^{168}Tm ε decay 1987Me04

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 111, 1807 (2010)	15-Jun-2010

Parent: ^{168}Tm: E=0.0; $J^{\pi}=3^{+}$; $T_{1/2}$=93.1 d *2*; Q(ε)=1678.9 *19*; %ε+%β^{+} decay=99.990 *7*

^{168}Tm-%ε+%β^{+} decay: from total I(γ+ce) to (g.s.(^{168}Er) + g.s.(^{168}Yb))=100%.

Others: 1957Gr74, 1959Ko64, 1960Br37, 1960Ja08, 1961Re07, 1962Bo18, 1964Re05, 1966Ju02, 1967Gu04, 1968Ke01, 1968Ku03, 1968Mi12, 1969Ke06, 1971La11, 1973Ki09, 1983Ji01, 1983Me17, 1985Ad03, 1990Me15, 1993BaZR, 1994Va02, 1996Al31, 1998Al15.

The decay scheme and all data are from 1987Me04, except where noted.

1987Me04: Sources from Tm metal (99.9% pure) + neutrons (E(n)=14.8 MeV), Tm oxide (99.9% pure) + neutrons (E(n) up to 40 MeV, chem), and high-energy spallation of tantalum (chem, mass separation); measured Eγ, Iγ (Ge(Li), high-purity germanium, LEPS spect). A few low-energy transitions were added from ce and (n,γ) data. Reference citations are given with data from other sources.

^{168}Er Levels

E(level)[†]	Jπ[‡]	$T_{1/2}$	Comments
0.0[#]	0+	stable	
79.8038[#] *17*	2+	1.853 ns *25*	$T_{1/2}$: adopted value (incorporates the following from ^{168}Tm decay: 1.72 ns *6* (cece(t), 1974Aw03), 1.92 ns *2* (γγ(t), 1972BeVM), 1.92 ns *4* (γγ(t), 1962Bo18), 1.90 ns *6* (γce(t), 1963Li04), and 1.88 ns *5* (γce(t), 1968Ku03). Others: 1959Be73, 1964Ja09).
264.0964[#] *17*	4+	114 ps *4*	$T_{1/2}$: weighted average of 106 ps *6* (cece(t), 1974Aw03), 113 ps *13* (γγ(t), 1972BeVM), 121 ps *8* (γce(t), 1963Li04), and 119 ps *7* (γce(t), 1968Ku03).
548.757[#] *4*	6+		
821.1643[@] *17*	2+		
895.7943[@] *23*	3+	≤120 ps	$T_{1/2}$: γγ(t) (1991De24).
994.7517[@] *24*	4+		
1094.0449[&] *23*	4−	109.0 ns *7*	$T_{1/2}$: γγ(t); weighted average of 108.9 ns *7* (unpublished value quoted in 1981Iw04), 120 ns *20* (1957Mi01), 110 ns *15* (1959Ko64), 107 ns *10* (1966Ju02), 115.7 ns *33* (1967Gu04), and 107.3 ns *22* (1973Ki09).
1117.5721[@] *25*	5+		
1193.034[&] *3*	5−		
1217.17[a] *15*	0+		
1276.298[a] *24*	2+		
1358.910[b] *12*	1−		
1403.718[b] *10*	(2)−		
1411.100[a] *10*	4+		
1422.3	0+		
1431.454[b] *6*	3−	41 ps	$T_{1/2}$: deduced by 1987Me04 from Coulomb-excitation, (d,d′), and ^{168}Tm-decay data.
1493.26[c] *8*	2+		
1541.5520[d] *24*	3−	8 ps	$T_{1/2}$: deduced by 1987Me04 from reanalysis of Coulomb excitation, (d,d′) and ^{168}Tm-decay data. Other: 1962Bo18 (≤800 ps).
1569.452[e] *7*	(2)−		
1574.12[b] *24*	5−		
1615.339[d] *4*	4−		
1633.453[e] *12*	3−		
1653.53[f] *4*	3+		
1656.312[c] *14*	(4)+		

Continued on next page (footnotes at end of table)

^{168}Tm ε decay 1987Me04 (continued)

^{168}Er Levels (continued)

† From least-squares fit to Eγ.
‡ From Adopted Levels.
# Band(A): K$^{\pi}$=0^{+} g.s. band member.
@ Band(B): K$^{\pi}$=2^{+} γ-vibration band member.
& Band(C): K$^{\pi}$=4^{-} band member.
a Band(D): K$^{\pi}$=0^{+} band member.
b Band(E): K$^{\pi}$=1^{-} octupole band member.
c Band(F): K$^{\pi}$=0^{+} band member.
d Band(G): K$^{\pi}$=3^{-} band.
e Band(H): K$^{\pi}$=2^{-} band.
f Band(I): K$^{\pi}$=3^{+} band.

ε,β^{+} radiations

E(decay)	E(level)	Iβ^{+} ‡	Iε‡	Log *ft*	I($\varepsilon+\beta^{+}$)†‡	Comments
(22.6 *19*)	1656.312		<1.7×10^{-5}	>10.3	<1.7×10^{-5}	εL=0.57 *3*; εM+=0.43 *3*
(25.4 *19*)	1653.53		0.009 *3*	7.74 *18*	0.009 *3*	εL=0.607 *22*; εM+=0.393 *22*
(45.4 *19*)	1633.453		0.020 *8*	8.05 *18*	0.020 *8*	εL=0.698 *5*; εM+=0.302 *5*
(63.6 *19*)	1615.339		0.70 *4*	6.87 *5*	0.70 *4*	εK=0.06 *4*; εL=0.681 *22*; εM+=0.261 *11*
(104.8 *19*)	1574.12		0.00010 *6*	10.3^{1u} *3*	0.00010 *6*	εK=0.080 *9*; εL=0.651 *6*; εM+=0.269 *4*
(109.4 *19*)	1569.452		0.591 *8*	7.82 *3*	0.591 *8*	εK=0.576 *9*; εL=0.316 *7*; εM+=0.108 *3*
(137.3 *19*)	1541.5520		43.66 *12*	6.258 *19*	43.66 *12*	εK=0.663 *5*; εL=0.253 *3*; εM+=0.0838 *12* measured εK(exp)=0.72 *4* (1994Va02; x-γ summing), 0.71 *3* (1982Se07).
(185.6 *19*)	1493.26		0.0015 *5*	11.09 *15*	0.0015 *5*	εK=0.7292 *17*; εL=0.2050 *12*; εM+=0.0659 *5*
(247.4 *19*)	1431.454		0.151 *11*	9.41 *4*	0.151 *11*	εK=0.7650 *8*; εL=0.1787 *6*; εM+=0.05623 *20*
(267.8 *19*)	1411.100		0.0029 *9*	11.21 *14*	0.0029 *9*	εK=0.7722 *7*; εL=0.1735 *5*; εM+=0.05430 *17*
(275.2 *19*)	1403.718		0.0234 *13*	10.33 *3*	0.0234 *13*	εK=0.7745 *6*; εL=0.1718 *5*; εM+=0.05370 *16*
(320.0 *19*)	1358.910		0.0466 *23*	9.675^{1u} *25*	0.0466 *23*	εK=0.6788 *15*; εL=0.2405 *11*; εM+=0.0806 *5*
(402.6 *19*)	1276.298		0.0199 *16*	10.79 *4*	0.0199 *16*	εK=0.7983 *3*; εL=0.15433 *17*; εM+=0.04738 *6*
(584.9 *19*)	1094.0449		46.6 *14*	7.782 *14*	46.6 *14*	εK=0.8122 *1*; εL=0.14410 *7*; εM+=0.04372 *3* measured εK=0.82 *5* (1994Va02) from x-γ summing.
(783.1# *19*)	895.7943		<0.6	>9.9	<0.6	εK=0.8193; εL=0.13884 *4*; εM+=0.04184 *2*
(857.7 *19*)	821.1643		11.98 *10*	8.729 *5*	11.98 *10*	εK=0.8211; εL=0.13754 *3*; εM+=0.04138 *1*
(1414.8 *19*)	264.0964		0.43 *25*	10.6 *3*	0.43 *25*	εK=0.8274; εL=0.1323; εM+=0.039519 *5*
(1599.1 *19*)	79.8038	<0.004	<1.0	>10.4	<1	av Eβ=274.21 *84*; εK=0.8263; εL=0.13102 *2*; εM+=0.039095 *5* I($\varepsilon+\beta^{+}$): deduced from I($\gamma^{\pm}$)=0.15 *3*, ε/β^{+} from theory, and Iβ^{+} for branch to 264.1 level.

† ε feedings are from intensity imbalance at each level (negligible g.s. feeding expected because ΔJ=3).
‡ Absolute intensity per 100 decays.
# Existence of this branch is questionable.

