^{216}Bi β^- decay (3.41 min) 2024An09,2025Li06

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. Morse	NDS 209,409 (2026)	5-Aug-2025

Parent: ^{216}Bi: E=24 *19*; J^π=(3$^-$); $T_{1/2}$=3.41 min *24*; Q(β^-)=4092 *11*; %β^- decay=100

^{216}Bi-$T_{1/2}$: Weighted average of 3.6 min *4* (1990Ru02) and 3.3 min *3* (2024An09).

^{216}Bi-Q(β^-): From 2021Wa16.

2024An09: ^{216}Bi produced by spallation of a 50-g/cm^2 UC_x target by 1.4 GeV protons at ISOLDE (CERN). Isotopes diffused out of the target and were laser ionized by RILIS, then delivered to the ISOLDE Decay Station and deposited on a tape. Four HPGe clover detectors were used for γ-rays and a plastic scintillator detected coincident β particles. Measured E_γ, I_γ, and analyzed $\beta\gamma$ and $\gamma\gamma$ coincidences; deduced decay scheme.

2025Li06: ^{216}Bi produced at ISOLDE (CERN) by spallation of a 50-g/cm^2 UC_x target by 1.4 GeV protons. Reaction products diffused out of the target and were laser ionized by RILIS and transported to a decay tape station. Four HPGe clover detectors were used for γ-ray spectroscopy, a plastic scintillator detected β particles, and two $LaBr_3$ detectors were used for γ-ray timing measurements. Measured E_γ, excited-state half-lives.

See 2014Mo02 (^{238}U fragmentation on ^{9}Be target at GSI), 2000Ku06 ($^{232}ThC_2$ spallation by 1 GeV proton beam at ISOLDE), and 1990Ru02 (thorium carbide spallation by 200 MeV proton beam at Orsay) for earlier β-decay work.

^{216}Po Levels

E(level)†	J^π‡	$T_{1/2}$‡	E(level)†	J^π‡
0.0@	0$^+$		2010.0 *3*	(1$^+$,2,3,4,5$^+$)
549.76@ *17*	2$^+$	11 ps *5*	2031.0 *3*	(2,3,4)
968.65@ *19*	(4$^+$)	21 ps *5*	2075.2# *3*	(2,3,4,5$^+$)
1130.60 *20*	(2,3,4)		2083.5? *6*	(1$^+$,2,3,4,5$^+$)
1328.2@ *3*	(6$^+$)	31 ps *5*	2114.5 *4*	(1$^+$,2,3,4,5$^+$)
1363.91 *19*	(1$^+$,2$^+$)		2179.7 *3*	(2$^+$,3,4$^+$)
1404.5 *3*	(1$^+$,2,3,4,5$^+$)		2282.6# *4*	(2,3,4,5$^+$)
1503.34 *21*	(2$^+$,3,4$^+$)		2406.6?# *3*	(1$^+$,2,3,4,5$^+$)
1525.4 *3*	(1$^+$,2,3,4,5$^+$)		2446.19# *25*	(1$^+$,2,3,4,5$^+$)
1627.1 *3*	(1$^+$,2,3,4,5$^+$)		2476.3 *5*	(1$^+$,2,3,4,5$^+$)
1676.0 *3*	(1$^+$,2,3,4$^+$)		2479.2# *4*	(1$^+$,2,3,4,5$^+$)
1709.71 *20*	(2$^+$,3,4$^+$)		2570.66 *25*	(2$^+$,3,4$^+$)
1727.19 *21*	(2$^+$,3,4$^+$)		2609.7 *4*	(1$^+$,2,3,4)
1792.25 *23*	(2$^+$,3,4$^+$)		2683.91 *23*	(2$^+$,3,4$^+$)
1797.5 *4*	(1$^+$,2,3,4,5$^+$)		2820.6 *3*	(2,3,4)
1818.08# *23*	(1$^+$,2,3,4,5$^+$)		2864.4 *3*	(2,3,4)
1875.73 *23*	(1$^+$,2,3,4,5$^+$)		3096.3? *9*	(1$^+$,2,3,4,5$^+$)
1908.26 *22*	(2$^+$,3,4$^+$)		3136.1? *3*	(2,3,4)
1911.8# *3*	(2,3,4,5$^+$)		3166.5? *8*	(2,3,4)
1916.8 *3*	(1$^+$,2,3,4,5$^+$)		3290.3 *6*	(2,3,4)
1964.35 *23*	(2$^+$,3,4$^+$)		3333.9 *4*	(2$^+$,3,4$^+$)
1970.6# *3*	(1$^+$,2,3,4,5$^+$)		3395.9 *5*	(2,3,4)

† From a least-squares fit to E_γ.

