^{209}Bi(t,2nγ) 1988Ma32

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia	NDS 121, 561 (2014)	31-Mar-2014

Additional information 1.

Target: metallic Bi. Projectile: tritons, E(t)=11.5-17 MeV. Measured Eγ, Iγ, excitation functions for E(t)=11.5, 12, 13, 15, and 17 MeV; γγ coin at E(t)=13 and 17 MeV; and conversion electrons at E(t)=13 MeV. Deduced conversion coefficients, conversion-electron subshell ratios, γ-ray multipolarities. Other: 1991Be03. Detectors: high-purity germanium with a bismuth germanate (BGO) anti-Compton shield. An electron spectrometer consisting of a superconducting solenoidal magnet transporter with a Si(Li) detector.

^{210}Po Levels

E(level)[c]	Jπ[†]	$T_{1/2}$[‡]	E(level)[c]	Jπ[†]	$T_{1/2}$[‡]
0.0[#]	0^+		3094.52[a] 14	4^+	
1181.40[#] 2	2^+		3111.64[b] 2	4^-	
1426.70[#] 1	4^+		3125.13[&] 3	$(6)^-$	
1473.34[#] 2	6^+		3138.00[&] 4	$(8)^-$	
1556.96[#] 3	8^+	101.0 ns 12	3182.77[&] 3	10^-	
2187.96[@] 3	8^+		3218.98[a] 4	$(6)^+$	
2290.10[@] 4	2^+		3428.58 2	5^-	
2326.00[@] 2	6^+		3525.34 3	6^-	
2382.55[@] 2	4^+		3685.39 4	7^-	
2386.78 2	3^-		3699.59 6	$(5)^-$	
2393.76[@] 6	1^+		3710.99 9	(5^-)	
2403.27[@] 2	5^+		3727.28 6	$(6)^-$	
2413.77[@] 3	3^+		3779.91 6	$(4,5)^-$	
2438.35[@] 3	7^+		3780.19 5	$(7)^-$	
2608.56[a] 7	0^+		4025.78 5	$(7,8,9^-)$	
2845.96[&] 7	$(3)^-$		4145.41 6	$(10)^-$	
2849.16[&] 3	11^-	19.6 ns 4	4324.11 3	11^-	
2910.05[b] 2	5^-		4371.94 3	13^-	56.1 ns 14
2999.48[&] 3	$(9)^-$		4502.80 7	(12^-)	
3016.47[&] 3	7^-		4777.28 8	14^-	
3023.73[&] 4	$(2)^-$		4971.29 14	$(11^-,12^-)$	
3026.42[&] 2	5^-		5057.61 4	16^+	
3075.13[&] 3	$(4)^-$				

[†] Spin and parity assignments are based on γ-ray multipolarities and excitation functions. Shell-model configuration assignments are based on the agreement between experimental and theoretical γ-ray branching ratios.

[‡] From Ce(t).

[#] Configuration=$((\pi\ 1h_{9/2})^2)$.

[@] Configuration=$((\pi\ 1h_{9/2})\ (\pi\ 2f_{7/2}))$.

[&] Configuration=$((\pi\ 1h_{9/2})\ (\pi\ 1i_{13/2}))$.

[a] Configuration=$((\pi\ 2f_{7/2})^2)$.

[b] Configuration=$((\nu\ 2g_{9/2})\ (\nu\ 3p_{1/2})^{-1})$.

[c] From a least-squares fit to γ-ray energies.

