^{129}Ce ε decay (3.5 min) 1997Gi08,2001Xi01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Janos Timar and Zoltan Elekes, Balraj Singh	NDS 121, 143 (2014)	31-May-2014

Parent: ^{129}Ce: E=0.0; J$^{\pi}$=(5/2^{+}); T$_{1/2}$=3.5 min *3*; Q(ε)=5040 *40*; %ε+%β^{+} decay=100.0

^{129}Ce-Q(ε): From 2012Wa38.

^{129}Ce-J$^{\pi}$,T$_{1/2}$: From ^{129}Ce Adopted Levels. For J^{π} assignment of (5/2^{+}) rather than 7/2^{+} as proposed in 1998Io01 based on 9/2^{-} for 107.6-keV isomer, see discussion in J^{π} comments for the 107.6-keV isomer and ground state in ^{129}Ce Adopted Levels.

1997Gi08: ^{129}Ce from ^{94}Mo(^{40}Ca,n4p),E=225 MeV; He-jet, Ge G, semi for ce. Measured Eγ, Iγ, $\gamma\gamma$, $\beta\gamma$ coin, xγ coin, (ce)γ coin, half-life. Deduced conversion coefficients, levels, J, π.

2001Xi01 (also 1997Xi01): ^{129}Ce from ^{117}Sn(^{16}O,4n),E=102 MeV; He-jet, chemical separation, Ge G . Measured Eγ, Iγ, $\gamma\gamma$, $\beta\gamma$ coin, xγ coin. Deduced levels, log *ft* values.

Both studies deduced level feeding intensities. There are disagreements between the two studies.

Others: 1993Al03, 1969ArZZ, 1963La03.

Experimental conversion coefficients are taken from 1997Gi08.

^{129}La Levels

E(level)[@]	J$^{\pi}$[†]	T$_{1/2}$[†]
0.0	(3/2^{+})	11.6 min *2*
68.18 *5*	(5/2^{+})	
216.29[#] *23*	(1/2^{+} to 9/2^{+})	
239.61 *8*	(5/2^{+})	
248.45 *8*	(7/2^{+})	
270.91[#] *13*	(1/2 to 7/2^{+})	
398.47 *9*	(3/2^{+},5/2^{+},7/2^{+})	
440.26 *13*	(7/2^{+})	
446.34 *12*	(9/2^{+})	
464.02 *12*	(5/2^{+},7/2^{+})	
472.21[#] *14*	(1/2^{+} to 7/2^{+})	
556.00?[#] *20*	(1/2 to 7/2^{+})	
587.64[#] *14*	(1/2^{+} to 7/2^{+})	
619.60 *13*	(3/2^{+} to 9/2^{+})	
645.39 *15*	(9/2^{+})	
652.5[‡] *3*	(1/2 to 9/2^{+})	
706.46 *12*	(5/2^{+} to 9/2^{+})	
782.3[‡] *3*	(5/2^{+} to 9/2^{+})	
796.21[#] *12*	(3/2^{+} to 7/2^{+})	
832.31[#] *15*	(3/2^{+} to 9/2^{+})	
928.87[#] *19*	(7/2^{+} to 11/2^{+})	
934.92[#] *18*	(1/2 to 9/2^{+})	
966.34[#] *14*	(1/2 to 7/2^{+})	
1015.26[#] *15*	(1/2 to 7/2^{+})	

[†] From Adopted Levels.
[‡] Reported only in 1997Gi08.
[#] Reported only in 2001Xi01.
[@] From least-squares fit to Eγ data.

