Adopted Levels, Gammas

History

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

Q(β^-)=−3954 *21*; S(n)=8484 *10*; S(p)=2702 *5*; Q(α)=5756.9 *20* 2012Wa38
S(2n)=15798 *13*, S(2p)=7406 *6*, Q(εp)=−1302 *5*, Q(β^-n)=−11298 *12* (2012Wa38).
Additional information 1.

^{209}At Levels

Additional information 2.

Cross Reference (XREF) Flags

A	^{209}Rn ε decay	E	^{209}Bi(π^+,π^-)
B	^{213}Fr α decay	F	^{209}Bi(^{3}He,3nγ)
C	^{205}Tl(^{9}Be,5nγ)	G	^{209}Bi(α,4nγ)
D	^{206}Pb(^{6}Li,3nγ)		

E(level)†	J$^\pi$	T$_{1/2}$	XREF	Comments
0	9/2$^-$	5.42 h *5*	ABCD FG	%α=4.1 *5*; %ε+%β^+=95.9 *5* J$^\pi$: favored α-decay (HF=1.2) to ^{205}Bi g.s. (J$^\pi$=9/2$^-$). T$_{1/2}$: weighted average of 5.41 h *5* (1968GuZX), 5.5 h *2* (1951Ba14) and 5.4 h *5* (1969Go23). %α: from 1968GuZX. Q: Q(^{209}At)/Q(^{210}At)=1.47 *7* from (α,4nγ) (1983Ha51) . configuration=$\pi(1h_{9/2})^{+1}$. Eα(decay to ^{205}Bi g.s.)=5647 *2* (1969Go23).
408.37 *3*	7/2$^-$		AB D F	J$^\pi$: 408.32γ E2(+M1) to 9/2$^-$, direct feeding in ^{209}Rn ε decay (J$^\pi$=5/2$^-$), $\gamma\gamma(\theta)$ from ^{209}Rn ε decay rules out J=5/2. Additional information 3.
577.08 *7*	11/2$^-$		AB D FG	J$^\pi$: 577.07γ M1+E2 to 9/2$^-$, 147.97γ M1(+E2) from 13/2$^-$. configuration=$\pi(1h_{9/2})^{+1}\otimes 2^+$.
725.07 *8*	13/2$^-$		CD FG	J$^\pi$: 725.05γ stretched E2 to 9/2$^-$. configuration=$\pi(1h_{9/2})^{+1}\otimes 2^+$.
745.81 *4*	7/2$^-$		A D F	J$^\pi$: 745.78γ M1(+E2) to 9/2$^-$ and direct feeding in ^{209}Rn ε decay (J$^\pi$=5/2$^-$). Additional information 4.
789.07 *21*	(9/2)$^-$		D F	J$^\pi$: 380.7γ M1(+E2) to 7/2$^-$, no direct feeding in ^{209}Rn ε decay (J$^\pi$=5/2$^-$).
794.62 *5*	5/2$^-$		A F	J$^\pi$: 794.68γ E2 to 9/2$^-$, 386.43γ (M1) to 7/2$^-$, probable direct feeding in ^{209}Rn ε decay (J$^\pi$=5/2$^-$).
934.51? *13*	(7/2)$^-$		A	J$^\pi$: 526.8γ M1+E2 to 7/2$^-$, 357.38γ to 11/2$^-$, probable direct feeding in ^{209}Rn ε decay (J$^\pi$=5/2$^-$).
1081.22 *5*	(5/2,7/2)$^-$		A F	J$^\pi$: 672.84γ E2(+M1) to 7/2$^-$, 1082γ to 9/2$^-$, probable direct feeding in ^{209}Rn ε decay (J$^\pi$=5/2$^-$).
1093.13 *16*	(7/2)$^-$		A	J$^\pi$: 684.75γ (E0+M1+E2) to 7/2$^-$, probable direct feeding in ^{209}Rn ε decay (J$^\pi$=5/2$^-$).
1097.74 *5*	(7/2)$^-$		A F	J$^\pi$: 689.30γ M1(+E2) to 7/2$^-$, probable direct feeding in ^{209}Rn ε decay (J$^\pi$=5/2$^-$), (698γ)(408γ)(θ) from 1985BuZT in ^{209}Rn ε decay, given δ(408γ)>10 and δ(698γ)<0.28, is consistent with J=7/2 and 9/2, not with J=5/2.
1131.11 *11*	(5/2,7/2)$^-$		A F	J$^\pi$: 722.74γ M1(+E2) to 7/2$^-$, probable direct feeding in ^{209}Rn ε decay (J$^\pi$=5/2$^-$).
1214.28 *13*	11/2$^-$,13/2$^-$		D F	J$^\pi$: 489.2γ M1(+E2) to 13/2$^-$, 637.2γ M1(+E2) to 11/2$^-$ and 1214.3γ to 9/2$^-$.
1242.36 *11*	(13/2$^-$)		D F	J$^\pi$: 517.2γ (E2) to 13/2$^-$, 665.3γ (M1) to 11/2$^-$; strong population of this level

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Adopted Levels, Gammas (continued)

^{209}At Levels (continued)

E(level)[†]	Jπ	$T_{1/2}$	XREF	Comments
				in (^{6}Li,3nγ) argues against Jπ=9/2$^-$.
1269.84 *17*	(11/2,13/2)$^-$		F	Jπ: 692.8γ M1+E2 to 11/2$^-$.
1321.57 *13*	17/2$^-$		CD FG	Jπ: 596.50γ stretched E2 to 13/2$^-$. configuration=π(1h$_{9/2}$)$^{+3}$.
1339.57 *22*	(13/2,15/2)$^-$		F	Jπ: 614.5γ M1+E2 to 13/2$^-$.
1393.57 *13*	(13/2,15/2)$^-$		F	Jπ: 668.5γ M1 to 13/2$^-$.
1394.16 *6*	(7/2)$^-$		A	Jπ: 1394.50γ E2(+M1) to 9/2$^-$, direct feeding in ^{209}Rn ε decay (Jπ=5/2$^-$).
1427.67 *16*	21/2$^-$	25.3 ns *7*	CD FG	μ=+9.9 *2*; Q=0.78 *8* Jπ: 106.10γ stretched E2 to 17/2$^-$. $T_{1/2}$: weighted average of 29 ns *2* (1976Sj01) from (^{6}Li,3nγ), and 25 ns *1* (1975Be39) and 24 ns *2* (1983Ma08) from (α,4nγ), 24 ns *2* from 1985Ra21 from (^{3}He,3nγ). μ: from g-factor=+0.94 *2* weighted average of +0.88 *6* (1975Be39) in ^{209}Bi(α,4nγ) and +0.95 *2* (1976Sj01) in ^{206}Pb(^{6}Li,3nγ). Q: from 1983Ma08 in (α,4nγ) by TDPAD. configuration=π(1h$_{9/2}$)$^{+3}$.
1516.90 *14*			F	
1659.97 *22*			F	
1772.56 *13*	(15/2$^-$)		D F	Jπ: 530.2γ M1+E2 to (13/2$^-$).
1851.72 *19*	23/2$^-$		CD FG	Jπ: 424.5γ stretched M1 to 21/2$^-$. configuration=π(1h$^{2}_{9/2}$,2f$^{1}_{7/2}$)$^{+3}$.
1907.27 *16*	(19/2)$^-$‡		FG	Jπ: 585.7γ M1+E2 to 17/2$^-$.
1953.52 *6*	7/2$^+$		A	Jπ: direct feeding in ^{209}Rn ε decay (Jπ=5/2$^-$), 855.77γ E1 to (7/2)$^-$, 1954.3γ to 9/2$^-$.
2075.87 *24*	(19/2$^-$)‡		FG	configuration=π(1h$^{2}_{9/2}$,2f$^{1}_{7/2}$)$^{+3}$. Jπ: 754.3γ (M1) to 17/2$^-$.
2086.36 *24*			F	
2135.81 *6*	(5/2,7/2)$^+$		A	Jπ: 1037.95γ E1(+M2) to (7/2)$^-$, probable direct feeding in ^{209}Rn ε decay (Jπ=5/2$^-$).
2183.2 *6*	(23/2$^-$)		G	Jπ: 755.5γ (M1) to 21/2$^-$.
2238.3 *3*	25/2$^-$‡		FG	Jπ: 810.6γ stretched E2 to 21/2$^-$ and 386.6γ D+Q to 23/2$^-$. configuration=π(1h$_{9/2}$)$^{+3}$⊗2$^+$.
2402.8 *6*	(21/2$^-$)		G	Jπ: 326.9γ (M1) to (19/2$^-$).
2415.01 *9*	5/2$^+$,7/2$^+$		A	Jπ: direct feeding in ^{209}Rn ε decay (Jπ=5/2$^-$) and 461.47γ M1(+E2) to 7/2$^+$.
2429.32 *22*	29/2$^+$	0.916 μs *10*	CD FG	μ=15.38 *14*; Q=1.50 *15* Jπ: 577.60γ E3 to 23/2$^-$. $T_{1/2}$: weighted average of 0.88 μs *10* (1975Be39) and 0.794 μs *20* (1983Ma08) from (α,4nγ), 0.933 μs *11* (1987Dr01) from ^{205}Tl(^{9}Be,5nγ), and 0.860 μs *20* (1985Ra21) in (^{3}He,3nγ). Other: 0.68 μs *8* (1976Sj01) in (^{6}Li,3nγ). μ: from weighted average of g-factor=1.061 *10* (1987Ca23) and 1.060 *20* (1975Be39) in (α,4nγ) by TDPAD. Q: from (α,4nγ) by TDPAD (1983Ma08). configuration=π(1h$^{2}_{9/2}$,1i$^{1}_{13/2}$)$^{+3}$. Additional information 5.
2516.70 *11*	(5/2 to 9/2)$^+$		A	Jπ: M1(+E2) 380.83γ to (5/2,7/2)$^+$, 1771.2γ to 7/2$^-$.
2522.27 *8*	(5/2$^+$,7/2$^+$)		A	Jπ: 386.43γ (M1) to (5/2,7/2)$^+$, direct feeding in ^{209}Rn ε decay (Jπ=5/2$^-$), 2114.05γ to 7/2$^-$.
2569.2 *3*	(3/2$^-$,5/2,7/2)		A	Jπ: 2160.7γ to 7/2$^-$, 1774.3γ to 5/2$^-$; direct feeding in ^{209}Rn ε decay (Jπ=5/2$^-$).
2581.13 *15*	(3/2,5/2,7/2)		A	Jπ: direct feeding in ^{209}Rn ε decay (Jπ=5/2$^-$).
2605.4 *3*	(25/2$^+$)‡		FG	Jπ: 753.7γ (E1) to 23/2$^-$.