γ(^{210}Po)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	δ[†]	$I_{(\gamma+ce)}$	Comments
20.72		2403.27	5$^+$	2382.55	4$^+$			1.8 *11*	
46.85[@] *5*		1473.34	6$^+$	1426.70	4$^+$	E2			
47.8		4371.94	13$^-$	4324.11	11$^-$			4.6 *3*	$I_{(\gamma+ce)}$: from γ-ray branchings in delayed spectra.
77.2[@] *2*		2403.27	5$^+$	2326.00	6$^+$			3.0 *8*	
83.54[@] *8*		1556.96	8$^+$	1473.34	6$^+$	E2		143 *30*	$I_{(\gamma+ce)}$: from L-conversion electron intensities and E2 multipolarity.
112.29 *10*	0.42 *7*	2438.35	7$^+$	2326.00	6$^+$				
116.47 *3*	0.63 *8*	3026.42	5$^-$	2910.05	5$^-$	M1			
123.77 *10*	0.38 *6*	2413.77	3$^+$	2290.10	2$^+$	M1,E2			
178.8 *2*	0.42[&] *15*	4502.80	(12$^-$)	4324.11	11$^-$				
178.81 *1*	0.63[&] *16*	4324.11	11$^-$	4145.41	(10)$^-$				
183.31 *3*	1.13 *14*	3182.77	10$^-$	2999.48	(9)$^-$	M1			
201.60 *3*	1.05 *15*	3111.64	4$^-$	2910.05	5$^-$	M1			I_γ: measured intensity has been reduced by 8% for contribution from the 201.8γ deexciting the 3727.3-keV level.
201.8[@] *2*	0.09	3727.28	(6)$^-$	3525.34	6$^-$				I_γ: based on Iγ(201.6γ)/Iγ(817.2γ)=0.087 in ^{210}At ε decay.
214.80 *8*	<0.2	2608.56	0$^+$	2393.76	1$^+$				Placement in the decay scheme is uncertain. γ ray was detected in experiments with 15- and 17-MeV triton projectiles only.
245.31 *1*	308 *1*	1426.70	4$^+$	1181.40	2$^+$	E2			
250.35 *3*	4.9 *3*	2438.35	7$^+$	2187.96	8$^+$	(M1)			
274.20 *7*	0.74[a] *10*	4777.28	14$^-$	4502.80	(12$^-$)				
279.89 *10*	1.1[a] *1*	5057.61	16$^+$	4777.28	14$^-$				
298.38 *10*	0.19 *3*	3727.28	(6)$^-$	3428.58	5$^-$				
316.99 *9*	0.41 *3*	3428.58	5$^-$	3111.64	4$^-$				
333.61 *2*	5.70 *12*	3182.77	10$^-$	2849.16	11$^-$	M1			
357.13 *10*	0.12 *4*	4502.80	(12$^-$)	4145.41	(10)$^-$				
402.15 *2*	1.99 *5*	3428.58	5$^-$	3026.42	5$^-$	M1			
405.5 *5*	9.9[a] *10*	4777.28	14$^-$	4371.94	13$^-$				
459.0 *3*	0.66 *30*	2845.96	(3)$^-$	2386.78	3$^-$	M1			
499.06 *7*	0.43 *8*	3525.34	6$^-$	3026.42	5$^-$	M1			
518.3[@] *2*	0.4 *2*	3428.58	5$^-$	2910.05	5$^-$				I_γ: from $\gamma\gamma$ coin.
527.4 *2*	0.19 *4*	2910.05	5$^-$	2382.55	4$^+$				
578.01 *5*	0.90 *8*	3016.47	7$^-$	2438.35	7$^+$	E1+M2	0.25 *5*		
599.51[‡] *16*	13[‡a] *4*	4971.29	(11$^-$,12$^-$)	4371.94	13$^-$				
609.94 *10*	0.51 *10*	3023.73	(2)$^-$	2413.77	3$^+$				
615.26 *4*	1.52 *9*	3525.34	6$^-$	2910.05	5$^-$	M1+E2	1.1 *2*		
622.83 *23*	0.25 *8*	3026.42	5$^-$	2403.27	5$^+$				
630.97 *1*	56.4 *2*	2187.96	8$^+$	1556.96	8$^+$	M1+E2	0.52 *5*		
636.95 *5*	1.72 *9*	3023.73	(2)$^-$	2386.78	3$^-$	M1			
639.56 *16*	0.5 *2*	3026.42	5$^-$	2386.78	3$^-$	(E2)			
661.17 *3*	2.0[&] *1*	2849.16	11$^-$	2187.96	8$^+$	E3			

From ENSDF

γ(^{210}Po) (continued)

