^{204}Pb(^{3}He,3nγ) 1987Ra04

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	C. J. Chiara and F. G. Kondev	NDS 111,141 (2010)	1-Oct-2009

Beam: E(^{3}He)=23.0 and 27.6 MeV; ^{204}Pb target enriched to 99.5%; measured $\gamma\gamma$ coin. with twoGe(Li) detectors, γ(t), $\gamma(\theta)$, and ce using magnetic spectrometer. Others: 1986RaZL, 1973Na18.

^{204}Po Levels

E(level)†	J$^{\pi}$‡	$T_{1/2}$#	Comments
0	0^{+}		
684.40 *10*	2^{+}		
1200.72 *13*	4^{+}		
1255.29 *19*	2^{+}		
1552.29 *17*	4^{+}		
1626.94 *16*	6^{+}		
1634.47 *17*	(3^{+})		
1639.0 *11*	8^{+}	158 ns *2*	$T_{1/2}$: Using 426γ(t), 516γ(t), and 684γ(t). g=0.91 *4* (1973Na18) measured using the stroboscopic resonance technique. This value was corrected for Knight and diamagnetic shifts of 0±1%. Configuration=(π $h_{9/2})^{+2}$.
1715.90 *23*			
1728.61 *18*	(4^{+})		
1962.02 *19*	6^{+}		
2041.75 *18*	5^{-} @		Main Configuration=((ν $i_{13/2})^{-1}$(ν $f_{5/2})^{-1}$).
2100.32 *24*	(3,4,5)$^{+}$ @		
2227.3 *11*	9^{-}	15.6 ns *5*	$T_{1/2}$: Using 588γ(t). Main Configuration=((ν $i_{13/2})^{-1}$(ν $f_{5/2})^{-1}$).
2248.2 *11*	8^{+}		Main Configuration=((π $h_{9/2})^{+1}$(π $f_{7/2})^{+1}$).
2289.67 *20*	7^{-}		Main Configuration=((ν $i_{13/2})^{-1}$(ν $f_{5/2})^{-1}$).
2302.9 *3*	(6)$^{-}$		
2378.7 *11*	7^{+}		
2470.7 *6*			
2527.4 *11*	10^{+}		
2553.2 *3*			
2587.3 *11*			
2620.5 *11*	11^{-}	3.6 ns *2*	$T_{1/2}$: Using 93γ(t). Main Configuration=((π $h_{9/2})^{+1}$(π $i_{13/2})^{+1}$).
2905.0 *11*	11^{-}		Main Configuration=((ν $p_{3/2})^{-1}$(ν $f_{5/2})^{-2}$(ν $i_{13/2})^{-1}$).
2945.6 *11*	10^{-} @		
3217.4 *11*	(10,11,12)$^{-}$ @		
3227.4 *11*	12^{-} @		
3440.2 *11*	13^{-} @		
3565.2? *15*	(15^{-})	≈13 ns	Main Configuration=((π $h_{9/2})^{+2}$(ν $f_{5/2})^{-1}$(ν $i_{13/2})^{-1}$).

† From a least-squares fit to Eγ.
‡ From deduced γ-ray transition multipolarities in 1987Ra04, based on $\gamma(\theta)$ and α(K)exp, unless otherwise specified.
# From γ(t) in 1987Ra04.
@ From Adopted Levels.

^{204}Pb(^{3}He,3nγ) 1987Ra04 (continued)

γ(^{204}Po)

