^{208}Pb(α,3nγ) 1974Be74

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. Chen # and F. G. Kondev	NDS 126, 373 (2015)	30-Sep-2013

1974Be74: E=33-43 MeV α beams were produced from the Stockholm 225-cm cyclotron. γ-rays were detected with Ge(Li) detectors of various sizes. Measured Eγ, Iγ, $\gamma(\theta)$, $\gamma\gamma(\theta)$,γ(t). Deduced levels,J^π, half-lives, γ-branchings, mixing ratios, multipolarities.

1976Re12: E=41-51 MeV α beam. Natural lead target. γ-rays were detected by two big Ge(Li) detectors placed at ±135° relative to the incident beam direction. Measured Eγ, $\gamma(\theta$,H,t). Deduced levels, g-factors.

1975WiZR: E=40 MeV. Measured Eγ, $\gamma\gamma$-coin, σ(Eγ,θ). Deduced levels, γ-multipolarities.

1983Da01: E=24, 35 MeV. Measured Eγ, $\gamma\gamma(\theta$,H,t). Deduced quadrupole moment.

Others: 1966AlZZ, 1968Ya08, 1973Ab09.

Data and level scheme are from 1974Be74 except for the 4354 level and its de-exciting γ's (1975WiZR) and the g-factor data (1976Re12).

^{209}Po Levels

E(level)†	J^π‡	$T_{1/2}$	Comments
0.0	$1/2^-$#		
545.10 *20*	$5/2^-$#		
1326.9 *3*	$9/2^-$#		
1417.8 *4*	$13/2^-$#	24.8 ns *14*	$T_{1/2}$: from 90.9γ(t) (1974Be74).
1472.7 *5*	$17/2^-$	98.1 ns *16*	Q=(−)0.39 *8* (1983Da01) g=0.89 *5* $T_{1/2}$: from 545γ(t) and 782γ(t). 100 ns *25* from 54.9γ(t). Q: from 1983Da01 using TDPAD method. g: weighted average of 0.90 *5* (1973Ab09) and 0.88 *5* (1968Ya08).
1937.8 *4*	$17/2^-$		
2029.9 *6*	$19/2^-$		
2167.1 *6*	$21/2^-$		
2311.9 *11*			
2770.1 *6*	$23/2^+$	2.5 ns *7*	$T_{1/2}$: preliminary value from 603γ(t).
2976.7 *6*	$25/2^+$		
3620.6 *6*	$27/2^+$		
4168.7 *7*	$29/2^+$		
4265.8 *6*	$31/2^-$	119 ns *4*	g=0.625 *5* $T_{1/2}$: weighted average of values from 1974Be74 (118 ns *3*) and 1976Re12 (132 ns *10*). g: from $\alpha,\gamma(\sigma$,H,t) H=8.4-25.5 kG (1976Re12). Value includes corrections for diamagnetism and knight shift.
4354.3 *7*	$31/2^-$		

† From a least-squares fit to γ energies.

‡ From deduced γ-ray transition multipolarities, using $\gamma(\theta)$ and comparisons with shell-model calculations.

From Adopted Levels.

^{208}Pb(α,3nγ) 1974Be74 (continued)

