Adopted Levels, Gammas

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

Q(β^-)=1047 *8*; S(n)=6427 *8*; S(p)=9857 *9*; Q(α)=735 *8* 2017Wa10
2002Xu06, 2002Tr09, 2002Ad12: measured production cross-sections.
1999GaZX: measured charge radii.

^{140}Ba Levels

Cross Reference (XREF) Flags

A	^{140}Cs β^- decay	F	^{138}Ba(^{14}C,^{12}C) E=64 MeV
B	^{248}Cm SF decay	G	^{208}Pb(^{18}O,Xγ)
C	^{252}Cf SF decay	H	^{235}U(n,Fγ)
D	^{138}Ba(t,p) E=17 MeV	I	Coulomb excitation
E	^{12}C(^{136}Xe,^{140}Baγ)		

E(level)[†‡]	J$^\pi$[#]	$T_{1/2}$	XREF	Comments
0.0[b]	0$^+$	12.751 d *4*	ABCDEFGHI	%β^-=100 $T_{1/2}$: weighted average of 12.753 d *12* (2014Un01, superseding 12.7527 d 23 of 2002Un02 and 12.753 d *2* of (1982HoZJ)), and 12.751 d *4* (1983Wa26); other value (outlier not included in the average): 12.789 d *6* (1971Ba28).
602.37[b] *3*	2$^+$	7.2 ps *+15−6*	ABCDEFGHI	Q=−0.52 *34* (2012Ba40) B(E2)↑=0.484 *+38−101* (2012Ba40) $T_{1/2}$: from DSAM (2012Ba40), systematic uncertainty is included. Others: 9.7 *41* ps from ^{140}Cs β^- decay (1989Ma38); 7.3 *+19−5* ps (from B(E2)↑ in Coul. Ex., 2012Ba40). J$^\pi$: L=2 in (^{14}C,^{12}C). Q: from reorientation analysis of Coul. ex. yields. Diagonal E2 matrix element=−0.69 *45* (2012Ba40) from Coul. ex. yields. RMS charge radius <r^2>$^{1/2}$=4.8684 fm *59* (2013An02).
1130.60[b] *6*	4$^+$		ABCDEFGH	J$^\pi$: L=4 in (^{14}C,^{12}C).
1510.68 *6*	2$^+$[@]		A DEF	
1660.3[b] *3*	6$^+$		BC E GH	J$^\pi$: 2,6 from ΔJ=2 Q to 4$^+$; member of g.s. band.
1802.90[c] *7*	3$^-$[@]		ABCDEF	J$^\pi$: observed in (t,p) with significant σ (natural spin-parity level).
1823.80 *9*	0$^+$[@]		A D	
1951.61 *25*	3$^+$		A DE	J$^\pi$: γ to 4$^+$ is M1+E2, γ from 2$^-$.
1993.66 *9*	2$^+$[@]		A DE	J$^\pi$: γ to 2$^+$ is M1+E2, and γ to 0$^+$;
2061.2			A	
2138.24 *11*	3$^{(+)}$[@]		A E	J$^\pi$: γ to 2$^+$ is D+Q and γ to 4$^+$ is (M1+E2).
2152.1[c] *4*	(5$^-$)[&]		BC G	
2204.21 *10*	2$^+$,3[@]		A E	
2237.24 *7*	2$^+$[@]		A E	
2309.52 *14*	2$^+$,1[@]		A	J$^\pi$: 1, 2, 3 from D+Q to 2$^+$; significant branch to 0$^+$ g.s. eliminates 2$^-$ and 3. If 1, the quadrupole mixing of 8.5% allows no π assignment; for 2$^+$ the E2 is only 4%.
2320.51 *15*	(3$^-$)		A	J$^\pi$: (2$^+$,3$^-$) from γ's from 1$^-$ and 4$^+$; 2$^+$ less likely from no β- feeding from 1$^-$ parent.
2429.52 *8*	1,2$^+$[@]		A	J$^\pi$: 1,2,3 from D+Q γ to 2$^+$; decay modes and log *ft* suggests 1 or 2$^+$.
2468.3[b] *4*	(8$^+$)		BC E G	J$^\pi$: syst. for N=84 even-even nuclei.

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Adopted Levels, Gammas (continued)

^{140}Ba Levels (continued)

E(level)[†‡]	Jπ[#]	XREF	Comments
2521.81 *10*	1,2$^{(+)}$	A	Jπ: (1,2$^+$) from γ′s to 0$^+$, 2$^+$, and 2$^-$; 0,1,2 from log *ft*=7.2 via 1$^-$ parent.
2620.3?		E	
2663.8 *3*		A	
2692.0 *4*	2	A	Jπ: (2,3$^-$) from γ from 1$^-$ and γ′s to 3$^+$ and 3$^-$; 0,1,2,3$^+$ from log *ft*=8.4 via 1$^-$ parent.
2704.04 *9*	1$^-$[@]	A	Jπ: E1+M2 γ to 2$^+$ and γ to 0$^+$.
2722.9[c] *4*	(7$^-$)[&]	BC G	
2782.08 *21*	2$^{(+)}$,3$^+$	A	Jπ: (2$^+$,3) from γ′s to 2$^+$, 4$^+$ and from 2$^-$; 0,1,2,3$^+$ from log *ft*=8.4 from 1$^-$ parent.
2787.55 *17*	1$^{(-)}$,2$^{(+)}$	A	Jπ: (1$^-$,2$^+$) from γ′s to 0$^+$ and 3$^-$; 0,1,2,3$^+$ from log *ft*=8.1 via 1$^-$ parent.
2800.3 *10*		G	Jπ: (8$^+$) postulated by 2007Ve14 (^{208}Pb(^{18}O,xγ) dataset).
2870.80 *19*	2$^+$[@]	A	Jπ: M1+E2 γ to 2$^+$.
2873.84 *17*	1$^{(+)}$,2$^{(+)}$	A	Jπ: (1$^+$,2$^+$) from γ′s to 0$^+$, 2$^+$, and 2$^-$; 0,1,2,3$^+$ from log *ft*=8.1 via 1$^-$ parent.
2932.63 *7*	2$^-$[@]	A	
2973.63 *20*		A	
3098.47 *14*	1$^{(+)}$,2$^{(+)}$	A	Jπ: (1$^+$,2$^+$) from γ′s to 0$^+$ and 3$^+$; 0,1,2,3$^+$ from log *ft*=8.0 via 1$^-$ parent.
3296.8[c] *5*	(9$^-$)[&]	BC G	
3383.8[b] *6*	(10$^+$)[&]	BC G	
3451.48 *10*	1$^{(-)}$,2$^{(+)}$	A	Jπ: (1$^-$,2$^+$) from γ′s to 0$^+$, 2$^+$ and 3$^-$; 0,1,2 from log *ft*=7.2 via 1$^-$ parent.
3520.6 *5*	1$^{(+)}$,2	A	Jπ: (1$^+$,2) from γ′s to 2$^+$, 2$^-$ and 3$^+$; 0,1,2 from log *ft*=7.1 via 1$^-$ parent.
3526.6 *4*	(1$^+$,2$^+$)[@]	A	
3601.7 *5*	1$^{(-)}$,2$^{(+)}$	A	Jπ: (1$^-$,2$^+$) from γ′s to 0$^+$ and 3$^-$; 0,1,2 from log *ft*=7.1 via 1$^-$ parent.
3656.08 *10*	2	A	Jπ: (2,3$^-$) from γ′s to 1$^-$, 3$^+$ and 3$^-$; 0,1,2 from log *ft*=6.3 via 1$^-$ parent.
3769.5[c] *6*	(11$^-$)[&]	BC G	
3845.3 *6*		A	
3851.05 *9*	1[@]	A	
3943.79 *6*	1[@]	A	
3973.20 *10*	2	A	Jπ: (2,3) from γ′s to 1, 3$^+$ and 3$^-$; 0,1,2 from log *ft*=6.3 via 1$^-$ parent.
4032.56? *25*	1,2	A	Jπ: (1,2) from γ′s to 2$^+$,2$^-$ and from 1$^-$; 0,1,2 from log *ft*=7.3 via 1$^-$ parent.
4037.25 *15*	2	A	Jπ: (2,3$^+$) from γ′s to 1$^+$, 2$^+$, 3$^+$, 3$^-$ and from 2$^-$; 0,1,2 from log *ft*=6.6 via 1$^-$ parent.
4079.96 *13*	1$^{(-)}$,2	A	Jπ: (1$^-$,2,3$^+$) from γ′s to 1$^+$, 2$^+$, 3$^-$ respectively; 0,1,2 from log *ft*=6.5 via 1$^-$ parent.
4102.8[b] *8*	(12$^+$)[&]	C	
4275.13 *24*	1,2	A	Jπ: (1,2,3) from γ′s to 2$^+$ and 2$^-$; 0,1,2 from log *ft*=6.8 via 1$^-$ parent.
4358.44 *17*	2[@]	A	
4388.06 *21*	1$^{(-)}$,2	A	Jπ: (1$^-$,2,3$^+$) from γ′s to 1$^+$ and 3$^-$; 0,1,2 from log *ft*=6.9 via 1$^-$ parent.
4395.7 *4*		A	
4416.1 *3*	1,2$^{(+)}$	A	Jπ: (1,2$^+$) from γ′s to 0$^+$, 2$^+$, and 2$^-$; 0,1,2 from log *ft*=6.9 via 1$^-$ parent.
4499.81 *11*	1$^{(+)}$,2$^{(+)}$	A	Jπ: (1$^+$,2$^+$) from γ′s to 0$^+$ and 3$^+$ respectively; 0,1,2 from log *ft*=6.6 via 1$^-$ parent.
4531.2[d] *8*	(13$^-$)[a]	C G	Level placed in ^{252}Cf SF decay dataset in the octupole band was replaced in ^{208}Pb(^{18}O,Xγ) dataset (2007Ve14) as the bandhead of the ΔJ=1 band based on (13$^-$), which was adopted here.
4659.2[c] *11*	(13$^-$)[a]	G	
4801.19? *21*	2	A	Jπ: (2,3) from γ′s to 1, 3$^+$, and 3$^-$; 0,1,2 from log *ft*=6.2 via 1$^-$ parent.
4858.3[d] *12*	(14$^-$)[a]	G	
4981.9? *5*	0$^{(+)}$,1,2$^{(+)}$	A	Jπ: (0$^+$,1,2$^+$) from γ′s to 0$^+$ and 2$^+$; 0,1,2 from log *ft*=6.2 via 1$^-$ parent.
5076.5[d] *13*	(15$^-$)[a]	G	
5109.98? *18*	1$^-$,2$^-$	A	Jπ: (1,2,3$^+$) from γ′s to 1$^+$, 2$^+$, and 2$^-$; 0$^-$,1$^-$,2$^-$ from log *ft*=5.7 via 1$^-$ parent.
5173.69? *18*	1$^-$,2$^-$	A	Jπ: (1,2,3$^-$) from γ′s to 1$^-$ and 3; 0$^-$,1$^-$,2$^-$ from log *ft*=5.5 via 1$^-$ parent.
5183.14? *15*	2$^-$	A	Jπ: (1$^+$,2,3$^-$) from γ′s to 1$^-$ and 3$^+$; 0$^-$,1$^-$,2$^-$ from log *ft*=5.5 via 1$^-$ parent.
5310.43? *24*	1$^-$,2$^-$	A	Jπ: (1$^-$,2,3$^+$) from γ′s to 1$^+$ and 3$^-$; 0$^-$,1$^-$,2$^-$ from log *ft*=5.5 via 1$^-$ parent.
5388.89? *12*	1$^-$	A	Jπ: (1$^-$,2$^+$) from γ′s to 0$^+$ and 3$^-$; 0$^-$,1$^-$,2$^-$ from log *ft*=5.5 via 1$^-$ parent.
5426.5[d] *13*	(16$^-$)[a]	G	