E_γ[‡]	I_γ[@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[†]	Comments
(12.1)		1639.0	8^+	1626.94	6^+			E_γ: There is no experimental evidence that this γ was observed.
93.1 *2*	≈1.5	2620.5	11^-	2527.4	10^+	E1		Mult.: From α(exp) deduced from intensity balance considerations in 1987Ra04.
(125)	<0.1	3565.2?	(15^-)	3440.2	13^-			
261.1 *2*	1.7 *5*	2302.9	$(6)^-$	2041.75	5^-	M1(+E2)	0.5 *3*	α(K)=0.3 *3*; α(L)=0.091 *15*; α(M)=0.022 *3*; α(N+..)=0.0070 *9* α(N)=0.0057 *7*; α(O)=0.00116 *18*; α(P)=0.00013 *4* Mult.: α(K)exp>0.4; A_2=−0.45 *3*, A_4=−0.06 *5*.
322.4 *2*	0.3 *1*	3227.4	12^-	2905.0	11^-			
327.6 *1*	1.9 *4*	2289.67	7^-	1962.02	6^+	E1	0.0256	α(K)=0.0209 *3*; α(L)=0.00360 *5*; α(M)=0.000844 *12*; α(N+..)=0.000265 *4* α(N)=0.000216 *3*; α(O)=4.42×10^{-5} *7*; α(P)=5.36×10^{-6} *8* Mult.: α(K)exp<0.02; A_2=−0.257 *6*, A_4=0.010 *9*.
335.0 *2*	3.1 *7*	1962.02	6^+	1626.94	6^+	M1	0.374	α(K)=0.304 *5*; α(L)=0.0531 *8*; α(M)=0.01250 *18*; α(N+..)=0.00398 *6* α(N)=0.00322 *5*; α(O)=0.000674 *10*; α(P)=8.71×10^{-5} *13* Mult.: α(K)exp=0.23 *1*; A_2=0.14 *4*, A_4=−0.01 *6*.
351.6 *2*	3.5 *5*	1552.29	4^+	1200.72	4^+	M1+E2	0.25 *4*	α(K)=0.19 *3*; α(L)=0.039 *3*; α(M)=0.0094 *7*; α(N+..)=0.00299 *20* α(N)=0.00242 *16*; α(O)=0.00050 *4*; α(P)=6.2×10^{-5} *6* Mult.: α(K)exp=0.20 *2*; A_2=0.06 *1*, A_4=0.06 *2*.
360.0 *2*	0.5 *2*	2587.3		2227.3	9^-			
379.1 *2*	0.9 *3*	1634.47	(3^+)	1255.29	2^+			
414.6 *2*	1.2 *4*	2041.75	5^-	1626.94	6^+			
426.2 *1*	45 *1*	1626.94	6^+	1200.72	4^+	E2	0.0476	α(K)=0.0309 *5*; α(L)=0.01252 *18*; α(M)=0.00318 *5*; α(N+..)=0.000996 *14* α(N)=0.000817 *12*; α(O)=0.0001619 *23*; α(P)=1.724×10^{-5} *25* Mult.: α(K)exp=0.0313 *6*; A_2=0.080 *3*, A_4=−0.009 *4*. Note that the measured A_2 value is not consistent with the assigned multipolarity, presumably due to attenuation of alignment.
433.7 *2*	1.5 *4*	1634.47	(3^+)	1200.72	4^+			
489.5 *2*	2.2 *5*	2041.75	5^-	1552.29	4^+	D		Mult.: A_2=−0.16 *6*, A_4=−0.04 *9*.
516.3 *1*	75 *2*	1200.72	4^+	684.40	2^+	E2	0.0298	α(K)=0.0207 *3*; α(L)=0.00678 *10*; α(M)=0.001699 *24*; α(N+..)=0.000533 *8* α(N)=0.000436 *7*; α(O)=8.72×10^{-5} *13*; α(P)=9.63×10^{-6} *14* Mult.: α(K)exp=0.0215 *4*; A_2=0.079 *14*, A_4=−0.01 *2* Note that the measured A_2 value is not consistent with the assigned multipolarity, presumably due to attenuation of alignment.
527.9 *2*	1.8 *4*	1728.61	(4^+)	1200.72	4^+	M1(+E2)	0.102 *9*	α(K)=0.083 *8*; α(L)=0.0146 *10*; α(M)=0.00344 *22*; α(N+..)=0.00109 *7* α(N)=0.00089 *6*; α(O)=0.000185 *12*; α(P)=2.38×10^{-5} *17* Mult.: α(K)exp=0.082 *8*; A_2=0.12 *2*, A_4=−0.02 *3*.
535.2 *2*	3.6 *8*	3440.2	13^-	2905.0	11^-	E2	0.0273	α(K)=0.0193 *3*; α(L)=0.00607 *9*; α(M)=0.001519 *22*; α(N+..)=0.000477 *7* α(N)=0.000390 *6*; α(O)=7.81×10^{-5} *11*;

