^{139}Sm ε decay (2.57 min) 1982De06

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	P. K. Joshi, B. Singh, S. Singh, A. K. Jain	NDS 138, 1 (2016)	15-Oct-2016

Parent: ^{139}Sm: E=0.0; J^π=1/2$^+$; $T_{1/2}$=2.57 min *10*; Q(ε)=5120 *17*; %ε+%β^+ decay=100.0
^{139}Sm-Q(ε): From 2012Wa38.
1982De06: measured low-energy Eγ, Iγ, and x rays, γ(t),. $\gamma\gamma$-coincidences (Ge(Li),Ge), ce, and $\beta\gamma$-coincidences (Ge,Ge(Li)).
Others: 1973VaYZ, 1975Va14, 1987BrZQ.

^{139}Pm Levels

E(level)	J^π †	$T_{1/2}$ †	Comments
0.0	(5/2)$^+$	4.15 min *5*	%ε+%β^+=100
227.96 *12*	(5/2$^+$,7/2$^+$)		
273.73 *9*	(3/2)$^+$		
306.69 *9*	(1/2,3/2)$^+$		
462.66 *11*	(1/2,3/2)$^+$		
589.48 *14*			
596.31 *12*	(1/2,3/2)$^+$		
655.30 *17*			
721.36 *18*	(1/2,3/2)$^+$		
782.03 *9*	(1/2,3/2)$^+$		
855.7 *4*			
862.19 *18*			
885.59 *23*			
925.85 *18*			
929.59 *17*			
1015.75 *15*			
1111.4 *3*			
1126.87 *22*			
1183.76 *17*			
1207.4 *3*			
1366.3 *3*			
1441.87 *16*			
1461.59 *25*			
1463.1 *3*			
1502.1 *3*			
1526.65 *23*			
1595.8 *4*			
1666.4 *3*			
1719.9 *4*			
1981.8 *3*			
2043.7 *3*			
2074.6 *4*			
2210.01 *19*	‡		
3236.1 *3*	‡		

† From the Adopted Levels.
‡ (1/2$^+$,3/2$^+$) suggested by 1982De06 not adopted by evaluators.

^{139}Sm ε decay (2.57 min) 1982De06 (continued)