γ(^{168}Er)

Iγ normalization: from total I(γ+ce) to (g.s.(^{168}Er) + g.s.(^{168}Yb))=100%.

See 1959Ko64, 1960Ja08, 1961Re07, 1962Bo18, 1964Re05, 1968Ke01, 1968Mi12, 1971La11, 1972BeVM, 1972BeVW, 1973Ki09, 1975Be43, 1980Fu03, 1981Iw04, 1982Se07, 1996Al31 and 1998Al15 for $\gamma\gamma$ and/or $\gamma\gamma(\theta)$ data.

E(aefgh) From Adopted Gammas.

K x ray data (1982Se07); intensities relative to Iγ=100 2 for 198.2γ.

	E(x ray)	I(x ray)
Er Kα_2 x ray	48.22	51.6 12
Er Kα_1 x ray	49.13	91.7 20
Er Kβ_1' x ray	55.68	29.7 6
Er Kβ_2' x ray	57.21	7.65 15

E$_\gamma$[‡]	I$_\gamma$[‡d]	E$_i$(level)	J$^\pi_i$	E$_f$	J$^\pi_f$	Mult.[#]	δ[#]	α[†]	I$_{(\gamma+ce)}$[d]	Comments
27.80		1569.452	(2)$^-$	1541.5520	3$^-$	M1,E2		5.×10^2 *5*		α(L)=4.E2 4; α(M)=9.E1 9; α(N+..)=22 *21* α(N)=19 *19*; α(O)=2.2 *22*; α(P)=0.0039 *24* E$_\gamma$,Mult.: from 1993BaZR. L1/L2=1.2 (1993BaZR); L1:L2=0.34:0.28 (1975Ab06).
(59.13 *15*)	0.00032 *16*	1276.298	2$^+$	1217.17	0$^+$	[E2]		24.3 *5*	0.008 *4*	ce(K)/(γ+ce)=0.0749 *17*; ce(L)/(γ+ce)=0.679 *9*; ce(M)/(γ+ce)=0.165 *4*; ce(N+)/(γ+ce)=0.0416 *11* ce(N)/(γ+ce)=0.0373 *10*; ce(O)/(γ+ce)=0.00430 *11*; ce(P)/(γ+ce)=5.46×10^{-6} *13* E$_\gamma$: from level-energy difference. I$_{(\gamma+ce)}$: required for intensity balance at 1217.2 level. I$_\gamma$: deduced from I(γ+ce) and α.
64.0		1633.453	3$^-$	1569.452	(2)$^-$	(E2)		17.36		α(K)=2.06 *3*; α(L)=11.72 *17*; α(M)=2.86 *4*; α(N+..)=0.720 *10* α(N)=0.645 *9*; α(O)=0.0746 *11*; α(P)=0.0001179 *17* E$_\gamma$,Mult.: from 1993BaZR; L2≈L3 (1993BaZR).
70.9		1493.26	2$^+$	1422.3	0$^+$	(E2)		11.35		α(K)=1.98 *3*; α(L)=7.18 *10*; α(M)=1.750 *25*; α(N+..)=0.441 *7* α(N)=0.395 *6*; α(O)=0.0458 *7*; α(P)=9.56×10^{-5} *14* E$_\gamma$,Mult.: from 1993BaZR; L2=L3 (1993BaZR).
73.784 *3*	0.19[@] *4*	1615.339	4$^-$	1541.5520	3$^-$	M1+E2	0.11 *+3−2*	6.87		α(K)=5.68 *9*; α(L)=0.93 *4*; α(M)=0.207 *10*; α(N+..)=0.0553 *24* α(N)=0.0481 *22*; α(O)=0.00684 *25*; α(P)=0.000352 *6* Mult.: α(K)exp=5.9 *16* (1993BaZR).
74.626 *3*	0.34[@] *10*	895.7943	3$^+$	821.1643	2$^+$	M1+E2	+1.42 *+4−5*	8.35 *13*		α(K)=3.09 *8*; α(L)=4.04 *10*; α(M)=0.978 *24*;

γ(^{168}Er) (continued)

E_γ[‡]	I_γ[‡d]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[#]	α[†]	Comments
									α(N+..)=0.248 6 α(N)=0.222 6; α(O)=0.0261 6; α(P)=0.000171 5 Mult.: K:L1:L2:L3=0.52:0.069:0.34:0.34 (1975Ab06). δ: sign from 75γ-821γ(θ) (1996Al31).
75.466 7	0.0078[@] 25	1193.034	5^-	1117.5721	5^+	E1		0.682	α(K)=0.561 8; α(L)=0.0945 14; α(M)=0.0210 3; α(N+..)=0.00543 8 α(N)=0.00478 7; α(O)=0.000626 9; α(P)=2.43×10^{-5} 4 Mult.: from α(K)exp=3.1 10 (1993BaZR). α(K)exp implies δ(E1,M2)=0.22 +4−5.
79.804 2	201 4	79.8038	2^+	0.0	0^+	E2		7.04	α(K)=1.698 24; α(L)=4.10 6; α(M)=0.998 14; α(N+..)=0.252 4 α(N)=0.226 4; α(O)=0.0262 4; α(P)=7.44×10^{-5} 11 Mult.: K:L1:L2:L3=37.4:3.7:37.4:37.0 (1975Ab06). %Iγ=10.94 13 assuming recommended decay scheme normalization.
98.982 2	2.8 4	1193.034	5^-	1094.0449	4^-	E2		3.06	α(K)=1.101 16; α(L)=1.499 21; α(M)=0.364 6; α(N+..)=0.0922 13 α(N)=0.0824 12; α(O)=0.00968 14; α(P)=4.58×10^{-5} 7 Eγ=99.293 2 for doublet (1987Me04).
99.289 2	77.7 4	1094.0449	4^-	994.7517	4^+	E1+M2[b]	−0.06[b] 5	0.43 23	α(K)=0.35 17; α(L)=0.06 5; α(M)=0.015 12; α(N+..)=0.004 3 α(N)=0.003 3; α(O)=0.0005 4; α(P)=2.0×10^{-5} 18 Eγ=99.293 2 for doublet (1987Me04). Mult.: K:L1:L2=1.0:0.14:0.05 (1975Ab06).
110.2		1541.5520	3^-	1431.454	3^-	M1(+E2)		2.10 7	α(K)=1.3 5; α(L)=0.6 4; α(M)=0.14 9; α(N+..)=0.036 20 α(N)=0.032 19; α(O)=0.0040 20; α(P)=7.E−5 4 Mult.: α(K)exp=1.6 5 (1993BaZR).
122.821 1	0.0023[@] 5	1117.5721	5^+	994.7517	4^+	M1+E2	1.57 +7−9	1.434 21	α(K)=0.840 21; α(L)=0.457 11; α(M)=0.109 3; α(N+..)=0.0279 7 α(N)=0.0249 7; α(O)=0.00303 7; α(P)=4.29×10^{-5} 15
[x]138.15									Eγ: from 1975Ab06; No other studies have confirmed this line, so placement from 1569 level is rejected by evaluator.
165.3		1569.452	$(2)^-$	1403.718	$(2)^-$	M1(+E2)		0.58 11	α(K)=0.43 15; α(L)=0.12 4; α(M)=0.028 9; α(N+..)=0.0072 22 α(N)=0.0064 20; α(O)=0.00083 19; α(P)=2.4×10^{-5} 12 Mult.: α(K)exp=0.48 16 (1993BaZR).
173.591 19	0.77 4	994.7517	4^+	821.1643	2^+	E2		0.406	α(K)=0.244 4; α(L)=0.1243 18; α(M)=0.0298 5; α(N+..)=0.00760 11 α(N)=0.00677 10; α(O)=0.000825 12; α(P)=1.112×10^{-5} 16
184.295 2	333 3	264.0964	4^+	79.8038	2^+	E2		0.331	α(K)=0.206 3; α(L)=0.0967 14; α(M)=0.0231 4; α(N+..)=0.00591 9

γ(^{168}Er) (continued)

