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	

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Adopted Levels, Gammas (continued)

^{146}Ce Levels (continued)

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

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Adopted Levels, Gammas (continued)

^{146}Ce Levels (continued)

E(level)[†‡]	Jπ	XREF	Comments
2713.44 *15*		AB	
2779.5 *4*	(1,2$^+$)	B	Jπ: 2779.4γ to 0$^+$.
2796.72 *25*		B	
2809.5 *3*		B	
2841.11 *11*		AB	
2861.88 *11*	(1,2$^+$)	AB	Jπ: 2861.5γ to 0$^+$.
2868.96 *12*		AB	
2914.23 *12*		B	
2953.46 *11*	(2,3$^-$)	AB	Jπ: 2028.8γ to 1$^-$, 1377.0γ to 3$^+$, 1992.5γ to 3$^-$.
2996.27 *24*	(1,2$^+$)	A	Jπ: 2996.0γ to 0$^+$.
3064.0 *3*		B	
3163.4[b] *3*	(13$^-$)[#]	C	
3164.6 *5*	(1,2$^+$)	B	Jπ: 3165.5γ to 0$^+$.
3166.65 *17*	(1,2$^+$)	A	Jπ: 1508.7γ to 0$^+$.
3243.11 *9*		B	
3255.45 *17*	(2,3$^+$)	AB	Jπ: 1129.2γ to (1$^+$,2$^+$), 2293.2γ to 3$^-$, 1678.7γ to 3$^+$.
3273.7 *9*		B	
3283.15 *10*	(1$^-$,2$^+$)	AB	Jπ: 1625.0γ to 0$^+$, 2322.38γ to 3$^-$.
3329.54 *12*	(2$^+$)	AB	Jπ: 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	Jπ: 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	Jπ: 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	Jπ: 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	Jπ: 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.

Adopted Levels, Gammas (continued)

γ(^{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+				

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Adopted Levels, Gammas (continued)

γ(^{146}Ce) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	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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Adopted Levels, Gammas (continued)

γ(^{146}Ce) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	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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Adopted Levels, Gammas (continued)

γ(^{146}Ce) (continued)

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

γ(^{146}Ce) (continued)

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

$^{146}_{58}Ce_{88}$-8

Adopted Levels, Gammas (continued)

γ(^{146}Ce) (continued)

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

$^{146}_{58}Ce_{88}$-9

Adopted Levels, Gammas (continued)

γ(^{146}Ce) (continued)

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

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Adopted Levels, Gammas (continued)

γ(^{146}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⁺	

$^{146}_{58}Ce_{88}$-11

Adopted Levels, Gammas (continued)

γ(^{146}Ce) (continued)

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

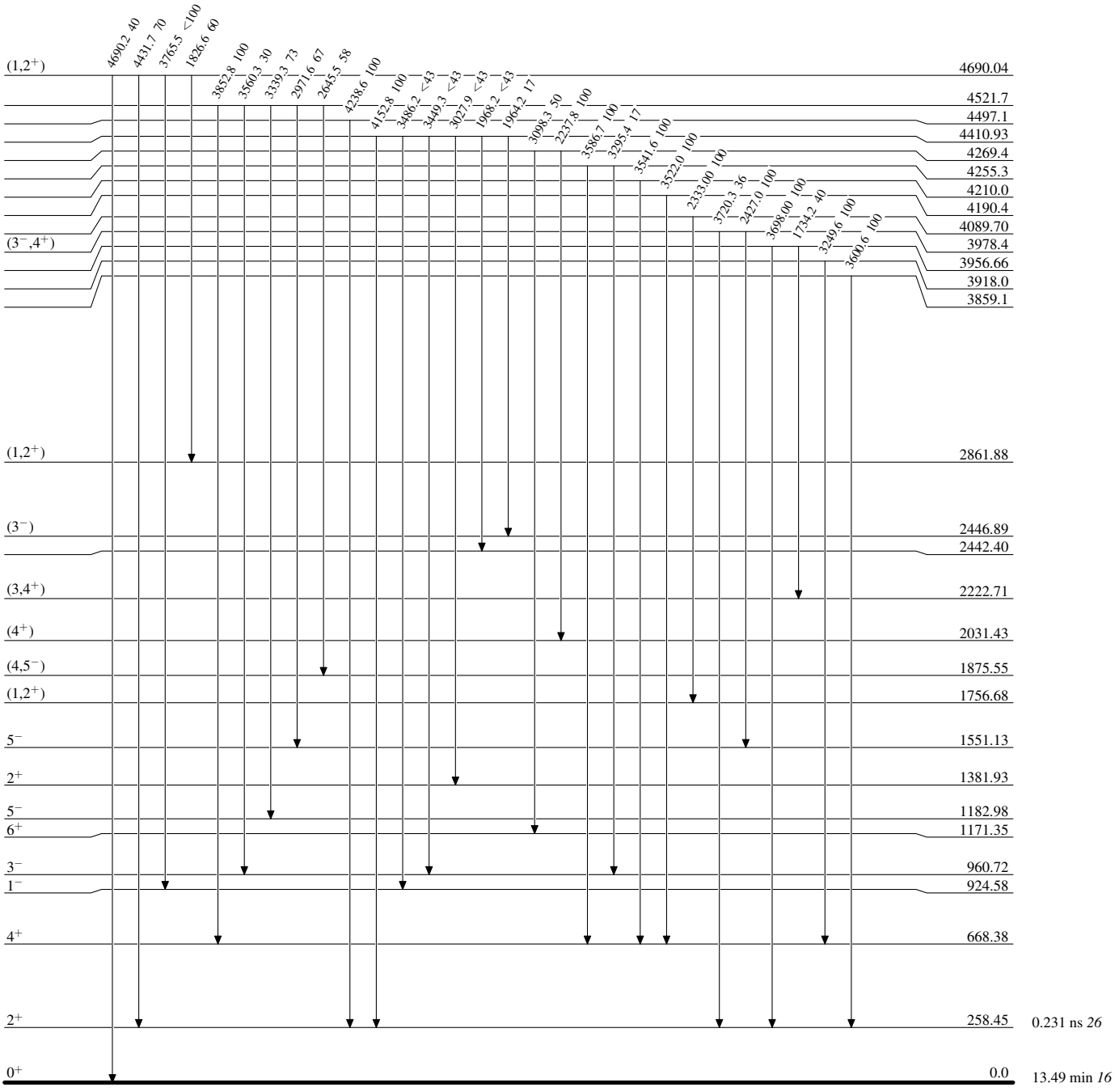
† From weighted average of Eγ's measured in ^{146}La β^- decays with $T_{1/2}$=6.1 s and 9.8 s, and ^{252}Cf SF decay, except as noted.
‡ From ^{146}La β^- decay (9.8 s), except as noted.
# From γγ(θ), α(exp), see 1981GoZN, 1982ShZV, 1983Wo03, 1993Sh10, 2000Ya08.
@ From γγ(θ) (2000Ya08).
& From ^{146}La 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



