^{197}Au(α,3nγ) 1977Kr04,2008La11,2010La15

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Huang Xiaolong and Kang Mengxiao	NDS 133, 221 (2016)	1-Dec-2015

2010La15,2008La11,2007La22: Eα=40 MeV, ^{197}Au target, two experiments were carried out. The first experiment was carried using the electron spectrometer, which was installed at the tandem accelerator lab. at Orsay. The second experiment was carried in South Africa at the iThemba LABS with the AFRODITE array, which consisted of 8 Ge clovers and 6 LEPS detectors. Measured Eγ, Iγ, ce, (ce)γ-coin, $\gamma\gamma$-coin, $\gamma\gamma(\theta)$(DCO), γ(linear polarization). Deduced Routhians, alignments, kinetic moments of inertia, B(M1)/B(E2) and energy. staggering (S(J)=[E(J)−E(J−1)]/(2J)) of band members. Comparisons with shell model calculations using Tilted-Axis Cranking (TAC) model, two-quasiparticle-plus-triaxial-rotor model and total Routhian surface (TRS) calculations.
The complete results reported in 2010La15. The partial results reported in 2008La11, 2007La22, are superseded by 2010La15.
1986Ve03: Eα=35 MeV; measured α(260.9γ) with HPGe.
1977Kr04: Eα=30-55 MeV; measured γ(E,θ,t), $\gamma\gamma$ coin, I(ce), Iγ, σ(Eα,Eγ,$\theta\gamma$,t) with Ge(Li) and orange β-spectrometer.
Other: 1988Si10.

^{198}Tl Levels

The particle configuration for g.s. is from literature, while the configuration for the side cascade provided by the authors is based on the cascading transitions in the yrast band and model calculations.

E(level)[†]	J$^{\pi}$[‡]	T$_{1/2}$[#]	E(level)[†]	J$^{\pi}$[‡]
0.0	2$^-$[@]	5.3[@] h *5*	2089.9[d] *5*	(10,12)$^+$
259.90 *20*	(2)$^-$[@]		2154.0[b] *5*	11$^+$
282.65 *11*	3$^-$[@]		2190.3 *6*	
543.6 *4*	7$^+$[@]	1.87[@] h *3*	2197.6 *6*	
674.4 *4*	(6,8)$^+$		2213.8[b] *6*	12$^+$
686.9[d] *5*	(5,7,9)$^+$	150 ns *40*	2254.9 *6*	
934.7[&] *5*	8$^-$	12.3 ns *3*	2263.5 *6*	
966.3[d] *5*	(6,8)$^+$		2279.8 *5*	(12$^-$)
977.6[d] *5*	(6,8,10)$^+$		2325.5[b] *7*	13$^+$
1000.8 *5*	(6,8)$^+$		2333.4[&] *6*	14$^-$
1006.5[a] *5*	9$^-$		2366.9 *6*	
1129.1[&] *5*	10$^-$		2401.1[c] *5*	13$^-$
1189.9 *5*	(7,9)$^+$		2430.4 *7*	
1290.5[d] *5*	(7,9)$^+$		2442.8[b] *7*	14$^+$
1388.2[a] *5*	11$^-$		2474.3 *6*	
1617.6[d] *5*	(8,10)$^+$		2482.4 *6*	(13$^-$)
1634.6[&] *5*	12$^-$		2488.7 *6*	
1654.4[c] *5*	10$^-$		2504.7 *6*	
1780.0 *6*	(7)		2590.8 *7*	
1837.0[c] *5*	11$^-$		2611.8 *6*	14$^-$
1865.8 *6*			2624.7 *6*	
1873.5 *6*			2636.1 *7*	
1875.6 *6*			2646.5 *7*	
1893.5[d] *5*	(9,11)$^+$		2666.1[b] *8*	15$^+$
1921.9 *6*	11		2690.1 *6*	15$^-$
2004.1 *6*			2716.9 *6*	
2004.3 *6*			2793.2 *7*	
2014.2 *6*			2822.1[a] *6*	15$^-$
2036.4[a] *5*	13$^-$		2838.1[c] *6*	14$^-$
2084.9[c] *5*	12$^-$		2864.6[b] *8*	16$^+$

Continued on next page (footnotes at end of table)

^{197}Au(α,3nγ) 1977Kr04,2008La11,2010La15 (continued)

^{198}Tl Levels (continued)

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡
3008.9 *8*		3145.1 *6*	16^-	3490.9[a] *6*	17^-	3900.6[a] *7*	19^-
3017.2 *6*	14	3234.3[b] *8*	17^+	3537.3[b] *8*	18^+	4068.4[&] *8*	20^-
3096.1[&] *6*	16^-	3422.7 *6*		3763.1[&] *7*	18^-		

† From level scheme and Eγ's by using least-squares fit to the Eγ values.
‡ From γ-ray multipolarities and band structure, except as noted.
# From γ(t) measurements in 1977Kr04, except as noted.
@ From Adopted Levels.
& Band(A): $\pi h_{9/2}\otimes\nu i^{-1}_{13/2},\alpha=0$.
a Band(a): $\pi h_{9/2}\otimes\nu i^{-1}_{13/2},\alpha=1$.
b Band(B): $\pi h_{9/2}\otimes\nu(i^{-2}_{13/2},j)$.
c Band(C): $\pi h_{9/2}\otimes\nu i^{-1}_{13/2}$. Possible chiral-partner of $\pi h_{9/2}\otimes\nu i^{-1}_{13/2}$ band based on 934.7-keV, 8^-.
d Band(D): Band based on 686.9-keV level.

^{197}Au(α,3nγ) 1977Kr04,2008La11,2010La15 (continued)