ε,β$^+$ radiations

E(decay)	E(level)	Iβ$^+$ ‡	Iε‡	Log *ft*	I(ε+β$^+$)‡	Comments
(1884 *17*)	3236.1	0.022 *5*	0.75 *17*	5.7 *1*	0.77 *17*	av Eβ=395.9 *88*; εK=0.8181 *20*; εL=0.1188 *4*; εM+=0.03414 *10*
(2910 *17*)	2210.01	0.72 *9*	1.8 *2*	5.70 *6*	2.5 *3*	av Eβ=851.9 *91*; εK=0.600 *6*; εL=0.0858 *9*; εM+=0.02462 *25*
(3045 *17*)	2074.6	0.14 *4*	0.27 *8*	6.6 *1*	0.41 *12*	av Eβ=913.0 *91*; εK=0.561 *6*; εL=0.0801 *9*; εM+=0.02298 *25*
(3076 *17*)	2043.7	0.18 *4*	0.33 *8*	6.5 *1*	0.51 *12*	av Eβ=927.0 *91*; εK=0.552 *6*; εL=0.0788 *9*; εM+=0.02260 *25*
(3138 *17*)	1981.8	0.50 *9*	0.85 *15*	6.09 *8*	1.35 *23*	av Eβ=955.0 *91*; εK=0.534 *6*; εL=0.0763 *9*; εM+=0.02186 *24*
(3400 *17*)	1719.9	0.08 *4*	0.10 *4*	7.1 *2*	0.18 *8*	av Eβ=1074.2 *92*; εK=0.461 *6*; εL=0.0657 *8*; εM+=0.01883 *23*
(3454 *17*)	1666.4	0.43 *8*	0.48 *9*	6.42 *9*	0.91 *17*	av Eβ=1098.6 *92*; εK=0.446 *6*; εL=0.0636 *8*; εM+=0.01824 *22*
(3524 *17*)	1595.8	0.22 *5*	0.22 *6*	6.8 *1*	0.44 *11*	av Eβ=1130.9 *92*; εK=0.428 *6*; εL=0.0610 *8*; εM+=0.01748 *22*
(3593 *17*)	1526.65	0.60 *9*	0.57 *8*	6.38 *7*	1.17 *17*	av Eβ=1162.5 *92*; εK=0.411 *5*; εL=0.0585 *8*; εM+=0.01676 *21*
(3618 *17*)	1502.1	0.17 *4*	0.16 *4*	7.0 *1*	0.33 *8*	av Eβ=1173.8 *92*; εK=0.404 *5*; εL=0.0576 *8*; εM+=0.01650 *21*
(3657 *17*)	1463.1	0.21 *6*	0.19 *6*	6.9 *1*	0.40 *12*	av Eβ=1191.7 *92*; εK=0.395 *5*; εL=0.0562 *7*; εM+=0.01611 *20*
(3658 *17*)	1461.59	0.35 *7*	0.31 *6*	6.67 *9*	0.66 *13*	av Eβ=1192.4 *92*; εK=0.395 *5*; εL=0.0562 *7*; εM+=0.01610 *20*
(3678 *17*)	1441.87	1.14 *14*	0.98 *12*	6.17 *6*	2.12 *25*	av Eβ=1201.4 *92*; εK=0.390 *5*; εL=0.0555 *7*; εM+=0.01590 *20*
(3754 *17*)	1366.3	0.37 *10*	0.29 *7*	6.7 *1*	0.66 *17*	av Eβ=1236.1 *92*; εK=0.372 *5*; εL=0.0530 *7*; εM+=0.01517 *19*
(3913 *17*)	1207.4	0.66 *10*	0.44 *6*	6.57 *7*	1.10 *16*	av Eβ=1309.3 *93*; εK=0.337 *5*; εL=0.0479 *6*; εM+=0.01374 *18*
(3936 *17*)	1183.76	1.5 *2*	0.94 *12*	6.24 *6*	2.4 *3*	av Eβ=1320.2 *93*; εK=0.332 *5*; εL=0.0472 *6*; εM+=0.01353 *18*
(3993 *17*)	1126.87	0.30 *7*	0.19 *4*	7.0 *1*	0.49 *11*	av Eβ=1346.5 *93*; εK=0.321 *4*; εL=0.0456 *6*; εM+=0.01306 *17*
(4009 *17*)	1111.4	0.43 *9*	0.26 *6*	6.8 *1*	0.69 *15*	av Eβ=1353.6 *93*; εK=0.318 *4*; εL=0.0451 *6*; εM+=0.01293 *17*
(4104 *17*)	1015.75	3.2 *3*	1.7 *2*	6.02 *5*	4.9 *5*	av Eβ=1397.8 *93*; εK=0.299 *4*; εL=0.0425 *6*; εM+=0.01217 *16*
(4190 *17*)	929.59	2.7 *3*	1.4 *2*	6.13 *6*	4.1 *5*	av Eβ=1437.7 *93*; εK=0.283 *4*; εL=0.0403 *5*; εM+=0.01153 *15*
(4194 *17*)	925.85	1.3 *2*	0.64 *10*	6.47 *8*	1.9 *3*	av Eβ=1439.5 *93*; εK=0.283 *4*; εL=0.0402 *5*; εM+=0.01150 *15*
(4234 *17*)	885.59	0.84 *13*	0.40 *7*	6.68 *8*	1.24 *20*	av Eβ=1458.1 *93*; εK=0.276 *4*; εL=0.0392 *5*; εM+=0.01121 *15*
(4258 *17*)	862.19	1.36 *16*	0.65 *7*	6.48 *6*	2.01 *23*	av Eβ=1469.0 *93*; εK=0.272 *4*; εL=0.0386 *5*; εM+=0.01105 *14*
(4264 *17*)	855.7	0.22 *5*	0.11 *3*	7.3 *1*	0.33 *8*	av Eβ=1472.0 *93*; εK=0.271 *4*; εL=0.0384 *5*; εM+=0.01101 *14*
(4338 *17*)	782.03	10.7 *12*	4.7 *5*	5.63 *6*	15.4 *17*	av Eβ=1506.2 *93*; εK=0.259 *4*; εL=0.0367 *5*; εM+=0.01051 *14*
(4399 *17*)	721.36	2.09 *16*	0.87 *7*	6.38 *4*	2.96 *22*	av Eβ=1534.4 *93*; εK=0.249 *4*; εL=0.0353 *5*; εM+=0.01012 *13*
(4465 *17*)	655.30	2.8 *4*	1.1 *2*	6.29 *7*	3.9 *6*	av Eβ=1565.2 *94*; εK=0.239 *3*; εL=0.0339 *5*; εM+=0.00971 *13*
(4524 *17*)	596.31	5.0 *7*	1.9 *2*	6.07 *6*	6.9 *9*	av Eβ=1592.6 *94*; εK=0.231 *3*; εL=0.0327 *4*; εM+=0.00936 *12*
(4531 *17*)	589.48	2.8 *3*	1.0 *1*	6.33 *5*	3.8 *4*	av Eβ=1595.8 *94*; εK=0.230 *3*; εL=0.0326 *4*; εM+=0.00932 *12*
(4657 *17*)	462.66	1.0 *4*	0.35 *15*	6.8 *2*	1.4 *6*	av Eβ=1655.0 *94*; εK=0.213 *3*; εL=0.0301 *4*; εM+=0.00862 *11*

