^{136}La ε decay (9.87 min) 1969Me18

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. A. Mccutchan	NDS 152, 331 (2018)	1-Apr-2018

Parent: ^{136}La: E=0.0; $J^\pi=1^+$; $T_{1/2}$=9.87 min *3*; Q(ε)=2.85×10^3 *5*; %ε+%$β^+$ decay=100.0

1969Me18: ^{136}La activity from ^{136}Ba(p,n) reaction with E(p)=14 MeV. Measured Eγ, γ, γ(t) using Ge(Li) detector.

1987PaZS: ^{136}La activity from 9.2 MeV protons on $BaCO_3$ targets. Measured Eγ, Iγ, Ece, Ice; deduced E0/E2 transition probabilities.

Others: 1968Ju02, 1959Gi50.

α: Additional information 1.

^{136}Ba Levels

Levels at 2333 (1514γ,2333γ), 2285 (1466γ), and 2607 (1791γ) suggested by 1969Me18 are not confirmed in any other experiment. Evaluator has not included these level here and their corresponding depopulating transitions are given as unplaced γ's.

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡
0.0	0^+	1579.02 *5*	0^+	2141.52 *5*	0^+	2532.1? *7*	3^-
818.52 *4*	2^+	2080.63 *8*	2^+	2315.44 *10*	0^+	2640.5? *5*	(1^+)
1551.14 *9*	2^+	2128.97 *6*	2^+	2485.60 *13*	2^+	2772.6? *3*	2^+

† From a least-squares fit to Eγ, by evaluator.

‡ From the Adopted Levels.

ε,$β^+$ radiations

Iγ($γ^\pm$)=3090 *430* if Iγ(818γ)=100 (1968Ju02) compared to 3090 *180* from decay scheme.

E(decay)	E(level)	Iβ+ †‡	Iε‡	Log *ft*	I(ε+β+)†‡	Comments
(8×10^1# *5*)	2772.6?		0.0020 *10*	5.5 *15*	0.0020 *10*	εK=0.6 *7*; εL=0.3 *5*; εM+=0.09 *21*
(2.1×10^2# *5*)	2640.5?		0.0040 *20*	6.3 *4*	0.0040 *20*	εK=0.806 *21*; εL=0.150 *16*; εM+=0.044 *6*
(3.2×10^2 *5*)	2532.1?		2.0×10^{-4} *20*	7.6^{1u} *6*	2.0×10^{-4} *20*	εK=0.76 *3*; εL=0.183 *22*; εM+=0.055 *8*
(3.6×10^2 *5*)	2485.60		0.018 *3*	6.23 *16*	0.018 *3*	εK=0.829 *5*; εL=0.133 *4*; εM+=0.0379 *12*
(5.3×10^2# *5*)	2315.44		0.043 *3*	6.21 *10*	0.043 *3*	εK=0.8380 *19*; εL=0.1263 *14*; εM+=0.0357 *5*
(7.1×10^2 *5*)	2141.52		0.260 *20*	5.69 *8*	0.260 *20*	εK=0.8423 *10*; εL=0.1231 *8*; εM+=0.03462 *25*
(7.2×10^2 *5*)	2128.97		0.150 *10*	5.95 *8*	0.150 *10*	εK=0.8425 *10*; εL=0.1229 *8*; εM+=0.03457 *24*
(7.7×10^2 *5*)	2080.63		0.049 *3*	6.49 *7*	0.049 *3*	εK=0.8433 *9*; εL=0.1223 *7*; εM+=0.03437 *21*
(1.27×10^3 *5*)	1579.02		0.290 *10*	6.17 *4*	0.290 *10*	εK=0.8476 *1*; εL=0.11884 *25*; εM+=0.03323 *8*
(1.30×10^3 *5*)	1551.14		0.019 *3*	7.37 *8*	0.019 *3*	εK=0.8476 *3*; εL=0.1187 *3*; εM+=0.03319 *8*
(2.03×10^3 *5*)	818.52	0.115 *19*	1.44† *6*	5.89 *4*	1.55 *6*	av Eβ=456 *22*; εK=0.788 *11*; εL=0.1083 *15*; εM+=0.0302 *5*
(2.85×10^3 *5*)	0.0	35.2 *20*	62.4† *20*	4.55 *3*	97.61 *9*	av Eβ=822 *23*; εK=0.545 *17*; εL=0.0743 *24*; εM+=0.0207 *7* E(decay): other: 2870 *70* (1959Gi50).