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Adopted Levels, Gammas (continued)

^{140}Ba Levels (continued)

E(level)[†‡]	Jπ[#]	XREF	Comments
5588.30? *23*	2^-	A	Jπ: (2,3) from γ′s to 2^+, 2^-, 3^+ and 3^-; 0^-,1^-,2^- from log *ft*=5.5 via 1^- parent.
5611.1? *4*	1^-,2^-	A	Jπ: (1,2,3^+) from γ′s to 1^+ and 3; 0^-,1^-,2^- from log *ft*=5.5 via 1^- parent.
5651.1? *3*	2^-	A	Jπ: (1^+,2,3^-) from γ′s to 1^- and 3^+; 0^-,1^-,2^- from log *ft*=5.5 via 1^- parent.
5765.3? *4*	2^-	A	Jπ: (1^+,2,3^+) from γ′s to 1^+ and 3^+; 0^-,1^-,2^- from log *ft*=5.5 via 1^- parent.

† From a least-squares fit to Eγ data (normalized χ^2=1.53> critical χ^2=1.25).
‡ Additional information 1.
# Spin assignments (tentative) based on decay modes and log *ft* values from 1986Ro16, except where noted.
@ From γγ(θ) for cascades with 2^+ to 0^+ E2 602γ. From ^{140}Cs β^- (1986Ro16).
& Spin assignments (tentative) from ^{252}Cf SF and ^{248}Cm SF based on assignments of transitions to g.s. and octupole bands (syst).
a Based on band membership.
b Band(A): g.s. band.
c Band(B): octupole band.
d Band(C): ΔJ=1 band based on (13^-). Possible configuration=$(\pi g^{-1}_{7/2})(\pi h^1_{11/2})\otimes(\nu f^2_{7/2})$ or $(\pi g^{-1}_{7/2})(\pi h^1_{11/2})\otimes(\nu f^1_{7/2})(\nu h^1_{9/2})$.

Adopted Levels, Gammas (continued)

γ(^{140}Ba)

E_i(level)	J_i^π	E_γ [†]	I_γ [‡]	E_f	J_f^π	Mult.[#]	δ[@a]	α[&]	Comments
602.37	2+	602.25 *5*	100	0.0	0+	E2		0.00600	α(N)=3.24×10^{-5} *5*; α(O)=4.84×10^{-6} *7*; α(P)=3.09×10^{-7} *5* B(E2)(W.u.)=22.8 *+21−40* α(K)=0.00508 *8*; α(L)=0.000729 *11*; α(M)=0.0001513 *22*
1130.60	4+	528.25 *5*	100	602.37	2+	E2		0.00848	α(K)=0.00715 *10*; α(L)=0.001060 *15*; α(M)=0.000220 *3* α(N)=4.71×10^{-5} *7*; α(O)=7.00×10^{-6} *10*; α(P)=4.32×10^{-7} *6*
1510.68	2+	908.25 *5*	100	602.37	2+	E2+M1	−0.60 *+18−17*	0.00289 *11*	α(K)=0.00249 *10*; α(L)=0.000317 *11*; α(M)=6.51×10^{-5} *22* α(N)=1.41×10^{-5} *5*; α(O)=2.16×10^{-6} *8*; α(P)=1.59×10^{-7} *7*
1660.3	6+	529.7 *3*	100	1130.60	4+	Q			Mult.: from ^{248}Cm SF by DCO.
1802.90	3−	672.1 *4*	24.1 *11*	1130.60	4+	(E1+M2)	+0.13 *+7−6*	0.0020 *4*	α(K)=0.0017 *3*; α(L)=0.00021 *5*; α(M)=4.4×10^{-5} *9* α(N)=9.5×10^{-6} *20*; α(O)=1.4×10^{-6} *3*; α(P)=1.05×10^{-7} *22* δ: 0.00 *5*.
		1200.3 *1*	100.0 *7*	602.37	2+	(E1)		5.74×10^{-4}	α(N)=2.53×10^{-6} *4*; α(O)=3.89×10^{-7} *6*; α(P)=2.88×10^{-8} *4*; α(IPF)=3.02×10^{-5} *5* α(K)=0.000472 *7*; α(L)=5.76×10^{-5} *8*; α(M)=1.175×10^{-5} *17* δ: −0.01 *2*.
1823.80	0+	1221.4 *1*	100 *5*	602.37	2+	E2		1.20×10^{-3}	α(N)=5.80×10^{-6} *9*; α(O)=8.86×10^{-7} *13*; α(P)=6.37×10^{-8} *9*; α(IPF)=9.00×10^{-6} *13* α(K)=0.001024 *15*; α(L)=0.0001312 *19*; α(M)=2.69×10^{-5} *4*
1951.61	3+	820.9 *4*	100	1130.60	4+	M1+E2		0.0034 *6*	α(K)=0.0029 *5*; α(L)=0.00038 *6*; α(M)=7.8×10^{-5} *11* α(N)=1.68×10^{-5} *24*; α(O)=2.6×10^{-6} *4*; α(P)=1.8×10^{-7} *4* δ: −0.51 to −2.4.
1993.66	2+	1391.25 *10*	100 *2*	602.37	2+	M1+E2	+0.18 *+5−6*	1.22×10^{-3} *2*	α(K)=0.001014 *15*; α(L)=0.0001263 *19*; α(M)=2.59×10^{-5} *4* α(N)=5.59×10^{-6} *9*; α(O)=8.60×10^{-7} *13*; α(P)=6.46×10^{-8} *10*; α(IPF)=4.30×10^{-5} *6*
		1993.5 *3*	28.2 *11*	0.0	0+				
2138.24	3(+)	627.5 *3*	18.6 *19*	1510.68	2+				
		1008.1 *2*	100 *3*	1130.60	4+	(M1+E2)	−4.5 *+14−26*	0.00181 *4*	α(K)=0.00156 *4*; α(L)=0.000203 *5*; α(M)=4.18×10^{-5} *9* α(N)=8.99×10^{-6} *19*; α(O)=1.37×10^{-6} *3*; α(P)=9.67×10^{-8} *24*
		1536.15 *20*	77 *3*	602.37	2+	D+Q			δ: +0.04 *+13−12* or +3.6 +3.7-1.3,

$^{140}_{56}Ba_{84}$-4

Adopted Levels, Gammas (continued)

γ(^{140}Ba) (continued)