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$^{204}Pb(^{3}He,3n\gamma)$ 1987Ra04 (continued)

$\gamma(^{204}Po)$ (continued)

E_γ [‡]	I_γ [@]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [#]	α [†]	Comments
								α(P)=8.68×10^{-6} *13* Mult.: From adopted gammas.
570.8 *2*	4.8 *5*	1255.29	2$^+$	684.40	2$^+$	M1(+E2)	0.079 *11*	α(K)=0.064 *10*; α(L)=0.0113 *13*; α(M)=0.0027 *3*; α(N+..)=0.00085 *10* α(N)=0.00069 *8*; α(O)=0.000144 *16*; α(P)=1.84×10^{-5} *23* Mult.: α(K)exp=0.057 *12*; A_2=−0.03 *4*, A_4=−0.01 *5*.
588.3 *1*	12 *1*	2227.3	9$^-$	1639.0	8$^+$	E1	0.00738 *11*	α=0.00738 *11*; α(K)=0.00609 *9*; α(L)=0.000986 *14*; α(M)=0.000230 *4*; α(N+..)=7.26×10^{-5} *11* α(N)=5.89×10^{-5} *9*; α(O)=1.218×10^{-5} *17*; α(P)=1.525×10^{-6} *22* Mult.: α(K)exp=0.006 *1*; A_2=−0.277 *14*, A_4=0.02 *2*.
596.9 *2*	≈1	3217.4	(10,11,12)$^-$	2620.5	11$^-$	M1+E2	0.05 *3*	α(K)=0.040 *25*; α(L)=0.008 *4*; α(M)=0.0019 *8*; α(N+..)=0.00059 *25* α(N)=0.00048 *20*; α(O)=0.00010 *5*; α(P)=1.2×10^{-5} *6* Mult.: α(K)exp=0.065 *12*.
609.2 *1*	5.0 *10*	2248.2	8$^+$	1639.0	8$^+$	M1(+E2)	0.067 *10*	α(K)=0.054 *8*; α(L)=0.0095 *11*; α(M)=0.00225 *25*; α(N+..)=0.00072 *8* α(N)=0.00058 *7*; α(O)=0.000121 *14*; α(P)=1.55×10^{-5} *19* Mult.: α(K)exp=0.05 *1*; A_2=0.14 *4*, A_4=0.01 *5*.
662.9 *2*	1.1 *3*	2289.67	7$^-$	1626.94	6$^+$			
677.7 *2*	2.2 *5*	2905.0	11$^-$	2227.3	9$^-$	E2	0.01618	α(K)=0.01208 *17*; α(L)=0.00310 *5*; α(M)=0.000762 *11*; α(N+..)=0.000240 *4* α(N)=0.000196 *3*; α(O)=3.96×10^{-5} *6*; α(P)=4.58×10^{-6} *7* Mult.: A_2=0.26 *2*, A_4=−0.07 *3*.
684.4 *1*	100 *2*	684.40	2$^+$	0	0$^+$	E2	0.01584	α(K)=0.01185 *17*; α(L)=0.00302 *5*; α(M)=0.000741 *11*; α(N+..)=0.000233 *4* α(N)=0.000190 *3*; α(O)=3.86×10^{-5} *6*; α(P)=4.47×10^{-6} *7* Mult.: α(K)exp=0.0119, value used as normalization; A_2=0.068 *13*, A_4=−0.01 *2*. Note that the measured A_2 value is not consistent with the assigned multipolarity, presumably due to attenuation of alignment.
718.3 *2*	1.8 *5*	2945.6	10$^-$	2227.3	9$^-$			
751.8 *10*	0.9 *3*	2378.7	7$^+$	1626.94	6$^+$	D		Mult.: A_2=−0.17 *16*, A_4=−0.2 *2*. E_γ: 749.45 *15* from Adopted Levels, gammas.
[x]761.2	<4.3							
761.2 *2*	<4.3	1962.02	6$^+$	1200.72	4$^+$	(E2)	0.01268	α(K)=0.00966 *14*; α(L)=0.00228 *4*; α(M)=0.000557 *8*; α(N+..)=0.0001755 *25* α(N)=0.0001430 *20*; α(O)=2.91×10^{-5} *4*; α(P)=3.43×10^{-6} *5* Mult.: No arguments were provided in 1987Ra04.

