Adopted Levels, Gammas

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	C. M. Baglin[1], E. A. Mccutchan[2], S. Basunia[1]	NDS 153, 1 (2018)	1-Oct-2018

Q(β^-)=−312.8 *18*; S(n)=7257.9 *15*; S(p)=8600 *20*; Q(α)=51.2 *17* 2017Wa10
S(2n)=13260.1 *15*; S(2p)=16127 *140*; Q(2β^-)=655.2 *16* (2017Wa10).
Other Reactions:
Muonic atoms: 1970Hi03; Measured muonic x ray spectra; deduced isotope shift and intrinsic Q=7.75 *10* (which implies Q(79 level)=2.21 *3* based on rotational model).
Isotope shift measurements: see, e.g., 2000As04, 1992Kr06, 1990Ji07, 1989Kr16, 1987Ah03.
Hexadecapole deformation ^{170}Er(^{16}O,^{16}O): 2014Ji08.

^{170}Er Levels

For rotational band configurations see, e.g., 1982Bo39, 1985SuZX, 1998GrZV, 2000Gr33, 2000Gr14, 2000Wu01.

Cross Reference (XREF) Flags

A	^{170}Ho β^- decay (2.76 min)	F	^{170}Er(d,d′)
B	^{170}Ho β^- decay (43 s)	G	^{170}Er(^{136}Xe,Xγ)
C	^{170}Tm ε decay	H	^{170}Er(^{238}U,^{238}U′γ)
D	^{170}Er(γ,γ'), (γ,pol γ')	I	Coulomb excitation
E	^{170}Er(n,n′γ)		

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$[#]	XREF	Comments
0.0[b]	0$^+$	stable	ABCDEFGHI	T$_{1/2}$: ≥ 4.1×10^{17} y (2018Be25) for (2ν+0ν) double β decay to ^{170}Yb(2$^+$, 84-keV level). Early limit ≥ 3.2×10^{17} y (1996De60).
78.590[b] *22*	2$^+$	1.896 ns *23*	ABCDEFGHI	μ=+0.633 *13* (1969Wi04) Q=−1.94 *23* (1973Lu02) μ: based on g(^{170}Er, 79)/g(^{166}Er, 81)=1.002 *13* (1969Wi04) from Mossbauer. Other: 0.66 *5* (1967Ku07) from time differential perturbed angular distribution. Q: from Coulomb excitation reorientation (1973Lu02). Other: Q/Q(^{166}Er, 81)=1.05 *16* (1969Wi04). J$^\pi$: E2 γ to 0$^+$. T$_{1/2}$: from Coulomb excitation. Additional information 1.
260.140[b] *24*	4$^+$		AB EFGHI	μ=+1.09 *15* (1968De28) Q=−2.2 *10* (1970McZQ) B(E4)↑=0.06 *+9−5* μ: from IMPAC (1968De28), recalculated by 2014StZZ using revised value for ^{166}Er(265 level) standard. Q: from Coulomb excitation reorientation (1970McZQ). B(E4)↑: from Coulomb excitation. J$^\pi$: stretched E2 182γ to 2$^+$ 79.
540.68[b] *3*	6$^+$		A EFGHI	J$^\pi$: stretched E2 γ to 4$^+$; g.s. band member.
890.88[c] *4*	(0$^+$)		B EF HI	J$^\pi$: (E2) 812γ to 2$^+$ 79; E matches that expected for K$^\pi$=0$^+$ bandhead.
914.97[b] *5*	8$^+$	3.6 ps *3*	E GHI	J$^\pi$: (E2) 374γ to 6$^+$ 541; g.s. band assignment. T$_{1/2}$: from Doppler-broadened lineshape analysis in Coulomb excitation (2011Di07).
934.023[d] *24*	2$^+$	1.81 ps *6*	A EFGHI	Q=2.0 *3*(1983Hu01) Q: from Coulomb excitation reorientation (1983Hu01).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{170}Er Levels (continued)

E(level)†	Jπ‡	$T_{1/2}$#	XREF	Comments
				Jπ: E2 934γ to 0+ g.s.. $T_{1/2}$: from B(E2)=0.103 *3* in Coulomb excitation (1978Mc02, 1974Ba81, 1972Do01).
959.994[c] *25*	2+	12.1 ps *15*	B EF HI	Jπ: E2 960γ to 0+ g.s.. $T_{1/2}$: from B(E2)=0.0079 *9* in Coulomb excitation (1978Mc02).
1010.53[d] *3*	(3+)		A E GHI	Jπ: D+Q γ to 2+; Q(+D) γ to 4+; large δ(932γ) favors π=+; band assignment.
1103.36[c] *3*	4+		A EFGHI	Jπ: ΔJ=2 E2 1025γ to 2+; M1+E2 843γ to 4+.
1127.29[d] *3*	4+		A EFGHI	Jπ: ΔJ=2 E2 1048γ to 2+; M1+E2 867γ to 4+.
1217.50[e] *3*	3(+)		A E GH	Jπ: D+Q γ to 2+ and 4+; large δ(1139γ) favors π=+.
1236.68[d] *4*	(5+)		A E HI	Jπ: D+Q γ to 4+; γ to 6+; possible 5+ member of Kπ=2+ band.
1266.63[f] *3*	(1)−		B E	Jπ: E1 1188γ to 2+ 78; Kπ=1− bandhead.
1268.68[g] *3*	(4−)	42.8 ns *17*	A E GH	$T_{1/2}$: from γγ(t) in ^{170}Er(^{238}U,^{238}U′γ). Jπ: E1 γ to 3(+); (E1) 165γ to 4+; possible Kπ=4− bandhead.
1304	(3−)&		F	
1304.57[e] *4*	(4+)		A E H	Jπ: M1 γ to 3(+); D+Q γ to 4+; possible Kπ=3+ band member.
1305.23[f] *6*	(2−)		B E	Jπ: γ to 2+; possible Kπ=1− band member.
1324.26[h] *5*	(0+)		B E	Jπ: γ to 2+; possible Kπ=0+ bandhead.
1332.0?@ *7*	2+@	4.8 ps *7*	I	Jπ: E2 1332γ to 0+. $T_{1/2}$: from B(E2)=0.0074 *11* in Coulomb excitation.
1335	(4+)&		F	
1340.18[f] *4*	3(−)		E I	Jπ: D+Q γ to 4+ and 2+; Kπ=1− band member.
1350.48[c] *8*	(6+)		E HI	
1370.6?@ *10*	(3−)@		f I	B(E3)=0.020 *3* from Coulomb excitation (1978Mc02). Jπ: apparent direct E3 excitation in Coulomb excitation (1978Mc02).
1372.11[g] *6*	(5−)		A EfGH	Jπ: 103γ to (4−) 1267 is M1; log *ft*=6.9 *3* from (6+) in ^{170}Ho β− decay (2.76 min); possible Kπ=4− band member.
1376.6[b] *4*	(10+)	1.48 ps *10*	GHI	Jπ: multiple Coulomb excitation; probable Kπ=0+ g.s. band member 1977Ke06. $T_{1/2}$: from Doppler-broadened lineshape analysis in Coulomb (1977Ke06). excitation.
1385.40[h] *3*	2+		E	Jπ: E2 γ to 0+.
1401.92[d] *7*	(6+)		EF HI	Jπ: γ-rays to 6+ and 4+; band assignment in (^{238}U,^{238}U′γ).
1413.12[e] *5*	(5+)		A E	Jπ: D+Q γ to 6+; γ to 4+; band assignment in (n,n′γ). Note, however, that the 1422 level instead was suggested as this band member in (^{238}U,^{238}U′γ) (2000Si32).
1416.23[i] *3*	(2+)		B E I	Jπ: γ to 2+; γ to 0+; possible Kπ=2+ bandhead.
1422.1 *8*	(5+,6+)		H	Jπ: indicated as J=5 member of Kπ=3+ band in (^{238}U,^{238}U′γ), but 1413 level is adopted as that member here. γ from (7+), γ to 4+.
1432.97[f] *4*	(4−)		E	Jπ: D(+Q) γ to 4+; γ to (3+); possible Kπ=1− band member.
1483.35[i] *4*	(3+)		Ef	Jπ: D+Q γ to 2+; possible 380γ to 4+; possible Kπ=2+ band member.
1483.75[f] *6*	(5−)		Ef I	Jπ: γ to 4+; γ to 6+; possible Kπ=1− band member.
1487.81 *12*	(4+,5+)		E	Jπ: 947γ to 6+; γ-rays to (5+) and (3+).
1496.15[g] *8*	(6−)		A E GH	Jπ: (M1,E2) 124γ to (5−); γ to (4−); possible J=6 member of Kπ=4− band.
1500.87 *19*	≤4		B	Jπ: γ to 2+.
1506.21[j] *8*	(2−)		E	Jπ: D+Q γ to (3+); 572γ to 2+; possible Kπ=2− bandhead.
1526.34[h] *7*	(4+)		E	Jπ: 1448γ to 2+; 1266γ to 6+.
1539	(1−)&		F	
1543.46[e] *14*	(6+)		E H	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{170}Er Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	XREF	Comments
1556.72[d] 8	(7+)		E H	Jπ: γ to 6+; Kπ=2+ band member.
1572.67[i] 6	(4+)		E	Jπ: D+Q γ to 4+; 638γ to 2+; possible 336γ to (5+); possible Kπ=2+ band assignment.
1579.16[j] 4	(3−)		EF I	Jπ: (3−) from σ(θ) in (d,d′); D(+Q) γ to 2+; 1319γ to 4+.
1590.80[n] 9	(6−)	4.0 ns 10	A E G	$T_{1/2}$: from (^{136}Xe,Xγ). Jπ: M1 95γ to (6−) 1496; log ft=6.3 from (6+) ^{170}Ho favors configuration=(ν 7/2[633])+(ν 5/2[512]) (2000Gr14).
1631.00[f] 8	(6−)		E	Jπ: 1090γ to 6+; band assignment.
1640.34[g] 8	(7−)		E GH	Jπ: 1100γ to 6+ 541; 725γ to (8+) 915; band assignment.
1676.35[j] 4	(4−)		E	Jπ: 460γ to 3(+) 1218; possible gammas to (2−) and (5+); band assignment in (n,n′γ).
1677.3[c] 6	(8+)		H	
1683.59[i] 8	(5+)		E	Jπ: γ-rays to 6+ and 4+; band assignment.
1689.78 10	(5+)		E	Jπ: γ to 4+.
1694.7[e] 7	(7+)		H	
1699.69 4	(1+)		E	Jπ: γ to 0+ and 3(+); not 2+ from 482γ(θ) in (n,n′γ).
1704.84[f] 19	(7−)		E I	Jπ: band assignment.
1708.17[k] 6	(5−)		EF	Jπ: γ-rays to 4+ and (5−) and (4−); (5−) favored by σ(θ) in (d,d′) and by band assignment.
1716.02[n] 16	(7−)		G	
1741.87 7			E	
1745.88? 6	(4−)		AB E	Jπ: D+Q γ to 3(−); γ to (4−); 406γ(θ) and linear polarization imply significant mixing for ΔJ=0 or J to J-1 transitions; J=4 favored by population probability in (n,n′γ); possible (π 7/2[523])+(π 1/2[411]) bandhead (2000Gr14).
1769.19 6			E	Jπ: γ to 4+.
1773.1[d] 5	(8+)		H	
1804.26[g] 14	(8−)		GH	
1805.23 6	(3+,4+)		E	Jπ: γ-rays to 2+ and (5+).
1819.11[k] 19	(6−)		E	Jπ: band assignment.
1823.23[i] 6	(6+)		E	Jπ: band assignment.
1824.61[l] 6	1−	5.7 fs 5	DE	Jπ: E1 γ to 0+. $T_{1/2}$: Other: 15.3 fs +14−13 from (n,n′γ). reason for discrepancy unclear (1992Be29).
1861.13[n] 17	(8−)		G	
1867.7[e] 5	(8+)		H	
1899.7? 3			E	Jπ: γ-rays to (3+) and 2+.
1918.6[b] 6	12+	0.57 ps 3	HI	Jπ: multiple Coulomb excitation; Kπ=0+ g.s. band member (1977Ke06). $T_{1/2}$: from Doppler broadened lineshape analysis in Coulomb excitation (2011Di07).
1935.50[l] 11	(3−)		EF	Jπ: D(+Q) γ to 2+; probable γ to 4+; (3−) from (d,d′).
1943.30[o] 22	(7)		G	possible K=7 intrinsic state.
1963.9[d] 6	(9+)		H	
1973.04[m] 8	1(+)		B DE	Jπ: D 1973γ to 0+ g.s.; possibly allowed feeding from (1+) in ^{170}Ho β− decay (43 s).
1982.61 11	(1+,2+)		E	Jπ: γ to 0+ and 3+.
1982.8 3			B	Jπ: γ to 2+; fed from (1+) in ^{170}Ho β− decay (43 s).
1990.81[g] 17	(9−)		GH	
2019.07[m] 17	(2+)		B EF	
2026.49[n] 20	(9−)		G	
2039.31 24	1	0.10 ps 3	B DE	Jπ: D γ to 0+.
2061.7[e] 7	(9+)		H	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{170}Er Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	XREF	Comments
2071.3 *3*	(1,2$^+$)		B EF	Jπ: γ to 0$^+$; D+Q γ to 2$^+$.
2080.52 *13*	2$^+$		E	Jπ: E2 γ to 0$^+$.
2080.7[c] *6*	(10$^+$)		H	
2106.7[o] *3*	(8)		G	
2112.2? *3*	(2$^+$)		EF	Jπ: probable (E2) γ to 0$^+$.
2132.97 *15*	1[a]	62 fs *9*	B DE	Other $T_{1/2}$: see comment in (n,n′γ).
2150.9[l] *3*	(5$^-$)		Ef	XREF: f(2154). Jπ: band assignment.
2158.94 *12*	(5$^+$)		A f	XREF: f(2154). Jπ: log *ft*=5.10 *8* from (6$^+$) in ^{170}Ho β$^-$ decay (2.76 min); 941γ to 3$^{(+)}$ 1217. Probable configuration=(ν 5/2[523])+(ν 5/2[512]) (2000Gr14) based on allowed unhindered β$^-$ decay from (6$^+$) ^{170}Ho.
2168.40 *15*	(7)		G	possible intrinsic state; May be the Kπ=7$^-$ (π 7/2[404])+(π 7/2[523]) bandhead (2010Dr02).
2188.45[g] *24*	(10$^-$)		GH	
2190.17 *19*	(4$^+$,5,6$^+$)		EF	Jπ: γ-rays to 6$^+$ and 4$^+$.
2212.01[n] *22*	(10$^-$)		G	
2223.2[d] *6*	(10$^+$)		H	
2285.6[e] *6*	(10$^+$)		H	
2289.7[o] *11*	(9)		G	
2399.04 *24*	(1$^+$,2$^+$)		EF	Jπ: γ to 0$^+$ and 3$^{(+)}$.
2407.9[n] *3*	(11)		G	
2431.71[p] *25*	(8)		G	possible intrinsic state; May be Kπ=8$^-$ (ν 9/2[624])+(ν 7/2[512]) bandhead (2010Dr02).
2434.2[g] *6*	(11$^-$)		H	
2444.9[d] *7*	(11$^+$)		H	
2451.57 *7*	(4$^+$)	76 fs *+33−25*	E	Jπ: γ-rays to 2$^+$ and 3$^+$ levels; possible candidate for two-phonon excitation state ($4^+_{\gamma\gamma}$ level) from (n,n′γ) (1999YoZY). $T_{1/2}$: from (n,n′γ).
2518.9[e] *7*	(11$^+$)		H	
2537.2[b] *11*	14$^+$		H	
2551.1[c] *7*	(12$^+$)		H	
2603.1[p] *4*	(9)		G	
2606			F	
2656.5[g] *3*	(12$^-$)		GH	
2657.4 *5*			EF	Jπ: γ to 4$^+$.
2684.8 *3*	(1,2$^+$)		B DE	Jπ: γ to 0$^+$ and 2$^+$.
2700.83 *24*	1[a]	23 fs *3*	B DE	
2717.2 *3*	(4$^+$,5,6$^+$)		Ef	Jπ: γ-rays to 4$^+$ and 6$^+$.
2720.13? *17*	(3$^+$,4$^+$)		Ef	Jπ: γ-rays to (5$^+$) and 2$^+$.
2723.7[e] *8*	(12$^+$)		H	
2750.8 *7*	(1)[a]	≈0.15 ps	D	
2753.3 *3*	(1,2$^+$)		E	Jπ: γ to 0$^+$ and 2$^+$. presumed to differ from 2751 level because its strong transition to g.s. is absent here.
2790.3 *4*	1$^+$[a]	7.7 fs *5*	B DE	
2794.1[p] *11*	(10)		G	
2813.3[d] *8*	(12$^+$)		H	
2897 *1*	1[a]		D	
2929.8 *7*	1[a]	39 fs *9*	D	Branching differs from that of 2931 level in (n,n′γ).
2930.9 *3*	(1,2$^+$)		E	Jπ: γ to 2$^+$, γ to 0$^+$. Branching differs from that for 2930 level in (γ,γ′).
2937.8 *7*	1[a]	31 fs *5*	D	
2943.0 *6*	(1,2$^+$)		E	Jπ: γ to 0$^+$.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{170}Er Levels (continued)

