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′γ)	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($\alpha,\alpha'\gamma$)	T	^{238}U(^{12}C,Fγ)
G	^{139}La(^{3}He,d)	N	^{140}Ce(^{17}O,^{17}O′γ)	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′γ)).
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 $\Gamma(0)=6.2\times10^{-6}$ *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, ($\gamma\gamma(\theta)$ for 432γ (1982Mi03)); and $\gamma(\theta)$ 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 $\Gamma(0)=0.004$ eV *9* with branching=0.59 *3* in (γ,γ′), 1995He25); 28 fs *2* (from $\Gamma(0)=0.0095$ 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, $\gamma(\theta)$ 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 $\Gamma(0)=0.0129$ 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)[†‡]	Jπ	$T_{1/2}$	XREF	Comments
3255.70 *5*	5⁻[&]		E G JKL	
3319.65 *6*	2⁺	58 fs *+19−12*	AB HIJ	Jπ: from analysis of σ(θ) 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	Jπ: L=4 in (α,α′).
3360.24 *18*			J	
3391.09 *8*			E J	Jπ: 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	Jπ: 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	Jπ: γ to 6⁺ is ΔJ=1, E1.
3432.8 *10*	7⁺		E	Jπ: γ to 5⁺ is ΔJ=2, E2; no γ to J<5.
3436.54 *7*	(2⁺,1)		J	Jπ: γ′s to 0⁺ and 2⁺.
3471.21 *11*	(2⁺)	0.097 ps *+76−35*	J	Jπ: (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	Jπ: 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	Jπ: 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	Jπ: 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	Jπ: 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	Jπ: γ to 0⁺. $T_{1/2}$: from 1993Go23 in (n,n′γ).
3648.23 *14*	(2⁺,3,4⁺)		J	Jπ: 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. Jπ: γ′s to 6⁺ and 4⁺.
3661.5 *10*	(7,8)		E	
3684.2 *6*	(1⁻,2⁺)		J	Jπ: γ′s to 0⁺ and 3⁻.
3708.60 *13*	(2⁺)		J	Jπ: 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)[†‡]	Jπ	$T_{1/2}$	XREF	Comments
3723.54 *17*	(2+)	≥0.097 ps	J	Jπ: (E2) γ to 0+ g.s.
3729 *2*	2+		F P	Jπ: L=2 in (t,p).
3735.3 *4*	(1,2+)		J	Jπ: γ to 0+ g.s.
3746 *2*			F P	
3767.97 *10*	(2+,3+,4+)		J	Jπ: γ's to 1+, 2+ and 4+.
3780	(3+,4+)		FG	Jπ: L=0 component in (^{3}He,d).
3792.72 *15*	3−[@]		JK P	
3836.1? *5*	(2+,3,4+)		J	Jπ: γ's to 2+ and 4+.
3847.10 *14*	(4+,5,6+)		J	Jπ: γ's to 6+ and 4+.
3853.2 *5*	(1,2+)		J	Jπ: γ to 0+ g.s.
3879.3 *8*	(1,2+)		J	Jπ: γ to 0+ g.s.
3894.5 *6*	9+[a]		E	
3910.93 *23*			J	
3911 *10*	5−		FG P	Jπ: 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	Jπ: L=3 from (α,α′).
3984.20 *16*	(2+,3,4+)		J	Jπ: 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	Jπ: L=2 in (^{3}He,n).
4158 *4*	2−[@]		d K	
4164.0 *3*	(1,2+)		J	Jπ: γ to 0+ g.s.
4171.1 *7*	(2+,1)		FG J	Jπ: 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	Jπ: L=2,(3,4) in (p,t).
4208 *6*			K	
4242 *10*	2+		FG P	Jπ: 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	Jπ: 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	Jπ: 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)[†‡]	Jπ	$T_{1/2}$	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	Jπ: 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)[†‡]	Jπ	$T_{1/2}$	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). Jπ: 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	Jπ: 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	Jπ: 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)[†‡]	Jπ	$T_{1/2}$	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	Jπ: 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 γ(θ) in (α,2nγ) (1979BiZN).
[b] From ^{140}Ce(α,α′γ) dataset based on measured γ-ray multipolarity (αγ(θ)); 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)

γ(^{140}Ce)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	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

Adopted Levels, Gammas (continued)

γ(^{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).