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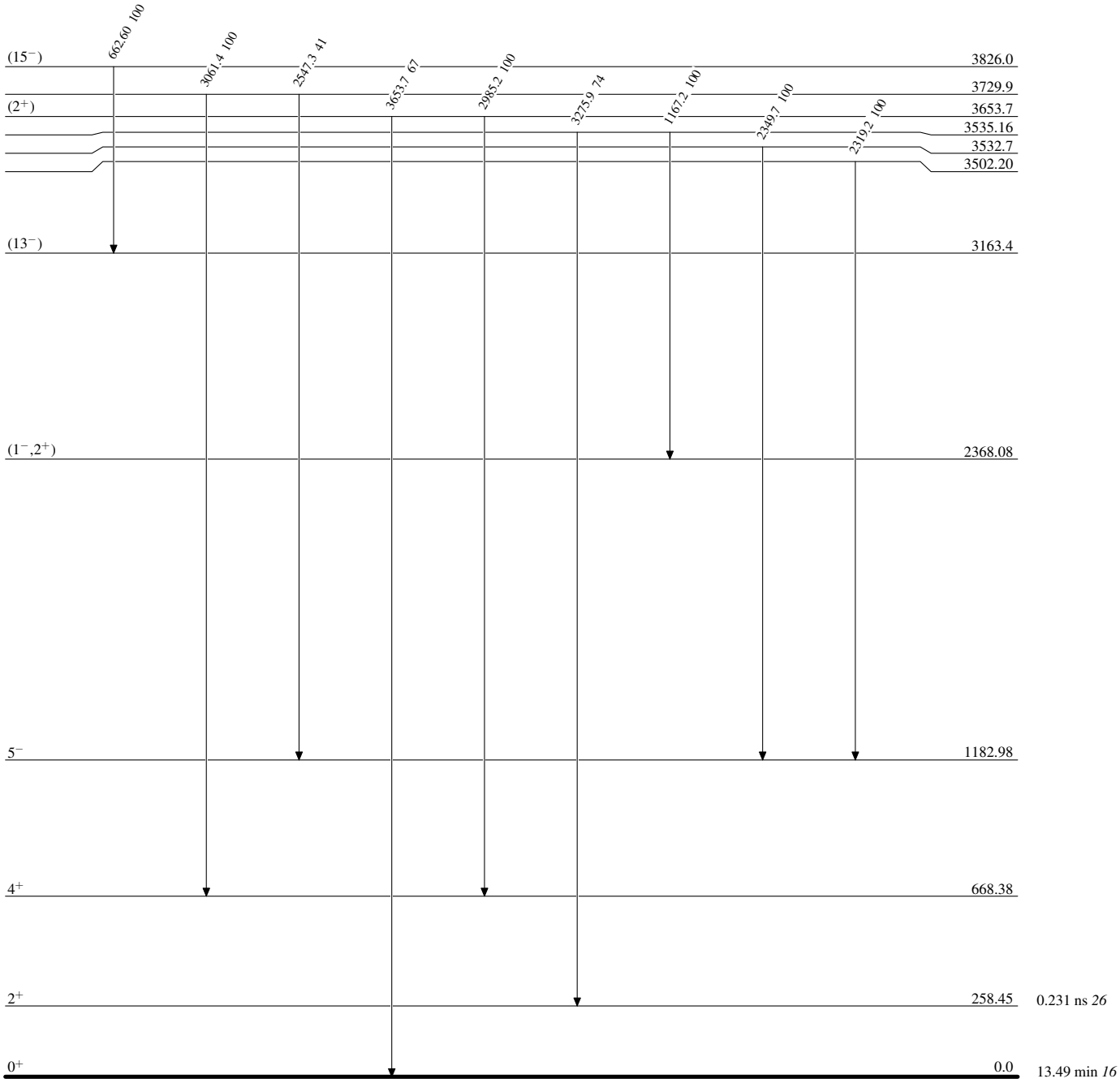
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