E_i(level)	J_i^π	E_γ [†]	I_γ [‡]	E_f	J_f^π	Mult.[#]	δ[@a]	α[&]	Comments
2152.1	(5$^-$)	491.9 *5*	100	1660.3	6$^+$				
		1021.5 *5*	25	1130.60	4$^+$				
2204.21	2$^+$,3	400.8 *5*	6.3 *32*	1802.90	3$^-$				
		693.4 *5*	21 *11*	1510.68	2$^+$				
		1072.9 *10*	39 *4*	1130.60	4$^+$				
		1601.75 *10*	100 *4*	602.37	2$^+$				
2237.24	2$^+$	413.4 *3*	6.3 *9*	1823.80	0$^+$				
		726.2 *5*	2.3 *19*	1510.68	2$^+$				
		1634.9 *1*	86 *1*	602.37	2$^+$	M1+E2	+1.00 *2*	8.79×10^{-4}	α(K)=0.000648 *10*; α(L)=8.06×10^{-5} *12*; α(M)=1.651×10^{-5} *24* α(N)=3.56×10^{-6} *5*; α(O)=5.48×10^{-7} *8*; α(P)=4.08×10^{-8} *6*; α(IPF)=0.0001300 *19*
		2237.25 *10*	100 *5*	0.0	0$^+$				
2309.52	2$^+$,1	798.9 *8*	9.1 *12*	1510.68	2$^+$				
		1707.4 *2*	100 *2*	602.37	2$^+$	D+Q			
		2309.3 *6*	20.3 *42*	0.0	0$^+$				
2320.51	(3$^-$)	809.8 *10*	19 *9*	1510.68	2$^+$				
		1190.0 *15*	76 *4*	1130.60	4$^+$				
		1718.05 *20*	100 *7*	602.37	2$^+$				
2429.52	1,2$^+$	918.3 *2*	36.1 *9*	1510.68	2$^+$	D+Q			
		1827.3 *2*	32.2 *18*	602.37	2$^+$				
		2429.6 *1*	100 *2*	0.0	0$^+$				
2468.3	(8$^+$)	808.0 *4*	100	1660.3	6$^+$	Q			Mult.: from ^{248}Cm SF by DCO.
2521.81	1,2$^{(+)}$	1010.4 *10*	12.8 *8*	1510.68	2$^+$				
		1918.7 *5*	6.2 *10*	602.37	2$^+$				
		2521.85 *10*	100 *7*	0.0	0$^+$				
2620.3?		960.0	100	1660.3	6$^+$				E_γ: measured by 2015St16 (^{12}C(^{136}Xe,^{140}Baγ) dataset).
2663.8		1154.2 *15*	29 *8*	1510.68	2$^+$				
		2061.5 *4*	100 *17*	602.37	2$^+$				
		2663.7 *10*	21 *13*	0.0	0$^+$				
2692.0	2	740.8 *10*	100 *36*	1951.61	3$^+$				
		889.1 *8*	64 *36*	1802.90	3$^-$				
		1181.4 *8*	36 *27*	1510.68	2$^+$				
		2089.7 *10*	82 *27*	602.37	2$^+$				
2704.04	1$^-$	2101.7 *1*	100 *1*	602.37	2$^+$	E1+M2	−0.09 *3*	8.80×10^{-4}	α(K)=0.000191 *5*; α(L)=2.30×10^{-5} *7*; α(M)=4.70×10^{-6} *13* α(N)=1.01×10^{-6} *3*; α(O)=1.56×10^{-7} *5*; α(P)=1.17×10^{-8} *4*; α(IPF)=0.000660 *10*
		2703.7 *2*	21.2 *5*	0.0	0$^+$				
2722.9	(7$^-$)	254.5 *5*	10	2468.3	(8$^+$)				
		570.9 *4*	100 *25*	2152.1	(5$^-$)				
		1062.5 *4*	48 *13*	1660.3	6$^+$				I_γ: from ^{248}Cm SF decay.
2782.08	2$^{(+)}$,3$^+$	643.5 *5*	25 *11*	2138.24	3$^{(+)}$				
		1270.9 *4*	86 *11*	1510.68	2$^+$				
		1651.1 *5*	100 *18*	1130.60	4$^+$				

$^{140}_{56}Ba_{84}$-5

Adopted Levels, Gammas (continued)

γ(^{140}Ba) (continued)

E_i(level)	J_i^π	E_γ [†]	I_γ [‡]	E_f	J_f^π	Mult.[#]	δ[@a]	α[&]	Comments
2782.08	$2^{(+)},3^+$	2180.3 *8*	32 *19*	602.37	2^+				
2787.55	$1^{(-)},2^{(+)}$	984.5 *9*	29 *10*	1802.90	3^-				
		1276.6 *5*	40 *10*	1510.68	2^+				
		2185.2 *2*	100 *6*	602.37	2^+				
		2788.2 *6*	36.5 *58*	0.0	0^+				
2800.3		1140.2	100	1660.3	6^+				
2870.80	2^+	1068.0 *10*	6.2 *22*	1802.90	3^-				
		2268.4 *2*	100 *2*	602.37	2^+	M1+E2	−0.19 *8*	8.50×10^{-4}	α(K)=0.000356 *6*; α(L)=4.37×10^{-5} *7*; α(M)=8.94×10^{-6} *13* α(N)=1.93×10^{-6} *3*; α(O)=2.98×10^{-7} *5*; α(P)=2.25×10^{-8} *4*; α(IPF)=0.000440 *7*
2873.84	$1^{(+)},2^{(+)}$	881.1 *5*	13.6 *37*	1993.66	2^+				
		1363.3 *5*	60 *4*	1510.68	2^+				
		2873.6 *2*	100 *4*	0.0	0^+				
2932.63	2^-	411.7 *8*	2.3 *9*	2521.81	$1,2^{(+)}$				
		695.5 *5*	7.7 *14*	2237.24	2^+				
		728.9 *6*	2.4 *7*	2204.21	$2^+,3$				
		794.6 *6*	2.3 *6*	2138.24	$3^{(+)}$				
		939.0 *5*	0.6 *4*	1993.66	2^+				
		1129.65 *5*	≈33	1802.90	3^-	M1+E2	+1.7 *2*	0.00152 *4*	α(K)=0.00131 *3*; α(L)=0.000168 *4*; α(M)=3.45×10^{-5} *7* α(N)=7.43×10^{-6} *16*; α(O)=1.136×10^{-6} *24*; α(P)=8.23×10^{-8} *19*; α(IPF)=1.088×10^{-6} *16*
		1422.0 *5*	19.7 *14*	1510.68	2^+	D+Q	+0.41 *+53−29*		
		2330.50 *10*	100 *1*	602.37	2^+	D+Q			δ: +0.41 *+53−29* or δ<−3.2 or >+2.9.
2973.63		735.9 *3*	100	2237.24	2^+				
3098.47	$1^{(+)},2^{(+)}$	862.3 *14*	15 *9*	2237.24	2^+				
		893.4 *5*	13 *7*	2204.21	$2^+,3$				
		1146.9 *4*	27.3 *36*	1951.61	3^+				
		2496.6 *2*	100 *5*	602.37	2^+				
		3098.6 *3*	47.3 *55*	0.0	0^+				
3296.8	(9^-)	573.9 *4*	51 *15*	2722.9	(7^-)				
		828.6 *4*	100 *25*	2468.3	(8^+)	D			Mult.: from ^{248}Cm SF by DCO.
3383.8	(10^+)	87[b]		3296.8	(9^-)				
		915.4 *4*	100	2468.3	(8^+)				
3451.48	$1^{(-)},2^{(+)}$	1627.2 *10*	18 *8*	1823.80	0^+				
		1648.5 *10*	14.3 *41*	1802.90	3^-				
		1940.2 *8*	19.4 *51*	1510.68	2^+				
		3451.45 *10*	100 *4*	0.0	0^+				
3520.6	$1^{(+)},2$	1381.8 *9*	7.5 *21*	2138.24	$3^{(+)}$				
		1526.8 *8*	8.2 *27*	1993.66	2^+				
		2009.9 *3*	100 *4*	1510.68	2^+				

$^{140}_{56}Ba_{84}$-6

Adopted Levels, Gammas (continued)

γ(^{140}Ba) (continued)