$^{140}_{58}Ce_{82}$-9

Adopted Levels, Gammas (continued)

γ(^{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
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)

γ(^{140}Ce) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[b]	δ[c,g]	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

Adopted Levels, Gammas (continued)

γ(^{140}Ce) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	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$_\gamma$: 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

Adopted Levels, Gammas (continued)

γ(^{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

Adopted Levels, Gammas (continued)

γ(^{140}Ce) (continued)

E_i(level)	J_i^π	E_γ [†]	I_γ [†]	E_f	J_f^π	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 γ(θ) 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$^+$			

$^{140}_{58}Ce_{82}$-14

Adopted Levels, Gammas (continued)

γ(^{140}Ce) (continued)

E_i(level)	J_i^π	E_γ [†]	I_γ [†]	E_f	J_f^π	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 (α,α′γ) and (γ,γ′).
4262.5	10$^+$	368.1		3894.5	9$^+$			
		548.3		3714.3	10$^+$			

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

Adopted Levels, Gammas (continued)

γ(^{140}Ce) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	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*

$^{140}_{58}Ce_{82}$-16

Adopted Levels, Gammas (continued)

γ(^{140}Ce) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	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 γ(θ) and linear pol in (γ,γ′). $I_{(\gamma+ce)}$: from Γ(γ$_0$)/Γ(γ)=0.93 *5* in (γ,γ′).
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

Adopted Levels, Gammas (continued)

γ(^{140}Ce) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	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)

γ(^{140}Ce) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	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