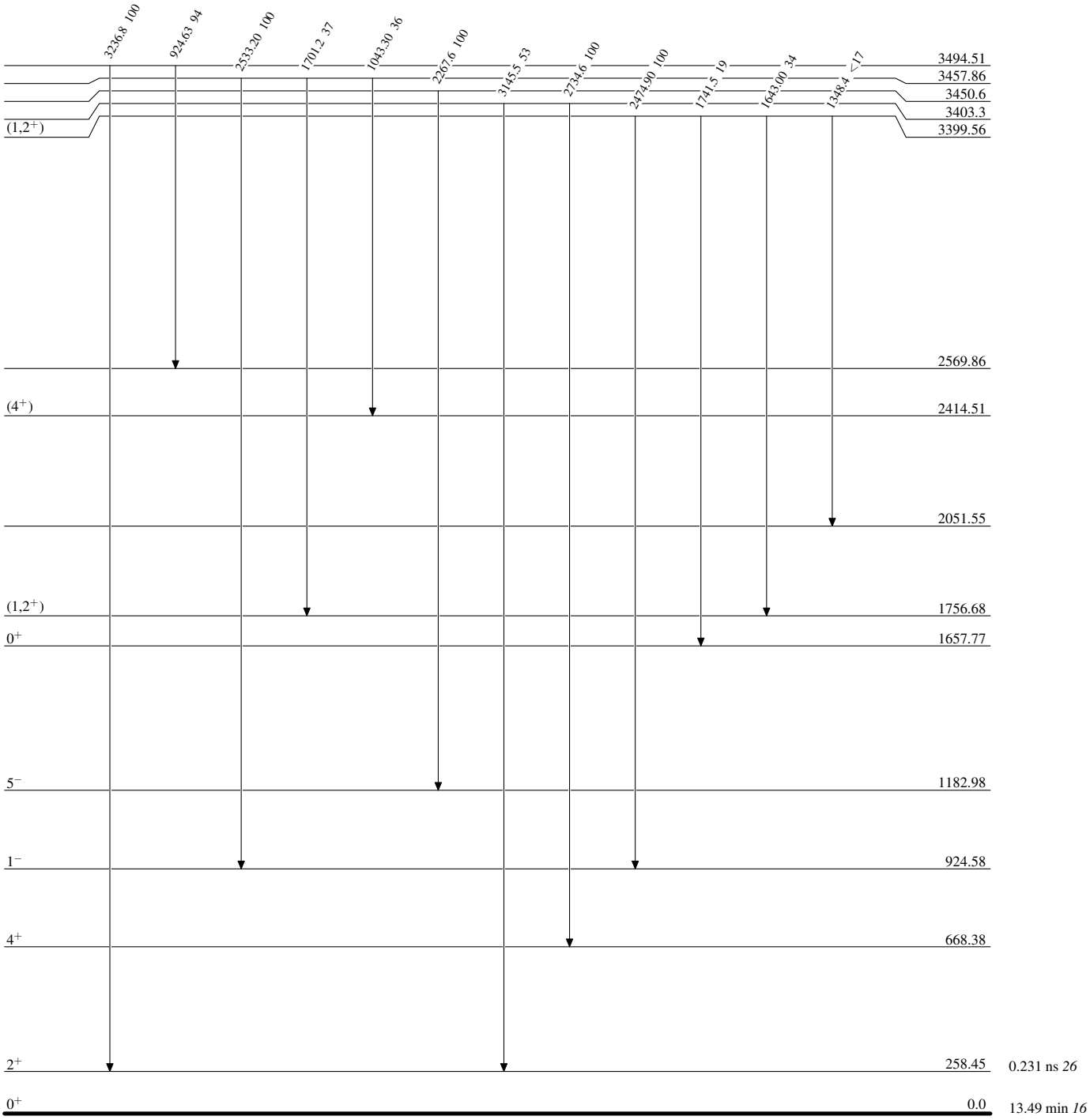


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



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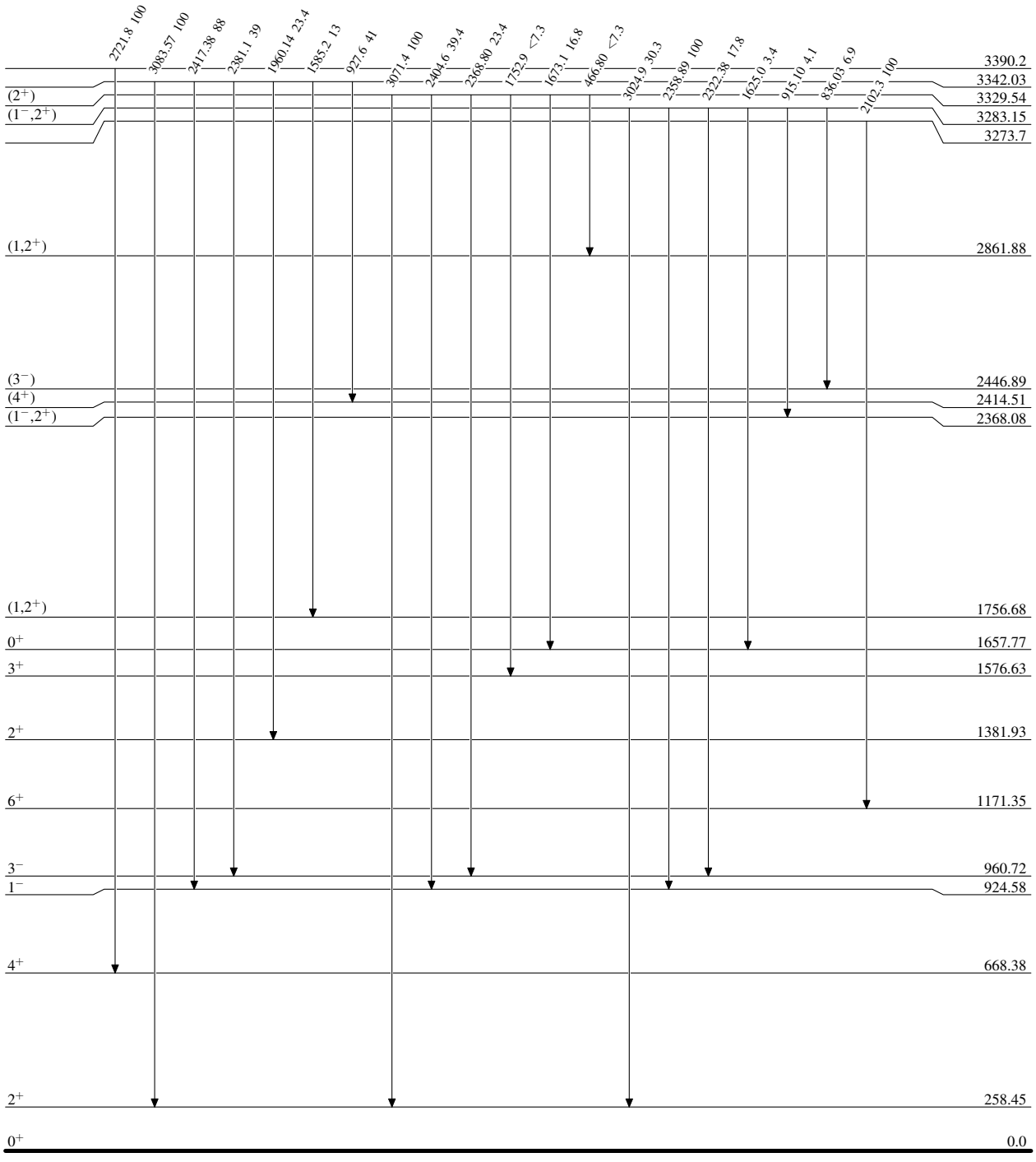
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