$\gamma(^{198}Tl)$

E_γ [†]	I_γ [†‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[@]	Comments
(13)		686.9	$(5,7,9)^+$	674.4	$(6,8)^+$			E_γ: Unobserved transition. Value from level-energy difference.
59.8 *3*	4.2 *22*	2213.8	12^+	2154.0	11^+	M1	7.05 *15*	DCO=0.50 *7*; α(L)exp=1.4 *3* α(L)=5.40 *11*; α(M)=1.26 *3* α(N)=0.319 *7*; α(O)=0.0619 *13*; α(P)=0.00585 *12* α(L)exp is attenuated due to sweeping of the magnetic field.
64.1 *3*	6.3 *19*	2154.0	11^+	2089.9	$(10,12)^+$	M1	5.76 *12*	DCO=0.63 *9*; α(L)exp=1.1 *3* α(L)=4.41 *9*; α(M)=1.031 *21* α(N)=0.260 *6*; α(O)=0.0506 *10*; α(P)=0.00477 *10* α(L)exp is attenuated due to sweeping of the magnetic field.
71.8 *3*	18 *7*	1006.5	9^-	934.7	8^-	M1	4.13 *8*	α(L1)exp+α(L2)exp=4.6 *20*; α(L3)exp=1.1 *5*; α(M)exp=0.9 *4*; α(N)exp=0.30 *12* α(L)=3.17 *6*; α(M)=0.740 *14* α(N)=0.187 *4*; α(O)=0.0363 *7*; α(P)=0.00343 *7* Mult.: α(L3)exp suggests M1+E2, others M1.
111.7 *3*	4.6 *14*	2325.5	13^+	2213.8	12^+	M1	6.26 *10*	DCO=0.54 *8*; α(L)exp=0.90 *9* α(K)=5.12 *9*; α(L)=0.879 *14*; α(M)=0.205 *4* α(N)=0.0519 *9*; α(O)=0.01008 *17*; α(P)=0.000951 *16*
117.3 *3*	3.6 *11*	2442.8	14^+	2325.5	13^+	M1+E2	4.4 *13*	DCO=0.58 *7*; α(L)exp=1.14 *9* α(K)=2.5 *20*; α(L)=1.3 *6*; α(M)=0.34 *16* α(N)=0.09 *4*; α(O)=0.015 *7*; α(P)=0.00077 *6*
122.5 *3*	19.4 *12*	1129.1	10^-	1006.5	9^-	M1	5.0 *2*	DCO=0.58 *4*; α(L)exp=0.93 *4*; α(M)exp=0.14 *4* (2010La15) α(K)=3.93 *7*; α(L)=0.674 *11*; α(M)=0.1576 *25* α(N)=0.0398 *7*; α(O)=0.00773 *13*; α(P)=0.000730 *12* $\gamma(\theta)$: A_2=−0.41 *2*, A_4=+0.03 *3* (1977Kr04). δ=−0.53 or −1.54 *+110−11*; L1/L2=7.2 rules out δ=−0.53 (1977Kr04). Mult.: 1977Kr04 suggest E2+M1 from $\gamma(\theta)$. E_γ: Other: 122.2 *2* (1977Kr04).
130.7 *3*	7.8 *20*	674.4	$(6,8)^+$	543.6	7^+	M1	4.16	α(K)=3.27 *5*; α(L)=0.560 *9*; α(M)=0.1308 *21* α(N)=0.0330 *6*; α(O)=0.00642 *10*; α(P)=0.000606 *10* DCO=0.68 *10*; α(L)exp=0.61 *8* (2010La15) $\gamma(\theta)$: A_2=−0.20 *2*, A_4=−0.07 *3* (1977Kr04). α(L1)exp=0.55, L1/L2=7.6 (1977Kr04). Mult.: From α(L)exp. E_γ: Other: 130.5 *2* (1977Kr04).
137.5 *3*	0.7 *2*	3900.6	19^-	3763.1	18^-			DCO=0.43 *11*
141.8 *3*	1.3 *4*	2646.5		2504.7				
146.7 *3*	1.1 *3*	2793.2		2646.5				
165.0[a] *3*	0.6 *2*	2254.9		2089.9	$(10,12)^+$			
167.8 *3*	0.6 *2*	4068.4	20^-	3900.6	19^-			
175.5[a] *3*	0.9 *3*	2430.4		2254.9		M1+E2	1.2 *6*	α(K)exp=0.62 *23* α(K)=0.8 *6*; α(L)=0.28 *4*; α(M)=0.069 *13* α(N)=0.017 *4*; α(O)=0.0032 *4*; α(P)=0.00020 *7*
182.6 *3*	1.1 *2*	1837.0	11^-	1654.4	10^-			DCO=0.44 *12*
189.1 *3*	3.7 *9*	1189.9	$(7,9)^+$	1000.8	$(6,8)^+$	M1	1.46	DCO=0.49 *7*; α(K)exp=1.4 *3* (2010La15)

$^{198}_{81}Tl_{117}$-3

^{197}Au(α,3nγ) 1977Kr04,2008La11,2010La15 (continued)

$\gamma(^{198}Tl)$ (continued)

E_γ [†]	I_γ [†‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [#]	α [@]	Comments
								α(K)=1.152 *17*; α(L)=0.196 *3*; α(M)=0.0458 *7* α(N)=0.01156 *17*; α(O)=0.00225 *4*; α(P)=0.000212 *4* δ=−0.14 *7* or 0.21 *+8−11* (1977Kr04). $\gamma(\theta)$: A_2=−0.45 *5*, A_4=−0.08 *6* (1977Kr04). α(K)exp=0.80 (1977Kr04). Mult.: 1977Kr04 suggest E2+M1 from α(K)exp and $\gamma(\theta)$. E_γ: Other: 188.6 *2* (1977Kr04).
196.4 *5*	14 *4*	2089.9	$(10,12)^+$	1893.5	$(9,11)^+$	M1	1.31	DCO=0.52 *3*; α(K)exp=1.19 *13*; α(L)exp=0.18 *3*; α(M)exp=0.070 *18* (2010La15) α(K)=1.036 *17*; α(L)=0.176 *3*; α(M)=0.0411 *7* α(N)=0.01039 *17*; α(O)=0.00202 *4*; α(P)=0.000191 *3* POL=−0.05 *24* for unresolved doublet (2010La15). δ=−2.47 *+22−27* or 3.49 *+52−41* (1977Kr04). $\gamma(\theta)$: A_2=−0.64 *5*, A_4=−0.08 *6* (1977Kr04). α(K)exp=1.0 (1977Kr04). Mult.: 1977Kr04 suggest M1+E2 from α(K)exp and $\gamma(\theta)$. E_γ: Other: 196.4 *2* (1977Kr04).
198.5 *3*	4.0 *9*	2864.6	16^+	2666.1	15^+	M1	1.28	DCO=0.54 *3*; α(K)exp=1.17 *19* α(K)=1.005 *15*; α(L)=0.171 *3*; α(M)=0.0399 *6* α(N)=0.01008 *15*; α(O)=0.00196 *3*; α(P)=0.000185 *3*
202.6[a] *3*	2.2 *4*	2482.4	(13^-)	2279.8	(12^-)	M1	1.20	DCO=0.48 *6*; α(K)exp=0.9 *5* α(K)=0.950 *14*; α(L)=0.1614 *24*; α(M)=0.0377 *6* α(N)=0.00952 *14*; α(O)=0.00185 *3*; α(P)=0.000175 *3*
205.7[a] *3*	0.8 *3*	2636.1		2430.4				
208.9[a] *3*	2.1 *4*	2488.7		2279.8	(12^-)			
215.7[a] *3*	1.7 *6*	3008.9		2793.2		M1+E2	0.7 *4*	α(K)exp=0.69 *7* α(K)=0.5 *4*; α(L)=0.133 *4*; α(M)=0.0327 *12* α(N)=0.0082 *3*; α(O)=0.00152 *4*; α(P)=0.00011 *5*
223.3 *3*	11 *3*	2666.1	15^+	2442.8	14^+	M1	0.92	DCO=0.48 *2*; α(K)exp=0.73 *7* α(K)=0.724 *11*; α(L)=0.1229 *18*; α(M)=0.0287 *5* α(N)=0.00725 *11*; α(O)=0.001408 *21*; α(P)=0.0001331 *20*
246.4 *3*	26 *3*	1634.6	12^-	1388.2	11^-	M1	0.700	DCO=0.48 *2*; α(K)exp=0.57 *4* (2010La15) α(K)=0.552 *8*; α(L)=0.0934 *14*; α(M)=0.0218 *4* α(N)=0.00551 *8*; α(O)=0.001070 *16*; α(P)=0.0001012 *15* POL=−0.027 *12* (2010La15). $\gamma(\theta)$: A_2=−0.49 *2*, A_4=−0.06 *3* (1977Kr04). Mult.: 1977Kr04 suggest M1+E2 with δ=−0.16 *2* from $\gamma(\theta)$. E_γ: Other: 246.0 *2* (1977Kr04).
247.8 *3*	3.7 *8*	2084.9	12^-	1837.0	11^-			DCO=0.4 *1*
259.1 *3*	51.3 *14*	1388.2	11^-	1129.1	10^-	M1	0.609	DCO=0.50 *2*; α(K)exp=0.50 *7*; α(L)exp=0.089 *12*; α(M)exp=0.020 *3* (2010La15) α(K)=0.480 *7*; α(L)=0.0813 *12*; α(M)=0.0190 *3* α(N)=0.00479 *7*; α(O)=0.000931 *14*; α(P)=8.80×10^{-5} *13* POL=−0.024 *12* (2010La15). $\gamma(\theta)$:=A_2=−0.48 *2*, A_4=−0.10 *3* (1977Kr04). α(K)exp=0.58 (1977Kr04).