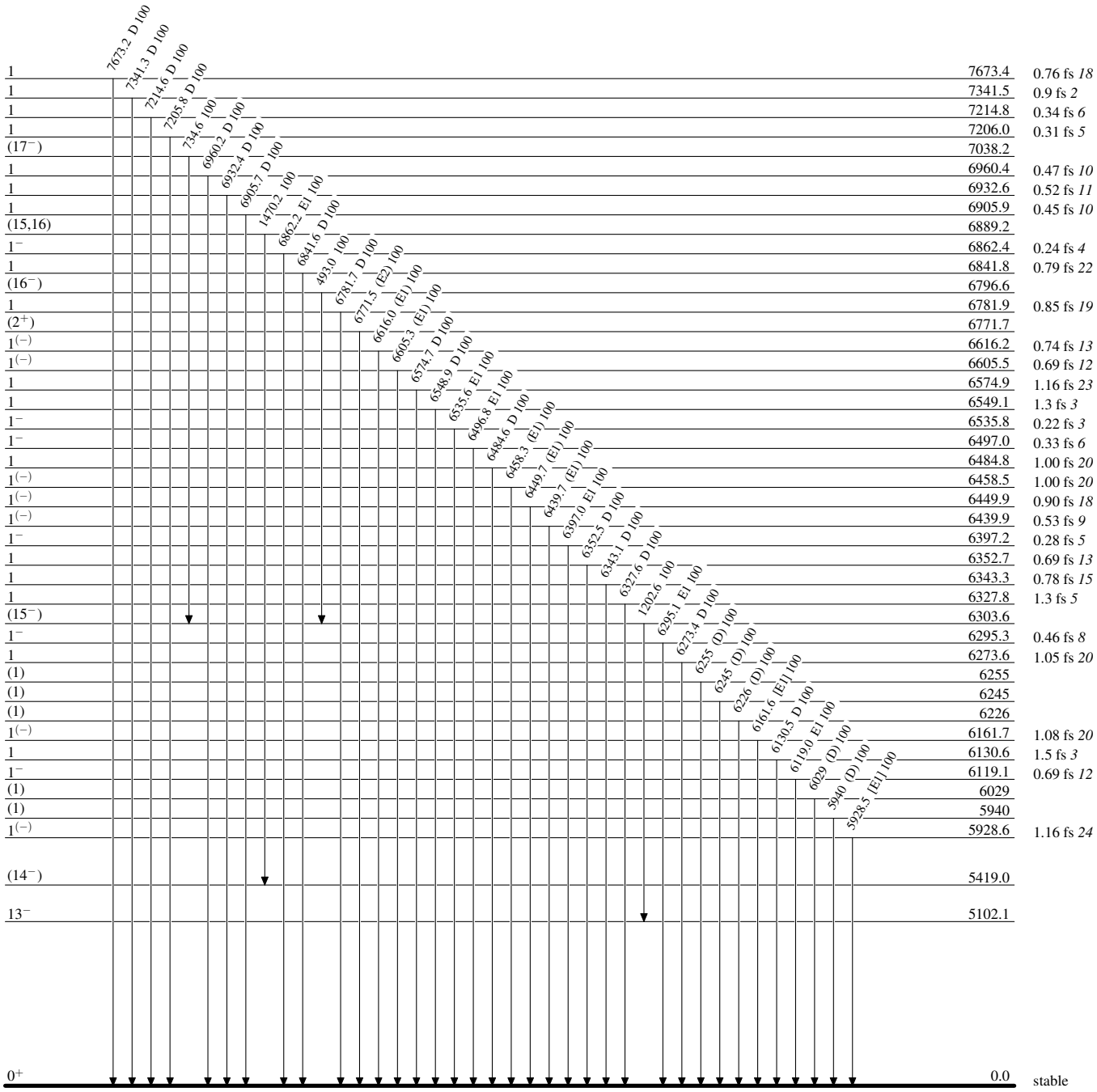
† Unless noted by footnote γ′s with ΔEγ are from ^{140}La β^-, and γ′s with no ΔEγ are from ^{138}Ba(α,2nγ).
‡ From ^{140}Pr ε Decay.
# From ^{140}Ce(n,n′γ).
@ From ^{238}U(^{12}C,Fγ)).
& From ^{140}Ce(γ,γ′) dataset.
[a] From (α,α′γ) and (γ,γ′) datasets.
[b] From α(K)exp, γ(θ), γγ(θ), linear pol in β^- and ε decay and in different nuclear reactions.
[c] From ^{140}La β^- by γγ(θ) (1982Mi03), except where noted.
[d] From ^{140}Ce(n,n′γ) by γ(θ) 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