E_i(level)	J_i^π	E_γ [†]	I_γ [‡]	E_f	J_f^π	Mult.[#]	δ[@a]
3526.6	(1$^+$,2$^+$)	862.3 *14*	32 *20*	2663.8			
		1288.5 *8*	88 *24*	2237.24	2$^+$		
		1323.4 *7*	52 *12*	2204.21	2$^+$,3		
		1701.8 *15*	100 *40*	1823.80	0$^+$		
		3526.6 *5*	64 *12*	0.0	0$^+$		
3601.7	1$^{(-)}$,2$^{(+)}$	1171.6 *20*	9 *8*	2429.52	1,2$^+$		
		1281.1 *10*	23 *9*	2320.51	(3$^-$)		
		1291.9 *10*	53 *11*	2309.52	2$^+$,1		
		1396.4 *15*	23 *15*	2204.21	2$^+$,3		
		1799.3 *8*	53 *19*	1802.90	3$^-$		
		3601.8 *9*	100 *11*	0.0	0$^+$		
3656.08	2	873.2 *6*	2.0 *8*	2782.08	2$^{(+)}$,3$^+$		
		1418.5 *7*	10.7 *15*	2237.24	2$^+$		
		1517.0 *5*	5.8 *6*	2138.24	3$^{(+)}$		
		1853.35 *10*	100 *5*	1802.90	3$^-$	D+Q	−0.24 *11*
		3053.3 *2*	32.6 *8*	602.37	2$^+$	D+(Q)	−0.04 *11*
3769.5	(11$^-$)	385.6 *5*	100 *33*	3383.8	(10$^+$)		
		472.8[b] *5*	75 *37*	3296.8	(9$^-$)		
3845.3		3845.2 *6*	100	0.0	0$^+$		
3851.05	1	980.7 *10*	10.1 *36*	2870.80	2$^+$		
		1064.0 *7*	17.3 *22*	2787.55	1$^{(-)}$,2$^{(+)}$		
		1146.9 *4*	10.8 *14*	2704.04	1$^-$		
		1422.0 *5*	7.2 *36*	2429.52	1,2$^+$		
		1613.9 *1*	100 *2*	2237.24	2$^+$		
		1857.9 *6*	68 *14*	1993.66	2$^+$		
		2048.1 *3*	38.9 *22*	1802.90	3$^-$		
		2340.00 *15*	33.1 *43*	1510.68	2$^+$	D+Q	−0.67 *32*
		3248.5 *10*	24 *7*	602.37	2$^+$		
		3851.1 *10*	2.9 *22*	0.0	0$^+$		
3943.79	1	969.4 *7*	5.6 *33*	2973.63			
		1513.8 *5*	28.9 *56*	2429.52	1,2$^+$		
		1949.9 *7*	100 *9*	1993.66	2$^+$	D+Q	−0.34 *20*
		2120.0 *4*	18.9 *33*	1823.80	0$^+$		
		3341.2 *5*	89 *4*	602.37	2$^+$		
		3944.1 *3*	71 *14*	0.0	0$^+$		
3973.20	2	1000.7 *5*	14.8 *39*	2973.63			
		1040.50 *15*	35.2 *23*	2932.63	2$^-$		
		1101.6 *10*	11.7 *39*	2870.80	2$^+$		
		1663.85 *20*	27.3 *23*	2309.52	2$^+$,1		
		1735.8 *10*	80 *16*	2237.24	2$^+$		
		1835.0 *4*	27.3 *23*	2138.24	3$^{(+)}$		
		2022.6 *9*	16 *6*	1951.61	3$^+$		
		2170.0 *2*	100 *3*	1802.90	3$^-$		

$^{140}_{56}Ba_{84}$-7

Adopted Levels, Gammas (continued)

γ(^{140}Ba) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.[#]	δ[@a]	Comments
3973.20	2	2462.9 *5*	55 *8*	1510.68	2^+	D+Q	+0.31 *+63−39*	
		3371.00 *25*	75.8 *31*	602.37	2^+	D+Q		
4032.56?	1,2	934.9[b] *3*	32 *16*	3098.47	$1^{(+)},2^{(+)}$			
		1057.2[b] *5*	48 *16*	2973.63				E_γ: differs by 3σ from ΔE_{levels}.
		1098.6[b] *10*	100 *20*	2932.63	2^-			
		1158.5[b] *8*	12 *8*	2873.84	$1^{(+)},2^{(+)}$			
		1795.0[b] *10*	60 *40*	2237.24	2^+			
4037.25	2	939.0 *5*	4.7 *35*	3098.47	$1^{(+)},2^{(+)}$			
		1064.0 *7*	28.2 *35*	2973.63				
		1104.8 *10*	14 *6*	2932.63	2^-			
		1164.4 *20*	7 *5*	2873.84	$1^{(+)},2^{(+)}$			
		1607.7 *4*	42 *7*	2429.52	$1,2^+$			
		1799.3 *8*	33 *12*	2237.24	2^+			
		1899.6 *9*	24.7 *47*	2138.24	$3^{(+)}$			
		2236.0 *15*	35 *12*	1802.90	3^-			
		3435.0 *2*	100 *5*	602.37	2^+			
4079.96	$1^{(-)},2$	980.7 *10*	11.3 *40*	3098.47	$1^{(+)},2^{(+)}$			
		1291.9 *10*	23 *5*	2787.55	$1^{(-)},2^{(+)}$			
		1375.9 *4*	16.1 *24*	2704.04	1^-			
		1651.1 *5*	22.6 *40*	2429.52	$1,2^+$			
		1770.2 *6*	8.9 *24*	2309.52	$2^+,1$			
		2086.8 *10*	14.5 *40*	1993.66	2^+			
		2277.00 *15*	100 *5*	1802.90	3^-			
		3477.6 *3*	27.4 *24*	602.37	2^+			
4102.8	(12^+)	719.0 *5*	100	3383.8	(10^+)			
4275.13	1,2	1299.2 *15*	100 *7*	2973.63				
		1339.2 *15*	42 *14*	2932.63	2^-			
		1492.3 *5*	42 *12*	2782.08	$2^{(+)},3^+$			
		2038.5 *5*	42 *7*	2237.24	2^+			
		2764.8 *4*	44 *7*	1510.68	2^+			
4358.44	2	1928.2 *7*	15.4 *26*	2429.52	$1,2^+$			
		2038.5 *5*	15.4 *26*	2320.51	(3^-)			
		2848.2 *2*	100 *4*	1510.68	2^+	D+Q		
4388.06	$1^{(-)},2$	862.3 *14*	13 *8*	3526.6	$(1^+,2^+)$			
		1454.7 *4*	48 *6*	2932.63	2^-			
		2067.7 *3*	100 *5*	2320.51	(3^-)			
4395.7		3793.3 *4*	100	602.37	2^+			
4416.1	$1,2^{(+)}$	760.3 *10*	26 *15*	3656.08	2			
		1319.7 *20*	15 *11*	3098.47	$1^{(+)},2^{(+)}$			
		1442.4 *3*	100 *11*	2973.63				
		1542.3 *6*	52 *15*	2873.84	$1^{(+)},2^{(+)}$			

$^{140}_{56}Ba_{84}$-8

Adopted Levels, Gammas (continued)

γ(^{140}Ba) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Comments
4416.1	1,2$^{(+)}$	4416.5 *6*	44 *11*	0.0	0$^+$	
4499.81	1$^{(+)}$,2$^{(+)}$	555.5 *2*	66.7 *48*	3943.79	1	
		1795.0 *10*	36 *24*	2704.04	1$^-$	
		1807.9 *5*	14 *10*	2692.0	2	
		2362.00 *15*	100 *14*	2138.24	3$^{(+)}$	E_γ: differs by 3σ from ΔE_{levels}.
		2674.6 *5*	33.3 *48*	1823.80	0$^+$	
4531.2	(13$^-$)	761.7 *5*	100	3769.5	(11$^-$)	
4659.2	(13$^-$)	889.2	100	3769.5	(11$^-$)	
4801.19?	2	949.4[b] *7*	25 *8*	3851.05	1	
		2280.3[b] *7*	58 *17*	2521.81	1,2$^{(+)}$	
		2371.5[b] *4*	53 *11*	2429.52	1,2$^+$	
		2564.1[b] *7*	31 *8*	2237.24	2$^+$	
		2663.7[b] *10*	14 *8*	2138.24	3$^{(+)}$	
		2998.2[b] *3*	100 *6*	1802.90	3$^-$	
4858.3	(14$^-$)	328.4	100	4531.2	(13$^-$)	
4981.9?	0$^{(+)}$,1,2$^{(+)}$	944.3[b] *10*	35 *15*	4037.25	2	
		949.4[b] *7*	45 *15*	4032.56?	1,2	
		2459.5[b] *10*	100 *50*	2521.81	1,2$^{(+)}$	
		4982.4[b] *8*	35 *15*	0.0	0$^+$	
5076.5	(15$^-$)	218.2	100	4858.3	(14$^-$)	
5109.98?	1$^-$,2$^-$	1137.5[b] *4*	42 *5*	3973.20	2	
		1454.7[b] *4*	70 *9*	3656.08	2	
		2236.0[b] *15*	70 *23*	2873.84	1$^{(+)}$,2$^{(+)}$	
		3115.9[b] *2*	100 *9*	1993.66	2$^+$	
5173.69?	1$^-$,2$^-$	758.5[b] *10*	9 *5*	4416.1	1,2$^{(+)}$	
		1137.5[b] *4*	22.0 *24*	4037.25	2	
		1517.0[b] *5*	46 *5*	3656.08	2	
		2387.1[b] *10*	10 *5*	2787.55	1$^{(-)}$,2$^{(+)}$	
		2969.2[b] *2*	100 *4*	2204.21	2$^+$,3	
		4572.1[b] *10*	5.0 *24*	602.37	2$^+$	
5183.14?	2$^-$	794.6[b] *6*	37 *9*	4388.06	1$^{(-)}$,2	
		826.9[b] *15*	12 *7*	4358.44	2	
		1526.8[b] *8*	28 *9*	3656.08	2	
		2250.9[b] *3*	67 *9*	2932.63	2$^-$	
		2312.4[b] *8*	37 *23*	2870.80	2$^+$	
		2401.1[b] *6*	28 *5*	2782.08	2$^{(+)}$,3$^+$	

$^{140}_{56}Ba_{84}$-9

Adopted Levels, Gammas (continued)

γ(^{140}Ba) (continued)