Continued on next page (footnotes at end of table)

^{139}Sm ε decay (2.57 min) 1982De06 (continued)

ϵ,β^+ radiations (continued)

E(decay)	E(level)	Iβ^+ ‡	Iε‡	Log *ft*	I$(\varepsilon+\beta^+)$‡	Comments
(4813† *17*)	306.69	22.6 *14*	6.7 *4*	5.57 *4*	29.3 *18*	av Eβ=1727.9 *94*; εK=0.1934 *24*; εL=0.0274 *4*; εM+=0.00785 *10* Measured E(ε)=5120 *150*.
(4846 *17*)	273.73	3.9 *14*	1.1 *4*	6.4 *2*	5.0 *18*	av Eβ=1743.3 *94*; εK=0.1897 *23*; εL=0.0269 *4*; εM+=0.00769 *10*
(4892# *17*)	227.96	<0.6	<0.2	>7.2	<0.8	av Eβ=1764.8 *94*; εK=0.1846 *22*; εL=0.0261 *4*; εM+=0.00748 *9* Iβ^+,Iε,I$(\varepsilon+\beta^+)$: upper limit with 90% confidence level has been estimated by evaluators for I$(\varepsilon+\beta^+)$<0.4 (from gamma-ray transition intensity balance).

† Other Eβ+=3.6 MeV *3* (1975Va14. $\beta\gamma$-coin; scin,Ge(Li)).

‡ Absolute intensity per 100 decays.

\# Existence of this branch is questionable.

$\gamma(^{139}Pm)$

Iγ normalization: from ΣIγ(1+α)(to g.s.)=100. $I_{\varepsilon+\beta^+}$(to g.s.)$\leq 1.5\times10^{-4}$ from log $ft\geq 11$ for ΔJ^π=2, no. Amount of growth of ^{139}Sm γ's observed completely accounted for by assuming no feeding of ^{139}Pm g.s. (1982De06); estimated uncertainty=5%.