E(level)[†]	Jπ[‡]	T$_{1/2}$[#]	XREF	Comments
2971.5 *6*	1,2$^{(+)}$		DE	Jπ: γ to 0$^+$; J=1,2 from (γ,γ′).
2973.2[g] *12*	(13$^-$)		H	
2984.4[e] *9*	(13$^+$)		H	
2993.5? *5*	(1,2$^+$)		E	Jπ: γ to 0$^+$.
2995 *1*	1,2$^{(+)}$		D	Jπ: γ to 0$^+$; J=1,2 from excitation in (γ,γ′). assumed to differ from 2993.5 level because γ deexcitation pattern differs.
3019 *1*	1[a]		D	
3063.4 *9*	1[a]	3.1 fs *4*	DE	
3073.3[c] *12*	(14$^+$)		H	
3073.9[d] *9*	(13$^+$)		H	
3084 *1*	1[a]		D	
3177.8 *7*	1[a]	7.9 fs *24*	D	
3182.8 *7*	1[a]	11 fs *4*	D	
3189.2[g] *11*	(14$^-$)		H	
3225.7[b] *14*	16$^+$		H	
3237.8 *7*	1[a]	27 fs *6*	D	
3242.8 *7*	1[a]	4.2 fs *6*	D	
3275.9[e] *12*	(14$^+$)		H	
3405.8 *7*	1$^{(+)}$[a]	2.09 fs *10*	D	Presumed to differ from 3405.9 level in (n,n′γ) because γ branching differs.
3405.9 *4*	(1,2$^+$)		E	Jπ: γ to 0$^+$. Presumed to differ from 3406 level in (γ,γ′) because γ branching differs.
3436.3[d] *10*	(14$^+$)		H	
3540	1[a]		D	
3554	1[a]		D	
3566	1[a]	4.9 fs *8*	D	
3572	1[a]		D	
3583.1[g] *16*	(15$^-$)		H	
3584.9[e] *14*	(15$^+$)		H	
3606.4 *4*	(1$^+$,2$^+$)		B E	Jπ: 2715γ to (0$^+$) 891; β$^-$ branch from (1$^+$) in ^{170}Ho β$^-$ decay (43 s) is probably allowed unhindered, consistent with configuration=((ν 5/2[523])⊗(n 5/2[512]))2$^+$ suggested in 2000Gr14.
3623	1[a]	3.3 fs *12*	D	
3633.4[c] *14*	(16$^+$)		H	
3695	1[a]		D	
3713.1[d] *11*	(15$^+$)		H	
3792.1[g] *15*	(16$^-$)		H	
3892.1[e] *15*	(16$^+$)		H	
3978.4[b] *15*	18$^+$		H	
4132.5[d] *12*	(16$^+$)		H	
4232.3[c] *15*	(18$^+$)		H	
4249.9[e] *17*	(17$^+$)		H	
4417.2[d] *15*	(17$^+$)		H	
4447.7[g] *15*	(18$^-$)		H	
4579.1[e] *18*	(18$^+$)		H	
4787.1[b] *16*	20$^+$		H	
4882.6[c] *15*	(20$^+$)		H	
4888.7[d] *16*	(18$^+$)		H	
4978.3[e] *20*	(19$^+$)		H	
5206.6[d] *18*	(19$^+$)		H	
5334.8[e] *21*	(20$^+$)		H	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{170}Er Levels (continued)

E(level)[†]	Jπ[‡]	XREF
5558.9[c] 17	(22+)	H
5674.8[b] 17	22+	H
6142.9[e] 23	(22+)	H
6586.6[b] 20	24+	H
7531.4[b] 22	26+	H

† For states deexcited by γ rays, E(level) values are from least-squares fit to Eγ (omitting the poorly-fitting, doubly-placed 572γ from 1676 level), except when level is excited in (γ,γ′) alone or (^{238}U,^{238}U′γ) alone. ΔE for energies adopted from (d,d′) is estimated by the evaluator to be ≤ 7 keV (authors do not state ΔE).

‡ Values given without comment are from deduced band structure in ^{170}Er(^{238}U,^{238}U′γ), supported by Coulomb excitation strengths, γ decay patterns and strengths, and band-mixing calculations.

From (γ,γ′), except As noted.

@ Reported in Coulomb excitation only. A level with this Jπ should have been clearly populated in (n,n′γ) but no evidence exists for its excitation in that reaction. Consequently, the existence of this level is considered to be doubtful.

& From σ(θ) and/or σ(90°)/σ(125°), and band configuration analysis in (d,d′).

a From γ(θ) and/or γ linear polarization in (γ,γ′).

b Band(A): Kπ=0+ g.s. band (2000Wu01). Rotational parameters: α=13.1, β=−0.007. Definite Jπ assigned to band members based on smooth progression of level energies and independently-established Jπ(g.s.)=0+ and mult(79γ)=E2, unless band membership is uncertain.

c Band(B): Kπ=(0)+ quasi β vibrational band (2000Wu01). Strongly mixed with γ band at J=4 (where β- and γ-band energies are almost degenerate); becomes yrast at J=22 (2000Wu01). Rotational parameters: α=11.6, β=−0.016 (J=0,2,6 members). Note that the J=4 and 6 levels are assigned, instead, to the γ band in (n,n′γ) (2000Gr14), and *vice versa*.

d Band(C): Kπ=2+ γ vibrational band (2000Wu01). See comments on β band and Kπ=3+ band. Rotational parameters: α=13.4, B=−0.010 (J=2,6,8); α=12.8, B=−0.006 (J odd).

e Band(D): Kπ=(3)+ band (2000Wu01). Significantly mixed with K=2 γ band as evidenced by strength of Coulomb excitation of a 3+ band, presence of K-forbidden E2 transitions to g.s. band and repulsion between J=12 and 13 members of this band and the γ band (2000Wu01). Rotational parameters: α=10.9, β=−0.002 (if 1413 level is J=5 member). Configuration=(ν 5/2[512])+(ν 1/2[521]) (2000Gr14).

f Band(E): Kπ=(1)− band (2000Gr14). Configuration=(ν 7/2[633])-(ν 5/2[512]) (2000Gr14).

g Band(F): Kπ=(4−) band (2000Gr14). Rotational parameter: α=10.34. Mixed configuration: comparable contributions from (ν 7/2[633])+(ν 1/2[521]) and (π 7/2[523])+(π 1/2[411]); supported by experimental band properties and expectations from multi-quasiparticle calculations.

h Band(G): Kπ=(0+) band (1992Be63). Rotational parameters: α=10.2, β=−0.006. Includes a two-phonon component (2000Gr14). Possibly involves neutron-pair excitation into 7/2[633] orbital or into 1/2[521] orbital (1998GrZV).

i Band(H): Kπ=(2+) band (2000Gr14). Rotational parameters: α=11.2, β=−0.002. Possible two-phonon βγ component (2000Gr14,2000Gr33). Possible configuration=(ν 5/2[512])⊗(ν 3/2[512]) indicated In 1998GrZV appears to be a misprint; 3/2[512] orbital seems unlikely At this energy, and also leads to inconsistent Kπ.

j Band(I): Kπ=(2−) band (2000Gr14). Rotational parameter: α=12.16. Configuration=(ν 9/2[624])-(ν 5/2[512]) (2000Gr14).

k Band(J): Kπ=(5−) band (2000Gr14). Configuration=(ν 9/2[624])+(ν 1/2[521]) (2000Gr14). Rotational parameter: α=9.24.

l Band(K): Kπ=(0−), α=1 band (2000Gr14). Configuration=(ν 7/2[514])-(ν 7/2[633]) (2000Gr14). Rotational parameter: α=10.7, β=+0.032.

m Band(L): Kπ=1(+) band (2000Gr14). Rotational parameter: α=11.5.

n Band(M): Kπ=(6−) band. possible configuration: (ν 7/2[633])+(ν 5/2[512]); consistent with observed alignment and In reasonable agreement with expected g_K-g_R. Transition energies are similar to those for the (6−) band in ^{168}Er. A K^π=7− (ν 7/2[633])+(ν 7/2[514]) configuration, predicted At comparable excitation energy, is expected to have significantly smaller g_K-g_R. Note, however, that I(95γ)/I(218γ) and absence of a 322γ to the 4− 1269 level differ from expectations for the Kπ=6− bandhead

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{170}Er Levels (continued)

option.

[o] Band(N): K=(7) band.

[p] Band(O): K=(8) band.

Adopted Levels, Gammas (continued)

γ(^{170}Er)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult.‡	δ‡	αg	Comments
78.590	2+	78.63 *3*	100	0.0	0+	E2&		7.47	B(E2)(W.u.)=208 *4* E_γ: weighted average of 78.63 *3* (n,n′γ), 78.65 *8* (^{170}Ho β^- decay (2.76 min)). Mult.: from α(exp) in ^{170}Ho β^- decay (2.76 min).
260.140	4+	181.570 *20*	100	78.590	2+	E2		0.348	
540.68	6+	280.523 *20*	100	260.140	4+	E2		0.0848	
890.88	(0+)	812.29 *3*	100	78.590	2+	(E2)&			
914.97	8+	374.27 *4*	100	540.68	6+	(E2)&		0.0360	B(E2)(W.u.)=3.7×10^2 *3*
934.023	2+	673.72 *9*	1.39 *21*	260.140	4+	[E2]			B(E2)(W.u.)=0.29 *5*
		855.445 *23*	100 *15*	78.590	2+	E2(+M1)&	≥14		B(M1)(W.u.)<6.1×10^{-5}; B(E2)(W.u.)>5.3 δ: <−70 from Coulomb excitation but +17 *+6−3* from (n,n′γ); discrepancy In signs not understood.
		934.06 *5*	89.7 *24*	0.0	0+	E2			B(E2)(W.u.)=3.68 *11* I_γ: from Coulomb excitation.
959.994	2+	69	0.65 *13*	890.88	(0+)				I_γ: from Coulomb excitation. E_γ: from level energy difference.
		699.870 *22*	65 *3*	260.140	4+	E2			B(E2)(W.u.)=1.42 *20* I_γ: other: 95 from Coulomb Excitation, 71 *11* from (n,n′γ).
		881.383 *21*	100 *4*	78.590	2+	E2+M1&	+0.27 *+19−8*		B(M1)(W.u.)=0.00108 *18*; B(E2)(W.u.)=0.05 *+7−5* δ: other: +1.7 *8* (Coulomb excitation).
		959.96 *6*	63 *6*	0.0	0+	E2			B(E2)(W.u.)=0.28 *3*
1010.53	(3+)	750.379 *23*	14.6 *8*	260.140	4+	(M1+E2)	−1.8×10^2 *+11−46*		I_γ: from ^{170}Ho β^- decay (2.76 min). Others: 21 *3* in (n,n′γ), 3.5 *3* in Coulomb Excitation. Mult.: D+Q from γ(θ) in (n,n′γ); Δπ=(no) from magnitude of δ. Other δ: +0.08 *+4−3* or (1/δ)=−0.03 *+4−3* in (n,n′γ).
		931.98 *4*	100 *5*	78.590	2+	(M1+E2)d	−1.5×10^2 *+8−50*		Other δ: 1/(−0.11 *+11−6*) in (n,n′γ).
1103.36	4+	843.25 *3*	100 *6*	260.140	4+	M1+E2	+2.81 *10*		Mult.: D+Q from (n,n′γ); E2(+M1) from Coulomb excitation. δ: from (n,n′γ). However, δ≤−16 In Coulomb excitation. Source of discrepancy In sign not apparent.
		1024.69 *3*	30.1 *19*	78.590	2+	E2			I_γ: weighted average of 29.6 *21* from Coulomb excitation and 33 *5* from (n,n′γ).
1127.29	4+	193.2c		934.023	2+				
		586.67h *14*	13.8h *21*	540.68	6+				
		867.18 *4*	100 *7*	260.140	4+	M1+E2&	−9.8 *+22−63*		I_γ: from Coulomb excitation. δ: −1.29 *+7−12* or −9.8 *+22−63* in (n,n′γ), −4.3 *+23−99* in Coulomb excitation.
		1048.67 *4*	80 *5*	78.590	2+	E2			I_γ: weighted average of 73 *6* from Coulomb excitation,

$^{170}_{68}Er_{102}$-8

Adopted Levels, Gammas (continued)