‡ From Adopted Levels.

Possibly due to decay of ^{216}Bi (8$^-$) state.

@ Seq.(A): Yrast sequence.

^{216}Bi β^- decay (3.41 min) 2024An09,2025Li06 (continued)

β^- radiations

av Eβ: Additional information 1.

E(decay)	E(level)	Iβ^-[†]	Log *ft*	Comments
(720 *22*)	3395.9	0.09 *4*	7.06 *20*	av Eβ=214.5 *39*
(782 *22*)	3333.9	0.28 *5*	6.69 *9*	av Eβ=236.7 *40*
(826 *22*)	3290.3	0.16 *5*	7.02 *14*	av Eβ=252.6 *40*
(950 *22*)	3166.5?	0.26 *13*	7.03 *22*	av Eβ=298.4 *41*
(980 *22*)	3136.1?	0.124 *13*	7.40 *6*	av Eβ=309.7 *41*
(1020 *22*)	3096.3?	0.11 *5*	7.51 *20*	av Eβ=324.8 *42*
(1252 *22*)	2864.4	0.43 *5*	7.24 *6*	av Eβ=414.3 *43*
(1295 *22*)	2820.6	1.05 *15*	6.91 *7*	av Eβ=431.3 *43*
(1432 *22*)	2683.91	0.65 *4*	7.280 *42*	av Eβ=485.7 *44*
(1506 *22*)	2609.7	0.31 *8*	7.68 *12*	av Eβ=515.5 *44*
(1545 *22*)	2570.66	1.11 *16*	7.17 *7*	av Eβ=531.3 *45*
(1637 *22*)	2479.2	0.50 *11*	7.61 *10*	av Eβ=568.7 *45*
(1640 *22*)	2476.3	0.49 *10*	7.62 *9*	av Eβ=569.9 *45*
(1670 *22*)	2446.19	0.61 *9*	7.56 *7*	av Eβ=582.2 *45*
(1709 *22*)	2406.6?	0.49 *12*	7.69 *11*	av Eβ=598.2 *45*
(1833 *22*)	2282.6	0.53 *11*	7.77 *10*	av Eβ=649.3 *46*
(1936 *22*)	2179.7	1.62 *22*	7.38 *7*	av Eβ=692.0 *46*
(2002 *22*)	2114.5	0.83 *16*	7.72 *9*	av Eβ=719.6 *46*
(2033 *22*)	2083.5?	0.26 *9*	8.25 *15*	av Eβ=732.5 *46*
(2041 *22*)	2075.2	0.74 *4*	7.807 *39*	av Eβ=735.9 *46*
(2085 *22*)	2031.0	2.9 *6*	7.25 *10*	av Eβ=754.3 *46*
(2106 *22*)	2010.0	0.40 *13*	8.13 *14*	av Eβ=763.1 *46*
(2145 *22*)	1970.6	0.97 *18*	7.77 *9*	av Eβ=779.5 *46*
(2152 *22*)	1964.35	1.33 *6*	7.641 *37*	av Eβ=782.5 *46*
(2199 *22*)	1916.8	1.16 *20*	7.74 *8*	av Eβ=802.3 *46*
(2204 *22*)	1911.8	0.94 *8*	7.832 *48*	av Eβ=804.4 *46*
(2208 *22*)	1908.26	3.4 *4*	7.28 *6*	av Eβ=806.1 *46*
(2240 *22*)	1875.73	2.46 *24*	7.44 *5*	av Eβ=819.6 *46*
(2298 *22*)	1818.08	1.10 *24*	7.83 *10*	av Eβ=844.1 *47*
(2319 *22*)	1797.5	0.68 *14*	8.06 *9*	av Eβ=853.0 *47*
(2324 *22*)	1792.25	5.3 *3*	7.171 *39*	av Eβ=855.1 *47*
(2389 *22*)	1727.19	13.9 *3*	6.799 *32*	av Eβ=882.7 *47*
(2406 *22*)	1709.71	13.4 *4*	6.827 *33*	av Eβ=890.0 *47*
(2440 *22*)	1676.0	2.1 *3*	7.66 *7*	av Eβ=904.4 *47*
(2489 *22*)	1627.1	2.2 *4*	7.67 *8*	av Eβ=925.3 *47*
(2591 *22*)	1525.4	1.36 *24*	7.95 *8*	av Eβ=968.8 *47*
(2613 *22*)	1503.34	7.9 *4*	7.197 *38*	av Eβ=978.2 *47*
(2712 *22*)	1404.5	3.30 *10*	7.640 *33*	av Eβ=1020.6 *47*
(2752 *22*)	1363.91	3.04 *15*	7.701 *37*	av Eβ=1037.8 *47*
(2985 *22*)	1130.60	5.4 *19*	7.59 *16*	av Eβ=1138.0 *47*
(3147 *22*)	968.65	9.5 *11*	7.44 *6*	av Eβ=1208.0 *48*
(3566 *22*)	549.76	6.9 *21*	7.80 *14*	av Eβ=1389.6 *48*