† See comment on Iγ normalization.

‡ Absolute intensity per 100 decays.

Existence of this branch is questionable.

^{136}La ε decay (9.87 min) 1969Me18 (continued)

γ(^{136}Ba)

Iγ normalization, I(γ+ce) normalization: from Iγ(818.5γ)/Iγ(γ±)=0.032 *6* (1968Ju02), ΣIγ(to 818), ΣIγ(1+α)(to g.s.), and theoretical ε/β+ ratios.

E_γ	I_γ[@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[#]	α	Comments
[x]541.5 *1*	0.20 *8*								
732.6 *1*	0.48 *6*	1551.14	2+	818.52	2+	M1+E2	−1.00 *4*	0.00443	α(K)=0.00380 *6*; α(L)=0.000500 *8*; α(M)=0.0001029 *16*; α(N)=2.22×10^{-5} *4*; α(O)=3.38×10^{-6} *6* α(P)=2.40×10^{-7} *4*
760.50 *4*	12.55 *25*	1579.02	0+	818.52	2+	E2		0.00337	α(K)=0.00287 *4*; α(L)=0.000393 *6*; α(M)=8.11×10^{-5} *12*; α(N)=1.742×10^{-5} *25*; α(O)=2.63×10^{-6} *4* α(P)=1.769×10^{-7} *25*
[x]767[&] *1*	0.16 *8*								
818.51 *4*	100	818.52	2+	0.0	0+	E2		0.00283	α(K)=0.00242 *4*; α(L)=0.000327 *5*; α(M)=6.75×10^{-5} *10*; α(N)=1.450×10^{-5} *21*; α(O)=2.19×10^{-6} *3* α(P)=1.495×10^{-7} *21*
[x]894[&]	0.2								
906.8 *2*	≤0.05	2485.60	2+	1579.02	0+	[E2]		0.00490	
935 *1*	0.09 *7*	2485.60	2+	1551.14	2+				
981.3[&]	≤0.005	2532.1?	3−	1551.14	2+	E1+M2	+0.11 *2*	0.00086 *3*	α(K)=0.00074 *3*; α(L)=9.2×10^{-5} *4*; α(M)=1.88×10^{-5} *7*; α(N)=4.05×10^{-6} *15*; α(O)=6.20×10^{-7} *23* α(P)=4.56×10^{-8} *17*
(1221.4[†‡] *3*)	0.04 *2*	2772.6?	2+	1551.14	2+				
1262.10 *9*	1.30 *9*	2080.63	2+	818.52	2+	M1+E2	−1.00 *5*	1.31×10^{-3} *2*	α(K)=0.001114 *18*; α(L)=0.0001405 *22*; α(M)=2.88×10^{-5} *5*; α(N)=6.21×10^{-6} *10* α(O)=9.53×10^{-7} *15*; α(P)=7.03×10^{-8} *12*
1310.41 *7*	4.31 *17*	2128.97	2+	818.52	2+	M1(+E2)	+0.005 *9*	1.37×10^{-3}	α(K)=0.001166 *17*; α(L)=0.0001456 *21*; α(M)=2.98×10^{-5} *5*; α(N)=6.44×10^{-6} *9* α(O)=9.92×10^{-7} *14*; α(P)=7.44×10^{-8} *11*
1322.99 *4*	11.50 *35*	2141.52	0+	818.52	2+	E2		1.04×10^{-3}	α(K)=0.000872 *13*; α(L)=0.0001109 *16*; α(M)=2.27×10^{-5} *4*; α(N)=4.90×10^{-6} *7* α(O)=7.49×10^{-7} *11*; α(P)=5.42×10^{-8} *8*
[x]1466 *1*	0.12 *5*								
1496.91 *9*	1.86 *8*	2315.44	0+	818.52	2+	E2		8.71×10^{-4}	α(K)=0.000685 *10*; α(L)=8.62×10^{-5} *12*; α(M)=1.766×10^{-5} *25*; α(N)=3.81×10^{-6} *6*; α(O)=5.83×10^{-7} *9* α(P)=4.26×10^{-8} *6*
[x]1514.5 *2*	0.10 *4*								
1551.2 *2*	0.48 *6*	1551.14	2+	0.0	0+	E2		8.37×10^{-4}	α(K)=0.000640 *9*; α(L)=8.03×10^{-5} *12*; α(M)=1.644×10^{-5} *23*; α(N)=3.55×10^{-6} *5*; α(O)=5.43×10^{-7} *8* α(P)=3.98×10^{-8} *6*

