^{130}Ce ε decay (22.9 min) 1996Xu04

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	NDS 93, 33 (2001)	11-May-2001

Parent: ^{130}Ce: E=0.0; $J^\pi=0^+$; $T_{1/2}$=22.9 min *5*; Q(ε)=2211 *SY*; %ε+%$β^+$ decay=100.0

^{130}Ce-Δ(Q(g.s.))=646 (syst,1995Au04).

1996Xu04: measured Eγ, Iγ, x rays, γγ, γγ(t), Xγ(t).

Others: 1965Ge03, 1966No05, 1968Ab02. 1968Ab02 report eight γ rays with only the 130γ placed from a level of this energy. A γ spectrum shown by 2000Li08 shows some of the lines belonging to ^{130}Ce ε decay.

^{130}La Levels

E(level)	J^π†	$T_{1/2}$‡	E(level)	J^π†	E(level)	J^π†
0.0	$3^{(+)}$		431.51 *15*	(1)	672.93 *23*	(0,1)
110.44 *9*	$(1^+,2,3^+)$	17 ns *5*	443.22 *13*	(1)	697.01 *14*	(1)
131.01 *8*	1^+	77 ns *10*	444.39 *9*	(1^+)	810.47 *22*	(1)
219.73 *9*	(1^+)		477.15 *18*	(1)	827.5 *4*	(0,1)
267.31 *9*	(1^+)		477.96 *13*	(1^+)	913.62 *13*	(1^+)
304.10 *12*	(1)		481.89 *16*	(1)	985.91 *22*	(0,1)
307.48 *9*	(1)		523.88 *11*	(1^+)	1032.45 *12*	(1^+)
340.61 *9*	(1^+)		589.06 *16*	(1)	1168.72 *13*	(1^+)
350.71 *10*	(1)		594.28 *18*	(1)	1196.79 *10*	1^+
384.78 *9*	(1)		606.75 *18*	(1)	1289.04 *12*	1^+
430.18 *17*	(1)		645.49 *14*	(1)	1431.19 *13*	(1^+)

† From Adopted Levels.

‡ From γγ(t).

