Adopted Levels, Gammas

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

Q(β^-)=−5168 *11*; S(n)=9964 *10*; S(p)=7154 *9*; Q(α)=−498.3 *11* 2017Wa10
S(2n)=17818 *20*, S(2p)=12136.46 *29* (2017Wa10).

^{136}Ce Levels

Cross Reference (XREF) Flags

A	^{136}Pr ε decay	D	^{139}La(p,4nγ)
B	^{136}Ce IT decay (1.9 μs)	E	(HI,xnγ)
C	Coulomb excitation		

$T_{1/2}$(2β^+,0ν)(g.s. to g.s.):
2017Be21: ≥ 4.1×10^{18} yr (90% confidence)
2014Be37: ≥ 6.9×10^{17} yr (90% confidence)
2011Be02: ≥ 7×10^{16} yr (90% confidence)
2009Be20: ≥ 4.2×10^{15} yr (90% confidence)
2001Da22: >1.9×10^{16} y (90% confidence)
2001Da22: >3.2×10^{16} y (68% confidence)
1997Be36: >6.9×10^{17} y (68% confidence)
$T_{1/2}$(2β^+,2ν)(g.s. to g.s.):
2017Be21: ≥ 4.1×10^{18} yr (90% confidence)
2014Be37: ≥ 3.5×10^{17} yr (90% confidence)
2011Be02: ≥ 9×10^{15} yr (90% confidence)
2009Be20: ≥ 4.2×10^{15} yr (90% confidence)
2001Da22: >1.8×10^{16} y (90% confidence)
2001Da22: >3.8×10^{16} y (68% confidence)
$T_{1/2}$(K-capture+β^+,0ν)(g.s. to g.s.):
2017Be21: ≥ 2.6×10^{18} yr (90% confidence)
2014Be37: ≥ 9.6×10^{16} yr (90% confidence)
2011Be02: ≥7×10^{16} yr (90% confidence)
2009Be20: ≥ 2.6×10^{15} yr (90% confidence)
2001Da22: >3.8×10^{16} y (90% confidence)
2001Da22: >6.0×10^{16} y (68% confidence)
$T_{1/2}$(K-capture+β^+,2ν)(g.s. to g.s.):
2017Be21: ≥ 1.0×10^{17} yr (90% confidence)
2014Be37: ≥ 2.7×10^{18} yr (90% confidence)
2011Be02: ≥9×10^{15} yr (90% confidence)
2009Be20: ≥ 2.6×10^{15} yr (90% confidence)
2001Da22: >1.8×10^{15} y (90% confidence)
2001Da22: >3.0×10^{15} y (68% confidence)
$T_{1/2}$(2K-capture,0ν)(g.s. to g.s.):
2017Be21: ≥ 2.1×10^{18} yr (90% confidence)
2014Be37: ≥ 4.6×10^{17} yr (90% confidence)
2011Be02: ≥3×10^{16} yr (90% confidence)
2009Be20: ≥ 1.6×10^{15} yr (90% confidence)
2001Da22: >6.0×10^{15} y (90% confidence)
2001Da22: >8.0×10^{15} y (68% confidence)
$T_{1/2}$(2K-capture,2ν)(g.s. to g.s.):
2011Be02: ≥ 3.2×10^{16} yr (90% confidence)
2001Da22: >0.7×10^{14} y (90% confidence)
2001Da22: >1.1×10^{14} y (68% confidence)

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Adopted Levels, Gammas (continued)

^{136}Ce Levels (continued)

E(level)†	J$^\pi$	T$_{1/2}$‡	XREF	Comments
0.0#	0$^+$	stable	ABCDE	%2ε=? T$_{1/2}$: 2ε decay is expected based on Q-value arguments. T$_{1/2}$ value should be dominated by fastest 2ε decay mode, ground state to ground state 2K-capture with the emission of 2 neutrinos. Most stringent limit for 2K-capture,2ν is ≥ 3.2×10^{16} yr (2011Be02) at 90% confidence level. For more details, see the table above. 2017Be21,2014Be37 and 2009Be20 provide T$_{1/2}$ limits to excited states in ^{136}Ba. $\Delta\langle r^2\rangle(^{136}Ce-^{140}Ce)=-0.031$ *9* (1997Is06).
552.05# *13*	2$^+$	6.7 ps *8*	ABCDE	B(E2)↑=0.81 *9* (1989Ga24) T$_{1/2}$: derived by evaluator from B(E2) and Adopted Gamma properties. J$^\pi$: E2 552γ to 0$^+$.
1075.9? *4*			A	E(level): very tentative assignment to ^{136}Ce, as depopulating transition could only be assigned to A=136 in ^{136}Pr ε decay and transition with similar energy is also assigned to ^{136}Nd ε decay.
1091.88 *15*	2$^+$	4.4 ps *7*	A CD	B(E2)↑=0.0114 *19* J$^\pi$: E2 1092γ to 0$^+$. T$_{1/2}$: weighted average of 4.3 ps *7* and 4.5 ps *7* deduced by evaluator from B(E2)(0 to 1092)=0.0114 *19* and B(E2)(552 to 1092)=0.199 *29*, respectively and Adopted Gamma properties. B(E2)↑: from Coulomb Excitation.
1313.74# *24*	4$^+$	0.94 ps *17*	ABCDE	B(E2)↑=0.42 *7* B(E2)↑: from Coulomb Excitation. J$^\pi$: E2 762γ to 2$^+$; band assignment. T$_{1/2}$: derived by evaluator from B(E2) and Adopted Gamma properties. Other: 6.6 ps *18* from RDDM in (HI,xnγ).
1552.98 *23*	3$^+$		A D	J$^\pi$: 3 from γγ(θ) in ^{136}Pr ε decay, π=+ from M1+E2 1001γ to 2$^+$.
1978.2@ *5*	5$^-$	496 ps *23*	B DE	J$^\pi$: E1 664γ to 4$^+$. T$_{1/2}$: from γγ(t) in (HI,xnγ).
1982.0 *6*	(3$^-$)		C	B(E3)↑=0.19 *3* J$^\pi$: sizable population in Coulomb excitation and absence of decay to ground state. B(E2)↑: from Coulomb Excitation.
2066.72 *22*	2$^+$	0.151 ps *16*	A C	B(E2)↑=0.025 *13* J$^\pi$: 2 from γγ(θ) in ^{136}Pr ε decay, population in Coulomb excitation suggests π=+. T$_{1/2}$: deduced by evaluator from B(E2)(552 to 2067) and Adopted Gamma properties. B(E2)↑: from Coulomb excitation. Others: B(E2)(552 to 2067)=0.00328 *16* and B(E2)(1092 to 2067) ≤ 0.037, both from Coulomb excitation.
2155.02 *18*	2$^+$	0.039 ps *5*	A C	B(E2)↑=0.0116 *6* J$^\pi$: 2 from γγ(θ) in ^{136}Pr ε decay, population in Coulomb excitation suggests π=+. T$_{1/2}$: deduced by evaluator from B(E2) and Adopted Gamma properties. B(E2)↑: from Coulomb excitation. Others: B(E2)(552 to 2155)=0.0116 *12* and B(E2)(1092 to 2155) ≤0.054, both from Coulomb excitation.
2213.7# *5*	6$^+$	≤5^g ns	B DE	J$^\pi$: E2 900γ to 4$^+$; band assignment.
2274.5 *7*	(2$^+$)	0.305 ps *25*	C	B(E2)↑=0.0118 *8* B(E2)↑: from Coulomb Excitation. Other: B(E2)(552 to 2275) ≤ 0.0033 from Coulomb Excitation. J$^\pi$: strong population in Coulomb excitation and strong decay to ground state. T$_{1/2}$: deduced by evaluator from B(E2) and Adopted Gamma properties.
2306.9@ *5*	7$^-$	270 ps *24*	B DE	J$^\pi$: E2 329γ to 5$^-$. T$_{1/2}$: from γγ(t) in (HI,xnγ).
2366.1 *5*	6$^+$	≤5^g ns	B DE	J$^\pi$: E2 1052.5γ to 4$^+$, E2 623γ from 8$^+$.

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Adopted Levels, Gammas (continued)

^{136}Ce Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[‡]	XREF	Comments
2424.7[&] 5	(6⁻)	≤3[g] ns	E	J^π: D+Q 446γ to 5⁻; band assignment.
2451.08 23	(2⁺)	0.17 ps 3	A C	B(E2)↑=0.0054 6 $T_{1/2}$: deduced by evaluator from B(E2) and Adopted Gamma properties. B(E2)↑: from Coulomb excitation. Others: B(E2)(552 to 2451) ≤ 0.0046 and B(E2)(1092 to 2451) ≤ 0.033, both from Coulomb excitation. J^π: strong population in Coulomb excitation, log *ft*=6.2 from 2⁺ parent.
2517.1 3	(2⁺,3)		A	J^π: log *ft*=6.5 from 2⁺ parent, 1204γ to 4⁺.
2595.2 3	(2⁺)		A	J^π: 1282γ to 4⁺, tentative 2596γ to 0⁺.
2682.0 3	(2⁺)		A	J^π: 1368γ to 4⁺, tentative 2681γ to 0⁺.
2792.7 4	(1,2⁺)		A	J^π: 2793γ to 0⁺.
2827.8 3	(1,2,3)		A	J^π: log *ft*=6.5 from 2⁺ parent.
2865.9 3	(1,2⁺)		A	J^π: log *ft*=6.4 from 2⁺ parent, tentative 2866γ to 0⁺.
2904.1 4	(1,2,3)		A	J^π: log *ft*=6.8 from 2⁺ parent.
2931.8 4	(1,2⁺)		A	J^π: 2931γ to 0⁺.
2942.1? 5	(2⁺)		A	J^π: 1628γ to 4⁺, 2942γ to 0⁺.
2954.6 5	(8⁺)		E	J^π: (E2) 741γ to 6⁺.
2989.4[#] 5	8⁺		B DE	XREF: D(2994.2). J^π: E2 623γ to 6⁺; band assignment.
2991.3? 5	(2⁺,3,4⁺)		A	J^π: 1678γ to 4⁺, 2439.5γ to 2⁺.
3011.16? 23			A	
3095.0[a] 6	10⁺	1.9 μs 1	B DE	%IT=100 μ=−1.80 2 (1981Ba69) $T_{1/2}$: from γ(t) taking weighted average of 552γ(t), 623γ(t), 762γ(t), and 1052γ(t) in (HI,xnγ). Other: 2.2 μs 2 from γ(t) in ^{139}La(p,4nγ) (note that 106γ depopulating the level was not observed and isomer was assigned to a 2994-keV level. J^π: E2 106γ to 8⁺. μ: from TDPAD. Other: 1.80 3 (1982Ri09, TDPAD). Q: Q/Q(10⁺, ^{138}Ce)=1.45 4 (1983Da29, TDPAD).
3146.2[&] 5	(8⁻)	≤3[g] ns	E	J^π: E2 721.5γ to (6⁻); band assignment.
3174.5 4	(1,2⁺)		A	J^π: 3175γ to 0⁺.
3201.3? 4	(2⁺)		A	J^π: 1887γ to 4⁺, 3201γ to 0⁺.
3233.0 3	(1,2,3)		A	J^π: log *ft*=6.4 from 2⁺ parent.
3264.1 4	(1,2⁺)		A	J^π: log *ft*=6.2 from 2⁺ parent, 3265γ to 0⁺.
3277.9[@] 7	9⁻	≤3[g] ns	E	J^π: E2 971γ to 7⁻; band assignment.
3280.6 4	(1,2⁺)		A	J^π: 3280γ to 0⁺.
3361.7 3	(1,2⁺)		A	J^π: 3362γ to 0⁺.
3399.7 5	(10⁺)	≤3[g] ns	E	J^π: (E2) 410γ to 8⁺.
3440.9 7	(9⁺)		E	J^π: 486γ to (8⁺).
3575.3? 9			E	
3579.4 7	(1,2⁺)		A	J^π: 3580γ to 0⁺.
3705.3 6	(1,2,3)		A	J^π: log *ft*=6.7 from 2⁺ parent.
3760.1[a] 7	12⁺		E	J^π: E2 665γ to 10⁺; band assignment.
3865.4 7	(10⁺)		E	J^π: E2 911γ to (8⁺).
3986.8[&] 6	(10⁻)	≤3[g] ns	E	J^π: Q 840.5γ to (8⁻); band assignment.
4023.3? 3	(1,2,3)		A	J^π: log *ft*=5.9 from 2⁺ parent.
4084.3[@] 7	11⁻	<3[g] ns	E	J^π: E2 806γ to 9⁻.
4240.3[b] 6	(11⁻)		E	J^π: D+Q 253γ to (10⁻).
4360.3[c] 9	(11⁺)		E	J^π: D 495γ to (10⁺).
4596.6[&] 7	(12⁻)		E	J^π: (E2) 610γ to (10⁻), band assignment.
4786.1 8	14⁺		E	J^π: E2 1026γ to 12⁺.
4832.7[a] 7	(14⁺)		E	J^π: (E2) 1073γ to 12⁺, band assignment.
4872.4[b] 6	(13⁻)		E	J^π: E2 632γ to (11⁻), band assignment.

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Adopted Levels, Gammas (continued)

^{136}Ce Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[‡]	XREF	Comments
4927.9[c] *10*	(13+)		E	J^π: (E2) 568γ to (11+), band assignment.
5097.5?[@] *8*	(13−)		E	J^π: 1013γ to 11−, band assignment.
5304.6[d] *7*	15+		E	J^π: M1 472γ to 14+.
5568.0[c] *11*	(15+)	0.69 ps *26*	E	J^π: (E2) 640γ to (13+), band assignment.
5593.5[d] *8*	(16+)		E	J^π: 761γ to (14+), band assignment.
5642.6[e] *8*	16+	>0.69 ps	E	J^π: E2 857γ to 14+.
5645.1[f] *7*	14−		E	J^π: M1 163γ from 15−; band assignment.
5662.4 *8*	(14−)		E	J^π: D 146γ from 15−, 790γ to (13−).
5800.6[b] *7*	(15−)		E	J^π: (E2) 928γ to (13−); band assignment.
5808.8[f] *7*	15−		E	J^π: M1 186γ from 16−; band assignment.
5840.6 *12*	(16)		E	J^π: D 536γ to 15+.
5855.6 *12*			E	
5876.9[e] *9*	17+	>0.69 ps	E	J^π: M1 234γ to 16+, band assignment.
5994.8[f] *7*	16−		E	J^π: E1 690γ to 15+.
6098.5[d] *9*	(17+)	<0.56 ps	E	J^π: D 505γ to (16+), band assignment.
6170.2[e] *9*	(18+)	>0.69 ps	E	J^π: D 293γ to 17+, band assignment.
6273.0[c] *15*	(17+)	0.35 ps *9*	E	J^π: 705γ to (15+), band assignment.
6282.5[f] *8*	17−		E	J^π: M1 288γ to 16−, band assignment.
6380.0 *15*			E	
6524.2 *14*	(19)		E	J^π: 354γ to (18+).
6539.1[e] *11*	(19+)	0.40 ps *15*	E	J^π: D 369γ to (18+); band assignment.
6642.2[d] *10*	(18+)		E	J^π: D 544γ to (17+), 1049γ to (16+), band assignment.
6662.9[f] *9*	18−	0.509 ps *15*	E	J^π: M1 380.5γ to 17−, 668γ to 16−, band assignment.
6831.7[b] *9*	(17−)		E	J^π: 1031γ to (15−), band assignment.
6885.5 *13*			E	
6933.2[e] *12*	(20+)	0.55 ps *+17−18*	E	J^π: D 394γ to (19+), band assignment.
7086.0[c] *18*	(19+)		E	J^π: 813γ to (17+).
7099.0[f] *9*	19−	0.315 ps *+12−10*	E	J^π: M1 436γ to 18−, band assignment.
7238.4?[d] *10*	(19+)		E	J^π: 596γ to (18+), band assignment.
7292.7 *16*			E	
7325.5 *16*			E	
7344.6[e] *13*	(21+)	<0.43 ps	E	J^π: D 411γ to (20+), band assignment.
7585.1[f] *10*	20−	0.263 ps *+26−31*	E	J^π: M1 486γ to 19−, 922γ to 18−, band assignment.
7800.6[e] *16*	(22+)		E	J^π: 456γ to (21+), band assignment.
8110.0?[f] *11*	21−	0.253 ps *+18−28*	E	J^π: D 525γ to 20−, 1011γ to 19−, band assignment.
8215.4 *17*			E	
8315.6?[e] *19*	(23+)		E	J^π: 515γ to (22+), band assignment.
8625.4[f] *12*	22−	<0.43 ps	E	J^π: D 515γ to 21−, band assignment.
9228.0[f] *15*	23−		E	J^π: 1118γ to 21−, band assignment.

[†] From a least-squares fit to Eγ, by evaluator.
[‡] From Doppler Shift Attenuation Method (DSAM), in (HI,xnγ), except where noted.
[#] Band(A): g.s. yrast band.
[@] Band(B): $\nu[h_{11/2}\otimes s_{1/2}d_{3/2}]$,α=1.
[&] Band(C): $\nu[h_{11/2}\otimes s_{1/2}d_{3/2}]$,α=0.
[a] Band(D): Band based on 10+. Probable configuration=$\nu h^2_{11/2}$.
[b] Band(E): Band based on 11−. Probable configuration=$\pi g_{7/2}h_{11/2}$.

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Adopted Levels, Gammas (continued)

^{136}Ce Levels (continued)

[c] Band(F): Highly deformed band based on $11^{(+)}$. Possible configuration=$\nu i^2_{13/2}$.

[d] Band(G): Dipole magnetic-rotational band based on 15^+. Possible configuration=$\pi[g_{7/2}h_{11/2}]\otimes\nu[g_{7/2}h_{11/2}]$.

[e] Band(H): Dipole magnetic-rotational band based on 16^+. Possible configuration=$\pi[h^2_{11/2}]\otimes\nu[h^{-2}_{11/2}]$.

[f] Band(I): Dipole magnetic-rotational band based on 14^-. Possible configuration=$\pi[g_{7/2}h_{11/2}]\otimes\nu[h^{-2}_{11/2}]$, oblate.

[g] From γ(t) in (HI,xnγ).

γ(^{136}Ce)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	α[f]	Comments
552.05	2^+	552.16[#] *19*	100	0.0	0^+	E2[@]		0.00827	α(K)=0.00693 *10*; α(L)=0.001055 *15*; α(M)=0.000223 *4*; α(N)=4.90×10^{-5} *7*; α(O)=7.72×10^{-6} *11* α(P)=4.91×10^{-7} *7* B(E2)(W.u.)=39 *5* Mult.: also E2 from DCO,POL in (HI,xnγ).
1075.9?		523.9[#g] *5*	100	552.05	2^+				
1091.88	2^+	539.75[#] *19*	100[a] *5*	552.05	2^+	E2(+M1)[@]	−4.7[&] *7*	0.00895 *14*	α(K)=0.00751 *12*; α(L)=0.001140 *17*; α(M)=0.000241 *4*; α(N)=5.30×10^{-5} *8*; α(O)=8.35×10^{-6} *13* α(P)=5.33×10^{-7} *9* B(E2)(W.u.)=47 *8*; B(M1)(W.u.)=0.0010 *4*
		1092.0[#] *5*	36.8[a] *6*	0.0	0^+	E2[@]		1.67×10^{-3}	α(K)=0.001434 *21*; α(L)=0.000190 *3*; α(M)=3.97×10^{-5} *6*; α(N)=8.78×10^{-6} *13* α(O)=1.414×10^{-6} *20*; α(P)=1.041×10^{-7} *15* B(E2)(W.u.)=0.53 *9*
1313.74	4^+	762.3 *5*	100	552.05	2^+	E2		0.00371	α(K)=0.00315 *5*; α(L)=0.000443 *7*; α(M)=9.29×10^{-5} *13*; α(N)=2.05×10^{-5} *3*; α(O)=3.27×10^{-6} *5* α(P)=2.27×10^{-7} *4* B(E2)(W.u.)=56 *10*
1552.98	3^+	460.9[#] *3*	100[#] *5*	1091.88	2^+	E2(+M1)[@]	−4.3[&] *6*	0.01379 *22*	α(K)=0.01148 *19*; α(L)=0.00182 *3*; α(M)=0.000387 *6*; α(N)=8.50×10^{-5} *13*; α(O)=1.329×10^{-5} *20* α(P)=8.06×10^{-7} *14* δ: other: second solution of −0.50 *4* from $\gamma\gamma(\theta)$ in ^{136}Pr ε decay is in disagreement with α(K)exp.
		1000.8[#] *3*	65.8[#] *34*	552.05	2^+	M1+E2[@]	+0.97[&] *28*	0.00247 *15*	α(K)=0.00212 *13*; α(L)=0.000277 *15*; α(M)=5.8×10^{-5} *3*; α(N)=1.28×10^{-5} *7*; α(O)=2.07×10^{-6} *12* α(P)=1.57×10^{-7} *11* E_γ: other: 1002.8 from (p,4nγ) is discrepant.
1978.2	5^-	664.3 *5*	100	1313.74	4^+	E1		0.00192	α(K)=0.001652 *24*; α(L)=0.000209 *3*; α(M)=4.33×10^{-5} *7*; α(N)=9.59×10^{-6} *14* α(O)=1.550×10^{-6} *22*; α(P)=1.164×10^{-7} *17* B(E1)(W.u.)=1.76×10^{-6} *9*
1982.0	(3^-)	890[a]	9.7[a] *3*	1091.88	2^+				
		1430[a]	100[a] *3*	552.05	2^+				
		(1982[a])	<0.3[a]	0.0	0^+				I_γ: transition not observed, upper limit for intensity is estimated in Coulomb excitation from the detection limit.
2066.72	2^+	974.2[#] *5*	13.9[a] *5*	1091.88	2^+				

$^{136}_{58}$Ce$_{78}$-6

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

E_i(level)	J^π_i	E_γ [†]	I_γ [†]	E_f	J^π_f	Mult. [‡]	δ [‡]	α [f]	Comments
2066.72	2^+	991.0[#g] *6*	5.6[#] *9*	1075.9?					α(K)=0.001758 *25*; α(L)=0.000236 *4*; α(M)=4.93×10^{-5} *7*; α(N)=1.092×10^{-5} *16* α(O)=1.755×10^{-6} *25*; α(P)=1.275×10^{-7} *18*
		1514.8[#] *4*	79.7[a] *14*	552.05	2^+	M1+E2	+0.46[&] *8*	1.17×10^{-3} *2*	α(K)=0.000934 *18*; α(L)=0.0001184 *22*; α(M)=2.46×10^{-5} *5*; α(N)=5.46×10^{-6} *10* α(O)=8.89×10^{-7} *17*; α(P)=6.95×10^{-8} *14* B(E2)(W.u.)=0.9 *3*; B(M1)(W.u.)=0.0155 *21* Mult.: D+Q from $\gamma\gamma(\theta)$ in ^{136}Pr ε decay, $\Delta\pi$=no from level scheme.
		2066.8[#] *3*	100[a] *3*	0.0	0^+	[E2]		8.10×10^{-4}	α(K)=0.000419 *6*; α(L)=5.25×10^{-5} *8*; α(M)=1.089×10^{-5} *16*; α(N)=2.42×10^{-6} *4*; α(O)=3.93×10^{-7} *6* α(P)=3.04×10^{-8} *5* B(E2)(W.u.)=1.34 *17*
2155.02	2^+	841.3[#g] *3*	1.9[#] *3*	1313.74	4^+	[E2]		0.00295	α(K)=0.00251 *4*; α(L)=0.000347 *5*; α(M)=7.27×10^{-5} *11*; α(N)=1.606×10^{-5} *23*; α(O)=2.57×10^{-6} *4* α(P)=1.82×10^{-7} *3* B(E2)(W.u.)=14 *3*
		1063.2[#] *7*	5.3[#] *6*	1091.88	2^+				
		1602.8[#] *3*	100[#] *8*	552.05	2^+	M1+E2	−0.41[&] *8*	1.08×10^{-3} *2*	α(K)=0.000832 *15*; α(L)=0.0001053 *19*; α(M)=2.19×10^{-5} *4*; α(N)=4.85×10^{-6} *9* α(O)=7.91×10^{-7} *15*; α(P)=6.19×10^{-8} *12* B(E2)(W.u.)=4.1 *16*; B(M1)(W.u.)=0.101 *18* Mult.: D+Q from $\gamma\gamma(\theta)$ in ^{136}Pr ε decay, $\Delta\pi$=no from level scheme.
		2154.9[#] *3*	8.7[#] *10*	0.0	0^+	[E2]		8.17×10^{-4}	α(K)=0.000388 *6*; α(L)=4.86×10^{-5} *7*; α(M)=1.008×10^{-5} *15*; α(N)=2.24×10^{-6} *4*; α(O)=3.64×10^{-7} *5* α(P)=2.82×10^{-8} *4* B(E2)(W.u.)=0.56 *11*
2213.7	6^+	900.1 *5*	100	1313.74	4^+	E2		0.00254	α(K)=0.00216 *3*; α(L)=0.000295 *5*; α(M)=6.18×10^{-5} *9*; α(N)=1.365×10^{-5} *20*; α(O)=2.19×10^{-6} *3* α(P)=1.566×10^{-7} *22* B(E2)(W.u.)>0.0046
2274.5	(2^+)	1722	28.7 *13*	552.05	2^+				
		2275	100 *3*	0.0	0^+	[E2]		8.33×10^{-4}	α(K)=0.000352 *5*; α(L)=4.40×10^{-5} *7*; α(M)=9.11×10^{-6} *13*; α(N)=2.02×10^{-6} *3*; α(O)=3.29×10^{-7} *5* α(P)=2.56×10^{-8} *4* B(E2)(W.u.)=0.57 *6*
2306.9	7^-	328.5 *5*	100	1978.2	5^-	E2		0.0367	α(K)=0.0297 *5*; α(L)=0.00549 *9*; α(M)=0.001178 *18*; α(N)=0.000257 *4*; α(O)=3.93×10^{-5} *6* α(P)=1.99×10^{-6} *3* B(E2)(W.u.)=12.7 *12*

$^{136}_{58}Ce_{78}$-7

γ(^{136}Ce) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	α[f]	Comments
2366.1	6^+	1052.5 *5*	100	1313.74	4^+	E2	0.00181	α(K)=0.001548 *22*; α(L)=0.000206 *3*; α(M)=4.30×10^{-5} *6*; α(N)=9.53×10^{-6} *14* α(O)=1.534×10^{-6} *22*; α(P)=1.123×10^{-7} *16* B(E2)(W.u.)>0.0021
2424.7	(6^-)	446.4 *5*	100	1978.2	5^-	D+Q	0.018 *3*	α(K)=0.015 *3*; α(L)=0.00218 *18*; α(M)=0.00046 *4*; α(N+..)=0.00012 *1*
2451.08	(2^+)	1359.9[#] *5*	100[#] *11*	1091.88	2^+			
		1899.0[#] *5*	95[#] *21*	552.05	2^+			
		2450.8[#] *3*	71[#] *8*	0.0	0^+	[E2]	8.65×10^{-4}	α(K)=0.000308 *5*; α(L)=3.84×10^{-5} *6*; α(M)=7.95×10^{-6} *12*; α(N)=1.765×10^{-6} *25*; α(O)=2.87×10^{-7} *4* α(P)=2.24×10^{-8} *4* B(E2)(W.u.)=0.24 *6*
2517.1	$(2^+,3)$	1203.8[#] *8*	22.2[#] *28*	1313.74	4^+			
		1425.0[#] *4*	100[#] *11*	1091.88	2^+			
		1965.2[#] *5*	16.7[#] *17*	552.05	2^+			
2595.2	(2^+)	1041.5[#g] *6*	21.4[#] *22*	1552.98	3^+			
		1282.4[#] *7*	17.9[#] *22*	1313.74	4^+			
		1503.3[#] *5*	34[#] *4*	1091.88	2^+			
		2042.7[#] *5*	100[#] *7*	552.05	2^+			
		2596.0[#g] *7*	21.4[#] *22*	0.0	0^+			
2682.0	(2^+)	1368.3[#] *6*	85[#] *10*	1313.74	4^+			
		1590.3[#] *8*	<75[#]	1091.88	2^+			
		2131.1[#] *8*	100[#] *10*	552.05	2^+			
		2681.3[#g] *5*	62[#] *8*	0.0	0^+			
2792.7	$(1,2^+)$	2240.7[#] *4*	100[#] *8*	552.05	2^+			
		2792.6[#] *7*	16.2[#] *16*	0.0	0^+			
2827.8	(1,2,3)	672.83[#g] *24*	54[#] *6*	2155.02	2^+			
		1735.7[#g] *4*	100[#] *11*	1091.88	2^+			
		2275.0[#] *10*	54[#] *11*	552.05	2^+			
2865.9	$(1,2^+)$	1773.8[#] *5*	38[#] *5*	1091.88	2^+			
		1790.2[#g] *10*	15.0[#] *17*	1075.9?				
		2313.7[#] *4*	100[#] *8*	552.05	2^+			
		2866.4[#g] *7*	17[#] *4*	0.0	0^+			
2904.1	(1,2,3)	1812.8[#g] *10*	<35[#]	1091.88	2^+			
		2351.9[#] *4*	100[#] *11*	552.05	2^+			
2931.8	$(1,2^+)$	2379.8[#] *4*	100[#] *11*	552.05	2^+			

$^{136}_{58}Ce_{78}$-8

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

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	α[f]	Comments
2931.8	(1,2+)	2931.3[#] 9	29[#] 4	0.0	0+			
2942.1?	(2+)	1628.2[#g] 7	100[#] 13	1313.74	4+			
		2389.5[#g] 10	95[#] 10	552.05	2+			
		2942.5[#g] 7	48[#] 10	0.0	0+			
2954.6	(8+)	647.8 5	<14	2306.9	7−			
		741.1 5	100 30	2213.7	6+	(E2)	0.00396	α(K)=0.00336 5; α(L)=0.000475 7; α(M)=9.98×10^{-5} 14; α(N)=2.20×10^{-5} 4; α(O)=3.51×10^{-6} 5 α(P)=2.42×10^{-7} 4 Mult.: stretched Q from R(DCO) and $\gamma(\theta)$ in (HI,xnγ), assumed E2.
2989.4	8+	623.4 5	95 5	2366.1	6+	E2	0.00605	α(K)=0.00510 8; α(L)=0.000750 11; α(M)=0.0001581 23; α(N)=3.48×10^{-5} 5; α(O)=5.52×10^{-6} 8 α(P)=3.64×10^{-7} 6
		683.1	1.9	2306.9	7−	[E1]	0.00181	α(K)=0.001557 22; α(L)=0.000197 3; α(M)=4.08×10^{-5} 6; α(N)=9.03×10^{-6} 13 α(O)=1.460×10^{-6} 21; α(P)=1.099×10^{-7} 16 E_γ,I_γ: from ^{136}Ce IT decay.
		775.6 5	100 9	2213.7	6+	E2	0.00356	α(K)=0.00302 5; α(L)=0.000424 6; α(M)=8.89×10^{-5} 13; α(N)=1.96×10^{-5} 3; α(O)=3.13×10^{-6} 5 α(P)=2.18×10^{-7} 3
2991.3?	(2+,3,4+)	1677.9[#g] 7	100[#] 11	1313.74	4+			
		2439.5[#g] 10	86[#] 8	552.05	2+			
3011.16?		855.92[#g] 22	100[#] 12	2155.02	2+			
		1919.2[#g] 7	78[#] 12	1091.88	2+			
		2460.4[#g] 5	93[#] 12	552.05	2+			
3095.0	10+	105.7 5	100	2989.4	8+	E2	1.68 4	α(K)=1.030 21; α(L)=0.512 13; α(M)=0.114 3; α(N)=0.0245 7; α(O)=0.00346 9 α(P)=5.52×10^{-5} 11 B(E2)(W.u.)=0.203 12 Mult.: stretched Q from R(DCO) and $\gamma(\theta)$ in (HI,xnγ), assumed E2.
3146.2	(8−)	192		2954.6	(8+)	(E1)[c]	0.0405	α(K)=0.0347 5; α(L)=0.00462 7; α(M)=0.000961 14; α(N)=0.000211 3; α(O)=3.35×10^{-5} 5 α(P)=2.26×10^{-6} 4
		721.5 2	100 12	2424.7	(6−)	E2	0.00422	α(K)=0.00358 5; α(L)=0.000509 8; α(M)=0.0001070 15; α(N)=2.36×10^{-5} 4; α(O)=3.76×10^{-6} 6 α(P)=2.57×10^{-7} 4 B(E2)(W.u.)>0.014
		839.3 5	65 8	2306.9	7−			
3174.5	(1,2+)	2082.4[#] 5	100[#] 12	1091.88	2+			
		2622.7[#] 8	71[#] 6	552.05	2+			

$^{136}_{58}Ce_{78}$-9

γ(^{136}Ce) (continued)

E$_i$(level)	J$^\pi_i$	E$_\gamma$†	I$_\gamma$†	E$_f$	J$^\pi_f$	Mult.‡	α f	Comments
3174.5	(1,2$^+$)	3174.9# 8	34# 6	0.0	0$^+$			
3201.3?	(2$^+$)	1886.7#g 9	96# 12	1313.74	4$^+$			
		2110.5#g 5	100# 12	1091.88	2$^+$			
		2647.8#g 8	40# 8	552.05	2$^+$			
		3200.6#g 8	56# 8	0.0	0$^+$			
3233.0	(1,2,3)	2140.9# 7	44# 5	1091.88	2$^+$			
		2681.0#g 3	100# 13	552.05	2$^+$			
3264.1	(1,2$^+$)	2171.0# 6	47# 5	1091.88	2$^+$			
		2713.3#g 5	59# 12	552.05	2$^+$			
		3262.0# 10	100# 11	0.0	0$^+$			
3277.9	9$^-$	970.8 5	100	2306.9	7$^-$	E2	0.00215	α(K)=0.00184 3; α(L)=0.000248 4; α(M)=5.17×10^{-5} 8; α(N)=1.144×10^{-5} 16; α(O)=1.84×10^{-6} 3 α(P)=1.332×10^{-7} 19 B(E2)(W.u.)>0.0052
3280.6	(1,2$^+$)	2189.0# 7	100# 8	1091.88	2$^+$			
		2204.2#g 10	38# 5	1075.9?				
		2728.7# 7	62# 8	552.05	2$^+$			
		3280.3# 10	30# 5	0.0	0$^+$			
3361.7	(1,2$^+$)	2270.2# 4	100# 11	1091.88	2$^+$			
		2808.7# 5	51# 6	552.05	2$^+$			
		3362.4# 10	16# 3	0.0	0$^+$			
3399.7	(10$^+$)	410.3 5	85 6	2989.4	8$^+$	(E2)	0.0188	α(K)=0.01552 23; α(L)=0.00261 4; α(M)=0.000555 8; α(N)=0.0001217 18; α(O)=1.89×10^{-5} 3 α(P)=1.069×10^{-6} 16 B(E2)(W.u.)>0.18 Mult.: stretched Q from R(DCO) and γ(θ) in (HI,xnγ), M2 excluded by comparison to RUL.
		445.2 5	100 12	2954.6	(8$^+$)	(E2)	0.01489	α(K)=0.01234 18; α(L)=0.00201 3; α(M)=0.000427 7; α(N)=9.38×10^{-5} 14; α(O)=1.461×10^{-5} 21 α(P)=8.58×10^{-7} 13 B(E2)(W.u.)>0.14 Mult.: stretched Q from R(DCO) and γ(θ) in (HI,xnγ), M2 excluded by comparison to RUL.
3440.9	(9$^+$)	486.4 5	100	2954.6	(8$^+$)			
3575.3?		429g	100	3146.2	(8$^-$)			
3579.4	(1,2$^+$)	3027.0#g 10	<67#	552.05	2$^+$			
		3579.6# 10	100# 13	0.0	0$^+$			
3705.3	(1,2,3)	2613.1# 8	100# 10	1091.88	2$^+$			

$^{136}_{58}Ce_{78}$-10

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

E_i(level)	J^π_i	E_γ [†]	I_γ [†]	E_f	J^π_f	Mult. [‡]	α [f]	Comments
3705.3	(1,2,3)	3153.6[#] 8	50[#] 5	552.05	2$^+$			
3760.1	12$^+$	665.2 5	100	3095.0	10$^+$	E2	0.00514	α(K)=0.00435 7; α(L)=0.000630 9; α(M)=0.0001325 19; α(N)=2.92$\times10^{-5}$ 5; α(O)=4.64$\times10^{-6}$ 7 α(P)=3.11$\times10^{-7}$ 5
3865.4	(10$^+$)	425[g] 1	23 3	3440.9	(9$^+$)	(M1)[d]	0.0234	α(K)=0.0201 3; α(L)=0.00264 4; α(M)=0.000552 9; α(N)=0.0001224 19; α(O)=1.99$\times10^{-5}$ 3 α(P)=1.528$\times10^{-6}$ 24
		910.6 5	100 17	2954.6	(8$^+$)	E2	0.00247	α(K)=0.00211 3; α(L)=0.000287 4; α(M)=6.01$\times10^{-5}$ 9; α(N)=1.328$\times10^{-5}$ 19; α(O)=2.13$\times10^{-6}$ 3 α(P)=1.528$\times10^{-7}$ 22
3986.8	(10$^-$)	840.5 5	100	3146.2	(8$^-$)	E2	0.00296	α(K)=0.00252 4; α(L)=0.000348 5; α(M)=7.28$\times10^{-5}$ 11; α(N)=1.609$\times10^{-5}$ 23; α(O)=2.58$\times10^{-6}$ 4 α(P)=1.82$\times10^{-7}$ 3 B(E2)(W.u.)>0.011 Mult.: stretched Q from R(DCO) in (HI,xnγ), M2 excluded by comparison to RUL.
4023.3?	(1,2,3)	1012.2[#g] 3	100[#] 10	3011.16?				
		1032.4[#g] 6	48[#] 10	2991.3?	(2$^+$,3,4$^+$)			
		2469.9[#g] 5	67[#] 7	1552.98	3$^+$			
		3471.1[#g] 10	52[#] 5	552.05	2$^+$			
4084.3	11$^-$	806.2 5	100	3277.9	9$^-$	E2	0.00325	α(K)=0.00277 4; α(L)=0.000385 6; α(M)=8.07$\times10^{-5}$ 12; α(N)=1.78$\times10^{-5}$ 3; α(O)=2.85$\times10^{-6}$ 4 α(P)=2.00$\times10^{-7}$ 3 B(E2)(W.u.)>0.013 Mult.: stretched Q from R(DCO) in (HI,xnγ), M2 excluded by comparison to RUL.
4240.3	(11$^-$)	253.4 5	100 17	3986.8	(10$^-$)	D+Q		
		665[g] 1		3575.3?				
		840.7 5		3399.7	(10$^+$)			
4360.3	(11$^+$)	494.9 5	100	3865.4	(10$^+$)	D		
4596.6	(12$^-$)	609.9 5	100	3986.8	(10$^-$)	(E2)[e]	0.00639	α(K)=0.00538 8; α(L)=0.000797 12; α(M)=0.0001680 24; α(N)=3.70$\times10^{-5}$ 6; α(O)=5.85$\times10^{-6}$ 9 α(P)=3.84$\times10^{-7}$ 6
4786.1	14$^+$	1026.1 5	100	3760.1	12$^+$	E2	0.00191	α(K)=0.001633 23; α(L)=0.000218 3; α(M)=4.56$\times10^{-5}$ 7; α(N)=1.009$\times10^{-5}$ 15 α(O)=1.623$\times10^{-6}$ 23; α(P)=1.185$\times10^{-7}$ 17
4832.7	(14$^+$)	1072.7 5	100	3760.1	12$^+$	(E2)[e]	1.74$\times10^{-3}$	α(K)=0.001488 21; α(L)=0.000198 3; α(M)=4.13$\times10^{-5}$ 6; α(N)=9.13$\times10^{-6}$ 13 α(O)=1.471$\times10^{-6}$ 21; α(P)=1.080$\times10^{-7}$ 16
4872.4	(13$^-$)	276.0[g] 5		4596.6	(12$^-$)			
		632.3 5	100	4240.3	(11$^-$)	E2	0.00584	α(K)=0.00493 7; α(L)=0.000723 11; α(M)=0.0001522 22;

$^{136}_{58}Ce_{78}$-11

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

E_i(level)	J^π_i	E_γ †	I_γ †	E_f	J^π_f	Mult. ‡	α f	Comments
								α(N)=3.35×10^{-5} 5; α(O)=5.31×10^{-6} 8 α(P)=3.52×10^{-7} 5
4927.9	(13$^+$)	567.6 5	100	4360.3	(11$^+$)	(E2)[e]	0.00769	α(K)=0.00646 10; α(L)=0.000975 14; α(M)=0.000206 3; α(N)=4.53×10^{-5} 7; α(O)=7.14×10^{-6} 11 α(P)=4.58×10^{-7} 7
5097.5?	(13$^-$)	1013.0[g] 5	100	4084.3	11$^-$			
5304.6	15$^+$	471.7 5	100	4832.7	(14$^+$)	M1	0.0180	α(K)=0.01542 22; α(L)=0.00202 3; α(M)=0.000422 6; α(N)=9.37×10^{-5} 14; α(O)=1.523×10^{-5} 22 α(P)=1.173×10^{-6} 17
5568.0	(15$^+$)	640.1 5	100	4927.9	(13$^+$)	E2	0.00566	α(K)=0.00478 7; α(L)=0.000698 10; α(M)=0.0001471 21; α(N)=3.24×10^{-5} 5; α(O)=5.14×10^{-6} 8 α(P)=3.41×10^{-7} 5 B(E2)(W.u.)=1.8×10^{2} 7 Mult.: stretched Q from R(DCO) in (HI,xnγ), M2 excluded by comparison to RUL.
5593.5	(16$^+$)	288.9 5		5304.6	15$^+$	(M1+E2)[b]	0.059 5	α(K)=0.049 6; α(L)=0.0080 7; α(M)=0.00169 18; α(N)=0.00037 4; α(O)=5.8×10^{-5} 4 α(P)=3.5×10^{-6} 7
		761 1		4832.7	(14$^+$)	(E2)	0.00372	α(K)=0.00316 5; α(L)=0.000445 7; α(M)=9.33×10^{-5} 14; α(N)=2.06×10^{-5} 3; α(O)=3.29×10^{-6} 5 α(P)=2.28×10^{-7} 4
5642.6	16$^+$	338[g] 1		5304.6	15$^+$			
		810[g] 1		4832.7	(14$^+$)			
		856.6 5	100	4786.1	14$^+$	E2	0.00283	α(K)=0.00242 4; α(L)=0.000332 5; α(M)=6.96×10^{-5} 10; α(N)=1.537×10^{-5} 22; α(O)=2.46×10^{-6} 4 α(P)=1.746×10^{-7} 25 B(E2)(W.u.)<43
5645.1	14$^-$	547.4 5	100	5097.5?	(13$^-$)	D		
5662.4	(14$^-$)	790 1	100	4872.4	(13$^-$)			
5800.6	(15$^-$)	928.1 5	100	4872.4	(13$^-$)	(E2)	0.00237	α(K)=0.00202 3; α(L)=0.000275 4; α(M)=5.75×10^{-5} 8; α(N)=1.270×10^{-5} 18; α(O)=2.04×10^{-6} 3 α(P)=1.466×10^{-7} 21
5808.8	15$^-$	146.4 5	20 3	5662.4	(14$^-$)	D		
		163.4 5	14 2	5645.1	14$^-$	M1[d]	0.297	α(K)=0.254 5; α(L)=0.0344 6; α(M)=0.00720 12; α(N)=0.00160 3; α(O)=0.000259 5 α(P)=1.96×10^{-5} 4
		936.4 5	100 7	4872.4	(13$^-$)	E2	0.00233	α(K)=0.00199 3; α(L)=0.000269 4; α(M)=5.63×10^{-5} 8; α(N)=1.244×10^{-5} 18; α(O)=2.00×10^{-6} 3 α(P)=1.438×10^{-7} 21
		976.1 5	20 7	4832.7	(14$^+$)	E1	8.85×10^{-4}	α(K)=0.000764 11; α(L)=9.53×10^{-5} 14; α(M)=1.97×10^{-5} 3; α(N)=4.37×10^{-6} 7; α(O)=7.09×10^{-7} 10 α(P)=5.43×10^{-8} 8

$^{136}_{58}$Ce$_{78}$-12

γ(^{136}Ce) (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	α[f]	Comments
5840.6	(16)	536 *1*	100	5304.6	15+	D	0.0112 *22*	α(K)=0.0094 *19*; α(L)=0.00132 *17*
5855.6		551 *1*	100	5304.6	15+			
5876.9	17+	234.4 *5*		5642.6	16+	M1	0.1110 *17*	α(K)=0.0949 *15*; α(L)=0.01275 *20*; α(M)=0.00267 *4*; α(N)=0.000591 *9*; α(O)=9.59×10−5 *15* α(P)=7.30×10−6 *11*
		572[g] *1*		5304.6	15+			
5994.8	16−	185.9 *5*	100 *12*	5808.8	15−	M1	0.208 *4*	α(K)=0.178 *3*; α(L)=0.0240 *4*; α(M)=0.00503 *8*; α(N)=0.001116 *18*; α(O)=0.000181 *3* α(P)=1.372×10−5 *22*
		194.2 *5*	32 *4*	5800.6	(15−)	M1[d]	0.185	α(K)=0.1579 *25*; α(L)=0.0213 *4*; α(M)=0.00446 *7*; α(N)=0.000990 *16*; α(O)=0.000160 *3* α(P)=1.217×10−5 *19*
		350 *1*		5645.1	14−			
		690.3 *5*	35 *12*	5304.6	15+	E1	1.77×10−3	α(K)=0.001524 *22*; α(L)=0.000192 *3*; α(M)=3.99×10−5 *6*; α(N)=8.83×10−6 *13* α(O)=1.428×10−6 *21*; α(P)=1.075×10−7 *16*
6098.5	(17+)	504.9 *5*		5593.5	(16+)	D		
		794 *1*		5304.6	15+			
6170.2	(18+)	293.3 *5*	100	5876.9	17+	D		
6273.0	(17+)	705 *1*	100	5568.0	(15+)	[E2]	0.00446	α(K)=0.00378 *6*; α(L)=0.000541 *8*; α(M)=0.0001136 *17*; α(N)=2.51×10−5 *4*; α(O)=3.99×10−6 *6* α(P)=2.71×10−7 *4* B(E2)(W.u.)=2.2×10² *6*
6282.5	17−	287.7 *5*	100 *7*	5994.8	16−	M1	0.0643	α(K)=0.0550 *9*; α(L)=0.00735 *11*; α(M)=0.001535 *23*; α(N)=0.000341 *5*; α(O)=5.53×10−5 *9* α(P)=4.22×10−6 *7*
		474 *1*	2.4 *7*	5808.8	15−			
6380.0		812 *1*	100	5568.0	(15+)			
6524.2	(19)	354 *1*	100	6170.2	(18+)			
6539.1	(19+)	368.9 *5*	100	6170.2	(18+)	D		
6642.2	(18+)	543.6 *5*		6098.5	(17+)	D		
		1049 *1*		5593.5	(16+)			
6662.9	18−	380.5 *5*	100 *5*	6282.5	17−	M1	0.0311	α(K)=0.0266 *4*; α(L)=0.00352 *5*; α(M)=0.000735 *11*; α(N)=0.0001630 *24*; α(O)=2.65×10−5 *4* α(P)=2.03×10−6 *3* B(M1)(W.u.)=0.72 *6*
		668 *1*	5.5 *5*	5994.8	16−	[E2]	0.00509	α(K)=0.00430 *7*; α(L)=0.000623 *9*; α(M)=0.0001310 *19*; α(N)=2.89×10−5 *5*; α(O)=4.59×10−6 *7* α(P)=3.08×10−7 *5* B(E2)(W.u.)=10.2 *11*
6831.7	(17−)	1031.1 *5*	100	5800.6	(15−)			
6885.5		603 *1*	100	6282.5	17−			

$^{136}_{58}$Ce$_{78}$-13

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

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	α f	Comments
6933.2	(20^+)	394.1 *5*	100	6539.1	(19^+)	D		
7086.0	(19^+)	813 g *1*	100	6273.0	(17^+)			
7099.0	19^-	436.3 *5*	100 *6*	6662.9	18^-	M1	0.0219	α(K)=0.0188 *3*; α(L)=0.00247 *4*; α(M)=0.000516 *8*; α(N)=0.0001145 *17*; α(O)=1.86×10^{-5} *3* α(P)=1.429×10^{-6} *21* B(M1)(W.u.)=0.78 *8*
		816 *1*	4.4 *3*	6282.5	17^-	[E2]	0.00317	α(K)=0.00269 *4*; α(L)=0.000374 *6*; α(M)=7.83×10^{-5} *12*; α(N)=1.730×10^{-5} *25*; α(O)=2.77×10^{-6} *4* α(P)=1.94×10^{-7} *3* B(E2)(W.u.)=4.9 *5*
7238.4?	(19^+)	596.1 g *5*		6642.2	(18^+)			
		1140 g *1*		6098.5	(17^+)			
7292.7		912.7 *5*	100	6380.0		Q		
7325.5		440 *1*	100	6885.5		D		
7344.6	(21^+)	411.4 *5*	100	6933.2	(20^+)			
7585.1	20^-	486.1 *5*	100 *8*	7099.0	19^-	M1	0.01667	α(K)=0.01430 *21*; α(L)=0.00188 *3*; α(M)=0.000391 *6*; α(N)=8.68×10^{-5} *13*; α(O)=1.411×10^{-5} *20* α(P)=1.087×10^{-6} *16* B(M1)(W.u.)=0.60 *+10−9*
		922 *1*	19.0 *13*	6662.9	18^-	[E2]	0.00241	α(K)=0.00205 *3*; α(L)=0.000279 *4*; α(M)=5.84×10^{-5} *9*; α(N)=1.290×10^{-5} *19*; α(O)=2.07×10^{-6} *3* α(P)=1.487×10^{-7} *22* B(E2)(W.u.)=12.2 *+19−17*
7800.6	(22^+)	456 g *1*	100	7344.6	(21^+)			
8110.0?	21^-	524.9 g *5*	100 *9*	7585.1	20^-	M1 d	0.01376	α(K)=0.01181 *17*; α(L)=0.001545 *22*; α(M)=0.000322 *5*; α(N)=7.15×10^{-5} *11* α(O)=1.162×10^{-5} *17*; α(P)=8.96×10^{-7} *13* B(M1)(W.u.)=0.43 *+5−3*
		1011 *1*	37 *3*	7099.0	19^-	[E2]	0.00197	α(K)=0.001685 *24*; α(L)=0.000226 *4*; α(M)=4.71×10^{-5} *7*; α(N)=1.043×10^{-5} *15* α(O)=1.678×10^{-6} *24*; α(P)=1.222×10^{-7} *18* B(E2)(W.u.)=13.7 *+17−9*
8215.4		922.7 *5*	100	7292.7		Q		
8315.6?	(23^+)	515 g *1*	100	7800.6	(22^+)			
8625.4	22^-	515.4 *5*	100 *13*	8110.0?	21^-	M1 d	0.01440	α(K)=0.01236 *18*; α(L)=0.001617 *23*; α(M)=0.000337 *5*; α(N)=7.49×10^{-5} *11* α(O)=1.217×10^{-5} *18*; α(P)=9.38×10^{-7} *14* B(M1)(W.u.)>0.24
		1040 *1*	54 *4*	7585.1	20^-	[E2]		B(E2)(W.u.)>9.0
9228.0	23^-	620.6 *5*	100 *10*					
		1118 *1*	45 *7*	8110.0?	21^-			

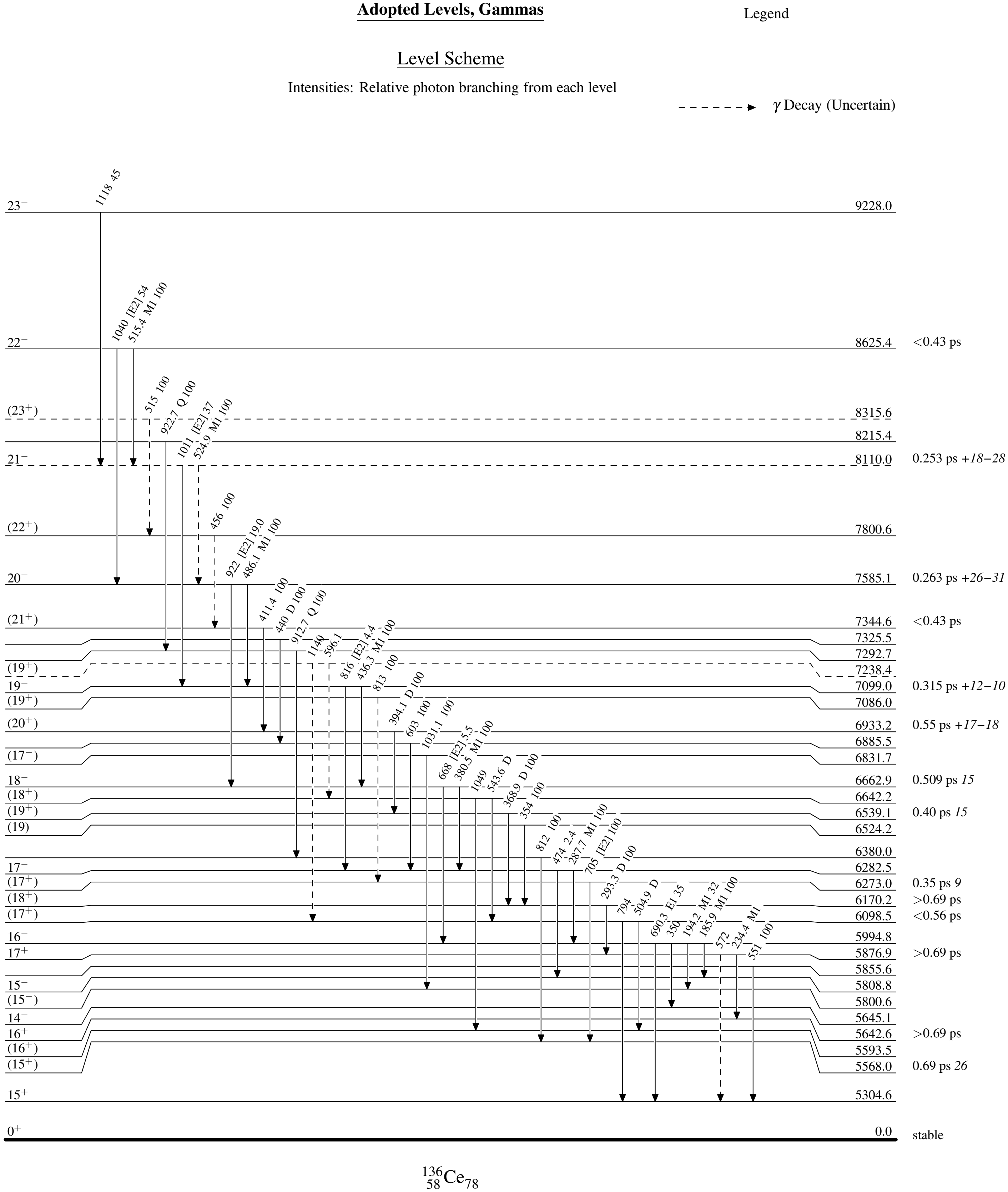
† From (HI,xnγ), except where noted.

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

‡ From R(DCO), $\gamma(\theta)$, and γ(lin pol) in (HI,xnγ), except where noted.
# From ^{136}Pr ε decay.
@ From ce measurements in ^{136}Pr ε decay.
& From $\gamma\gamma(\theta)$ in ^{136}Pr ε decay.
[a] From Coulomb Excitation.
[b] D+Q from R(DCO) in (HI,xnγ), $\Delta\pi$=no from level scheme.
[c] D from R(DCO) in (HI,xnγ), $\Delta\pi$=yes from level scheme.
[d] D from R(DCO) in (HI,xnγ), $\Delta\pi$=no from level scheme.
[e] Q from R(DCO) in (HI,xnγ), E2 from assumed band member.
[f] 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.
[g] Placement of transition in the level scheme is uncertain.

$^{136}_{58}Ce_{78}$-15

Adopted Levels, Gammas



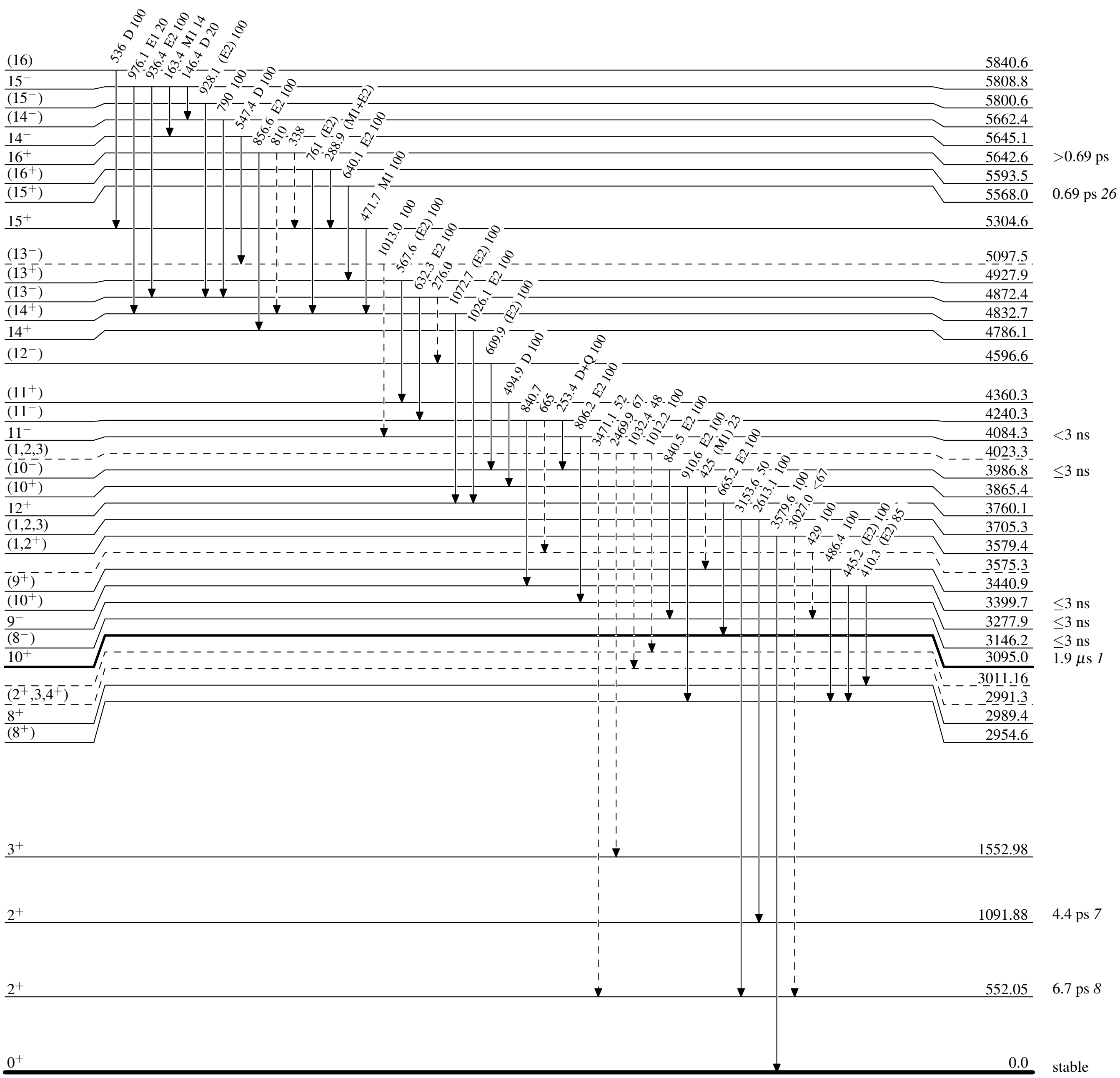
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

Legend

γ Decay (Uncertain)



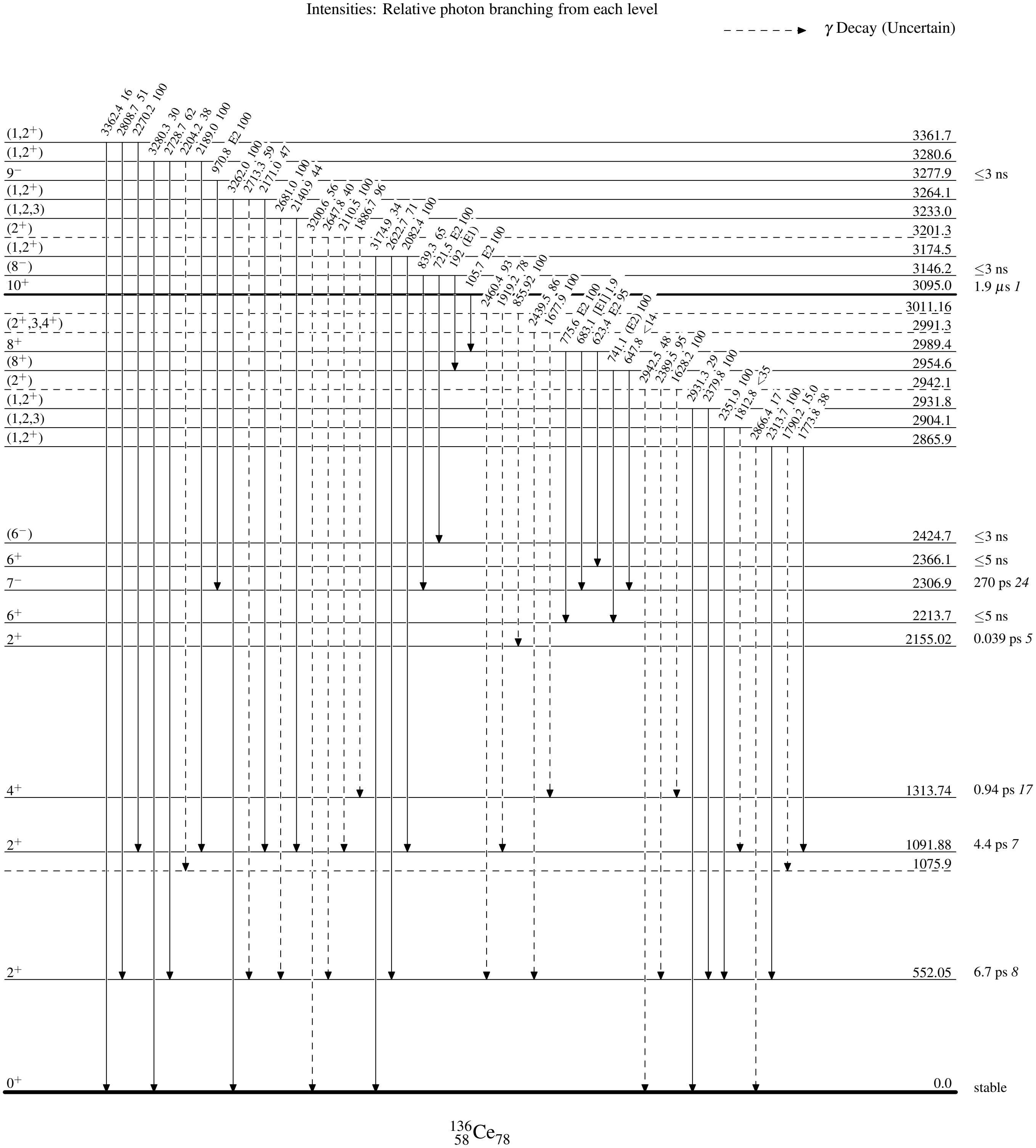
$^{136}_{58}Ce_{78}$

Adopted Levels, Gammas

Legend

Level Scheme (continued)

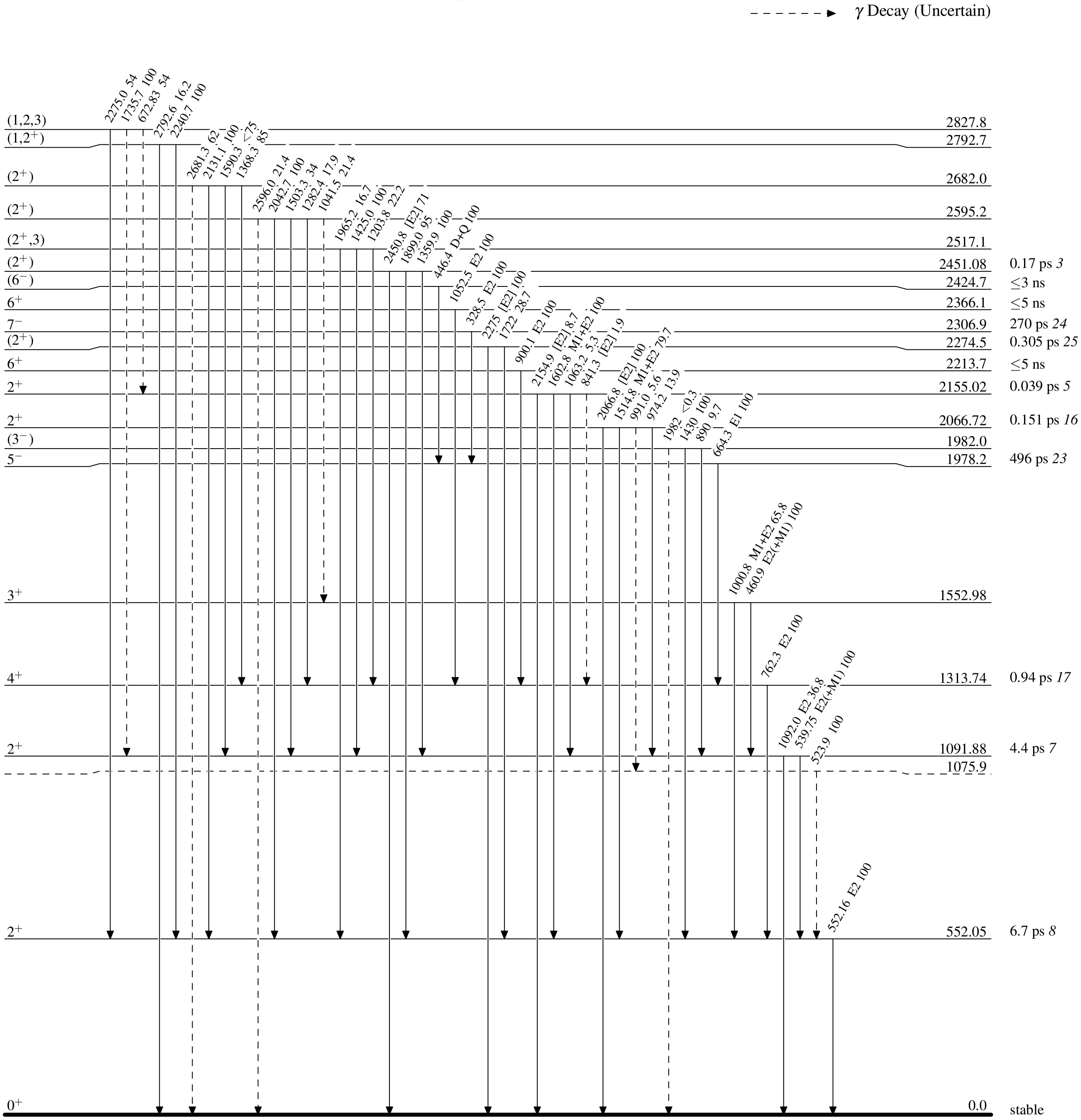
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

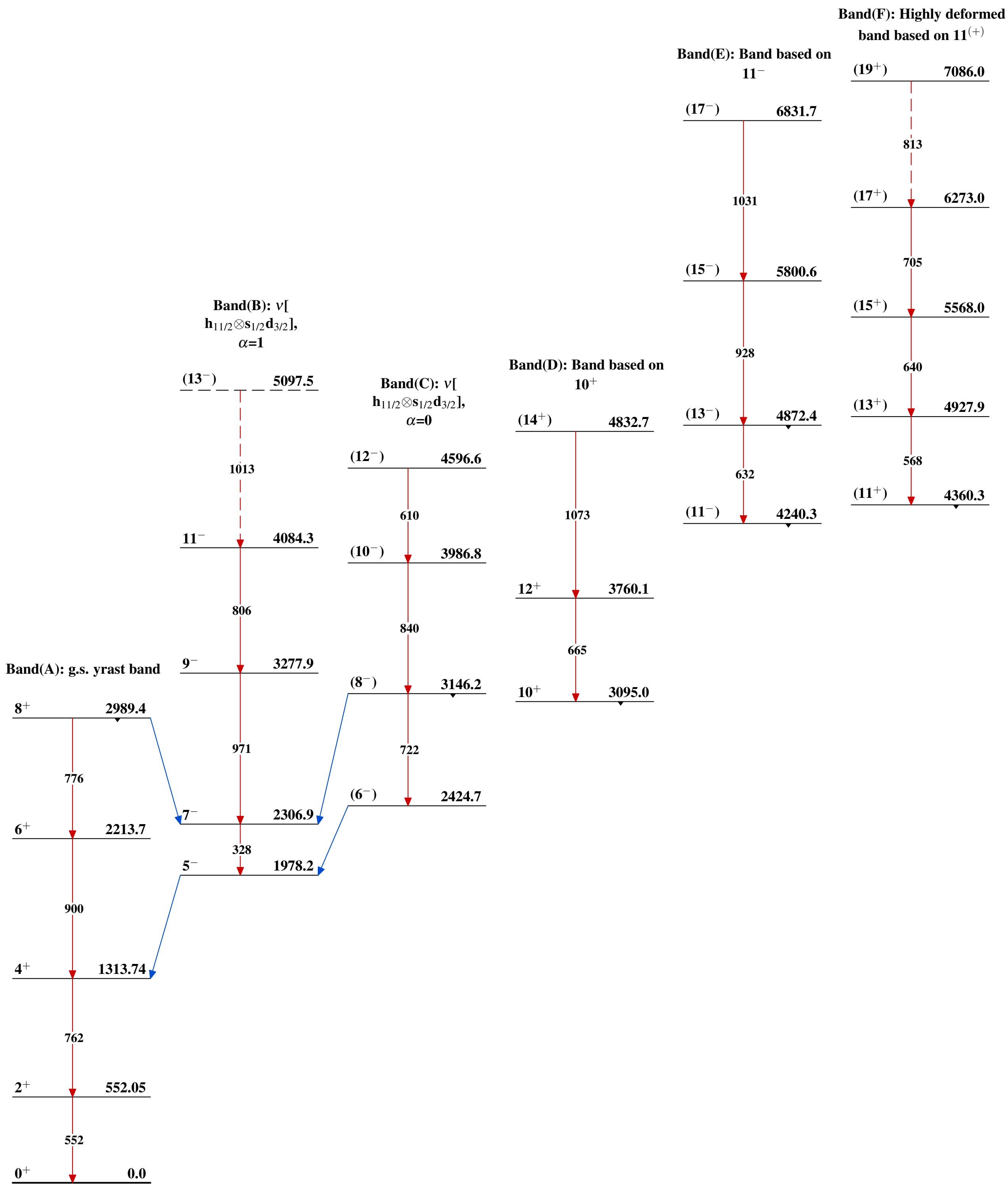
Level Scheme (continued)

Intensities: Relative photon branching from each level



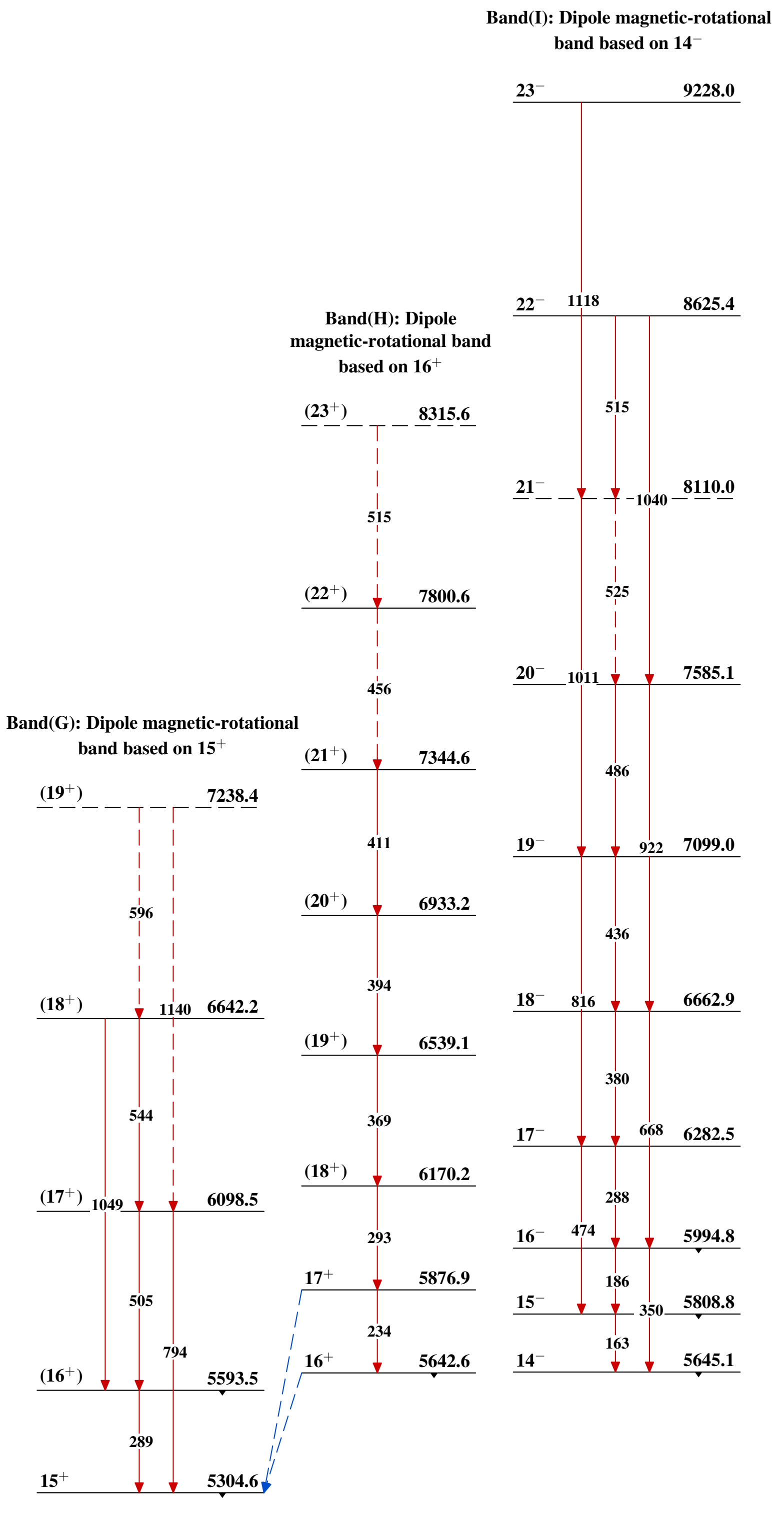
$^{136}_{58}Ce_{78}$

Adopted Levels, Gammas



$^{136}_{58}Ce_{78}$

Adopted Levels, Gammas (continued)



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Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 146, 1 (2017)	30-Sep-2017

$Q(\beta^-)$=−4437 *10*; S(n)=9724 *5*; S(p)=7719 *50*; $Q(\alpha)$=−1046 *5* 2017Wa10
S(2n)=17205 *5*, S(2p)=13262 *5* (2017Wa10).
First identification of ^{138}Ce nuclide by A.J. Dempster: Phys Rev 49, 947 (1936).
Other measurement:
$^{138}Ba(\pi^+,\pi^-)$: GDR built on IAS state (1992Od01).
Theoretical calculations:
2016Du04: calculated charge densities, rms charge radii.
2016Pr01: calculated B(E2).
2015El05: calculated two-neutron separation energies.
2015Hu05,2013Bo24,2010Pa12,2009Si32,2008Lo05,2007Ji05,2007Tu03, 2004Yo04: calculated energy levels, J, π, B(E2).

