Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	F. G. Kondev	NDS 196,342 (2024)	1-Sep-2023

Q(β^-)=−40 *4*; S(n)=6871 *14*; S(p)=5606.9 *18*; Q(α)=1175.5 *19* 2021Wa16
S(2n)=15076 *6*, S(2p)=13318 *27* (2021Wa16).

^{202}Tl Levels

Cross Reference (XREF) Flags

A	^{202}Tl IT decay (591 μs)	F	^{203}Tl(p,d)
B	^{202}Tl IT decay (215 μs)	G	^{204}Hg(p,3nγ)
C	^{202}Pb ε decay (5.25×10^4 y)	H	^{204}Pb(d,α)
D	^{202}Pb ε decay (3.54 h)	I	^{207}Pb(μ^-,5nγ)
E	^{203}Tl(n,2nγ)		

E(level)†	J$^\pi$@	T$_{1/2}$	XREF	Comments
0.0	2$^-$	12.4706 d *55*	ABCDEFGHI	%ε+%β^+=100 μ=0.06 *1* J$^\pi$: Atomic beam (1958Ma35); μ. T$_{1/2}$: From 2011Hi19, includes both statistical and systematics uncertainties. Others: 12.47 d *8* (2002Un02,2014Un01), 12.6 d *1* (1984Ta09), 12.23 d *2* (1975Co19), 12.4 d *1* (1966Le06) and 12.0 d *1* (1957Ha97). μ: From 1976Ek03, 2019StZV using the atomic-beam magnetic resonance method. The sign of μ is expected to be negative based on theory. configuration: Admixture of $\pi(s_{1/2}^{-1})\otimes\nu(f_{5/2}^{-1})$ and $\pi(s_{1/2}^{-1})\otimes\nu(p_{3/2}^{-1})$.
186.3 *4*	(0$^-$,1$^-$)		Ef	XREF: f(188). J$^\pi$: L(p,d)=1 would suggest J^π=0$^-$,1$^-$ or 2$^-$. Since this level is not fed in ^{202}Tl IT decay, J^π=2$^-$ can be excluded.
189.9 *4*	(0$^-$,1$^-$)		Ef	XREF: f(188). J$^\pi$: L(p,d)=1 would suggest J^π=0$^-$,1$^-$ or 2$^-$. Since this level is not fed in ^{202}Tl IT decay, J^π=2$^-$ can be excluded.
312.4 *5*	(0$^-$,1$^-$)		EF	XREF: F(315). J$^\pi$: L(p,d)=(1) would suggest J^π=(0$^-$,1$^-$ or 2$^-$). Since this level is not fed in ^{202}Tl IT decay, J^π=2$^-$ can be excluded.
348.3 *5*	(3$^-$,4$^-$)		EF	XREF: F(351). J$^\pi$: L(p,d)=(3).
401.6 *5*	(1$^-$,2$^-$)		E	J$^\pi$: 211.6γ and 215.4γ to 0$^-$,1$^-$.
480‡ *20*	(0$^-$,1$^-$,2$^-$)		F	J$^\pi$: L(p,d)=(1).
490.47 *7*	4$^-$		AB DE GHI	J$^\pi$: 490γ E2 to 2$^-$. L(d,α)=5. configuration: $\pi(d_{3/2}^{-1})\otimes\nu(f_{5/2}^{-1})$.
511.3 *5*	(1$^-$,2$^-$)		E	J$^\pi$: 321.5γ and 324.9γ to 0$^-$,1$^-$.
627‡ *20*			F	
701.8 *7*			EF	XREF: F(720).
810‡ *20*			F	
922.6 *5*			E	
950.19 *10*	7$^+$	591 μs *3*	AB DEFGH	%IT=100 μ=+0.90 *4* XREF: F(952). J$^\pi$: 459.72γ E3 to 4$^-$; L(p,d)=6. T$_{1/2}$: Weighted average of 592 μs *4* [490.5γ(t)] and 589 μs *4* [459.7 γ(t)] in 2007Fo06. Others: 565 μs *10* (1965Gr04), 585 μs *25*

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Adopted Levels, Gammas (continued)

^{202}Tl Levels (continued)

