Adopted Levels, Gammas

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

Q(β^-)=318.6 *9*; S(n)=6897 *4*; S(p)=9549 *8*; Q(α)=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, $\delta<r^2>$ =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$^\pi$‡	$T_{1/2}$	XREF	Comments
0.0#	0$^+$	284.91 d *5*	AB	%β^-=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$^\pi$: E2 γ to 0$^+$ g.s.
938.65# *6*	4$^+$		AB	J$^\pi$: E2 γ to 2$^+$, (541γ)(397γ)(θ) gives J=4.
1242.21@ *15*	(3$^-$)		AB	J$^\pi$: (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$^\pi$: decays to 0$^+$ g.s. Not fed in β^- from (3$^-$) parent.
1489.0 *3*	2$^{(+)}$		A	J$^\pi$: decays to 0$^+$ g.s., (1092γ)(397γ)(θ) consistent with 2(D,Q)2(Q)0.
1523.67@ *10*	(5$^-$)		AB	J$^\pi$: $\gamma\gamma(\theta)$ 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$^\pi$: from $\gamma\gamma(\theta)$ J=4, 1276γ to 2$^+$ 397 is Q.
1691.53 *22*	3$^{(+)}$		A	J$^\pi$: (1294γ)(397γ)(θ).
1819.0 *4*	2$^+$		A	J$^\pi$: γ to 0$^+$ g.s., (1421γ)(397γ)(θ) is consistent only with J=2.
1829.01 *19*	4$^+$		A	J$^\pi$: (1432γ)(397γ)(θ) is consistent with 4(Q)2(Q)0.
1864.5 *4*	1		A	J$^\pi$: (1467γ)(397γ)(θ) give J=1 with 1467γ as D,Q.
1890.92 *18*	5$^{(+)}$,3		A	J$^\pi$: $\gamma\gamma(\theta)$ give J=3,5.
1991.55 *22*	3,5		A	J$^\pi$: $\gamma\gamma(\theta)$ give J=3,5.
1994.34@ *19*	(7$^-$)		B	
2021.1 *4*	3$^{(+)}$		A	J$^\pi$: from $\gamma\gamma(\theta)$.
2028.7 *4*	1$^{(+)}$		A	J$^\pi$: γ to 0$^+$ g.s., (1631γ)(397γ)(θ) not consistent with J=2.
2040.7 *3*	3$^{(+)}$		A	J$^\pi$: from $\gamma\gamma(\theta)$.
2112.10 *19*	2$^+$,(1$^+$)		A	J$^\pi$: γ to 0$^+$ g.s., $\gamma\gamma(\theta)$.
2127.0 *3*	2$^+$,3$^{(+)}$,4		A	
2152.8 *4*	2$^+$		A	J$^\pi$: γ to 0$^+$ g.s., (1755γ)(397γ)(θ) not consistent with J=1.
2220.8 *4*	4$^{(-)}$		A	J$^\pi$: from $\gamma\gamma(\theta)$.
2339.8 *4*	2$^{(+)}$		A	J$^\pi$: from $\gamma\gamma(\theta)$.
2352.6 *4*	2$^+$		A	J$^\pi$: 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 γγ(θ).
2447.5 *10*		A	
2534.3 *3*	3(+)	A	Jπ: from γγ(θ).
2536.6 *6*	2,3(+),4	A	Jπ: from γγ(θ).
2623.2 *5*		A	
2636.74[@] *21*	(9−)	B	
2642.41 *21*	4(+),(2+)	A	Jπ: from γγ(θ).
2692.8 *5*	4(+),3	A	Jπ: from γγ(θ).
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 γγ(θ).
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 γγ(θ).
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 γγ(θ).
3197.18 *24*	4(+),(3+)	A	Jπ: from γγ(θ).
3209.3 *6*		A	
3238.85 *25*	4(−),(2)	A	Jπ: from γγ(θ).
3263.0 *5*	(2+,3,4+)	A	Jπ: from γγ(θ).
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 γγ(θ) results of 1982Mi01. High-spin from fission experiments.

[#] Band(A): Ground-state band.

[@] Band(B): Octupole band.