[†] Absolute intensity per 100 decays.

^{216}Bi β^- decay (3.41 min) 2024An09,2025Li06 (continued)

$\gamma(^{216}Po)$

Iγ normalization: Calculated assuming no β-decay to the ground state and that $\Sigma I_\gamma(1+\alpha)$ to the ground state equals 100%.

E_γ	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[‡]	Comments
206.4 *3*	0.96 *23*	1709.71	$(2^+,3,4^+)$	1503.34	$(2^+,3,4^+)$			%Iγ=0.93 *22*
223.7 *2*	0.82 *16*	1727.19	$(2^+,3,4^+)$	1503.34	$(2^+,3,4^+)$			%Iγ=0.79 *15*
305.2[@] *2*	0.38 *7*	1709.71	$(2^+,3,4^+)$	1404.5	$(1^+,2,3,4,5^+)$			%Iγ=0.37 *7*
345.7 *2*	0.76 *11*	1709.71	$(2^+,3,4^+)$	1363.91	$(1^+,2^+)$			%Iγ=0.74 *11*
359.6 *2*		1328.2	(6^+)	968.65	(4^+)	(E2)	0.0748 *11*	α(K)=0.0447 *6*; α(L)=0.02254 *32*; α(M)=0.00579 *8*; α(N)=0.001487 *21*; α(O)=0.000292 *4* α(P)=3.01×10^{-5} *4*
372.6 *2*	0.82 *12*	1503.34	$(2^+,3,4^+)$	1130.60	(2,3,4)			%Iγ=0.79 *12*
418.8 *2*	43.7 *7*	968.65	(4^+)	549.76	2^+	(E2)	0.0498 *7*	%Iγ=42.3 *7* α(K)=0.0321 *5*; α(L)=0.01328 *19*; α(M)=0.00338 *5*; α(N)=0.000868 *12*; α(O)=0.0001717 *24* α(P)=1.823×10^{-5} *26*
428.4[@] *3*	0.24 *5*	1792.25	$(2^+,3,4^+)$	1363.91	$(1^+,2^+)$			%Iγ=0.23 *5*
534.9 *3*	1.33 *13*	1503.34	$(2^+,3,4^+)$	968.65	(4^+)			%Iγ=1.29 *13*
544.4 *3*	0.24 *5*	1908.26	$(2^+,3,4^+)$	1363.91	$(1^+,2^+)$			%Iγ=0.23 *5*
549.8 *2*	100	549.76	2^+	0.0	0^+	(E2)	0.0257 *4*	%Iγ=96.8 α(K)=0.01826 *26*; α(L)=0.00560 *8*; α(M)=0.001399 *20*; α(N)=0.000359 *5*; α(O)=7.20×10^{-5} *10* α(P)=8.04×10^{-6} *11*
556.8 *2*	1.44 *25*	1525.4	$(1^+,2,3,4,5^+)$	968.65	(4^+)			%Iγ=1.39 *24*