$^{198}_{81}Tl_{117}$-4

^{197}Au(α,3nγ) 1977Kr04,2008La11,2010La15 (continued)

$\gamma(^{198}Tl)$ (continued)

E_γ[†]	I_γ[†‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[#&]	α[@]	Comments
									Mult.: 1977Kr04 suggest M1+E2 with δ=−0.16 *+3−1* from α(K)exp and $\gamma(\theta)$.
									E_γ: Other: 259.0 *2* (1977Kr04).
259.9 *2*	5.1 *6*	259.90	(2)$^-$	0.0	2$^-$				E_γ,I_γ: From 1977Kr04.
260.5 *3*	1.4 *6*	2154.0	11$^+$	1893.5	(9,11)$^+$				
260.9 *3*		543.6	7$^+$	282.65	3$^-$	M4		34.3	α(K)=14.56 *22*; α(L)=14.12 *22*; α(M)=4.06 *7* α(N)=1.052 *17*; α(O)=0.190 *3*; α(P)=0.01008 *16* α(exp)=40.1 *86* (1986Ve03). Mult.: From α(exp). E_γ: Other: 260.9 *2* (1977Kr04).
266.3 *3*	1.9 *3*	1654.4	10$^-$	1388.2	11$^-$				DCO=0.48 *7*
272.2 *3*	1.7 *7*	3763.1	18$^-$	3490.9	17$^-$	M1		0.532	DCO=0.38 *12*; α(K)exp=0.52 *15* α(K)=0.419 *6*; α(L)=0.0709 *11*; α(M)=0.01655 *24* α(N)=0.00418 *6*; α(O)=0.000812 *12*; α(P)=7.68×10^{-5} *11*
274.1 *3*	2.7 *8*	3096.1	16$^-$	2822.1	15$^-$				DCO=0.57 *15*
275.9 *3*	13 *4*	1893.5	(9,11)$^+$	1617.6	(8,10)$^+$	M1		0.513	DCO=0.42 *2*; α(K)exp=0.35 *5*; α(L)exp=0.094 *10* (2010La15) α(K)=0.404 *6*; α(L)=0.0683 *10*; α(M)=0.01594 *23* α(N)=0.00403 *6*; α(O)=0.000782 *12*; α(P)=7.40×10^{-5} *11* δ=−0.21 *+3−4* or 0.29 *+3−4* (1977Kr04). $\gamma(\theta)$: A_2=−0.58 *2*, A_4=−0.01 *2* (1977Kr04). α(K)exp=0.44 (1977Kr04). Mult.: 1977Kr04 suggest E2+M1 from α(K)exp and $\gamma(\theta)$. E_γ: Other: 275.6 *2* (1977Kr04).
279.4 *3*	10.1 *25*	966.3	(6,8)$^+$	686.9	(5,7,9)$^+$	M1+E2	1.7 *+23−6*	0.23 *7*	α(K)=0.16 *7*; α(L)=0.051 *4*; α(M)=0.0127 *8* α(N)=0.00320 *19*; α(O)=0.00059 *5*; α(P)=3.8×10^{-5} *9* DCO=0.30 *2*; α(K)exp=0.19 *4*; α(L)exp=0.058 *8* (2010La15) $\gamma(\theta)$: A_2=−0.45 *2*, A_4=+0.01 *2* (1977Kr04). α(K)exp=0.16 (1977Kr04). Mult.: α(L)exp suggests M1. δ: From 1977Kr04. E_γ: Other: 279.0 *2* (1977Kr04).
282.8 *2*	43 *2*	282.65	3$^-$	0.0	2$^-$				I_γ: From 1977Kr04.
290.7 *3*	20 *6*	977.6	(6,8,10)$^+$	686.9	(5,7,9)$^+$	M1		0.445	DCO=0.43 *5*; α(K)exp=0.34 *5*; α(L)exp=0.063 *10* (2010La15) α(K)=0.350 *5*; α(L)=0.0592 *9*; α(M)=0.01380 *20* α(N)=0.00349 *5*; α(O)=0.000677 *10*; α(P)=6.40×10^{-5} *10* δ=−1.60 *+22−13* or 2.47 *+28−23* (1977Kr04). $\gamma(\theta)$: A_2=−0.45 *2*, A_4=+0.04 *3* (1977Kr04). α(K)exp=0.45 (1977Kr04). Mult.: 1977Kr04 suggest E2+M1 from α(K)exp and $\gamma(\theta)$. E_γ: Other: 290.5 *2* (1977Kr04).
292.0 *3*	8.3 *25*	966.3	(6,8)$^+$	674.4	(6,8)$^+$	M1		0.439	DCO=0.87 *6*; α(K)exp=0.38 *8*; α(L)exp=0.063 *16* (2010La15) α(K)=0.346 *5*; α(L)=0.0584 *9*; α(M)=0.01363 *20* α(N)=0.00344 *5*; α(O)=0.000669 *10*; α(P)=6.33×10^{-5} *9*

$^{198}_{81}Tl_{117}$-5

^{197}Au(α,3nγ) 1977Kr04,2008La11,2010La15 (continued)

$\gamma(^{198}Tl)$ (continued)