E_γ[‡]	I_γ[‡d]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[#]	α[†]	Comments
									α(N)=0.00526 *8*; α(O)=0.000644 *9*; α(P)=9.49×10^{-6} *14* Mult.: K:L1:L2:L3=6.64:0.68:1.0:0.76 (1975Ab06).
^{x}196.4						M1(+E2)		0.35 *8*	α(K)=0.26 *10*; α(L)=0.064 *11*; α(M)=0.015 *3*; α(N+..)=0.0038 *7* α(N)=0.0034 *7*; α(O)=0.00045 *6*; α(P)=1.5×10^{-5} *7* Mult.: from α(K)exp=0.36 *13* (1993BaZR).
198.251 *2*	1000 *3*	1094.0449	4$^-$	895.7943	3$^+$	E1+M2	−0.12 *3*	0.084 *18*	α(K)=0.069 *14*; α(L)=0.012 *3*; α(M)=0.0027 *7*; α(N+..)=0.00072 *18* α(N)=0.00062 *16*; α(O)=8.7×10^{-5} *23*; α(P)=4.2×10^{-6} *12* Mult.: K:L1:L2:L3=4.13:0.8:0.12:0.12 (1975Ab06). δ: −0.12 *3* from γγ(θ) In text and abstract of 1981Iw04 (but −0.13 *2* In table II and fig. 5). others: <0.095 (1975Ab06), +0.02 *2* (1975Be43).
205.1		1422.3	0$^+$	1217.17	0$^+$	E0			E_γ,Mult.: from 1993BaZR; conversion electrons but No photons observed.
221.8 *5*	0.04 *2*	1117.5721	5$^+$	895.7943	3$^+$	E2		0.179	α(K)=0.1200 *19*; α(L)=0.0454 *8*; α(M)=0.01077 *18*; α(N+..)=0.00277 *5* α(N)=0.00246 *5*; α(O)=0.000306 *5*; α(P)=5.79×10^{-6} *9*
272.896 *13*	1.70 *7*	1094.0449	4$^-$	821.1643	2$^+$	M2		0.754	α(K)=0.602 *9*; α(L)=0.1175 *17*; α(M)=0.0270 *4*; α(N+..)=0.00726 *11* α(N)=0.00631 *9*; α(O)=0.000898 *13*; α(P)=4.61×10^{-5} *7* Mult.: K:L1:L2:L3=0.14:0.022:0.005:0.004 (1975Ab06).
284.655 *14*	1.66 *8*	548.757	6$^+$	264.0964	4$^+$	E2		0.0811	α(K)=0.0586 *9*; α(L)=0.01734 *25*; α(M)=0.00407 *6*; α(N+..)=0.001052 *15* α(N)=0.000930 *13*; α(O)=0.0001189 *17*; α(P)=2.99×10^{-6} *5*
348.509 *2*	6.49 *7*	1541.5520	3$^-$	1193.034	5$^-$	E2		0.0442	α(K)=0.0334 *5*; α(L)=0.00837 *12*; α(M)=0.00194 *3*; α(N+..)=0.000506 *7* α(N)=0.000446 *7*; α(O)=5.82×10^{-5} *9*; α(P)=1.766×10^{-6} *25* Mult.: K:L1=0.021:0.003 (1975Ab06).
422.305 *7*	5.59 *8*	1615.339	4$^-$	1193.034	5$^-$	M1		0.0540	α(K)=0.0455 *7*; α(L)=0.00662 *10*; α(M)=0.001464 *21*; α(N+..)=0.000394 *6* α(N)=0.000341 *5*; α(O)=4.95×10^{-5} *7*; α(P)=2.76×10^{-6} *4* Mult.: K:L1=0.028:0.005 (1975Ab06).
445.995 *4*	1.4 *4*	994.7517	4$^+$	548.757	6$^+$	[E2]		0.0222	α(K)=0.01743 *25*; α(L)=0.00370 *6*; α(M)=0.000849 *12*; α(N+..)=0.000222 *4* α(N)=0.000195 *3*; α(O)=2.61×10^{-5} *4*; α(P)=9.53×10^{-7} *14* Eγ=447.501 *2* for (446γ+448γ) doublet (1987Me04).
447.515 *3*	440 *2*	1541.5520	3$^-$	1094.0449	4$^-$	M1+E2[a]	−0.09[a] *1*	0.0463	Mult.: K:L1:L2:L3=2.0:0.31:0.048:0.01 (1975Ab06). α(K)=0.0390 *6*; α(L)=0.00567 *8*; α(M)=0.001253 *18*; α(N+..)=0.000337 *5* α(N)=0.000292 *4*; α(O)=4.24×10^{-5} *6*; α(P)=2.36×10^{-6} *4* Eγ=447.501 *2* for (446γ+448γ) doublet (1987Me04). other δ: −0.09 *+3−8* (1975Be43).
497.78 *6*	0.68 *8*	1615.339	4$^-$	1117.5721	5$^+$	E1		0.00564 *8*	α=0.00564 *8*; α(K)=0.00478 *7*; α(L)=0.000670 *10*;

$^{168}_{68}$Er$_{100}$-5

γ(^{168}Er) (continued)

$E_γ$[‡]	$I_γ$[‡d]	E_i(level)	$J^π_i$	E_f	$J^π_f$	Mult.[#]	δ[#]	α[†]	Comments
									α(M)=0.0001473 21; α(N+..)=3.93×10^{-5} 6 α(N)=3.41×10^{-5} 5; α(O)=4.86×10^{-6} 7; α(P)=2.56×10^{-7} 4
521.13 7	0.58 7	1615.339	4$^-$	1094.0449	4$^-$	M1+E2	1.1 +9−5	0.022 5	α(K)=0.018 5; α(L)=0.0030 5; α(M)=0.00067 10; α(N+..)=0.00018 3 α(N)=0.000155 22; α(O)=2.2×10^{-5} 4; α(P)=1.1×10^{-6} 3
535.642 21	0.0048[@] 10	1431.454	3$^-$	895.7943	3$^+$				
537.76 6	0.0058[@] 12	1358.910	1$^-$	821.1643	2$^+$				
546.81 3	48.7[&] 4	1541.5520	3$^-$	994.7517	4$^+$	E1(+M2)[a]	+0.007[a] 23	0.00460 10	α=0.00460 10; α(K)=0.00390 8; α(L)=0.000543 12; α(M)=0.000119 3; α(N+..)=3.19×10^{-5} 8 α(N)=2.77×10^{-5} 7; α(O)=3.95×10^{-6} 9; α(P)=2.10×10^{-7} 5 other δ: −0.01 3 (1975Be43).
557.083 12	4.1 2	821.1643	2$^+$	264.0964	4$^+$	E2[c]		0.01252	α(K)=0.01008 15; α(L)=0.00190 3; α(M)=0.000430 6; α(N+..)=0.0001135 16 α(N)=9.94×10^{-5} 14; α(O)=1.357×10^{-5} 19; α(P)=5.63×10^{-7} 8
559.5 4	0.15 5	1653.53	3$^+$	1094.0449	4$^-$	E1		0.00437 7	α=0.00437 7; α(K)=0.00371 6; α(L)=0.000516 8; α(M)=0.0001134 16; α(N+..)=3.03×10^{-5} 5 α(N)=2.63×10^{-5} 4; α(O)=3.76×10^{-6} 6; α(P)=2.00×10^{-7} 3
568.8 4	0.11 5	1117.5721	5$^+$	548.757	6$^+$	E2+M1	3.6 3	0.01284 25	α(K)=0.01042 21; α(L)=0.00188 3; α(M)=0.000424 7; α(N+..)=0.0001123 19 α(N)=9.81×10^{-5} 16; α(O)=1.352×10^{-5} 23; α(P)=5.89×10^{-7} 13
582.57 25	0.03 2	1403.718	(2)$^-$	821.1643	2$^+$	E1		0.00401 6	α=0.00401 6; α(K)=0.00340 5; α(L)=0.000472 7; α(M)=0.0001037 15; α(N+..)=2.77×10^{-5} 4 α(N)=2.41×10^{-5} 4; α(O)=3.44×10^{-6} 5; α(P)=1.84×10^{-7} 3
[x]615.15						M1+E0			Mult.: from α(K)exp=0.029 6 (1993BaZR).
620.59 7	0.14 5	1615.339	4$^-$	994.7517	4$^+$				
[x]626.06						M1+E0			Mult.: from α(K)exp=0.026 5 (1993BaZR).
631.705 3	170 1	895.7943	3$^+$	264.0964	4$^+$	M1+E2	−4.8 2	0.00965 14	α=0.00965 14; α(K)=0.00788 12; α(L)=0.001376 20; α(M)=0.000310 5; α(N+..)=8.22×10^{-5} 12 α(N)=7.18×10^{-5} 11; α(O)=9.95×10^{-6} 15; α(P)=4.46×10^{-7} 7 Mult.: K:L1=0.13:0.028 (1975Ab06). δ: from γγ(θ) (1981Iw04). others: −4.9 3 (1975Be43); δ>71 (1975Ab06).
644.277 5	0.23[@] 4	1193.034	5$^-$	548.757	6$^+$	E1		0.00324 5	α=0.00324 5; α(K)=0.00276 4; α(L)=0.000380 6;

From ENSDF

γ(^{168}Er) (continued)