Adopted Levels, Gammas (continued)

γ(^{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)			

$^{144}_{58}Ce_{86}$-3

Adopted Levels, Gammas (continued)

γ(^{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.×10[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.×10[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

Adopted Levels, Gammas (continued)

γ(^{144}Ce) (continued)

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

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

Adopted Levels, Gammas (continued)

γ(^{144}Ce) (continued)

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

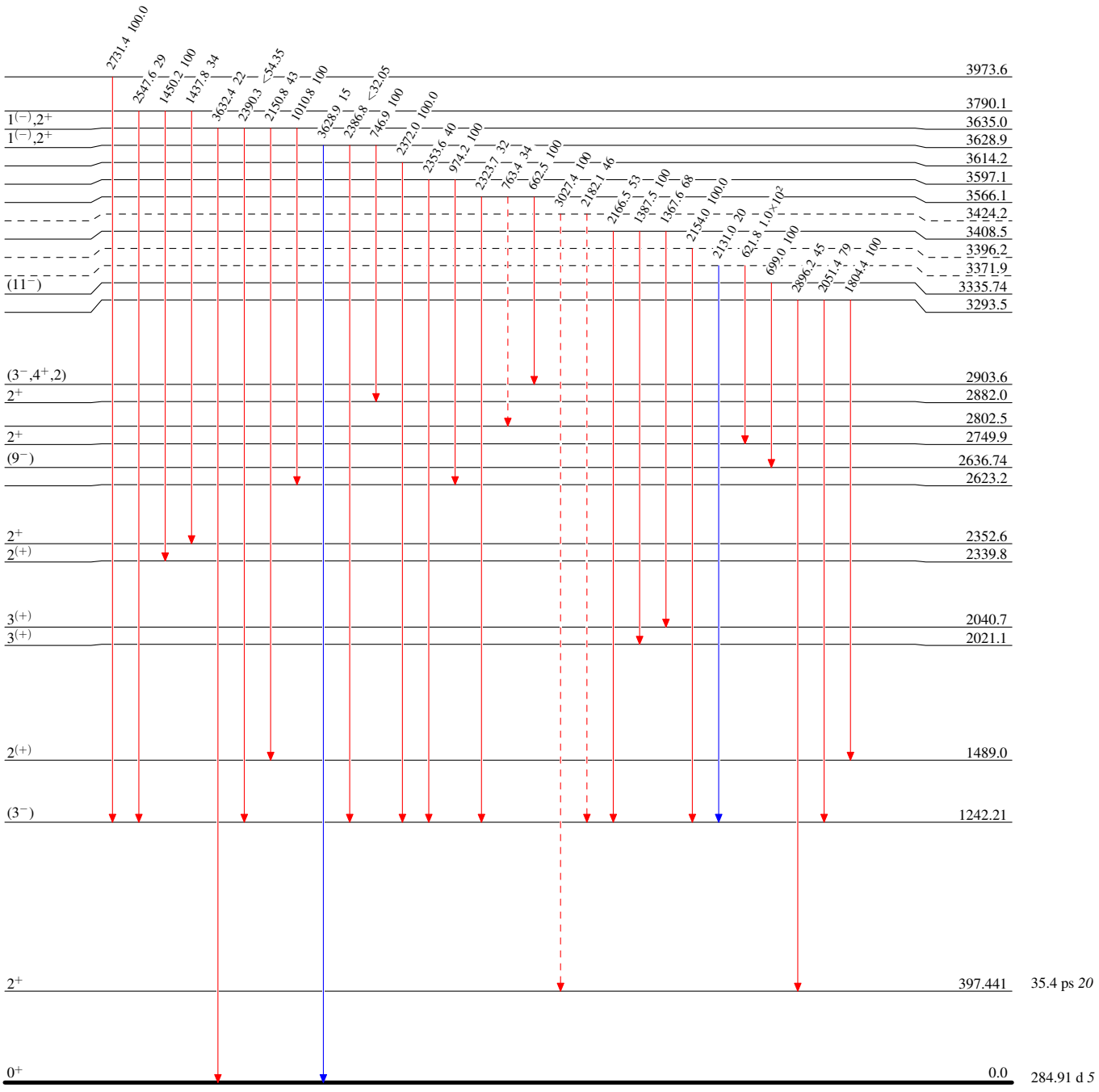
† From β-decay studies, except as noted.
‡ From 1995Zh34 in SF decay.
# Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
@ Placement of transition in the level scheme is uncertain.

