^{148}Tb ε decay (2.20 min) 1991CoZY

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 117, 1 (2014)	1-Oct-2013

Parent: ^{148}Tb: E=90.1 *3*; J$^{\pi}$=(9)$^{+}$; T$_{1/2}$=2.20 min *5*; Q(ε)=5738 *13*; %ε+%β^{+} decay=100.0

1991CoZY: measured Eγ, Iγ, $\gamma\gamma$ coin, T$_{1/2}$.

1985Sc09: measured Iβ^{+}/(Iε+Iβ^{+}), Iβ^{+}/εK(exp) to the 2693-keV level to determine Q±.

1981Sc21: measured ε/β^{+} to the 2693-keV level to determine Q±.

1974Ne01: measured Eγ, Iγ, $\gamma\gamma$ coin, T$_{1/2}$.

1973Bo13: measured Eγ, Iγ, $\gamma\gamma$ coin, T$_{1/2}$.

2003NaZV: measured Gamow-Teller strength distribution.

Other: 1971Ar31.

There are problems in reconciling log *ft* values from ^{148}Tb ε decay (2.20 min) with ΔJ$^{\pi}$ of the transitions. More data are needed to clarify these problems.

All data and the level scheme are from 1991CoZY, unless indicated otherwise.

^{148}Gd Levels

E(level)†	J$^{\pi}$‡	T$_{1/2}$	Comments
0.0	0^{+}		
784.48 *6*	2^{+}		
1273.36 *11*	3^{-}		
1416.34 *9*	4^{+}		
1810.89 *12*	6^{+}		
1912.9 *3*	4^{-}		
2082.13 *15*	5^{-}		
2563.83 *13*	7^{-}		
2693.28 *13*	8^{+}		
2694.63 *16*	9^{-}	17.5 ns	
2782.54 *19*			
2868.67 *22*	(5)$^{+}$		
2936.1 *4*	7^{-}		
3029.49 *20*	8^{-}		
3045.6 *4*			
3128.7 *4*			
3152.49 *23*	8^{-}		
3156.9 *4*			
3357.7 *3*			
3477.9 *4*	(8,9)		J$^{\pi}$: log $f^{1u}t$=7.4 from (9)$^{+}$ and γ to 6^{+}.
3502.1 *4*			
3645.84 *25*	(8^{+})		
3666.3 *4*	10^{-}		
3758.3 *4*	10^{+}		
3768.28 *25*			
3808.27 *22*	(8^{+})		
3868.61 *21*			
3990.45 *22*	(8,9,10)$^{+}$		J$^{\pi}$: log *ft*=5.9 from (9)$^{+}$.
4119.18 *17*	(8,9)$^{+}$		J$^{\pi}$: log *ft*=5.2 from (9)$^{+}$; γ to 6^{+}.
4170.22 *22*	(8,9^{-})		
4271.3 *4*			
4311.95 *20*	(8,9,10)$^{+}$		J$^{\pi}$: log *ft*=5.1 from (9)$^{+}$.
4408.86 *19*	(8)$^{+}$		J$^{\pi}$: log *ft*=5.3 from (9)$^{+}$; γ to (5)$^{+}$.

† From a least-squares fit to Eγ.

‡ Adopted values; supported by internal conversion data, log *ft* values from this decay, and related in-beam work.

^{148}Tb ε decay (2.20 min) 1991CoZY (continued)

