^{196}Pb ε decay (37 min) 1982Hi04,1961Sv01

History

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

Parent: ^{196}Pb: E=0.0; J$^{\pi}$=0^{+}; $T_{1/2}$=37 min *3*; Q(ε)=2136 *19*; %ε+%β^{+} decay=100.0
^{196}Pb-$T_{1/2}$: From 1961Sv01, 1957An53. 1982Hi04 adopted 36.4 min.
Source prepared by ^{197}Au(^{6}Li,7n), E(^{6}Li)=95 MeV (1982Hi04); ^{201}Tl(p,6n),^{203}Tl(p,8n) E(p)=120 MeV (1961Sv01).
Measured Eγ, Ir, γγ-coincidence (1982Hi04); Ice (1961Sv01).
The decay scheme presented here was constructed by 1982Hi04. The evaluators have noted some of the problems in the comments.

^{196}Tl Levels

E(level)†	J$^{\pi}$‡	$T_{1/2}$‡	Comments
0.0	2^{-}	1.84 h *3*	J$^{\pi}$: from 1976Fu06. $T_{1/2}$: from 1960Ju01, 1958An52.
191.7 *4*	0^{-}		
240.0 *4*	(2)$^{-}$		
253.1 *4*	1^{-}		J$^{\pi}$: the relatively strong feeding to this level suggests J$^{\pi}$=(1^{-}).
366.5 *5*	1^{-}		
493.9 *4*	1^{-}		
755.2 *5*	(1^{-})		Based on strong coincidence between 502γ and 253γ. Fast 1U β transition (1982Hi04).
954.1 *5*	(1^{-})		

† 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
(1182 *19*)	954.1		7.0 *15*	6.11 *10*	7.0 *15*	εK=0.7949 *4*; εL=0.1544 *3*; εM+=0.05064 *11*
(1381 *19*)	755.2	0.0056 *16*	33 *4*	5.58 *7*	33 *4*	av Eβ=182.6 *88*; εK=0.7979 *3*; εL=0.15218 *19*; εM+=0.04975 *8*
(1642 *19*)	493.9	0.019 *4*	11.5 *21*	6.20 *9*	11.5 *21*	av Eβ=300.4 *85*; εK=0.7996; εL=0.14987 *16*; εM+=0.04887 *6*
(1770 *19*)	366.5	0.087 *16*	25 *4*	5.93 *8*	25 *4*	av Eβ=356.7 *87*; εK=0.7992 *2*; εL=0.14883 *16*; εM+=0.04848 *6*
(1883 *19*)	253.1	0.08 *3*	13 *5*	6.27 *17*	13 *5*	av Eβ=406.5 *86*; εK=0.7981 *3*; εL=0.14788 *17*; εM+=0.04813 *6* if J$^{\pi}$=1^{-}, ε/β^{+}>100 (1979Ha41).
(1944 *19*)	191.7	0.083 *24*	11 *3*	6.37 *13*	11 *3*	av Eβ=433.5 *84*; εK=0.7972 *4*; εL=0.14734 *18*; εM+=0.04793 *7*

† From intensity balance at each level.
‡ Absolute intensity per 100 decays.

γ(^{196}Tl)

Iγ normalization: calculated from ΣI(γ+ce)=100% to g.s., assuming no (ε+β^{+})-feeding to ^{196}Tl g.s.

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^{196}Pb ε decay (37 min) 1982Hi04,1961Sv01 (continued)

γ(^{196}Tl) (continued)