γ(^{170}Er) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult.‡	δ‡	α[g]	Comments
									86 *12* from (n,n′γ). Other: 21 *11* in ^{170}Ho β⁻ decay (2.76 min).
1217.50	3(+)	283.457 *24*	12.9 *22*	934.023	2+	[M1]		0.1553	I_γ: from ^{170}Ho β⁻ decay (2.76 min). Other: 25 *3* in (n,n′γ).
		957.26 *7*	18.3 *10*	260.140	4+	D+Q			I_γ: from β⁻ decay. δ: +0.27 *+9−6* or +6.6 *+40−23* from (n,n′γ).
		1138.99 *3*	100 *4*	78.590	2+	(M1+E2)[d]	+14 *+7−4*		I_γ: from β⁻ decay (2.76 min).
1236.68	(5+)	695.92[h] *5*	≤20[h]	540.68	6+				
		976.45 *8*	100 *15*	260.140	4+	(M1+E2)[d]			δ: +0.12≤δ≤+0.2 or δ>+10 in ^{170}Er(n,n′γ).
1266.63	(1)−	1188.040 *21*	100 *14*	78.590	2+	E1			δ: δ(D,Q)=0.00 *10* from (n,n′γ).
1268.68	(4−)	51.30[@] *10*	6.8[@] *5*	1217.50	3(+)	E1[@]		0.355 *6*	B(E1)(W.u.)=2.06×10^{-6} *20* E_γ: from β⁻ decay only; γ absent in (n,n′γ).
		141.50[@] *9*	4.6[@] *6*	1127.29	4+	[E1]		0.1293	B(E1)(W.u.)=6.7×10^{-8} *10* E_γ: from β⁻ decay only; γ absent in (n,n′γ).
		165.33 *4*	10.2 *7*	1103.36	4+	(E1)[@]		0.0856	B(E1)(W.u.)=9.2×10^{-8} *9* I_γ: weighted average of 10.3 *13* from (n,n′γ) and 10.1 *9* from β⁻ decay (2.76 min).
		258.136 *20*	100 *5*	1010.53	(3+)	D+Q[f]			I_γ: from β⁻ decay (2.76 min). Mult.: Δπ=(yes) from level scheme, but δ=−30 *+7−13* in (n,n′γ) is unreasonably large for E1+M2.
		1008.3 *3*	0.25 *8*	260.140	4+				
1304.57	(4+)	87.16[@] *9*	16.4[@] *23*	1217.50	3(+)	M1[@]		4.22	E_γ: absent in (n,n′γ).
		293.94 *10*	19 *3*	1010.53	(3+)				E_γ: absent in ^{170}Ho β⁻ decay (2.76 min).
		1044.40 *4*	100	260.140	4+	(M1+E2)[d]	+6.3 *+45−18*		
		1226.0[@] *3*	48[@] *7*	78.590	2+				
1305.23	(2−)	370.99[h] *17*	3.2[h] *9*	934.023	2+				
		1226.64 *6*	100 *16*	78.590	2+				E_γ,I_γ: possible doublet in (n,n′γ); intensity suitably divided.
1324.26	(0+)	390.11[i] *10*	16.5 *23*	934.023	2+				
		1245.69 *4*	100 *14*	78.590	2+				
1332.0?	2+	398[&i]	87[&]	934.023	2+	M1+E2[&]	−0.40 *+15−20*	0.059 *5*	B(M1)(W.u.)=0.028 *5*; B(E2)(W.u.)=13 *9* Mult.,δ: γ(θ) in Coulomb excitation; RUL.
		1332[&i]	100[&]	0.0	0+	E2[&]			B(E2)(W.u.)=0.26 *4*
1340.18	3(−)	379.99[h] *7*	11.5[h] *14*	959.994	2+				
		1080.09 *3*	100 *14*	260.140	4+	(E1+M2)[f]	+0.016 *+23−17*		
		1261.51 *6*	43 *7*	78.590	2+	D+Q			I_γ: other: <29 from Coulomb Excitation. δ: −0.014 *+4−5* or −3.8 *6* in (n,n′γ).
1350.48	(6+)	247.4 *7*	7.6 *21*	1103.36	4+				E_γ: other: 247.0 in (^{238}U,^{238}U′γ).
		809.78 *7*	100 *17*	540.68	6+				E_γ: other: 809.6 in (^{238}U,^{238}U′γ).
		1090.6 *4*	<66	260.140	4+				E_γ: other: 1090.1 from (^{238}U,^{238}U′γ).

$^{170}_{68}Er_{102}$-9

Adopted Levels, Gammas (continued)

γ(^{170}Er) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	α[g]	Comments
1370.6?	(3⁻)	1292[&i]	100[&]	78.590	2⁺				
1372.11	(5⁻)	103.46 *10*	100	1268.68	(4⁻)	M1[@]		2.58	
		831.44 *23*	23 *4*	540.68	6⁺				I_γ: other: 15 from ^{170}Ho β^- decay (2.76 min).
		1111.81 *11*	46[@] *4*	260.140	4⁺				I_γ: other: 78 *13* from (n,n′γ).
1376.6	(10⁺)	461.5[&] *5*	100[&]	914.97	8⁺	(E2)[&]		0.0203	B(E2)(W.u.)=320 *22*
1385.40	2⁺	1125.28 *3*	51 *7*	260.140	4⁺	E2			
		1306.810 *24*	100 *14*	78.590	2⁺	(M1+E2)[d]	−0.74 *+7−12*		
		1385.31 *5*	44 *6*	0.0	0⁺	E2			
1401.92	(6⁺)	274.43[h] *21*	≤12[h]	1127.29	4⁺	E2			Mult.: from Coulomb excitation.
		861.26 *6*	100 *14*	540.68	6⁺				E_γ: other: 860.5 in (^{238}U,^{238}U′γ).
		1141.0[c]		260.140	4⁺				
1413.12	(5⁺)	108.32 *14*	24 *4*	1304.57	(4⁺)				
		195.58 *9*	14.5 *21*	1217.50	3⁽⁺⁾				
		872.40 *7*	22 *5*	540.68	6⁺	D+Q			I_γ: weighted average of 32 *8* in (n,n′γ), 19 *4* in ^{170}Ho β^- decay (2.76 min). δ: 0.15 *+7−6* or −30<δ<−1.6 in (n,n′γ).
		1153.14 *8*	100[@] *9*	260.140	4⁺				E_γ: possible multiplet in (n,n′γ).
1416.23	(2⁺)	405.71[h] *9*	≤64[h]	1010.53	(3⁺)				
		456.53 *12*	19.2 *25*	959.994	2⁺				I_γ: from I(457γ)/I(1338γ) in ^{170}Ho β^- decay (43 s).
		482.200[h] *23*	≤254[h]	934.023	2⁺				
		1337.64 *3*	100 *14*	78.590	2⁺	D+Q	+4.9 *+12−9*		
		1415.6[#] *5*	86[#] *12*	0.0	0⁺				E_γ,I_γ: other: 1416.23 *7*, I(1416γ)/I(1338γ)=1.14 *17* for doublet in (n,n′γ).
1422.1	(5⁺,6⁺)	1161.9[c]		260.140	4⁺				
1432.97	(4⁻)	422.63[h] *14*	5.0[h] *7*	1010.53	(3⁺)				
		1172.82 *3*	100 *14*	260.140	4⁺	(E1+M2)[f]	+0.02 *+4−3*		
1483.35	(3⁺)	356.27[h] *14*	9[h] *4*	1127.29	4⁺				
		379.99[h] *7*	29[h] *4*	1103.36	4⁺				
		472.84 *4*	95 *12*	1010.53	(3⁺)				
		549.31[h] *8*	≤68[h]	934.023	2⁺				
		1223.55[hi] *9*	≤84[h]	260.140	4⁺				δ: δ(D,Q)=−0.06 *+3−4* for doubly-placed γ in (n,n′γ).
		1404.73 *4*	100 *14*	78.590	2⁺	D+Q	+5.1 *+15−12*		
1483.75	(5⁻)	356.27[hi] *14*	19[h] *8*	1127.29	4⁺				
		943.09 *6*	100 *15*	540.68	6⁺				
		1223.55[h] *9*	≤185[h]	260.140	4⁺				δ: δ(D,Q)=−0.06 *+3−4* for doubly-placed γ in (n,n′γ).
1487.81	(4⁺,5⁺)	250.8[h] *3*	4.5[h] *12*	1236.68	(5⁺)				I_γ: relative to I(477γ doublet).
		477.21[hi] *6*	100[h] *14*	1010.53	(3⁺)				
		947.19 *12*	12.9 *20*	540.68	6⁺				I_γ: relative to I(477γ doublet).

$^{170}_{68}Er_{102}$-10

Adopted Levels, Gammas (continued)

γ(^{170}Er) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	α[g]	Comments
1496.15	(6⁻)	123.90[@] *14*	100[@] *19*	1372.11	(5⁻)	(M1,E2)[@]		1.44 *11*	E_γ: absent in (n,n′γ).
		227.41[@] *9*	100[@] *13*	1268.68	(4⁻)	[E2]		0.1650	E_γ: other: 227.21 *6* in (n,n′γ).
1500.87	≤4	540.9[#] *2*	100[#]	959.994	2⁺				
1506.21	(2⁻)	288.9 *3*	12.8 *23*	1217.50	3⁽⁺⁾				
		495.67 *7*	100 *16*	1010.53	(3⁺)	D+Q			δ: 0.10 *4* or −12 *+4−5* in (n,n′γ).
		572.22[h] *5*	≤377[h]	934.023	2⁺				
1526.34	(4⁺)	422.63[h] *14*	9.4[h] *13*	1103.36	4⁺				
		985.80 *17*	12.5 *19*	540.68	6⁺				
		1266.24 *8*	100 *15*	260.140	4⁺				
		1447.97[h] *20*	36[h] *6*	78.590	2⁺				
1543.46	(6⁺)	237.4[c]		1305.23	(2⁻)				E_γ: absent in (n,n′γ).
		1002.63 *17*	100 *15*	540.68	6⁺				E_γ: other: 1000.8 in (^{238}U,^{238}U′γ).
		1283.61 *20*	46 *7*	260.140	4⁺				E_γ: other: 1281.3 in (^{238}U,^{238}U′γ).
1556.72	(7⁺)	320.2[c]		1236.68	(5⁺)				E_γ: from (^{238}U,^{238}U′γ) only.
		641.71[h] *22*	≤85[h]	914.97	8⁺				
		1016.04 *7*	100 *15*	540.68	6⁺				
1572.67	(4⁺)	336.05[h] *10*	46[h] *6*	1236.68	(5⁺)				
		445.29 *15*	24 *4*	1127.29	4⁺				
		469.29 *16*	20 *3*	1103.36	4⁺				
		562.30[h] *12*	38[h] *15*	1010.53	(3⁺)				
		638.0 *3*	9.6 *23*	934.023	2⁺				
		1312.51 *11*	100 *15*	260.140	4⁺	D+Q			δ: −0.59 *+7−8* or +3.5 *+10−6* in (n,n′γ).
1579.16	(3⁻)	274.43[h] *21*	≤8.3[h]	1304.57	(4⁺)				E_γ: feeds 1304 (3⁻), or 1304 (4⁺), or both levels.
		451.72 *6*	54 *7*	1127.29	4⁺				
		475.47 *7*	25 *4*	1103.36	4⁺				
		568.65[h] *9*	≤127[h]	1010.53	(3⁺)				
		645.23 *3*	100 *15*	934.023	2⁺	D(+Q)	−0.07 *+4−5*		
		1319.1 *3*	34 *5*	260.140	4⁺				E_γ,I_γ: multiplet; intensity not divided.
1590.80	(6⁻)	94.67[@] *8*	100[@] *8*	1496.15	(6⁻)	M1[@]		3.33	B(M1)(W.u.)=0.0014 *4* E_γ: absent in (n,n′γ).
		218.69 *10*	47[@] *9*	1372.11	(5⁻)				E_γ: from ^{170}Ho β⁻ decay (2.76 min); possible doublet in (n,n′γ).
1631.00	(6⁻)	280.523 *20*	≤6×10^3	1350.48	(6⁺)				E_γ,I_γ: for doublet; intensity not divided.
		620.46[i] *17*	100 *15*	1010.53	(3⁺)				
		1090.6[h] *4*	≤203[h]	540.68	6⁺				
1640.34	(7⁻)	144.5 *10*		1496.15	(6⁻)				E_γ: from (^{238}U,^{238}U′γ). Other: 142.9 *2* In (^{136}Xe,Xγ). Absent In (n,n′γ). I_γ: Iγ/I(268γ)=0.45 *6* from (^{136}Xe,Xγ).
		268.0 *10*		1372.11	(5⁻)				E_γ: from (^{238}U,^{238}U′γ). Other: 266.8 *2* In (^{136}Xe,Xγ).

$^{170}_{68}Er_{102}$-11

Adopted Levels, Gammas (continued)

γ(^{170}Er) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	Comments
							Absent In (n,n′γ).
							I_γ: from (^{136}Xe,Xγ).
1640.34	(7$^-$)	725.29 *8*	77 *14*	914.97	8$^+$		
		1099.99 *11*	100 *14*	540.68	6$^+$		
1676.35	(4$^-$)	370.99[h] *17*	5.6[h] *15*	1305.23	(2$^-$)		
		439.50[h] *5*	24[h] *3*	1236.68	(5$^+$)		
		459.55 *21*	3.5 *6*	1217.50	3$^{(+)}$		
		549.31[h] *8*	23[h] *4*	1127.29	4$^+$		
		572.22[h] *5*	100[h] *13*	1103.36	4$^+$		
		665.84[h] *5*	20[h] *3*	1010.53	(3$^+$)		δ: −6.4<δ(D,Q)<−2.0 if J=4 (for doublet).
		1416.23 *7*	47 *7*	260.140	4$^+$		I_γ: for doublet; intensity not divided.
1677.3	(8$^+$)	326.9[c]		1350.48	(6$^+$)		
		762.4[c]		914.97	8$^+$		
		1136.5[c]		540.68	6$^+$		
1683.59	(5$^+$)	447.2[h] *3*	≤27[h]	1236.68	(5$^+$)		
		580.33 *9*	100 *3*	1103.36	4$^+$		
		1142.78 *9*	91 *3*	540.68	6$^+$		
		1423.4 *3*	≤109	260.140	4$^+$		E_γ: possible multiplet.
1689.78	(5$^+$)	562.30[h] *12*	50[h] *20*	1127.29	4$^+$		
		586.67[h] *14*	100[h] *15*	1103.36	4$^+$		
1694.7	(7$^+$)	272.6[c]		1422.1	(5$^+$,6$^+$)		
		1154.0[c]		540.68	6$^+$		
1699.69	(1$^+$)	482.200[h] *23*	≤750[h]	1217.50	3$^{(+)}$		
		1699.57 *9*	100 *15*	0.0	0$^+$		
1704.84	(7$^-$)	1164.16 *18*	100	540.68	6$^+$		
1708.17	(5$^-$)	336.05[h] *10*	35[h] *5*	1372.11	(5$^-$)		
		439.50[h] *5*	100[h] *12*	1268.68	(4$^-$)		
		1447.97[h] *20*	56[h] *9*	260.140	4$^+$		
1716.02	(7$^-$)	125.5[e] *2*	100	1590.80	(6$^-$)		
1741.87		1663.27 *6*	100	78.590	2$^+$		
1745.88?	(4$^-$)	405.71[h] *9*	69[h] *8*	1340.18	3$^{(-)}$	D+Q	E_γ: absent in ^{170}Ho β^- decay (2.76 min).
		477.21[h] *6*	100[h] *14*	1268.68	(4$^-$)		E_γ: other: 477.4 *2* in ^{170}Ho β^- decay (2.76 min).
1769.19		641.71[h] *22*	32[h] *6*	1127.29	4$^+$		
		665.84[h] *5*	100[h] *14*	1103.36	4$^+$		
1773.1	(8$^+$)	371.6[c]		1401.92	(6$^+$)		
		858.0[c]		914.97	8$^+$		
		1232.1[c]		540.68	6$^+$		
1804.26	(8$^-$)	164.3[e] *2*	24[e] *3*	1640.34	(7$^-$)		E_γ: other 164.5 *10* from (^{238}U,^{238}U′γ).
							I_γ: other: 43 *9* from (^{238}U,^{238}U′γ).