ε,β⁺ radiations

E(decay)	E(level)	Iβ⁺ ‡	Iε‡	Log *ft*	I(ε+β⁺)†‡	Comments
(1419 *13*)	4408.86	0.00131	1.15	5.3	1.15	av Eβ=192.5 *58*; εK=0.8341; εL=0.12762 *8*; εM+=0.03712 *3*
(1516 *13*)	4311.95	0.0050	1.80	5.2	1.80	av Eβ=235.3 *58*; εK=0.8333 *2*; εL=0.12700 *9*; εM+=0.03691 *3*
(1557 *13*)	4271.3	0.00061	0.16	6.2	0.16	av Eβ=253.4 *58*; εK=0.8327 *3*; εL=0.1267 *1*; εM+=0.03682 *3*
(1658 *13*)	4170.22	0.0024	0.32	6.0	0.32	av Eβ=297.9 *58*; εK=0.8302 *5*; εL=0.1259 *2*; εM+=0.03657 *4*
(1709 *13*)	4119.18	0.0225	2.26	5.2	2.28	av Eβ=320.3 *57*; εK=0.8283 *6*; εL=0.12542 *13*; εM+=0.03642 *4*
(1838 *13*)	3990.45	0.0086	0.46	5.9	0.47	av Eβ=376.7 *57*; εK=0.8217 *9*; εL=0.12397 *17*; εM+=0.03598 *5*
(1959 *13*)	3868.61	0.0069	0.22	6.3	0.23	av Eβ=430.2 *58*; εK=0.8124 *12*; εL=0.12222 *22*; εM+=0.03546 *7*
(2020 *13*)	3808.27	0.013	0.33	6.1	0.34	av Eβ=456.7 *58*; εK=0.8067 *14*; εL=0.12120 *24*; εM+=0.03515 *7*
(2182 *13*)	3645.84	0.030	0.47	6.1	0.50	av Eβ=528.2 *58*; εK=0.7874 *18*; εL=0.1179 *3*; εM+=0.03418 *9*
(2326 *13*)	3502.1	0.010	0.11	6.8	0.12	av Eβ=591.7 *58*; εK=0.7654 *22*; εL=0.1144 *4*; εM+=0.03314 *11*
(2350 *13*)	3477.9	0.055	0.54	6.1	0.60	av Eβ=602.4 *58*; εK=0.7612 *23*; εL=0.1137 *4*; εM+=0.03294 *11*
(2470 *13*)	3357.7	0.013	0.097	6.9	0.11	av Eβ=655.7 *58*; εK=0.739 *3*; εL=0.1102 *4*; εM+=0.03192 *12*
(2671 *13*)	3156.9	0.022	0.11	6.9	0.13	av Eβ=745.2 *59*; εK=0.696 *3*; εL=0.1035 *5*; εM+=0.02997 *14*
(2676 *13*)	3152.49	0.033	0.16	6.7	0.19	av Eβ=747.2 *59*; εK=0.695 *3*; εL=0.1033 *5*; εM+=0.02992 *14*
(2799 *13*)	3029.49	0.10	0.39	6.4	0.49	av Eβ=802.2 *59*; εK=0.666 *4*; εL=0.0988 *5*; εM+=0.02862 *15*
(2892 *13*)	2936.1	0.032	0.34	7.9^{1u}	0.37	av Eβ=853.2 *57*; εK=0.7625 *17*; εL=0.1167 *3*; εM+=0.03396 *9*
(3046 *13*)	2782.54	0.034	0.086	7.1	0.12	av Eβ=913.2 *59*; εK=0.603 *4*; εL=0.0893 *6*; εM+=0.02584 *15*
(3133 *13*)	2694.63	0.538 *12*	1.20 *2*	5.973 *14*	1.74 *3*	av Eβ=952.9 *59*; εK=0.580 *4*; εL=0.0858 *6*; εM+=0.02483 *15*
3030 *30*	2693.28	27.9 *4*	62.2 *4*	4.259 *12*	90.1 *1*	av Eβ=953.5 *59*; εK=0.580 *4*; εL=0.0858 *6*; εM+=0.02482 *15* E(decay): from Q±=5725 *30* (1985Sc09). Other: 5755 *50* (1981Sc21).
(4017 *13*)	1810.89	1.25 *2*	0.962 *20*	6.288 *14*	2.21 *4*	av Eβ=1356.2 *60*; εK=0.366 *3*; εL=0.0538 *4*; εM+=0.01556 *12*

† From γ transition intensity balance at each level. Based on the existing data, the following levels have negative β⁺+ε feeding (not given here): 784.48, 1273.36, 1416.34, 2563.83.

‡ Absolute intensity per 100 decays.

^{148}Tb ε decay (2.20 min) 1991CoZY (continued)

γ(^{148}Gd)

Iγ normalization: I(784γ+ce) to g.s.=100.
All data and the level scheme are from 1991CoZY, unless indicated otherwise.