E_γ[†]	I_γ[‡@]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ	α[&]	Comments
113[a] *1*	1.0 *4*	366.5	1⁻	253.1	1⁻	[M1]		6.06 *18*	α(K)=4.95 *15*; α(L)=0.85 *3*; α(M)=0.199 *6*; α(N+..)=0.0608 *18* ce(K)=10 *3* (1961Sv01) ce(K)(113)/ce(K)(253.2)=0.10 *3* (1961Sv01). E_γ: from 1961Sv01 only. ΔE,I_γ: Estimated from 1961Sv01 by evaluators.
126 *1*	7.6 *17*	366.5	1⁻	240.0	(2)⁻	[M1]		4.44 *12*	α(K)=3.63 *10*; α(L)=0.622 *17*; α(M)=0.145 *4*; α(N+..)=0.0445 *12* ce(K)=6 *2* (1961Sv01) ce(K)(126)/ce(K)(253.2)=0.06 *2* (1961Sv01). E_γ: from 1961Sv01 only. I_γ: From I(γ+ce)/(1+α) and I(γ+ce) required for intensity balance at 240 level.
127[a] *1*	0.9 *4*	493.9	1⁻	366.5	1⁻	[M1]		4.34 *12*	α(K)=3.55 *10*; α(L)=0.608 *17*; α(M)=0.142 *4*; α(N+..)=0.0435 *12* ce(K)=6 *2* (1961Sv01) ce(K)(127)/ce(K)(253.2)=0.06 *2* (1961Sv01). E_γ: from 1961Sv01 only. ΔE,I_γ: Estimated from 1961Sv01 by evaluators.
175[a] *2*	2.9 *12*	366.5	1⁻	191.7	0⁻	[M1]		1.75 *7*	α(K)=1.43 *6*; α(L)=0.244 *9*; α(M)=0.0570 *21*; α(N+..)=0.0174 *7* ce(K)=8 *3* (1961Sv01) ce(K)(175)/ce(K)(253.2)=0.08 *3* (1961Sv01). E_γ: from 1961Sv01 only. ΔE,I_γ: Estimated from 1961Sv01 by evaluators.
191.7 *5*	41 *6*	191.7	0⁻	0.0	2⁻	E2		0.474 *8*	α(K)=0.187 *3*; α(L)=0.215 *4*; α(M)=0.0558 *10*; α(N+..)=0.0165 *3* Mult.: K:L2:L3:M:N=13 *2*:9 *2*:6 *2*:8 *2*:1.5 *7* (1961Sv01). K/L=0.8 *2*, L2/L3=1.7 *6*, L/M=2.1 *8*, M/N=5 *2* (1961Sv01). E2 theory: K/L=0.87, L2/L3=1.6. ce(K)(191.8)/ce(K)(253.2)=0.13 *2* (1961Sv01). $I_{(\gamma+ce)}$: I(γ+ce)=34 *5* (1961Sv01). Mult.: M1 from 1982Hi04.
240.0 *5*	30 *5*	240.0	(2)⁻	0.0	2⁻	M1+E2	<0.6	0.66 *7*	α(K)=0.53 *7*; α(L)=0.098 *3*; α(M)=0.0232 *5*; α(N+..)=0.00709 *15* K/L≥2.8; K/L3>60; ce(K)=34 *4*; ce(L)≤12 (1961Sv01) ce(K)(240.3)/ce(K)(253.2)=0.34 *4* (1961Sv01). $I_{(\gamma+ce)}$: I(γ+ce)=31 *4* (1961Sv01).
241[a] *2*	3.5 *10*	493.9	1⁻	253.1	1⁻	[M1]		0.716 *20*	α(K)=0.586 *16*; α(L)=0.099 *3*; α(M)=0.0232 *7*; α(N+..)=0.00710 *20* ce(K)=4 *1* (1961Sv01) ce(K)(241)/ce(K)(253.2)=0.04 *1* (1961Sv01). E_γ: from 1961Sv01 only. ΔE,I_γ: Estimated from 1961Sv01 by evaluators.
253.1 *5*	100 *8*	253.1	1⁻	0.0	2⁻	M1		0.625	α(K)=0.512 *8*; α(L)=0.0867 *13*; α(M)=0.0202 *3*; α(N+..)=0.00620 *10* K/L=5.4 *9*; L/M=5 *3*; ce(K)=100; ce(L)=18 *4* ce(M)=3.5 *10* (1961Sv01) Mult.: M1 theory: K/L=5.90, L/M=4.3; E1 theory: K/L=5.87, L/M=4.3.
302.2 *5*	14 *4*	493.9	1⁻	191.7	0⁻	M1		0.384	α(K)=0.315 *5*; α(L)=0.0531 *8*; α(M)=0.01240 *19*; α(N+..)=0.00380 *6* ce(K)=1.2 *5* (1961Sv01) ce(K)(302)/ce(K)(253.2)=0.012 *5* (1961Sv01).
366.5 *5*	41 *6*	366.5	1⁻	0.0	2⁻	M1		0.228	α(K)=0.187 *3*; α(L)=0.0314 *5*; α(M)=0.00732

