^{200}Bi ε decay (36.4 min) 1973Pa04,1970Ha14

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	F. G. Kondev	NDS 192,1 (2023)	1-Aug-2023

Parent: ^{200}Bi: E=0; $J^\pi=7^+$; $T_{1/2}$=36.4 min *5*; Q(ε)=5880 *25*; %ε+%β^+ decay=100

1973Pa04: Source produced in nat Pb(p,xn) reactions; Detectors: Ge(Li) and Si(Li); Measured: Eγ, Iγ, Ice, γγ coin; Deduced: level scheme, J^π, Mult., $T_{1/2}$.

1970Ha14: Source produced in nat Pb(d,xn) reactions; Detectors: Ge(Li), Si(Li), and NaI(Tl); Measured: Eγ, Iγ, Ice, γγ coin, ceγ coin; Deduced: level scheme, J^π, Mult., $T_{1/2}$.

Others: 1972Kr08, 1977LiZF, 1978LiZM, 1972Al44.

The decay scheme is based mainly on the γγ-coin results of 1973Pa04. There is a discrepancy in Iγ(1026) between the different experiments; 1972Kr08 and 1977LiZF suggest that two ^{200}Bi isomers with approximately the same half-life exist. The low-spin isomer ($J^\pi=2^+$) is produced from ^{200}Po ε decay (1977LiZF) and in spallation of uranium (1972Kr08), and it is expected to decay mainly through the 1026 level of ^{200}Pb. The Iγ data of 1970Ha14 suggest that less than 2% of their activity (produced by ^{204}Pb(d,6n) E(d)=52 MeV) consists of the $J^\pi=2^+$ isomer. The Iγ data of 1973Pa04 suggest that perhaps ≈10% of the activity (produced by Pb(p,xn)) is due to the $J^\pi=2^+$ isomer.

The decay scheme is incomplete and no β-decay feeding intensities and log *ft* values are given.

^{200}Pb Levels

E(level)†	Jπ‡	$T_{1/2}$	Comments
0.0	0^+	21.5 h *4*	$T_{1/2}$: From Adopted Levels.
1026.49 *17*	2^+		
1488.83 *22*	4^+	0.33 ns *2*	$T_{1/2}$: From γγ(t) in 1972Al44.
1762.3 *3*	$(5)^+$		
1908.59 *25*	$(5)^-$	1.35 ns *6*	$T_{1/2}$: From Adopted Levels. Values measured in ^{200}Bi ε decay: 1.32 ns *7* from γγ(t) in 1972Al44 and 1.50 ns *8* from 245γ-420γ(t) in 1972Kr08.
2153.7 *3*	$(7)^-$	45.2 ns *7*	$T_{1/2}$: From Adopted Levels. Values measured in ^{200}Bi ε decay: 44 ns *2* in 1973Pa04 and 47.6 ns *25* in 1972Kr08.
2183.2 *11*	(9^-)	454 ns *9*	$T_{1/2}$: From Adopted Levels. Value measured in ^{200}Bi ε decay: 480 ns *30* from γ(t) in 1973Pa04.
2256.9 *3*	$(6)^-$		
2268.1 *4*	$(7)^-$		
2354.9 *3*	$(6,7)^-$		
2551.3 *4*	$(5,6)^-$		
2699.3 *3*	$(6,7,8)^-$		
3002.7 *4*	$(6,7,8)^-$		
3191.9 *5*			
3483.1 *4*	$(6,7)^-$		

† From a least-squares fit to Eγ.

‡ From Adopted Levels.

^{200}Bi ε decay (36.4 min) 1973Pa04,1970Ha14 (continued)

γ(^{200}Pb)

Iγ normalization: I(γ+ce)(1026.5γ)≈100%.