E_γ[†]	I_γ[#a]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ	α[&]	Comments
123.0 *3*	0.7	3152.49	8^-	3029.49	8^-				
129.5[‡] *2*	31	2693.28	8^+	2563.83	7^-	E1		0.1454	α(K)=0.1225 *18*; α(L)=0.0180 *3*; α(M)=0.00389 *6* α(N)=0.000882 *13*; α(O)=0.0001305 *19*; α(P)=7.10×10^{-6} *11* I_γ: 25 *4* (1973Bo13), 27 *3* (1974Ne01).
130.8 *3*	10.7	2694.63	9^-	2563.83	7^-	E2		0.956 *16*	α(K)=0.550 *9*; α(L)=0.314 *6*; α(M)=0.0735 *13* α(N)=0.0164 *3*; α(O)=0.00219 *4*; α(P)=2.86×10^{-5} *5*
142.7[‡] *3*	32	1416.34	4^+	1273.36	3^-	E1		0.1119 *17*	α(K)=0.0945 *15*; α(L)=0.01372 *21*; α(M)=0.00297 *5* α(N)=0.000674 *11*; α(O)=0.0001002 *16*; α(P)=5.55×10^{-6} *9* I_γ: 24 *3* (1973Bo13), 21 *3* (1974Ne01).
169.2 *3*	1.3	2082.13	5^-	1912.9	4^-				
271.0 *3*	4.0	2082.13	5^-	1810.89	6^+	E1+M2	≤0.23	0.034 *14*	α(K)=0.029 *11*; α(L)=0.0045 *21*; α(M)=0.0010 *5* α(N)=0.00023 *11*; α(O)=3.4×10^{-5} *17*; α(P)=2.1×10^{-6} *10*
334.8 *3*	3.4	3029.49	8^-	2694.63	9^-	M1		0.0715	α(K)=0.0606 *9*; α(L)=0.00853 *13*; α(M)=0.00185 *3* α(N)=0.000426 *6*; α(O)=6.61×10^{-5} *10*; α(P)=4.47×10^{-6} *7*
394.55[‡] *8*	965	1810.89	6^+	1416.34	4^+	E2		0.0267	α(K)=0.0212 *3*; α(L)=0.00428 *6*; α(M)=0.000959 *14* α(N)=0.000218 *3*; α(O)=3.16×10^{-5} *5*; α(P)=1.386×10^{-6} *20* I_γ: 860 *50* (1973Bo13), 900 *50* (1974Ne01).
443.4 *3*	0.4	4311.95	$(8,9,10)^+$	3868.61					
457.9 *3*	0.6	3152.49	8^-	2694.63	9^-				
465.6 *3*	5.4	3029.49	8^-	2563.83	7^-	M1		0.0303	α(K)=0.0258 *4*; α(L)=0.00359 *5*; α(M)=0.000777 *11* α(N)=0.000179 *3*; α(O)=2.78×10^{-5} *4*; α(P)=1.89×10^{-6} *3*
481.65[‡] *10*	38	2563.83	7^-	2082.13	5^-	E2		0.01541	α(K)=0.01249 *18*; α(L)=0.00228 *4*; α(M)=0.000506 *7* α(N)=0.0001152 *17*; α(O)=1.699×10^{-5} *24*; α(P)=8.34×10^{-7} *12* I_γ: 30 *4* (1973Bo13), 26 *3* (1974Ne01).

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^{148}Tb ε decay (2.20 min) 1991CoZY (continued)

γ(^{148}Gd) (continued)

