^{212}Bi α decay (60.55 min)

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	M. J. Martin	NDS 108,1583 (2007)	1-Jun-2007

Parent: ^{212}Bi: E=0.0; $J^\pi=1^{(-)}$; $T_{1/2}$=60.55 min *6*; Q(α)=6207.26 *3*; %α decay=35.94 *6*

^{212}Bi-%α decay: Weighted average of 36.00 *3* (1965Wa09), 35.81 *4* (1962Be09), and 35.96 *6* (1960Sc07) based on Iα(^{212}Bi)/[Iα(^{212}Bi)+Iα(^{212}Po)]. Others: 1961Ba12, 1961Fe04, 1958Ev80, 1958Pr70, 1956Se17, 1953Ma26 and 1950To63.

This data set is updated from 1992Ar05. The Q(α) value has been replaced by the value from 2003Au03. The following are J^π changes: J^π(g.s.) from $5^{(+)}$ to 5^+, J^π(40) from $4^{(+)}$ to 4^+, J^π(328) from $5^{(+)}$ to 5^+, J^π(473) from (3^+,4^+,5^+) to (4^+), and J^π(493) from (3^+,5^+) to $(3)^+$. The mult data have been reanalyzed using the theoretical values of 2005KiZT.

^{208}Tl Levels

(γ)(γ): 1958De25.

(α)(γ): 1955Ni19, 1962Be09, 1967Be19.

(α)(γ)(θ): 1) 6051 α − 40γ data of 1955We10, 1956Fi41, 1956Ho11, and 1968Do17 are consistent with the spin sequences 1-3-4, and 1-4-5. Not consistent with 1-5-5, 1-4-4, 1-5-4, nor 1-6-5. Not consistent with J(^{212}Bi)=0. The evaluator assumes that the 39.9γ is M1 (δ<0.02 based on ce data). 2) 5768 α − 288γ and 5768 α − 328γ data of 1966KlZZ are consistent with the spin sequences 1(L,L+2)J(D,Q)4 and 1(L,L+2)J(D,Q)5, respectively, for J(328 level)=5, L(α)=5, δ(288γ)=+0.067 *6*, δ(328γ)=+0.07 *5*. Other: 1963Co28. 3) 5625 α − 432γ and 5625 α − 472γ data of 1966KlZZ are not consistent with J(472 level)=3 to 6, the maximum J-range allowed by ce data. Authors′ analysis, which yields J=4, δ(432γ)=+1.7 to 2.6, δ(472γ)=−14 to −8, δ(α L=5/L=3)=+1, appears to Be In error. In particular, the experimental A_4 terms have the opposite sign from the theoretical values (for all values of L=5, L=3 α-mixing), whereas 1966KlZZ show the theoretical A_4 values changing signs with α mixing (the authors′ term linear In δ(α) appears to Be≈5 times too large). The lack of agreement In possible J-values between the Ag(θ) and ce data might Be due to the inability to resolve the weak 5626 α from the 5607 α In the α gate and the weak 432 and 472 γ′s from 452γ In the coincidence spectrum. 4) 5606 α − 452γ and 5606 α − 492γ data of 1966KlZZ are consistent with the spin sequences 1(L,L+2)J(D,Q)4 and 1(L,L+2)J(D,Q)5, respectively, for J(492 level)=3, L(α)=3, δ(453γ)=−0.048 *8* and for J=5, L(α)=5, δ(453γ)=+0.123 *4*, δ(492γ)=−0.51 *2*, +2.06 *8*. Data are not consistent with J=4 or 6. Note, however, that the 492γ is very weak. (others: 1956Ko60, 1963Co28 for 452γ) 5) 5486 α − 620γ and 5486 α − 576γ data of 1966KlZZ are suspect. The 5486 α was not seen In the authors′ spectrum, so a wide gate was set At its expected position. And the existence of the 576γ is In doubt. IT has not been reported In singles studies and, As pointed out by 1966KlZZ, most of its contribution to Ag(θ) could Be due to chance coincidences from the strong 583γ In ^{208}Pb. Data for the 620γ are consistent with J(620 level)=6, L(α)=5, δ(620γ)<−8; >47; not consistent with J=3,4 or 5.

Ag(θ,H,t): 1969Va21 studied the transient magnetic field (due to recoil) on ^{208}Tl nuclei In Fe.