^{138}Ce Levels

Cross Reference (XREF) Flags

A	$^{138}La\ \beta^-$ decay	E	$^{124}Sn(^{18}O,4n\gamma)$	I	$^{139}La(p,2n\gamma)$
B	$^{138}Pr\ \varepsilon$ decay (1.45 min)	F	$^{130}Te(^{12}C,4n\gamma)$	J	$^{140}Ce(p,t)$
C	$^{138}Pr\ \varepsilon$ decay (2.03 h)	G	$^{136}Ba(\alpha,2n\gamma)$	K	Coulomb excitation
D	^{138}Ce IT decay (8.73 ms)	H	$^{138}Ba(\alpha,4n\gamma)$		

E(level)[†]	J^π	$T_{1/2}$[‡]	XREF	Comments
0.0[@]	0^+	>4.4×10^{16} y	ABCDEFGHIJK	%2ε=100 $T_{1/2}$: From 2014Be37 for the 2ν2K decay mode for the decay branch of g.s. to g.s. at 90% confidence level. Limits of $T_{1/2}$ values for other 0ν decay modes to g.s. were also derived in 2014Be37 and are: ≥5.5×10^{17} y for 0ν2K mode; ≥4.6×10^{17} y for 0νKL mode; and ≥4.0×10^{17} for 0ν2L mode. Others: 2011Be02, 2009Be20, 2001Da22. $\Delta<r^2>(^{138}Ce,^{140}Ce)$=0.056 *16* (1989Ga24), isotope shift $\delta\nu(^{138}Ce,^{140}Ce)$=26.0 *42* MHz (1999Is02). Evaluated nuclear charge radius $<r^2>^{1/2}$=4.8737 fm *18* (2013An02).
788.744[@] *8*	2^+	1.98 ps *4*	ABCDEFGHIJK	μ=0.52 *16* (2014Na15) β_2=0.126 *8*; B(E2)↑=0.45 *3* J^π: 788.742γ E2 to 0^+, L(p,t)=2. $T_{1/2}$: weighted average of 2.06 ps *14* from B(E2)↑ in Coulomb Excitation and 1.97 ps *4* from RDDS in Coulomb Excitation. μ: from g-factor=0.26 *8* measured using the Time-Dependent Recoil Into Vacuum (TDRIM) technique (2014Na15). β_2 and B(E2) from Coulomb Excitation.
1476.93 *9*	0^+		B G I K	J^π: 1476.9γ E0 to 0^+.
1510.80 *15*	2^+	0.834 ps *20*	B G IJK	J^π: 722.2γ M1 to 2^+, 1510.5γ E2 to 0^+; systematics of N=80 nuclides. $T_{1/2}$: from Coulomb excitation by DSAM.
1826.51[@] *10*	4^+	<40 ps	CDEFGHIJK	J^π: 1037.8γ E2 to 2^+. See J^π comment for 2137 level. $T_{1/2}$: from γγ(t) in $^{130}Te(^{12}C,4n\gamma)$.
2129.28[@] *12*	7^-	8.73 ms *20*	CDEFGHIJ	%IT=100 J^π: 302.8γ E3 to 4^+; L(p,t)=7. $T_{1/2}$: from γ(t) in ^{138}Ce IT decay (1977Go15 and 1960Mo19). Configuration=$\nu d^{-1}_{3/2}h^{-1}_{11/2}$ (1976Lu05).
2137.00 *13*	4^+		BC EFGHI	J^π: L(p,t)=5,6 for 2217 level; 80.4γ from 2217 to 2137 level, 1348.1γ E2 from 2137 level to 2^+; and 390.9γ E1 from 2217 level to 1826

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{138}Ce Levels (continued)

E(level)[†]	J^{π}	$T_{1/2}$[‡]	XREF	Comments
				level, 1037.8γ E2 from 1826 level to 2^+, establish $J^{\pi}(1826)=4^+$, $J^{\pi}(2137)=4^+$ and $J^{\pi}(2217)=5^-$.
2142.9 *7*	(2^+)	123 fs *7*	K	J^{π}: 1354γ (M1+E2) to 2^+, 2143γ to 0^+. $T_{1/2}$: from Coulomb excitation by DSAM.
2177.37 *16*	(3^-)		G I K	B(E3)↑=0.163 *9* (2006Ra08) J^{π}: suggested by 2006Ra08 in Coulomb excitation based on $\gamma(\theta)$. $J^{\pi}=(3^+)$ suggested by 1987Lo12 in (α,2nγ) but no experimental evidence. B(E3)↑ from Coulomb excitation (2006Ra08).
2217.41 *12*	5^-	450 ps *30*	C EFGHIJ	J^{π}: L(p,t)=5,6; 390.9γ E1 to 4^+. See J^{π} comment for 2137 level. $T_{1/2}$: from $\gamma\gamma$(t) in ^{130}Te(^{12}C,4nγ). Other: <0.3 ns from $\gamma\gamma$(t) in ^{138}Pr ε decay (2.03 h).
2236.54 *15*	2^+	56.8 fs *35*	B K	J^{π}: 2236.5γ E2 to 0^+, 1447.8γ M1+E2 to 2^+. $T_{1/2}$: from Coulomb excitation by DSAM.
2293.97[@] *12*	6^+	880 ps *19*	FGHI	J^{π}: 467.5γ E2 to 4^+, 157.0γ E2 to 4^+, 164.7γ (E1) to 7^-. $T_{1/2}$: from $\gamma\gamma$(t) in ^{130}Te(^{12}C,4nγ).
2339.85 *10*	0^+		B J	J^{π}: L(p,t)=0; log *ft*=5.7 from 1^+ parent in ^{138}Pr ε decay (1.45 m).
2393.91 *23*	(3^-)		G IJ	J^{π}: L(p,t)=(2,3); 176.5γ to 5^-.
2396.11 *22*	6^+		G I	J^{π}: 569.6γ E2 to 4^+, no γ to J<4.
2443.90 *25*	4^+		G IJ	J^{π}: 933.1γ Q to 2^+, L(p,t)=4 or 5.
2470.99 *15*	$(1,2^+)$	109 fs *6*	B K	J^{π}: 1682.1γ to 2^+, 2471.1γ to 0^+.
2471.68 *18*	$(4^+,5^+)$		G I	J^{π}: 334.6γ (M1+E2) to 4^+, 177.8γ to 6^+.
2642.4 *3*	2^+	66 fs *32*	B JK	J^{π}: L(p,t)=2 or 3, 2642.0γ to 0^+. $T_{1/2}$: from Coulomb excitation by DSAM.
2719 *15*	$(4^+,5^-)$		J	J^{π}: L(p,t)=4,5.
2733.09 *18*	6^+		FG I	J^{π}: 906.6γ E2 to 4^+, 439.1γ M1+E2 to 6^+.
2748.78 *18*	5^+		G I	J^{π}: 611.7γ M1 to 4^+ and 454.9γ M1+E2 to 6^+.
2764.94 *13*	6^-		C FGHI	J^{π}: 547.5γ M1 to 5^-, 635.7γ M1 to 7^-.
2885 *16*	$(2^+,3^-)$		J	J^{π}: L(p,t)=2,3.
2899.25 *18*	6^-		C G I	J^{π}: 770.1γ M1 to 7^-, 681.7γ ΔJ=1 to 5^-.
2903.21 *20*	$(1,2^+)$		B	J^{π}: 1426.9γ to 0^+, 2114.4γ to 2^+.
2907.22 *22*	(3,4,5)		G I	J^{π}: 1080.7γ D+Q to 4^+.
2942 *16*	$(4^+,5^-)$		J	J^{π}: L(p,t)=4,5.
2950.5 *3*	$(2^-,3^-,4^-)$		G I	J^{π}: 556.6γ M1 to (3^-).
2995.72 *22*	6^+		G I	J^{π}: 1169.2γ E2, ΔJ=2 to 4^+.
3005 *16*	$(4^+,5^-)$		J	J^{π}: L(p,t)=4,5.
3082 *19*	$(4^+,5^-)$		J	J^{π}: L(p,t)=4,5.
3109.02[@] *13*	8^+		FGHI	J^{π}: 979.7γ E1 to 7^-, 815.1γ E2 to 6^+.
3176.27 *23*			G I	
3177.4? *7*			B	
3214.17 *23*	(5,6,7)		G I	J^{π}: 920.2γ to 6^+, ΔJ<2 from $\gamma(\theta)$ in (α,2nγ).
3220 *16*	$(2^+,3^-)$		J	J^{π}: L(p,t)=2,3.
3229.8 *3*			G I	
3277 *16*	(3^-)		J	J^{π}: L(p,t)=(3).
3331.59 *20*	8^-		F	J^{π}: 1202.3γ M1 to 7^-.
3356 *18*	$(2^+,3^-)$		J	J^{π}: L(p,t)=2,3.
3367.8 *4*			C	
3429 *16*	$(4^+,5^-)$		J	J^{π}: L=4,5 in (p,t) dataset.
3430.2 *3*	$(7)^+$		FG I	J^{π}: 697.1γ M1(+E2) to 6^+; no γ to J<6. 2009Bh04 in (^{12}C,4nγ) assigned (8^+) assuming 697.1γ (E2) to 6^+ but no experimental support is presented.
3507.30[b] *17*	9^-		F	J^{π}: 1378.0γ E2 to 7^-, 175.7γ to 8^-, 398.3γ to 8^+.
3531 *16*			J	
3539.21[@] *15*	10^+	82 ns *2*	EFGHI	%IT=100

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{138}Ce Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[‡]	XREF	Comments
				μ=−1.70 *3* (1980Ba68,2014StZZ); Q=0.77 (1983Da29,2016St14) J^π: 430.2γ E2 to 8$^+$, band structure. $T_{1/2}$: weighted average of 81 ns *2* from (^{12}C,4nγ), 81 ns *5* from (α,4nγ), 82 ns *2* from (^{18}O,4nγ). μ: from g-factor=−0.170 *3* in 1980Ba68 in (^{18}O,4nγ). Other: g-factor=−0.176 *10* from 1980Me11 in (^{12}C,4nγ). MOMM2: estimated by 1983Da29 using an effective charge of 1.87. Configuration=$\nu h_{11/2}^{-2}$ (1976Lu05).
3545.79 *23*	(9$^-$)		F	E(level): this level is constructed by 2009Bh04 in (^{12}C,4nγ) from the placement of the 396.7γ-1416.5γ cascade from the 3942, 11$^+$ level to the 2129, 7$^-$ level. 1999Zh28 in (^{18}O,4nγ) placed the cascade in opposite order, making a level at E=2526 level instead. A 1416.5γ is also observed but unplaced in ^{138}Pr ε decay (2.03 h) from 7$^-$ parent decay and it could indicate that the placement of this γ from the 3942, 11$^+$ level in (^{18}O,4nγ) is less likely and its placement from the 3546, (9$^-$) level is favored. J^π: 1416.5γ (E2) to 7$^-$.
3646 *16*	(7$^-$)		J	J^π: L(p,t)=(7).
3670.6 *3*	(6,7$^-$)		C	J^π: 1453.3γ to 5$^-$, 1540.9γ to 7$^-$, log *ft*=7.1 from 7$^-$ parent.
3800.6 *4*	(6,7$^-$)		C	J^π: 1671.2γ to 7$^-$, 1583.2γ to 5$^-$, log *ft*=7.2 from 7$^-$ parent.
3926.7 *5*	(6,7$^-$)		C	J^π: 1797.5γ to 7$^-$, 1709.2γ to 5$^-$, log *ft*=7.2 from 7$^-$ parent.
3942.42[@] *18*	11$^+$	140 ps *11*	EFGHI	J^π: 403.2γ M1+E2 to 10$^+$, 396.7γ (M2) to (9$^-$), band structure. $T_{1/2}$: from $\gamma\gamma$(t) in (^{12}C,4nγ). Other: <1.5 ns from 1976Lu07.
4050.0? *3*			G I	
4139.3 *3*	(10$^-$)		F	J^π: 632.0γ (M1) to 9$^-$.
4157.0 *5*	6,7,8		C	J^π: 2026.6γ to 7$^-$, 1392.6γ to 6$^-$, log *ft*=6.7 from 7$^-$ parent.
4204.0 *3*	(10$^-$)		F	J^π: proposed in (^{12}C,4nγ).
4248.1 *7*	(6,7$^-$)		C	J^π: 2119.3γ to 7$^-$, 2030.2γ to 5$^-$, log *ft*=7.1 from 7$^-$ parent.
4359.93[@] *23*	12$^+$		EFGHI	J^π: 417.5γ M1 to 11$^+$, band structure.
4401.9[b] *3*	10$^-$		F	J^π: 894.6γ M1 to 9$^-$, band structure.
4781.51 *25*	(12$^+$)		F	J^π: 839.1γ (M1+E2) to 11$^+$.
4843.0 *3*	13$^-$		F	J^π: 483.0γ E1 to 12$^+$.
4974.64 *25*	13$^+$		EF H	J^π: 614.7γ M1 to 12$^+$; no γ to J<12.
5071.3 *4*	(11$^-$)		F	J^π: 932.0γ (M1) to (10$^-$).
5089.32 *24*	12$^-$		EF H	J^π: 1146.9γ E1 to 11$^+$, 729.3γ to 12$^+$.
5214.30[@] *24*	13$^-$		EFGHI	J^π: 854.4γ E1 to 12$^+$, 124.8γ M1+E2 to 12$^-$, band structure.
5312.39[@] *25*	14$^+$	80 ps *9*	EF H	J^π: 337.7γ M1 to 13$^+$, band structure. $T_{1/2}$: from $\gamma\gamma$(t) in (^{12}C,4nγ).
5387.7[b] *4*	11$^-$		F	J^π: 985.8γ M1 to 10$^-$, band structure.
5411.5[&] *3*	14$^-$		F H	J^π: 197.9γ M1 to 13$^-$, 568.5γ M1 to 13$^-$, 99.1γ to 14$^+$, band structure.
5566.4[@] *3*	15$^+$		F H	J^π: 254.0γ M1+E2 to 14$^+$, band structure.
5714.4 *3*	(14$^-$)		F	J^π: 500.1γ (M1) to 13$^-$.
5726.6[a] *3*	14$^+$		F	J^π: 1366.7γ E2 to 12$^+$, band structure.
5731.0[&] *3*	15$^-$		F H	J^π: 319.5γ M1 to 14$^-$, band structure.
5871.2[a] *3*	15$^+$		F	J^π: 896.6γ E2 to 13$^+$, 144.6γ to 14$^+$, band structure.
5955.3 *4*			F	
6014.4[@] *3*	16$^+$		EF H	J^π: 448.0γ M1 to 15$^+$, band structure.
6134.7 *3*	(14$^+$)		F	J^π: 1291.7γ (E1) to 13$^-$.
6328.7[b] *4*	(12$^-$)		F	J^π: 941.0γ (M1) to 11$^-$, band structure.
6363.4[&] *4*	16$^-$		F	J^π: 632.4γ M1 to 15$^-$, band structure.
6408.6 *4*	(15$^-$)		F	J^π: proposed in (^{12}C,4nγ) assuming 997.1γ (M1) to 14$^-$.
6451.0 *4*			F	
6451.2[a] *4*	16$^+$		F	J^π: 580.0γ M1 to 15$^+$, band structure.
6536.4[#] *3*	15$^{(-)}$		F	J^π: 1224.0γ (E1+M2), ΔJ=1 to 14$^+$, 970.0γ to 15$^+$, 149.1γ ΔJ=1 from 16$^-$.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{138}Ce Levels (continued)

E(level)†	J^π	XREF	Comments
6597.6 5		F	
6606.3[a] 4	17$^+$	F	J^π: 155.1γ M1 to 16$^+$, band structure.
6685.5[#] 3	16$^-$	EF	J^π: 1119.1γ E1 to 15$^+$, band structure. J^π=16$^+$ assigned by 1999Zh28 in (^{18}O,4nγ) is inconsistent with γ(DCO) and γ(pol) data in (^{12}C,4nγ) and not adopted.
6738.3 4	(16$^-$)	F	J^π: proposed in (^{12}C,4nγ) assuming 1007.3γ (M1) to 15$^-$.
6841.7[@] 3	17$^+$	EF	J^π: 827.3γ M1 to 16$^+$, 1275.3γ ΔJ=2 to 15$^+$, band structure.
6859.7 5		F	
6889.0[#] 3	17$^-$	EF	J^π: 874.6γ E1 to 16$^+$, 203.5γ M1 to 16$^-$, band structure.
7074.0[&] 4	(17$^-$)	F	J^π: proposed in (^{12}C,4nγ) assuming 710.6γ (M1) to 16$^-$ and 1343.0γ (E2) to 15$^-$.
7104.7[@] 3	18$^+$	EF	J^π: 1090.3γ E2 to 16$^+$, 263.0γ M1 to 17$^+$, band structure.
7185.3 4	(16$^-$)	F	J^π: proposed in (^{12}C,4nγ).
7211.3[#] 3	18$^-$	EF	J^π: 322.3γ M1 to 17$^-$, band structure.
7225.2 3	(16$^-$)	F	J^π: proposed in (^{12}C,4nγ).
7392.3[a] 5	(18$^+$)	F	J^π: proposed in (^{12}C,4nγ) assuming 786.0γ (M1) to 17$^+$.
7427.6 4		F	
7532.4 3	(17$^-$)	F	J^π: 347.1γ (M1) to (16$^-$), 1518.0γ (E1) to 16$^+$.
7682.9 4	19$^+$	EF	J^π: 578.2γ M1 to 18$^+$.
7685.8[#] 4	19$^-$	EF	J^π: 474.5γ M1 to 18$^-$, band structure.
7744.2 4	(18$^-$)	F	J^π: 211.8γ (M1+E2) to (17$^-$).
7803.2[@] 4	20$^+$	EF	J^π: 120.3γ M1+E2 to 19$^+$, 698.5γ to 18$^+$, band structure.
8322.3 4	(20$^+$)	F	J^π: 211.8γ (M1) to 19$^+$.
8350.3[#] 4	20$^-$	EF	J^π: 664.5γ M1 to 19$^-$, 1139.0γ to 18$^-$, band structure.
8709.6[#] 4	21$^-$	F	J^π: 359.3γ M1 to 20$^-$, band structure.
8873.5[@] 4	22$^+$	EF	J^π: 1070.3γ E2 to 20$^+$, band structure.
8921.1 4		F	
8957.9[#] 5	22$^{(-)}$	F	J^π: 248.3γ (M1), ΔJ=1 to 21$^-$, band structure.
8978.3 4		F	
9430.9[@] 5	(23$^+$)	F	J^π: 557.4γ (M1) to 22$^+$, band structure.
9511.4 4		F	

† From least-squares fit to Eγ, assuming ΔEγ=1 keV when unknown.

‡ From Coulomb excitation by DSAM and (^{12}C,4nγ) by γγ(t), unless otherwise noted.

Band(A): Band based on 15$^-$. Possible magnetic-rotational band with proposed configuration= $\pi g_{7/2}\otimes\pi h_{11/2}\otimes\nu h^{-2}_{11/2}$.

@ Seq.(E): Yrast sequence. Configurations: $[\pi(g^6_{7/2}d^2_{5/2})\otimes\nu h^{-2}_{11/2} + \pi(g^5_{7/2}d^3_{5/2})\otimes\nu h^{-2}_{11/2}]$ for positive-parity states and $[\pi(g^6_{7/2}d^1_{5/2}h^1_{11/2})\otimes\nu h^{-2}_{11/2}] + [\pi(g^5_{7/2}d^2_{5/2}h^1_{11/2})\otimes\nu h^{-2}_{11/2}] + [\pi(g^5_{7/2}d^3_{5/2})\otimes\nu(s^{-1}_{1/2}h^{-1}_{11/2}]$ for negative-parity states. Above 6 MeV excitation, configuration= $\pi h^2_{11/2}\otimes\nu h^{-2}_{11/2}$.

& Band(B): Band based on 14$^-$. Possible configuration=$\pi(g_{7/2}d_{5/2})\otimes\ \nu(h^{-1}_{11/2}d^{-1}_{3/2})$.

a Band(C): Band based on 14$^+$.

b Band(D): Band based on 9$^-$. Possible configuration=$\nu h_{11/2}\otimes\nu d_{3/2}$ or $\nu h_{11/2}\otimes\nu s_{1/2}$.

$\gamma(^{138}Ce)$

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	α†	$I_{(\gamma+ce)}$	Comments
788.744	2^+	788.742 *8*	100	0.0	0^+	E2@	0.00342		α(K)=0.00291 *4*; α(L)=0.000406 *6*; α(M)=8.52×10^{-5} *12* α(N)=1.88×10^{-5} *3*; α(O)=3.01×10^{-6} *5*; α(P)=2.10×10^{-7} *3* B(E2)(W.u.)=21.2 *+16−14* E_γ: from ^{138}La β^- decay.
1476.93	0^+	688.2 *1*	100	788.744	2^+	E2&	0.00473		α(K)=0.00400 *6*; α(L)=0.000576 *8*; α(M)=0.0001211 *17* α(N)=2.67×10^{-5} *4*; α(O)=4.24×10^{-6} *6*; α(P)=2.87×10^{-7} *4* E_γ: from ^{138}Pr ε decay (1.45 m).
		1476.9 *2*		0.0	0^+	E0&		3.1 *3*	E_γ,$I_{(\gamma+ce)}$: from ^{138}Pr ε decay (1.45 m).
1510.80	2^+	722.2 *2*	75.9 *9*	788.744	2^+	M1#	0.00630		α(K)=0.00541 *8*; α(L)=0.000700 *10*; α(M)=0.0001458 *21* α(N)=3.24×10^{-5} *5*; α(O)=5.27×10^{-6} *8*; α(P)=4.09×10^{-7} *6* B(M1)(W.u.)=0.0301 *11* E_γ: weighted average of 722.3 *3* from ^{138}Pr ε decay (1.45 m), 722.1 *2* from ^{136}Ba(α,2nγ), and 722 *1* from Coulomb excitation. I_γ: weighted average of 89 *11* from ^{138}Pr ε decay (1.45 m), 81 *3* from ^{139}La(p,2nγ), and 75.7 *6* Coulomb Excitation. Other: 90 *3* from ^{136}Ba(α,2nγ). Mult.: Other: M1+E2 from Coulomb Excitation with δ=−1.97 *+32−25* based on $\gamma(\theta)$.
		1510.5 *3*	100.0 *6*	0.0	0^+	E2	9.54×10^{-4}		α(K)=0.000751 *11*; α(L)=9.63×10^{-5} *14*; α(M)=2.00×10^{-5} *3* α(N)=4.44×10^{-6} *7*; α(O)=7.19×10^{-7} *10*; α(P)=5.47×10^{-8} *8*; α(IPF)=8.10×10^{-5} *12* B(E2)(W.u.)=1.15 *4* E_γ: weighted average of 1510.2 *2* from ^{138}Pr ε decay (1.45 m), 1510.9 *2* from ^{136}Ba(α,2nγ), and 1510 *1* from Coulomb excitation. I_γ: from Coulomb excitation. Mult.: Q from $\gamma(\theta)$ in ^{136}Ba(α,2nγ) and Coulomb excitation; M2 is ruled out by RUL.
1826.51	4^+	1037.8 *1*	100	788.744	2^+	E2	0.00186		α(K)=0.001594 *23*; α(L)=0.000213 *3*; α(M)=4.44×10^{-5} *7* α(N)=9.83×10^{-6} *14*; α(O)=1.583×10^{-6} *23*; α(P)=1.157×10^{-7} *17* B(E2)(W.u.)>0.28 E_γ: weighted average of 1038.0 *1* from ^{138}Pr ε decay (2.03 h), 1037.6 *9* from ^{138}Ce IT decay, 1037.6 *1* from ^{130}Te(^{12}C,4nγ), 1037.7 *2* from ^{136}Ba(α,2nγ), 1037.6 *3* from ^{138}Ba(α,4nγ), and 1038 *1* from Coulomb excitation. Mult.: based on ce data in ^{138}Pr ε decay (2.03 h), $\gamma(\theta)$ in ^{136}Ba(α,2nγ), ^{138}Ba(α,4nγ) and Coulomb excitation, and γ(DCO) and γ(pol) in ^{130}Te(^{12}C,4nγ).
2129.28	7^-	302.8 *1*	100	1826.51	4^+	E3	0.183		α(K)=0.1236 *18*; α(L)=0.0462 *7*; α(M)=0.01033 *15* α(N)=0.00223 *4*; α(O)=0.000324 *5*; α(P)=8.31×10^{-6} *12* B(E3)(W.u.)=0.450 *12*

From ENSDF

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Adopted Levels, Gammas (continued)

$\gamma(^{138}Ce)$ (continued)

E_i(level)	J_i^π	E_γ‡	I_γ‡	E_f	J_f^π	Mult.	δ	α†	Comments
									E_γ: weighted average of 302.7 *1* from ^{138}Pr ε decay, 302.9 *8* from ^{138}Ce IT decay, 302.9 *1* from ^{130}Te(^{12}C,4nγ), 302.7 *2* from ^{136}Ba(α,2nγ), and 302.7 *3* from ^{138}Ba(α,4nγ). Mult.: based on ce data in ^{138}Pr ε decay (2.03 h) and ^{138}Ce IT decay.
2137.00	4^+	1348.1 *2*	100	788.744	2^+	E2		1.12×10^{-3}	α(K)=0.000937 *14*; α(L)=0.0001213 *17*; α(M)=2.52×10^{-5} *4* α(N)=5.59×10^{-6} *8*; α(O)=9.05×10^{-7} *13*; α(P)=6.81×10^{-8} *10*; α(IPF)=3.17×10^{-5} *5* E_γ: weighted average of 1347.8 *10* from ^{138}Pr ε decay (1.45 m), 1348.0 *3* from ^{138}Pr ε decay (2.03 h), 1348.1 *2* from ^{130}Te(^{12}C,4nγ), 1348.1 *2* from ^{136}Ba(α,2nγ). Mult.: based on ce data in (p,2nγ) and (α,2nγ), $\gamma(\theta)$ in ^{136}Ba(α,2nγ), γ(DCO) and γ(pol) in ^{130}Te(^{12}C,4nγ).
2142.9	(2^+)	1354 *1*	100 *1*	788.744	2^+	(M1+E2)	−0.83 *+6−8*	0.00133 *3*	α(K)=0.001120 *22*; α(L)=0.000143 *3*; α(M)=2.97×10^{-5} *6* α(N)=6.60×10^{-6} *13*; α(O)=1.073×10^{-6} *21*; α(P)=8.29×10^{-8} *17*; α(IPF)=3.33×10^{-5} *6* B(M1)(W.u.)=0.032 *+6−4*; B(E2)(W.u.)=7.4 *+12−13* E_γ,I_γ: from Coulomb excitation. Mult.,δ: from Coulomb excitation based on $\gamma(\theta)$; bracket is added by evaluator.
		2143 *1*	32.2 *7*	0.0	0^+	[E2]		8.16×10^{-4}	α(K)=0.000392 *6*; α(L)=4.91×10^{-5} *7*; α(M)=1.018×10^{-5} *15* α(N)=2.26×10^{-6} *4*; α(O)=3.67×10^{-7} *6*; α(P)=2.85×10^{-8} *4*; α(IPF)=0.000362 *5* B(E2)(W.u.)=0.58 *+6−5* E_γ,I_γ: from Coulomb excitation.
2177.37	(3^-)	666.6 *2*	48.1 *7*	1510.80	2^+				E_γ: from (α,2nγ). I_γ: from Coulomb excitation. Other: 30 *2* from (p,2nγ).
		1388.6 *2*	100.0 *7*	788.744	2^+	(E1+M2)	−0.025 *+12−19*	0.00063 *3*	α(K)=0.000427 *24*; α(L)=5.3×10^{-5} *3*; α(M)=1.10×10^{-5} *7* α(N)=2.43×10^{-6} *15*; α(O)=3.95×10^{-7} *24*; α(P)=3.06×10^{-8} *19*; α(IPF)=0.0001339 *23* E_γ: from (α,2nγ). I_γ: from Coulomb excitation. Mult.,δ: from Coulomb excitation based on $\gamma(\theta)$, bracket added by evaluator. Other: δ=−2.2 *2* for Mult=M1+E2 in (α,2nγ).

$\gamma(^{138}Ce)$ (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	δ	α†	Comments
2217.41	5^-	80.4 *2*	2.4 *10*	2137.00	4^+	[E1]		0.442	α(K)=0.375 *6*; α(L)=0.0536 *9*; α(M)=0.01117 *18* α(N)=0.00243 *4*; α(O)=0.000375 *6*; α(P)=2.19×10^{-5} *4* B(E1)(W.u.)=2.0×10^{-5} *+13−10* E_γ: weighted average of 79.4 *6* from ^{138}Pr ε decay (2.03 h), 80.4 *2* from ^{130}Te(^{12}C,4nγ), and 80.4 *2* from ^{136}Ba(α,2nγ). I_γ: from ^{138}Pr ε decay (2.03 h). Other: ≤5 from (α,4nγ).
		88.0	5.6 *14*	2129.28	7^-	[E2]		3.25	α(K)=1.756 *25*; α(L)=1.167 *17*; α(M)=0.261 *4* α(N)=0.0559 *8*; α(O)=0.00784 *11*; α(P)=9.11×10^{-5} *13* B(E2)(W.u.)=2.5×10^{2} *7* E_γ,I_γ: from (α,4nγ) only.
		390.9 *1*	100 *4*	1826.51	4^+	E1		0.00642	α(K)=0.00552 *8*; α(L)=0.000713 *10*; α(M)=0.0001482 *21* α(N)=3.27×10^{-5} *5*; α(O)=5.25×10^{-6} *8*; α(P)=3.81×10^{-7} *6* B(E1)(W.u.)=7.4×10^{-6} *+11−9* E_γ: weighted average of 390.9 *1* from ^{130}Te(^{12}C,4nγ), 390.8 *2* from ^{136}Ba(α,2nγ), 390.7 *3* from ^{138}Ba(α,4nγ), and 390.9 *1* from ^{138}Pr ε decay (2.03 h). I_γ: from (α,2nγ). Mult.: based on ce data in (α,2nγ) and ^{138}Pr ε decay (2.03 h), $\gamma(\theta)$ in (α,2nγ) and (α,4nγ), γ(DCO) and γ(pol) in (^{12}C,4nγ).
2236.54	2^+	1447.8 *2*	100.0 *7*	788.744	2^+	M1+E2	0.18 *+5−4*	1.30×10^{-3}	α(K)=0.001069 *16*; α(L)=0.0001354 *20*; α(M)=2.81×10^{-5} *5* α(N)=6.25×10^{-6} *10*; α(O)=1.018×10^{-6} *15*; α(P)=7.98×10^{-8} *12*; α(IPF)=6.11×10^{-5} *9* B(M1)(W.u.)=0.069 *+7−6*; B(E2)(W.u.)=0.6 *+5−3* E_γ: from ^{138}Pr ε decay (1.45 m). I_γ: from Coulomb excitation. Mult.: from Coulomb excitation based on $\gamma(\theta)$ and RUL.
		2236.5 *2*	80.0 *11*	0.0	0^+	E2		8.27×10^{-4}	α(K)=0.000363 *5*; α(L)=4.54×10^{-5} *7*; α(M)=9.41×10^{-6} *14* α(N)=2.09×10^{-6} *3*; α(O)=3.39×10^{-7} *5*; α(P)=2.64×10^{-8} *4*; α(IPF)=0.000407 *6* B(E2)(W.u.)=1.87 *+15−13* E_γ: from ^{138}Pr ε decay (1.45 m). I_γ: from Coulomb excitation. Other: 61 *9* from ^{138}Pr ε decay (1.45 m). Mult.: Q from $\gamma(\theta)$ in Coulomb excitation; M2 is ruled out by RUL.
2293.97	6^+	76.6 *1*	41 *5*	2217.41	5^-	(E1)		0.505	α(K)=0.427 *7*; α(L)=0.0616 *9*; α(M)=0.01282 *19* α(N)=0.00279 *4*; α(O)=0.000429 *7*; α(P)=2.48×10^{-5} *4* B(E1)(W.u.)=0.000123 *18* E_γ: weighted average of 76.7 *1* from ^{130}Te(^{12}C,4nγ), 76.4 *2*

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$\gamma(^{138}Ce)$ (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	α†	Comments
								from ^{136}Ba(α,2nγ), and 76.5 *3* from ^{138}Ba(α,4nγ). I_γ: weighted average of 43 *5* from ^{130}Te(^{12}C,4nγ), 34 *9* from ^{136}Ba(α,2nγ). Mult.: based on $\gamma(\theta)$ in (α,2nγ) and (α,4nγ).
2293.97	6⁺	157.0 *2*	8.2 *4*	2137.00	4⁺	E2	0.420	α(K)=0.302 *5*; α(L)=0.0932 *14*; α(M)=0.0205 *3* α(N)=0.00442 *7*; α(O)=0.000642 *10*; α(P)=1.76×10^{-5} *3* B(E2)(W.u.)=6.1 *+9−8* E_γ: weighted average of 157.1 *2* from ^{130}Te(^{12}C,4nγ), 156.8 *2* from ^{136}Ba(α,2nγ). I_γ: weighted average of 9.2 *10* from ^{136}Ba(α,2nγ) and 8.0 *4* from ^{139}La(p,2nγ). Other: 27.2 *27* from ^{130}Te(^{12}C,4nγ). Mult.: from Coulomb excitation based on γ(DCO) and RUL.
		164.7 *1*	100 *4*	2129.28	7⁻	(E1)	0.0616	α(K)=0.0527 *8*; α(L)=0.00707 *10*; α(M)=0.001470 *21* α(N)=0.000323 *5*; α(O)=5.09×10^{-5} *8*; α(P)=3.38×10^{-6} *5* B(E1)(W.u.)=3.0×10^{-5} *+4−3* E_γ: weighted average of 164.7 *1* from ^{130}Te(^{12}C,4nγ), 164.6 *2* from ^{136}Ba(α,2nγ) and 164.6 *3* from ^{138}Ba(α,4nγ). I_γ: from (p,2nγ). Mult.: based on $\gamma(\theta)$ in (α,4nγ) and (α,2nγ); also suggested in Coulomb excitation.
		467.5 *2*	33 *3*	1826.51	4⁺	E2	0.01298	α(K)=0.01079 *16*; α(L)=0.001729 *25*; α(M)=0.000367 *6* α(N)=8.06×10^{-5} *12*; α(O)=1.258×10^{-5} *18*; α(P)=7.53×10^{-7} *11* B(E2)(W.u.)=0.105 *+18−16* E_γ: weighted average of 467.6 *1* from ^{130}Te(^{12}C,4nγ), 467.2 *2* from ^{136}Ba(α,2nγ), and 467.0 *3* from ^{138}Ba(α,4nγ). I_γ: unweighted average of 29.6 *10* from (α,2nγ) and 36 *2* from (p,2nγ). Other: 56.9 *30* from (^{12}C,4nγ). Mult.: based on ce data in (α,2nγ) and (p,2nγ), $\gamma(\theta)$ in (α,2nγ) and (α,4nγ), γ(DCO) and γ(pol) in ^{130}Te(^{12}C,4nγ).
2339.85	0⁺	1551.1 *1*	100	788.744	2⁺	E2	9.25×10^{-4}	α(K)=0.000714 *10*; α(L)=9.13×10^{-5} *13*; α(M)=1.90×10^{-5} *3* α(N)=4.21×10^{-6} *6*; α(O)=6.82×10^{-7} *10*; α(P)=5.20×10^{-8} *8*; α(IPF)=9.56×10^{-5} *14* E_γ: from ^{138}Pr ε decay (1.45 m). Mult.: M1,E2 from ce data in ^{138}Pr ε decay (1.45 m); M1 is ruled out by level-spin difference.
2393.91	(3⁻)	176.5 *2*	100	2217.41	5⁻			E_γ: from (α,2nγ).
2396.11	6⁺	569.6 *2*	100	1826.51	4⁺	E2	0.00762	α(K)=0.00640 *9*; α(L)=0.000965 *14*; α(M)=0.000204 *3* α(N)=4.48×10^{-5} *7*; α(O)=7.07×10^{-6} *10*; α(P)=4.54×10^{-7} *7* E_γ: from (α,2nγ). Mult.: based on $\gamma(\theta)$ in (α,2nγ) and ce data in (p,2nγ).
2443.90	4⁺	933.1 *2*	100	1510.80	2⁺	E2	0.00234	α(K)=0.00200 *3*; α(L)=0.000271 *4*; α(M)=5.67×10^{-5} *8*

$^{138}_{58}Ce_{80}$-8

Adopted Levels, Gammas (continued)

$\gamma(^{138}Ce)$ (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	δ	α†	Comments
									α(N)=1.254×10^{-5} *18*; α(O)=2.01×10^{-6} *3*; α(P)=1.449×10^{-7} *21* E_γ: from (α,2nγ). Mult.: Q from $\gamma(\theta)$ in (α,2nγ) and M2 is ruled out by no level-parity change.
2470.99	(1,2$^+$)	1682.1 *2*	80.8 *10*	788.744	2$^+$				E_γ: from ^{138}Pr ε decay (1.45 m). I_γ: weighted average of 68 *14* from ^{138}Pr ε decay (1.45 m) and 80.9 *10* from Coulomb excitation.
		2471.1 *2*	100 *3*	0.0	0$^+$				E_γ: from ^{138}Pr ε decay (1.45 m). I_γ: from Coulomb excitation.
2471.68	(4$^+$,5$^+$)	177.8 *2*	57.3 *24*	2293.97	6$^+$				E_γ: from (α,2nγ). I_γ: weighted average of 68 *16* from ^{136}Ba(α,2nγ) and 57.1 *24* from ^{139}La(p,2nγ).
		334.6 *2*	100 *5*	2137.00	4$^+$	(M1+E2)	−0.16 *4*	0.039 *5*	α(K)=0.033 *5*; α(L)=0.00504 *14*; α(M)=0.00107 *4* α(N)=0.000235 *8*; α(O)=3.70×10^{-5} *6*; α(P)=2.4×10^{-6} *5* E_γ,I_γ: from (α,2nγ). Mult.,δ: from $\gamma(\theta)$ in (α,2nγ). Other: (M1,E2) from ce data in (p,2nγ).
2642.4	2$^+$	1853.7 *3*	100 *4*	788.744	2$^+$				E_γ: from ^{138}Pr ε decay (1.45 m). I_γ: from Coulomb excitation.
		2642.0 *7*	35 *14*	0.0	0$^+$	[E2]		9.10×10^{-4}	α(K)=0.000270 *4*; α(L)=3.35×10^{-5} *5*; α(M)=6.94×10^{-6} *10* α(N)=1.541×10^{-6} *22*; α(O)=2.51×10^{-7} *4*; α(P)=1.96×10^{-8} *3*; α(IPF)=0.000598 *9* B(E2)(W.u.)=0.41 *+63−23* E_γ: from ^{138}Pr ε decay (1.45 m). I_γ: from Coulomb excitation.
2733.09	6$^+$	439.1 *2*	16.9 *12*	2293.97	6$^+$	M1+E2#	1.6 *3*	0.0172 *6*	α(K)=0.0144 *6*; α(L)=0.00219 *5*; α(M)=0.000464 *9* α(N)=0.0001021 *20*; α(O)=1.61×10^{-5} *4*; α(P)=1.03×10^{-6} *5* E_γ: weighted average of 438.7 *2* from ^{130}Te(^{12}C,4nγ) and 439.5 *2* from ^{136}Ba(α,2nγ). I_γ: weighted average of 52 *8* from ^{130}Te(^{12}C,4nγ), 19 *3* from ^{136}Ba(α,2nγ), and 16.5 *12* from ^{139}La(p,2nγ). δ: from (α,2nγ).
		906.6 *2*	100 *3*	1826.51	4$^+$	E2#		0.00250	α(K)=0.00213 *3*; α(L)=0.000290 *4*; α(M)=6.07×10^{-5} *9* α(N)=1.342×10^{-5} *19*; α(O)=2.15×10^{-6} *3*; α(P)=1.542×10^{-7} *22* E_γ: weighted average of 906.3 *2* from ^{130}Te(^{12}C,4nγ) and 906.9 *2* from ^{136}Ba(α,2nγ). I_γ: from (α,2nγ).
2748.78	5$^+$	454.9 *2*	70 *5*	2293.97	6$^+$	M1+E2#	2.5 *15*	0.017 *3*	α(K)=0.014 *3*; α(L)=0.00205 *18*; α(M)=0.00043 *4*

$^{138}_{58}Ce_{80}$-9

Adopted Levels, Gammas (continued)

$\gamma(^{138}$Ce) (continued)

E_i(level)	J_i^π	E_γ[‡]	I_γ[‡]	E_f	J_f^π	Mult.	δ	α[†]	Comments
									α(N)=9.5×10^{-5} *8*; α(O)=1.52×10^{-5} *16*; α(P)=1.05×10^{-6} *24* E_γ,δ: from (α,2nγ). I_γ: from (p,2nγ).
2748.78	5^+	611.7 *2*	100 *6*	2137.00	4^+	M1[#]		0.00943	α(K)=0.00810 *12*; α(L)=0.001054 *15*; α(M)=0.000220 *3* α(N)=4.87×10^{-5} *7*; α(O)=7.93×10^{-6} *12*; α(P)=6.13×10^{-7} *9* E_γ: from (α,2nγ). I_γ: from (p,2nγ).
2764.94	6^-	547.5 *1*	100 *5*	2217.41	5^-	M1[#a]		0.01239	α(K)=0.01064 *15*; α(L)=0.001389 *20*; α(M)=0.000290 *4* α(N)=6.43×10^{-5} *9*; α(O)=1.045×10^{-5} *15*; α(P)=8.07×10^{-7} *12* E_γ: weighted average of 547.5 *1* from ^{138}Pr ε decay (2.03 h), 547.3 *2* from ^{130}Te(^{12}C,4nγ), and 547.7 *2* from ^{136}Ba(α,2nγ). I_γ: from ^{138}Pr ε decay (2.03 h).
		635.7 *1*	35 *3*	2129.28	7^-	M1[a]		0.00858	α(K)=0.00737 *11*; α(L)=0.000958 *14*; α(M)=0.000200 *3* α(N)=4.43×10^{-5} *7*; α(O)=7.21×10^{-6} *10*; α(P)=5.58×10^{-7} *8* E_γ,I_γ: from ^{138}Pr ε decay (2.03 h).
2899.25	6^-	681.7 *2*	43 *3*	2217.41	5^-	M1+E2	−2.5 *3*	0.00517 *11*	α(K)=0.00439 *10*; α(L)=0.000620 *12*; α(M)=0.0001302 *24* α(N)=2.87×10^{-5} *6*; α(O)=4.59×10^{-6} *9*; α(P)=3.18×10^{-7} *8* E_γ: weighted average of 680.8 *5* from ^{138}Pr ε decay (2.03 h) and 681.8 *2* from ^{136}Ba(α,2nγ). I_γ: weighted average of 35 *7* from ^{138}Pr ε decay (2.03 h), 50 *7* from ^{136}Ba(α,2nγ), and 43.5 *27* from ^{139}La(p,2nγ). Mult.,δ: D+Q from $\gamma(\theta)$ in (α,2nγ), ΔJ=1; polarity from level-parity change.
		770.1 *2*	100 *5*	2129.28	7^-	M1[#]		0.00539	α(K)=0.00464 *7*; α(L)=0.000599 *9*; α(M)=0.0001247 *18* α(N)=2.77×10^{-5} *4*; α(O)=4.51×10^{-6} *7*; α(P)=3.50×10^{-7} *5* E_γ: weighted average of 770.4 *4* from ^{138}Pr ε decay (2.03 h) and 770.0 *2* from ^{136}Ba(α,2nγ). I_γ: from (p,2nγ). Mult.: ΔJ=1 from $\gamma(\theta)$ in (α,2nγ).
2903.21	(1,2^+)	1426.9 *7*	31 *16*	1476.93	0^+				E_γ,I_γ: from ^{138}Pr ε decay (1.45 m).
		2114.4 *2*	100 *19*	788.744	2^+				E_γ,I_γ: from ^{138}Pr ε decay (1.45 m).
2907.22	(3,4,5)	1080.7 *2*	100	1826.51	4^+	D+Q			E_γ: from (α,2nγ). Mult.: deduced by evaluator based on $\gamma(\theta)$ in (α,2nγ).
2950.5	(2^-,3^-,4^-)	556.6 *2*	100	2393.91	(3^-)	M1[#]		0.01189	α(K)=0.01021 *15*; α(L)=0.001333 *19*; α(M)=0.000278 *4* α(N)=6.17×10^{-5} *9*; α(O)=1.003×10^{-5} *14*; α(P)=7.74×10^{-7} *11* E_γ: from (α,2nγ).
2995.72	6^+	1169.2 *2*	100	1826.51	4^+	E2[#]		1.46×10^{-3}	α(K)=0.001246 *18*; α(L)=0.0001638 *23*; α(M)=3.41×10^{-5} *5*

From ENSDF

$\gamma(^{138}Ce)$ (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	δ	α†	Comments
									α(N)=7.56×10^{-6} *11*; α(O)=1.220×10^{-6} *17*; α(P)=9.05×10^{-8} *13*; α(IPF)=3.17×10^{-6} *5* Mult.: ΔJ=2 from $\gamma(\theta)$ in (α,2nγ).
3109.02	8$^+$	815.1 *1*	100 *3*	2293.97	6$^+$	E2		0.00317	α(K)=0.00270 *4*; α(L)=0.000375 *6*; α(M)=7.85×10^{-5} *11* α(N)=1.735×10^{-5} *25*; α(O)=2.77×10^{-6} *4*; α(P)=1.95×10^{-7} *3* E_γ: weighted average of 815.0 *1* from ^{130}Te(^{12}C,4nγ), 815.3 *2* from ^{136}Ba(α,2nγ), and 815.0 *3* from ^{138}Ba(α,4nγ). I_γ: from (α,2nγ). Mult.: based on ce data in (α,2nγ) and (p,2nγ), $\gamma(\theta)$ in (α,2nγ) and (α,4nγ), γ(DCO) and γ(pol) in (^{12}C,4nγ).
		979.7 *1*	47.2 *21*	2129.28	7$^-$	E1#		8.78×10^{-4}	α(K)=0.000759 *11*; α(L)=9.46×10^{-5} *14*; α(M)=1.96×10^{-5} *3* α(N)=4.34×10^{-6} *6*; α(O)=7.04×10^{-7} *10*; α(P)=5.39×10^{-8} *8* E_γ: weighted average of 979.7 *1* from ^{130}Te(^{12}C,4nγ), 979.8 *2* from ^{136}Ba(α,2nγ), and 979.3 *3* from ^{138}Ba(α,4nγ). I_γ: weighted average of 45.7 *21* from ^{136}Ba(α,2nγ) and 49.6 *26* from ^{139}La(p,2nγ). Others: 36.9 *19* from ^{130}Te(^{12}C,4nγ), 24 *4* from ^{138}Ba(α,4nγ). Mult.: based on ce data in (α,2nγ) and (p,2nγ), $\gamma(\theta)$ in (α,2nγ) and (α,4nγ), γ(DCO) and γ(pol) in (^{12}C,4nγ).
3176.27		882.3 *2*	100	2293.97	6$^+$				E_γ: from (α,2nγ).
3177.4?		3177.4 *7*	100	0.0	0$^+$				E_γ: from ^{138}Pr ε decay (1.45 m) only.
3214.17	(5,6,7)	920.2 *2*	100	2293.97	6$^+$				E_γ: from (α,2nγ).
3229.8		758.1 *2*	100	2471.68	(4$^+$,5$^+$)				E_γ: from (α,2nγ). Mult.: ΔJ=1 from $\gamma(\theta)$ in (α,2nγ).
3331.59	8$^-$	1202.3 *2*	100	2129.28	7$^-$	M1		0.00191	α(K)=0.001638 *23*; α(L)=0.000209 *3*; α(M)=4.34×10^{-5} *6* α(N)=9.63×10^{-6} *14*; α(O)=1.569×10^{-6} *22*; α(P)=1.227×10^{-7} *18*; α(IPF)=6.32×10^{-6} *10* E_γ: from (^{12}C,4nγ). A 1202.4γ is observed but unplaced in ^{138}Pr ε decay (2.03 h) from 7$^-$ parent. Mult.: based on γ(DCO) and γ(pol) in (^{12}C,4nγ).
3367.8		1239.0 *6*	100 *6*	2129.28	7$^-$				E_γ,I_γ: from ^{138}Pr ε decay (2.03 h).
		1540.9b *5*	<16b	1826.51	4$^+$				E_γ,I_γ: from ^{138}Pr ε decay (2.03 h).
3430.2	(7)$^+$	697.1 *2*	100	2733.09	6$^+$	M1(+E2)	≤1.1	0.0062 *7*	α(K)=0.0053 *6*; α(L)=0.00071 *6*; α(M)=0.000148 *12* α(N)=3.3×10^{-5} *3*; α(O)=5.3×10^{-6} *5*; α(P)=4.0×10^{-7} *5* E_γ: from (α,2nγ). Mult.,δ: based on ce data in (α,2nγ) and (p,2nγ) and $\gamma(\theta)$ in (α,2nγ). Mult=(E2) suggested by 2009Bh04 in (^{12}C,4nγ) is inconsistent. Mixing ratio is deduced by evaluator from ce data using the BrIccMixing program; M1 is given in (α,2nγ) and (p,2nγ).

Adopted Levels, Gammas (continued)

$\gamma(^{138}Ce)$ (continued)

E_i(level)	J_i^π	E_γ [‡]	I_γ [‡]	E_f	J_f^π	Mult.	α [†]	Comments
3507.30	9^-	175.7 *2*	61 *9*	3331.59	8^-	M1	0.243	α(K)=0.208 *3*; α(L)=0.0281 *4*; α(M)=0.00588 *9* α(N)=0.001305 *19*; α(O)=0.000211 *3*; α(P)=1.602×10^{-5} *23* E_γ,I_γ: from (^{12}C,4nγ). Mult.: D from γ(DCO) in (^{12}C,4nγ); polarity from no level-parity change.
		398.3 *2*	17.3 *27*	3109.02	8^+	[E1]	0.00613	α(K)=0.00528 *8*; α(L)=0.000681 *10*; α(M)=0.0001415 *20* α(N)=3.12×10^{-5} *5*; α(O)=5.02×10^{-6} *7*; α(P)=3.64×10^{-7} *6* E_γ,I_γ: from (^{12}C,4nγ).
		1378.0 *2*	100 *15*	2129.28	7^-	E2	1.08×10^{-3}	α(K)=0.000897 *13*; α(L)=0.0001159 *17*; α(M)=2.41×10^{-5} *4* α(N)=5.34×10^{-6} *8*; α(O)=8.65×10^{-7} *13*; α(P)=6.53×10^{-8} *10*; α(IPF)=3.95×10^{-5} *6* E_γ,I_γ: from (^{12}C,4nγ). Mult.: based on γ(DCO) and γ(pol) in (^{12}C,4nγ).
3539.21	10^+	31.9[c] *2*	0.081 *16*	3507.30	9^-	(E1)	0.934 *22*	α(L)=0.741 *17*; α(M)=0.155 *4* α(N)=0.0331 *8*; α(O)=0.00481 *11*; α(P)=0.000214 *5* B(E1)(W.u.)=7.5×10^{-8} *+20−18* E_γ,I_γ,Mult.: from (^{12}C,4nγ) only.
		109.0[c] *2*	0.081 *16*	3430.2	$(7)^+$		1.510 *24*	α(K)=0.940 *15*; α(L)=0.446 *8*; α(M)=0.0994 *17* α(N)=0.0213 *4*; α(O)=0.00302 *5*; α(P)=5.07×10^{-5} *8* E_γ,I_γ,Mult.: from (^{12}C,4nγ) only. Mult.: (E2) from (^{12}C,4nγ) given J^π(3430.2)=$(8)^+$ suggested by 2009Bh04.
		430.2 *1*	100 *4*	3109.02	8^+	E2	0.01642	α(K)=0.01358 *19*; α(L)=0.00224 *4*; α(M)=0.000477 *7* α(N)=0.0001045 *15*; α(O)=1.625×10^{-5} *23*; α(P)=9.40×10^{-7} *14* B(E2)(W.u.)=0.0108 *3* E_γ: weighted average of 430.2 *1* from ^{130}Te(^{12}C,4nγ), 430.1 *2* from ^{136}Ba(α,2nγ), and 430.0 *3* from ^{138}Ba(α,4nγ). I_γ: from (α,2nγ). Other: 100 *5* from (^{12}C,4nγ). Mult.: based on ce data in (α,2nγ) and (p,2nγ), $\gamma(\theta)$ in (α,2nγ) and (α,4nγ), γ(DCO) and γ(pol) in (^{12}C,4nγ).
		1409.9 *2*	0.73 *8*	2129.28	7^-	(E3)	0.00193	α(K)=0.001628 *23*; α(L)=0.000226 *4*; α(M)=4.74×10^{-5} *7* α(N)=1.050×10^{-5} *15*; α(O)=1.688×10^{-6} *24*; α(P)=1.218×10^{-7} *17*; α(IPF)=1.80×10^{-5} *3* B(E3)(W.u.)=0.0084 *+16−14* E_γ,I_γ,Mult.: from (^{12}C,4nγ). Also observed in (^{18}O,4nγ).
3545.79	(9^-)	1416.5 *2*	100	2129.28	7^-	(E2)	1.04×10^{-3}	α(K)=0.000851 *12*; α(L)=0.0001096 *16*; α(M)=2.28×10^{-5} *4* α(N)=5.05×10^{-6} *7*; α(O)=8.18×10^{-7} *12*; α(P)=6.19×10^{-8} *9*; α(IPF)=5.05×10^{-5} *7* E_γ: placed by 2009Bh04 in (^{12}C,4nγ). 1999Zh28 in (^{18}O,4nγ) placed this transition from the 3942 level, making a level at E=2526. See also the comment for 3546 level. Mult.: from (^{12}C,4nγ) based on γ(DCO).

$^{138}_{58}Ce_{80}$-12

γ(^{138}Ce) (continued)

E_i(level)	J^π_i	E_γ[‡]	I_γ[‡]	E_f	J^π_f	Mult.	α[†]	Comments
3670.6	(6,7$^-$)	1453.3 *3*	100 *7*	2217.41	5$^-$			E_γ,I_γ: from ^{138}Pr ε decay (2.03 h).
		1540.9[b] *5*	<63[b]	2129.28	7$^-$			E_γ,I_γ: from ^{138}Pr ε decay (2.03 h).
3800.6	(6,7$^-$)	1583.2 *5*	100 *10*	2217.41	5$^-$			E_γ,I_γ: from ^{138}Pr ε decay (2.03 h).
		1671.2 *5*	85 *8*	2129.28	7$^-$			E_γ,I_γ: from ^{138}Pr ε decay (2.03 h).
3926.7	(6,7$^-$)	1709.2 *7*	92 *12*	2217.41	5$^-$			E_γ,I_γ: from ^{138}Pr ε decay (2.03 h).
		1797.5 *7*	100 *11*	2129.28	7$^-$			E_γ,I_γ: from ^{138}Pr ε decay (2.03 h).
3942.42	11$^+$	396.7[c] *2*	3.0 *5*	3545.79	(9$^-$)	(M2)	0.1020	α(K)=0.0854 *12*; α(L)=0.01309 *19*; α(M)=0.00278 *4* α(N)=0.000618 *9*; α(O)=9.95×10^{-5} *14*; α(P)=7.27×10^{-6} *11* B(M2)(W.u.)=24 *+8−6* E_γ,I_γ: placed by 2009Bh04 in (^{12}C,4nγ). But this placement is still considered questionable since it wrould require an unreasonable large B(M2) value. 1999Zh28 in (^{18}O,4nγ) has placed this transition from a level at E=2526 to the 2129 level which is however unfavored. See also the comment for 3546 level. Mult.: from (^{12}C,4nγ) based on γ(DCO).
		403.2 *1*	100 *6*	3539.21	10$^+$	M1+E2	0.023 *4*	α(K)=0.020 *4*; α(L)=0.00289 *14*; α(M)=0.000610 *24* α(N)=0.000135 *6*; α(O)=2.14×10^{-5} *15*; α(P)=1.4×10^{-6} *4* E_γ: weighted average of 403.3 *1* from ^{130}Te(^{12}C,4nγ), 403.1 *2* from ^{136}Ba(α,2nγ), and 403.0 *3* from ^{138}Ba(α,4nγ). I_γ: from (^{12}C,4nγ). Mult.: from ^{130}Te(^{12}C,4nγ) based on γ(DCO) and γ(pol).
4050.0?		941.0[c] *2*	100	3109.02	8$^+$			E_γ: from (α,2nγ).
4139.3	(10$^-$)	632.0 *2*	100	3507.30	9$^-$	(M1)	0.00870	α(K)=0.00748 *11*; α(L)=0.000972 *14*; α(M)=0.000202 *3* α(N)=4.49×10^{-5} *7*; α(O)=7.31×10^{-6} *11*; α(P)=5.66×10^{-7} *8* E_γ,Mult.: from (^{12}C,4nγ). Mult is based on γ(DCO) and γ(pol).
4157.0	6,7,8	1392.6 *5*	68 *8*	2764.94	6$^-$			E_γ,I_γ: from ^{138}Pr ε decay (2.03 h).
		2026.6 *7*	100 *8*	2129.28	7$^-$			E_γ,I_γ: from ^{138}Pr ε decay (2.03 h).
4204.0	(10$^-$)	658.2 *2*	100	3545.79	(9$^-$)	(M1)	0.00788	α(K)=0.00677 *10*; α(L)=0.000879 *13*; α(M)=0.000183 *3* α(N)=4.07×10^{-5} *6*; α(O)=6.61×10^{-6} *10*; α(P)=5.12×10^{-7} *8* E_γ,Mult.: from (^{12}C,4nγ). No γ(DCO) and γ(pols) data to support mult.
4248.1	(6,7$^-$)	2030.2 *9*	100 *67*	2217.41	5$^-$			E_γ,I_γ: from ^{138}Pr ε decay (2.03 h).
		2119.3 *9*	66 *12*	2129.28	7$^-$			E_γ,I_γ: from ^{138}Pr ε decay (2.03 h).
4359.93	12$^+$	417.5 *2*	100	3942.42	11$^+$	M1	0.0245	α(K)=0.0210 *3*; α(L)=0.00277 *4*; α(M)=0.000578 *9* α(N)=0.0001282 *18*; α(O)=2.08×10^{-5} *3*; α(P)=1.600×10^{-6} *23* E_γ: weighted average of 417.6 *1* from ^{130}Te(^{12}C,4nγ), 417.5 *2* from ^{136}Ba(α,2nγ), and 417.4 *3* from ^{138}Ba(α,4nγ). Mult.: based on ce data in (α,2nγ), $\gamma(\theta)$ in (α,2nγ) and (α,4nγ), γ(DCO) and γ(pol) in (^{12}C,4nγ).
4401.9	10$^-$	894.6 *2*	100	3507.30	9$^-$	M1	0.00378	α(K)=0.00325 *5*; α(L)=0.000418 *6*; α(M)=8.69×10^{-5} *13* α(N)=1.93×10^{-5} *3*; α(O)=3.14×10^{-6} *5*; α(P)=2.45×10^{-7} *4* E_γ,Mult.: from (^{12}C,4nγ); mult is based on γ(DCO) and γ(pol).
4781.51	(12$^+$)	839.1 *2*	100	3942.42	11$^+$	(M1+E2)	0.0037 *8*	α(K)=0.0032 *7*; α(L)=0.00042 *7*; α(M)=8.7×10^{-5} *15*

$^{138}_{58}Ce_{80}$-13

$\gamma(^{138}Ce)$ (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	α†	Comments
								α(N)=1.9×10^{-5} *4*; α(O)=3.1×10^{-6} *6*; α(P)=2.3×10^{-7} *6* E_γ,Mult.: from (^{12}C,4nγ); mult is based on γ(DCO).
4843.0	13$^-$	483.0 *2*	100	4359.93	12$^+$	E1	0.00388	α(K)=0.00334 *5*; α(L)=0.000428 *6*; α(M)=8.89×10^{-5} *13* α(N)=1.97×10^{-5} *3*; α(O)=3.17×10^{-6} *5*; α(P)=2.33×10^{-7} *4* E_γ,Mult.: from (^{12}C,4nγ); mult is based on γ(DCO) and γ(pol).
4974.64	13$^+$	614.7 *1*	100	4359.93	12$^+$	M1	0.00931	α(K)=0.00800 *12*; α(L)=0.001041 *15*; α(M)=0.000217 *3* α(N)=4.81×10^{-5} *7*; α(O)=7.83×10^{-6} *11*; α(P)=6.06×10^{-7} *9* E_γ: from (^{12}C,4nγ). Mult.: based on γ(DCO) and γ(pol) in (^{12}C,4nγ) and $\gamma(\theta)$ in (α,4nγ).
5071.3	(11$^-$)	932.0 *2*	100	4139.3	(10$^-$)	(M1)	0.00343	α(K)=0.00295 *5*; α(L)=0.000379 *6*; α(M)=7.88×10^{-5} *11* α(N)=1.751×10^{-5} *25*; α(O)=2.85×10^{-6} *4*; α(P)=2.22×10^{-7} *4* E_γ,I_γ: from (^{12}C,4nγ); mult is based on γ(DCO).
5089.32	12$^-$	729.3 *2*	1.53 *23*	4359.93	12$^+$	E1	1.58×10^{-3}	α(K)=0.001359 *19*; α(L)=0.0001713 *24*; α(M)=3.55×10^{-5} *5* α(N)=7.86×10^{-6} *11*; α(O)=1.272×10^{-6} *18*; α(P)=9.60×10^{-8} *14* E_γ,I_γ: from (^{12}C,4nγ) only. Mult.: D from (^{12}C,4nγ) based on γ(DCO); polarity from level-parity change.
		1146.9 *2*	100 *10*	3942.42	11$^+$	E1	6.66×10^{-4}	α(K)=0.000567 *8*; α(L)=7.03×10^{-5} *10*; α(M)=1.456×10^{-5} *21* α(N)=3.23×10^{-6} *5*; α(O)=5.24×10^{-7} *8*; α(P)=4.04×10^{-8} *6*; α(IPF)=9.86×10^{-6} *15* E_γ,I_γ: from (^{12}C,4nγ). Other: Eγ=1146.9 *3* from (α,4nγ). Mult.: based on γ(DCO) and γ(pol) in (^{12}C,4nγ). Mult=(M1+E2) deduced by 1978Mu09 in (α,4nγ) based on $\gamma(\theta)$ is inconsistent and not adopted.
5214.30	13$^-$	124.8 *3*	11.4 *18*	5089.32	12$^-$	M1+E2	0.78 *16*	α(K)=0.58 *5*; α(L)=0.16 *9*; α(M)=0.035 *20* α(N)=0.008 *5*; α(O)=0.0011 *6*; α(P)=3.8×10^{-5} *4* E_γ: weighted average of 125.0 *2* from ^{130}Te(^{12}C,4nγ) and 124.4 *3* from ^{138}Ba(α,4nγ). I_γ: weighted average of 10.8 *16* from ^{130}Te(^{12}C,4nγ) and 17 *5* from ^{138}Ba(α,4nγ). Mult.: based on γ(DCO) and γ(pol) in (^{12}C,4nγ) and $\gamma(\theta)$ in (α,4nγ).
		432.8 *2*	4.6 *7*	4781.51	(12$^+$)	(E1)	0.00502	α(K)=0.00432 *6*; α(L)=0.000556 *8*; α(M)=0.0001155 *17* α(N)=2.55×10^{-5} *4*; α(O)=4.10×10^{-6} *6*; α(P)=3.00×10^{-7} *5* E_γ,I_γ,Mult.: from (^{12}C,4nγ) only.
		854.4 *1*	100 *5*	4359.93	12$^+$	E1	1.14×10^{-3}	α(K)=0.000988 *14*; α(L)=0.0001238 *18*; α(M)=2.57×10^{-5} *4* α(N)=5.68×10^{-6} *8*; α(O)=9.21×10^{-7} *13*; α(P)=7.01×10^{-8} *10* E_γ: weighted average of 854.3 *1* from ^{130}Te(^{12}C,4nγ), 854.6 *2* from ^{136}Ba(α,2nγ), and 854.2 *3* from ^{138}Ba(α,4nγ). I_γ: from (^{12}C,4nγ). Mult.: based on γ(DCO) and γ(pol) in (^{12}C,4nγ). Mult=(M1+E2) deduced by 1978Mu09 in (α,4nγ) based on $\gamma(\theta)$ is inconsistent and not adopted.