E(level)[†]	Jπ[@]	$T_{1/2}$	XREF	Comments
				(1958Du80), 536 μs *15* (1973Sa22), 500 μs (1972Gu06), 570 μs (1991Be41) and 572 μs (1977HeZJ).
				μ: From g=0.128 *6* based on γ(θ,H,t) measurement in ^{204}Hg(p,3nγ) (1974Ha06,2020StZV).
				configuration: Dominant $\pi(s^{-1}_{1/2})\otimes\nu(i^{-1}_{13/2})$.
1048.7 *5*			E	
1079.2 *5*			E	
1098.94 *14*	6^+		B DEF	Jπ: 148.55γ M1(+E2) to 7^+; L(p,d)=(6).
1105.5 *5*			E	
1340.13 *12*	8^+		B DE	Jπ: 241.1γ E2 to 6^+, 389.94γ M1(+E2) to 7^+.
1357.7 *5*			E	
1383.5 *5*			E	
1552.09 *12*	9^+		B DE H	XREF: H(1580). Jπ: 211.92γ M1 to 8^+, 601.95γ E2 to 7^+; L(d,α)=8.
1620[‡] *20*	$2^-,3^-,4^-$		F	Jπ: L(p,d)=3.
1675.68 *16*	$8^+,9^+$		DE	Jπ: 335γ M1(+E2) to 8^+; direct population in ^{202}Pb ε decay (3.54 h) ($J^\pi=9^-$) rules out 7^+.
1732[‡] *20*			F	
1849[‡] *20*			F	
1940[‡] *20*			F	
1968.2 *4*	(10^+)		B E	Jπ: 416.0γ to 9^+, 628.4γ (E2) to 8^+.
2005[‡] *20*			F	
2045.0 *4*	(11^+)		B E	Jπ: 77.0γ to (10^+), 492.7γ (E2) to 9^+.
2179.2 *7*	(12^-)		B H	XREF: H(2150). Jπ: 134.2γ E1 to (11^+); L(d,α)=11. configuration: Dominant $\pi(h^{-1}_{11/2})\otimes\nu(i^{-1}_{13/2})$.
2340[#]	$7^+,8^+,9^+$		H	Jπ: L(d,α)=8.
2873.7 *8*	(13^-)		B	Jπ: 694.3γ (M1) to (12^-).
3040.7 *8*	(14^-)		B	Jπ: 166.7γ M1 to (13^-), 861.7γ E2 to (12^-).
3057.3 *9*	(15^-)		B	Jπ: 183.6γ E2 to (13^-).
3111.4 *11*	$(15^-,16^-)$		B	Jπ: 54.1γ to (15^-); the absence of a transition from the $J^\pi=(20^+)$ isomer excludes a possible J=17 assignment.
3233.4 *10*	(16^-)		B	Jπ: 175.6γ M1 to (15^-).
3486.4 *10*	(16^-)		B	Jπ: 253.0γ E2 to (16^-), 429.0γ to (15^-); the absence of a transition from the $J^\pi=(20^+)$ isomer excludes a possible $J^\pi=17^-$ or 18^- assignment.
3863.0 *10*	(17^-)		B	Jπ: 376.5γ M1 to (16^-), 806.2γ to (15^-).
4148.8 *11*	(20^+)	215 μs *10*	B	%IT=100 Jπ: 285.8γ E3 to (17^-). configuration: $\pi(h^{-1}_{11/2})\otimes\nu(f^{-1}_{5/2},i^{-2}_{13/2})$. $T_{1/2}$: From 134γ(t) and 493γ(t) in 2020Wa24.

[†] From a least-square fit to Eγ, unless otherwise stated.
[‡] From ^{203}Tl(p,d).
[#] From ^{204}Pb(d,α).
[@] From ^{202}Pb ε decay (3.54 h), unless otherwise stated.

Adopted Levels, Gammas (continued)