E(level)†	J^π‡	$T_{1/2}$	Comments
0.0	5^+	3.053 min *4*	
39.857 *4*	4^+	6.5 ps *8*	$T_{1/2}$: (α)(ce(L) 39.85γ)(t); measured recoil of atoms (1965Se02). Others(ps):≈4 (1956Bu26), 2.6 *10* (1958Si81).
328.04 *4*	5^+	>0.1 ps	
473.4 *4*	(4^+)		
492.84 *4*	(3^+)		
621#	(6^+)		
759#			
803#			

† From Eγ, unless otherwise noted.
‡ From ^{208}Tl Adopted Levels.
# Calculated from ΔQ(α).

^{212}Bi α decay (60.55 min) (continued)

α radiations

(α)γ(θ): see ^{208}Tl levels from ^{212}Bi α decay (60.55 min).
Other: 1962Be09,

Eα[†]	E(level)	Iα[†&]	HF[‡@]	Comments
5302 *2*	803	0.00011 *1*	≈20000	
5345	759	0.0010 *1*	≈3800	
5481	621	0.013	≈1500	
5607	492.84	1.13	≈70	
5626	473.4	0.157	≈630	
5768	328.04	1.70	≈280	Iα: other: 1.67 *2* (1962Be09).
6050.78[#] *3*	39.857	69.91[#] *15*	≈130	
6089.88[#] *3*	0.0	27.12[#] *14*	≈480	

[†] From 1960Wa14, unless otherwise noted. Eα corrected (+4 keV) for calibration change (see 1991Ry01). Iα renormalized by evaluator to ΣIα(weak branches)=100−ΣIα(6051+6090).
[‡] r_0(^{208}Tl)=1.50 *2*.
[#] From 1991Ry01.
[@] The radius parameter is poorly known, and alone contributes an uncertainty of Δ(HF)=+53% and −35%. HF=71 +*38*−*25*, for the 5607α, for example.
[&] For absolute intensity per 100 decays, multiply by 0.3594 *6*.

γ(^{208}Tl)

Absolute intensity measurements: Iγ(288.20γ)=0.337 *4* per 100 ^{212}Bi decays (1984Ge07) which gives Iγ(288.20γ)=0.938 *8* per 100 ^{212}Bi α decays. Other: 1983Sc13.

E_γ[†]	I_γ[‡b]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[a]	δ	α[c]	Comments
39.857 *4*	2.96 *24*	39.857	4^+	0.0	5^+	M1		23.2	α(L)=17.81 *25*; α(M)=4.16 *6*; α(N+..)=1.275 *18* α(N)=1.052 *15*; α(O)=0.204 *3*; α(P)=0.0193 *3* E_γ: from the B×ρ measurements of 1956Si23, recalculated by the evaluator using revised fundamental constants (1987Co39) and electron binding energies (1967Be73). Mult.: L1:L2:L3:M1:M2:M3:N12:O12=1000 *25*:106 *5*:8.2 *33*:262 *15*:30 *5*:6.2 *25*: 76 *4*:10 *4* (1963Se20). L1:L2:L3:M1:N:O=1000:92:8.0:231:57:13 (1957Zh05). α=22.6 *5* from αγ-coin (1966Il01). From L3/L1, δ<0.012.
[x]124.1									E_γ: from 1973SlZJ; observed ce(L) and ce(M) lines In ^{212}Pb source and found to Be converted In Tl. Not reported by other authors.
[x]144.94[d]									1957Zh05 report E=144.94 with I(ce(K))=0.036. The transition is not seen by 1962Be09 who report Iγ<0.006. These data give α(K)exp>6, consistent only with a large E0 component.

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^{212}Bi α decay (60.55 min) (continued)

γ(^{208}Tl) (continued)

