^{196}Tl ε decay (1.84 h) 1960Ju01,1968Pe13,1973BeYM

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Huang Xiaolong	NDS 108, 1093 (2007)	1-Jan-2006

Parent: ^{196}Tl: E=0.0; $J^\pi=2^-$; $T_{1/2}$=1.84 h *3*; Q(ε)=4330 *12*; %ε+%$β^+$ decay=100.0

Source prepared by Tl(p,xn)^{196}Pb(ε)^{196}Tl, E(p)=45-115 MeV, mass separator (1960Ju01); Pb,U(p,spallation products), E(p)=3 GeV, scin, semi, mass separator (1968Pe13); Th(p,spallation products), E(p)=600 MeV, semi, scin, isotope separator (1973BeYM). The decay scheme is primarily that of 1973BeYM.

^{196}Hg Levels

E(level)†	Jπ‡	$T_{1/2}$	E(level)†	Jπ‡	E(level)†	Jπ‡
0.0	0^+	stable	1390.6 *5*	$(2^+,3,4^+)$	2012.3 *8*	$(2)^+$
425.67 *19*	2^+		1775.3 *4*	$2^+,3,4^+$	2454.5 *6*	$(1,2^+)$
958.1? *5*	$1,2^+$		1814.7 *4*	$(2^+,3^+)$	2495.5 *11*	$(2^+,3)$
1036.2 *4*	$1^+,2^+$		1845.0 *5*	$1,2^+$	2653.8 *7*	$(1^+,2,3)$
1060.9 *4*	4^+		1921.6 *5*	$(2^+,3^+)$	3163.5 *18*	$(2^+,3,4^+)$
1318.8 *9*	0^+		1978.7 *7*	$1,2^+$		

† 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
(1167 *12*)	3163.5		3.9 *5*	6.80 *6*	3.9 *5*	εK=0.7974 *3*; εL=0.15282 *17*; εM+=0.04976 *7*
(1676 *12*)	2653.8	0.0059 *8*	2.6 *3*	7.31 *6*	2.6 *3*	av Eβ=314.9 *54*; εK=0.8020; εL=0.1479 *1*; εM+=0.04788 *4*
(1835 *12*)	2495.5	0.019 *2*	3.7 *4*	7.24 *5*	3.7 *4*	av Eβ=384.5 *53*; εK=0.8009 *2*; εL=0.1466 *1*; εM+=0.04740 *4*
(1876 *12*)	2454.5	0.0177 *15*	2.86 *20*	7.37 *4*	2.88 *20*	av Eβ=402.6 *53*; εK=0.8003 *2*; εL=0.1463 *1*; εM+=0.04728 *4*
(2318 *12*)	2012.3	0.17 *2*	6.2 *6*	7.22 *5*	6.4 *6*	av Eβ=596.2 *53*; εK=0.7866 *6*; εL=0.14167 *16*; εM+=0.04569 *6*
(2351 *12*)	1978.7	0.16 *2*	5.3 *6*	7.30 *5*	5.5 *6*	av Eβ=611.0 *53*; εK=0.7849 *7*; εL=0.14124 *16*; εM+=0.04554 *6*
(2408 *12*)	1921.6	0.28 *3*	8.3 *10*	7.13 *6*	8.6 *10*	av Eβ=636.0 *53*; εK=0.7818 *7*; εL=0.14048 *17*; εM+=0.04528 *6*
(2485 *12*)	1845.0	0.099 *9*	2.48 *20*	7.68 *4*	2.58 *21*	av Eβ=669.5 *53*; εK=0.7771 *8*; εL=0.13940 *18*; εM+=0.04492 *6*
(2515 *12*)	1814.7	0.21 *2*	4.9 *5*	7.40 *5*	5.1 *5*	av Eβ=682.8 *53*; εK=0.7752 *8*; εL=0.13895 *19*; εM+=0.04477 *6*
(2555 *12*)	1775.3	0.25 *3*	5.3 *6*	7.38 *5*	5.5 *6*	av Eβ=700.1 *53*; εK=0.7725 *9*; εL=0.13834 *19*; εM+=0.04457 *7*
(2939 *12*)	1390.6	0.30 *4*	3.1 *5*	7.73 *7*	3.4 *5*	av Eβ=869.5 *53*; εK=0.7392 *13*; εL=0.13142 *25*; εM+=0.04229 *8*
(3011 *12*)	1318.8	<0.001	<0.04	>11.2[1u]	<0.04	av Eβ=894.4 *51*; εK=0.7770 *5*; εL=0.1449 *2*; εM+=0.04699 *5*
(3269 *12*)	1060.9	0.51 *15*	3.3 *10*	7.80 *13*	3.8 *11*	av Eβ=1015.5 *54*; εK=0.7012 *16*; εL=0.1241 *3*; εM+=0.03990 *10*
(3294 *12*)	1036.2	0.93 *19*	5.8 *12*	7.56 *10*	6.7 *14*	av Eβ=1026.5 *54*; εK=0.6981 *16*; εL=0.1235 *3*; εM+=0.03970 *10*
(3372 *12*)	958.1?	0.052 *8*	0.29 *4*	8.89 *7*	0.34 *5*	av Eβ=1061.2 *54*; εK=0.6878 *16*; εL=0.1215 *3*; εM+=0.03908 *10*
(3904 *12*)	425.67	9.2 *15*	28 *5*	7.03 *7*	37 *6*	av Eβ=1299.3 *54*; εK=0.6106 *19*; εL=0.1073 *4*;