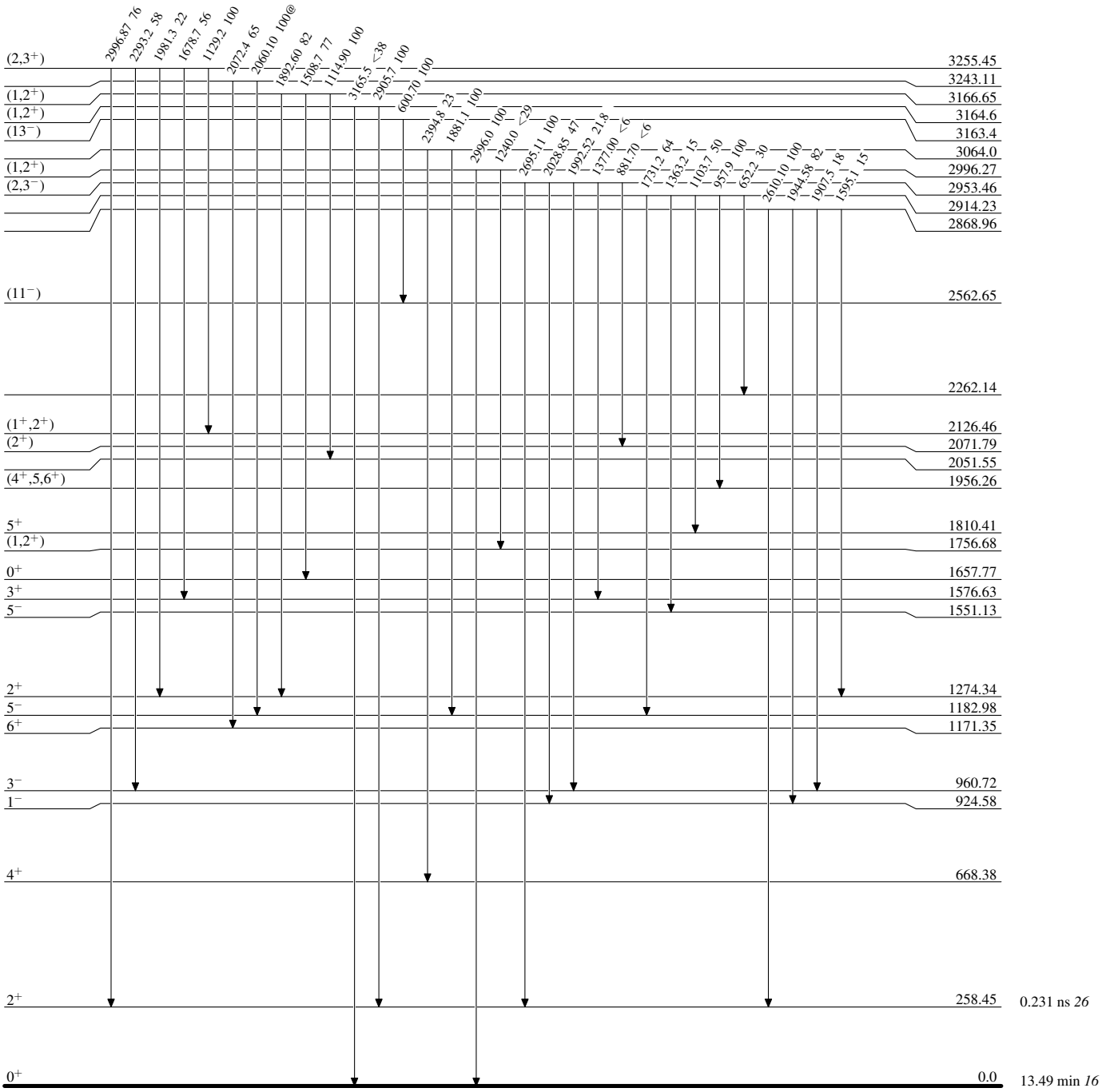


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

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

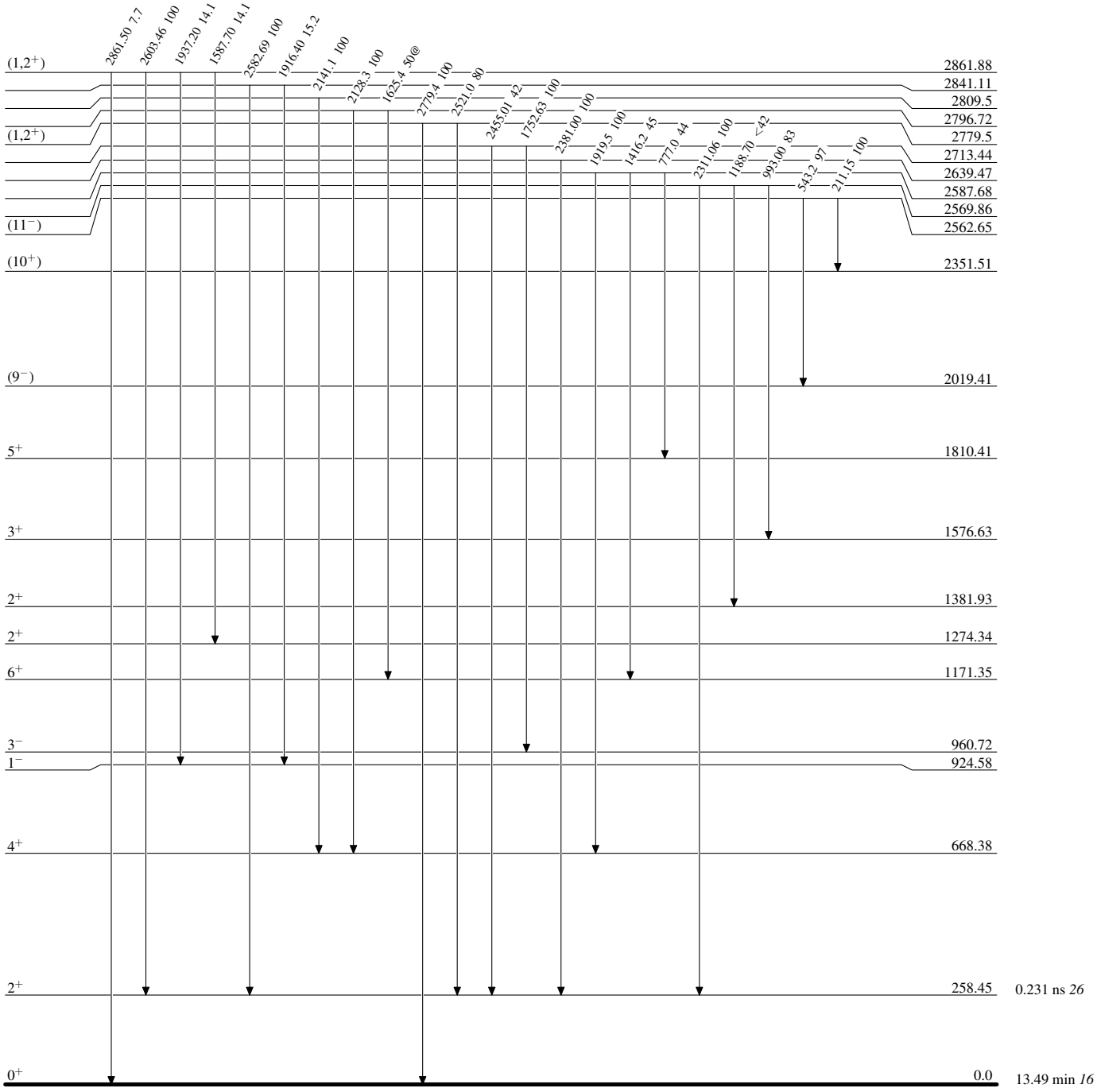


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

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