$\gamma(^{209}Po)$

E_γ[‡]	I_γ[&]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ	α[†]	$I_{(\gamma+ce)}$	Comments
54.9 *5*	0.59	1472.7	17/2$^-$	1417.8	13/2$^-$	[E2]		120 *6*	73	ce(L)/(γ+ce)=0.736 *25*; ce(M)/(γ+ce)=0.196 *12*; ce(N+)/(γ+ce)=0.060 *4* ce(N)/(γ+ce)=0.050 *4*; ce(O)/(γ+ce)=0.0095 *7*; ce(P)/(γ+ce)=0.00083 *6* I_γ: from I(γ+ce) and conversion coefficient. $I_{(\gamma+ce)}$: from intensity balance at 1472.7 (I(γ+ce)≥66) and at 1417.8 (I(γ+ce)≤79), with internal conversion taken into account for all transitions.
90.9 *2*	6.6	1417.8	13/2$^-$	1326.9	9/2$^-$	E2[a]		10.71 *19*		α(L)=7.94 *14*; α(M)=2.12 *4*; α(N+..)=0.655 *12* α(N)=0.543 *10*; α(O)=0.1031 *18*; α(P)=0.00919 *16*
97.0 *5*	2.0	4265.8	31/2$^-$	4168.7	29/2$^+$	E1		0.484 *9*		α(K)=0.378 *7*; α(L)=0.0805 *16*; α(M)=0.0191 *4*; α(N+..)=0.00591 *12* α(N)=0.00484 *10*; α(O)=0.000958 *19*; α(P)=0.0001054 *21* Mult.: from α(exp)=0.2 *4* based on intensity balance at the 4169 level in a delayed spectrum (1974BE74).
137.2 *2*	6.9	2167.1	21/2$^-$	2029.9	19/2$^-$	M1		4.51		α(K)=3.66 *6*; α(L)=0.648 *10*; α(M)=0.1529 *23*; α(N+..)=0.0487 *8* α(N)=0.0394 *6*; α(O)=0.00824 *12*; α(P)=0.001064 *16* Mult.: from α(exp)=3.9 *8* based on intensity balance at the 2030 level in a delayed spectrum (1974Be74). A_2=−0.31 *8* and A_4=+0.02 *10* consistent with stretched dipole (1974Be74).
185.6[#] *5*		4354.3	31/2$^-$	4168.7	29/2$^+$	D[b]				
206.6 *2*	16.1	2976.7	25/2$^+$	2770.1	23/2$^+$	M1		1.419		α(K)=1.153 *17*; α(L)=0.203 *3*; α(M)=0.0479 *7*; α(N+..)=0.01523 *22* α(N)=0.01232 *18*; α(O)=0.00258 *4*; α(P)=0.000333 *5* Mult.: from α(exp)=1.6 *4* based on intensity balance at the 2770 level in a delayed spectrum (1974Be74). A_2=−0.27 *5*, A_4=+0.11 *7* consistent with stretched dipole (1974Be74).
465.1 *5*	1.9	1937.8	17/2$^-$	1472.7	17/2$^-$	(M1+E2)	1.16 *20*			Mult.,δ: A_2=+0.16 *12*, A_4=−0.20 *17* (1974Be74).
520.0 *2*	6.3	1937.8	17/2$^-$	1417.8	13/2$^-$	(E2)				Mult.: A_2=+0.33 *7*, A_4=+0.02 *10* (1974Be74).
545.1 *2*	100.0	545.10	5/2$^-$	0.0	1/2$^-$	E2		0.0262		α(K)=0.0186 *3*; α(L)=0.00575 *8*; α(M)=0.001436 *21*; α(N+..)=0.000451 *7* α(N)=0.000369 *6*; α(O)=7.39×10^{-5} *11*; α(P)=8.24×10^{-6} *12* Mult.: A_2=+0.16 *2*, A_4=−0.01 *4* (1974Be74) and A_2=0.24 *2*$, A_4=0.01 *3* (1968Ya08) are consistent with stretched quadrupole.
548.1 *2*	7.8	4168.7	29/2$^+$	3620.6	27/2$^+$					
557.2 *2*	43.8	2029.9	19/2$^-$	1472.7	17/2$^-$	(M1+E2)	0.53 *5*	0.080 *3*		α(K)=0.0648 *22*; α(L)=0.0117 *3*; α(M)=0.00276 *7*; α(N+..)=0.000877 *23* α(N)=0.000710 *19*; α(O)=0.000148 *4*; α(P)=1.89×10^{-5} *6* Mult.,δ: A_2=−0.84 *4*, A_4=+0.10 *6*, δ=0.53 *5* or 1.67 *16* (1974Be74). 1974Be74 choose mult=M1+E2 rather than

$^{209}_{84}Po_{125}$-2

^{208}Pb(α,3nγ) 1974Be74 (continued)

$\gamma(^{209}Po)$ (continued)