579.1 *2*	1.6 *3*	1709.71	$(2^+,3,4^+)$	1130.60	(2,3,4)			%Iγ=1.55 *29*
580.2[@] *3*	0.32 *12*	1908.26	$(2^+,3,4^+)$	1328.2	(6^+)			%Iγ=0.31 *12*
580.9 *2*	12.2 *19*	1130.60	(2,3,4)	549.76	2^+			%Iγ=11.8 *18*
596.8 *2*	1.12 *6*	1727.19	$(2^+,3,4^+)$	1130.60	(2,3,4)			%Iγ=1.08 *6*
628.1 *2*	0.43 *7*	2446.19	$(1^+,2,3,4,5^+)$	1818.08	$(1^+,2,3,4,5^+)$			%Iγ=0.42 *7*
658.5 *2*	2.3 *4*	1627.1	$(1^+,2,3,4,5^+)$	968.65	(4^+)			%Iγ=2.2 *4*
660.9 *3*	0.23 *4*	2479.2	$(1^+,2,3,4,5^+)$	1818.08	$(1^+,2,3,4,5^+)$			%Iγ=0.22 *4*
684.0 *4*	0.32 *8*	2476.3	$(1^+,2,3,4,5^+)$	1792.25	$(2^+,3,4^+)$			%Iγ=0.31 *8*
687.5 *2*	0.78 *15*	1818.08	$(1^+,2,3,4,5^+)$	1130.60	(2,3,4)			%Iγ=0.76 *15*
741.1 *2*	3.32 *5*	1709.71	$(2^+,3,4^+)$	968.65	(4^+)			%Iγ=3.21 *5*
745.0 *2*	0.80 *3*	1875.73	$(1^+,2,3,4,5^+)$	1130.60	(2,3,4)			%Iγ=0.774 *29*
758.6 *2*	12.23 *12*	1727.19	$(2^+,3,4^+)$	968.65	(4^+)			%Iγ=11.84 *12*
814.1 *2*	3.06 *5*	1363.91	$(1^+,2^+)$	549.76	2^+			%Iγ=2.96 *5*
815.6 *6*	0.68 *3*	2179.7	$(2^+,3,4^+)$	1363.91	$(1^+,2^+)$			%Iγ=0.658 *29*
823.6 *2*	4.02 *6*	1792.25	$(2^+,3,4^+)$	968.65	(4^+)			%Iγ=3.89 *6*
849.3 *2*	1.04 *18*	1818.08	$(1^+,2,3,4,5^+)$	968.65	(4^+)			%Iγ=1.01 *17*
854.5 *4*	0.15 *4*	2864.4	(2,3,4)	2010.0	$(1^+,2,3,4,5^+)$			%Iγ=0.15 *4*
854.7 *2*	3.87 *7*	1404.5	$(1^+,2,3,4,5^+)$	549.76	2^+			%Iγ=3.75 *7*
939.6 *2*	1.31 *4*	1908.26	$(2^+,3,4^+)$	968.65	(4^+)			%Iγ=1.27 *4*
943.2 *2*	1.00 *8*	1911.8	$(2,3,4,5^+)$	968.65	(4^+)			%Iγ=0.97 *8*
953.5 *2*	7.78 *9*	1503.34	$(2^+,3,4^+)$	549.76	2^+			%Iγ=7.53 *9*
995.7 *2*	0.71 *5*	1964.35	$(2^+,3,4^+)$	968.65	(4^+)			%Iγ=0.69 *5*