E_γ	I_γ	E_i(level)	J^π_i	E_f	J^π_f	Mult.[†]	δ[†]	Comments
661.17 3	0.23[&] 7	3075.13	(4)$^-$	2413.77	3$^+$			
685.69 2	12.2[a] 4	5057.61	16$^+$	4371.94	13$^-$			
688.2[‡] 1	1.4[‡] 2	3075.13	(4)$^-$	2386.78	3$^-$			
690.6[#] 2	1.6[&] 3	3016.47	7$^-$	2326.00	6$^+$			
691.2[#] 2	2.8[&] 4	3094.52	4$^+$	2403.27	5$^+$	M1+E2	0.67 31	
692.4[#] 2	0.4[&] 2	3075.13	(4)$^-$	2382.55	4$^+$			
699.51[‡] 25	1.2[‡] 2	3138.00	(8)$^-$	2438.35	7$^+$	E1		
721.84 3	2.3 2	3125.13	(6)$^-$	2403.27	5$^+$	E1		
724.86 2	3.6 4	3111.64	4$^-$	2386.78	3$^-$	M1+E2	1.02 27	
728.4[#] 4	0.3 1	3111.64	4$^-$	2382.55	4$^+$			
768.9[‡] 5	0.31[‡] 13	3094.52	4$^+$	2326.00	6$^+$			
769.20 6	1.10 8	2326.00	6$^+$	1556.96	8$^+$			
780.62 3	3.49 9	3218.98	(6)$^+$	2438.35	7$^+$	M1+E2	0.59 18	
799.19 4	1.27 10	3125.13	(6)$^-$	2326.00	6$^+$	E1		
811.51 1	10.3 2	2999.48	(9)$^-$	2187.96	8$^+$	E1		
817.23 10	1.0 1	3727.28	(6)$^-$	2910.05	5$^-$	M1+E2	0.53 23	
825.44 27	0.90[a] 24	4971.29	(11$^-$,12$^-$)	4145.41	(10)$^-$			
852.66 1	29.9 3	2326.00	6$^+$	1473.34	6$^+$	M1+E2	0.59 15	
870.01 8	0.83 11	3779.91	(4,5)$^-$	2910.05	5$^-$	M1+E2	$\leq$2	
881.39 2	6.45 14	2438.35	7$^+$	1556.96	8$^+$	M1+E2	0.56 17	
899.23 14	0.58 9	2326.00	6$^+$	1426.70	4$^+$			
909.00 8	0.83 6	2382.55	4$^+$	1473.34	6$^+$			
929.93 2	7.89 16	2403.27	5$^+$	1473.34	6$^+$	M1+E2	0.72 11	
949.97 4	1.45 11	3138.00	(8)$^-$	2187.96	8$^+$	E1+M2	0.14 4	
955.84 1	14.1 2	2382.55	4$^+$	1426.70	4$^+$	M1+E2	0.47 17	
960.01 5	2.22 12	2386.78	3$^-$	1426.70	4$^+$	E1		
962.61 7	2.01 13	4145.41	(10)$^-$	3182.77	10$^-$	M1		
965.01 3	4.29 1	2438.35	7$^+$	1473.34	6$^+$	M1+E2	1.0 2	
976.55 2	7.92 14	2403.27	5$^+$	1426.70	4$^+$	M1+E2	0.61 20	
987.12 10	0.71 10	2413.77	3$^+$	1426.70	4$^+$	M1		
1030.6[‡] 5	0.27[‡] 11	3218.98	(6)$^+$	2187.96	8$^+$			
1041.7[‡] 3	0.7[‡] 2	3428.58	5$^-$	2386.78	3$^-$	(E2)		
1046.3[‡] 3	0.32[‡] 4	3428.58	5$^-$	2382.55	4$^+$			
1087.02 6	0.91 10	3525.34	6$^-$	2438.35	7$^+$	(E1+M2)	0.29 6	Mult.: α(K)exp is also consistent with pure E2 multipolarity.
1108.55 7	1.01 10	2290.10	2$^+$	1181.40	2$^+$	M1+E2	0.61 31	
1122.0[‡] 2	1.3[‡] 3	3525.34	6$^-$	2403.27	5$^+$	(E1+M2)	0.39 15	Mult.: α(K)exp is also consistent with pure E2 multipolarity.
1146.47 20	0.23 9	4145.41	(10)$^-$	2999.48	(9)$^-$	(M1)		
1181.39 1	459 2	1181.40	2$^+$	0.0	0$^+$	E2		
1201.46 13	0.96 13	2382.55	4$^+$	1181.40	2$^+$	E2		
1205.38 2	19.6 3	2386.78	3$^-$	1181.40	2$^+$	E1		

