^{208}Pb(α,nγ) 1981Fa01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. K. Tuli, P. Blokhin, J. Kaur, J. Y. Lee and N. Sharma	NDS 114, 661 (2013)	28-Feb-2013

^{211}Po Levels

E=18.3 to 20.6 MeV; measured Eγ, Iγ, Ice, $\gamma\gamma$, $\alpha\gamma(\theta)$, $\alpha\gamma$(t), excit.

The level scheme is that of 1981Fa01. For the strong transitions (Iγ/Iγ(1050)≥0.10) the placement of the transition in the level scheme is based on excit, $\gamma\gamma$(t) and $\gamma\gamma$ measurements. Weaker transitions are placed in the level scheme on the basis of energy, intensity and coincidence data.

Excit shows that: 362.9γ, 1064.8γ deexcite high spin states; 193.1γ, 334.3γ deexcite low spin states; and 1050.6γ, 1161.5γ deexcite intermediate spin states.

Others: 1976Ha56: E=25 MeV; measured Eγ
1973FaZD: E=22.5 MeV; measured $\alpha\gamma(\theta$,H,t) H=16.6 kG
1970Ya03: E=24 MeV; measured $\alpha\gamma$(t)

E(level)	J$^{\pi}$[†]	T$_{1/2}$	Comments
0.0	9/2$^+$		
687.1 *7*	11/2$^+$		
1050.6 *9*	5/2$^+$		
1064.7 *8*	15/2$^-$	15.9 ns *14*	g=−0.05 *2* T$_{1/2}$: from γ(t) (1973FaZD). Other: 14 ns (1981Fa01). g: from $\gamma(\theta$,H) (1973FaZD).
1121.8 *6*	7/2$^+$		
1160.6 *7*	(9/2$^+$)		
1181.2 *8*	(13/2$^+$)		
1384.9 *12*	(3/2)$^+$		
1407.4 *8*	($^+$)		
1409.4 *8*	($^+$)		
1427.6 *13*	(17/2$^+$)		
1427.6+x?		≈20 ns	Additional information 1. E(level): level postulated to explain T$_{1/2}$≈20 ns observed for the 362.9-keV γ. 1981Fa01 suggest that this is the 21/2$^+$ level with E(calc)≈1500.
1436.6 *7*	(5/2$^+$,7/2$^+$,9/2$^+$)		
1443.0 *10*	3/2$^+$,5/2$^+$,7/2$^+$		
1458.4 *13*	(15/2$^+$)		
1508.3 *9*	($^+$)		
1509.3 *13*	($^+$)		
1517.2 *12*	($^+$)		
1541.7 *17*			
1578.0 *16*	(1/2)	3.5 ns	
1584.3 *13*	($^+$)		
1614.4 *9*	(5/2$^+$,7/2$^+$)		
1615.6 *17*			
1637.8 *9*	($^+$)		
1696.3 *17*	($^+$)		
1716.5 *13*			
1727.1 *13*			
1735.6 *17*			E(level): based on (^{9}Be,α2nγ) (1998Mc03), this level is defined as 1735.6+x in Adopted Levels, decaying by 308.0γ to 1427.6+x level.
1739.5 *12*	($^+$)		
1797.1 *13*			
1809.2?			
1876.8 *13*			

Continued on next page (footnotes at end of table)

^{208}Pb(α,nγ) 1981Fa01 (continued)

^{211}Po Levels (continued)

E(level)	E(level)	J^{π}†	E(level)	E(level)
1944.7 *13*	2077.0 *14*	(+)	2223.7 *19*	2339.5 *14*
2023.6 *13*	2079.0		2277.6 *13*	2547.9 *19*
2029.5 *12*	2094.1 *13*	(+)	2297.9 *14*	
2034.2 *13*	2112.1 *11*		2300.0 *16*	

† From Adopted Levels.