E_γ[‡]	I_γ[&]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ	α[†]	Comments
									E1+M2 based on expectation from theory of $19/2^-$ but not $19/2^+$ level at this energy.
603.0 *2*	44.9	2770.1	$23/2^+$	2167.1	$21/2^-$	(E1)		0.00703	α(K)=0.00580 *9*; α(L)=0.000937 *14*; α(M)=0.000219 *3*; α(N+..)=6.90×10^{-5} *10* α(N)=5.59×10^{-5} *8*; α(O)=1.158×10^{-5} *17*; α(P)=1.451×10^{-6} *21* Mult.: A_2=−0.23 *4* and A_4=+0.03 *5* consistent with stretched dipole (1974Be74).
643.9 *2*	12.5	3620.6	$27/2^+$	2976.7	$25/2^+$	(M1+E2)	0.12 *2*		Mult.,δ: A_2=−0.42 *4*, A_4=+0.03 *5* consistent with stretched dipole with a small quadrupole admixture (1974Be74).
694.3 *2*	10.5	2167.1	$21/2^-$	1472.7	$17/2^-$	(E2)			A_2=+0.11 *6*; A_4=−0.01 *8* Mult.: A_2=+0.11 *6*, A_4=−0.01 *8* (1974Be74). But 1974Be74 gives mult=M1+E2 with δ=0.21 *6*, inconsistent with the J^π predictions of $21/2^-$ to $17/2^-$.
781.8 *2*	99.0	1326.9	$9/2^-$	545.10	$5/2^-$	E2		0.01200	α(K)=0.00919 *13*; α(L)=0.00213 *3*; α(M)=0.000519 *8*; α(N+..)=0.0001637 *23* α(N)=0.0001333 *19*; α(O)=2.72×10^{-5} *4*; α(P)=3.21×10^{-6} *5* Mult.: A_2=+0.16 *2*, A_4=−0.02 *4* (1974Be74) and A_2=0.24 *2*, A_4=0.01 *3* (1968Ya08) are consistent with stretched quadrupole.
985 *1*		2311.9		1326.9	$9/2^-$				E_γ: The author of 1974Be74 has seen a peak at Eγ=985 keV but not placed it. The evaluators made this placement based on adopted level scheme, assuming an uncertainty of 1 keV.
1289.1 *2*	8.0	4265.8	$31/2^-$	2976.7	$25/2^+$	E3		0.00986	α(K)=0.00753 *11*; α(L)=0.001762 *25*; α(M)=0.000430 *6*; α(N+..)=0.0001412 *20* α(N)=0.0001108 *16*; α(O)=2.27×10^{-5} *4*; α(P)=2.74×10^{-6} *4*; α(IPF)=4.97×10^{-6} *7* Mult.: A_2=+0.27 *5*, A_4=+0.05 *7* (1974Be74).
1297.4 *2*	5.9	2770.1	$23/2^+$	1472.7	$17/2^-$	E3		0.00972	α(K)=0.00743 *11*; α(L)=0.001732 *25*; α(M)=0.000423 *6*; α(N+..)=0.0001394 *20* α(N)=0.0001089 *16*; α(O)=2.23×10^{-5} *4*; α(P)=2.70×10^{-6} *4*; α(IPF)=5.47×10^{-6} *8* Mult.: A_2=+0.46 *3*, A_4=−0.03 *5*, consistent with octupole transition (1974Be74). M3 is excluded because it would imply a too long half-life.
1377.7[#] *5*		4354.3	$31/2^-$	2976.7	$25/2^+$	(E3)[b]			

[†] Additional information 1.
[‡] From 1974Be74, unless otherwise noted. A uncertainty of 0.2 keV is assumed by evaluators for strong transitions and 0.5 keV for weak ones.
[#] From 1975WiZR, uncertainty=0.5 keV assigned by evaluators.
[@] From $\gamma(\theta)$ in 1974Be74, unless otherwise noted.
[&] From prompt spectrum of 1974Be74. Authors also quote Iγ from delayed spectrum.

$^{209}_{84}Po_{125}$-3

$\gamma(^{209}\text{Po})$ (continued)

[a] From ^{209}At ec+β^+ decay.
[b] From $\gamma(\theta)$ (1975WiZR).