E_i(level)	J_i^π	E_γ †	I_γ ‡	E_f	J_f^π	Comments
5183.14?	2⁻	2477.5[b] *8*	21 *7*	2704.04	1⁻	
		2660.8[b] *10*	12 *7*	2521.81	1,2$^{(+)}$	
		3189.5[b] *2*	100 *9*	1993.66	2$^+$	
		3671.7[b] *5*	40 *7*	1510.68	2$^+$	
		4053.2[b] *10*	12 *7*	1130.60	4$^+$	Mult.: could be M2 from J^π's.
5310.43?	1⁻,2⁻	1459.25[b] *35*	100 *14*	3851.05	1	
		1784.0[b] *15*	28 *10*	3526.6	(1$^+$,2$^+$)	
		2646.8[b] *5*	52 *14*	2663.8		
		3318.7[b] *9*	52 *14*	1993.66	2$^+$	
		3507.1[b] *4*	59 *10*	1802.90	3⁻	
5388.89?	1⁻	889.1[b] *8*	18 *10*	4499.81	1$^{(+)}$,2$^{(+)}$	
		1000.7[b] *5*	48 *13*	4388.06	1$^{(-)}$,2	
		1031.5[b] *3*	63 *8*	4358.44	2	E_γ: differs by 3σ from ΔE_{levels}.
		1113.6[b] *10*	15 *10*	4275.13	1,2	
		2456.4[b] *10*	38 *25*	2932.63	2⁻	
		2513.3[b] *15*	100 *50*	2873.84	1$^{(+)}$,2$^{(+)}$	
		3067.8[b] *3*	73 *8*	2320.51	(3⁻)	
		3394.4[b] *4*	55 *8*	1993.66	2$^+$	
		3565.00[b] *25*	73 *8*	1823.80	0$^+$	
		4786.3[b] *10*	10 *5*	602.37	2$^+$	
5426.5	(16⁻)	568.2	100	4858.3	(14⁻)	
5588.30?	2⁻	1171.6[b] *20*	8 *7*	4416.1	1,2$^{(+)}$	
		1737.5[b] *10*	100 *33*	3851.05	1	
		2656.7[b] *10*	5 *3*	2932.63	2⁻	
		3066.8[b] *3*	48 *5*	2521.81	1,2$^{(+)}$	
		3159.8[b] *10*	7 *3*	2429.52	1,2$^+$	
		3267.6[b] *7*	34 *7*	2320.51	(3⁻)	
		3383.0[b] *5*	18 *7*	2204.21	2$^+$,3	
		3635.4[b] *9*	36 *5*	1951.61	3$^+$	
5611.1?	1⁻,2⁻	2089.7[b] *10*	22.5 *75*	3520.6	1$^{(+)}$,2	
		2513.3[b] *15*	100 *50*	3098.47	1$^{(+)}$,2$^{(+)}$	
		2737.2[b] *13*	23 *8*	2873.84	1$^{(+)}$,2$^{(+)}$	
		3088.7[b] *5*	45 *8*	2521.81	1,2$^{(+)}$	
		3303.7[b] *9*	33 *10*	2309.52	2$^+$,1	
		3407.1[b] *10*	13 *8*	2204.21	2$^+$,3	

$^{140}_{56}Ba_{84}$-10

Adopted Levels, Gammas (continued)

γ(^{140}Ba) (continued)

E_i(level)	J_i^π	E_γ †	I_γ ‡	E_f	J_f^π
5651.1?	2$^-$	1262.9[b] *6*	18 *5*	4388.06	1$^{(-)}$,2
		1375.9[b] *4*	25 *4*	4275.13	1,2
		2553.6[b] *6*	10 *5*	3098.47	1$^{(+)}$,2$^{(+)}$
		3341[b] *5*	100 *5*	2309.52	2$^+$,1
		3412.8[b] *10*	6 *4*	2237.24	2$^+$
		3657.7[b] *10*	5.0 *25*	1993.66	2$^+$
5651.1?	2$^-$	3698.9[b] *7*	9 *4*	1951.61	3$^+$
5765.3?	2$^-$	2109.2[b] *4*	54 *1*	3656.08	2
		2666.7[b] *10*	11 *6*	3098.47	1$^{(+)}$,2$^{(+)}$
		3242.8[b] *10*	100 *19*	2521.81	1,2$^{(+)}$
		3627.9[b] *9*	29 *6*	2138.24	3$^{(+)}$

† From ^{140}Cs β^-. γ's from band levels from ^{252}Cf SF and ^{248}Cm SF.
‡ From ^{140}Cs β^-.
# From ^{140}Cs β^- by $\gamma\gamma(\theta)$ (1986Ro16). It was assumed that M2 cannot compete with E1; therefore, D+Q are M1+E2 and Q γ's are E2.
@ From ^{140}Cs β^- by $\gamma\gamma(\theta)$ (1986Ro16).
& Additional information 2.
[a] 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.
[b] Placement of transition in the level scheme is uncertain.

$^{140}_{56}Ba_{84}$-11

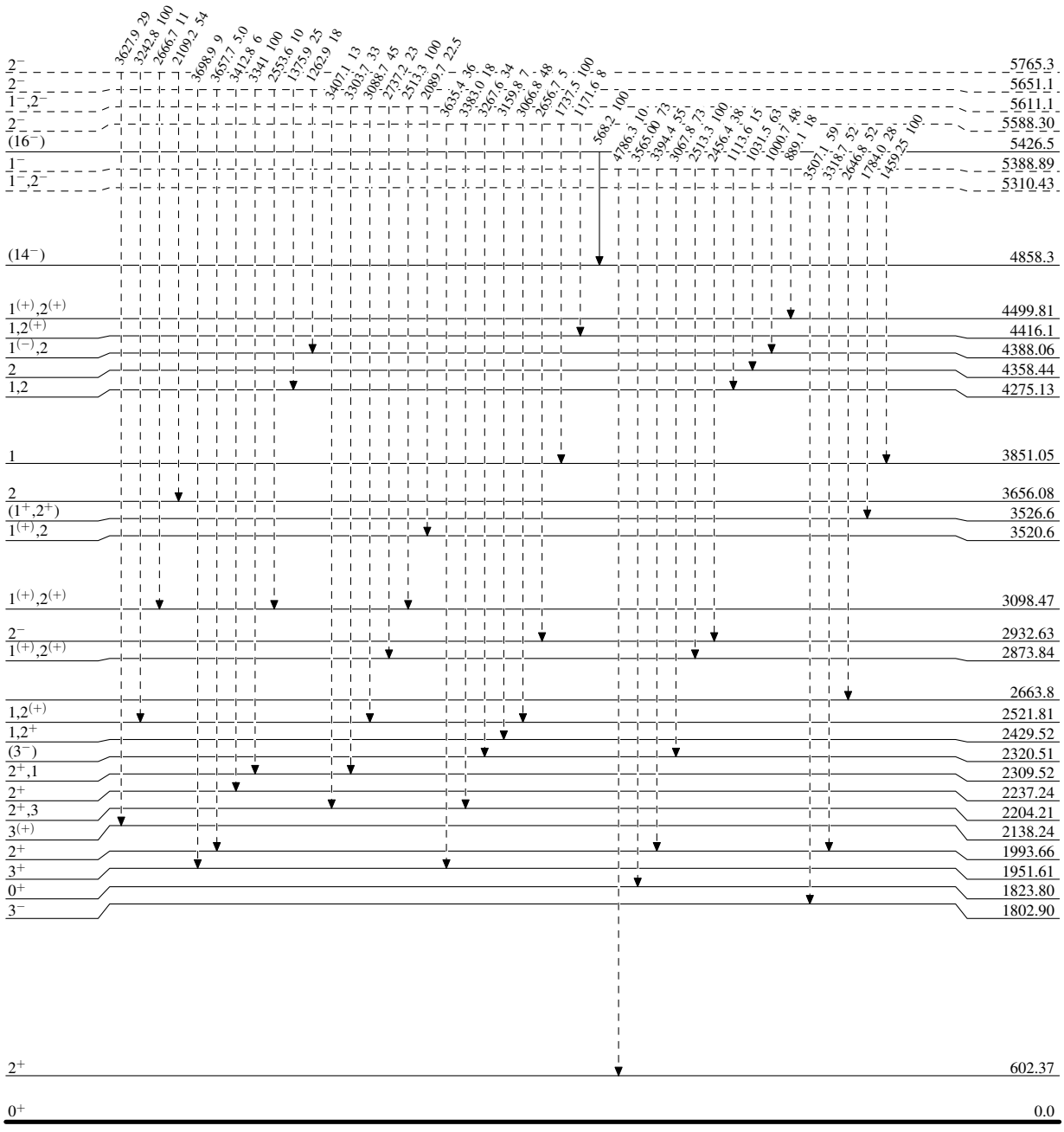
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

- - - - - - ► γ Decay (Uncertain)