E_γ[†]	I_γ[†‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[#&]	α[@]	Comments
									$\gamma(\theta)$: A_2=+0.24 *3*, A_4=−0.19 *4* (1977Kr04). α(K)exp=0.36 (1977Kr04). Mult.: 1977Kr04 suggest E2+M1 with δ=1.11 *+17−15* from α(K)exp and $\gamma(\theta)$. E_γ: Other: 291.9 *2* (1977Kr04).
297.0 *3*	7.5 *8*	2333.4	14^-	2036.4	13^-	M1		0.419	DCO=0.46 *2*; α(K)exp=0.32 *4*; α(L)exp=0.086 *25* (2010La15) α(K)=0.330 *5*; α(L)=0.0558 *8*; α(M)=0.01301 *19* α(N)=0.00329 *5*; α(O)=0.000638 *10*; α(P)=6.04×10^{-5} *9* POL=−0.05 *3* (2010La15). $\gamma(\theta)$: A_2=−0.56 *4*, A_4=−0.01 *4* (1977Kr04). α(K)exp=0.52 (1977Kr04). Mult.: 1977Kr04 suggest M1+E2 with δ=−0.21 *7* from α(K)exp and $\gamma(\theta)$. E_γ: Other: 296.7 *2* (1977Kr04).
303.0[a] *3*	1.7 *7*	3537.3	18^+	3234.3	17^+				
303.1 *3*	1.5 *6*	977.6	$(6,8,10)^+$	674.4	$(6,8)^+$				DCO=0.68 *25* E_γ: Other: 303.7 *2* (1977Kr04).
312.9 *3*	8 *2*	1290.5	$(7,9)^+$	977.6	$(6,8,10)^+$	M1+E2	−1.0 *+5−5*	0.23 *8*	DCO=0.36 *2*; α(K)exp=0.19 *4* (2010La15) α(K)=0.17 *7*; α(L)=0.039 *6*; α(M)=0.0094 *11* α(N)=0.0024 *3*; α(O)=0.00044 *7*; α(P)=3.5×10^{-5} *11* δ=−1.03 *+50−45* or 1.60 *+45−107* (1977Kr04). $\gamma(\theta)$: A_2=−0.71 *4*, A_4=+0.07 *5* (1977Kr04). α(K)exp=0.31 (1977Kr04). E_γ: Other: 312.6 *2* (1977Kr04).
316.2 *3*	2.8 *5*	2401.1	13^-	2084.9	12^-				DCO=0.36 *7*
323.1 *3*	1.7 *4*	3145.1	16^-	2822.1	15^-				DCO=0.38 *12*
324.2 *3*	12 *4*	1290.5	$(7,9)^+$	966.3	$(6,8)^+$	M1		0.30	DCO=0.40 *2*; α(K)exp=0.223 *24* (2010La15) α(K)=0.260 *4*; α(L)=0.0439 *7*; α(M)=0.01023 *15* α(N)=0.00258 *4*; α(O)=0.000502 *8*; α(P)=4.75×10^{-5} *7* δ=−1.11 *+53−27* or 1.48 *+25−86* (1977Kr04). $\gamma(\theta)$: A_2=−0.57 *5*, A_4=+0.06 *5* (1977Kr04). α(K)exp=0.18 (1977Kr04). Mult.: 1977Kr04 suggest E2+M1 from α(K)exp and $\gamma(\theta)$. E_γ: Other: 324.1 *2* (1977Kr04).
326.3 *3*	12 *3*	1000.8	$(6,8)^+$	674.4	$(6,8)^+$	(M1+E2)	1.9 *+4−3*	0.140 *15*	α(K)=0.097 *13*; α(L)=0.0295 *12*; α(M)=0.00730 *24* α(N)=0.00184 *6*; α(O)=0.000337 *13*; α(P)=2.27×10^{-5} *19* DCO=0.96 *11* (2010La15) $\gamma(\theta)$: A_2=+0.36 *20*, A_4=−0.2 *2* (1977Kr04). α(K)exp=0.16 (1977Kr04). Mult.: From α(K)exp and $\gamma(\theta)$ in 1977Kr04. δ: From 1977Kr04. E_γ: Other: 326.1 *2* (1977Kr04).
327.1 *3*	15 *4*	1617.6	$(8,10)^+$	1290.5	$(7,9)^+$	M1+E2	−4.0 *+5−7*	0.101 *4*	DCO=0.39 *2*; α(K)exp=0.199 *16*; α(L)exp=0.031 *13*

$^{198}_{81}Tl_{117}$-6

^{197}Au(α,3nγ) 1977Kr04,2008La11,2010La15 (continued)

$\gamma(^{198}Tl)$ (continued)

E_γ [†]	I_γ [†‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [#]	α [@]	Comments
								(2010La15) α(K)=0.064 *4*; α(L)=0.0265 *5*; α(M)=0.00667 *12* α(N)=0.00168 *3*; α(O)=0.000302 *6*; α(P)=1.76×10^{-5} *6* δ=−4.01 *+52−69* or 9 *+5−4* (1977Kr04). $\gamma(\theta)$: A_2=+0.36 *20*, A_4=−0.2 *2* (1977Kr04). E_γ: Other: 326.9 *2* (1977Kr04).
345.8 *3*	1.5 *3*	3490.9	17$^-$	3145.1	16$^-$	M1	0.277	DCO=0.55 *8*; α(K)exp=0.84 *15* α(K)=0.219 *4*; α(L)=0.0368 *6*; α(M)=0.00858 *13* α(N)=0.00217 *3*; α(O)=0.000421 *6*; α(P)=3.98×10^{-5} *6*
350.7 *3*	1.4 *4*	2504.7		2154.0	11$^+$			
356.7 *3*	2.0 *3*	2690.1	15$^-$	2333.4	14$^-$			DCO=0.52 *7*
369.7[a] *3*	5.3 *22*	3234.3	17$^+$	2864.6	16$^+$			
381.8 *3*	4.4 *5*	1388.2	11$^-$	1006.5	9$^-$	E2	0.0566	DCO=0.64 *7*; α(K)exp=0.06 *3* (2010La15) α(K)=0.0365 *6*; α(L)=0.01466 *21*; α(M)=0.00369 *6* α(N)=0.000926 *14*; α(O)=0.0001672 *24*; α(P)=9.88×10^{-6} *14* $\gamma(\theta)$: A_2=+0.28 *16*, A_4=+0.30 *26* (1977Kr04). E_γ: Other: 381.1 *2* (1977Kr04).
391.0 *3*	100 *2*	934.7	8$^-$	543.6	7$^+$	E1	0.0157	DCO=0.55 *2*; α(K)exp=0.0099 *12* (2010La15) α(K)=0.01293 *19*; α(L)=0.00210 *3*; α(M)=0.000488 *7* α(N)=0.0001224 *18*; α(O)=2.33×10^{-5} *4*; α(P)=1.97×10^{-6} *3* POL=+0.042 *8* (2010La15). $\gamma(\theta)$: A_2=−0.28 *2*, A_4=−0.06 *3* (1977Kr04). α(K)exp=0.012 (1977Kr04). Mult.: 1977Kr04 suggest E1(+M2) with δ=−0.035 *+12−8* from α(K)exp and $\gamma(\theta)$. E_γ: Other: 390.6 *2* (1977Kr04).
394.8 *3*	0.8 *3*	3490.9	17$^-$	3096.1	16$^-$			
401.8 *3*	17.0 *17*	2036.4	13$^-$	1634.6	12$^-$	M1	0.185	DCO=0.43 *2*; α(K)exp=0.124 *14*; α(L)exp=0.033 *5* (2010La15) α(K)=0.1461 *21*; α(L)=0.0245 *4*; α(M)=0.00570 *8* α(N)=0.001440 *21*; α(O)=0.000280 *4*; α(P)=2.65×10^{-5} *4* POL=−0.024 *10* (2010La15). $\gamma(\theta)$: A_2=−0.56 *2*, A_4=−0.03 *3* (1977Kr04). α(K)exp=0.21 (1977Kr04). Mult.: 1977Kr04 suggest M1+E2 with δ=−0.19 *2* from α(K)exp and $\gamma(\theta)$. E_γ: Other: 401.5 *2* (1977Kr04).
421.7[a] *3*	2 *1*	2864.6	16$^+$	2442.8	14$^+$			
422.6 *3*	3.3 *12*	966.3	(6,8)$^+$	543.6	7$^+$			DCO=0.63 *10*
437.1 *3*	1.6 *3*	2838.1	14$^-$	2401.1	13$^-$	M1	0.148	DCO=0.4 *3*; α(K)exp=0.110 *22* α(K)=0.1167 *17*; α(L)=0.0195 *3*; α(M)=0.00455 *7* α(N)=0.001148 *17*; α(O)=0.000223 *4*; α(P)=2.11×10^{-5} *3*
457.1 *3*	12 *3*	1000.8	(6,8)$^+$	543.6	7$^+$	M1	0.131	DCO=0.29 *4*; α(K)exp=0.099 *5* (2010La15) α(K)=0.1036 *15*; α(L)=0.01730 *25*; α(M)=0.00403 *6* α(N)=0.001017 *15*; α(O)=0.000198 *3*; α(P)=1.87×10^{-5} *3*