ε,β^{+} radiations

E(decay)	E(level)	Iβ^{+} [@]	Iε[@]	Log *ft*[‡]	I($\varepsilon+\beta^{+}$)[†@]	Comments
(4.02×10^{3} *4*)	1015.26	0.70 *14*	0.30 *6*	6.8	1.0 *2*	av Eβ=1360 *19*; εK=0.252 *8*; εL=0.0344 *10*; εM+=0.0097 *3*
(4.07×10^{3} *4*)	966.34	0.6 *1*	0.2 *1*	6.9	0.8 *2*	av Eβ=1383 *19*; εK=0.244 *7*; εL=0.0333 *10*; εM+=0.0093 *3*
(4.11×10^{3} *4*)	934.92	0.86 *22*	0.34 *8*	6.7	1.2 *3*	av Eβ=1398 *19*; εK=0.238 *7*; εL=0.0326 *10*; εM+=0.0091 *3*
(4.11×10^{3} *4*)	928.87	0.5 *1*	0.2 *1*	7.0	0.7 *2*	av Eβ=1401 *19*; εK=0.237 *7*; εL=0.0324 *10*; εM+=0.0091 *3*
(4.21×10^{3} *4*)	832.31	0.89 *15*	0.31 *5*	6.8	1.2 *2*	av Eβ=1445 *19*; εK=0.222 *7*; εL=0.0303 *9*; εM+=0.00850 *24*
(4.24×10^{3} *4*)	796.21	1.3 *1*	0.46 *5*	6.6	1.8 *2*	av Eβ=1462 *19*; εK=0.216 *6*; εL=0.0295 *9*; εM+=0.00829 *24*

Continued on next page (footnotes at end of table)

^{129}Ce ε decay (3.5 min) 1997Gi08,2001Xi01 (continued)

ε,β⁺ radiations (continued)

E(decay)	E(level)	Iβ⁺ [@]	Iε [@]	Log *ft* [‡]	I(ε+β⁺) [†@]	Comments
(4.26×10³ *4*)	782.3	2.4 *4*	0.81 *15*	6.4	3.2 *6*	av Eβ=1469 *19*; εK=0.214 *6*; εL=0.0293 *9*; εM+=0.00821 *24*
(4.33×10³ *4*)	706.46	3.3 *5*	1.0 *1*	6.3	4.3 *6*	av Eβ=1504 *19*; εK=0.203 *6*; εL=0.0278 *8*; εM+=0.00779 *22*
(4.39×10³ *4*)	652.5	1.8 *4*	0.53 *12*	6.6	2.3 *5*	av Eβ=1529 *19*; εK=0.196 *6*; εL=0.0268 *8*; εM+=0.00751 *21*
(4.39×10³ [&] *4*)	645.39	1.5 *2*	0.46 *7*	6.7 [#]	2.0 *3*	av Eβ=1533 *19*; εK=0.195 *6*; εL=0.0266 *8*; εM+=0.00747 *21*
(4.42×10³ *4*)	619.60	4.0 *7*	1.1 *2*	6.3	5.1 *9*	av Eβ=1545 *19*; εK=0.192 *6*; εL=0.0262 *8*; εM+=0.00734 *21*
