^{199}Tl ε decay (7.42 h) 1975Ma05,1960Ju03,1962Ba37

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	NDS 108, 79 (2007)	15-Oct-2006

Parent: ^{199}Tl: E=0.0; $J^\pi=1/2^+$; $T_{1/2}$=7.42 h *8*; Q(ε)=1488 *28*; %ε+%β^+ decay=100.0

1975Ma05: prepared by ^{197}Au(α,2n), measured Eγ, Iγ.

1960Ju03: prepared by 85-MeV proton irradiation of thallium. Chem separation of Pb followed by mass-separator Tl purification, ce spectra, magnetic spectrometer.

1962Ba37: measured γ, γγ, γγ(t), γγ(θ).

Others:
γ: 1951Is02.
ce: 1960Ju03, 1953Be79.
γγ: 1961Gr29.
γγ(t), γγ(θ,H,t): 1961Gr29.
(ce)(ce)(t): 1961Re12.

^{199}Hg Levels

E(level)†	J^π‡	$T_{1/2}$	Comments
0.0	1/2⁻		
158.37950 *9*	5/2⁻	2.36 ns *8*	g=+0.352 *13* from 1977Kr11 Iγ(θ,$T_{1/2}$,h). $T_{1/2}$: weighted average of 2.32 ns *8* (1961Gr29,1962Ba37), 2.53 ns *15* (1961Re12).
208.20616 *10*	3/2⁻		
403.51 *3*	3/2⁻		
413.84 *5*	5/2⁻		
455.462 *17*	1/2⁻,3/2⁻		
492.297 *18*	3/2⁻		
750.40 *3*	1/2⁻,3/2⁻		
1221.17 *4*	$1/2^{(-)},3/2^{(-)}$		

† From least-squares fit to Eγ′s.
‡ From 'Adopted Levels'.

ε,β^+ radiations

E(decay)	E(level)	Iβ^+ ‡	Iε‡	Log *ft*	I(ε+β^+)†‡	Comments
(2.7×10^2 *3*)	1221.17		2.6 *3*	6.10 *14*	2.6 *3*	εK=0.699 *21*; εL=0.223 *15*; εM+=0.078 *6*
(7.4×10^2 *3*)	750.40		1.88 *20*	7.29 *6*	1.88 *20*	εK=0.7843 *15*; εL=0.1622 *11*; εM+=0.0534 *5*
(1.00×10^3 *3*)	492.297		7.3 *8*	6.98 *6*	7.3 *8*	εK=0.7937 *8*; εL=0.1555 *6*; εM+=0.05080 *21*
(1.03×10^3 *3*)	455.462		29 *3*	6.42 *6*	29 *3*	εK=0.7946 *7*; εL=0.1548 *5*; εM+=0.05055 *20*
(1.07×10^3# *3*)	413.84		<0.08	>9.6^{1u}	<0.08	εK=0.7684 *16*; εL=0.1735 *12*; εM+=0.0580 *5*
(1.08×10^3 *3*)	403.51		1.77 *23*	7.68 *7*	1.77 *23*	εK=0.7958 *7*; εL=0.1540 *5*; εM+=0.05022 *18*
(1.28×10^3 *3*)	208.20616		9.3 *17*	7.11 *9*	9.3 *17*	εK=0.7993 *5*; εL=0.1515 *4*; εM+=0.04923 *13*
(1.33×10^3# *3*)	158.37950		<0.4	>9.3^{1u}	<0.4	εK=0.7794 *10*; εL=0.1657 *7*; εM+=0.0549 *3*
(1.49×10^3 *3*)	0.0	0.027 *8*	48 *5*	6.54 *5*	48 *5*	av Eβ=231 *13*; εK=0.8015 *2*; εL=0.14946 *25*; εM+=0.04846 *10* I(ε+β^+): from 1962Ba37, ΔI(ε+β^+) estimated by evaluator. Iβ^+: no β^+ detected (1951Is02); from theory and Q+, ε/β^+≈3000. The uncertainty in ε/β^+ is large due to the large uncertainty in Q+.

Continued on next page (footnotes at end of table)

^{199}Tl ε decay (7.42 h) 1975Ma05,1960Ju03,1962Ba37 (continued)

ε,β^+ radiations (continued)

† Deduced from level scheme, unless otherwise noted.
‡ Absolute intensity per 100 decays.
# Existence of this branch is questionable.

γ(^{199}Hg)

Iγ normalization: From intensity balance at each level combined with adopted Iε=48% to g.s. (1962Ba37). 1962Ba37 do not state explicitly their K x ray intensity. Evaluator estimates 10% uncertainty in Iγ normalization.

α(K)exp (1975Ma05) given in the table were calculated from Ice(K)(1960Ju03)/Iγ(1975Ma05) assuming that the 158.379γ is E2 and α(K)=0.30.