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^{196}Tl ε decay (1.84 h) 1960Ju01,1968Pe13,1973BeYM (continued)

ε,β+ radiations (continued)

E(decay)	E(level)	Iβ+ †	Iε†	Log *ft*	I(ε+β+)†	Comments
						εM+=0.03446 *11*
(4330 *12*)	0.0	<0.8	<4	>9.8[1u]	<5	av Eβ=1457.1 *52*; εK=0.6836 *12*; εL=0.12372 *25*; εM+=0.03993 *8* Iε: I(ε+β+)<5 from the values based on K x ray /γ in 1973BeYM.

† Absolute intensity per 100 decays.

γ(^{196}Hg)

Iγ normalization: ΣI(γ+ce)(g.s.)=97.5 *25*, where %ε+β+(g.s.)=2.5 *25* (<5% from the estimated values based on K x ray /γ in 1973BeYM).

E_γ†	I_γ†[a]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	δ	α[b]	Comments
329.6 *5*	0.34 *5*	1390.6	(2+,3,4+)	1060.9	4+				
x344.9# *10*	2.1								
354.5 *5*	1.3 *2*	1390.6	(2+,3,4+)	1036.2	1+,2+				
425.7‡ *2*	87 *5*	425.67	2+	0.0	0+	E2		0.0403	α(K)=0.0278 *4*; α(L)=0.00945 *14*; α(M)=0.00235 *4*; α(N+..)=0.000692 *10* Mult.: supported by K/L=2.8 *3* (1968Pe13).
x495.8# *12*									
532.7‡c *5*	0.12c *3*	958.1?	1,2+	425.67	2+				
532.7‡c *5*	0.12c *3*	2454.5	(1,2+)	1921.6	(2+,3+)				Placed from 958 level by 1973BeYM also.
610.5 *5*	12.4 *12*	1036.2	1+,2+	425.67	2+	E2+M1	1.4 *4*	0.030 *6*	α(K)=0.024 *6*; α(L)=0.0046 *7*; α(M)=0.00108 *16*; α(N+..)=0.00032 *5* Mult.: based upon α(K)exp=0.028 *5* (1973BeYM), 0.021 *5* (1968Pe13).
635.2 *5*	10.2 *10*	1060.9	4+	425.67	2+	E2		0.0155	α(K)=0.01178 *17*; α(L)=0.00282 *4*; α(M)=0.000681 *10*; α(N+..)=0.000202 *3* Mult.: based upon α(K)exp=0.012 *2* (1973BeYM), 0.014 *3* (1968Pe13).
x705.0 *10*	1.4 *2*								
713.6‡ *10*	1.3 *2*	1775.3	2+,3,4+	1060.9	4+				
738.7 *7*	0.39 *6*	1775.3	2+,3,4+	1036.2	1+,2+				
x750.0‡ *10*	1.4								
754.0 *5*	1.5 *2*	1814.7	(2+,3+)	1060.9	4+	(E2)		0.0107	α(K)=0.00835 *12*; α(L)=0.00179 *3*; α(M)=0.000428 *6*; α(N+..)=0.0001276 *18* Mult.: based upon α(K)exp=0.008 *3*.
778.4 *5*	1.2 *2*	1814.7	(2+,3+)	1036.2	1+,2+				

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^{196}Tl ε decay (1.84 h) 1960Ju01,1968Pe13,1973BeYM (continued)

γ(^{196}Hg) (continued)