E_γ [†]	I_γ [†b]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [@]	δ [&]	α [a]	Comments
29.5 *10*		2183.2	(9$^-$)	2153.7	(7)$^-$				E_γ: From adopted gammas.
83.8 [c]	0.42 *21*	2268.1	(7)$^-$	2183.2	(9$^-$)	E2		13.35 *19*	%Iγ≈0.4 α(L)=9.94 *14*; α(M)=2.63 *4* α(N)=0.661 *9*; α(O)=0.1176 *16*; α(P)=0.00442 *6* E_γ: From ce(L) in 1973Pa04. I_γ: Calculated from I(γ+ce)=6 *3* (1973Pa04) and α. Mult.: (α(L1)exp+α(L2)exp)/α(L3)exp=1.2 *3* (1973Pa04).
98.09 *29*	0.3	2354.9	(6,7)$^-$	2256.9	(6)$^-$	M1		9.88 *16*	%Iγ≈0.3 α(K)=8.04 *13*; α(L)=1.406 *23*; α(M)=0.330 *5* α(N)=0.0838 *14*; α(O)=0.01670 *27*; α(P)=0.001784 *29* I_γ: 0.4 in 1973Pa04. Mult.: α(L1)exp≈2.2 (1973Pa04).
103.25 *17*	1.3	2256.9	(6)$^-$	2153.7	(7)$^-$	M1		8.54 *13*	%Iγ≈1.3 α(K)=6.95 *10*; α(L)=1.212 *18*; α(M)=0.284 *4* α(N)=0.0723 *11*; α(O)=0.01440 *21*; α(P)=0.001538 *23* I_γ: 1 in 1973Pa04. Mult.: α(L1)exp≈1.9 (1973Pa04).
114.40 *16*	1.2	2268.1	(7)$^-$	2153.7	(7)$^-$	M1		6.37 *9*	%Iγ≈1.2 α(K)=5.19 *8*; α(L)=0.902 *13*; α(M)=0.2115 *31* α(N)=0.0538 *8*; α(O)=0.01072 *16*; α(P)=0.001144 *17* I_γ: 1.1 in 1973Pa04. Mult.: α(K)exp=7.7 *3* and K/L(exp)=5.0 *5* (1973Pa04).
201.11 *17*	0.9	2354.9	(6,7)$^-$	2153.7	(7)$^-$	M1		1.289 *18*	%Iγ≈0.9 α(K)=1.053 *15*; α(L)=0.1810 *26*; α(M)=0.0424 *6* α(N)=0.01078 *15*; α(O)=0.002149 *31*; α(P)=0.0002297 *33* I_γ: 0.7 *3* in 1972Kr08; Iγ=1 in 1973Pa04. Mult.: α(K)exp=1.27 *26* (1970Ha14); α(K)exp=1.3 *5* and K/L>1.5 (1973Pa04).
245.15 *13*	46	2153.7	(7)$^-$	1908.59	(5)$^-$	E2		0.2162 *30*	%Iγ≈45.7 α(K)=0.1046 *15*; α(L)=0.0835 *12*; α(M)=0.02164 *31* α(N)=0.00547 *8*; α(O)=0.000996 *14*; α(P)=5.51×10^{-5} *8* I_γ: 22 *3* in 1972Kr08; Iγ=848.5 in 1973Pa04. Mult.: α(K)exp=0.108 *8* and K/L(exp)=1.27 *6* (1970Ha14); K/L=1.28 *15* (1973Pa04); α(K)exp=0.12 *2* (1972Kr08).
273.39 *20*	1.2	1762.3	(5)$^+$	1488.83	4$^+$	M1+E2	0.44 *33*	0.49 *8*	%Iγ≈1.2 α(K)=0.39 *8*; α(L)=0.073 *5*; α(M)=0.0174 *9* α(N)=0.00441 *23*; α(O)=0.00087 *6*; α(P)=8.8×10^{-5} *13*

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^{200}Bi ε decay (36.4 min) 1973Pa04,1970Ha14 (continued)

γ(^{200}Pb) (continued)