$^{138}_{58}Ce_{80}$-14

$\gamma(^{138}Ce)$ (continued)

E_i(level)	J_i^π	E_γ ‡	I_γ ‡	E_f	J_f^π	Mult.	α †	Comments
5312.39	14^+	98.1 *1*	100 *10*	5214.30	13^-	(E1)	0.256	α(K)=0.218 *4*; α(L)=0.0304 *5*; α(M)=0.00634 *9* α(N)=0.001384 *20*; α(O)=0.000215 *3*; α(P)=1.310×10^{-5} *19* B(E1)(W.u.)=0.0014 *+4−3* E_γ,I_γ: from (^{12}C,4nγ). Other: Eγ=98.3 *3* from (α,4nγ). Mult.: from (^{12}C,4nγ) with bracket added by evaluator since no γ(DCO) and γ(pol) data. This assignment is consistent with $\gamma(\theta)$ in (α,4nγ).
		337.7 *2*	91 *9*	4974.64	13^+	M1	0.0423	α(K)=0.0362 *5*; α(L)=0.00481 *7*; α(M)=0.001004 *15* α(N)=0.000223 *4*; α(O)=3.62×10^{-5} *5*; α(P)=2.77×10^{-6} *4* B(M1)(W.u.)=0.0028 *+8−6* E_γ,I_γ: from (^{12}C,4nγ). Other: Eγ=337.7 *3* from (α,4nγ). Mult.: based on γ(DCO) and γ(pol) in (^{12}C,4nγ) and $\gamma(\theta)$ in (α,4nγ).
		469.4 *2*	11.3 *19*	4843.0	13^-	(E1)	0.00415	α(K)=0.00357 *5*; α(L)=0.000458 *7*; α(M)=9.51×10^{-5} *14* α(N)=2.10×10^{-5} *3*; α(O)=3.38×10^{-6} *5*; α(P)=2.49×10^{-7} *4* B(E1)(W.u.)=1.5×10^{-6} *+7−5* E_γ,I_γ: from (^{12}C,4nγ) only. Mult.: from (^{12}C,4nγ) with bracket added by evaluator since no γ(DCO) and γ(pol) data.
5387.7	11^-	985.8 *2*	100	4401.9	10^-	M1	0.00301	α(K)=0.00259 *4*; α(L)=0.000332 *5*; α(M)=6.90×10^{-5} *10* α(N)=1.532×10^{-5} *22*; α(O)=2.50×10^{-6} *4*; α(P)=1.95×10^{-7} *3* E_γ,Mult.: from (^{12}C,4nγ); mult is based on γ(DCO) and γ(pol).
5411.5	14^-	99.1 *2*	2.5 *4*	5312.39	14^+	(E1)	0.249	α(K)=0.212 *4*; α(L)=0.0296 *5*; α(M)=0.00616 *10* α(N)=0.001345 *21*; α(O)=0.000209 *4*; α(P)=1.276×10^{-5} *19* E_γ,I_γ: from (^{12}C,4nγ) only. Mult.: from (^{12}C,4nγ) with bracket added by evaluator since no γ(DCO) and γ(pol) data.
		197.9 *7*	100 *10*	5214.30	13^-	M1	0.176 *3*	α(K)=0.150 *3*; α(L)=0.0202 *4*; α(M)=0.00423 *8* α(N)=0.000939 *16*; α(O)=0.000152 *3*; α(P)=1.156×10^{-5} *20* E_γ: unweighted average of 197.2 *2* from ^{130}Te(^{12}C,4nγ) and 198.6 *3* from ^{138}Ba(α,4nγ). I_γ: from (^{12}C,4nγ). Mult.: from (^{12}C,4nγ) based on γ(DCO) and γ(pol).
		568.5 *2*	5.1 *9*	4843.0	13^-	M1	0.01129	α(K)=0.00969 *14*; α(L)=0.001264 *18*; α(M)=0.000264 *4* α(N)=5.85×10^{-5} *9*; α(O)=9.51×10^{-6} *14*; α(P)=7.35×10^{-7} *11* E_γ,I_γ: from (^{12}C,4nγ) only. Mult.: from (^{12}C,4nγ) based on γ(DCO) and γ(pol).
5566.4	15^+	254.0 *1*	100	5312.39	14^+	M1+E2	0.086 *4*	α(K)=0.071 *6*; α(L)=0.0121 *19*; α(M)=0.0026 *5* α(N)=0.00056 *9*; α(O)=8.8×10^{-5} *11*; α(P)=5.0×10^{-6} *9* E_γ: from (^{12}C,4nγ). Other: 254.1 *3* from (α,4nγ). Mult.: from (^{12}C,4nγ) based on γ(DCO) and γ(pol).
5714.4	(14^-)	500.1 *2*	100	5214.30	13^-	(M1)	0.01553	α(K)=0.01332 *19*; α(L)=0.001745 *25*; α(M)=0.000364 *6* α(N)=8.08×10^{-5} *12*; α(O)=1.313×10^{-5} *19*; α(P)=1.012×10^{-6} *15* E_γ,Mult.: from (^{12}C,4nγ); mult is based on γ(DCO).

$^{138}_{58}Ce_{80}$-15

Adopted Levels, Gammas (continued)

$\gamma(^{138}Ce)$ (continued)

E_i(level)	J_i^π	E_γ‡	I_γ‡	E_f	J_f^π	Mult.	α†	Comments
5726.6	14^+	1366.7 *2*	100	4359.93	12^+	E2	1.10×10^{-3}	α(K)=0.000912 *13*; α(L)=0.0001179 *17*; α(M)=2.45×10^{-5} *4* α(N)=5.44×10^{-6} *8*; α(O)=8.80×10^{-7} *13*; α(P)=6.63×10^{-8} *10*; α(IPF)=3.64×10^{-5} *6* E_γ: from (^{12}C,4nγ) only. E_γ,Mult.: from (^{12}C,4nγ); mult is based on γ(DCO).
5731.0	15^-	319.5 *2*	100	5411.5	14^-	M1	0.0488	α(K)=0.0418 *6*; α(L)=0.00556 *8*; α(M)=0.001162 *17* α(N)=0.000258 *4*; α(O)=4.19×10^{-5} *6*; α(P)=3.20×10^{-6} *5* E_γ: weighted average of 319.6 *2* from $^{130}Te(^{12}C$,4nγ) and 319.3 *3* from $^{138}Ba(\alpha$,4nγ). Mult.: based on γ(DCO) and γ(pol) in (^{12}C,4nγ) and $\gamma(\theta)$ in (α,4nγ).
5871.2	15^+	144.6 *2*	6.2 *8*	5726.6	14^+	M1	0.417	α(K)=0.356 *6*; α(L)=0.0484 *7*; α(M)=0.01014 *15* α(N)=0.00225 *4*; α(O)=0.000364 *6*; α(P)=2.75×10^{-5} *4* E_γ,I_γ: from (^{12}C,4nγ) only. Mult.: D from γ(DCO) in (^{12}C,4nγ); polarity from no level-parity change.
		896.6 *2*	100 *10*	4974.64	13^+	E2	0.00256	α(K)=0.00218 *3*; α(L)=0.000298 *5*; α(M)=6.23×10^{-5} *9* α(N)=1.378×10^{-5} *20*; α(O)=2.21×10^{-6} *3*; α(P)=1.580×10^{-7} *23* E_γ,I_γ: from (^{12}C,4nγ) only. Mult.: from (^{12}C,4nγ) based on γ(DCO) and γ(DCO).
5955.3		388.9 *2*	100	5566.4	15^+			E_γ: from (^{12}C,4nγ) only.
6014.4	16^+	448.0 *1*	100	5566.4	15^+	M1	0.0205	α(K)=0.01756 *25*; α(L)=0.00231 *4*; α(M)=0.000482 *7* α(N)=0.0001069 *15*; α(O)=1.737×10^{-5} *25*; α(P)=1.336×10^{-6} *19* E_γ: from (^{12}C,4nγ). Other: 447.5 *3* from (α,4nγ). Mult.: based on γ(DCO) and γ(pol) in (^{12}C,4nγ) and $\gamma(\theta)$ in (α,4nγ).
6134.7	(14^+)	1291.7 *2*	100	4843.0	13^-	(E1)	6.05×10^{-4}	α(K)=0.000459 *7*; α(L)=5.67×10^{-5} *8*; α(M)=1.173×10^{-5} *17* α(N)=2.60×10^{-6} *4*; α(O)=4.23×10^{-7} *6*; α(P)=3.27×10^{-8} *5*; α(IPF)=7.43×10^{-5} *11* E_γ: from (^{12}C,4nγ) only. Mult.: based on γ(DCO) and γ(pol) in (^{12}C,4nγ).
6328.7	(12^-)	941.0 *2*	100	5387.7	11^-	(M1)	0.00335	α(K)=0.00289 *4*; α(L)=0.000370 *6*; α(M)=7.71×10^{-5} *11* α(N)=1.711×10^{-5} *24*; α(O)=2.79×10^{-6} *4*; α(P)=2.17×10^{-7} *3* E_γ: from (^{12}C,4nγ) only. Mult.: based on γ(DCO) and in (^{12}C,4nγ).
6363.4	16^-	632.4 *2*	100	5731.0	15^-	M1	0.00869	α(K)=0.00746 *11*; α(L)=0.000970 *14*; α(M)=0.000202 *3* α(N)=4.49×10^{-5} *7*; α(O)=7.30×10^{-6} *11*; α(P)=5.65×10^{-7} *8* E_γ: from (^{12}C,4nγ) only. Mult.: based on γ(DCO) and γ(pol) in (^{12}C,4nγ).
6408.6	(15^-)	997.1 *2*	100	5411.5	14^-	(M1)	0.00293	α(K)=0.00252 *4*; α(L)=0.000323 *5*; α(M)=6.72×10^{-5} *10* α(N)=1.492×10^{-5} *21*; α(O)=2.43×10^{-6} *4*; α(P)=1.89×10^{-7} *3* E_γ,Mult.: from (^{12}C,4nγ). No γ(DCO) or γ(pol) data for mult.
6451.0		495.7 *2*	100	5955.3				E_γ: from (^{12}C,4nγ) only.
6451.2	16^+	580.0 *2*	100	5871.2	15^+	M1	0.01074	α(K)=0.00923 *13*; α(L)=0.001203 *17*; α(M)=0.000251 *4*

$^{138}_{58}Ce_{80}$-16

$\gamma(^{138}Ce)$ (continued)

E_i(level)	J^π_i	E_γ ‡	I_γ ‡	E_f	J^π_f	Mult.	α †	Comments
								α(N)=5.56×10^{-5} *8*; α(O)=9.05×10^{-6} *13*; α(P)=6.99×10^{-7} *10* E_γ: from (^{12}C,4nγ) only. Mult.: based on γ(DCO) and γ(pol) in (^{12}C,4nγ).
6536.4	15$^{(-)}$	970.0 *2*	40 *6*	5566.4	15$^+$	(E1)	8.95×10^{-4}	α(K)=0.000774 *11*; α(L)=9.65×10^{-5} *14*; α(M)=2.00×10^{-5} *3* α(N)=4.43×10^{-6} *7*; α(O)=7.18×10^{-7} *10*; α(P)=5.49×10^{-8} *8* E_γ,I_γ: from (^{12}C,4nγ) only. Mult.: from (^{12}C,4nγ) with bracket added by evaluator since no γ(DCO) or γ(pol) data.
		1224.0 *2*	100 *20*	5312.39	14$^+$	(E1+M2)	0.00066 *4*	α(K)=0.00054 *4*; α(L)=6.7×10^{-5} *5*; α(M)=1.38×10^{-5} *9* α(N)=3.06×10^{-6} *21*; α(O)=5.0×10^{-7} *4*; α(P)=3.8×10^{-8} *3*; α(IPF)=3.95×10^{-5} *7* E_γ,I_γ: from (^{12}C,4nγ) only. Mult.: from (^{12}C,4nγ) based on γ(DCO), with bracket added by evaluator since no γ(pol) data.
6597.6		146.6 *2*	100	6451.0				E_γ: from (^{12}C,4nγ) only.
6606.3	17$^+$	155.1 *2*	100	6451.2	16$^+$	M1	0.343	α(K)=0.293 *5*; α(L)=0.0398 *6*; α(M)=0.00833 *12* α(N)=0.00185 *3*; α(O)=0.000299 *5*; α(P)=2.26×10^{-5} *4* E_γ: from (^{12}C,4nγ) only. Mult.: based on γ(DCO) and γ(pol) in (^{12}C,4nγ).
6685.5	16$^-$	149.1 *2*	12.9 *22*	6536.4	15$^{(-)}$	(M1)	0.383	α(K)=0.327 *5*; α(L)=0.0444 *7*; α(M)=0.00930 *14* α(N)=0.00206 *3*; α(O)=0.000334 *5*; α(P)=2.53×10^{-5} *4* E_γ,I_γ: from (^{12}C,4nγ) only. Mult.: D from γ(DCO) in (^{12}C,4nγ); polarity from no level-parity change.
		550.8 *2*	6.5 *11*	6134.7	(14$^+$)	(M2)	0.0379	α(K)=0.0320 *5*; α(L)=0.00465 *7*; α(M)=0.000982 *14* α(N)=0.000218 *3*; α(O)=3.53×10^{-5} *5*; α(P)=2.63×10^{-6} *4* E_γ,I_γ,Mult.: from (^{12}C,4nγ) only. No γ(DCO) or γ(pol) data for mult.
		671.1 *2*	4.3 *7*	6014.4	16$^+$	E1+M2	0.00207 *20*	α(K)=0.00178 *17*; α(L)=0.000228 *24*; α(M)=4.7×10^{-5} *5* α(N)=1.05×10^{-5} *11*; α(O)=1.69×10^{-6} *18*; α(P)=1.27×10^{-7} *14* E_γ,I_γ: from (^{12}C,4nγ) only. Mult.: from γ(DCO) in (^{12}C,4nγ); polarity from no level-parity change.
		1119.1 *2*	100 *15*	5566.4	15$^+$	E1	6.90×10^{-4}	α(K)=0.000593 *9*; α(L)=7.36×10^{-5} *11*; α(M)=1.524×10^{-5} *22* α(N)=3.38×10^{-6} *5*; α(O)=5.48×10^{-7} *8*; α(P)=4.22×10^{-8} *6*; α(IPF)=4.61×10^{-6} *7* E_γ,I_γ: from (^{12}C,4nγ). Mult.: based on γ(DCO) and γ(pol) in (^{12}C,4nγ).
6738.3	(16$^-$)	1007.3 *2*	100	5731.0	15$^-$	(M1)	0.00286	α(K)=0.00246 *4*; α(L)=0.000315 *5*; α(M)=6.56×10^{-5} *10* α(N)=1.456×10^{-5} *21*; α(O)=2.37×10^{-6} *4*; α(P)=1.85×10^{-7} *3* E_γ,Mult.: from (^{12}C,4nγ). No γ(DCO) or γ(pol) data for mult.

$^{138}_{58}Ce_{80}$-17

γ(^{138}Ce) (continued)

E$_i$(level)	J$^\pi_i$	E$_\gamma$‡	I$_\gamma$‡	E$_f$	J$^\pi_f$	Mult.	α†	Comments
6841.7	17$^+$	827.3 *2*	100 *11*	6014.4	16$^+$	M1	0.00455	α(K)=0.00391 *6*; α(L)=0.000504 *7*; α(M)=0.0001049 *15* α(N)=2.33×10^{-5} *4*; α(O)=3.79×10^{-6} *6*; α(P)=2.95×10^{-7} *5* E$_\gamma$,I$_\gamma$,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO) and γ(pol).
		1275.3 *2*	32 *5*	5566.4	15$^+$	E2	1.23×10^{-3}	α(K)=0.001046 *15*; α(L)=0.0001362 *19*; α(M)=2.84×10^{-5} *4* α(N)=6.28×10^{-6} *9*; α(O)=1.015×10^{-6} *15*; α(P)=7.60×10^{-8} *11*; α(IPF)=1.688×10^{-5} *24* E$_\gamma$,I$_\gamma$: from (^{12}C,4nγ). Mult.: Q from γ(DCO) in (^{12}C,4nγ); polarity from no level-parity change.
6859.7		262.1 *2*	100	6597.6				E$_\gamma$: from (^{12}C,4nγ) only.
6889.0	17$^-$	203.5 *2*	81 *12*	6685.5	16$^-$	M1	0.1627	α(K)=0.1390 *20*; α(L)=0.0187 *3*; α(M)=0.00392 *6* α(N)=0.000870 *13*; α(O)=0.0001410 *21*; α(P)=1.071×10^{-5} *16* E$_\gamma$,I$_\gamma$,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO) and γ(pol).
		874.6 *2*	100 *15*	6014.4	16$^+$	E1	1.09×10^{-3}	α(K)=0.000944 *14*; α(L)=0.0001182 *17*; α(M)=2.45×10^{-5} *4* α(N)=5.42×10^{-6} *8*; α(O)=8.79×10^{-7} *13*; α(P)=6.70×10^{-8} *10* E$_\gamma$,I$_\gamma$,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO) and γ(pol).
7074.0	(17$^-$)	710.6 *2*	54 *8*	6363.4	16$^-$	(M1)	0.00655	α(K)=0.00563 *8*; α(L)=0.000729 *11*; α(M)=0.0001517 *22* α(N)=3.37×10^{-5} *5*; α(O)=5.48×10^{-6} *8*; α(P)=4.25×10^{-7} *6* E$_\gamma$,I$_\gamma$,Mult.: from (^{12}C,4nγ) only. No γ(DCO) or γ(pol) data for mult.
		1343.0 *2*	100 *15*	5731.0	15$^-$	(E2)	1.13×10^{-3}	α(K)=0.000944 *14*; α(L)=0.0001222 *18*; α(M)=2.54×10^{-5} *4* α(N)=5.64×10^{-6} *8*; α(O)=9.12×10^{-7} *13*; α(P)=6.86×10^{-8} *10*; α(IPF)=3.05×10^{-5} *5* E$_\gamma$,I$_\gamma$,Mult.: from (^{12}C,4nγ) only. No γ(DCO) or γ(pol) data for mult.
7104.7	18$^+$	263.0 *2*	100 *10*	6841.7	17$^+$	M1	0.0816	α(K)=0.0698 *10*; α(L)=0.00934 *14*; α(M)=0.00195 *3* α(N)=0.000433 *7*; α(O)=7.03×10^{-5} *10*; α(P)=5.36×10^{-6} *8* E$_\gamma$,I$_\gamma$,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO) and γ(pol).
		1090.3 *2*	29 *4*	6014.4	16$^+$	E2	1.68×10^{-3}	α(K)=0.001438 *21*; α(L)=0.000191 *3*; α(M)=3.98×10^{-5} *6* α(N)=8.81×10^{-6} *13*; α(O)=1.419×10^{-6} *20*; α(P)=1.044×10^{-7} *15* E$_\gamma$,I$_\gamma$,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO) and γ(pol).
7185.3	(16$^-$)	1170.9 *2*	100	6014.4	16$^+$	(E1)	6.49×10^{-4}	α(K)=0.000546 *8*; α(L)=6.77×10^{-5} *10*; α(M)=1.402×10^{-5} *20* α(N)=3.11×10^{-6} *5*; α(O)=5.04×10^{-7} *7*; α(P)=3.89×10^{-8} *6*; α(IPF)=1.696×10^{-5} *25* E$_\gamma$,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO) and γ(pol).
7211.3	18$^-$	322.3 *1*	100 *10*	6889.0	17$^-$	M1	0.0477	α(K)=0.0409 *6*; α(L)=0.00544 *8*; α(M)=0.001135 *16* α(N)=0.000252 *4*; α(O)=4.09×10^{-5} *6*; α(P)=3.13×10^{-6} *5* E$_\gamma$,I$_\gamma$,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO) and γ(pol).
		369.6 *2*	6.2 *11*	6841.7	17$^+$	(E1)	0.00737	α(K)=0.00633 *9*; α(L)=0.000820 *12*; α(M)=0.0001703 *24* α(N)=3.76×10^{-5} *6*; α(O)=6.03×10^{-6} *9*; α(P)=4.35×10^{-7} *7* E$_\gamma$,I$_\gamma$,Mult.: from (^{12}C,4nγ) only. No γ(DCO) or γ(pol) data for mult.
7225.2	(16$^-$)	1210.8 *2*	100 *14*	6014.4	16$^+$	(E1)	6.28×10^{-4}	α(K)=0.000514 *8*; α(L)=6.37×10^{-5} *9*; α(M)=1.318×10^{-5} *19* α(N)=2.92×10^{-6} *4*; α(O)=4.75×10^{-7} *7*; α(P)=3.66×10^{-8} *6*; α(IPF)=3.36×10^{-5} *5* E$_\gamma$,I$_\gamma$,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO).

γ(^{138}Ce) (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.	α†	Comments
7225.2	(16⁻)	1494.1 *2*	86 *14*	5731.0	15⁻	(M1)	1.24×10^{-3}	α(K)=0.001004 *14*; α(L)=0.0001271 *18*; α(M)=2.64×10^{-5} *4* α(N)=5.86×10^{-6} *9*; α(O)=9.55×10^{-7} *14*; α(P)=7.50×10^{-8} *11*; α(IPF)=7.69×10^{-5} *11* E_γ,I_γ,Mult.: from (^{12}C,4nγ) only. No γ(DCO) or γ(pol) data for mult.
7392.3	(18⁺)	786.0 *2*	100	6606.3	17⁺	(M1)	0.00514	α(K)=0.00442 *7*; α(L)=0.000570 *8*; α(M)=0.0001187 *17* α(N)=2.64×10^{-5} *4*; α(O)=4.29×10^{-6} *6*; α(P)=3.33×10^{-7} *5* E_γ,I_γ,Mult.: from (^{12}C,4nγ) only. No γ(DCO) or γ(pol) data for mult.
7427.6		585.9 *2*	100	6841.7	17⁺			E_γ: from (^{12}C,4nγ) only.
7532.4	(17⁻)	307.2 *2*	40 *6*	7225.2	(16⁻)	(M1)	0.0541	α(K)=0.0463 *7*; α(L)=0.00617 *9*; α(M)=0.001289 *19* α(N)=0.000286 *4*; α(O)=4.64×10^{-5} *7*; α(P)=3.55×10^{-6} *5* E_γ,I_γ,Mult.: from (^{12}C,4nγ) only. No γ(DCO) or γ(pol) data for mult.
		347.1 *2*	100 *20*	7185.3	(16⁻)	(M1)	0.0394	α(K)=0.0337 *5*; α(L)=0.00447 *7*; α(M)=0.000934 *14* α(N)=0.000207 *3*; α(O)=3.37×10^{-5} *5*; α(P)=2.58×10^{-6} *4* E_γ,I_γ,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO).
		1518.0 *2*	80 *12*	6014.4	16⁺	(E1)	6.31×10^{-4}	α(K)=0.000348 *5*; α(L)=4.28×10^{-5} *6*; α(M)=8.85×10^{-6} *13* α(N)=1.96×10^{-6} *3*; α(O)=3.19×10^{-7} *5*; α(P)=2.48×10^{-8} *4*; α(IPF)=0.000229 *4* E_γ,I_γ,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO).
7682.9	19⁺	578.2 *2*	100	7104.7	18⁺	M1	0.01083	α(K)=0.00930 *13*; α(L)=0.001212 *17*; α(M)=0.000253 *4* α(N)=5.61×10^{-5} *8*; α(O)=9.12×10^{-6} *13*; α(P)=7.04×10^{-7} *10* E_γ,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO) and γ(pol).
7685.8	19⁻	474.5 *2*	100	7211.3	18⁻	M1	0.01771	α(K)=0.01519 *22*; α(L)=0.00199 *3*; α(M)=0.000416 *6* α(N)=9.23×10^{-5} *13*; α(O)=1.500×10^{-5} *21*; α(P)=1.155×10^{-6} *17* E_γ,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO) and γ(pol).
7744.2	(18⁻)	211.8 *2*	100	7532.4	(17⁻)	(M1+E2)	0.149 *4*	α(K)=0.120 *5*; α(L)=0.022 *6*; α(M)=0.0048 *13* α(N)=0.0010 *3*; α(O)=0.00016 *4*; α(P)=8.4×10^{-6} *12* E_γ,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO).
7803.2	20⁺	120.3 *2*	100 *17*	7682.9	19⁺	M1+E2	0.88 *19*	α(K)=0.65 *5*; α(L)=0.19 *11*; α(M)=0.041 *24* α(N)=0.009 *5*; α(O)=0.0013 *7*; α(P)=4.2×10^{-5} *4* E_γ,I_γ,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO) and γ(pol).
		698.5 *2*	96 *13*	7104.7	18⁺	(E2)	0.00457	α(K)=0.00387 *6*; α(L)=0.000554 *8*; α(M)=0.0001164 *17* α(N)=2.57×10^{-5} *4*; α(O)=4.08×10^{-6} *6*; α(P)=2.77×10^{-7} *4* E_γ,I_γ,Mult.: from (^{12}C,4nγ) only. No γ(DCO) or γ(pol) data for mult. Bracket is added by evaluator.
8322.3	(20⁺)	639.4 *2*	100	7682.9	19⁺	(M1)	0.00846	α(K)=0.00727 *11*; α(L)=0.000944 *14*; α(M)=0.000197 *3* α(N)=4.37×10^{-5} *7*; α(O)=7.10×10^{-6} *10*; α(P)=5.50×10^{-7} *8* E_γ,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO).
8350.3	20⁻	664.5 *2*	100 *15*	7685.8	19⁻	M1	0.00770	α(K)=0.00662 *10*; α(L)=0.000859 *12*; α(M)=0.000179 *3* α(N)=3.97×10^{-5} *6*; α(O)=6.46×10^{-6} *9*; α(P)=5.00×10^{-7} *7* E_γ,I_γ,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO) and γ(pol).
		1139.0 *2*	12.2 *24*	7211.3	18⁻	(E2)	1.53×10^{-3}	α(K)=0.001314 *19*; α(L)=0.0001733 *25*; α(M)=3.61×10^{-5} *5*

$^{138}_{58}$Ce$_{80}$-19

$\gamma(^{138}Ce)$ (continued)

E_i(level)	J^π_i	E_γ [‡]	I_γ [‡]	E_f	J^π_f	Mult.	α [†]	Comments
								α(N)=8.00×10^{-6} *12*; α(O)=1.290×10^{-6} *18*; α(P)=9.55×10^{-8} *14*; α(IPF)=1.394×10^{-6} *22* E_γ,I_γ,Mult.: from (^{12}C,4nγ) only. No γ(DCO) or γ(pol) data for mult. Bracket is added by evaluator.
8709.6	21$^-$	359.3 *2*	100 *14*	8350.3	20$^-$	M1	0.0360	α(K)=0.0308 *5*; α(L)=0.00409 *6*; α(M)=0.000853 *12* α(N)=0.000189 *3*; α(O)=3.07×10^{-5} *5*; α(P)=2.36×10^{-6} *4* E_γ,I_γ,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO) and γ(pol).
		1023.8 *2*	4.5 *9*	7685.8	19$^-$	(E2)	0.00192	α(K)=0.001641 *23*; α(L)=0.000219 *3*; α(M)=4.58×10^{-5} *7* α(N)=1.014×10^{-5} *15*; α(O)=1.631×10^{-6} *23*; α(P)=1.190×10^{-7} *17* E_γ,I_γ,Mult.: from (^{12}C,4nγ) only. No γ(DCO) or γ(pol) data for mult. Bracket is added by evaluator.
8873.5	22$^+$	1070.3 *2*	100	7803.2	20$^+$	E2	1.75×10^{-3}	α(K)=0.001495 *21*; α(L)=0.000199 *3*; α(M)=4.15×10^{-5} *6* α(N)=9.18×10^{-6} *13*; α(O)=1.478×10^{-6} *21*; α(P)=1.085×10^{-7} *16* E_γ,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO) and γ(pol).
8921.1		570.8 *2*	100	8350.3	20$^-$			E_γ: from (^{12}C,4nγ) only.
8957.9	22$^{(-)}$	248.3 *2*	100	8709.6	21$^-$	(M1)	0.0951	α(K)=0.0813 *12*; α(L)=0.01091 *16*; α(M)=0.00228 *4* α(N)=0.000506 *8*; α(O)=8.21×10^{-5} *12*; α(P)=6.25×10^{-6} *9* E_γ,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO) with bracket added by evaluator.
8978.3		628.0 *2*	100	8350.3	20$^-$			E_γ: from (^{12}C,4nγ) only.
9430.9	(23$^+$)	557.4 *2*	100	8873.5	22$^+$	(M1)	0.01185	α(K)=0.01017 *15*; α(L)=0.001328 *19*; α(M)=0.000277 *4* α(N)=6.15×10^{-5} *9*; α(O)=9.99×10^{-6} *14*; α(P)=7.72×10^{-7} *11* E_γ,Mult.: from (^{12}C,4nγ). Mult is based γ(DCO).
9511.4		1161.1 *2*	100	8350.3	20$^-$			E_γ: from (^{12}C,4nγ) only.

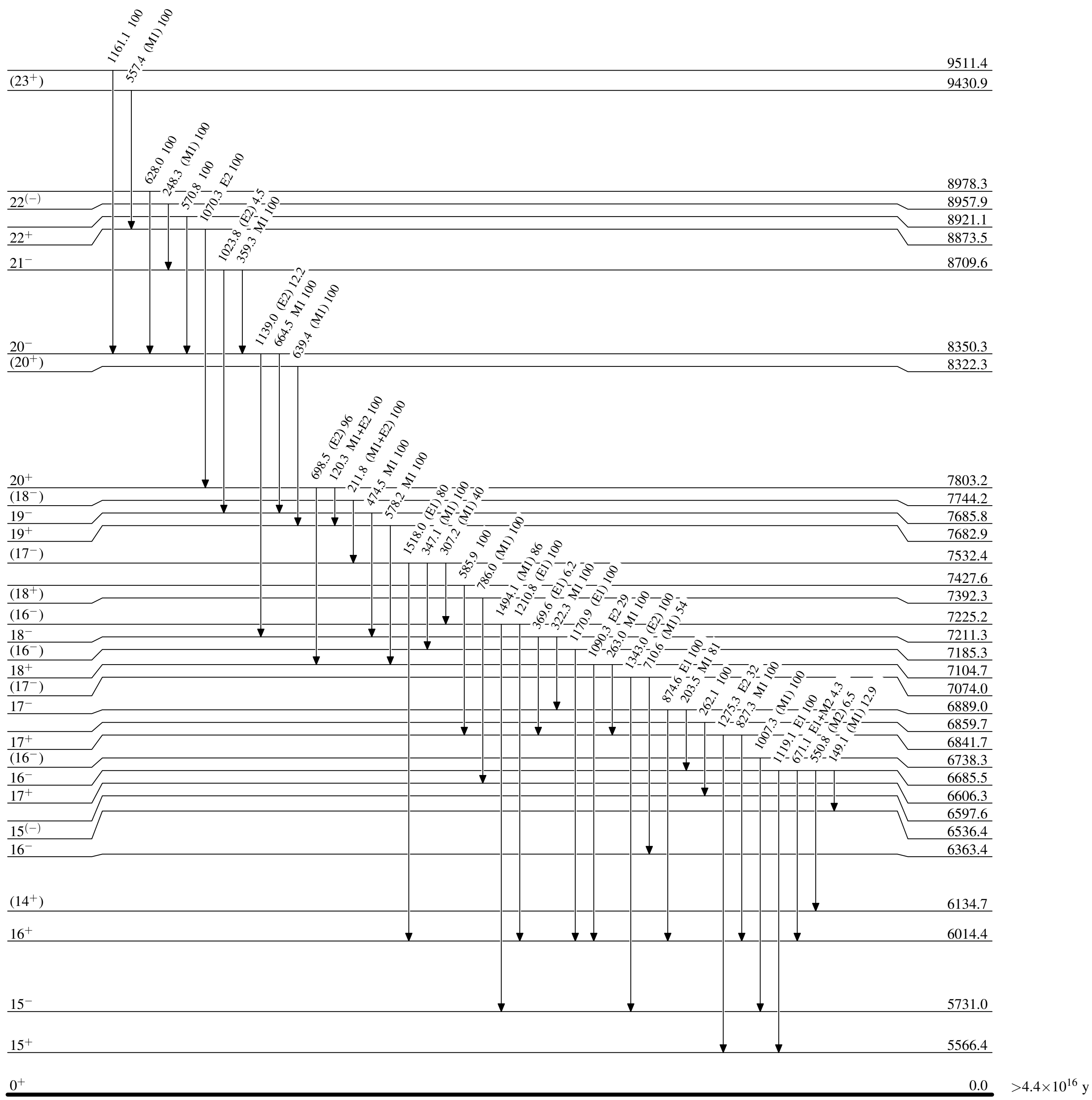
[†] Additional information 1.
[‡] Primarily from (^{12}C,4nγ), ^{138}Pr ε decay and (α,2nγ). Weighted average is taken when available.
[#] From (p,2nγ) and (α,2nγ) (1987Lo12) based on ce data.
[@] From (α,4nγ) based on $\gamma(\theta)$.
[&] From ^{138}Pr ε decay (1.45 min) based on ce data.
[a] From ^{138}Pr ε decay (2.1 h) based on ce data.
[b] Multiply placed with undivided intensity.
[c] Placement of transition in the level scheme is uncertain.

$^{138}_{58}Ce_{80}$-20

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

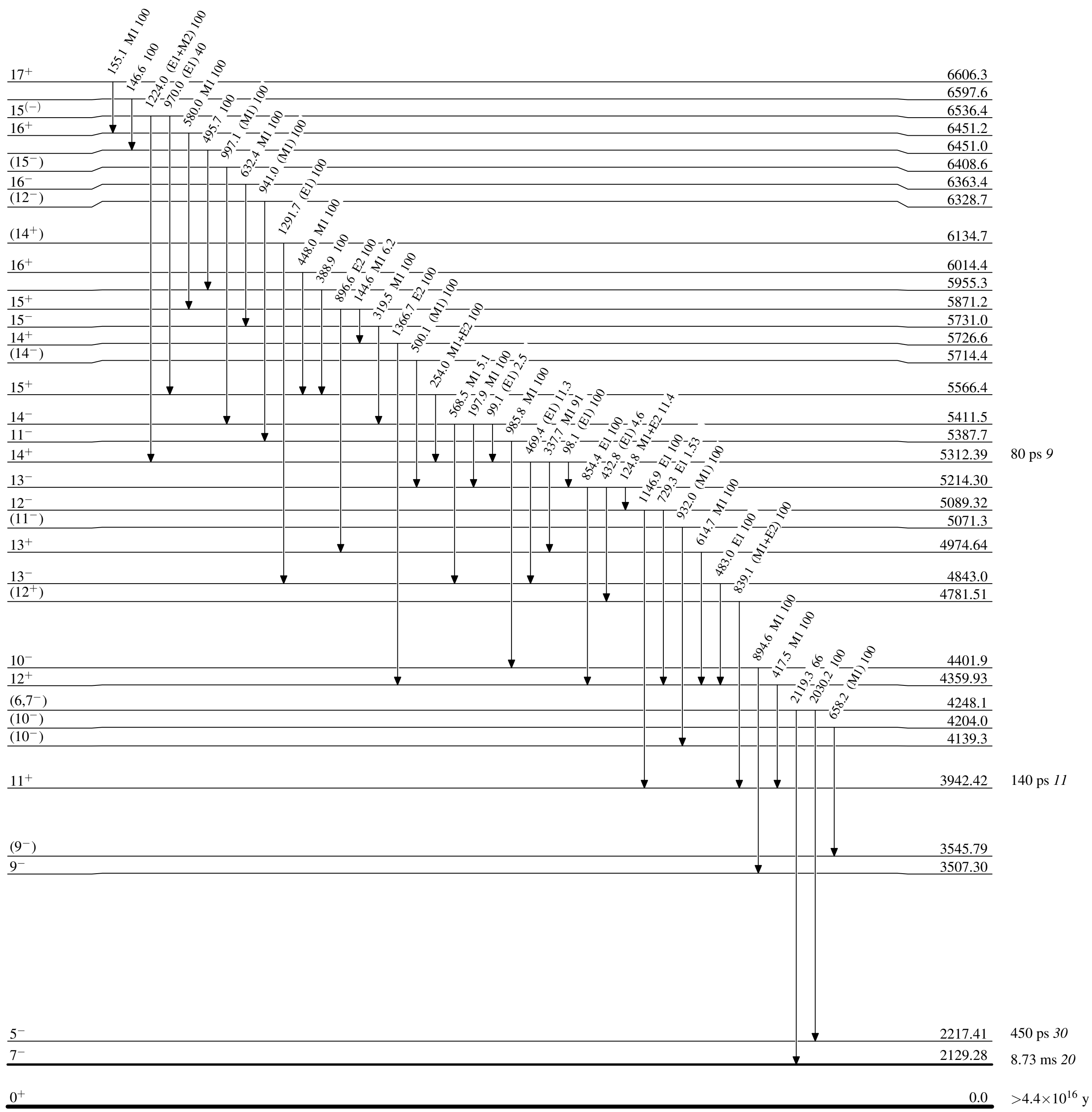


$^{138}_{58}Ce_{80}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



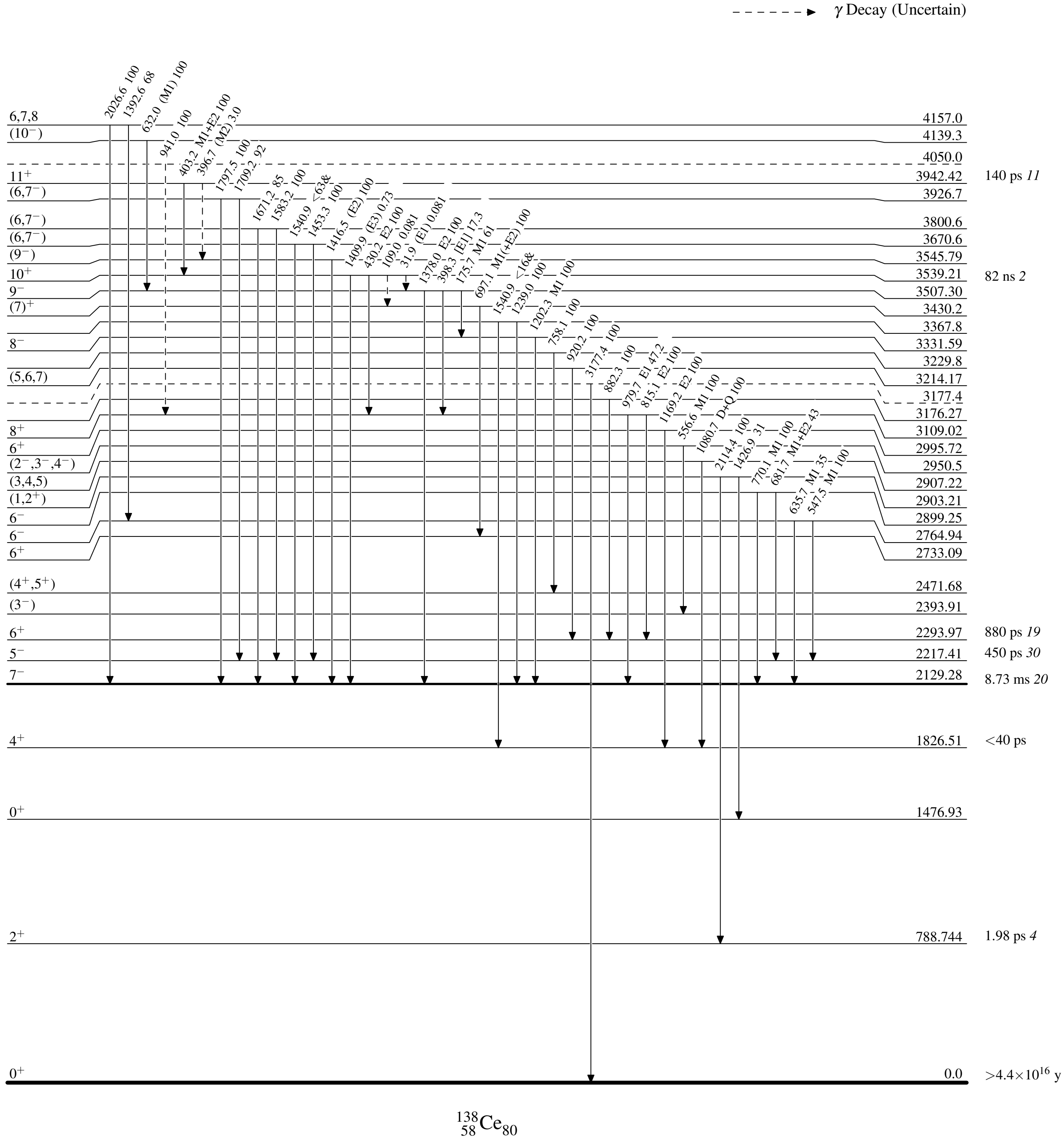
$^{138}_{58}Ce_{80}$

Adopted Levels, Gammas

Legend

Level Scheme (continued)

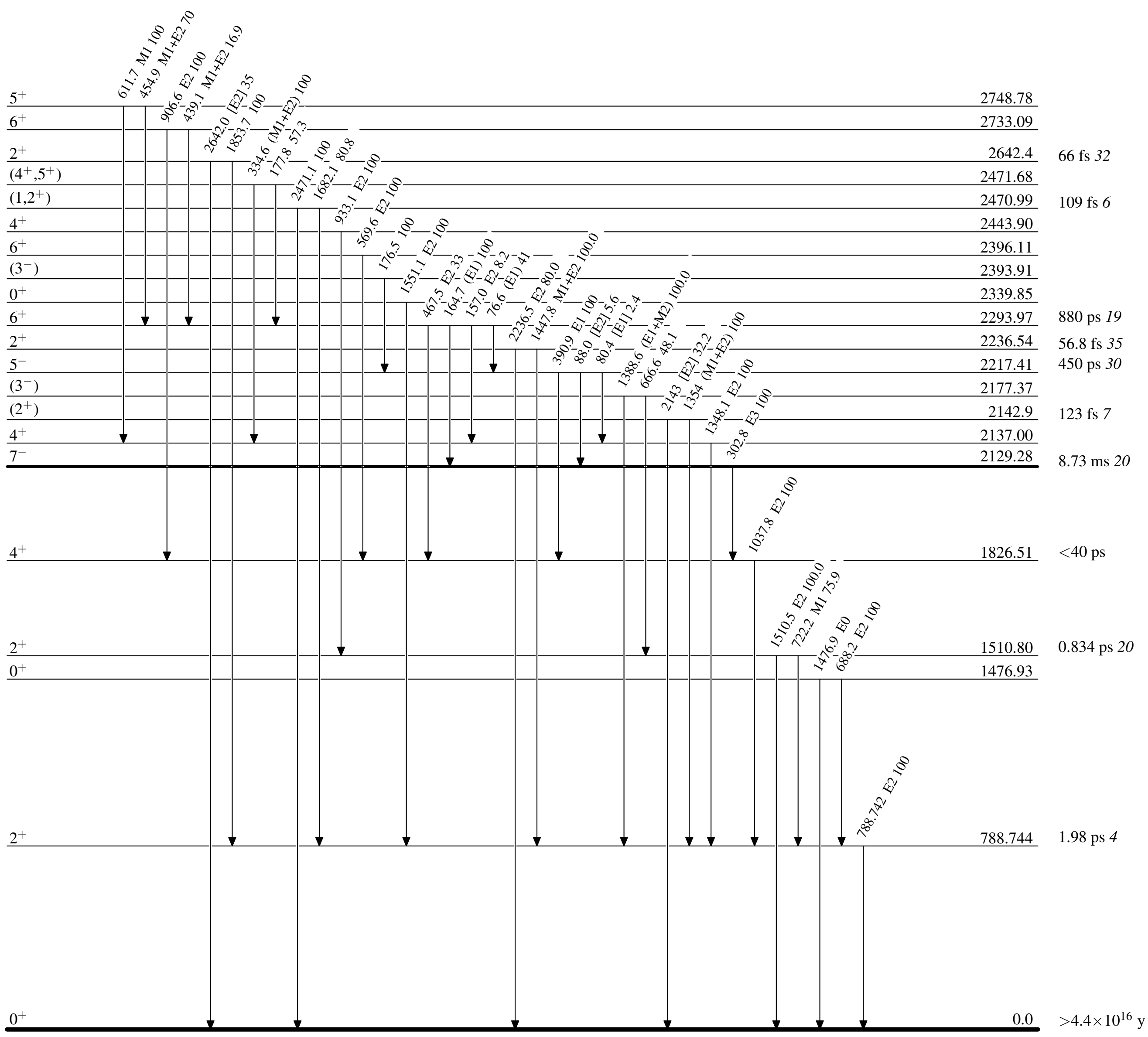
Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



Adopted Levels, Gammas

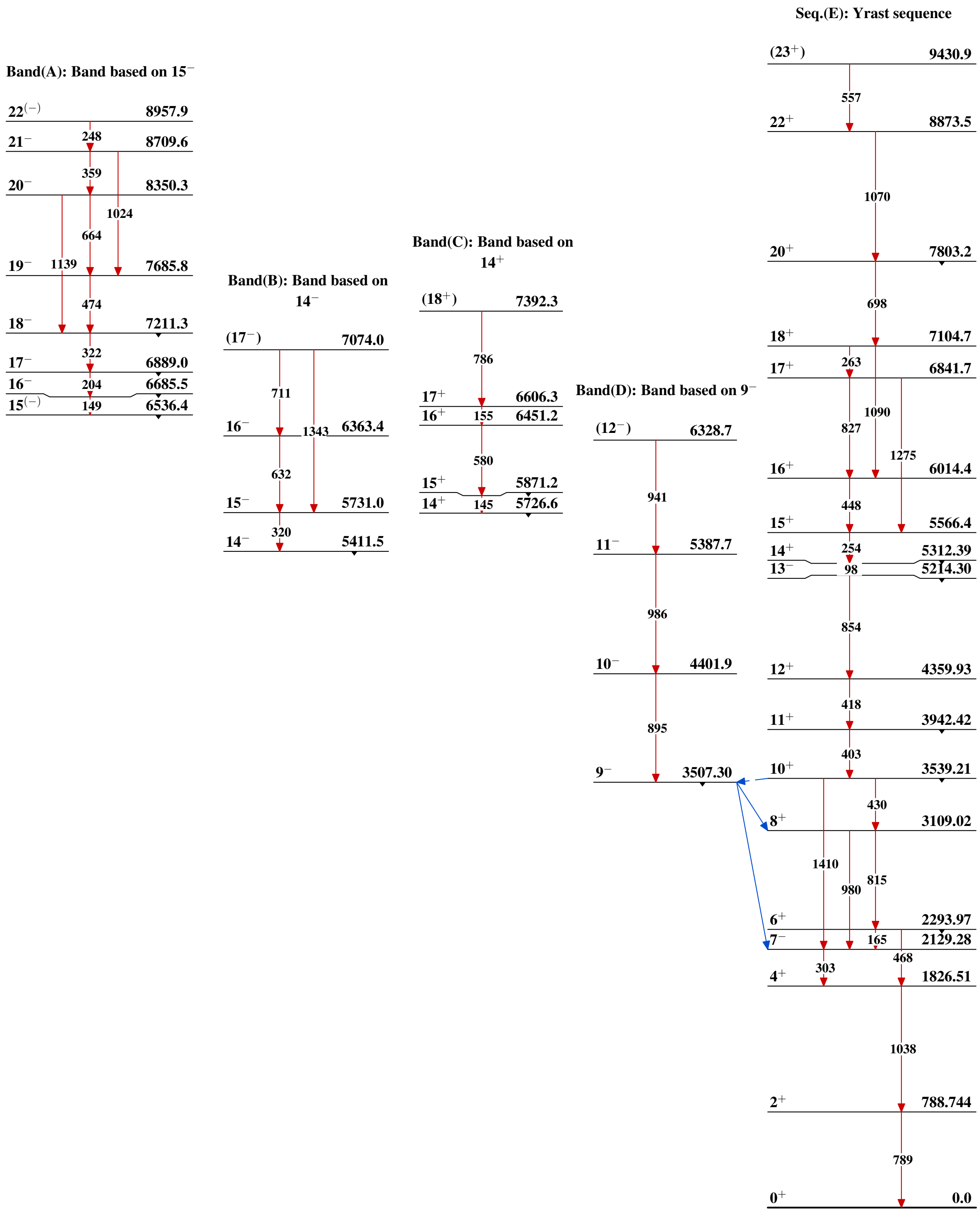
Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



$^{138}_{58}Ce_{80}$

Adopted Levels, Gammas



$^{138}_{58}Ce_{80}$

Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 154, 1 (2018)	20-Nov-2018

Q(β^-)=−3388 *6*; S(n)=9200 *7*; S(p)=8138.8 *17*; Q(α)=−1614.1 *16* 2017Wa10
Measured nuclear charge radii and isotopes shifts: 2000Ga58, 1999GaZU, 1999Is02, 1997Is06, 1997IsZY.

^{140}Ce Levels

Cross Reference (XREF) Flags

A	^{140}La β^- decay	H	^{140}Ce(γ,γ')	O	^{141}Pr(d,^{3}He)
B	^{140}Pr ε decay	I	^{140}Ce(e,e$'$)	P	^{142}Ce(p,t)
C	^{144}Nd α decay	J	^{140}Ce(n,n$'\gamma$)	Q	^{142}Nd(^{14}C,^{16}O)
D	^{138}Ba(^{3}He,n)	K	^{140}Ce(p,p$'$)	R	^{143}Nd(n,α),(n,$\alpha\gamma$)
E	^{138}Ba(α,2nγ)	L	^{140}Ce(α,α')	S	^{144}Nd(d,^{6}Li)
F	^{138}Ce(t,p)	M	^{140}Ce(α,$\alpha'\gamma$)	T	^{238}U(^{12}C,Fγ)
G	^{139}La(^{3}He,d)	N	^{140}Ce(^{17}O,^{17}O$'\gamma$)	U	Coulomb excitation

E(level)[†‡]	J$^\pi$	T$_{1/2}$	XREF	Comments
0.0[f]	0$^+$	stable	ABCDEFGHIJKLMNOPQRSTU	
1596.233[f] *23*	2$^+$	0.0910 ps *+48−44*	AB DEFGHIJKL NOPQRSTU	μ=+1.9 *2* (2014StZZ) T$_{1/2}$: from 2016Pr01 (weighted average of 12 measured values). J$^\pi$: L=2 in (p,p$'$). μ: measured by transient field integral perturbed angular correlation (1991Ba38). RMS charge radius <r^2>$^{1/2}$=4.8771 fm *18* (2013An02).
1903.31 *6*	0$^+$	0.40 ns *3*	AB EF JK NOP R	J$^\pi$: transition to 0$^+$ is E0. T$_{1/2}$: from ^{138}Ba (α,2nγ) (1984Ju01). Others: 0.27 ns *5* (1965Sa03), <0.6 ns (1966Bu19) (from ^{140}La β^- decay);
2083.259[f] *24*	4$^+$	3.45 ns *3*	A E G IJKL OPQR T	μ=+4.20 *15* Q=0.35 *7* (2013StZZ,2014StZZ) J$^\pi$: γ to 0$^+$ is E4. T$_{1/2}$: weighted average of 3.45 ns *9* (1971Bo13), 3.44 ns *6* (1962Cu02), 3.46 ns *3* (1963Do16) (^{140}La β^- decay). Others: 3.40 ns *9* (1989Ka01); 3.3 ns *2* (1993Gr08); 2.0 ns *4* from Γ in (e,e$'$); 3.7 ns *2* (1985PrZY), 4 ns *1* (1970Sm05) (α,2nγ). μ: weighted average of values: +4.00 *20* (2013Oh03), 4.06 *15* (1965Le16), 3.8 *4* (1964Sc16), 4.44 *16* (1963Ko07) 4.6 *3* (1963Ka03); all measured by time dependent perturbed angular correlation; 1965Le16 also by integral perturbed angular correlation. Q: measured by time dependent perturbed angular correlation (1973KlZV).
2107.854[f] *24*	6$^+$	7.3 μs *15*	A E IJ OP T	J$^\pi$: γ to 4$^+$ is E2, $\sigma(\theta)$ in (e,e$'$) (1985HeZW). T$_{1/2}$: from ^{138}Ba(α,2nγ) (1969Iv02); others: 8 μs (1966SuZY), 7 μs *2* (γ,n) (1964Kr02).
2347.881 *24*	2$^+$	≤0.2 ns	AB E IJ L O R	J$^\pi$: γ to 0$^+$ is E2. T$_{1/2}$: from ^{140}La β^- (1993Gr08,1990PeZR); other value: ≥0.62 ps (19933Go23, (n,n$'\gamma$)).
2349.805 *25*	5$^+$	≤12 ps	A E IJ L O R	T$_{1/2}$: from ^{140}La β^- (1995Ma75). J$^\pi$: γ to 6$^+$ is M1(+E2), γ to 4$^+$ is M1+E2.

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Adopted Levels, Gammas (continued)

^{140}Ce Levels (continued)

E(level)†‡	J^π	$T_{1/2}$	XREF	Comments
2412.013 *24*	3^+	1.3 ps *4*	A E G J O R	$T_{1/2}$: from ^{140}La β^- decay (1995Ma75); other value: ≥ 1.1 ps (19933Go23, (n,n′γ)). J^π: γ to 2^+, 2348 is M1, γ to 4^+ is M1+E2.
2464.08 *3*	3^-	0.15 ps *3*	A EFG IJKL N PQR U	J^π: L=3 in (p,p′), (α,α′). $T_{1/2}$: from Γ(0)=6.2×10^{-6} *7* in (e,e′) (1970Pi06) and adopted branching=0.0021 *3*. For $T_{1/2}$ from Coul ex see 1963Ha20. 1965Mc05, however, noticed that B(E3) in 1963Ha20 usually are 3-4 times too high; $T_{1/2}$≤0.1 ns in 1993Gr08.
2480.925 *24*	4^+	22 ps *7*	A E J	J^π: γ to 3^+ is M1, γ to 5^+ is M1+E2. $T_{1/2}$: from ^{140}La β^- decay (1995Ma75).
2515.76 *3*	4^+	≤2.5 ps	A E G J OP R	J^π: ΔJ=0 M1+E2 γ to 4^+ and E2 γ to 2^+ in (n,n′γ) (1993Go23). This removes the ambiguous 3^+,4^+ adopted by 1994Pe19, because M1+E2 γ to 4^+ agreed only with J=3 (β^- decay, (γγ(θ) for 432γ (1982Mi03)); and γ(θ) for 919γ in (n,n′γ) agree only with J=4 (1985Di11). $T_{1/2}$: from ^{140}La β^- decay (1995Ma75); other value: ≥ 0.62 ps (19933Go23, (n,n′γ)).
2521.428 *24*	2^+	≤2.4 ps	AB DE G J OP	$T_{1/2}$: from ^{140}La β^- decay (1966Bu19); other value: ≥ 0.62 ps (19933Go23, (n,n′γ)). J^π: γ to 0^+, g.s. is E2.
2547.23 *4*	1^+	0.19 ps *+11−5*	AB J R	J^π: γ to 0^+, g.s. is M1. $T_{1/2}$: from (n,n′γ) (1993Go23); other value: ≤ 4.0 ps from ^{140}La β^- decay (1995Ma75).
2628.81 *4*	6^+		E G J	J^π: γ to 6^+ is ΔJ=0, M1+E2 in (n,n′γ).
2658.3? *10*			E J	
2899.59 *4*	2^+	49 fs *9*	AB GHIJKL OP	J^π: γ to 0^+ is E2. $T_{1/2}$: from 1993Go23 in (n,n′γ); other values: 67 fs *16* (from Γ(0)=0.004 eV *9* with branching=0.59 *3* in (γ,γ′), 1995He25); 28 fs *2* (from Γ(0)=0.0095 eV *4*, same branching, in (e,e′)).
3001.12 *14*	2^+	0.16 ps *+10−5*	A J O	J^π: γ to 0^+, 1903; γ to 2^+, 1596 is M1+E2, γ(θ) in (n,n′γ) rejects J=1. $T_{1/2}$: from 1993Go23 in (n,n′γ).
3016.9 *5*	0^+	≥0.14 ps	B F J P	J^π: γ to 0^+ is E0. $T_{1/2}$: from 1993Go23 in (n,n′γ).
3039.0 *4*	3^-		J L	Additional information 1. E(level): no suitable γ rays to decay this level were found by 1993Go23 in (n,n′γ) that conclude that this level is inexsistent. However this might be the level populated by 808γ. J^π: L=3 in (α,α′).
3118.55 *16*	2^+	27.5 fs *85*	AB FGHIJKL NOP	J^π: L=2 in (α,α′). $T_{1/2}$: mean value with unc covering the values of 0.019 ps *3* ((n,n′γ), 1993Go23) and 0.036 ps *3* (from Γ(0)=0.0129 eV *10* (2006Vo11) in (γ,γ′)).
3120.34? *20*	2^+		J	Extra 2^+ level found only by 1985Di11 about 2 keV higher in energy than the previous 2^+, 3118.5 level found only by 1993Go23, both levels being mainly determined by a γ transition to g.s., which suggests that this can be a same level. J^π: E2 γ to g.s.
3122.11 *5*	4^+		J	J^π: E2 γ to 2^+ and γ to 5^+.
3168.3? *10*			E	
3219.95 *11*	(0^+)		J	J^π: postulated by 1993Go23 based on expected intensity rules.
3226 *2*	0^+#		F P	

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Adopted Levels, Gammas (continued)

^{140}Ce Levels (continued)

E(level)[†‡]	J^π	$T_{1/2}$	XREF	Comments
3255.70 *5*	5^-[&]		E G JKL	
3319.65 *6*	2^+	58 fs *+19−12*	AB HIJ	J^π: from analysis of $\sigma(\theta)$ in (e,e′) (1970Pi06). $T_{1/2}$: from 1993Go23 in (n,n′γ); other values: 154 fs *38* (from Γ(0)=0.0030 eV *3*, no branching, in (γ,γ′) (1995He25)); 35 fs *7* (from Γ(0)=0.019 eV *4*, no branching, in (e,e′)).
3335.47 *11*	4^+		FG J L P	J^π: L=4 in (α,α′).
3360.24 *18*			J	
3391.09 *8*			E J	J^π: γ′s to 2^+ and 4^+.
3394.92 *7*	(4^-)[@]	0.042 ps *+49−21*	A G JK	
3395.1? *10*	(4^+)[a]		E	
3408.02 *15*	(2^+)	≥0.062 ps	J	J^π: assigned by 1993Go23 as $(1,2^+)$ from γ to 0^+ g.s.; γ′s to 3^+ and 3^- are likely to exclude J=1. $T_{1/2}$: from 1993Go23 in (n,n′γ).
3424.6 *3*	7^-		E G IJ P T	J^π: γ to 6^+ is ΔJ=1, E1.
3432.8 *10*	7^+		E	J^π: γ to 5^+ is ΔJ=2, E2; no γ to J<5.
3436.54 *7*	$(2^+,1)$		J	J^π: γ′s to 0^+ and 2^+.
3471.21 *11*	(2^+)	0.097 ps *+76−35*	J	J^π: (E2) γ to 0^+. $T_{1/2}$: from 1993Go23 in (n,n′γ).
3473.75 *4*	3^-[@]	0.066 ps *+21−13*	A G JK	$T_{1/2}$: from 1993Go23 in (n,n′γ).
3476.3 *3*	8^-[a]		E T	
3484.2 *10*	6^+[a]		E	
3491.2? *3*			J	E(level): uncertain level by 1993Go23 in (n,n′γ) due to relatively weak population.
3492.23 *25*	9^-[a]	1.7 ns *2*	E T	$T_{1/2}$: from (α,2nγ) (1984En01,1985PrZY).
3512.3[f] *3*	8^+[a]		E T	
3520.87 *14*	(4^+)		A	J^π: L=(4) in (α,α′).
3522.2 *10*	(5)		E G	
3534.6 *10*	(3,4)[a]		E L	
3539.1 *3*	2^+	≥0.21 ps	J	J^π: E2 γ to 0^+ g.s. $T_{1/2}$: from 1993Go23 in (n,n′γ).
3551 *3*	$2^+,3^-$[#]		F K P	
3567.5 *3*	(2^+)		J	J^π: γ′s to 0^+ and 4^+.
3602			I	
3620.7 *6*	8^+[a]		E	
3642.8 *3*	1^-	1.45 fs *19*	H J MN	J^π: γ to 0^+ is E1. $T_{1/2}$: from (γ,γ′). Other value: ≤ 1.7 fs in (n,n′γ) (1993Go23).
3646.7 *6*	$(1,2^+)$	≥0.062 ps	J	J^π: γ to 0^+. $T_{1/2}$: from 1993Go23 in (n,n′γ).
3648.23 *14*	$(2^+,3,4^+)$		J	J^π: γ′s to 2^+ and 4^+.
3653 *3*	$2^+,3^-$[#]		F K P	
3657.64? *18*	$(4^+,5,6^+)$		J	E(level): uncertain level by 1993Go23 in (n,n′γ) due to relatively weak population. J^π: γ′s to 6^+ and 4^+.
3661.5 *10*	(7,8)		E	
3684.2 *6*	$(1^-,2^+)$		J	J^π: γ′s to 0^+ and 3^-.
3708.60 *13*	(2^+)		J	J^π: γ′s to 0^+ and 4^+.
3710 *4*	5^-[@]		FG K P	
3714.3[f] *3*	10^+[a]	23.1 ns *4*	E T	μ=+10.3 *4* (2014StZZ,1988Ka04) $T_{1/2}$: from 1984En01. Others: 26 ns *2* (1979BiZN), 27 ns *3* (1985PrZY), 22 ns *2* (1970Sm05) (α,2nγ). μ: measured by time dependent perturbed angular correlation.

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Adopted Levels, Gammas (continued)

^{140}Ce Levels (continued)

E(level)[†‡]	J$^{\pi}$	T$_{1/2}$	XREF	Comments
3723.54 *17*	(2^{+})	≥0.097 ps	J	J$^{\pi}$: (E2) γ to 0^{+} g.s.
3729 *2*	2^{+}		F P	J$^{\pi}$: L=2 in (t,p).
3735.3 *4*	(1,2^{+})		J	J$^{\pi}$: γ to 0^{+} g.s.
3746 *2*			F P	
3767.97 *10*	(2^{+},3^{+},4^{+})		J	J$^{\pi}$: γ's to 1^{+}, 2^{+} and 4^{+}.
3780	(3^{+},4^{+})		FG	J$^{\pi}$: L=0 component in (^{3}He,d).
3792.72 *15*	3^{-}[@]		JK P	
3836.1? *5*	(2^{+},3,4^{+})		J	J$^{\pi}$: γ's to 2^{+} and 4^{+}.
3847.10 *14*	(4^{+},5,6^{+})		J	J$^{\pi}$: γ's to 6^{+} and 4^{+}.
3853.2 *5*	(1,2^{+})		J	J$^{\pi}$: γ to 0^{+} g.s.
3879.3 *8*	(1,2^{+})		J	J$^{\pi}$: γ to 0^{+} g.s.
3894.5 *6*	9^{+}[a]		E	
3910.93 *23*			J	
3911 *10*	5^{-}		FG P	J$^{\pi}$: 4^{+},5^{-} from L in (p,t) (1977Sh06); 4^{+} excluded from L=5 in ^{139}La(^{3}He,d).
3912 *4*	2^{-}[@]		K	
3956 *4*			K	
3957.93 *18*			J	
3970.8? *10*			E	
3980	3^{-}		L P	J$^{\pi}$: L=3 from (α,α').
3984.20 *16*	(2^{+},3,4^{+})		J	J$^{\pi}$: γ's to 2^{+} and 4^{+}.
4000 *4*	4^{-}[@]		K	
4017 *10*			G P	
4053	(1)[d]		H	
4061			I	
4125 *10*	2^{+}[#]		d FG P	J$^{\pi}$: L=2 in (^{3}He,n).
4158 *4*	2^{-}[@]		d K	
4164.0 *3*	(1,2^{+})		J	J$^{\pi}$: γ to 0^{+} g.s.
4171.1 *7*	(2^{+},1)		FG J	J$^{\pi}$: γ's to 0^{+} and 2^{+}.
4173.6 *8*	1$^{(-)}$[b]	3.6[e] fs *7*	H MN	
4182 *4*	1^{-}[@]		K	
4183 *10*	2^{+},(3^{-},4^{+})		P	J$^{\pi}$: L=2,(3,4) in (p,t).
4208 *6*			K	
4242 *10*	2^{+}		FG P	J$^{\pi}$: 2^{+},1^{-} from L(p,t)=1,2; 1^{-} excluded from L(^{3}He,d)=0.
4262.5 *7*	10^{+}[a]		E	
4279.9 *4*	(2^{+},3,4^{+})		J	J$^{\pi}$: γ's to 2^{+} and 4^{+}.
4296 *6*	3^{-},4^{+}[#]		I K P	
4331	(1)[d]		H	
4340 *10*	(1^{-})[@]		K P	
4354.9 *7*	1[d]	3.7[e] fs *8*	H N	
4360 *10*	+		G P	J$^{\pi}$: L=2 in (^{3}He,d).
4364 *4*	1^{-}[@]		K	
4371	(1)[d]		H	
4388	(1)[d]		H	
4424 *4*	2^{+},3^{-}[#]		K P	
4437	(1)[d]		H	
4448.5 *11*	(9,11)[a]		E	
4450 *10*			K	
4485 *10*			K	
4514.9 *9*	1$^{(-)}$[b]	2.7[e] fs *5*	H MN	
4538 *4*	3^{-}[@]		K P	

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Adopted Levels, Gammas (continued)

^{140}Ce Levels (continued)

E(level)[†‡]	J^π	$T_{1/2}$	XREF	Comments
4571.3? 13	(8+,10+)		E	
4580 4	2−[@]		K	
4640 10			K	
4655	(1)[d]		H	
4660 15			K	
4700 10			I K	
4720 15			K	
4748 4	2−[@]		K P	
4760 15			K	
4770 10	1−[@]		K	
4787.8 9	1(−)[b]	2.3[e] fs 4	H MN	
4790 15			K	
4827 10	2+,3−[#]		P	
4851.1[f] 4	12+[a]		E T	
4860 10			K	
4875	(1)[d]		H	
4880 15			K	
4883	(1)[d]		H	
4904.6 5	11−[a]		E T	
4910 15			K	
4951	(1)[d]		H	
4958.0 8	(11+)[a]		E	
4979 10	2+,3−[#]		N P	
5000 15			K	
5026 6	2−,3−[@]		I K	
5050 15			K	
5069.5 11	(9,11)[a]		E	
5093.4 7	(12−)[a]		E T	
5101 10	≥5[#]		K P	Additional information 2.
5102.1 5	13−[a]		E T	
5140 15			K	
5157.3 12	1(−)[b]	2.6[e] fs 5	H M p	XREF: p(5160).
5160 15			K n p	XREF: n(5170).
5190.2 10	1(−)[b]	2.1[e] fs 4	H Mn	XREF: n(5170).
5196 6	2−,3−[@]		K	
5211.6 14	1(−)[b]	3.6[e] fs 9	H MN	
5230 15			K P	J^π: L(p,t)=2,3,4.
5245	(1)[d]		H	
5295 10	5−,6+[#]		P	
5330	(1)[d]		H	
5335.0 9	(12−)[a]		E	
5337.3 9	1(−)[b]	1.8[e] fs 4	H MN	
5377 10	4+,5−[#]		I P	
5419.0 4	(14−)[c]		T	
5424 6	2−,3−[@]		K	
5449 10			P	
5466 6	2−,3−[@]		K	
5470	(1)[d]		H	
5494	(1)[d]		H	

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Adopted Levels, Gammas (continued)

^{140}Ce Levels (continued)

E(level)[†‡]	J^π	$T_{1/2}$	XREF	Comments
5548.4 *7*	$1^{(-)}$[b]	0.97[e] fs *17*	H Mn	XREF: n(5560).
5573.8 *14*	$1^{(-)}$[b]	1.7[e] fs *4*	H Mn	XREF: n(5560).
5574 *15*	(0^+)[#]		P	
5624	(1)[d]		H	
5650 *15*	$2^+,3^-$[#]		P	
5659.9 *6*	1^-	0.0121 eV *29*	H MN	$T_{1/2}$: from (γ,γ') (1974Te01,1972Wo21). J^π: γ to 0^+ is E1.
5693.3 *5*			T	
5703 *15*	$1^-,2^+$[#]		P	
5721	(1)[d]		H	
5759	(1)[d]		H	
5789 *15*			P	J^π: L(p,t)=2,3,4.
5809	(1)[d]		H	
5823	(1)[d]		H	
5896 *15*	$1^-,2^+$[#]		P	
5928.6 *10*	$1^{(-)}$[b]	1.16[e] fs *24*	H M	
5940	(1)[d]		H	
5989 *15*	$(3^-,4^+)$[#]		P	
6029	(1)[d]		H	
6078 *15*	$2^+,3^-$[#]		P	
6119.1 *15*	1^-[d]	0.69[e] fs *12*	H	
6130.6 *12*	1[d]	1.5[e] fs *3*	H	
6161.7 *14*	$1^{(-)}$[b]	1.08[e] fs *20*	H MN	
6187 *15*	$2^+,3^-$[#]		P	
6226	(1)[d]		H	
6233			I	
6245	(1)[d]		H	
6255	(1)[d]		H	
6268 *15*			P	J^π: L(p,t)=3,4,5.
6273.6 *10*	1[d]	1.05[e] fs *20*	H	
6295.3 *8*	1^-[d]	0.46[e] fs *8*	H	
6303.6 *3*	(15^-)[c]		T	
6327.8 *12*	1[d]	1.3[e] fs *5*	H	
6343.3 *11*	1[d]	0.78[e] fs *15*	H	
6352.7 *10*	1[d]	0.69[e] fs *13*	H	
6364 *15*	$3^-,4^+$[#]		P	
6397.2 *8*	1^-[d]	0.28[e] fs *5*	H	
6439.9 *14*	$1^{(-)}$[d]	0.53[e] fs *9*	H	
6449.9 *15*	$1^{(-)}$[d]	0.90[e] fs *18*	H	
6458.5 *15*	$1^{(-)}$[d]	1.00[e] fs *20*	H	
6484.8 *10*	1[d]	1.00[e] fs *20*	H	
6497.0 *7*	1^-[d]	0.33[e] fs *6*	H	
6535.8 *6*	1^-[d]	0.22[e] fs *3*	H	
6549.1 *11*	1[d]	1.3[e] fs *3*	H	
6574.9 *15*	1[d]	1.16[e] fs *23*	H	
6605.5 *10*	$1^{(-)}$[d]	0.69[e] fs *12*	H	

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Adopted Levels, Gammas (continued)

^{140}Ce Levels (continued)

E(level)[†‡]	J$^{\pi}$	T$_{1/2}$	XREF	Comments
6616.2 *10*	$1^{(-)}$[d]	0.74[e] fs *13*	H	
6678			I	
6771.7 *14*	(2^{+})[d]		H	
6781.9 *15*	1[d]	0.85[e] fs *19*	H	
6796.6 *5*	(16^{-})[c]		T	
6841.8 *12*	1[d]	0.79[e] fs *22*	H	
6862.4 *7*	1^{-}[d]	0.24[e] fs *4*	H	
6889.2 *8*	(15,16)[c]		T	
6905.9 *15*	1[d]	0.45[e] fs *10*	H	
6932.6 *14*	1[d]	0.52[e] fs *11*	H	
6960.4 *12*	1[d]	0.47[e] fs *10*	H	
7038.2 *6*	(17^{-})[c]		T	
7050			I	
7206.0 *14*	1[d]	0.31[e] fs *5*	H	
7214.8 *15*	1[d]	0.34[e] fs *6*	H	
7341.5 *14*	1[d]	0.9[e] fs *2*	H	
7370	0^{+}		D	J$^{\pi}$: L=0 in (^{3}He,n).
7673.4 *12*	1[d]	0.76[e] fs *18*	H	

† From least-squares fit to γ energies.
‡ Additional information 3.
# From L in (p,t) (1977Sh06).
@ From analysis of (p,p′) *via* IAR decay (1969He13,1970He05).
& From L in (p,p′) (1977Sh06).
a From multipolarities deduced from α(K)exp and $\gamma(\theta)$ in (α,2nγ) (1979BiZN).
b From ^{140}Ce(α,$\alpha'\gamma$) dataset based on measured γ-ray multipolarity ($\alpha\gamma(\theta)$); only natural parities are excited under the kinematic conditions of the experiment.
c From ^{238}U(^{12}C,Fγ) dataset tentatively assigned by 2012As06 based on the following criteria: (i) Spin values increase with excitation energy, (ii) High-energy (low-energy) transitions likely have an E2 (M1) character, and (iii) Measured branching ratios as well as the existence or the absence of cross-over transitions place some conditions on the multipolarities.
d Based on measured multipolarity and parity of γ-ray that decays to 0^{+} g.s. in ^{140}Ce(γ,γ') dataset.
e From ^{140}Ce(γ,γ') dataset, deduced from Γ_0^2/Γ values in 2006Vo11, when available, assuming $\Gamma_0=\Gamma$ based on the observation of only the ground-state transitions. As no transitions other than those to the ground-state were observed, it is a reasonable approximation.
f Band(A): g.s. band.