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

Adopted Levels, Gammas

Level Scheme

Intensities: Type not specified

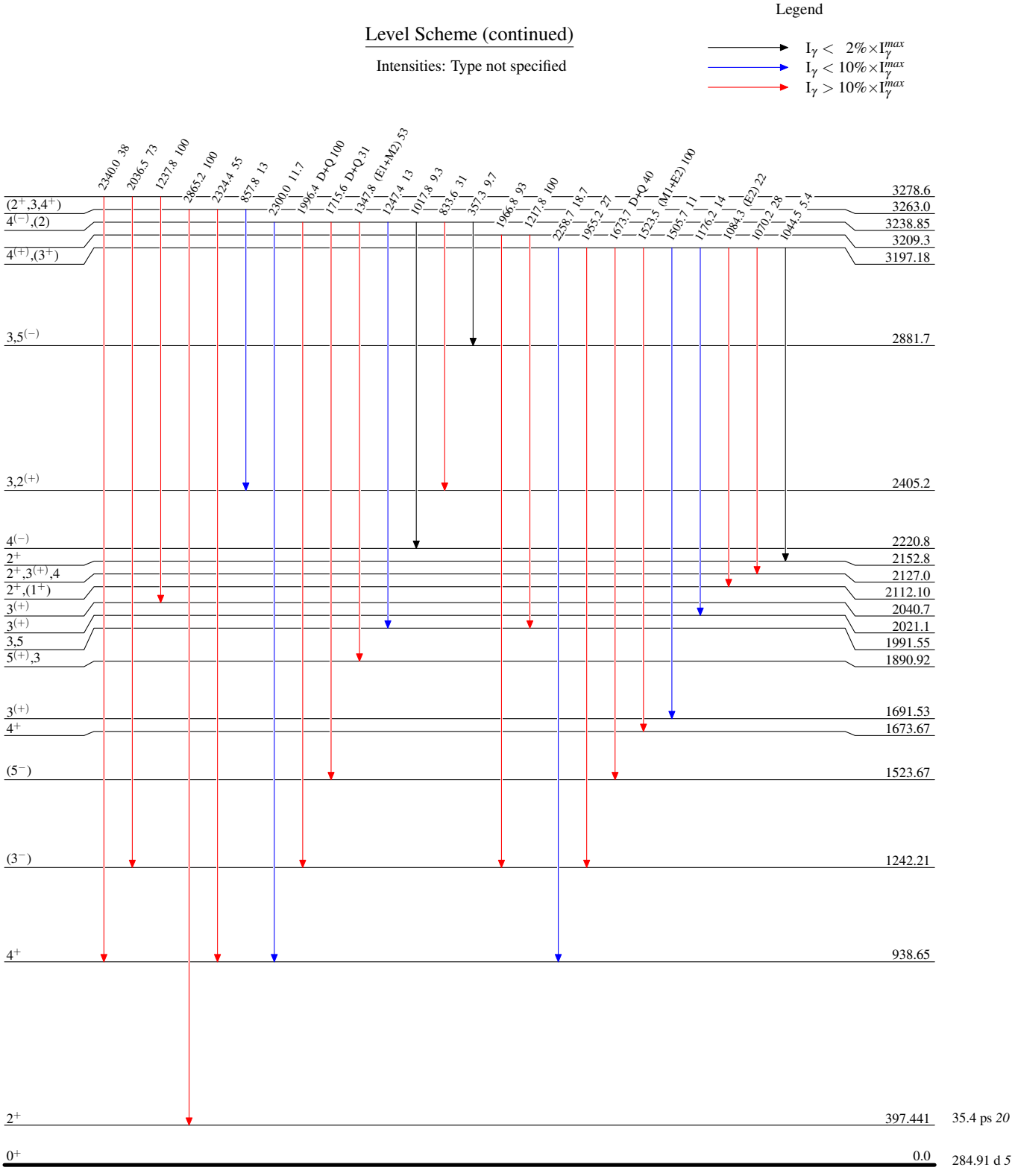


$^{144}_{58}Ce_{86}