$\gamma(^{211}Po)$

All data are from singles spectra with Eα=20.6 MeV.
Energy resolution: gammas: ≈0.7 keV at 122 keV, ≈1.7 keV at 1333 keV; electrons: ≈2.5 keV at 1000 keV.
Other: 1976Ha56.
All α(exp) measured relative to α(K)(1050.6γ,E2)=0.0054 (from HSICC code). Corresponding value of α(K)(1050.6γ,E2) from BrIcc code is 0.00530, thus α(exp) has been adjusted about 2% lower, but this does not alter interpretation about multipolarities.

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.	$\alpha^\dagger$	Comments
x		1427.6+x?		1427.6	(17/2$^+$)			E_γ: unobserved γ required to explain $T_{1/2}$≈20 ns observed for the 362.9-keV (E1) γ.
114.1	0.4	1541.7		1427.6	(17/2$^+$)			
171.4	1.6	1614.4	(5/2$^+$,7/2$^+$)	1443.0	3/2$^+$,5/2$^+$,7/2$^+$			
188.0	1.1	1615.6		1427.6	(17/2$^+$)			
193.1	10.3	1578.0	(1/2)	1384.9	(3/2)$^+$			Mult.: α(L)exp≈0.12 suggests either E2 or E1+M2.
246.5[&]	0.5	1407.4	($^+$)	1160.6	(9/2$^+$)			
248.8[&]	0.5	1409.4	($^+$)	1160.6	(9/2$^+$)			
268.7	1.4	1696.3	($^+$)	1427.6	(17/2$^+$)	(M1)	0.684	α(K)=0.556 *8*; α(L)=0.0974 *14*; α(M)=0.0230 *4* α(N)=0.00591 *9*; α(O)=0.001237 *18*; α(P)=0.0001599 *23* Mult.: from α(K)exp≈0.3.
276.0	2.9	1436.6	(5/2$^+$,7/2$^+$,9/2$^+$)	1160.6	(9/2$^+$)	(E2)	0.1624	α(K)=0.0809 *12*; α(L)=0.0608 *9*; α(M)=0.01585 *23* α(N)=0.00407 *6*; α(O)=0.000791 *11*; α(P)=7.79×10^{-5} *11* Mult.: from α(K)exp≈0.15.
277.2	2.9	1458.4	(15/2$^+$)	1181.2	(13/2$^+$)			
285.4	2.6	1407.4	($^+$)	1121.8	7/2$^+$	(M1)	0.579	α(K)=0.471 *7*; α(L)=0.0825 *12*; α(M)=0.0194 *3* α(N)=0.00500 *7*; α(O)=0.001047 *15*; α(P)=0.0001353 *19* Mult.: from α(K)exp=0.59.
287.7	2.3	1409.4	($^+$)	1121.8	7/2$^+$	(M1)	0.567	α(K)=0.461 *7*; α(L)=0.0807 *12*; α(M)=0.0190 *3* α(N)=0.00489 *7*; α(O)=0.001024 *15*; α(P)=0.0001324 *19* Mult.: from α(K)exp=0.43.
296.4	1.7	1739.5	($^+$)	1443.0	3/2$^+$,5/2$^+$,7/2$^+$	(M1)	0.522	α(K)=0.425 *6*; α(L)=0.0743 *11*; α(M)=0.01751 *25* α(N)=0.00451 *7*; α(O)=0.000943 *14*; α(P)=0.0001219 *17* Mult.: from α(K)exp=0.38.
308.0	0.5	1735.6		1427.6	(17/2$^+$)			
314.7	1.6	1436.6	(5/2$^+$,7/2$^+$,9/2$^+$)	1121.8	7/2$^+$	(M1)	0.443	α(K)=0.361 *5*; α(L)=0.0630 *9*; α(M)=0.01485 *21* α(N)=0.00382 *6*; α(O)=0.000800 *12*; α(P)=0.0001034 *15* Mult.: from α(K)exp=0.45.
334.3	19.8	1384.9	(3/2)$^+$	1050.6	5/2$^+$	E2	0.0918	α(K)=0.0525 *8*; α(L)=0.0294 *5*; α(M)=0.00758 *11* α(N)=0.00195 *3*; α(O)=0.000381 *6*; α(P)=3.88×10^{-5} *6* Mult.: from α(K)exp=0.053, K/L=1.3.
347.7	0.3	1508.3	($^+$)	1160.6	(9/2$^+$)			
354.6[@#]	2.1[@]	1739.5	($^+$)	1384.9	(3/2)$^+$	(M1)	0.320	α(K)=0.261 *4*; α(L)=0.0454 *7*; α(M)=0.01070 *15* α(N)=0.00275 *4*; α(O)=0.000576 *8*; α(P)=7.45×10^{-5} *11* Mult.: from α(K)exp=0.29.