$^{170}_{68}Er_{102}$-12

Adopted Levels, Gammas (continued)

γ(^{170}Er) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	α[g]	Comments
1804.26	(8⁻)	307.5[e] *2*	100[e]	1496.15	(6⁻)				
1805.23	(3⁺,4⁺)	568.65[h] *9*	278[h] *43*	1236.68	(5⁺)				
		678.27 *16*	22 *4*	1127.29	4⁺				E_γ: multiplet.
		1544.96 *8*	100 *15*	260.140	4⁺				
		1726.1 *3*	62 *10*	78.590	2⁺				E_γ: possible multiplet; intensity not divided.
1819.11	(6⁻)	447.2[h] *3*	≤170[h]	1372.11	(5⁻)				
		1278.32 *23*	100 *40*	540.68	6⁺				
1823.23	(6⁺)	250.8[h] *3*	9.6[h] *26*	1572.67	(4⁺)				
		586.67[h] *14*	87[h] *13*	1236.68	(5⁺)				
		695.92[h] *5*	100[h] *13*	1127.29	4⁺				
		720.6 *10*	11 *4*	1103.36	4⁺				E_γ,I_γ: multiplet; intensity not divided.
		1282.3 *4*	10.0 *17*	540.68	6⁺				
1824.61	1⁻	1746.01 *5*	100[a] *3*	78.590	2⁺	(E1)			B(E1)(W.u.)=0.0045 *5* Mult.: D from (n,n′γ); adopted Δπ=yes. δ(D,Q)=−0.1 *3* from (n,n′γ).
		1824.6 *3*	61.35[a]	0.0	0⁺	E1[b]			B(E1)(W.u.)=0.00242 *22*
1861.13	(8⁻)	145.1[e] *2*	100[e]	1716.02	(7⁻)				
		270.4[e] *2*	15.9[e] *11*	1590.80	(6⁻)				
1867.7	(8⁺)	325.6[c]		1543.46	(6⁺)				
		465.9[c]		1401.92	(6⁺)				
		952.3[c]		914.97	8⁺				
		1326.4[c]		540.68	6⁺				
1899.7?		889.8 *5*	59 *16*	1010.53	(3⁺)				
		1820.9 *3*	100 *18*	78.590	2⁺				
1918.6	12⁺	541.9[&] *5*	100[&]	1376.6	(10⁺)	(E2)[&]		0.01341	B(E2)(W.u.)=375 *20*
1935.50	(3⁻)	1675.38 *14*	96 *17*	260.140	4⁺				E_γ,I_γ: possible multiplet; intensity not divided.
		1856.88 *14*	100 *17*	78.590	2⁺	D(+Q)	−0.03 *+4−5*		
1943.30	(7)	352.5[e] *2*	100	1590.80	(6⁻)				
1963.9	(9⁺)	407.0[c]		1556.72	(7⁺)				
		1049.0[c]		914.97	8⁺				
1973.04	1(+)	1894.43 *8*	100 *3*	78.590	2⁺				
		1973.1 *3*	81 *3*	0.0	0⁺	D			
1982.61	(1⁺,2⁺)	765.11 *10*	100 *15*	1217.50	3(+)				
		1090.6[hi] *4*	≤167[h]	890.88	(0⁺)				
1982.8		482.0[#] *3*	79[#] *3*	1500.87	≤4				
		1022.7[#] *4*	100[#] *5*	959.994	2⁺				
1990.81	(9⁻)	186.3[e] *2*	50 *12*	1804.26	(8⁻)				I_γ: from (^{238}U,^{238}U′γ).
		350.7[e] *2*	100	1640.34	(7⁻)				I_γ: from (^{238}U,^{238}U′γ).
2019.07	(2⁺)	1059.2 *3*	8.2 *18*	959.994	2⁺				
		1940.41 *20*	100 *18*	78.590	2⁺				

$^{170}_{68}Er_{102}$-13

Adopted Levels, Gammas (continued)

γ(^{170}Er) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	Comments
2026.49	(9$^-$)	165.4[e] *2*	100[e]	1861.13	(8$^-$)		
		310.4[e] *2*	46[e] *3*	1716.02	(7$^-$)		
2039.31	1	1960.7[#] *4*	93[#] *10*	78.590	2$^+$		I_γ: other: 52 *8* in (n,n′γ) where 1961γ is possible doublet.
		2039.3 *3*	100[#] *10*	0.0	0$^+$	D	
2061.7	(9$^+$)	366.9[c]		1694.7	(7$^+$)		
		1146.8[c]		914.97	8$^+$		
2071.3	(1,2$^+$)	1992.8 *3*	100 *15*	78.590	2$^+$	D+Q	δ: −0.14 *+6−5* or +3.5 *+7−6* in (n,n′γ).
		2071.0 *5*	21 *3*	0.0	0$^+$		
2080.52	2$^+$	953.0 *3*	3.2 *10*	1127.29	4$^+$		
		1070.1 *3*	4.6 *10*	1010.53	(3$^+$)		
		2080.53 *15*	100 *15*	0.0	0$^+$	E2	
2080.7	(10$^+$)	403.5[c]		1677.3	(8$^+$)		
		704.2[c]		1376.6	(10$^+$)		
		1165.9[c]		914.97	8$^+$		
2106.7	(8)	163.4[e] *2*	100	1943.30	(7)		
2112.2?	(2$^+$)	1177.8 *3*	11 *3*	934.023	2$^+$		
		2034.6 *5*	13 *3*	78.590	2$^+$		
		2113.0[i] *5*	100 *23*	0.0	0$^+$	(E2)	
2132.97	1	2054.37 *15*	39[a] *10*	78.590	2$^+$		Iγ:Iγ(2133 multiplet)=108 *15*:100 *15* in (n,n′γ), suggesting 2054γ is multiplet there.
		2132.9 *4*	100[a]	0.0	0$^+$	D[b]	E_γ: multiplet in (n,n′γ).
2150.9	(5$^-$)	1610.2 *7*	54 *12*	540.68	6$^+$		E_γ,I_γ: multiplet (1992BE63); intensity not divided.
		1890.8 *3*	100 *19*	260.140	4$^+$		
2158.94	(5$^+$)	413.2[@] *2*	14.3[@] *9*	1745.88?	(4$^-$)		
		662.9[@i] *3*	5.5[@] *7*	1496.15	(6$^-$)		
		746.0[@i] *2*	7.0[@] *10*	1413.12	(5$^+$)		
		786.3[@] *5*	22[@] *4*	1372.11	(5$^-$)		
		854.7[@] *5*	48[@] *7*	1304.57	(4$^+$)		E_γ,I_γ: probable doublet dominated by this transition; divided Iγ given.
		890.2[@] *2*	100[@]	1268.68	(4$^-$)		
		941.4[@] *2*	94.0[@] *20*	1217.50	3$^{(+)}$		
2168.40	(7)	452.7[e] *2*		1716.02	(7$^-$)		
		577.4[e] *2*		1590.80	(6$^-$)		
		672.1[e] *2*		1496.15	(6$^-$)		
2188.45	(10$^-$)	197.1[c] *10*	23 *6*	1990.81	(9$^-$)		
		384.2[e] *2*	100	1804.26	(8$^-$)		I_γ: from (^{238}U,^{238}U′γ).
2190.17	(4$^+$,5,6$^+$)	885.52 *20*	56 *13*	1304.57	(4$^+$)		
		1063.8 *7*	100 *22*	1127.29	4$^+$		
		1649.5 *5*	66 *19*	540.68	6$^+$		
2212.01	(10$^-$)	185.5[e] *2*	100[e]	2026.49	(9$^-$)		
		350.9[e] *2*	46[e] *5*	1861.13	(8$^-$)		
2223.2	(10$^+$)	450.2[c]		1773.1	(8$^+$)		

$^{170}_{68}Er_{102}$-14

Adopted Levels, Gammas (continued)

γ(^{170}Er) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	Comments
2223.2	(10$^+$)	846.5[c]		1376.6	(10$^+$)		
		1308.2[c]		914.97	8$^+$		
2285.6	(10$^+$)	418.2[c]		1867.7	(8$^+$)		
		512.5[c]		1773.1	(8$^+$)		
		908.8[c]		1376.6	(10$^+$)		
2289.7	(9)	183[e] *1*	100	2106.7	(8)		
2399.04	(1$^+$,2$^+$)	1182.1 *4*	73 *17*	1217.50	3$^{(+)}$		
		2398.7 *3*	100 *17*	0.0	0$^+$		
2407.9	(11)	381.4[e] *2*	100	2026.49	(9$^-$)		
2431.71	(8)	263.3[e] *2*		2168.40	(7)		
		716[e] *1*		1716.02	(7$^-$)		
2434.2	(11$^-$)	244.6[c] *10*	57 *15*	2188.45	(10$^-$)		
		443.6[c] *10*	100	1990.81	(9$^-$)		
2444.9	(11$^+$)	481.0[c]		1963.9	(9$^+$)		
		1068.3[c]		1376.6	(10$^+$)		
2451.57	(4$^+$)	1441.03 *6*		1010.53	(3$^+$)		
		1518		934.023	2$^+$		
2518.9	(11$^+$)	457.2[c]		2061.7	(9$^+$)		
		555.0[c]		1963.9	(9$^+$)		
		1142.3[c]		1376.6	(10$^+$)		
2537.2	14$^+$	618.5[c]	100	1918.6	12$^+$		
2551.1	(12$^+$)	470.6[c]		2080.7	(10$^+$)		
		632.0[c]		1918.6	12$^+$		
		1174.8[c]		1376.6	(10$^+$)		
2603.1	(9)	171.4[e] *2*	100	2431.71	(8)		
2656.5	(12$^-$)	221.5[c] *10*	34 *8*	2434.2	(11$^-$)		
		468.1[e] *2*	100	2188.45	(10$^-$)		I_γ: from (^{238}U,^{238}U′γ).
2657.4		1352.8 *5*	100 *27*	1304.57	(4$^+$)		
		1530.7[i] *7*	40 *10*	1127.29	4$^+$		
2684.8	(1,2$^+$)	2606.1[#] *4*	96[#] *9*	78.590	2$^+$		I_γ: other: 19 *8* in (n,n′γ); possibly 2683.6γ in (n,n′γ) is a multiplet.
		2684.8[#] *4*	100[#] *7*	0.0	0$^+$		
2700.83	1	2622.4 *4*	48[a] *6*	78.590	2$^+$		I_γ: other: 97 *15* from (n,n′γ).
		2700.7[b] *3*	100[a]	0.0	0$^+$	D[b]	
2717.2	(4$^+$,5,6$^+$)	1590.2 *3*	100 *22*	1127.29	4$^+$		
		1612.5 *7*	30 *8*	1103.36	4$^+$		
		2176.6[i] *10*	64 *40*	540.68	6$^+$		E_γ,I_γ: possible multiplet: intensity not divided.
2720.13?	(3$^+$,4$^+$)	1483.38 *17*	100 *14*	1236.68	(5$^+$)		
		1617.3 *5*	7 *3*	1103.36	4$^+$		
		1786.4[i] *17*	19 *6*	934.023	2$^+$		E_γ,I_γ: possible multiplet; intensity not divided.
2723.7	(12$^+$)	438.1[c]		2285.6	(10$^+$)		
		500.4[c]		2223.2	(10$^+$)		

$^{170}_{68}Er_{102}$-15

Adopted Levels, Gammas (continued)

γ(^{170}Er) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult. ‡	Comments
2750.8	(1)	2672 [b]	≈0 [a]	78.590	2^+		
		2751 [b]	100 [a]	0.0	0^+	(D)	
2753.3	$(1,2^+)$	1862.6 *3*	22 *8*	890.88	(0^+)		
		2673.1 *9*	100 *24*	78.590	2^+		
2790.3	1^+	2711.2 *12*	52 [a] *5*	78.590	2^+		
		2790.3 *4*	100 [a]	0.0	0^+	M1 [b]	B(M1)(W.u.)=0.087 *7*
2794.1	(10)	191 [e] *1*	100	2603.1	(9)		
2813.3	(12^+)	527.7 [c]		2285.6	(10^+)		
		590.0 [c]		2223.2	(10^+)		
2897	1	2897	100	0.0	0^+	D [b]	
2929.8	1	2851 [b]	88 [a] *20*	78.590	2^+		
		2930 [b]	100 [a]	0.0	0^+	D [b]	
2930.9	$(1,2^+)$	1996.7 *3*	100 *16*	934.023	2^+		
		2852.6 *5*	51 *11*	78.590	2^+		
2937.8	1	2859 [b]	61 [a] *13*	78.590	2^+		
		2938 [b]	100 [a]	0.0	0^+	D [b]	
2943.0	$(1,2^+)$	2051.9 *6*	71 *21*	890.88	(0^+)		
		2865.1 *10*	100 *29*	78.590	2^+		
		2938 [i] *3*	71 *29*	0.0	0^+		E_γ,I_γ: possible multiplet; intensity not divided.
2971.5	$1,2^{(+)}$	2893.4 *6*	100 *18*	78.590	2^+		E_γ: absent In (γ,γ').
		2968.8 *13*	38 *10*	0.0	0^+		E_γ: other: 2973 from (γ,γ').
2973.2	(13^-)	539.0 [c] *10*	100	2434.2	(11^-)		
2984.4	(13^+)	465.5 [c]		2518.9	(11^+)		
		539.5 [c]		2444.9	(11^+)		
2993.5?	$(1,2^+)$	2102.3 *5*	100 *17*	890.88	(0^+)		
		2919.0 *18*	21 *8*	78.590	2^+		
2995	$1,2^{(+)}$	2995 [b]	100	0.0	0^+		
3019	1	3019 [b]	100	0.0	0^+	D [b]	
3063.4	1	2984.1 *15*	100 [a] *9*	78.590	2^+		E_γ: for possible multiplet.
		3063.8 *11*	41.0 [a]	0.0	0^+	D [b]	
3073.3	(14^+)	522.3 [c]	100	2551.1	(12^+)		
3073.9	(13^+)	555.0 [c]		2518.9	(11^+)		
		629.0 [c]		2444.9	(11^+)		
3084	1	3084 [b]	100	0.0	0^+	D [b]	
3177.8	1	3099 [b]	100 [a] *22*	78.590	2^+		
		3178 [b]	41 [a]	0.0	0^+	D [b]	
3182.8	1	3104 [b]	100 [a] *25*	78.590	2^+		
		3183 [b]	45 [a]	0.0	0^+	D [b]	
3189.2	(14^-)	532.7 [c] *10*	100	2656.5	(12^-)		

$^{170}_{68}Er_{102}$-16

Adopted Levels, Gammas (continued)