E_γ[†]	I_γ[†b]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ[&]	α[a]	Comments
									I_γ: 0.9 in 1973Pa04. Mult.: α(K)exp=0.39 *8* and K/L(exp)=4.5 *13* (1970Ha14); α(K)exp=0.6 *3* (1973Pa04).
294.43 *21*	0.9	2551.3	$(5,6)^-$	2256.9	$(6)^-$	M1		0.449 *6*	%Iγ≈0.9 α(K)=0.367 *5*; α(L)=0.0627 *9*; α(M)=0.01468 *21* α(N)=0.00373 *5*; α(O)=0.000744 *11*; α(P)=7.95×10^{-5} *11*
									I_γ: 1.3 in 1973Pa04. Mult.: α(K)exp=0.42 *12* K/L(exp)=5.9 *18* (1970Ha14); α(K)exp=0.35 *10* (1973Pa04).
303.41 *18*	2.2	3002.7	$(6,7,8)^-$	2699.3	$(6,7,8)^-$	M1		0.414 *6*	%Iγ≈2.2 α(K)=0.338 *5*; α(L)=0.0577 *8*; α(M)=0.01351 *19* α(N)=0.00343 *5*; α(O)=0.000685 *10*; α(P)=7.32×10^{-5} *10*
									I_γ: 2.2 *8* in 1972Kr08; Iγ=1.9 in 1973Pa04. Mult.: α(K)exp=0.33 *7* (1970Ha14); α(K)exp=0.28 *10* (1973Pa04) α(K)exp=0.36 *6* (1972Kr08).
[x]319.0[#] *7*	3.3[#] *9*								%Iγ≈3.28
344.6[‡] *5*	0.5[‡]	2699.3	$(6,7,8)^-$	2354.9	$(6,7)^-$	[M1]		0.292 *4*	%Iγ≈0.5 α(K)=0.2393 *35*; α(L)=0.0407 *6*; α(M)=0.00953 *14* α(N)=0.002422 *35*; α(O)=0.000483 *7*; α(P)=5.17×10^{-5} *8*
348.33 *17*	2.5	2256.9	$(6)^-$	1908.59	$(5)^-$	M1+E2	0.86 *+26−21*	0.195 *28*	%Iγ≈2.5 α(K)=0.153 *25*; α(L)=0.0320 *24*; α(M)=0.0077 *5* α(N)=0.00195 *13*; α(O)=0.000380 *28*; α(P)=3.6×10^{-5} *4*
									I_γ: ≈ 2 in 1972Kr08; Iγ=2.2 in 1973Pa04. Mult.: α(K)exp=0.153 *24* (1970Ha14).
[x]353.6[‡]	0.4[‡]								%Iγ≈0.4
419.77 *13*	91	1908.59	$(5)^-$	1488.83	4^+	E1		0.01388 *19*	%Iγ≈90.4 α(K)=0.01144 *16*; α(L)=0.001869 *26*; α(M)=0.000435 *6* α(N)=0.0001098 *15*; α(O)=2.148×10^{-5} *30*; α(P)=2.070×10^{-6} *29*
									I_γ: 53 *6* in 1972Kr08; Iγ=85 in 1973Pa04. Mult.: α(K)exp<0.015; α(L)exp<0.0022 (1970Ha14); α(K)exp=0.013 *3* (1973Pa04).
462.34 *13*	98	1488.83	4^+	1026.49	2^+	E2		0.0356 *5*	%Iγ≈97.4 α(K)=0.02454 *34*; α(L)=0.00831 *12*; α(M)=0.002076 *29* α(N)=0.000526 *7*; α(O)=9.89×10^{-5} *14*; α(P)=7.46×10^{-6} *10*
									I_γ: 63 *7* in 1972Kr08; Iγ=90 in 1973Pa04. Mult.: α(K)exp=0.0238 *16* and K/L(exp)=2.94 *23* (1970Ha14); α(K)exp=0.0266 *13* (1973Pa04); α(K)exp=0.028 *6* (1972Kr08).
480.43 *24*	2.3	3483.1	$(6,7)^-$	3002.7	$(6,7,8)^-$	M1		0.1200 *17*	%Iγ≈2.3 α(K)=0.0984 *14*; α(L)=0.01659 *23*; α(M)=0.00388 *5*

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^{200}Bi ε decay (36.4 min) 1973Pa04,1970Ha14 (continued)

γ(^{200}Pb) (continued)