ε,$β^+$ radiations

E(decay)	E(level)	Iβ+ †	Iε†	Log *ft*	I(ε+β+)†	Comments
(779 *SY*)	1431.19		1.0 *2*	5.6	1.0 *2*	εK=0.842 *19*; εL=0.123 *14*; εM+=0.035 *5*
(921 *SY*)	1289.04		4.3 *3*	5.1	4.3 *3*	εK=0.844 *11*; εL=0.122 *8*; εM+=0.035 *3*
(1014 *SY*)	1196.79		11 *1*	4.8	11 *1*	εK=0.844 *8*; εL=0.121 *6*; εM+=0.0343 *19*
(1042 *SY*)	1168.72		3.0 *2*	5.4	3.0 *2*	εK=0.845 *7*; εL=0.121 *6*; εM+=0.0342 *18*
(1178 *SY*)	1032.45		1.4 *2*	5.8	1.4 *2*	εK=0.846 *25*; εL=0.120 *8*; εM+=0.034 *3*
(1225 *SY*)	985.91		0.3 *1*	6.5	0.3 *1*	εK=0.85 *3*; εL=0.120 *7*; εM+=0.0339 *22*
(1297 *SY*)	913.62		1.5 *2*	5.9	1.5 *2*	εK=0.85 *4*; εL=0.120 *8*; εM+=0.0338 *23*
(1383 *SY*)	827.5		0.4 *1*	6.5	0.4 *1*	εK=0.85 *6*; εL=0.119 *10*; εM+=0.034 *3*
(1400 *SY*)	810.47		0.3 *1*	6.6	0.3 *1*	εK=0.85 *6*; εL=0.119 *10*; εM+=0.034 *3*
(1513 *SY*)	697.01	0.01	0.99 *22*	6.2	1.0 *2*	av Eβ=230 *285*; εK=0.84 *8*; εL=0.118 *13*; εM+=0.033 *4*
(1538 *SY*)	672.93		0.8 *1*	6.3	0.8 *1*	εK=0.84 *9*; εL=0.118 *13*; εM+=0.033 *4*
(1565 *SY*)	645.49	0.01	0.8 *2*	6.3	0.8 *2*	av Eβ=253 *286*; εK=0.84 *9*; εL=0.118 *14*; εM+=0.033 *4*
(1604 *SY*)	606.75	0.01	0.8 *2*	6.3	0.8 *2*	av Eβ=270 *286*; εK=0.84 *10*; εL=0.118 *15*; εM+=0.033 *5*
(1616 *SY*)	594.28	0.01	0.8 *1*	6.3	0.8 *1*	av Eβ=275 *286*; εK=0.84 *10*; εL=0.118 *16*; εM+=0.033 *5*
(1621 *SY*)	589.06	0.01	0.8 *1*	6.3	0.8 *1*	av Eβ=277 *286*; εK=0.84 *10*; εL=0.117 *16*; εM+=0.033 *5*
(1687 *SY*)	523.88	0.1	3.8 *6*	5.7	3.9 *2*	av Eβ=306 *297*; εK=0.83 *12*; εL=0.117 *17*; εM+=0.033 *5*
(1729 *SY*)	481.89	0.01	0.7 *2*	6.5	0.7 *2*	av Eβ=324 *293*; εK=0.83 *13*; εL=0.116 *18*; εM+=0.033 *6*
(1733 *SY*)	477.96	0.1	2.5 *7*	5.9	2.6 *5*	av Eβ=326 *293*; εK=0.83 *13*; εL=0.116 *19*; εM+=0.033 *6*
(1733 *SY*)	477.15	0.01	0.7 *2*	6.5	0.7 *2*	av Eβ=326 *293*; εK=0.83 *13*; εL=0.116 *19*; εM+=0.033 *6*
(1766 *SY*)	444.39	0.1	3.3 *12*	5.8	3.4 *11*	av Eβ=340 *291*; εK=0.83 *13*; εL=0.116 *19*; εM+=0.033 *6*
(1767‡ *SY*)	443.22	0.01	0.3 *2*	6.9	0.3 *2*	av Eβ=341 *290*; εK=0.83 *13*; εL=0.116 *19*; εM+=0.033 *6*
(1779 *SY*)	431.51	0.02	0.7 *2*	6.5	0.7 *2*	av Eβ=346 *290*; εK=0.83 *14*; εL=0.115 *20*; εM+=0.032 *6*
(1780 *SY*)	430.18	0.03	1.3 *5*	6.2	1.3 *4*	av Eβ=347 *290*; εK=0.83 *14*; εL=0.115 *20*; εM+=0.032 *6*

Continued on next page (footnotes at end of table)

^{130}Ce ε decay (22.9 min) 1996Xu04 (continued)

ε,β+ radiations (continued)

E(decay)	E(level)	Iβ+ †	Iε†	Log *ft*	I(ε+β+)†	Comments
(1826‡ *SY*)	384.78	<0.04	<1.2	>6.3	<1.2	av Eβ=367 *288*; εK=0.82 *14*; εL=0.115 *21*; εM+=0.032 *6*
(1860 *SY*)	350.71	0.04	1.2 *6*	6.3	1.2 *6*	av Eβ=382 *288*; εK=0.82 *15*; εL=0.114 *22*; εM+=0.032 *6*
(1870 *SY*)	340.61	0.1	2.7 *7*	5.9	2.8 *4*	av Eβ=386 *288*; εK=0.82 *15*; εL=0.114 *22*; εM+=0.032 *7*
(1903 *SY*)	307.48	0.1	2.0 *6*	6.1	2.1 *4*	av Eβ=400 *288*; εK=0.81 *16*; εL=0.113 *23*; εM+=0.032 *7*
(1906‡ *SY*)	304.10	<0.1	0.6 *5*	6.6	0.6 *5*	av Eβ=402 *288*; εK=0.81 *16*; εL=0.113 *23*; εM+=0.032 *7*
(1943 *SY*)	267.31	0.4	7.0 *21*	5.5	7.4 *10*	av Eβ=418 *289*; εK=0.81 *17*; εL=0.112 *24*; εM+=0.032 *7*
(1991 *SY*)	219.73	0.4	5 *2*	5.7	5.2 *20*	av Eβ=439 *289*; εK=0.80 *17*; εL=0.111 *25*; εM+=0.031 *7*
(2079 *SY*)	131.01	3 *9*	39 *11*	4.9	42 *2*	av Eβ=478 *290*; εK=0.78 *19*; εL=0.11 *3*; εM+=0.031 *8*
(2100‡ *SY*)	110.44					

† Absolute intensity per 100 decays.
‡ Existence of this branch is questionable.