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Adopted Levels, Gammas (continued)

^{209}At Levels (continued)

E(level)†	Jπ	XREF	Comments
			configuration=$\pi(1h^2_{9/2}\,1i^1_{13/2})^{+3}$.
2612.0 *3*	(25/2$^-$)	FG	Jπ: 760.3γ (M1) to 23/2$^-$.
2677.4 *8*		G	
2683.9 *6*	(27/2$^-$)‡	G	Jπ: 445.6γ (M1) to 25/2$^-$.
2689.92 *24*	(3/2$^-$,5/2,7/2)	A	Jπ: direct feeding in ^{209}Rn ε decay (Jπ=5/2$^-$), 2281.7γ to 7/2$^-$.
2712.9 *5*	(3/2$^-$,5/2,7/2)	A	Jπ: 1616.0γ to (7/2$^-$); direct feeding in ^{209}Rn ε decay (Jπ=5/2$^-$).
2821.9 *5*	(5/2,7/2)	A	Jπ: 868.43γ to 7/2$^+$, 2413.5γ to 7/2$^-$; probable direct feeding in ^{209}Rn ε decay (Jπ=5/2$^-$).
3140.44 *13*	(5/2,7/2)	A	Jπ: direct feeding in ^{209}Rn ε decay (Jπ=5/2$^-$), 1186.91γ to 7/2$^+$, 2394.7γ to 7/2$^-$.
3172.3 *3*	(3/2$^-$,5/2,7/2)	A	Jπ: 2426.0γ to 7/2$^-$; direct feeding in ^{209}Rn ε decay (Jπ=5/2$^-$).
3188.6 *3*	(31/2$^+$)‡	FG	Jπ: 759.3γ (M1) to 29/2$^+$.
3292.9 *8*	(29/2$^-$)‡	G	
3388.44 *20*	(3/2$^-$,5/2,7/2)	A	Jπ: 2642.9γ to 7/2$^-$; direct feeding in ^{209}Rn ε decay (Jπ=5/2$^-$).
3544.40 *17*	(5/2,7/2)	A	Jπ: probable direct feeding in ^{209}Rn ε decay (Jπ=5/2$^-$); 3136.0γ to 7/2$^-$; 1129γ to 5/2$^+$,7/2$^+$.
3551.4 *3*	(5/2,7/2,9/2)	A	Jπ: 1597.4γ to 7/2$^+$, and 3143.7γ to 7/2$^-$.
3592?	(33/2$^+$)‡	G	E(level): the relative order of the 405.4γ and 583.7γ has not been established. These cascade transitions could define a level at 3771 instead of at 3592. Jπ: 405.4γ (M1) to (31/2$^+$).
3627.0 *4*	(3/2$^-$,5/2,7/2)	A	Jπ: direct feeding in ^{209}Rn ε decay (Jπ=5/2$^-$); 3218.0γ to 7/2$^-$.
3748.7 *6*	(33/2$^+$)‡	G	
3753.7 *3*	(5/2,7/2)	A	Jπ: direct allowed feeding in ^{209}Rn ε decay (Jπ=5/2$^-$); 3007.5γ to 7/2$^-$; 1338.0γ to 5/2$^+$,7/2$^+$.
3812.6 *6*	(33/2$^+$)‡	G	Jπ: 624.0γ (M1) to (31/2$^+$).
3899.1 *6*	(33/2$^+$)‡	G	Jπ: 710.5γ (M1) to (31/2$^+$).
4176	(35/2$^+$)‡	G	Jπ: 583.7γ (M1) to (33/2$^+$).
4376.6 *8*		G	
4506?	(35/2$^+$)	G	Jπ: 759.0γ (M1) to (33/2$^+$).
4696.9 *12*		G	
35×10^3 *1*	(9/2$^-$)	E	Jπ: possible double isobaric analog of the ^{209}Bi g.s. (1980Mo20) from (π^+,π^-).

† From a least-squares fit to the γ-ray energies.
‡ From (α,4nγ) (1990Mu04) based on γ(θ).

Adopted Levels, Gammas (continued)

γ(^{209}At)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[g]	δ[ik]	α[j]	Comments
408.37	7/2$^-$	408.32 *4*	100	0	9/2$^-$	E2(+M1)		0.238	α(K)=0.194 *3*; α(L)=0.0340 *5*; α(M)=0.00803 *12* α(N)=0.00208 *3*; α(O)=0.000445 *7*; α(P)=6.16×10^{-5} *9* Mult.: α(K)exp=0.0348 *17*, K:L:M=163 *6*:73 *5*:20.3 *23* in ^{209}Rn ε decay (1974Vy01), α(K)exp=0.035 *2*, A_2=−0.03 *1* and A_4=−0.01 *1* in (^{3}He,3γ) (1985Ra21).
577.08	11/2$^-$	577.07[‡] *8*	100	0	9/2$^-$	M1+E2	0.8 *1*	0.067 *5*	α(K)=0.054 *4*; α(L)=0.0102 *6*; α(M)=0.00244 *12* α(N)=0.00063 *3*; α(O)=0.000134 *7*; α(P)=1.81×10^{-5} *10* Mult.,δ: α(K)exp=0.050 *7* from 1974Vy01 in ^{209}Rn ε decay; α(K)exp=0.055 *3*, A_2=−0.25 *1*, A_4=+0.01 *1* from 1985Ra21 in (^{3}He,3nγ), α(exp)=0.07 *1*, A_2=−0.133 *22* from 1975Be39 in (α,4nγ), for 577.07+577.60 doublet.
725.07	13/2$^-$	147.97 *10*	7.5 *9*	577.08	11/2$^-$	M1(+E2)	<0.25	3.89 *9*	α(K)=3.12 *10*; α(L)=0.584 *13*; α(M)=0.139 *4* α(N)=0.0361 *10*; α(O)=0.00769 *18*; α(P)=0.001049 *17* I_γ: weighted average of values from (^{6}Li,3nγ) and (^{3}He,3nγ). E_γ: weighted average of values from (α,4nγ), (^{6}Li,3nγ) and (^{3}He,3nγ). Mult.: α(L)exp=0.52 *5*, A_2=−0.11 *1*, A_4=+0.01 *2* from 1985Ra21 in (^{3}He,3nγ), α(exp)=3.9 *5* and A_2=−0.044 *43* from 1975Be39 in (α,4nγ).
		725.05 *10*	100	0	9/2$^-$	E2		0.01472	α(K)=0.01104 *16*; α(L)=0.00277 *4*; α(M)=0.000682 *10* α(N)=0.0001764 *25*; α(O)=3.67×10^{-5} *6*; α(P)=4.64×10^{-6} *7* E_γ: weighted average from (α,4nγ), (^{6}Li,3nγ) and (^{3}He,3nγ). Mult.: α(K)exp=0.011 *1*, A_2=+0.11 *1*, A_4=−0.03 *1* from 1985Ra21 in (^{3}He,3nγ), α(exp)=0.016 *3*, α(K)exp/α(L)exp=4.5 *4*, A_2=+0.091 *8* from 1975Be39 in (α,4nγ), A_2=+0.27 *2*, A_4=−0.06 *4* from 1976Sj01 in (^{6}Li,3nγ).
745.81	7/2$^-$	337.47[‡] *4*	64[‡] *3*	408.37	7/2$^-$	M1(+E2)	<0.4	0.378 *22*	α(K)=0.305 *20*; α(L)=0.0553 *20*; α(M)=0.0131 *5* α(N)=0.00340 *11*; α(O)=0.00073 *3*; α(P)=0.000100 *5* Mult.: α(K)exp=0.329 *24*, K:L:M=443 *26*:71 *6*:18.6 *13* (1974Vy01), α(K)exp=0.32 *3* (1973Jo14) from ^{209}Rn ε decay, α(K)exp=0.33 *3*, A_2=+0.11 *5*, A_4=+0.05 *8* (1985Ra21) from (^{3}He,3nγ).
		745.78[‡] *4*	100[‡] *3*	0	9/2$^-$	M1(+E2)	<0.4	0.0459 *25*	α(K)=0.0374 *21*; α(L)=0.0065 *3*; α(M)=0.00153 *7* α(N)=0.000397 *19*; α(O)=8.5×10^{-5} *4*; α(P)=1.17×10^{-5} *6* Mult.,δ: α(K)exp=0.036 *3*, K:L:M=75 *6*:13.1 *17*:3.7 *11* (1974Vy01), α(K)exp=0.04 *1* (1973Jo14) from ^{209}Rn ε decay, α(K)exp=0.040 *2* (1985Ra21) from (^{3}He,3nγ).
789.07	(9/2)$^-$	380.7[a] *2*	100	408.37	7/2$^-$	M1(+E2)	<0.4	0.273 *16*	α(K)=0.220 *14*; α(L)=0.0397 *16*; α(M)=0.0094 *4* α(N)=0.00243 *9*; α(O)=0.000520 *21*; α(P)=7.1×10^{-5} *4* E_γ: weighted average of values from (^{6}Li,3nγ) and (^{3}He,3nγ). Mult.: α(K)exp=0.24 *3*, A_2=+0.02 *5*, A_4=+0.01 *8* from 1985Ra21 in (^{3}He,3nγ).