$\gamma(^{202}Tl)$

E_i(level)	J_i^π	E_γ[†]	I_γ	E_f	J_f^π	Mult.[@]	δ[@]	α[a]	Comments
186.3	$(0^-,1^-)$	186.2[‡] *5*		0.0	2^-				
189.9	$(0^-,1^-)$	190.0[‡] *5*		0.0	2^-				
312.4	$(0^-,1^-)$	312.4[‡] *5*		0.0	2^-				
348.3	$(3^-,4^-)$	348.3[‡] *5*		0.0	2^-				
401.6	$(1^-,2^-)$	211.6[‡] *5*		189.9	$(0^-,1^-)$				
		215.4[‡] *5*		186.3	$(0^-,1^-)$				
490.47	4^-	490.47 *7*	100	0.0	2^-	E2		0.0295 *4*	α(K)=0.02096 *29*; α(L)=0.00643 *9*; α(M)=0.001591 *22* α(N)=0.000400 *6*; α(O)=7.33×10^{-5} *10*; α(P)=4.91×10^{-6} *7* Mult.: α(L)exp=0.0072 *12* and L12/L3=8 *2*.
511.3	$(1^-,2^-)$	321.5[‡] *5*		189.9	$(0^-,1^-)$				
		324.9[‡] *5*		186.3	$(0^-,1^-)$				
701.8		353.5[‡] *5*		348.3	$(3^-,4^-)$				
922.6		432.1[‡] *5*		490.47	4^-				
950.19	7^+	459.72 *7*	100	490.47	4^-	E3		0.1212 *17*	α(K)=0.0614 *9*; α(L)=0.0447 *6*; α(M)=0.01165 *16* α(N)=0.00294 *4*; α(O)=0.000527 *7*; α(P)=2.99×10^{-5} *4* B(E3)(W.u.)=0.1742 *10* Mult.: L12/L3=5.1 *5* and K/L<1.7, α(L)exp=0.041 *7*, K/L=1.51 *15*.
1048.7		558.2[‡] *5*		490.47	4^-				
1079.2		588.7[‡] *5*		490.47	4^-				
1098.94	6^+	148.55 *15*	100	950.19	7^+	M1(+E2)	≤0.3	2.71 *8*	α(K)=2.19 *9*; α(L)=0.399 *12*; α(M)=0.094 *4* α(N)=0.0237 *9*; α(O)=0.00457 *14*; α(P)=0.000414 *9* Mult.: K/L=6.1 *12*, α(K)exp=3.1 *12*.
1105.5		615.0[‡] *5*		490.47	4^-				
1340.13	8^+	241.1 *1*	13.7 *24*	1098.94	6^+	E2		0.2186 *31*	α(K)=0.1081 *15*; α(L)=0.0828 *12*; α(M)=0.02135 *30* α(N)=0.00535 *8*; α(O)=0.000943 *13*; α(P)=4.32×10^{-5} *6* Mult.: K/L=1.3 *2*, L12/L3=2.5 *3*.
		389.94 *7*	100 *8*	950.19	7^+	M1(+E2)	≤0.4	0.1832 *99*	α(K)=0.150 *9*; α(L)=0.0256 *10*; α(M)=0.00600 *21* α(N)=0.00151 *5*; α(O)=0.000293 *11*; α(P)=2.74×10^{-5} *14* Mult.: α(K)exp=0.18 *3*, K/L=6 *3*.
1357.7		867.2[‡] *5*		490.47	4^-				
1383.5		893.0[‡] *5*		490.47	4^-				
1552.09	9^+	211.92 *7*	100 *20*	1340.13	8^+	M1		1.023 *14*	α(K)=0.838 *12*; α(L)=0.1423 *20*; α(M)=0.0332 *5* α(N)=0.00839 *12*; α(O)=0.001630 *23*; α(P)=0.0001540 *22* Mult.: α(L1)exp=0.14.
		601.95 *8*	80 *7*	950.19	7^+	E2		0.01825 *26*	α(K)=0.01364 *19*; α(L)=0.00350 *5*; α(M)=0.000854 *12* α(N)=0.0002148 *30*; α(O)=3.99×10^{-5} *6*; α(P)=2.92×10^{-6} *4* Mult.,δ: α(K)exp=0.016.

$^{202}_{81}Tl_{121}$-3

Adopted Levels, Gammas (continued)