γ(^{170}Er) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	Comments
3225.7	16^+	688.4[c]	100	2537.2	14^+		
3237.8	1	3159[b]	51[a] *17*	78.590	2^+		
		3238[b]	100[a]	0.0	0^+	D[b]	
3242.8	1	3164[b]	93[a] *8*	78.590	2^+		
		3243[b]	100[a]	0.0	0^+	D[b]	
3275.9	(14^+)	552.2[c]	100	2723.7	(12^+)		
3405.8	$1^{(+)}$	3327[b]	46.1[a] *23*	78.590	2^+		
		3406[b]	100[a]	0.0	0^+	D[b]	B(M1)(W.u.)=0.175 *25*
3405.9	$(1,2^+)$	2472.4 *6*	261 *50*	934.023	2^+		E_γ: possible multiplet in (n,n′γ);
		3326.3 *7*	100 *28*	78.590	2^+		
		3406.2 *8*	78 *22*	0.0	0^+		
3436.3	(14^+)	623.0[c]		2813.3	(12^+)		
		712.6[c]		2723.7	(12^+)		
3540	1	3540[b]	100	0.0	0^+	D[b]	
3554	1	3554[b]	100	0.0	0^+	D[b]	
3566	1	3487[b]	42[a] *8*	78.590	2^+		
		3566[b]	100[a]	0.0	0^+	D[b]	
3572	1	3572[b]	100	0.0	0^+	D[b]	
3583.1	(15^-)	609.9[c] *10*	100	2973.2	(13^-)		
3584.9	(15^+)	600.5[c]	100	2984.4	(13^+)		
3606.4	$(1^+,2^+)$	2646.5[#] *4*	100 *8*	959.994	2^+		I_γ: from Iγ/I(2715γ)=1.52 *22* in ^{170}Ho β^- decay (43 s) γ-ray absent In (n,n′γ).
		2715.1 *8*	66[#] *8*	890.88	(0^+)		Eγ=2716.1 *4* in (n,n′γ).
3623	1	3544[b]	100[a] *43*	78.590	2^+		
		3623[b]	71[a]	0.0	0^+	D[b]	
3633.4	(16^+)	560.1[c]	100	3073.3	(14^+)		
3695	1	3616[b]		78.590	2^+		
		3695[b]		0.0	0^+	D[b]	
3713.1	(15^+)	639.2[c]		3073.9	(13^+)		
		728.7[c]		2984.4	(13^+)		
3792.1	(16^-)	602.9[c] *10*	100	3189.2	(14^-)		
3892.1	(16^+)	616.2[c]	100	3275.9	(14^+)		
3978.4	18^+	752.7[c]	100	3225.7	16^+		
4132.5	(16^+)	696.2[c]		3436.3	(14^+)		
		856.6[c]		3275.9	(14^+)		
4232.3	(18^+)	599.0[c]	100	3633.4	(16^+)		
4249.9	(17^+)	665.0[c]	100	3584.9	(15^+)		
4417.2	(17^+)	704.1[c]	100	3713.1	(15^+)		
4447.7	(18^-)	655.6[c] *10*	100	3792.1	(16^-)		
4579.1	(18^+)	687.0[c]	100	3892.1	(16^+)		

$^{170}_{68}Er_{102}$-17

Adopted Levels, Gammas (continued)

$\gamma(^{170}Er)$ (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π
4787.1	20^+	808.7[c]	100	3978.4	18^+	5558.9	(22^+)	676.4[c]		4882.6	(20^+)
4882.6	(20^+)	650.3[c]		4232.3	(18^+)			771.8[c]		4787.1	20^+
		904.1[c]		3978.4	18^+	5674.8	22^+	792.3[c]		4882.6	(20^+)
4888.7	(18^+)	756.2[c]	100	4132.5	(16^+)			887.7[c]		4787.1	20^+
4978.3	(19^+)	728.4[c]	100	4249.9	(17^+)	6142.9	(22^+)	808.1[c]	100	5334.8	(20^+)
5206.6	(19^+)	789.4[c]	100	4417.2	(17^+)	6586.6	24^+	911.7[c]	100	5674.8	22^+
5334.8	(20^+)	755.7[c]	100	4579.1	(18^+)	7531.4	26^+	944.8	100	6586.6	24^+

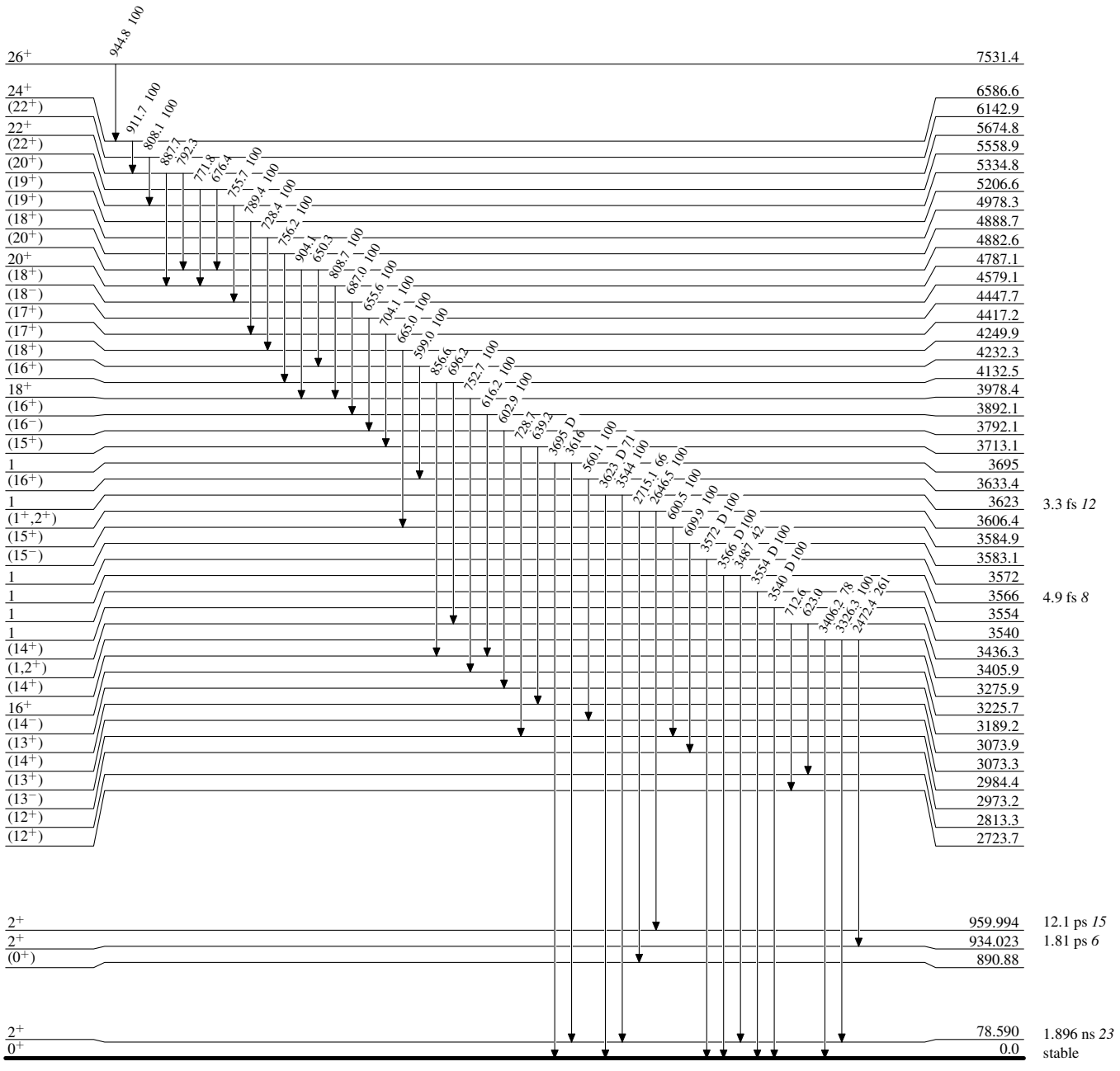
† From ^{170}Er(n,n′γ), except as noted.
‡ From $\gamma(\theta)$ and/or γ linear polarization in (n,n′γ), except as noted.
# From ^{170}Ho β^- decay (43 s).
@ From ^{170}Ho β^- decay (2.76 min).
& From Coulomb excitation.
[a] From $\Gamma_{\gamma 0}/\Gamma$ in (γ,γ').
[b] From (γ,γ').
[c] From (^{238}U,^{238}U′γ).
[d] D+Q or D(+Q) in (n,n′γ); adopted $\Delta\pi$=no.
[e] From ^{170}Er(^{136}Xe,Xγ).
[f] D+Q in (γ,γ'); adopted $\Delta\pi$=yes.
[g] 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.
[h] Multiply placed with undivided intensity.
[i] Placement of transition in the level scheme is uncertain.

$^{170}_{68}Er_{102}$-18

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



$^{170}_{68}Er_{102}$

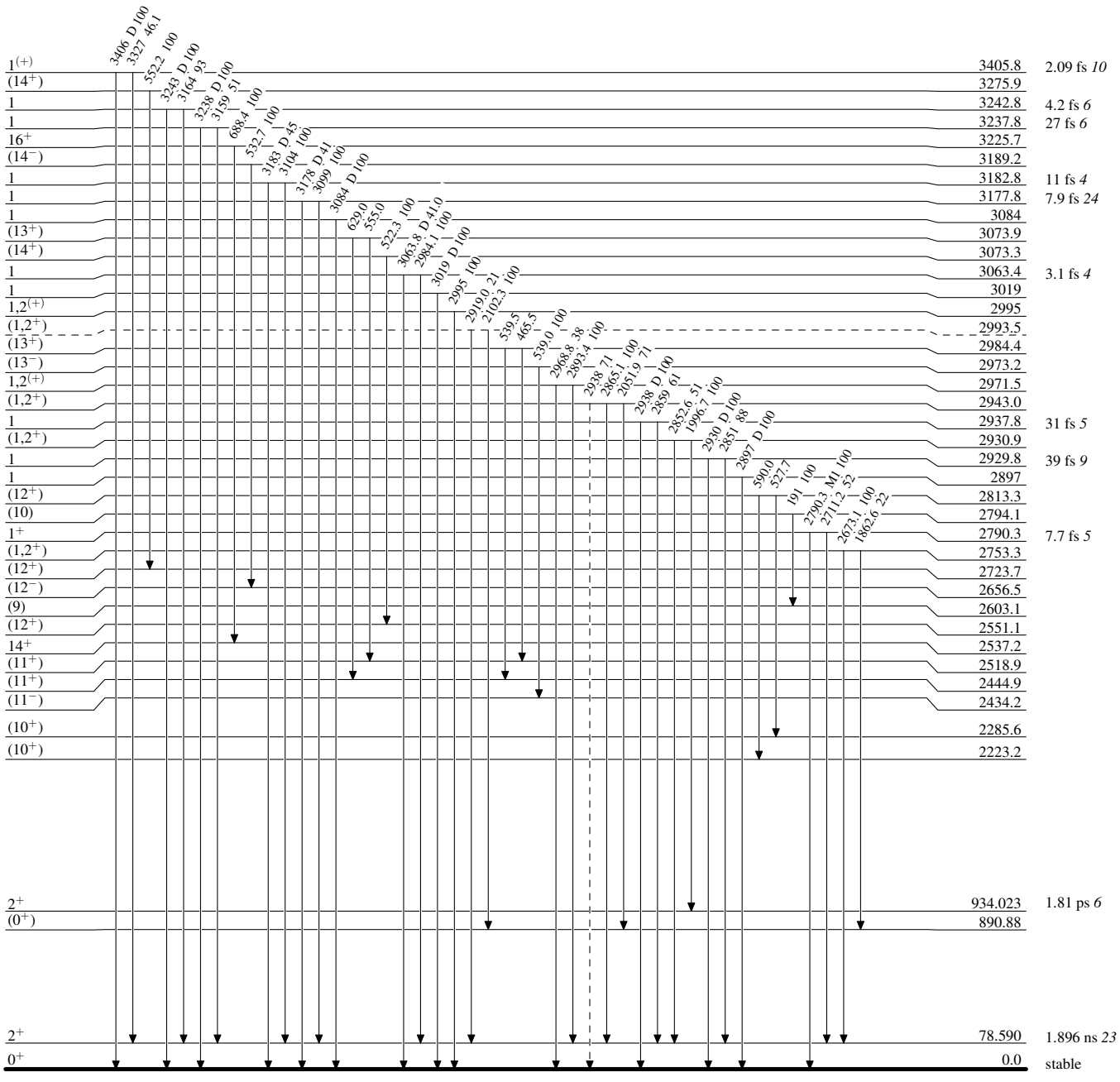
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{170}_{68}Er_{102}$

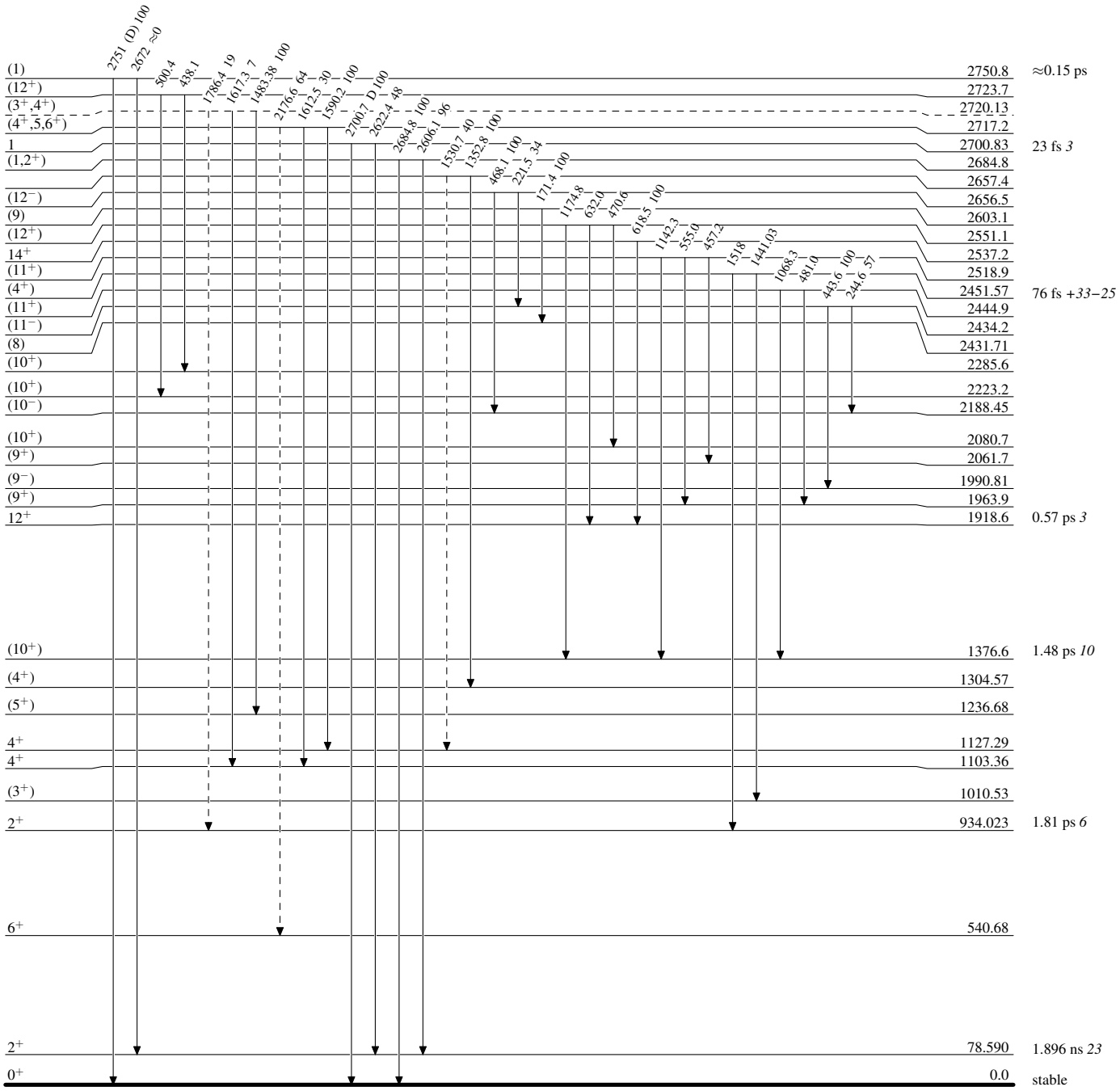
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{170}_{68}Er_{102}$