From ENSDF

$^{136}_{56}Ba_{80}$-2

^{136}La ε decay (9.87 min) 1969Me18 (continued)

γ(^{136}Ba) (continued)

E_γ	I_γ[@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[#]	α	$I_{(\gamma+ce)}$[@]	Comments
1579.0[†]		1579.02	0^+	0.0	0^+	E0			0.00035 *CA*	ce(K)/(γ+ce)=0.89; ce(L)/(γ+ce)=0.11 B(E0)/B(E2 to 2^+, 818 level)=0.173 *15* (1987PaZS); B(E2 to 2^+, 1551 level)/B(E2 to 2^+, 818 level)≈0 (1987PaZS).
1666.9 *2*	0.48 *6*	2485.60	2^+	818.52	2^+	M1+E2	+0.24 *4*	9.30×10^{-4} *14*		α(K)=0.000680 *10*; α(L)=8.43×10^{-5} *13*; α(M)=1.726×10^{-5} *25*; α(N)=3.73×10^{-6} *6*; α(O)=5.74×10^{-7} *9* α(P)=4.32×10^{-8} *7*
1713.2[&]	≤0.01	2532.1?	3^-	818.52	2^+	E1+M2	+0.010 *8*	6.76×10^{-4}		α(K)=0.000257 *4*; α(L)=3.11×10^{-5} *5*; α(M)=6.34×10^{-6} *9*; α(N)=1.368×10^{-6} *20*; α(O)=2.10×10^{-7} *3* α(P)=1.573×10^{-8} *22*
[x]1791.4 *3*	0.29 *8*									
1822.0[&] *5*	0.15 *6*	2640.5?	(1^+)	818.52	2^+	D+Q	0.1 *+50−1*			
1955[&] *1*	0.07 *2*	2772.6?	2^+	818.52	2^+	M1+E2	+0.65 *25*	8.17×10^{-4} *18*		α(K)=0.000466 *13*; α(L)=5.76×10^{-5} *16*; α(M)=1.18×10^{-5} *4*; α(N)=2.54×10^{-6} *7*; α(O)=3.92×10^{-7} *11* α(P)=2.94×10^{-8} *9*
2080.60 *15*	0.84 *5*	2080.63	2^+	0.0	0^+	E2		7.61×10^{-4}		α(K)=0.000370 *6*; α(L)=4.56×10^{-5} *7*; α(M)=9.33×10^{-6} *13*; α(N)=2.01×10^{-6} *3*; α(O)=3.09×10^{-7} *5* α(P)=2.30×10^{-8} *4*
2129.00 *8*	2.04 *8*	2128.97	2^+	0.0	0^+	E2		7.67×10^{-4}		α(K)=0.000355 *5*; α(L)=4.37×10^{-5} *7*; α(M)=8.94×10^{-6} *13*; α(N)=1.93×10^{-6} *3*; α(O)=2.96×10^{-7} *5* α(P)=2.21×10^{-8} *3*
2141.5[†]		2141.52	0^+	0.0	0^+	[E0]				B(E0)/B(E2 to 2^+, 818 level)=0.125 *15* (1987PaZS); B(E2 to 2^+, 1551 level)/B(E2 to 2^+, 818 level)≈0 (1987PaZS).
[x]2286[&] *2*	0.02 *1*									
[x]2332.5 *10*	0.1 *1*									
2485.4 *3*	0.14 *2*	2485.60	2^+	0.0	0^+	E2		8.38×10^{-4}		α(K)=0.000269 *4*; α(L)=3.29×10^{-5} *5*; α(M)=6.73×10^{-6} *10*; α(N)=1.452×10^{-6} *21*; α(O)=2.23×10^{-7} *4* α(P)=1.674×10^{-8} *24*

[†] From 1987PaZS.
[‡] Expected if placement of 1955γ is correct.

From ENSDF

$^{136}_{56}Ba_{80}$-3

^{136}La ε decay (9.87 min) 1969Me18 (continued)

$\gamma(^{136}Ba)$ (continued)

[#] From the Adopted Gammas.
[@] For absolute intensity per 100 decays, multiply by 0.0230 *8*.
[&] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

From ENSDF

$^{136}_{56}Ba_{80}$-4

^{136}La ε decay (9.87 min) 1969Me18

Decay Scheme

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