(4.45×10³ *4*)	587.64	1.7 *2*	0.48 *7*	6.6	2.2 *3*	av Eβ=1560 *19*; εK=0.188 *6*; εL=0.0256 *7*; εM+=0.00718 *20*
(4.48×10³ [&] *4*)	556.00?	0.7 *1*	0.2 *1*	7.0	0.9 *1*	av Eβ=1574 *19*; εK=0.184 *5*; εL=0.0251 *7*; εM+=0.00703 *20*
(4.57×10³ *4*)	472.21	1.2 *2*	0.31 *4*	6.9	1.5 *2*	av Eβ=1614 *19*; εK=0.174 *5*; εL=0.0237 *7*; εM+=0.00665 *18*
(4.58×10³ *4*)	464.02	2.0 *4*	0.51 *10*	6.6	2.5 *5*	av Eβ=1617 *19*; εK=0.173 *5*; εL=0.0236 *7*; εM+=0.00661 *18*
(4.59×10³ [&] *4*)	446.34	1.3 *3*	0.32 *8*	6.8 [#]	1.6 *4*	av Eβ=1626 *19*; εK=0.171 *5*; εL=0.0233 *7*; εM+=0.00653 *18*
(4.60×10³ *4*)	440.26	3.7 *7*	0.92 *18*	6.4	4.6 *9*	av Eβ=1629 *19*; εK=0.170 *5*; εL=0.0232 *7*; εM+=0.00650 *18*
(4.64×10³ *4*)	398.47	1.0 *5*	0.25 *12*	7.0	1.3 *6*	av Eβ=1648 *19*; εK=0.165 *5*; εL=0.0226 *6*; εM+=0.00633 *17*
(4.77×10³ *4*)	270.91	0.7 *2*	0.2 *1*	7.2	0.9 *2*	av Eβ=1708 *19*; εK=0.152 *4*; εL=0.0207 *6*; εM+=0.00582 *16*
(4.79×10³ *4*)	248.45	3.4 *5*	0.72 *11*	6.5	4.1 *6*	av Eβ=1719 *19*; εK=0.150 *4*; εL=0.0204 *6*; εM+=0.00573 *16*
(4.80×10³ *4*)	239.61	11 *2*	2.3 *4*	6.0	13 *2*	av Eβ=1723 *19*; εK=0.149 *4*; εL=0.0203 *6*; εM+=0.00570 *15*
(4.82×10³ [&] *4*)	216.29	<0.2	<0.05	>7.7	<0.3	av Eβ=1734 *19*; εK=0.147 *4*; εL=0.0200 *6*; εM+=0.00562 *15*
(4.97×10³ *4*)	68.18	15 *3*	2.8 *5*	6.0	18 *3*	av Eβ=1803 *19*; εK=0.134 *4*; εL=0.0182 *5*; εM+=0.00511 *14*
(5.04×10³ *4*)	0.0	22 *6*	3.9 *11*	5.84 *13*	26 *7*	av Eβ=1836 *19*; εK=0.128 *4*; εL=0.0175 *5*; εM+=0.00489 *13* I(ε+β⁺): estimated by 2001Xi01 from growth-decay curve for 278.6γ from ^{129}La decay.