$^{209}_{85}At_{124}$-4

Adopted Levels, Gammas (continued)

γ(^{209}At) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[g]	δ[ik]	α[j]	Comments
794.62	5/2$^-$	386.43[lcd] *7*	61[l] *4*	408.37	7/2$^-$	(M1)		0.276	α(K)=0.225 *4*; α(L)=0.0395 *6*; α(M)=0.00933 *13* α(N)=0.00242 *4*; α(O)=0.000517 *8*; α(P)=7.15×10^{-5} *10* E_γ: weighted average of 386.43 *7* for a doublet from ^{209}Rn ε decay and 386.4 *2* for a doublet from (^{3}He,3nγ). Mult.: α(K)exp=0.229 *21* for a doublet from 1974Vy01, 0.2 *1* from 1973Jo14 in ^{209}Rn ε decay.
		794.68 *7*	100 *7*	0	9/2$^-$	E2		0.01219	α(K)=0.00929 *13*; α(L)=0.00219 *3*; α(M)=0.000535 *8* α(N)=0.0001384 *20*; α(O)=2.89×10^{-5} *4*; α(P)=3.69×10^{-6} *6* Mult.: α(K)exp≈0.0077 from 1974Vy01 in ^{209}Rn ε decay.
934.51?	(7/2)$^-$	188.4 *3*	37 *10*	745.81	7/2$^-$	[M1]		2.00	α(K)=1.623 *24*; α(L)=0.289 *5*; α(M)=0.0685 *10* α(N)=0.0177 *3*; α(O)=0.00380 *6*; α(P)=0.000525 *8*
		357.38 *15*	100 *30*	577.08	11/2$^-$	[E2]		0.0796	α(K)=0.0463 *7*; α(L)=0.0248 *4*; α(M)=0.00642 *9* α(N)=0.001661 *24*; α(O)=0.000335 *5*; α(P)=3.80×10^{-5} *6*
		526.8 *5*	63 *20*	408.37	7/2$^-$	M1+E2	≈0.7	≈0.0907	α(K)≈0.0726; α(L)≈0.01373; α(M)≈0.00328 α(N)≈0.000848; α(O)≈0.000180; α(P)≈2.44×10^{-5} Mult.: α(K)exp≈0.075 (1974Vy01) from ^{209}Rn ε decay.
1081.22	(5/2,7/2)$^-$	≈147[b]	<3	934.51?	(7/2)$^-$			≈2.8	
		286.59 *10*	9.2 *30*	794.62	5/2$^-$	[M1]		0.624	α(K)=0.506 *8*; α(L)=0.0896 *13*; α(M)=0.0212 *3* α(N)=0.00549 *8*; α(O)=0.001176 *17*; α(P)=0.0001624 *23*
		672.84[‡] *4*	100 *3*	408.37	7/2$^-$	E2(+M1)		0.0632	α(K)=0.0515 *8*; α(L)=0.00892 *13*; α(M)=0.00210 *3* α(N)=0.000545 *8*; α(O)=0.0001166 *17*; α(P)=1.614×10^{-5} *23* Mult.: α(K)exp=0.0115 *24* (1974Vy01) from ^{209}Rn ε decay.
		1082 *1*	3.3 *17*	0	9/2$^-$	[M1,E2]		0.0184	α(K)=0.01500 *22*; α(L)=0.00256 *4*; α(M)=0.000603 *9* α(N)=0.0001561 *23*; α(O)=3.35×10^{-5} *5*; α(P)=4.64×10^{-6} *7*
1093.13	(7/2)$^-$	684.75 *15*	100	408.37	7/2$^-$	(E0+M1+E2)		0.121 *21*	α(K)=0.0492 *7*; α(L)=0.00851 *12*; α(M)=0.00201 *3* α(N)=0.000520 *8*; α(O)=0.0001113 *16*; α(P)=1.541×10^{-5} *22* Mult.: α(K)exp=0.100 *17* (1974Vy01), α(K)exp=0.08 *6* (1973Jo14) from ^{209}Rn ε decay α(K)exp=0.100 *17* is much larger than the M1 value suggesting a E0 component. α: 0.121 *21* from α(K)exp=0.100 *17* and assumption that ce(K)/(γ+ce)=0.826 for M1 transition.
1097.74	(7/2)$^-$	302.98 *13*	5.8 *15*	794.62	5/2$^-$	M1(+E2)	<0.6	0.48 *6*	α(K)=0.39 *5*; α(L)=0.073 *5*; α(M)=0.0174 *9* α(N)=0.00449 *23*; α(O)=0.00096 *6*; α(P)=0.000130 *10* Mult.,δ: α(K)exp=0.43 *12* (1974Vy01), 0.5 *2* (1973Jo14) from ^{209}Rn ε decay.

$^{209}_{85}At_{124}$-5

Adopted Levels, Gammas (continued)

γ(^{209}At) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult.[g]	δ[ik]	α[j]	Comments
1097.74	(7/2)$^-$	689.30‡ *6*	100 *3*	408.37	7/2$^-$	M1(+E2)	<0.4	0.056 *3*	α(K)=0.046 *3*; α(L)=0.0080 *4*; α(M)=0.00189 *9* α(N)=0.000489 *23*; α(O)=0.000105 *5*; α(P)=1.45×10^{-5} *7* Mult.,δ: α(K)exp=0.049 *3*, K:L=44.5 *20*:7.3 *17* (1974Vy01); α(K)exp=0.06 *2* (1973Jo14) from ^{209}Rn ε decay.
		1097.55 *25*	2.44 *22*	0	9/2$^-$				
1131.11	(5/2,7/2)$^-$	722.74‡ *10*	100	408.37	7/2$^-$	M1(+E2)	<0.4	0.050 *3*	α(K)=0.0405 *23*; α(L)=0.0071 *4*; α(M)=0.00167 *8* α(N)=0.000432 *20*; α(O)=9.2×10^{-5} *5*; α(P)=1.28×10^{-5} *7* Mult.,δ: α(K)exp=0.049 *8* (1974Vy01) from ^{209}Rn ε decay, α(K)exp=0.04 *1* (1985Ra21) from (^{3}He,3nγ).
1214.28	11/2$^-$,13/2$^-$	489.2@ *2*	50@ *10*	725.07	13/2$^-$	M1(+E2)	<0.3	0.142 *5*	α(K)=0.115 *5*; α(L)=0.0204 *6*; α(M)=0.00481 *14* α(N)=0.00125 *4*; α(O)=0.000267 *8*; α(P)=3.68×10^{-5} *12* Mult.: α(K)exp=0.14 *2* (1985Ra21) from (^{3}He,3nγ).
		637.2@ *2*	100@ *10*	577.08	11/2$^-$	M1(+E2)	<0.3	0.0707 *25*	α(K)=0.0575 *21*; α(L)=0.0100 *3*; α(M)=0.00237 *7* α(N)=0.000614 *18*; α(O)=0.000131 *4*; α(P)=1.81×10^{-5} *6* E_γ: 635.3 *5* from (^{6}Li,3nγ). Mult.: α(K)exp=0.062 *5*, A_2=+0.02 *7*, A_4=0.0 *1* (1985Ra21) from (^{3}He,3nγ).
		1214.3@ *2*	50@ *10*	0	9/2$^-$				
1242.36	(13/2$^-$)	517.2@ *2*	17@ *3*	725.07	13/2$^-$	(E2)		0.0310	α(K)=0.0214 *3*; α(L)=0.00724 *11*; α(M)=0.00183 *3* α(N)=0.000472 *7*; α(O)=9.68×10^{-5} *14*; α(P)=1.164×10^{-5} *17* Mult.: α(K)exp=0.03 *2* (1985Ra21) from (^{3}He,3nγ).
		665.3@ *1*	100@ *6*	577.08	11/2$^-$	(M1)		0.0651	α(K)=0.0530 *8*; α(L)=0.00919 *13*; α(M)=0.00217 *3* α(N)=0.000561 *8*; α(O)=0.0001202 *17*; α(P)=1.663×10^{-5} *24* E_γ: 664.2 *5* from (^{6}Li,3nγ). Mult.: A_2=−0.07 *1*, A_4=−0.02 *2* from ^{209}Bi(^{3}He,3nγ) (1985Ra21); A_2=−0.25 *6*, A_4=−0.3 *2* from ^{206}Pb(^{6}Li,3nγ) (1976Sj01).
1269.84	(11/2,13/2)$^-$	692.8@ *2*	100	577.08	11/2$^-$	M1+E2	1.3 *3*	0.032 *6*	α(K)=0.025 *5*; α(L)=0.0050 *7*; α(M)=0.00121 *16* α(N)=0.00031 *4*; α(O)=6.6×10^{-5} *9*; α(P)=8.8×10^{-6} *13* Mult.,δ: α(K)exp=0.026 *3* (1985Ra21) from (^{3}He,3nγ).
1321.57	17/2$^-$	596.5# *1*	100	725.07	13/2$^-$	E2		0.0224	α(K)=0.01609 *23*; α(L)=0.00474 *7*; α(M)=0.001182 *17* α(N)=0.000306 *5*; α(O)=6.31×10^{-5} *9*; α(P)=7.76×10^{-6} *11* Mult.: α(K)exp=0.017 *1*, A_2=+0.10 *1*, A_4=−0.01 *1* (1985Ra21) from (^{3}He,3nγ), α(exp)=0.0222, α(K)exp/α(L)exp=3.3 *3* and A_2=−0.091 *12* (1975Be39) from (α,4nγ), A_2=+0.3 *1*, A_4=−0.1 *1* (1976Sj01) in (^{6}Li,3nγ).