$^{198}_{81}Tl_{117}$-7

^{197}Au(α,3nγ) 1977Kr04,2008La11,2010La15 (continued)

$\gamma(^{198}Tl)$ (continued)

E_γ[†]	I_γ[†‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[@]	Comments
								δ=−0.62 *+13−75* or 1.11 *+49−44* (1977Kr04). $\gamma(\theta)$: A_2=−0.73 *2*, A_4=+0.05 *3* (1977Kr04). Mult.: 1977Kr04 suggest D+Q from $\gamma(\theta)$. E_γ: Other: 456.8 *2* (1977Kr04).
472.3 *3*	7 *2*	2089.9	$(10,12)^+$	1617.6	$(8,10)^+$	E2	0.0326	DCO=0.97 *14*; α(K)exp=0.100 *15* (2010La15) α(K)=0.0227 *4*; α(L)=0.00724 *11*; α(M)=0.00180 *3* α(N)=0.000451 *7*; α(O)=8.25×10^{-5} *12*; α(P)=5.43×10^{-6} *8* POL=+0.06 *4* (2010La15). $\gamma(\theta)$: A_2=+0.28 *6*, A_4=−0.15 *8* (1977Kr04). E_γ: Other: 472.1 *2* (1977Kr04).
488.7 *3*	9.0 *12*	2822.1	15^-	2333.4	14^-	M1	0.110	DCO=0.44 *5*; α(K)exp=0.0747 *17* (2010La15) α(K)=0.0868 *13*; α(L)=0.01446 *21*; α(M)=0.00337 *5* α(N)=0.000851 *12*; α(O)=0.0001653 *24*; α(P)=1.567×10^{-5} *22* $\gamma(\theta)$: A_2=−0.2 *1*, A_4=+0.3 *2* (1977Kr04). E_γ: Other: 488.6 *2* (1977Kr04).
505.5 *3*	9.7 *5*	1634.6	12^-	1129.1	10^-	E2	0.0277	DCO=0.86 *6*; α(K)exp=0.020 *6* (2010La15) α(K)=0.0197 *3*; α(L)=0.00586 *9*; α(M)=0.001446 *21* α(N)=0.000363 *6*; α(O)=6.68×10^{-5} *10*; α(P)=4.54×10^{-6} *7* POL=+0.06 *4* (2010La15). $\gamma(\theta)$: A_2=+0.11 *8*, A_4=−0.3 *2* (1977Kr04). E_γ: Other: 505.3 *2* (1977Kr04).
519.4 *3*	2.5 *3*	2154.0	11^+	1634.6	12^-			
525.3 *3*	1.7 *4*	1654.4	10^-	1129.1	10^-	M1	0.091	DCO=0.72 *15*; α(K)exp=0.09 *4* α(K)=0.0718 *11*; α(L)=0.01193 *17*; α(M)=0.00278 *4* α(N)=0.000701 *10*; α(O)=0.0001364 *20*; α(P)=1.293×10^{-5} *19*
563.0 *3*	5.2 *14*	2197.6		1634.6	12^-			DCO=0.82 *13*
564.1 *3*	0.8 *2*	2401.1	13^-	1837.0	11^-			
575.4 *3*	2.2 *6*	2611.8	14^-	2036.4	13^-	M1+E2	0.05 *3*	DCO=0.47 *15*; α(K)exp=0.034 *13* α(K)=0.036 *21*; α(L)=0.007 *3*; α(M)=0.0016 *6* α(N)=0.00040 *16*; α(O)=8.E−5 *3*; α(P)=7.E−6 *4*
603.0 *5*	16 *5*	1893.5	$(9,11)^+$	1290.5	$(7,9)^+$	E2	0.0184	DCO=0.89 *13*; α(K)exp=0.014 *3* (2010La15) α(K)=0.01359 *20*; α(L)=0.00348 *5*; α(M)=0.000850 *12* α(N)=0.000214 *3*; α(O)=3.97×10^{-5} *6*; α(P)=2.90×10^{-6} *5* POL=+0.08 *3* for unresolved doublet (2010La15). $\gamma(\theta)$: A_2=+0.18 *20*, A_4=0 (1977Kr04). E_γ: Other: 602.4 *2* (1977Kr04).
603.5 *5*	12 *4*	1290.5	$(7,9)^+$	686.9	$(5,7,9)^+$	E2	0.0183	DCO=0.98 *14*; α(K)exp=0.014 *3* (2010La15) α(K)=0.01357 *20*; α(L)=0.00348 *5*; α(M)=0.000848 *12* α(N)=0.000213 *3*; α(O)=3.96×10^{-5} *6*; α(P)=2.90×10^{-6} *4* POL=+0.08 *3* for unresolved doublet (2010La15). $\gamma(\theta)$: A_2=+0.4 *2*, A_4=0 (1977Kr04). E_γ: Other: 603.0 *2* (1977Kr04).
640.1 *3*	6 *2*	1617.6	$(8,10)^+$	977.6	$(6,8,10)^+$			DCO=0.99 *11* (2010La15) $\gamma(\theta)$: A_2=+0.36 *5*, A_4=−0.02 *6* (1977Kr04). E_γ: Other: 639.5 *2* (1977Kr04).