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^{208}Pb(α,nγ) 1981Fa01 (continued)

$\gamma(^{211}Po)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α[†]	Comments
354.6[@#]	2.1[@]	2094.1	(+)	1739.5	(+)	(M1)		0.320	α(K)=0.261 *4*; α(L)=0.0454 *7*; α(M)=0.01070 *15* α(N)=0.00275 *4*; α(O)=0.000576 *8*; α(P)=7.45×10^{-5} *11* Mult.: from α(K)exp=0.29.
356.6	1.3	1517.2	(+)	1160.6	(9/2$^+$)	(M1)		0.316	α(K)=0.257 *4*; α(L)=0.0447 *7*; α(M)=0.01054 *15* α(N)=0.00271 *4*; α(O)=0.000568 *8*; α(P)=7.34×10^{-5} *11* Mult.: from α(K)exp=0.19.
362.9	10.1	1427.6	(17/2$^+$)	1064.7	15/2$^-$	(E1)		0.0204	α(K)=0.01669 *24*; α(L)=0.00283 *4*; α(M)=0.000665 *10* α(N)=0.0001698 *24*; α(O)=3.48×10^{-5} *5*; α(P)=4.26×10^{-6} *6* Mult.: from α(K)exp≈0.023.
377.6	1.2	1064.7	15/2$^-$	687.1	11/2$^+$	M2		0.878	α(K)=0.668 *10*; α(L)=0.1584 *23*; α(M)=0.0390 *6* α(N)=0.01011 *15*; α(O)=0.00210 *3*; α(P)=0.000265 *4* B(M2)(W.u.)=0.266 *24* Mult.: from α(K)exp=0.84, K/L=3.3.
386.5	4.1	1508.3	(+)	1121.8	7/2$^+$	(M1)		0.254	α(K)=0.207 *3*; α(L)=0.0359 *5*; α(M)=0.00846 *12* α(N)=0.00218 *3*; α(O)=0.000456 *7*; α(P)=5.89×10^{-5} *9* Mult.: from α(K)exp=0.15.
392.3	18.3	1443.0	3/2$^+$,5/2$^+$,7/2$^+$	1050.6	5/2$^+$	M1+E2	+0.10[‡] *3*	0.242	α(K)=0.197 *3*; α(L)=0.0343 *5*; α(M)=0.00809 *12* α(N)=0.00208 *3*; α(O)=0.000436 *7*; α(P)=5.63×10^{-5} *9* Mult.: from α(K)exp=0.21, K/L=6.3; $\gamma(\theta)$.
458.7	1.0	1509.3	(+)	1050.6	5/2$^+$	(M1)		0.1603	α(K)=0.1307 *19*; α(L)=0.0226 *4*; α(M)=0.00532 *8* α(N)=0.001369 *20*; α(O)=0.000287 *4*; α(P)=3.71×10^{-5} *6* Mult.: from α(K)exp=0.12.
462.6	2.4	2077.0	(+)	1614.4	(5/2$^+$,7/2$^+$)	(M1)		0.1567	α(K)=0.1278 *18*; α(L)=0.0221 *3*; α(M)=0.00520 *8* α(N)=0.001338 *19*; α(O)=0.000280 *4*; α(P)=3.62×10^{-5} *5* Mult.: from α(K)exp=0.08.
477.1	2.3	1637.8	(+)	1160.6	(9/2$^+$)				
492.6	4.4	1614.4	(5/2$^+$,7/2$^+$)	1121.8	7/2$^+$	(M1)		0.1326	α(K)=0.1081 *16*; α(L)=0.0187 *3*; α(M)=0.00439 *7* α(N)=0.001130 *16*; α(O)=0.000237 *4*; α(P)=3.06×10^{-5} *5* Mult.: from α(K)exp=0.10.
494.1	0.3	1181.2	(13/2$^+$)	687.1	11/2$^+$				
516.0	4.2	1637.8	(+)	1121.8	7/2$^+$	(M1)		0.1172	α(K)=0.0956 *14*; α(L)=0.01648 *23*; α(M)=0.00388 *6* α(N)=0.000998 *14*; α(O)=0.000209 *3*; α(P)=2.70×10^{-5} *4* Mult.: from α(K)exp=0.12.
533.7	4.1	1584.3	(+)	1050.6	5/2$^+$	(M1)		0.1072	α(K)=0.0874 *13*; α(L)=0.01506 *21*; α(M)=0.00354 *5* α(N)=0.000912 *13*; α(O)=0.000191 *3*; α(P)=2.47×10^{-5} *4* Mult.: from α(K)exp=0.10.
563.7	4.3	1614.4	(5/2$^+$,7/2$^+$)	1050.6	5/2$^+$	(M1+E2)	1.35	0.0485	α(K)=0.0380 *6*; α(L)=0.00797 *12*; α(M)=0.00192 *3* α(N)=0.000494 *7*; α(O)=0.0001016 *15*; α(P)=1.241×10^{-5} *18* Mult.,δ: from α(K)exp=0.038.
645.7	3.0	2223.7		1578.0	(1/2)				Mult.: α(K)exp=0.035 fits M1+E2 or E3.