$^{209}_{84}Po_{125}$-4

^{208}Pb(α,3nγ) 1974Be74

Level Scheme

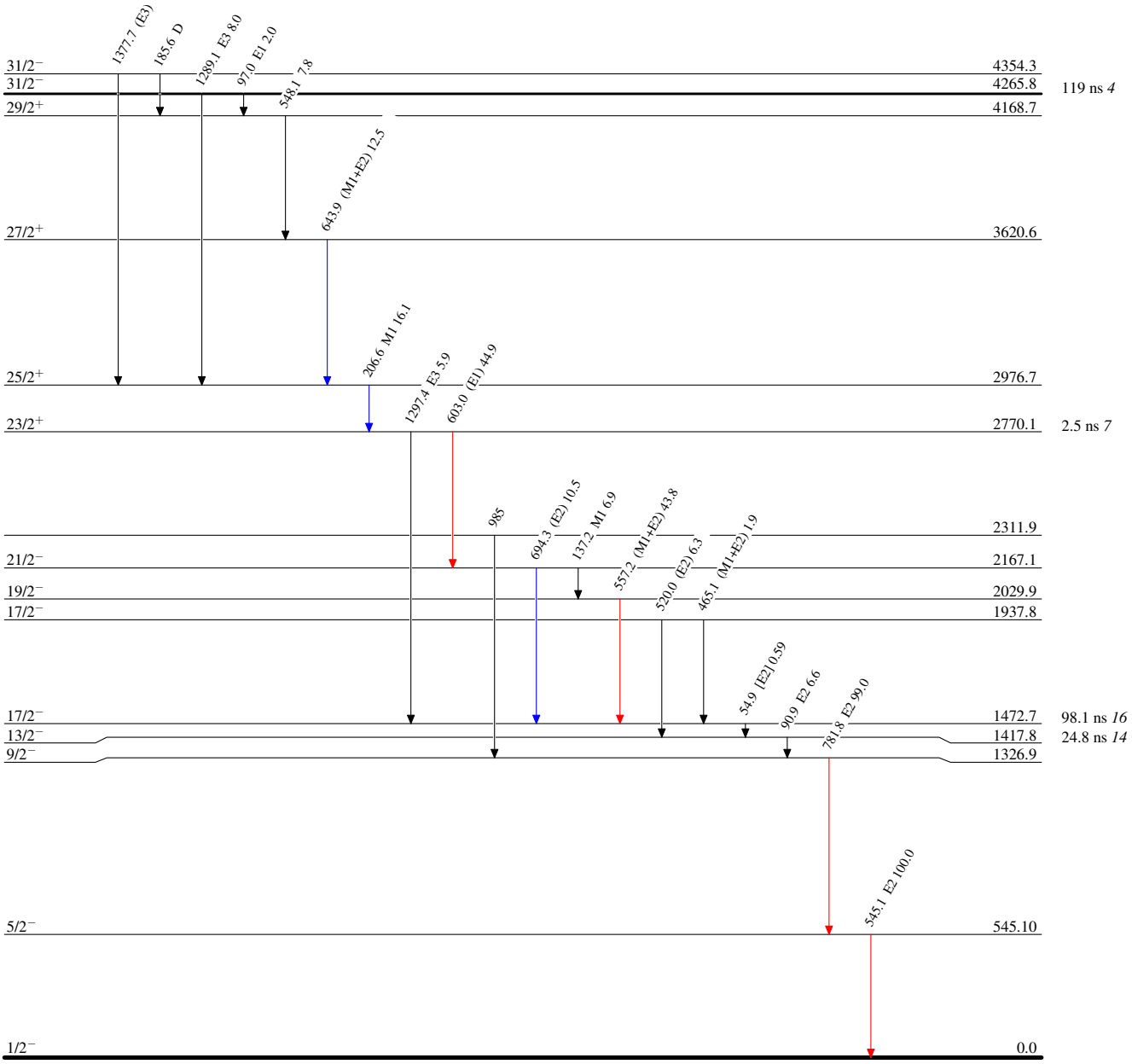
Intensities: Relative I_γ

Legend

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

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

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



$^{209}_{84}Po_{125}$