^{137}Pm ε decay 1975No08

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 108,2173 (2007)	1-Oct-2006

Parent: ^{137}Pm: E=0.0; J$^{\pi}$=11/2^{-}; T$_{1/2}$=2.4 min *1*; Q(ε)=5507 *17*; %ε+%β^{+} decay=100.0

Additional information 1.

Measured: γ rays, γγ coin, conversion electrons (1975No08).

Others: 1973VaYZ, 1973HaWA, 1973WeZK.

Decay scheme is that proposed by 1975No08.

Decay scheme normalization and ε feedings have been determined by the assumption of no ε decay to levels below 520 keV. The presence of many unplaced γ rays suggests, however, that these feedings are not accurate, and often inconsistent with assigned levels spin and parity in 1975No08.

^{137}Nd Levels

E(level)‡	J$^{\pi}$†	T$_{1/2}$	Comments
0.0	1/2^{+}	38.5 min *15*	
108.53 *16*	3/2^{+}		
268.86 *22*	(3/2)$^{+}$		
286.00 *16*	5/2^{+}		
519.5 *3*	11/2^{-}	1.6 s	
614.7 *4*	7/2^{+}		
797.8 *4*			
834.66 *25*	(7/2^{+})		
851.77 *25*	(7/2^{+})		
976.7 *3*			J$^{\pi}$: J$^{\pi}$=9/2^{-} assigned in 1975No08 based on 690γ(M2) to 5/2^{+}, 457γ([M1,E2]) to 11/2^{-}, and log ft≈6.7 from 11/2^{-} for β^{-} intensity deduced from γ-ray transition intensity balance. However, Iγ(457)/Iγ(690)=1.45(5) is not consistent with Weisskopf half-life estimates of≈1 ps for 457γ, and≈10 ns for 690γ. Also, evaluators have determined from γ-ray transition intensity balance no β^{-} feeding to this level. Thus, the J$^{\pi}$=9/2^{-} assignment is questionable.
1100.4 *4*	13/2^{-}		
1374.4 *3*	(7/2,5/2^{-})		
1510.5 *3*	(11/2)$^{-}$		
1706.7 *4*	(9/2,11/2)		
1788.4? *5*			
1899.5 *3*	(9/2^{-},11/2^{+})		
1987.4 *5*	(9/2,11/2)		
2370.0 *4*	(9/2,11/2,13/2)$^{-}$		
2433.3 *5*			
2722.1 *4*			
2803.9 *5*			

† From Adopted Levels.

‡ Deduced by evaluators from a least-squares fit to γ-ray energies.

ε,β^{+} radiations

E(decay)†	E(level)	Iβ^{+} ‡	Iε‡	Log *ft*	I(ε+β^{+})‡	Comments
(2703 *17*)	2803.9	1	5 *1*	5.16 *8*	6 *1*	av Eβ=757 *8*; εK=0.648 *5*; εL=0.0919 *8*; εM+=0.02625 *21*
(2785 *17*)	2722.1	≈0.8	≈2	≈5.5	≈3	av Eβ=794 *8*; εK=0.624 *5*; εL=0.0884 *8*; εM+=0.02527 *21*
(3074 *17*)	2433.3	≈1	≈2	≈5.7	≈3	av Eβ=925 *8*; εK=0.538 *5*; εL=0.0760 *8*; εM+=0.02172 *21*
(3137 *17*)	2370.0	≈2	≈2	≈5.6	≈4	av Eβ=953 *8*; εK=0.519 *5*; εL=0.0734 *8*; εM+=0.02095 *21*
(3520 *17*)	1987.4	≈0.5	≈0.5	≈6.4	≈1	av Eβ=1128 *8*; εK=0.413 *5*; εL=0.0582 *7*; εM+=0.01661 *18*

Continued on next page (footnotes at end of table)

^{137}Pm ε decay 1975No08 (continued)

ϵ,β^+ radiations (continued)