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^{196}Pb ε decay (37 min) 1982Hi04,1961Sv01 (continued)

γ(^{196}Tl) (continued)

E_γ[†]	I_γ[‡@]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	α[&]	Comments
								11; α(N+..)=0.00224 *4* Mult.: K/L>5, ce(K)=18 *6* (1961Sv01). ce(K)(366.6)/ce(K)(253.2)=0.18 *6* (1961Sv01). $I_{(\gamma+ce)}$: I(γ+ce)=38 *12* (1961Sv01).
493.9 *5*	21 *4*	493.9	1⁻	0.0	2⁻	M1	0.1027	α(K)=0.0844 *12*; α(L)=0.01406 *20*; α(M)=0.00327 *5*; α(N+..)=0.001003 *15* ce(K)=4 *2* (1961Sv01) ce(K)(494)/ce(K)(253.2)=0.04 *2* (1961Sv01). $I_{(\gamma+ce)}$: I(γ+ce)=17 *9* (1961Sv01).
502.1 *5*	98 *8*	755.2	(1⁻)	253.1	1⁻	(M1)	0.0984	α(K)=0.0808 *12*; α(L)=0.01345 *20*; α(M)=0.00313 *5*; α(N+..)=0.000959 *14* K/L=5 *2*; ce(K)=21 *2*; ce(L)=4 *2* (1961Sv01) This is the same γ-ray as 503γ (1961Sv01). ce(K)(503)/ce(K)(253.2)=0.21 *2* (1961Sv01).
515.2 *5*	5.0 *25*	755.2	(1⁻)	240.0	(2)⁻	(M1)	0.0919	α(K)=0.0755 *11*; α(L)=0.01256 *18*; α(M)=0.00293 *5*; α(N+..)=0.000896 *13*
[x]608.2[a] *8*								Seen in γγ-coincidence (1982Hi04).
701.0 *8*	7 *3*	954.1	(1⁻)	253.1	1⁻	(M1)	0.0411	α(K)=0.0338 *5*; α(L)=0.00557 *8*; α(M)=0.001296 *19*; α(N+..)=0.000397 *6*
714.1 *8*	3.0 *15*	954.1	(1⁻)	240.0	(2)⁻	(M1)	0.0391	α(K)=0.0322 *5*; α(L)=0.00531 *8*; α(M)=0.001234 *18*; α(N+..)=0.000378 *6*
755.2 *8*	7 *3*	755.2	(1⁻)	0.0	2⁻	(M1)	0.0339	α(K)=0.0279 *4*; α(L)=0.00458 *7*; α(M)=0.001066 *16*; α(N+..)=0.000326 *5*
954.1 *8*	15 *4*	954.1	(1⁻)	0.0	2⁻	(M1)	0.0186	α(K)=0.01531 *22*; α(L)=0.00250 *4*; α(M)=0.000580 *9*; α(N+..)=0.000178 *3*

[†] From 1982Hi04 except where noted. ΔE=0.5 for Eγ≤600 keV; ΔE=0.8 for Eγ≥800 keV (1982Hi04).
[‡] Relative photon intensity measured by 1982Hi04. Transition intensities are relative to 253γ in 1961Sv01.
[#] Inferred from comparisons of the experimental conversion ratios with theoretical values.
[@] For absolute intensity per 100 decays, multiply by 0.271 *15*.
[&] 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.
[a] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

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