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

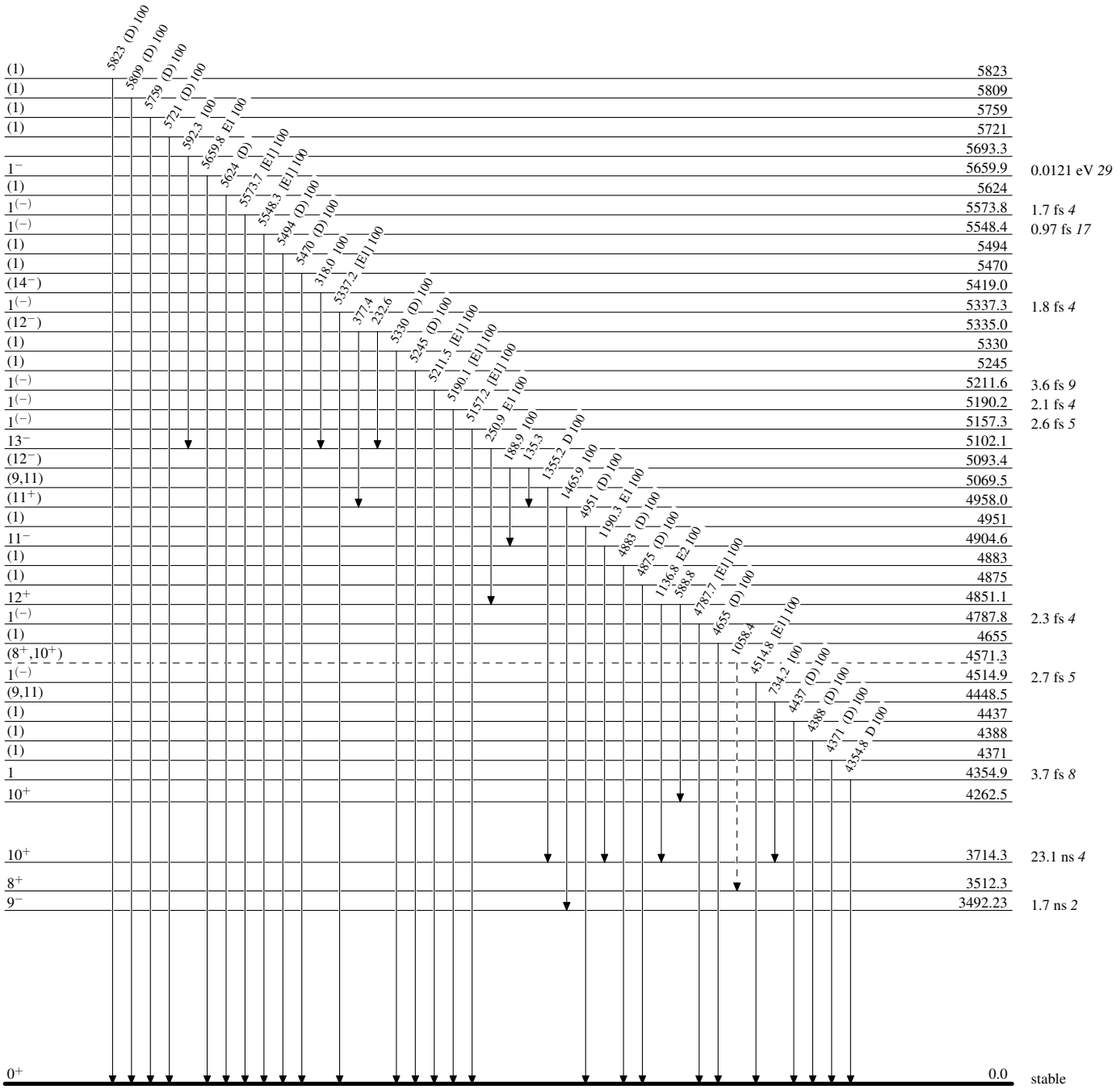
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