† Values treated by the evaluators as approximate since there are several disagreements between the data from 1997Gi08 and 2001Xi01. The β feeding to ground-state in 2001Xi01 seems to be only an estimated value.
‡ Values are treated as only approximate and not used for J^{π} assignments.
\# Value of ≈6.8 is too low to be realistic for 5/2⁺ to 9/2⁺ β transition.
@ Absolute intensity per 100 decays.
& Existence of this branch is questionable.

γ(^{129}La)

Eγ[†]	Iγ[‡a]	Ei(level)	J^π_i	E_f	J^π_f	Mult.	α[b]	Comments
68.20 *6*	30.7	68.18	(5/2+)	0.0	(3/2+)	M1	3.25	α(L)exp=0.36 *3* α(K)=2.78 *4*; α(L)=0.378 *6*; α(M)=0.0786 *12* α(N)=0.01728 *25*; α(O)=0.00281 *4*; α(P)=0.000217 *3* Iγ: calculated from I(γ+ce)=100 (2001Xi01) using α=3.25 from BrIcc code.
127.6[@] *3*	0.3 *1*	398.47	(3/2+,5/2+,7/2+)	270.91	(1/2 to 7/2+)	[D,E2]	0.48 *36*	
148.2[@] *3*	1.3 *1*	216.29	(1/2+ to 9/2+)	68.18	(5/2+)	[D,E2]	0.29 *21*	
158.9 *1*	2.2 *1*	398.47	(3/2+,5/2+,7/2+)	239.61	(5/2+)	M1,E2	0.34 *5*	α(K)=0.269 *18*; α(L)=0.058 *25*; α(M)=0.013 *6* α(N)=0.0027 *12*; α(O)=0.00041 *16*; α(P)=1.83×10^{-5} *13* α(K)exp=0.24 *5*; K/L=4.5 *6*
171.5 *1*	30.3 *2*	239.61	(5/2+)	68.18	(5/2+)	M1	0.238	α(K)=0.203 *3*; α(L)=0.0273 *4*; α(M)=0.00567 *8* α(N)=0.001247 *18*; α(O)=0.000203 *3*; α(P)=1.582×10^{-5} *23* α(K)exp=0.176 *9*; K/L=6.5 *9*
179.1[#] *4*	2.1[&] *10*	619.60	(3/2+ to 9/2+)	440.26	(7/2+)	[D,E2]	0.16 *11*	
180.4 *1*	13.9 *2*	248.45	(7/2+)	68.18	(5/2+)	M1	0.207	α(K)=0.1771 *25*; α(L)=0.0237 *4*; α(M)=0.00493 *7* α(N)=0.001084 *16*; α(O)=0.0001764 *25*; α(P)=1.376×10^{-5} *20* α(K)exp=0.147 *11*; K/L=7.1 *12*
192.0 *3*	0.2 *1*	440.26	(7/2+)	248.45	(7/2+)	[M1,E2]	0.189 *16*	
197.9 *2*	2.6 *1*	446.34	(9/2+)	248.45	(7/2+)	M1,E2	0.173 *12*	α(K)=0.139 *3*; α(L)=0.026 *8*; α(M)=0.0056 *18* α(N)=0.0012 *4*; α(O)=0.00019 *5*; α(P)=9.7×10^{-6} *10* α(K)exp=0.15 *4*; K/L>5
201.0[#] *5*	0.76[&] *15*	440.26	(7/2+)	239.61	(5/2+)	[M1,E2]	0.165 *11*	
215.6 *2*	1.5 *4*	464.02	(5/2+,7/2+)	248.45	(7/2+)	M1,E2	0.133 *6*	α(K)=0.1082 *18*; α(L)=0.019 *5*; α(M)=0.0041 *12* α(N)=0.00089 *23*; α(O)=0.00014 *3*; α(P)=7.6×10^{-6} *9* α(K)exp=0.11 *2*; K/L>4
221.5[@] *3*	1.5 *4*	619.60	(3/2+ to 9/2+)	398.47	(3/2+,5/2+,7/2+)	[D,E2]	0.08 *5*	
239.5 *2*	2.1 *1*	239.61	(5/2+)	0.0	(3/2+)	[M1,E2]	0.097 *2*	
242.5[#] *5*	1.2[&] *3*	706.46	(5/2+ to 9/2+)	464.02	(5/2+,7/2+)	[D,E2]	0.06 *4*	
248.5 *2*	2.5 *1*	248.45	(7/2+)	0.0	(3/2+)	(E2)	0.0862	α(K)=0.0683 *10*; α(L)=0.01415 *21*; α(M)=0.00303 *5* α(N)=0.000653 *10*; α(O)=9.88×10^{-5} *15*; α(P)=4.42×10^{-6} *7* α(K)exp=0.09 *3*; K/L≈4
254.0[#] *5*	2.4[&] *6*	652.5	(1/2 to 9/2+)	398.47	(3/2+,5/2+,7/2+)	[D,E2]	0.05 *3*	
256.0[@] *3*	1.3 *2*	472.21	(1/2+ to 7/2+)	216.29	(1/2+ to 9/2+)	[D,E2]	0.05 *3*	
260.0[@] *2*	0.3 *1*	706.46	(5/2+ to 9/2+)	446.34	(9/2+)	[D,E2]	0.05 *3*	
271.0[@] *2*	4.3 *1*	270.91	(1/2 to 7/2+)	0.0	(3/2+)	[D,E2]	0.043 *27*	
308.1 *3*	1.6 *5*	706.46	(5/2+ to 9/2+)	398.47	(3/2+,5/2+,7/2+)			
318.0[#] *5*	2.7[&] *6*	782.3	(5/2+ to 9/2+)	464.02	(5/2+,7/2+)			