γ(^{130}La)

Iγ normalization: Σ (I(γ+ce) of γ's to g.s.)=100. Conversion coefficients are included where significant.

E_γ	I_γ#	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α@
46.7† *3*	0.07‡ *3*	350.71	(1)	304.10	(1)	[D,E2]	18 *16*
47.5† *3*	0.10 *5*	267.31	(1+)	219.73	(1+)	[M1,E2]	21 *11*
59.6 *2*	0.41 *7*	444.39	(1+)	384.78	(1)	[D,E2]	7.5 *65*
73.5 *3*	0.13 *6*	340.61	(1+)	267.31	(1+)	[M1,E2]	4.4 *17*
77.6 *2*	0.05 *3*	384.78	(1)	307.48	(1)	[D,E2]	2.8 *23*
80.5 *3*	0.06 *4*	384.78	(1)	304.10	(1)	[D,E2]	2.4 *20*
83.4 *2*	0.28 *6*	350.71	(1)	267.31	(1+)	[D,E2]	2.2 *18*
87.9† *3*	0.34‡ *10*	307.48	(1)	219.73	(1+)	[D,E2]	1.8 *14*
88.9† *2*	2.40 *12*	219.73	(1+)	131.01	1+	[M1,E2]	0.23 *8*
93.3 *2*	0.90 *18*	477.96	(1+)	384.78	(1)	[D,E2]	1.4 *11*
103.9 *2*	0.65 *13*	444.39	(1+)	340.61	(1+)	[M1,E2]	1.4 *4*
109.3† *3*	5.8‡ *6*	219.73	(1+)	110.44	(1+,2,3+)	[D,E2]	0.8 *6*
110.4† *2*	5.8 *6*	110.44	(1+,2,3+)	0.0	3(+)	[D,E2]	0.8 *6*
127.5 *3*	0.06 *4*	431.51	(1)	304.10	(1)	[D,E2]	0.5 *4*
131.0† *3*	0.87‡ *5*	350.71	(1)	219.73	(1+)	[D,E2]	0.44 *33*
131.1† *2*	100.0	131.01	1+	0.0	3(+)	[E2]	0.77
136.4† *2*	13.7 *3*	267.31	(1+)	131.01	1+	[M1,E2]	0.56 *11*
136.6† *3*	0.96‡ *30*	444.39	(1+)	307.48	(1)	[D,E2]	0.38 *28*
139.0 *3*	0.06‡ *4*	443.22	(1)	304.10	(1)	[D,E2]	0.36 *27*
141.3 *2*	0.6 *4*	481.89	(1)	340.61	(1+)	[D,E2]	0.34 *25*
163.0 *3*	2.1 *5*	430.18	(1)	267.31	(1+)	[D,E2]	0.21 *15*
170.5 *3*	0.68‡ *10*	477.96	(1+)	307.48	(1)	[D,E2]	0.18 *13*
173.1 *2*	0.59 *12*	523.88	(1+)	350.71	(1)	[D,E2]	0.17 *12*
175.8† *3*	0.53‡ *26*	443.22	(1)	267.31	(1+)	[D,E2]	0.17 *14*
176.9† *2*	3.52 *14*	444.39	(1+)	267.31	(1+)	[D,E2]	0.16 *11*
183.2 *2*	2.39 *12*	523.88	(1+)	340.61	(1+)	[M1,E2]	0.22 *2*
193.6 *2*	0.42 *11*	304.10	(1)	110.44	(1+,2,3+)	[D,E2]	0.12 *8*
196.9 *2*	2.45 *15*	307.48	(1)	110.44	(1+,2,3+)	[D,E2]	0.11 *7*

Continued on next page (footnotes at end of table)

^{130}Ce ε decay (22.9 min) 1996Xu04 (continued)

γ(^{130}La) (continued)

