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$^\pi$[‡]	$T_{1/2}$	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$^\pi$: 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$^\pi$: 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$^\pi$: from $\gamma\gamma(\theta)$ In ^{148}La β^- decay.
839.52[&] *16*	6$^+$[#]		CD	
841.39 *5*	(3$^-$)		A	J$^\pi$: γ to 2$^+$, and 4$^+$; no γ to 0$^+$; systematics of 3$^-$ levels.
935.59 *5*	(2$^+$)		A	J$^\pi$: 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$^\pi$: γ's to 0$^+$ and 4$^+$.
1116.63[b] *5*	(3$^+$)		A C	J$^\pi$: 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$^\pi$: 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	

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Adopted Levels, Gammas (continued)

^{148}Ce Levels (continued)

E(level)†	Jπ‡	XREF	E(level)†	Jπ‡	XREF	E(level)†	Jπ‡	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.

γ(^{148}Ce)

E_i(level)	J_i^π	E_γ‡	I_γ#	E_f	J_f^π	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 γγ(θ) 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)

γ(^{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)

γ(^{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.

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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.

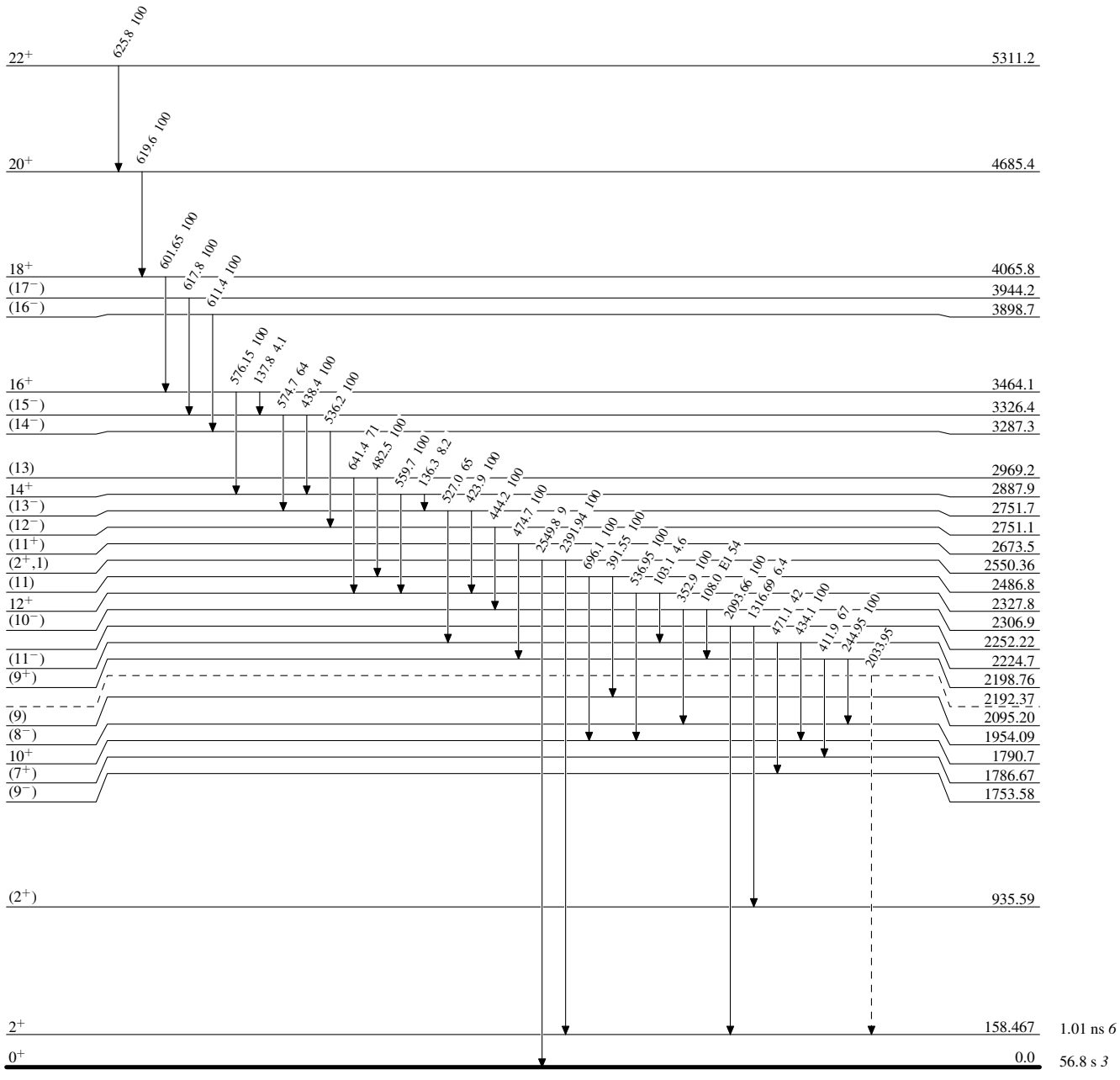
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