From ENSDF

γ(^{129}La) (continued)

E_γ [†]	I_γ [‡a]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	α [b]	Comments
330.3 2	4.3 2	398.47	(3/2+,5/2+,7/2+)	68.18	(5/2+)	M1,E2	0.038 4	α(K)exp=0.04 2 α(K)=0.032 4; α(L)=0.00485 23; α(M)=0.00102 6 α(N)=0.000222 11; α(O)=3.52×10^{-5} 9; α(P)=2.3×10^{-6} 4
336.0[#] 5	2.7[&] 6	782.3	(5/2+ to 9/2+)	446.34	(9/2+)			
342[#] 1	0.6[&] 3	782.3	(5/2+ to 9/2+)	440.26	(7/2+)			
348.5[@] 3	1.1 2	619.60	(3/2+ to 9/2+)	270.91	(1/2 to 7/2+)			
370.7 5	0.6[&] 3	619.60	(3/2+ to 9/2+)	248.45	(7/2+)			
372.2[#] 3	7.0[&] 7	440.26	(7/2+)	68.18	(5/2+)	M1	0.0302	α(K)=0.0259 4; α(L)=0.00340 5; α(M)=0.000704 10 α(N)=0.0001549 22; α(O)=2.53×10^{-5} 4; α(P)=1.99×10^{-6} 3 α(K)exp=0.036 13; K/L>5 In 2001Xi01 the strong 371.7 keV γ is considered as a single γ, in 1997Gi08 it is resolved to 370.7 and 372.2 keV γ rays in γγ coin.
378.0 2	3.8 4	446.34	(9/2+)	68.18	(5/2+)	[E2]	0.0230	
380.1 2	1.9 4	619.60	(3/2+ to 9/2+)	239.61	(5/2+)			
395.8 2	6.2 2	464.02	(5/2+,7/2+)	68.18	(5/2+)	M1,E2	0.023 3	α(K)exp=0.023 6 α(K)=0.019 3; α(L)=0.00283 9; α(M)=0.000591 13 α(N)=0.000129 4; α(O)=2.06×10^{-5} 10; α(P)=1.4×10^{-6} 3
397[#] 1	1.5[&] 3	645.39	(9/2+)	248.45	(7/2+)			
398.5 2	3.6 2	398.47	(3/2+,5/2+,7/2+)	0.0	(3/2+)	M1,E2	0.023 3	α(K)exp=0.024 8 α(K)=0.019 3; α(L)=0.00277 9; α(M)=0.000580 14 α(N)=0.000127 4; α(O)=2.02×10^{-5} 10; α(P)=1.4×10^{-6} 3
404.0[@] 2	0.8 1	472.21	(1/2+ to 7/2+)	68.18	(5/2+)			
405.7 2	1.0 1	645.39	(9/2+)	239.61	(5/2+)			
414[#] 1	0.6[&] 3	652.5	(1/2 to 9/2+)	239.61	(5/2+)			
440.0 2	4.4 1	440.26	(7/2+)	0.0	(3/2+)	(E2)	0.0147	α(K)=0.01226 18; α(L)=0.00196 3; α(M)=0.000413 6 α(N)=8.98×10^{-5} 13; α(O)=1.408×10^{-5} 20; α(P)=8.60×10^{-7} 12 Mult.: α(K)exp=0.019 8 gives M1,E2, but ΔJ$^\pi$=(2) requires E2.
458.5[#] 5	1.0[&] 3	706.46	(5/2+ to 9/2+)	248.45	(7/2+)			
464.0 2	1.3 2	464.02	(5/2+,7/2+)	0.0	(3/2+)			
466.7 2	4.3 2	706.46	(5/2+ to 9/2+)	239.61	(5/2+)			
472.2[@] 2	1.0 1	472.21	(1/2+ to 7/2+)	0.0	(3/2+)			
482.5[@] 2	0.6 1	928.87	(7/2+ to 11/2+)	446.34	(9/2+)			
519.5[@] 2	2.4 1	587.64	(1/2+ to 7/2+)	68.18	(5/2+)			
536.6[@] 3	1.7 5	934.92	(1/2 to 9/2+)	398.47	(3/2+,5/2+,7/2+)			
543.1[#] 5	0.9[&] 3	782.3	(5/2+ to 9/2+)	239.61	(5/2+)			
548.0[@] 2	0.3 1	796.21	(3/2+ to 7/2+)	248.45	(7/2+)			
551.3 3	3.2 6	619.60	(3/2+ to 9/2+)	68.18	(5/2+)			
556.0[@] 2	2.0 1	556.00?	(1/2 to 7/2+)	0.0	(3/2+)			Evaluators consider the placement of the 556.0 keV γ tentative due to lack of supporting γγ coin or other γ from the level.