E_γ	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[@]
209.6[†] *2*	11.85 *20*	340.61	(1$^+$)	131.01	1$^+$	[M1,E2]	0.15
209.9[†] *2*	0.85[‡] *8*	477.15	(1)	267.31	(1$^+$)	[D,E2]	0.09 *6*
214.7 *3*	0.36[‡] *7*	481.89	(1)	267.31	(1$^+$)	[D,E2]	0.09 *5*
219.8 *2*	15.7 *16*	219.73	(1$^+$)	0.0	3$^{(+)}$	[E2]	0.13
230.5 *2*	0.82 *20*	340.61	(1$^+$)	110.44	(1$^+$,2,3$^+$)	[D,E2]	0.07 *5*
240.1 *2*	0.71 *10*	350.71	(1)	110.44	(1$^+$,2,3$^+$)	[D,E2]	0.06 *4*
248.4 *2*	0.58 *20*	589.06	(1)	340.61	(1$^+$)		
253.7 *2*	4.0 *3*	384.78	(1)	131.01	1$^+$	[D,E2]	0.05 *3*
256.5 *2*	4.50 *14*	523.88	(1$^+$)	267.31	(1$^+$)	[M1,E2]	0.08
266.9[†] *2*	0.82[‡] *10*	697.01	(1)	430.18	(1)		
267.3[†] *2*	12.9 *3*	267.31	(1$^+$)	0.0	3$^{(+)}$	[E2]	0.07
274.2 *2*	2.46 *12*	384.78	(1)	110.44	(1$^+$,2,3$^+$)	[D,E2]	0.04 *3*
294.8 *2*	0.67 *20*	645.49	(1)	350.71	(1)		
300.5 *2*	2.17 *13*	431.51	(1)	131.01	1$^+$	[D,E2]	0.03 *2*
304.1 *2*	2.82 *14*	304.10	(1)	0.0	3$^{(+)}$	[D,E2]	0.03 *2*
307.5 *2*	14.35 *10*	307.48	(1)	0.0	3$^{(+)}$	[D,E2]	0.03 *2*
313.3 *2*	0.66 *13*	444.39	(1$^+$)	131.01	1$^+$		
321.7 *3*	0.40 *11*	589.06	(1)	267.31	(1$^+$)		
333.9 *2*	0.65 *14*	444.39	(1$^+$)	110.44	(1$^+$,2,3$^+$)		
340.6 *2*	4.28 *10*	340.61	(1$^+$)	0.0	3$^{(+)}$	[D,E2]	0.03 *2*
346.8 *2*	3.0 *3*	477.96	(1$^+$)	131.01	1$^+$		
350.8 *2*	1.71 *15*	350.71	(1)	0.0	3$^{(+)}$		
384.8 *2*	1.9 *4*	384.78	(1)	0.0	3$^{(+)}$		
387.0 *2*	0.62 *4*	606.75	(1)	219.73	(1$^+$)		
389.2 *3*	0.33 *17*	697.01	(1)	307.48	(1)		
393.0 *2*	0.96[‡] *20*	523.88	(1$^+$)	131.01	1$^+$		
430.2[†] *3*	1.9 *6*	430.18	(1)	0.0	3$^{(+)}$		
431.5[†] *3*	0.7 *4*	431.51	(1)	0.0	3$^{(+)}$		
443.2[†] *3*	1.7 *5*	443.22	(1)	0.0	3$^{(+)}$		
444.2[†] *3*	1.3 *4*	444.39	(1$^+$)	0.0	3$^{(+)}$		
463.3 *2*	1.86 *18*	594.28	(1)	131.01	1$^+$		
470.5 *2*	0.55 *14*	913.62	(1$^+$)	443.22	(1)		
477.0 *3*	1.0 *3*	477.15	(1)	0.0	3$^{(+)}$		
478.0 *3*	1.0 *3*	477.96	(1$^+$)	0.0	3$^{(+)}$		
481.7 *3*	0.66 *10*	481.89	(1)	0.0	3$^{(+)}$		
520.0 *3*	0.97[‡] *10*	827.5	(0,1)	307.48	(1)		
524.0 *3*	1.09 *22*	523.88	(1$^+$)	0.0	3$^{(+)}$		
528.8 *2*	1.23 *24*	913.62	(1$^+$)	384.78	(1)		
535.1 *2*	0.8 *4*	645.49	(1)	110.44	(1$^+$,2,3$^+$)		
541.7 *3*	2.00 *10*	672.93	(0,1)	131.01	1$^+$		
562.7 *3*	0.19 *12*	672.93	(0,1)	110.44	(1$^+$,2,3$^+$)		
566.2 *2*	1.3 *3*	697.01	(1)	131.01	1$^+$		
589.2 *3*	1.11 *16*	589.06	(1)	0.0	3$^{(+)}$		
590.7 *3*	0.42[‡] *8*	810.47	(1)	219.73	(1$^+$)		
594.2 *3*	0.21 *10*	594.28	(1)	0.0	3$^{(+)}$		
605.8 *3*	1.5 *5*	913.62	(1$^+$)	307.48	(1)		
606.8 *3*	1.5 *5*	606.75	(1)	0.0	3$^{(+)}$		
645.3 *3*	0.61 *15*	645.49	(1)	0.0	3$^{(+)}$		
694.2 *3*	0.38 *20*	913.62	(1$^+$)	219.73	(1$^+$)		
696.7 *3*	0.17 *10*	697.01	(1)	0.0	3$^{(+)}$		
718.6 *2*	0.76[‡] *15*	985.91	(0,1)	267.31	(1$^+$)		