- - - - - - ► γ Decay (Uncertain)



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

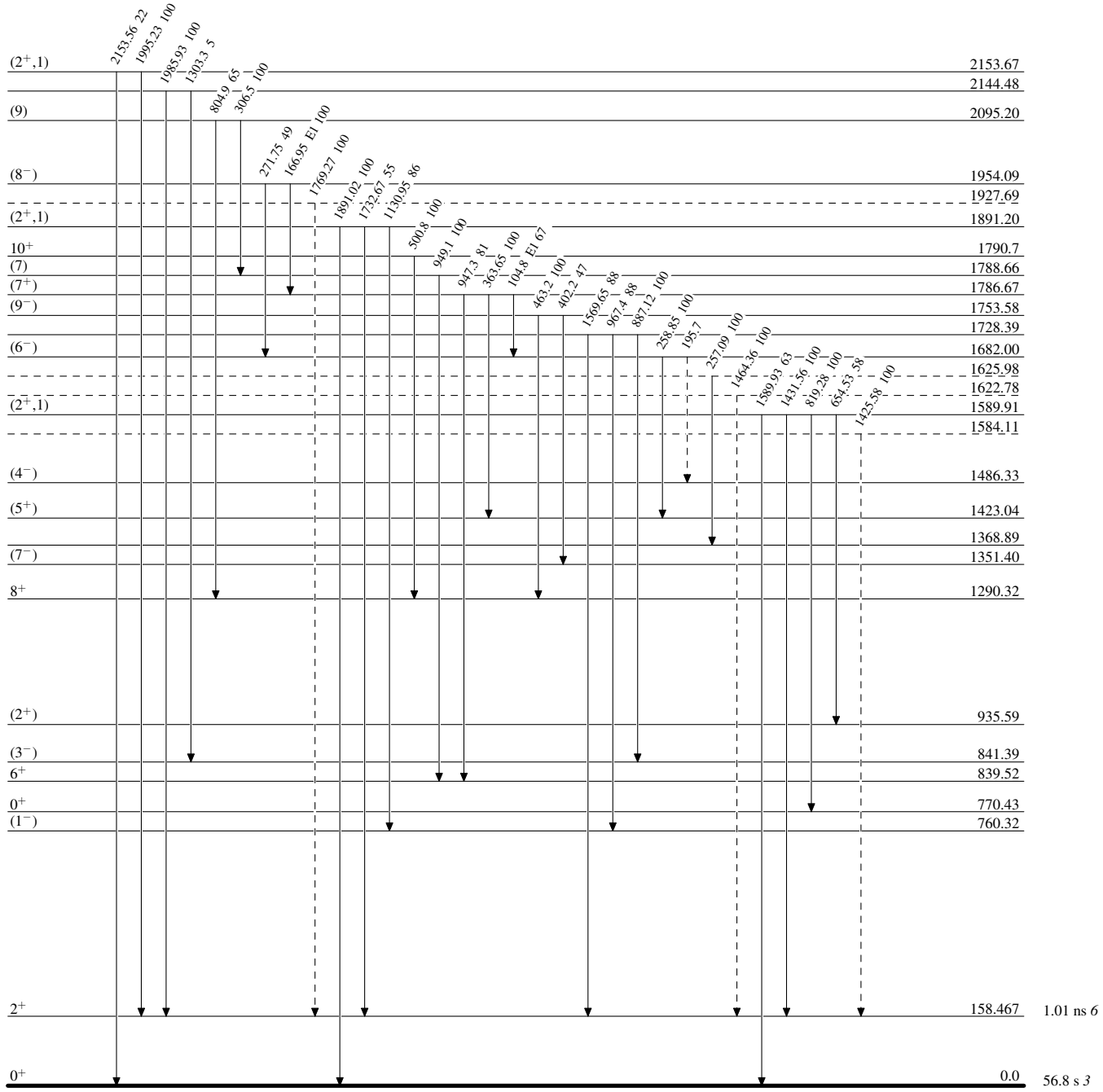
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