E_γ[‡]	I_γ[‡d]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[#]	α[†]	Comments
									α(M)=8.35×10^{-5} *12*; α(N+..)=2.23×10^{-5} *4* α(N)=1.94×10^{-5} *3*; α(O)=2.78×10^{-6} *4*; α(P)=1.493×10^{-7} *21* Eγ=645.766 *3* for (644γ+646γ) doublet (1987Me04).
645.775 *15*	27.2[&] *2*	1541.5520	3$^-$	895.7943	3$^+$	E1		0.00323 *5*	α=0.00323 *5*; α(K)=0.00274 *4*; α(L)=0.000378 *6*; α(M)=8.31×10^{-5} *12*; α(N+..)=2.22×10^{-5} *4* α(N)=1.93×10^{-5} *3*; α(O)=2.76×10^{-6} *4*; α(P)=1.486×10^{-7} *21* Eγ=645.766 *3* for (644γ+646γ) doublet (1987Me04).
673.670 *15*	3.0 *1*	1569.452	(2)$^-$	895.7943	3$^+$	E1		0.00296 *5*	α=0.00296 *5*; α(K)=0.00252 *4*; α(L)=0.000346 *5*; α(M)=7.60×10^{-5} *11*; α(N+..)=2.03×10^{-5} *3* α(N)=1.764×10^{-5} *25*; α(O)=2.53×10^{-6} *4*; α(P)=1.364×10^{-7} *19*
719.550 *5*	3.8[@] *6*	1615.339	4$^-$	895.7943	3$^+$	E1+M2	−0.007 *4*	0.00259 *4*	α=0.00259 *4*; α(K)=0.00220 *3*; α(L)=0.000302 *5*; α(M)=6.63×10^{-5} *10*; α(N+..)=1.772×10^{-5} *25* α(N)=1.539×10^{-5} *22*; α(O)=2.21×10^{-6} *4*; α(P)=1.197×10^{-7} *17* Eγ=720.379 *4* for (719.6γ+720.4γ) doublet (1987Me04). Mult.: K:L1=0.053:0.010 (1975Ab06).
720.392 *5*	224	1541.5520	3$^-$	821.1643	2$^+$	E1+M2[a]	−0.012[a] *10*	0.00259 *4*	α=0.00259 *4*; α(K)=0.00220 *4*; α(L)=0.000302 *5*; α(M)=6.62×10^{-5} *10*; α(N+..)=1.77×10^{-5} *3* α(N)=1.537×10^{-5} *24*; α(O)=2.21×10^{-6} *4*; α(P)=1.196×10^{-7} *18* Eγ=720.379 *4* for (719.6γ+720.4γ) doublet (1987Me04). other δ: −0.01 *2* (1975Be43).
730.660 *4*	96.8 *4*	994.7517	4$^+$	264.0964	4$^+$	M1+E2	+13 *+16−3*	0.00664 *10*	α=0.00664 *10*; α(K)=0.00546 *9*; α(L)=0.000915 *14*; α(M)=0.000206 *3*; α(N+..)=5.46×10^{-5} *8* α(N)=4.76×10^{-5} *7*; α(O)=6.64×10^{-6} *10*; α(P)=3.09×10^{-7} *5* Mult.: K:L1=0.055:0.014 (1975Ab06). $\gamma\gamma(\theta)$ data (1975Be43) consistent with D+Q and δ≥+12 or≤−47; δ=+30 *+170−14* from $\gamma\gamma(\theta)$ (1981Iw04).
737.7 *7*	0.2 *1*	1633.453	3$^-$	895.7943	3$^+$	E1		0.00246 *4*	α=0.00246 *4*; α(K)=0.00209 *3*; α(L)=0.000287 *4*; α(M)=6.29×10^{-5} *9*; α(N+..)=1.682×10^{-5} *24* α(N)=1.461×10^{-5} *21*; α(O)=2.10×10^{-6} *3*; α(P)=1.139×10^{-7} *16*
741.355 *4*	235 *1*	821.1643	2$^+$	79.8038	2$^+$	M1+E2[a]	>25[a]	0.00639 *9*	α=0.00639 *9*; α(K)=0.00526 *8*; α(L)=0.000879 *13*; α(M)=0.000197 *3*; α(N+..)=5.24×10^{-5} *8* α(N)=4.57×10^{-5} *7*; α(O)=6.38×10^{-6} *9*; α(P)=2.98×10^{-7} *5* Mult.: K:L1=0.13:0.024 (1975Ab06). δ: from ε decay: 1/(−0.003 *8*) (i.e. δ<−91 or δ>+200) from 720γ-741$\gamma(\theta)$ (1998Al15); δ=+32 *+24−9* from 741γ-890$\gamma(\theta)$ (1998Al15); δ=−28 *+6−12* from $\gamma\gamma(\theta)$ (1981Iw04); −28 *+9−23* (1975Be43); δ=+64 *+135−26* from 720γ-741$\gamma(\theta)$ (1971La11).

γ(^{168}Er) (continued)

E_γ[‡]	I_γ[‡d]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[#]	α[†]	Comments
748.282 *7*	7.8 *1*	1569.452	(2)$^-$	821.1643	2$^+$	E1		0.00239 *4*	α=0.00239 *4*; α(K)=0.00204 *3*; α(L)=0.000278 *4*; α(M)=6.11×10^{-5} *9*; α(N+..)=1.634×10^{-5} *23* α(N)=1.419×10^{-5} *20*; α(O)=2.04×10^{-6} *3*; α(P)=1.108×10^{-7} *16*
812.287 *11*	0.17[@] *9*	1633.453	3$^-$	821.1643	2$^+$				
815.989 *5*	935 *3*	895.7943	3$^+$	79.8038	2$^+$	M1+E2	+17.7 *23*	0.00518 *8*	α=0.00518 *8*; α(K)=0.00429 *6*; α(L)=0.000694 *10*; α(M)=0.0001552 *22*; α(N+..)=4.13×10^{-5} *6* α(N)=3.60×10^{-5} *5*; α(O)=5.05×10^{-6} *7*; α(P)=2.44×10^{-7} *4* Mult.: K:L1=0.43:0.076 (1975Ab06). δ: data from ε decay: 1/(+0.005 *15*) (i.e., δ<−100 or δ>+50) from 816γ-80$\gamma(\theta)$ (1998Al15); +20 *4* from $\gamma\gamma(\theta)$ (1981Iw04); +17 *3* (1975Be43); +13 *+9−3* (1975Ab06).
821.162 *2*	220 *1*	821.1643	2$^+$	0.0	0$^+$	E2		0.00510 *8*	α=0.00510 *8*; α(K)=0.00422 *6*; α(L)=0.000682 *10*; α(M)=0.0001525 *22*; α(N+..)=4.06×10^{-5} *6* α(N)=3.53×10^{-5} *5*; α(O)=4.96×10^{-6} *7*; α(P)=2.40×10^{-7} *4* Mult.: K:L1=0.11:0.010 (1975Ab06).
829.948 *6*	128 *1*	1094.0449	4$^-$	264.0964	4$^+$	E1+M2[a]	−0.05[a] *3*	0.00201 *10*	α=0.00201 *10*; α(K)=0.00171 *8*; α(L)=0.000234 *13*; α(M)=5.1×10^{-5} *3*; α(N+..)=1.37×10^{-5} *8* α(N)=1.19×10^{-5} *7*; α(O)=1.71×10^{-6} *10*; α(P)=9.4×10^{-8} *6* other δ:−0.04 *5* (1975Be43);0 <0.14 (1975Ab06).
832.36 *4*	0.015[@] *6*	1653.53	3$^+$	821.1643	2$^+$				
853.468 *3*	0.63 *3*	1117.5721	5$^+$	264.0964	4$^+$	M1+E2	3.6 *+24−8*	0.00500 *21*	α=0.00500 *21*; α(K)=0.00416 *18*; α(L)=0.000655 *23*; α(M)=0.000146 *5*; α(N+..)=3.89×10^{-5} *14* α(N)=3.39×10^{-5} *12*; α(O)=4.79×10^{-6} *18*; α(P)=2.38×10^{-7} *12*
862.6 *3*	0.027 *15*	1411.100	4$^+$	548.757	6$^+$	E2		0.00458 *7*	α=0.00458 *7*; α(K)=0.00381 *6*; α(L)=0.000605 *9*; α(M)=0.0001353 *19*; α(N+..)=3.60×10^{-5} *5* α(N)=3.14×10^{-5} *5*; α(O)=4.42×10^{-6} *7*; α(P)=2.16×10^{-7} *3*
914.933 *4*	57.2 *3*	994.7517	4$^+$	79.8038	2$^+$	E2		0.00404 *6*	α=0.00404 *6*; α(K)=0.00337 *5*; α(L)=0.000527 *8*; α(M)=0.0001175 *17*; α(N+..)=3.13×10^{-5} *5* α(N)=2.73×10^{-5} *4*; α(O)=3.85×10^{-6} *6*; α(P)=1.92×10^{-7} *3* Mult.: K:L1=0.022:0.0034 (1975Ab06). δ(D,Q)=0.00 *1* from $\gamma\gamma(\theta)$ (1981Iw04).
928.916 *7*	1.17 *3*	1193.034	5$^-$	264.0964	4$^+$	E1		0.001571 *22*	α=0.001571 *22*; α(K)=0.001339 *19*; α(L)=0.000181 *3*; α(M)=3.97×10^{-5} *6*; α(N+..)=1.063×10^{-5} *1*

