)	(M1,E2)	0.068 *13*	α(K)=0.056 *13*; α(L)=0.00957 *17*; α(M)=0.00209 *7* α(N)=0.000470 *12*; α(O)=6.76×10^{-5} *19*; α(P)=3.3×10^{-6} *10*
348.56 *4*	6.77 *24*	348.636	(5/2⁻)	0.0	(3/2⁻)	(M1,E2)	0.045 *10*	α(K)=0.037 *9*; α(L)=0.0061 *4*; α(M)=0.00132 *6* α(N)=0.000297 *15*; α(O)=4.3×10^{-5} *4*; α(P)=2.2×10^{-6} *7*
426.06 *11*	2.02 *21*	426.210	(7/2⁻)	0.0	(3/2⁻)	(E2)	0.0199	α(K)=0.01611 *23*; α(L)=0.00295 *5*; α(M)=0.000649 *10* α(N)=0.0001453 *21*; α(O)=2.06×10^{-5} *3*; α(P)=9.12×10^{-7} *13*
495.66 *7*	4.5 *3*	621.39	(5/2)	125.747	(7/2⁻)			
518.86 *4*	9.0 *3*	571.29	(3/2)	52.393	(5/2⁻)			
568.72[a] *10*	<4.4[a]	621.39	(5/2)	52.393	(5/2⁻)			
568.72[a] *10*	<4.4[a]	694.29	(7/2)	125.747	(7/2⁻)			
571.27 *4*	15.4 *4*	571.29	(3/2)	0.0	(3/2⁻)			
621.55 *7*	5.4 *3*	621.39	(5/2)	0.0	(3/2⁻)			
641.81 *11*	3.0 *11*	694.29	(7/2)	52.393	(5/2⁻)			
722.35 *10*		1293.64		571.29	(3/2)			
727.85 *23*	1.4 *3*	1421.84	(3/2⁻)	694.29	(7/2)			
783.80 *8*	6.1 *4*	1478.05	(5/2⁻)	694.29	(7/2)			
800.50 *8*	6.3 *3*	1421.84	(3/2⁻)	621.39	(5/2)			
850.50 *5*	13.6 *5*	1421.84	(3/2⁻)	571.29	(3/2)			
856.72 *15*	2.8 *3*	1478.05	(5/2⁻)	621.39	(5/2)			
906.49 *17*	2.5 *3*	1478.05	(5/2⁻)	571.29	(3/2)			
1052.3 *4*	1.2 *3*	1674.0		621.39	(5/2)			
1067.5 *4*		1421.84	(3/2⁻)	353.80				
1073.24 *10*	6.2 *4*	1421.84	(3/2⁻)	348.636	(5/2⁻)			
1117.75 *24*		1466.39		348.636	(5/2⁻)			
1132.8 *3*		1293.64		160.586	(5/2⁺)			
1146.4 *3*		1362.82		216.425	(7/2⁺)			
1202.22 *16*	3.6 *4*	1362.82		160.586	(5/2⁺)			
1241.36 *18*	3.2 *4*	1293.64		52.393	(5/2⁻)			
1261.43 *17*	3.8 *4*	1421.84	(3/2⁻)	160.586	(5/2⁺)			
1295.45 *19*	3.4 *4*	1421.84	(3/2⁻)	125.747	(7/2⁻)			
1317.59 *25*	2.2 *3*	1478.05	(5/2⁻)	160.586	(5/2⁺)			
1369.73 *15*	5.7 *6*	1421.84	(3/2⁻)	52.393	(5/2⁻)			
1421.94 *22*	2.7 *3*	1421.84	(3/2⁻)	0.0	(3/2⁻)			
1477.8 *4*	1.4 *3*	1478.05	(5/2⁻)	0.0	(3/2⁻)			
1533.7 *3*	1.8 *3*	1694.48		160.586	(5/2⁺)			
1622.0 *5*	1.0 *3*	1674.0		52.393	(5/2⁻)			
1694.8 *4*	1.4 *3*	1694.48		0.0	(3/2⁻)			

† From 1994WiZZ. Other: 1992Sh32 report 30 γ′s with energy uncertainties of 0.1 to 0.3 keV and intensities which differ from those given here by as much as a factor of 2.