E_γ	I_γ[&]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[@]	δ	α[†]	$I_{(\gamma+ce)}$[a]	Comments
33.0 *1*	‡	306.69	(1/2,3/2)$^+$	273.73	(3/2)$^+$	(M1)[#]		6.00 *10*	7.3‡ *10*	ce(L)/(γ+ce)=0.675 *7*; ce(M)/(γ+ce)=0.144 *3* ce(N)/(γ+ce)=0.0325 *7*; ce(O)/(γ+ce)=0.00489 *11*; ce(P)/(γ+ce)=0.000306 *7* α(L)=4.73 *8*; α(M)=1.010 *17*; α(N)=0.227 *4*; α(O)=0.0342 *6*; α(P)=0.00214 *4*
188.9 *1*	7.4 *4*	462.66	(1/2,3/2)$^+$	273.73	(3/2)$^+$	M1(+E2)	$\leq$1.0	0.256 *5*		α(K)=0.209 *12*; α(L)=0.036 *6*; α(M)=0.0079 *14* α(N)=0.0018 *3*; α(O)=0.00026 *4*; α(P)=1.28$\times10^{-5}$ *14* α(K)exp=0.23 *3*
228.0 *2*	8.2 *5*	227.96	(5/2$^+$,7/2$^+$)	0.0	(5/2)$^+$	[M1,E2]		0.143 *13*		α(K)=0.115 *17*; α(L)=0.022 *4*; α(M)=0.0048 *9* α(N)=0.00106 *19*; α(O)=0.000151 *19*; α(P)=6.8$\times10^{-6}$ *17*
234.6 *3*	3.0 *10*	462.66	(1/2,3/2)$^+$	227.96	(5/2$^+$,7/2$^+$)					
273.7 *2*	100	273.73	(3/2)$^+$	0.0	(5/2)$^+$	E2(+M1)	$\geq$0.94	0.078 *6*		α(K)=0.063 *7*; α(L)=0.0123 *5*; α(M)=0.00270 *13* α(N)=0.00060 *3*; α(O)=8.48$\times10^{-5}$ *19*; α(P)=3.6$\times10^{-6}$ *6* α(K)exp=0.063 *7*; K/L=5.4 *8*
306.7 *2*	78 *5*	306.69	(1/2,3/2)$^+$	0.0	(5/2)$^+$	E2		0.0507		α(K)=0.0399 *6*; α(L)=0.00843 *12*; α(M)=0.00186 *3* α(N)=0.000412 *6*; α(O)=5.74$\times10^{-5}$ *9*; α(P)=2.18$\times10^{-6}$ *3* α(K)exp=0.040 *5*; K/L=5.0 *6*
315.7 *2*	3.8 *6*	589.48		273.73	(3/2)$^+$					
319.2 *3*	1.7 *5*	782.03	(1/2,3/2)$^+$	462.66	(1/2,3/2)$^+$					
322.6 *3*	2.5 *5*	596.31	(1/2,3/2)$^+$	273.73	(3/2)$^+$					
329.5 *4*	0.5 *2*	925.85		596.31	(1/2,3/2)$^+$					
333.4 *4*	1.2 *4*	929.59		596.31	(1/2,3/2)$^+$					
361.5 *3*	1.4 *4*	589.48		227.96	(5/2$^+$,7/2$^+$)					
368.4 *3*	0.8 *3*	596.31	(1/2,3/2)$^+$	227.96	(5/2$^+$,7/2$^+$)					
381.4 *4*	0.3 *1*	655.30		273.73	(3/2)$^+$					
419.7 *3*	1.1 *3*	1015.75		596.31	(1/2,3/2)$^+$					
427.5 *4*	0.5 *2*	655.30		227.96	(5/2$^+$,7/2$^+$)					
447.5 *2*	8.8 *5*	721.36	(1/2,3/2)$^+$	273.73	(3/2)$^+$	M1(+E2)	$\leq$0.84	0.0243 *21*		α(K)=0.0206 *19*; α(L)=0.00290 *15*; α(M)=0.00062 *3* α(N)=0.000140 *7*; α(O)=2.09$\times10^{-5}$ *12*; α(P)=1.29$\times10^{-6}$ *14* α(K)exp=0.028 *9*
463.1 *3*	1.6 *4*	925.85		462.66	(1/2,3/2)$^+$					