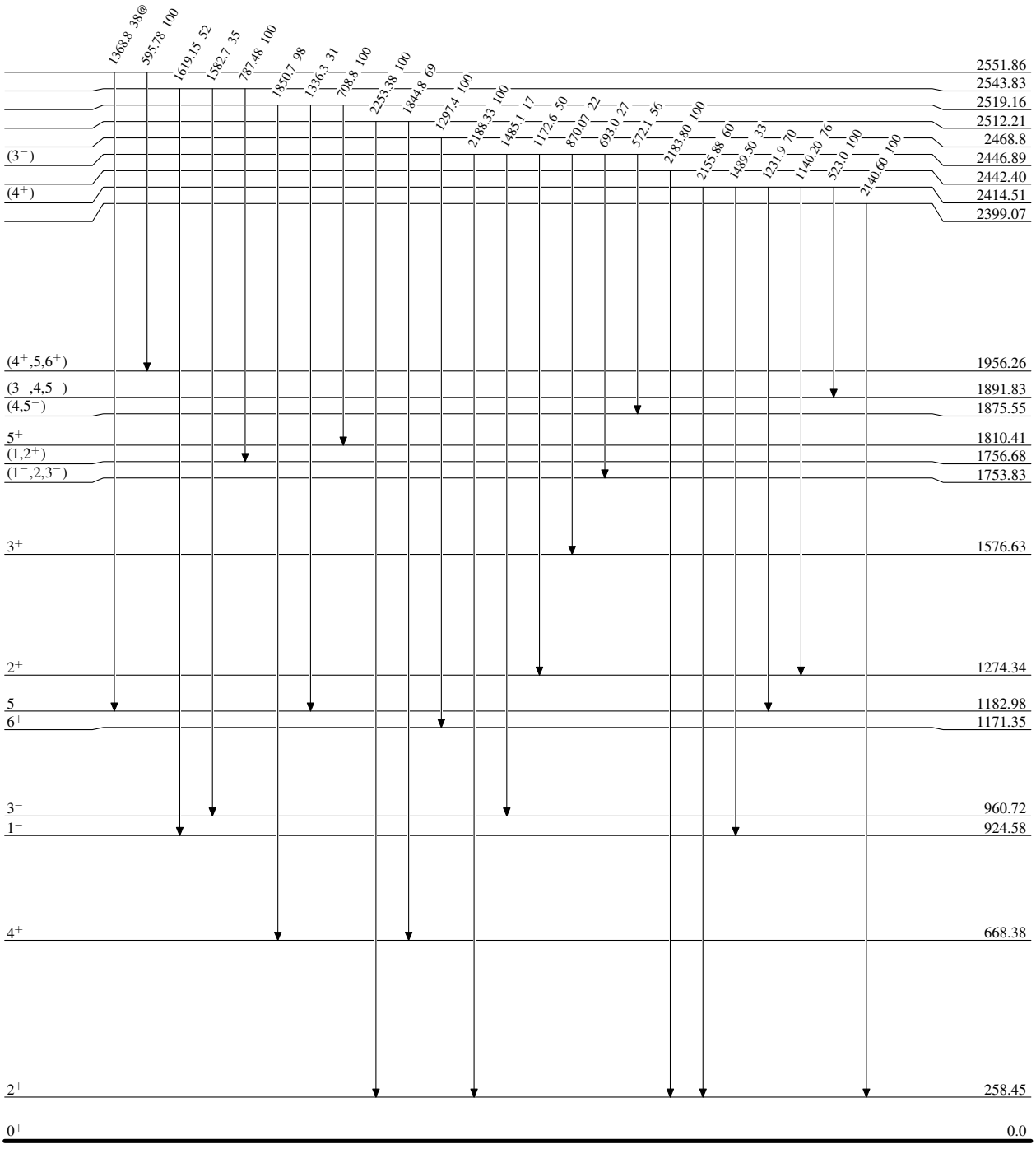


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

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

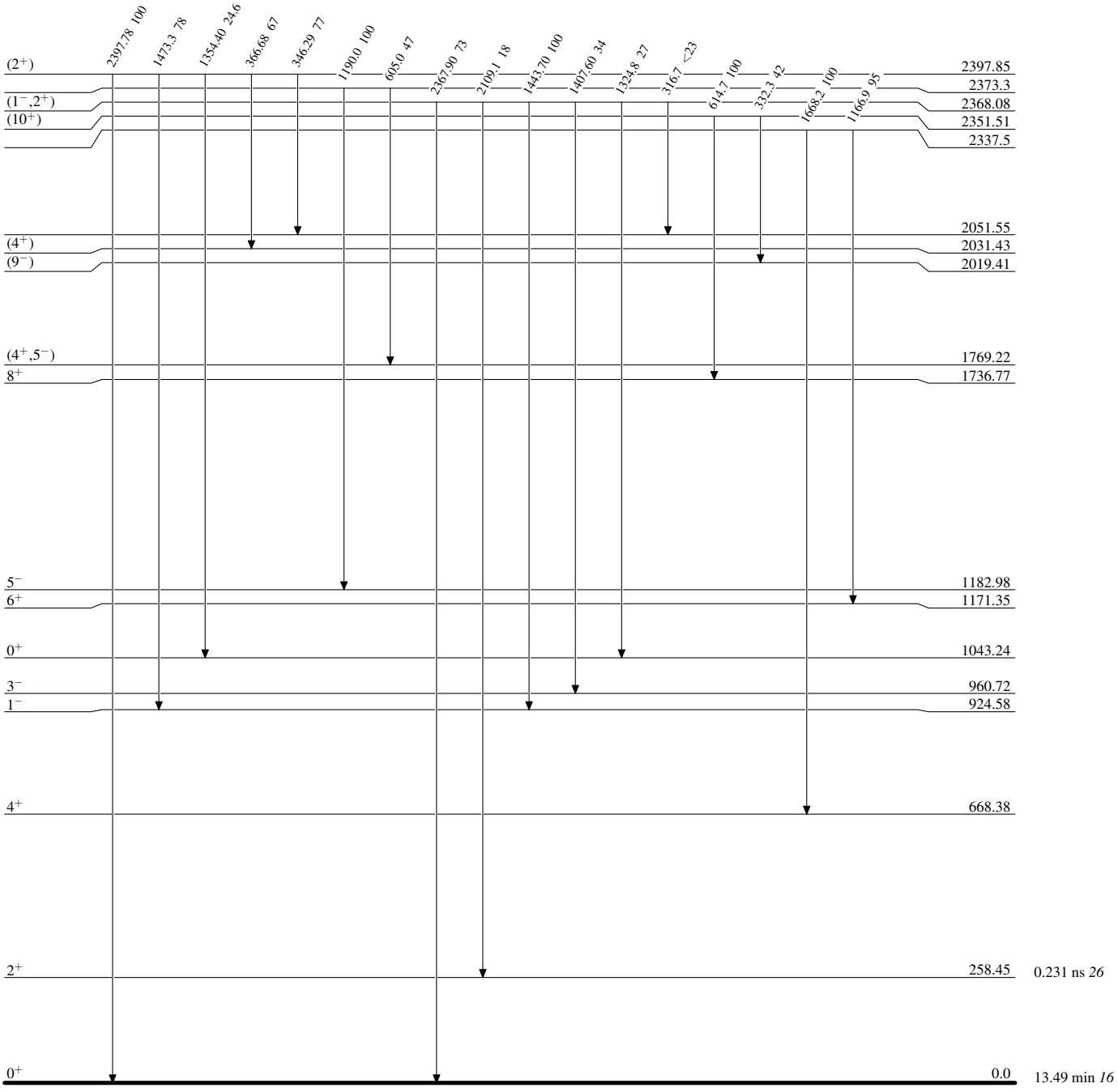


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

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