Adopted Levels, Gammas (continued)

$\gamma(^{140}Ce)$

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[b]	δ[cg]	α[f]	$I_{(\gamma+ce)}$[e]	Comments
1596.233	2^+	1596.210 *35*	100	0.0	0^+	E2		8.98×10^{-4}		B(E2)(W.u.)=13.9 *7* α(K)=0.000676 *10*; α(L)=8.63×10^{-5} *12*; α(M)=1.79×10^{-5} *3* α(N)=3.97×10^{-6} *6*; α(O)=6.45×10^{-7} *9*; α(P)=4.92×10^{-8} *7*; α(IPF)=0.0001128 *16*
1903.31	0^+	306.9 *2*	100	1596.233	2^+	E2		0.0454		α(K)=0.0365 *6*; α(L)=0.00697 *10*; α(M)=0.001498 *22* α(N)=0.000327 *5*; α(O)=4.98×10^{-5} *7*; α(P)=2.42×10^{-6} *4* B(E2)(W.u.)=7.4 *10*
		1903.5		0.0	0^+	E0			57 *17*	ρ^2=13.5×10^{-3} *13* (2005Ki02). $I_{(\gamma+ce)}$: ce(K)=1.52 *15* if ce(K)(1596γ)=6.9 *4* (^{140}La β^-, 1967Ka12). More recent measurements of ce(K) are reflected in ρ^2, but ce(K) was not given (^{140}La ε, 1984Ju01).
2083.259	4^+	487.021 *12*	100.0 *13*	1596.233	2^+	E2		0.01159		B(E2)(W.u.)=0.1370 *12* α(K)=0.00966 *14*; α(L)=0.001527 *22*; α(M)=0.000324 *5* α(N)=7.11×10^{-5} *10*; α(O)=1.113×10^{-5} *16*; α(P)=6.77×10^{-7} *10*
		2083.2 *5*	0.03 *2*	0.0	0^+	E4		1.36×10^{-3}		α(K)=0.001162 *17*; α(L)=0.0001598 *23*; α(M)=3.35×10^{-5} *5* α(N)=7.43×10^{-6} *11*; α(O)=1.198×10^{-6} *17*; α(P)=8.83×10^{-8} *13* B(E4)(W.u.)=14 *10*
2107.854	6^+	24.595 *4*	100	2083.259	4^+	E2		697		B(E2)(W.u.)=0.29 *+8−5* α(L)=545 *8*; α(M)=122.0 *18* α(N)=25.9 *4*; α(O)=3.52 *5*; α(P)=0.000945 *14*
2347.881	2^+	445.5 *5*	0.07 *2*	1903.31	0^+	[E2]		0.01486		α(K)=0.01232 *18*; α(L)=0.00201 *3*; α(M)=0.000427 *7* α(N)=9.36×10^{-5} *14*; α(O)=1.458×10^{-5} *21*; α(P)=8.56×10^{-7} *13*
		751.637 *18*	100 *1*	1596.233	2^+	M1+E2	+0.38 *4*	0.00548 *9*		α(K)=0.00471 *8*; α(L)=0.000613 *10*; α(M)=0.0001277 *20* α(N)=2.83×10^{-5} *5*; α(O)=4.60×10^{-6} *8*; α(P)=3.54×10^{-7} *6* δ: +0.31 *+34−14* (1985Di11), +1.15 *+33−25* (1985Di11), +0.5 *+6−2* (1993Go23), all in (n,n′γ).
		2347.88 *5*	19.6 *7*	0.0	0^+	E2		8.45×10^{-4}		α(K)=0.000333 *5*; α(L)=4.15×10^{-5} *6*; α(M)=8.60×10^{-6} *12*

$^{140}_{58}Ce_{82}$-8

$\gamma(^{140}Ce)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[b]	δ[cg]	α[f]	Comments
									α(N)=1.91×10^{-6} *3*; α(O)=3.11×10^{-7} *5*; α(P)=2.42×10^{-8} *4*; α(IPF)=0.000460 *7*
2349.805	5$^+$	241.933 *30*	88.9 *17*	2107.854	6$^+$	M1+E2	−0.04[d] *+3−6*	0.1020	α(K)=0.0872 *13*; α(L)=0.01171 *17*; α(M)=0.00245 *4* α(N)=0.000543 *8*; α(O)=8.81×10^{-5} *13*; α(P)=6.70×10^{-6} *10* δ: −0.19 *10* ((n,n′γ), 1993Go23).
		266.543 *12*	100.0 *16*	2083.259	4$^+$	M1+E2	−0.04[d] *4*	0.0787	α(K)=0.0673 *10*; α(L)=0.00902 *13*; α(M)=0.00188 *3* α(N)=0.000418 *6*; α(O)=6.78×10^{-5} *10*; α(P)=5.17×10^{-6} *8* δ: −0.14 *12* in (^{140}La β^-, 1982Mi03), −0.069 *15* ((n,n′γ), 1993Go23).
2412.013	3$^+$	64.135 *10*	0.06 *1*	2347.881	2$^+$	M1		4.26	B(M1)(W.u.)=0.020 *+14−8* α(K)=3.63 *5*; α(L)=0.499 *7*; α(M)=0.1046 *15* α(N)=0.0232 *4*; α(O)=0.00375 *6*; α(P)=0.000281 *4*
		328.762 *8*	87.3 *17*	2083.259	4$^+$	M1+E2	−0.049 *6*	0.0453	α(K)=0.0388 *6*; α(L)=0.00516 *8*; α(M)=0.001078 *15* α(N)=0.000239 *4*; α(O)=3.88×10^{-5} *6*; α(P)=2.97×10^{-6} *5* B(M1)(W.u.)=0.22 *+10−5*; B(E2)(W.u.)=2.9 *+24−12* δ: +0.19 *4*, +13 *+11−5* ((n,n′γ), 1993Go23).
		815.772 *19*	100.0 *9*	1596.233	2$^+$	M1(+E2)	−0.03 *1*	0.00470	α(K)=0.00404 *6*; α(L)=0.000521 *8*; α(M)=0.0001085 *16* α(N)=2.41×10^{-5} *4*; α(O)=3.92×10^{-6} *6*; α(P)=3.05×10^{-7} *5* B(M1)(W.u.)=0.016 *+8−4*; B(E2)(W.u.)=0.013 *+21−9* δ: −0.06 *+3−2* (1985Di11), −0.056 *12* (1993Go23), in (n,n′γ).
2464.08	3$^-$	867.846 *20*	100 *1*	1596.233	2$^+$	E1		1.11×10^{-3}	B(E1)(W.u.)=0.0026 *+6−4* α(K)=0.000959 *14*; α(L)=0.0001200 *17*; α(M)=2.49×10^{-5} *4* α(N)=5.51×10^{-6} *8*; α(O)=8.92×10^{-7} *13*; α(P)=6.80×10^{-8} *10* Mult.,δ: E1 in (α,2nγ) and (n,n′γ). Small M2 admixture δ=−0.044 *20* (1991Ch05) in β- decay is incompatible with recommended upper limit (RUL) for B(M2)(W.u.).
		2464.1 *5*	0.21 *3*	0.0	0$^+$	[E3]		9.28×10^{-4}	α(K)=0.000514 *8*; α(L)=6.61×10^{-5} *10*; α(M)=1.375×10^{-5} *20* α(N)=3.05×10^{-6} *5*; α(O)=4.95×10^{-7} *7*; α(P)=3.81×10^{-8} *6*; α(IPF)=0.000331 *5* B(E3)(W.u.)=26 *+12−8*
2480.925	4$^+$	68.916 *6*	16.1 *5*	2412.013	3$^+$	M1		3.46	α(K)=2.95 *5*; α(L)=0.405 *6*; α(M)=0.0848 *12* α(N)=0.0188 *3*; α(O)=0.00304 *5*; α(P)=0.000228 *4* B(M1)(W.u.)=0.20 *+11−6*
		131.117 *8*	100 *2*	2349.805	5$^+$	M1+E2	−0.13 *+2−5*	0.553 *9*	α(K)=0.470 *7*; α(L)=0.0661 *22*; α(M)=0.0139 *5* α(N)=0.00307 *11*; α(O)=0.000495 *15*; α(P)=3.61×10^{-5} *6* B(M1)(W.u.)=0.18 *+9−5*; B(E2)(W.u.)=1.1×10^2 *+20−5* δ: +0.071 *16*, −35 *+40−12* ((n,n′γ), 1993Go23).

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$\gamma(^{140}Ce)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.[b]	δ[cg]	α[f]	Comments
2480.925	4^+	397.52 *5*	15.7 *10*	2083.259	4^+	(E2)		0.0206	α(K)=0.01699 *24*; α(L)=0.00289 *4*; α(M)=0.000616 *9* α(N)=0.0001349 *19*; α(O)=2.09×10^{-5} *3*; α(P)=1.166×10^{-6} *17* B(E2)(W.u.)=3.9 *+23−12* Mult.,δ: ΔJ=0 γ for which 1993Go23 give (M1+E2) with δ=+0.5 *+3−4*, in (n,n′γ).
2515.76	4^+	432.493 *12*	100 *1*	2083.259	4^+	M1+E2	−0.04 *2*	0.0224	α(K)=0.0192 *3*; α(L)=0.00253 *4*; α(M)=0.000527 *8* α(N)=0.0001170 *17*; α(O)=1.90×10^{-5} *3*; α(P)=1.461×10^{-6} *21* Mult.,δ: from (n,n′γ) (1993Go23).
		919.550 *23*	92 *1*	1596.233	2^+	E2		0.00242	α(K)=0.00207 *3*; α(L)=0.000281 *4*; α(M)=5.87×10^{-5} *9* α(N)=1.298×10^{-5} *19*; α(O)=2.08×10^{-6} *3*; α(P)=1.496×10^{-7} *21*
2521.428	2^+	109.422 *11*	3.18 *6*	2412.013	3^+	M1+E2	+0.26 *5*	0.952 *20*	α(K)=0.790 *12*; α(L)=0.128 *9*; α(M)=0.0271 *19* α(N)=0.0060 *4*; α(O)=0.00094 *6*; α(P)=5.98×10^{-5} *9* δ: the original unc of +0.26 *2* (1991Ch05, in ^{140}La β^- decay) was increased by evaluator because of exceeding RUL limit.
		173.543 *9*	1.84 *6*	2347.881	2^+	M1		0.252	α(K)=0.215 *3*; α(L)=0.0291 *4*; α(M)=0.00609 *9* α(N)=0.001351 *19*; α(O)=0.000219 *3*; α(P)=1.658×10^{-5} *24*
		438.5 *5*	0.57 *14*	2083.259	4^+				
		618.12 *5*	0.54 *6*	1903.31	0^+				
		925.189 *21*	100 *1*	1596.233	2^+	E2+M1	−0.22 *4*	0.00344 *6*	α(K)=0.00296 *5*; α(L)=0.000381 *6*; α(M)=7.92×10^{-5} *12* α(N)=1.76×10^{-5} *3*; α(O)=2.86×10^{-6} *5*; α(P)=2.22×10^{-7} *4* δ: +5.1 *5* (1985Di11), −0.17 *2* (1993Go23), in (n,n′g).
		2521.40 *5*	50.2 *6*	0.0	0^+	E2		8.81×10^{-4}	α(K)=0.000293 *5*; α(L)=3.65×10^{-5} *6*; α(M)=7.55×10^{-6} *11* α(N)=1.676×10^{-6} *24*; α(O)=2.73×10^{-7} *4*; α(P)=2.13×10^{-8} *3*; α(IPF)=0.000542 *8*
2547.23	1^+	950.987 *26*	100 *1*	1596.233	2^+	M1(+E2)	+0.01 *7*	0.00327	α(K)=0.00282 *4*; α(L)=0.000361 *5*; α(M)=7.52×10^{-5} *11* α(N)=1.669×10^{-5} *24*; α(O)=2.72×10^{-6} *4*; α(P)=2.12×10^{-7} *3* B(M1)(W.u.)=0.112 *42* δ: −0.10 *12* ((n,n′g), 1993Go23).
		2547.34 *11*	19.5 *6*	0.0	0^+	M1		9.62×10^{-4}	α(K)=0.000318 *5*; α(L)=3.97×10^{-5} *6*; α(M)=8.24×10^{-6} *12* α(N)=1.83×10^{-6} *3*; α(O)=2.99×10^{-7} *5*; α(P)=2.36×10^{-8} *4*; α(IPF)=0.000593 *9* B(M1)(W.u.)=0.00114 *+46−44*
2628.81	6^+	278.84# *13*	12.7# *16*	2349.805	5^+	M1,E2		0.066 *5*	α(K)=0.054 *6*; α(L)=0.0089 *10*; α(M)=0.00190 *23* α(N)=0.00042 *5*; α(O)=6.5×10^{-5} *5*; α(P)=3.9×10^{-6} *7*

$^{140}_{58}Ce_{82}$-10

Adopted Levels, Gammas (continued)

$\gamma(^{140}Ce)$ (continued)

E_i(level)	J^{π}_i	E_γ[†]	I_γ[†]	E_f	J^{π}_f	Mult.[b]	δ[cg]	α[f]	$I_{(\gamma+ce)}$[e]	Comments
2628.81	6^+	520.964[#] *25*	100[#] *5*	2107.854	6^+	E2+M1	−0.19[d] *6*	0.01387 *22*		α(K)=0.01189 *20*; α(L)=0.001563 *24*; α(M)=0.000326 *5* α(N)=7.23×10^{-5} *11*; α(O)=1.175×10^{-5} *18*; α(P)=9.01×10^{-7} *15* δ: +0.78 *15* ((n,n′g), 1985Di11).
2658.3?		575[h]	100	2083.259	4^+					
2899.59	2^+	996.2[#] *3*	3.2[#] *8*	1903.31	0^+					
		1303.38[#] *5*	53[#] *3*	1596.233	2^+	M1+E2	−1.5[d] *+10−4*	0.00132 *21*		α(K)=0.00111 *18*; α(L)=0.000143 *22*; α(M)=3.0×10^{-5} *5* α(N)=6.6×10^{-6} *10*; α(O)=1.07×10^{-6} *17*; α(P)=8.2×10^{-8} *15*; α(IPF)=2.19×10^{-5} *3* B(M1)(W.u.)=0.021 *+51−10*; B(E2)(W.u.)=17 *+8−13*
		2899.55[#] *4*	100[#] *5*	0.0	0^+	E2		9.79×10^{-4}		B(E2)(W.u.)=0.83 *+23−16* α(K)=0.000230 *4*; α(L)=2.84×10^{-5} *4*; α(M)=5.88×10^{-6} *9* α(N)=1.306×10^{-6} *19*; α(O)=2.13×10^{-7} *3*; α(P)=1.669×10^{-8} *24*; α(IPF)=0.000714 *10*
3001.12	2^+	1097.20 *23*	39 *8*	1903.31	0^+					
		1405.20 *17*	100 *12*	1596.233	2^+	(M1+E2)	+0.7[d] *3*	0.00127 *7*		α(K)=0.00106 *6*; α(L)=0.000135 *7*; α(M)=2.80×10^{-5} *15* α(N)=6.2×10^{-6} *4*; α(O)=1.01×10^{-6} *6*; α(P)=7.8×10^{-8} *5*; α(IPF)=4.75×10^{-5} *7* B(M1)(W.u.)=0.024 *+25−14*; B(E2)(W.u.)=3.5 *+50−27*
3016.9	0^+	1420.7[‡] *5*	100[‡] *15*	1596.233	2^+	E2		1.03×10^{-3}		α(K)=0.000846 *12*; α(L)=0.0001089 *16*; α(M)=2.27×10^{-5} *4* α(N)=5.02×10^{-6} *7*; α(O)=8.13×10^{-7} *12*; α(P)=6.15×10^{-8} *9*; α(IPF)=5.17×10^{-5} *8*
		3016.3[‡] *12*	[‡]	0.0	0^+	E0			0.022 *32*	
3118.55	2^+	3118.51 *16*	100	0.0	0^+	(E2)		1.04×10^{-3}		α(K)=0.000203 *3*; α(L)=2.50×10^{-5} *4*; α(M)=5.18×10^{-6} *8* α(N)=1.149×10^{-6} *16*; α(O)=1.87×10^{-7} *3*; α(P)=1.472×10^{-8} *21*; α(IPF)=0.000808 *12* B(E2)(W.u.)=1.6 *+7−4*

$^{140}_{58}Ce_{82}$-11

$\gamma(^{140}Ce)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[b]	α[f]	Comments
3120.34?	2+	3120.3[#h] 2	100[#]	0.0	0+	E2	1.04×10^{-3}	α(K)=0.000203 3; α(L)=2.50×10^{-5} 4; α(M)=5.17×10^{-6} 8 α(N)=1.148×10^{-6} 16; α(O)=1.87×10^{-7} 3; α(P)=1.470×10^{-8} 21; α(IPF)=0.000809 12
3122.11	4+	657.5[#] 4	2.9[#] 10	2464.08	3−			
		772.50[#] 13	23[#] 2	2349.805	5+			
		1525.85[#] 4	100[#] 5	1596.233	2+	E2	9.43×10^{-4}	α(K)=0.000737 11; α(L)=9.44×10^{-5} 14; α(M)=1.96×10^{-5} 3 α(N)=4.35×10^{-6} 6; α(O)=7.05×10^{-7} 10; α(P)=5.36×10^{-8} 8; α(IPF)=8.64×10^{-5} 12
3168.3?		1085[h]	100	2083.259	4+			E_γ: γ peak confounded with first Ge escape of intense 1596γ (1993Go23, (n,n′γ)).
3219.95	(0+)	1623.71[#] 10	100[#]	1596.233	2+			
3255.70	5−	739.94[#] 4	100[#] 6	2515.76	4+	(E1)	1.53×10^{-3}	α(K)=0.001319 19; α(L)=0.0001662 24; α(M)=3.45×10^{-5} 5 α(N)=7.63×10^{-6} 11; α(O)=1.234×10^{-6} 18; α(P)=9.33×10^{-8} 13
		774.8[#] 3	22[#] 4	2480.925	4+			
3319.65	2+	772.50[#h] 13	39[#] 3	2547.23	1+			
		1235.8[#h] 6	11[#] 4	2083.259	4+			
		1724.7[#h]	52[#] 3	1596.233	2+			
		3319.61[#] 6	100[#] 6	0.0	0+	E2	1.10×10^{-3}	α(K)=0.000182 3; α(L)=2.24×10^{-5} 4; α(M)=4.64×10^{-6} 7 α(N)=1.031×10^{-6} 15; α(O)=1.680×10^{-7} 24; α(P)=1.322×10^{-8} 19; α(IPF)=0.000892 13 B(E2)(W.u.)=0.29 9
3335.47	4+	855.1[#] 4	18[#] 4	2480.925	4+			
		985.63[#] 22	9[#] 3	2349.805	5+			
		1227.71[#h] 16	43[#] 5	2107.854	6+			
		1252.12[#] 13	100[#] 8	2083.259	4+			
		1739.4[#] 3	23[#] 4	1596.233	2+			
3360.24		1010.45[#] 19	100[#] 10	2349.805	5+			
		1276.9[#] 4	27[#] 8	2083.259	4+			
3391.09		1307.73[#] 10	100[#] 8	2083.259	4+			
		1794.93[#] 10	79[#] 5	1596.233	2+			
3394.92	(4−)	982.89[#h]	100[#] 6	2412.013	3+			
		1045.11[#] 7	74[#] 5	2349.805	5+			
		1287.03[#] 19	22[#] 3	2107.854	6+			
		1311.56[#h] 19	22[#] 3	2083.259	4+			
3395.1?	(4+)	983.1[h]	100	2412.013	3+	M1,E2	0.0026 5	α(K)=0.0022 5; α(L)=0.00029 5; α(M)=6.0×10^{-5} 10 α(N)=1.33×10^{-5} 22; α(O)=2.1×10^{-6} 4; α(P)=1.6×10^{-7} 4
3408.02	(2+)	886.42 22	100 11	2521.428	2+			

$^{140}_{58}Ce_{82}$-12

$\gamma(^{140}Ce)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[b]	α[f]	Comments
3408.02	(2+)	944.0 3	41 7	2464.08	3−			
		996.2 3	27 7	2412.013	3+			
		1811.0[h] 3	49 7	1596.233	2+			
		3408.1 4	57 7	0.0	0+			
3424.6	7−	1316.8[@] 3	100[@]	2107.854	6+	E1	6.01×10^{-4}	α(K)=0.000444 7; α(L)=5.48×10^{-5} 8; α(M)=1.134×10^{-5} 16 α(N)=2.51×10^{-6} 4; α(O)=4.08×10^{-7} 6; α(P)=3.16×10^{-8} 5; α(IPF)=8.84×10^{-5} 13
3432.8	7+	1083.0	100	2349.805	5+	E2	1.70×10^{-3}	α(K)=0.001459 21; α(L)=0.000194 3; α(M)=4.04×10^{-5} 6 α(N)=8.94×10^{-6} 13; α(O)=1.440×10^{-6} 21; α(P)=1.059×10^{-7} 15
3436.54	(2+,1)	1088.65[#] 6	100[#] 5	2347.881	2+			
		1533.2[#h] 4	6.2[#] 11	1903.31	0+			
		3436.8[#] 8	5.4[#] 12	0.0	0+			
3471.21	(2+)	1568.1[#] 5	16[#] 4	1903.31	0+			
		3471.15[#] 11	100[#] 6	0.0	0+	(E2)	1.15×10^{-3}	α(K)=0.0001690 24; α(L)=2.08×10^{-5} 3; α(M)=4.30×10^{-6} 6 α(N)=9.54×10^{-7} 14; α(O)=1.556×10^{-7} 22; α(P)=1.226×10^{-8} 18; α(IPF)=0.000951 14 B(E2)(W.u.)=0.23 +15−11
3473.75	3−	992.9 5	33 12	2480.925	4+			
		1125.64[#] 22	22[#] 3	2347.881	2+			
		1877.51 3	100 10	1596.233	2+			
3476.3	8−	51.7[@] 1	100[@]	3424.6	7−			
		848.2		2628.81	6+			
3484.2	6+	1134.4	100	2349.805	5+	E2	1.55×10^{-3}	α(K)=0.001325 19; α(L)=0.0001749 25; α(M)=3.65×10^{-5} 6 α(N)=8.07×10^{-6} 12; α(O)=1.302×10^{-6} 19; α(P)=9.63×10^{-8} 14; α(IPF)=1.211×10^{-6} 17
3491.2?		944.0[#] 3	100[#] 18	2547.23	1+			
		3491.2[#] 7	79[#] 18	0.0	0+			
3492.23	9−	15.7		3476.3	8−			
		69.5		3424.6	7−			
		1384.2[@] 3	[@]	2107.854	6+			
3512.3	8+	1404.4[@] 3	100[@]	2107.854	6+	E2	1.05×10^{-3}	α(K)=0.000865 13; α(L)=0.0001115 16; α(M)=2.32×10^{-5} 4 α(N)=5.14×10^{-6} 8; α(O)=8.32×10^{-7} 12; α(P)=6.29×10^{-8} 9; α(IPF)=4.69×10^{-5} 7
3520.87	(4+)	1924.62 13	100	1596.233	2+			
3522.2	(5)	1041.3		2480.925	4+			
3534.6	(3,4)	1184.8	100	2349.805	5+			
3539.1	2+	3539.1 3	100	0.0	0+	E2	1.17×10^{-3}	α(K)=0.0001636 23; α(L)=2.01×10^{-5} 3; α(M)=4.16×10^{-6} 6 α(N)=9.23×10^{-7} 13; α(O)=1.505×10^{-7} 21; α(P)=1.186×10^{-8} 17; α(IPF)=0.000978 14

$^{140}_{58}Ce_{82}$-13

$\gamma(^{140}Ce)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[b]	α[f]	Comments
3567.5	(2+)	1484.3[#] 3	100[#] 13	2083.259	4+			
		3567.0[#] 10	55[#] 16	0.0	0+			
3620.7	8+	992.2		2628.81	6+			
		1512.9		2107.854	6+			
3642.8	1−	1739.4[#h] 3	22[#] 4	1903.31	0+			
		3642.7[#] 3	100[#] 7	0.0	0+	E1	1.61×10^{-3}	α(K)=9.12×10^{-5} 13; α(L)=1.102×10^{-5} 16; α(M)=2.28×10^{-6} 4 B(E1)(W.u.)=0.0030 5 α(N)=5.05×10^{-7} 7; α(O)=8.24×10^{-8} 12; α(P)=6.50×10^{-9} 10; α(IPF)=0.001502 21 Mult.: from $\gamma(\theta)$ and linear pol in (γ,γ').
3646.7	(1,2+)	1743.31[#h] 22	75[#] 11	1903.31	0+			
		3646.6[#] 6	100[#] 18	0.0	0+			
3648.23	(2+,3,4+)	1564.92[#] 16	100[#] 8	2083.259	4+			
		2052.07[#] 22	69[#] 7	1596.233	2+			
3657.64?	(4+,5,6+)	1307.73[#h] 10	100[#] 3	2349.805	5+			
		1549.76[#] 19	45[#] 5	2107.854	6+			
		1574.5[#] 5	12[#] 4	2083.259	4+			
3661.5	(7,8)	1032.7		2628.81	6+			
3684.2	(1−,2+)	1220.5[#h] 3	100[#] 14	2464.08	3−			
		3684.1[#] 6	76[#] 12	0.0	0+			
3708.60	(2+)	1227.71[#] 16	81[#] 10	2480.925	4+			
		2112.30[#] 19	100[#] 8	1596.233	2+			
		3708.1[#] 11	33[#] 8	0.0	0+			
3714.3	10+	202.0[@] 3	54[@] 12	3512.3	8+	E2	0.178	α(K)=0.1351 20; α(L)=0.0335 5; α(M)=0.00731 12 α(N)=0.001583 24; α(O)=0.000234 4; α(P)=8.31×10^{-6} 13 B(E2)(W.u.)=0.55 14
		222.0[@] 3	100[@] 15	3492.23	9−	E1	0.0274	α(K)=0.0235 4; α(L)=0.00311 5; α(M)=0.000646 10 α(N)=0.0001423 21; α(O)=2.26×10^{-5} 4; α(P)=1.555×10^{-6} 23 B(E1)(W.u.)=6.0×10^{-7} 10
3723.54	(2+)	1311.56[#] 19	45[#] 7	2412.013	3+			
		3723.4[#] 3	100[#] 7	0.0	0+	(E2)	1.23×10^{-3}	α(K)=0.0001502 21; α(L)=1.84×10^{-5} 3; α(M)=3.81×10^{-6} 6 α(N)=8.46×10^{-7} 12; α(O)=1.381×10^{-7} 20; α(P)=1.089×10^{-8} 16; α(IPF)=0.001053 15
3735.3	(1,2+)	3735.2[#] 4	100[#]	0.0	0+			
3767.97	(2+,3+,4+)	1220.5[#] 3	34[#] 5	2547.23	1+			
		1252.12[#h] 13	98[#] 8	2515.76	4+			
		1287.03[#] 19	36[#] 5	2480.925	4+			

$\gamma(^{140}Ce)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[b]	α[f]	Comments
3767.97	$(2^+,3^+,4^+)$	1684.4[#] 3	23[#] 3	2083.259	4^+			
		2171.82[#] 13	100[#] 6	1596.233	2^+			
3792.72	3^-	893.7[#] 3	100[#] 13	2899.59	2^+			
		1276.9[#] 4	48[#] 14	2515.76	4^+			
		1311.56[#] 19	94[#] 14	2480.925	4^+			
		2196.6[#] 6	93[#] 10	1596.233	2^+			
3836.1?	$(2^+,3,4^+)$	1753.1[#h] 4	32[#] 10	2083.259	4^+			
		2239.8[#] 5	100[#] 17	1596.233	2^+			
3847.10	$(4^+,5,6^+)$	808.1[#] 3	49[#] 7	3039.0	3^-			
		1497.31[#] 22	100[#] 10	2349.805	5^+			
		1739.4[#] 3	38[#] 6	2107.854	6^+			
		1763.6[#] 3	47[#] 6	2083.259	4^+			
3853.2	$(1,2^+)$	2256.8[#] 7	30[#] 8	1596.233	2^+			
		3853.3[#] 6	100[#] 11	0.0	0^+			
3879.3	$(1,2^+)$	3879.2[#] 8	100[#]	0.0	0^+			
3894.5	9^+	180.0		3714.3	10^+			
		274.2		3620.7	8^+			
		382.3		3512.3	8^+			
3910.93		2314.68[#] 22	100[#]	1596.233	2^+			
3957.93		1493.6[#] 3	69[#] 9	2464.08	3^-			
		2361.80[#] 22	100[#] 9	1596.233	2^+			
3970.8?		1621.0[h]		2349.805	5^+			
3984.20	$(2^+,3,4^+)$	1901.4[#] 5	87[#] 19	2083.259	4^+			
		2387.90[#] 16	100[#] 15	1596.233	2^+			
4053	(1)	4053[&]	100	0.0	0^+	(D)		
4164.0	$(1,2^+)$	2567.8[#] 3	100[#] 16	1596.233	2^+			
		4163.5[#] 9	53[#] 18	0.0	0^+			
4171.1	$(2^+,1)$	2576.1[#h] 6	31[#] 10	1596.233	2^+			
		4171.0[#] 7	100[#] 14	0.0	0^+			
4173.6	$1^{(-)}$	4173.5 8	100	0.0	0^+	[E1]	0.00180	α(K)=7.56×10^{-5} 11; α(L)=9.12×10^{-6} 13; α(M)=1.88×10^{-6} 3 α(N)=4.18×10^{-7} 6; α(O)=6.81×10^{-8} 10; α(P)=5.39×10^{-9} 8; α(IPF)=0.001714 24 B(E1)(W.u.)=9.6×10^{-4} +23−16 E_γ: from $(\alpha,\alpha'\gamma)$ and (γ,γ').
4262.5	10^+	368.1		3894.5	9^+			
		548.3		3714.3	10^+			

$^{140}_{58}Ce_{82}$-15

$\gamma(^{140}Ce)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[b]	α[f]	Comments
4279.9	(2+,3,4+)	2196.6[#] *4*	74[#] *8*	2083.259	4+			
		2683.6[#] *7*	100[#] *12*	1596.233	2+			
4331	(1)	4331[&]	100	0.0	0+	(D)		
4354.9	1	4354.8[&] *7*	100	0.0	0+	D		
4371	(1)	4371[&]	100	0.0	0+	(D)		
4388	(1)	4388[&]	100	0.0	0+	(D)		
4437	(1)	4437[&]	100	0.0	0+	(D)		
4448.5	(9,11)	734.2	100	3714.3	10+			
4514.9	1(−)	4514.8[a] *9*	100	0.0	0+	[E1]	0.00192	α(K)=6.80×10^{-5} *10*; α(L)=8.19×10^{-6} *12*; α(M)=1.691×10^{-6} *24* α(N)=3.75×10^{-7} *6*; α(O)=6.12×10^{-8} *9*; α(P)=4.84×10^{-9} *7*; α(IPF)=0.00184 *3* B(E1)(W.u.)=0.00101 *+23−16*
4571.3?	(8+,10+)	1058.4[h]		3512.3	8+			
4655	(1)	4655[&]	100	0.0	0+	(D)		
4787.8	1(−)	4787.7[a] *9*	100	0.0	0+	[E1]	0.00201	α(K)=6.28×10^{-5} *9*; α(L)=7.57×10^{-6} *11*; α(M)=1.562×10^{-6} *22* α(N)=3.47×10^{-7} *5*; α(O)=5.65×10^{-8} *8*; α(P)=4.47×10^{-9} *7*; α(IPF)=0.00194 *3* B(E1)(W.u.)=9.9×10^{-4} *+21−15*
4851.1	12+	588.8		4262.5	10+			
		1136.8[@] *3*	100[@]	3714.3	10+	E2	1.54×10^{-3}	α(K)=0.001320 *19*; α(L)=0.0001741 *25*; α(M)=3.63×10^{-5} *5* α(N)=8.03×10^{-6} *12*; α(O)=1.296×10^{-6} *19*; α(P)=9.59×10^{-8} *14*; α(IPF)=1.304×10^{-6} *22*
4875	(1)	4875[&]	100	0.0	0+	(D)		
4883	(1)	4883[&]	100	0.0	0+	(D)		
4904.6	11−	1190.3[@] *4*	100[@]	3714.3	10+	E1	6.38×10^{-4}	α(K)=0.000530 *8*; α(L)=6.57×10^{-5} *10*; α(M)=1.360×10^{-5} *19* α(N)=3.01×10^{-6} *5*; α(O)=4.90×10^{-7} *7*; α(P)=3.78×10^{-8} *6*; α(IPF)=2.44×10^{-5} *4*
4951	(1)	4951[&]	100	0.0	0+	(D)		
4958.0	(11+)	1465.9	100	3492.23	9−			
5069.5	(9,11)	1355.2	100	3714.3	10+	D		
5093.4	(12−)	135.3		4958.0	(11+)			
		188.9[@] *5*	100[@]	4904.6	11−			
5102.1	13−	250.9[@] *3*	100[@]	4851.1	12+	E1	0.0198	α(K)=0.01700 *25*; α(L)=0.00224 *4*; α(M)=0.000465 *7* α(N)=0.0001024 *15*; α(O)=1.632×10^{-5} *24*; α(P)=1.137×10^{-6} *17*
5157.3	1(−)	5157.2[a] *12*	100	0.0	0+	[E1]	0.00211	α(K)=5.70×10^{-5} *8*; α(L)=6.85×10^{-6} *10*; α(M)=1.414×10^{-6} *20* α(N)=3.14×10^{-7} *5*; α(O)=5.12×10^{-8} *8*; α(P)=4.05×10^{-9} *6*; α(IPF)=0.00205 *3* B(E1)(W.u.)=7.0×10^{-4} *+17−11*

γ(^{140}Ce) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[b]	α[f]	$I_{(\gamma+ce)}$[e]	Comments
5190.2	$1^{(-)}$	5190.1[a] *10*	100	0.0	0^+	[E1]	0.00212		α(K)=5.65×10^{-5} *8*; α(L)=6.80×10^{-6} *10*; α(M)=1.402×10^{-6} *20* α(N)=3.11×10^{-7} *5*; α(O)=5.08×10^{-8} *8*; α(P)=4.02×10^{-9} *6*; α(IPF)=0.00206 *3* B(E1)(W.u.)=8.5×10^{-4} *+20−14*
5211.6	$1^{(-)}$	5211.5[a] *14*	100	0.0	0^+	[E1]	0.00213		α(K)=5.62×10^{-5} *8*; α(L)=6.76×10^{-6} *10*; α(M)=1.395×10^{-6} *20* α(N)=3.09×10^{-7} *5*; α(O)=5.05×10^{-8} *7*; α(P)=4.00×10^{-9} *6*; α(IPF)=0.00207 *3* B(E1)(W.u.)=4.9×10^{-4} *+17−10*
5245	(1)	5245[&]	100	0.0	0^+	(D)			
5330	(1)	5330[&]	100	0.0	0^+	(D)			
5335.0	(12^-)	232.6		5102.1	13^-				
		377.4		4958.0	(11^+)				
5337.3	$1^{(-)}$	5337.2[a] *9*	100	0.0	0^+	[E1]	0.00217		α(K)=5.45×10^{-5} *8*; α(L)=6.55×10^{-6} *10*; α(M)=1.351×10^{-6} *19* α(N)=3.00×10^{-7} *5*; α(O)=4.89×10^{-8} *7*; α(P)=3.87×10^{-9} *6*; α(IPF)=0.00210 *3* B(E1)(W.u.)=9.1×10^{-4} *+26−17*
5419.0	(14^-)	318.0[@] *4*	100[@]	5102.1	13^-				
5470	(1)	5470[&]	100	0.0	0^+	(D)			
5494	(1)	5494[&]	100	0.0	0^+	(D)			
5548.4	$1^{(-)}$	5548.3[a] *7*	100	0.0	0^+	[E1]	0.00223		α(K)=5.18×10^{-5} *8*; α(L)=6.22×10^{-6} *9*; α(M)=1.284×10^{-6} *18* α(N)=2.85×10^{-7} *4*; α(O)=4.65×10^{-8} *7*; α(P)=3.68×10^{-9} *6*; α(IPF)=0.00217 *3* B(E1)(W.u.)=0.00151 *+32−23*
5573.8	$1^{(-)}$	5573.7[a] *14*	100	0.0	0^+	[E1]	0.00223		α(K)=5.15×10^{-5} *8*; α(L)=6.19×10^{-6} *9*; α(M)=1.276×10^{-6} *18* α(N)=2.83×10^{-7} *4*; α(O)=4.62×10^{-8} *7*; α(P)=3.66×10^{-9} *6*; α(IPF)=0.00218 *3* B(E1)(W.u.)=8.5×10^{-4} *+26−16*
5624	(1)	5624[&]		0.0	0^+	(D)			
5659.9	1^-	5659.8[a] *6*	100	0.0	0^+	E1	0.00226	93 *5*	α(K)=5.05×10^{-5} *7*; α(L)=6.06×10^{-6} *9*; α(M)=1.251×10^{-6} *18* α(N)=2.78×10^{-7} *4*; α(O)=4.53×10^{-8} *7*; α(P)=3.59×10^{-9} *5*; α(IPF)=0.00220 *3* B(E1)(W.u.)=3.7×10^{-5} *9* Mult.: from $\gamma(\theta)$ and linear pol in (γ,γ'). $I_{(\gamma+ce)}$: from $\Gamma(\gamma_0)/\Gamma(\gamma)$=0.93 *5* in ($\gamma$,$\gamma'$).
5693.3		592.3[@] *5*	100[@]	5102.1	13^-				
5721	(1)	5721[&]	100	0.0	0^+	(D)			
5759	(1)	5759[&]	100	0.0	0^+	(D)			
5809	(1)	5809[&]	100	0.0	0^+	(D)			
5823	(1)	5823[&]	100	0.0	0^+	(D)			

$^{140}_{58}$Ce$_{82}$-17

$\gamma(^{140}Ce)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[b]	α[f]	Comments
5928.6	$1^{(-)}$	5928.5[a] *10*	100	0.0	0^+	[E1]	0.00233	α(K)=4.75×10^{-5} *7*; α(L)=5.71×10^{-6} *8*; α(M)=1.178×10^{-6} *17* B(E1)(W.u.)=0.00104 *+27−18* α(N)=2.61×10^{-7} *4*; α(O)=4.27×10^{-8} *6*; α(P)=3.38×10^{-9} *5*; α(IPF)=0.00227 *4*
5940	(1)	5940[&]	100	0.0	0^+	(D)		
6029	(1)	6029[&]	100	0.0	0^+	(D)		
6119.1	1^-	6119.0[&] *15*	100	0.0	0^+	E1		B(E1)(W.u.)=0.00159 *+34−24*
6130.6	1	6130.5[&] *12*	100	0.0	0^+	D		
6161.7	$1^{(-)}$	6161.6[a] *14*	100	0.0	0^+	[E1]		B(E1)(W.u.)=9.9×10^{-4} *+23−16*
6226	(1)	6226[&]	100	0.0	0^+	(D)		
6245	(1)	6245[&]	100	0.0	0^+	(D)		
6255	(1)	6255[&]	100	0.0	0^+	(D)		
6273.6	1	6273.4[&] *10*	100	0.0	0^+	D		
6295.3	1^-	6295.1[&] *8*	100	0.0	0^+	E1		B(E1)(W.u.)=0.00219 *+46−33*
6303.6	(15^-)	1202.6[@] *3*	100[@]	5102.1	13^-			
6327.8	1	6327.6[&] *12*	100	0.0	0^+	D		
6343.3	1	6343.1[&] *11*	100	0.0	0^+	D		
6352.7	1	6352.5[&] *10*	100	0.0	0^+	D		
6397.2	1^-	6397.0[&] *8*	100	0.0	0^+	E1		B(E1)(W.u.)=0.0034 *+8−5*
6439.9	$1^{(-)}$	6439.7[&] *14*	100	0.0	0^+	(E1)		B(E1)(W.u.)=0.00177 *+37−26*
6449.9	$1^{(-)}$	6449.7[&] *15*	100	0.0	0^+	(E1)		B(E1)(W.u.)=0.00104 *+26−17*
6458.5	$1^{(-)}$	6458.3[&] *15*	100	0.0	0^+	(E1)		B(E1)(W.u.)=9.3×10^{-4} *+23−16*
6484.8	1	6484.6[&] *10*	100	0.0	0^+	D		
6497.0	1^-	6496.8[&] *7*	100	0.0	0^+	E1		B(E1)(W.u.)=0.0028 *+6−4*
6535.8	1^-	6535.6[&] *6*	100	0.0	0^+	E1		B(E1)(W.u.)=0.0041 *+7−5*
6549.1	1	6548.9[&] *11*	100	0.0	0^+	D		
6574.9	1	6574.7[&] *15*	100	0.0	0^+	D		
6605.5	$1^{(-)}$	6605.3[&] *10*	100	0.0	0^+	(E1)		B(E1)(W.u.)=0.00126 *+27−19*
6616.2	$1^{(-)}$	6616.0[&] *10*	100	0.0	0^+	(E1)		B(E1)(W.u.)=0.00117 *+25−18*
6771.7	(2^+)	6771.5[&] *14*	100	0.0	0^+	(E2)		
6781.9	1	6781.7[&] *15*	100	0.0	0^+	D		
6796.6	(16^-)	493.0[@] *4*	100[@]	6303.6	(15^-)			
6841.8	1	6841.6[&] *12*	100	0.0	0^+	D		
6862.4	1^-	6862.2[&] *7*	100	0.0	0^+	E1		B(E1)(W.u.)=0.0032 *+7−5*
6889.2	(15,16)	1470.2[@] *7*	100[@]	5419.0	(14^-)			
6905.9	1	6905.7[&] *15*	100	0.0	0^+	D		

$^{140}_{58}Ce_{82}$-18

Adopted Levels, Gammas (continued)

$\gamma(^{140}Ce)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[b]
6932.6	1	6932.4[&] *14*	100	0.0	0^+	D
6960.4	1	6960.2[&] *12*	100	0.0	0^+	D
7038.2	(17^-)	734.6[@] *5*	100[@]	6303.6	(15^-)	
7206.0	1	7205.8[&] *14*	100	0.0	0^+	D
7214.8	1	7214.6[&] *15*	100	0.0	0^+	D
7341.5	1	7341.3[&] *14*	100	0.0	0^+	D
7673.4	1	7673.2[&] *12*	100	0.0	0^+	D

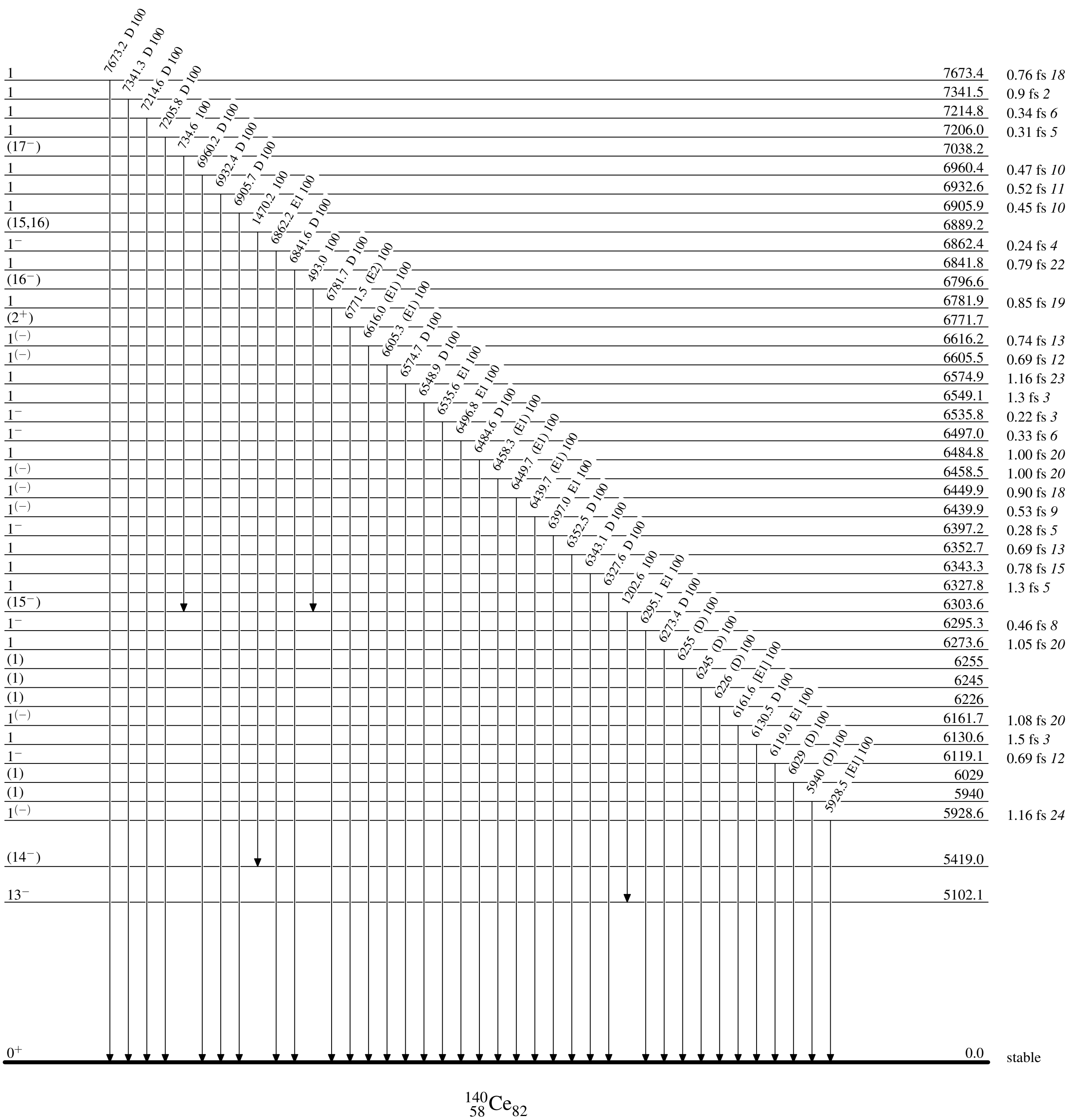
[†] Unless noted by footnote γ's with $\Delta E\gamma$ are from ^{140}La β^-, and γ's with no $\Delta E\gamma$ are from ^{138}Ba(α,2nγ).
[‡] From ^{140}Pr ε Decay.
[#] From ^{140}Ce(n,n$'\gamma$).
[@] From ^{238}U(^{12}C,Fγ)).
[&] From ^{140}Ce(γ,γ') dataset.
[a] From (α,$\alpha'\gamma$) and (γ,γ') datasets.
[b] From α(K)exp, $\gamma(\theta)$, $\gamma\gamma(\theta)$, linear pol in β^- and ε decay and in different nuclear reactions.
[c] From ^{140}La β^- by $\gamma\gamma(\theta)$ (1982Mi03), except where noted.
[d] From ^{140}Ce(n,n$'\gamma$) by $\gamma(\theta)$ assuming that D+Q is M1+E2 and Q is E2. In many cases lineal pol measurements determine explicitly the electric or magnetic type.
[e] From ^{140}Pr ε decay, except as noted.
[f] Additional information 4.
[g] If no value given it was assumed δ=1.00 for E2/M1, δ=1.00 for E3/M2 and δ=0.10 for the other multipolarities.
[h] Placement of transition in the level scheme is uncertain.

$^{140}_{58}Ce_{82}$-19

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



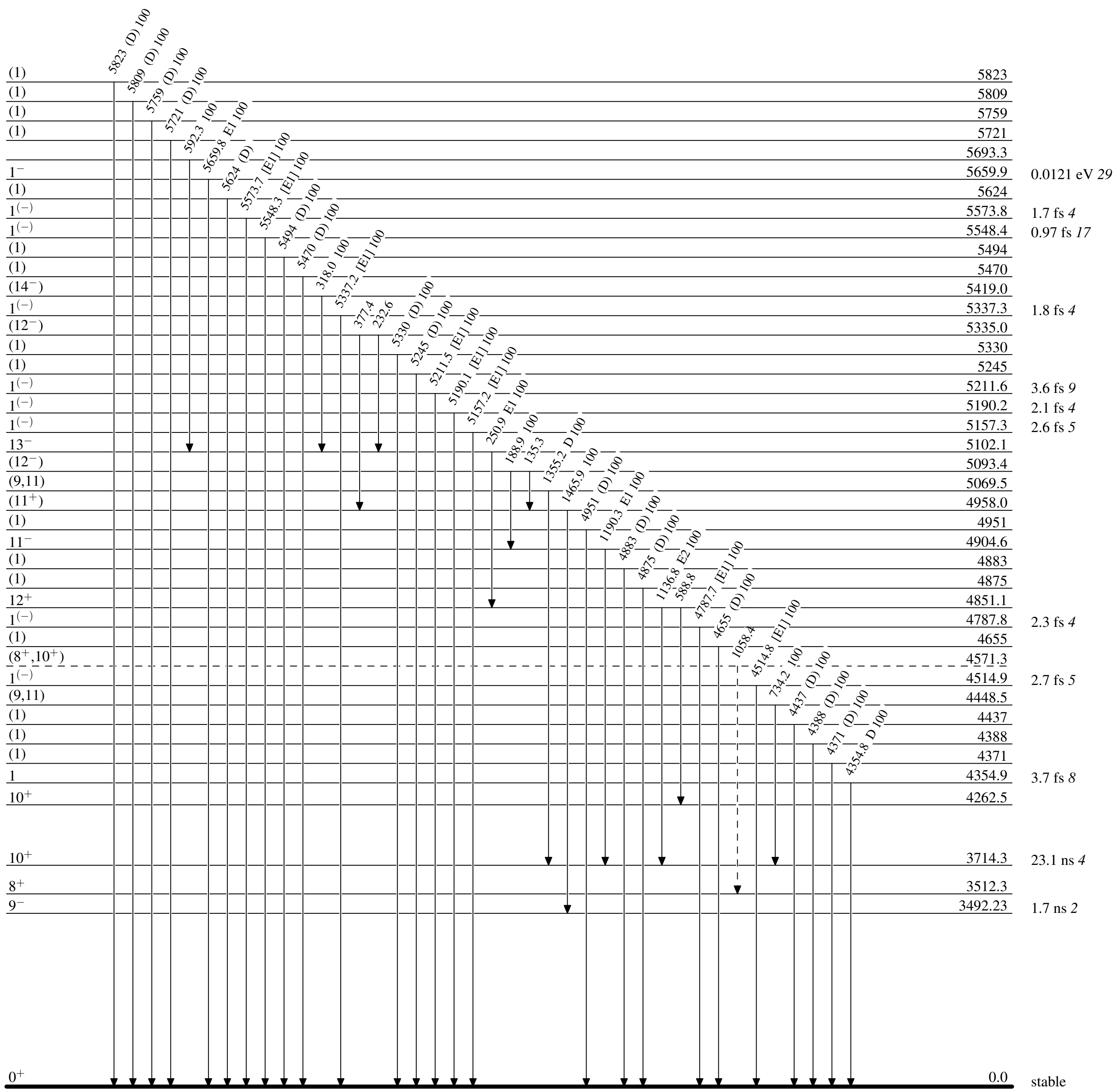
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{140}_{58}Ce_{82}$

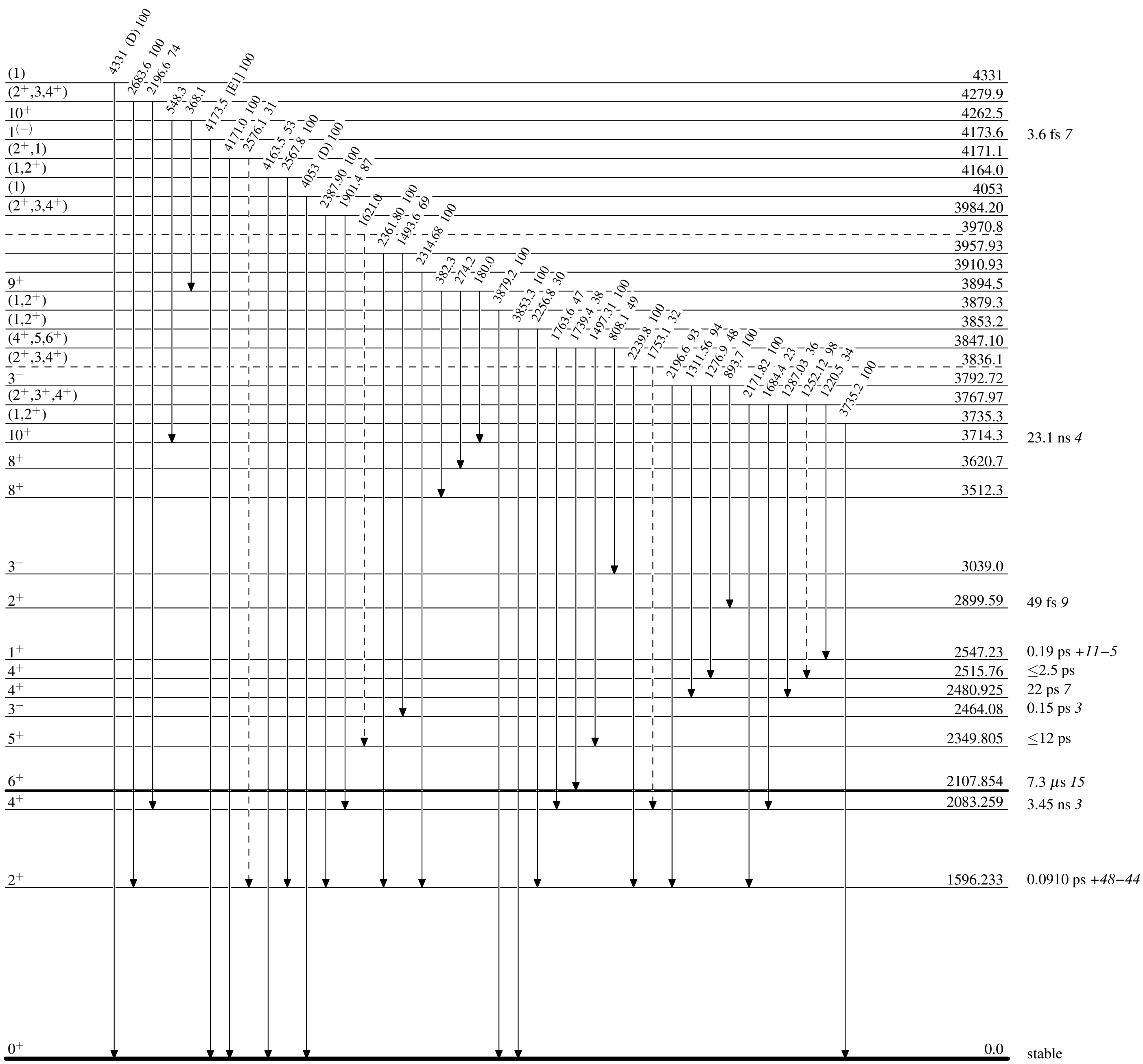
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{140}_{58}Ce_{82}$

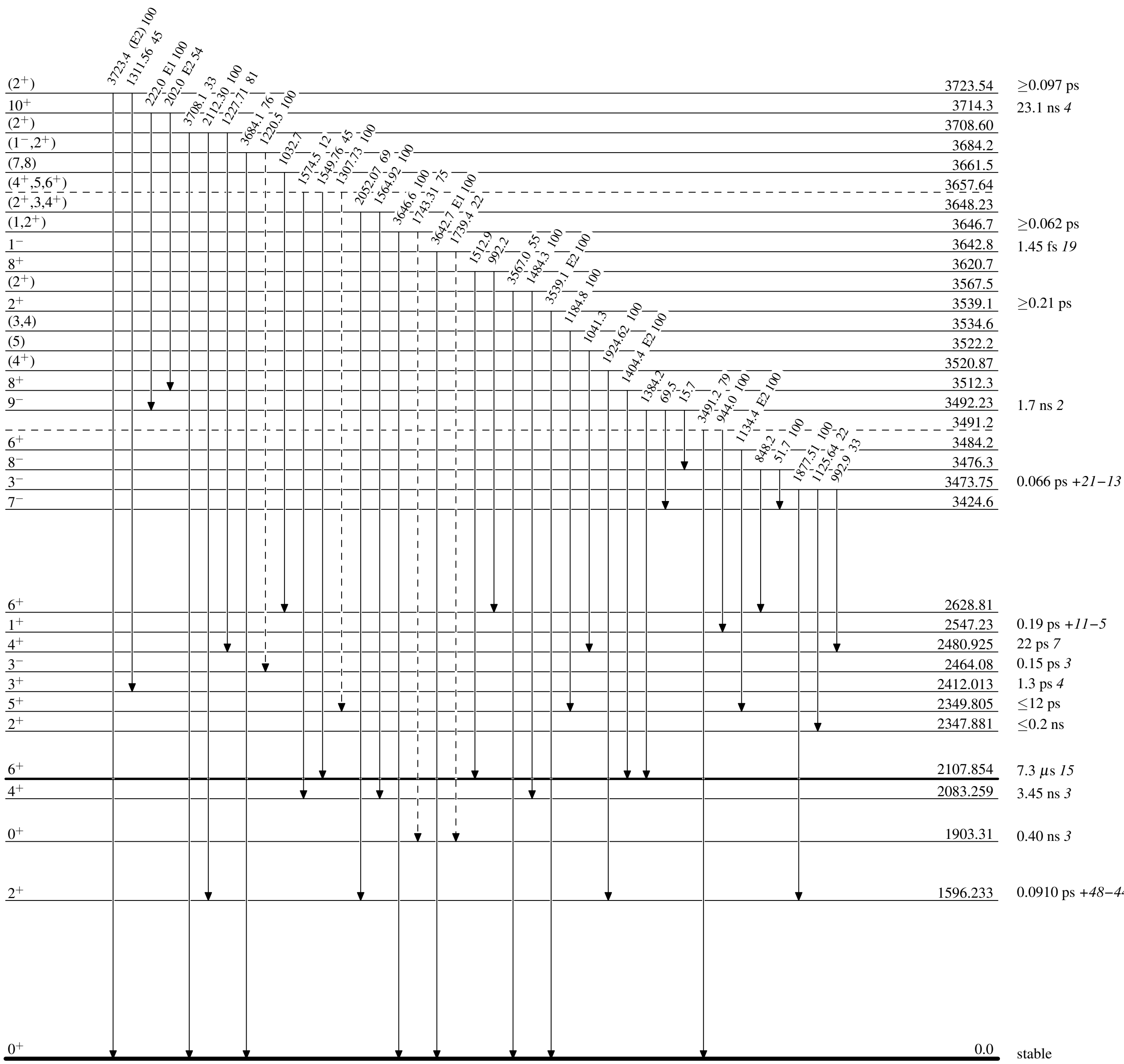
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{140}_{58}Ce_{82}$

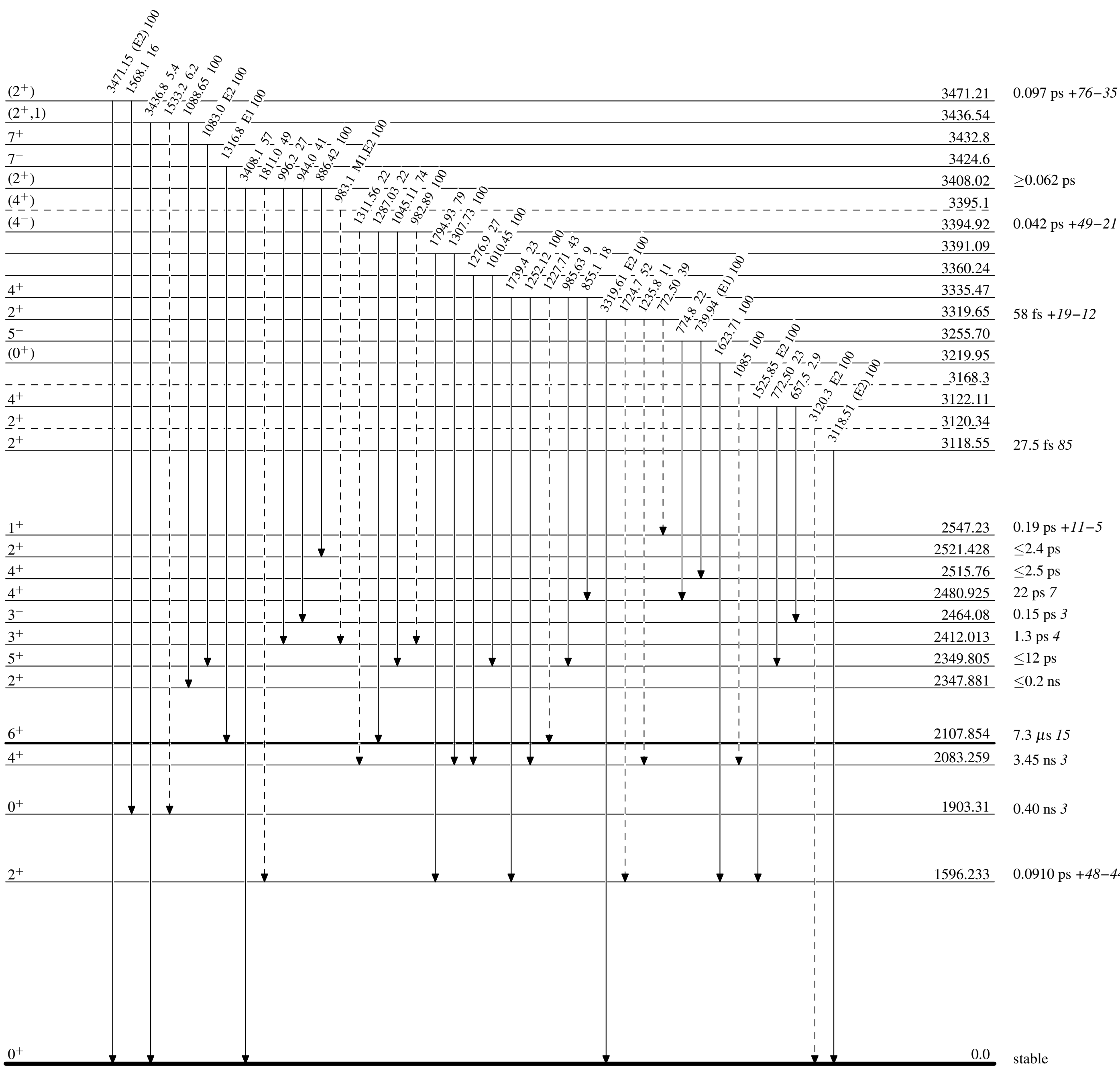
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

Legend

γ Decay (Uncertain)

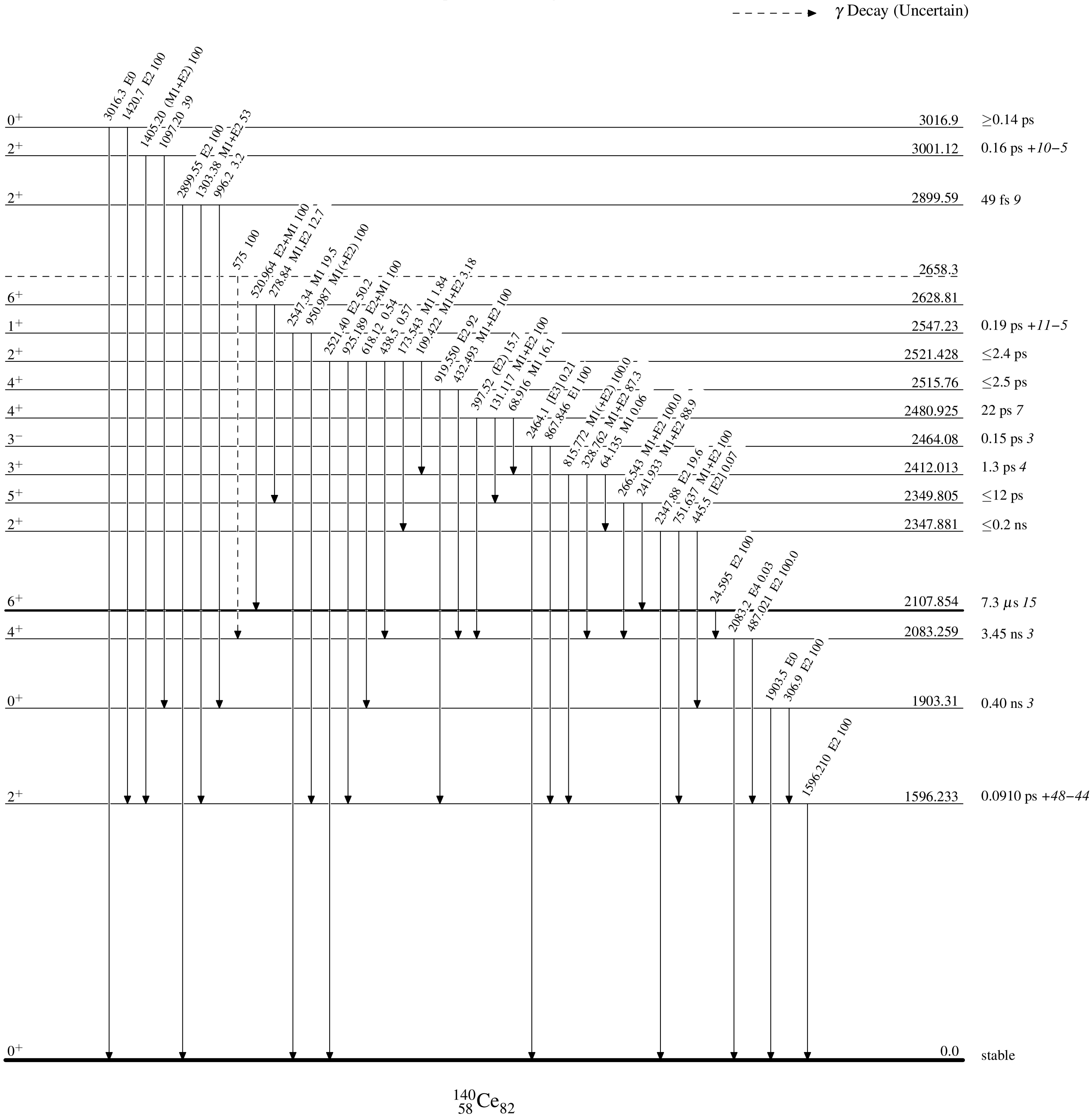


$^{140}_{58}Ce_{82}$

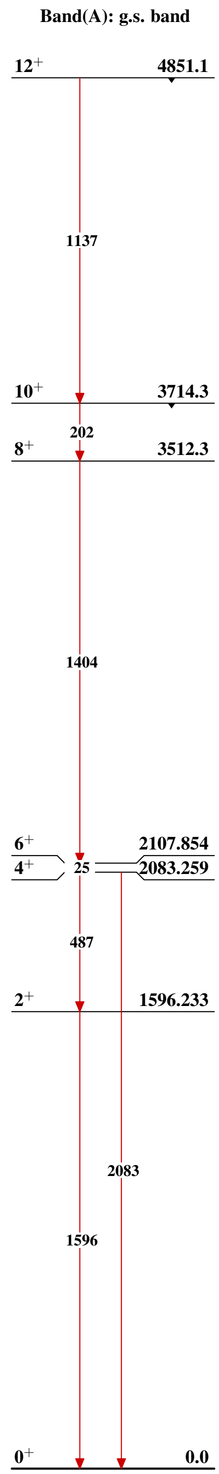
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



Adopted Levels, Gammas



$^{140}_{58}Ce_{82}$

Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	T. D. Johnson, D. Symochko(a), M. Fadil(b), and J. K. Tuli	NDS 112,1949 (2011)	1-Jun-2010

Q(β^-)=−744.5 *24*; S(n)=7168.0 *25*; S(p)=8887 *5*; Q(α)=1304 *3* 2012Wa38
Note: Current evaluation has used the following Q record −744.3 247167.9 *248887* 5 *1305* 3 2011AuZZ.
Q(β^-n)=−6588.9 *24*, Q(εp)=−12102 *9* 2011AuZZ.
Values in 2003Au03: Q(β^-)=745.8 *24*, S(n)=7169.7 *24*, S(p)=8889 *5*, Q(α)=1298 *3* Q(β^-n)=−6588.9 *24*, Q(εp)=−12102 *9*.
Some recent nuclear structure, Theory, Calculations:
2009Lo02, 2006Yu04, 2007Ji05, 1999Za09, 1998Ts05, 1995Zh26, 1992Wo11, 1992Na07, 1992Eg01, 1992Di01, 1992Co25, 1992Co21.
For recommended double beta-decay half-lives see compilation: 2010PrZZ.
See 1995Va25 for suggested configuration of states under various models.