$^{210}_{84}$Po$_{126}$-3

γ(^{210}Po) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.†	δ†	Comments
1212.18 16	0.6 1	2393.76	1$^+$	1181.40	2$^+$			
1232.36 3	4.50 16	2413.77	3$^+$	1181.40	2$^+$	M1+E2	1.15 16	
1289.29 16	0.88 12	3727.28	(6)$^-$	2438.35	7$^+$			
1292.20 1	41.0 3	2849.16	11$^-$	1556.96	8$^+$	E3		
1307.26 15	0.38 8	3710.99	(5$^-$)	2403.27	5$^+$			
1312.39 20	0.30 6	3699.59	(5)$^-$	2386.78	3$^-$	E2		
1359.55 7	0.75 8	3685.39	7$^-$	2326.00	6$^+$			
1373.58 22	0.4 1	3699.59	(5)$^-$	2326.00	6$^+$			
1409.4 2	<0.3	3699.59	(5)$^-$	2290.10	2$^+$	(E3)		Mult.: M2+E3 from ce data. Level scheme requires E3. E_γ: from K-conversion electrons.
1427.2 1	0.47 23	2608.56	0$^+$	1181.40	2$^+$	E2		E_γ: from K-conversion electrons. I_γ: from $\gamma\gamma$ coin.
1436.70 2	7.5 2	2910.05	5$^-$	1473.34	6$^+$	E1		
1442.60 3	3.34 16	2999.48	(9)$^-$	1556.96	8$^+$	E1+M2	0.18 3	
1453.7 2	0.3 1	3780.19	(7)$^-$	2326.00	6$^+$	E1+M2	>0.17	
1474.94 1	8.14 2	4324.11	11$^-$	2849.16	11$^-$	M1		
1483.39 2	12.3 2	2910.05	5$^-$	1426.70	4$^+$	E1		
1497.41 5	1.62 8	3685.39	7$^-$	2187.96	8$^+$	E1		
1522.79 2	2.70 10	4371.94	13$^-$	2849.16	11$^-$	E2		
1543.14 2	4.58 11	3016.47	7$^-$	1473.34	6$^+$	E1		
1553.0 5	≤0.05	3026.42	5$^-$	1473.34	6$^+$			
1581.09 4	1.45 9	3138.00	(8)$^-$	1556.96	8$^+$	E1+M2	0.25 5	
1592.25 3	2.8 1	3780.19	(7)$^-$	2187.96	8$^+$	E1+M2	0.20 5	
1599.70 2	6.4 2	3026.42	5$^-$	1426.70	4$^+$	E1		
1625.91 6	0.85 8	3182.77	10$^-$	1556.96	8$^+$	M2+E3	0.44 32	
1648.45 3	2.64 9	3075.13	(4)$^-$	1426.70	4$^+$	E1		
1653.43 15	0.57 7	4502.80	(12$^-$)	2849.16	11$^-$	(M1)		
1664.57 7	1.76 15	2845.96	(3)$^-$	1181.40	2$^+$	E1+M2	0.25 5	
1667.9‡ 5	0.24‡ 10	3094.52	4$^+$	1426.70	4$^+$			
1684.6‡ 4	0.48‡ 15	3111.64	4$^-$	1426.70	4$^+$	E1		
1745.98 29	2.4 11	3218.98	(6)$^+$	1473.34	6$^+$	M1+E2	≈3	
1837.79 3	2.31 9	4025.78	(7,8,9$^-$)	2187.96	8$^+$			
1913.10 21	0.28 5	3094.52	4$^+$	1181.40	2$^+$	E2		
1955.14 6	0.90 6	3428.58	5$^-$	1473.34	6$^+$	E1		
2052.1 3	0.26 6	3525.34	6$^-$	1473.34	6$^+$	(E1)		
2128.08 15	0.70 6	3685.39	7$^-$	1556.96	8$^+$	E1		
2211.81 22	0.73 10	3685.39	7$^-$	1473.34	6$^+$	E1		
2226.61 14	0.50 8	3699.59	(5)$^-$	1473.34	6$^+$	E1+M2	0.61 19	
2238.17 23	0.61 8	3710.99	(5$^-$)	1473.34	6$^+$	(E1)		
2254.28 12	0.7 1	3727.28	(6)$^-$	1473.34	6$^+$	E1		
2272.86 7	1.58 9	3699.59	(5)$^-$	1426.70	4$^+$	E1		
2284.42 11	0.64 10	3710.99	(5$^-$)	1426.70	4$^+$			
2290.22 5	9.0 2	2290.10	2$^+$	0.0	0$^+$	E2		