γ(^{139}Pm) (continued)

E_γ	I_γ[&]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[@]	α[†]	Comments
467.0 *3*	1.5 *4*	929.59		462.66	(1/2,3/2)$^+$			
475.3 *2*	6.8 *7*	782.03	(1/2,3/2)$^+$	306.69	(1/2,3/2)$^+$			
508.5 *3*	13 *3*	782.03	(1/2,3/2)$^+$	273.73	(3/2)$^+$	M1,E2	0.015 *4*	α(K)=0.013 *4*; α(L)=0.0019 *3*; α(M)=0.00041 *6* α(N)=9.2×10^{-5} *14*; α(O)=1.36×10^{-5} *24*; α(P)=7.9×10^{-7} *24* α(K)exp=0.015 *5*
554.2 *3*	2.0 *4*	782.03	(1/2,3/2)$^+$	227.96	(5/2$^+$,7/2$^+$)			
578.9 *4*	0.6 *2*	885.59		306.69	(1/2,3/2)$^+$			
582.0 *3*	0.9 *2*	855.7		273.73	(3/2)$^+$			
587.3 *4*	0.3 *1*	1183.76		596.31	(1/2,3/2)$^+$			
588.4 *4*	0.2 *1*	862.19		273.73	(3/2)$^+$			
589.5 *2*	5.2 *6*	589.48		0.0	(5/2)$^+$			
596.3 *2*	22 *2*	596.31	(1/2,3/2)$^+$	0.0	(5/2)$^+$	M1,E2	0.010 *3*	α(K)=0.0087 *23*; α(L)=0.00124 *23*; α(M)=0.00027 *5* α(N)=6.0×10^{-5} *11*; α(O)=8.9×10^{-6} *18*; α(P)=5.3×10^{-7} *16* α(K)exp=0.010 *3*
611.7 *3*	0.8 *3*	885.59		273.73	(3/2)$^+$			
619.2 *3*	1.8 *4*	925.85		306.69	(1/2,3/2)$^+$			
622.9 *4*	0.5 *2*	929.59		306.69	(1/2,3/2)$^+$			
648.8 *3*	1.5 *4*	1111.4		462.66	(1/2,3/2)$^+$			
652.2 *3*	1.3 *4*	925.85		273.73	(3/2)$^+$			
655.3 *2*	9.9 *15*	655.30		0.0	(5/2)$^+$			
655.8 *2*	7.9 *12*	929.59		273.73	(3/2)$^+$			
679.3 *4*	0.5 *2*	1461.59		782.03	(1/2,3/2)$^+$			
709.0 *4*	0.6 *2*	1015.75		306.69	(1/2,3/2)$^+$			
720.4 *4*	0.3 *1*	1441.87		721.36	(1/2,3/2)$^+$			
720.7 *4*	0.5 *2*	1183.76		462.66	(1/2,3/2)$^+$			
741.4 *4*	0.3 *1*	1463.1		721.36	(1/2,3/2)$^+$			
741.9 *3*	7.3 *10*	1015.75		273.73	(3/2)$^+$			
744.8 *3*	1.8 *3*	1207.4		462.66	(1/2,3/2)$^+$			
770.0 *3*	1.0 *2*	1366.3		596.31	(1/2,3/2)$^+$			
782.0 *1*	19 *3*	782.03	(1/2,3/2)$^+$	0.0	(5/2)$^+$	M1,E2	0.0053 *13*	α(K)exp=0.0055 *14* α(K)=0.0045 *11*; α(L)=0.00062 *13*; α(M)=0.00013 *3* α(N)=3.0×10^{-5} *6*; α(O)=4.5×10^{-6} *10*; α(P)=2.8×10^{-7} *8*
837.6 *4*	0.4 *1*	1111.4		273.73	(3/2)$^+$			
853.1 *3*	0.23 *5*	1126.87		273.73	(3/2)$^+$			
862.2 *2*	5.3 *6*	862.19		0.0	(5/2)$^+$			
877.2 *3*	1.0 *2*	1183.76		306.69	(1/2,3/2)$^+$			
886.0 *5*	2.0 *4*	885.59		0.0	(5/2)$^+$			
910.1 *2*	4.9 *7*	1183.76		273.73	(3/2)$^+$			
930.1 *3*	2.5 *4*	1526.65		596.31	(1/2,3/2)$^+$			
933.6 *4*	1.2 *3*	1207.4		273.73	(3/2)$^+$			
1015.7 *2*	4.5 *7*	1015.75		0.0	(5/2)$^+$			
1126.9 *3*	1.1 *3*	1126.87		0.0	(5/2)$^+$			
1135.2 *2*	2.2 *4*	1441.87		306.69	(1/2,3/2)$^+$			