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

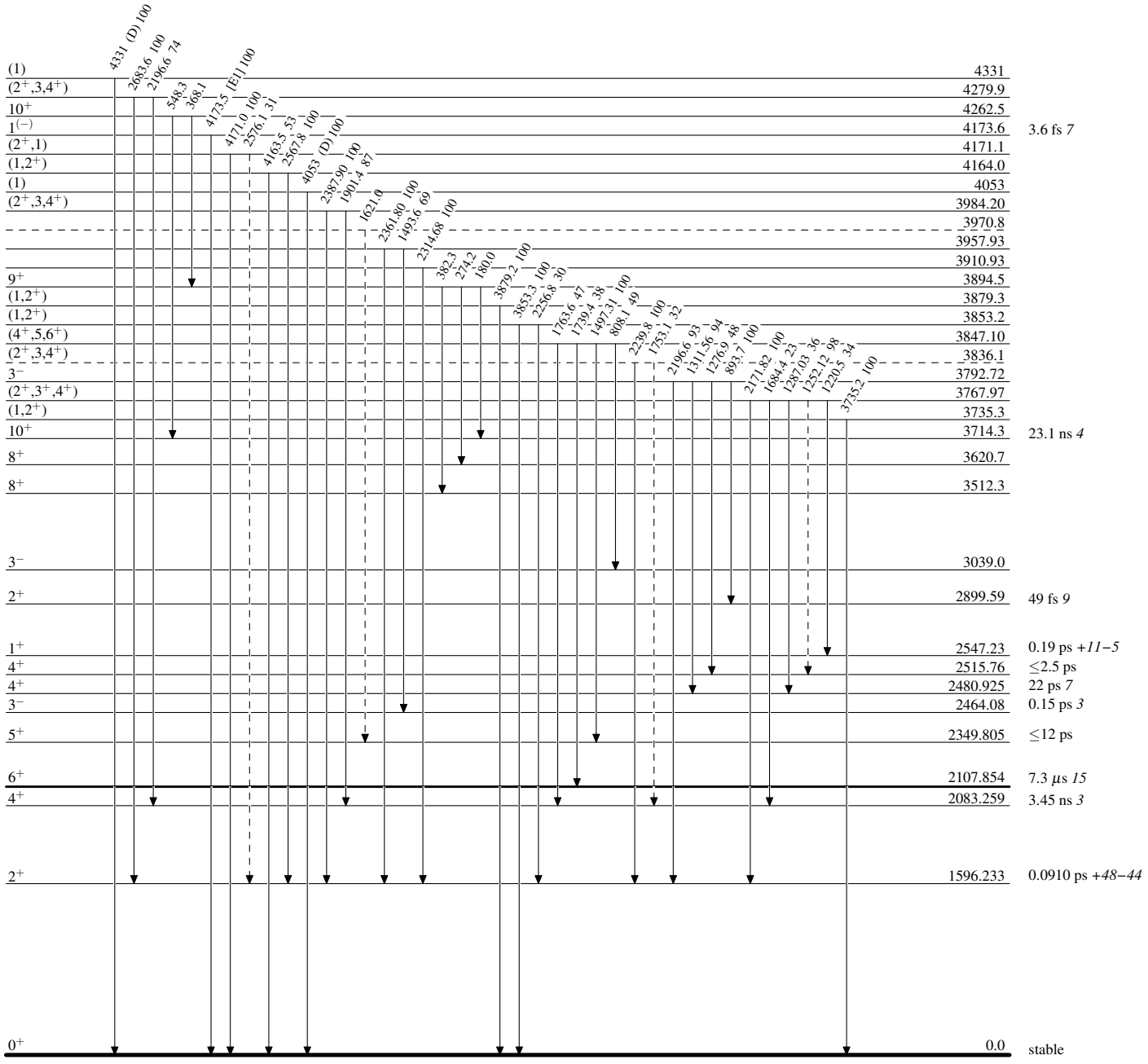
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