E(decay)†	E(level)	Iβ^+ ‡	Iε‡	Log *ft*	I($\varepsilon+\beta^+$)‡	Comments
(3608 *17*)	1899.5	5.4 *5*	4.6 *5*	5.41 *5*	10 *1*	av Eβ=1168 *8*; εK=0.391 *5*; εL=0.0550 *6*; εM+=0.01571 *18*
(3719# *17*)	1788.4?	≈2	≈1	≈6.0	≈3	av Eβ=1219 *8*; εK=0.364 *4*; εL=0.0512 *6*; εM+=0.01463 *17*
(3800 *17*)	1706.7	4 *1*	2	5.73 *8*	6 *1*	av Eβ=1257 *8*; εK=0.345 *4*; εL=0.0486 *6*; εM+=0.01388 *16*
(3997 *17*)	1510.5	8.3 *13*	4.7 *7*	5.50 *7*	13 *2*	av Eβ=1347 *8*; εK=0.304 *4*; εL=0.0428 *5*; εM+=0.01222 *14*
(4407 *17*)	1100.4	6.2 *14*	2.3 *6*	5.88 *11*	8.5 *20*	av Eβ=1538 *8*; εK=0.234 *3*; εL=0.0329 *4*; εM+=0.00937 *11*
(4988 *17*)	519.5	34 *5*	8.1 *12*	5.45 *7*	42 *6*	av Eβ=1809 *8*; εK=0.1635 *17*; εL=0.02291 *24*; εM+=0.00653 *7*

† Eβ+=4132 *+150−115* (1983Al06).
‡ Absolute intensity per 100 decays.
# Existence of this branch is questionable.

γ(^{137}Nd)

Iγ normalization: weighted average of 0.349 *5*, 0.389 *8*, and 0.504 *14*, from Σ I(γ+ce) to g.s., Σ I(γ+ce) to g.s. and 108.6-keV level, and Σ I(γ+ce) to 108.6-, 268.7-, and 286.0-keV levels.
α(K)exp normalized so that α(K)=0.01 (M1,theory) for 581γ from ^{137}Nd ε decay.