$E_γ$[†]	$I_γ$[†b]	E_i(level)	$J^π_i$	E_f	$J^π_f$	Mult.	δ[&]	α[c]	$I_{(γ+ce)}$[b]	Comments
(10.4[#] *10*)		413.84	5/2⁻	403.51	3/2⁻	[M1,E2]			0.08	$I_{(γ+ce)}$: deduced from 337-keV coin data (1975Ma05).
36.83[@] *3*	0.09[‡] *2*	492.297	3/2⁻	455.462	1/2⁻,3/2⁻	M1		27.9		α(L)= 21.31; α(M)= 4.97 Mult.: L1/L2≈10, L/M=3 *1* (1960Ju03).
49.817[@] *15*	4.1 *2*	208.20616	3/2⁻	158.37950	5/2⁻	M1+E2	−0.044[a] *4*	11.7		α(L)= 8.92 *4*; α(M)= 2.08 *1* Mult.: L1/L3=61 *12*, L2/L3=6 *2*, L/M=4.8 *5*, M/N=3.1 *3*, N/O=5 *2* (1960Ju03); theory: L1/L3=45 *4*, L2/L3=5.1 *5*, L/M=4.29 *1*. $I_γ$: calculated from adopted branching ratio.
51.93[@] *6*	0.19[‡] *6*	455.462	1/2⁻,3/2⁻	403.51	3/2⁻	(M1)		10.12		α(L)= 7.74; α(M)= 1.801; α(N+..)= 0.579 Mult.: L1/L3>5, L/M=3 *1* (1960Ju03).
158.359[@] *25*	40 *2*	158.37950	5/2⁻	0.0	1/2⁻	E2		0.914		α(K)= 0.296; α(L)= 0.461; α(M)= 0.1194; α(N+..)= 0.0374 Mult.: K/L=0.6 *2*, L/M=3.6 *4*, M/N=4.4 *10*, L1/L2<0.3, (L1+L2)/L3= 1.7 *3* (1960Ju03).
195.30 *5*	2.1 *2*	403.51	3/2⁻	208.20616	3/2⁻	M1		1.23		α(K)= 1.007; α(L)= 0.1695; α(M)= 0.0394; α(N+..)=0.01262 Mult.: K/L=5.3 *10* (1960Ju03); α(K)exp=1.0 *2* (1975Ma05).
205.6[#] *10*	0.08 *3*	413.84	5/2⁻	208.20616	3/2⁻	[M1,E2]		0.7 *4*		
208.20 *3*	99 *5*	208.20616	3/2⁻	0.0	1/2⁻	M1+E2	−0.388[a] *9*	0.937 *4*		α(K)=0.751 *4*; α(L)=0.142; α(M)=0.0334 *2*; α(N+..)=0.0106 Mult.: α(K)exp=0.8 *1* (1975Ma05); K/L=5.1 *6*, L/M=4.4 *5*, M/N=4.4 *10*, L1/L3=20 *10* (1960Ju03).
245.1[#] *10*	≤0.3	403.51	3/2⁻	158.37950	5/2⁻	[M1,E2]		0.43 *23*		
247.26 *3*	75 *4*	455.462	1/2⁻,3/2⁻	208.20616	3/2⁻	M1		0.637		α(K)= 0.523; α(L)= 0.0877; α(M)=0.02036; α(N+..)=0.00650 Mult.: K/L=5.4 *11*, L1/L2>20 (1960Ju03), α(K)exp=0.5 *1*

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γ(^{199}Hg) (continued)