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

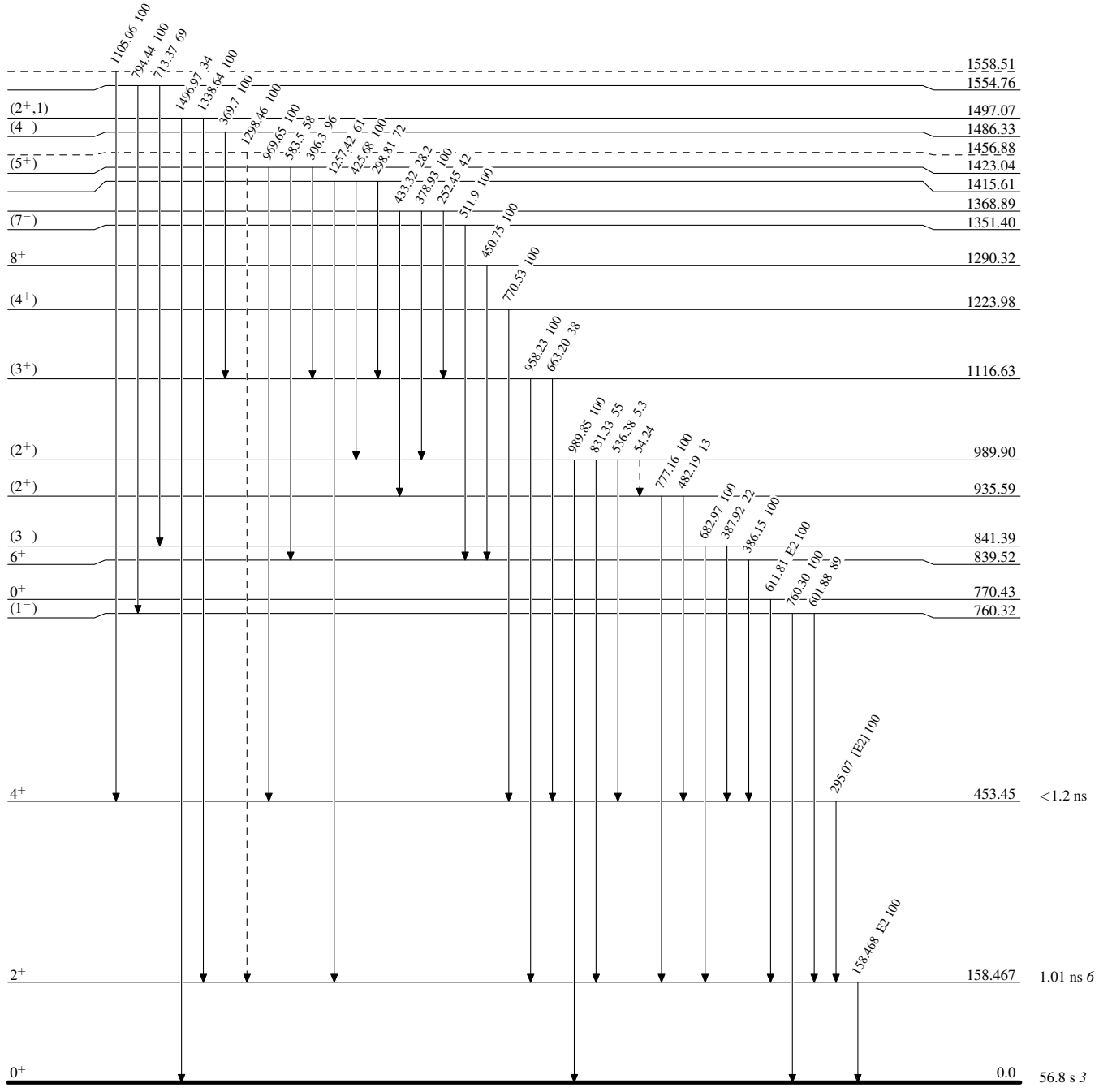
Adopted Levels, Gammas

Legend

Level Scheme (continued)