$^{209}_{85}At_{124}$-6

Adopted Levels, Gammas (continued)

γ(^{209}At) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[g]	δ[ik]	α[j]	Comments
1339.57	(13/2,15/2)$^-$	614.5[@] *2*	100	725.07	13/2$^-$	M1+E2	0.48 *14*	0.069 *6*	α(K)=0.056 *5*; α(L)=0.0100 *7*; α(M)=0.00238 *15* α(N)=0.00062 *4*; α(O)=0.000131 *9*; α(P)=1.80×10^{-5} *13* Mult.,δ: α(K)exp=0.056 *4*, A_2=+0.06 *8*, A_4=−0.06 *11* (1985Ra21) from (^{3}He,3nγ).
1393.57	(13/2,15/2)$^-$	668.5[@] *1*	100	725.07	13/2$^-$	M1(+E2)	<0.2	0.0634 *13*	α(K)=0.0516 *11*; α(L)=0.00896 *17*; α(M)=0.00211 *4* α(N)=0.000548 *10*; α(O)=0.0001173 *22*; α(P)=1.62×10^{-5} *3* Mult.: α(K)exp=0.057 *4* (1985Ra21) from (^{3}He,3nγ).
1394.16	(7/2)$^-$	296.6 *4*	33 *5*	1097.74	(7/2)$^-$	M1+E2	1.6 *+7−4*	0.26 *6*	α(K)=0.18 *5*; α(L)=0.059 *5*; α(M)=0.0147 *9* α(N)=0.00382 *22*; α(O)=0.00078 *6*; α(P)=9.5×10^{-5} *10* Mult.,δ: α(K)exp=0.18 *5* (1974Vy01) from ^{209}Rn ε decay.
		599.87 *12*	59 *6*	794.62	5/2$^-$	M1(+E2)	<0.3	0.083 *3*	α(K)=0.0674 *24*; α(L)=0.0118 *4*; α(M)=0.00278 *8* α(N)=0.000721 *21*; α(O)=0.000154 *5*; α(P)=2.13×10^{-5} *7* Mult.,δ: α(K)exp=0.072 *15* (1974Vy01) from ^{209}Rn ε decay.
		986.06 *10*	55 *6*	408.37	7/2$^-$	E2(+M1)	>2	0.0095 *16*	α(K)=0.0075 *13*; α(L)=0.00150 *20*; α(M)=0.00036 *5* α(N)=9.3×10^{-5} *12*; α(O)=2.0×10^{-5} *3*; α(P)=2.6×10^{-6} *4* Mult.: α(K)exp=0.0072 *18* (1974Vy01) from ^{209}Rn ε decay.
		1394.50 *9*	100 *5*	0	9/2$^-$	E2(+M1)	>1.1	0.0054 *13*	α(K)=0.0043 *11*; α(L)=0.00077 *17*; α(M)=0.00018 *4* α(N)=4.7×10^{-5} *10*; α(O)=1.00×10^{-5} *22*; α(P)=1.4×10^{-6} *3*; α(IPF)=4.0×10^{-5} *7* Mult.,δ: α(K)exp=0.0041 *11* (1974Vy01) from ^{209}Rn ε decay.
1427.67	21/2$^-$	106.1[#] *1*	100	1321.57	17/2$^-$	E2		6.03	α(K)=0.393 *6*; α(L)=4.17 *7*; α(M)=1.119 *17* α(N)=0.289 *5*; α(O)=0.0566 *9*; α(P)=0.00572 *9* B(E2)(W.u.)=3.21 *10* Mult.: from α(exp) based on intensity balance and I(γ) in delayed spectrum in 1976Sj01 from (^{6}Li,3nγ), A_2=+0.08 *1*, A_4=+0.02 *2* (1985Ra21) from (^{3}He,3nγ), α(exp)=6.3 *8* (1975Be39) from (α,4nγ).
1516.90		247.1[@] *2*	33[@] *7*	1269.84	(11/2,13/2)$^-$				

$^{209}_{85}At_{124}$-7

Adopted Levels, Gammas (continued)

γ(^{209}At) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult.[g]	δ[ik]	α[j]	Comments
1516.90		791.8[@] *2*	100[@] *20*	725.07	13/2$^-$				
		939.8[@] *2*	67[@] *13*	577.08	11/2$^-$				
1659.97		934.9[@] *2*	100	725.07	13/2$^-$				
1772.56	(15/2$^-$)	530.2[@] *1*	100[@] *5*	1242.36	(13/2$^-$)	M1+E2	0.57 *5*	0.097 *4*	α(K)=0.078 *3*; α(L)=0.0143 *4*; α(M)=0.00341 *9* α(N)=0.000883 *23*; α(O)=0.000188 *5*; α(P)=2.56×10^{-5} *8* Mult.,δ: α(K)exp=0.078 *2*, A_2=−0.30 *3*, A_4=−0.00 *5* (1985Ra21) from (^{3}He,3nγ), A_2=−0.59 *15*, A_4=−0.05 *5* (1976Sj01) in (^{6}Li,3nγ).
		1047.5[@] *2*	20[@] *4*	725.07	13/2$^-$				
1851.72	23/2$^-$	424.05[#] *10*	100	1427.67	21/2$^-$	M1		0.215	α(K)=0.1749 *25*; α(L)=0.0307 *5*; α(M)=0.00725 *11* α(N)=0.00188 *3*; α(O)=0.000402 *6*; α(P)=5.56×10^{-5} *8* Mult.: α(K)exp=0.183, A_2=−0.21 *2*, A_4=−0.03 *2* (1985Ra21) from (^{3}He,3nγ), α(exp)=0.23 *2*, α(K)exp/α(L)exp=5.9 *4* and A_2=−0.123 *14* (1975Be39) from (α,4nγ), A_2=−0.26 *12*, A_4=−0.4 *3* (1976Sj01) from (^{6}Li,3nγ).
1907.27	(19/2)$^-$	585.7[@] *1*	100	1321.57	17/2$^-$	M1+E2	1.8 *3*	0.039 *5*	α(K)=0.030 *5*; α(L)=0.0069 *6*; α(M)=0.00167 *13* α(N)=0.00043 *4*; α(O)=9.1×10^{-5} *8*; α(P)=1.17×10^{-5} *11* Mult.,δ: α(K)exp=0.030 *3*, A_2=−0.33 *4*, A_4=+0.04 *5* (1985Ra21) from (^{3}He,3nγ).
1953.52	7/2$^+$	855.77 *5*	100 *5*	1097.74	(7/2)$^-$	E1		0.00375	α(K)=0.00311 *5*; α(L)=0.000492 *7*; α(M)=0.0001148 *16* α(N)=2.96×10^{-5} *5*; α(O)=6.29×10^{-6} *9*; α(P)=8.55×10^{-7} *12* Mult.: α(K)exp≈0.0055 (1974Vy01), α(K)exp<0.007 (1973Jo14) from ^{209}Rn ε decay.
		872.40 *15*	14 *5*	1081.22	(5/2,7/2)$^-$	[E1]		0.00362	α(K)=0.00300 *5*; α(L)=0.000475 *7*; α(M)=0.0001107 *16* α(N)=2.85×10^{-5} *4*; α(O)=6.07×10^{-6} *9*; α(P)=8.25×10^{-7} *12*
		1158.86 *10*	17.2 *11*	794.62	5/2$^-$	[E1]		0.00219	α(K)=0.00181 *3*; α(L)=0.000282 *4*; α(M)=6.55×10^{-5} *10* α(N)=1.689×10^{-5} *24*; α(O)=3.60×10^{-6} *5*; α(P)=4.93×10^{-7} *7*; α(IPF)=5.26×10^{-6} *8*
		1207.4 *4*	5.0 *5*	745.81	7/2$^-$	[E1]		0.00205	α(K)=0.001688 *24*; α(L)=0.000262 *4*; α(M)=6.09×10^{-5} *9* α(N)=1.569×10^{-5} *22*; α(O)=3.35×10^{-6} *5*; α(P)=4.59×10^{-7} *7*; α(IPF)=1.64×10^{-5} *3*
		1954.3 *10*	2.7 *3*	0	9/2$^-$	[E1]		1.39×10^{-3}	α(K)=0.000753 *11*; α(L)=0.0001145 *16*; α(M)=2.65×10^{-5} *4* α(N)=6.84×10^{-6} *10*; α(O)=1.464×10^{-6} *21*; α(P)=2.02×10^{-7} *3*; α(IPF)=0.000489 *7*
2075.87	(19/2$^-$)	754.3[e] *2*	100	1321.57	17/2$^-$	(M1)		0.0469	α(K)=0.0382 *6*; α(L)=0.00659 *10*; α(M)=0.001555 *22*