E_γ	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	α[#]	Comments
^{x}87.0 *2*	16.4 *1*							α(L)exp=0.93 *30*.
108.6 *2*	100	108.53	3/2$^+$	0.0	1/2$^+$	M1	1.119	α(K)=0.951 *15*; α(L)=0.1323 *20*; α(M)=0.0281 *5*; α(N+..)=0.00730 *11* α(N)=0.00629 *10*; α(O)=0.000955 *15*; α(P)=6.17×10^{-5} *10* Mult.: From α(K)exp=0.90 *19*, K/L=6.3 *12* (1973VaYZ).
160.5 *4*	4.7 *1*	268.86	(3/2)$^+$	108.53	3/2$^+$	M1,E2	0.393 *22*	α(K)=0.303 *15*; α(L)=0.07 *3*; α(M)=0.016 *7*; α(N+..)=0.0039 *15* α(N)=0.0034 *14*; α(O)=0.00048 *16*; α(P)=1.7×10^{-5} *4* Mult.: α(K)exp=0.34 *11*, α from assumption that δ=1.
177.5 *2*	115.1 *3*	286.00	5/2$^+$	108.53	3/2$^+$	M1+(E2)	0.288 *7*	α(K)=0.225 *15*; α(L)=0.049 *16*; α(M)=0.011 *4*; α(N+..)=0.0027 *9* α(N)=0.0024 *8*; α(O)=0.00033 *10*; α(P)=1.3×10^{-5} *3* Mult.: α(K)exp=0.220 *55*, K/L=7.0 *20* (1973VaYZ), α from assumption that δ=1.
192.9 *4*	1.6 *1*	1899.5	(9/2$^-$,11/2$^+$)	1706.7	(9/2,11/2)			
199.0[†] *5*		1987.4	(9/2,11/2)	1788.4?				
^{x}213.0 *5*	<1							
^{x}220.2 *5*	<1							
233.6 *3*	84.5 *3*	519.5	11/2$^-$	286.00	5/2$^+$	E3	0.566	α(K)=0.316 *5*; α(L)=0.194 *3*; α(M)=0.0448 *7*; α(N+..)=0.01103 *17* α(N)=0.00974 *15*; α(O)=0.001276 *20*; α(P)=1.688×10^{-5} *25* Mult.: From α(K)exp=0.25 *6*, K/L=1.5 *2* (1973VaYZ).
268.7 *3*	24.2 *2*	268.86	(3/2)$^+$	0.0	1/2$^+$	M1,E2	0.083 *9*	α(K)=0.068 *11*; α(L)=0.0117 *11*; α(M)=0.0025 *3*; α(N+..)=0.00065 *6* α(N)=0.00056 *6*; α(O)=8.1×10^{-5} *5*; α(P)=4.1×10^{-6} *10* Mult.: α(K)exp=0.091 *23*, α from assumption that δ=1.
286.0 *2*	45.9 *2*	286.00	5/2$^+$	0.0	1/2$^+$	E2	0.0609	α(K)=0.0479 *7*; α(L)=0.01018 *15*; α(M)=0.00223 *4*; α(N+..)=0.000562 *8* α(N)=0.000491 *7*; α(O)=6.88×10^{-5} *10*; α(P)=2.61×10^{-6} *4* Mult.: From α(K)exp=0.030 *8*.
^{x}293.1 *5*	<1							
^{x}325.1 *5*	8.3 *2*							α(K)exp=0.036 *14*.
328.5 *5*	9.4 *2*	614.7	7/2$^+$	286.00	5/2$^+$	M1,E2	0.047 *8*	α(K)=0.039 *8*; α(L)=0.00622 *10*; α(M)=0.00134 *3*; α(N+..)=0.000343 *5* α(N)=0.000297 *5*; α(O)=4.36×10^{-5} *15*; α(P)=2.4×10^{-6} *6* Mult.: From α(K)exp=0.039 *14*.
^{x}340.3 *4*	1.3 *1*							
352.3 *3*	3.7 *1*	2722.1		2370.0	(9/2,11/2,13/2)$^-$	M1,E2	0.038 *7*	α(K)=0.032 *7*; α(L)=0.00503 *17*; α(M)=0.001080 *22*;

γ(^{137}Nd) (continued)