E_γ †	I_γ †a	E_i(level)	J_i^π	E_f	J_f^π	Mult.&	α b	Comments
808.9c 5	0.58c 9	1845.0	1,2+	1036.2	1+,2+			
808.9c 5	0.58c 9	2653.8	(1+,2,3)	1845.0	1,2+			
861.0‡ 15	0.46 7	1921.6	(2+,3+)	1060.9	4+			
885 1	0.18 3	1921.6	(2+,3+)	1036.2	1+,2+			
893.2‡ 10	0.26 4	1318.8	0+	425.67	2+	(E2)	0.00755	α(K)=0.00601 9; α(L)=0.001180 17; α(M)=0.000280 4; α(N+..)=8.36×10^{-5} 12 Mult.: based upon α(K)exp=0.014 8 (1973BeYM). Theory: α(K)(M1)=0.018, α(K)(E2)=0.0060. The measurement of α(K)exp is not sufficiently accurate to permit choosing between E2 and M1. ΔJ=2 from decay scheme.
x957.2‡ 10	0.24 4							placed from 958 level by 1973BeYM.
957.2‡ 10	0.24 4	958.1?	1,2+	0.0	0+			
964.6‡ 10	3.7 4	1390.6	(2+,3,4+)	425.67	2+	(E2)	0.00648	α(K)=0.00519 8; α(L)=0.000985 14; α(M)=0.000233 4; α(N+..)=6.97×10^{-5} 10 Mult.: from α(K)exp=0.0066 15 (1973BeYM). M1 mixing cannot be excluded.
976.1‡ 15	0.44 6	2012.3	(2)+	1036.2	1+,2+			
x1025.0‡ 15	0.9 2							
1036.2‡ 10	2.7 3	1036.2	1+,2+	0.0	0+			
1064.9‡ 20	0.32 5	2454.5	(1,2+)	1390.6	(2+,3,4+)			
x1105.5# 15								
1105.9‡@ 20	0.59 9	2495.5	(2+,3)	1390.6	(2+,3,4+)			Eγ: probably same as 1105.5 15 of 1968Pe13.
1136.5‡ 20	0.27 4	2454.5	(1,2+)	1318.8	0+			
x1190.0# 12								
1262.1‡ 20	0.83 12	2653.8	(1+,2,3)	1390.6	(2+,3,4+)			
x1289.1‡ 15	1.2 2							
1319.2‡ 20	≤0.05	1318.8	0+	0.0	0+	E0		Mult.: based upon low limit for Iγ, α(K)exp>0.06; theory: α(K)(E1)=0.0012, α(K)(M2)=0.015. Supported by log *ft*=10.3, deduced from level feeding. $I_{(\gamma+ce)}$: 0.0040 12 from ce (1973BeYM).
1350.0 5	1.2 2	1775.3	2+,3,4+	425.67	2+			
1389.0 5	2.6 3	1814.7	(2+,3+)	425.67	2+	(M1)	0.00668	α(K)=0.00549 8; α(L)=0.000875 13; α(M)=0.000202 3; α(N+..)=0.0001169 17 Mult.: based upon α(K)exp=0.0075 (1973BeYM).
1418.6‡c 20	0.72c 11	1845.0	1,2+	425.67	2+			
1418.6‡c 20	0.72c 11	2454.5	(1,2+)	1036.2	1+,2+			
1434.2 20	1.5 2	2495.5	(2+,3)	1060.9	4+			α: α(K)exp=0.0092 (1973BeYM).

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^{196}Tl ε decay (1.84 h) 1960Ju01,1968Pe13,1973BeYM (continued)

γ(^{196}Hg) (continued)

E_γ †	I_γ †[a]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	α[b]	Comments
1460.3‡@ *20*	0.69 *10*	2495.5	(2+,3)	1036.2	1+,2+			
1495.8 *5*	8.5 *9*	1921.6	(2+,3+)	425.67	2+	(M1)	0.0056	α(K)=0.00456 *7*; α(L)=0.000725 *11*; α(M)=0.0001677 *24*; α(N+..)=0.0001536 *22* Based upon α(K)exp=0.0040 (1973BeYM).
[x]1510.6 *12*	3.0							
1553.0 *7*	5.0 *5*	1978.7	1,2+	425.67	2+			
1586.7 *10*	2.4 *3*	2012.3	(2)+	425.67	2+			
[x]1621.4‡ *20*	5.1 *6*							
[x]1696.7‡ *20*	3.1 *4*							
1775.5 *10*	2.9 *4*	1775.3	2+,3,4+	0.0	0+			E_γ: not observed in ^{197}Au(p,2nγ).
1844.9	2.0	1845.0	1,2+	0.0	0+			
1979 *2*	0.81 *12*	1978.7	1,2+	0.0	0+			
2011.3‡ *25*	3.9 *4*	2012.3	(2)+	0.0	0+			
2029.1	1.6	2454.5	(1,2+)	425.67	2+			
[x]2049.2‡ *20*	1.2 *2*							
2067.4‡@ *25*	1.1 *2*	2495.5	(2+,3)	425.67	2+			
2102.1 *25*	1.2 *2*	3163.5	(2+,3,4+)	1060.9	4+			
2127.8 *25*	2.9 *4*	3163.5	(2+,3,4+)	1036.2	1+,2+			
[x]2149.0‡ *20*	1.0 *2*							
[x]2212.0‡ *20*	3.5 *4*							
2227.7 *25*	1.3 *2*	2653.8	(1+,2,3)	425.67	2+			
[x]2392.7‡ *20*	1.8 *3*							