$^{209}_{85}At_{124}$-8

Adopted Levels, Gammas (continued)

γ(^{209}At) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[g]	δ[ik]	α[j]	Comments
									α(N)=0.000402 *6*; α(O)=8.62×10^{-5} *12*; α(P)=1.193×10^{-5} *17* Mult.: α(K)exp=0.03 *1* and A_2=−0.38 *5*, A_4=−0.01 *8* for the 753.7+754.4 doublet (1985Ra21) in (^{3}He,3nγ).
2086.36		313.8[@] *2*	100	1772.56	(15/2$^-$)				
2135.81	(5/2,7/2)$^+$	182.23 *12*	5.9 *13*	1953.52	7/2$^+$	[M1]		2.20	α(K)=1.78 *3*; α(L)=0.318 *5*; α(M)=0.0753 *11* α(N)=0.0195 *3*; α(O)=0.00417 *6*; α(P)=0.000577 *9*
		1037.95 *6*	100 *5*	1097.74	(7/2)$^-$	E1(+M2)	<0.09	0.00283 *19*	α(K)=0.00235 *16*; α(L)=0.00037 *3*; α(M)=8.7×10^{-5} *7* α(N)=2.24×10^{-5} *19*; α(O)=4.8×10^{-6} *4*; α(P)=6.5×10^{-7} *6* Mult.: α(K)exp=0.0020 *4* (1974Vy01), α(K)exp<0.005 (1973Jo14) from ^{209}Rn ε decay.
		1054.52 *7*	39.3 *21*	1081.22	(5/2,7/2)$^-$	E1(+M2)	<0.123	0.0029 *4*	α(K)=0.0024 *3*; α(L)=0.00039 *6*; α(M)=9.0×10^{-5} *13* α(N)=2.3×10^{-5} *4*; α(O)=5.0×10^{-6} *7*; α(P)=6.8×10^{-7} *10* Mult.: α(K)exp=0.0029 *9* (1974Vy01) from ^{209}Rn ε decay.
		1341.86 *13*	11.9 *10*	794.62	5/2$^-$	[E1]		1.76×10^{-3}	α(K)=0.001408 *20*; α(L)=0.000217 *3*; α(M)=5.05×10^{-5} *7* α(N)=1.301×10^{-5} *19*; α(O)=2.78×10^{-6} *4*; α(P)=3.82×10^{-7} *6*; α(IPF)=6.92×10^{-5} *10*
		1727.5[lc] *7*	<2.6[l]	408.37	7/2$^-$	[E1]		1.43×10^{-3}	α(K)=0.000923 *13*; α(L)=0.0001408 *20*; α(M)=3.27×10^{-5} *5* α(N)=8.42×10^{-6} *12*; α(O)=1.80×10^{-6} *3*; α(P)=2.49×10^{-7} *4*; α(IPF)=0.000325 *5*
2183.2	(23/2$^-$)	755.5[&] *5*	100	1427.67	21/2$^-$	(M1)[h]		0.0467	α(K)=0.0380 *6*; α(L)=0.00657 *10*; α(M)=0.001548 *22* α(N)=0.000401 *6*; α(O)=8.59×10^{-5} *13*; α(P)=1.188×10^{-5} *17*
2238.3	25/2$^-$	386.6[d] *2*	100 *6*	1851.72	23/2$^-$	M1+E2		0.276	α(K)=0.224 *4*; α(L)=0.0394 *6*; α(M)=0.00932 *14* α(N)=0.00241 *4*; α(O)=0.000517 *8*; α(P)=7.14×10^{-5} *10* Mult.: D+Q from γ(θ) (1990Mu04), Δπ=no required by level scheme. I_γ: from (α,4nγ).
		810.6[#] *4*	68 *4*	1427.67	21/2$^-$	E2		0.01171	α(K)=0.00895 *13*; α(L)=0.00208 *3*;

$^{209}_{85}At_{124}$-9

Adopted Levels, Gammas (continued)

γ(^{209}At) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[g]	δ[ik]	α[j]	Comments
									α(M)=0.000509 *8* α(N)=0.0001315 *19*; α(O)=2.75×10^{-5} *4*; α(P)=3.52×10^{-6} *5* Mult.: α(K)exp=0.008 *2*, A_2=+0.21 *6*, A_4=+0.06 *9* (1985Ra21) in (^{3}He,3nγ). I_γ: from (α,4nγ), I(386.6γ)/I(810.6γ)=5/6.7 from (^{3}He,3nγ).
2402.8	(21/2$^-$)	326.9[&] *5*	100	2075.87	(19/2$^-$)	(M1)[h]		0.435	α(K)=0.353 *6*; α(L)=0.0624 *10*; α(M)=0.01475 *22* α(N)=0.00382 *6*; α(O)=0.000818 *12*; α(P)=0.0001130 *17*
2415.01	5/2$^+$,7/2$^+$	279.20 *10*	77 *8*	2135.81	(5/2,7/2)$^+$	M1(+E2)	<0.4	0.64 *4*	α(K)=0.51 *4*; α(L)=0.094 *3*; α(M)=0.0224 *6* α(N)=0.00579 *14*; α(O)=0.00124 *4*; α(P)=0.000169 *7* Mult.: α(K)exp=0.62 *10* (1974Vy01), α(K)exp=0.6 *3* (1973Jo14) from ^{209}Rn ε decay.
		461.47 *9*	100 *5*	1953.52	7/2$^+$	M1(+E2)	<0.6	0.154 *18*	α(K)=0.125 *15*; α(L)=0.0226 *19*; α(M)=0.0054 *5* α(N)=0.00139 *11*; α(O)=0.000296 *25*; α(P)=4.1×10^{-5} *4* Mult.: α(K)exp=0.129 *11*, K:L=17.2 *10*:2.97 *20* (1974Vy01); α(K)exp=0.2 *1* (1973Jo14) from ^{209}Rn ε decay.
		1317.8[b] *8*	<7	1097.74	(7/2)$^-$	[E1]		0.00180	α(K)=0.001452 *21*; α(L)=0.000224 *4*; α(M)=5.21×10^{-5} *8* α(N)=1.343×10^{-5} *19*; α(O)=2.87×10^{-6} *4*; α(P)=3.94×10^{-7} *6*; α(IPF)=5.75×10^{-5} *9*
		1669.5 *10*	8.2 *11*	745.81	7/2$^-$	[E1]		1.45×10^{-3}	α(K)=0.000977 *14*; α(L)=0.0001493 *21*; α(M)=3.46×10^{-5} *5* α(N)=8.93×10^{-6} *13*; α(O)=1.91×10^{-6} *3*; α(P)=2.63×10^{-7} *4*; α(IPF)=0.000283 *4*
2429.32	29/2$^+$	577.60[#] *10*	100	1851.72	23/2$^-$	E3		0.0750	α(K)=0.0417 *6*; α(L)=0.0247 *4*; α(M)=0.00648 *9* α(N)=0.001683 *24*; α(O)=0.000343 *5*; α(P)=4.00×10^{-5} *6* B(E3)(W.u.)=22.17 *25* Mult.: α(K)exp=0.055 *3*, A_2=−0.25 *1*, A_4=+0.01 *1* (1985Ra21) from (^{3}He,3nγ), α(exp)=0.07 *1*, α(K)exp/α(L)exp=2.0 *2*, A_2=−0.133 *22* (1975Be39) from (α,4nγ), for 577.07+577.60 doublet; $T_{1/2}$=0.89 μs *3* implies mult=E3.
2516.70	(5/2 to 9/2)$^+$	380.83 *10*	100 *31*	2135.81	(5/2,7/2)$^+$	M1(+E2)	≈0.6	≈0.229	α(K)≈0.182; α(L)≈0.0355; α(M)≈0.00849

$^{209}_{85}At_{124}$-10

Adopted Levels, Gammas (continued)

γ(^{209}At) (continued)