Continued on next page (footnotes at end of table)

^{130}Ce ε decay (22.9 min) 1996Xu04 (continued)

γ(^{130}La) (continued)

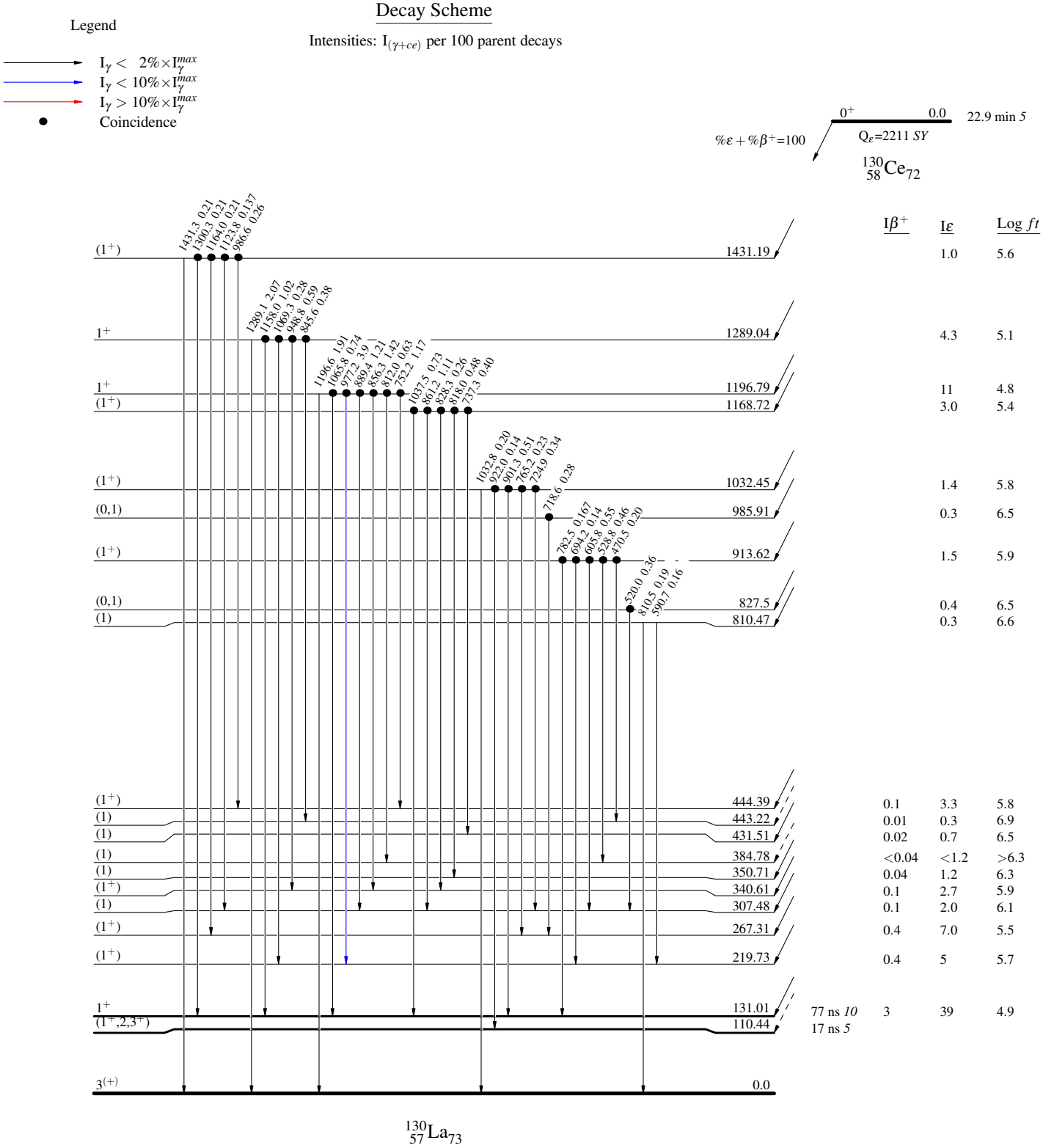
E_γ	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π
724.9 *2*	0.91 *15*	1032.45	(1$^+$)	307.48	(1)
737.3 *3*	1.09 *22*	1168.72	(1$^+$)	431.51	(1)
752.2 *2*	3.16 *25*	1196.79	1$^+$	444.39	(1$^+$)
765.2 *3*	0.62 *12*	1032.45	(1$^+$)	267.31	(1$^+$)
782.5 *3*	0.45[‡] *6*	913.62	(1$^+$)	131.01	1$^+$
810.5 *3*	0.50 *25*	810.47	(1)	0.0	3$^{(+)}$
812.0 *3*	1.7 *4*	1196.79	1$^+$	384.78	(1)
818.0 *2*	1.30 *14*	1168.72	(1$^+$)	350.71	(1)
828.3 *3*	0.71 *14*	1168.72	(1$^+$)	340.61	(1$^+$)
845.6 *2*	1.04 *16*	1289.04	1$^+$	443.22	(1)
856.3 *2*	3.83 *20*	1196.79	1$^+$	340.61	(1$^+$)
861.2 *2*	2.99 *18*	1168.72	(1$^+$)	307.48	(1)
889.4 *2*	3.28 *20*	1196.79	1$^+$	307.48	(1)
901.3 *2*	1.37 *15*	1032.45	(1$^+$)	131.01	1$^+$
922.0 *3*	0.38 *13*	1032.45	(1$^+$)	110.44	(1$^+$,2,3$^+$)