$^{139}_{61}$Pm$_{78}$-5

$\gamma(^{139}Pm)$ (continued)

E_γ	I_γ[&]	E_i(level)	J^π_i	E_f	J^π_f
1138.2 *4*	0.8 *4*	1366.3		227.96	$(5/2^+,7/2^+)$
1156.7 *4*	0.8 *3*	1463.1		306.69	$(1/2,3/2)^+$
1168.1 *3*	1.9 *3*	1441.87		273.73	$(3/2)^+$
1188.0 *3*	1.3 *3*	1461.59		273.73	$(3/2)^+$
1220.2 *3*	0.7 *2*	1526.65		306.69	$(1/2,3/2)^+$
1228.3 *4*	0.3 *1*	1502.1		273.73	$(3/2)^+$
1274.1 *3*	0.6 *2*	1502.1		227.96	$(5/2^+,7/2^+)$
1322.1 *3*	1.2 *3*	1595.8		273.73	$(3/2)^+$
1322.3 *4*	0.3 *1*	2043.7		721.36	$(1/2,3/2)^+$
1359.7 *3*	0.7 *2*	1666.4		306.69	$(1/2,3/2)^+$
1392.2 *5*	0.11 *4*	1981.8		589.48	
1392.6 *4*	1.8 *4*	1666.4		273.73	$(3/2)^+$
1441.9 *3*	1.4 *4*	1441.87		0.0	$(5/2)^+$
1446.2 *4*	0.5 *2*	1719.9		273.73	$(3/2)^+$
1675.2 *3*	3.6 *6*	1981.8		306.69	$(1/2,3/2)^+$
1768.0 *4*	0.9 *3*	2074.6		306.69	$(1/2,3/2)^+$
1770.0 *3*	1.1 *3*	2043.7		273.73	$(3/2)^+$
1800.7 *5*	0.21 *5*	2074.6		273.73	$(3/2)^+$
1903.2 *3*	1.2 *3*	2210.01		306.69	$(1/2,3/2)^+$
1936.6 *5*	0.9 *3*	2210.01		273.73	$(3/2)^+$
1982.0 *5*	0.5 *2*	2210.01		227.96	$(5/2^+,7/2^+)$
2210.0 *3*	4.3 *6*	2210.01		0.0	$(5/2)^+$
2929.0 *10*	0.4 *2*	3236.1		306.69	$(1/2,3/2)^+$
2962.4 *3*	1.7 *4*	3236.1		273.73	$(3/2)^+$

[†] Theoretical values using BrIcc code. If δ(E2/M1) not given value overlaps those for M1 and E2.

[‡] Iγ=5.4 *7* given in table I not consistent with I(γ+ce) given in figure 6. I(γ+ce) is consistent with the discussion of 1982De06 and $\beta\gamma$-coin which indicates a direct feeding of 274 level.

[#] If γ were E2, Iγ would be too small to be observed since α(E2)=217.