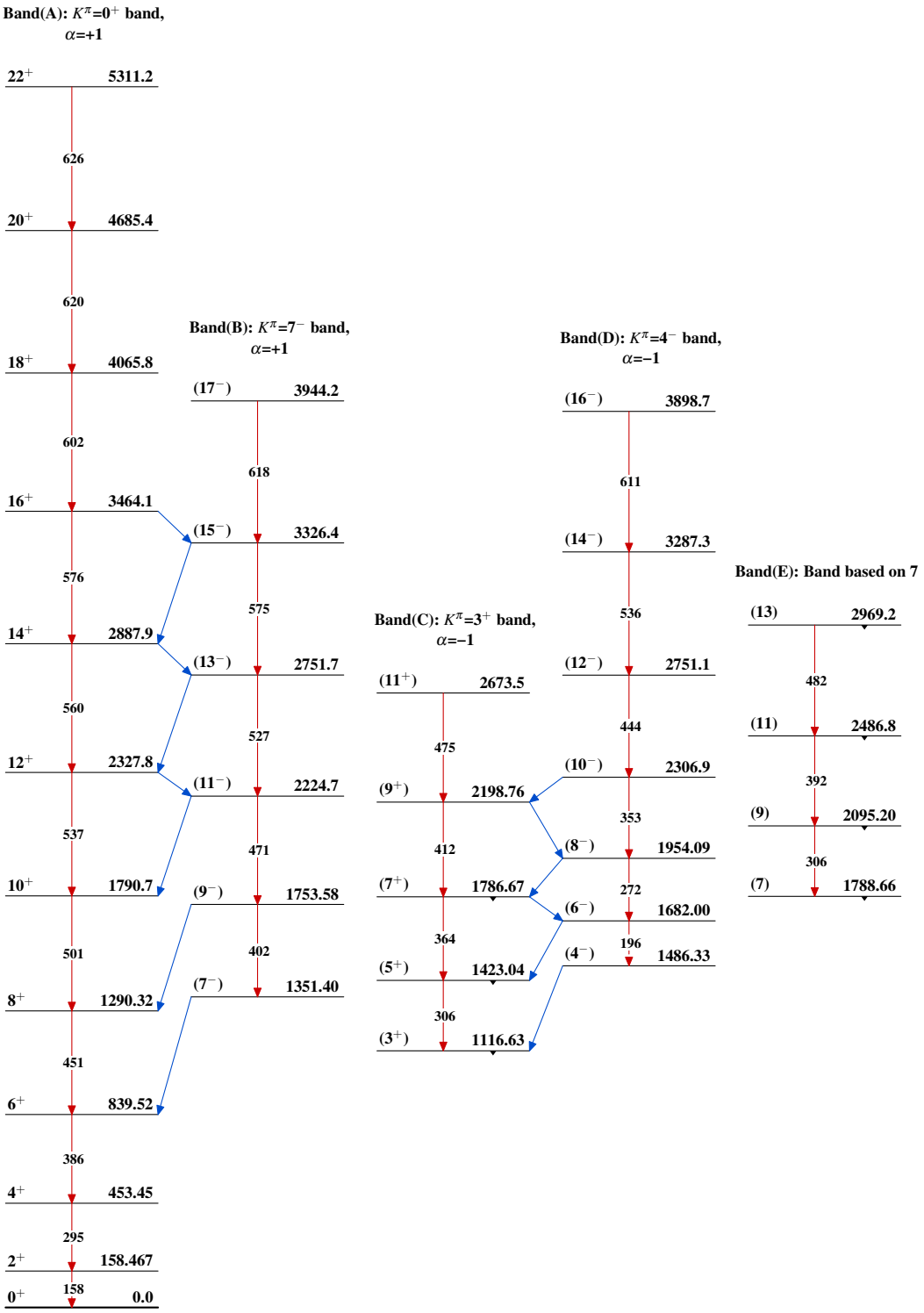
Intensities: Relative photon branching from each level

γ Decay (Uncertain)



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

Adopted Levels, Gammas



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