Continued on next page (footnotes at end of table)

^{216}Bi β^- decay (3.41 min) 2024An09,2025Li06 (continued)

$\gamma(^{216}Po)$ (continued)

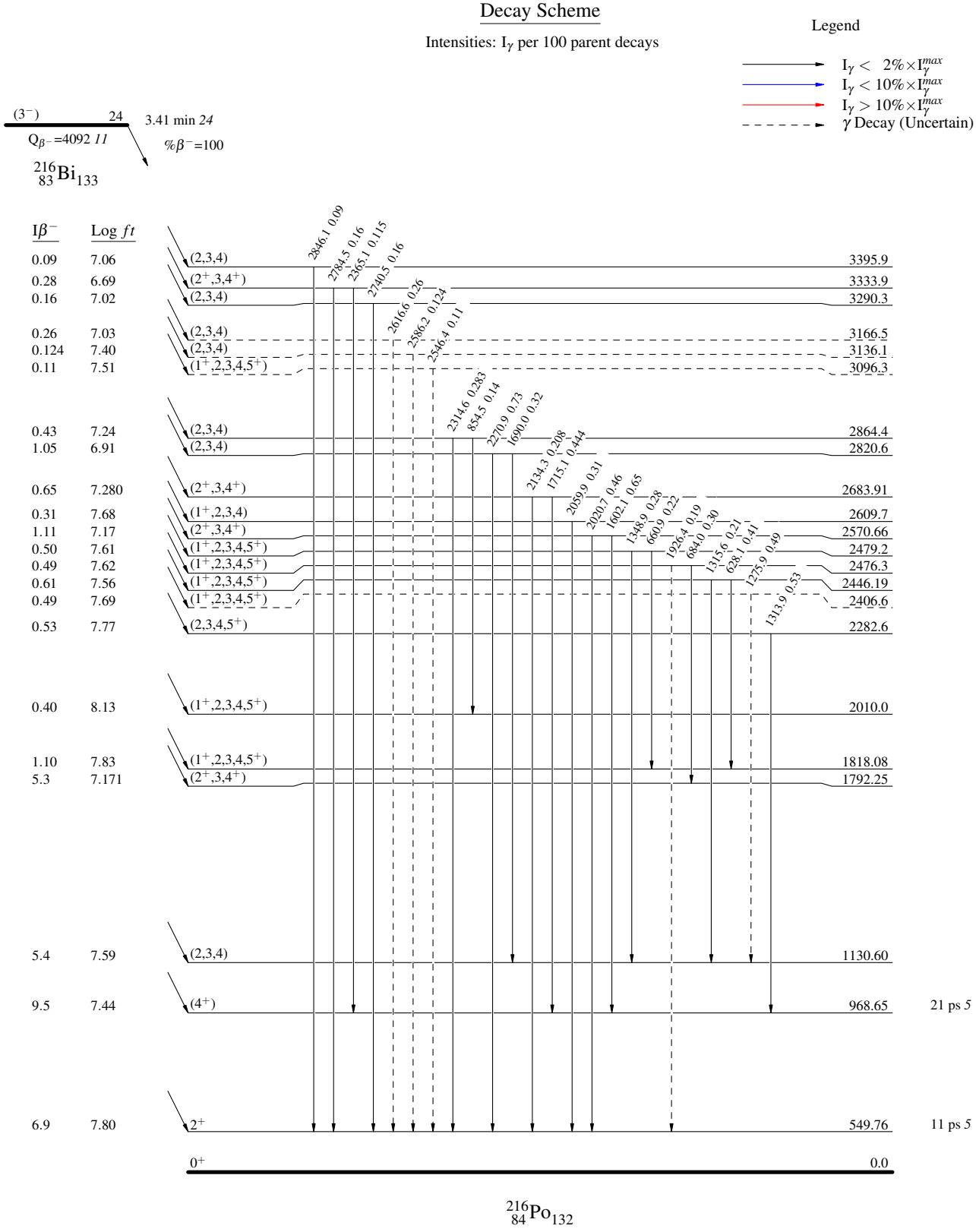
E_γ	I_γ [#]	E_i(level)	J_i^π	E_f	J_f^π	Comments
1002.0 *2*	1.03 *19*	1970.6	$(1^+,2,3,4,5^+)$	968.65	(4^+)	%Iγ=1.00 *18*
1062.4 *2*	2.9 *6*	2031.0	(2,3,4)	968.65	(4^+)	%Iγ=2.8 *6*
1106.6 *2*	0.78 *4*	2075.2	$(2,3,4,5^+)$	968.65	(4^+)	%Iγ=0.76 *4*
1126.2 *2*	1.7 *3*	1676.0	$(1^+,2,3,4^+)$	549.76	2^+	%Iγ=1.65 *29*
1160.0 *2*	7.05 *8*	1709.71	$(2^+,3,4^+)$	549.76	2^+	%Iγ=6.82 *8*
1177.3 *2*	0.55 *22*	1727.19	$(2^+,3,4^+)$	549.76	2^+	%Iγ=0.53 *21*
1211.0 *3*	0.53 *19*	2179.7	$(2^+,3,4^+)$	968.65	(4^+)	%Iγ=0.51 *18*
1242.5 *2*	1.7 *3*	1792.25	$(2^+,3,4^+)$	549.76	2^+	%Iγ=1.65 *29*
1247.7 *3*	0.72 *14*	1797.5	$(1^+,2,3,4,5^+)$	549.76	2^+	%Iγ=0.70 *14*
1275.9[@] *3*	0.52 *12*	2406.6?	$(1^+,2,3,4,5^+)$	1130.60	(2,3,4)	%Iγ=0.50 *12*
1313.9 *3*	0.56 *11*	2282.6	$(2,3,4,5^+)$	968.65	(4^+)	%Iγ=0.54 *11*
1315.6 *2*	0.22 *5*	2446.19	$(1^+,2,3,4,5^+)$	1130.60	(2,3,4)	%Iγ=0.21 *5*
1326.1 *2*	1.44 *25*	1875.73	$(1^+,2,3,4,5^+)$	549.76	2^+	%Iγ=1.39 *24*
1348.9 *4*	0.3 *1*	2479.2	$(1^+,2,3,4,5^+)$	1130.60	(2,3,4)	%Iγ=0.29 *10*
1358.5 *2*	1.7 *3*	1908.26	$(2^+,3,4^+)$	549.76	2^+	%Iγ=1.65 *29*
1363.8 *3*	2.08 *6*	1363.91	$(1^+,2^+)$	0.0	0^+	%Iγ=2.01 *6*
1367.0 *2*	1.23 *21*	1916.8	$(1^+,2,3,4,5^+)$	549.76	2^+	%Iγ=1.19 *20*
1414.6 *2*	0.70 *4*	1964.35	$(2^+,3,4^+)$	549.76	2^+	%Iγ=0.68 *4*
1460.3 *3*	0.57 *13*	2010.0	$(1^+,2,3,4,5^+)$	549.76	2^+	%Iγ=0.55 *13*
1481.8[@] *5*	0.13 *7*	2031.0	(2,3,4)	549.76	2^+	%Iγ=0.13 *7*