$^{198}_{81}Tl_{117}$-8

^{197}Au(α,3nγ) 1977Kr04,2008La11,2010La15 (continued)

$\gamma(^{198}Tl)$ (continued)

E_γ [†]	I_γ [†‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[#&]	α[@]	Comments
646.2 *3*	7.3 *18*	1189.9	(7,9)$^+$	543.6	7$^+$				DCO=0.80 *15*
648.2 *3*	5.4 *4*	2036.4	13$^-$	1388.2	11$^-$				DCO=0.88 *11* (2010La15) $\gamma(\theta)$: A_2=+0.15 *8*, A_4=0 (1977Kr04). E_γ: Other: 647.7 *2* (1977Kr04).
651.3 *3*	6.9 *21*	1617.6	(8,10)$^+$	966.3	(6,8)$^+$				DCO=0.94 *12* (2010La15) $\gamma(\theta)$: A_2=+0.32 *5*, A_4=−0.10 *7* (1977Kr04). E_γ: Other: 650.7 *2* (1977Kr04).
668.7 *3*	0.7 *2*	3490.9	17$^-$	2822.1	15$^-$				DCO=0.84 *18*
668.9 *3*	1.6 *9*	2590.8		1921.9	11				DCO=1.6 *6*
672.7[a] *3*	1.1 *4*	3537.3	18$^+$	2864.6	16$^+$				DCO=0.91 *19*
675.9[a] *3*	4.4 *11*	1865.8		1189.9	(7,9)$^+$				DCO=0.9 *4*
683.6 *3*	1.9 *5*	1873.5		1189.9	(7,9)$^+$				DCO=0.8 *4*
694.3 *3*	2.0 *5*	2474.3		1780.0	(7)				
696.6 *3*	2.4 *9*	2084.9	12$^-$	1388.2	11$^-$				DCO=0.25 *11*
698.8 *5*	10.9 *16*	2333.4	14$^-$	1634.6	12$^-$	E2		0.0133	DCO=0.92 *23* (2010La15) α(K)=0.01010 *15*; α(L)=0.00233 *4*; α(M)=0.000563 *8* α(N)=0.0001415 *20*; α(O)=2.65×10^{-5} *4*; α(P)=2.04×10^{-6} *3* POL=+0.08 *5* for unresolved doublet (2010La15). $\gamma(\theta)$: A_2=+0.4 *1*, A_4=0 (1977Kr04). E_γ: Other: 698.2 *2* (1977Kr04).
703.6 *3*	1.7 *9*	1893.5	(9,11)$^+$	1189.9	(7,9)$^+$				
707.9 *3*	1.6 *3*	1837.0	11$^-$	1129.1	10$^-$				DCO=0.23 *7*
719.8 *3*	2.3 *5*	1654.4	10$^-$	934.7	8$^-$				DCO=0.91 *13*
753.2 *3*	1.3 *6*	2838.1	14$^-$	2084.9	12$^-$				
762.7 *3*	3.7 *5*	3096.1	16$^-$	2333.4	14$^-$	E2		0.0111	DCO=0.81 *11* α(K)=0.00851 *12*; α(L)=0.00186 *3*; α(M)=0.000446 *7* α(N)=0.0001123 *16*; α(O)=2.11×10^{-5} *3*; α(P)=1.674×10^{-6} *24* POL=+0.07 *4*.
765.8 *5*	5.4 *9*	2154.0	11$^+$	1388.2	11$^-$	E1		0.00394	DCO=1.2 *3* α(K)=0.00328 *5*; α(L)=0.000504 *7*; α(M)=0.0001162 *17* α(N)=2.92×10^{-5} *5*; α(O)=5.62×10^{-6} *8*; α(P)=5.06×10^{-7} *8* POL=−0.06 *5* for unresolved doublet.
766.6 *3*	1.6 *5*	2401.1	13$^-$	1634.6	12$^-$				DCO=0.33 *17*
779.2 *3*	8 *2*	1780.0	(7)	1000.8	(6,8)$^+$	M1+E2	2.7 *+13−7*	0.0133 *18*	DCO=0.93 *13* (2010La15) α(K)=0.0103 *14*; α(L)=0.00206 *20*; α(M)=0.00049 *5* α(N)=0.000123 *12*; α(O)=2.34×10^{-5} *23*; α(P)=1.96×10^{-6} *24* δ=2.7 *+13−7* or −2.25 *+52−50* (1977Kr04). $\gamma(\theta)$: A_2=+0.37 *5*, A_4=+0.15 *6* (1977Kr04). Mult.,δ: From 1977Kr04. E_γ: Other: 778.1 *2* (1977Kr04).
785.7 *3*	3.7 *6*	2822.1	15$^-$	2036.4	13$^-$				DCO=0.95 *14* E_γ: Other: 784.7 *2* (1977Kr04).
792.8 *3*	13 *2*	1921.9	11	1129.1	10$^-$				DCO=0.37 *3*

$^{198}_{81}Tl_{117}$-9

^{197}Au(α,3nγ) 1977Kr04,2008La11,2010La15 (continued)

$\gamma(^{198}Tl)$ (continued)

E_γ[†]	I_γ[†‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[@]	Comments
802.1 *3*	2.0 *3*	2190.3		1388.2	11^-			
811.7 *3*	3.9 *4*	3145.1	16^-	2333.4	14^-	E2	0.0097	DCO=1.08 *15* α(K)=0.00754 *11*; α(L)=0.001588 *23*; α(M)=0.000380 *6* α(N)=9.57×10^{-5} *14*; α(O)=1.80×10^{-5} *3*; α(P)=1.457×10^{-6} *21* POL=+0.09 *4*.
814.4 *3*	2.8 *8*	2004.3		1189.9	$(7,9)^+$			DCO=0.45 *19*
830.3 *3*	1.4 *4*	1837.0	11^-	1006.5	9^-			DCO=1.4 *6*
851.1[a] *3*	0.6 *3*	2716.9		1865.8				
874.8 *3*	1.5 *5*	1875.6		1000.8	$(6,8)^+$			DCO=0.3 *2*
891.6[a] *3*	4.7 *9*	2279.8	(12^-)	1388.2	11^-			DCO=0.40 *13*
955.8 *3*	0.33 *16*	2084.9	12^-	1129.1	10^-			
977.2 *3*	1.6 *5*	2611.8	14^-	1634.6	12^-			DCO=0.9 *4*
978.7 *3*	2.4 *14*	2366.9		1388.2	11^-			
980.8 *3*	0.7 *3*	3017.2	14	2036.4	13^-			DCO=0.4 *3*
990.1[a] *3*	0.4 *1*	2624.7		1634.6	12^-			
1003.3 *3*	0.4 *1*	2004.1		1000.8	$(6,8)^+$			
1025.0 *3*	3.5 *8*	2154.0	11^+	1129.1	10^-			DCO=0.56 *8*
1073.6 *3*	1.4 *4*	2263.5		1189.9	$(7,9)^+$			
1079.5[a] *3*	0.9 *4*	2014.2		934.7	8^-			
1089.3[a] *3*	0.4 *1*	3422.7		2333.4	14^-			
1150.7[a] *3*	1.2 *6*	2279.8	(12^-)	1129.1	10^-			

[†] From 2010La15, except as noted.
[‡] Measured at Eα≈35 MeV. Relative intensities normalized to Iγ(391γ)=100 *2*.
[#] From α(K)exp, α(L)exp and DCO measurements in 2010La15. The errors for the conversion coefficients range from 20% to 40% depending on the intensity and complexity of the line. α(K)exp normalized to α(K)exp for 505γ, E2 transition.
[@] Additional information 1.
[&] 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.
[a] Placement of transition in the level scheme is uncertain.