$E_γ$[†]	$I_γ$[#a]	E_i(level)	$J_i^π$	E_f	$J_f^π$	Mult.[@]	δ	α[&]	Comments
488.83[‡] *10*	62	1273.36	3⁻	784.48	2⁺	E1+M2	+0.18 *9*	0.008 *3*	α(K)=0.0064 *25*; α(L)=0.0009 *4*; α(M)=0.00020 *9* α(N)=4.6×10^{-5} *21*; α(O)=7.E−6 *4*; α(P)=4.5×10^{-7} *21* $I_γ$: 52 *5* (1973Bo13), 52 *5* (1974Ne01).
540.3 *3*	0.5	4408.86	(8)⁺	3868.61					
588.6 *3*	0.6	3152.49	8⁻	2563.83	7⁻	M1		0.01675	α(K)=0.01424 *20*; α(L)=0.00197 *3*; α(M)=0.000425 *6* α(N)=9.79×10^{-5} *14*; α(O)=1.525×10^{-5} *22*; α(P)=1.039×10^{-6} *15*
631.87[‡] *6*	937	1416.34	4⁺	784.48	2⁺	E2		0.00772	α(K)=0.00639 *9*; α(L)=0.001045 *15*; α(M)=0.000230 *4* α(N)=5.25×10^{-5} *8*; α(O)=7.88×10^{-6} *11*; α(P)=4.36×10^{-7} *7* $I_γ$: 950 *50* (1973Bo13), 900 *50* (1974Ne01).
639.5 *5*	1.3	1912.9	4⁻	1273.36	3⁻	M1		0.01362	α(K)=0.01158 *17*; α(L)=0.001595 *23*; α(M)=0.000345 *5* α(N)=7.94×10^{-5} *12*; α(O)=1.236×10^{-5} *18*; α(P)=8.44×10^{-7} *12*
640.4 *3*	1.3	4408.86	(8)⁺	3768.28					
665.8 *3*	4.0	2082.13	5⁻	1416.34	4⁺	E1+M2	≤0.34	0.0042 *17*	α(K)=0.0036 *14*; α(L)=0.00051 *22*; α(M)=0.00011 *5* α(N)=2.5×10^{-5} *11*; α(O)=3.9×10^{-6} *17*; α(P)=2.6×10^{-7} *12*
753.0[‡] *1*	21	2563.83	7⁻	1810.89	6⁺	E1		0.00197	α(K)=0.001686 *24*; α(L)=0.000223 *4*; α(M)=4.79×10^{-5} *7* α(N)=1.100×10^{-5} *16*; α(O)=1.698×10^{-6} *24*; α(P)=1.126×10^{-7} *16* $I_γ$: 17 *2* (1973Bo13), 20 *2* (1974Ne01).
784.48[‡] *6*	1000	784.48	2⁺	0.0	0⁺	E2		0.00466	α(K)=0.00390 *6*; α(L)=0.000597 *9*; α(M)=0.0001305 *19* α(N)=2.99×10^{-5} *5*; α(O)=4.53×10^{-6} *7*; α(P)=2.68×10^{-7} *4*
808.1[‡] *6*	29	2082.13	5⁻	1273.36	3⁻	E2		0.00436	α(K)=0.00365 *6*; α(L)=0.000555 *8*; α(M)=0.0001212 *18* α(N)=2.77×10^{-5} *4*; α(O)=4.21×10^{-6} *6*; α(P)=2.52×10^{-7} *4* $I_γ$: 29 *3* (1973Bo13), 27 *3* (1974Ne01).
882.41[‡] *8*	900	2693.28	8⁺	1810.89	6⁺	E2		0.00359	α(K)=0.00302 *5*; α(L)=0.000449 *7*; α(M)=9.79×10^{-5} *14* α(N)=2.24×10^{-5} *4*; α(O)=3.42×10^{-6} *5*; α(P)=2.09×10^{-7} *3* $I_γ$: 920 *40* (1973Bo13), 944 *50* (1974Ne01).
883.6 *3*	11.1	2694.63	9⁻	1810.89	6⁺	E3		0.00802	α(K)=0.00650 *10*; α(L)=0.001186 *17*; α(M)=0.000264 *4*

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^{148}Tb ε decay (2.20 min) 1991CoZY (continued)

γ(^{148}Gd) (continued)