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

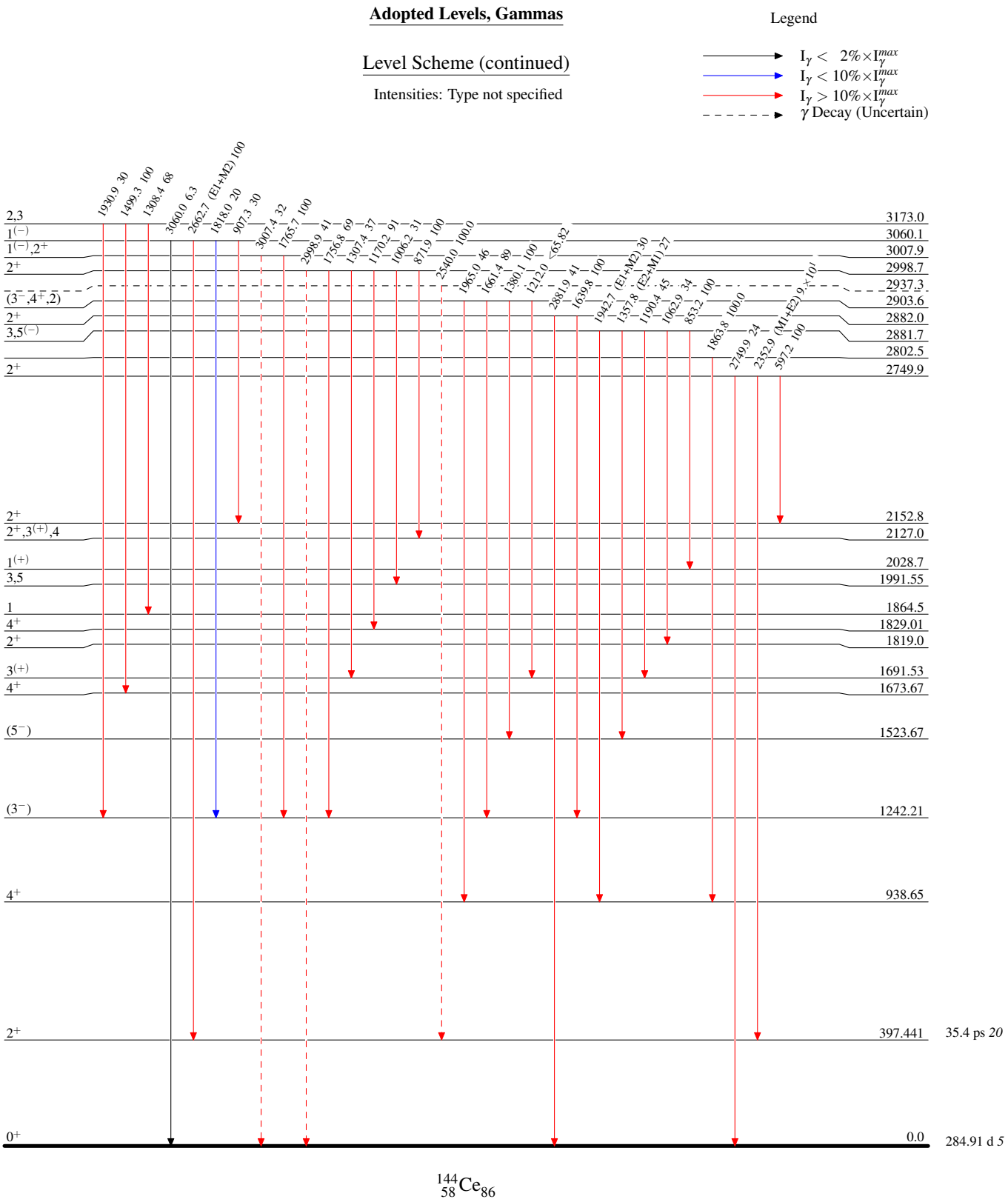


$^{144}_{58}Ce_{86}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

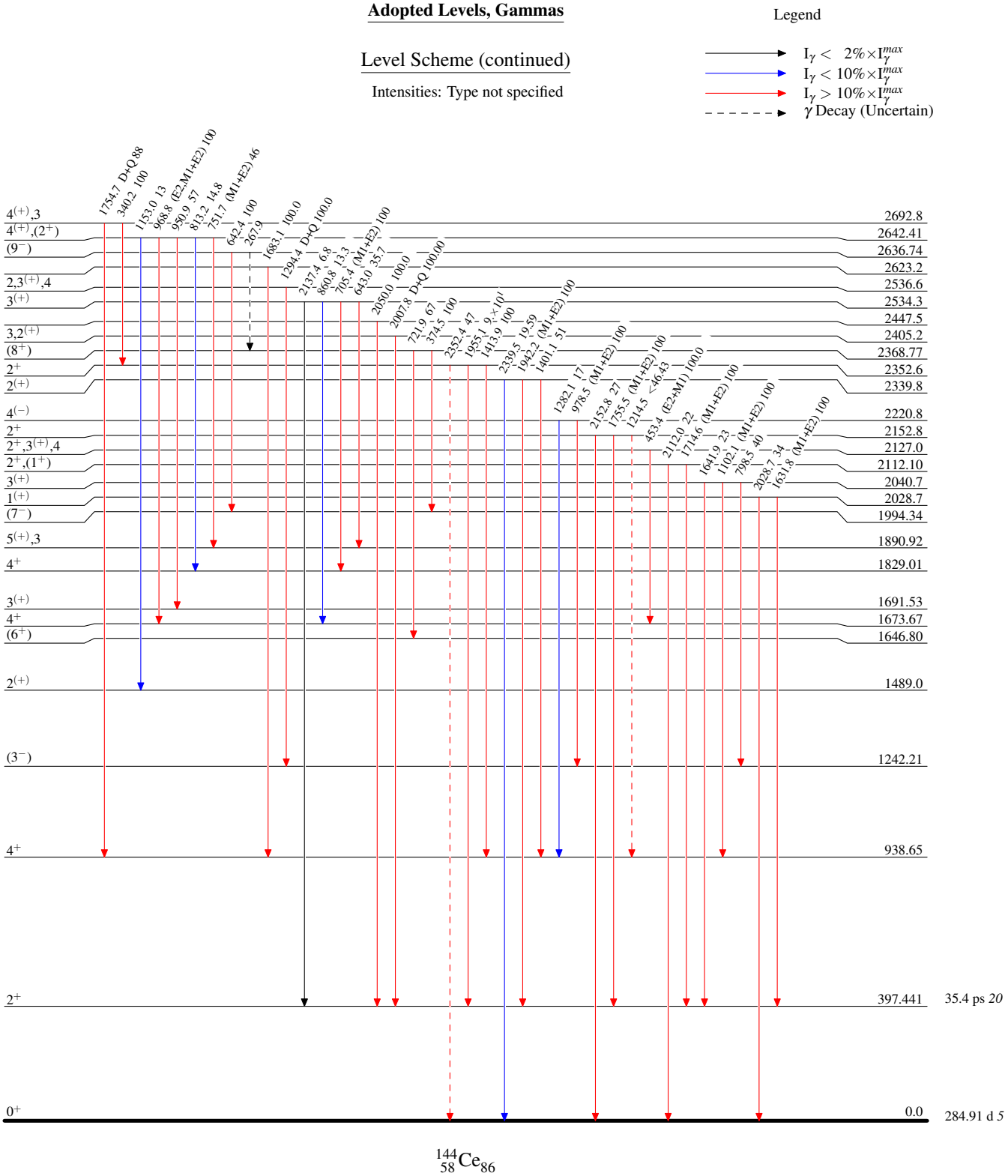