E_i(level)	J_i^π	E_γ [†]	I_γ [†]	E_f	J_f^π	Mult.[g]	α[j]	Comments
								α(N)≈0.00220; α(O)≈0.000467; α(P)≈6.28×10^{-5}
								Mult.: α(K)exp≈0.18 (1974Vy01) from ^{209}Rn ε decay.
2516.70	(5/2 to 9/2)$^+$	1722.5 *10*	25 *3*	794.62	5/2$^-$	[E1]	1.43×10^{-3}	α(K)=0.000927 *13*; α(L)=0.0001415 *20*; α(M)=3.28×10^{-5} *5* α(N)=8.46×10^{-6} *12*; α(O)=1.81×10^{-6} *3*; α(P)=2.50×10^{-7} *4*; α(IPF)=0.000321 *5*
		1771.2 *5*	34 *2*	745.81	7/2$^-$	[E1]	1.42×10^{-3}	α(K)=0.000885 *13*; α(L)=0.0001350 *19*; α(M)=3.13×10^{-5} *5* α(N)=8.07×10^{-6} *12*; α(O)=1.727×10^{-6} *25*; α(P)=2.38×10^{-7} *4*; α(IPF)=0.000357 *5*
2522.27	(5/2$^+$,7/2$^+$)	386.43[lc] *7*	[l]	2135.81	(5/2,7/2)$^+$	(M1)	0.276	α(K)=0.225 *4*; α(L)=0.0395 *6*; α(M)=0.00933 *13* α(N)=0.00242 *4*; α(O)=0.000517 *8*; α(P)=7.15×10^{-5} *10* I_γ: ≤625 *39* for this multiply placed transition if normalized to I(2114.05γ)=100 *4*. Mult.: α(K)exp=0.229 *21* for a doublet from 1974Vy01, 0.2 *1* from 1973Jo14 in ^{209}Rn ε decay.
		1429[b] *1*	<30	1093.13	(7/2)$^-$			
		1727.5[lcb] *7*	<30[l]	794.62	5/2$^-$			
		2114.05 *20*	100 *4*	408.37	7/2$^-$			
2569.2	(3/2$^-$,5/2,7/2)	1471.8 *5*	100 *12*	1097.74	(7/2)$^-$			
		1635.0 *10*	38 *11*	934.51?	(7/2)$^-$			
		1774.3 *5*	68 *8*	794.62	5/2$^-$			
		1823[b] *1*	<75	745.81	7/2$^-$			
		2160.7 *6*	60 *8*	408.37	7/2$^-$			
2581.13	(3/2,5/2,7/2)	1186.91[c] *15*	100 *8*	1394.16	(7/2)$^-$			
		1500.2 *4*	21 *3*	1081.22	(5/2,7/2)$^-$			
		1786.6[b] *5*	≈26	794.62	5/2$^-$			
		1836[b] *1*	<26	745.81	7/2$^-$			
2605.4	(25/2$^+$)	753.7[e] *2*	100	1851.72	23/2$^-$	(E1)	0.00475	α(K)=0.00393 *6*; α(L)=0.000629 *9*; α(M)=0.0001467 *21* α(N)=3.78×10^{-5} *6*; α(O)=8.03×10^{-6} *12*; α(P)=1.086×10^{-6} *16* Mult.: α(K)exp=0.03 *1* and A_2=−0.38 *5*, A_4=−0.01 *8* for the 753.7+754.4 doublet (1985Ra21) in (^{3}He,3nγ).
2612.0	(25/2$^-$)	760.3[#] *2*	100	1851.72	23/2$^-$	(M1)	0.0459	α(K)=0.0374 *6*; α(L)=0.00646 *9*; α(M)=0.001522 *22* α(N)=0.000394 *6*; α(O)=8.44×10^{-5} *12*; α(P)=1.169×10^{-5} *17* Mult.: α(K)exp=0.05 *1* and A_2=−0.38 *6*, A_4=−0.01 *9* for the 759.3+760.3 doublet (1985Ra21) in (^{3}He,3nγ), mult=D from γ(θ) (1990Mu04) in (α,4nγ).
2677.4		494.2[&] *5*	100	2183.2	(23/2$^-$)			
2683.9	(27/2$^-$)	445.6[&] *5*	100	2238.3	25/2$^-$	(M1)[h]	0.188	α(K)=0.1532 *22*; α(L)=0.0268 *4*; α(M)=0.00634 *9* α(N)=0.001641 *24*; α(O)=0.000351 *5*; α(P)=4.86×10^{-5} *7*
2689.92	(3/2$^-$,5/2,7/2)	1592.1 *3*	100 *6*	1097.74	(7/2)$^-$			

Adopted Levels, Gammas (continued)

γ(^{209}At) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[g]	α[j]	Comments
2689.92	(3/2⁻,5/2,7/2)	1608.5 *10*	34 *5*	1081.22	(5/2,7/2)⁻			
		2281.7 *4*	59 *6*	408.37	7/2⁻			
2712.9	(3/2⁻,5/2,7/2)	1616.0 *10*	100 *21*	1097.74	(7/2)⁻			
		1631.5 *10*	88 *26*	1081.22	(5/2,7/2)⁻			
		1778.2[c] *5*		934.51?	(7/2)⁻			
2821.9	(5/2,7/2)	868.43	≈100[f]	1953.52	7/2⁺			
		1741.0 *10*	11 *4*	1081.22	(5/2,7/2)⁻			
		1887.0 *10*	19 *8*	934.51?	(7/2)⁻			
		2413.5 *6*	20.3 *23*	408.37	7/2⁻			
3140.44	(5/2,7/2)	1186.91[c] *15*	100 *8*	1953.52	7/2⁺			
		1746.1 *3*	35 *3*	1394.16	(7/2)⁻			
		2043.5[b] *10*	<26	1097.74	(7/2)⁻			
		2205.2 *10*	15 *3*	934.51?	(7/2)⁻			
		2346.0 *3*	28 *3*	794.62	5/2⁻			
		2394.7 *6*	20.3 *23*	745.81	7/2⁻			
3172.3	(3/2⁻,5/2,7/2)	1778.2[c] *5*	≤80	1394.16	(7/2)⁻			
		2074.5 *3*	100 *12*	1097.74	(7/2)⁻			
		2426.0 *10*	≈34	745.81	7/2⁻			
3188.6	(31/2⁺)	759.3[e] *2*	100	2429.32	29/2⁺	(M1)[h]	0.0461	α(K)=0.0376 *6*; α(L)=0.00648 *9*; α(M)=0.001528 *22* α(N)=0.000395 *6*; α(O)=8.47×10^{-5} *12*; α(P)=1.173×10^{-5} *17* Mult.: α(K)exp=0.05 *1* and A_2=−0.38 *6*, A_4=−0.01 *9* for the 759.3+760.3 doublet (1985Ra21) in (^{3}He,3nγ), mult=D from γ(θ) (1990Mu04) in (α,4nγ).
3292.9	(29/2⁻)	609.0[&] *5*	100	2683.9	(27/2⁻)			
3388.44	(3/2⁻,5/2,7/2)	2290.5 *3*	23 *4*	1097.74	(7/2)⁻			
		2306.0 *15*	≈9	1081.22	(5/2,7/2)⁻			
		2453.5[c] *5*	<23	934.51?	(7/2)⁻			I_γ: 19 *4* from this doubly placed γ-ray.
		2642.9 *3*	100 *10*	745.81	7/2⁻			
		2981.0 *10*	6.2 *21*	408.37	7/2⁻			
3544.40	(5/2,7/2)	1027.55 *20*	100 *24*	2516.70	(5/2 to 9/2)⁺			
		1129 *1*	94 *12*	2415.01	5/2⁺,7/2⁺			
		2150.0 *10*	83 *8*	1394.16	(7/2)⁻			
		2446.9 *4*	36 *6*	1097.74	(7/2)⁻			
		2463.7 *6*	55 *7*	1081.22	(5/2,7/2)⁻			
		2750.3 *6*	27 *6*	794.62	5/2⁻			
		2798.1 *10*	36 *4*	745.81	7/2⁻			
		3136.0 *8*	71 *7*	408.37	7/2⁻			
3551.4	(5/2,7/2,9/2)	1415.5[b] *10*	≈110	2135.81	(5/2,7/2)⁺			
		1597.4 *6*	100 *12*	1953.52	7/2⁺			
		2453.5[c] *5*	<74	1097.74	(7/2)⁻			I_γ: 62 *12* from this doubly placed γ-ray.
		3143.7 *8*	65 *8*	408.37	7/2⁻			

Adopted Levels, Gammas (continued)

γ(^{209}At) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult.[g]	α[j]	Comments
3592?	(33/2$^+$)	405.4[&m]	100	3188.6	(31/2$^+$)	(M1)[h]	0.243	α(K)=0.197 *3*; α(L)=0.0347 *5*; α(M)=0.00819 *12* α(N)=0.00212 *3*; α(O)=0.000454 *7*; α(P)=6.28×10^{-5} *9*
3627.0	(3/2$^-$,5/2,7/2)	1110.2 *4*	100 *42*	2516.70	(5/2 to 9/2)$^+$			
		2233[b] *1*	<83	1394.16	(7/2)$^-$			
		2833.5 *10*	≈21	794.62	5/2$^-$			
		2881.0 *10*	35 *8*	745.81	7/2$^-$			
		3218.0 *15*	19 *4*	408.37	7/2$^-$			
3748.7	(33/2$^+$)	560.1[&] *5*	100	3188.6	(31/2$^+$)			
3753.7	(5/2,7/2)	202.3[b] *4*	<69	3551.4	(5/2,7/2,9/2)			
		1338.0 *8*	100 *13*	2415.01	5/2$^+$,7/2$^+$			
		2656.4 *4*	39 *8*	1097.74	(7/2)$^-$			
		3007.5 *6*	35 *4*	745.81	7/2$^-$			
3812.6	(33/2$^+$)	624.0[&] *5*	100	3188.6	(31/2$^+$)	(M1)[h]	0.0770	α(K)=0.0628 *9*; α(L)=0.01089 *16*; α(M)=0.00257 *4* α(N)=0.000665 *10*; α(O)=0.0001425 *21*; α(P)=1.97×10^{-5} *3*
3899.1	(33/2$^+$)	710.5[&] *5*	100	3188.6	(31/2$^+$)	(M1)[h]	0.0548	α(K)=0.0447 *7*; α(L)=0.00772 *11*; α(M)=0.00182 *3* α(N)=0.000471 *7*; α(O)=0.0001010 *15*; α(P)=1.397×10^{-5} *20*
4176	(35/2$^+$)	583.7[&m] *5*	100	3592?	(33/2$^+$)	(M1)[h]	0.0919	α(K)=0.0748 *11*; α(L)=0.01301 *19*; α(M)=0.00307 *5* α(N)=0.000795 *12*; α(O)=0.0001702 *25*; α(P)=2.35×10^{-5} *4*
4376.6		564.0[&] *5*	100	3812.6	(33/2$^+$)			
4506?	(35/2$^+$)	759.0[em]	100	3748.7	(33/2$^+$)	(M1)[h]	0.0461	α(K)=0.0376 *6*; α(L)=0.00649 *9*; α(M)=0.001529 *22* α(N)=0.000396 *6*; α(O)=8.48×10^{-5} *12*; α(P)=1.174×10^{-5} *17* Mult.: α(K)exp=0.05 *1* and A_2=−0.38 *6*, A_4=−0.01 *9* for the 759.3+760.3 doublet (1985Ra21) in (^{3}He,3nγ), mult=D from γ(θ) (1990Mu04) in (α,4nγ).
4696.9		797.8[&]	100	3899.1	(33/2$^+$)			