γ(^{129}La) (continued)

E_γ[†]	I_γ[‡a]	E_i(level)	J^π_i	E_f	J^π_f	Comments
577.3 *2*	1.8 *2*	645.39	(9/2$^+$)	68.18	(5/2$^+$)	
584.0[#] *5*	1.8[&] *6*	652.5	(1/2 to 9/2$^+$)	68.18	(5/2$^+$)	
584.0[@] *2*	1.6 *1*	832.31	(3/2$^+$ to 9/2$^+$)	248.45	(7/2$^+$)	
587.6[@] *2*	2.2 *2*	587.64	(1/2$^+$ to 7/2$^+$)	0.0	(3/2$^+$)	
616.7[@] *2*	1.3 *3*	1015.26	(1/2 to 7/2$^+$)	398.47	(3/2$^+$,5/2$^+$,7/2$^+$)	
638.4 *2*	0.6 *1*	706.46	(5/2$^+$ to 9/2$^+$)	68.18	(5/2$^+$)	
664.0[@] *3*	0.4 *1*	934.92	(1/2 to 9/2$^+$)	270.91	(1/2 to 7/2$^+$)	
680.5[@] *3*	0.8 *4*	928.87	(7/2$^+$ to 11/2$^+$)	248.45	(7/2$^+$)	
728.0[@] *2*	1.7 *2*	796.21	(3/2$^+$ to 7/2$^+$)	68.18	(5/2$^+$)	
744.5[@] *2*	0.7 *1*	1015.26	(1/2 to 7/2$^+$)	270.91	(1/2 to 7/2$^+$)	
764.0[@] *2*	1.0 *3*	832.31	(3/2$^+$ to 9/2$^+$)	68.18	(5/2$^+$)	
796.0[@] *2*	1.8 *2*	796.21	(3/2$^+$ to 7/2$^+$)	0.0	(3/2$^+$)	
866.6[@] *3*	0.4 *2*	934.92	(1/2 to 9/2$^+$)	68.18	(5/2$^+$)	
897.9[@] *2*	0.9 *2*	966.34	(1/2 to 7/2$^+$)	68.18	(5/2$^+$)	
966.6[@] *2*	0.9 *1*	966.34	(1/2 to 7/2$^+$)	0.0	(3/2$^+$)	
1015.1[@] *3*	0.2 *1*	1015.26	(1/2 to 7/2$^+$)	0.0	(3/2$^+$)	