E_γ[†]	I_γ[†b]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	α[a]	Comments
								α(N)=0.000985 *14*; α(O)=0.0001965 *28*; α(P)=2.105×10^{-5} *30* I_γ: 2 in 1973Pa04. Mult.: α(K)exp=0.100 *15* (1970Ha14).
[x]494.31 *20*	1.2					(M1)	0.1113 *16*	%Iγ≈1.2 α(K)=0.0912 *13*; α(L)=0.01537 *22*; α(M)=0.00359 *5* α(N)=0.000913 *13*; α(O)=0.0001821 *26*; α(P)=1.951×10^{-5} *27* Mult.: α(K)exp<0.22 and α(L)exp=0.002 *1* (1970Ha14). I_γ: 7.6 *14* in 1972Kr08.
[x]519.2 *7*	0.5					M1	0.0977 *14*	%Iγ≈0.5 α(K)=0.0801 *12*; α(L)=0.01348 *19*; α(M)=0.00315 *5* α(N)=0.000801 *12*; α(O)=0.0001597 *23*; α(P)=1.711×10^{-5} *25* Mult.: α(K)exp=0.102 *27* (1970Ha14).
[x]536.0[#] *6*	6.3[#] *13*							%Iγ≈6.3
[x]539.14 *26*	1.7							%Iγ≈1.7 I_γ: 1.9 in 1973Pa04.
545.50 *17*	4.5	2699.3	(6,7,8)$^-$	2153.7	(7)$^-$	M1	0.0858 *12*	%Iγ≈4.5 α(K)=0.0703 *10*; α(L)=0.01182 *17*; α(M)=0.00276 *4* α(N)=0.000702 *10*; α(O)=0.0001400 *20*; α(P)=1.500×10^{-5} *21* I_γ: 4.6 *1* in 1972Kr08; Iγ=4.4 in 1973Pa04. Mult.: α(K)exp<0.102; α(L)exp=0.015 *3* (1970Ha14).
642.7 *8*	0.8	2551.3	(5,6)$^-$	1908.59	(5)$^-$	[M1]	0.0558 *8*	%Iγ≈0.8 α(K)=0.0458 *7*; α(L)=0.00766 *11*; α(M)=0.001788 *26* α(N)=0.000454 *7*; α(O)=9.06×10^{-5} *13*; α(P)=9.72×10^{-6} *14* I_γ: 0.7 in 1973Pa04.
648.0 *4*	2.6	3002.7	(6,7,8)$^-$	2354.9	(6,7)$^-$	M1	0.0546 *8*	%Iγ≈2.6 α(K)=0.0448 *6*; α(L)=0.00749 *11*; α(M)=0.001749 *25* α(N)=0.000444 *6*; α(O)=8.87×10^{-5} *12*; α(P)=9.52×10^{-6} *13* I_γ: 2.5 in 1973Pa04. Mult.: α(K)exp=0.045 *8* (1970Ha14).
[x]781.0 *5*	2.0							%Iγ≈2.0 I_γ: 2.6 in 1973Pa04.
788.6 *7*	1.0	2551.3	(5,6)$^-$	1762.3	(5)$^+$	[E1]	0.00388 *5*	%Iγ≈1.0 α(K)=0.00322 *5*; α(L)=0.000499 *7*; α(M)=0.0001154 *16* α(N)=2.92×10^{-5} *4*; α(O)=5.77×10^{-6} *8*; α(P)=5.87×10^{-7} *8* I_γ: 0.9 in 1973Pa04.
[x]811.0 *7*	0.7							%Iγ≈0.7 I_γ: 4.2 *12* in 1972Kr08.
836.9[‡] *5*	1.5[‡]	3191.9		2354.9	(6,7)$^-$			%Iγ≈1.5
[x]902.6[‡]	1[‡]							%Iγ≈1.0
931.7 *5*	2.6	3483.1	(6,7)$^-$	2551.3	(5,6)$^-$			%Iγ≈2.6 I_γ: 3.4 in 1973Pa04.

$^{200}_{82}Pb_{118}$-4

^{200}Bi ε decay (36.4 min) 1973Pa04,1970Ha14 (continued)

γ(^{200}Pb) (continued)

E_γ [†]	I_γ [†b]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [@]	α [a]	Comments
935.3 *7*	1.4	3191.9		2256.9	$(6)^-$			%Iγ≈1.4 I_γ: 1 in 1973Pa04.
[x]979.8[‡]	0.7[‡]							%Iγ≈0.7
[x]992.9[‡]	2.9[‡]							%Iγ≈2.9 I_γ: 4.8 *16* in 1972Kr08.
1026.49 *17*	100	1026.49	2^+	0.0	0^+	E2	0.00633 *9*	%Iγ≈99.4 α(K)=0.00505 *7*; α(L)=0.000973 *14*; α(M)=0.0002313 *32* α(N)=5.86×10^{-5} *8*; α(O)=1.146×10^{-5} *16*; α(P)=1.111×10^{-6} *16* Mult.: α(K)exp=0.0051 *3* and K/L(exp)=5.0 *4* (1970Ha14); α(L)exp=0.00095 *27* (1972Kr08).
[x]1101.4[‡]	1.1[‡]							%Iγ≈1.1 I_γ: 8.3 *31* in 1972Kr08.

