^{206}Tl β^- decay 1968Zo02,1972CoYX,1972Gr01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	F. G. Kondev	NDS 201,346 (2025)	21-Jan-2025

Parent: ^{206}Tl: E=0.0; $J^\pi=0^-$; $T_{1/2}$=4.202 min *14*; Q(β^-)=1532.2 *6*; %β^- decay=100

^{206}Tl-J^π,$T_{1/2}$: From Adopted Levels for ^{206}Tl.

^{206}Tl-Q(β^-): From 2021Wa16.

1970Zo02,1968Zo02: chemically purified ^{206}Tl source produced at the MIT reactor. γ rays were measured with a 26 cm^3 Ge(Li) detector and β rays were measured with a 2π proportional counter equipped with anti-coincidence guard counters.

1972CoYX: chemically purified ^{206}Tl source produced at the ORNL reactor. Absolute γ rays [Ge(Li) detector] and β rays were measured.

1972Gr01: chemically purified ^{206}Tl source produced at the UMichigan reactor. γ rays were measured with Ge(Li) detectors and β rays were measured with a $4\pi\beta$ counter.

Others (experiment): 1951Al14, 1961Ho17, 1963Bu23, 1970Fl12, 1971Pe03, 1972Wi18.

Others (theory): 1963Bu23, 1969Da25, 1980Kr09, 1985To20, and 1987Ki11.

^{206}Pb Levels

E(level)†	J^π†	$T_{1/2}$†
0.0	0^+	
803.043 *25*	2^+	8.17 ps *8*
1166.4 *3*	0^+	0.75 ns *4*

† From Adopted Levels.

β^- radiations

av Eβ: Additional information 2.

E(decay)	E(level)	Iβ^-†‡	Log *ft*	Comments
(365.8 *12*)	1166.4	0.110 *19*	6.08 *8*	av Eβ=103.87 *19*
(729.2 *12*)	803.043	0.0051 *5*	8.675^{1u} *43*	av Eβ=227.21 *20*
(1532.2 *16*)	0.0	99.885 *19*	5.2711 *15*	av Eβ=533.29 *24* Experimental shape factor, Cexp(W)=1+C_1W, with C1=−0.020 2 (1972Wi18,1970Fl12) was used. Additional information 1. E(decay): Measured values are 1523 *4* (1970Fl12), 1534 *5* (1971Pe03), 1527 *4* (1972Wi18), 1510 *10* (1951Al14) and 1571 *10* (1961Ho17). The shape of this 0^- to 0^+ β spectrum has been measured by 1961Ho17 (A=−0.154, B=−0.484), 1970Fl12 (A=−0.017 *5*, B=0.030 *9*), 1971Pe03 (A=0.00 *1*), and 1972Wi18 (A=−0.020 *2*, from same data as 1970Fl12). If shape is needed, the result of 1972Wi18 is recommended. Iβ^-: From 100 − I_{β^-}(803-keV level) − I_{β^-}(1166-keV level).

† From I(γ+ce) values and the decay scheme.

‡ Absolute intensity per 100 decays.

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$\gamma(^{206}Pb)$

E_γ[†]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[‡]	$I_{(\gamma+ce)}$[#]	Comments
(363.3 *5*)	0.00013 *4*	1166.4	0^+	803.043	2^+	[E2]	0.0668 *10*		α(K)=0.0418 *6*; α(L)=0.01875 *28*; α(M)=0.00476 *7* α(N)=0.001204 *18*; α(O)=0.0002235 *33*; α(P)=1.505×10^{-5} *22* E_γ: From level energy differences. I_γ: From <0.00026% in 1972CoYX, which is a 2σ limit. Others: <0.001% (1972Gr01) and <0.001% (1968Zo02).
803.04 *3*	0.0050 *5*	803.043	2^+	0.0	0^+	E2	0.01032 *14*		α(K)=0.00803 *11*; α(L)=0.001742 *24*; α(M)=0.000420 *6* α(N)=0.0001063 *15*; α(O)=2.059×10^{-5} *29*; α(P)=1.890×10^{-6} *26* I_γ: Weighted average of 0.0055% *4* (1970Zo02), 0.0041% *6* (1972CoYX) and 0.0040% *10* (1972Gr01).
1166.4 *5*		1166.4	0^+	0.0	0^+	E0		0.110 *19*	E_γ: From adopted gammas. $I_{(\gamma+ce)}$: Based on the assumption that the K x rays are produced from the E0 transition and shake-off electrons. I(γ+ce) is deduced as follow: (a) I(K x ray) is the weighted mean of I(K x ray)=0.08% *2* (1972Gr01) and 0.10% *2* (1972CoYZ), deduced after a correction for shake-off was taken into account; (b) Ice(K)=I(K x ray)/ω(K), where the fluorescence yield is ω(K)=0.963 *4* (1996Sc06); (c) ce(K)/tot=0.85 *6*, the weighted average of 0.85 *6* and 0.86 *14*, values deduced from the measured K/L=5.61 *38* (1990Tr01) and 6.0 *10* (1977Dr08), respectively. It should be noted that the BRICC program (2008Ki07) gives ce(K)/tot=Ω(E0,K)/Ω(E0,T)= 0.8554 in very good agreement with the experimentally determined value of 0.85 *6*. Thus, I(γ+ce)=I(K x ray)/ω(K)/[ce(K)/tot]=0.090% *10*/0.9634/ 0.85 *6*=0.110% 19.

[†] From adopted gammas.
[‡] Additional information 3.
[#] Absolute intensity per 100 decays.

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Decay Scheme

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

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)