1503.4[@] *2*	0.20 *3*	1503.34	$(2^+,3,4^+)$	0.0	0^+	%Iγ=0.194 *29*
1533.6[@] *6*	0.27 *9*	2083.5?	$(1^+,2,3,4,5^+)$	549.76	2^+	%Iγ=0.26 *9*
1564.7 *3*	0.88 *17*	2114.5	$(1^+,2,3,4,5^+)$	549.76	2^+	%Iγ=0.85 *16*
1602.1 *2*	0.69 *13*	2570.66	$(2^+,3,4^+)$	968.65	(4^+)	%Iγ=0.67 *13*
1630.0 *5*	0.51 *13*	2179.7	$(2^+,3,4^+)$	549.76	2^+	%Iγ=0.49 *13*
1676.1[@] *2*	0.52 *3*	1676.0	$(1^+,2,3,4^+)$	0.0	0^+	%Iγ=0.503 *29*
1690.0 *3*	0.34 *7*	2820.6	(2,3,4)	1130.60	(2,3,4)	%Iγ=0.33 *7*
1710.0[@] *2*	0.13 *2*	1709.71	$(2^+,3,4^+)$	0.0	0^+	%Iγ=0.126 *19*
1715.1 *2*	0.47 *3*	2683.91	$(2^+,3,4^+)$	968.65	(4^+)	%Iγ=0.455 *29*
1875.9[@] *2*	0.36 *3*	1875.73	$(1^+,2,3,4,5^+)$	0.0	0^+	%Iγ=0.348 *29*
1926.4[@] *3*	0.20 *6*	2476.3	$(1^+,2,3,4,5^+)$	549.76	2^+	%Iγ=0.19 *6*
2020.7 *3*	0.49 *10*	2570.66	$(2^+,3,4^+)$	549.76	2^+	%Iγ=0.47 *10*
2059.9 *3*	0.33 *8*	2609.7	$(1^+,2,3,4)$	549.76	2^+	%Iγ=0.32 *8*
2134.3 *2*	0.22 *3*	2683.91	$(2^+,3,4^+)$	549.76	2^+	%Iγ=0.213 *29*
2270.9 *3*	0.77 *14*	2820.6	(2,3,4)	549.76	2^+	%Iγ=0.75 *14*
2314.6 *2*	0.30 *2*	2864.4	(2,3,4)	549.76	2^+	%Iγ=0.290 *19*
2365.1 *3*	0.122 *16*	3333.9	$(2^+,3,4^+)$	968.65	(4^+)	%Iγ=0.118 *15*
2546.4[@] *9*	0.12 *5*	3096.3?	$(1^+,2,3,4,5^+)$	549.76	2^+	%Iγ=0.12 *5*
2586.2[@] *3*	0.131 *13*	3136.1?	(2,3,4)	549.76	2^+	%Iγ=0.127 *13*
2616.6[@] *8*	0.28 *13*	3166.5?	(2,3,4)	549.76	2^+	%Iγ=0.27 *13*
2740.5 *5*	0.17 *5*	3290.3	(2,3,4)	549.76	2^+	%Iγ=0.16 *5*
2784.5 *5*	0.17 *5*	3333.9	$(2^+,3,4^+)$	549.76	2^+	%Iγ=0.16 *5*
2846.1 *4*	0.10 *4*	3395.9	(2,3,4)	549.76	2^+	%Iγ=0.10 *4*