† From 1973BeYM except where noted otherwise.
‡ Uncertainty estimated by evaluators.
# Reported by 1968Pe13.
@ Not given in table 7 of 1973BeYM, but shown in decay scheme.
& α(K)exp of 1973BeYM are normalized to 0.027 for the 426γ, for mult=E2.
[a] For absolute intensity per 100 decays, multiply by 0.95 *5*.
[b] 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.
[c] Multiply placed with undivided intensity.
[x] γ ray not placed in level scheme.

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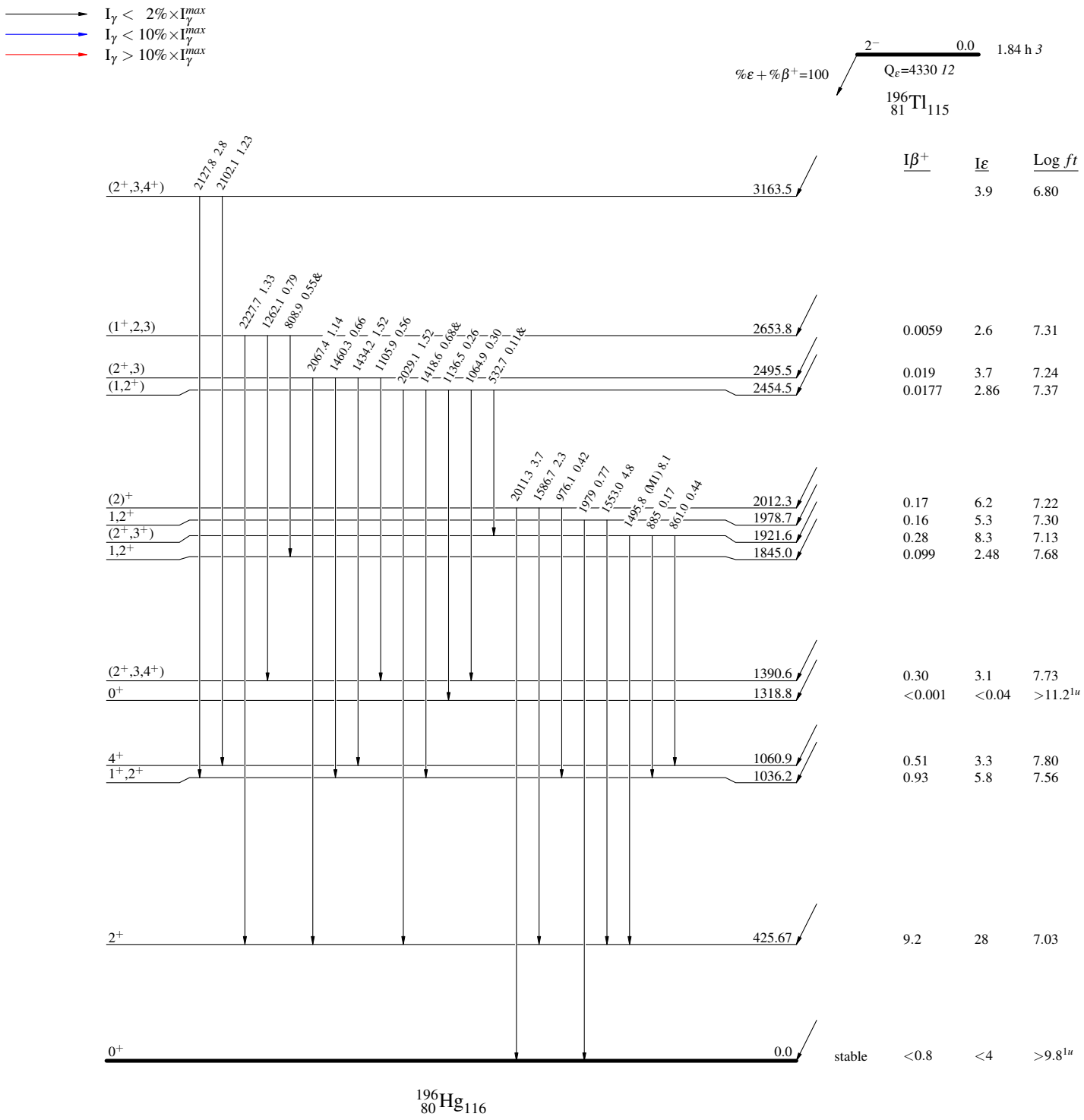
Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given



^{196}Tl ε decay (1.84 h) 1960Ju01,1968Pe13,1973BeYM

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given