‡ $I_{K\alpha}$ = 78 *4* and $I_{K\beta}$ = 19.5 *12* (1992Sh32).

From 1994WiZZ and based on information not available to evaluator.

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^{157}Pm β^- decay 1994WiZZ,1997Gr09,1996Gr20 (continued)

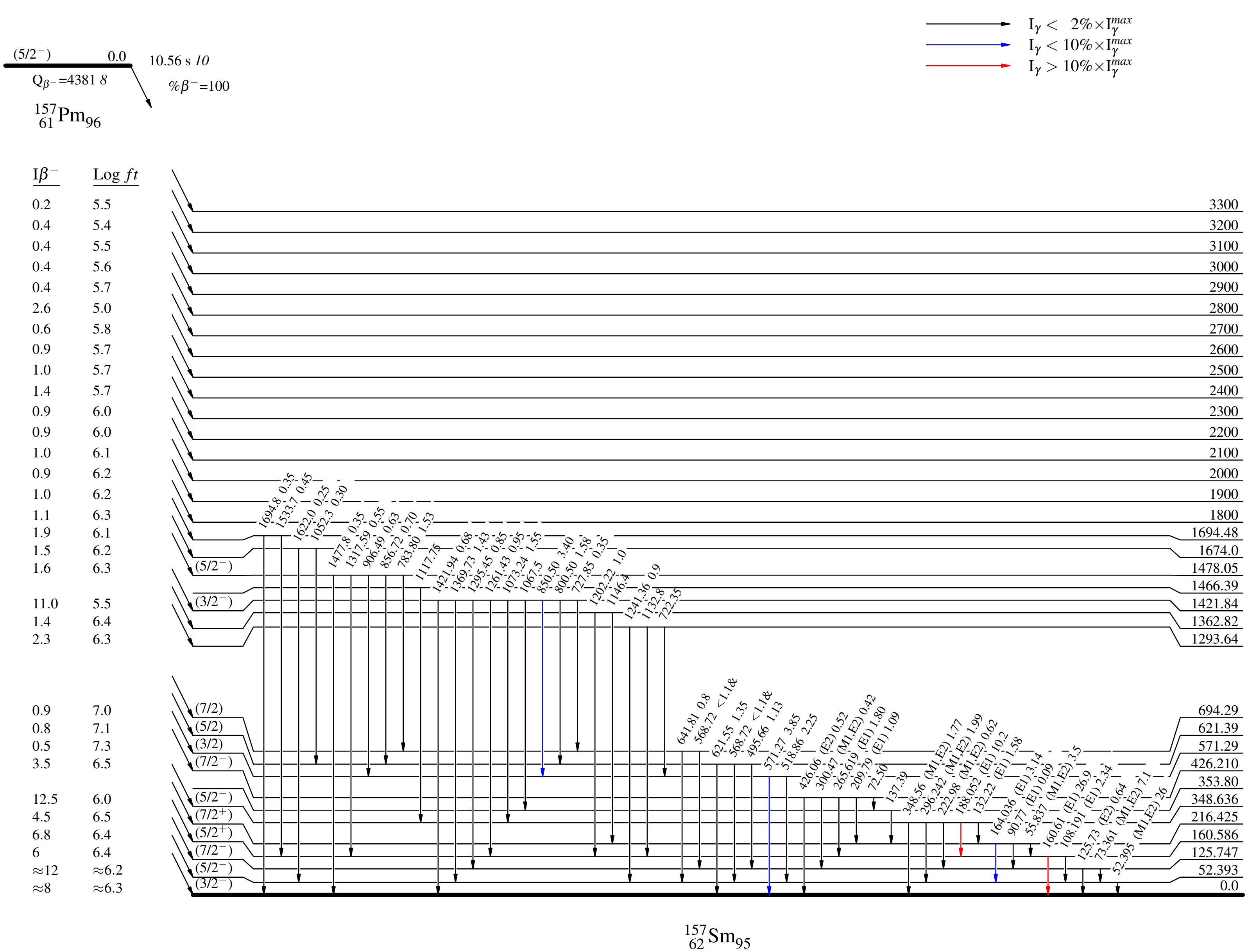
γ(^{157}Sm) (continued)

[@] Additional information 1.
[&] For absolute intensity per 100 decays, multiply by 0.25.
[a] Multiply placed with undivided intensity.