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

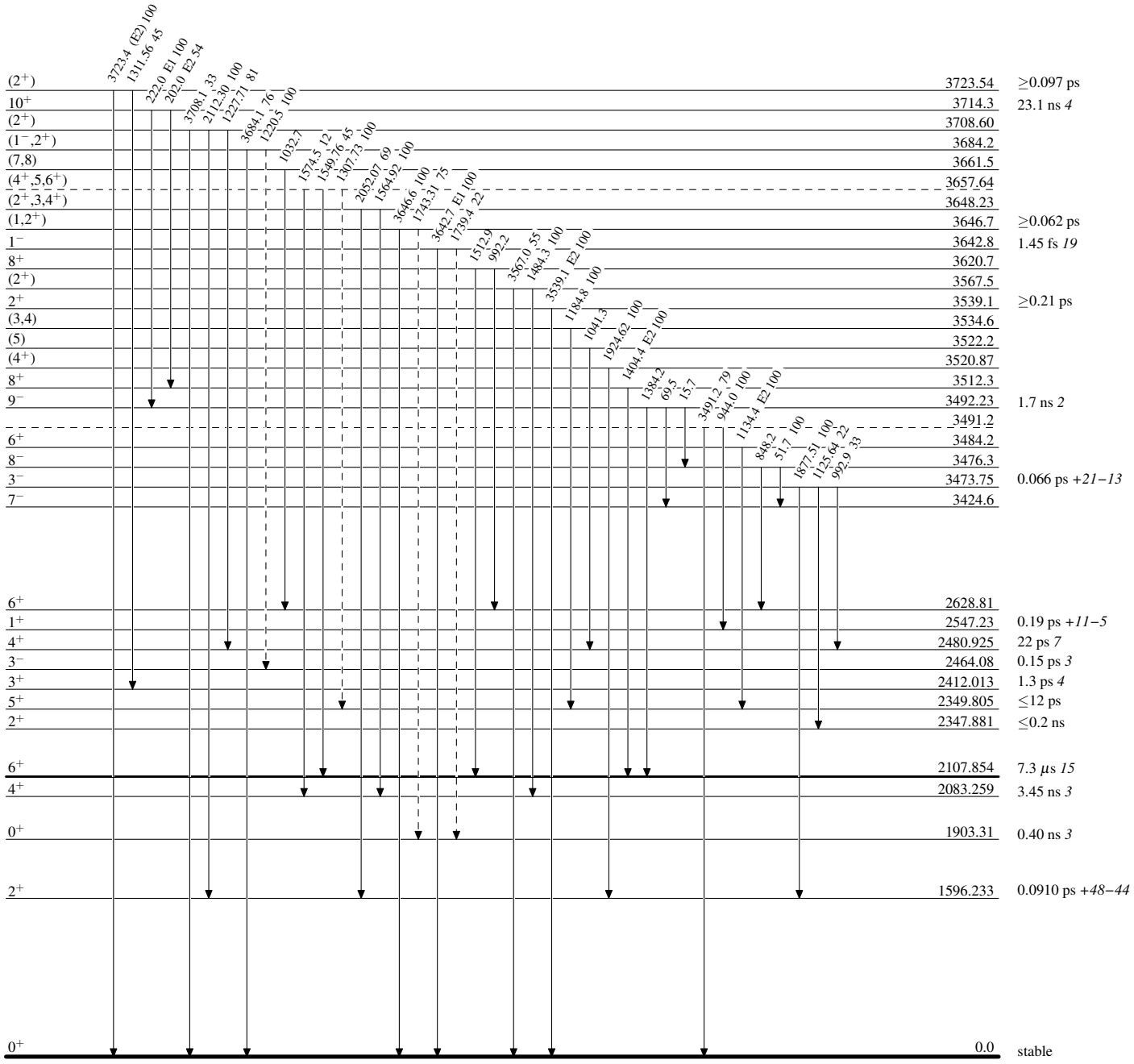
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