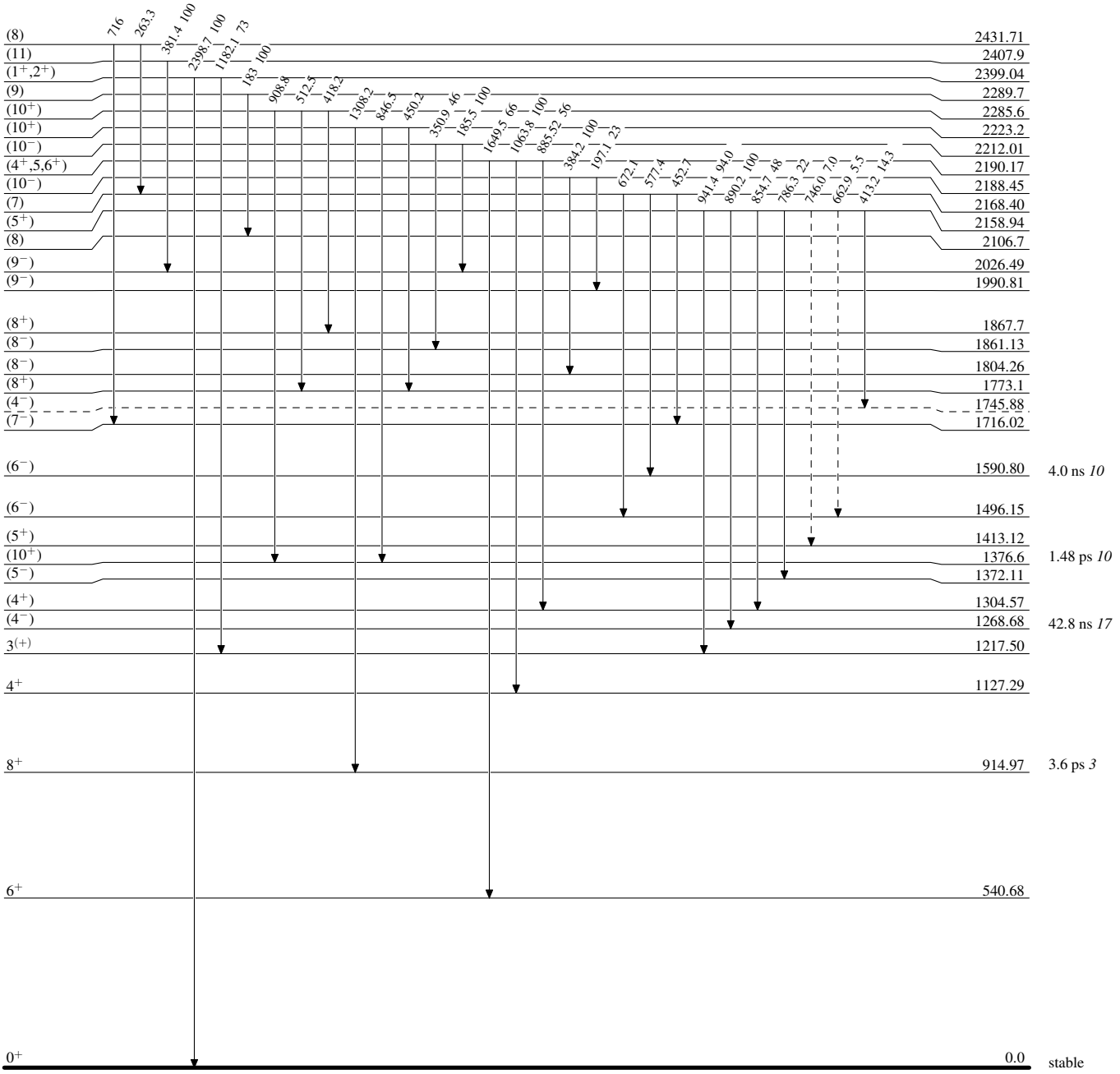
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



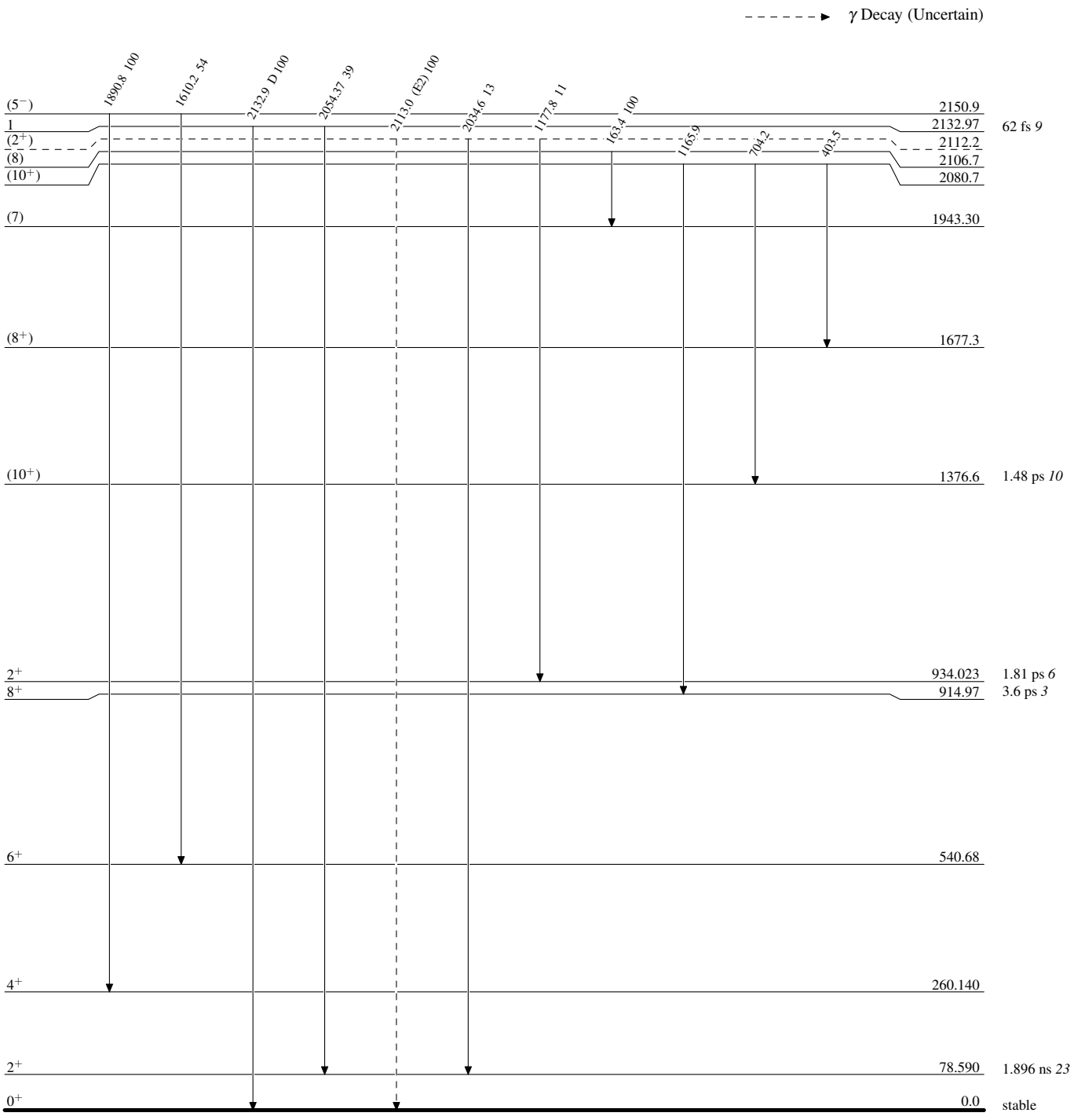
$^{170}_{68}Er_{102}$

Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{170}_{68}Er_{102}$

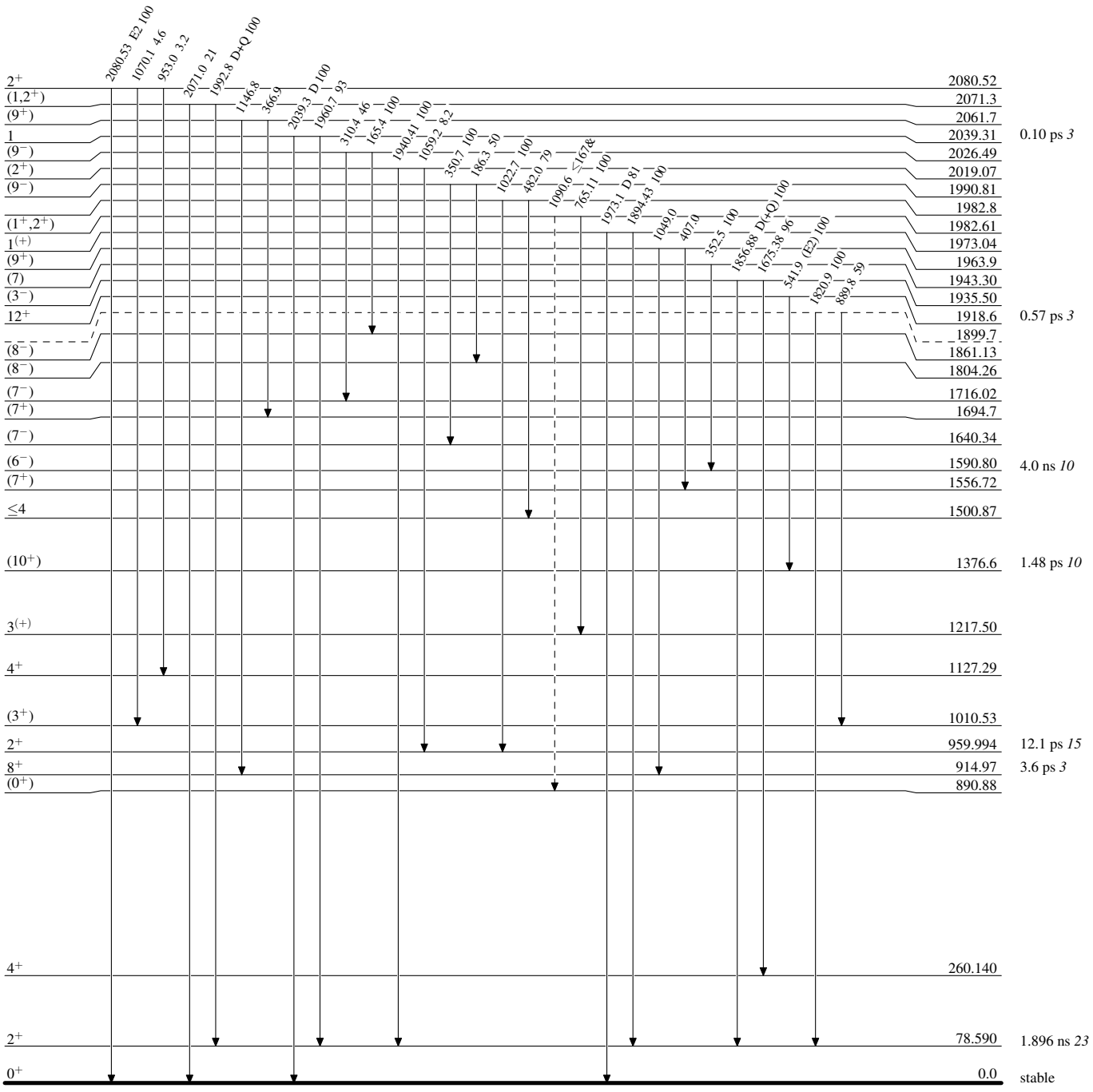
Adopted Levels, Gammas

Legend

Level Scheme (continued)

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

γ Decay (Uncertain)

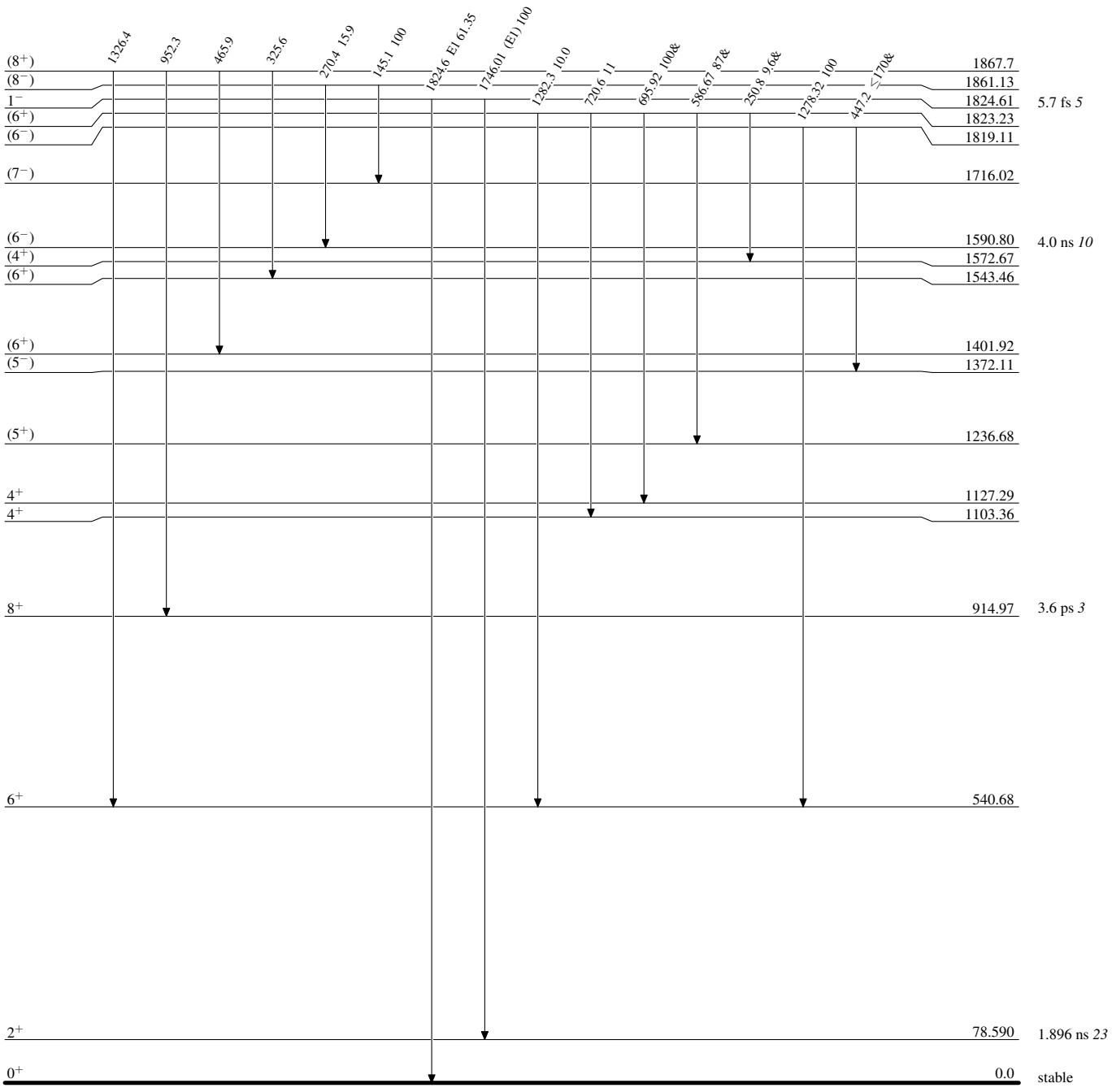


$^{170}_{68}Er_{102}$

Adopted Levels, Gammas

Level Scheme (continued)

