^{199}Pb ε decay (12.2 min) 1974JoZX,1973JoZF,1978LeZA

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

Parent: ^{199}Pb: E=424.1 *8*; J^π=(13/2$^+$); $T_{1/2}$=12.2 min *3*; Q(ε)=2830 *40*; %ε+%$β^+$ decay≈7.0

^{199}Pb-%ε+%$β^+$ decay: 1978LeZA (Table of Isotopes 1978) adopted %IT=93, %ε+%$β^+$=7 from a priv. comm. (from authors of 1973JoZF,1974JoZX) in 1974. Inspection of the gamma-ray spectrum from the decay of ^{199}Pb isomer presented in 1973JoZF shows a dominant 425γ and a weak 382γ, the latter assigned to 9/2$^-$ isomer in ^{199}Tl, suggesting that %IT branch is much stronger than the %ε+%$β^+$ branch. Ratio I(γ+ce)(425γ)/I(γ+ce)(382γ)=16.6 (from Iγ(425)=2482, Iγ(382)=620) GIVES %IT ≈ 94, %ε+%$β^+$ ≈ 6.

1974JoZX (also 1973JoZF): Produced by ^{200}Hg(^{3}He,4n) E(^{3}He)=35 MeV, γ′s observed following ε decay from both ^{199}Pb (90 min) and from ^{199}Pb (12.2 min) (1973JoZF,1974JoZX).

1978LeZA compilation adopted data from a priv. comm. received in 1974 from the first author of 1974JoZX and 1973JoZF. But a copy of this communication is no longer available from the Table of Isotopes group in Berkeley. The e-mail queries (in July 2001) by the evaluator (of the 2006 evaluation of A=199) sent to two of the authors of 1974JoZX+1973JOZF produced no response.

The level scheme and γ ray placements are proposed tentatively by the evaluator based on matching of Eγ′s with those In (α,2nγ) study, and levels of known spin (from (α,2nγ)) expected to Be populated by ε decay of (13/2$^+$) ^{199}Pb isomer, although, the branching ratios are In disagreement for two of the proposed levels.

^{199}Tl Levels

Levels at 1012.5, 1826.4, 2042.4, 2397.1, and 2751.9 keV from ^{199}Pb (12.2 min) ε decay as well as 13 previously described levels from ^{199}Pb (90 min) ε decay and ^{197}Au(α,2nγ) are noted by 1974JoZX. 1973JoZF suggest that levels may exist at 2612, 2019 and 1647 keV based upon sums (no coin data). None of these levels is supported by γ-ray data quoted in 1978LeZA based on priv. comm. from authors of 1974JoZX and 1973JoZF. Thus none of the above levels are included here.

E(level)	J^π[†]	$T_{1/2}$	Comments
0.0	1/2$^+$		
366.90 *6*	3/2$^+$		
748.88 *8*	9/2$^-$	28.4 ms *2*	$T_{1/2}$: from 'Adopted Levels'.
1117.91? *12*	11/2$^-$		
1394.08? *13*	(11/2$^-$)		
1450.26? *12*	13/2$^-$		
1716.37? *15*	(13/2$^-$)		
1866.73? *13*	(15/2$^-$)		
2079.81? *19*	(15/2$^+$)		

[†] From 'Adopted Levels'.

γ(^{199}Tl)

Following γ rays reported by 1973JoZF have been omitted since these are not included in priv. comm. in 1974 by the same authors to 1978LeZA: 145.1, 323.4, 387.1, 896.1, 1223.2, 1602.2, 1891.0, 2612.9.

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[#]	Comments
332.2[@] *2*	290[‡] *15*	1450.26?	13/2$^-$	1117.91?	11/2$^-$			
363.2[@] *2*	≤3	2079.81?	(15/2$^+$)	1716.37?	(13/2$^-$)			
366.90 *6*		366.90	3/2$^+$	0.0	1/2$^+$			E_γ: from 'Adopted Gammas'.
369.0[@] *1*	610 *30*	1117.91?	11/2$^-$	748.88	9/2$^-$			
381.98 *5*	620 *20*	748.88	9/2$^-$	366.90	3/2$^+$	E3	0.229	Mult.: from 'Adopted Gammas'.

Continued on next page (footnotes at end of table)

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γ(^{199}Tl) (continued)

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π
416.4@ *1*	37‡ *2*	1866.73?	(15/2$^-$)	1450.26?	13/2$^-$	x660.6 *2*	13 *1*				
x494.6 *1*	65 *7*					701.4@ *1*	56‡ *3*	1450.26?	13/2$^-$	748.88	9/2$^-$
x592.2 *2*	11 *1*					748.9@ *1*	12‡ *1*	1866.73?	(15/2$^-$)	1117.91?	11/2$^-$
598.4@ *1*	17 *2*	1716.37?	(13/2$^-$)	1117.91?	11/2$^-$	x812.8 *2*	18 *2*				
x614.8 *2*	27 *3*					x853.3 *1*	16 *2*				
629.8@ *2*	12 *1*	2079.81?	(15/2$^+$)	1450.26?	13/2$^-$	x947.1 *2*	50 *3*				
645.2@ *1*	160 *8*	1394.08?	(11/2$^-$)	748.88	9/2$^-$	x2398.5 *5*	≈2				
x648.3 *2*	11 *1*					x2751.9 *4*	3.0 *3*				

† From 1978LeZA compilation where values were adopted from a priv. comm. (in 1974) from authors of 1973JoZF and 1974JoZX. intensities are relative to 2482 for 425γ from IT decay of 12.2-min ^{199}Pb.

‡ Branching ratios of γ rays from 1450 and 1867 levels disagree with those from (α,2nγ) study of 1970Ne06.

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.

@ Placement of transition in the level scheme is uncertain.

x γ ray not placed in level scheme.

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Decay Scheme

Intensities: Relative I_γ