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

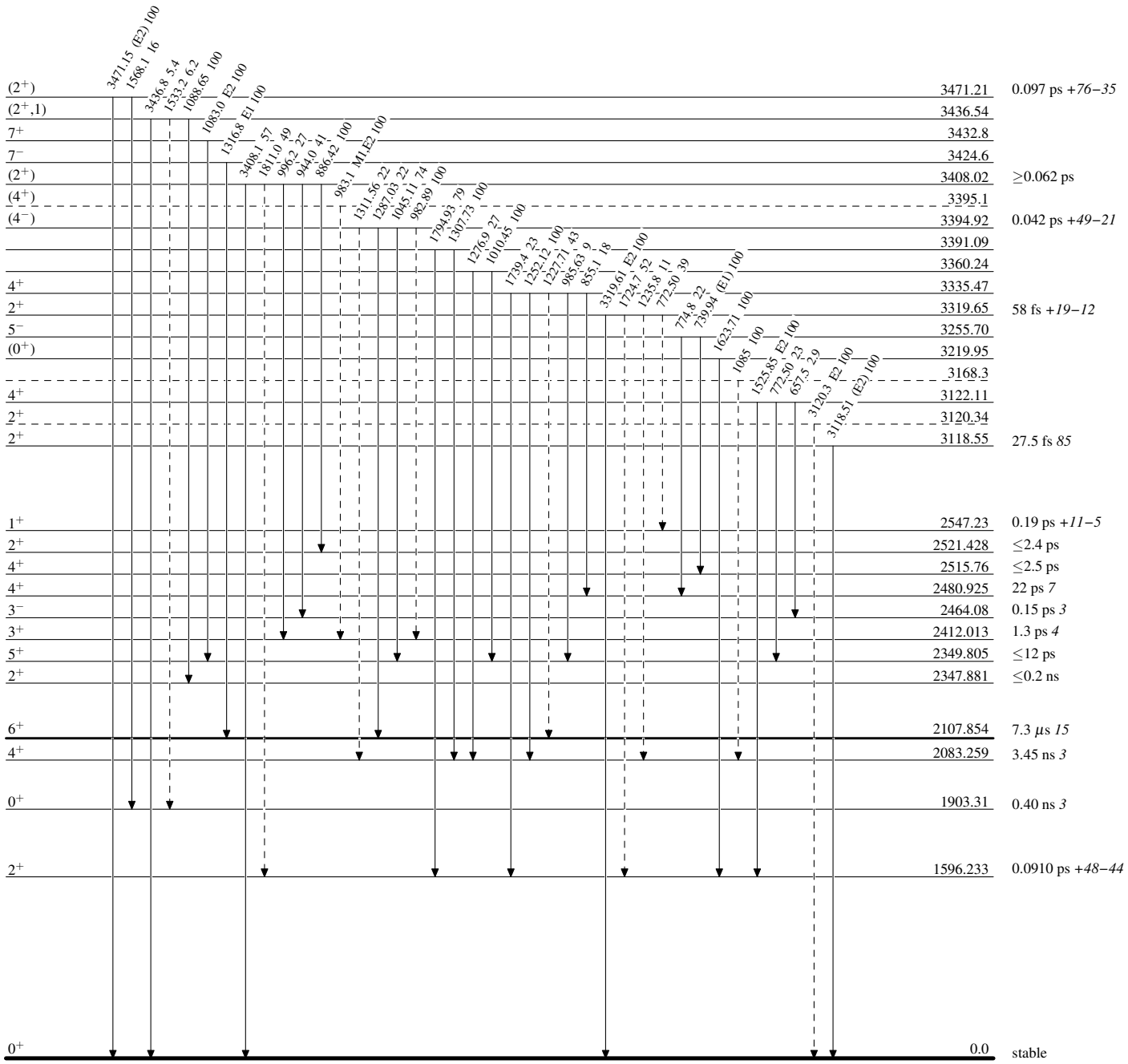
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