γ(^{202}Tl) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ	E_f	J_f^π	Mult.[@]	δ[@]	α[a]	Comments
1675.68	8$^+$,9$^+$	335.55 *10*	100	1340.13	8$^+$	M1(+E2)	≤0.7	0.255 *35*	α(K)=0.206 *31*; α(L)=0.0372 *28*; α(M)=0.0087 *6* α(N)=0.00221 *15*; α(O)=0.000425 *32*; α(P)=3.9×10^{-5} *5* Mult.: α(K)exp=0.23 *6*, K/L ≈ 5.
1968.2	(10$^+$)	416.0[#] *5*	18.4[#] *20*	1552.09	9$^+$				
		628.4[#] *5*	100[#] *8*	1340.13	8$^+$	(E2)[&]		0.01658 *23*	DCO=1.65 *10* α(K)=0.01250 *18*; α(L)=0.00310 *4*; α(M)=0.000755 *11* α(N)=0.0001899 *27*; α(O)=3.53×10^{-5} *5*; α(P)=2.63×10^{-6} *4*
2045.0	(11$^+$)	77.0[#] *5*	4[#] *3*	1968.2	(10$^+$)				
		492.7[#] *5*	100[#] *5*	1552.09	9$^+$	(E2)[&]		0.0291 *4*	DCO=1.66 *6*; pol=+0.045 *6* α(K)=0.02076 *29*; α(L)=0.00634 *9*; α(M)=0.001568 *23* α(N)=0.000394 *6*; α(O)=7.23×10^{-5} *10*; α(P)=4.85×10^{-6} *7*
2179.2	(12$^-$)	134.2[#] *5*	100[#]	2045.0	(11$^+$)	E1[&]		0.2059 *35*	DCO=1.15 *6* α(K)=0.1658 *28*; α(L)=0.0307 *5*; α(M)=0.00720 *12* α(N)=0.001791 *31*; α(O)=0.000330 *6*; α(P)=2.38×10^{-5} *4*
2873.7	(13$^-$)	694.3[#] *5*	100[#]	2179.2	(12$^-$)	(M1)[&]		0.0421 *6*	DCO=1.20 *7* α(K)=0.0347 *5*; α(L)=0.00571 *8*; α(M)=0.001329 *19* α(N)=0.000336 *5*; α(O)=6.52×10^{-5} *9*; α(P)=6.20×10^{-6} *9*
3040.7	(14$^-$)	166.7[#] *5*	8[#] *1*	2873.7	(13$^-$)	M1[&]		2.006 *33*	α(K)=1.641 *27*; α(L)=0.280 *5*; α(M)=0.0654 *11* α(N)=0.01651 *27*; α(O)=0.00321 *5*; α(P)=0.000303 *5*
		861.7[#] *5*	100[#] *9*	2179.2	(12$^-$)	E2[&]		0.00852 *12*	DCO=1.73 *11* α(K)=0.00672 *9*; α(L)=0.001372 *19*; α(M)=0.000328 *5* α(N)=8.24×10^{-5} *12*; α(O)=1.559×10^{-5} *22*; α(P)=1.279×10^{-6} *18*
3057.3	(15$^-$)	(16.7)		3040.7	(14$^-$)				E_γ: From level-energy difference.
		183.6[#] *5*	100[#]	2873.7	(13$^-$)	E2[&]		0.552 *9*	α(K)=0.2064 *32*; α(L)=0.258 *5*; α(M)=0.0672 *12* α(N)=0.01683 *31*; α(O)=0.00293 *5*; α(P)=0.0001167 *20*
3111.4	(15$^-$,16$^-$)	(54.1)		3057.3	(15$^-$)				E_γ: From level-energy difference.
3233.4	(16$^-$)	175.6[#] *5*	100[#]	3057.3	(15$^-$)	M1[&]		1.733 *28*	α(K)=1.418 *23*; α(L)=0.242 *4*; α(M)=0.0564 *9* α(N)=0.01425 *23*; α(O)=0.00277 *4*; α(P)=0.000261 *4*
3486.4	(16$^-$)	253.0[#] *5*	100[#] *6*	3233.4	(16$^-$)	E2[&]		0.1873 *29*	α(K)=0.0963 *14*; α(L)=0.0682 *11*; α(M)=0.01756 *28* α(N)=0.00440 *7*; α(O)=0.000777 *12*; α(P)=3.66×10^{-5} *6*
		375.0 *5*	20 *5*	3111.4	(15$^-$,16$^-$)				
		429.0 *5*	19 *5*	3057.3	(15$^-$)				
3863.0	(17$^-$)	376.5[#] *5*	100[#] *7*	3486.4	(16$^-$)	M1[&]		0.2119 *31*	α(K)=0.1739 *25*; α(L)=0.0292 *4*; α(M)=0.00680 *10* α(N)=0.001718 *25*; α(O)=0.000334 *5*; α(P)=3.16×10^{-5} *5*
		629.0 *5*	18 *3*	3233.4	(16$^-$)				
		806.2 *5*	56 *7*	3057.3	(15$^-$)				
4148.8	(20$^+$)	285.8[#] *5*	100[#]	3863.0	(17$^-$)	E3[&]		0.727 *12*	α(K)=0.1946 *28*; α(L)=0.395 *6*; α(M)=0.1058 *17*

$^{202}_{81}Tl_{121}$-4

Adopted Levels, Gammas (continued)

$\gamma(^{202}Tl)$ (continued)

E_i(level)	E_γ †	Comments
		α(N)=0.0267 *4*; α(O)=0.00468 *8*; α(P)=0.0002131 *34* B(E3)(W.u.)=8.7 *5*

† From ^{202}Pb ε decay (3.54 h), unless otherwise stated.
‡ From ^{203}Tl(n,2nγ).
# From ^{202}Tl IT decay (215 μs).
@ From ^{202}Pb ε decay (3.54 h) based on α(K)exp, α(L)exp and subshell ratios, unless otherwise stated.
& From intensity-balance considerations, DCO ratios and POL in 2020Wa24 [^{202}Tl IT decay (215 μs)]. Typical values for the DCO ratios are ≈1.0 for stretched dipole and ≈2.0 for stretched quadrupole transitions, when gated on stretched dipole transitions.
[a] Additional information 1.