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^{208}Pb(α,nγ) 1981Fa01 (continued)

$\gamma(^{211}Po)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	$\alpha^\dagger$	Comments
651.1	1.4	2094.1	$(^+)$	1443.0	$3/2^+,5/2^+,7/2^+$				
669.0	2.1	2112.1		1443.0	$3/2^+,5/2^+,7/2^+$				
687.0	35.5	687.1	$11/2^+$	0.0	$9/2^+$	M1+E2	$-0.20^{\ddagger}$ *2*	0.0536	α(K)=0.0438 *7*; α(L)=0.00752 *12*; α(M)=0.00177 *3* α(N)=0.000455 *7*; α(O)=9.53×10^{-5} *14*; α(P)=1.232×10^{-5} *19* Mult.: from α(K)exp=0.053, K/L=5.7; consistent with pure M1.
[x]737.2	2.0								E_γ: γ in coincidence with 1181.2γ.
854.9	6.0	2297.9		1443.0	$3/2^+,5/2^+,7/2^+$				Mult.: α(K)exp=0.014 fits M1+E2 or E3.
896.5	2.0	2339.5		1443.0	$3/2^+,5/2^+,7/2^+$				
907.7	2.4	2029.5		1121.8	$7/2^+$				
915.1	2.3	2300.0		1384.9	$(3/2)^+$				
969.9	1.4	2547.9		1578.0	(1/2)				
973.0	3.7	2023.6		1050.6	$5/2^+$				
983.6	2.1	2034.2		1050.6	$5/2^+$				
1028.4[&]	3.2	2079.0		1050.6	$5/2^+$				
1029.4	1.6	1716.5		687.1	$11/2^+$				
1040.0	2.4	1727.1		687.1	$11/2^+$				
1050.6	100	1050.6	$5/2^+$	0.0	$9/2^+$	E2		0.00669 *10*	α=0.00669 *10*; α(K)=0.00530 *8*; α(L)=0.001052 *15*; α(M)=0.000252 *4* α(N)=6.48×10^{-5} *9*; α(O)=1.332×10^{-5} *19*; α(P)=1.632×10^{-6} *23* Mult.: from K/L(exp)=4.8 and level scheme.
1061.5	6.8	2112.1		1050.6	$5/2^+$				Mult.: α(K)exp=0.022 fits E3, M1 or M2; most likely mult=M1.