$^{140}_{56}Ba_{84}$

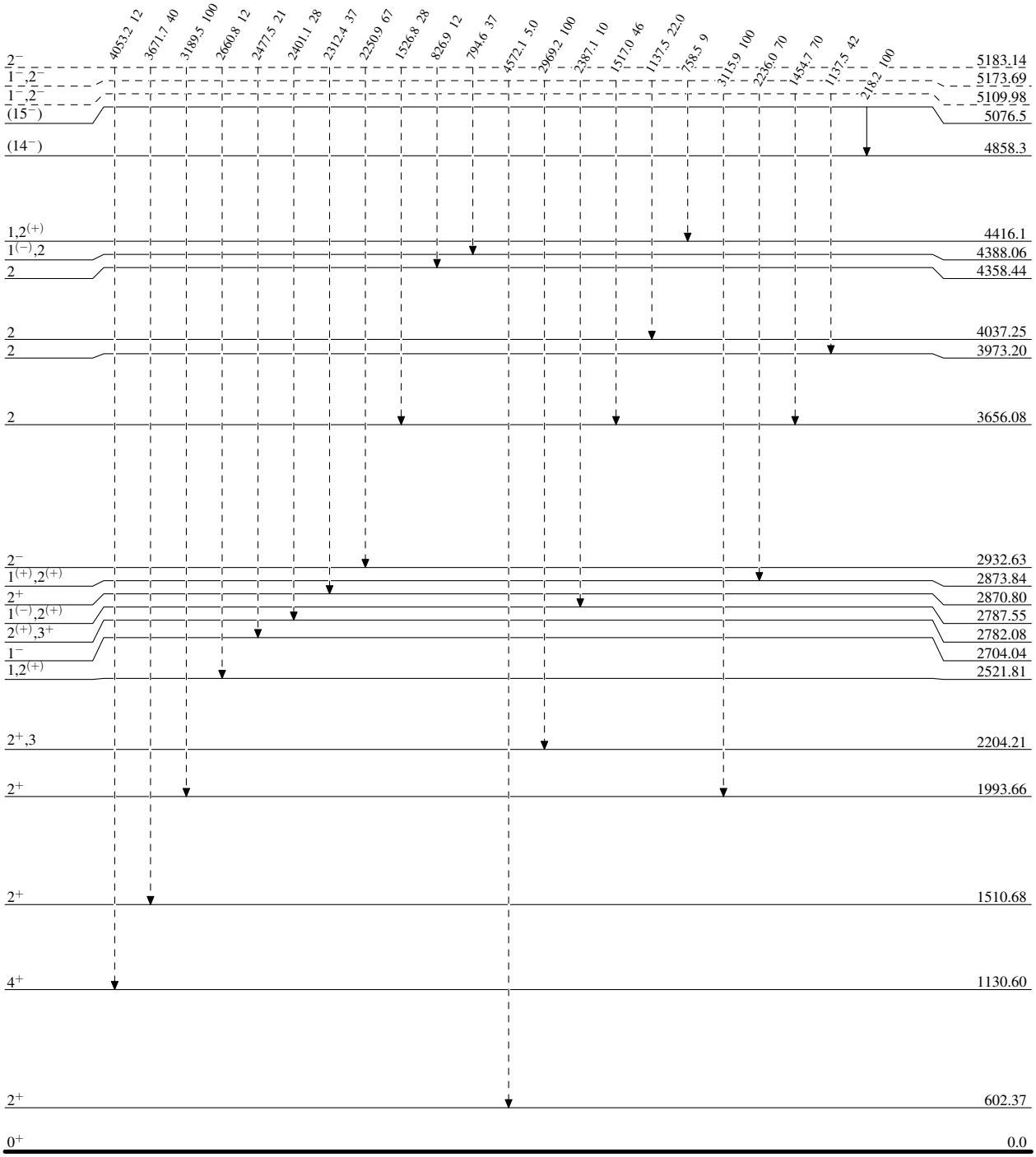
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{140}_{56}Ba_{84}$

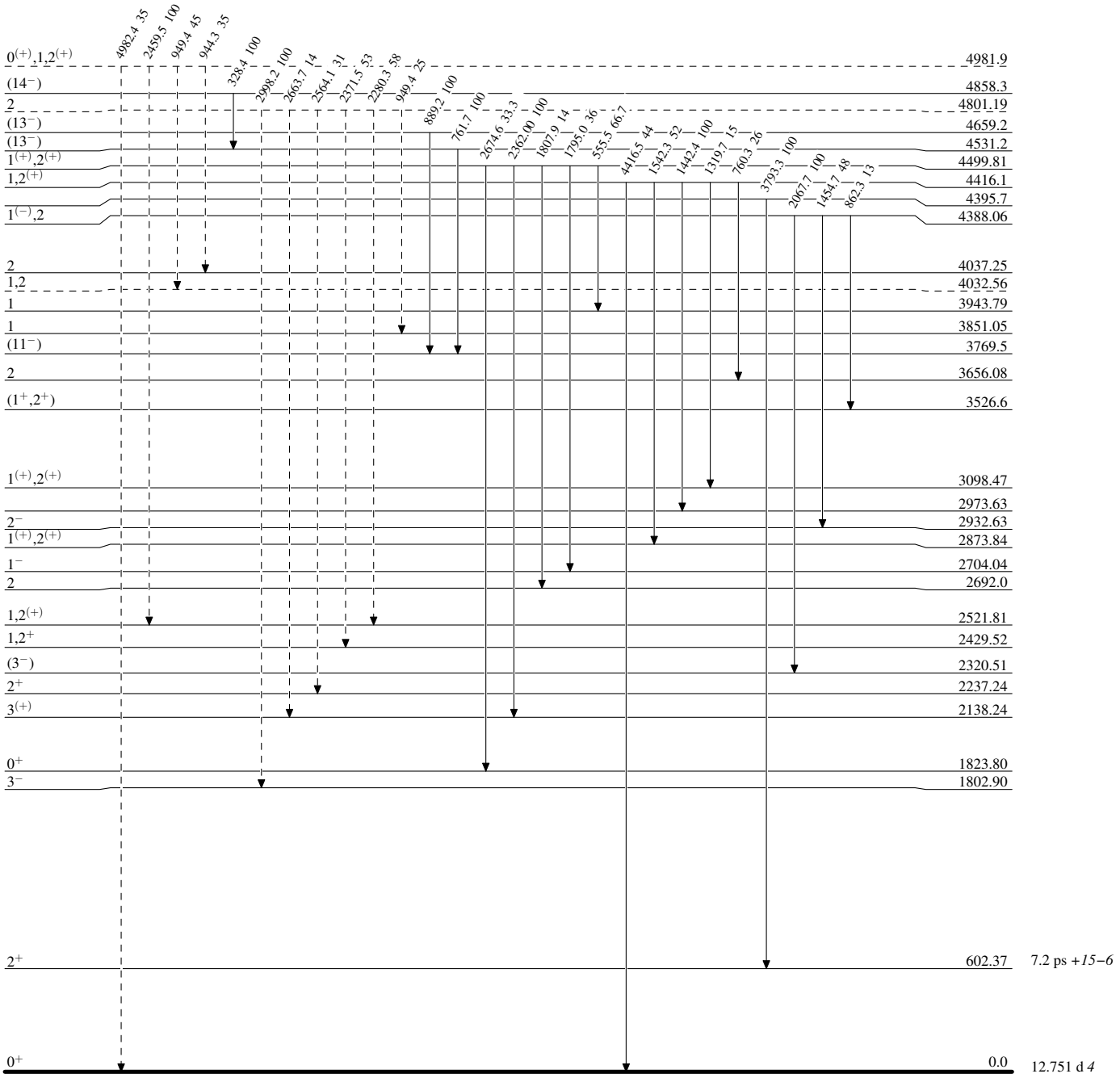
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{140}_{56}Ba_{84}$

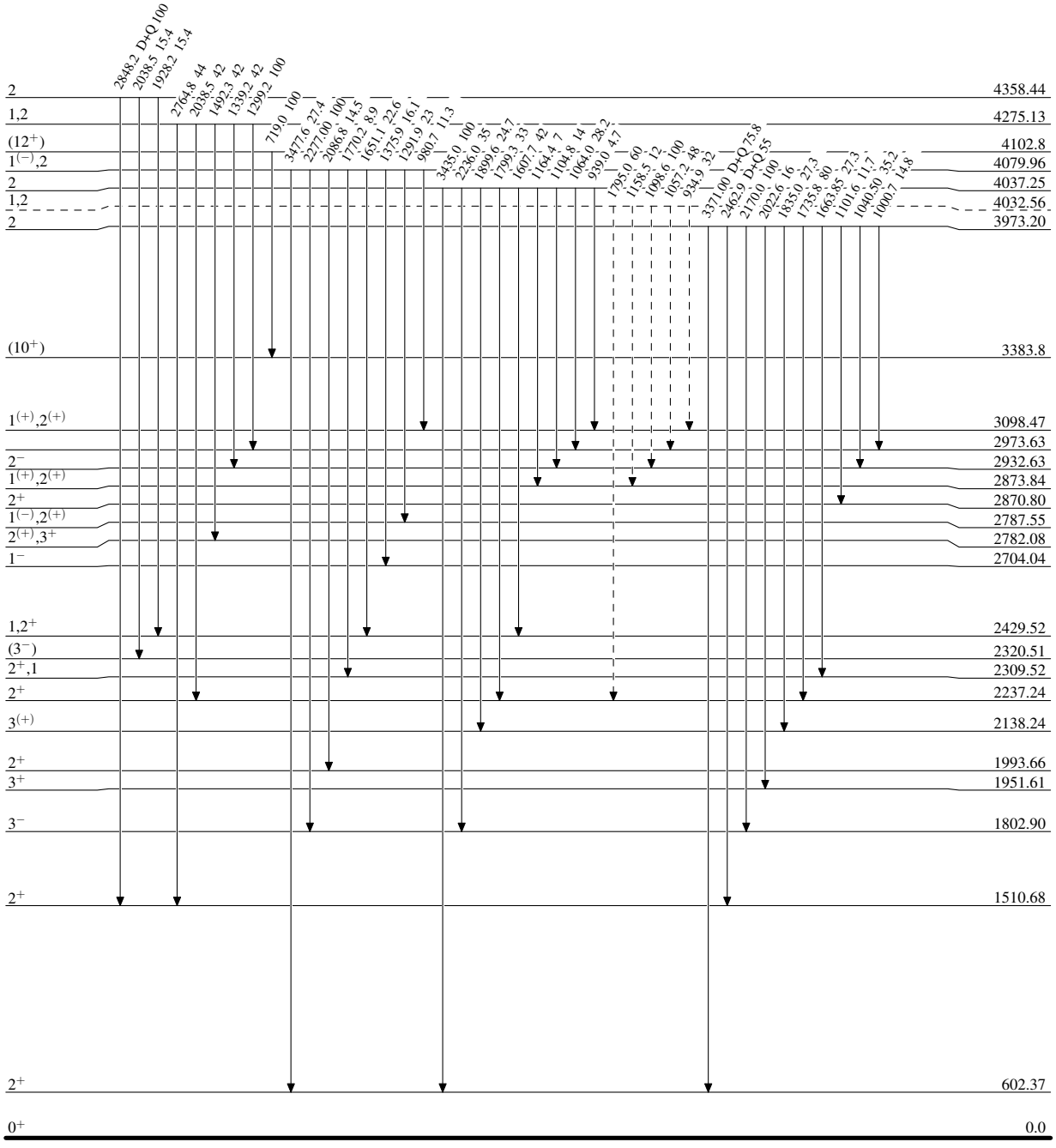
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{140}_{56}Ba_{84}$