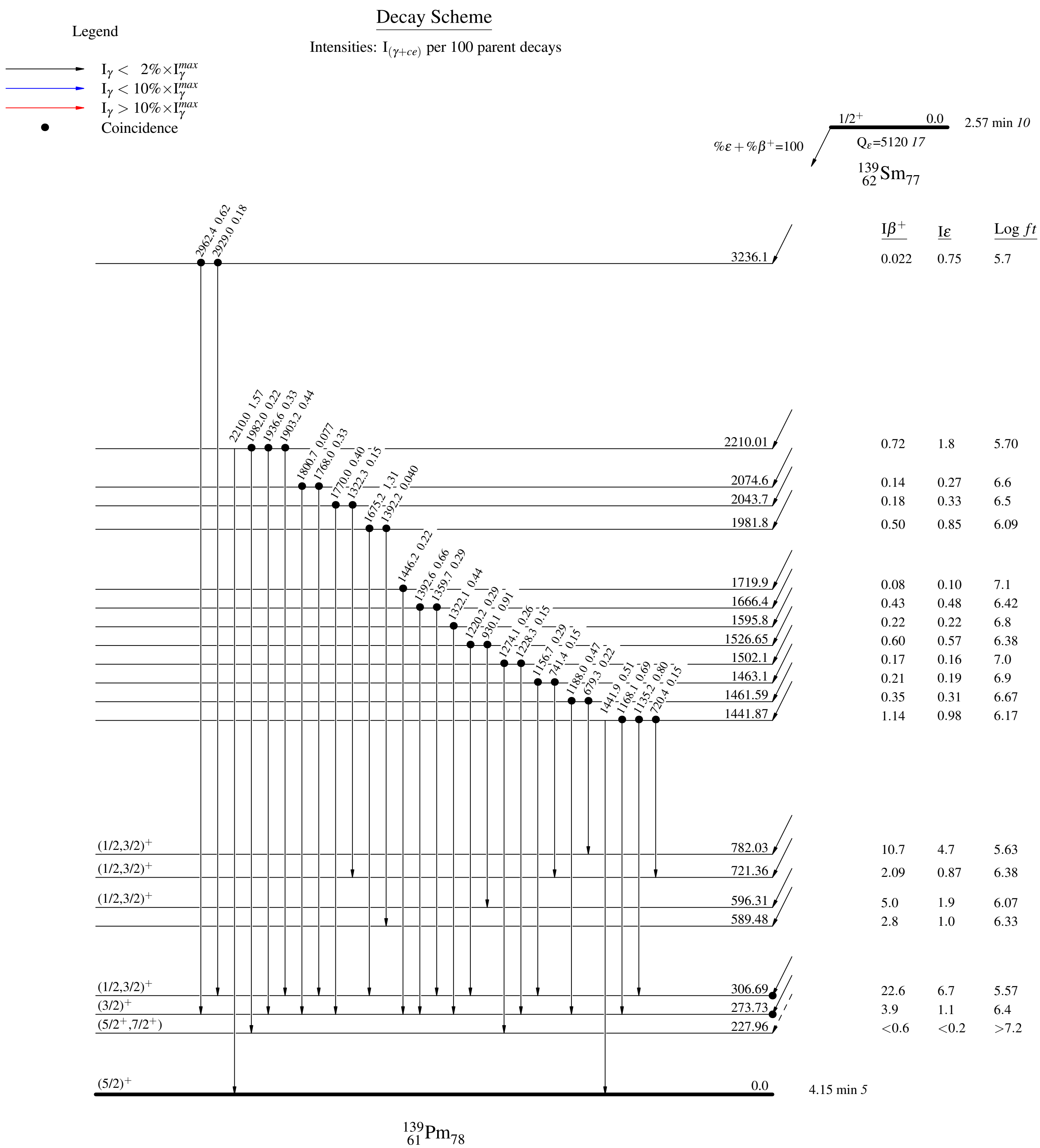
[@] From Adopted Gammas.

[&] For absolute intensity per 100 decays, multiply by 0.365 *10*.

[a] Absolute intensity per 100 decays.