$^{198}_{81}Tl_{117}$-10

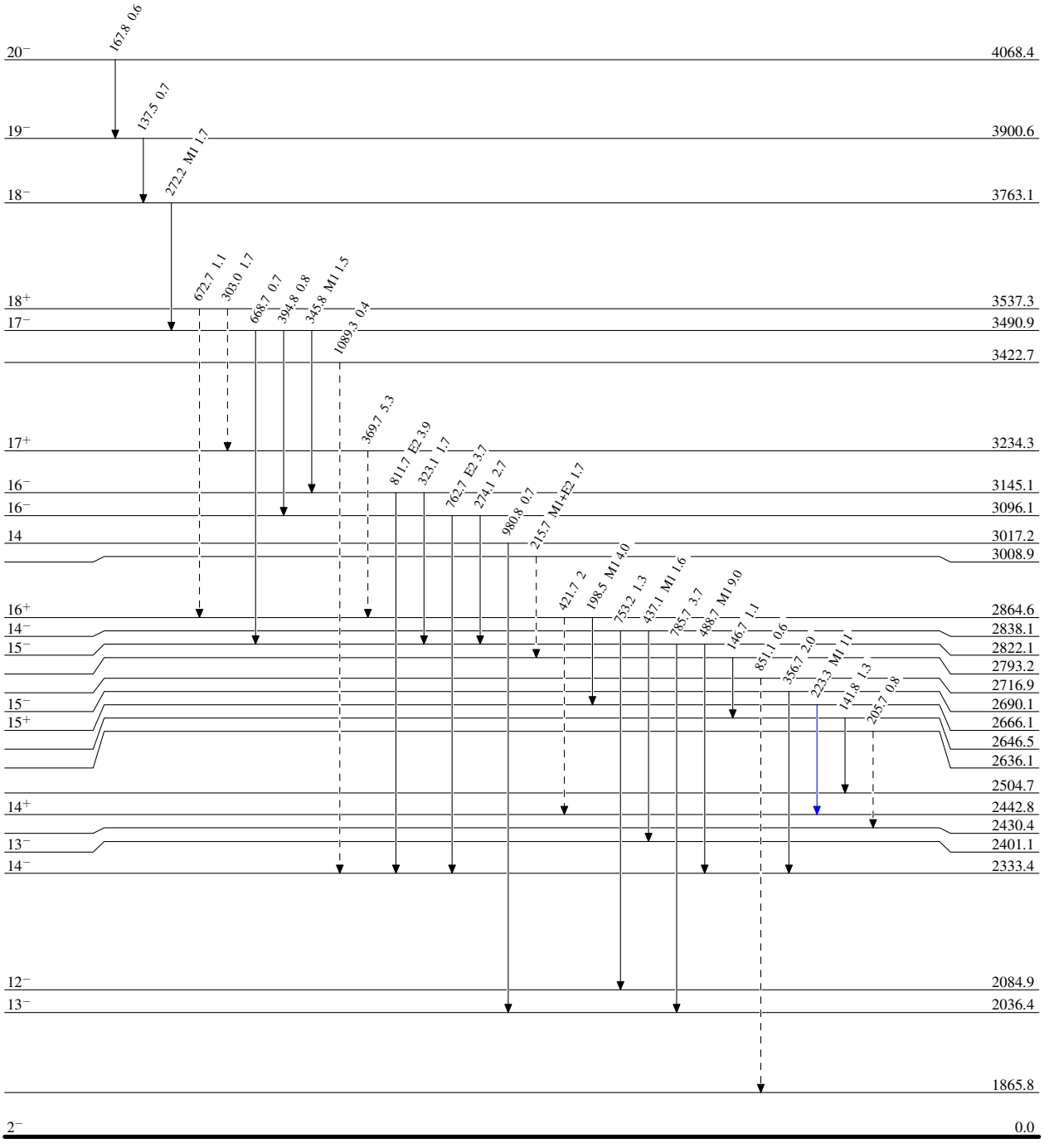
^{197}Au(α,3nγ) 1977Kr04,2008La11,2010La15

Level Scheme

Intensities: Relative I_γ

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)