^{142}Ce Levels

Cross Reference (XREF) Flags

A	^{142}La β^- decay	E	^{142}Ce(n,n′γ)
B	^{142}Pr ε decay	F	^{142}Ce(e,e′)
C	Coulomb excitation	G	^{142}Ce(γ,γ′)
D	^{140}Ce(t,p)	H	^{238}U(HI,xγ)

E(level)[@]	J$^\pi$[#]	$T_{1/2}$[‡]	XREF	Comments
0.0[&]	0$^+$	>5×10^{16} y	ABCDEFGH	$T_{1/2}$: Limit for 2β^- decay from 1961Ma05. Others: >1×10^{16} y (1959Se49), 5.1×10^{15} y *+51−25* (1957Ri43). 1957Ri43 report E(α)=1500 in ^{142}Ce α decay; however, 1959Se49 and 1961Ma05 did not observe any α′s (Q(α)=1310 *5*). Δ<r^2>(^{142}Ce,^{144}Ce)=0.232 *20* fm^2 (1999Is02), Δ<r^2>(^{142}Ce,^{140}Ce)=0.265 *12* (1999GaZX).
641.282[&] *9*	2$^+$	5.56 ps *12*	ABCDEFGH	μ=+0.42 *10* (1991Ba38) Q: −0.16 *5* or −0.37 *5* (1988Ve08). Other: −0.12 *9* (1970En01). J$^\pi$: L=2 in (t,p). $T_{1/2}$: from Coul ex.
1219.37[&] *3*	4$^+$	7.5 ps *7*	A CDEF H	J$^\pi$: From γ linear pol data (1992Al11). $T_{1/2}$: from Coul ex.
1536.33 *4*	2$^+$	<0.83 ps	A C EF	J$^\pi$: E2 γ to g.s.
1652.91 *4*	3$^-$[†]	>1.8 ps	A CDEF	J$^\pi$: L=3 in (t,p).
1742 *3*	5$^-$		D F	J$^\pi$: L=(5) in (t,p), confirmed in (e,e′).
1743.05[&] *6*	6$^+$		E H	J$^\pi$: From γ linear pol data (1992Al11).
2004.89 *7*	2$^+$	0.045 ps *+5−4*	A CDEF	J$^\pi$: L=2 in (t,p).
2014.5 *3*			A	E(level): level not confirmed in (n,n′γ) (1992Al11).
2031.01 *9*	0$^+$[†]	0.17 ps *+15−6*	A E	
2044.51 *6*	4$^+$[†]	0.33 ps *+11−7*	A DEF	J$^\pi$: from L(e,e′).
2111.87 *11*	4$^+$[†]	0.37 ps *+30−12*	DE	
2124.91 *8*	5$^-$[†]	>0.41 ps	DEF	J$^\pi$: from L(e,e′).
2181.95 *5*	3$^+$	0.26 ps *+55−11*	A E	
2187.54 *12*	1$^-$	0.011 ps *2*	A DE G	J$^\pi$: E1 γ to g.s. $T_{1/2}$: Others: 7.07 fs 28 from (γ,γ′).
2210.60[a] *6*	6$^+$		EF H	J$^\pi$: from L(e,e′); consistent with γ linear pol data (1992Al11).
2278.14 *8*	4$^+$[†]	0.083 ps *+49−28*	DEF	J$^\pi$: from L(e,e′).
2329.88 *10*	3$^+$	0.21 ps *+21−8*	E	
2364.91 *12*	2$^+$	0.016 ps *+3−2*	A DEF	J$^\pi$: E2 γ to g.s.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{142}Ce Levels (continued)

E(level)[@]	Jπ[#]	$T_{1/2}$[‡]	XREF	Comments
2374.96 *8*	+	>0.69 ps	E	Jπ: suggested J=6 (1995Va25) is not consistent with D+Q γ to 4^+.
2384.45 *7*	4^-	0.060 ps *+76−28*	E	
2398.42 *7*	1^+	0.076 ps *+21−14*	A E G	$T_{1/2}$: Others: 49.9 fs 28 from (γ,γ′). Jπ: M1 γ to g.s.
2539.72 *10*	4^+[†]	0.041 ps *+18−12*	DE	
2542.65 *19*	1	<0.014 ps	E	
2543.21 *8*	2^+	0.21 ps *+25−8*	A EF	
2570.08 *11*	5^+	0.12 ps *+18−6*	E	
2576.23 *6*	3^+	>0.69 ps	E	
2591.0 *3*			A F	
2592.5 *9*	(7^-)		H	Jπ: From systematics of yrast levels of N=84 isotones.
2598.27 *10*	2^+[†]	>1.66 ps	E	Jπ: E2 γ to g.s.
2602.55 *6*	$(3,2)^+$	0.24 ps *+25−8*	DEF	
2606.49 *8*	4^+[†]	0.049 ps *+83−28*	E	
2624.4[&] *9*	8^+		H	
2667.0 *3*	1^+	0.054 ps *+24−15*	A E	Jπ: M1 γ to g.s.
2680.50 *20*	$(2,3,4)^+$	0.15 ps *+15−6*	E	
2697.03 *7*	2^+	0.08 ps *+6−3*	A EF	Jπ: from L(e,e′).
2698.58 *11*	4^+[†]	0.076 ps *+21−15*	DE	
2715.14 *7*	3^+	0.12 ps *+13−5*	E	
2725.78 *10*	5^+	0.049 ps *+26−16*	E	
2727.89 *7*	$2^{(-)}$	0.27 ps *+29−8*	A E	
2734.77 *9*	$(3,2)^+$	>0.37 ps	DE	
2741.97 *10*	$(2,3)^+$	0.076 ps *+28−14*	A EF	Jπ: 1^- in (e,e′).
2767.86 *8*	$(1,2,3)^+$	0.055 ps *+18−12*	A EF	
2773.92 *9*	$(3)^+$	>0.69 ps	DE	
2784.78 *21*	(3,4,5)	0.23 ps *+63−10*	E	
2792.9 *3*			A	
2800.78 *9*	$1^{(+)}$	0.010 ps *2*	A E G	Jπ: M1 γ to g.s. $T_{1/2}$: Others: 12.8 fs 5 from (γ,γ′).
2806.42 *9*	3^+	0.10 ps *+7−3*	DE	
2842.56 *12*	$(2,3)^+$	0.038 ps *+10−8*	E	
2853.34 *12*	2^+	0.076 ps *+42−21*	E	Jπ: E2 γ to g.s.
2857.6[a] *7*	(8^+)		H	Jπ: Band assignment.
2859.75 *10*	4	>0.69 ps	DEF	
2868.97 *10*	$(4)^+$	>0.46 ps	E	
2887.74 *15*	3^+	0.041 ps *+12−9*	E	
2922 *4*			D	
2935.14 *21*	(2,3,4)	>0.48 ps	E	
2956.39 *15*	3^+	0.017 ps *+7−6*	E	
2986 *5*			D	
2994.0 *10*	$9^{(-)}$		H	Jπ: Stretched dipole to 8^+.
2999.02 *15*	1^+	0.017 ps *+13−8*	A DEFG	$T_{1/2}$: Others: 14.6 fs 14 from (γ,γ′).
3009.90 *20*		>0.69 ps	A E	
3011.93 *20*	1	0.016 ps *+6−4*	E G	$T_{1/2}$: Others: 20.4 fs 7 from (γ,γ′).
3042.29 *15*		0.18 ps *+34−8*	E	
3051.79 *15*	$(3)^+$	>0.69 ps	E	
3060.98 *9*	+	0.09 ps *+11−4*	A EF	Jπ: 3^- in (e,e′).
3067 *4*			D	
3089.70 *20*	$(2,3)^+$	0.058 ps *+29−17*	E	
3101.87 *24*			A	
3106.04 *15*	3^+	0.053 ps *+26−15*	E	
3109.79 *15*		>0.69 ps	E	
3122.4 *4*			A	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{142}Ce Levels (continued)

E(level)[@]	J^{π}[#]	$T_{1/2}$[‡]	XREF	Comments
3125.71 *20*	(1,2,3)	>0.65 ps	E	
3144.57 *15*	3^+		E	
3153.76 *14*	2^+	0.11 ps *+15−5*	A E	J^{π}: E2 γ to g.s.
3155.36 *15*		>0.69 ps	E	
3164.7 *5*			A D	
3180.37 *15*	1	>0.69 ps	A E	
3208.95 *15*	3^+	0.043 ps *+41−18*	E	
3218.21 *20*		>0.69 ps	E	
3228.64 *10*	(5^-)		DEF	J^{π}: (3^-) in (n,n′γ) (1992Al11).
3300.74 *21*		>0.69 ps	E	
3304.5 *6*	2^+		A	
3313.78 *20*	1	13.3 fs *6*	A G	J^{π}: From angular distribution in (γ,γ'). $T_{1/2}$: From (γ,γ').
3380.5[a] *10*	(9^+)		H	J^{π}: Band assignment.
3400.9 *10*	1	13.6 fs *5*	G	J^{π}: From angular distribution in (γ,γ').
3420.15 *23*	$1^-,2^-$		A	
3423.61 *22*			A	
3436 *4*			D	
3459.91 *21*			A	
3470.31 *24*			A	
3515.1 *7*	1	33 fs *+6−4*	G	J^{π}: From angular distribution in (γ,γ').
3536.3[a] *10*	(10^+)		H	J^{π}: Band assignment.
3612.5 *3*	2^+		A D	
3633.37 *22*	1	36.7 fs *21*	A G	J^{π}: From angular distribution in (γ,γ'). $T_{1/2}$: From (γ,γ').
3643.5 *10*	1	15.2 fs *7*	G	
3648.6 *4*			A	
3675.8 *5*	1^+		A	
3688.9 *4*			A	
3703.9 *3*			A	
3717.81 *22*	1^+		A	
3719.6 *4*	1	40.9 fs *28*	A G	J^{π}: From angular distribution in (γ,γ'). $T_{1/2}$: From (γ,γ').
3732 *4*			D	
3745.8 *10*	1	37.4 fs *28*	G	
3776.7 *10*	1	33.3 fs *28*	G	
3832.6 *12*	$11^{(-)}$		H	J^{π}: Stretched E2 to $9^{(-)}$.
3851.1 *6*		22.2 fs *21*	A G	J^{π}: From angular distribution in (γ,γ'). $T_{1/2}$: From (γ,γ').
3884.2 *5*			A	
3906.3[a] *11*	(11^+)		H	J^{π}: Band assignment.
3914.4 *5*			A	
3975.94 *17*			A	
4043.5 *4*	2^+		A	
4045.6 *4*			A	
4048.4 *14*			H	
4356.7[a] *13*	(12^+)		H	J^{π}: Band assignment.
4605.2[b] *13*	(13^-)		H	J^{π}: Band assignment.
4717.2 *14*			H	
4896.2[b] *14*	(14^-)		H	J^{π}: Band assignment.
5173.4[b] *14*	(15^-)		H	J^{π}: Band assignment.
5514.6[b] *15*	(16^-)		H	J^{π}: Band assignment.
5877.2[b] *16*	(17^-)		H	J^{π}: Band assignment.

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Adopted Levels, Gammas (continued)

^{142}Ce Levels (continued)

E(level)[@]	XREF
6528.1 *18*	H
6879.9 *19*	H

† Consistent with γ linear pol data (1992Al11).

‡ From DSA in (n,n′γ), unless given otherwise.

\# Unless explicitly given, J^{π} are based on $\gamma(\theta)$ measurements of 1992Al11, 1995Va25 in (n,n′γ). Pure quadrupole transitions are taken to be E2 while significantly mixed D+Q transitions are assumed to be M1+E2. See 1992Al11 for detailed arguments for many of the assignments.

@ From least-squares fit to Eγ.

& Band(A): g.s. band.

^{a} Band(B): Band based on 6^+ state. Possible configuration=$(\pi g^{1}_{7/2})(\pi d^{1}_{5/2})\otimes(\nu f^{2}_{7/2})$.

^{b} Band(C): ΔJ=1 band based on (13^-). Possible configuration=$(\pi g^{-1}_{7/2})(\pi h^{1}_{11/2})\otimes(\nu f^{2}_{7/2})$ or $(\pi g^{-1}_{7/2})(\pi h^{1}_{11/2})\otimes(\nu f^{1}_{7/2})(\nu h^{1}_{9/2})$.

$\gamma(^{142}Ce)$

Mostly data are from (n,n′γ), ^{142}La β^- decay.

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.[‡]	δ	α[†]	Comments
641.282	2+	641.285 *9*	100.0	0.0	0+	E2[@]		0.00563 *8*	B(E2)(W.u.)=21.2 *5* α(K)=0.00475 *7*; α(L)=0.000695 *10*; α(M)=0.0001463 *21*; α(N+..)=3.77×10^{-5} *6* α(N)=3.22×10^{-5} *5*; α(O)=5.11×10^{-6} *8*; α(P)=3.40×10^{-7} *5* E_γ: from 1979Bo26 (cryst).
1219.37	4+	578.09 *4*	2.8 *1*	641.282	2+	E2		0.00733 *11*	B(E2)(W.u.)=26.4 *25* α(K)=0.00616 *9*; α(L)=0.000925 *13*; α(M)=0.000195 *3*; α(N+..)=5.02×10^{-5} *7* α(N)=4.30×10^{-5} *6*; α(O)=6.79×10^{-6} *10*; α(P)=4.38×10^{-7} *7* E_γ: see 1983Wo09.
1536.33	2+	895.1 *1*	100.00	641.282	2+	M1+E2	−1.5 *+6−13*	0.0029 *3*	B(M1)(W.u.)>0.0050; B(E2)(W.u.)>14 α(K)=0.0025 *3*; α(L)=0.00034 *3*; α(M)=7.0×10^{-5} *6*; α(N+..)=1.82×10^{-5} *16* α(N)=1.55×10^{-5} *14*; α(O)=2.50×10^{-6} *23*; α(P)=1.85×10^{-7} *22*
		1537.4 *2*	1.010	0.0	0+	E2[@]		0.000934 *13*	B(E2)(W.u.)>0.018 α(K)=0.000726 *11*; α(L)=9.30×10^{-5} *13*; α(M)=1.93×10^{-5} *3*; α(N+..)=9.56×10^{-5} *14* α(N)=4.28×10^{-6} *6*; α(O)=6.94×10^{-7} *10*; α(P)=5.28×10^{-8} *8*; α(IPF)=9.06×10^{-5} *13*
1652.91	3−	433.2 *1*	14.94	1219.37	4+	E1[#]		0.00501 *7*	B(E1)(W.u.)<0.00022 α(K)=0.00431 *6*; α(L)=0.000555 *8*; α(M)=0.0001153 *17*; α(N+..)=2.99×10^{-5} *5* α(N)=2.55×10^{-5} *4*; α(O)=4.09×10^{-6} *6*; α(P)=2.99×10^{-7} *5*
		1011.7 *1*	100.0	641.282	2+	E1[#]		0.000827 *12*	B(E1)(W.u.)<0.00012 α(K)=0.000715 *10*; α(L)=8.90×10^{-5} *13*; α(M)=1.84×10^{-5} *3*; α(N+..)=4.80×10^{-6} *7* α(N)=4.08×10^{-6} *6*; α(O)=6.62×10^{-7} *10*; α(P)=5.08×10^{-8} *8*
1743.05	6+	523.5 *1*	100.0	1219.37	4+	E2[#]		0.00952 *14*	α(K)=0.00797 *12*; α(L)=0.001231 *18*; α(M)=0.000260 *4*; α(N+..)=6.68×10^{-5} *10* α(N)=5.73×10^{-5} *8*; α(O)=9.00×10^{-6} *13*; α(P)=5.62×10^{-7} *8*
2004.89	2+	352.1 *1*	2.857	1652.91	3−				
		1363.6 *1*	100.0	641.282	2+	M1+E2	−0.26 *+14−17*	0.00144 *4*	B(M1)(W.u.)=0.127 *17*; B(E2)(W.u.)=3 *3* α(K)=0.00121 *4*; α(L)=0.000154 *5*; α(M)=3.20×10^{-5} *9*; α(N+..)=4.42×10^{-5} *7*

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Adopted Levels, Gammas (continued)

$\gamma(^{142}Ce)$ (continued)

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.‡	δ	α†	Comments
									B(M1)(W.u.)=0.127 *17*; B(E2)(W.u.)=3 *3* α(K)=0.00121 *4*; α(L)=0.000154 *5*; α(M)=3.20×10^{-5} *9*; α(N+..)=4.42×10^{-5} *7* α(N)=7.10×10^{-6} *19*; α(O)=1.16×10^{-6} *4*; α(P)=9.0×10^{-8} *3*; α(IPF)=3.59×10^{-5} *5*
2004.89	2$^+$	2004.9 *2*	40.00	0.0	0$^+$	E2@		0.000808 *12*	B(E2)(W.u.)=2.5 *3* α(K)=0.000443 *7*; α(L)=5.56×10^{-5} *8*; α(M)=1.154×10^{-5} *17*; α(N+..)=0.000298 *5* α(N)=2.56×10^{-6} *4*; α(O)=4.16×10^{-7} *6*; α(P)=3.22×10^{-8} *5*; α(IPF)=0.000295 *5*
2014.5		1372.9 *7*	5.×10^1 *5*	641.282	2$^+$				
		2014.1 *10*	100.0	0.0	0$^+$				
2031.01	0$^+$	1389.7 *1*	100.0	641.282	2$^+$				
2044.51	4$^+$	825.2 *1*	3.093	1219.37	4$^+$	M1(+E2)	−0.06 *+14−23*	0.00457 *13*	B(M1)(W.u.)=0.0036 *12* α(K)=0.00393 *12*; α(L)=0.000506 *13*; α(M)=0.000105 *3*; α(N+..)=2.75×10^{-5} *7* α(N)=2.34×10^{-5} *6*; α(O)=3.81×10^{-6} *10*; α(P)=2.96×10^{-7} *9*
		1403.0 *1*	100.00	641.282	2$^+$	E2@		0.001054 *15*	B(E2)(W.u.)=7.0 *24* α(K)=0.000867 *13*; α(L)=0.0001117 *16*; α(M)=2.32×10^{-5} *4*; α(N+..)=5.25×10^{-5} α(N)=5.15×10^{-6} *8*; α(O)=8.34×10^{-7} *12*; α(P)=6.30×10^{-8} *9*; α(IPF)=4.65×10^{-5} *7*
2111.87	4$^+$	892.5 *1*	100.0	1219.37	4$^+$	M1+E2	−0.43 *+4−9*	0.00361 *9*	B(M1)(W.u.)=0.07 *6*; B(E2)(W.u.)=10 *8* α(K)=0.00310 *8*; α(L)=0.000402 *9*; α(M)=8.36×10^{-5} *19*; α(N+..)=2.18×10^{-5} *5* α(N)=1.86×10^{-5} *4*; α(O)=3.02×10^{-6} *7*; α(P)=2.32×10^{-7} *6*
2124.91	5$^-$	381.8 *1*	11.25	1743.05	6$^+$				
		471& *1*	12.50	1652.91	3$^-$				
		905.6 *1*	100.0	1219.37	4$^+$	E1@		0.001021 *15*	B(E1)(W.u.)<0.00066 α(K)=0.000882 *13*; α(L)=0.0001103 *16*; α(M)=2.29×10^{-5} *4*; α(N+..)=5.95×10^{-6} α(N)=5.06×10^{-6} *7*; α(O)=8.20×10^{-7} *12*; α(P)=6.26×10^{-8} *9*
2181.95	3$^+$	528.7 *1*	8.696	1652.91	3$^-$				
		645.6 *1*	26.09	1536.33	2$^+$	M1+E2	−0.40 *+8−11*	0.00789 *22*	B(M1)(W.u.)=0.03 *+7−3*; B(E2)(W.u.)=7 *+16−7* α(K)=0.00676 *19*; α(L)=0.000889 *21*; α(M)=0.000185 *5*; α(N+..)=4.83×10^{-5} *12* α(N)=4.11×10^{-5} *10*; α(O)=6.67×10^{-6} *16*; α(P)=5.09×10^{-7} *16*
		962.5 *1*	100.0	1219.37	4$^+$	M1(+E2)	−0.5 *+15−17*	0.0030 *7*	B(M1)(W.u.)=0.03 *+9−3*

$\gamma(^{142}Ce)$ (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.‡	δ	α†	Comments
									α(K)=0.0026 *6*; α(L)=0.00033 *7*; α(M)=6.9×10^{-5} *13*; α(N+..)=1.8×10^{-5} *4* α(N)=1.5×10^{-5} *3*; α(O)=2.5×10^{-6} *5*; α(P)=1.9×10^{-7} *5*
2181.95	3$^+$	1540.9 *1*	84.78	641.282	2$^+$	M1+E2	+0.09 *+4−3*	0.001180 *17*	B(M1)(W.u.)=0.009 *+19−9*; B(E2)(W.u.)=0.02 *+4−2* α(K)=0.000936 *14*; α(L)=0.0001184 *17*; α(M)=2.46×10^{-5} *4*; α(N+..)=0.000100 α(N)=5.46×10^{-6} *8*; α(O)=8.90×10^{-7} *13*; α(P)=6.98×10^{-8} *10*; α(IPF)=9.42×10^{-5} *14*
2187.54	1$^-$	534& *1*	<0.5172	1652.91	3$^-$				
		1546.3 *2*	70.69	641.282	2$^+$	E1		0.000640 *9*	B(E1)(W.u.)=0.0025 *5* α(K)=0.000337 *5*; α(L)=4.15×10^{-5} *6*; α(M)=8.58×10^{-6} *12*; α(N+..)=0.000253 *4* α(N)=1.90×10^{-6} *3*; α(O)=3.09×10^{-7} *5*; α(P)=2.41×10^{-8} *4*; α(IPF)=0.000250 *4* I_γ: 63 *2* from (γ,γ').
		2187.4 *2*	100.0	0.0	0$^+$	E1@		0.000941 *14*	B(E1)(W.u.)=0.00126 *23* α(K)=0.000193 *3*; α(L)=2.35×10^{-5} *4*; α(M)=4.86×10^{-6} *7*; α(N+..)=0.000719 *10* α(N)=1.079×10^{-6} *16*; α(O)=1.757×10^{-7} *25*; α(P)=1.377×10^{-8} *20*; α(IPF)=0.000718 *10*
2210.60	6$^+$	467.55 *2*	100	1743.05	6$^+$				
		991.21 *6*	20	1219.37	4$^+$	E2		0.00206 *3*	α(K)=0.001757 *25*; α(L)=0.000236 *4*; α(M)=4.93×10^{-5} *7*; α(N+..)=1.279×10^{-5} *18* α(N)=1.091×10^{-5} *16*; α(O)=1.754×10^{-6} *25*; α(P)=1.274×10^{-7} *18* E_γ: Not seen in (HI,xγ) (2007Ve14). Authors suggest Branching to be <5%.
2278.14	4$^+$	1058.5 *1*	40.85	1219.37	4$^+$	M1+E2	2.1 *+18−3*	0.00193 *10*	B(M1)(W.u.)=0.012 *+19−12*; B(E2)(W.u.)=28 *19* α(K)=0.00165 *9*; α(L)=0.000218 *10*; α(M)=4.54×10^{-5} *21*; α(N+..)=1.18×10^{-5} *6* α(N)=1.01×10^{-5} *5*; α(O)=1.62×10^{-6} *8*; α(P)=1.21×10^{-7} *7*
		1636.8 *2*	100.0	641.282	2$^+$	E2@		0.000878 *13*	B(E2)(W.u.)=9 *6* α(K)=0.000645 *9*; α(L)=8.21×10^{-5} *12*; α(M)=1.706×10^{-5} *24*; α(N+..)=0.0001335 α(N)=3.78×10^{-6} *6*; α(O)=6.14×10^{-7} *9*; α(P)=4.69×10^{-8} *7*; α(IPF)=0.0001290 *18*
2329.88	3$^+$	793.4 *1*	42.86	1536.33	2$^+$	M1+E2	0.37 *+23−18*	0.00483 *25*	B(M1)(W.u.)=0.06 *6*; B(E2)(W.u.)=7 *+11−7* α(K)=0.00415 *22*; α(L)=0.000538 *24*; α(M)=0.000112 *5*;

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$\gamma(^{142}$Ce) (continued)

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.‡	δ	α†	Comments
									α(N+..)=2.92×10^{-5} *13* α(N)=2.49×10^{-5} *11*; α(O)=4.04×10^{-6} *19*; α(P)=3.11×10^{-7} *18*
2329.88	3^+	1689.2 *2*	100.0	641.282	2^+	M1+E2	−0.16 *13*	0.001040 *18*	B(M1)(W.u.)=0.015 *15*; B(E2)(W.u.)=0.08 *+15−8* α(K)=0.000762 *14*; α(L)=9.61×10^{-5} *17*; α(M)=2.00×10^{-5} *4*; α(N+..)=0.0001619 α(N)=4.43×10^{-6} *8*; α(O)=7.22×10^{-7} *13*; α(P)=5.67×10^{-8} *11*; α(IPF)=0.0001567 *23*
2364.91	2^+	350.3 *3*	<3	2014.5					
		1723.6 *2*	100.0	641.282	2^+	M1(+E2)	−0.03 *+9−10*	0.001022 *15*	B(M1)(W.u.)=0.20 *4* α(K)=0.000733 *11*; α(L)=9.23×10^{-5} *14*; α(M)=1.92×10^{-5} *3*; α(N+..)=0.0001777 α(N)=4.26×10^{-6} *7*; α(O)=6.94×10^{-7} *10*; α(P)=5.46×10^{-8} *8*; α(IPF)=0.0001727 *25*
		2364.8 *2*	31.58	0.0	0^+	E2		0.000848 *12*	B(E2)(W.u.)=2.6 *5* α(K)=0.000329 *5*; α(L)=4.10×10^{-5} *6*; α(M)=8.49×10^{-6} *12*; α(N+..)=0.000470 *7* α(N)=1.88×10^{-6} *3*; α(O)=3.07×10^{-7} *5*; α(P)=2.39×10^{-8} *4*; α(IPF)=0.000468 *7*
2374.96	+	631.8 *1*	92.3	1743.05	6^+	M1+E2	<−1.5	0.0077 *10*	B(E2)(W.u.)<62 α(K)=0.0066 *9*; α(L)=0.00089 *9*; α(M)=0.000185 *18*; α(N+..)=4.8×10^{-5} *5* α(N)=4.1×10^{-5} *4*; α(O)=6.6×10^{-6} *7*; α(P)=4.9×10^{-7} *8*
		1155.7 *1*	100.0	1219.37	4^+	M1+E2	−0.09 *+6−11*	0.00208 *4*	B(M1)(W.u.)<0.011; B(E2)(W.u.)<0.088 α(K)=0.00179 *3*; α(L)=0.000228 *4*; α(M)=4.74×10^{-5} *8*; α(N+..)=1.460×10^{-5} *23* α(N)=1.053×10^{-5} *17*; α(O)=1.72×10^{-6} *3*; α(P)=1.341×10^{-7} *23*; α(IPF)=2.22×10^{-6} *4*
2384.45	4^-	202.3 *1*	6.329	2181.95	3^+				
		731.5 *1*	100.0	1652.91	3^-	M1+E2	−0.8 *+3−4*	0.0053 *5*	B(M1)(W.u.)=0.5 *+6−5*; B(E2)(W.u.)=3.E+2 *+5−3* α(K)=0.0046 *4*; α(L)=0.00061 *4*; α(M)=0.000126 *8*; α(N+..)=3.29×10^{-5} *21* α(N)=2.80×10^{-5} *18*; α(O)=4.5×10^{-6} *3*; α(P)=3.4×10^{-7} *3*
		1165.3 *1*	20.25	1219.37	4^+				
2398.42	1^+	367.3 *2*	1.0	2031.01	0^+				
		393.6 *2*	1.4	2004.89	2^+				
		862.1 *1*	10.26	1536.33	2^+	M1(+E2)	0.03 *5*	0.00412 *6*	B(M1)(W.u.)=0.035 *10* α(K)=0.00355 *5*; α(L)=0.000456 *7*; α(M)=9.50×10^{-5} *14*; α(N+..)=2.48×10^{-5} *4* α(N)=2.11×10^{-5} *3*; α(O)=3.43×10^{-6} *5*; α(P)=2.67×10^{-7} *4*
		1757.1 *1*	17.95	641.282	2^+	M1+E2	−1.6 *+3−4*	0.000882 *20*	B(M1)(W.u.)=0.0021 *8*; B(E2)(W.u.)=1.0 *3*

$\gamma(^{142}$Ce) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.‡	δ	α†	Comments
									α(K)=0.000603 *16*; α(L)=7.63×10^{-5} *19*; α(M)=1.58×10^{-5} *4*; α(N+..)=0.000187 *3* α(N)=3.51×10^{-6} *9*; α(O)=5.71×10^{-7} *15*; α(P)=4.42×10^{-8} *12*; α(IPF)=0.000183 *3*
2398.42	1$^+$	2398.5 *2*	100.0	0.0	0$^+$	M1@		0.000934 *13*	B(M1)(W.u.)=0.016 *5* α(K)=0.000361 *5*; α(L)=4.51×10^{-5} *7*; α(M)=9.36×10^{-6} *14*; α(N+..)=0.000519 *8* α(N)=2.08×10^{-6} *3*; α(O)=3.39×10^{-7} *5*; α(P)=2.67×10^{-8} *4*; α(IPF)=0.000516 *8*
2539.72	4$^+$	358.7& *1*	100.0	2181.95	3$^+$	(M1+E2)	−0.5859	0.0341	B(M1)(W.u.)=6 *3* α(K)=0.0289 *4*; α(L)=0.00409 *6*; α(M)=0.000860 *12*; α(N+..)=0.000223 *4* α(N)=0.000190 *3*; α(O)=3.05×10^{-5} *5*; α(P)=2.16×10^{-6} *3*
		1320.3 *1*	26.87	1219.37	4$^+$	E2#		0.001162 *17*	B(E2)(W.u.)=14 *7* α(K)=0.000976 *14*; α(L)=0.0001266 *18*; α(M)=2.64×10^{-5} *4*; α(N+..)=3.22×10^{-5} α(N)=5.84×10^{-6} *9*; α(O)=9.44×10^{-7} *14*; α(P)=7.10×10^{-8} *10*; α(IPF)=2.54×10^{-5} *4*
		1898.6 *2*	20.90	641.282	2$^+$	E2@		0.000812 *12*	B(E2)(W.u.)=1.8 *8* α(K)=0.000489 *7*; α(L)=6.16×10^{-5} *9*; α(M)=1.279×10^{-5} *18*; α(N+..)=0.000248 *4* α(N)=2.84×10^{-6} *4*; α(O)=4.61×10^{-7} *7*; α(P)=3.56×10^{-8} *5*; α(IPF)=0.000245 *4*
2542.65	1	2542.8 *2*	100.0	0.0	0$^+$				
2543.21	2$^+$	178.3 *3*	1.9 *5*	2364.91	2$^+$				
		355.3 *3*	<0.5	2187.54	1$^-$				
		538.3 *5*	0.5	2004.89	2$^+$				
		1006.7 *2*	2.4	1536.33	2$^+$				
		1323.9 *1*	50	1219.37	4$^+$	E2		0.001156 *17*	B(E2)(W.u.)=3 *+4−3* α(K)=0.000971 *14*; α(L)=0.0001259 *18*; α(M)=2.62×10^{-5} *4*; α(N+..)=3.30×10^{-5} α(N)=5.81×10^{-6} *9*; α(O)=9.39×10^{-7} *14*; α(P)=7.06×10^{-8} *10*; α(IPF)=2.61×10^{-5} *4* Mult.: from $\gamma\gamma(\theta)$ (1983Wo09,1990La04).
		1902.1 *2*	67.4	641.282	2$^+$	M1+E2	+0.65 *5*	0.000905 *14*	B(M1)(W.u.)=0.003 *3*; B(E2)(W.u.)=0.2 *+3−2* α(K)=0.000560 *9*; α(L)=7.05×10^{-5} *11*; α(M)=1.463×10^{-5} *23*; α(N+..)=0.000259 α(N)=3.25×10^{-6} *5*; α(O)=5.29×10^{-7} *8*; α(P)=4.14×10^{-8} *7*;

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$\gamma(^{142}Ce)$ (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.‡	δ	α†	Comments
									α(IPF)=0.000255 *4* δ: +0.55 *+40−54* (1983Wo09). Other: +0.71 *7* (1977CoZO); data of 1982Mi01 and 1975Ba15 are not consistent with J=2, data of 1983Wo09 agree better with J=1 or 3. −0.19 *+14−10* in (n,n′γ).
2543.21	2^+	2543.1 *2*	100.0	0.0	0^+				
2570.08	5^+	827.4& *1*	14.94	1743.05	6^+	(M1+E2)	−0.5 *+21−3*	0.0042 *8*	B(M1)(W.u.)=0.03 *+8−3*; B(E2)(W.u.)=1.E+1 *+5−1* α(K)=0.0036 *7*; α(L)=0.00048 *8*; α(M)=9.9×10^{-5} *16*; α(N+..)=2.6×10^{-5} *4* α(N)=2.2×10^{-5} *4*; α(O)=3.6×10^{-6} *6*; α(P)=2.7×10^{-7} *6*
		1350.7 *1*	100.0	1219.37	4^+	M1+E2	−0.6 *+16−10*	0.00139 *18*	B(M1)(W.u.)=0.05 *+10−5*; B(E2)(W.u.)=5 *+23−5* α(K)=0.00117 *15*; α(L)=0.000149 *18*; α(M)=3.1×10^{-5} *4*; α(N+..)=4.06×10^{-5} *12* α(N)=6.9×10^{-6} *9*; α(O)=1.12×10^{-6} *14*; α(P)=8.7×10^{-8} *12*; α(IPF)=3.25×10^{-5} *5*
2576.23	3^+	297.8 *1*	48.39	2278.14	4^+	M1+E2	1.1 *+6−4*	0.0539 *21*	B(M1)(W.u.)<0.13; B(E2)(W.u.)<9.7×10^2 α(K)=0.0446 *24*; α(L)=0.0073 *3*; α(M)=0.00155 *7*; α(N+..)=0.000396 *14* α(N)=0.000340 *13*; α(O)=5.31×10^{-5} *13*; α(P)=3.2×10^{-6} *3*
		394.0& *1*	61.29	2181.95	3^+	(M1+E2)	0.5 *+5−4*	0.0270 *22*	B(M1)(W.u.)<0.11; B(E2)(W.u.)<1.9×10^2 α(K)=0.0230 *21*; α(L)=0.00317 *9*; α(M)=0.000664 *15*; α(N+..)=0.000172 *5* α(N)=0.000147 *4*; α(O)=2.36×10^{-5} *9*; α(P)=1.72×10^{-6} *20*
		531.9 *1*	100.0	2044.51	4^+	M1(+E2)	0.00 *+6−9*	0.01331	B(M1)(W.u.)<0.065 α(K)=0.01143 *16*; α(L)=0.001494 *21*; α(M)=0.000311 *5*; α(N+..)=8.12×10^{-5} *12* α(N)=6.91×10^{-5} *10*; α(O)=1.124×10^{-5} *16*; α(P)=8.67×10^{-7} *13*
		923.4 *1*	38.71	1652.91	3^-				
		1039.9 *1*	77.42	1536.33	2^+	M1+E2	−0.8 *+4−7*	0.00234 *25*	B(M1)(W.u.)<0.0057; B(E2)(W.u.)<2.3 α(K)=0.00201 *22*; α(L)=0.000261 *25*; α(M)=5.4×10^{-5} *5*; α(N+..)=1.42×10^{-5} *14* α(N)=1.21×10^{-5} *12*; α(O)=1.96×10^{-6} *19*; α(P)=1.50×10^{-7} *18*
2591.0		1949.4 *9*	100 *13*	641.282	2^+				
		2590.6 *10*	37.50	0.0	0^+				
2592.5	(7^-)	849.5	100.0	1743.05	6^+				
2598.27	2^+	1062.0 *1*	100.0	1536.33	2^+	M1+E2	−0.26 *+11−7*	0.00248 *5*	B(M1)(W.u.)<0.0059; B(E2)(W.u.)<0.35 α(K)=0.00214 *4*; α(L)=0.000274 *5*; α(M)=5.69×10^{-5} *11*; α(N+..)=1.49×10^{-5} *3* α(N)=1.264×10^{-5} *23*; α(O)=2.06×10^{-6} *4*; α(P)=1.60×10^{-7} *4*

From ENSDF

Adopted Levels, Gammas (continued)

$\gamma(^{142}Ce)$ (continued)

E_i(level)	J^{π}_i	E_γ	I_γ	E_f	J^{π}_f	Mult.[‡]	δ	α[†]	Comments
2598.27	2^+	2598.0 *2*	85.19	0.0	0^+	E2[@]		0.000899 *13*	B(E2)(W.u.)<0.030 α(K)=0.000278 *4*; α(L)=3.45×10^{-5} *5*; α(M)=7.16×10^{-6} *10*; α(N+..)=0.000579 *9* α(N)=1.588×10^{-6} *23*; α(O)=2.59×10^{-7} *4*; α(P)=2.02×10^{-8} *3*; α(IPF)=0.000577 *8*
2602.55	$(3,2)^+$	557.7 *1*	19.12	2044.51	4^+				
		1066.1 *2*	<5.882	1536.33	2^+	(M1+E2)	1.2 *+23−7*	0.0021 *3*	B(M1)(W.u.)=0.0006 *+17−6*; B(E2)(W.u.)=0.5 *+10−5* α(K)=0.0018 *3*; α(L)=0.00023 *3*; α(M)=4.8×10^{-5} *7*; α(N+..)=1.25×10^{-5} *17* α(N)=1.07×10^{-5} *14*; α(O)=1.73×10^{-6} *23*; α(P)=1.31×10^{-7} *21*
		1383.3 *1*	22.06	1219.37	4^+	M1+E2	1.1 *+6−4*	0.00123 *8*	B(M1)(W.u.)=0.002 *+3−2*; B(E2)(W.u.)=0.9 *+11−9* α(K)=0.00103 *7*; α(L)=0.000131 *9*; α(M)=2.73×10^{-5} *17*; α(N+..)=4.82×10^{-5} *9* α(N)=6.1×10^{-6} *4*; α(O)=9.8×10^{-7} *7*; α(P)=7.6×10^{-8} *6*; α(IPF)=4.11×10^{-5} *6*
		1961.5 *1*	100.0	641.282	2^+	M1(+E2)	0.03 *3*	0.000930 *13*	B(M1)(W.u.)=0.008 *8* α(K)=0.000553 *8*; α(L)=6.95×10^{-5} *10*; α(M)=1.442×10^{-5} *21*; α(N+..)=0.000293 α(N)=3.20×10^{-6} *5*; α(O)=5.22×10^{-7} *8*; α(P)=4.11×10^{-8} *6*; α(IPF)=0.000289 *4*
2606.49	4^+	1387.1 *1*	100.0	1219.37	4^+	M1+E2	1.1 *+4−4*	0.00123 *8*	B(M1)(W.u.)=0.07 *+12−7*; B(E2)(W.u.)=2.E+1 *+5−2* α(K)=0.00102 *7*; α(L)=0.000131 *8*; α(M)=2.72×10^{-5} *17*; α(N+..)=4.92×10^{-5} *9* α(N)=6.0×10^{-6} *4*; α(O)=9.8×10^{-7} *7*; α(P)=7.5×10^{-8} *6*; α(IPF)=4.22×10^{-5} *6*
		1965.2 *1*	16.28	641.282	2^+				
2624.4	8^+	881.4	100.0	1743.05	6^+	E2		0.00266 *4*	α(K)=0.00227 *4*; α(L)=0.000310 *5*; α(M)=6.49×10^{-5} *9*; α(N+..)=1.682×10^{-5} *24* α(N)=1.435×10^{-5} *20*; α(O)=2.30×10^{-6} *4*; α(P)=1.640×10^{-7} *23*
2667.0	1^+	1130.6 *5*	26 *3*	1536.33	2^+	M1(+E2)	−6 *+2−7*	0.00158 *3*	B(M1)(W.u.)=0.0011 *9* α(K)=0.00135 *3*; α(L)=0.000178 *4*; α(M)=3.71×10^{-5} *7*; α(N+..)=1.071×10^{-5} *19* α(N)=8.21×10^{-6} *15*; α(O)=1.325×10^{-6} *25*; α(P)=9.81×10^{-8} *20*; α(IPF)=1.073×10^{-6} *23* δ: from β^- decay; >3.0 or <−2.5 from 1982Mi01.
		2025.5 *10*	55 *3*	641.282	2^+	M1+(E2)	+1.3 *3*	0.000850 *19*	B(M1)(W.u.)=0.006 *3*; B(E2)(W.u.)=1.3 *7* α(K)=0.000465 *13*; α(L)=5.84×10^{-5} *16*; α(M)=1.21×10^{-5} *4*; α(N+..)=0.000314 *5* α(N)=2.69×10^{-6} *8*; α(O)=4.37×10^{-7} *12*; α(P)=3.41×10^{-8} *10*;

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Adopted Levels, Gammas (continued)

$\gamma(^{142}Ce)$ (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.‡	δ	α†	Comments
									α(IPF)=0.000311 *5* δ: from β^- decay; +1.02 to +2.54 (1982Mi01), +0.60 *5* (1975Ba15), see also 1977CoZO.
2667.0	1^+	2666.8 *9*	100 *6*	0.0	0^+	M1		0.000989 *14*	B(M1)(W.u.)=0.012 *6* α(K)=0.000290 *4*; α(L)=3.61×10^{-5} *5*; α(M)=7.49×10^{-6} *11*; α(N+..)=0.000656 *10* α(N)=1.662×10^{-6} *24*; α(O)=2.71×10^{-7} *4*; α(P)=2.14×10^{-8} *3*; α(IPF)=0.000654 *10*
2680.50	$(2,3,4)^+$	2039.2 *2*	100.0	641.282	2^+	M1(+E2)	0.06 *+14−9*	0.000918 *14*	B(M1)(W.u.)=0.017 *17* α(K)=0.000509 *8*; α(L)=6.38×10^{-5} *10*; α(M)=1.325×10^{-5} *20*; α(N+..)=0.000332 α(N)=2.94×10^{-6} *5*; α(O)=4.80×10^{-7} *8*; α(P)=3.78×10^{-8} *6*; α(IPF)=0.000329 *5*
2697.03	2^+	105.9 *3*	5.3	2591.0					
		332.1 *4*	2 *2*	2364.91	2^+				
		514.7 *4*	5 *2*	2181.95	3^+				
		692.4 *6*	3.5	2004.89	2^+				
		1044.1 *1*	100.0	1652.91	3^-				
		1160.8 *1*	65.85	1536.33	2^+	M1+E2	−0.19 *17*	0.00204 *6*	B(M1)(W.u.)=0.04 *4*; B(E2)(W.u.)=0.7 *+13−7* α(K)=0.00176 *5*; α(L)=0.000224 *6*; α(M)=4.66×10^{-5} *12*; α(N+..)=1.47×10^{-5} *4* α(N)=1.04×10^{-5} *3*; α(O)=1.69×10^{-6} *5*; α(P)=1.32×10^{-7} *4*; α(IPF)=2.54×10^{-6} *4*
		2055.8 *2*	78.05	641.282	2^+	M1+E2	−1.2 *+7−19*	0.00085 *5*	B(M1)(W.u.)=0.004 *4*; B(E2)(W.u.)=0.8 *7* α(K)=0.00045 *3*; α(L)=5.7×10^{-5} *4*; α(M)=1.18×10^{-5} *8*; α(N+..)=0.000330 *9* α(N)=2.63×10^{-6} *18*; α(O)=4.3×10^{-7} *3*; α(P)=3.3×10^{-8} *3*; α(IPF)=0.000327 *9*
2698.58	4^+	1479.2 *1*	100.0	1219.37	4^+	M1+E2	1.3 *+18−3*	0.00108 *8*	B(M1)(W.u.)=0.03 *+6−3*; B(E2)(W.u.)=15 *+16−15* α(K)=0.00087 *7*; α(L)=0.000111 *9*; α(M)=2.32×10^{-5} *18*; α(N+..)=7.68×10^{-5} *14* α(N)=5.1×10^{-6} *4*; α(O)=8.3×10^{-7} *7*; α(P)=6.4×10^{-8} *6*; α(IPF)=7.08×10^{-5} *11*
2715.14	3^+	1178.8 *1*	40.00	1536.33	2^+	M1+E2	−0.8 *+4−4*	0.00177 *15*	B(M1)(W.u.)=0.014 *+16−14*; B(E2)(W.u.)=4 *+5−4* α(K)=0.00152 *13*; α(L)=0.000196 *15*; α(M)=4.1×10^{-5} *3*; α(N+..)=1.46×10^{-5} *8* α(N)=9.0×10^{-6} *7*; α(O)=1.47×10^{-6} *12*; α(P)=1.13×10^{-7} *10*; α(IPF)=3.94×10^{-6} *6*
		1495.8 *1*	100.0	1219.37	4^+	M1+E2	0.37 *7*	0.001206 *21*	B(M1)(W.u.)=0.02 *+3−2*; B(E2)(W.u.)=0.9 *+10−9* α(K)=0.000973 *17*; α(L)=0.0001233 *21*; α(M)=2.56×10^{-5} *5*;

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Adopted Levels, Gammas (continued)

$\gamma(^{142}\mathrm{Ce})$ (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.‡	δ	α†	Comments
									α(N+..)=8.40×10^{-5} α(N)=5.69×10^{-6} *10*; α(O)=9.27×10^{-7} *16*; α(P)=7.25×10^{-8} *13*; α(IPF)=7.73×10^{-5} *11*
2715.14	3$^+$	2073.7 *2*	60.00	641.282	2$^+$	M1(+E2)	−0.03 *6*	0.000916 *13*	B(M1)(W.u.)=0.006 *6* α(K)=0.000491 *7*; α(L)=6.16×10^{-5} *9*; α(M)=1.278×10^{-5} *18*; α(N+..)=0.000350 *5* α(N)=2.84×10^{-6} *4*; α(O)=4.63×10^{-7} *7*; α(P)=3.65×10^{-8} *6*; α(IPF)=0.000347 *5*
2725.78	5$^+$	982.7 *1*	47.06	1743.05	6$^+$	M1(+E2)	−0.13 *+19−14*	0.00302 *7*	B(M1)(W.u.)=0.15 *8* α(K)=0.00260 *6*; α(L)=0.000333 *7*; α(M)=6.92×10^{-5} *14*; α(N+..)=1.81×10^{-5} *4* α(N)=1.54×10^{-5} *3*; α(O)=2.50×10^{-6} *6*; α(P)=1.95×10^{-7} *5*
		1506.4 *2*	100.0	1219.37	4$^+$	M1+E2	0.09 *+4−3*	0.001223 *18*	B(M1)(W.u.)=0.09 *5*; B(E2)(W.u.)=0.18 *18* α(K)=0.000984 *14*; α(L)=0.0001245 *18*; α(M)=2.59×10^{-5} *4*; α(N+..)=8.81×10^{-5} α(N)=5.74×10^{-6} *9*; α(O)=9.36×10^{-7} *14*; α(P)=7.34×10^{-8} *11*; α(IPF)=8.13×10^{-5} *12*
2727.89	2$^{(-)}$	1074.9 *1*	23.40	1652.91	3$^-$	M1+E2	−2.0 *+7−9*	0.00188 *13*	B(M1)(W.u.)=0.0014 *+18−14*; B(E2)(W.u.)=3 *+4−3* α(K)=0.00161 *12*; α(L)=0.000212 *13*; α(M)=4.4×10^{-5} *3*; α(N+..)=1.15×10^{-5} *8* α(N)=9.8×10^{-6} *6*; α(O)=1.58×10^{-6} *10*; α(P)=1.18×10^{-7} *9*
		1191.6 *1*	100.0	1536.33	2$^+$	D+Q	−0.43 *10*		
		2086.6 *1*	89.36	641.282	2$^+$				
2734.77	(3,2)$^+$	622.7& *1*	61.54	2111.87	4$^+$	(M1+E2)	0.19 *25*	0.0089 *4*	B(M1)(W.u.)<0.062; B(E2)(W.u.)<11 α(K)=0.0077 *4*; α(L)=0.00100 *4*; α(M)=0.000208 *8*; α(N+..)=5.43×10^{-5} *20* α(N)=4.62×10^{-5} *17*; α(O)=7.5×10^{-6} *3*; α(P)=5.8×10^{-7} *3*
		1081.9 *1*	35.90	1652.91	3$^-$	(M1+E2)	−0.09 *+12−20*	0.00242 *6*	B(M1)(W.u.)<0.0066; B(E2)(W.u.)<0.095 α(K)=0.00208 *6*; α(L)=0.000266 *7*; α(M)=5.53×10^{-5} *13*; α(N+..)=1.44×10^{-5} *4* α(N)=1.23×10^{-5} *3*; α(O)=2.00×10^{-6} *5*; α(P)=1.56×10^{-7} *5*
		1515.4 *2*	100.0	1219.37	4$^+$	M1+E2	−0.29 *+23−18*	0.00119 *4*	B(M1)(W.u.)<0.0068; B(E2)(W.u.)<0.32 α(K)=0.00096 *3*; α(L)=0.000121 *4*; α(M)=2.51×10^{-5} *7*; α(N+..)=9.10×10^{-5} *14* α(N)=5.58×10^{-6} *16*; α(O)=9.1×10^{-7} *3*; α(P)=7.12×10^{-8} *22*; α(IPF)=8.45×10^{-5} *12*
		2093.3 *2*	61.54	641.282	2$^+$	M1+E2	5.2 *+5−22*	0.000815 *14*	B(M1)(W.u.)<6.5×10^{-5}; B(E2)(W.u.)<0.20 α(K)=0.000412 *8*; α(L)=5.16×10^{-5} *10*; α(M)=1.070×10^{-5} *20*; α(N+..)=0.000341

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$\gamma(^{142}Ce)$ (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.‡	δ	α†	Comments
									α(N)=2.37×10^{-6} *5*; α(O)=3.86×10^{-7} *7*; α(P)=3.00×10^{-8} *6*; α(IPF)=0.000338 *5*
2741.97	$(2,3)^+$	1089.0 *1*	28.21	1652.91	3^-				
		1205.7 *5*	4.6	1536.33	2^+				
		2100.9 *2*	100.0	641.282	2^+	M1+E2	−0.32 *14*	0.000905 *16*	B(M1)(W.u.)=0.021 *8*; B(E2)(W.u.)=0.3 *3* α(K)=0.000471 *9*; α(L)=5.91×10^{-5} *11*; α(M)=1.225×10^{-5} *23*; α(N+..)=0.000362 α(N)=2.72×10^{-6} *6*; α(O)=4.44×10^{-7} *9*; α(P)=3.49×10^{-8} *7*; α(IPF)=0.000359 *6*
2767.86	$(1,2,3)^+$	1115.0 *1*	27.87	1652.91	3^-				
		1231.5 *1*	36.07	1536.33	2^+	M1+E2	0.47 *+3−19*	0.00172 *6*	B(M1)(W.u.)=0.039 *13*; B(E2)(W.u.)=3.3 *12* α(K)=0.00147 *5*; α(L)=0.000188 *6*; α(M)=3.91×10^{-5} *13*; α(N+..)=2.03×10^{-5} *4* α(N)=8.7×10^{-6} *3*; α(O)=1.41×10^{-6} *5*; α(P)=1.10×10^{-7} *4*; α(IPF)=1.008×10^{-5} *15*
		2126.5 *2*	100.0	641.282	2^+	M1+E2	−0.19 *8*	0.000910 *14*	B(M1)(W.u.)=0.025 *8*; B(E2)(W.u.)=0.11 *10* α(K)=0.000463 *7*; α(L)=5.80×10^{-5} *9*; α(M)=1.204×10^{-5} *18*; α(N+..)=0.000377 *6* α(N)=2.67×10^{-6} *4*; α(O)=4.36×10^{-7} *7*; α(P)=3.43×10^{-8} *6*; α(IPF)=0.000374 *6* Mult.: from $\gamma\gamma(\theta)$ (1982Mi01,1990La04).
2773.92	$(3)^+$	661.5& *1*	30.77	2111.87	4^+	(M1+E2)	0.19 *25*	0.0077 *4*	B(M1)(W.u.)<0.019; B(E2)(W.u.)<2.9 α(K)=0.0066 *3*; α(L)=0.00086 *4*; α(M)=0.000179 *7*; α(N+..)=4.68×10^{-5} *18* α(N)=3.98×10^{-5} *15*; α(O)=6.47×10^{-6} *25*; α(P)=5.0×10^{-7} *3*
		1237.6 *1*	28.85	1536.33	2^+	M1+E2	0.40 *+23−18*	0.00172 *8*	B(M1)(W.u.)<0.0025; B(E2)(W.u.)<0.26 α(K)=0.00148 *7*; α(L)=0.000188 *8*; α(M)=3.91×10^{-5} *16*; α(N+..)=2.12×10^{-5} *5* α(N)=8.7×10^{-6} *4*; α(O)=1.41×10^{-6} *6*; α(P)=1.10×10^{-7} *6*; α(IPF)=1.094×10^{-5} *16*
		1553.8 *2*	32.69	1219.37	4^+	M1+E2	−0.9 *+5−10*	0.00106 *9*	B(M1)(W.u.)<0.0012; B(E2)(W.u.)<0.25 α(K)=0.00083 *7*; α(L)=0.000105 *9*; α(M)=2.18×10^{-5} *18*; α(N+..)=0.0001038 *20* α(N)=4.8×10^{-6} *4*; α(O)=7.9×10^{-7} *7*; α(P)=6.1×10^{-8} *6*; α(IPF)=9.81×10^{-5} *17*
		2133.3 *2*	100.0	641.282	2^+	M1+E2	0.19 *+3−7*	0.000910 *13*	B(M1)(W.u.)<0.0017; B(E2)(W.u.)<0.0100 α(K)=0.000460 *7*; α(L)=5.77×10^{-5} *9*; α(M)=1.196×10^{-5} *18*; α(N+..)=0.000380 *6* α(N)=2.66×10^{-6} *4*; α(O)=4.33×10^{-7} *7*; α(P)=3.41×10^{-8} *5*; α(IPF)=0.000377 *6*

$^{142}_{58}Ce_{84}$-14

γ(^{142}Ce) (continued)

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.‡	δ	α†	Comments
2784.78	(3,4,5)	1565.4 *2*	100.0	1219.37	4^+				
2792.9		2152.0 *8*	100.0	641.282	2^+				
2800.78	$1^{(+)}$	1264.4 *1*	58.93	1536.33	2^+	M1		0.001710 *24*	B(M1)(W.u.)=0.36 *8* α(K)=0.001461 *21*; α(L)=0.000186 *3*; α(M)=3.86×10^{-5} *6*; α(N+..)=2.51×10^{-5} *4* α(N)=8.57×10^{-6} *12*; α(O)=1.397×10^{-6} *20*; α(P)=1.093×10^{-7} *16*; α(IPF)=1.504×10^{-5} *22*
		2160.0 *2*	19.64	641.282	2^+	M1		0.000913 *13*	B(M1)(W.u.)=0.122 *25* α(K)=0.000450 *7*; α(L)=5.64×10^{-5} *8*; α(M)=1.170×10^{-5} *17*; α(N+..)=0.000395 *6* α(N)=2.60×10^{-6} *4*; α(O)=4.24×10^{-7} *6*; α(P)=3.34×10^{-8} *5*; α(IPF)=0.000392 *6* I_γ: 19 *2* from (γ,γ'). See comment on this gamma in (n,n′g) dataset.
		2800.4 *2*	100	0.0	0^+	M1		0.001023 *15*	B(M1)(W.u.)=0.0110 *22* α(K)=0.000262 *4*; α(L)=3.26×10^{-5} *5*; α(M)=6.76×10^{-6} *10*; α(N+..)=0.000721 *11* α(N)=1.502×10^{-6} *21*; α(O)=2.45×10^{-7} *4*; α(P)=1.94×10^{-8} *3*; α(IPF)=0.000720 *10*
2806.42	3^+	1270.2 *1*	97.62	1536.33	2^+	M1+E2	−0.16 *+8−11*	0.00168 *3*	B(M1)(W.u.)=0.04 *3*; B(E2)(W.u.)=0.4 *+5−4* α(K)=0.00144 *3*; α(L)=0.000183 *4*; α(M)=3.80×10^{-5} *7*; α(N+..)=2.59×10^{-5} *4* α(N)=8.43×10^{-6} *15*; α(O)=1.374×10^{-6} *25*; α(P)=1.074×10^{-7} *21*; α(IPF)=1.599×10^{-5} *23*
		1586.9 *2*	40.48	1219.37	4^+	M1(+E2)	0.3 *+5−3*	0.00111 *8*	B(M1)(W.u.)=0.009 *7* α(K)=0.00086 *7*; α(L)=0.000109 *8*; α(M)=2.27×10^{-5} *16*; α(N+..)=0.0001181 *22* α(N)=5.0×10^{-6} *4*; α(O)=8.2×10^{-7} *6*; α(P)=6.4×10^{-8} *5*; α(IPF)=0.0001122 *19*
		2164.8 *2*	100.0	641.282	2^+	M1+E2	0.43 *+8−4*	0.000899 *14*	B(M1)(W.u.)=0.008 *6*; B(E2)(W.u.)=0.18 *14* α(K)=0.000438 *7*; α(L)=5.49×10^{-5} *9*; α(M)=1.139×10^{-5} *18*; α(N+..)=0.000394 *6* α(N)=2.53×10^{-6} *4*; α(O)=4.12×10^{-7} *7*; α(P)=3.24×10^{-8} *6*; α(IPF)=0.000391 *6*
2842.56	$(2,3)^+$	838.0 *2*	<1.149	2004.89	2^+				
		1623.0 *2*	13.79	1219.37	4^+				
		2201.1 *2*	100.0	641.282	2^+	M1+E2	−0.26 *+4−15*	0.000909 *15*	B(M1)(W.u.)=0.045 *12*; B(E2)(W.u.)=0.36 *15* α(K)=0.000429 *8*; α(L)=5.37×10^{-5} *10*; α(M)=1.114×10^{-5} *20*; α(N+..)=0.000415

From ENSDF

$^{142}_{58}$Ce$_{84}$-15

Adopted Levels, Gammas (continued)

γ(^{142}Ce) (continued)

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.‡	δ	α†	Comments
									α(N)=2.47×10^{-6} *5*; α(O)=4.04×10^{-7} *8*; α(P)=3.18×10^{-8} *6*; α(IPF)=0.000412 *6*
2853.34	2$^+$	1634.2 *2*	<0.4688	1219.37	4$^+$				
		2212.3 *2*	100.0	641.282	2$^+$	M1+E2	−0.5 *+15−3*	0.00090 *3*	B(M1)(W.u.)=0.014 *+18−14*; B(E2)(W.u.)=0.4 *+20−4* α(K)=0.000416 *19*; α(L)=5.21×10^{-5} *23*; α(M)=1.08×10^{-5} *5*; α(N+..)=0.000417 *10* α(N)=2.40×10^{-6} *11*; α(O)=3.91×10^{-7} *18*; α(P)=3.08×10^{-8} *15*; α(IPF)=0.000414 *10*
		2852.8 *2*	56.25	0.0	0$^+$	E2@		0.000966 *14*	B(E2)(W.u.)=0.32 *18* α(K)=0.000236 *4*; α(L)=2.92×10^{-5} *4*; α(M)=6.05×10^{-6} *9*; α(N+..)=0.000695 *10* α(N)=1.344×10^{-6} *19*; α(O)=2.19×10^{-7} *3*; α(P)=1.717×10^{-8} *24*; α(IPF)=0.000693 *10*
2857.6	(8$^+$)	647.0		2210.60	6$^+$				
		1114.4		1743.05	6$^+$				
2859.75	4	1206.7 *1*	100.0	1652.91	3$^-$				
		1640.9 *2*	28.21	1219.37	4$^+$				
2868.97	(4)$^+$	1216.1 *1*	100.0	1652.91	3$^-$				
		1649.4 *2*	89.74	1219.37	4$^+$	M1+E2	−0.4 *+3−4*	0.00105 *6*	B(M1)(W.u.)<0.0039; B(E2)(W.u.)<0.25 α(K)=0.00078 *5*; α(L)=9.9×10^{-5} *6*; α(M)=2.06×10^{-5} *12*; α(N+..)=0.000144 *3* α(N)=4.6×10^{-6} *3*; α(O)=7.4×10^{-7} *5*; α(P)=5.8×10^{-8} *4*; α(IPF)=0.0001384 *23*
		2228.3& *2*	66.67	641.282	2$^+$				
2887.74	3$^+$	1668.4 *2*	28.21	1219.37	4$^+$	M1+E2	1.1 *+17−6*	0.00095 *7*	B(M1)(W.u.)=0.012 *+20−12*; B(E2)(W.u.)=3 *+5−3* α(K)=0.00070 *6*; α(L)=8.8×10^{-5} *8*; α(M)=1.83×10^{-5} *15*; α(N+..)=0.000149 *3* α(N)=4.1×10^{-6} *4*; α(O)=6.6×10^{-7} *6*; α(P)=5.1×10^{-8} *5*; α(IPF)=0.000145 *3*
		2246.4 *2*	100.0	641.282	2$^+$	M1+E2	0.9 *+12−3*	0.00088 *4*	B(M1)(W.u.)=0.02 *+3−2*; B(E2)(W.u.)=2 *+3−2* α(K)=0.000390 *21*; α(L)=4.9×10^{-5} *3*; α(M)=1.01×10^{-5} *6*; α(N+..)=0.000428 *12* α(N)=2.25×10^{-6} *13*; α(O)=3.66×10^{-7} *21*; α(P)=2.87×10^{-8} *18*; α(IPF)=0.000426 *12*
2935.14	(2,3,4)	1398.8 *2*		1536.33	2$^+$				
		2292.7 *2*	100.0	641.282	2$^+$				
2956.39	3$^+$	1737.1 *2*	51.52	1219.37	4$^+$	M1(+E2)	0.06 *+7−9*	0.001013 *15*	B(M1)(W.u.)=0.08 *4* α(K)=0.000720 *11*; α(L)=9.07×10^{-5} *13*; α(M)=1.88×10^{-5} *3*; α(N+..)=0.000184 *3* α(N)=4.18×10^{-6} *6*; α(O)=6.82×10^{-7} *10*; α(P)=5.36×10^{-8} *8*; α(IPF)=0.000179 *3*

$^{142}_{58}$Ce$_{84}$-16

$\gamma(^{142}$Ce) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.‡	δ	α†	Comments
2956.39	3^+	2315.0 *2*	100.0	641.282	2^+	M1+E2	−0.6 +*23*−*9*	0.00090 *5*	B(M1)(W.u.)=0.05 +*11*−*5*; B(E2)(W.u.)=2 +*12*−*2* α(K)=0.000376 *24*; α(L)=4.7×10^{-5} *3*; α(M)=9.8×10^{-6} *7*; α(N+..)=0.000468 *16* α(N)=2.17×10^{-6} *14*; α(O)=3.53×10^{-7} *23*; α(P)=2.78×10^{-8} *20*; α(IPF)=0.000465 *16*
2994.0	$9^{(-)}$	369.6		2624.4	8^+	D			
		401.5		2592.5	(7^-)				
2999.02	1^+	2358.3 *2*	100.0	641.282	2^+	E2+M1		0.00089 *5*	α(K)=0.000352 *23*; α(L)=4.4×10^{-5} *3*; α(M)=9.1×10^{-6} *6*; α(N+..)=0.000482 *17* α(N)=2.02×10^{-6} *14*; α(O)=3.30×10^{-7} *23*; α(P)=2.59×10^{-8} *19*; α(IPF)=0.000480 *17* Mult.: from β^- decay.
		2998.4 *2*	51.52	0.0	0^+				I_γ: 60.6 from (γ,γ').
3009.90		2368.6 *2*	100.0	641.282	2^+				
3011.93	1	3011.9 *2*	100.0	0.0	0^+				
3042.29		1822.9 *2*	100.0	1219.37	4^+	M1+E2	−0.37 *10*	0.000953 *17*	B(M1)(W.u.)=0.010 +*19*−*10*; B(E2)(W.u.)=0.2 +*5*−*2* α(K)=0.000634 *12*; α(L)=7.98×10^{-5} *15*; α(M)=1.66×10^{-5} *3*; α(N+..)=0.000223 *4* α(N)=3.68×10^{-6} *7*; α(O)=6.00×10^{-7} *11*; α(P)=4.70×10^{-8} *9*; α(IPF)=0.000219 *4*
		2401.0 *2*	85.19	641.282	2^+				
3051.79	$(3)^+$	864.6& *2*		2187.54	1^-				
		1398.8& *1*	100.0	1652.91	3^-				
		1832.6 *2*	33.33	1219.37	4^+	M1+E2	<−0.6	0.000948 *24*	B(E2)(W.u.)<0.053 α(K)=0.000625 *18*; α(L)=7.87×10^{-5} *23*; α(M)=1.63×10^{-5} *5*; α(N+..)=0.000228 *4* α(N)=3.63×10^{-6} *11*; α(O)=5.91×10^{-7} *18*; α(P)=4.64×10^{-8} *15*; α(IPF)=0.000223 *4*
		2410.3 *2*	17.39	641.282	2^+	M1(+E2)	0.09 *14*	0.000935 *14*	B(M1)(W.u.)<0.00027; B(E2)(W.u.)<0.00087 α(K)=0.000357 *6*; α(L)=4.46×10^{-5} *7*; α(M)=9.25×10^{-6} *14*; α(N+..)=0.000524 *8* α(N)=2.05×10^{-6} *3*; α(O)=3.35×10^{-7} *5*; α(P)=2.64×10^{-8} *4*; α(IPF)=0.000522 *8*
3060.98	+	1525.5 *2*	58.73	1536.33	2^+	M1(+E2)	−0.09 +*15*−*14*	0.001198 *20*	B(M1)(W.u.)=0.019 +*24*−*19* α(K)=0.000957 *17*; α(L)=0.0001211 *21*; α(M)=2.51×10^{-5} *5*; α(N+..)=9.49×10^{-5} α(N)=5.58×10^{-6} *10*; α(O)=9.10×10^{-7} *16*; α(P)=7.14×10^{-8} *13*; α(IPF)=8.84×10^{-5} *13* I_γ: branching ratio in β^- decay and (n,n$'\gamma$) do not agree.
		2419.8 *2*	100.0	641.282	2^+	M1+E2	−0.26 *17*	0.000932 *15*	B(M1)(W.u.)=0.008 +*10*−*8*; B(E2)(W.u.)=0.05 +*9*−*5*

$^{142}_{58}Ce_{84}$-17

Adopted Levels, Gammas (continued)

$\gamma(^{142}Ce)$ (continued)

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.‡	δ	α†	Comments
									α(K)=0.000352 7; α(L)=4.40×10^{-5} 8; α(M)=9.12×10^{-6} 16; α(N+..)=0.000527 8 α(N)=2.02×10^{-6} 4; α(O)=3.30×10^{-7} 6; α(P)=2.60×10^{-8} 5; α(IPF)=0.000525 8
3060.98	+	3060.7 1	50	0.0	0^+				
3089.70	$(2,3)^+$	978.1& 2	38.89	2111.87	4^+				
		2448.4 2	100.0	641.282	2^+	M1+E2	−0.8 +3−4	0.000912 20	B(M1)(W.u.)=0.011 7; B(E2)(W.u.)=0.7 5 α(K)=0.000331 9; α(L)=4.13×10^{-5} 12; α(M)=8.57×10^{-6} 24; α(N+..)=0.000531 1 α(N)=1.90×10^{-6} 6; α(O)=3.10×10^{-7} 9; α(P)=2.44×10^{-8} 8; α(IPF)=0.000528 11
3101.87		2460.3 10	100 10	641.282	2^+				
		3101.5 12	30.00	0.0	0^+				
3106.04	3^+	1887.5 2	23.46	1219.37	4^+	M1+E2	2.5 +6−23	0.00083 12	B(M1)(W.u.)=0.0016 11; B(E2)(W.u.)=1.7 9 α(K)=0.00051 9; α(L)=6.4×10^{-5} 11; α(M)=1.33×10^{-5} 23; α(N+..)=0.000245 11 α(N)=3.0×10^{-6} 5; α(O)=4.8×10^{-7} 9; α(P)=3.7×10^{-8} 8; α(IPF)=0.000242 11
		2463.9 2	100.0	641.282	2^+	M1+E2	−2.0 +5−4	0.000884 15	B(M1)(W.u.)=0.005 3; B(E2)(W.u.)=1.7 9 α(K)=0.000313 6; α(L)=3.89×10^{-5} 8; α(M)=8.07×10^{-6} 16; α(N+..)=0.000524 9 α(N)=1.79×10^{-6} 4; α(O)=2.92×10^{-7} 6; α(P)=2.28×10^{-8} 5; α(IPF)=0.000522 9
3109.79		1890.3 2	100.0	1219.37	4^+				
		2468.6 2	42.86	641.282	2^+				
3122.4		1091.2 8	50.00	2031.01	0^+				
		1117.7 5	<25.00	2004.89	2^+				
		3121.9 13	100.0	0.0	0^+				
3125.71	(1,2,3)	2484.4 2	100.0	641.282	2^+				
3144.57	3^+	1608.4 2	100.0	1536.33	2^+	M1+E2	−2.0 +20−6	0.00094 18	α(K)=0.00070 15; α(L)=9.0×10^{-5} 19; α(M)=1.9×10^{-5} 4; α(N+..)=0.000123 5 α(N)=4.1×10^{-6} 9; α(O)=6.7×10^{-7} 14; α(P)=5.2×10^{-8} 12; α(IPF)=0.000118 4
		2503.1 2	96.08	641.282	2^+	M1+E2	−0.8 +3−4	0.000923 20	α(K)=0.000317 8; α(L)=3.96×10^{-5} 11; α(M)=8.20×10^{-6} 22; α(N+..)=0.000558 1 α(N)=1.82×10^{-6} 5; α(O)=2.97×10^{-7} 8; α(P)=2.33×10^{-8} 7; α(IPF)=0.000556 11
3153.76	2^+	361.1 3	33	2792.9					I_γ: branching ratios from β^- decay. They do not agree with (n,n′γ).
		1618.2 7	100	1536.33	2^+				I_γ: branching ratios from β^- decay. They do not agree with (n,n′γ).