γ(^{168}Er) (continued)

E_γ[‡]	I_γ[‡d]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[#]	α[†]	Comments
									α(N)=9.23×10^{-6} *13*; α(O)=1.330×10^{-6} *19*; α(P)=7.33×10^{-8} *11*
1012.26 *6*	0.21 *2*	1276.298	2$^+$	264.0964	4$^+$	E2		0.00328 *5*	α=0.00328 *5*; α(K)=0.00274 *4*; α(L)=0.000418 *6*; α(M)=9.30×10^{-5} *13*; α(N+..)=2.48×10^{-5} *4* α(N)=2.16×10^{-5} *3*; α(O)=3.07×10^{-6} *5*; α(P)=1.561×10^{-7} *22*
1014.226 *10*	1.35 *5*	1094.0449	4$^-$	79.8038	2$^+$	M2+E3[a]	−0.55[a] *2*	0.01304 *21*	α(K)=0.01086 *18*; α(L)=0.00170 *3*; α(M)=0.000380 *6*; α(N+..)=0.0001020 *16* α(N)=8.85×10^{-5} *14*; α(O)=1.274×10^{-5} *20*; α(P)=6.85×10^{-7} *12* other δ: −0.54 *5* (1975Be43).
1025.4 *4*	0.0006 *4*	1574.12	5$^-$	548.757	6$^+$	E1		0.001306 *19*	α=0.001306 *19*; α(K)=0.001114 *16*; α(L)=0.0001501 *21*; α(M)=3.29×10^{-5} *5*; α(N+..)=8.81×10^{-6} α(N)=7.64×10^{-6} *11*; α(O)=1.103×10^{-6} *16*; α(P)=6.11×10^{-8} *9*
1137.36 *15*	0.008 *4*	1217.17	0$^+$	79.8038	2$^+$	E2		0.00259 *4*	α=0.00259 *4*; α(K)=0.00217 *3*; α(L)=0.000324 *5*; α(M)=7.18×10^{-5} *10*; α(N+..)=2.02×10^{-5} *3* α(N)=1.667×10^{-5} *24*; α(O)=2.38×10^{-6} *4*; α(P)=1.239×10^{-7} *18*; α(IPF)=1.007×10^{-6} *15*
1146.998 *9*	0.011[@] *4*	1411.100	4$^+$	264.0964	4$^+$	M1		0.00443 *7*	α=0.00443 *7*; α(K)=0.00375 *6*; α(L)=0.000527 *8*; α(M)=0.0001161 *17*; α(N+..)=3.29×10^{-5} *5* α(N)=2.71×10^{-5} *4*; α(O)=3.94×10^{-6} *6*; α(P)=2.23×10^{-7} *4*; α(IPF)=1.658×10^{-6} *24*
1167.357 *6*	1.36 *3*	1431.454	3$^-$	264.0964	4$^+$	E1		0.001043 *15*	α=0.001043 *15*; α(K)=0.000881 *13*; α(L)=0.0001180 *17*; α(M)=2.58×10^{-5} *4*; α(N+..)=1.86×10^{-5} α(N)=6.01×10^{-6} *9*; α(O)=8.68×10^{-7} *13*; α(P)=4.84×10^{-8} *7*; α(IPF)=1.163×10^{-5} *17*
1196.51 *5*	0.074 *9*	1276.298	2$^+$	79.8038	2$^+$	M1+E2(+E0)	−5.0 *+19−26*	0.00241 *10*	α=0.00241 *10*; α(K)=0.00202 *9*; α(L)=0.000297 *12*; α(M)=6.59×10^{-5} *25*; α(N+..)=2.24×10^{-5} *8* α(N)=1.53×10^{-5} *6*; α(O)=2.19×10^{-6} *9*; α(P)=1.16×10^{-7} *6*; α(IPF)=4.82×10^{-6} *9* Mult.: from α(K)exp=0.0042 *10* (1993BaZR).
1217.1		1217.17	0$^+$	0.0	0$^+$	E0			E_γ,Mult.: from 1993BaZR; conversion electrons but No photons observed.
1229.08 *11*	0.015 *9*	1493.26	2$^+$	264.0964	4$^+$	E2		0.00223 *4*	α=0.00223 *4*; α(K)=0.00187 *3*; α(L)=0.000274 *4*; α(M)=6.07×10^{-5} *9*; α(N+..)=2.47×10^{-5} *4* α(N)=1.411×10^{-5} *20*; α(O)=2.02×10^{-6} *3*; α(P)=1.065×10^{-7} *15*; α(IPF)=8.45×10^{-6} *12*
1276.27 *3*	0.074[@] *17*	1276.298	2$^+$	0.0	0$^+$	E2		0.00208 *3*	α=0.00208 *3*; α(K)=0.001738 *25*; α(L)=0.000253 *4*; α(M)=5.60×10^{-5} *8*; α(N+..)=3.01×10^{-5} *5*

From ENSDF

γ(^{168}Er) (continued)

Eγ[‡]	Iγ[‡d]	Ei(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[#]	α[†]	Comments
									α(N)=1.303×10^{-5} *19*; α(O)=1.87×10^{-6} *3*; α(P)=9.91×10^{-8} *14*; α(IPF)=1.509×10^{-5} *22*
1277.451 *5*	30.9[&] *2*	1541.5520	3$^-$	264.0964	4$^+$	E1+M2[a]	−0.040[a] *18*	0.000947 *19*	α=0.000947 *19*; α(K)=0.000761 *15*; α(L)=0.0001017 *22*; α(M)=2.23×10^{-5} *5*; α(N+..)=6.23×10^{-5} α(N)=5.18×10^{-6} *11*; α(O)=7.49×10^{-7} *16*; α(P)=4.19×10^{-8} *9*; α(IPF)=5.63×10^{-5} *8* other δ: −0.05 *3* (1975Be43).
1279.100 *23*	0.66 *4*	1358.910	1$^-$	79.8038	2$^+$	E1		0.000934 *13*	α=0.000934 *13*; α(K)=0.000749 *11*; α(L)=0.0001000 *14*; α(M)=2.19×10^{-5} *3*; α(N+..)=6.30×10^{-5} α(N)=5.09×10^{-6} *8*; α(O)=7.36×10^{-7} *11*; α(P)=4.12×10^{-8} *6*; α(IPF)=5.72×10^{-5} *8*
^{x}1281.03						M1(+E0)		0.00341 *5*	α=0.00341 *5*; α(K)=0.00288 *4*; α(L)=0.000403 *6*; α(M)=8.87×10^{-5} *13*; α(N+..)=4.30×10^{-5} *6* α(N)=2.07×10^{-5} *3*; α(O)=3.01×10^{-6} *5*; α(P)=1.709×10^{-7} *24*; α(IPF)=1.91×10^{-5} *3* Mult.: from α(K)exp=0.0040 *16* (1993BaZR).
1310.0 *3*	0.0012 *9*	1574.12	5$^-$	264.0964	4$^+$	E1		0.000914 *13*	α=0.000914 *13*; α(K)=0.000719 *10*; α(L)=9.58×10^{-5} *14*; α(M)=2.10×10^{-5} *3*; α(N+..)=7.83×10^{-5} *11* α(N)=4.88×10^{-6} *7*; α(O)=7.06×10^{-7} *10*; α(P)=3.96×10^{-8} *6*; α(IPF)=7.26×10^{-5} *11*
1323.909 *9*	0.40 *1*	1403.718	(2)$^-$	79.8038	2$^+$	E1		0.000906 *13*	α=0.000906 *13*; α(K)=0.000706 *10*; α(L)=9.41×10^{-5} *14*; α(M)=2.06×10^{-5} *3*; α(N+..)=8.58×10^{-5} *12* α(N)=4.78×10^{-6} *7*; α(O)=6.93×10^{-7} *10*; α(P)=3.88×10^{-8} *6*; α(IPF)=8.03×10^{-5} *12*
1331.39 *9*	0.015 *4*	1411.100	4$^+$	79.8038	2$^+$	E2		0.00192 *3*	α=0.00192 *3*; α(K)=0.001603 *23*; α(L)=0.000232 *4*; α(M)=5.13×10^{-5} *8*; α(N+..)=3.88×10^{-5} *6* α(N)=1.192×10^{-5} *17*; α(O)=1.710×10^{-6} *24*; α(P)=9.13×10^{-8} *13*; α(IPF)=2.51×10^{-5} *4*
1351.2	≈0.22	1615.339	4$^-$	264.0964	4$^+$				Eγ=1351.575 *5* for (1351.2γ+1351.5γ) doublet (1987Me04). Eγ: from level-energy difference. Iγ: estimate from apparent total Iγ for doublet and Iγ deduced for 1351.5γ. δ: from 720γ-821γ(θ) (1998Al15).
1351.54 *4*	1.39[@] *19*	1431.454	3$^-$	79.8038	2$^+$	E1		0.000893 *13*	α=0.000893 *13*; α(K)=0.000681 *10*; α(L)=9.07×10^{-5} *13*; α(M)=1.98×10^{-5} *3*; α(N+..)=0.0001020 α(N)=4.61×10^{-6} *7*; α(O)=6.68×10^{-7} *10*; α(P)=3.75×10^{-8} *6*; α(IPF)=9.66×10^{-5} *14* Eγ=1351.575 *5* for (1351.2γ+1351.5γ) doublet (1987Me04).
1358.904 *14*	0.19 *1*	1358.910	1$^-$	0.0	0$^+$				