$^{202}_{81}Tl_{121}$-5

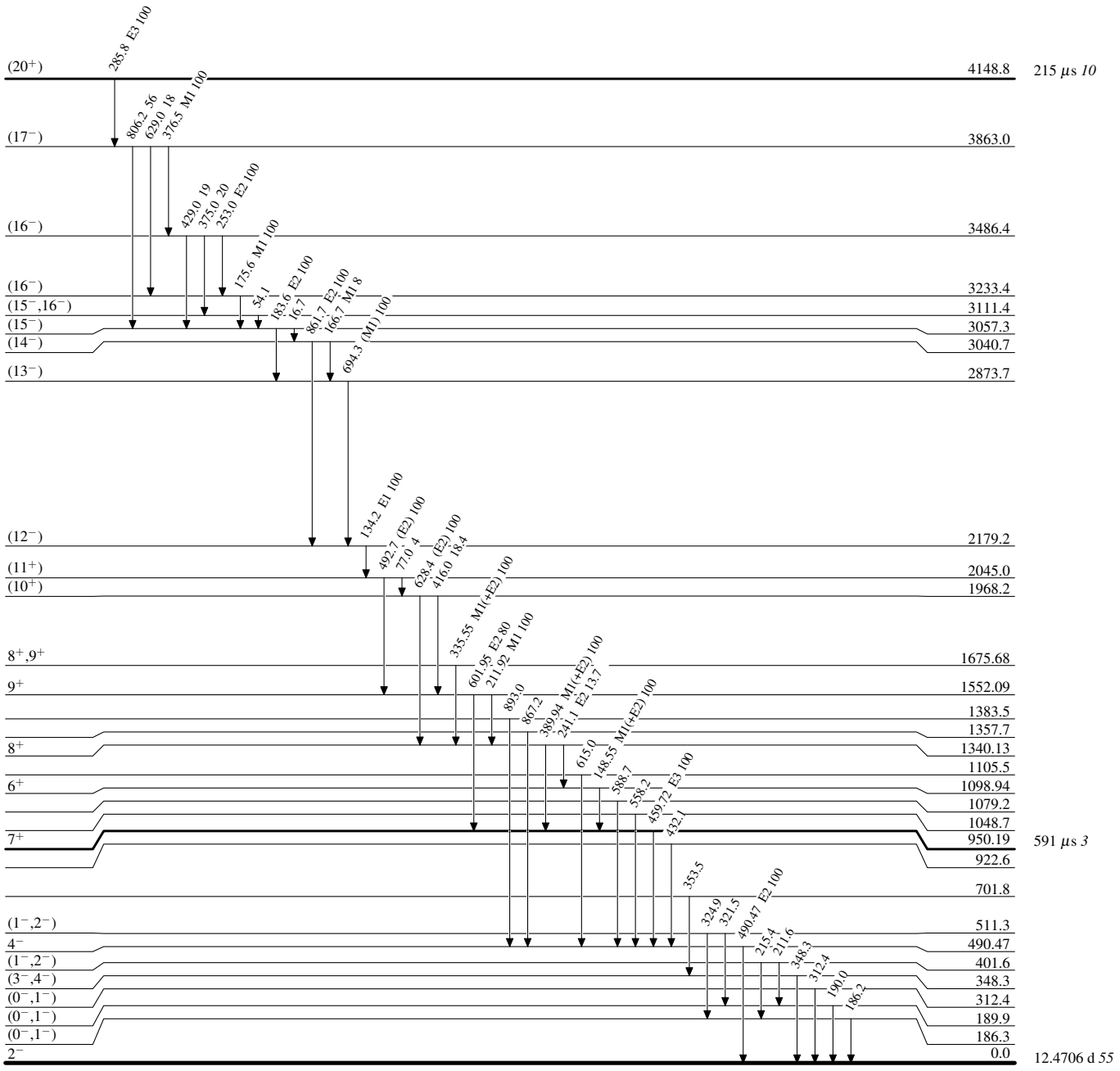
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{202}_{81}Tl_{121}$