948.8 *3*	1.6 *3*	1289.04	1$^+$	340.61	(1$^+$)
977.2 *2*	10.5 *8*	1196.79	1$^+$	219.73	(1$^+$)
986.6 *2*	0.7 *4*	1431.19	(1$^+$)	444.39	(1$^+$)
1032.8 *3*	0.54 *16*	1032.45	(1$^+$)	0.0	3$^{(+)}$
1037.5 *3*	1.97 *20*	1168.72	(1$^+$)	131.01	1$^+$
1065.8 *3*	2.01 *20*	1196.79	1$^+$	131.01	1$^+$
1069.3 *3*	0.76 *16*	1289.04	1$^+$	219.73	(1$^+$)
1123.8 *3*	0.37[‡] *5*	1431.19	(1$^+$)	307.48	(1)
1158.0 *3*	2.75 *21*	1289.04	1$^+$	131.01	1$^+$
1164.0 *3*	0.56 *17*	1431.19	(1$^+$)	267.31	(1$^+$)
1196.6 *2*	5.17 *26*	1196.79	1$^+$	0.0	3$^{(+)}$
1289.1 *2*	5.6 *3*	1289.04	1$^+$	0.0	3$^{(+)}$
1300.3 *3*	0.57 *16*	1431.19	(1$^+$)	131.01	1$^+$
1431.3 *3*	0.57 *16*	1431.19	(1$^+$)	0.0	3$^{(+)}$

[†] The γ-ray peak is a part of an unresolved doublet.
[‡] From γγ and Xγ coin spectra.
[#] For absolute intensity per 100 decays, multiply by 0.37 *1*.
[@] 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.