1064.8	29.7	1064.7	$15/2^-$	0.0	$9/2^+$	E3		0.01499	α(K)=0.01105 *16*; α(L)=0.00298 *5*; α(M)=0.000737 *11* α(N)=0.000190 *3*; α(O)=3.87×10^{-5} *6*; α(P)=4.55×10^{-6} *7* B(E3)(W.u.)=17.1 *15* Mult.: from α(K)exp=0.014, K/L=2.3 $\gamma(\theta$,H,t) indicates $15/2^-$ to $9/2^+$ enhanced E3 transition.
1110.0	1.4	1797.1		687.1	$11/2^+$				
1121.8	64.0	1121.8	$7/2^+$	0.0	$9/2^+$	M1+E2	$+0.15^{\ddagger}$ *2*	0.01526 *23*	α(K)=0.01250 *19*; α(L)=0.00211 *3*; α(M)=0.000495 *8* α(N)=0.0001273 *19*; α(O)=2.67×10^{-5} *4*; α(P)=3.46×10^{-6} *5*; α(IPF)=6.63×10^{-7} *10* Mult.: from α(K)exp=0.013, K/L=5.3; $\gamma(\theta)$.
1122.2[&]	≈3	1809.2?		687.1	$11/2^+$				
1160.6	16.5	1160.6	$(9/2^+)$	0.0	$9/2^+$	(E2+M1)	3.1	0.00635 *9*	α=0.00635 *9*; α(K)=0.00510 *8*; α(L)=0.000948 *14*; α(M)=0.000225 *4* α(N)=5.79×10^{-5} *9*; α(O)=1.198×10^{-5} *17*; α(P)=1.496×10^{-6} *21*; α(IPF)=1.444×10^{-6} *21* Mult.,δ: from α(K)exp=0.0051.
1181.2	21.2	1181.2	$(13/2^+)$	0.0	$9/2^+$	(E2)		0.00535 *8*	α=0.00535 *8*; α(K)=0.00428 *6*; α(L)=0.000812 *12*;

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$\gamma(^{211}Po)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Comments
						α(M)=0.000193 *3* α(N)=4.97×10^{-5} *7*; α(O)=1.026×10^{-5} *15*; α(P)=1.270×10^{-6} *18*; α(IPF)=2.36×10^{-6} *4* Mult.: $\gamma(\theta)$ suggests E2.
1189.7	3.2	1876.8		687.1	11/2$^+$	
1227.0	3.6	2277.6		1050.6	5/2$^+$	
[x]1236.0	8.2					
1257.6	1.6	1944.7		687.1	11/2$^+$	
1407.5	7.4	1407.4	(+)	0.0	9/2$^+$	
1409.2	7.5	1409.4	(+)	0.0	9/2$^+$	
1436.7	11.0	1436.6	(5/2$^+$,7/2$^+$,9/2$^+$)	0.0	9/2$^+$	