† From ^{209}Rn ε decay, unless otherwise noted.
‡ Weighted average of values from ^{209}Rn ε decay and (^{3}He,3nγ).
# Weighted average of values from (^{3}He,3nγ) and (α,4nγ).
@ From (^{3}He,3nγ).
& From (α,4nγ).
[a] Weighted average of values from (^{6}Li,3nγ) and (^{3}He,3nγ).
[b] Assignment to ^{209}At (from ε decay) not definitely established.
[c] Doublets at 386, 1187, 1727, 1778 and 2453 from ^{209}Rn ε decay.
[d] Doublet at 386 from (^{3}He,3nγ).
[e] Doublets at 754 from (^{3}He,3nγ) and (α,4nγ), at 759 from (α,4nγ).

$^{209}_{85}At_{124}$-13

Adopted Levels, Gammas (continued)

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

[f] Transition shown on drawing in ^{209}Rn ε decay (1974Vy01), but not in authors′ table of gammas. Intensity deduced by evaluator based on intensity balance at 2822 level. The deduced value is thus actually a lower limit; however, 1974Vy01 show log *ft*>8.5 to the 2822 level; thus, I(ε)<0.03%.
[g] From ce data in ^{209}Rn ε decay and (^{3}He,3nγ), unless otherwise noted.
[h] From 1990Mu04 in (α,4nγ), based on $\gamma(\theta)$.
[i] From measured ce data in ^{209}Rn ε decay and (^{3}He,3nγ) using the BrIccMixing program, unless otherwise noted.
[j] Additional information 6.
[k] Additional information 7.
[l] Multiply placed with undivided intensity.
[m] Placement of transition in the level scheme is uncertain.

$^{209}_{85}At_{124}$-14

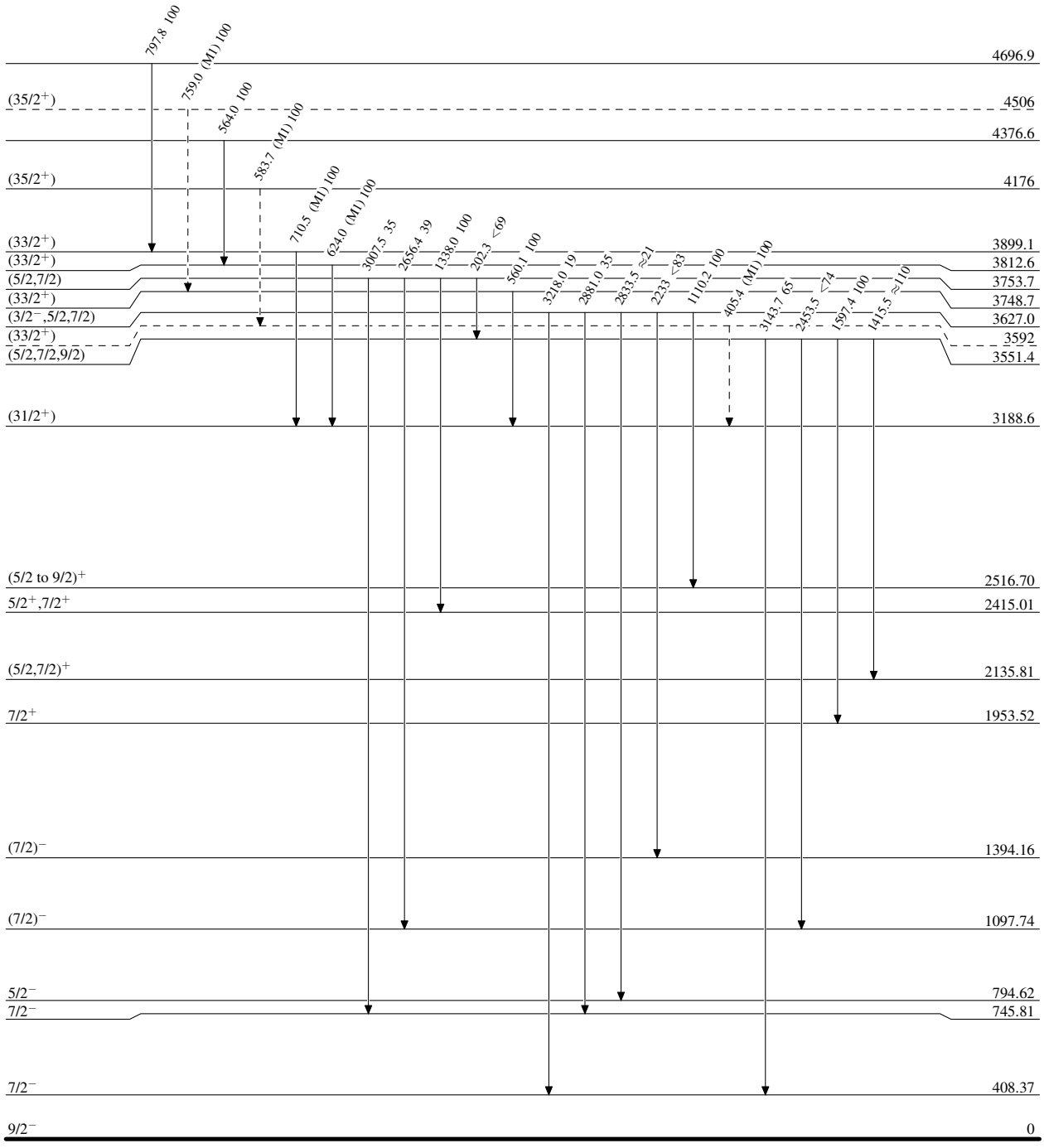
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)