From ENSDF

γ(^{168}Er) (continued)

E_γ[‡]	I_γ[‡d]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	α[†]	Comments
1392.209 *13*	<0.0004	1656.312	(4)$^+$	264.0964	4$^+$			
1413.35 *15*	0.008 *2*	1493.26	2$^+$	79.8038	2$^+$	M1	0.00274 *4*	α=0.00274 *4*; α(K)=0.00228 *4*; α(L)=0.000318 *5*; α(M)=7.00×10^{-5} *10*; α(N+..)=7.40×10^{-5} *11* α(N)=1.632×10^{-5} *23*; α(O)=2.38×10^{-6} *4*; α(P)=1.351×10^{-7} *19*; α(IPF)=5.52×10^{-5} *8* Mult.: from α(K)exp=0.0029 *8* (1993BaZR); small E0 admixture possible.
1422.2		1422.3	0$^+$	0.0	0$^+$	E0		E_γ,Mult.: from 1993BaZR; conversion electrons but No photons observed.
1431.7 *4*	0.0068 *15*	1431.454	3$^-$	0.0	0$^+$			
1461.750 *4*	4.54 *6*	1541.5520	3$^-$	79.8038	2$^+$			
1489.66 *3*	0.039 *2*	1569.452	(2)$^-$	79.8038	2$^+$			
1493.7 *2*	0.0037 *6*	1493.26	2$^+$	0.0	0$^+$	E2	0.001594 *23*	α=0.001594 *23*; α(K)=0.001290 *18*; α(L)=0.000184 *3*; α(M)=4.05×10^{-5} *6*; α(N+..)=8.08×10^{-5} *12* α(N)=9.42×10^{-6} *14*; α(O)=1.355×10^{-6} *19*; α(P)=7.35×10^{-8} *11*; α(IPF)=7.00×10^{-5} *10*
1541.56 *3*	0.042 *2*	1541.5520	3$^-$	0.0	0$^+$			
1553.5 *7*	0.0008 *4*	1633.453	3$^-$	79.8038	2$^+$			
1569.5 *4*	0.0004 *2*	1569.452	(2)$^-$	0.0	0$^+$			

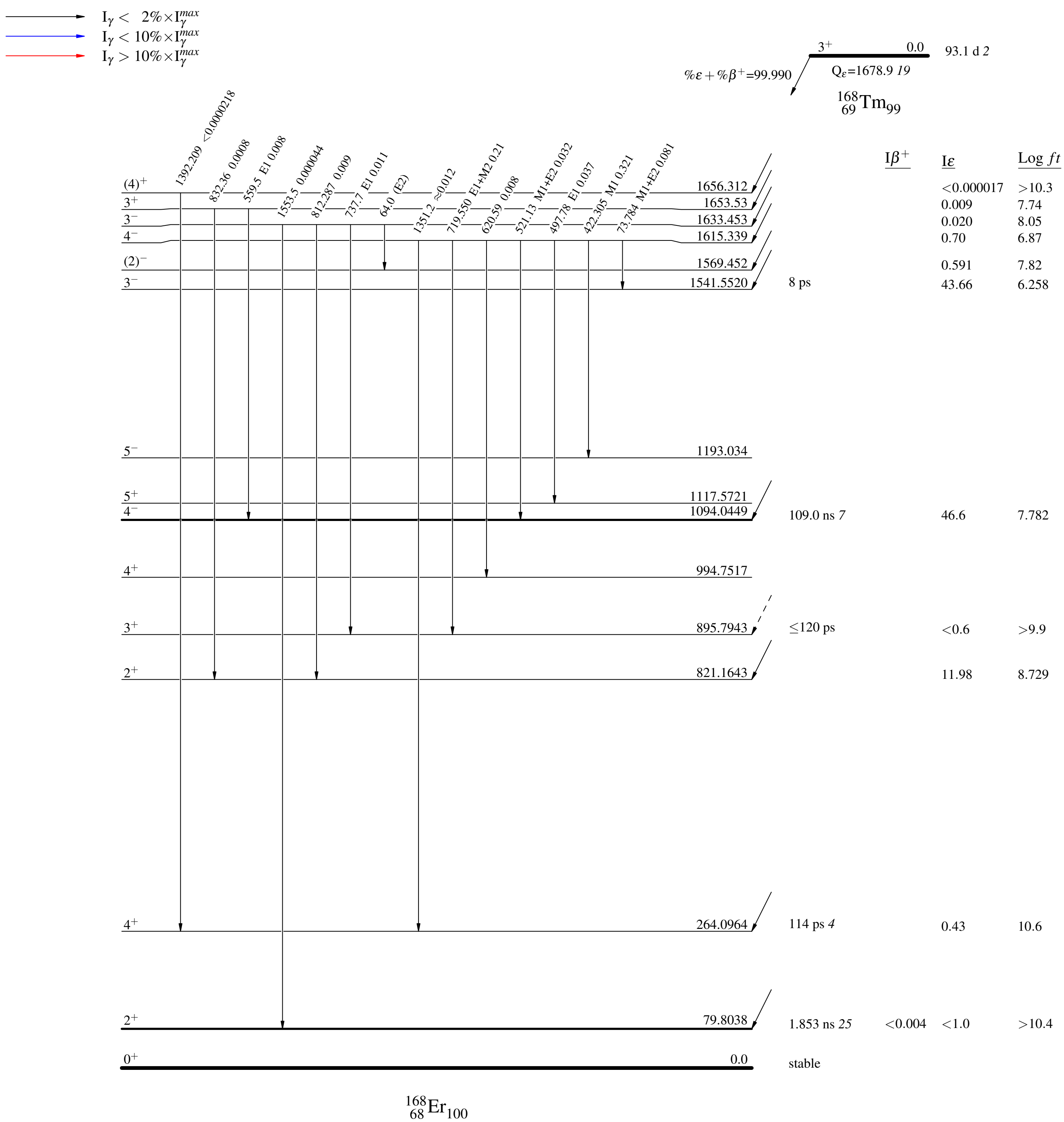
† Additional information 1.
‡ From 1987Me04, except As noted.
# From Adopted Gammas, except where noted.
@ Deduced from corresponding Iγ′s for γ′s depopulating same level in ^{167}Er(n,γ) E=thermal.
& Limit (Iγ<0.1) set for possible component depopulating 1541.7 level (see Adopted Gammas).
a From $\gamma\gamma(\theta)$ (1981Iw04).
b From $\gamma\gamma(\theta)$ (1975Be43).
c From ce data (1975Ab06).
d For absolute intensity per 100 decays, multiply by 5.4495×10^{-2} *4*.
x γ ray not placed in level scheme.