† From 1970Ha14, unless otherwise stated.
‡ From 1973Pa04.
# From 1972Kr08, but the assignment to ^{200}Pb is uncertain.
@ From ce data of 1970Ha14 and 1973Pa04.
& From α(K)exp in 1970Ha14.
a Additional information 1.
b For absolute intensity per 100 decays, multiply by ≈0.99.
c Placement of transition in the level scheme is uncertain.
x γ ray not placed in level scheme.

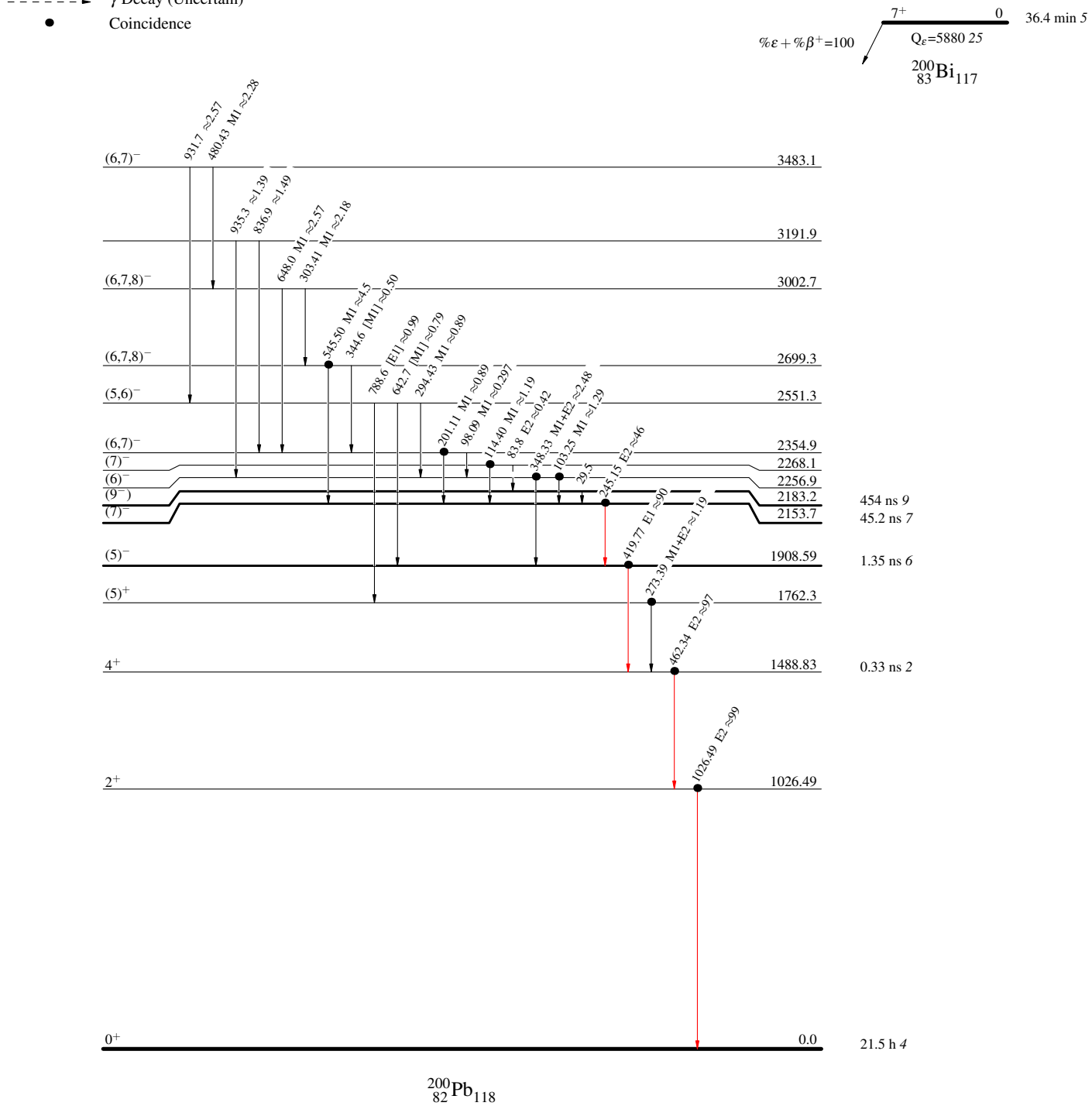
$^{200}_{82}Pb_{118}$-5

^{200}Bi ε decay (36.4 min) 1973Pa04,1970Ha14

Decay Scheme

Intensities: I_γ 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)
- Coincidence



$^{200}_{82}Pb_{118}$