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

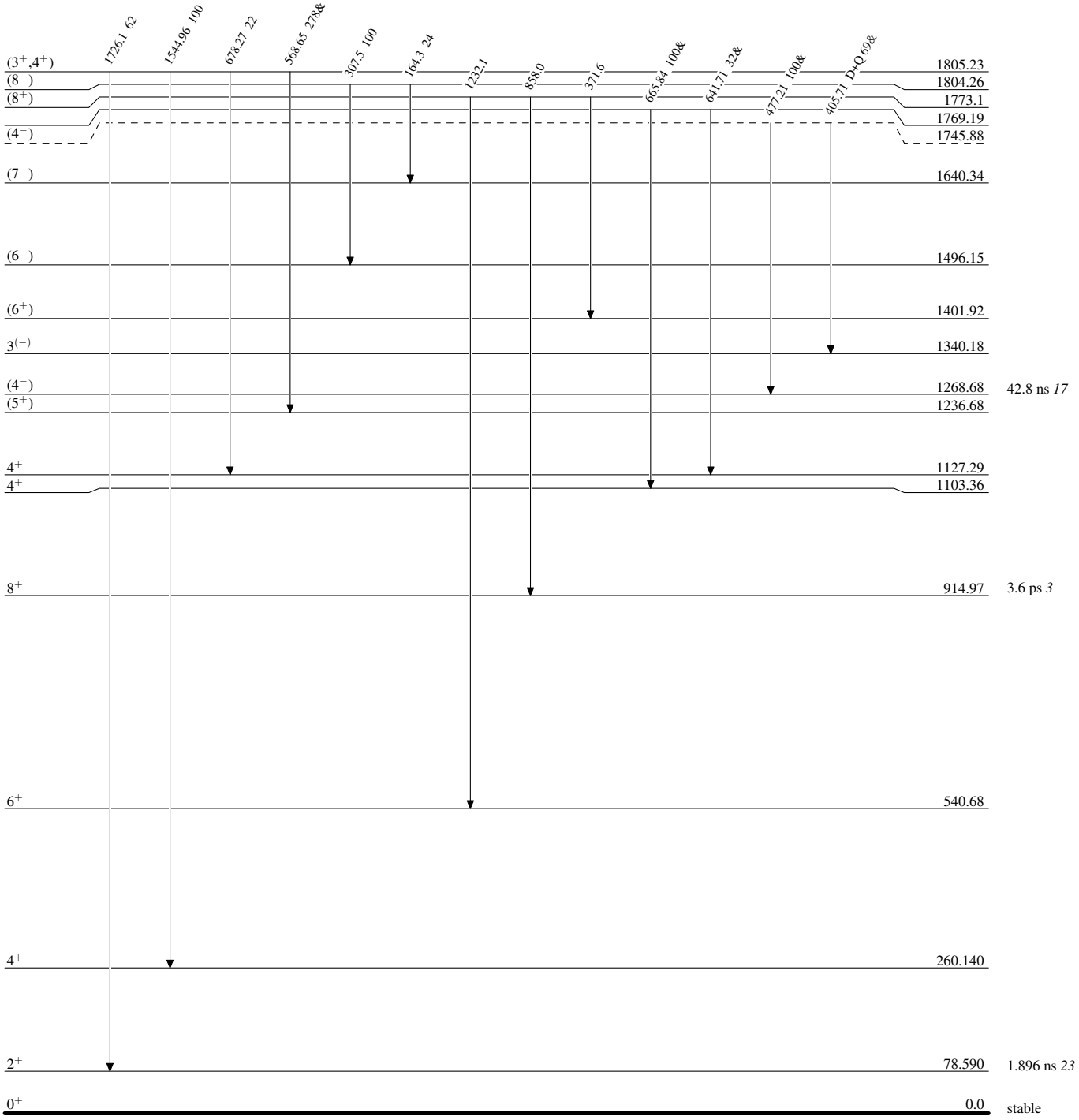


$^{170}_{68}Er_{102}$

Adopted Levels, Gammas

Level Scheme (continued)

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

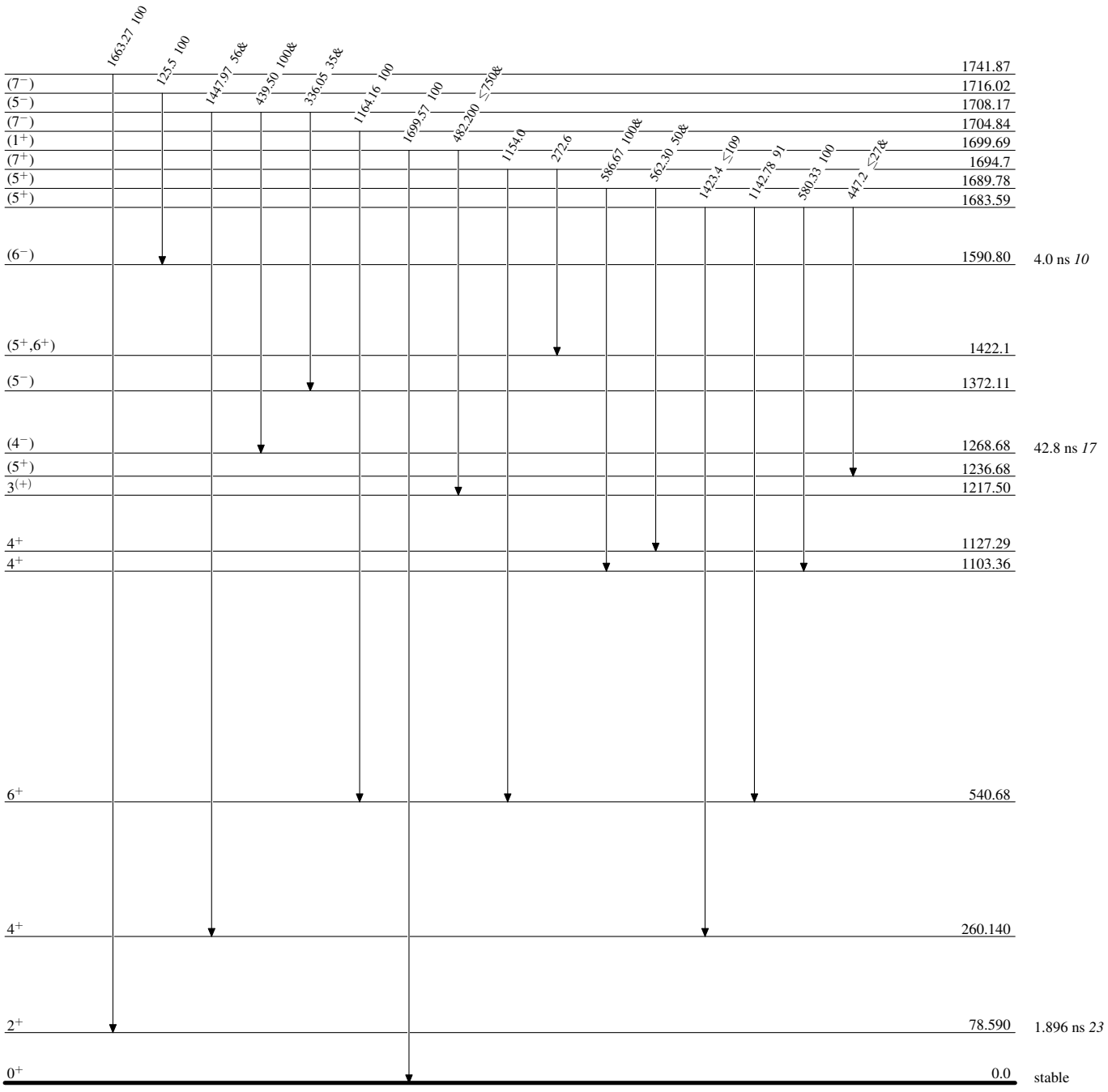


$^{170}_{68}Er_{102}$

Adopted Levels, Gammas

Level Scheme (continued)

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



$^{170}_{68}Er_{102}$

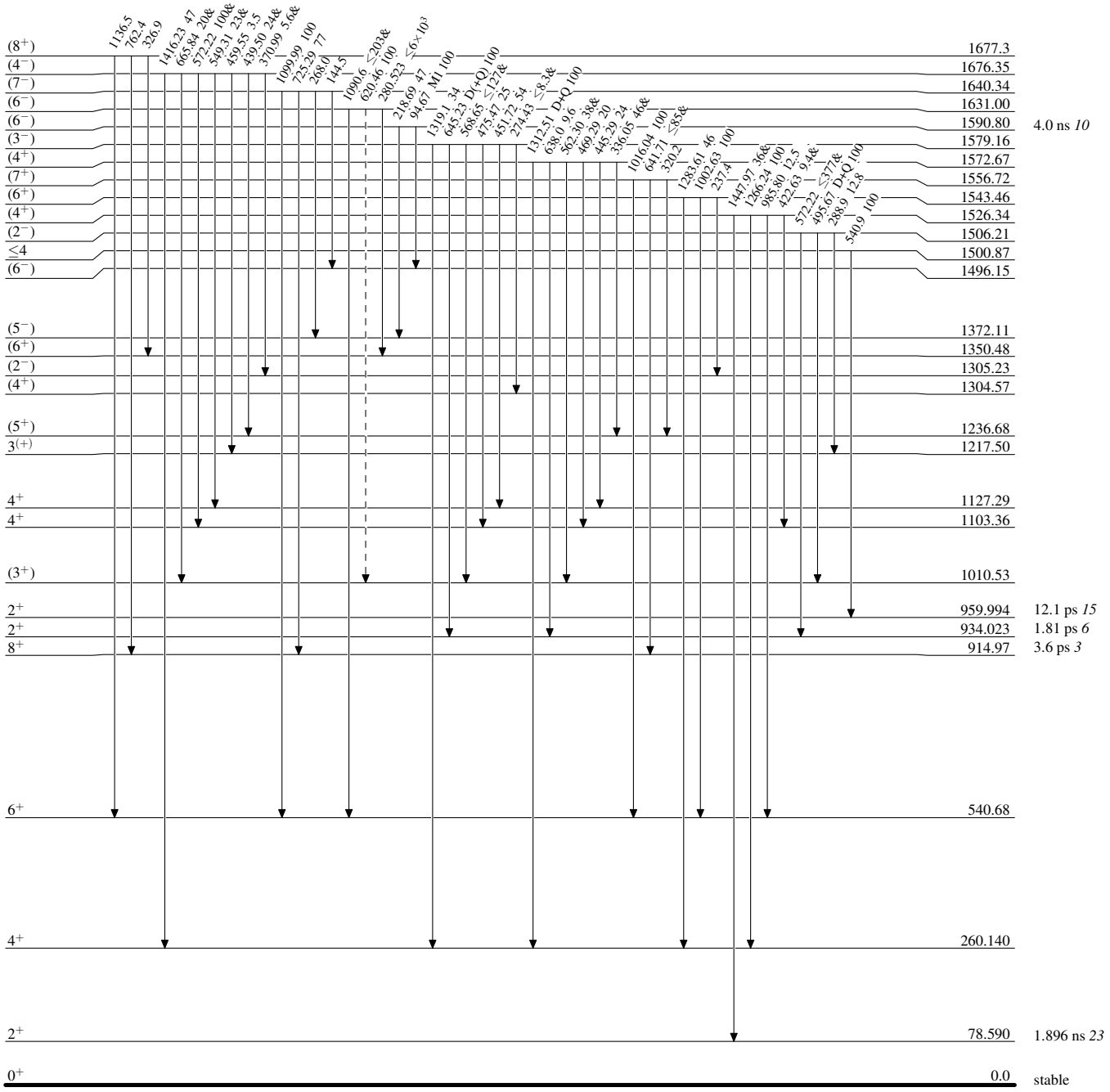
Adopted Levels, Gammas

Legend

Level Scheme (continued)

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

– – – – – – ► γ Decay (Uncertain)



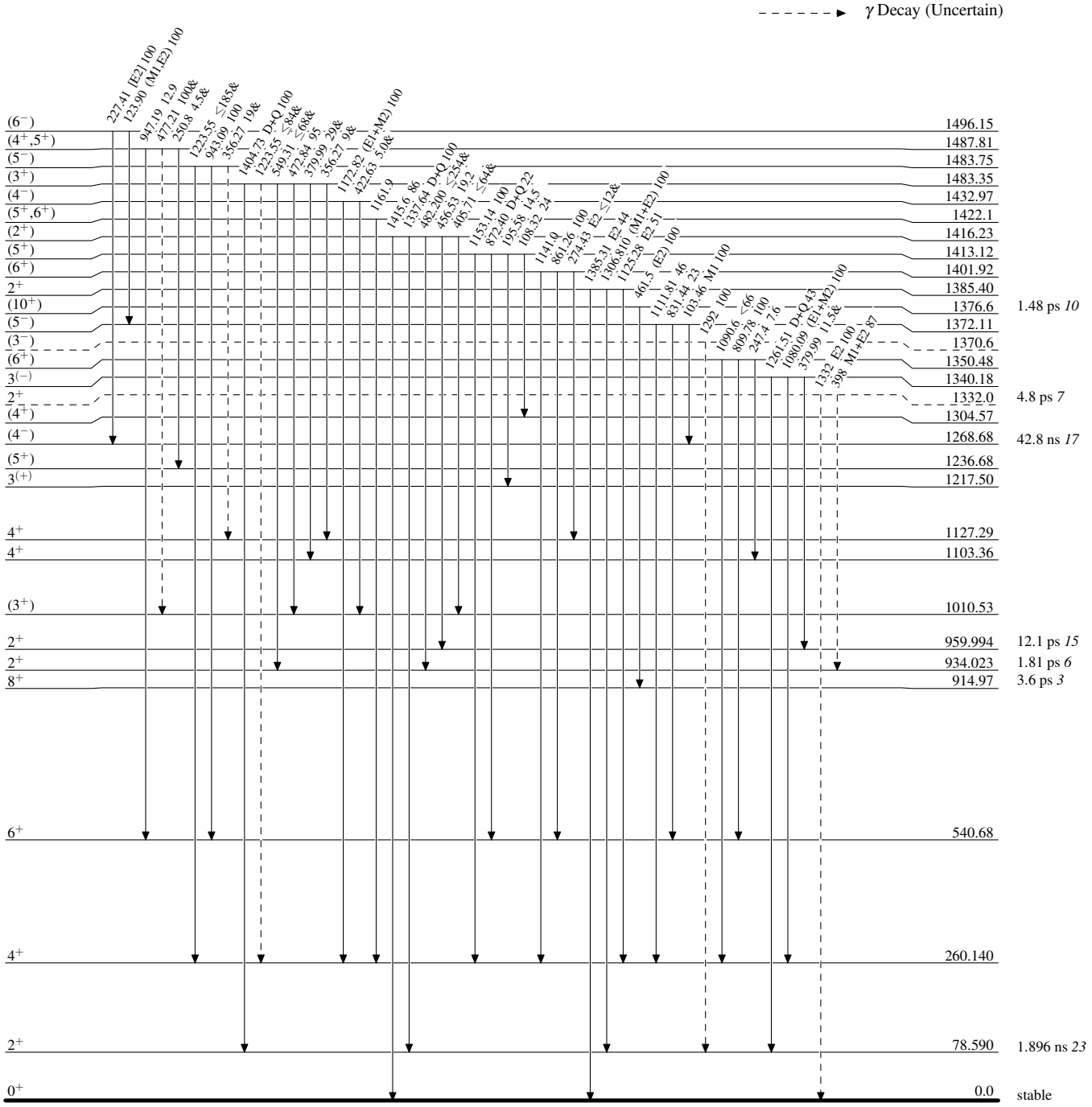
$^{170}_{68}Er_{102}$

Adopted Levels, Gammas

Legend

Level Scheme (continued)