^{157}Pm β^- decay 1994WiZZ,1997Gr09,1996Gr20

Decay Scheme

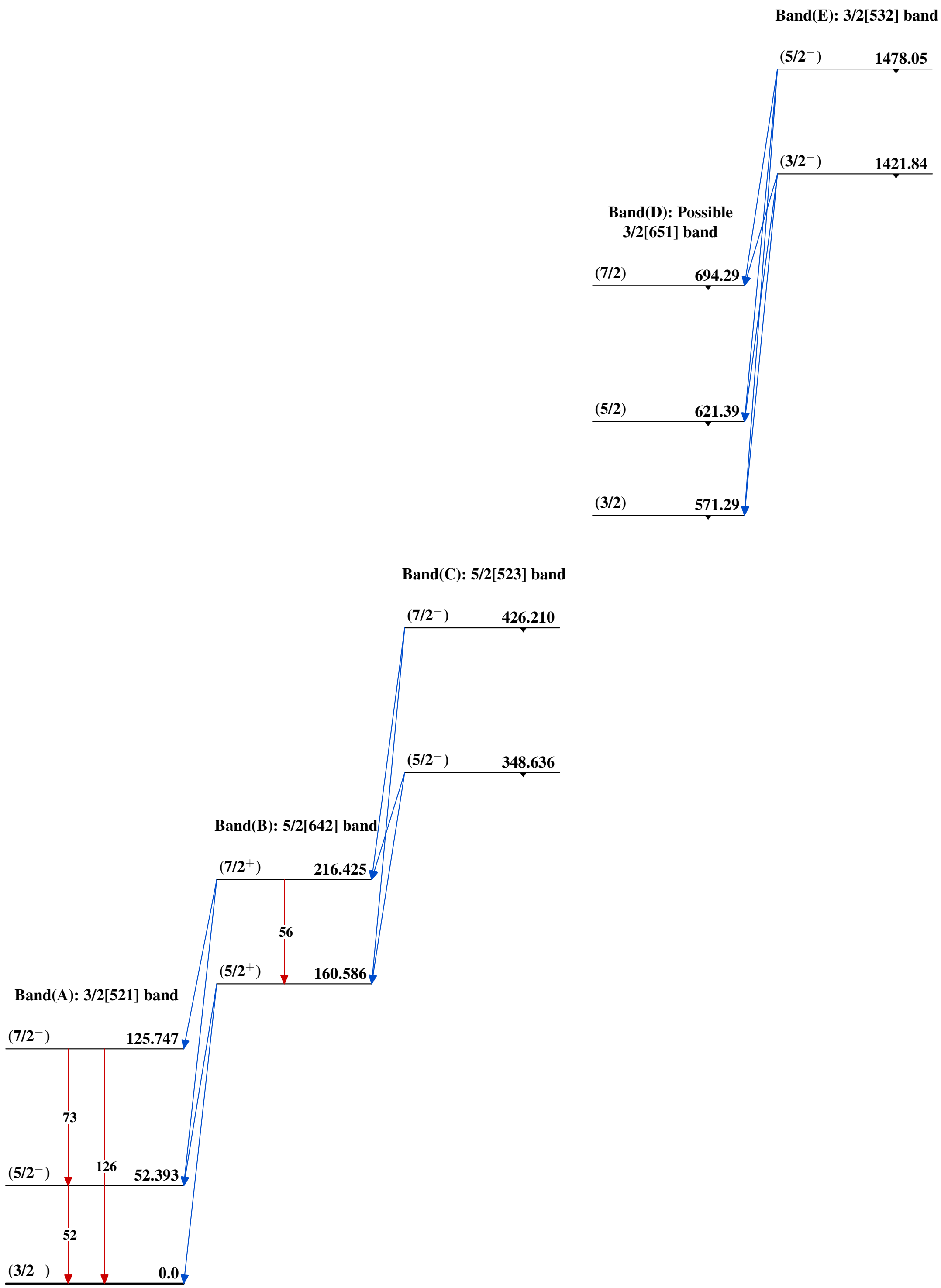
Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given



From ENSDF

$^{157}_{62}Sm_{95}$-6

^{157}Pm β^- decay 1994WiZZ,1997Gr09,1996Gr20



$^{157}_{62}Sm_{95}$