E_γ[†]	I_γ[#a]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[@]	δ	α[&]	Comments
									α(N)=6.04×10^{-5} *9*; α(O)=9.02×10^{-6} *13*; α(P)=4.76×10^{-7} *7* Additional information 1.
938.3 *3*	1.2	3502.1		2563.83	7$^-$				
952.7 *3*	1.0	3645.84	(8$^+$)	2693.28	8$^+$				
954.3 *3*	2.0	4311.95	(8,9,10)$^+$	3357.7					1991CoZY show this γ depopulating the 4409 level. However, such a placement does not lead to a final level observed by them. The evaluator has assumed that the Eγ is correct and the final level is 3358 keV as shown by 1991CoZY, leading to an initial level of 4312.5 keV.
971.7[b] *3*	1.9[b]	2782.54		1810.89	6$^+$				
971.7[b] *3*	0.6[b]	3666.3	10$^-$	2694.63	9$^-$	M1		0.00490	α(K)=0.00418 *6*; α(L)=0.000567 *8*; α(M)=0.0001224 *18* α(N)=2.82×10^{-5} *4*; α(O)=4.39×10^{-6} *7*; α(P)=3.02×10^{-7} *5*
1057.7 *3*	1.4	2868.67	(5)$^+$	1810.89	6$^+$	M1,E2		0.0032 *8*	α(K)=0.0027 *7*; α(L)=0.00038 *9*; α(M)=8.2×10^{-5} *18* α(N)=1.9×10^{-5} *4*; α(O)=2.9×10^{-6} *7*; α(P)=1.9×10^{-7} *6*
1063.7 *3*	0.6	3758.3	10$^+$	2694.63	9$^-$	E1+M2	≤0.18	0.00115 *14*	α(K)=0.00098 *12*; α(L)=0.000130 *17*; α(M)=2.8×10^{-5} *4* α(N)=6.4×10^{-6} *9*; α(O)=1.00×10^{-6} *14*; α(P)=6.7×10^{-8} *9*
1089.7 *3*	1.5	4119.18	(8,9)$^+$	3029.49	8$^-$				
1113.7 *3*	0.7	3808.27	(8$^+$)	2694.63	9$^-$				
1115.0 *3*	0.9	3808.27	(8$^+$)	2693.28	8$^+$				
1125.2 *3*	3.7	2936.1	7$^-$	1810.89	6$^+$	E1+M2	≤0.14	0.00099 *8*	α(K)=0.00084 *7*; α(L)=0.000111 *9*; α(M)=2.38×10^{-5} *20* α(N)=5.5×10^{-6} *5*; α(O)=8.5×10^{-7} *7*; α(P)=5.7×10^{-8} *5*; α(IPF)=4.27×10^{-6} *9*
1174.0 *3*	2.5	3868.61		2694.63	9$^-$				
1175.4 *3*	0.7	3868.61		2693.28	8$^+$				
1208.2 *3*	2.0	3990.45	(8,9,10)$^+$	2782.54					
1234.7 *3*	0.6	3045.6		1810.89	6$^+$				
1250.5 *3*	1.0	4119.18	(8,9)$^+$	2868.67	(5)$^+$				1991CoZY show this γ depopulating the 3991 level. However, such a placement does not lead to a final level observed by them. The evaluator has assumed that Eγ is correct, and the final level is 2869 keV as shown by 1991CoZY leading to an initial level of 4119.5 keV.
1282.3 *3*	2.1	4311.95	(8,9,10)$^+$	3029.49	8$^-$				
1295.5 *3*	0.4	3990.45	(8,9,10)$^+$	2694.63	9$^-$				
1297.2 *3*	2.3	3990.45	(8,9,10)$^+$	2693.28	8$^+$				

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^{148}Tb ε decay (2.20 min) 1991CoZY (continued)

γ(^{148}Gd) (continued)

E_γ [†]	I_γ [#a]	E_i(level)	J^π_i	E_f	J^π_f
1317.8 *3*	0.8	3128.7		1810.89	6^+
1336.6 *3*	1.5	4119.18	$(8,9)^+$	2782.54	
1346.0 *3*	1.3	3156.9		1810.89	6^+
1366.4 *3*	2.8	2782.54		1416.34	4^+
1424.6 *3*	2.5	4119.18	$(8,9)^+$	2694.63	9^-
1425.9 *3*	11.5	4119.18	$(8,9)^+$	2693.28	8^+
1475.6 *3*	1.5	4170.22	$(8,9^-)$	2694.63	9^-
1476.9 *3*	1.2	4170.22	$(8,9^-)$	2693.28	8^+
1540.1 *3*	0.4	4408.86	$(8)^+$	2868.67	$(5)^+$
1546.9 *3*	3.1	3357.7		1810.89	6^+
1555.4 *3*	2.2	4119.18	$(8,9)^+$	2563.83	7^-
1578.0 *3*	1.6	4271.3		2693.28	8^+
1606.4 *3*	0.5	4170.22	$(8,9^-)$	2563.83	7^-
1618.7 *3*	9.0	4311.95	$(8,9,10)^+$	2693.28	8^+
1667.0 *3*	6.0	3477.9	(8,9)	1810.89	6^+
1714.3 *3*	1.6	4408.86	$(8)^+$	2694.63	9^-
1715.7 *3*	5.6	4408.86	$(8)^+$	2693.28	8^+
1748.1 *3*	4.5	4311.95	$(8,9,10)^+$	2563.83	7^-
1834.8 *3*	4.0	3645.84	(8^+)	1810.89	6^+
1845.0 *3*	2.1	4408.86	$(8)^+$	2563.83	7^-
1957.2 *3*	1.7	3768.28		1810.89	6^+
1997.3 *3*	1.8	3808.27	(8^+)	1810.89	6^+
2308.2 *3*	2.7	4119.18	$(8,9)^+$	1810.89	6^+

[†] From 1991CoZY, unless indicated otherwise. The evaluator has assumed a $\Delta E\gamma$=0.3 keV, since the authors did not give these data.