E_γ	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	α[#]	Comments
								α(N+..)=0.000277 *9* α(N)=0.000240 *7*; α(O)=3.54×10^{-5} *21*; α(P)=2.0×10^{-6} *5* Mult.: From α(K)exp=0.063 *27*.
370.6 *3*	8.3 *1*	2803.9		2433.3		M1,E2	0.033 *6*	α(K)=0.028 *6*; α(L)=0.00432 *22*; α(M)=0.00093 *4*; α(N+..)=0.000238 *12* α(N)=0.000206 *10*; α(O)=3.05×10^{-5} *23*; α(P)=1.7×10^{-6} *5* Mult.: From α(K)exp=0.038 *13*.
^{x}379.5 *4*	1.3 *1*							
389.2 *3*	8.4 *1*	1899.5	(9/2$^-$,11/2$^+$)	1510.5	(11/2)$^-$	M1,E2	0.029 *6*	α(K)=0.024 *6*; α(L)=0.00374 *25*; α(M)=0.00080 *5*; α(N+..)=0.000206 *14* α(N)=0.000178 *11*; α(O)=2.64×10^{-5} *24*; α(P)=1.5×10^{-6} *4* Mult.: From α(K)exp=0.033 *14*.
397.7 *3*	3.4 *1*	1374.4	(7/2,5/2$^-$)	976.7				
410.6 *5*	20.0 *3*	1510.5	(11/2)$^-$	1100.4	13/2$^-$	M1,E2	0.025 *5*	α(K)=0.021 *5*; α(L)=0.0032 *3*; α(M)=0.00069 *5*; α(N+..)=0.000177 *15* α(N)=0.000153 *12*; α(O)=2.27×10^{-5} *24*; α(P)=1.3×10^{-6} *4* Mult.: From α(K)exp=0.016 *5*.
414.0 *5*	6.2 *2*	1788.4?		1374.4	(7/2,5/2$^-$)	M1,E2	0.025 *5*	α(K)=0.021 *5*; α(L)=0.0031 *3*; α(M)=0.00067 *5*; α(N+..)=0.000172 *15* α(N)=0.000149 *13*; α(O)=2.21×10^{-5} *24*; α(P)=1.3×10^{-6} *4* Mult.: α(K)exp=0.037 *13*.
^{x}419.1 *5*	<1							
434.0[&] *3*	1.9 *1*	2803.9		2370.0	(9/2,11/2,13/2)$^-$			
457.3 *5*	12.1 *3*	976.7		519.5	11/2$^-$			
^{x}459.2 *5*	5.4 *3*					M1,E2	0.019 *4*	α(K)=0.016 *4*; α(L)=0.0023 *3*; α(M)=0.00050 *6*; α(N+..)=0.000128 *15* α(N)=0.000111 *13*; α(O)=1.65×10^{-5} *23*; α(P)=1.0×10^{-6} *3* Mult.: From α(K)exp=0.018 *7*.
^{x}463.7 *5*	<1							
470.7 *3*	10.4 *1*	2370.0	(9/2,11/2,13/2)$^-$	1899.5	(9/2$^-$,11/2$^+$)	M1,E2	0.018 *4*	α(K)=0.015 *4*; α(L)=0.0022 *3*; α(M)=0.00046 *6*; α(N+..)=0.000120 *15* α(N)=0.000103 *13*; α(O)=1.54×10^{-5} *22*; α(P)=9.1×10^{-7} *25* Mult.: From α(K)exp=0.019 *8*.
506 *1*	20 *5*	614.7	7/2$^+$	108.53	3/2$^+$			
512[†&] *1*		797.8		286.00	5/2$^+$			
525.1 *4*	4 *1*	1899.5	(9/2$^-$,11/2$^+$)	1374.4	(7/2,5/2$^-$)			
529.2 *4*	7.1 *1*	797.8		268.86	(3/2)$^+$			
533.8[@] *4*	14.8[@] *2*	1510.5	(11/2)$^-$	976.7				
533.8[@] *4*	14.8[@] *2*	2433.3		1899.5	(9/2$^-$,11/2$^+$)			
548.8 *3*	11.3 *2*	834.66	(7/2$^+$)	286.00	5/2$^+$			
565.6[@] *3*	7.4[@] *1*	834.66	(7/2$^+$)	268.86	(3/2)$^+$			
565.6[@] *3*	7.4[@] *1*	851.77	(7/2$^+$)	286.00	5/2$^+$			

$^{137}_{60}$Nd$_{77}$-4

γ(^{137}Nd) (continued)