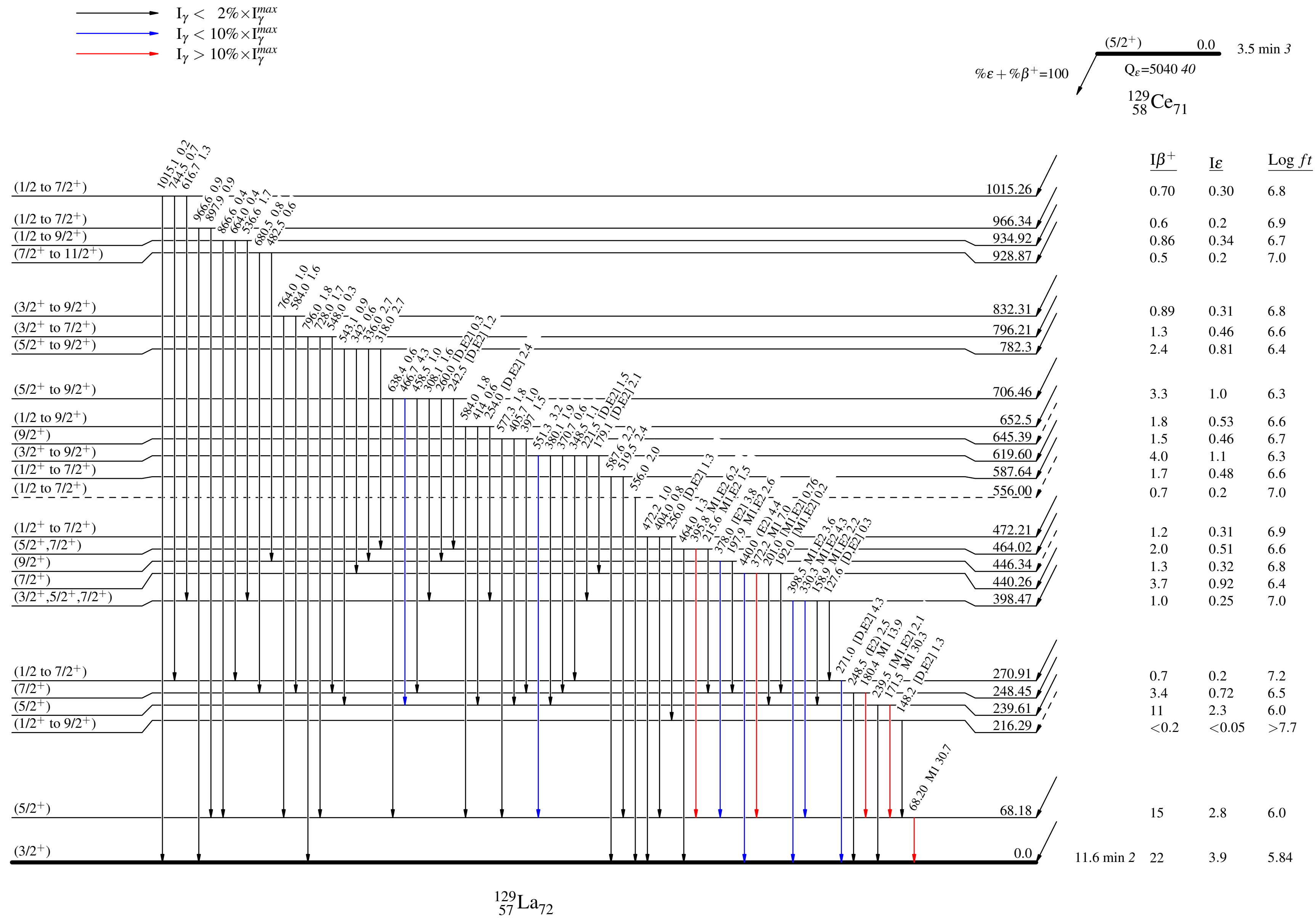
[†] Weighted average of Eγ values from 1997Gi08 and 2001Xi01.
[‡] From 2001Xi01, unless if otherwise noted.
[#] Reported only in 1997Gi08.
[@] Reported only in 2001Xi01.
[&] From 1997Gi08, normalized to the 171.5 keV transition.
[a] For absolute intensity per 100 decays, multiply by 0.47 *5*.
[b] Total 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.

$^{129}_{57}La_{72}$-5

^{129}Ce ε decay (3.5 min) 1997Gi08,2001Xi01

Decay Scheme

Intensities: Relative I_γ



From ENSDF