$^{168}_{68}$Er$_{100}$-11

^{168}Tm ε decay 1987Me04

Decay Scheme

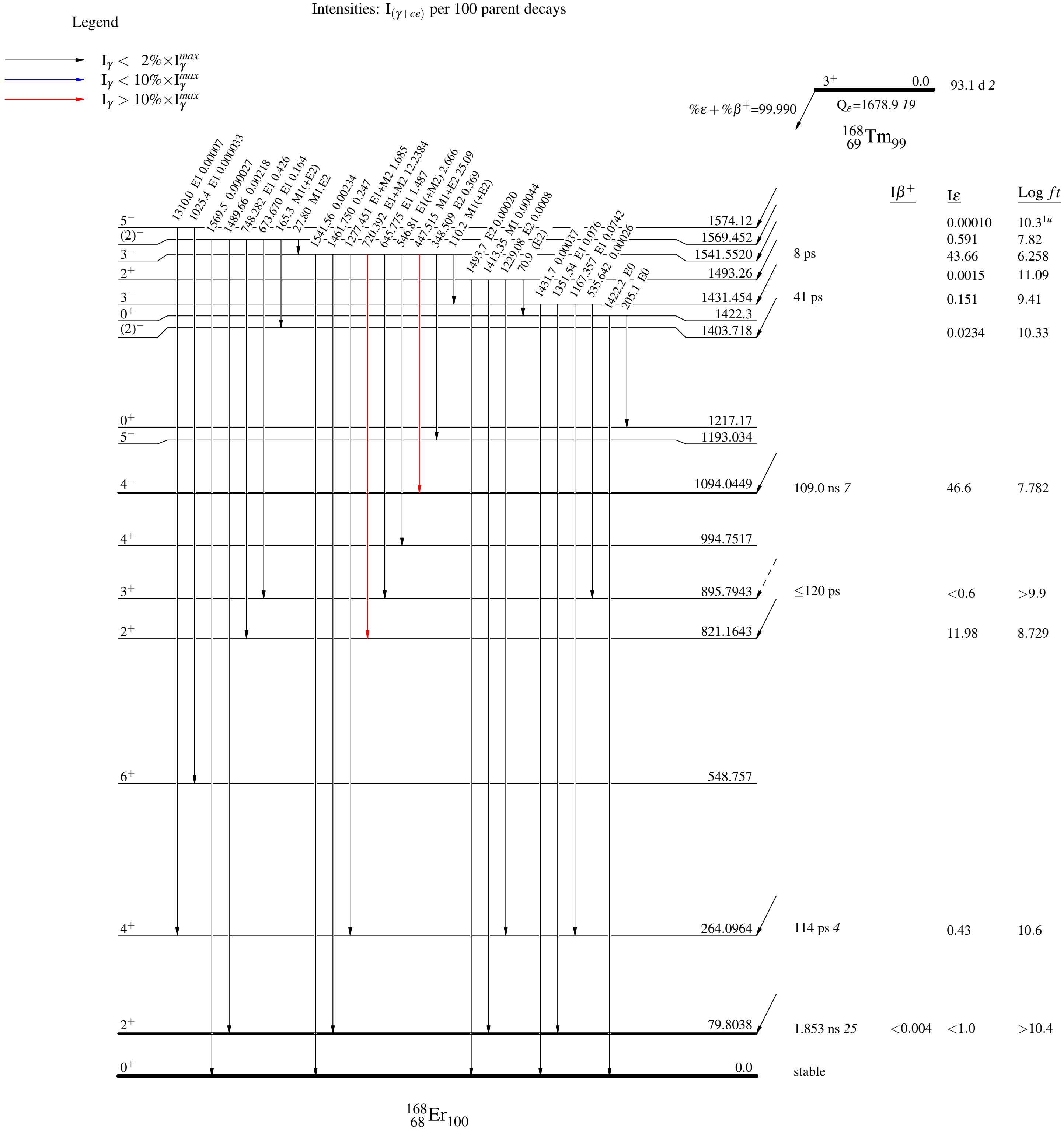
Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



^{168}Tm ε decay 1987Me04

Decay Scheme (continued)

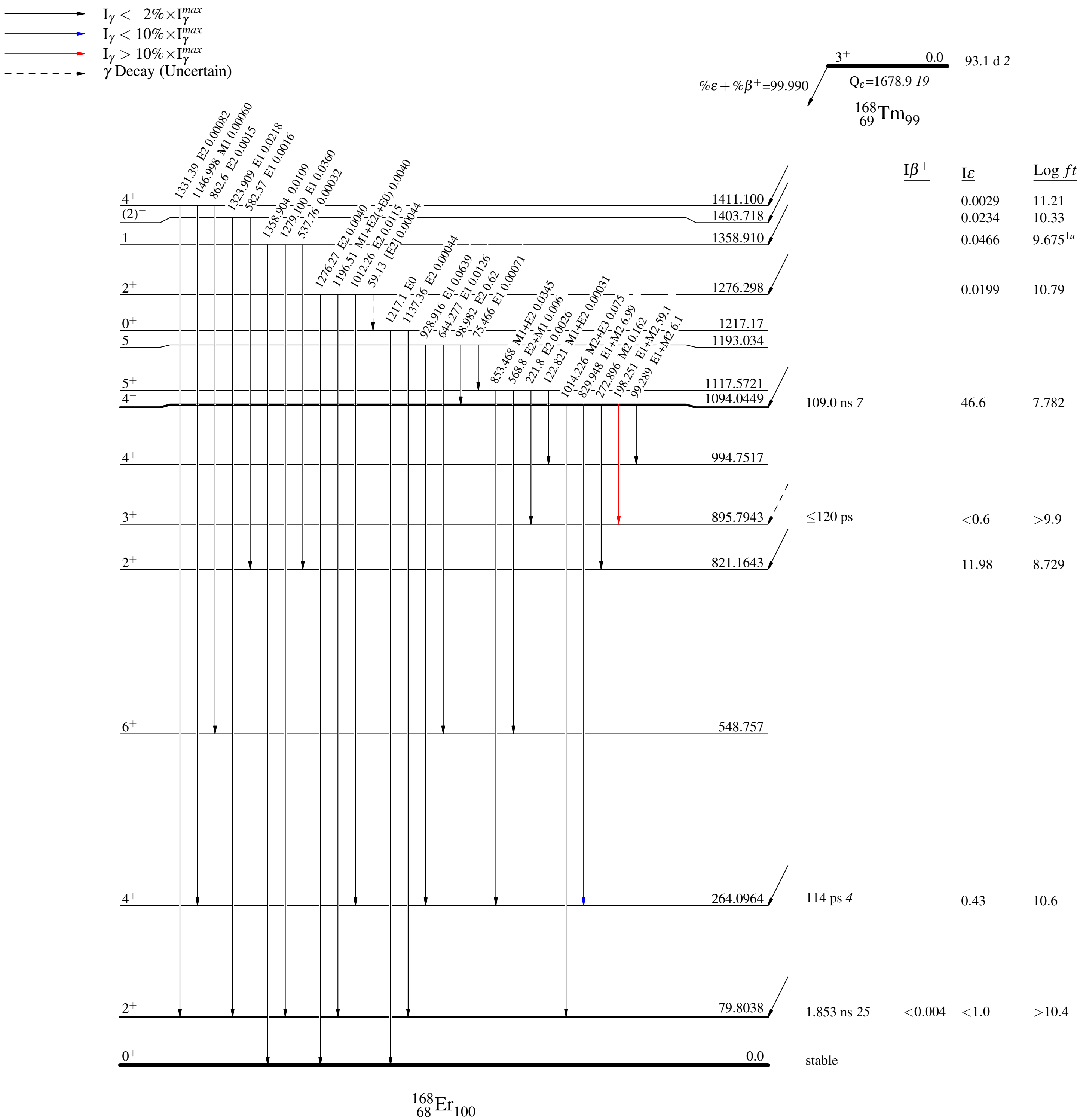
Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



^{168}Tm ε decay 1987Me04

Decay Scheme (continued)

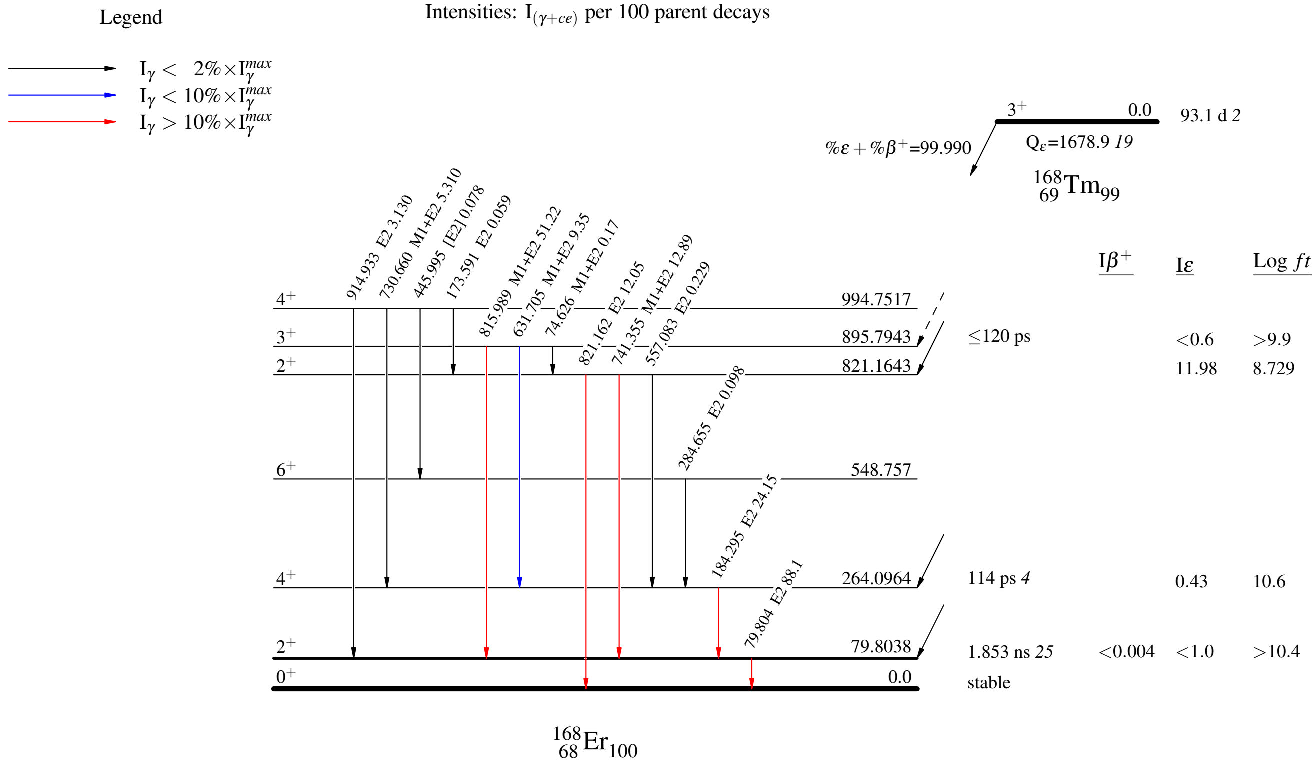
Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