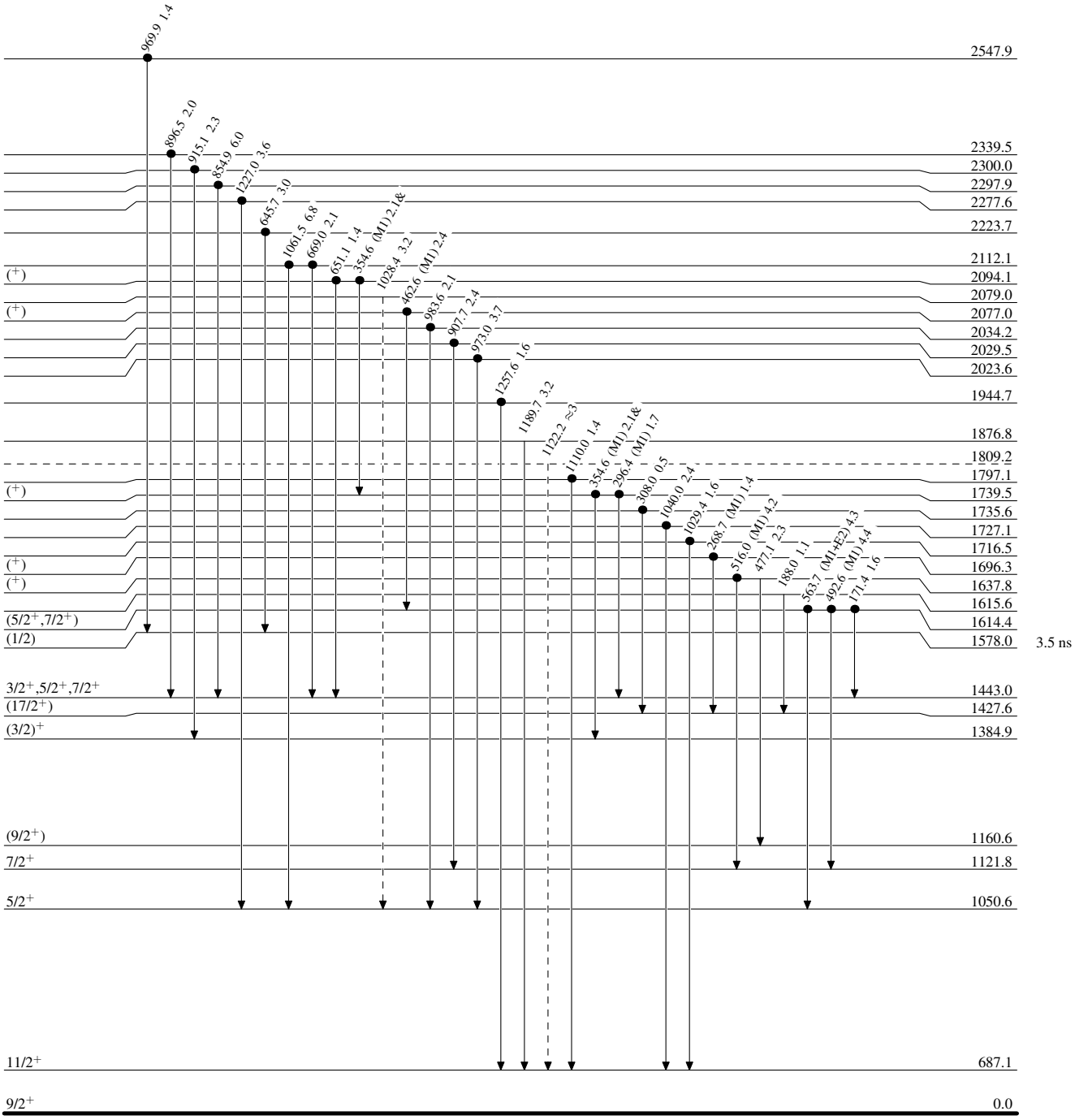
[†] Additional information 2.
[‡] From $\gamma(\theta)$.
[#] (354.6γ)(354.6γ) shows that the transition is a doublet.
[@] Multiply placed with undivided intensity.
[&] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

