Adopted Levels, Gammas

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

Q(β^-)=−2678 *10*; S(n)=7860 *15*; S(p)=2464 *13*; Q(α)=2663 *17* 2012Wa38
Mass measurement (Penning trap): 2000Be42.

^{148}Tb Levels

Cross Reference (XREF) Flags

- A ^{148}Dy ε decay
- B ^{152}Ho α decay (50.0 s)
- C ^{152}Ho α decay (161.8 s)
- D (HI,xnγ)

E(level)	J$^\pi$[†]	T$_{1/2}$	XREF	Comments
0.0	2$^-$	60 min *1*	A CD	%ε+%β^+=100 μ=−1.75 *2* (1997StZR,1990Al36,2005St24) Q=−0.29 *20* (1997StZR,1990Al36,2005St24) μ,Q: measured by collinear fast beam LASER spectroscopy − accelerated beam method. J$^\pi$: J=2 from optical-isotope shift and hyperfine-structure data measurement (1990Al36); π=− from E1 620γ from 1$^+$ level. T$_{1/2}$: from 1975SpZU, 66 min *10* (1961Bo19), see also 1960To04. rms charge radius <r^2>$^{1/2}$=4.9299 fm *1507* (2004An14).
90.1 *3*	(9)$^+$	2.20 min *5*	B D	%ε+%β^+=100 T$_{1/2}$: from 1973Bo13. Others: 2.43 min *7* (1975SpZU), 2.3 min *2* (1974Ne01). E(level): from level scheme (balance of Eγ) (1987StZU). J$^\pi$: log *ft*≈4.5 to 8$^+$ and systematics.
109.6 *2*	4$^-$	80 ns *4*	A CD	T$_{1/2}$: from (^{6}Li,2nγ) (1987StZV).
178.4 *2*	2$^+$	7.0 ns *6*	A CD	T$_{1/2}$: from (^{6}Li,2nγ) (1987StZV).
195.4	3$^-$		A CD	
280.9	3$^+$		A CD	
327.9 *4*	7$^+$	4.5 ns *4*	B D	T$_{1/2}$: from (^{6}Li,2nγ) (1987StZV).
345	5$^-$		D	
351.3	5$^+$		D	
375.3	4$^+$		D	
406.0 *4*	8$^+$	≤0.7 ns	B D	T$_{1/2}$: from (^{6}Li,2nγ) (1987StZV).
425.8	6$^+$		D	
620.24 *1*	1$^+$	≤0.25 ns	A	J$^\pi$: log *ft*=3.9 via 0$^+$ parent. T$_{1/2}$: from 1975AlZE, 1975VaYY (^{148}Dy ε decay).
657.8	(3$^-$)		A	J$^\pi$: γ to 2$^-$ is (M1).
794.5	2$^-$		A	
950.8	(2$^-$,1$^-$)		A	
1095.8	(11)$^-$	22 ns *1*	D	J$^\pi$: γ to (9)$^+$ is M2+E3 and systematics. T$_{1/2}$: unweighted average of 22 ns *1* (1979Br28), 25 ns *2* (1979Si08), 20 ns *2* (1980Bo07), and 20 ns *2* (1980Ja16).
1220	(5$^-$)		D	
1246	(6$^-$)		D	
1247.2	1$^+$		A	J$^\pi$: log *ft*=5.4 via 0$^+$.
1249	9$^-$		D	
1267	10$^+$		D	
1276.9	1		A	
1295	(8$^-$)		D	
1305	(7$^-$)		D	
1332.7	1		A	

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Adopted Levels, Gammas (continued)

^{148}Tb Levels (continued)

E(level)	J^{π}[†]	$T_{1/2}$	XREF	Comments
1365.9	1		A	
1380.0	$(12)^-$		D	J^{π}: γ to $(11)^-$ is M1 $\Delta J=1$; no γ to J<10.
1484	(10^+)		D	
1642.9	1^+		A	J^{π}: log *ft*=5.9 via 0^+.
1654	(8^+)		D	
1723	(9^+)		D	
1828.5	1		A	
1840.1	1^+		A	J^{π}: log *ft*=5.4 via 0^+.
2361.7			D	
2714.0	$(14)^-$		D	J^{π}: γ to $(12)^-$ is E2 $\Delta J=2$.
2868.4			D	
2953.9	$(15)^-$		D	J^{π}: see 3168 level.
3167.9	$(16)^-$		D	J^{π}: 214γ and 240γ are M1+E2, crossover 454γ is $\Delta J=2$ Q. This establishes $J^{\pi}=(15)^-$ and $(16)^-$ for levels: 2953.9 and 3167.9.
3367.1			D	
3594.9	(17^-)		D	
3801.8	$(17)^-$		D	J^{π}: γ to $(16)^-$ is M1+E2 $\Delta J=1$.
4178.5	(17)		D	
4238.9	(17)		D	
4295.7	(18)		D	
4422.9	(18^-)		D	
4504.9	(18)		D	
4862.1	(18)		D	
4946.1			D	
5008.9	(18)		D	
5172.4	(18)		D	
5225.4	(19^-)		D	
5314.5	(19)		D	
5558.4	(19)		D	
5747.0	(20^-)		D	
6489.8	(21^+)		D	
6523.3	(21)		D	
6933.5			D	
7270.0	(23^+)		D	
7341.9	(23^-)		D	
7620.4	(24^+)		D	
7760.9	(26^+)		D	
7833.8			D	
8338.1			D	
8618.6	(27^+)	1.310 μs *7*	D	$T_{1/2}$: from 1995Id01. Others: 1.3 μs *5* (1980Ja16), 0.84 μs *4* (1981BeYH).
9196.0			D	
9576.9	(29)		D	
9920.0			D	
9972.5			D	
10148.0			D	
10424.4			D	
10511.6			D	
10752.6			D	
10791.6			D	
10880.1			D	
10963.9			D	
11445.7			D	
12116.2			D	
12342.5			D	
12449.3			D	
13060.2			D	

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Adopted Levels, Gammas (continued)

^{148}Tb Levels (continued)

E(level)	XREF
13379.6	D
14090.6	D

† From analysis of $\gamma(\theta)$, α(K)exp, and systematics, except where noted otherwise.

$\gamma(^{148}Tb)$

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.†	α‡	Comments
109.6	4^-	109.6 *2*	100	0.0	2^-	E2	1.86	B(E2)(W.u.)=3.36 *18* α(K)=0.898 *14*; α(L)=0.745 *13*; α(M)=0.177 *3* α(N)=0.0396 *7*; α(O)=0.00515 *9*; α(P)=4.49×10^{-5} *7*
178.4	2^+	178.4 *2*	100	0.0	2^-	E1	0.0636	B(E1)(W.u.)=5.7×10^{-6} *5* α(K)=0.0537 *8*; α(L)=0.00776 *12*; α(M)=0.001687 *25* α(N)=0.000386 *6*; α(O)=5.72×10^{-5} *9*; α(P)=3.22×10^{-6} *5*
195.4	3^-	85.8	100	109.6	4^-	M1	3.41	α(K)=2.88 *4*; α(L)=0.420 *6*; α(M)=0.0918 *13* α(N)=0.0212 *3*; α(O)=0.00327 *5*; α(P)=0.000214 *3*
280.9	3^+	102.5	100	178.4	2^+	M1	2.05	α(K)=1.725 *25*; α(L)=0.251 *4*; α(M)=0.0549 *8* α(N)=0.01270 *18*; α(O)=0.00196 *3*; α(P)=0.0001285 *18*
327.9	7^+	237.8 *2*	100	90.1	$(9)^+$	E2	0.1297	B(E2)(W.u.)=3.1 *3* α(K)=0.0934 *14*; α(L)=0.0282 *4*; α(M)=0.00650 *10* α(N)=0.001471 *22*; α(O)=0.000202 *3*; α(P)=5.55×10^{-6} *8*
351.3	5^+	241.7	100	109.6	4^-	E1	0.0287	α(K)=0.0243 *4*; α(L)=0.00344 *5*; α(M)=0.000747 *11* α(N)=0.0001712 *24*; α(O)=2.56×10^{-5} *4*; α(P)=1.507×10^{-6} *21*
375.3	4^+	94.4	100	280.9	3^+	M1	2.59	α(K)=2.18 *3*; α(L)=0.319 *5*; α(M)=0.0696 *10* α(N)=0.01610 *23*; α(O)=0.00248 *4*; α(P)=0.0001628 *23*
406.0	8^+	78.1		327.9	7^+	M1	4.48	α(K)=3.77 *6*; α(L)=0.552 *8*; α(M)=0.1206 *17* α(N)=0.0279 *4*; α(O)=0.00429 *6*; α(P)=0.000282 *4*
		315.9 *2*		90.1	$(9)^+$	M1	0.0906	α(K)=0.0766 *11*; α(L)=0.01091 *16*; α(M)=0.00238 *4* α(N)=0.000550 *8*; α(O)=8.49×10^{-5} *12*; α(P)=5.65×10^{-6} *8*
425.8	6^+	74.4		351.3	5^+	M1	5.15	α(K)=4.34 *6*; α(L)=0.636 *9*; α(M)=0.1389 *20* α(N)=0.0321 *5*; α(O)=0.00494 *7*; α(P)=0.000324 *5*
		97.8		327.9	7^+	M1	2.34	α(K)=1.97 *3*; α(L)=0.288 *4*; α(M)=0.0629 *9* α(N)=0.01454 *21*; α(O)=0.00224 *4*; α(P)=0.0001471 *21*
620.24	1^+	339.6	0.04	280.9	3^+			
		442.0	0.13	178.4	2^+	(M1)	0.0376	B(M1)(W.u.)>1.3×10^{-6} α(K)=0.0319 *5*; α(L)=0.00449 *7*; α(M)=0.000978 *14* α(N)=0.000226 *4*; α(O)=3.49×10^{-5} *5*; α(P)=2.33×10^{-6} *4*
		620.24 *1*	100	0.0	2^-	E1	0.00308	B(E1)(W.u.)>4.0×10^{-6} α(K)=0.00263 *4*; α(L)=0.000354 *5*; α(M)=7.65×10^{-5} *11* α(N)=1.762×10^{-5} *25*; α(O)=2.69×10^{-6} *4*; α(P)=1.735×10^{-7} *25*
657.8	(3^-)	462.1	65	195.4	3^-	(M1)	0.0335	α(K)=0.0284 *4*; α(L)=0.00400 *6*; α(M)=0.000871 *13* α(N)=0.000201 *3*; α(O)=3.11×10^{-5} *5*; α(P)=2.08×10^{-6} *3*
		657.8	100	0.0	2^-	(M1)	0.01373	α(K)=0.01167 *17*; α(L)=0.001620 *23*; α(M)=0.000352 *5* α(N)=8.15×10^{-5} *12*; α(O)=1.260×10^{-5} *18*; α(P)=8.48×10^{-7} *12*

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Adopted Levels, Gammas (continued)

γ(^{148}Tb) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.[†]	δ[#]	α[‡]	Comments
794.5	2⁻	136.9	62	657.8	(3⁻)	(M1)		0.898	α(K)=0.758 *11*; α(L)=0.1100 *16*; α(M)=0.0240 *4* α(N)=0.00555 *8*; α(O)=0.000855 *12*; α(P)=5.64×10^{-5} *8*
		616.2	5	178.4	2⁺				
		794.9	100	0.0	2⁻	(M1)		0.00860	α(K)=0.00732 *11*; α(L)=0.001009 *15*; α(M)=0.000219 *3* α(N)=5.07×10^{-5} *8*; α(O)=7.85×10^{-6} *11*; α(P)=5.30×10^{-7} *8*
950.8	(2⁻,1⁻)	156.0	3	794.5	2⁻				
		772.0	3	178.4	2⁺				
		950.8	100	0.0	2⁻	(M1)		0.00557	α(K)=0.00474 *7*; α(L)=0.000650 *9*; α(M)=0.0001410 *20* α(N)=3.26×10^{-5} *5*; α(O)=5.05×10^{-6} *7*; α(P)=3.42×10^{-7} *5*
1095.8	(11)⁻	690.2		406.0	8⁺				
		1006.2		90.1	(9)⁺	E3+M2	2.2 *6*	0.0072 *7*	α(K)=0.0059 *6*; α(L)=0.00098 *7*; α(M)=0.000218 *15* α(N)=5.0×10^{-5} *4*; α(O)=7.6×10^{-6} *6*; α(P)=4.4×10^{-7} *5* Additional information 1.
1220	(5⁻)	793.9		425.8	6⁺				
		869.5		351.3	5⁺				
1246	(6⁻)	820.1		425.8	6⁺				
		917.9		327.9	7⁺				
1247.2	1⁺	627	4.7	620.24	1⁺				
		1068.9	5.3	178.4	2⁺				
		1247.2	100	0.0	2⁻	E1		8.42×10^{-4}	α(K)=0.000684 *10*; α(L)=8.92×10^{-5} *13*; α(M)=1.92×10^{-5} *3* α(N)=4.44×10^{-6} *7*; α(O)=6.84×10^{-7} *10*; α(P)=4.59×10^{-8} *7*; α(IPF)=4.51×10^{-5} *7*
1249	9⁻	842.5	100	406.0	8⁺	E1		1.65×10^{-3}	α(K)=0.001413 *20*; α(L)=0.000187 *3*; α(M)=4.05×10^{-5} *6* α(N)=9.33×10^{-6} *13*; α(O)=1.432×10^{-6} *20*; α(P)=9.42×10^{-8} *14*
1267	10⁺	1177.2	100	90.1	(9)⁺				
1276.9	1	1097	5.3	178.4	2⁺				
		1276.9	100	0.0	2⁻				
1295	(8⁻)	888.7		406.0	8⁺				
		967.1		327.9	7⁺				
1305	(7⁻)	899	100	406.0	8⁺				
1332.7	1	1332.7	100	0.0	2⁻				
1365.9	1	1085.4	100	280.9	3⁺				
		1187.5	75	178.4	2⁺				
		1366	50	0.0	2⁻				
1380.0	(12)⁻	284.1 *2*	100	1095.8	(11)⁻	M1		0.1202	α(K)=0.1017 *15*; α(L)=0.01452

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Adopted Levels, Gammas (continued)

γ(^{148}Tb) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.[†]	δ[#]	α[‡]	Comments
									21; α(M)=0.00317 *5* α(N)=0.000732 *11*; α(O)=0.0001130 *16*; α(P)=7.50×10^{-6} *11*
1484	(10$^+$)	1078.2		406.0	8$^+$				
		1394.0		90.1	(9)$^+$				
1642.9	1$^+$	691.9	100	950.8	(2$^-$,1$^-$)				
		847.1	47	794.5	2$^-$				
		1642.9	5.9	0.0	2$^-$				
1654	(8$^+$)	1228		425.8	6$^+$				
		1247.7		406.0	8$^+$				
		1563.0		90.1	(9)$^+$				
1723	(9$^+$)	1317.4		406.0	8$^+$				
		1395.3		327.9	7$^+$				
		1633		90.1	(9)$^+$				
1828.5	1	1547	25	280.9	3$^+$				
		1650.2	100	178.4	2$^+$				
1840.1	1$^+$	890.0	86	950.8	(2$^-$,1$^-$)				
		1045.9	100	794.5	2$^-$				
		1840.1	21	0.0	2$^-$				
2361.7		981.7	100	1380.0	(12)$^-$				
2714.0	(14)$^-$	1334.1 *3*	100	1380.0	(12)$^-$	E2		1.65×10^{-3}	α(K)=0.001375 *20*; α(L)=0.000192 *3*; α(M)=4.18×10^{-5} *6* α(N)=9.63×10^{-6} *14*; α(O)=1.476×10^{-6} *21*; α(P)=9.51×10^{-8} *14*; α(IPF)=2.66×10^{-5} *4*
2868.4		506.7	100	2361.7					
2953.9	(15)$^-$	240.0 *2*	100	2714.0	(14)$^-$	M1+E2	+0.09 *2*	0.189	α(K)=0.1595 *23*; α(L)=0.0230 *4*; α(M)=0.00502 *8* α(N)=0.001161 *17*; α(O)=0.000179 *3*; α(P)=1.179×10^{-5} *17*
3167.9	(16)$^-$	214.1 *2*	100 *10*	2953.9	(15)$^-$	M1+E2		0.22 *4*	α(K)=0.17 *5*; α(L)=0.037 *6*; α(M)=0.0084 *15* α(N)=0.0019 *4*; α(O)=0.00027 *3*; α(P)=1.2×10^{-5} *5*
		454.1 *3*	16 *4*	2714.0	(14)$^-$	Q			
3367.1		498.7	100	2868.4					
3594.9	(17$^-$)	427.0 *2*		3167.9	(16)$^-$	M1+E2		0.032 *10*	α(K)=0.026 *9*; α(L)=0.0042 *7*; α(M)=0.00093 *14* α(N)=0.00021 *4*; α(O)=3.2×10^{-5} *6*; α(P)=1.9×10^{-6} *7*
		640.8		2953.9	(15)$^-$				
3801.8	(17)$^-$	434.7		3367.1					
		634.2 *2*		3167.9	(16)$^-$	M1+E2		0.012 *4*	α(K)=0.010 *3*; α(L)=0.0014 *4*; α(M)=0.00031 *8* α(N)=7.3×10^{-5} *17*; α(O)=1.1×10^{-5} *3*; α(P)=6.9×10^{-7} *24*
4178.5	(17)	1010.6	100	3167.9	(16)$^-$				
4238.9	(17)	1071.0	100	3167.9	(16)$^-$				
4295.7	(18)	493.8		3801.8	(17)$^-$				

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Adopted Levels, Gammas (continued)

$\gamma(^{148}Tb)$ (continued)

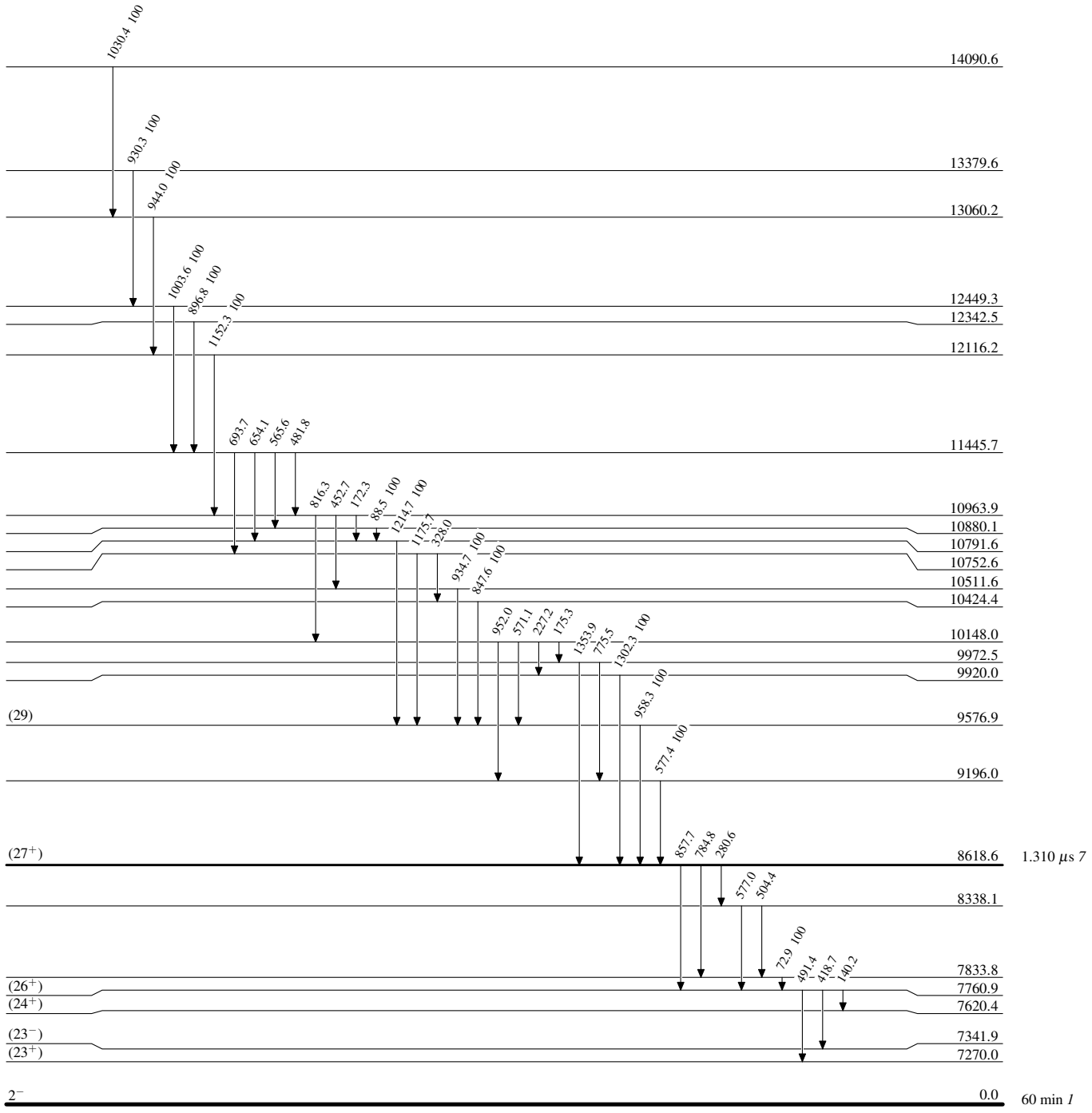
E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π
4295.7	(18)	700.8		3594.9	(17^-)	7760.9	(26^+)	491.4		7270.0	(23^+)
4422.9	(18^-)	184.0		4238.9	(17)	7833.8		72.9	100	7760.9	(26^+)
		244.7		4178.5	(17)	8338.1		504.4		7833.8	
		621[@] *1*		3801.8	$(17)^-$			577.0		7760.9	(26^+)
		828		3594.9	(17^-)	8618.6	(27^+)	280.6		8338.1	
4504.9	(18)	82.0	100	4422.9	(18^-)			784.8		7833.8	
4862.1	(18)	566.3		4295.7	(18)			857.7		7760.9	(26^+)
		1060.4		3801.8	$(17)^-$	9196.0		577.4	100	8618.6	(27^+)
4946.1		522.5 *5*	100	4422.9	(18^-)	9576.9	(29)	958.3	100	8618.6	(27^+)
5008.9	(18)	1207.1	100	3801.8	$(17)^-$	9920.0		1302.3	100	8618.6	(27^+)
5172.4	(18)	1370.6		3801.8	$(17)^-$	9972.5		775.5		9196.0	
5225.4	(19^-)	216.6		5008.9	(18)			1353.9		8618.6	(27^+)
		363.0		4862.1	(18)	10148.0		175.3		9972.5	
		720.5		4504.9	(18)			227.2		9920.0	
		802.5		4422.9	(18^-)			571.1		9576.9	(29)
		929.4		4295.7	(18)			952.0		9196.0	
		1631.0		3594.9	(17^-)	10424.4		847.6	100	9576.9	(29)
5314.5	(19)	142.3		5172.4	(18)	10511.6		934.7	100	9576.9	(29)
		452.0		4862.1	(18)	10752.6		328.0		10424.4	
		809.7		4504.9	(18)			1175.7		9576.9	(29)
5558.4	(19)	333.0	100	5225.4	(19^-)	10791.6		1214.7	100	9576.9	(29)
5747.0	(20^-)	521.6	100	5225.4	(19^-)	10880.1		88.5	100	10791.6	
6489.8	(21^+)	742.6		5747.0	(20^-)	10963.9		172.3		10791.6	
		931.5		5558.4	(19)			452.7		10511.6	
		1175.5		5314.5	(19)			816.3		10148.0	
6523.3	(21)	1208.8	100	5314.5	(19)	11445.7		481.8		10963.9	
6933.5		443.7	100	6489.8	(21^+)			565.6		10880.1	
7270.0	(23^+)	336.6		6933.5				654.1		10791.6	
		746.6		6523.3	(21)			693.7		10752.6	
		780.1		6489.8	(21^+)	12116.2		1152.3	100	10963.9	
7341.9	(23^-)	71.9		7270.0	(23^+)	12342.5		896.8	100	11445.7	
7620.4	(24^+)	278.4		7341.9	(23^-)	12449.3		1003.6	100	11445.7	
		350.6		7270.0	(23^+)	13060.2		944.0	100	12116.2	
7760.9	(26^+)	140.2		7620.4	(24^+)	13379.6		930.3	100	12449.3	
		418.7		7341.9	(23^-)	14090.6		1030.4	100	13060.2	

† From conversion electron data in ε decay, and $\gamma(\theta)$, DCO ratios, conversion electron and linear-polarization data in (HI,xnγ).
‡ Additional information 2.
# 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.
@ Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



$^{148}_{65}Tb_{83}$

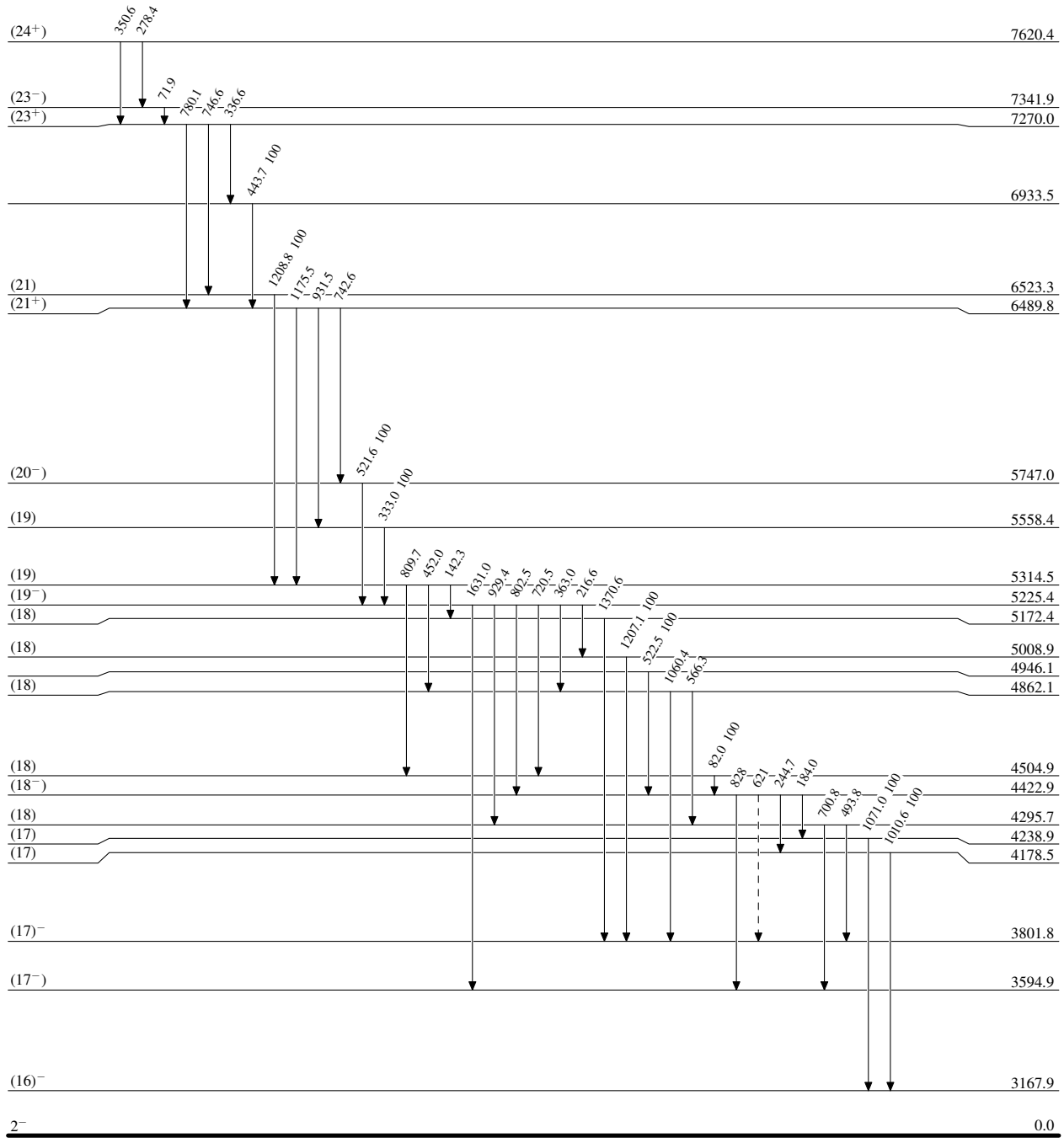
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

- - - - - - ► γ Decay (Uncertain)

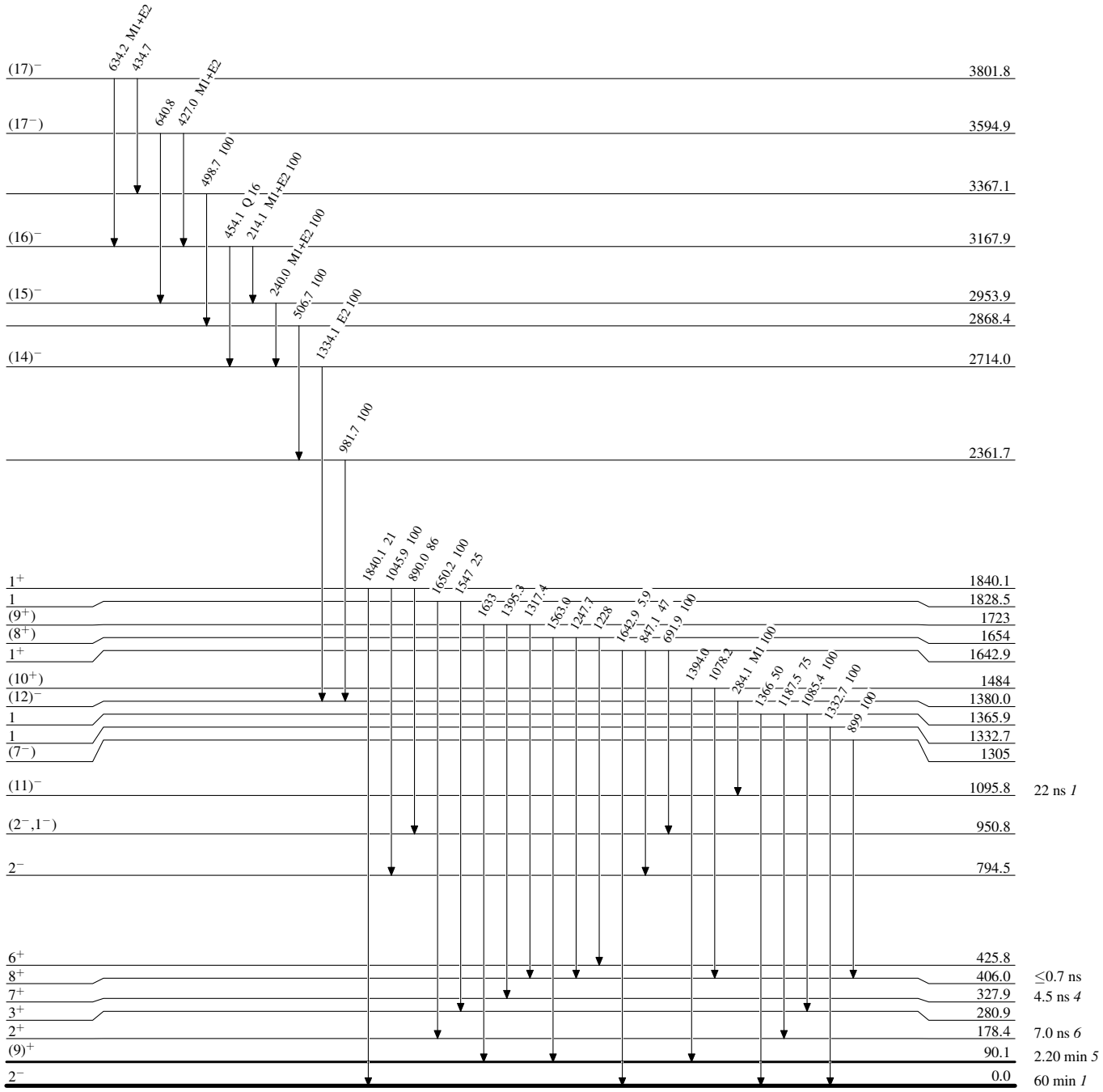


$^{148}_{65}Tb_{83}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

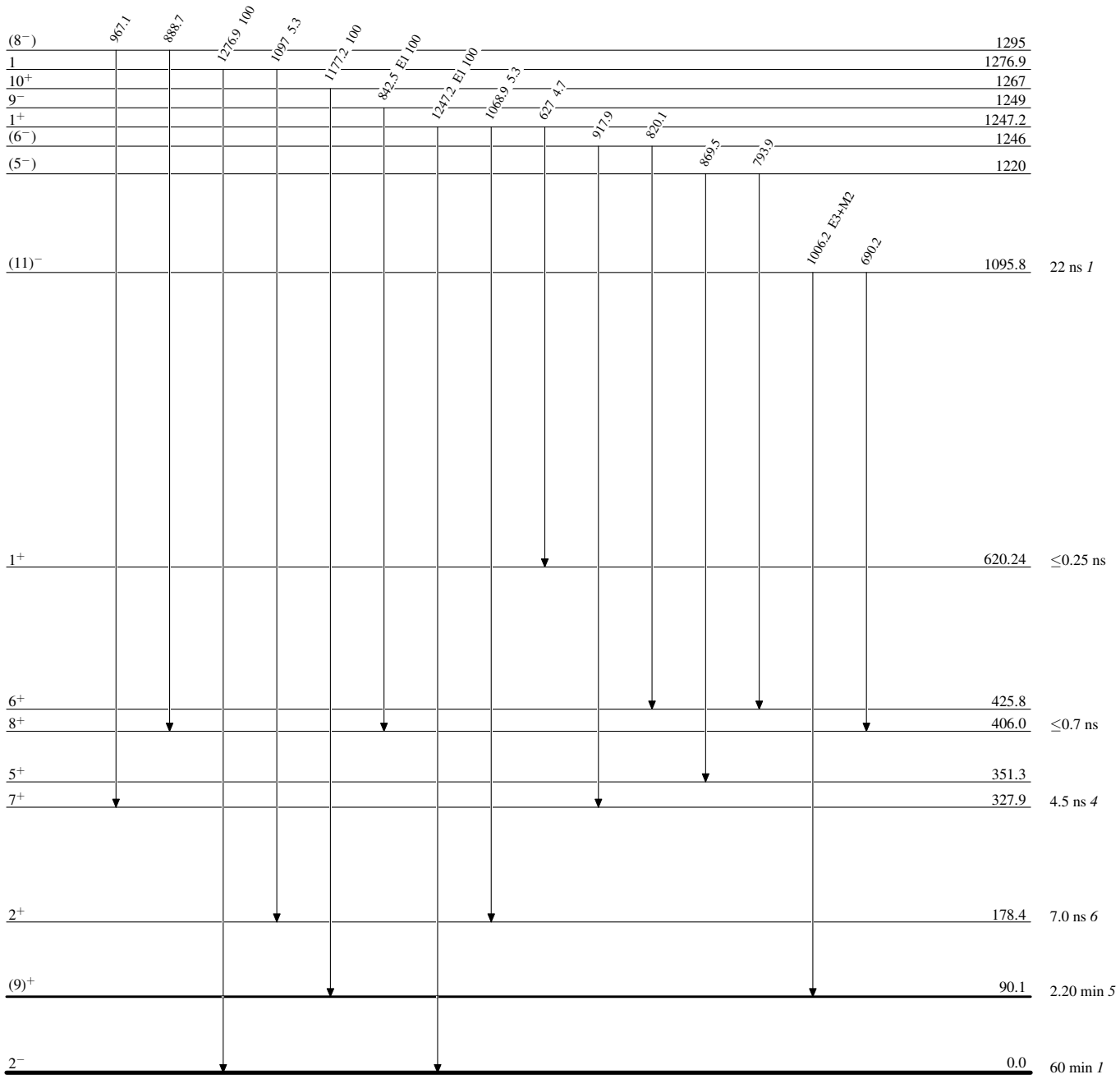


$^{148}_{65}Tb_{83}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

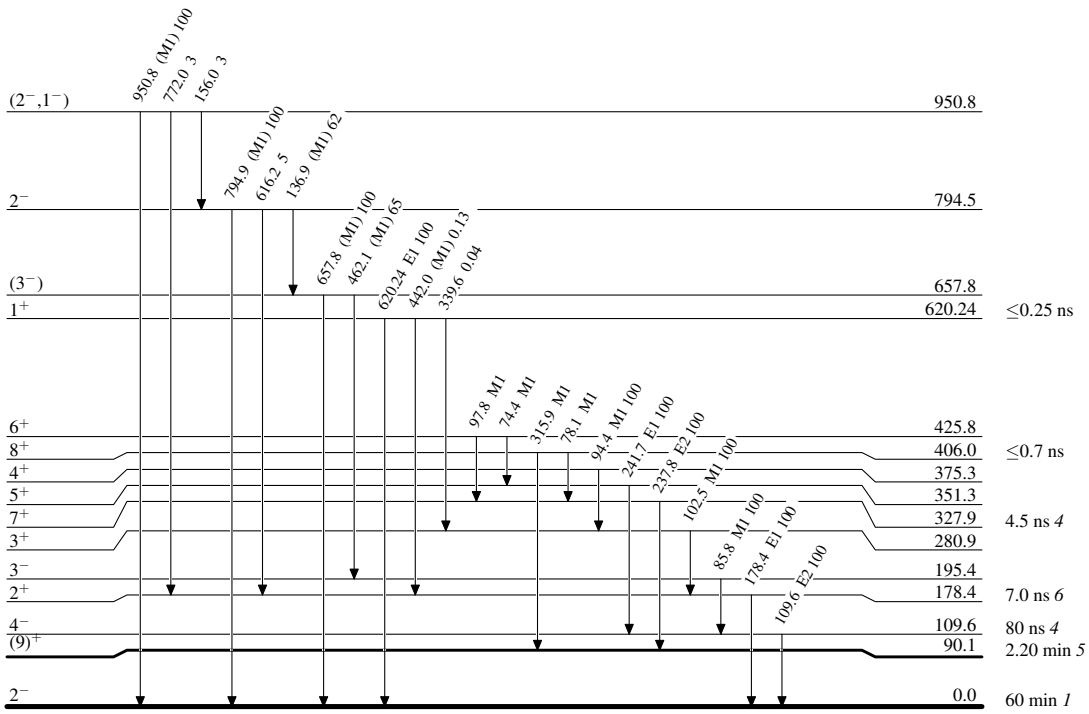


$^{148}_{65}Tb_{83}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{148}_{65}Tb_{83}$