E_γ[†]	I_γ[†b]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	δ[&]	α[c]	Comments
									(1975Ma05). (247γ)[50γ](158γ)(θ): isotropic (1962Ba37). (247γ)(208γ)(θ): A_2=0.00 *1*, A_4=0.00 *1* (1962Ba37).
255.5 *1*	0.10 *3*	413.84	5/2$^-$	158.37950	5/2$^-$	[M1,E2]		0.38 *20*	
258.14 *11*	0.58 *6*	750.40	1/2$^-$,3/2$^-$	492.297	3/2$^-$	[M1,E2]		0.37 *20*	
284.09 *3*	17.8 *9*	492.297	3/2$^-$	208.20616	3/2$^-$	M1		0.435	α(K)= 0.357; α(L)= 0.0597; α(M)=0.01386; α(N+..)=0.00442 Mult.: K/L=5.8 *15* (1960Ju03), α(K)exp=0.39 *8* (1975Ma05).
294.94 *10*	0.42 *4*	750.40	1/2$^-$,3/2$^-$	455.462	1/2$^-$,3/2$^-$	[M1,E2]		0.25 *14*	
297.07 *6*	2.8 *3*	455.462	1/2$^-$,3/2$^-$	158.37950	5/2$^-$	(E2)		0.1108	α(K)= 0.0651; α(L)= 0.0343; α(M)=0.00870; α(N+..)=0.00272 Mult.: non observation in ce spectrum of 1960Ju03 excludes a predominantly M1 transition, decay scheme excludes E1.
333.93 *4*	14.2 *7*	492.297	3/2$^-$	158.37950	5/2$^-$	M1+E2	+0.22 *2*	0.271 *2*	α(K)= 0.2219 *15*; α(L)=0.03760 *14*; α(M)=0.00875 *3*; α(N+..)=0.00279 Mult.: K/M>16 (1960Ju03), α(K)exp=0.24 *5* (1975Ma05). δ: from A_2=−0.42 *2*, A_4=+0.01 *2* (1962Ba37).
336.5 *1*	1.14 *11*	750.40	1/2$^-$,3/2$^-$	413.84	5/2$^-$	[M1,E2]		0.18 *10*	
346.89 *8*	1.07 *11*	750.40	1/2$^-$,3/2$^-$	403.51	3/2$^-$	[M1,E2]		0.16 *9*	
403.50 *4*	13.9 *7*	403.51	3/2$^-$	0.0	1/2$^-$	M1+E2	+0.32 *2*	0.157 *1*	α(K)= 0.1286 *12*; α(L)=0.02190 *13*; α(M)=0.00510 *3*; α(N+..)=0.00162 Mult.: α(K)exp=0.15 *5* (1975Ma05).
413.85 *8*	1.6 *2*	413.84	5/2$^-$	0.0	1/2$^-$	E2[&]		0.0437	α(K)= 0.0298; α(L)=0.01050; α(M)=0.00261; α(N+..)=0.00082
455.46 *3*	100 *5*	455.462	1/2$^-$,3/2$^-$	0.0	1/2$^-$	M1		0.1221	α(K)= 0.1004; α(L)=0.01662; α(M)=0.00385; α(N+..)=0.00123 Mult.: K/L=5.3 *13*, L/M=4.0 *12* (1960Ju03), α(K)exp=0.12 *2* (1975Ma05).
470.77 *13*	0.31 *6*	1221.17	1/2$^{(-)}$,3/2$^{(-)}$	750.40	1/2$^-$,3/2$^-$	[M1,E2]		0.07 *4*	
492.30 *4*	12.3 *6*	492.297	3/2$^-$	0.0	1/2$^-$	M1		0.0994	α(K)= 0.0818; α(L)=0.01352; α(M)=0.00313; α(N+..)=0.00100 Mult.: α(K)exp=0.06 *3* (1975Ma05), no L3 (1953Be79).
542.21 *5*	2.1 *2*	750.40	1/2$^-$,3/2$^-$	208.20616	3/2$^-$	[M1,E2]		0.05 *3*	
592.0[#] *1*	0.8 *3*	750.40	1/2$^-$,3/2$^-$	158.37950	5/2$^-$	[M1,E2]		0.040 *22*	
728.86 *11*	0.36 *4*	1221.17	1/2$^{(-)}$,3/2$^{(-)}$	492.297	3/2$^-$	[M1,E2]		0.024 *12*	
750.4 *1*	8.4 *4*	750.40	1/2$^-$,3/2$^-$	0.0	1/2$^-$	[M1,E2]		0.022 *11*	
765.7[#] *2*	≈0.1	1221.17	1/2$^{(-)}$,3/2$^{(-)}$	455.462	1/2$^-$,3/2$^-$	[M1,E2]		0.021 *11*	
807.3 *1*	0.40 *4*	1221.17	1/2$^{(-)}$,3/2$^{(-)}$	413.84	5/2$^-$	[M1,E2]		0.019 *9*	
817.67 *10*	3.3 *2*	1221.17	1/2$^{(-)}$,3/2$^{(-)}$	403.51	3/2$^-$	[M1,E2]		0.018 *9*	
1012.95 *10*	14.2 *7*	1221.17	1/2$^{(-)}$,3/2$^{(-)}$	208.20616	3/2$^-$	[M1,E2]		0.011 *5*	

From ENSDF

$\gamma(^{199}$Hg) (continued)

E_γ[†]	I_γ[†b]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[c]
1062.8 *1*	2.0 *2*	1221.17	$1/2^{(-)},3/2^{(-)}$	158.37950	$5/2^-$	[M1,E2]	0.010 *4*
1221.16 *10*	0.24 *3*	1221.17	$1/2^{(-)},3/2^{(-)}$	0.0	$1/2^-$	[M1,E2]	0.007 *3*

[†] From 1975Ma05, unless otherwise noted.
[‡] γ line not seen. Estimated from ce spectra of 1960Ju03 based on M1 assignment.
[#] γ seen in coincidence spectra only (1975Ma05).
[@] From 1960Ju03.
[&] From 'adopted gammas', unless otherwise indicated.
[a] For possible penetration effect, see comment in ^{199}Au β^- decay.
[b] For absolute intensity per 100 decays, multiply by 0.124 *12*.
[c] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

$^{199}_{80}$Hg$_{119}$-5

^{199}Tl ε decay (7.42 h) 1975Ma05,1960Ju03,1962Ba37

Decay Scheme

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