γ(^{210}Po) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	δ[†]
2353.02 *9*	0.78 *7*	3779.91	(4,5)$^-$	1426.70	4$^+$	E1	
2393.79 *7*	1.63 *8*	2393.76	1$^+$	0.0	0$^+$	M1	
2469.11 *14*	0.61 *8*	4025.78	(7,8,9$^-$)	1556.96	8$^+$	E1+M2	>0.23
2608.56 *10*		2608.56	0$^+$	0.0	0$^+$	E0	
2767.1 *4*	0.29 *4*	4324.11	11$^-$	1556.96	8$^+$		

[†] From conversion electron data. The following transitions were used for the efficiency calibration of the electron spectrometer: 245.3γ, 631.0γ, 852.7γ, 1181.4γ, 1292.2γ, 2290.2γ, and 2393.8γ.

[‡] From γγ coin.

[#] From γγ coin.

[@] From ^{210}At ε decay.

[&] Unresolved multiplet. Intensity divided from γγ coin data.

[a] Measured at E(t)=17 MeV.

$^{210}_{84}Po_{126}$-5

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Level Scheme

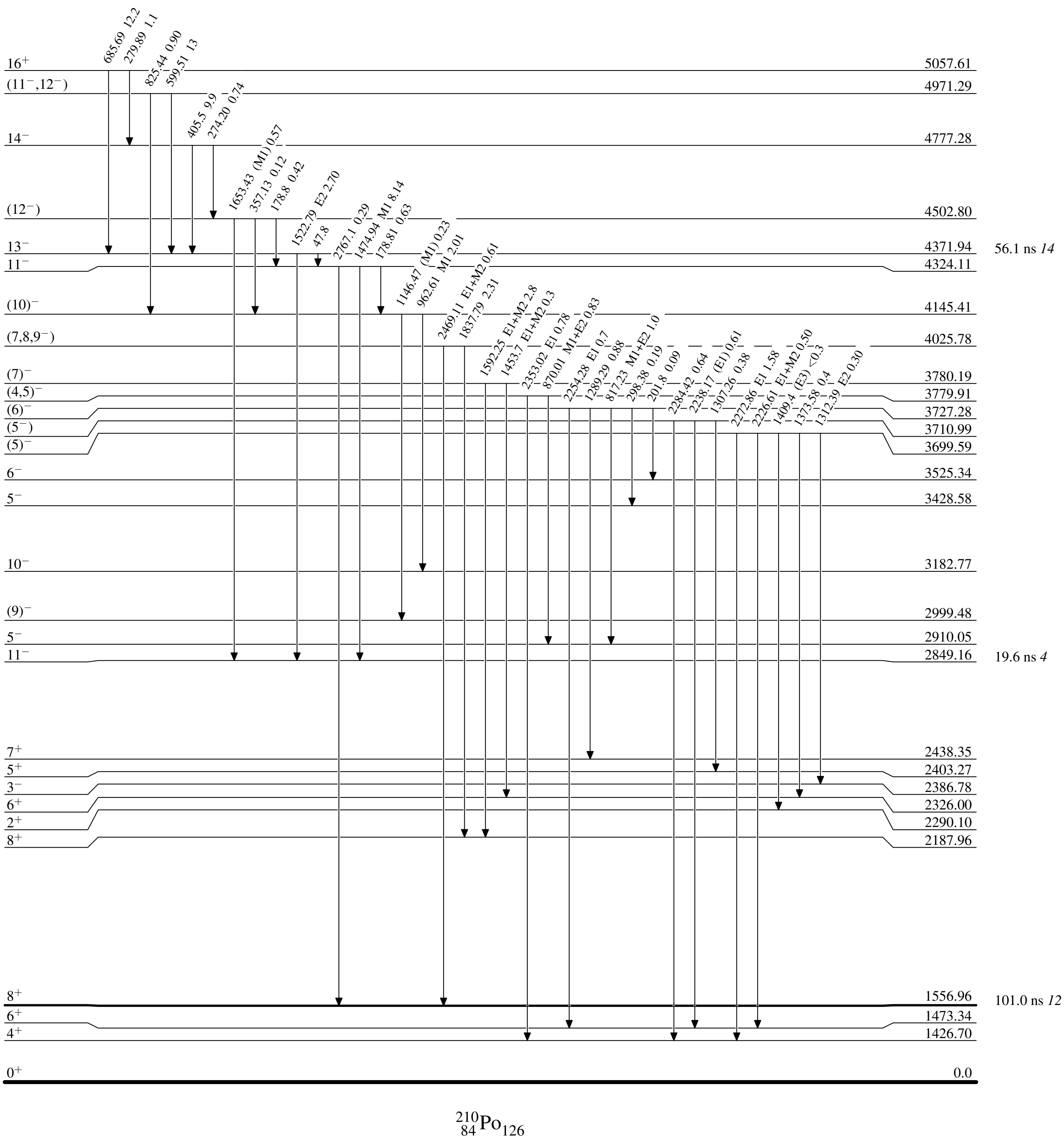
Intensities: Relative I_γ

Legend

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

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

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



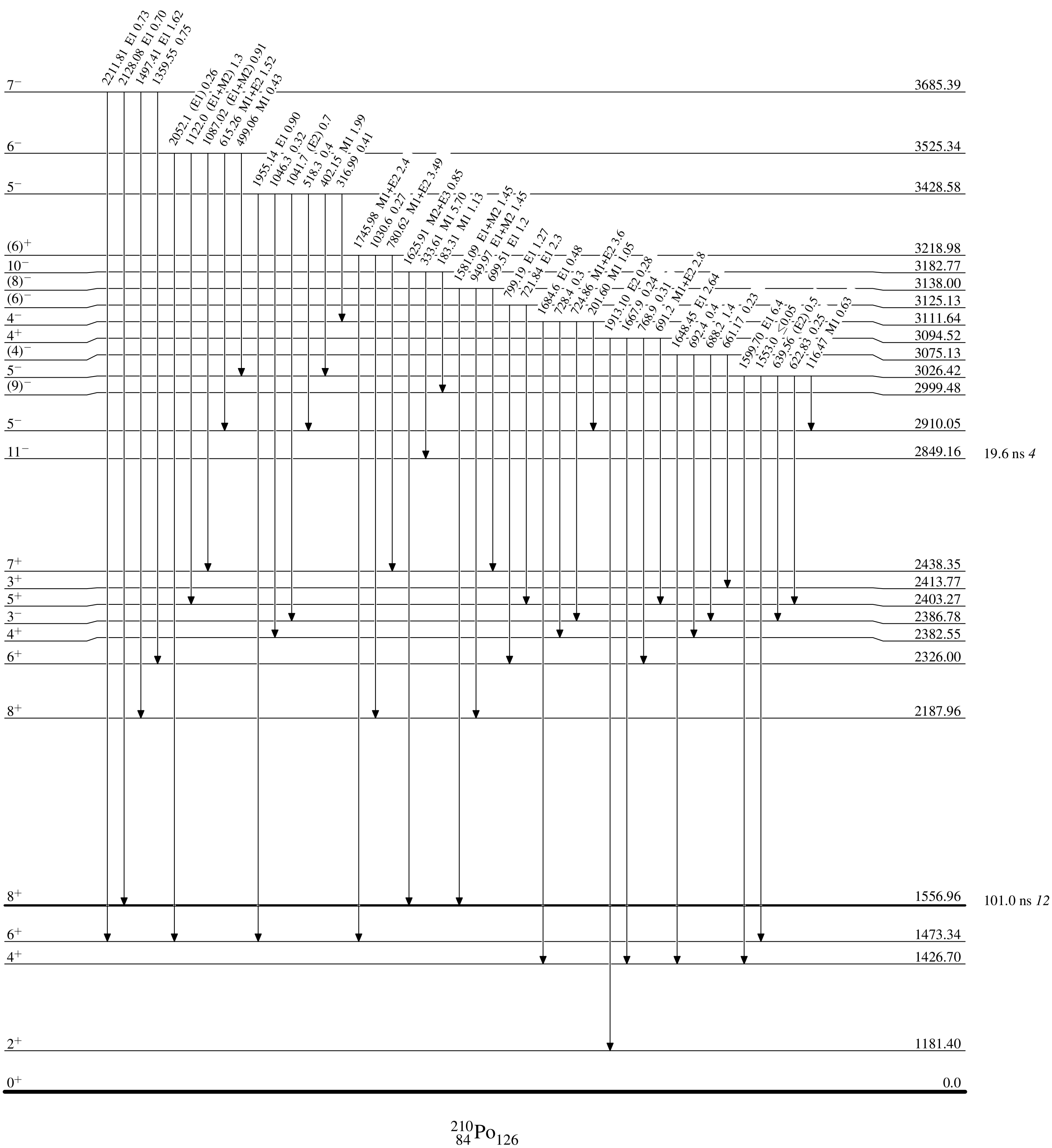
^{209}Bi(t,2nγ) 1988Ma32

Level Scheme (continued)