[†] From Adopted Gammas.
[‡] Additional information 2.
[#] For absolute intensity per 100 decays, multiply by 0.9446 *8*.
[@] Placement of transition in the level scheme is uncertain.

^{216}Bi β^- decay (3.41 min) 2024An09,2025Li06

Decay Scheme

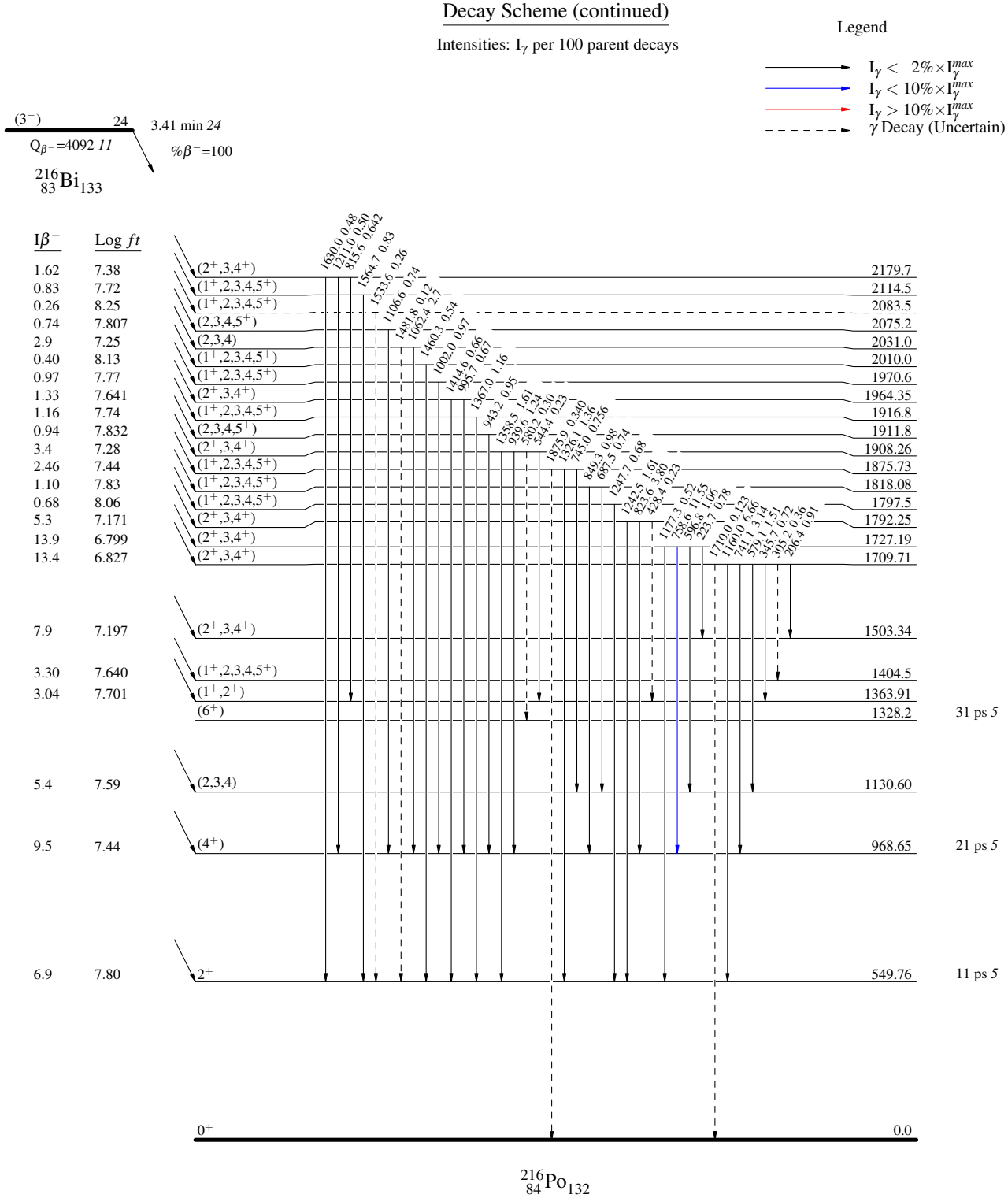
Intensities: I_γ per 100 parent decays



^{216}Bi β^- decay (3.41 min) 2024An09,2025Li06

Decay Scheme (continued)