[‡] From 1973Bo13.

[#] Relative intensity.

[@] From adopted gammas; supported by internal conversion data this decay.

[&] Additional information 2.

[a] For absolute intensity per 100 decays, multiply by 0.099536.

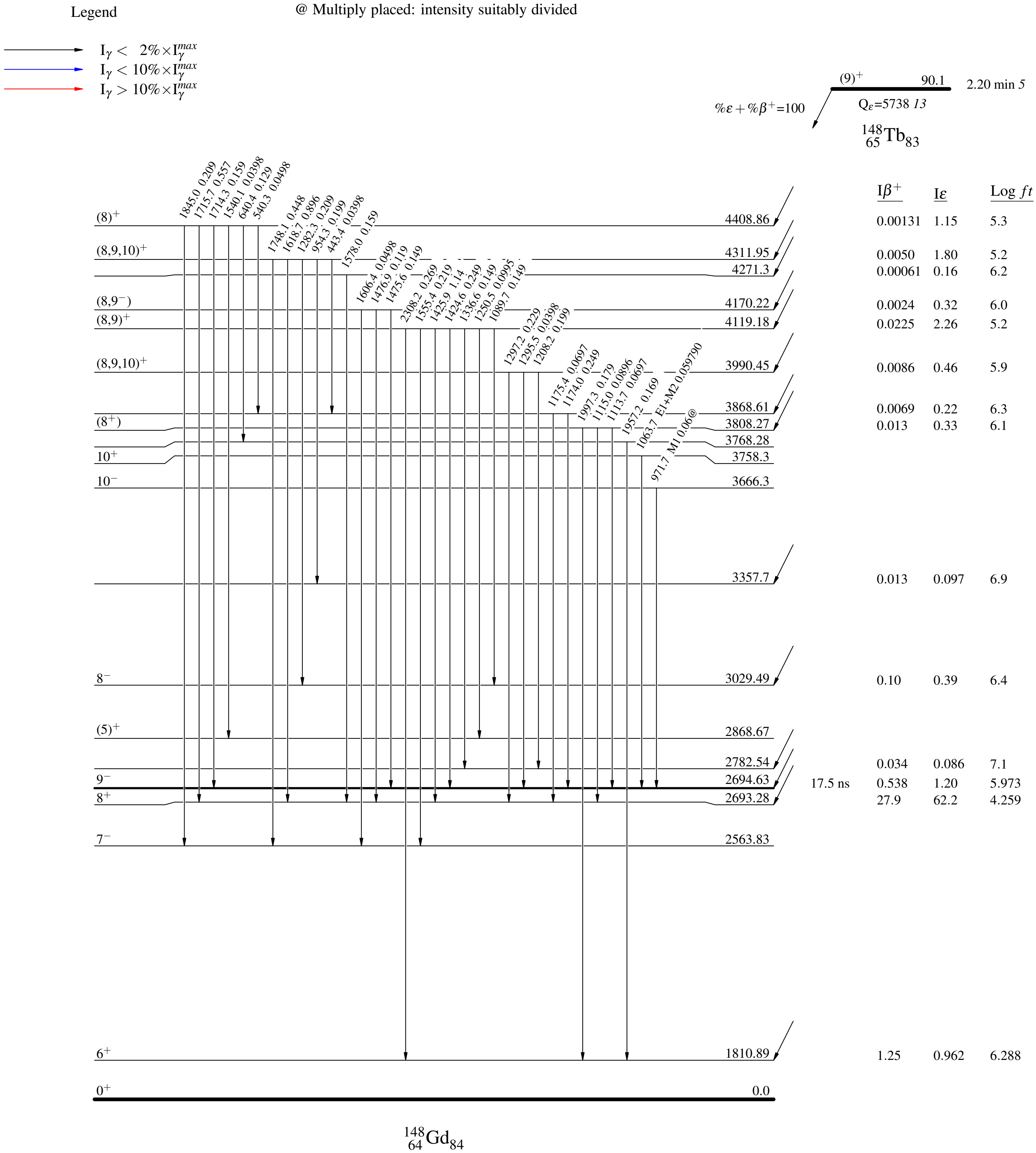
[b] Multiply placed with intensity suitably divided.

^{148}Tb ε decay (2.20 min) 1991CoZY

Decay Scheme

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

@ Multiply placed: intensity suitably divided



^{148}Tb ε decay (2.20 min) 1991CoZY

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
@ Multiply placed: intensity suitably divided