^{208}Pb(α,nγ) **1981Fa01**

Level Scheme

Intensities: Relative I_γ
& Multiply placed: undivided intensity given

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



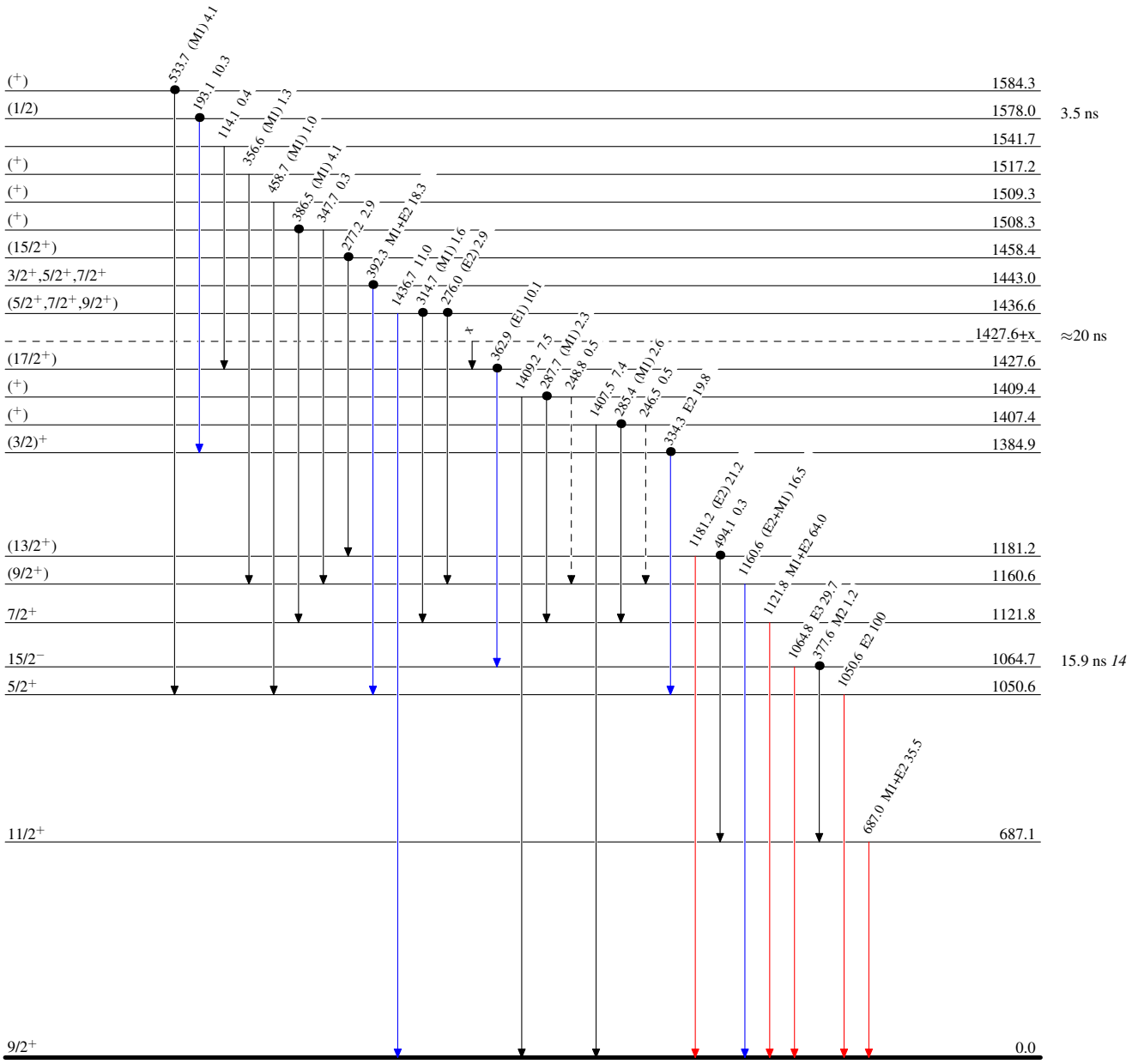
$^{211}_{84}Po_{127}$

^{208}**Pb(α,nγ)** **1981Fa01**

Level Scheme (continued)

Intensities: Relative I_γ
& Multiply placed: undivided intensity given

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



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