E_γ	I_γ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α#	Comments
581 *1*	38 *5*	1100.4	13/2−	519.5	11/2−	M1,E2	0.0103 *24*	α(K)=0.0087 *21*; α(L)=0.00123 *20*; α(M)=0.00026 *4*; α(N+..)=6.8×10^{-5} *11* α(N)=5.8×10^{-5} *10*; α(O)=8.8×10^{-6} *16*; α(P)=5.4×10^{-7} *15* Mult.: From α(K)exp=0.0093 *35*.
^{x}586.9 *4*	1.8 *1*							
^{x}591.5 *4*	<1							
^{x}611.6 *5*	<1							
^{x}645.7 *3*	1.9 *1*							
658.6 *3*	1.5 *1*	1510.5	(11/2)−	851.77	(7/2+)			
^{x}669.2 *5*	<1							
^{x}672.7 *4*	1.1 *1*							
690.8 *3*	8.3 *2*	976.7		286.00	5/2+	M2	0.0231	α(K)=0.0195 *3*; α(L)=0.00283 *4*; α(M)=0.000604 *9*; α(N+..)=0.0001573 *23* α(N)=0.0001354 *19*; α(O)=2.06×10^{-5} *3*; α(P)=1.324×10^{-6} *19* Mult.: From α(K)exp=0.030 *15*.
^{x}695.4 *5*	<1							
^{x}703.5 *5*	<1							
^{x}712.8 *4*	2.0 *1*							
^{x}714.3 *4*	1.1 *1*							
^{x}722.9 *4*	1.5 *1*							
735.0 *5*	<1	2722.1		1987.4	(9/2,11/2)			
743.3 *4*	1.9 *1*	851.77	(7/2+)	108.53	3/2+			
^{x}749.1 *5*	<1							
759.5 *5*	3.1 *1*	1374.4	(7/2,5/2−)	614.7	7/2+			
^{x}788.8 *5*	2.4 *1*							
798.6 *5*	1.4 *1*	1899.5	(9/2−,11/2+)	1100.4	13/2−			
^{x}818 *1*	<1							
821.7 *5*	2.2 *1*	2722.1		1899.5	(9/2−,11/2+)			
^{x}829 *1*	<1							
^{x}836.8 *6*	2.8 *1*							
^{x}854 *1*	<1							
^{x}871 *1*	<1							
^{x}880 *1*	<1							
^{x}895 *1*	<1							
^{x}921.2 *6*	1.9 *1*							
923.0 *5*	6.8 *2*	1899.5	(9/2−,11/2+)	976.7				
^{x}939 *1*	<1							
^{x}946 *1*	<1							
^{x}968 *1*	<1							
^{x}977 *1*	<1							
^{x}991 *1*	<1							
995 *1*	1.2 *1*	2370.0	(9/2,11/2,13/2)−	1374.4	(7/2,5/2−)			
^{x}1013.7 *5*	2.0 *1*							
^{x}1028 *1*	<1							

$^{137}_{60}$Nd$_{77}$-5

γ(^{137}Nd) (continued)

E_γ	I_γ ‡	E_i(level)	J^π_i	E_f	J^π_f
^{x}1038 *1*	<1				
1047.6 *5*	2.0 *1*	1899.5	(9/2$^-$,11/2$^+$)	851.77	(7/2$^+$)
1064.7 *5*	2.8 *1*	1899.5	(9/2$^-$,11/2$^+$)	834.66	(7/2$^+$)
^{x}1090 *1*	1.2 *1*				
1092.2 *5*	12.7 *2*	1706.7	(9/2,11/2)	614.7	7/2$^+$
^{x}1123.6 *5*	1.1 *1*				
^{x}1136 *1*	1.2 *1*				
^{x}1141 *1*	<1				
^{x}1145 *1*	<1				
^{x}1153 *1*	<1				
^{x}1171 *1*	<1				
1189.9 *5*	3.3 *1*	1987.4	(9/2,11/2)	797.8	
^{x}1201 *1*	<1				
^{x}1278.9 *8*	1.6 *1*				
1284.7 *5*	19.3 *3*	1899.5	(9/2$^-$,11/2$^+$)	614.7	7/2$^+$
1293.5† *5*	≈3	2803.9		1510.5	(11/2)$^-$
^{x}1381 *1*	<1				
^{x}1409 *1*	<1				
^{x}1461 *1*	<1				
^{x}1468 *1*	<1				
^{x}1518 *1*	1.2 *1*				
^{x}1551 *1*	<1				
^{x}1605 *1*	<1				

† From decay scheme in 1975No08.

‡ For absolute intensity per 100 decays, multiply by 0.37 *3*.

\# Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

@ Multiply placed with undivided intensity.

& Placement of transition in the level scheme is uncertain.

^{x} γ ray not placed in level scheme.

$^{137}_{60}$Nd$_{77}$-6

^{137}Pm ε decay 1975No08

Decay Scheme

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