From ENSDF

$^{142}_{58}Ce_{84}$-18

Adopted Levels, Gammas (continued)

$\gamma(^{142}Ce)$ (continued)

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.‡	δ	α†	Comments
3153.76	2^+	2512.4 *2*	33	641.282	2^+	M1+E2	0.7 *+9−5*	0.00093 *4*	B(M1)(W.u.)=0.0012 *+20−12*; B(E2)(W.u.)=0.05 *+12−5* α(K)=0.000317 *14*; α(L)=3.95×10^{-5} *18*; α(M)=8.2×10^{-6} *4*; α(N+..)=0.000565 *17* α(N)=1.82×10^{-6} *8*; α(O)=2.97×10^{-7} *14*; α(P)=2.33×10^{-8} *12*; α(IPF)=0.000563 *17* I_γ: branching ratios from β^- decay. They do not agree with (n,n′γ).
		3153.6 *2*	67	0.0	0^+	E2@		0.001053 *15*	B(E2)(W.u.)=0.11 *+15−11* α(K)=0.000199 *3*; α(L)=2.45×10^{-5} *4*; α(M)=5.08×10^{-6} *8*; α(N+..)=0.000824 *12* α(N)=1.127×10^{-6} *16*; α(O)=1.84×10^{-7} *3*; α(P)=1.444×10^{-8} *21*; α(IPF)=0.000823 *12* I_γ: branching ratios from β^- decay. They do not agree with (n,n′γ).
3155.36		1619.1 *2*	100.0	1536.33	2^+				
		1935.9 *2*	100.0	1219.37	4^+				
3164.7		1628.5 *7*	<50.00	1536.33	2^+				
		2523.3 *9*	<50.00	641.282	2^+				
		3164.7 *13*	100.0	0.0	0^+				
3180.37	1	439.0 *5*	13	2741.97	$(2,3)^+$				I_γ: branching ratios from β^- decay.
		453.7 *5*	25	2725.78	5^+				I_γ: branching ratios from β^- decay.
		1644.3 *7*	63	1536.33	2^+				I_γ: branching ratios from β^- decay.
		2539.4 *3*	100	641.282	2^+				I_γ: branching ratios from β^- decay.
		3180.2 *2*	75	0.0	0^+				I_γ: branching ratios from β^- decay.
3208.95	3^+	1990.2 *2*	19.05	1219.37	4^+				
		2567.0 *2*	100.0	641.282	2^+	M1+E2	−0.32 *+4−8*	0.000959 *14*	B(M1)(W.u.)=0.023 *22*; B(E2)(W.u.)=0.21 *21* α(K)=0.000311 *5*; α(L)=3.87×10^{-5} *6*; α(M)=8.03×10^{-6} *12*; α(N+..)=0.000602 *9* α(N)=1.78×10^{-6} *3*; α(O)=2.91×10^{-7} *5*; α(P)=2.30×10^{-8} *4*; α(IPF)=0.000599 *9*
3218.21		2576.9 *2*	100.0	641.282	2^+				
3228.64	(5^-)	1575.72 *9*		1652.91	3^-				
3300.74		1764.4 *2*	100	1536.33	2^+				
3304.5	2^+	1768.2 *7*	33 *7*	1536.33	2^+				
		2663.1 *10*	100 *14*	641.282	2^+	Q+(D)	>+1.1		
3313.78	1	546.0 *2*	<5.000	2767.86	$(1,2,3)^+$				
		646.2 *7*	15 *10*	2667.0	1^+				
		2672.6 *10*	21 *3*	641.282	2^+				I_γ: From (γ,γ').
		3313.8 *12*	100 *5*	0.0	0^+				
3380.5	(9^+)	522.9	100.0	2857.6	(8^+)				
3400.9	1	3400.9	100	0.0	0^+				

$^{142}_{58}Ce_{84}$-19

$\gamma(^{142}Ce)$ (continued)

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.‡	δ
3420.15	$1^-,2^-$	318.0 3	2.5 25	3101.87			
		878.2 4	10.00	2543.21	2^+		
		1233.1 6	100.0 25	2187.54	1^-	D+Q	
3423.61		681.2 6	14 15	2741.97	$(2,3)^+$		
		1058.4 4	28.57	2364.91	2^+		
		1242.0 4	71.43	2181.95	3^+		
		1393.0 8	42.86	2031.01	0^+		
		1770.8 7	57 15	1652.91	3^-		
		1887.3 8	$4.\times10^1$ 3	1536.33	2^+		
		2782.2 10	100.0	641.282	2^+		
3459.91		793.1 4	6 7	2667.0	1^+		
		1061.5 4	0.000	2398.42	1^+		
		1455.1 5	12.50	2004.89	2^+		
		1923.3 7	25 7	1536.33	2^+		
		2818.5 11	100 7	641.282	2^+		
		3459.3 13	31.25	0.0	0^+		
3470.31		677.0 6	17 17	2792.9			
		1072.2 8	33 17	2398.42	1^+		
		1104.8 8	16.67	2364.91	2^+		
		1283.2 5	<16.67	2187.54	1^-		
		1288.5 4	<16.67	2181.95	3^+		
		1933.6 7	50.00	1536.33	2^+		
		2828.8 11	100.0	641.282	2^+		
		3470.0 13	33.33	0.0	0^+		
3515.1	1	2873.8	100	641.282	2^+		
		3515.1	90.9	0.0	0^+		
3536.3	(10^+)	155.8		3380.5	(9^+)		
		678.7		2857.6	(8^+)		
3612.5	2^+	915.6 5	1.5 16	2697.03	2^+		
		1069.4 5	3.0 16	2543.21	2^+		
		1214.0 5	1.5 16	2398.42	1^+		
		2076.1 9	26 3	1536.33	2^+	D+Q	−0.7 3
		2971.0 12	100 5	641.282	2^+		
		3612.1 14	28.8 16	0.0	0^+		
3633.37	1	173.5 3	10 5	3459.91			
		531.6 2	14.29	3101.87			
		1089.9 7	14.29	2543.21	2^+		
		1445.5 5	14.29	2187.54	1^-		
		2096.6 9	5 5	1536.33	2^+		
		2991.6 11	9.524	641.282	2^+		
		3632.7 13	100 5	0.0	0^+		
3643.5	1	3643.4	100	0.0	0^+		

$\gamma(^{142}Ce)$ (continued)

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.‡	δ	α†	Comments
3648.6		1461.2 *5*	100 *5*	2187.54	1^-				
		2111.9 *8*	<5.000	1536.33	2^+				
		3006.8 *12*	10.00	641.282	2^+				
3675.8	1^+	1494.1 *7*	27.27	2181.95	3^+				
		2139.3 *8*	100 *19*	1536.33	2^+	D+Q	−0.56 *10*		
		3034.3 *14*	100 *9*	641.282	2^+				
3688.9		946.9 *4*	22.22	2741.97	$(2,3)^+$				
		3047.4 *14*	100.0	641.282	2^+				
3703.9		1112.9 *5*	10 *10*	2591.0					
		1516.3 *6*	90 *10*	2187.54	1^-				
		2050.9 *8*	100 *20*	1652.91	3^-				
		3062.4 *13*	20.00	641.282	2^+				
3717.81	1^+	297.9 *3*	9 *9*	3420.15	$1^-,2^-$				
		989.8 *5*	18.18	2727.89	$2^{(-)}$				
		1020.8 *4*	<9.091	2697.03	2^+				
		1352.6 *5*	18.18	2364.91	2^+				
		2180.9 *9*	100 *19*	1536.33	2^+	D+Q	−1.2 *+3−5*		
		3075.9 *12*	36.36	641.282	2^+				
3719.6	1	1176.4 *4*	50.00	2543.21	2^+				
		1688.6 *8*	83.33	2031.01	0^+				
		3719.1 *13*	100.0	0.0	0^+				
3745.8	1	3745.7	100	0.0	0^+				
3776.7	1	3776.6	100	0.0	0^+				
3832.6	$11^{(-)}$	838.7	100	2994.0	$9^{(-)}$	E2		0.00297 *5*	α(K)=0.00253 *4*; α(L)=0.000350 *5*; α(M)=7.32×10^{-5} *11*; α(N+..)=1.90×10^{-5} *3* α(N)=1.618×10^{-5} *23*; α(O)=2.59×10^{-6} *4*; α(P)=1.83×10^{-7} *3*
3851.1		1846.2 *8*	20 *20*	2004.89	2^+				
		3210.2 *12*	40.00	641.282	2^+				
		3850.4 *13*	100.0	0.0	0^+				
3884.2		570.6 *5*	25 *25*	3313.78	1				
		2347.4 *9*	25 *25*	1536.33	2^+				
		3242.4 *12*	100.0	641.282	2^+				
3906.3	(11^+)	370.0		3536.3	(10^+)				
		525.8		3380.5	(9^+)				
3914.4		1121.2 *6*	33.33	2792.9					
		2378.6 *9*	100.0	1536.33	2^+				
		3273.2 *14*	100.0	641.282	2^+				
3975.94		1280.1 *4*	<33.33	2697.03	2^+				
		1793.8 *7*	<33.33	2181.95	3^+				
		1961.5 *9*	100.0	2014.5					
		3334.2 *12*	66.67	641.282	2^+				

$\gamma(^{142}Ce)$ (continued)

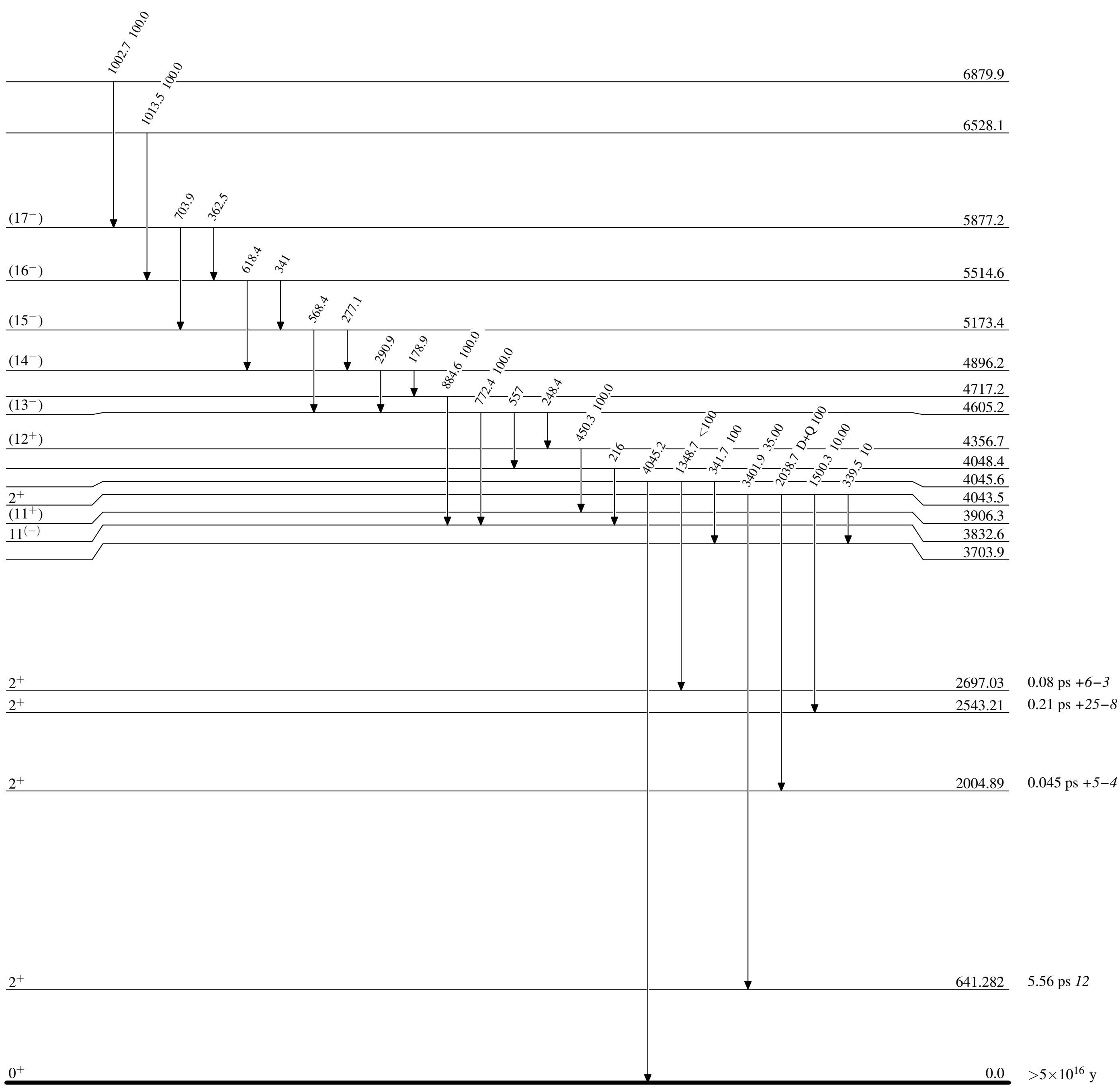
E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.‡	δ
3975.94		3975.6 *2*	<33.33	0.0	0^+		
4043.5	2^+	339.5 *4*	10 *5*	3703.9			
		1500.3 *6*	10.00	2543.21	2^+		
		2038.7 *8*	100 *5*	2004.89	2^+	D+Q	−0.99 *20*
		3401.9 *12*	35.00	641.282	2^+		
4045.6		341.7 *4*	100	3703.9			
		1348.7 *5*	<100	2697.03	2^+		
		4045.2		0.0	0^+		
4048.4		216		3832.6	$11^{(-)}$		
4356.7	(12^+)	450.3	100.0	3906.3	(11^+)		
4605.2	(13^-)	248.4		4356.7	(12^+)		
		557		4048.4			
		772.4	100.0	3832.6	$11^{(-)}$		
4717.2		884.6	100.0	3832.6	$11^{(-)}$		
4896.2	(14^-)	178.9		4717.2			
		290.9		4605.2	(13^-)		
5173.4	(15^-)	277.1		4896.2	(14^-)		
		568.4		4605.2	(13^-)		
5514.6	(16^-)	341		5173.4	(15^-)		
		618.4		4896.2	(14^-)		
5877.2	(17^-)	362.5		5514.6	(16^-)		
		703.9		5173.4	(15^-)		
6528.1		1013.5	100.0	5514.6	(16^-)		
6879.9		1002.7	100.0	5877.2	(17^-)		

† Additional information 1.
‡ From $\gamma\gamma(\theta)$ in ^{142}La β^- decay or $\gamma(\theta)$ in (n,n′γ) and assumption that usually M2 cannot compete with E1. Pure quadrupole transitions are taken to be E2 while significantly admixed D+Q transitions are assumed to be M1+E2.
# From $\gamma(\theta)$, supported by γ(linear pol) results (1992Al11).
@ From $\gamma(\theta)$ (1992Al11).
& Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



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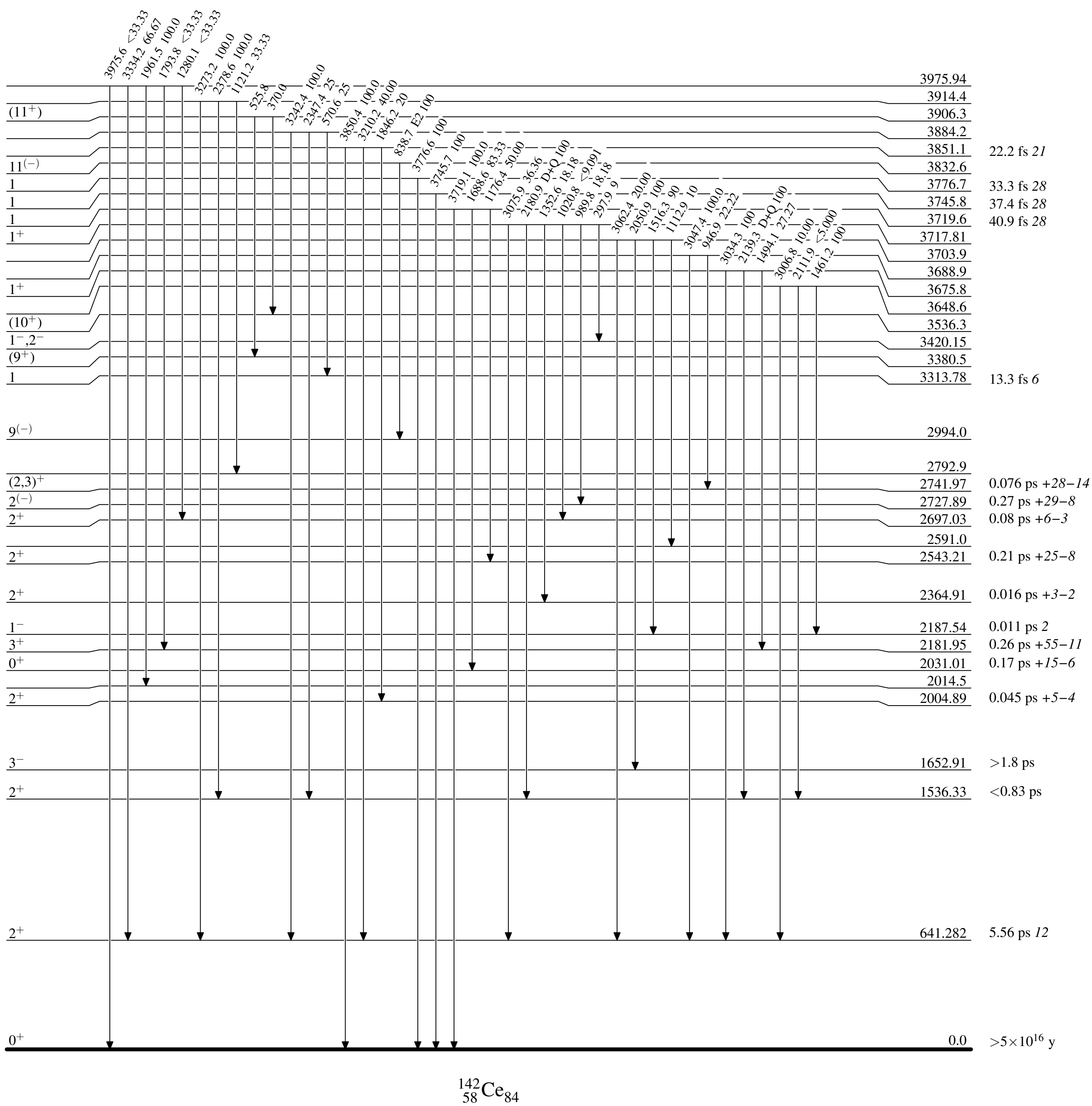
Adopted Levels, Gammas

Level Scheme (continued)

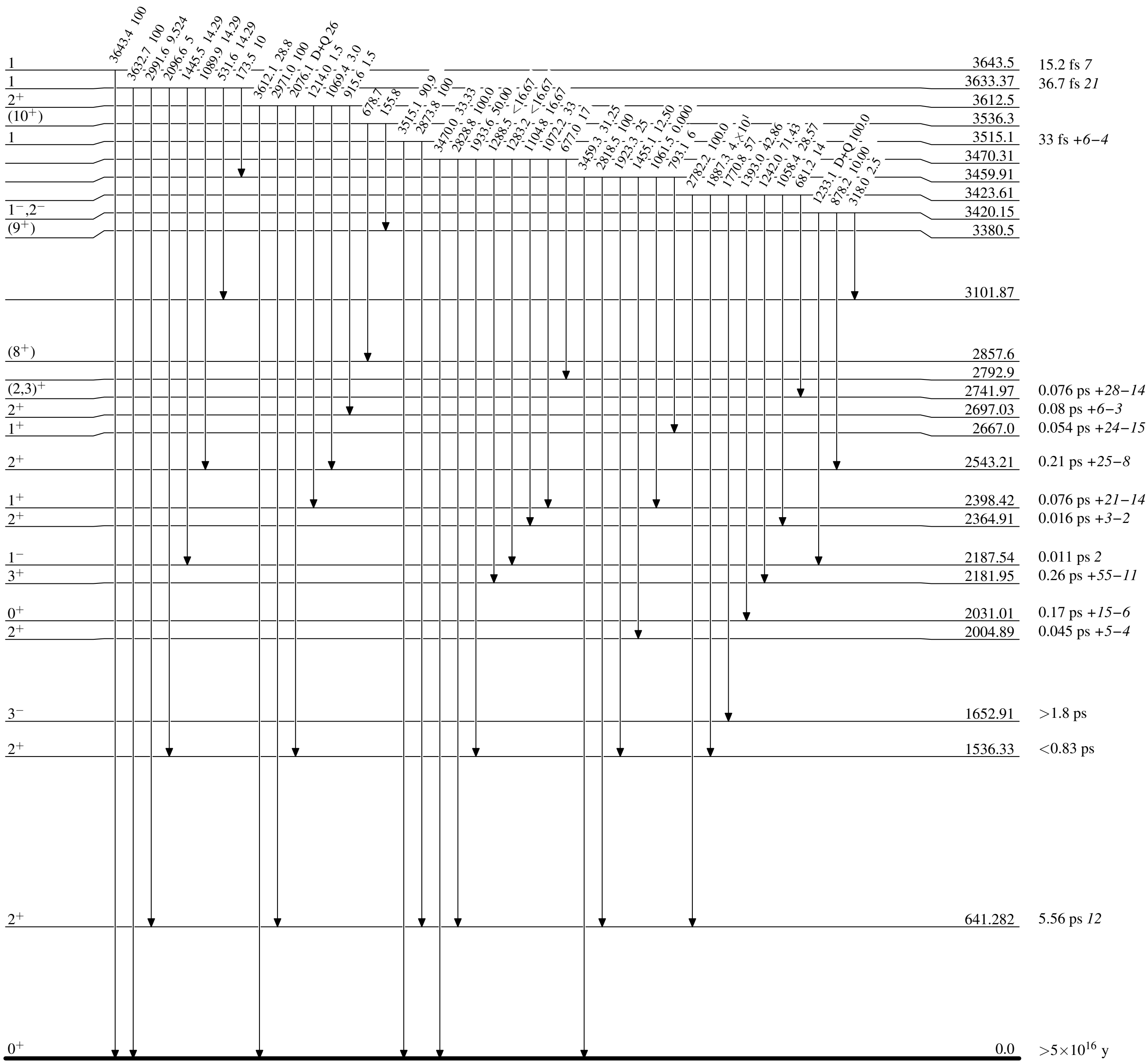
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



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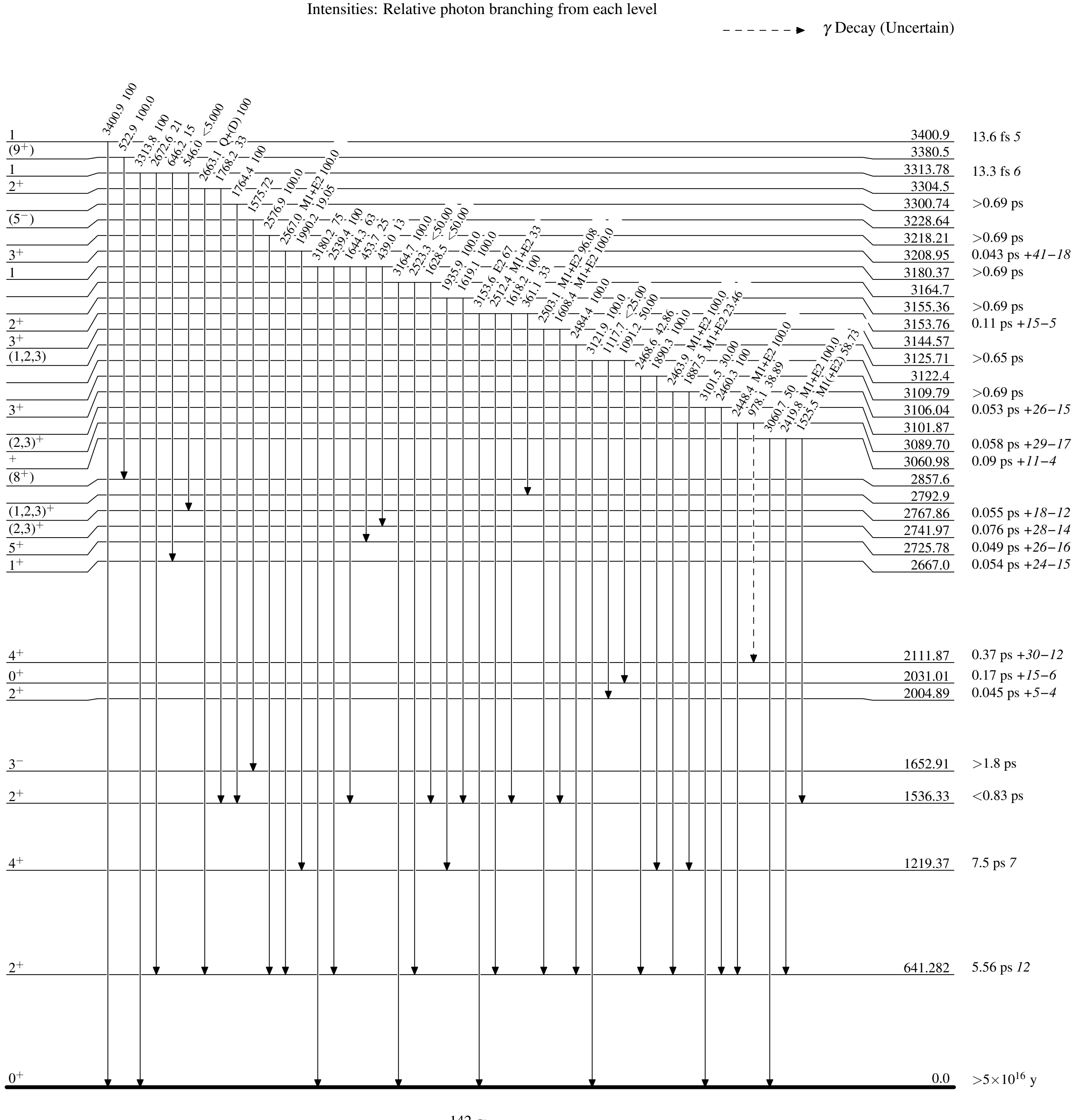
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

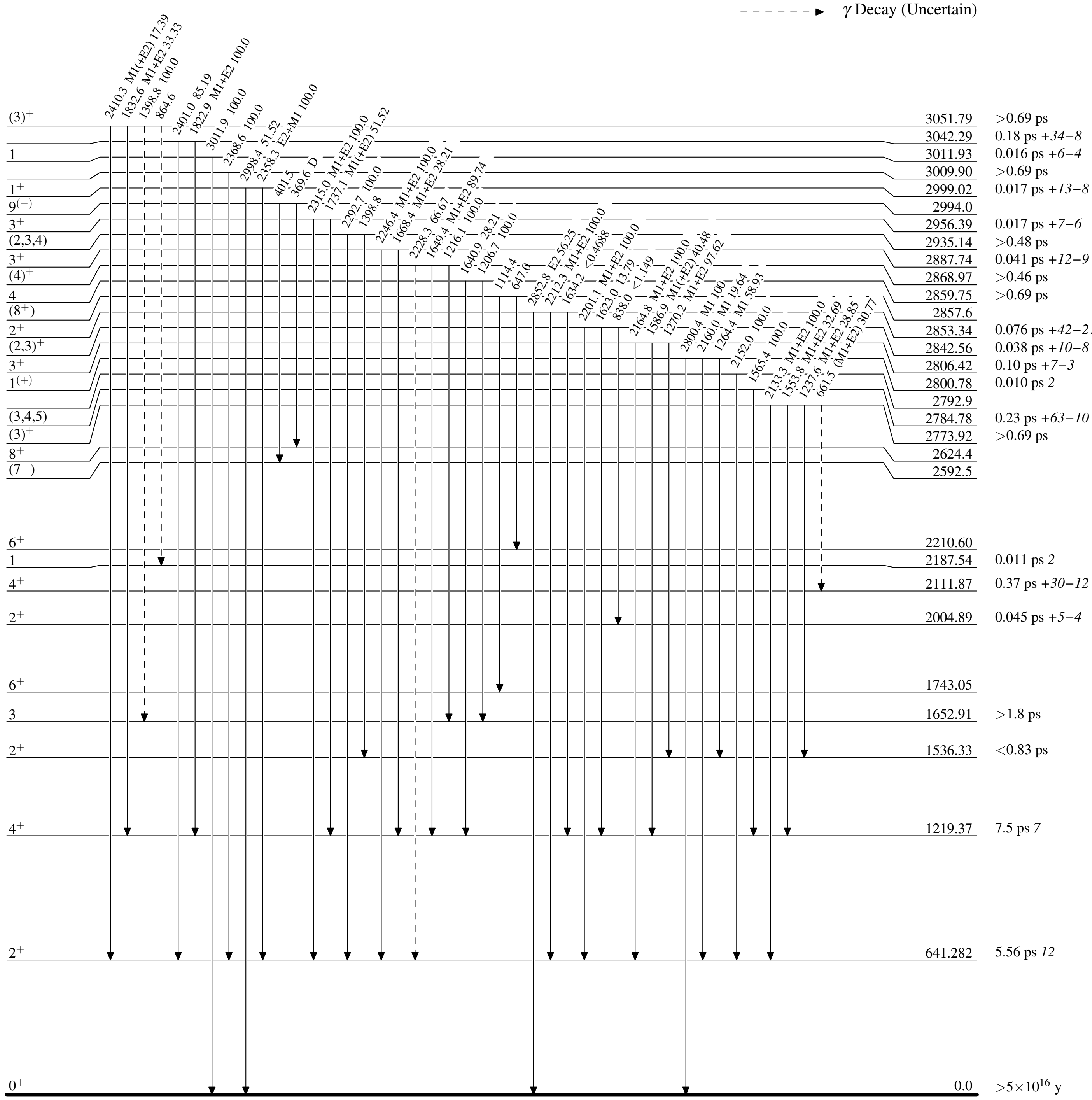


$^{142}_{58}Ce_{84}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



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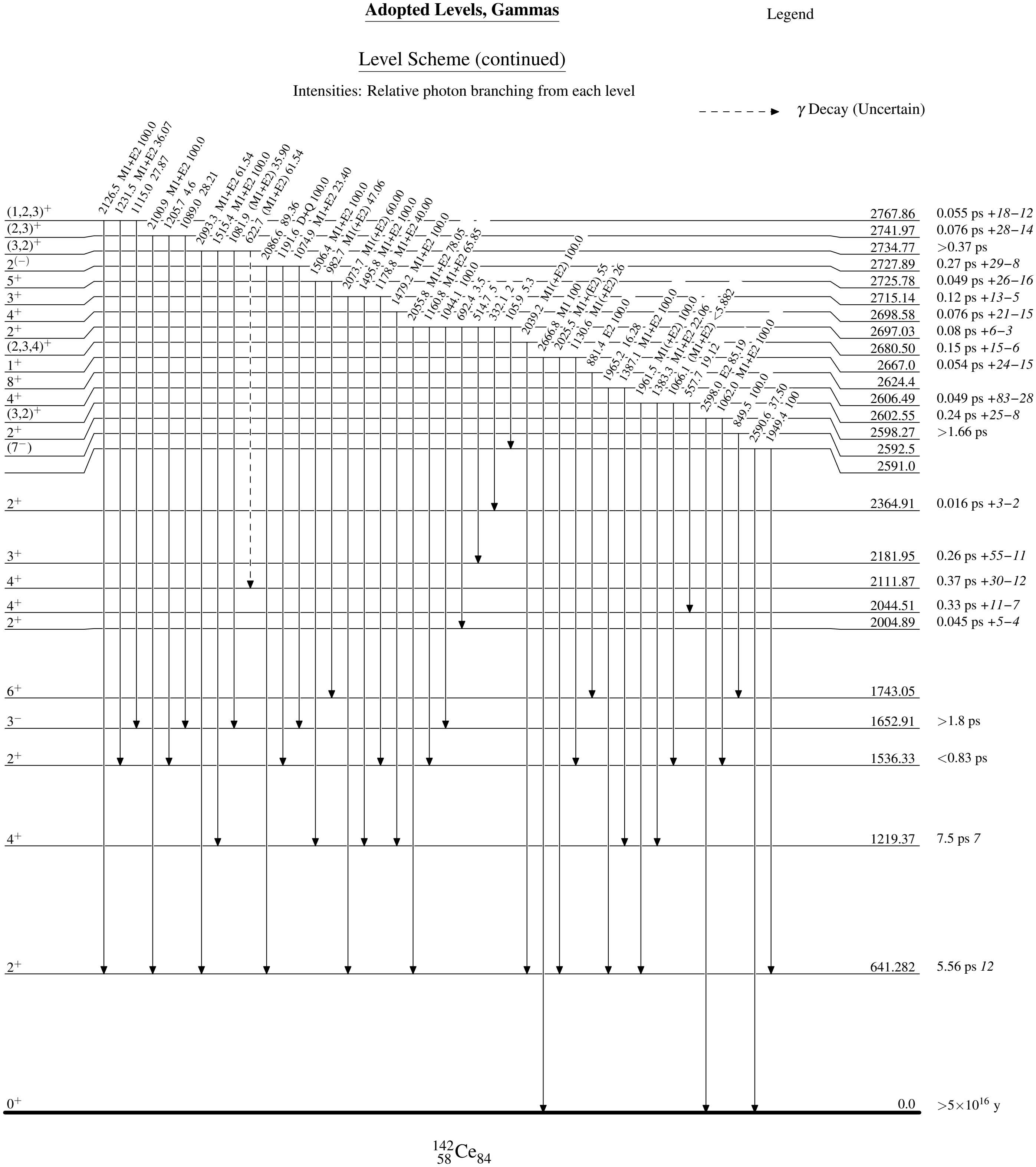
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



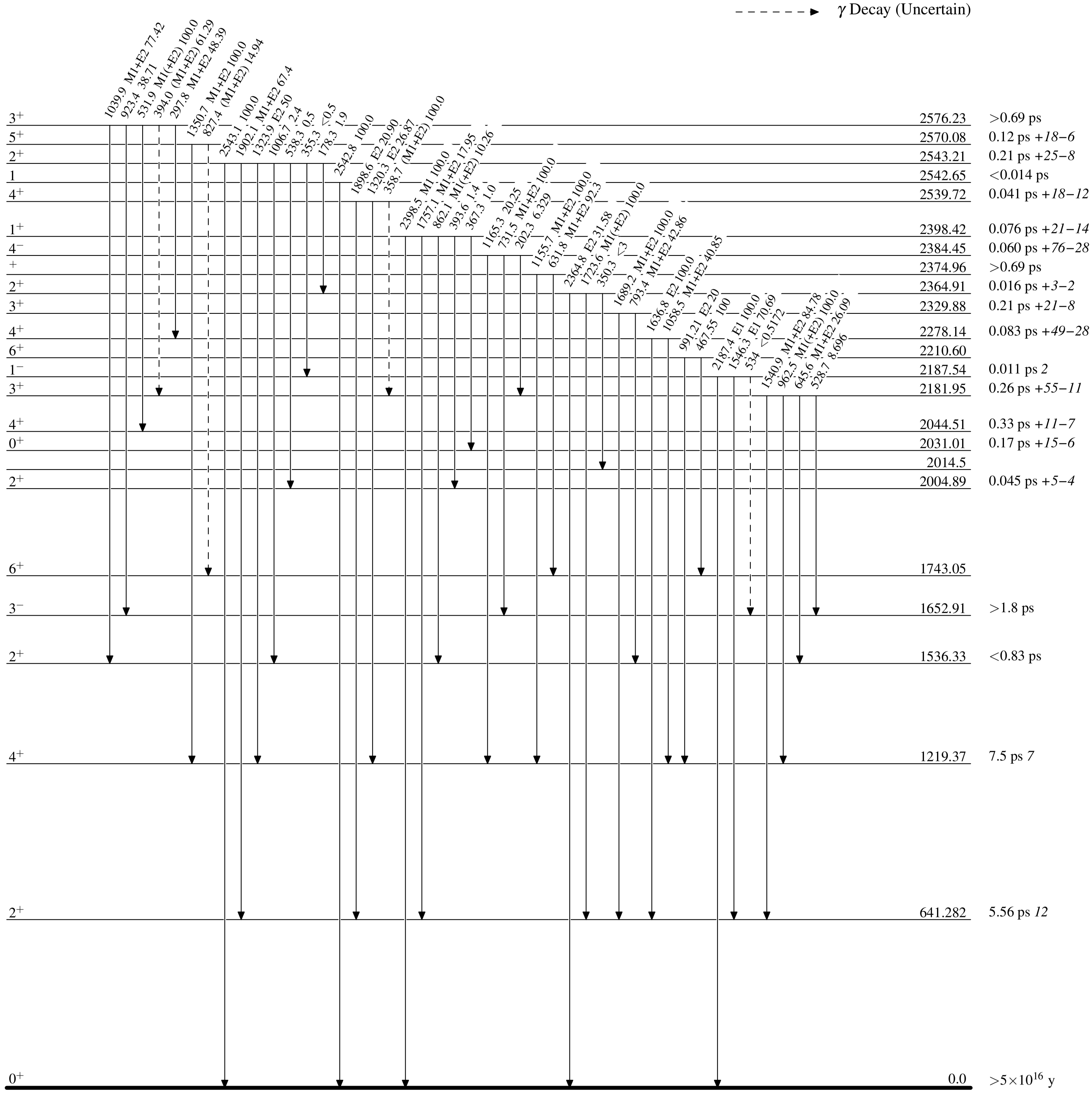
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



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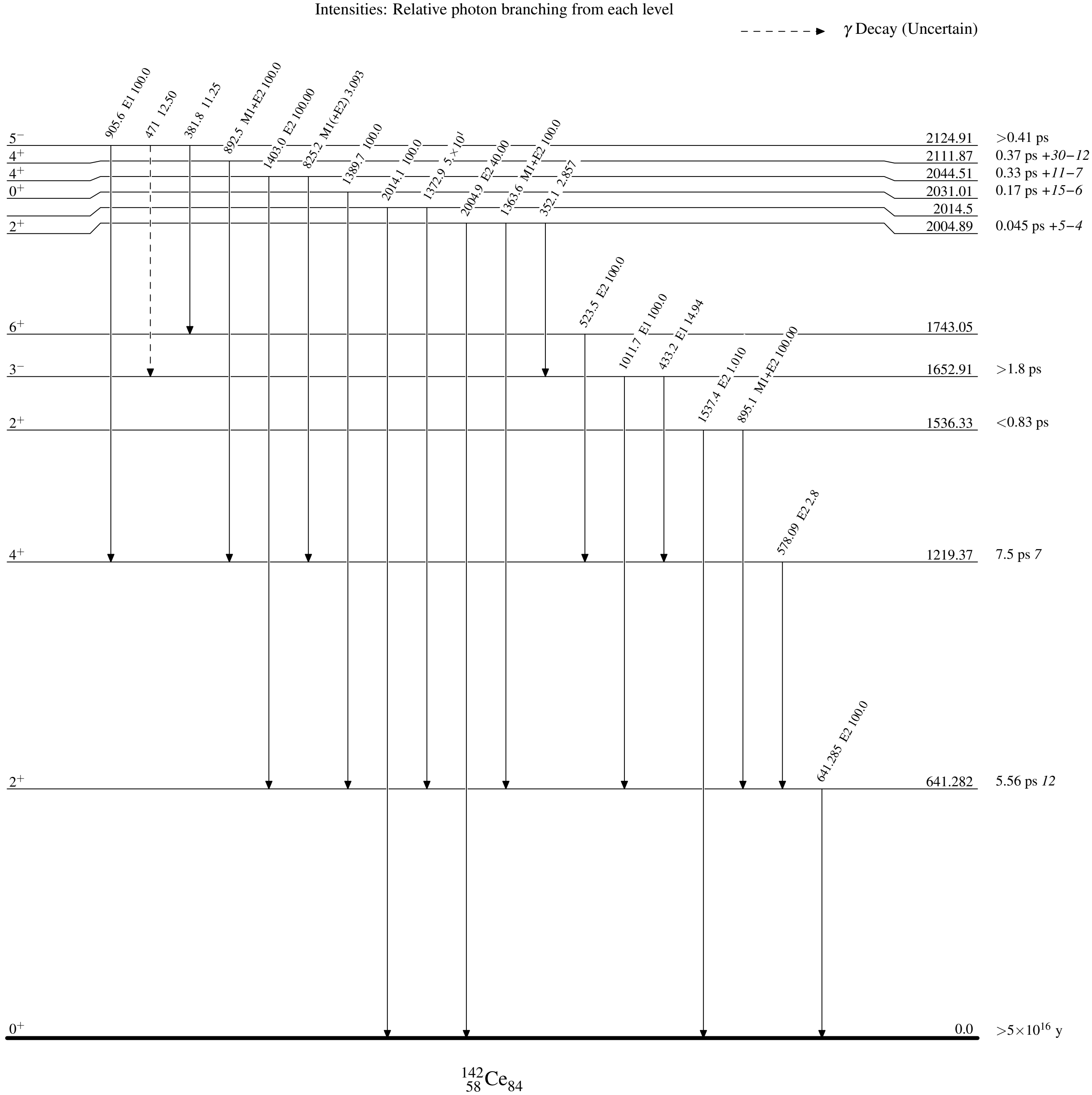
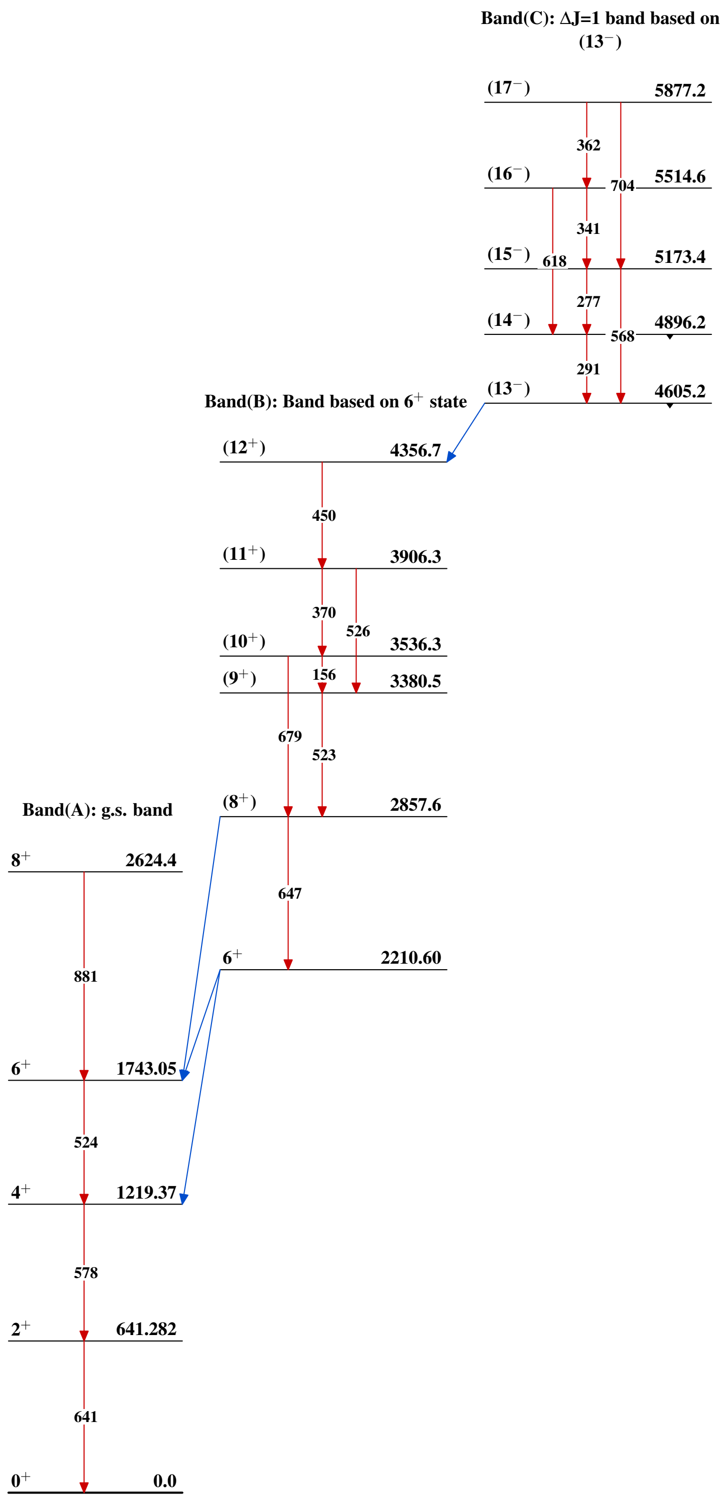
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



Adopted Levels, Gammas



$^{142}_{58}Ce_{84}$

Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	A. A. Sonzogni	NDS 93,599 (2001)	1-Dec-2000

$Q(\beta^-)$=318.6 *9*; S(n)=6897 *4*; S(p)=9549 *8*; $Q(\alpha)$=414 *9* 2012Wa38
Note: Current evaluation has used the following Q record 318.7 86896 59539 16 *410* 9 1995Au04.
Theory: 1992Bh04, 1992Eg01, 1992Na07, 1988So08.
1999Is02: Measured difference in mean-square nuclear charge radius between ^{143}Ce and ^{144}Ce using collinear laser-ion-beam spectroscopy, $\delta\langle r^2\rangle$ =0.232 fm^2 20.

^{144}Ce Levels

Cross Reference (XREF) Flags

A ^{144}La β^- decay
B ^{252}Cf,^{242}Pu SF decay

E(level)[†]	J^π[‡]	$T_{1/2}$	XREF	Comments
0.0[#]	0^+	284.91 d *5*	AB	$\%\beta^-$=100 $T_{1/2}$: weighted average from 284.5 d *10* (1956Sc87), 284.3 d *3* (1957Ke26), 283.8 d *6* (1965Fl02), 284.8 d *10* (1968La10), 284.9 d *8* (1968Re04), 285.08 d *18* (1976WaZH), 285.8 d *1* (1980Ho17), 284.45 d *14* (1983Wa26), 284.893 d 8 (1986Ol01) and 286.14 d *9* (1997Ma75).
397.441[#] *9*	2^+	35.4 ps *20*	AB	$T_{1/2}$: weigthed average from 29 ps *7* (1989Ma38) and 36.0 ps *21* (1989Mo06). J^π: E2 γ to 0^+ g.s.
938.65[#] *6*	4^+		AB	J^π: E2 γ to 2^+, (541γ)(397γ)(θ) gives J=4.
1242.21[@] *15*	(3^-)		AB	J^π: (303γ)(541γ)θ gives J=3 with 303γ as D(Q), the latter is assumed to be E1. From systematics, member of octupole band.
1346.1 *7*	(1)		A	J^π: decays to 0^+ g.s. Not fed in β^- from (3^-) parent.
1489.0 *3*	$2^{(+)}$		A	J^π: decays to 0^+ g.s., (1092γ)(397γ)(θ) consistent with 2(D,Q)2(Q)0.
1523.67[@] *10*	(5^-)		AB	J^π: $\gamma\gamma(\theta)$ is consistent with J=3, 5. $J^\pi=5^-$ is suggested by 1986WaZQ on the basis of decay of higher lying levels. Large β feeding to the level shows missing γ feeding to the level.
1646.80[#] *17*	(6^+)		B	
1673.67 *18*	4^+		A	J^π: from $\gamma\gamma(\theta)$ J=4, 1276γ to 2^+ 397 is Q.
1691.53 *22*	$3^{(+)}$		A	J^π: (1294γ)(397γ)(θ).
1819.0 *4*	2^+		A	J^π: γ to 0^+ g.s., (1421γ)(397γ)(θ) is consistent only with J=2.
1829.01 *19*	4^+		A	J^π: (1432γ)(397γ)(θ) is consistent with 4(Q)2(Q)0.
1864.5 *4*	1		A	J^π: (1467γ)(397γ)(θ) give J=1 with 1467γ as D,Q.
1890.92 *18*	$5^{(+)}$,3		A	J^π: $\gamma\gamma(\theta)$ give J=3,5.
1991.55 *22*	3,5		A	J^π: $\gamma\gamma(\theta)$ give J=3,5.
1994.34[@] *19*	(7^-)		B	
2021.1 *4*	$3^{(+)}$		A	J^π: from $\gamma\gamma(\theta)$.
2028.7 *4*	$1^{(+)}$		A	J^π: γ to 0^+ g.s., (1631γ)(397γ)(θ) not consistent with J=2.
2040.7 *3*	$3^{(+)}$		A	J^π: from $\gamma\gamma(\theta)$.
2112.10 *19*	$2^+,(1^+)$		A	J^π: γ to 0^+ g.s., $\gamma\gamma(\theta)$.
2127.0 *3*	$2^+,3^{(+)}$,4		A	
2152.8 *4*	2^+		A	J^π: γ to 0^+ g.s., (1755γ)(397γ)(θ) not consistent with J=1.
2220.8 *4*	$4^{(-)}$		A	J^π: from $\gamma\gamma(\theta)$.
2339.8 *4*	$2^{(+)}$		A	J^π: from $\gamma\gamma(\theta)$.
2352.6 *4*	2^+		A	J^π: γ to 0^+ g.s., (1955γ)(397γ)(θ) not consistent with J=1.
2368.77[#] *19*	(8^+)		B	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{144}Ce Levels (continued)

E(level)†	Jπ‡	XREF	Comments
2405.2 *4*	3,2$^{(+)}$	A	Jπ: from $\gamma\gamma(\theta)$.
2447.5 *10*		A	
2534.3 *3*	3$^{(+)}$	A	Jπ: from $\gamma\gamma(\theta)$.
2536.6 *6*	2,3$^{(+)}$,4	A	Jπ: from $\gamma\gamma(\theta)$.
2623.2 *5*		A	
2636.74@ *21*	(9$^-$)	B	
2642.41 *21*	4$^{(+)}$,(2$^+$)	A	Jπ: from $\gamma\gamma(\theta)$.
2692.8 *5*	4$^{(+)}$,3	A	Jπ: from $\gamma\gamma(\theta)$.
2749.9 *4*	2$^+$	A	Jπ: γ to 0$^+$ g.s., (2353γ)(397γ)(θ) not consistent with J=1.
2802.5 *9*		A	
2881.7 *3*	3,5$^{(-)}$	A	Jπ: from $\gamma\gamma(\theta)$.
2882.0 *7*	2$^+$	A	Jπ: γ to 0$^+$ g.s., (1639γ)γ(397γ)(θ) consistent with J=2.
2903.6 *4*	(3$^-$,4$^+$,2)	A	Jπ: from $\gamma\gamma(\theta)$.
2937.3?		A	
2998.7 *3*	2$^+$	A	Jπ: γ to 0$^+$ g.s., γ to 4$^{(+)}$, 1829 level.
3007.9 *9*	1$^{(-)}$,2$^+$	A	Jπ: γ to 0$^+$ g.s., γ to 3$^{(-)}$ 1242 level.
3060.1 *5*	1$^{(-)}$	A	Jπ: γ to 0$^+$ g.s., (2662γ)(397γ)(θ) not consistent with J=2, γ to 3$^{(-)}$.
3173.0 *5*	2,3	A	Jπ: from $\gamma\gamma(\theta)$.
3197.18 *24*	4$^{(+)}$,(3$^+$)	A	Jπ: from $\gamma\gamma(\theta)$.
3209.3 *6*		A	
3238.85 *25*	4$^{(-)}$,(2)	A	Jπ: from $\gamma\gamma(\theta)$.
3263.0 *5*	(2$^+$,3,4$^+$)	A	Jπ: from $\gamma\gamma(\theta)$.
3278.6 *6*		A	
3293.5 *6*		A	
3335.74@ *23*	(11$^-$)	B	
3371.9? *6*		A	
3396.2? *11*		A	
3408.5 *4*		A	
3424.2?		A	
3566.1 *5*		A	
3597.1 *6*		A	
3614.2 *20*		A	
3628.9 *7*	1$^{(-)}$,2$^+$	A	Jπ: γ to 0$^+$ g.s., γ to 3$^{(-)}$, 1242 level.
3635.0 *6*	1$^{(-)}$,2$^+$	A	Jπ: γ to 0$^+$ g.s., γ to 3$^{(-)}$, 1242 level.
3790.1 *5*		A	
3973.6 *12*		A	

† From least squares fit to Eγ.

‡ J^π=1,2$^+$ for levels decaying directly to 0$^+$ g.s. Low-spin J assignments are based upon $\gamma\gamma(\theta)$ results of 1982Mi01. High-spin from fission experiments.

\# Band(A): Ground-state band.

@ Band(B): Octupole band.

Adopted Levels, Gammas (continued)

$\gamma(^{144}Ce)$

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	δ[†]	α[#]	Comments
397.441	2+	397.440 9	100.0	0.0	0+	E2		0.0207	α(K)=0.0170 6; α(L)=0.00290 9; α(M)=0.00061 2; α(N+..)=0.00016 1 B(E2)(W.u.)=38 4
938.65	4+	541.20 6	100.0	397.441	2+	E2		0.0088	α(K)=0.00731 22; α(L)=0.00112 4
1242.21	(3−)	303.6 3	6.6 4	938.65	4+	(E1+M2)	+0.007 8	0.0121 1	
		844.8 4	100 4	397.441	2+	(E1+M2)	−0.126 5	0.0013	
1346.1	(1)	948.6		397.441	2+				
		1346.1		0.0	0+				
1489.0	2(+)	1092.1 5	71 8	397.441	2+	(E2+M1)	+5 +12−3	0.0017 2	
		1489.6 6	100 8	0.0	0+				
1523.67	(5−)	585.02 9	100.0	938.65	4+	D+Q			
1646.80	(6+)	708.6[‡]	100.0[‡]	938.65	4+				
1673.67	4+	431.4 3	51.2 22	1242.21	(3−)	(E1+M2)	+0.03 6	0.0051 6	
		735.2 3	100 3	938.65	4+	(M1+E2)	+0.52 4	0.0057 1	
		1276.3 5	22.7 16	397.441	2+	(E2)		0.00123	α(K)=0.00105 4; α(L)=0.00014
1691.53	3(+)	449.5 4	20 3	1242.21	(3−)				
		1294.2 5	100 10	397.441	2+	(M1+E2)			
1819.0	2+	1421.8 6	100 10	397.441	2+	E2+M1	−3.5 +14−49	0.00102 4	α(K)=0.00087 4; α(L)=0.00011
		1819.1 9	11 11	0.0	0+				
1829.01	4+	587.0 3	22.6 25	1242.21	(3−)				
		890.4 4	30.2 25	938.65	4+	(M1+E2)	+0.68 14	0.0035 2	
		1431.4 4	100 4	397.441	2+	(E2)		0.00098	α(K)=0.00083 3; α(L)=0.00011
1864.5	1	1467.1 6	100 16	397.441	2+	D(+Q)	−0.4 4		
		1864.2 9	47 18	0.0	0+				
1890.92	5(+),3	367.3 3	50 4	1523.67	(5−)				
		952.2 3	100 13	938.65	4+	D+Q			
1991.55	3,5	467.7 4	26 5	1523.67	(5−)				
		1052.7 3	100 6	938.65	4+	D+Q			
1994.34	(7−)	347.6[‡]	100[‡]	1646.80	(6+)				
		471.1[‡@]	[‡]	1523.67	(5−)				
2021.1	3(+)	1082.7 6	78 14	938.65	4+	(E2+M1)	−6 4	0.0017 2	
		1623.8 7	100 14	397.441	2+	(M1+E2)	0.13 +24−19		
2028.7	1(+)	1631.8 7	100 10	397.441	2+	(M1+E2)	+0.53 +14−11		
		2028.7 9	34 6	0.0	0+				
2040.7	3(+)	798.5 5	40 6	1242.21	(3−)				
		1102.1 5	100 9	938.65	4+	(M1+E2)	−0.63 +32−16	0.0021 2	
		1641.9 9	23 12	397.441	2+				
2112.10	2+,(1+)	1714.6 8	100 18	397.441	2+	(M1+E2)			
		2112.0 2	22 8	0.0	0+				
2127.0	2+,3(+),4	453.4 4	100.0	1673.67	4+	(E2+M1)			

$\gamma(^{144}Ce)$ (continued)

E_i(level)	J_i^π	E_γ†	I_γ†	E_f	J_f^π	Mult.†	δ†	α#
2152.8	2^+	1214.5@ *8*	<46.43	938.65	4^+			
		1755.5 *8*	100 *16*	397.441	2^+	(M1+E2)		
		2152.8 *9*	27 *13*	0.0	0^+			
2220.8	$4^{(-)}$	978.5 *5*	100 *6*	1242.21	(3^-)	(M1+E2)	−0.32 *9*	0.0030 *1*
		1282.1 *6*	17 *5*	938.65	4^+			
2339.8	$2^{(+)}$	1401.1 *6*	51 *7*	938.65	4^+			
		1942.2 *9*	100 *9*	397.441	2^+	(M1+E2)	+0.07 *17*	
		2339.5	19.59	0.0	0^+			
2352.6	2^+	1413.9 *6*	100 *18*	938.65	4^+			
		1955.1 *9*	$9.\times10^1$ *3*	397.441	2^+			
		2352.4@ *10*	47 *18*	0.0	0^+			
2368.77	(8^+)	374.5‡	100‡	1994.34	(7^-)			
		721.9‡	67‡	1646.80	(6^+)			
2405.2	$3,2^{(+)}$	2007.8 *9*	100.00	397.441	2^+	D+Q		
2447.5		2050.0 *10*	100.0	397.441	2^+			
2534.3	$3^{(+)}$	643.0 *4*	35.7 *25*	1890.92	$5^{(+)},3$			
		705.4 *4*	100 *4*	1829.01	4^+	(M1+E2)	−0.63 *9*	0.0061 *2*
		860.8 *5*	13.3 *21*	1673.67	4^+			
		2137.4 *9*	6.8 *18*	397.441	2^+			
2536.6	$2,3^{(+)},4$	1294.4 *5*	100.0	1242.21	(3^-)	D+Q		
2623.2		1683.1 *7*	100.0	938.65	4^+			
2636.74	(9^-)	267.9‡@	‡	2368.77	(8^+)			
		642.4‡	100‡	1994.34	(7^-)			
2642.41	$4^{(+)},(2^+)$	751.7 *3*	46 *4*	1890.92	$5^{(+)},3$	(M1+E2)		
		813.2 *4*	14.8 *23*	1829.01	4^+			
		950.9 *3*	57 *12*	1691.53	$3^{(+)}$			
		968.8 *5*	100 *4*	1673.67	4^+	(E2,M1+E2)		
		1153.0 *5*	13 *3*	1489.0	$2^{(+)}$			
2692.8	$4^{(+)},3$	340.2 *3*	100 *16*	2352.6	2^+			
		1754.7 *9*	88 *16*	938.65	4^+	D+Q		
2749.9	2^+	597.2 *4*	100 *17*	2152.8	2^+			
		2352.9 *10*	$9.\times10^1$ *3*	397.441	2^+	(M1+E2)		
		2749.9 *12*	24 *6*	0.0	0^+			
2802.5		1863.8 *9*	100.0	938.65	4^+			
2881.7	$3,5^{(-)}$	853.2 *5*	100 *9*	2028.7	$1^{(+)}$			
		1062.9 *6*	34 *9*	1819.0	2^+			
		1190.4 *6*	45 *9*	1691.53	$3^{(+)}$			
		1357.8 *5*	27 *9*	1523.67	(5^-)	(E2+M1)		
		1942.7 *9*	30 *7*	938.65	4^+	(E1+M2)		

$^{144}_{58}Ce_{86}$-4

$\gamma(^{144}Ce)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[†]	δ[†]	α[#]	Comments
2882.0	2^+	1639.8 *9*	100 *15*	1242.21	(3^-)				
		2881.9 *12*	41 *8*	0.0	0^+				
2903.6	$(3^-,4^+,2)$	1212.0 *8*	<65.82	1691.53	$3^{(+)}$				
		1380.1 *6*	100 *14*	1523.67	(5^-)				
		1661.4 *7*	89 *13*	1242.21	(3^-)				
		1965.0 *9*	46 *11*	938.65	4^+				
2937.3?		2540.0[@] *11*	100.0	397.441	2^+				
2998.7	2^+	871.9 *5*	100 *19*	2127.0	$2^+,3^{(+)},4$				
		1006.2 *5*	31 *10*	1991.55	3,5				
		1170.2 *5*	91 *19*	1829.01	4^+				
		1307.4 *6*	37 *10*	1691.53	$3^{(+)}$				
		1756.8 *8*	69 *17*	1242.21	(3^-)				
		2998.9[@] *15*	41 *10*	0.0	0^+				
3007.9	$1^{(-)},2^+$	1765.7 *8*	100 *16*	1242.21	(3^-)				
		3007.4[@] *15*	32 *8*	0.0	0^+				
3060.1	$1^{(-)}$	907.3 *5*	30 *5*	2152.8	2^+				
		1818.0 *9*	20 *4*	1242.21	(3^-)				
		2662.7 *10*	100 *5*	397.441	2^+	(E1+M2)	−0.09 *8*		
		3060.0 *15*	6.3 *15*	0.0	0^+				
3173.0	2,3	1308.4 *6*	68 *14*	1864.5	1				
		1499.3 *7*	100 *15*	1673.67	4^+				
		1930.9 *8*	30 *10*	1242.21	(3^-)				
3197.18	$4^{(+)},(3^+)$	1044.5 *5*	5.4 *22*	2152.8	2^+				
		1070.2 *5*	28 *3*	2127.0	$2^+,3^{(+)},4$				
		1084.3 *6*	22 *4*	2112.10	$2^+,(1^+)$	(E2)		0.00172	α(K)=0.00146 *5*; α(L)=0.00019 *1*
		1176.2 *5*	14 *4*	2021.1	$3^{(+)}$				
		1505.7 *7*	11 *3*	1691.53	$3^{(+)}$				
		1523.5 *7*	100 *5*	1673.67	4^+	(M1+E2)			
		1673.7 *6*	40 *4*	1523.67	(5^-)	D+Q			
		1955.2 *9*	27 *4*	1242.21	(3^-)				
		2258.7 *9*	18.7 *22*	938.65	4^+				
3209.3		1217.8 *6*	100 *22*	1991.55	3,5				
		1966.8 *9*	93 *19*	1242.21	(3^-)				
3238.85	$4^{(-)},(2)$	357.3 *4*	9.7 *24*	2881.7	$3,5^{(-)}$				
		833.6 *4*	31 *3*	2405.2	$3,2^{(+)}$				
		1017.8 *5*	9.3 *20*	2220.8	$4^{(-)}$				
		1247.4 *6*	13 *4*	1991.55	3,5				
		1347.8 *6*	53 *4*	1890.92	$5^{(+)},3$	(E1+M2)	−0.09 *22*	0.00052 *24*	α(K)=0.00045 *20*
		1715.6 *8*	31 *4*	1523.67	(5^-)	D+Q			
		1996.4 *7*	100 *5*	1242.21	(3^-)	D+Q			

From ENSDF

$^{144}_{58}Ce_{86}$-5

Adopted Levels, Gammas (continued)

γ(^{144}Ce) (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f
3238.85	$4^{(-)}$,(2)	2300.0 *10*	11.7 *24*	938.65	4^+
3263.0	(2^+,3,4^+)	857.8 *5*	13 *12*	2405.2	3,$2^{(+)}$
		2324.4 *9*	55 *9*	938.65	4^+
		2865.2 *12*	100 *9*	397.441	2^+
3278.6		1237.8 *6*	100 *16*	2040.7	$3^{(+)}$
		2036.5 *9*	73 *15*	1242.21	(3^-)
		2340.0 *15*	38 *10*	938.65	4^+
3293.5		1804.4 *8*	100 *13*	1489.0	$2^{(+)}$
		2051.4 *10*	79 *13*	1242.21	(3^-)
		2896.2 *12*	45 *9*	397.441	2^+
3335.74	(11^-)	699.0‡	100‡	2636.74	(9^-)
3371.9?		621.8 *5*	1.0×10^2 *3*	2749.9	2^+
		2131.0 *16*	20 *10*	1242.21	(3^-)
3396.2?		2154.0 *10*	100.0	1242.21	(3^-)
3408.5		1367.6 *5*	68 *15*	2040.7	$3^{(+)}$
		1387.5 *6*	100 *15*	2021.1	$3^{(+)}$
		2166.5 *9*	53 *11*	1242.21	(3^-)
3424.2?		2182.1@ *9*	46 *16*	1242.21	(3^-)
3424.2?		3027.4@ *15*	100 *20*	397.441	2^+
3566.1		662.5 *4*	100 *9*	2903.6	(3^-,4^+,2)
		763.4@ *4*	34 *8*	2802.5	
		2323.7 *9*	32 *6*	1242.21	(3^-)
3597.1		974.2 *5*	100 *17*	2623.2	
		2353.6 *10*	40 *9*	1242.21	(3^-)
3614.2		2372.0 *20*	100.0	1242.21	(3^-)
3628.9	$1^{(-)}$,2^+	746.9 *4*	100 *12*	2882.0	2^+
		2386.8 *20*	<32.05	1242.21	(3^-)
		3628.9 *15*	15 *4*	0.0	0^+
3635.0	$1^{(-)}$,2^+	1010.8 *5*	100 *22*	2623.2	
		2150.8 *9*	43 *18*	1489.0	$2^{(+)}$
		2390.3 *20*	<54.35	1242.21	(3^-)
		3632.4 *15*	22 *7*	0.0	0^+
3790.1		1437.8 *6*	34 *20*	2352.6	2^+
		1450.2 *6*	100 *25*	2339.8	$2^{(+)}$
		2547.6 *11*	29 *10*	1242.21	(3^-)
3973.6		2731.4 *12*	100.0	1242.21	(3^-)

† From β-decay studies, except as noted.

‡ From 1995Zh34 in SF decay.

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.

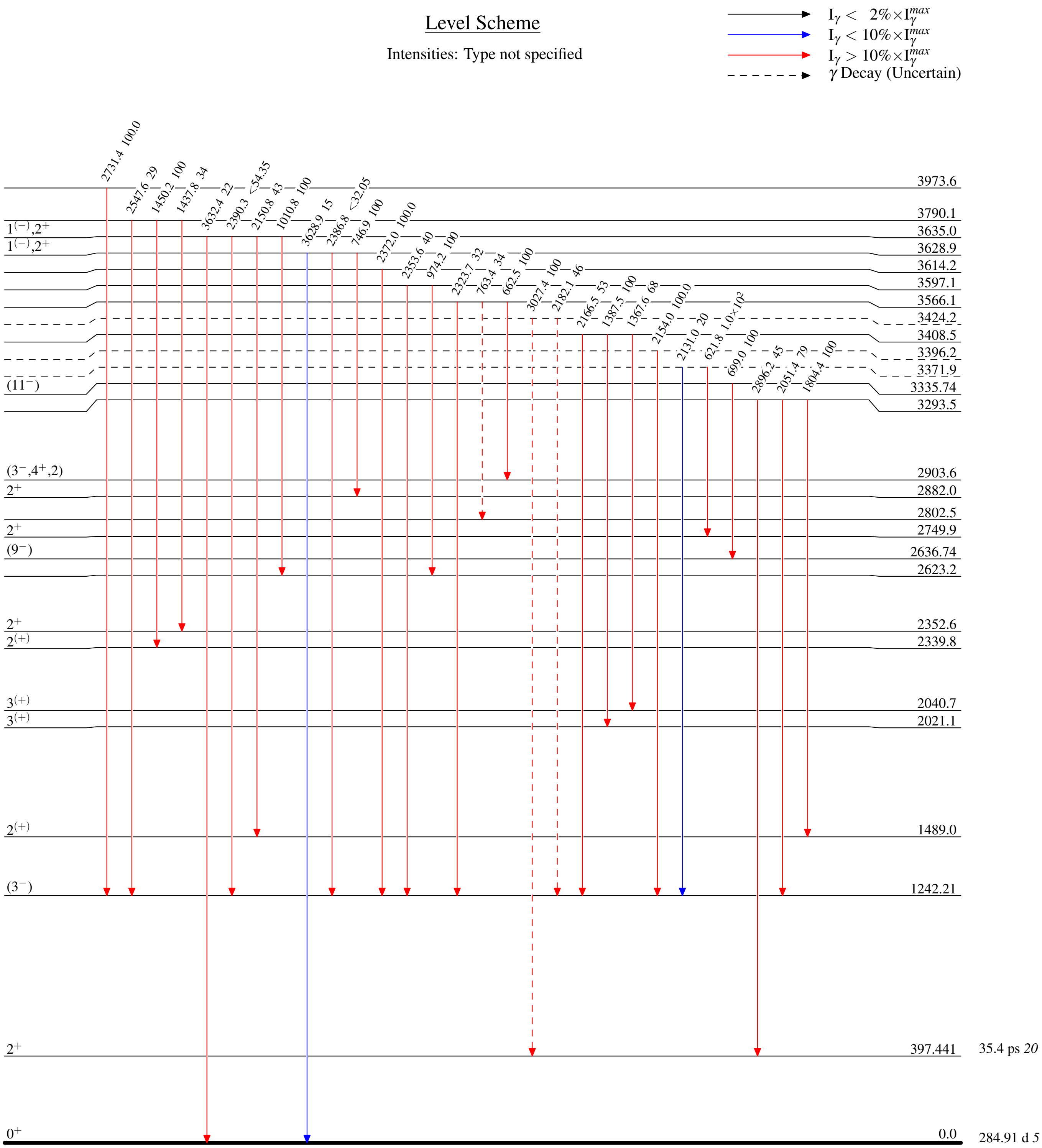
@ Placement of transition in the level scheme is uncertain.