$^{139}_{61}Pm_{78}$-6

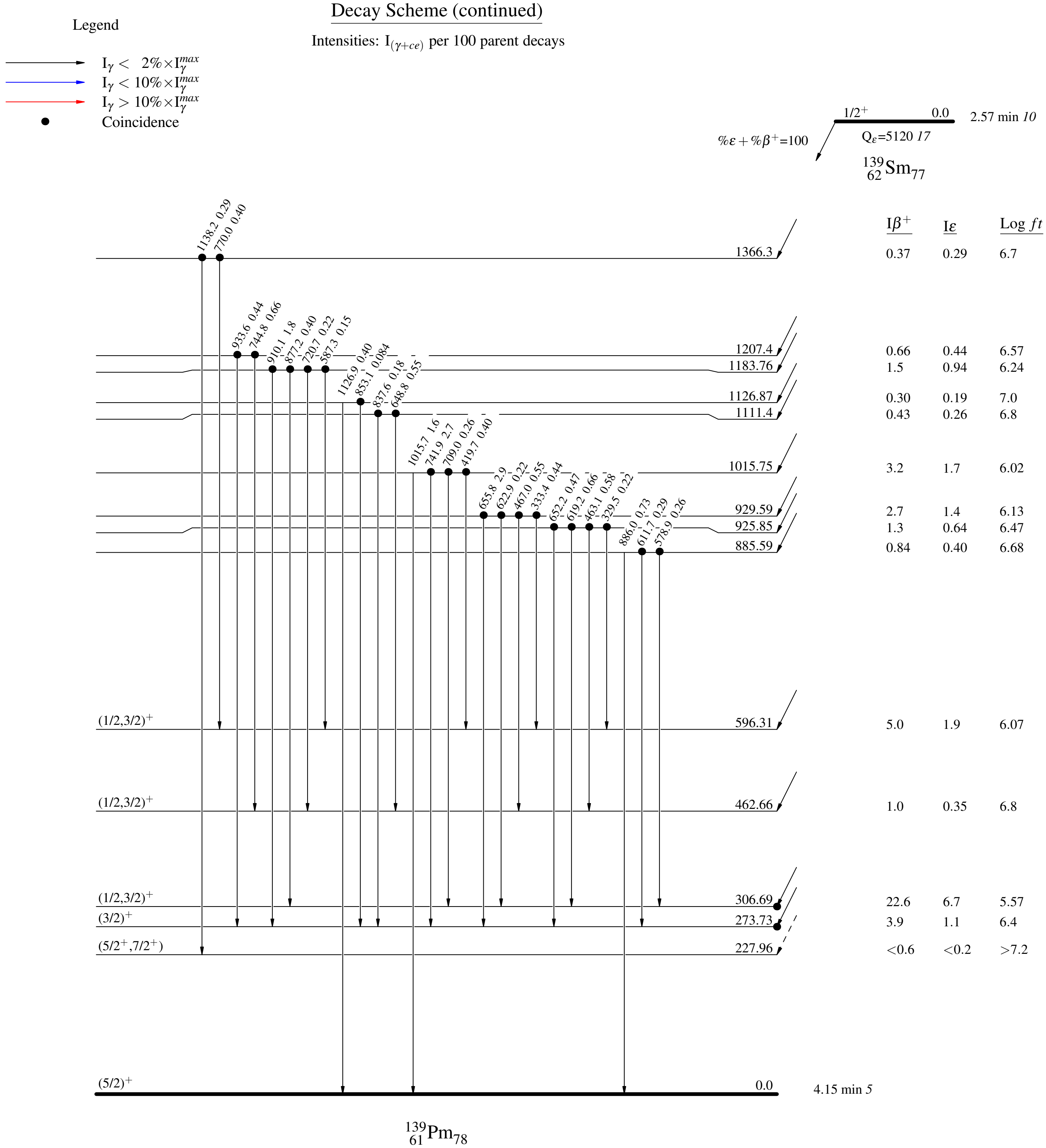
^{139}Sm ε decay (2.57 min) 1982De06



^{139}Sm ε decay (2.57 min) 1982De06

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



^{139}Sm ε decay (2.57 min) 1982De06

Legend

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays