

(HI,xnγ) 1995Sc25

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

Production: (HI,xpynγ) with ions: α (1979Br28), ⁶Li, ⁷Li (1993KIZZ,1987StZU,1987StZV,1988StZX), ¹⁰B (1979Si08), ¹²C, ¹⁴N, ¹⁶O (1980Ja16), ¹³C (1995Id01), ¹⁶O (1978BeYX), ³¹P (1995Sc25), ⁵⁰Ti, ⁶⁵Cu (1980Bo07), ¹³⁰Te (1995Id01).

Measured: γ, γ(t) (1978BeYX,1979Si08,1979Br28,1980Bo07,1980Ja16,1980Kh06,1982TaZS), γ(θ), γγ, ce (1978BeYX,1979Si08,1979Br28,1987StZU,1987StZV,1988StZX), linear polarization (1979Br28).

The level scheme is a combination of the data of many groups, including the results of ¹⁴⁴Sm(⁶Li,xng), ¹⁴⁴Sm(⁷Li,xny) (1993KIZZ,1987StZU,1987StZV,1988StZX), and the ¹²²Sn(³¹P,5nγ), ¹²⁰Sn(³¹P,3nγ) (1995Sc25) studies, with all level energies shifted up 90.1 keV. Out of a total of 31 excited states observed by 1995Id01, 8 levels from 5969 to 11795 keV are not confirmed by 1995Sc25 and have been left out.

2007Po13,2005Od04,2005Od03,2002GoZY: remeasured the 8618.6, 1.310 7 μs isomer.

1980Vr01: search for α decay of high-spin isomers in ¹⁴⁸Tb with a T_{1/2}=19 ns; no evidence of α decay was observed.

¹⁴⁸Tb Levels

E(level)	J ^π	T _{1/2}	Comments
0.0	2 ⁻	60 min <i>I</i>	
90.1 3	(9) ⁺		E(level): from 1988StZX.
109.6 2	4 ⁻	80 [±] ns 4	
178.4 2	2 ⁺	7.0 [±] ns 6	
195.4	3 ⁻		
280.9	3 ⁺		
327.9 4	7 ⁺	4.5 [±] ns 4	
345	5 ⁻		
351.3	5 ⁺		
375.3	4 ⁺		
406.0 4	8 ⁺	≤0.7 [±] ns	
425.8	6 ⁺		
1095.8	(11) ⁻	22 ns <i>I</i>	T _{1/2} : unweighted average of 22 ns <i>I</i> (1979Br28), 25 ns 2 (1979Si08), 20 ns 2 (1980Bo07), and 20 ns 2 (1980Ja16).
1220	(5 ⁻)		
1246	(6 ⁻)		
1249	9 ⁻		
1267	10 ⁺		
1295	(8 ⁻)		
1305	(7 ⁻)		
1380.0	(12) ⁻		
1484	(10 ⁺)		
1654	(8 ⁺)		
1723	(9 ⁺)		
2361.7			
2714.0	(14) ⁻		
2868.4			
2953.9	(15) ⁻		
3167.9	(16) ⁻		
3367.1			
3594.9	(17 ⁻)		
3801.8	(17) ⁻		
4178.5	(17)		
4238.9	(17)		
4295.7	(18)		
4422.9	(18 ⁻)		
4504.9	(18)		

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(HI,xnγ) 1995Sc25 (continued)

¹⁴⁸Tb Levels (continued)

E(level)	J ^π †	E(level)	J ^π †	T _{1/2}	E(level)
4862.1	(18)	7341.9	(23 ⁻)		10511.6
4946.1		7620.4	(24 ⁺)		10752.6
5008.9	(18)	7760.9	(26 ⁺)		10791.6
5172.4	(18)	7833.8			10880.1
5225.4	(19 ⁻)	8338.1			10963.9
5314.5	(19)	8618.6	(27 ⁺)	1.310 [#] μs 7	11445.7
5558.4	(19)	9196.0			12116.2
5747.0	(20 ⁻)	9576.9	(29)		12342.5
6489.8	(21 ⁺)	9920.0			12449.3
6523.3	(21)	9972.5			13060.2
6933.5		10148.0			13379.6
7270.0	(23 ⁺)	10424.4			14090.6

† From Adopted Levels; supported by γ(θ), conversion electron data, and systematics. Details not given by authors.

‡ From 1987StZV (γγ(t)).

From 1995Id01 (particle-γ coincidence data). Others: 1.3 μs 5 (1980Ja16), 0.84 μs 4 (1981BeYH).

E _γ	I _γ [#]	γ(¹⁴⁸ Tb)						Comments
		E _i (level)	J _i ^π	E _f	J _f ^π	Mult. [‡]	α [@]	
71.9		7341.9	(23 ⁻)	7270.0	(23 ⁺)			
72.9		7833.8		7760.9	(26 ⁺)			
74.4		425.8	6 ⁺	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
78.1		406.0	8 ⁺	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
82.0		4504.9	(18)	4422.9	(18 ⁻)			
85.8		195.4	3 ⁻	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
88.5		10880.1		10791.6				
94.4		375.3	4 ⁺	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
97.8		425.8	6 ⁺	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
102.5		280.9	3 ⁺	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
109.6 2		109.6	4 ⁻	0.0	2 ⁻	E2 [†]	1.86	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
140.2		7760.9	(26 ⁺)	7620.4	(24 ⁺)			
142.3		5314.5	(19)	5172.4	(18)			
172.3		10963.9		10791.6				
175.3		10148.0		9972.5				
178.4 2		178.4	2 ⁺	0.0	2 ⁻	E1 [†]	0.0636	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
184.0		4422.9	(18 ⁻)	4238.9	(17)			
214.1 2	49 5	3167.9	(16) ⁻	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 Mult.: A ₂ =-0.14 1, A ₄ =-0.01 2 (1979Br28), A ₂ =-0.17 3, A ₄ =+0.09 3, α(K)exp=0.22 3 (1979Si08).

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(HI,xnγ) **1995Sc25** (continued)

γ(¹⁴⁸Tb) (continued)

<u>E_γ</u>	<u>I_γ[#]</u>	<u>E_i(level)</u>	<u>J_i^π</u>	<u>E_f</u>	<u>J_f^π</u>	<u>Mult.[‡]</u>	<u>δ[‡]&</u>	<u>α[@]</u>	<u>Comments</u>
216.6		5225.4	(19 ⁻)	5008.9	(18)				
227.2		10148.0		9920.0					
237.8 2		327.9	7 ⁺	90.1	(9) ⁺	E2 [†]		0.1297	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
240.0 2	59 6	2953.9	(15) ⁻	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 I _γ : corrected for a 15% 8 contribution from the 240-keV γ from ¹⁴⁵ Eu. Mult.: A ₂ =-0.09 1, A ₄ =+0.00 2; linear polarization=0.92 6 (1979Br28), A ₂ =-0.11 2, A ₄ =+0.03 2, α(K)exp=0.16 2 (1979Si08).
241.7		351.3	5 ⁺	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
244.7		4422.9	(18 ⁻)	4178.5	(17)				
278.4		7620.4	(24 ⁺)	7341.9	(23 ⁻)				
280.6		8618.6	(27 ⁺)	8338.1					
284.1 2	100	1380.0	(12) ⁻	1095.8	(11) ⁻	M1 [†]		0.1202	α(K)=0.1017 15; α(L)=0.01452 21; α(M)=0.00317 5 α(N)=0.000732 11; α(O)=0.0001130 16; α(P)=7.50×10 ⁻⁶ 11 Mult.: A ₂ =-0.18 1, A ₄ =+0.01 1, linear polarization=0.94 5 (1979Br28), A ₂ =-0.24 3, A ₄ =+0.02 3, α(K)exp=0.086 5 (1979Si08).
315.9 2		406.0	8 ⁺	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
328.0		10752.6		10424.4					
333.0		5558.4	(19)	5225.4	(19 ⁻)				
336.6		7270.0	(23 ⁺)	6933.5					
350.6		7620.4	(24 ⁺)	7270.0	(23 ⁺)				
363.0		5225.4	(19 ⁻)	4862.1	(18)				
418.7		7760.9	(26 ⁺)	7341.9	(23 ⁻)				
427.0 2	23 3	3594.9	(17 ⁻)	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 Mult.: A ₂ =+0.25 5, A ₄ =+0.07 7 (1979Br28),
434.7		3801.8	(17) ⁻	3367.1					
443.7		6933.5		6489.8	(21 ⁺)				
452.0		5314.5	(19)	4862.1	(18)				
452.7		10963.9		10511.6					
454.1 3	8 2	3167.9	(16) ⁻	2714.0	(14) ⁻	Q			Mult.: A ₂ =+0.4 1, A ₄ =-0.2 2 (1979Br28).
481.8		11445.7		10963.9					

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(HI,xn γ) 1995Sc25 (continued)

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

E_γ	I_γ #	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. ‡	$\alpha^{\text{@}}$	Comments
491.4		7760.9	(26 ⁺)	7270.0	(23 ⁺)			
493.8		4295.7	(18)	3801.8	(17) ⁻			
498.7		3367.1		2868.4				
504.4		8338.1		7833.8				
506.7		2868.4		2361.7				
521.6		5747.0	(20 ⁻)	5225.4	(19 ⁻)			
522.5 5	12 1	4946.1		4422.9	(18 ⁻)			M: $A_2=+0.2$, $A_4=-0.1$ 1 (1979Br28).
565.6		11445.7		10880.1				
566.3		4862.1	(18)	4295.7	(18)			
571.1		10148.0		9576.9	(29)			
577.0		8338.1		7760.9	(26 ⁺)			
577.4		9196.0		8618.6	(27 ⁺)			
621 ^a 1	≈ 6	4422.9	(18 ⁻)	3801.8	(17) ⁻			
634.2 2	29 3	3801.8	(17) ⁻	3167.9	(16) ⁻	M1+E2	0.012 4	$\alpha(\text{K})=0.010$ 3; $\alpha(\text{L})=0.0014$ 4; $\alpha(\text{M})=0.00031$ 8 $\alpha(\text{N})=7.3\times 10^{-5}$ 17; $\alpha(\text{O})=1.1\times 10^{-5}$ 3; $\alpha(\text{P})=6.9\times 10^{-7}$ 24 Mult.: $A_2=-0.13$ 4, $A_4=-0.02$ 6 (1979Br28).
640.8		3594.9	(17 ⁻)	2953.9	(15) ⁻			
654.1		11445.7		10791.6				
690.2		1095.8	(11) ⁻	406.0	8 ⁺			
693.7		11445.7		10752.6				
700.8		4295.7	(18)	3594.9	(17 ⁻)			
720.5		5225.4	(19 ⁻)	4504.9	(18)			
742.6		6489.8	(21 ⁺)	5747.0	(20 ⁻)			
746.6		7270.0	(23 ⁺)	6523.3	(21)			
775.5		9972.5		9196.0				
780.1		7270.0	(23 ⁺)	6489.8	(21 ⁺)			
784.8		8618.6	(27 ⁺)	7833.8				
793.9		1220	(5 ⁻)	425.8	6 ⁺			
802.5		5225.4	(19 ⁻)	4422.9	(18 ⁻)			
809.7		5314.5	(19)	4504.9	(18)			
816.3		10963.9		10148.0				
820.1		1246	(6 ⁻)	425.8	6 ⁺			
828 1	≈ 14	4422.9	(18 ⁻)	3594.9	(17 ⁻)			I_γ : composite γ in singles spectrum; I_γ estimated from coincidence spectra with $\approx 50\%$ uncertainty. Mult.: $A_2=-0.08$ 4, $A_4=-0.02$ 5 (1979Br28).
842.5		1249	9 ⁻	406.0	8 ⁺	E1 †	1.65×10^{-3}	$\alpha(\text{K})=0.001413$ 20; $\alpha(\text{L})=0.000187$ 3; $\alpha(\text{M})=4.05\times 10^{-5}$ 6 $\alpha(\text{N})=9.33\times 10^{-6}$ 13; $\alpha(\text{O})=1.432\times 10^{-6}$ 20; $\alpha(\text{P})=9.42\times 10^{-8}$ 14
847.6		10424.4		9576.9	(29)			
857.7		8618.6	(27 ⁺)	7760.9	(26 ⁺)			
869.5		1220	(5 ⁻)	351.3	5 ⁺			
888.7		1295	(8 ⁻)	406.0	8 ⁺			
896.8		12342.5		11445.7				
899		1305	(7 ⁻)	406.0	8 ⁺			
917.9		1246	(6 ⁻)	327.9	7 ⁺			
929.4		5225.4	(19 ⁻)	4295.7	(18)			
930.3		13379.6		12449.3				
931.5		6489.8	(21 ⁺)	5558.4	(19)			
934.7		10511.6		9576.9	(29)			
944.0		13060.2		12116.2				
952.0		10148.0		9196.0				

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(HI,xny) 1995Sc25 (continued) $\gamma(^{148}\text{Tb})$ (continued)

E_γ	$I_\gamma^\#$	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. ‡	$\delta^\ddagger\&$	$\alpha^\@$	Comments
958.3		9576.9	(29)	8618.6	(27 ⁺)				
967.1		1295	(8 ⁻)	327.9	7 ⁺				
981.7		2361.7		1380.0	(12) ⁻				
1003.6		12449.3		11445.7					
1006.2	98 16	1095.8	(11) ⁻	90.1	(9) ⁺	M2+E3 ‡	2.23 55	0.0071 6	$\alpha(\text{K})=0.0059$ 5; $\alpha(\text{L})=0.00098$ 6; $\alpha(\text{M})=0.000218$ 13 $\alpha(\text{N})=5.0\times 10^{-5}$ 3; $\alpha(\text{O})=7.6\times 10^{-6}$ 5; $\alpha(\text{P})=4.4\times 10^{-7}$ 4 I_γ : corrected for a 25% 8 contribution from the 1007-keV γ in ^{148}Gd . Mult.: $A_2=+0.04$ 2, $A_4=-0.06$ 2, $\alpha(\text{K})_{\text{exp}}=0.0067$ 9, linear polarization=1.09 12 (1979Br28), $A_2=-0.03$ 2, $A_4=-0.02$, $\alpha(\text{K})_{\text{exp}}=0.0055$ 5, E3 (1979Si08).
1010.6		4178.5	(17)	3167.9	(16) ⁻				
1030.4		14090.6		13060.2					
1060.4		4862.1	(18)	3801.8	(17) ⁻				
1071.0		4238.9	(17)	3167.9	(16) ⁻				
1078.2		1484	(10 ⁺)	406.0	8 ⁺				
1152.3		12116.2		10963.9					
1175.5		6489.8	(21 ⁺)	5314.5	(19)				
1175.7		10752.6		9576.9	(29)				
1177.2		1267	10 ⁺	90.1	(9) ⁺				
1207.1		5008.9	(18)	3801.8	(17) ⁻				
1208.8		6523.3	(21)	5314.5	(19)				
1214.7		10791.6		9576.9	(29)				
1228		1654	(8 ⁺)	425.8	6 ⁺				
1247.7		1654	(8 ⁺)	406.0	8 ⁺				
1302.3		9920.0		8618.6	(27 ⁺)				
1317.4		1723	(9 ⁺)	406.0	8 ⁺				
1334.1 3	87 9	2714.0	(14) ⁻	1380.0	(12) ⁻	E2		1.65×10^{-3}	$\alpha(\text{K})=0.001375$ 20; $\alpha(\text{L})=0.000192$ 3; $\alpha(\text{M})=4.18\times 10^{-5}$ 6 $\alpha(\text{N})=9.63\times 10^{-6}$ 14; $\alpha(\text{O})=1.476\times 10^{-6}$ 21; $\alpha(\text{P})=9.51\times 10^{-8}$ 14; $\alpha(\text{IPF})=2.66\times 10^{-5}$ 4 Mult.: $A_2=+0.31$ 2, $A_4=-0.07$ 3, $\alpha(\text{K})_{\text{exp}}=0.00141$ 17 (1979Br28). Others: $A_2=+0.30$ 3, $A_4=+0.00$ 3, $\alpha(\text{K})_{\text{exp}}=+0.0021$ 2, M1+E2, $\delta=+0.32$ 5 (1979Si08).
1353.9		9972.5		8618.6	(27 ⁺)				
1370.6		5172.4	(18)	3801.8	(17) ⁻				
1394.0		1484	(10 ⁺)	90.1	(9) ⁺				
1395.3		1723	(9 ⁺)	327.9	7 ⁺				
1563.0		1654	(8 ⁺)	90.1	(9) ⁺				
1631.0		5225.4	(19) ⁻	3594.9	(17) ⁻				
1633		1723	(9 ⁺)	90.1	(9) ⁺				

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(HI,xn γ) 1995Sc25 (continued)

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

† From $\gamma(\theta)$, DCO ratios, and conversion electron data ([1993KIZZ](#),[1987StZV](#),[1987StZU](#),[1988StZX](#)).

‡ From $\gamma(\theta)$, linear polarization, and conversion electron data of [1979Br28](#) and [1979Si08](#), unless indicated otherwise.

Relative intensity ([1979Br28](#)).

@ [Additional information 1](#).

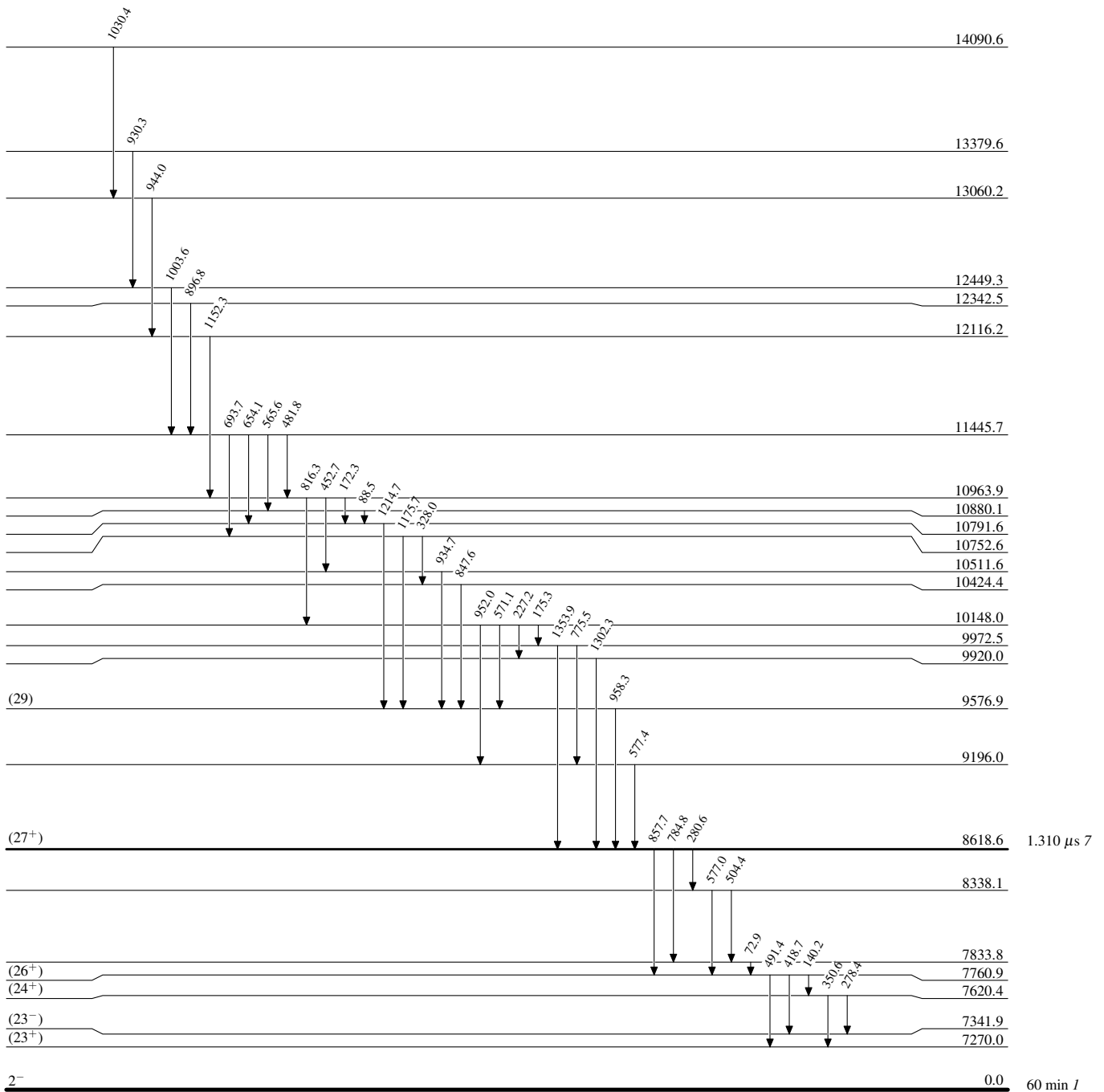
& If No value given it was assumed $\delta=1.00$ for E2/M1, $\delta=1.00$ for E3/M2 and $\delta=0.10$ for the other multipolarities.