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^{204}Pb(^{3}He,3nγ) 1987Ra04 (continued)

γ(^{204}Po) (continued)

E_γ ‡	I_γ @	E_i(level)	J_i^π	E_f	J_f^π	Mult.#	δ	α †	Comments
841.2 *2*	6.2 *6*	2041.75	5^-	1200.72	4^+	E1		0.00372 *6*	α=0.00372 *6*; α(K)=0.00309 *5*; α(L)=0.000485 *7*; α(M)=0.0001128 *16*; α(N+..)=3.56×10^{-5} *5* α(N)=2.89×10^{-5} *4*; α(O)=6.00×10^{-6} *9*; α(P)=7.62×10^{-7} *11* Mult.: α(K)exp<0.004; A_2=−0.15 *5*, A_4=−0.03 *7*.
843.8 *5*	1.8 *4*	2470.7		1626.94	6^+	M1+E2		0.021 *11*	α(K)=0.017 *10*; α(L)=0.0031 *14*; α(M)=0.0007 *4*; α(N+..)=0.00024 *10* α(N)=0.00019 *8*; α(O)=4.0×10^{-5} *18*; α(P)=5.0×10^{-6} *24* Mult.: α(K)exp≈0.02; A_2=0.05 *8*, A_4=0.04 *11*.
867.9 *2*	3.5 *5*	1552.29	4^+	684.40	2^+	E2		0.00972 *14*	α=0.00972 *14*; α(K)=0.00755 *11*; α(L)=0.001645 *23*; α(M)=0.000398 *6*; α(N+..)=0.0001257 α(N)=0.0001023 *15*; α(O)=2.09×10^{-5} *3*; α(P)=2.51×10^{-6} *4* Mult.: α(K)exp=0.0075 *7*; A_2=0.11 *5*, A_4=−0.02 *6*.
888.4 *2*	3.7 *8*	2527.4	10^+	1639.0	8^+	E2		0.00928 *13*	α=0.00928 *13*; α(K)=0.00723 *11*; α(L)=0.001555 *22*; α(M)=0.000376 *6*; α(N+..)=0.0001187 α(N)=9.65×10^{-5} *14*; α(O)=1.98×10^{-5} *3*; α(P)=2.37×10^{-6} *4* Mult.: α(K)exp=0.0085 *15*; A_2=0.25 *3*, A_4=−0.07 *4*.
899.6 *2*	4.2 *9*	2100.32	$(3,4,5)^+$	1200.72	4^+	M1+E2	0.9 *1*	0.0182 *21*	α(K)=0.0147 *17*; α(L)=0.0027 *3*; α(M)=0.00063 *6*; α(N+..)=0.000199 *19* α(N)=0.000161 *15*; α(O)=3.4×10^{-5} *4*; α(P)=4.3×10^{-6} *5* Mult.: α(K)exp=0.016 *1*. δ: From α(K)exp.
926.3 *2*	0.7 *2*	2553.2		1626.94	6^+				
950.2 *2*	2.2 *4*	1634.47	(3^+)	684.40	2^+	(M1+E2)			Mult.: A_2=0.08 *3*, A_4=−0.05 *3*.
1031.5 *2*	0.9 *3*	1715.90		684.40	2^+				Mult.: A_2=0.01 *3*, A_4=−0.01 *4*.
1044.2 *2*	3.0 *6*	1728.61	(4^+)	684.40	2^+				Mult.: A_2=−0.01 *3*, A_4=−0.03 *4*.

† Additional information 1.
‡ From 1987Ra04. Eγ are stated to be accurate to within 0.1-0.2 keV. Uncertainties for individual γ′s were assigned by the evaluators.
# From 1987Ra04, based on α(K)exp and $\gamma(\theta)$, unless otherwise specified.
@ Values measured at E(^{3}He)=27.6 MeV in 1987Ra04 with ΔIγ ranging from 2 to 30%, depending on statistics. Individual ΔIγ were estimated by the evaluators.
^{x} γ ray not placed in level scheme.