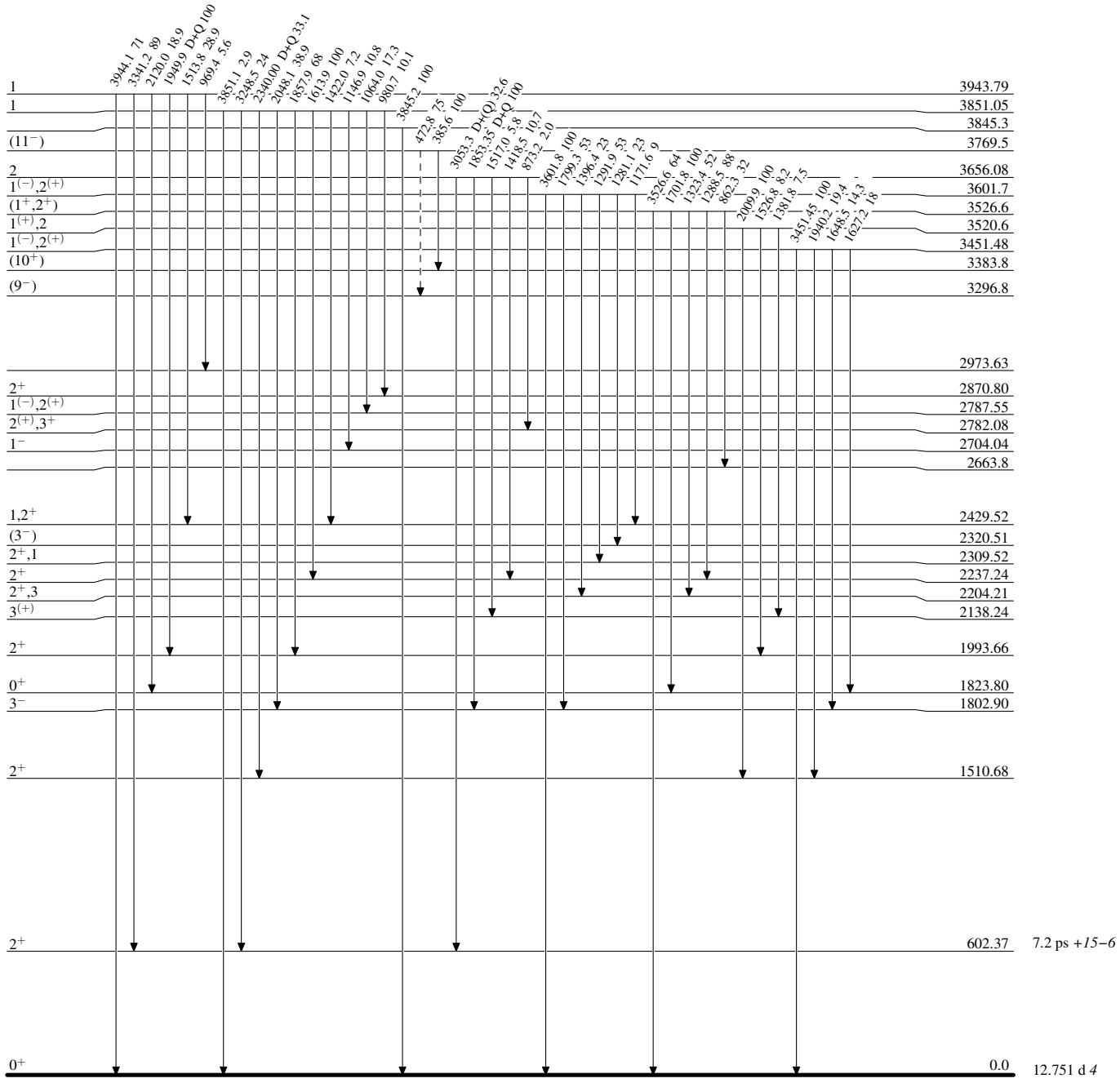
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{140}_{56}Ba_{84}$

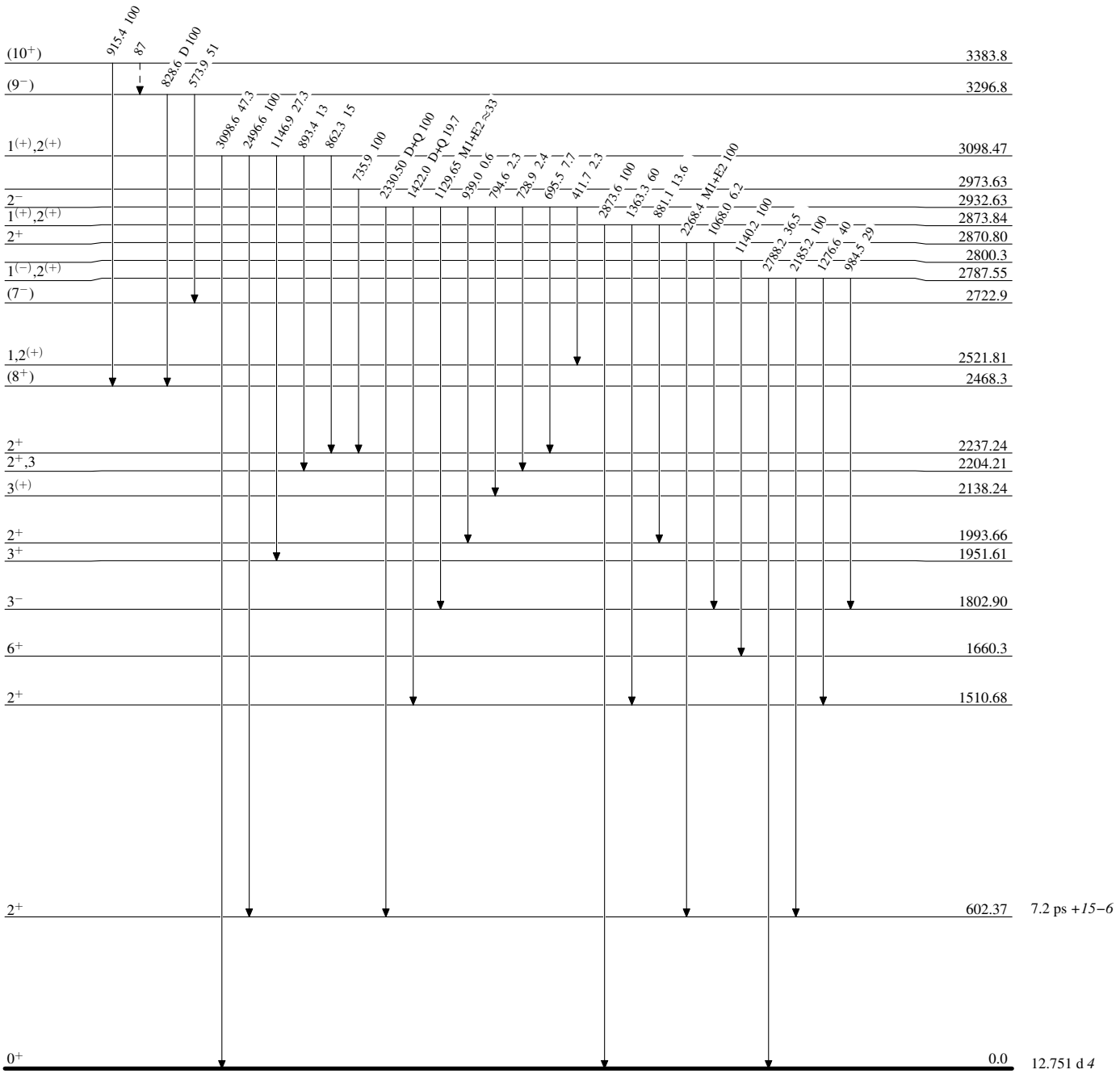
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)