$^{144}_{58}$Ce$_{86}$-6

Adopted Levels, Gammas

Level Scheme

Intensities: Type not specified

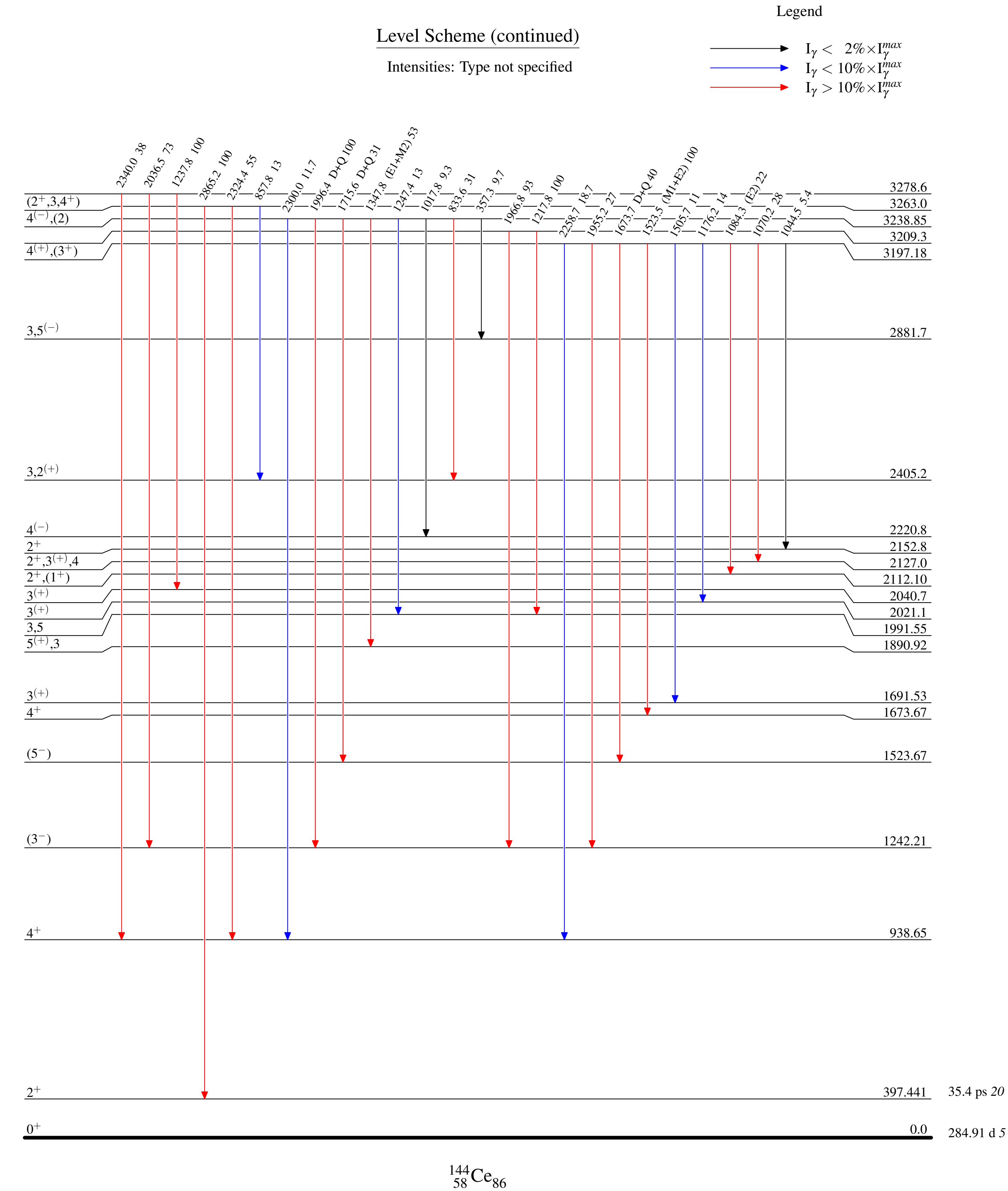


$^{144}_{58}Ce_{86}$

Adopted Levels, Gammas

Level Scheme (continued)

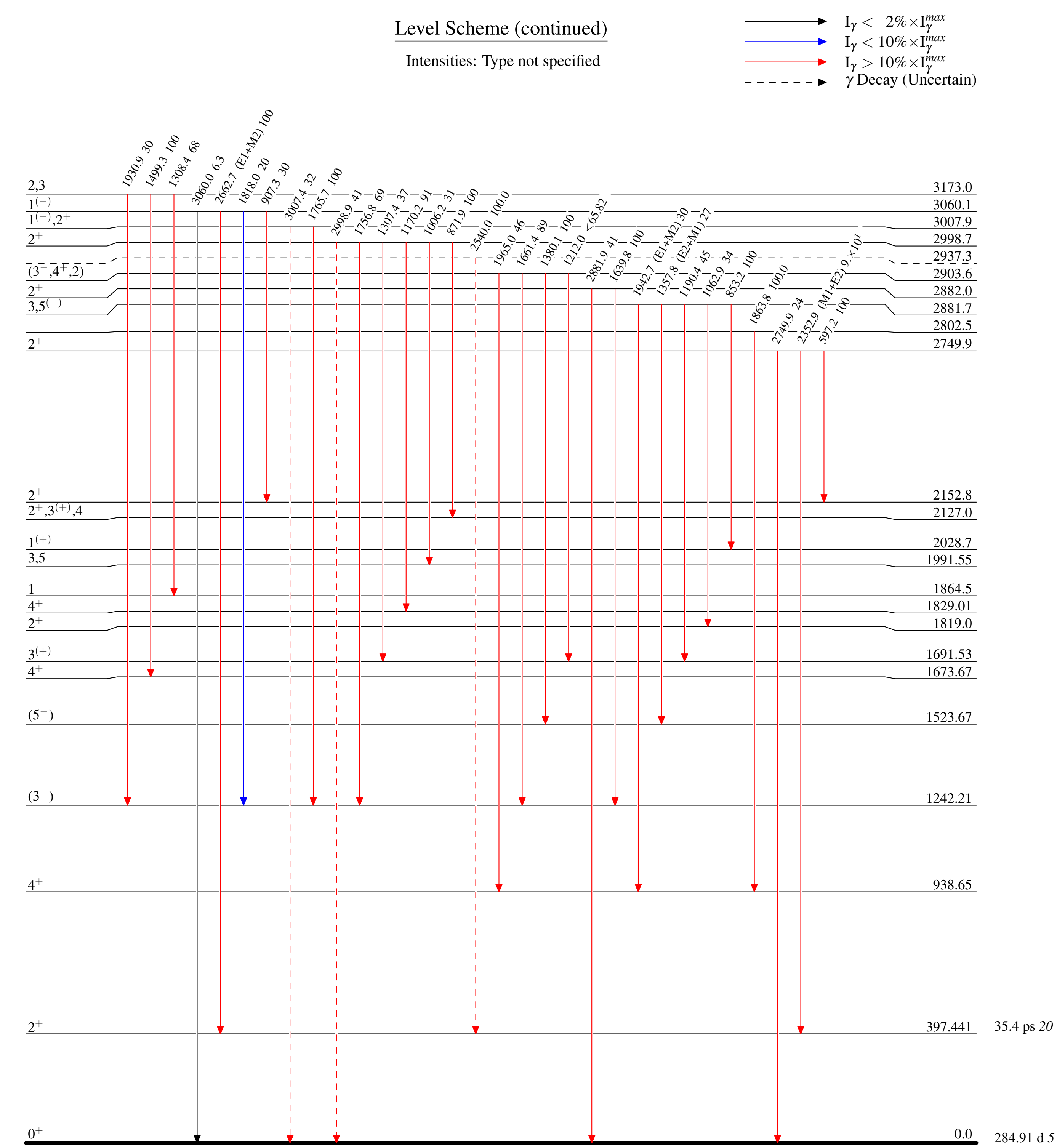
Intensities: Type not specified



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified



$^{144}_{58}Ce_{86}$

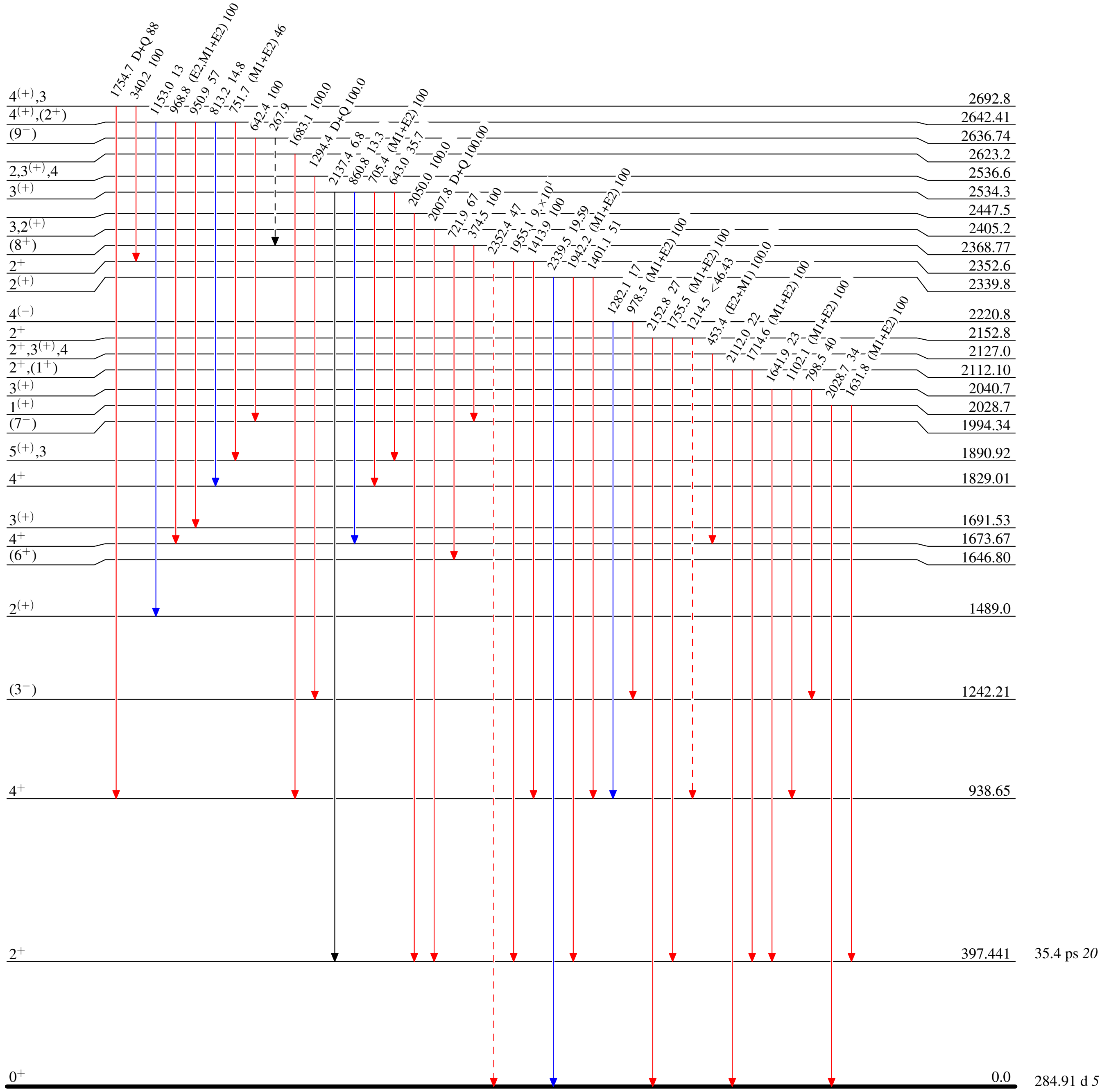
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

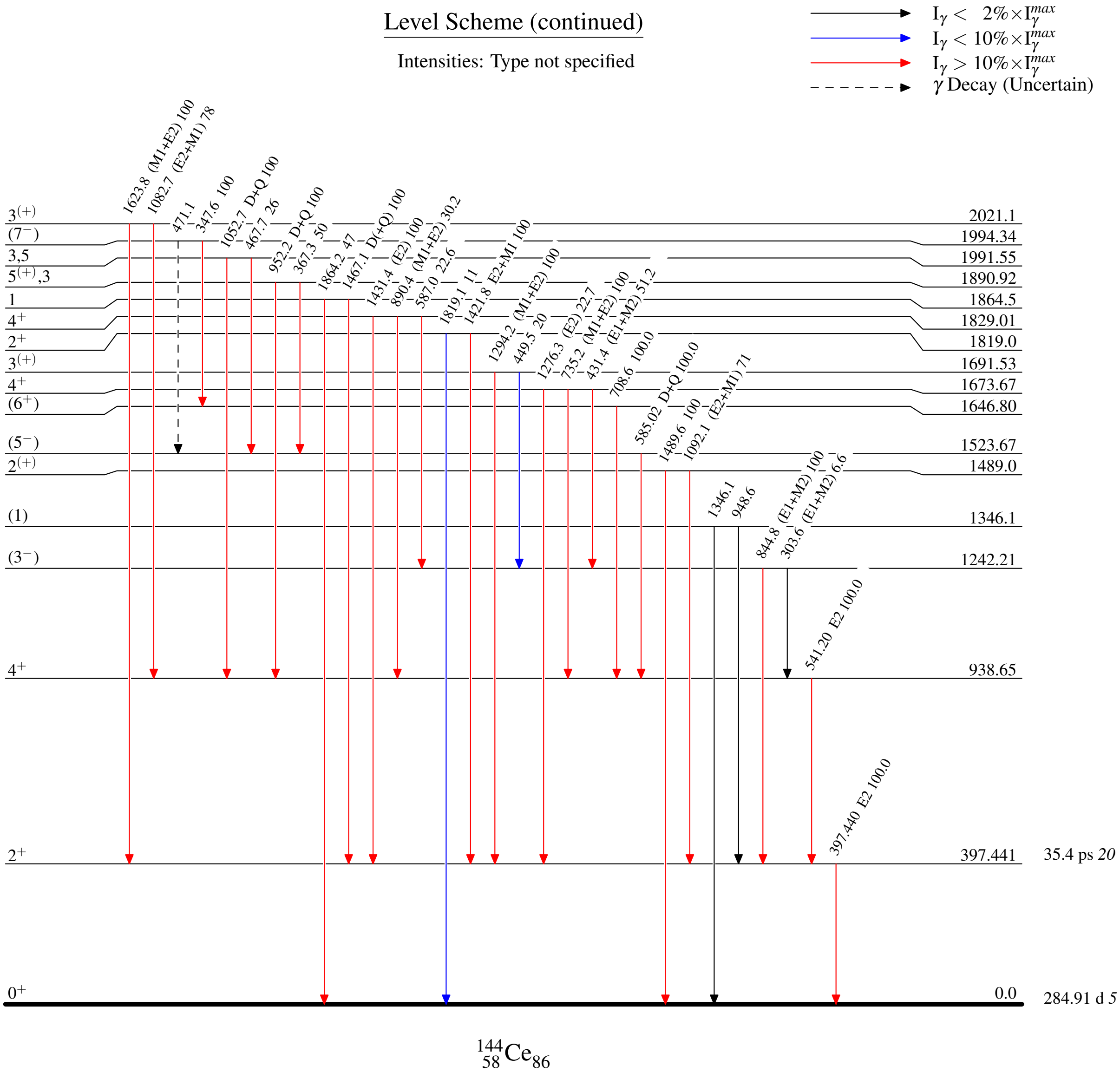
Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)

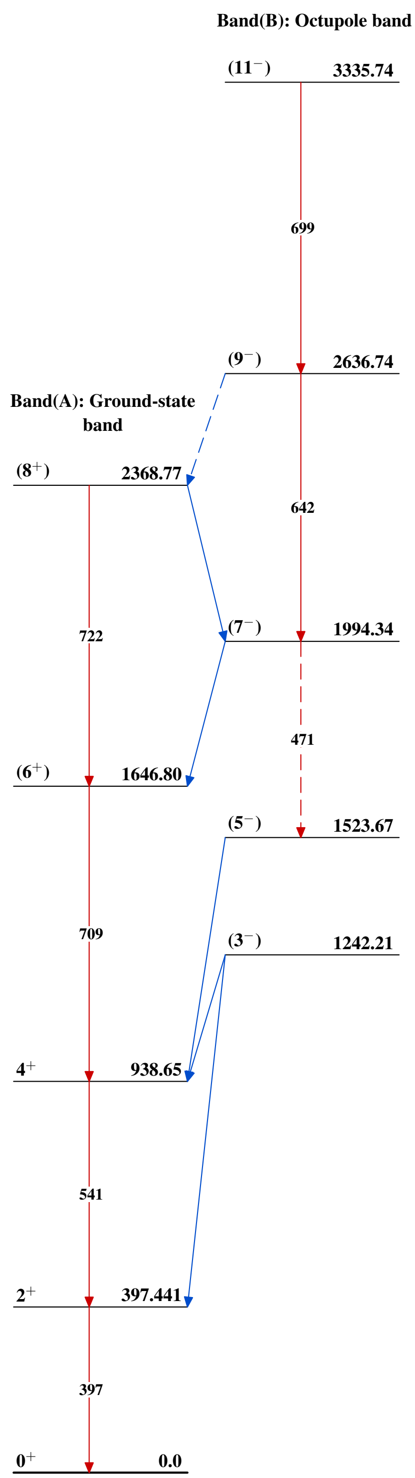


$^{144}_{58}Ce_{86}$

Adopted Levels, Gammas



Adopted Levels, Gammas



$^{144}_{58}Ce_{86}$

Adopted Levels, Gammas

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Yu. Khazov, A. Rodionov and G. Shulyak	NDS 136, 163 (2016)	14-Jul-2016

Q(β^-)=1050 *30*; S(n)=6640 *40*; S(p)=10089 *20*; Q(α)=−240 *17* 2012Wa38
Produced and identified by 1953Ca10; uranium fission.

^{146}Ce Levels

The level scheme of ^{146}Ce is constructed on the basis of data on 6.1 s and 9.8 s β^- decays of ^{146}La, and fragment decay in ^{252}Cf SF. ^{146}Ce produced also in ^{147}La(β^-n) decay; %β^-n=0.035 *6* (1986Wa17), %β^-n=0.033 *25* (1984Ma39), no γ rays of ^{146}Ce were observed.

Cross Reference (XREF) Flags

A	^{146}La β^- decay (6.1 s)
B	^{146}La β^- decay (9.8 s)
C	^{252}Cf SF decay
D	^{235}U(n,Fγ)

E(level)[†‡]	J$^\pi$	T$_{1/2}$	XREF	Comments
0.0[@]	0$^+$	13.49 min *16*	ABCD	%β^-=100 T$_{1/2}$: average with Rajeval technique of 13.16 min *5* (1983Ge11), 13.52 min *13* (1980Ya07), 13.9 min *6* (1953Ca10), 14.6 min *8* (1950Sc85).
258.45[@] *4*	2$^+$	0.231 ns *26*	ABCD	μ=+0.92 *20* (2009Go09) J$^\pi$: 258.4γ E2 to 0$^+$, band assignment. μ: obtained by IPAC method; sign from systematics, theory. Others: μ=0.92 *68* (IMPAC 1999Sm05), μ=0.48 *10* (IPAC 1986Gi05). T$_{1/2}$: average with Rajeval technique of 0.26 ns *5* (1974JaYY), 0.24 ns *3* (1980ChZM), 0.189 ns *10* (1989Ma38). Other: 0.29 ns (1970Wi16).
668.38[@] *4*	4$^+$		ABC	J$^\pi$: 409.8γ E2 to 2$^+$, band assignment.
924.58[b] *4*	1$^-$		ABC	J$^\pi$: 666.1γ E1 to 2$^+$, 924.59γ to 0$^+$, from $\gamma\gamma(\theta)$, head level of octupole band. This level is not connected by a transition with next member of the band, namely 960.72 keV level. Assignment is based on E(level) considerations (1988Ph02,1999HaZV).
960.72[b] *5*	3$^-$		ABC	J$^\pi$: 702.2γ E1 to 2$^+$, from $\gamma\gamma(\theta)$, octupole band assignment.
1043.24[&] *8*	0$^+$		AB	J$^\pi$: 784.7γ E2 to 2$^+$, from $\gamma\gamma(\theta)$, head level of β-band.
1171.35[@] *7*	6$^+$		ABC	J$^\pi$: 503.0γ E2 to 4$^+$, band assignment.
1182.98[b] *6*	5$^-$		ABC	J$^\pi$: 514.7γ E1 to 4$^+$, from $\gamma\gamma(\theta)$, octupole band assignment.
1274.34[&] *5*	2$^+$		AB	J$^\pi$: 1015.9γ M1+E2 to 2$^+$, 1274.3γ to 0$^+$, from $\gamma\gamma(\theta)$, β-band assignment.
1381.93[a] *5*	2$^+$		AB	J$^\pi$: 713.41γ to 4$^+$, 1382.02γ to 0$^+$, head level of γ band (2000Ya08).
1551.06[b] *10*	7$^-$		C	J$^\pi$: 379.7γ (E1) to 6$^+$, 368.0γ to 5$^-$; decay pattern and band assignment. E(level): this could be the same as the level 1551.13 keV. There is a discrepancy in their J^π assignments and their decay patterns.
1551.13 *9*	5$^-$		B	J$^\pi$: 379.8γ E1 to 6$^+$, 882.6γ to 4$^+$ is confirmed by $\gamma\gamma$ coin in 1993Sh10.
1576.63[a] *6*	3$^+$		AB	J$^\pi$: 1318.14γ M1+E2 to 2$^+$, from $\gamma\gamma(\theta)$, band assignment.
1627.30[&] *7*	4$^+$		AB	J$^\pi$: 959.1γ M1+E2 to 4$^+$, from $\gamma\gamma(\theta)$, band assignment.
1657.77 *12*	0$^+$		AB	J$^\pi$: 1398.8γ to 2$^+$, from $\gamma\gamma(\theta)$, 0+→2+→0$^+$ cascade in 1981WaZL; log $f^{1u}t$=8 in β- decay of ^{146}La, J^π=(2$^-$).
1711.92[a] *8*	(4$^+$)		B	J$^\pi$: 1453.5γ to 2$^+$, 528.8γ to 5$^-$, 427.7γ from (5$^+$); band assignment (2000Ya08).
1736.77[@] *12*	8$^+$[#]		BC	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{146}Ce Levels (continued)

E(level)[†‡]	J$^{\pi}$	XREF	Comments
1753.83 7	(1$^-$,2,3$^-$)	AB	J$^{\pi}$: 793.1γ to 3$^-$, 829.3γ to 1$^-$.
1756.68 6	(1,2$^+$)	AB	J$^{\pi}$: 713.5γ and 1756.8γ to 0$^+$.
1769.22 10	(4$^+$,5$^-$)	B	J$^{\pi}$: 808.6γ to 3$^-$, 501.3γ from (6$^+$); from feeding in ^{146}La, J$^{\pi}$=6$^-$ β^- decay.
1797.0 3		B	
1802.31 4	(4$^+$)	AB	J$^{\pi}$: 1543.9γ to 2$^+$, 631.4γ to 6$^+$.
1808.45 13		AB	
1810.41[a] 6	5$^+$	B	J$^{\pi}$: 183.2γ M1+E2 to 4$^+$, 638.9γ, M1+E2 to 6$^+$; band assignment (2000Ya08).
1831.91 11	(1,2$^+$)	AB	J$^{\pi}$: 1831.6γ to 0$^+$.
1875.55 17	(4,5$^-$)	B	J$^{\pi}$: 915.0γ to 3$^-$, 692.4γ to 5$^-$.
1891.83 9	(3$^-$,4,5$^-$)	B	J$^{\pi}$: 523.0γ from (3$^-$); feeding in ^{146}La, J$^{\pi}$=6$^-$ β^- decay.
1916.19 11	(4,5$^-$)	B	J$^{\pi}$: 955.5γ to 3$^-$; from feeding in ^{146}La, J$^{\pi}$=6$^-$ β^- decay.
1956.26 8	(4$^+$,5,6$^+$)	AB	J$^{\pi}$: 784.8γ to 6$^+$, 1288.2γ to 4$^+$; from feeding in ^{146}La, J$^{\pi}$=6$^-$ β^- decay.
1989.16 14		AB	
2019.41[b] 14	(9$^-$)[#]	C	
2022.6 3	(4$^+$)	B	J$^{\pi}$: 1764.2γ to 2$^+$; from feeding in ^{146}La, J$^{\pi}$=6$^-$ β^- decay.
2031.43 9	(4$^+$)	AB	J$^{\pi}$: 1772.7γ to 2$^+$, 860.7γ to 6$^+$.
2051.55 10		AB	
2071.79 12	(2$^+$)	AB	J$^{\pi}$: 1028.5γ to 0$^+$, 1404.2γ to 4$^+$.
2090.47 13	(4$^+$)	B	J$^{\pi}$: 1832.7γ to 2$^+$, 918.6γ to 6$^+$.
2126.46 11	(1$^+$,2$^+$)	AB	J$^{\pi}$: 1084.3γ to 0$^+$, 549.8γ to 3$^+$.
2128.68 21		B	
2139.81 14	(4$^+$,5$^+$)	B	J$^{\pi}$: 969.0γ to 6$^+$, 563.4γ to 3$^+$.
2155.99 12	(1$^-$,2$^+$)	AB	J$^{\pi}$: 2155.8γ to 0$^+$, 1195.4γ to 3$^-$.
2177.37 7	(5$^-$,4$^+$)	B	J$^{\pi}$: 1216.5γ to 3$^-$, 1006.1γ to 6$^+$.
2179.44 18	(1,2$^+$)	A	J$^{\pi}$: 2179.6γ to 0$^+$.
2183.0 5		B	
2194.08 17		B	
2209.6 4		B	
2222.71 13	(3,4$^+$)	AB	J$^{\pi}$: 948.4γ to 2$^+$, 646.0γ to 3$^+$, 1262.2γ to 3$^-$.
2233.66 16	(1,2$^+$)	A	J$^{\pi}$: 2233.9γ to 0$^+$.
2256.53 8	(4$^+$,5,6$^+$)	B	J$^{\pi}$: 225.0γ to (4$^+$); from feeding in ^{146}La, J$^{\pi}$=6$^-$ β^- decay.
2261.1 3		A	
2262.14 11		B	
2270.30[&] 14	(6$^+$)	B	J$^{\pi}$: 1602.1γ to 4$^+$; band assignment (1993Sh10).
2274.5 3		B	
2311.02 11	(1$^-$,2$^+$)	AB	J$^{\pi}$: 2311.0γ to 0$^+$, 1350.5γ to 3$^-$.
2318.57 7	(1,2$^+$)	AB	J$^{\pi}$: 2318.6γ to 0$^+$.
2337.5 6		B	
2351.51[@] 16	(10$^+$)[#]	C	
2368.08 10	(1$^-$,2$^+$)	AB	J$^{\pi}$: 2367.9γ to 0$^+$, 1407.6γ to 3$^-$.
2373.3 3		B	
2397.85 9	(2$^+$)	AB	J$^{\pi}$: 2397.78γ to 0$^+$, 366.68γ to (4$^+$).
2399.07 19		A	
2414.51 10	(4$^+$)	AB	J$^{\pi}$: 2155.9γ to 2$^+$; from feeding in ^{146}La, J$^{\pi}$=6$^-$ β^- decay.
2442.40 22		A	
2446.89 10	(3$^-$)	AB	J$^{\pi}$: 2188.3γ to 2$^+$, 572.1γ to (4,5$^-$), 836.0γ from (1$^-$,2$^+$).
2468.8 3		B	
2512.21 21		AB	
2519.16 15		B	
2543.83 13		AB	
2551.86 10		AB	
2562.65[b] 16	(11$^-$)[#]	C	
2569.86 13		AB	
2587.68 21		B	
2639.47 19		A	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{146}Ce Levels (continued)

E(level)[†‡]	J^π	XREF	Comments
2713.44 *15*		AB	
2779.5 *4*	(1,2$^+$)	B	J^π: 2779.4γ to 0$^+$.
2796.72 *25*		B	
2809.5 *3*		B	
2841.11 *11*		AB	
2861.88 *11*	(1,2$^+$)	AB	J^π: 2861.5γ to 0$^+$.
2868.96 *12*		AB	
2914.23 *12*		B	
2953.46 *11*	(2,3$^-$)	AB	J^π: 2028.8γ to 1$^-$, 1377.0γ to 3$^+$, 1992.5γ to 3$^-$.
2996.27 *24*	(1,2$^+$)	A	J^π: 2996.0γ to 0$^+$.
3064.0 *3*		B	
3163.4[b] *3*	(13$^-$)[#]	C	
3164.6 *5*	(1,2$^+$)	B	J^π: 3165.5γ to 0$^+$.
3166.65 *17*	(1,2$^+$)	A	J^π: 1508.7γ to 0$^+$.
3243.11 *9*		B	
3255.45 *17*	(2,3$^+$)	AB	J^π: 1129.2γ to (1$^+$,2$^+$), 2293.2γ to 3$^-$, 1678.7γ to 3$^+$.
3273.7 *9*		B	
3283.15 *10*	(1$^-$,2$^+$)	AB	J^π: 1625.0γ to 0$^+$, 2322.38γ to 3$^-$.
3329.54 *12*	(2$^+$)	AB	J^π: 1673.1γ to 0$^+$, 1752.9γ to 3$^+$, 2368.8γ to 3$^-$.
3342.03 *10*		AB	
3390.2 *6*		B	
3399.56 *11*	(1,2$^+$)	A	J^π: 1741.5γ to 0$^+$.
3403.3 *4*		B	
3450.6 *4*		B	
3457.86 *10*		A	
3494.51 *16*		B	
3502.20 *21*		B	
3532.7 *4*		B	
3535.16 *21*		AB	
3653.7 *5*	(2$^+$)	B	J^π: 3653.7γ to 0$^+$, 2985.2γ to 4$^+$.
3729.9 *4*		B	
3826.0[b] *4*	(15$^-$)[#]	C	
3859.1 *5*		B	
3918.0 *6*		B	
3956.66 *19*		A	
3978.4 *5*	(3$^-$,4$^+$)	B	J^π: 2427.0γ to 5$^-$, 3720.3γ to 2$^+$.
4089.70 *19*		A	
4190.4 *6*		B	
4210.0 *5*		B	
4255.3 *4*		B	
4269.4 *4*		B	
4410.93 *19*		A	
4497.1 *9*		B	
4521.7 *3*		B	
4690.04 *21*	(1,2$^+$)	A	J^π: 4690.2γ to 0$^+$.

† Band assignments are as in 2000Ya08 and 1999HaZV (octupole vibrational band), except as noted.
‡ From a least-squares fit to Eγ, normalized χ^2=1.5.
# From band structure with well established spins and parity of low-lying levels connected by cascade of transitions.
@ Band(A): ground state band, ΔJ=2.
& Band(B): possible β vibrational band, ΔJ=2.
a Band(C): possible γ vibrational band, ΔJ=1.
b Band(D): octupole vibrational band, ΔJ=2.

$\gamma(^{146}Ce)$

Warning: there is serious discrepancy in γ placement between the ^{146}La (6.1 s) and the ^{146}La (9.8 s) decays. Often the branching ratios differ significantly from each other.

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.[#]	δ[@]	α[f]	Comments
258.45	2^+	258.43 *5*	100	0.0	0^+	E2		0.0786	B(E2)(W.u.)=43 *5*
668.38	4^+	409.78 *5*	100	258.45	2^+	E2		0.0189	
924.58	1^-	666.09[ah] *6*	80[hd] *4*	258.45	2^+	E1+(M2)		0.00191 *4*	Very small value of A_4 in the cascade 666γ-258γ indicates pure dipole transition (1983Wo03).
		924.59 *6*	100[d] *5*	0.0	0^+				
960.72	3^-	36.2 *3*	1.7 *10*	924.58	1^-				
		292.32 *5*	10.7 *7*	668.38	4^+				
		702.18 *8*	100 *5*	258.45	2^+	E1		0.00170 *5*	Very small value of A_4 in the cascade 666γ-258γ indicates pure dipole transition (1983Wo03).
1043.24	0^+	118.5 *2*	1.7[d] *4*	924.58	1^-				
		784.7 *6*	100 *33*	258.45	2^+	E2		0.00346	
1171.35	6^+	503.0 *1*	100	668.38	4^+	E2		0.01061	
1182.98	5^-	221.60[b] *25*		960.72	3^-				
		514.67 *6*	100	668.38	4^+	E1		0.00336	
1274.34	2^+	231.2 *5*	0.73 *30*	1043.24	0^+				
		314.8[a] *8*	11 *2*	960.72	3^-				
		349.9[a] *6*	2.9 *12*	924.58	1^-				
		607.1 *4*	1.3 *5*	668.38	4^+				
		1015.90 *7*	100 *12*	258.45	2^+	M1+E2	5.4 *+31−15*	0.00198 *4*	
		1274.29 *12*	37 *8*	0.0	0^+				
1381.93	2^+	107.61 *9*	0.56[d]	1274.34	2^+				
		338.8 *3*	0.48 *15*	1043.24	0^+				
		421.11 *9*	20 *13*	960.72	3^-				
		457.40 *7*	55 *15*	924.58	1^-				
		713.41 *18*	40 *13*	668.38	4^+				
		1382.02 *8*	100 *33*	0.0	0^+				
1551.06	7^-	368.0[b] *1*	14[e]	1182.98	5^-				
		379.70[b] *25*	100[e]	1171.35	6^+	(E1)		0.00689	
1551.13	5^-	379.80[a] *7*	100 *9*	1171.35	6^+	E1		0.00689	
		882.6[a] *3*	9.4 *15*	668.38	4^+				
1576.63	3^+	194.8[&] *5*	2.6[d] *13*	1381.93	2^+				
		302.4[&] *3*	<5[d]	1274.34	2^+				
		908.15 *15*	22.5[d] *15*	668.38	4^+				
		1318.14 *7*	100[d] *5*	258.45	2^+	M1+E2	6.5 *+17−11*	1.17×10^{-3}	
1627.30	4^+	352.9[a] *3*	3.6 *5*	1274.34	2^+				

$^{146}_{58}Ce_{88}$-4

γ(^{146}Ce) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[‡]	E_f	J^π_f	Mult.[#]	δ[@]	α[f]	Comments
1627.30	4^+	444.2[a] *2*	12.6 *7*	1182.98	5^-				
		666.09[ach] *8*	24[h] *3*	960.72	3^-				E_γ: poor fit, difference between energies of corresponding levels equals 666.58 *7*.
		959.10[a] *14*	100 *10*	668.38	4^+	M1+E2	1.19 *+16−14*	0.00262 *8*	
		1368.8[h] *1*	30[h] *5*	258.45	2^+	E2		1.09×10^{-3}	
1657.77	0^+	275.5 *3*	6[d] *4*	1381.93	2^+				
		383.21 *24*	13[d] *5*	1274.34	2^+				
		1398.87 *28*	100[d] *50*	258.45	2^+				
1711.92	(4^+)	528.8[a] *3*	26 *4*	1182.98	5^-				
		751.1[a] *1*	75 *8*	960.72	3^-				
		1043.6[a] *1*	100 *10*	668.38	4^+				
		1453.5[a] *3*	40 *4*	258.45	2^+				
1736.77	8^+	185.65[b] *15*	30[e]	1551.06	7^-				
		565.60 *16*	100[e]	1171.35	6^+				
1753.83	$(1^-,2,3^-)$	793.08 *14*	100 *30*	960.72	3^-				
		829.25 *7*	82 *17*	924.58	1^-				
		1495.2 *3*	<7[d]	258.45	2^+				
1756.68	$(1,2^+)$	713.47[h] *10*	15[h] *7*	1043.24	0^+				
		831.97 *17*	20 *5*	924.58	1^-				
		1498.15 *14*	100 *17*	258.45	2^+				
		1756.79 *9*	60 *12*	0.0	0^+				
1769.22	$(4^+,5^-)$	585.8[a] *4*	19 *3*	1182.98	5^-				
		808.6[a] *1*	100 *10*	960.72	3^-				
1797.0		1538.5[a] *3*	100	258.45	2^+				
1802.31	(4^+)	631.4[a] *7*	34 *6*	1171.35	6^+				
		1133.92[a] *19*	48 *9*	668.38	4^+				
		1543.86[a] *17*	100 *10*	258.45	2^+				
1808.45		533.7[&] *2*	30[d] *5*	1274.34	2^+				
		1140.2[&] *2*	100[d] *8*	668.38	4^+				
		1550.30[&] *21*	100[d] *10*	258.45	2^+				
1810.41	5^+	183.16[a] *7*	100 *9*	1627.30	4^+	E2+M1	2.7 *+9−7*	0.244 *5*	
		233.6[a] *4*	6.0 *7*	1576.63	3^+				
		627.1[a] *2*	14.5 *15*	1182.98	5^-				
		638.9[a] *1*	34 *3*	1171.35	6^+	M1+E2	0.33 *15*	0.0082 *3*	
		1142.1[a] *1*	89 *7*	668.38	4^+				
1831.91	$(1,2^+)$	1573.60 *13*	100[d] *5*	258.45	2^+				
		1831.60[&] *18*	22.5[d] *25*	0.0	0^+				
1875.55	$(4,5^-)$	692.4[a] *4*	40 *8*	1182.98	5^-				
		915.0[a] *2*	100 *8*	960.72	3^-				

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γ(^{146}Ce) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[‡]	E_f	J^π_f	Comments
1891.83	(3^-,4,5^-)	81.2[a] 2	19.5 21	1810.41	5^+	
		123.1[a] 4	15 5	1769.22	(4^+,5^-)	
		1223.5[a] 1	100 8	668.38	4^+	
1916.19	(4,5^-)	732.4[a] 5	7.6 18	1182.98	5^-	
		955.5[a] 1	100 9	960.72	3^-	
1956.26	(4^+,5,6^+)	145.5[a] 6	3.9 11	1810.41	5^+	
		404.7[a] 4	27.1 21	1551.13	5^-	
		773.5[a] 1	100 7	1182.98	5^-	
		784.8[a] 1	42 9	1171.35	6^+	
		1288.2[a] 2	38 5	668.38	4^+	
1989.16		1028.42[g] 18	48.7[dg] 17	960.72	3^-	
		1064.6[&g] 2	100[dg] 7	924.58	1^-	
2019.41	(9^-)	282.7[b] 1	100[e]	1736.77	8^+	
		468.25[b] 15	69[e]	1551.06	7^-	
2022.6	(4^+)	1353.9[a] 5	87 13	668.38	4^+	
		1764.2[a] 3	100 15	258.45	2^+	
2031.43	(4^+)	221.5[a] 2	97 23	1810.41	5^+	
		756.89 24	18 5	1274.34	2^+	
		860.7[a] 2	95 26	1171.35	6^+	
		1362.87 30	100 23	668.38	4^+	
		1772.67 14	95 21	258.45	2^+	
2051.55		294.70[&] 25	<10.3[d]	1756.68	(1,2^+)	
		1793.28 18	100[d] 4	258.45	2^+	
2071.79	(2^+)	797.50[&] 25	<27[d]	1274.34	2^+	
		1028.5[&g] 2	100[dg] 11	1043.24	0^+	
		1404.2 6	16 5	668.38	4^+	
		1813.26 22	19 5	258.45	2^+	
2090.47	(4^+)	908.0[ah] 2	14[h] 3	1182.98	5^-	
		918.6[a] 3	38 6	1171.35	6^+	
		1421.7[a] 2	100 10	668.38	4^+	
		1832.7[a] 5	15 4	258.45	2^+	
2126.46	(1^+,2^+)	549.8[&] 3	27[d] 3	1576.63	3^+	
		744.8[&] 3	25[d] 6	1381.93	2^+	
		852.17 16	100[d] 10	1274.34	2^+	
		1084.31[c] 14	94[d] 5	1043.24	0^+	E_γ: poor fit, difference between energies of corresponding levels equals 1083.21 12.
		1201.63 17	41[d] 6	924.58	1^-	
		1868.3 3	83[d] 11	258.45	2^+	
2128.68		1460.3[a] 2	100	668.38	4^+	
2139.81	(4^+,5^+)	329.4[a] 2	100 9	1810.41	5^+	

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$\gamma(^{146}Ce)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[‡]	E_f	J^π_f
2139.81	(4+,5+)	427.7[a] 2	51 5	1711.92	(4+)
		563.4[a] 4	34 5	1576.63	3+
		969.0[a] 4	30 6	1171.35	6+
2155.99	(1−,2+)	881.70[&] 25	<20[d]	1274.34	2+
		1195.36 22	33[d] 6	960.72	3−
		1897.67 25	63[d] 4	258.45	2+
		2155.80[&g] 18	100[dg] 6	0.0	0+
2177.37	(5−,4+)	284.7[a] 4	6.0 10	1891.83	(3−,4,5−)
		367.00[a] 7	100 9	1810.41	5+
		465.5[a] 3	15.8 20	1711.92	(4+)
		550.0[a] 1	86 7	1627.30	4+
		993.8[a] 4	10.4 20	1182.98	5−
		1006.1[a] 2	35 3	1171.35	6+
		1216.5[a] 3	18 3	960.72	3−
		1509.2[a] 2	54 4	668.38	4+
2179.44	(1,2+)	1920.80[&] 25	73[d] 5	258.45	2+
		2179.60[&] 25	100[d] 8	0.0	0+
2183.0		1924.5[a] 5	100	258.45	2+
2194.08		383.4[ah] 4	11[h] 3	1810.41	5+
		1011.2[a] 2	100 15	1182.98	5−
		1022.6[a] 4	52 9	1171.35	6+
2209.6		1248.9[a] 4	100	960.72	3−
2222.71	(3,4+)	646.0 3	61 9	1576.63	3+
		948.42 15	100 18	1274.34	2+
		1262.2 4	70 12	960.72	3−
2233.66	(1,2+)	1975.10[&] 18	100[d] 10	258.45	2+
		2233.9[&] 3	<42[d]	0.0	0+
2256.53	(4+,5,6+)	225.0[a] 4	6.0 8	2031.43	(4+)
		300.3[a] 1	14.8 12	1956.26	(4+,5,6+)
		446.05[a] 7	100 9	1810.41	5+
		705.8[a] 7	9.9 20	1551.13	5−
		1074.0[a] 2	13.5 10	1182.98	5−
2261.1		1336.50[&] 25	100[d]	924.58	1−
2262.14		307.0[a] 4	11.4 11	1956.26	(4+,5,6+)
		1079.1[a] 1	100 8	1182.98	5−
2270.30	(6+)	501.3[a] 6	55 16	1769.22	(4+,5−)
		642.9[a] 2	100 8	1627.30	4+
		1087.6[a] 6	17 6	1182.98	5−
		1098.0[a] 5	25 6	1171.35	6+

$^{146}_{58}Ce_{88}$-7

Adopted Levels, Gammas (continued)

$\gamma(^{146}\mathrm{Ce})$ (continued)

E_i(level)	J^{π}_i	E_{γ}[†]	I_{γ}[‡]	E_f	J^{π}_f	Comments
2270.30	(6+)	1602.1[a] 2	100 11	668.38	4+	
2274.5		358.5[a] 8	23 7	1916.19	(4,5−)	
		1091.5[a] 3	100 30	1182.98	5−	
2311.02	(1−,2+)	1037.65[c] 15	67[d] 4	1274.34	2+	E_{γ}: poor fit, difference between energies of corresponding levels equals 1036.72 12.
		1350.5[&] 3	19[d] 3	960.72	3−	
		1386.37 17	26 3	924.58	1−	
		2052.5[a] 3	100[d] 6	258.45	2+	
		2311.00[&] 18	19[d] 3	0.0	0+	
2318.57	(1,2+)	2060.10[h] 6	72[dh] 16	258.45	2+	
		2318.60[&] 18	100[d] 5	0.0	0+	
2337.5		1166.9[a] 7	95 24	1171.35	6+	
		1668.2[a] 8	100 27	668.38	4+	
2351.51	(10+)	332.3[b] 2	42[e]	2019.41	(9−)	
		614.7[b] 2	100[e]	1736.77	8+	
2368.08	(1−,2+)	316.7[&] 3	<23[d]	2051.55		
		1324.8[&] 3	27[d] 9	1043.24	0+	
		1407.60[&] 25	34[d] 7	960.72	3−	
		1443.70[&] 18	100[d] 9	924.58	1−	
		2109.1 4	18[d] 5	258.45	2+	
		2367.90[&] 18	73[d] 5	0.0	0+	
2373.3		605.0[a] 5	47 7	1769.22	(4+,5−)	
		1190.0[a] 3	100 14	1182.98	5−	
2397.85	(2+)	346.29 15	77 5	2051.55		
		366.68[&] 17	67[d] 5	2031.43	(4+)	
		1354.40[&] 17	24.6[d] 18	1043.24	0+	
		1473.3[a] 4	78 44	924.58	1−	
		2397.78 15	100[d] 7	0.0	0+	
2399.07		2140.60[&] 18	100[d]	258.45	2+	
2414.51	(4+)	523.0[a] 2	100 12	1891.83	(3−,4,5−)	
		1140.20[&] 25	76[d] 6	1274.34	2+	
		1231.9[a] 3	70 11	1182.98	5−	
		1489.50[&] 25	33[d] 5	924.58	1−	I_{γ}: doubtful transition from ^{146}La β decay (6 s) (1982ShZV), it should be seen also in 9.8 s β decay of ^{146}La but it is not measured (1993Sh10).
		2155.88 19	60 7	258.45	2+	
2442.40		2183.80[&] 25	100	258.45	2+	
2446.89	(3−)	572.1[a] 4	56 12	1875.55	(4,5−)	
		693.0[&] 4	27[d] 16	1753.83	(1−,2,3−)	

From ENSDF

γ(^{146}Ce) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[‡]	E_f	J^π_f	Comments
2446.89	(3⁻)	870.07 *16*	22 *8*	1576.63	3⁺	
		1172.6 *7*	50 *16*	1274.34	2⁺	
		1485.1[&c] *3*	17[d] *3*	960.72	3⁻	E_γ: poor fit, difference between energies of corresponding levels equals 1486.16 *9*.
		2188.33 *15*	100 *12*	258.45	2⁺	
2468.8		1297.4[a] *3*	100	1171.35	6⁺	
2512.21		1844.8[a] *4*	69 *25*	668.38	4⁺	E_γ: poor fit, difference between energies of corresponding levels equals 1842.93 *13*.
		2253.38[a] *24*	100 *34*	258.45	2⁺	
2519.16		708.8[a] *2*	100 *10*	1810.41	5⁺	
		1336.3[a] *5*	31 *9*	1182.98	5⁻	
		1850.7[a] *2*	98 *10*	668.38	4⁺	
2543.83		787.48 *25*	100 *10*	1756.68	(1,2⁺)	
		1582.7[a] *6*	35 *13*	960.72	3⁻	
		1619.15 *15*	52 *10*	924.58	1⁻	
2551.86		595.78 *16*	100 *30*	1956.26	(4⁺,5,6⁺)	
		1368.8[h] *1*	38[h] *10*	1182.98	5⁻	
2562.65	(11⁻)	211.15[b] *5*	100[e]	2351.51	(10⁺)	
		543.2[b] *1*	97[e]	2019.41	(9⁻)	
2569.86		993.00[&] *25*	83[d] *21*	1576.63	3⁺	
		1188.70[&] *25*	<42[d]	1381.93	2⁺	E_γ: poor fit, difference between energies of corresponding levels equals 1187.65 *15*.
		2311.06 *17*	100[d] *8*	258.45	2⁺	
2587.68		777.0[a] *4*	44 *6*	1810.41	5⁺	
		1416.2[a] *4*	45 *11*	1171.35	6⁺	
		1919.5[a] *3*	100 *16*	668.38	4⁺	
2639.47		2381.00[&] *18*	100[d]	258.45	2⁺	
2713.44		1752.63 *23*	100 *42*	960.72	3⁻	
		2455.01 *18*	42 *17*	258.45	2⁺	
2779.5	(1,2⁺)	2521.0[a] *4*	80	258.45	2⁺	
		2779.4[a] *5*	100	0.0	0⁺	
2796.72		1625.4[ah] *4*	50[h] *8*	1171.35	6⁺	
		2128.3[a] *3*	100 *14*	668.38	4⁺	
2809.5		2141.1[a] *3*	100	668.38	4⁺	
2841.11		1916.40[&] *18*	15.2[d] *16*	924.58	1⁻	
		2582.69 *13*	100[d] *6*	258.45	2⁺	
2861.88	(1,2⁺)	1587.70[&] *18*	14.1[d] *13*	1274.34	2⁺	
		1937.20[&] *18*	14.1[d] *13*	924.58	1⁻	
		2603.46 *26*	100[d] *6*	258.45	2⁺	
		2861.50 *21*	7.7[d] *13*	0.0	0⁺	
2868.96		1595.1[&] *4*	15[d] *5*	1274.34	2⁺	

$\gamma(^{146}$Ce) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[‡]	E_f	J^π_f	Comments
2868.96		1907.5 *4*	18[d] *5*	960.72	3⁻	
		1944.58 *15*	82[d] *8*	924.58	1⁻	
		2610.10[a] *22*	100[d] *5*	258.45	2⁺	
2914.23		652.2[a] *3*	30 *4*	2262.14		
		957.9[a] *7*	100 *24*	1956.26	(4⁺,5,6⁺)	
		1103.7[a] *2*	50 *6*	1810.41	5⁺	
		1363.2[a] *2*	15 *6*	1551.13	5⁻	
		1731.2[a] *2*	64 *6*	1182.98	5⁻	
2953.46	(2,3⁻)	881.70[&] *25*	<6[d]	2071.79	(2⁺)	
		1377.00[&] *25*	<6[d]	1576.63	3⁺	
		1992.52 *16*	21.8[d] *18*	960.72	3⁻	
		2028.85 *40*	47[d] *3*	924.58	1⁻	
		2695.11 *17*	100[d] *3*	258.45	2⁺	
2996.27	(1,2⁺)	1240.0[&] *4*	<29[d]	1756.68	(1,2⁺)	
		2996.0[&] *3*	100[d] *6*	0.0	0⁺	
3064.0		1881.1[a] *3*	100 *18*	1182.98	5⁻	
		2394.8[a] *8*	23 *9*	668.38	4⁺	
3163.4	(13⁻)	600.70[b] *25*	100[e]	2562.65	(11⁻)	
3164.6	(1,2⁺)	2905.7[a] *6*	100	258.45	2⁺	
		3165.5[a] *9*	<38	0.0	0⁺	
3166.65	(1,2⁺)	1114.90[&] *25*	100[d] *23*	2051.55		
		1508.7[&] *3*	77[d] *18*	1657.77	0⁺	
		1892.60[&] *25*	82[d] *9*	1274.34	2⁺	
3243.11		2060.10[ah] *7*	100[h] *20*	1182.98	5⁻	
		2072.4[a] *5*	65 *25*	1171.35	6⁺	
3255.45	(2,3⁺)	1129.2[&] *9*	100[d] *9*	2126.46	(1⁺,2⁺)	
		1678.7[&] *3*	56[d] *7*	1576.63	3⁺	
		1981.3[&] *3*	22[d] *4*	1274.34	2⁺	
		2293.2[ac] *4*	58[d] *4*	960.72	3⁻	E_γ: poor fit, difference between energies of corresponding levels equals 2294.77 *17*.
		2996.87 *26*	76[d] *4*	258.45	2⁺	
3273.7		2102.3[a] *9*	100	1171.35	6⁺	
3283.15	(1⁻,2⁺)	836.03[&] *17*	6.9[d] *13*	2446.89	(3⁻)	
		915.10[&] *25*	4.1[d] *9*	2368.08	(1⁻,2⁺)	
		1625.0[&] *3*	3.4[d] *6*	1657.77	0⁺	
		2322.38 *19*	17.8[d] *9*	960.72	3⁻	
		2358.89 *19*	100[d] *3*	924.58	1⁻	

$^{146}_{58}Ce_{88}$-10

Adopted Levels, Gammas (continued)

$\gamma(^{146}\mathrm{Ce})$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Comments
3283.15	$(1^-,2^+)$	3024.9 *3*	30.3[d] *19*	258.45	2^+	
3329.54	(2^+)	466.80[&c] *25*	<7.3[d]	2861.88	$(1,2^+)$	E_γ: poor fit, difference between energies of corresponding levels equals 467.66 *16*.
		1673.1[&c] *2*	16.8[d] *15*	1657.77	0^+	E_γ: poor fit, difference between energies of corresponding levels equals 1671.75 *15*.
		1752.9[&] *2*	<7.3[d]	1576.63	3^+	
		2368.80[&] *18*	23.4[d] *15*	960.72	3^-	
		2404.6 *3*	39.4[d] *22*	924.58	1^-	
		3071.4 *3*	100[d] *7*	258.45	2^+	
3342.03		927.6[&] *2*	41[d] *6*	2414.51	(4^+)	
		1585.2[&] *4*	13[d] *3*	1756.68	$(1,2^+)$	
		1960.14 *17*	23.4[d] *16*	1381.93	2^+	
		2381.1[a] *4*	39 *13*	960.72	3^-	
		2417.38 *15*	88[d] *5*	924.58	1^-	
		3083.57 *22*	100[d] *6*	258.45	2^+	
3390.2		2721.8[a] *6*	100	668.38	4^+	
3399.56	$(1,2^+)$	1348.4[&] *3*	<17[d]	2051.55		
		1643.00[&] *18*	34[d] *4*	1756.68	$(1,2^+)$	
		1741.5[&] *2*	19[d] *4*	1657.77	0^+	
		2474.90[&] *18*	100[d] *7*	924.58	1^-	
3403.3		2734.6[a] *5*	100 *22*	668.38	4^+	
		3145.5[a] *7*	53 *19*	258.45	2^+	
3450.6		2267.6[a] *4*	100	1182.98	5^-	
3457.86		1043.30[&] *25*	36[d]	2414.51	(4^+)	
		1701.2[&] *1*	37[d]	1756.68	$(1,2^+)$	
		2533.20[&] *18*	100[d]	924.58	1^-	
3494.51		924.63[a] *9*	94	2569.86		
		3236.8[a] *6*	100	258.45	2^+	
3502.20		2319.2[a] *2*	100	1182.98	5^-	
3532.7		2349.7[a] *4*	100	1182.98	5^-	
3535.16		1167.2[&] *2*	100[d] *12*	2368.08	$(1^-,2^+)$	
		3275.9 *5*	74[d] *6*	258.45	2^+	
3653.7	(2^+)	2985.2[a] *6*	100	668.38	4^+	
		3653.7[a] *6*	67	0.0	0^+	
3729.9		2547.3[a] *8*	41 *15*	1182.98	5^-	
		3061.4[a] *4*	100 *15*	668.38	4^+	
3826.0	(15^-)	662.60[b] *25*	100[e]	3163.4	(13^-)	
3859.1		3600.6[a] *5*	100	258.45	2^+	
3918.0		3249.6[a] *6*	100	668.38	4^+	

$^{146}_{58}\mathrm{Ce}_{88}$-11

Adopted Levels, Gammas (continued)

$\gamma(^{146}Ce)$ (continued)

E_i(level)	J^{π}_i	E_{γ}[†]	I_{γ}[‡]	E_f	J^{π}_f
3956.66		1734.2[&] *3*	40[d] *7*	2222.71	(3,4$^+$)
		3698.00[&] *23*	100[d] *13*	258.45	2$^+$
3978.4	(3$^-$,4$^+$)	2427.0[a] *6*	100 *13*	1551.13	5$^-$
		3720.3[a] *8*	36 *10*	258.45	2$^+$
4089.70		2333.00[&] *18*	100[d]	1756.68	(1,2$^+$)
4190.4		3522.0[a] *6*	100	668.38	4$^+$
4210.0		3541.6[a] *5*	100	668.38	4$^+$
4255.3		3295.4[a] *10*	17 *6*	960.72	3$^-$
		3586.7[a] *4*	100 *15*	668.38	4$^+$
4269.4		2237.8[a] *4*	100	2031.43	(4$^+$)
		3098.3[a] *6*	50	1171.35	6$^+$
4410.93		1964.2[&] *4*	17[d] *4*	2446.89	(3$^-$)
		1968.2[&] *4*	<43[d]	2442.40	
		3027.9[&] *8*	<43[d]	1381.93	2$^+$
4410.93		3449.3[&] *8*	<43[d]	960.72	3$^-$
		3486.2[&] *5*	<43[d]	924.58	1$^-$
		4152.8[&] *3*	100[d] *9*	258.45	2$^+$
4497.1		4238.6[a] *9*	100	258.45	2$^+$
4521.7		2645.5[a] *7*	58 *18*	1875.55	(4,5$^-$)
		2971.6[a] *7*	67 *21*	1551.13	5$^-$
		3339.3[a] *6*	73 *18*	1182.98	5$^-$
		3560.3[a] *7*	30 *18*	960.72	3$^-$
		3852.8[a] *6*	100 *18*	668.38	4$^+$
4690.04	(1,2$^+$)	1826.6[&] *6*	60[d] *20*	2861.88	(1,2$^+$)
		3765.5[&] *5*	<100[d]	924.58	1$^-$
		4431.7[&] *4*	70[d] *10*	258.45	2$^+$
		4690.2[&] *3*	40[d] *10*	0.0	0$^+$

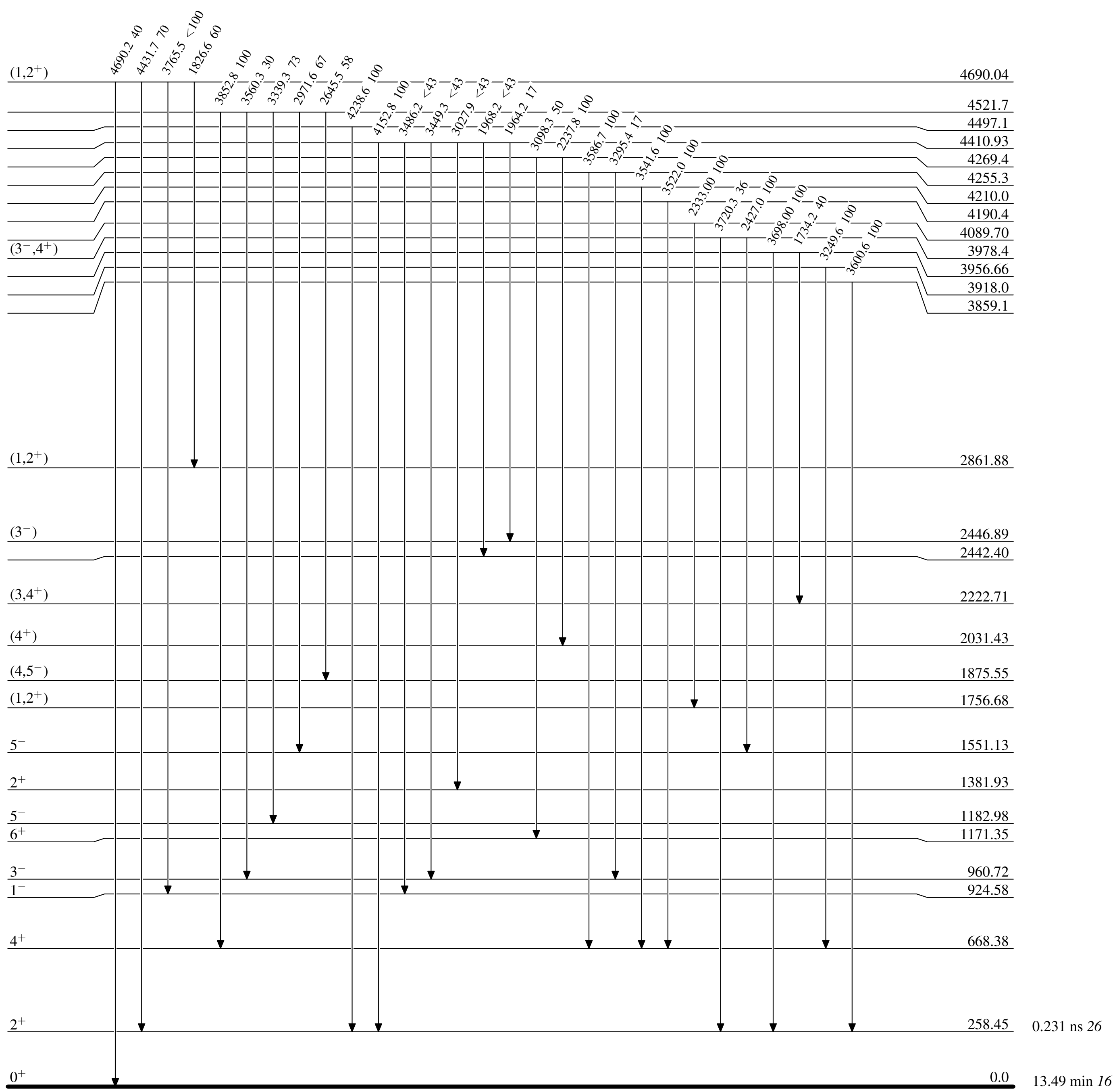
† From weighted average of $E\gamma$'s measured in ^{146}La β^- decays with $T_{1/2}$=6.1 s and 9.8 s, and ^{252}Cf SF decay, except as noted.
‡ From ^{146}La β^- decay (9.8 s), except as noted.
# From $\gamma\gamma(\theta)$, α(exp), see 1981GoZN, 1982ShZV, 1983Wo03, 1993Sh10, 2000Ya08.
@ From $\gamma\gamma(\theta)$ (2000Ya08).
& From ^{146}La β^- decay (6.1 s).
a From ^{146}La β^- decay (9.8 s).
b From ^{252}Cf SF decay.
c Energy of γ ray is not used in a least-squares fitting.
d Branching from ^{146}La β^- 6.1 s decay.
e Branching from ^{252}Cf SF decay.
f Additional information 1.
g Multiply placed with undivided intensity.
h Multiply placed with intensity suitably divided.

$^{146}_{58}Ce_{88}$-12

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

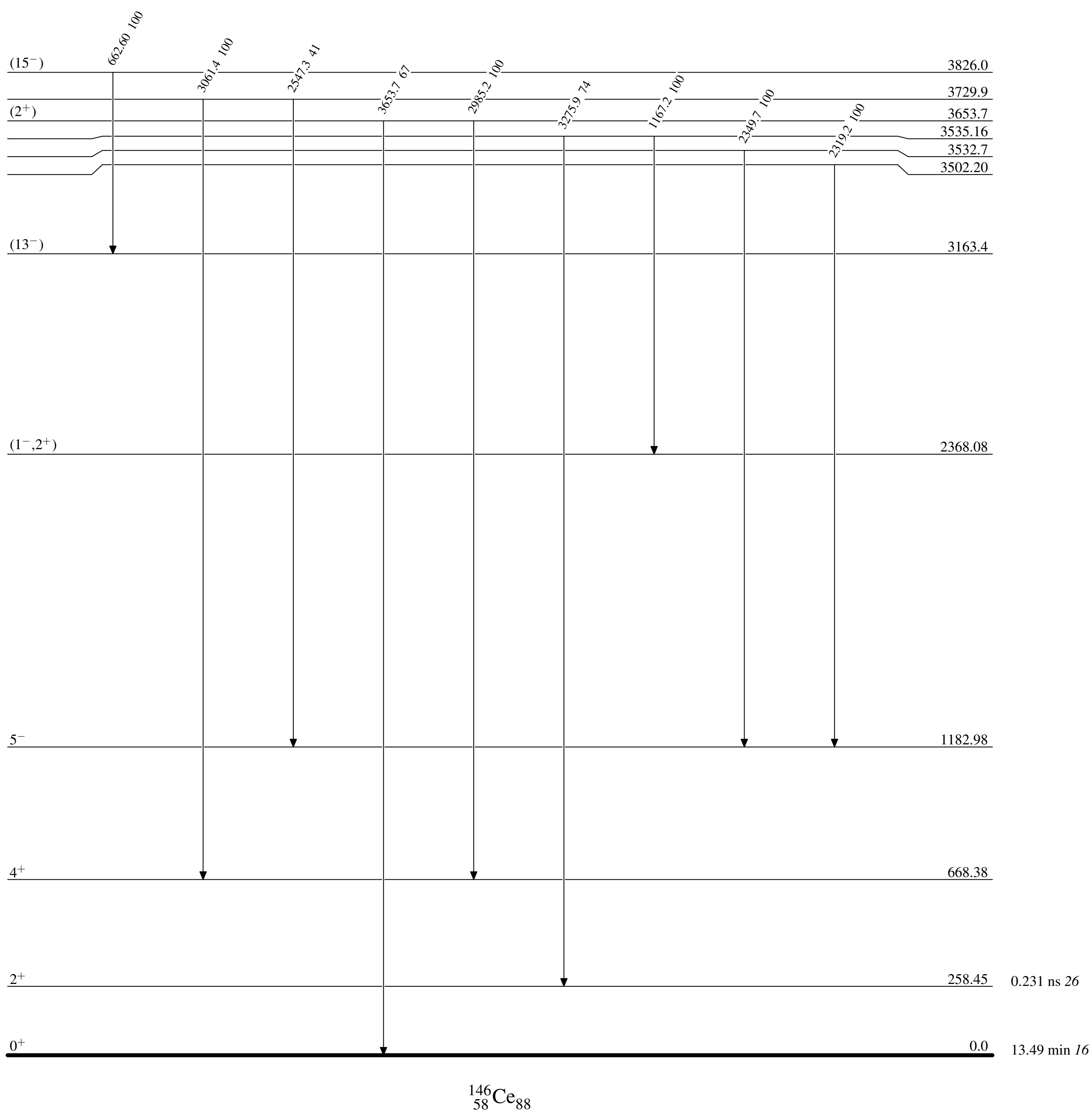


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

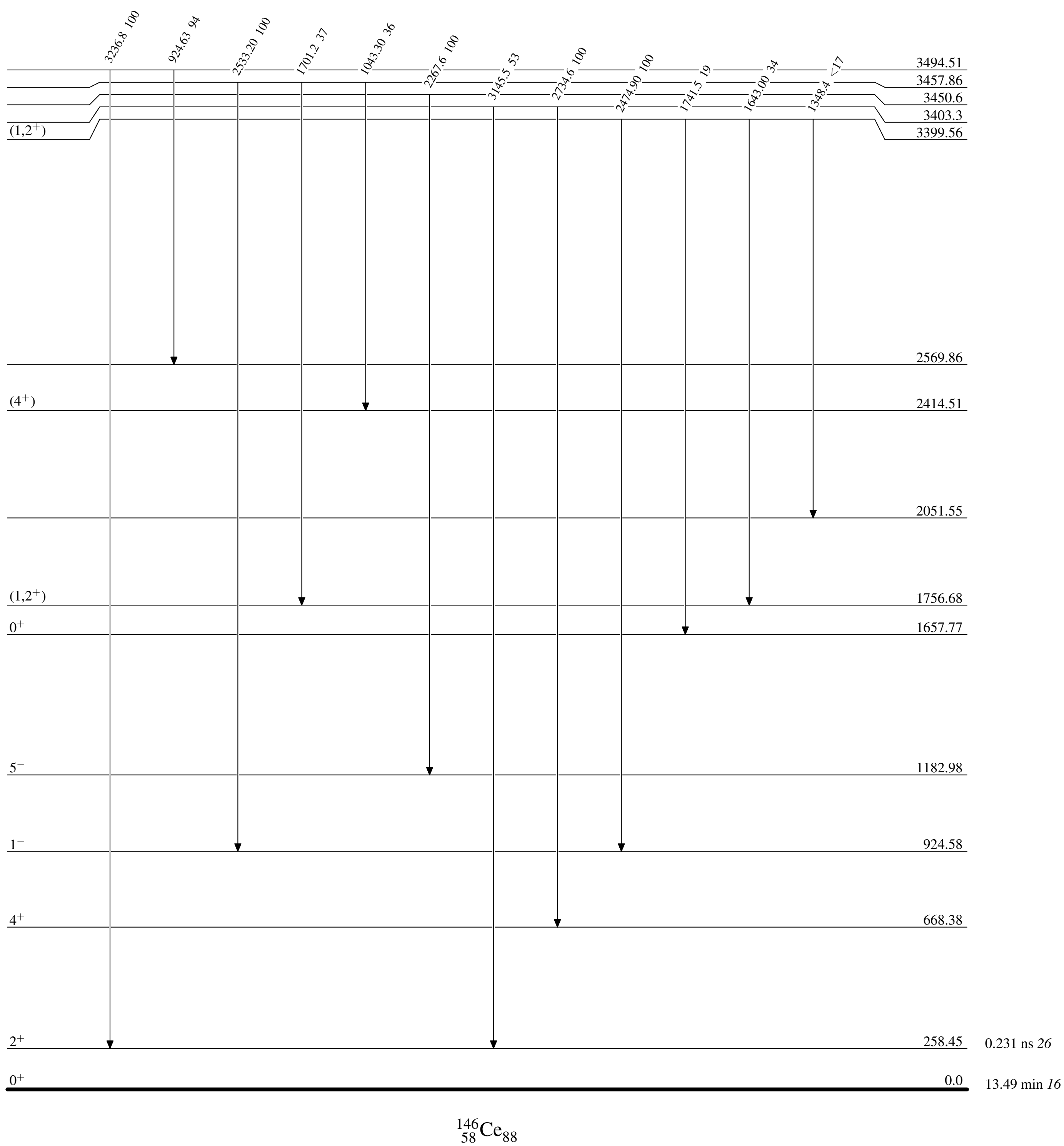
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

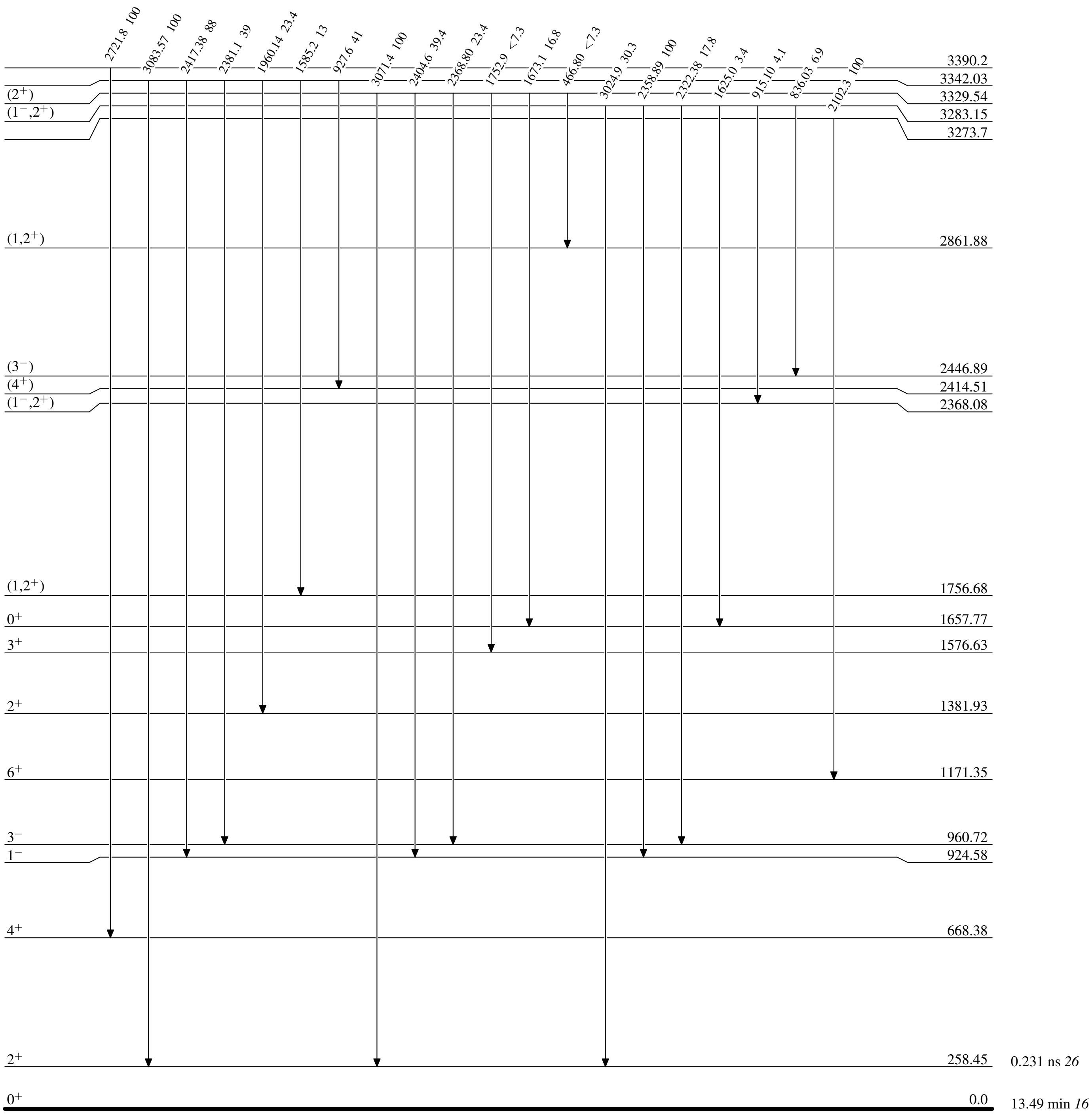
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