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

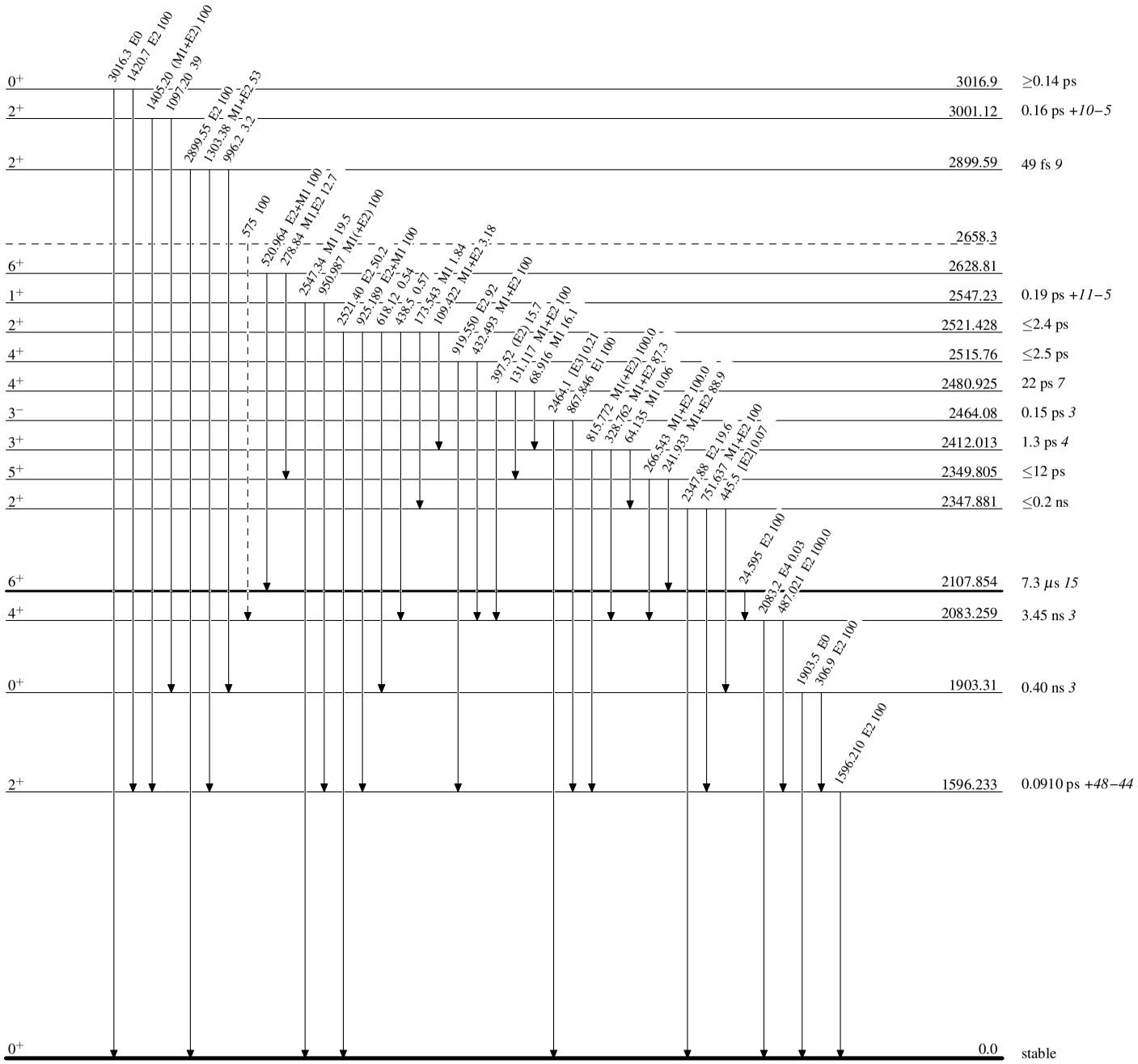
Adopted Levels, Gammas

Legend

Level Scheme (continued)

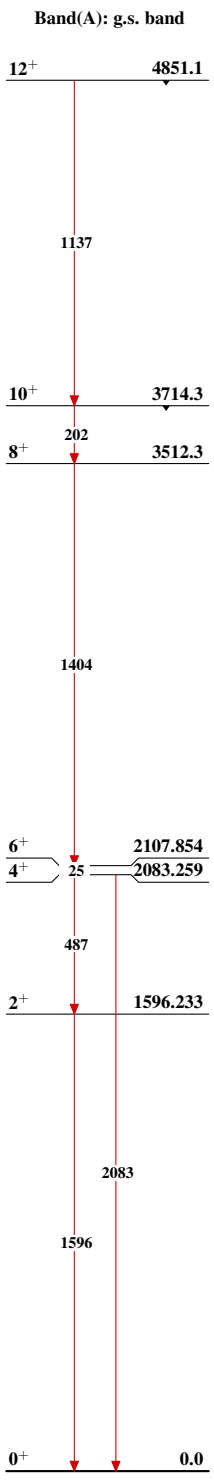
Intensities: Relative photon branching from each level

γ Decay (Uncertain)



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

Adopted Levels, Gammas



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