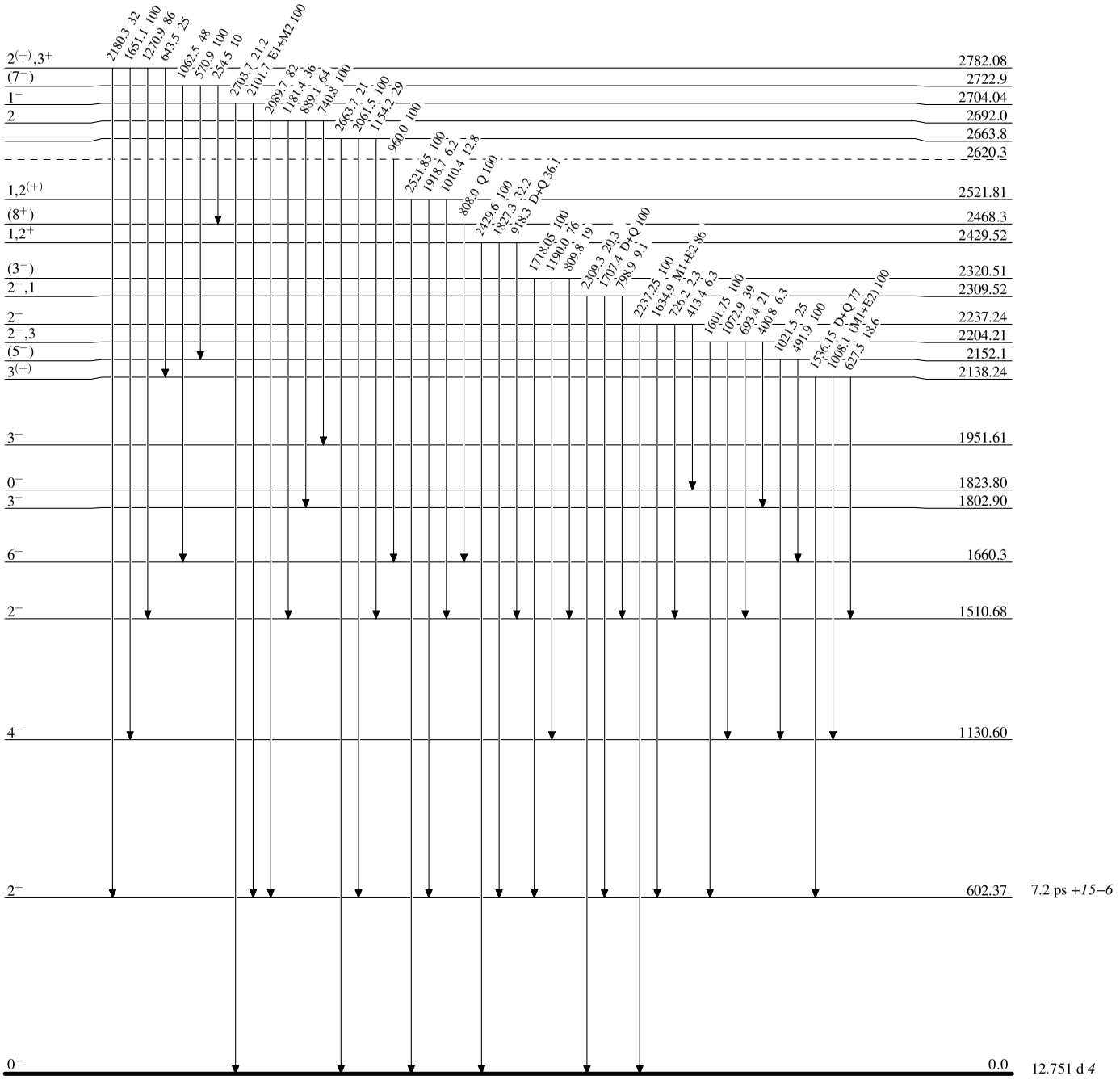


$^{140}_{56}Ba_{84}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

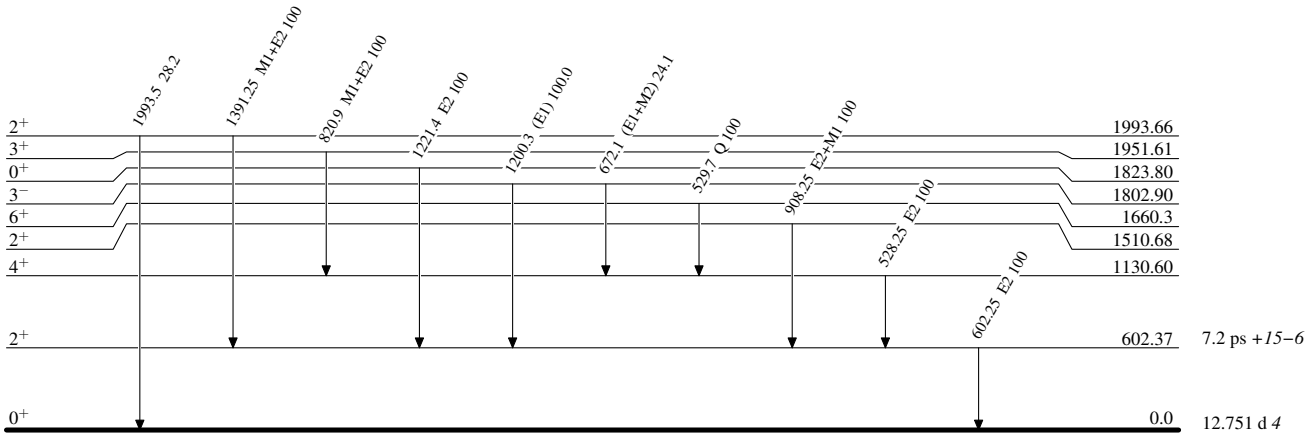


$^{140}_{56}Ba_{84}$

Adopted Levels, Gammas

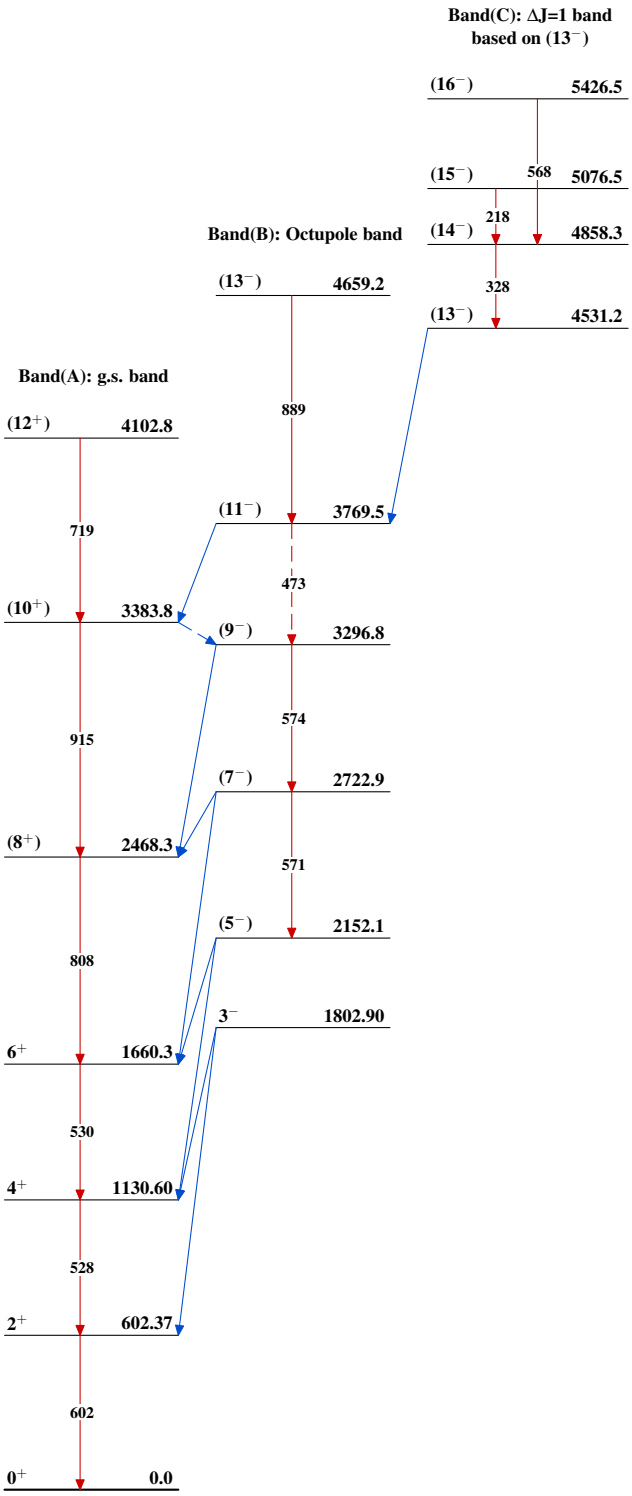
Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{140}_{56}Ba_{84}$

Adopted Levels, Gammas



$^{140}_{56}Ba_{84}$