E_γ[†]	I_γ[‡b]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[a]	δ	α[c]	Comments
288.20 *4*	0.938 *8*	328.04	5$^+$	39.857	4$^+$	M1+E2	+0.067 *6*	0.436	α(K)=0.357 *5*; α(L)=0.0605 *9*; α(M)=0.01411 *20*; α(N+..)=0.00432 *6* α(N)=0.00356 *5*; α(O)=0.000692 *10*; α(P)=6.54×10^{-5} *10* Mult.: from K/L=5.6 *6* (1967Be19); Ag(θ) (1963Co28, 1966KlZZ). δ: δ from Ag(θ) (1966KlZZ).
328.03 *4*	0.349[&] *17*	328.04	5$^+$	0.0	5$^+$	M1		0.307	α(K)=0.252 *4*; α(L)=0.0425 *6*; α(M)=0.00990 *14*; α(N+..)=0.00303 *5* α(N)=0.00250 *4*; α(O)=0.000486 *7*; α(P)=4.60×10^{-5} *7* Mult.: α(K)exp=0.230 *15* (1955Ni19), 0.27 *2* (1967Be19), 0.31 *3* from (K x ray)γ/γ (1966Il01). L1/K=0.23 *+7−6* (1963Da11). L/K=0.15 *4* (1967Be19), 0.21 *4* (1955Ni19). Other: α(K)exp=0.30 (1957Vo22).
433.7 *5*	0.047[#] *9*	473.4	(4$^+$)	39.857	4$^+$	M1		0.1451	α(K)=0.1191 *17*; α(L)=0.0199 *3*; α(M)=0.00464 *7*; α(N+..)=0.001421 *21* α(N)=0.001172 *17*; α(O)=0.000228 *4*; α(P)=2.16×10^{-5} *3* Mult.: α(K)exp=0.43 *12* (1967Be19), 0.25 *9* (1955Ni19). Other: 0.12 (1957Vo22), 0.13 *7* (1963Da11) using authors Ice(K)/Ice(K)(328γ).
452.98 *5*	1.010 *9*	492.84	(3$^+$)	39.857	4$^+$	M1		0.1292	α(K)=0.1061 *15*; α(L)=0.01772 *25*; α(M)=0.00413 *6*; α(N+..)=0.001264 *18* α(N)=0.001042 *15*; α(O)=0.000203 *3*; α(P)=1.92×10^{-5} *3* Mult.: α(K)exp=0.086 *22* (1978Av01), normalized to mult(583γ)=E2 In ^{208}Tl β$^-$ decay, 0.115 *6* (1967Be19), 0.100 *7* (1955Ni19). Other: 0.11 (1957Vo22).
473.0 *7*	0.14[#] *1*	473.4	(4$^+$)	0.0	5$^+$	M1+E2		0.07 *5*	α(K)=0.06 *4*; α(L)=0.011 *5*; α(M)=0.0027 *10*; α(N+..)=0.0008 *3* α(N)=0.00069 *24*; α(O)=0.00013 *5*; α(P)=1.1×10^{-5} *6* Mult.: α(K)exp=0.079 *18* (1967Be19), 0.100 *15* (1966Il01). 0.053 *15* (1955Ni19). Other: 0.12 (1957Vo22). The value of 1966Il01 is from (K x ray)γ/γ for the unresolved 473+493γ; however, the 493γ is questionable.
493.3[d] *7*	<0.01[#]	492.84	(3$^+$)	0.0	5$^+$				Mult.: I(ce(K))=0.009 (1957Vo22) not seen by 1967Be19 who report Iγ<0.01. These data give α(K)exp>0.9, requiring mult≥M4 or an E0 component. The placement is not consistent with mult=E0.

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^{212}Bi α decay (60.55 min) (continued)

$\gamma(^{208}Tl)$ (continued)

E_γ[†]	I_γ[‡b]	E_i(level)	J^π_i	E_f	J^π_f	Comments
576[@d]	<0.001	621	(6$^+$)	39.857	4$^+$	I_γ: I(γ)/I(620γ)=0.22 *10* (1966KlZZ). Transition masked by strong 583γ In ^{208}Tl decay.
620[@d]	<0.003	621	(6$^+$)	0.0	5$^+$	I_γ: not seen. The Iγ limit is from 1962Be09.

† From 1957Vo22, unless otherwise noted. The evaluator has recalculated Eγ from B×ρ(ce(K)) using revised fundamental constants (1987Co39) and electron binding energies (1967Be73). Others: 1984Ge07, 1982Sa36, 1973Da38, 1967Be19.

‡ From 1984Ge07, unless otherwise noted. Others: 1983Sc13, 1982Sa36, 1973Da38, 1967Be19, 1962Be09, 1960Em01.

From 1967Be19.

@ From 1966KlZZ.

& Corrected for contribution from 327.6-keV γ from ^{232}U decay.

a The quoted α(K)exp values are from Ice(K) and the adopted Iγ values, normalized to α(K)=0.357 for the 288γ, unless noted otherwise.

b For absolute intensity per 100 decays, multiply by 0.3594 *6*.

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.

d Placement of transition in the level scheme is uncertain.

x γ ray not placed in level scheme.

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Decay Scheme

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