$^{144}_{58}Ce_{86}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

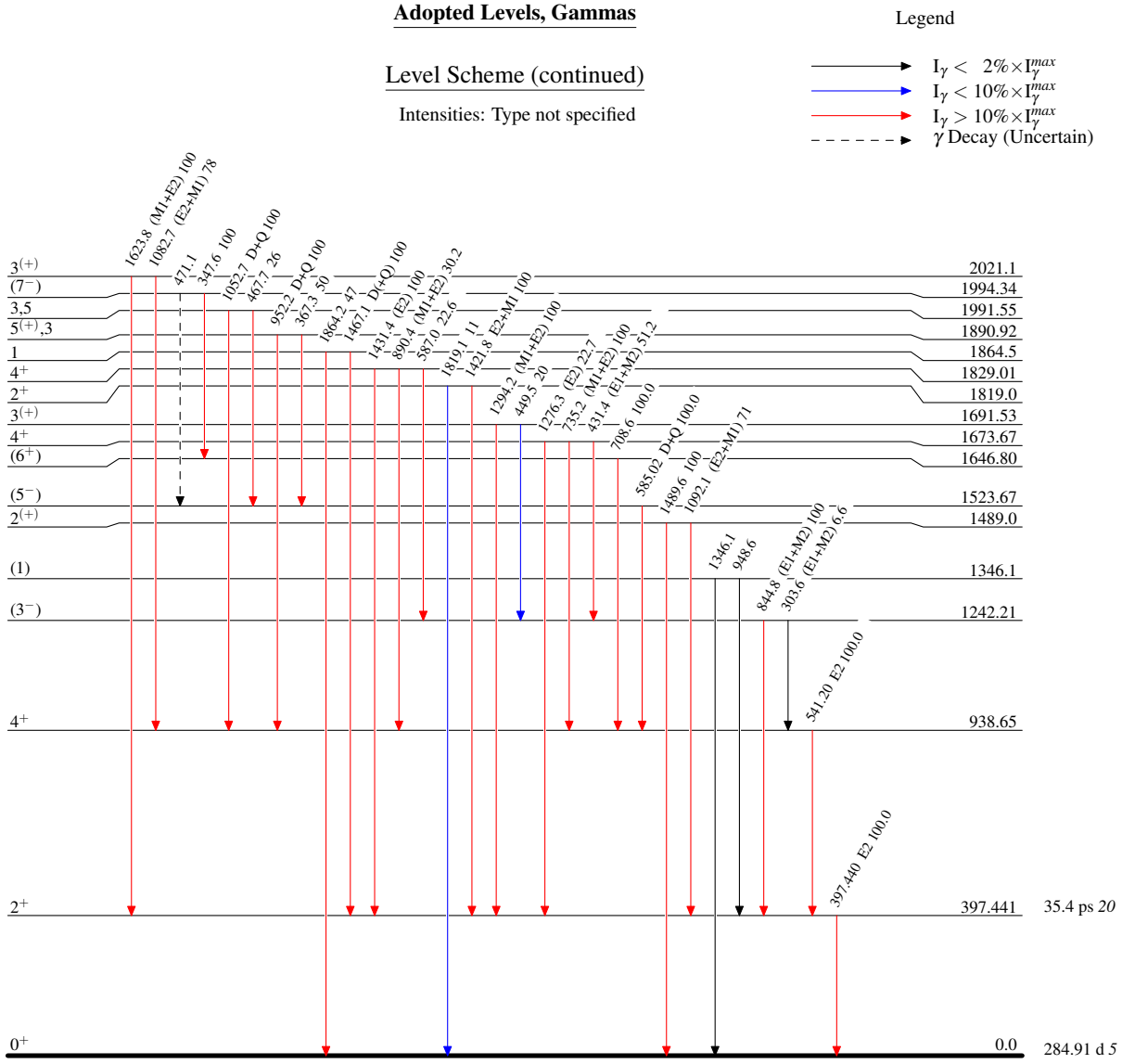


$^{144}_{58}Ce_{86}$

Adopted Levels, Gammas

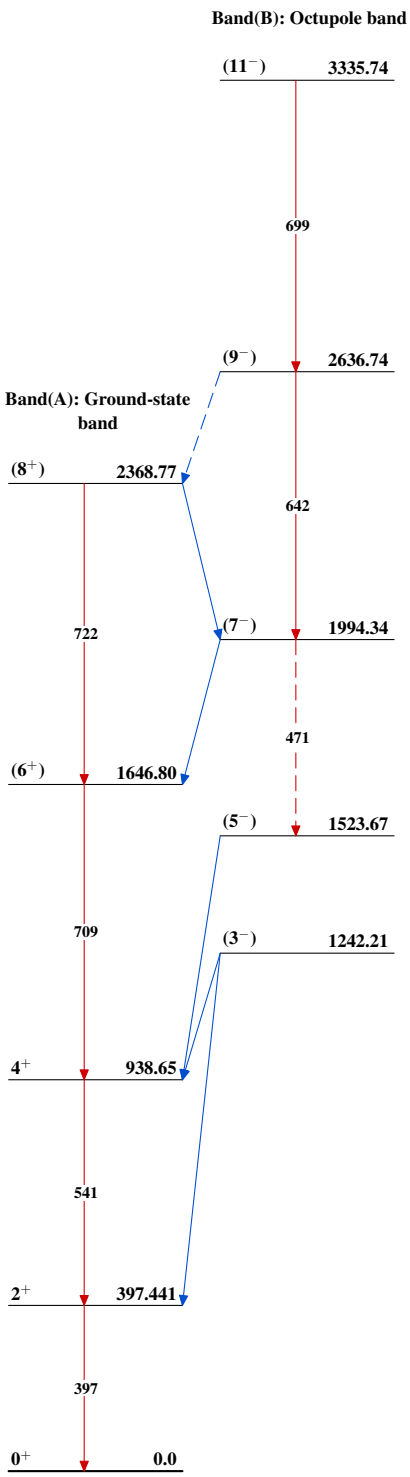
Level Scheme (continued)

Intensities: Type not specified



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

Adopted Levels, Gammas



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