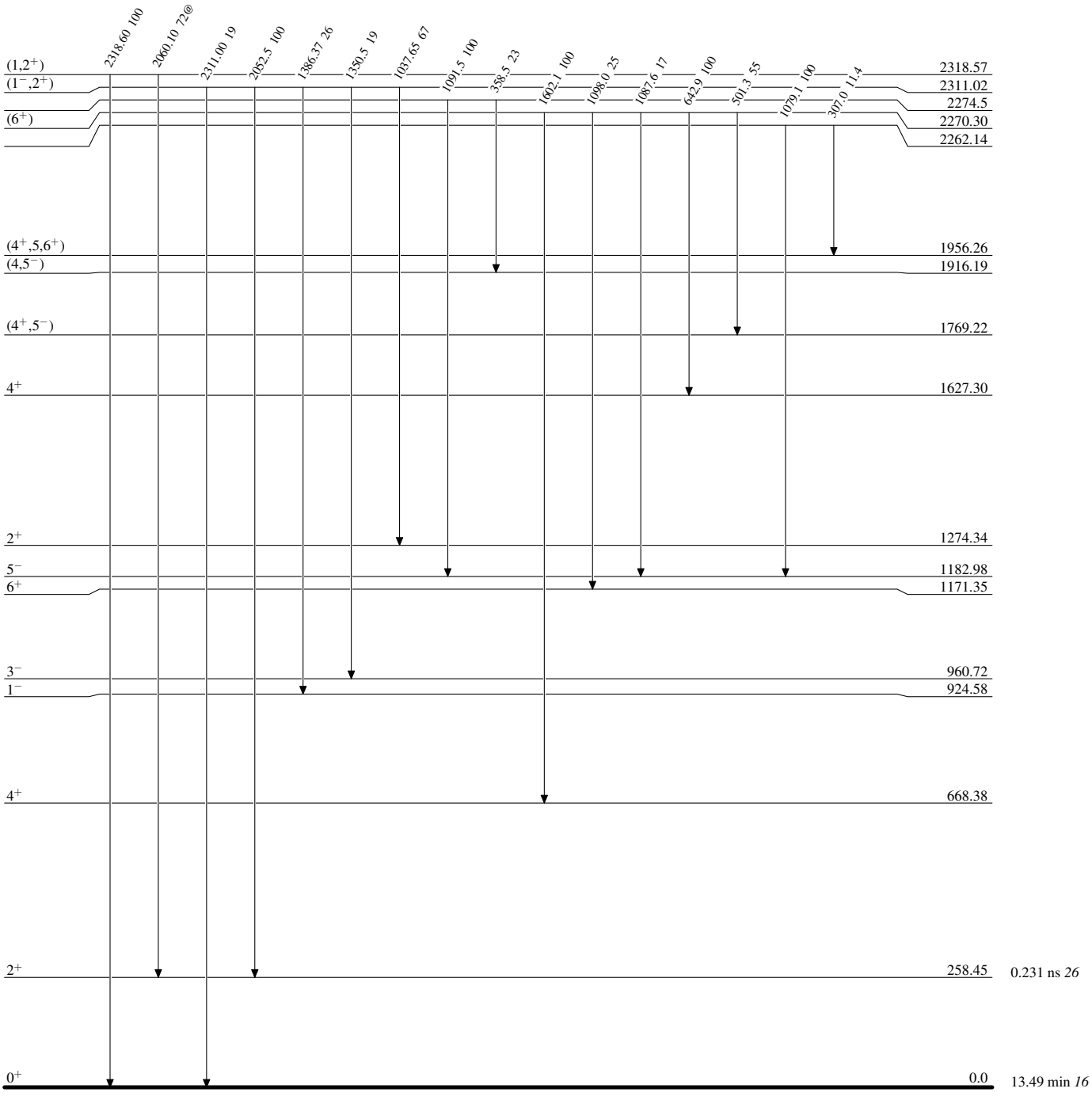


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

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

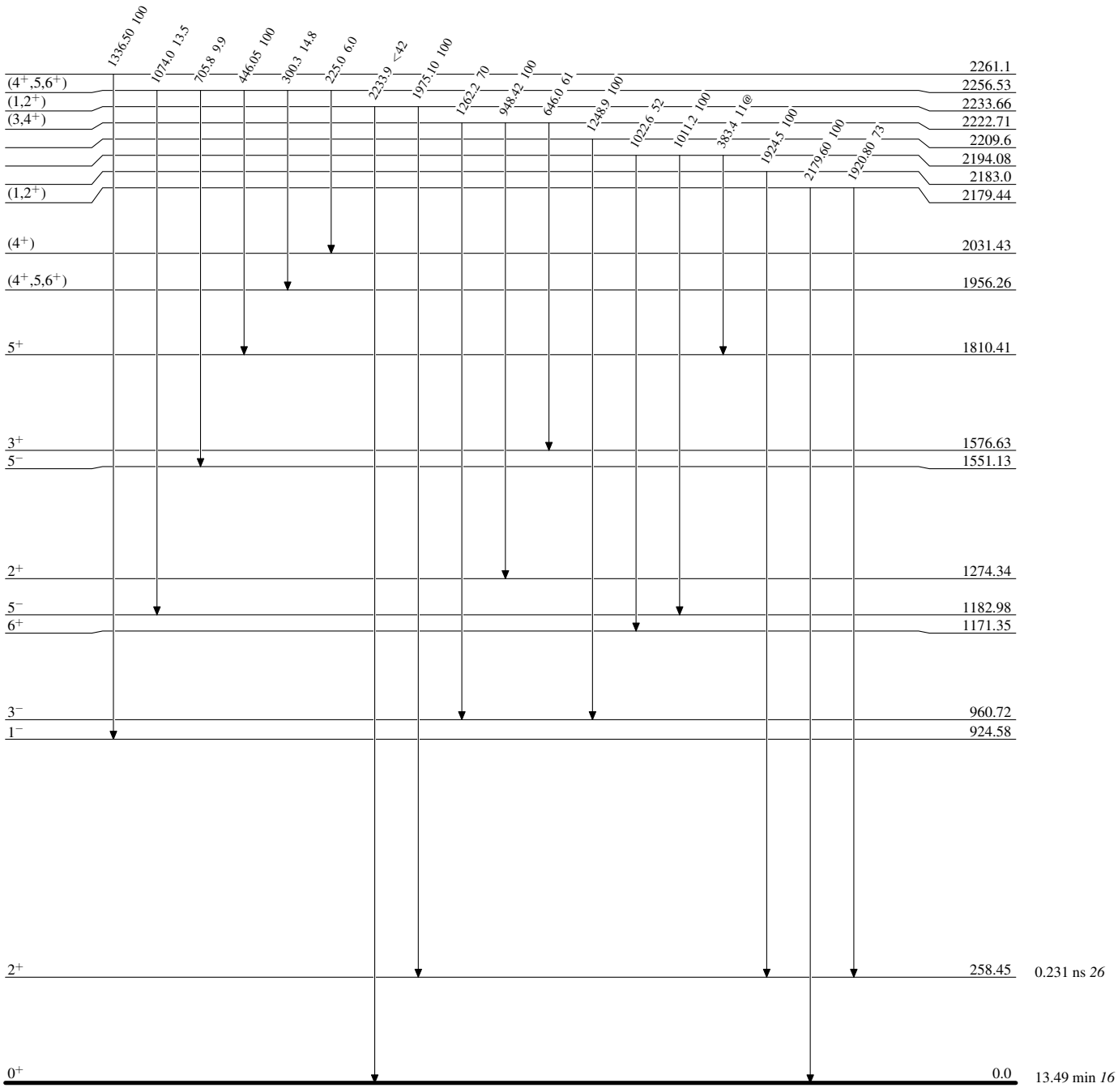


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