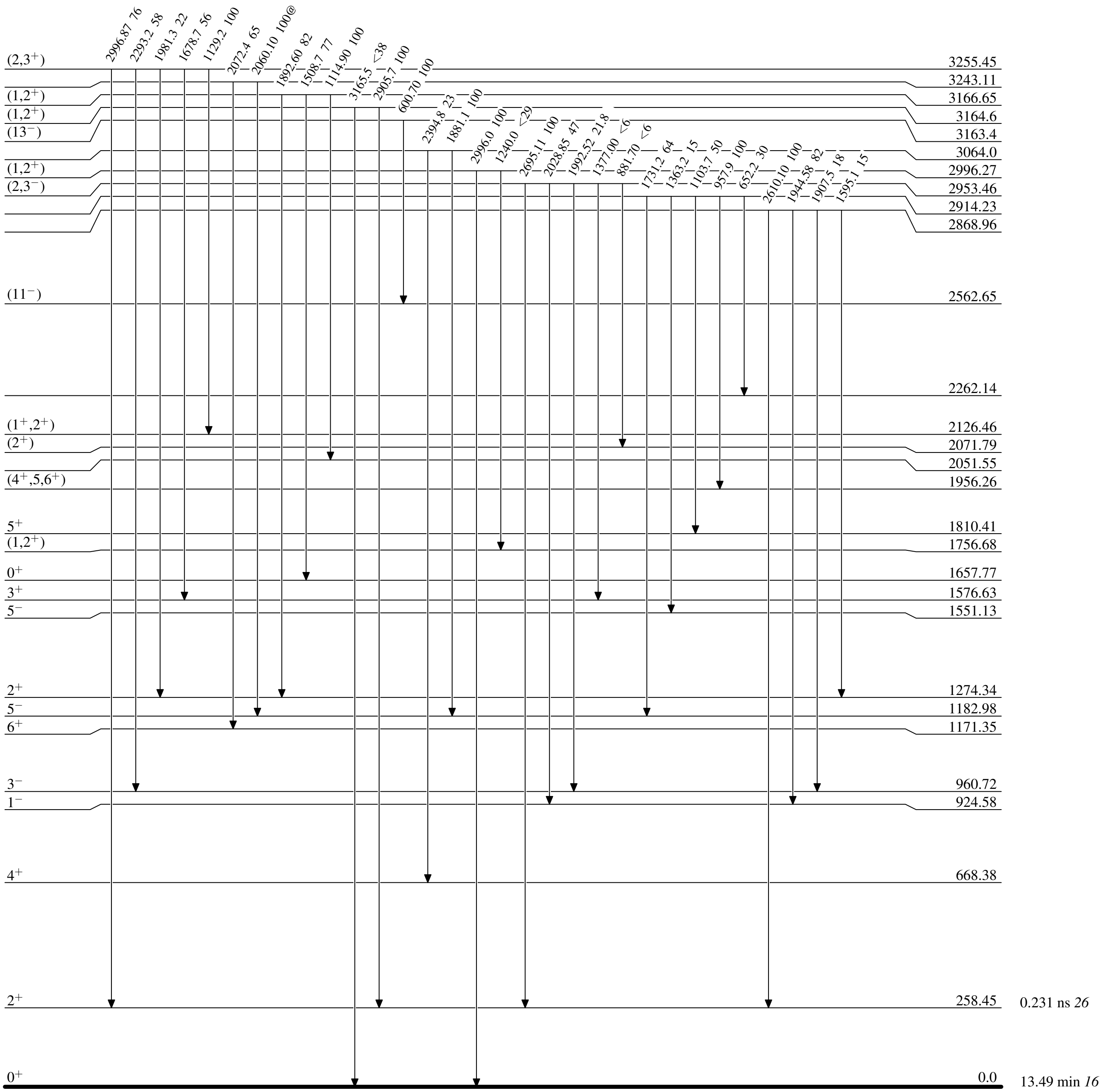


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided

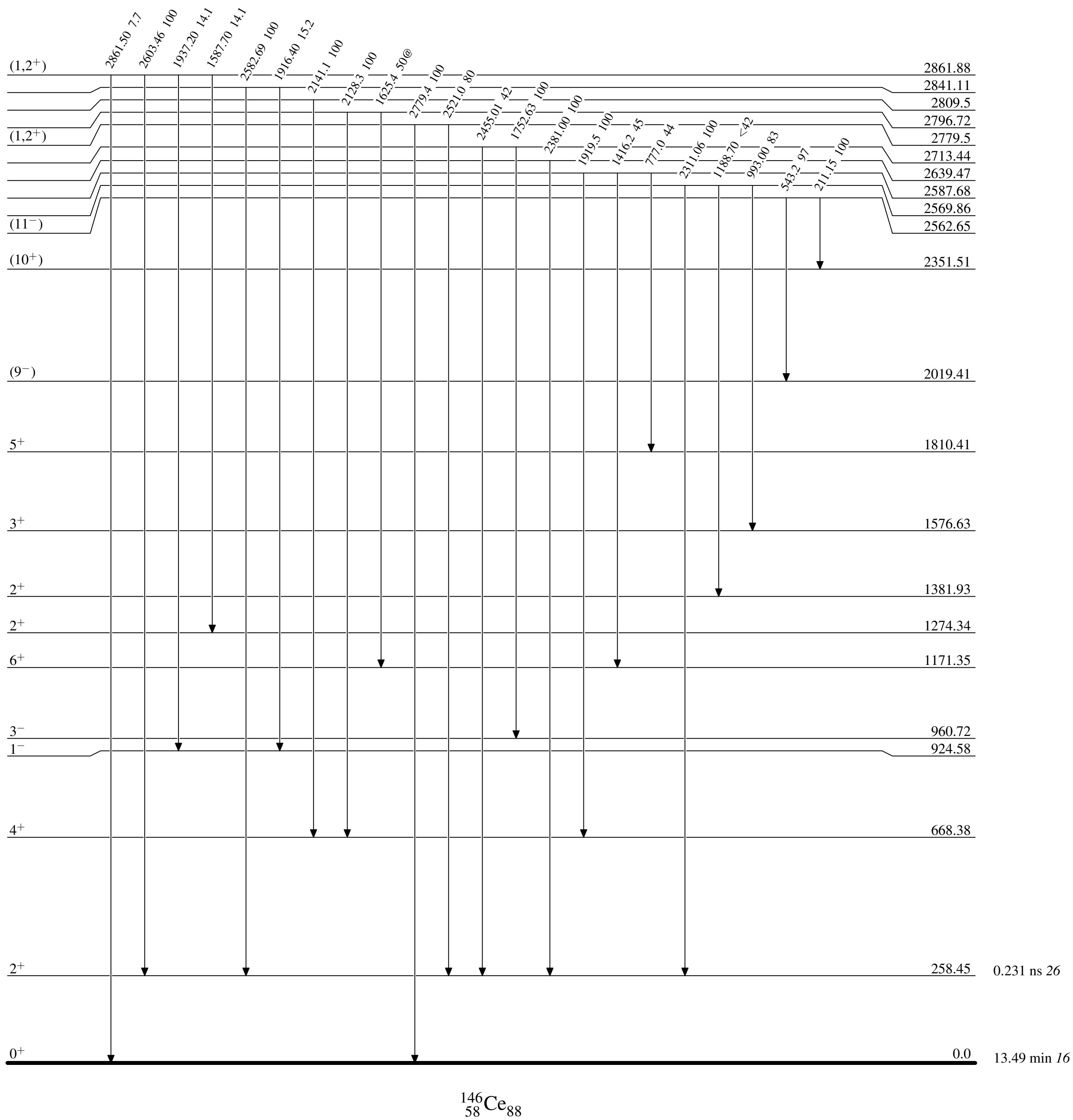


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

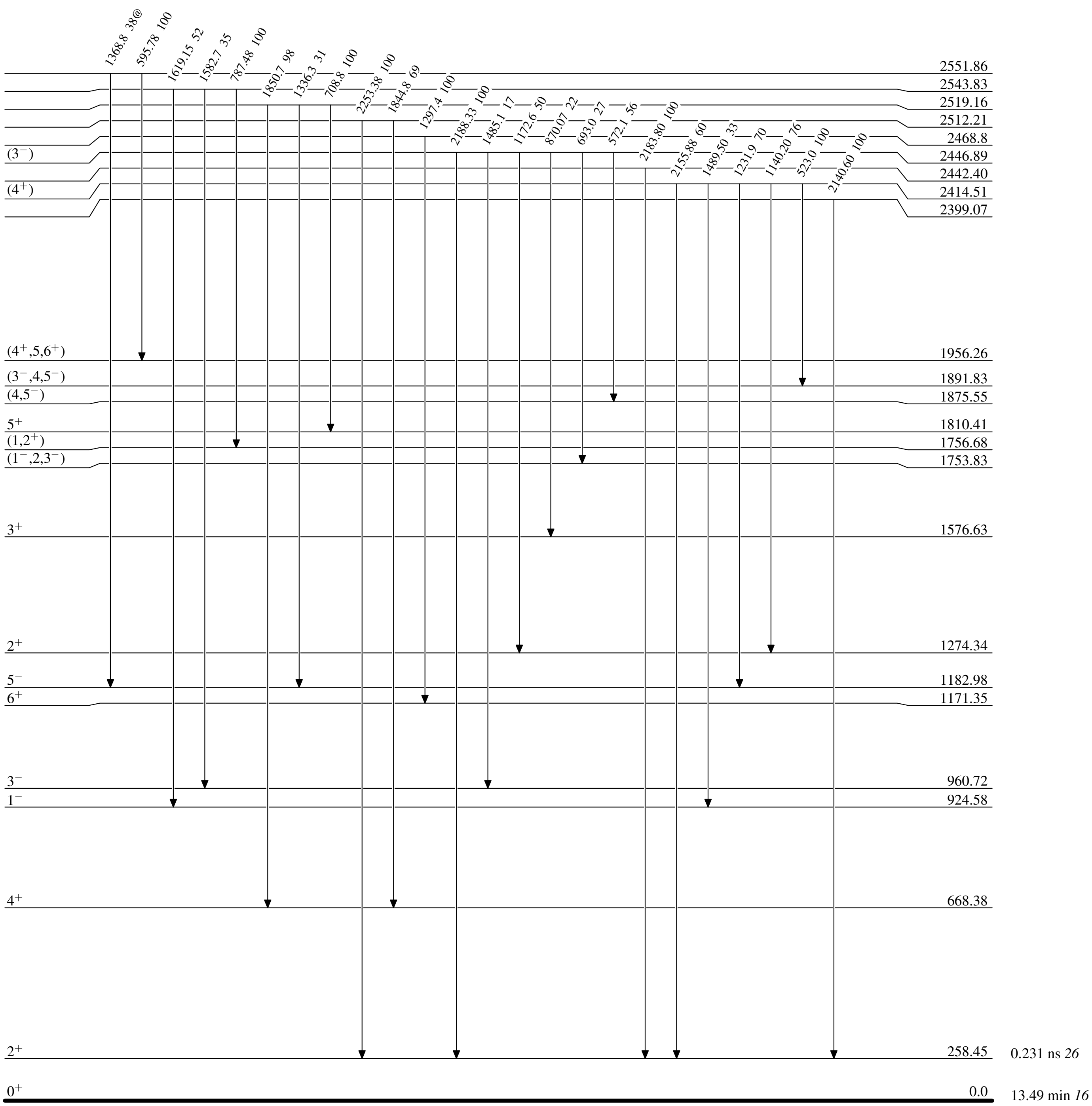
Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided

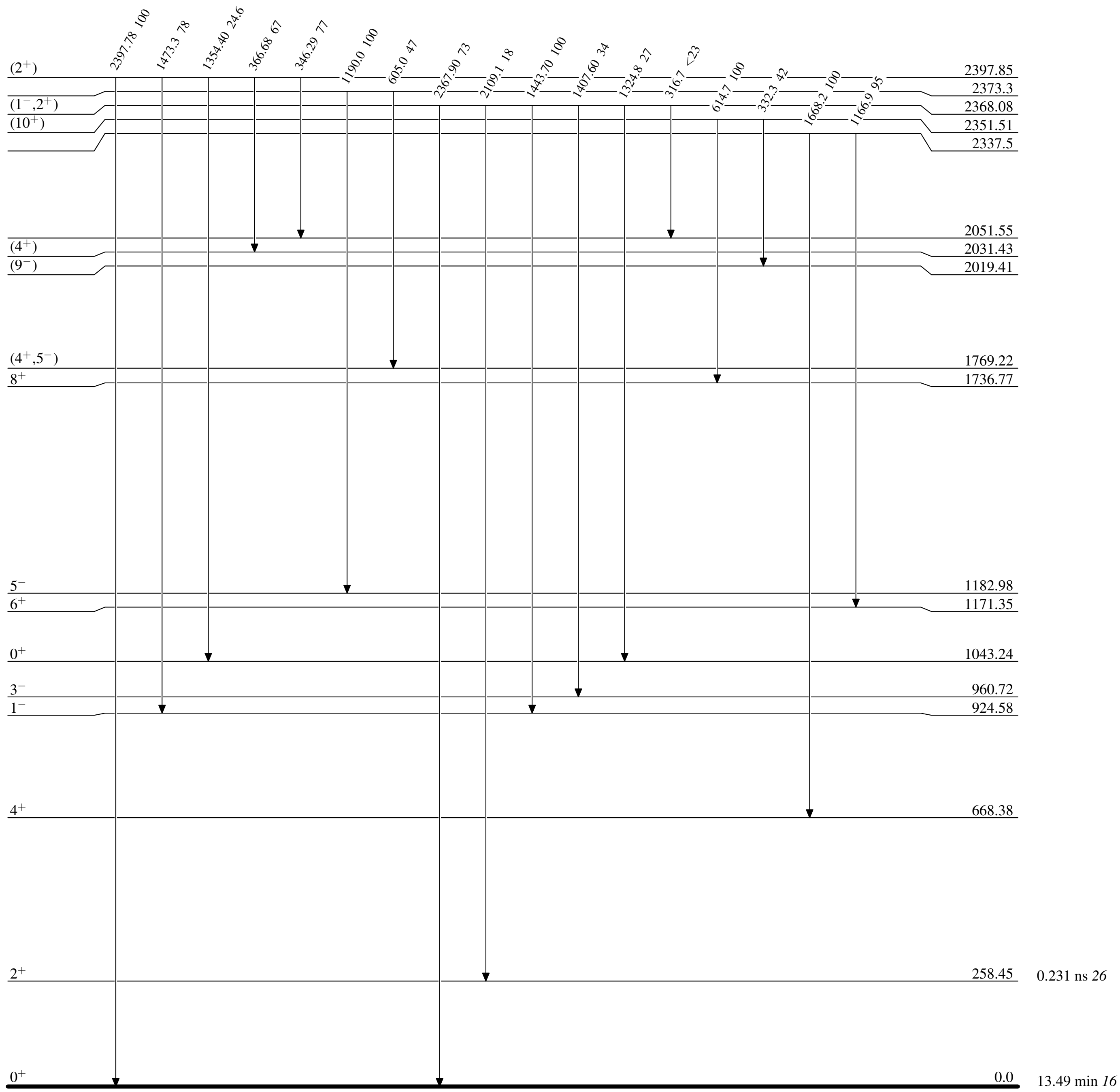


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided

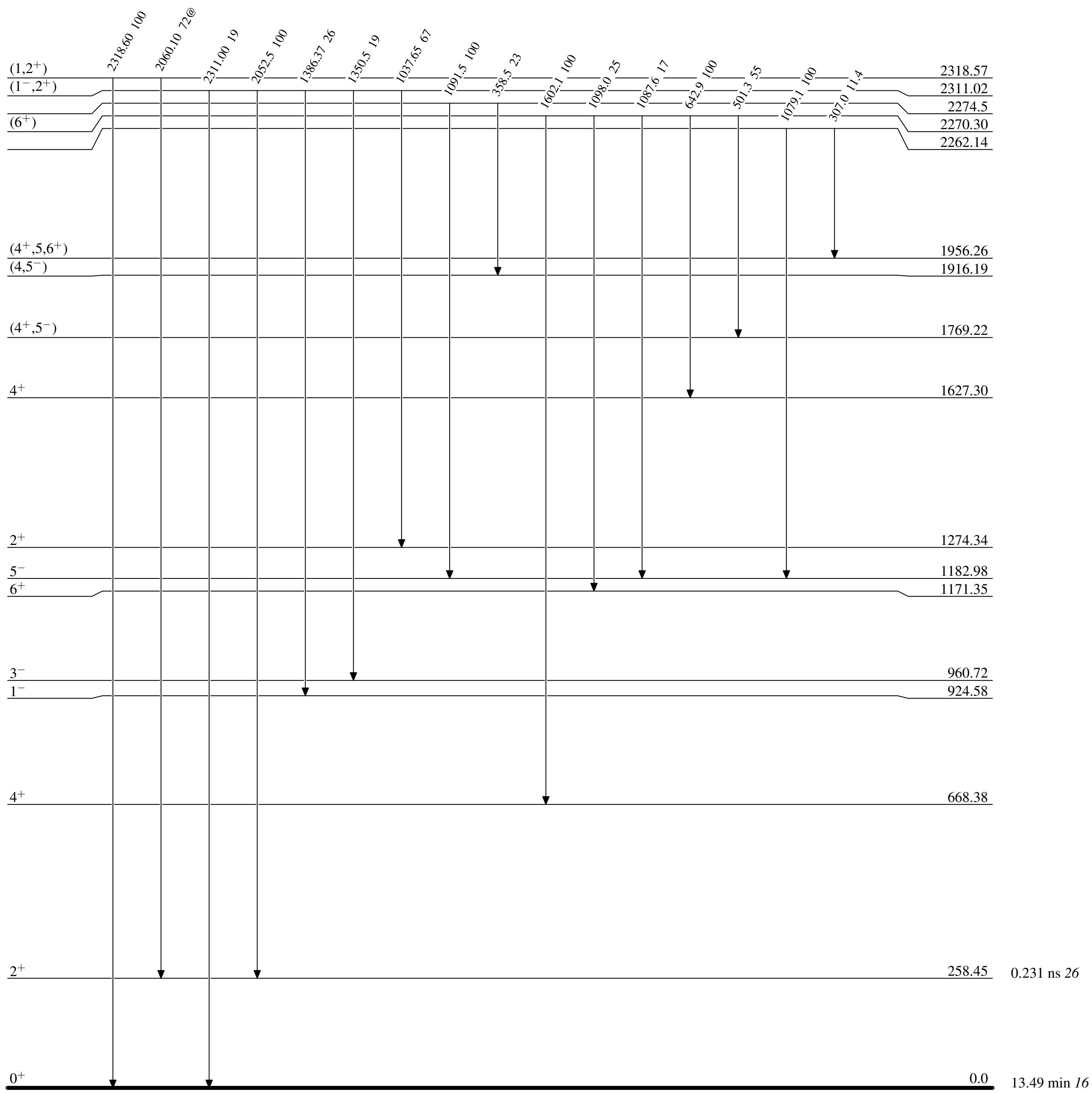


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided

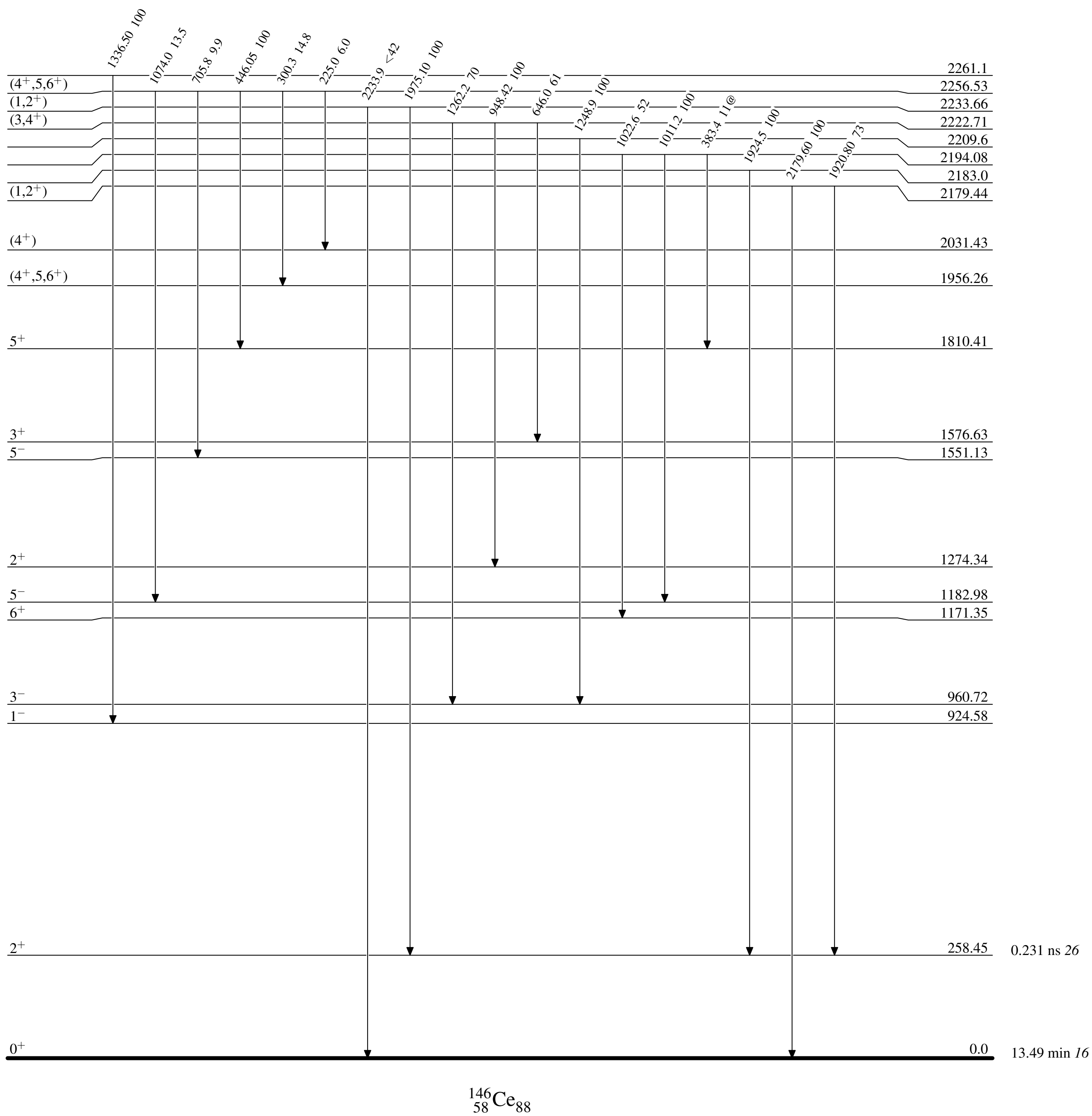


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

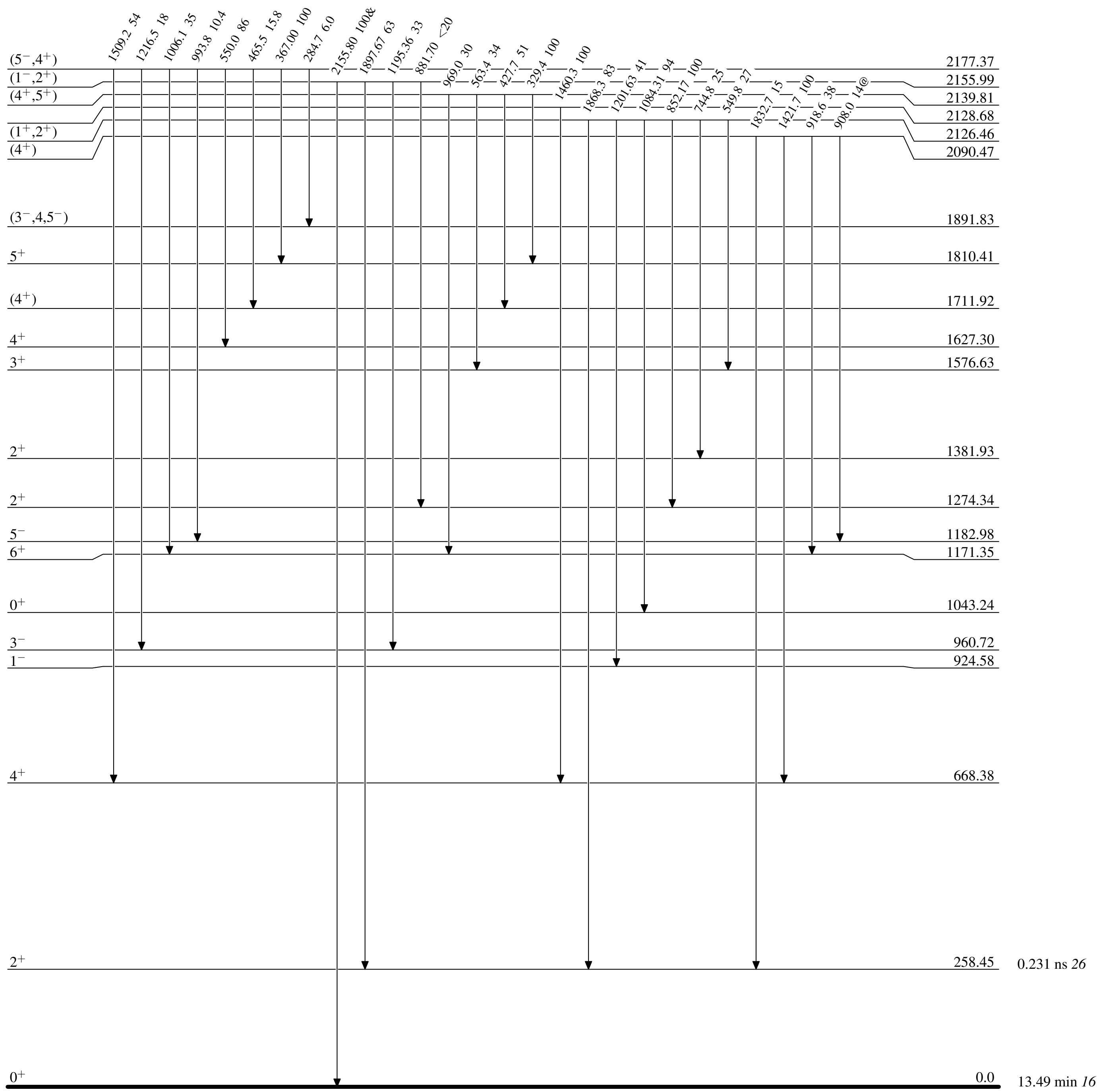
Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

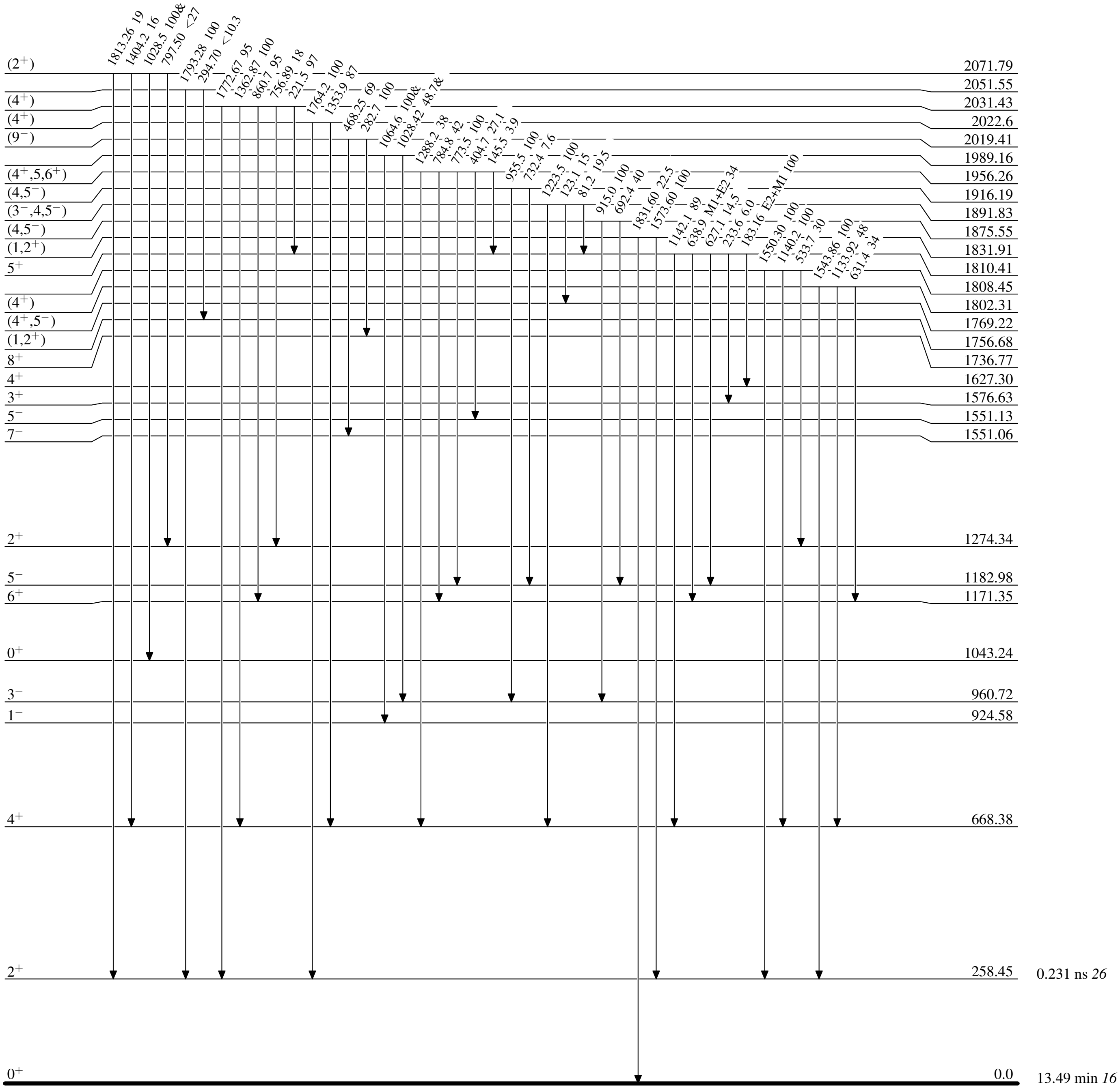


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

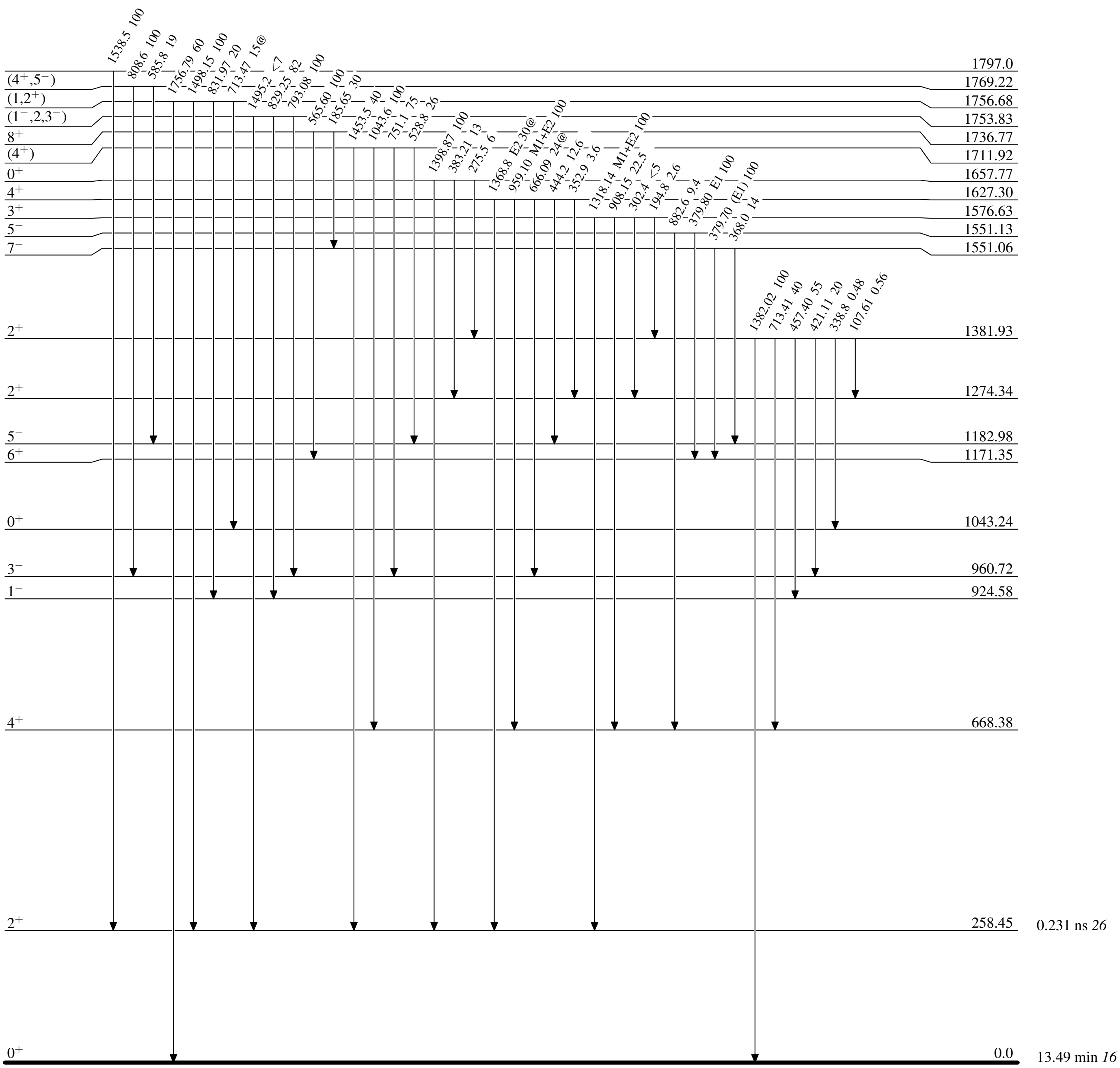


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

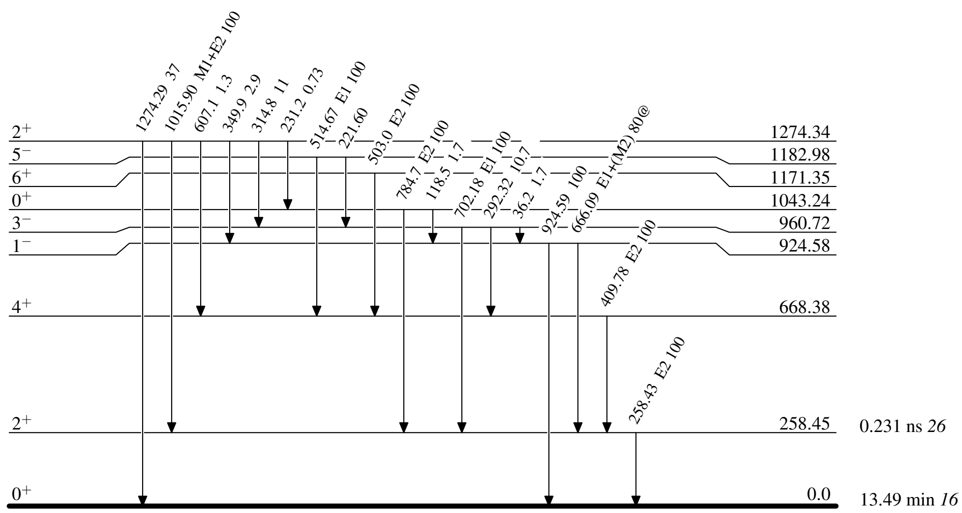


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

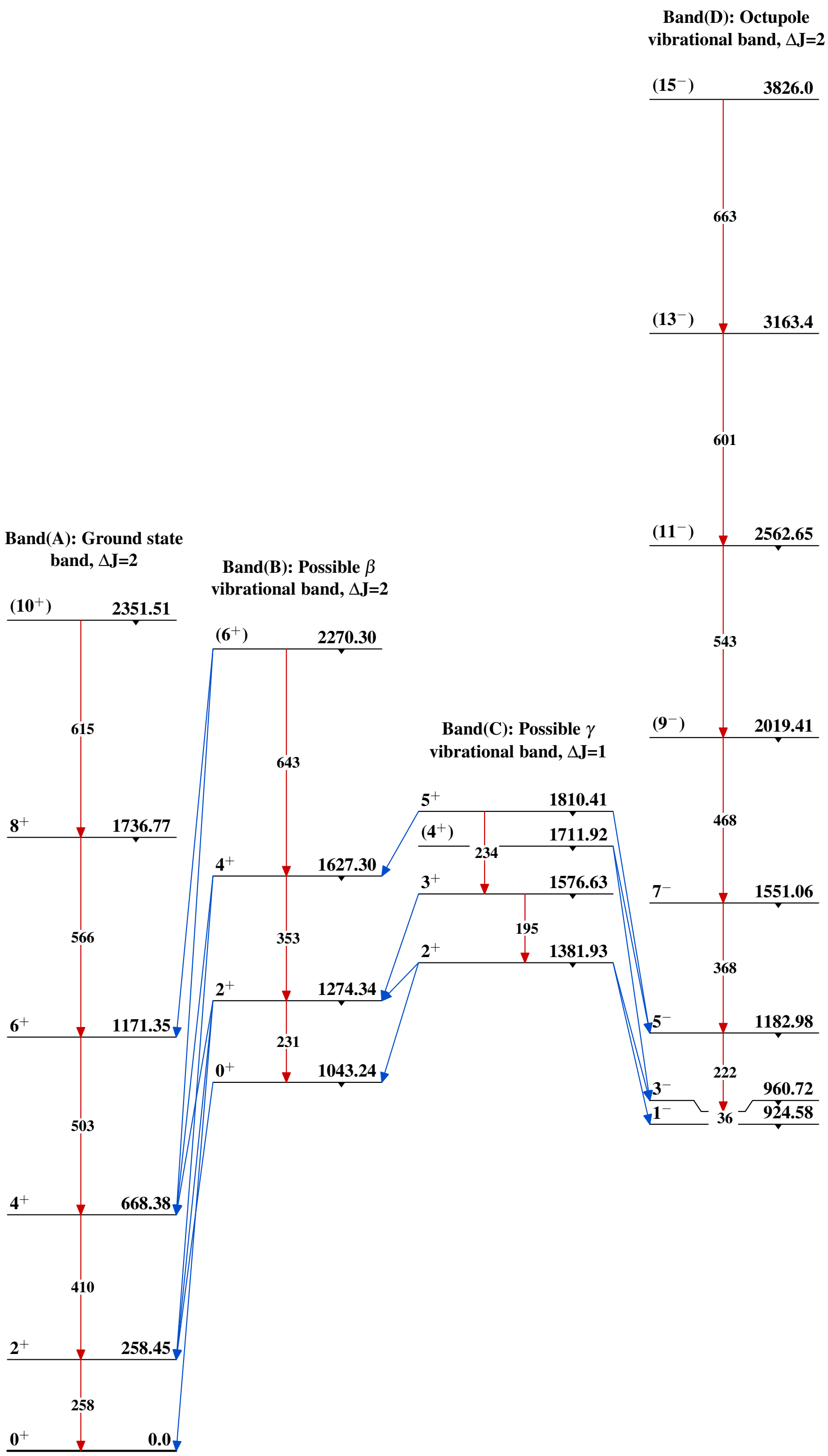
Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided



$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas



$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 117, 1 (2014)	1-Oct-2013

Q(β^-)=2137 *13*; S(n)=6456 *14*; S(p)=11009 *15*; Q(α)=−1056 *13* 2012Wa38

^{148}Ce Levels

Cross Reference (XREF) Flags

- A ^{148}La β^- decay
- B ^{149}La β^-n decay (1.05 s)
- C ^{252}Cf SF decay
- D ^{235}U(n,F) E=thermal

E(level)[†]	J^π[‡]	$T_{1/2}$	XREF	Comments
0.0[&]	0^+[#]	56.8 s *3*	A CD	%β^-=100 $T_{1/2}$: weighted average of: 56 s *1* (1983Ar15) and 56.9 s *3* (2004Ko05). Others: 48 s *1* (1974Ar25), 45.1 s *5* (1986BuZV). measured δ<r^2> =1.089 fm^2 *2* relative to ^{144}Ce (2003Ch60); <r^2>$^{1/2}$=4.9911 fm *35* (2004An14).
158.467[&] *5*	2^+[#]	1.01 ns *6*	A CD	μ=0.74 *12* (2005St24,1986Gi05,1999Sm05) g=0.38 *5* μ: from $\gamma\gamma(\theta$,H) in ^{148}La β^- decay (1986Gi05), and time-integral perturbed angular correlation method in ^{252}Cf SF decay (1999Sm05). g: weighted average of 0.37 *6* (1999Sm05) and 0.39 *8* (2009Go09) In ^{252}Cf SF decay. J^π: ΔJ=2, E2 γ to 0^+, g.s.. $T_{1/2}$: weighted average of 0.95 ns *8* (1980ChZM, from ^{254}Cf SF decay, not included In ^{148}Ce evaluation) and 1.06 ns *8* (1974JaZN, ^{252}Cf SF decay dataset). Others (from ^{252}Cf SF decay dataset): 1.3 ns *2* (1970Wa05), 0.9 ns *3* (2006Hw01).
453.45[&] *5*	4^+[#]	<1.2 ns	A CD	$T_{1/2}$: 0.2 ns *+10−2* from ^{252}Cf SF decay (2004Li66) was adopted As a limit by evaluator.
760.32 *4*	(1^-)		A	J^π: γ's to 0^+, and 2^+; strong β^- from (2^-) parent; systematics of 1^- levels in α=140-152 region.
770.43 *6*	0^+		A	J^π: from $\gamma\gamma(\theta)$ In ^{148}La β^- decay.
839.52[&] *16*	6^+[#]		CD	
841.39 *5*	(3^-)		A	J^π: γ to 2^+, and 4^+; no γ to 0^+; systematics of 3^- levels.
935.59 *5*	(2^+)		A	J^π: strong γ's to 2^+, and 4^+ and weak γ to 0^+ g.s. is typical for J=2^+ member of β-vibrational band, ΔE(2^+ to 0^+)(β^-vibr)=165 keV is comparable with ΔE(2^+ to 0^+)(g.s.)=158 keV.
989.90 *4*	(2^+)		A	J^π: γ's to 0^+ and 4^+.
1116.63[b] *5*	(3^+)		A C	J^π: γ's to 2^+ and 4^+ respectively; band member In ^{252}Cf decay dataset In accordance with systematics for γ-vibrational bands in α=144-152 nuclei.
1223.98 *11*	(4^+)		A	J^π: γ to 4^+; systematics for β-vibrational bands in α=144-152 nuclei.
1290.32[&] *20*	8^+[#]		C	
1351.40[a] *23*	(7^-)		C	
1368.89 *5*			A	
1415.61 *7*			A	
1423.04[b] *14*	(5^+)		C	
1456.88? *25*			A	
1486.33[c] *21*	(4^-)		A C	
1497.07 *7*	$(2^+,1)$[@]		A	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{148}Ce Levels (continued)

E(level)[†]	J^π[‡]	XREF	E(level)[†]	J^π[‡]	XREF	E(level)[†]	J^π[‡]	XREF
1554.76 *9*		A	1927.69? *21*		A	2673.5[b] *3*	(11^+)	C
1558.51? *16*		A	1954.09[c] *22*	(8^-)	C	2751.1[c] *5*	(12^-)	C
1584.11? *17*		A	2095.20[d] *23*	(9)	C	2751.7[a] *3*	(13^-)	C
1589.91 *6*	$(2^+,1)$[@]	A	2144.48 *15*		A	2887.9[&] *4*	14^+[#]	C
1622.78? *12*		A	2153.67 *14*	$(2^+,1)$[@]	A	2969.2[d] *3*	(13)	C
1625.98? *10*		A	2192.37? *24*		A	3287.3[c] *5*	(14^-)	C
1682.00[c] *19*	(6^-)	C	2198.76[b] *24*	(9^+)	C	3326.4[a] *4*	(15^-)	C
1728.39 *11*		A	2224.7[a] *3*	(11^-)	C	3464.1[&] *4*	16^+[#]	C
1753.58[a] *23*	(9^-)	C	2252.22 *14*		A	3898.7[c] *6*	(16^-)	C
1786.67[b] *18*	(7^+)	C	2306.9[c] *4*	(10^-)	C	3944.2[a] *4*	(17^-)	C
1788.66[d] *23*	(7)	C	2327.8[&] *3*	12^+[#]	C	4065.8[&] *4*	18^+[#]	C
1790.7[&] *3*	10^+[#]	C	2486.8[d] *3*	(11)	C	4685.4[&] *5*	20^+[#]	C
1891.20 *8*	$(2^+,1)$[@]	A	2550.36 *21*	$(2^+,1)$[@]	A	5311.2[&] *5*	22^+[#]	C

[†] From a least-squares fit to Eγ data.
[‡] From 2006Ch24 based on presumed rotational-band structure and systematics, unless noted otherwise.
[#] E2 γ to 0^+ band member and regular band sequence.
[@] Gammas to 0^+ and 2^+.
[&] Band(A): $K^\pi=0^+$ band, $\alpha=+1$.
[a] Band(B): $K^\pi=7^-$ band, $\alpha=+1$.
[b] Band(C): $K^\pi=3^+$ band, $\alpha=-1$.
[c] Band(D): $K^\pi=4^-$ band, $\alpha=-1$.
[d] Band(E): Band based on 7.

$\gamma(^{148}Ce)$

E_i(level)	J^π_i	E_γ[‡]	I_γ[#]	E_f	J^π_f	Mult.	α[†]	Comments
158.467	2^+	158.468 *5*	100	0.0	0^+	E2	0.407	α(K)=0.293 *5*; α(L)=0.0896 *13*; α(M)=0.0197 *3*; α(N+..)=0.00489 *7* α(N)=0.00425 *6*; α(O)=0.000618 *9*; α(P)=1.713×10^{-5} *24* B(E2)(W.u.)=86 *6* Mult.: from K/L in ^{252}Cf SF decay and RUL.
453.45	4^+	295.07 *9*	100	158.467	2^+	[E2]	0.0513	α(K)=0.0412 *6*; α(L)=0.00802 *12*; α(M)=0.001726 *25*; α(N+..)=0.000436 *7* α(N)=0.000376 *6*; α(O)=5.71×10^{-5} *8*; α(P)=2.71×10^{-6} *4* B(E2)(W.u.)>4.3
760.32	(1^-)	601.88 *6*	89 *1*	158.467	2^+			
		760.30 *6*	100 *5*	0.0	0^+			
770.43	0^+	611.81 *7*	100	158.467	2^+	E2	0.00634 *9*	α=0.00634 *9*; α(K)=0.00534 *8*; α(L)=0.000790 *11*; α(M)=0.0001665 *24*; α(N+..)=4.29×10^{-5} *6* α(N)=3.67×10^{-5} *6*; α(O)=5.80×10^{-6} *9*; α(P)=3.81×10^{-7} *6* Mult.: from $\gamma\gamma(\theta)$ and syst for β-vibrational levels in A≈150 deformed nuclei (^{148}La β^- decay).
839.52	6^+	386.15 *20*	100	453.45	4^+			

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Adopted Levels, Gammas (continued)

$\gamma(^{148}Ce)$ (continued)

E_i(level)	J_i^π	E_γ‡	I_γ#	E_f	J_f^π	Mult.	α†	Comments
841.39	(3⁻)	387.92 *10*	22 *1*	453.45	4⁺			
		682.97 *6*	100 *8*	158.467	2⁺			
935.59	(2⁺)	482.19 *7*	13 *1*	453.45	4⁺			
		777.16 *6*	100 *3*	158.467	2⁺			
989.90	(2⁺)	(54.24)		935.59	(2⁺)			
		536.38 *16*	5.3 *6*	453.45	4⁺			
		831.33 *6*	55 *3*	158.467	2⁺			
		989.85 *6*	100 *3*	0.0	0⁺			
1116.63	(3⁺)	663.20 *7*	38 *1*	453.45	4⁺			
		958.23 *6*	100 *1*	158.467	2⁺			
1223.98	(4⁺)	770.53 *10*	100	453.45	4⁺			
1290.32	8⁺	450.75 *20*	100	839.52	6⁺			
1351.40	(7⁻)	511.9 *2*	100	839.52	6⁺			
1368.89		252.45 *7*	42 *3*	1116.63	(3⁺)			
		378.93 *4*	100 *10*	989.90	(2⁺)			
		433.32 *8*	28.2 *14*	935.59	(2⁺)			
1415.61		298.81 *14*	72 *6*	1116.63	(3⁺)			
		425.68 *8*	100 *6*	989.90	(2⁺)			
		1257.42 *14*	61 *6*	158.467	2⁺			
1423.04	(5⁺)	306.3 *2*	96 *5*	1116.63	(3⁺)			
		583.5 *3*	58 *3*	839.52	6⁺			
		969.65 *25*	100 *5*	453.45	4⁺			
1456.88?		1298.46@ *25*	100	158.467	2⁺			
1486.33	(4⁻)	369.7 *2*	100	1116.63	(3⁺)			E_γ: from ^{252}Cf SF decay.
1497.07	(2⁺,1)	1338.64 *8*	100 *6*	158.467	2⁺			
		1496.97 *12*	34 *3*	0.0	0⁺			
1554.76		713.37 *12*	69 *8*	841.39	(3⁻)			
		794.44 *11*	100 *8*	760.32	(1⁻)			
1558.51?		1105.06 *15*	100	453.45	4⁺			
1584.11?		1425.58@ *11*	100	158.467	2⁺			
1589.91	(2⁺,1)	654.53 *11*	58 *17*	935.59	(2⁺)			
		819.28 *8*	100 *25*	770.43	0⁺			
		1431.56 *10*	100 *4*	158.467	2⁺			
		1589.93 *13*	63 *4*	0.0	0⁺			
1622.78?		1464.36@ *11*	100	158.467	2⁺			
1625.98?		257.09 *9*	100	1368.89				
1682.00	(6⁻)	195.7@		1486.33	(4⁻)			
		258.85 *20*	100	1423.04	(5⁺)			
1728.39		887.12 *12*	100 *13*	841.39	(3⁻)			
		967.4 *4*	88 *25*	760.32	(1⁻)			
		1569.65 *25*	88 *25*	158.467	2⁺			
1753.58	(9⁻)	402.2 *2*	47 *4*	1351.40	(7⁻)			
		463.2 *2*	100 *5*	1290.32	8⁺			
1786.67	(7⁺)	104.8 *2*	67 *4*	1682.00	(6⁻)	E1	0.214 *4*	α(K)=0.182 *3*; α(L)=0.0252 *4*; α(M)=0.00525 *8*; α(N+..)=0.001338 *20* α(N)=0.001148 *18*; α(O)=0.000179 *3*; α(P)=1.103×10^{-5} *17* Mult.: based on α(exp) (^{252}Cf SF decay).
		363.65 *20*	100 *6*	1423.04	(5⁺)			
		947.3 *2*	81 *6*	839.52	6⁺			
1788.66	(7)	949.1 *2*	100	839.52	6⁺			
1790.7	10⁺	500.8 *5*	100	1290.32	8⁺			
1891.20	(2⁺,1)	1130.95 *10*	86 *9*	760.32	(1⁻)			
		1732.67 *16*	55 *5*	158.467	2⁺			
		1891.02 *17*	100 *5*	0.0	0⁺			

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Adopted Levels, Gammas (continued)

$\gamma(^{148}Ce)$ (continued)

E_i(level)	J_i^π	E_γ[‡]	I_γ[#]	E_f	J_f^π	Mult.	α[†]	Comments
1927.69?		1769.27[@] 21	100	158.467	2^+			
1954.09	(8^-)	166.95 20	100 5	1786.67	(7^+)	E1	0.0584	α(K)=0.0499 8; α(L)=0.00669 10; α(M)=0.001392 20; α(N+..)=0.000357 6 α(N)=0.000306 5; α(O)=4.83×10^{-5} 7; α(P)=3.21×10^{-6} 5 Mult.: based on α(exp) (^{252}Cf SF decay).
		271.75 20	49 3	1682.00	(6^-)			
2095.20	(9)	306.5 2	100 8	1788.66	(7)			
		804.9 2	65 5	1290.32	8^+			
2144.48		1303.3 3	5 5	841.39	(3^-)			
		1985.93 17	100 2	158.467	2^+			
2153.67	$(2^+,1)$	1995.23 16	100 3	158.467	2^+			
		2153.56 23	22 3	0.0	0^+			
2192.37?		2033.95[@] 24		158.467	2^+			
2198.76	(9^+)	244.95 25	100 9	1954.09	(8^-)			
		411.9 2	67 6	1786.67	(7^+)			
2224.7	(11^-)	434.1 2	100 6	1790.7	10^+			
		471.1 2	42 4	1753.58	(9^-)			
2252.22		1316.69 18	6.4 8	935.59	(2^+)			
		2093.66 21	100 2	158.467	2^+			
2306.9	(10^-)	108.0 6	54 3	2198.76	(9^+)	E1	0.197 5	α(K)=0.167 4; α(L)=0.0232 5; α(M)=0.00482 11; α(N+..)=0.00123 3 α(N)=0.001054 23; α(O)=0.000164 4; α(P)=1.020×10^{-5} 21 Mult.: based on α(exp) (^{252}Cf SF decay).
		352.9 4	100 8	1954.09	(8^-)			
2327.8	12^+	103.1 2	4.6 7	2224.7	(11^-)			
		536.95 25	100 6	1790.7	10^+			
2486.8	(11)	391.55 20	100 8	2095.20	(9)			
		696.1 2	100 8	1790.7	10^+			
2550.36	$(2^+,1)$	2391.94 22	100 7	158.467	2^+			
		2549.8 6	9 6	0.0	0^+			
2673.5	(11^+)	474.7 2	100	2198.76	(9^+)			
2751.1	(12^-)	444.2 2	100	2306.9	(10^-)			
2751.7	(13^-)	423.9 2	100 9	2327.8	12^+			
		527.0 2	65 9	2224.7	(11^-)			
2887.9	14^+	136.3 2	8.2 11	2751.7	(13^-)			
		559.7 5	100 5	2327.8	12^+			
2969.2	(13)	482.5 2	100 12	2486.8	(11)			
		641.4 2	71 12	2327.8	12^+			
3287.3	(14^-)	536.2 2	100	2751.1	(12^-)			
3326.4	(15^-)	438.4 2	100 14	2887.9	14^+			
		574.7 2	64 7	2751.7	(13^-)			
3464.1	16^+	137.8 2	4.1 13	3326.4	(15^-)			
		576.15 20	100 5	2887.9	14^+			
3898.7	(16^-)	611.4 2	100	3287.3	(14^-)			
3944.2	(17^-)	617.8 2	100	3326.4	(15^-)			
4065.8	18^+	601.65 20	100	3464.1	16^+			
4685.4	20^+	619.6 2	100	4065.8	18^+			
5311.2	22^+	625.8 2	100	4685.4	20^+			

† Additional information 1.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

$\gamma(^{148}Ce)$ (continued)

‡ From ^{148}La β^- decay for transitions not related to band structures, while for In-band and inter-band transitions Eγ's are from ^{252}Cf SF decay; for levels common to both datasets, Eγ's are from ^{148}La β^- decay.

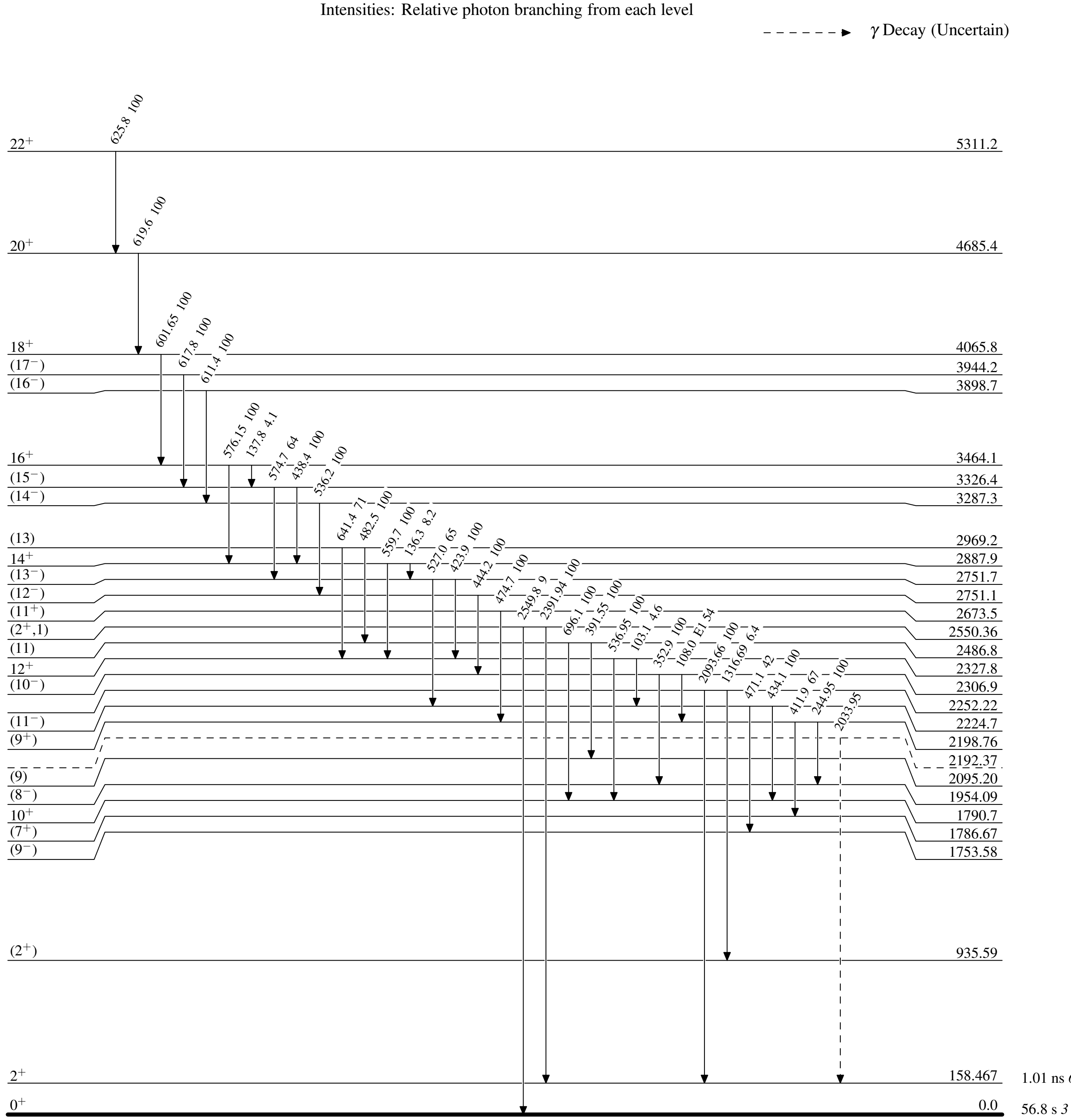
Relative photon branching from each level.

@ Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



$^{148}_{58}Ce_{90}$

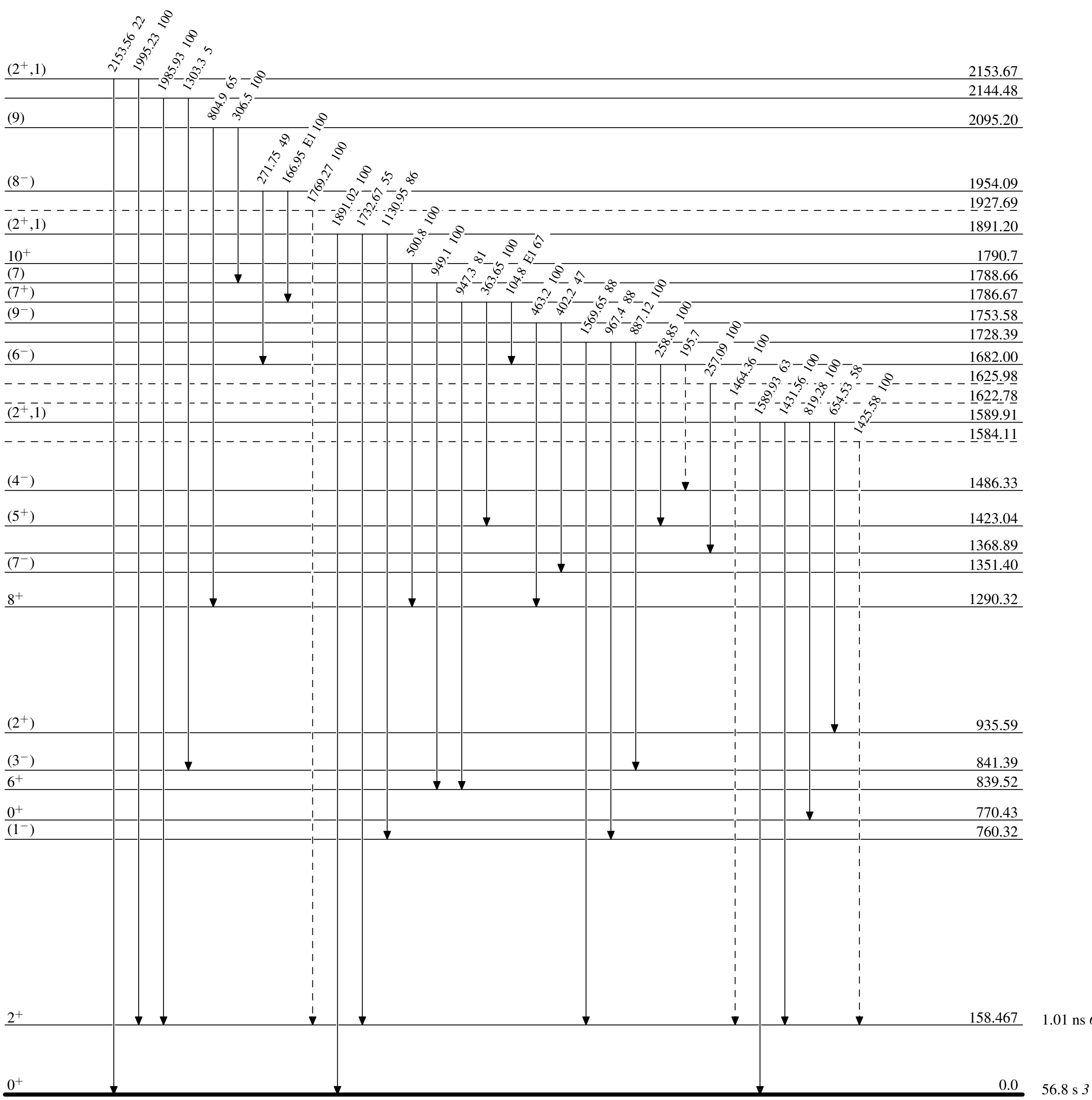
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)

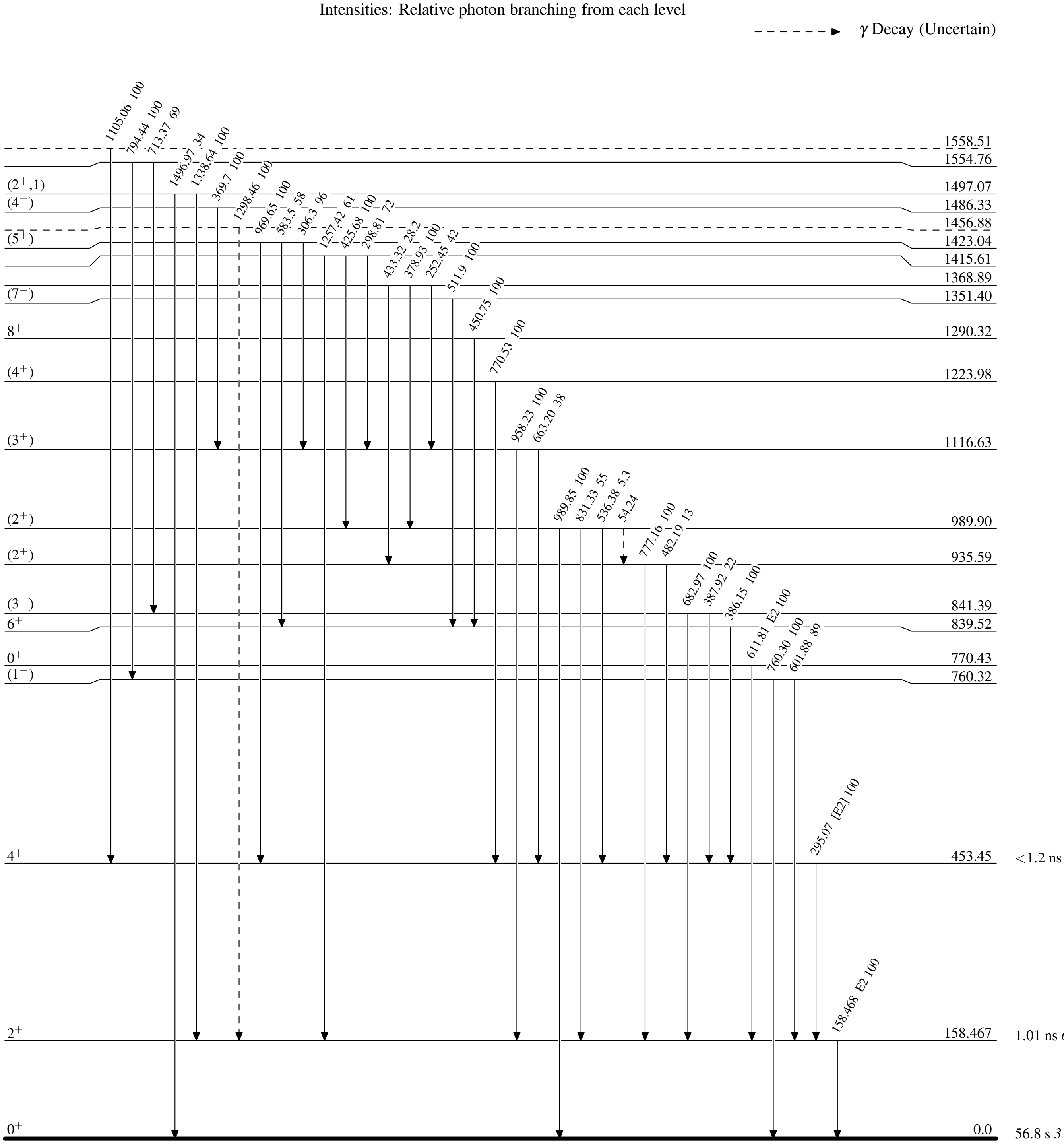


$^{148}_{58}Ce_{90}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



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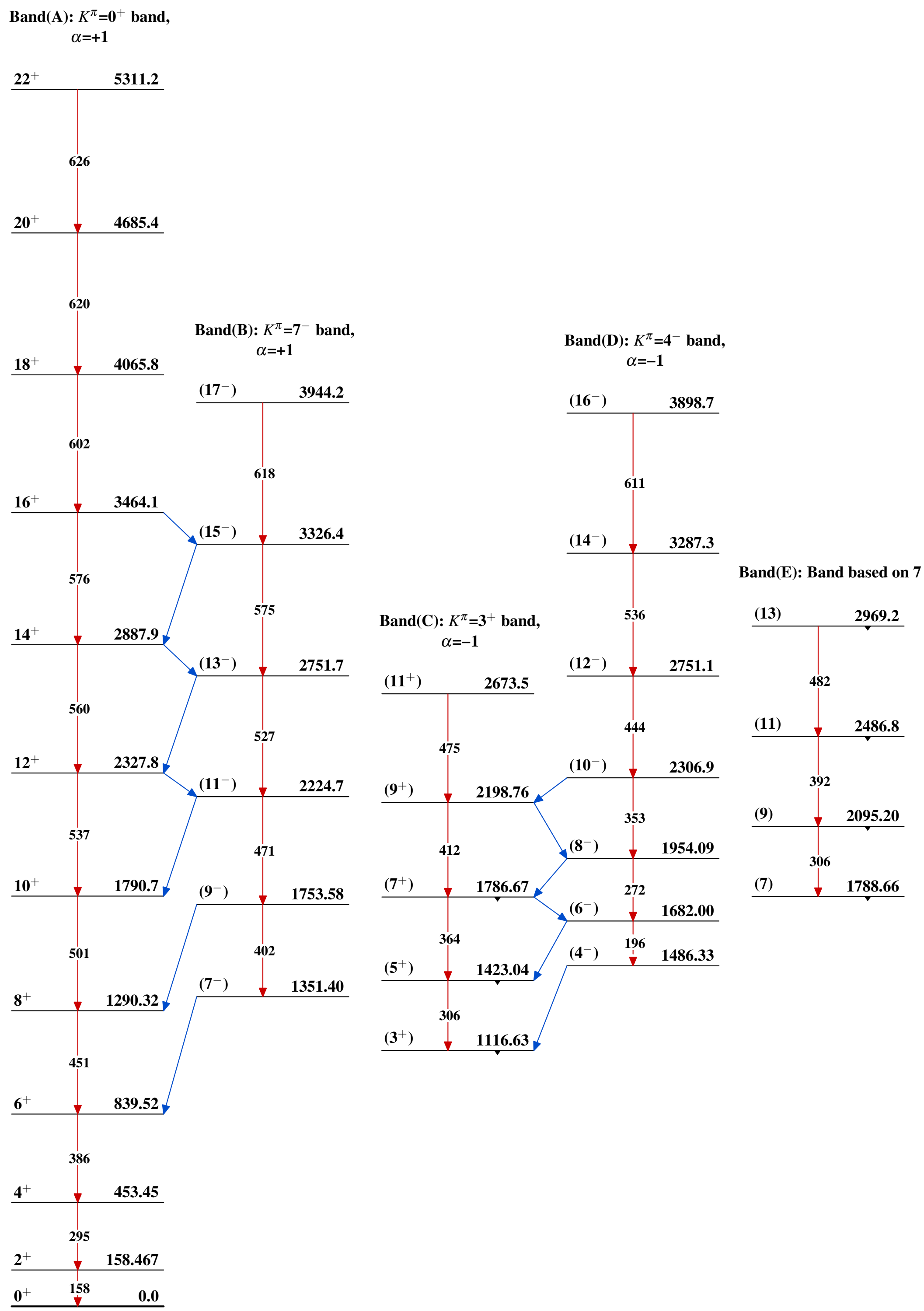
Adopted Levels, Gammas



$^{148}_{58}Ce_{90}$