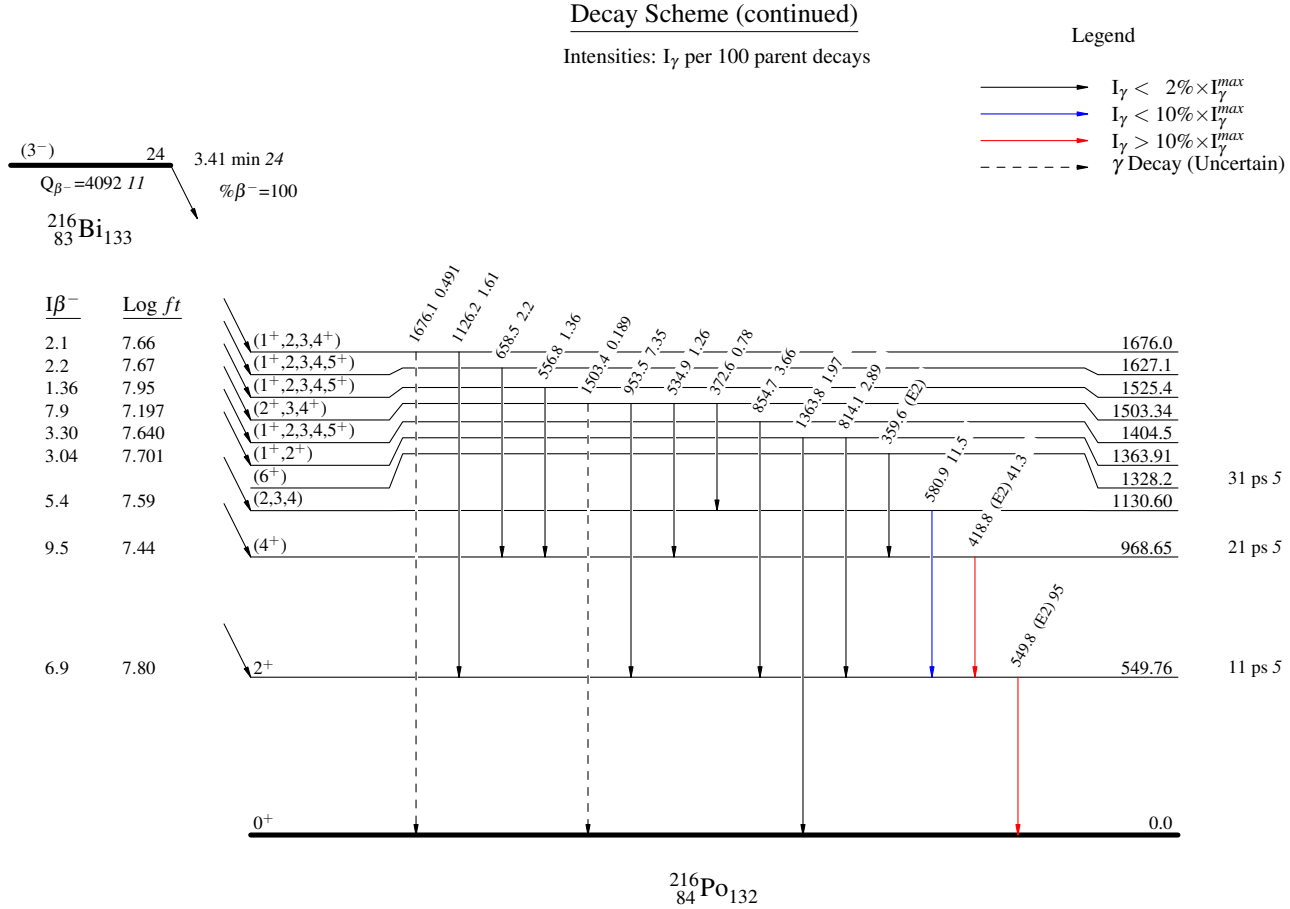
Intensities: I_γ per 100 parent decays



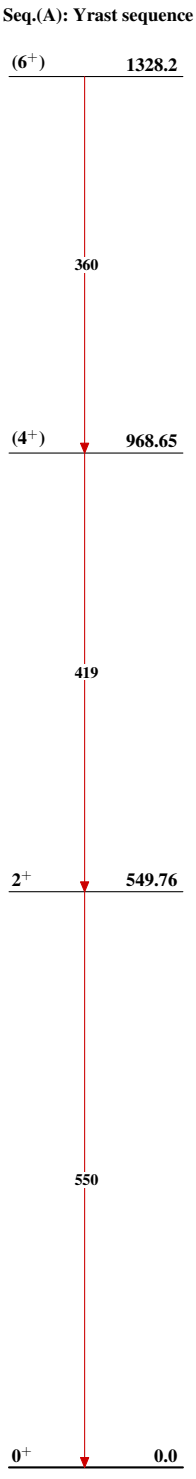
^{216}Bi β^- decay (3.41 min) 2024An09,2025Li06

Decay Scheme (continued)

Intensities: I_γ per 100 parent decays



^{216}Bi β^- decay (3.41 min) 2024An09,2025Li06



$^{216}_{84}Po_{132}$