$^{204}Pb(^{3}He,3n\gamma)$ 1987Ra04

Level Scheme

Intensities: Type not specified

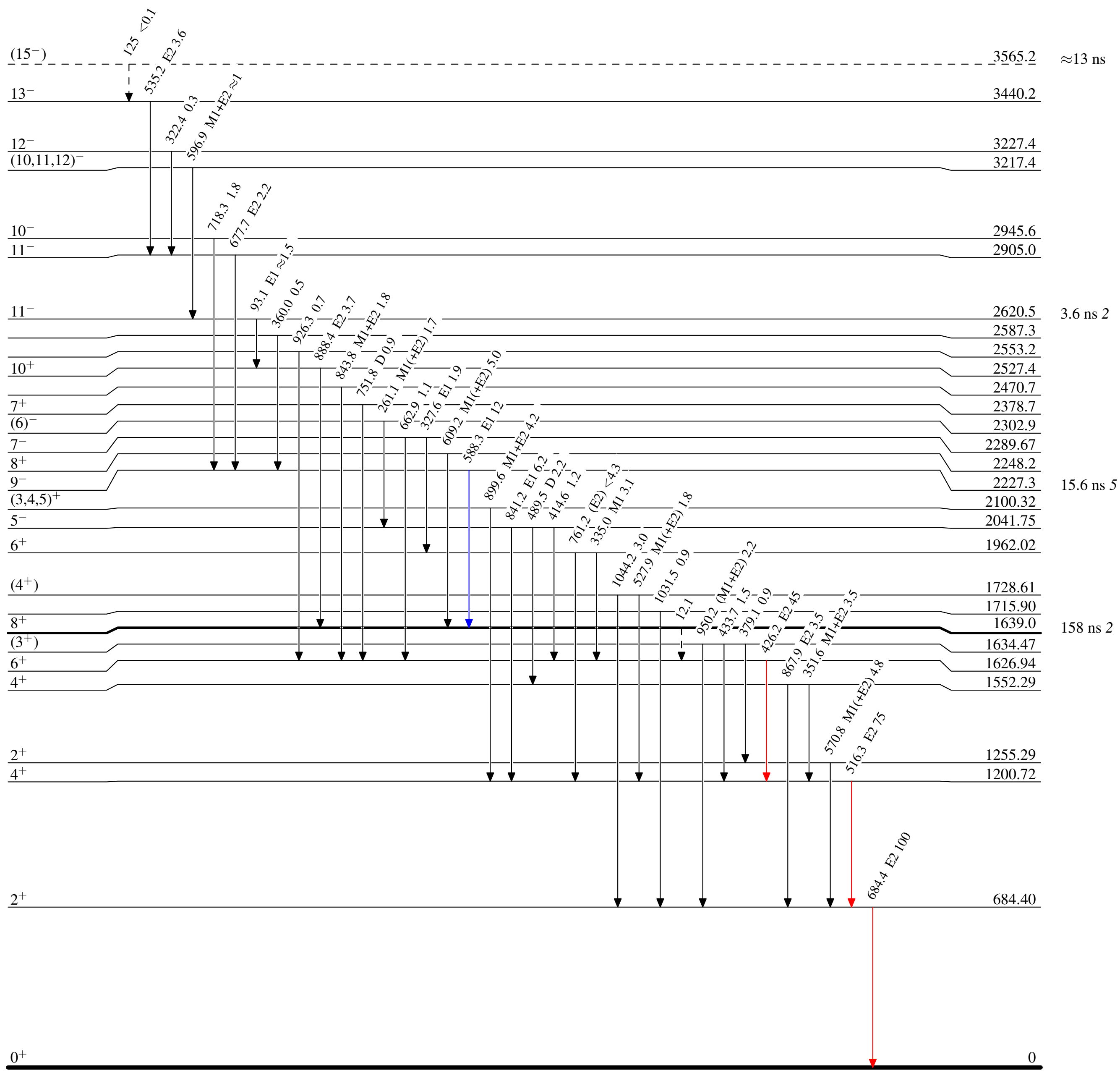
Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$

γ Decay (Uncertain)



$^{204}_{84}Po_{120}$