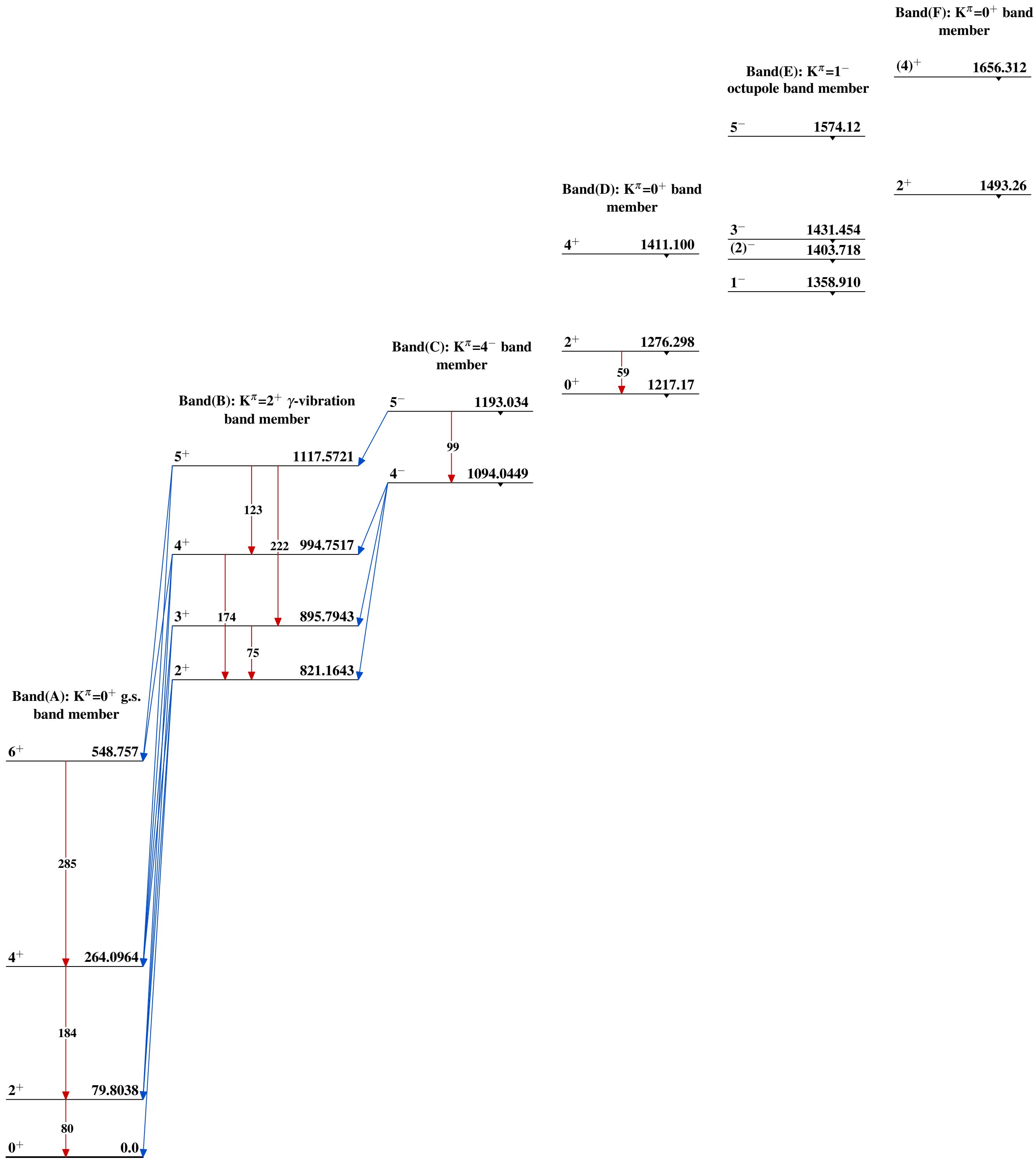
^{168}Tm ε decay 1987Me04

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays

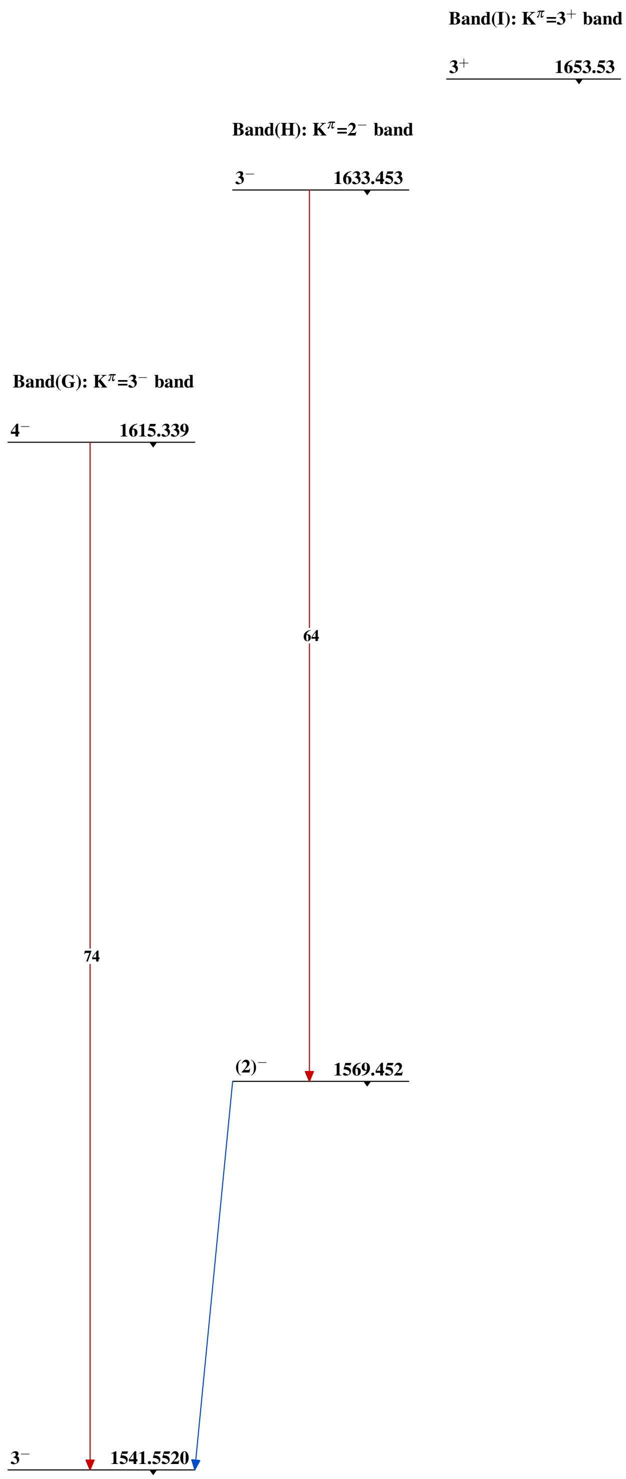


^{168}Tm ε decay 1987Me04



$^{168}_{68}Er_{100}$

^{168}Tm ε decay 1987Me04 (continued)



$^{168}_{68}Er_{100}$