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

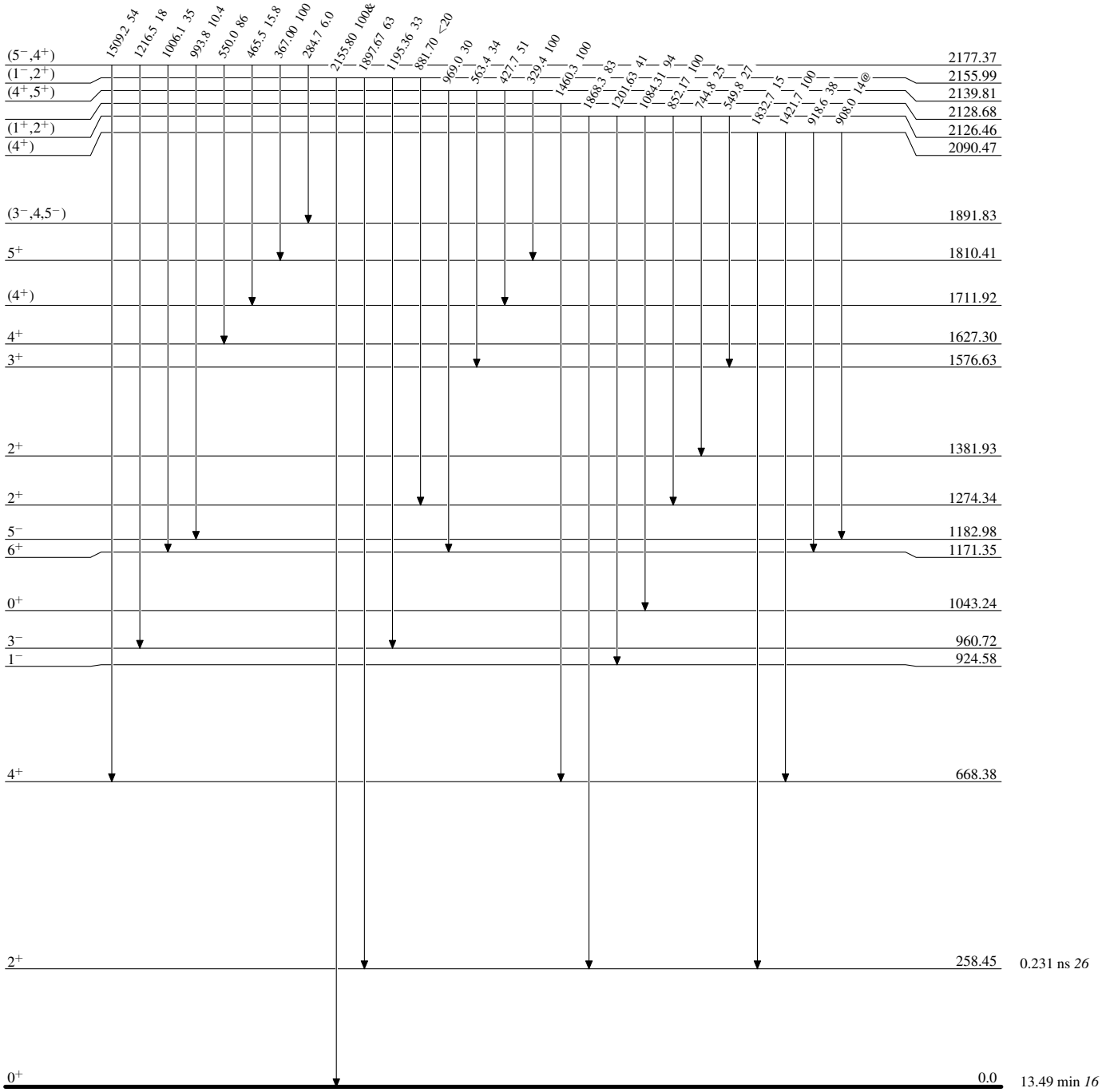


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

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

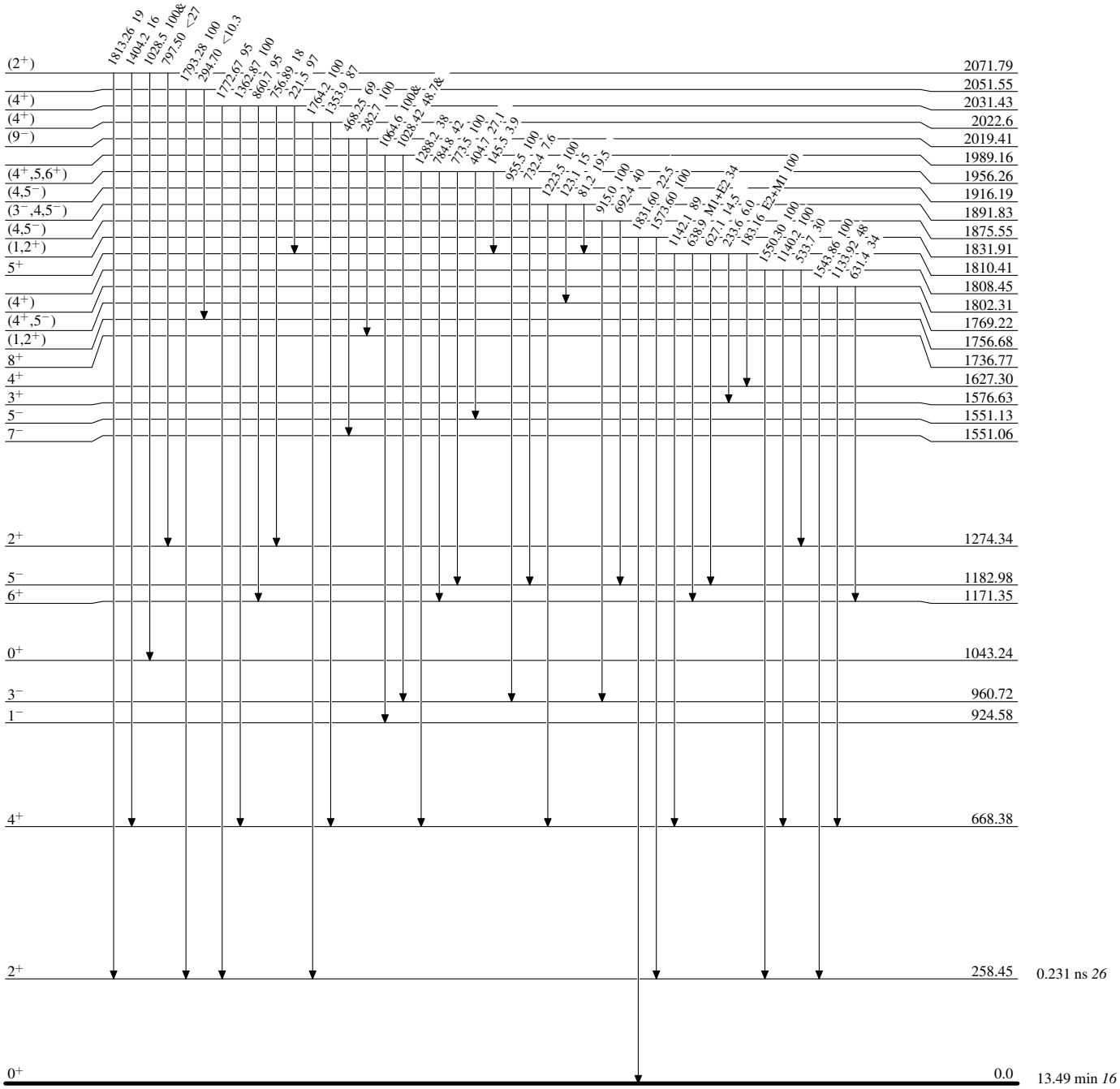


$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