^{130}Ce ε decay (22.9 min) 1996Xu04

Decay Scheme

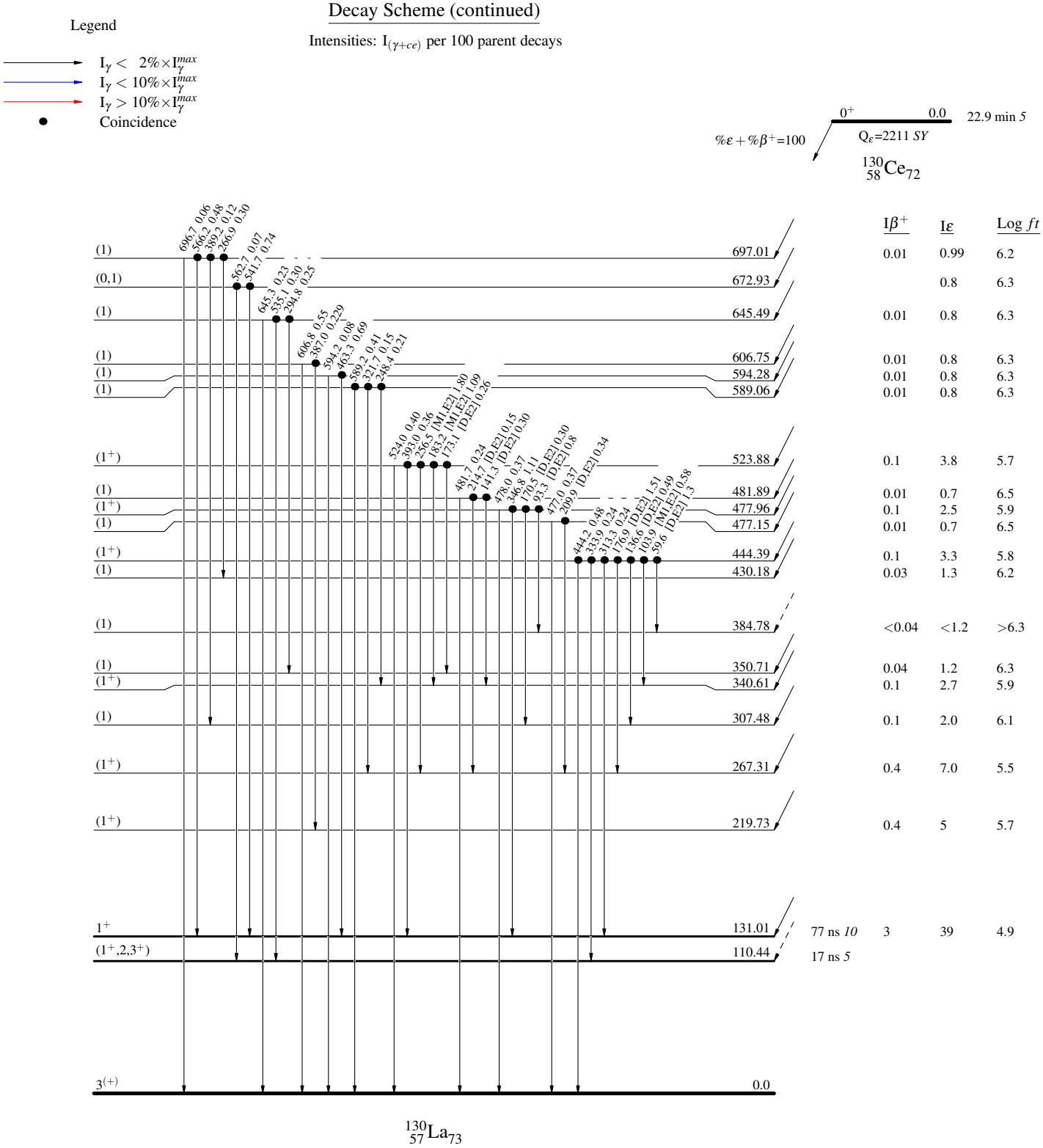
Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