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



$^{170}_{68}Er_{102}$

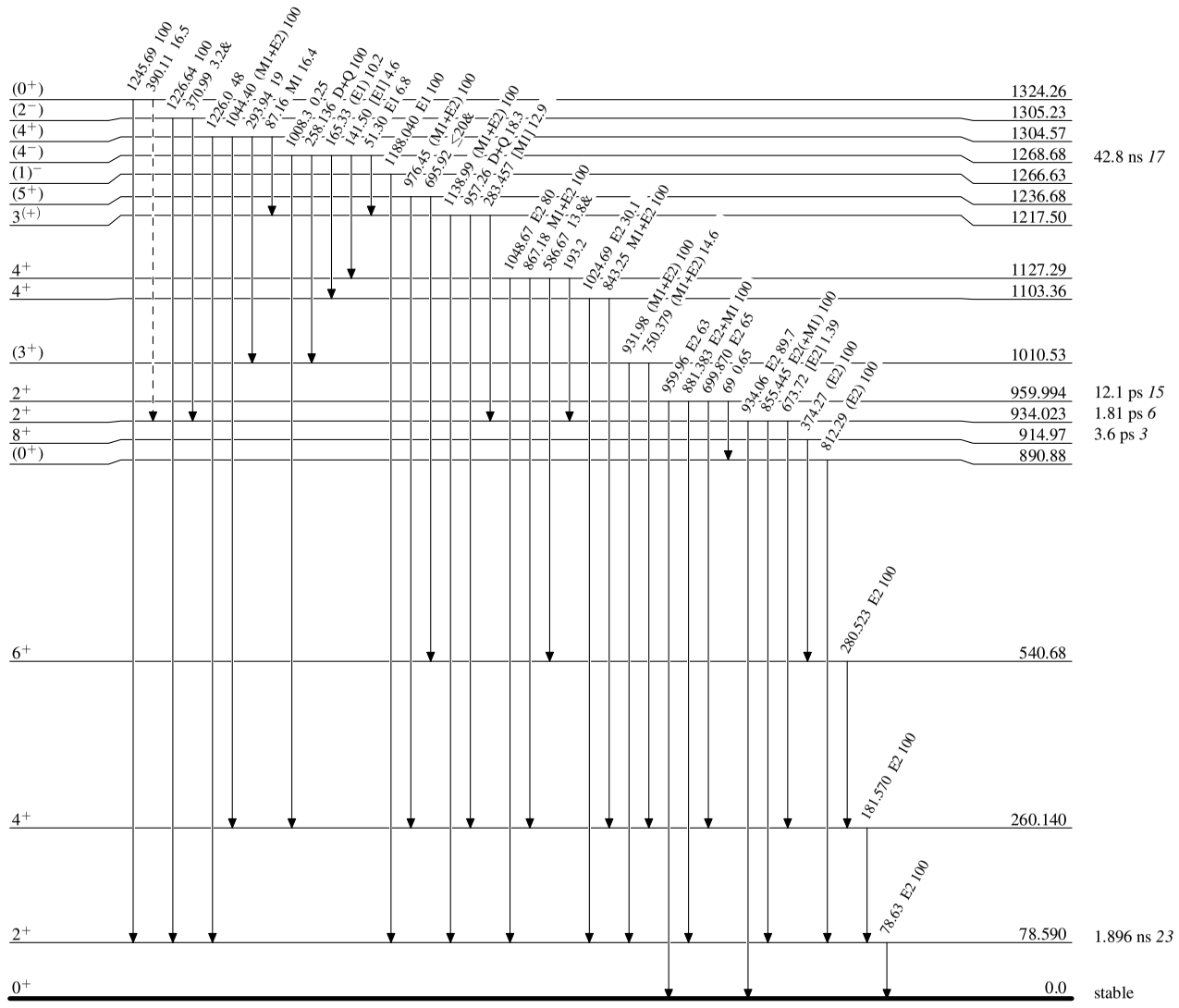
Adopted Levels, Gammas

Legend

Level Scheme (continued)

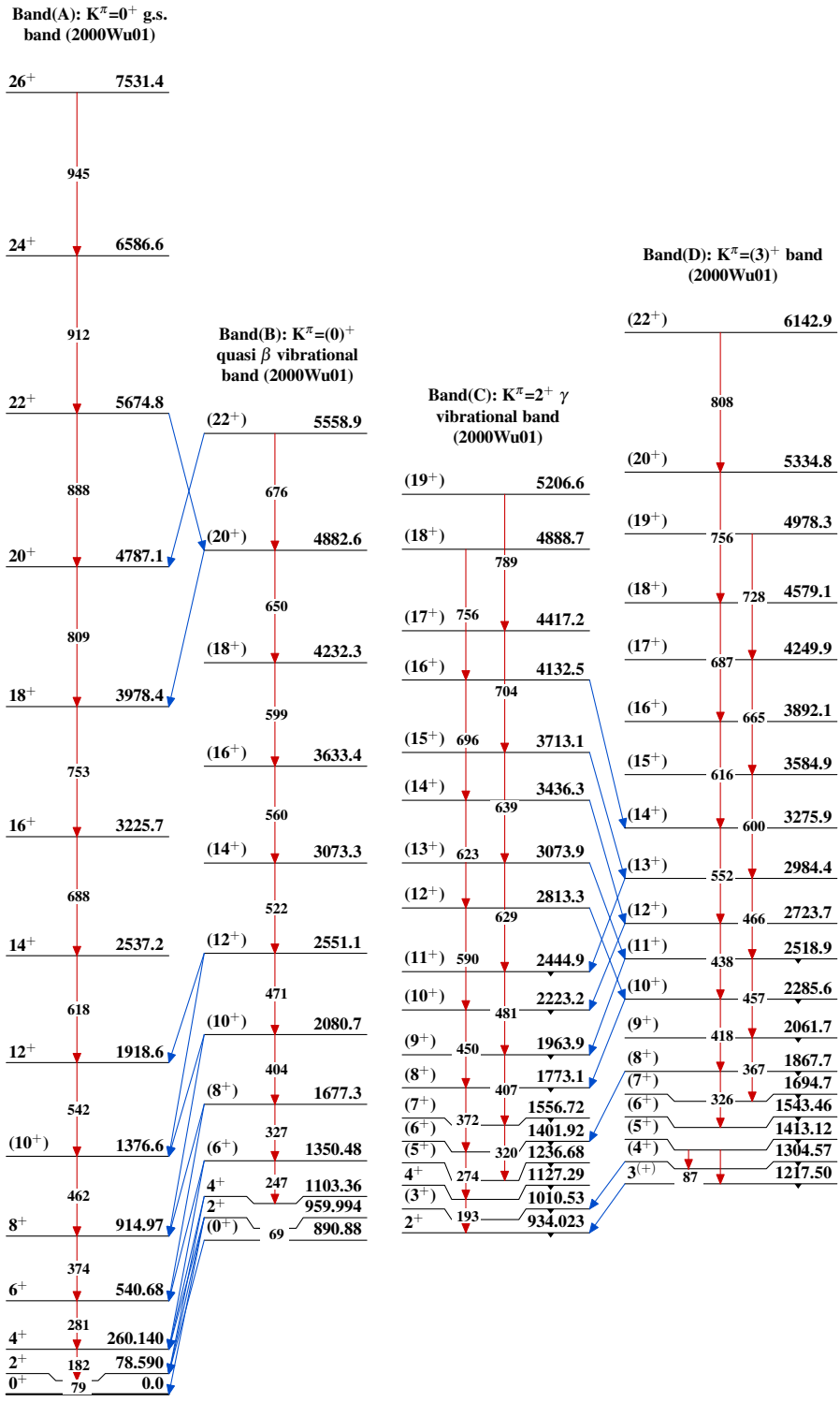
Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

– – – – – – ► γ Decay (Uncertain)

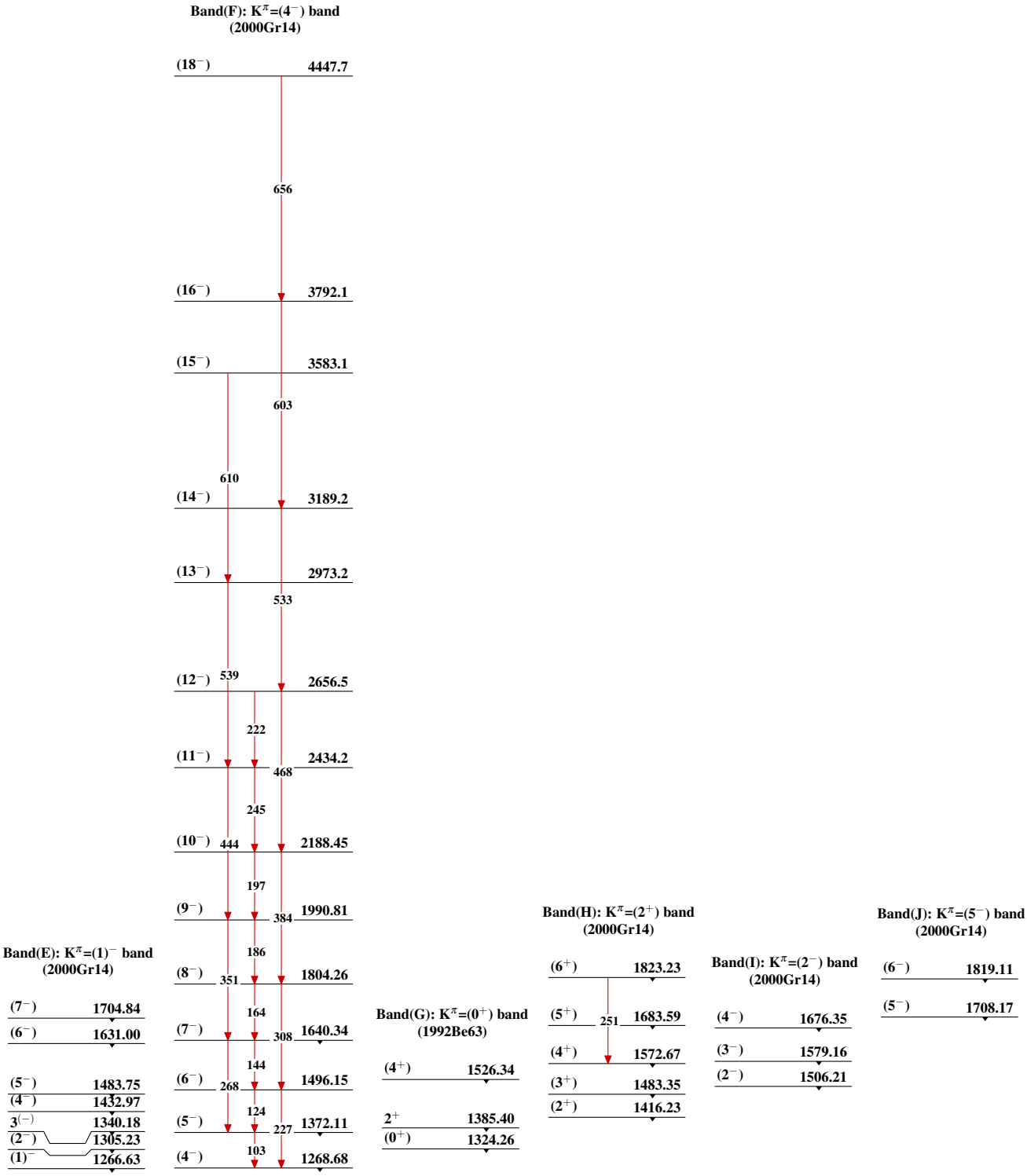


$^{170}_{68}Er_{102}$

Adopted Levels, Gammas

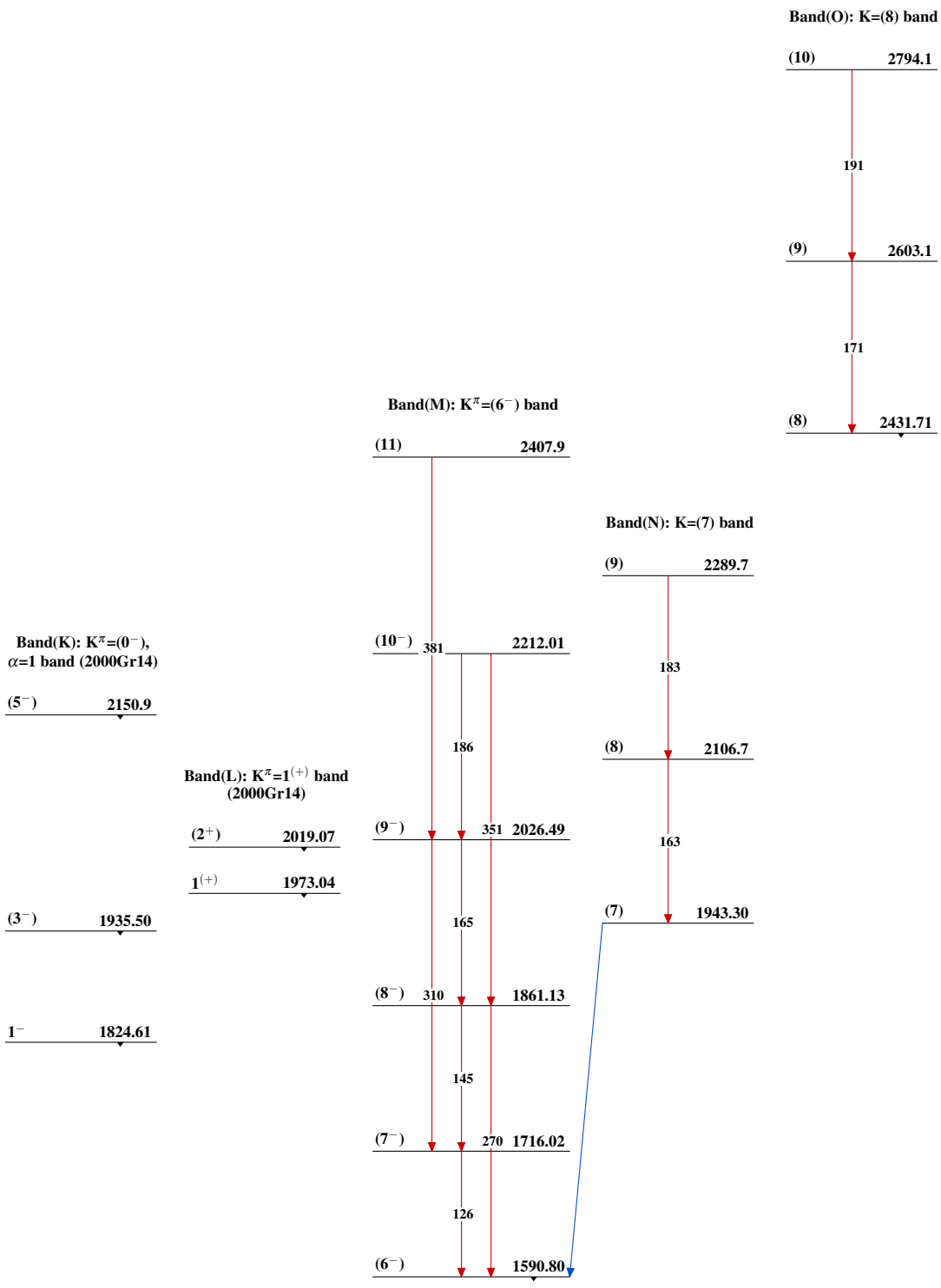


Adopted Levels, Gammas (continued)



$^{170}_{68}Er_{102}$

Adopted Levels, Gammas (continued)



$^{170}_{68}Er_{102}$