^a Placement of transition in the level scheme is uncertain.

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Level Scheme

Intensities: Relative I_{γ}



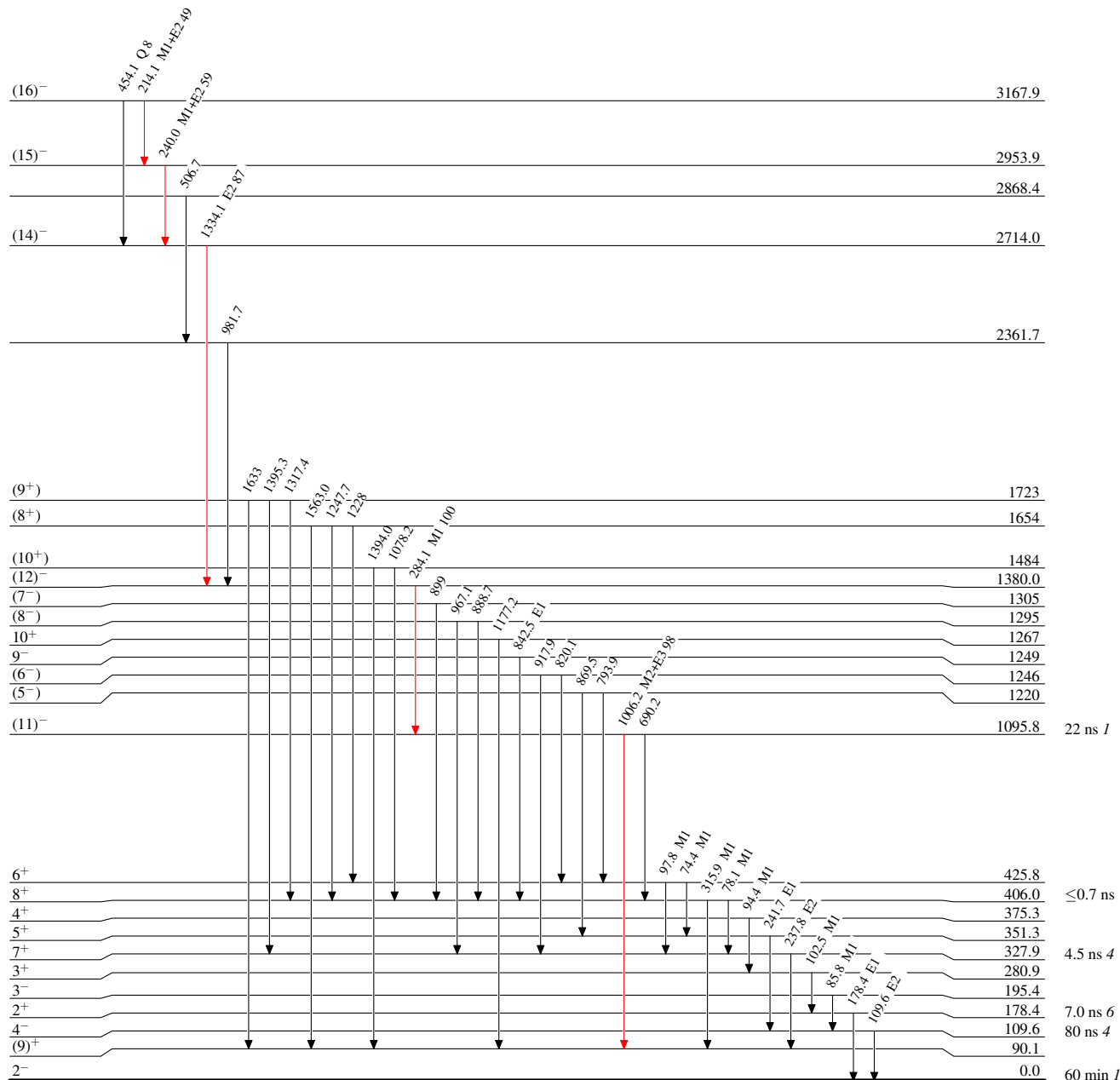
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Level Scheme (continued)

Intensities: Relative I_γ

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$



$^{148}\text{Tb}_{83}$