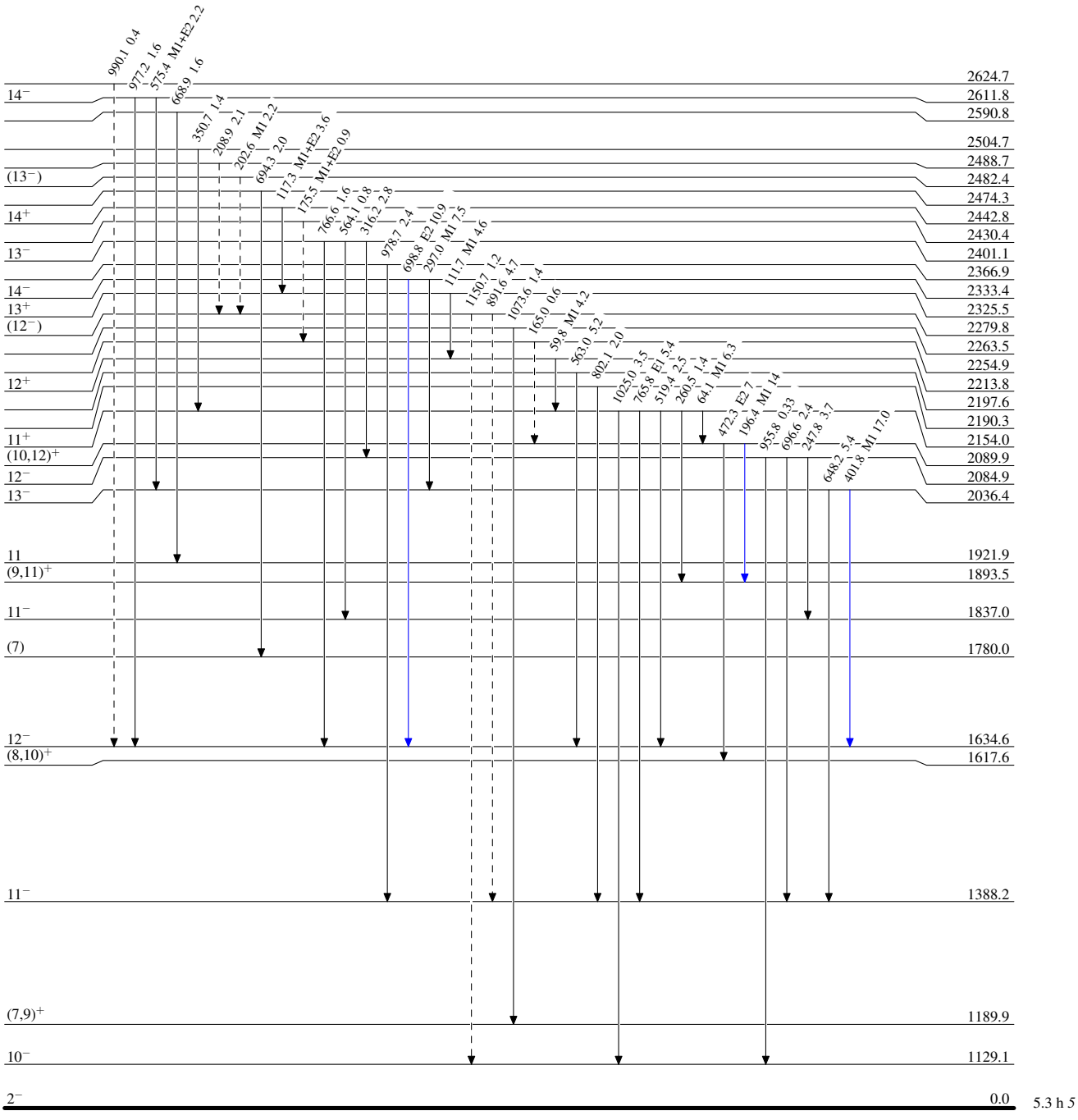
$^{198}_{81}Tl_{117}$

^{197}Au(α,3nγ) 1977Kr04,2008La11,2010La15

Level Scheme (continued)

Intensities: Relative I_γ

Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)



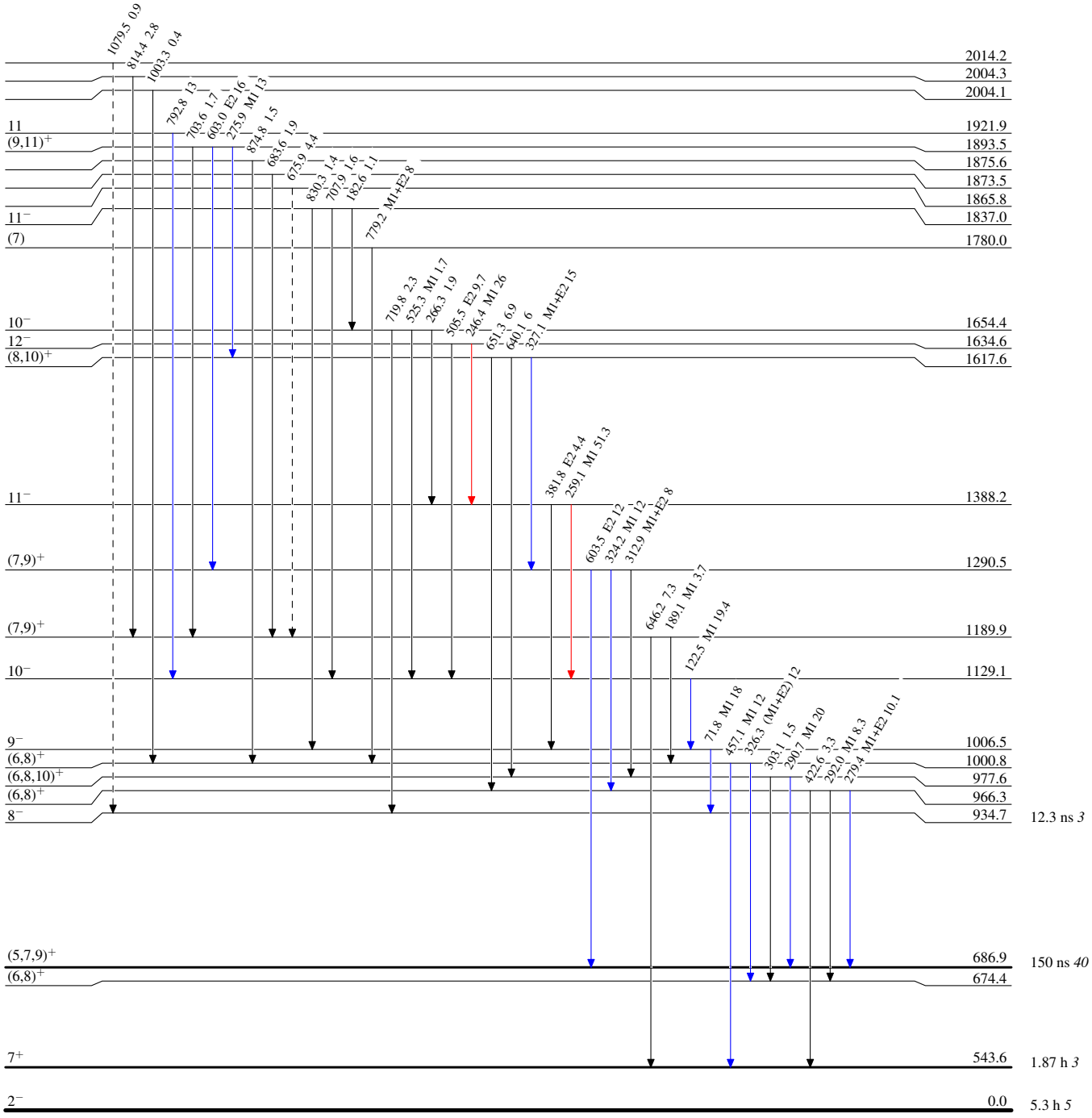
$^{198}_{81}Tl_{117}$

^{197}Au(α,3nγ) 1977Kr04,2008La11,2010La15

Level Scheme (continued)

Intensities: Relative I_γ

Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)



$^{198}_{81}Tl_{117}$

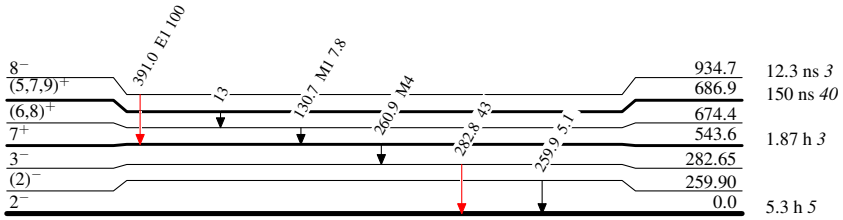
^{197}Au(α,3nγ) 1977Kr04,2008La11,2010La15

Level Scheme (continued)

Intensities: Relative I_γ

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
γ Decay (Uncertain)



$^{198}_{81}Tl_{117}$

^{197}Au(α,3nγ) 1977Kr04,2008La11,2010La15