Intensities: Relative I_γ

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$



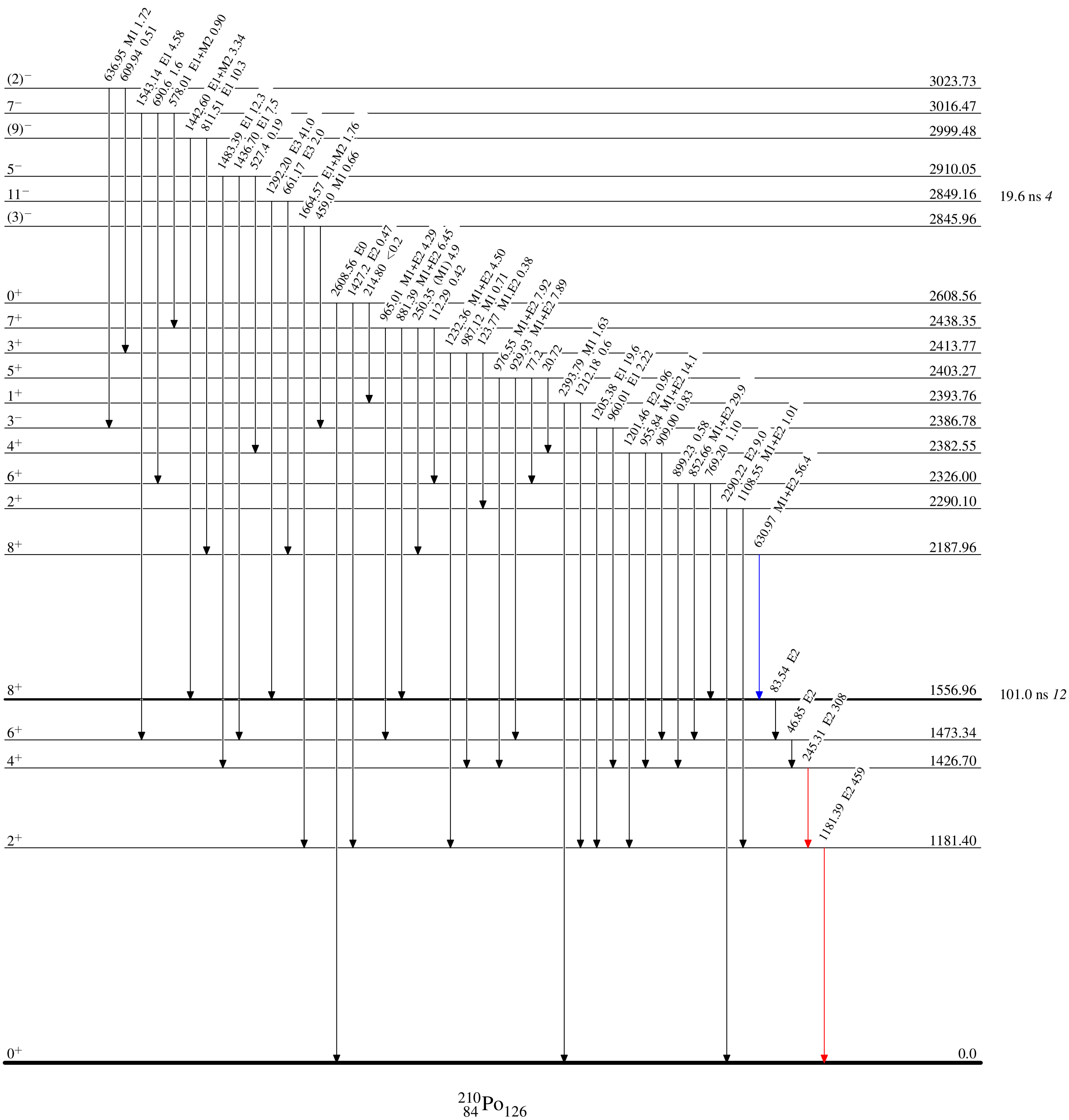
^{209}Bi(t,2nγ) 1988Ma32

Level Scheme (continued)

Intensities: Relative I_γ

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$



$^{210}_{84}Po_{126}$