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

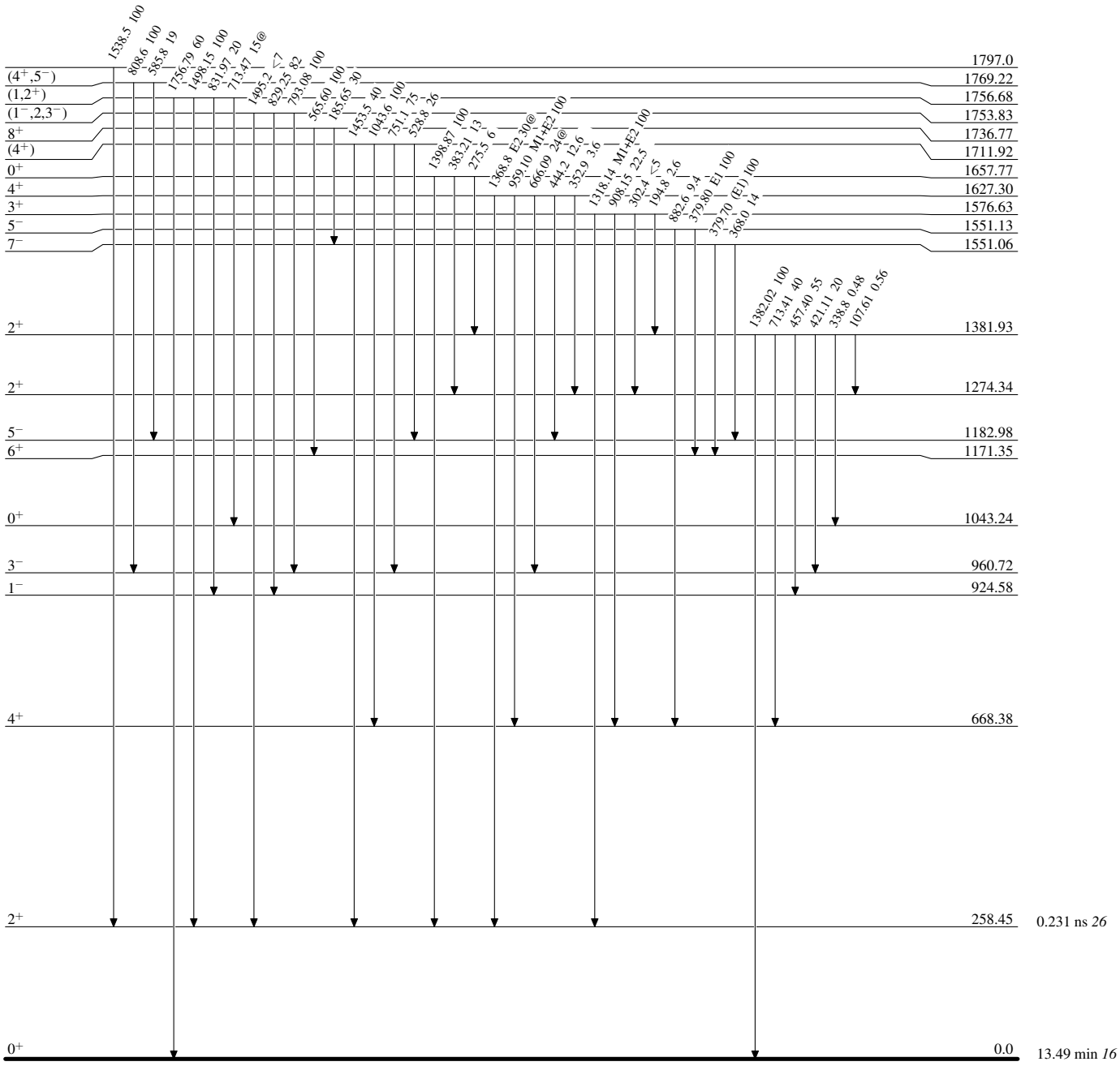


$^{146}_{58}Ce_{88}$

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
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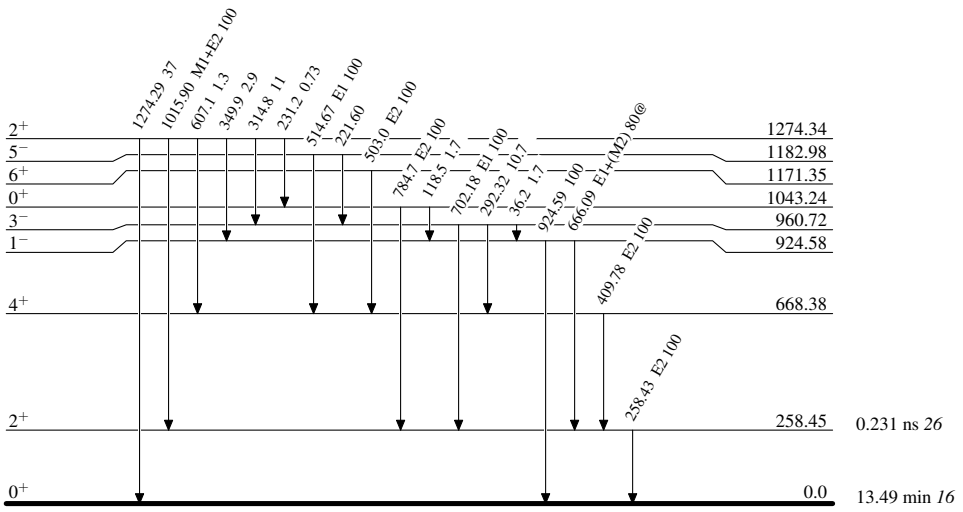

$^{146}_{58}Ce_{88}$

Adopted Levels, Gammas