^{130}Ce ε decay (22.9 min) 1996Xu04

Decay Scheme (continued)

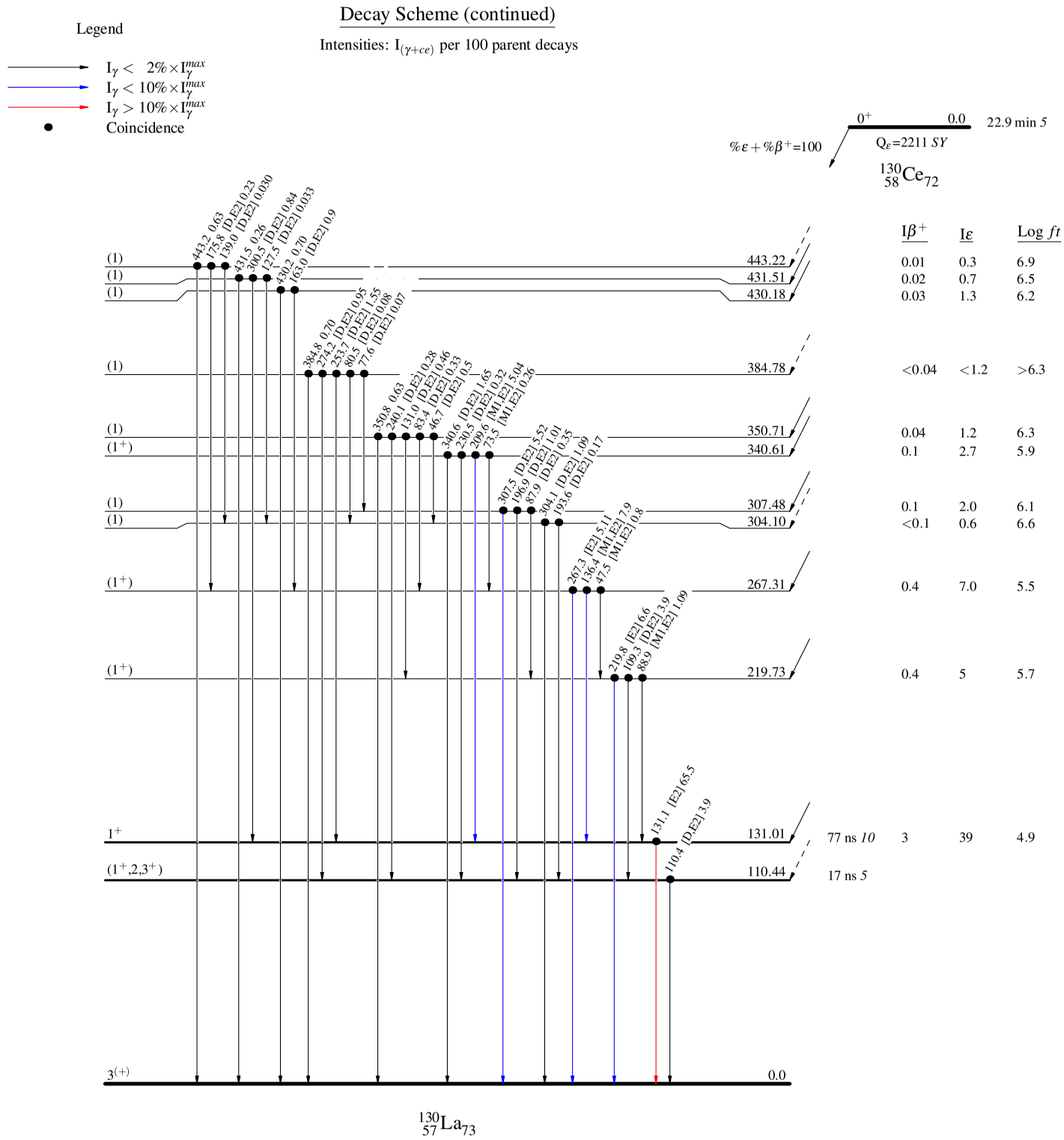
Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



^{130}Ce ε decay (22.9 min) 1996Xu04

Decay Scheme (continued)

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



$^{130}_{57}La_{73}$