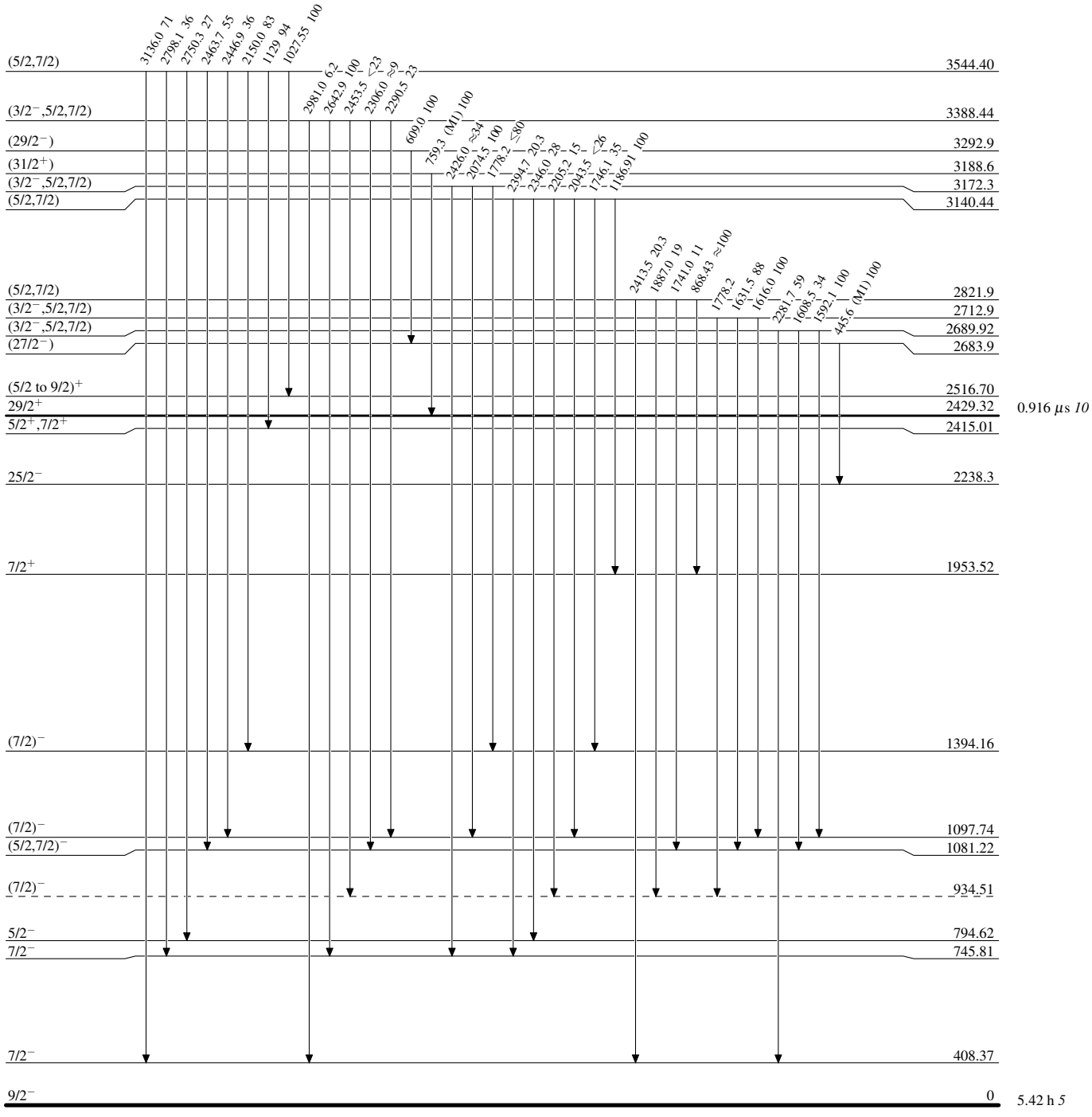


$^{209}_{85}At_{124}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

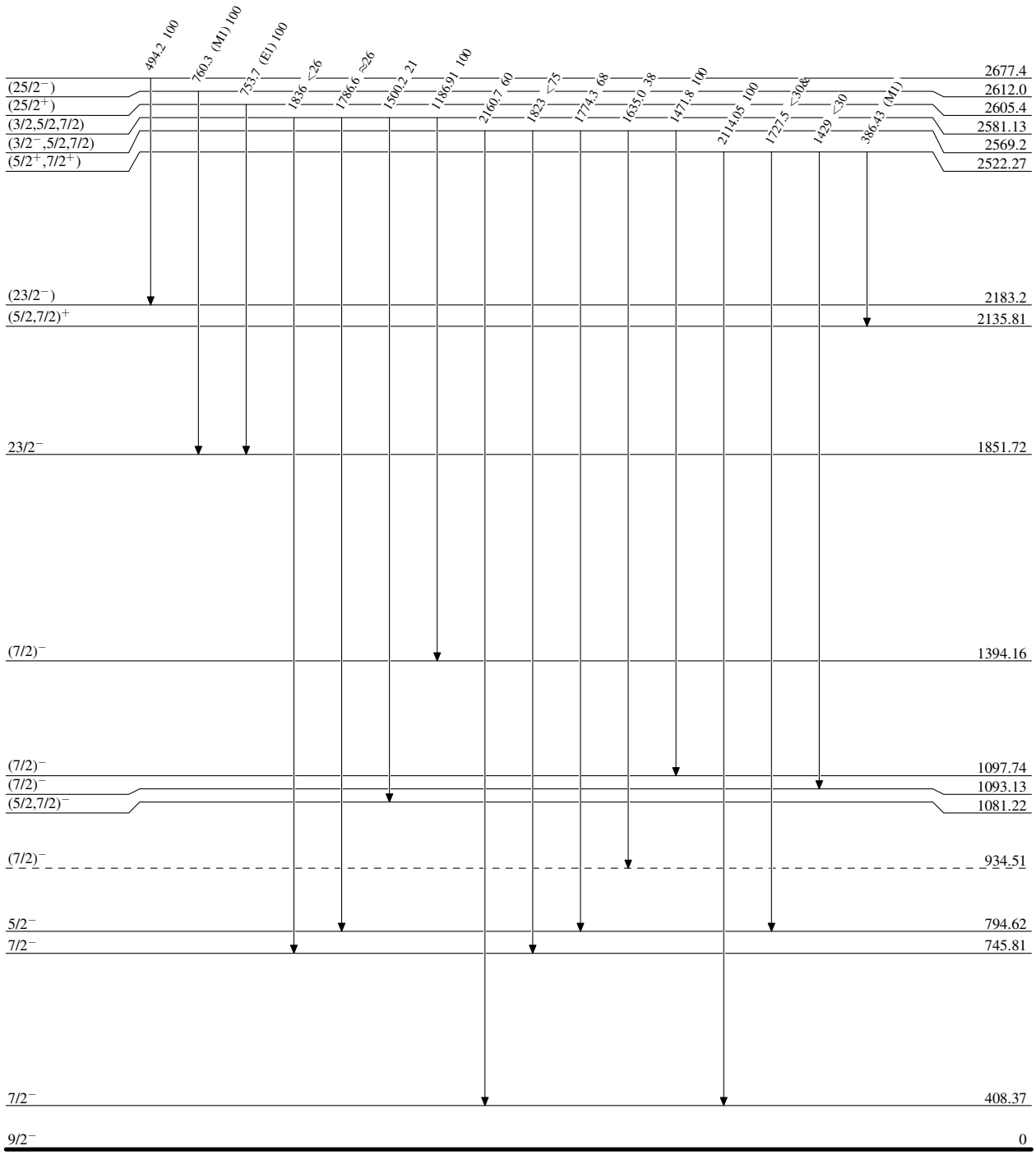


$^{209}_{85}At_{124}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

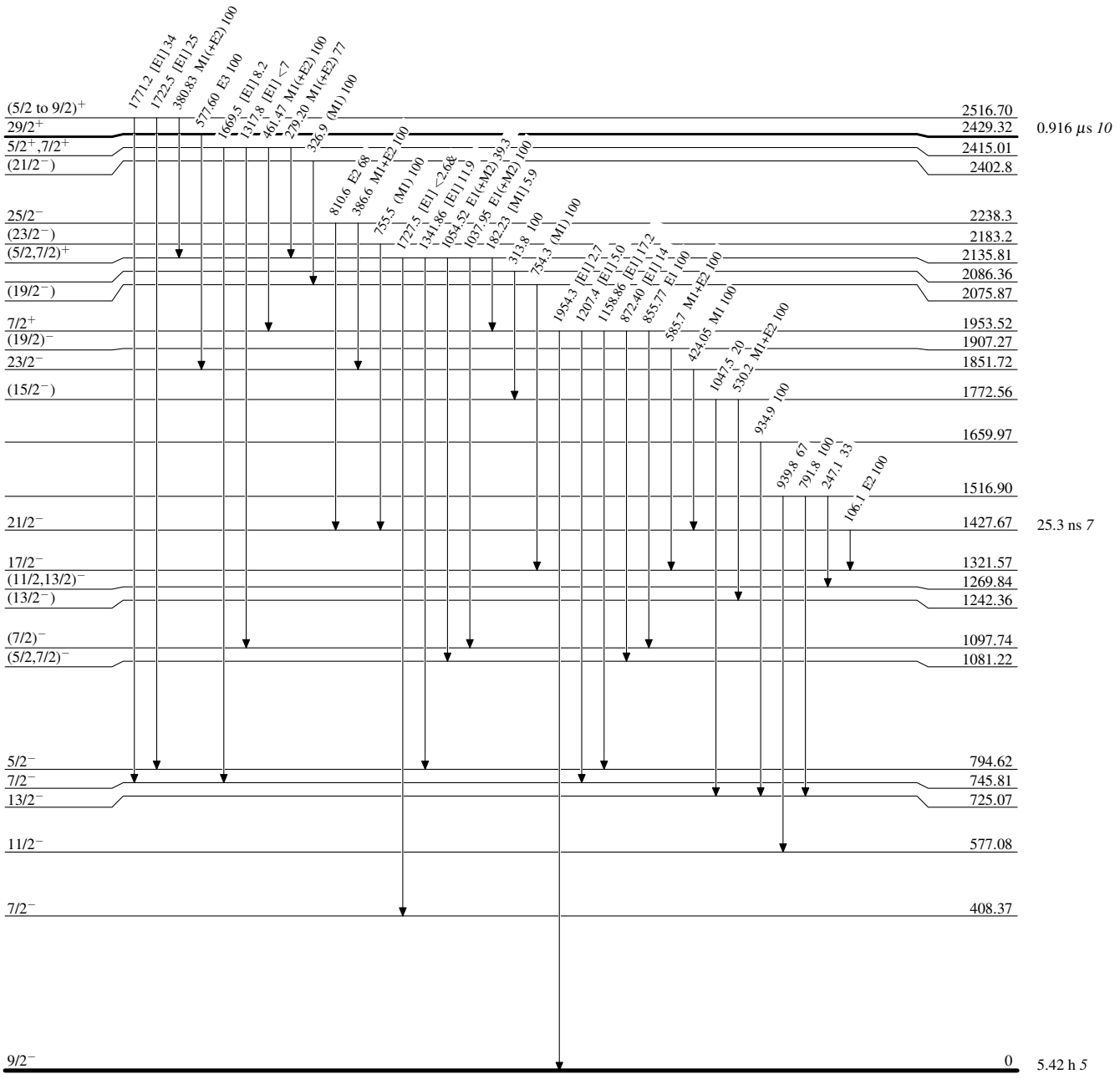


$^{209}_{85}At_{124}$

Adopted Levels, Gammas

Level Scheme (continued)

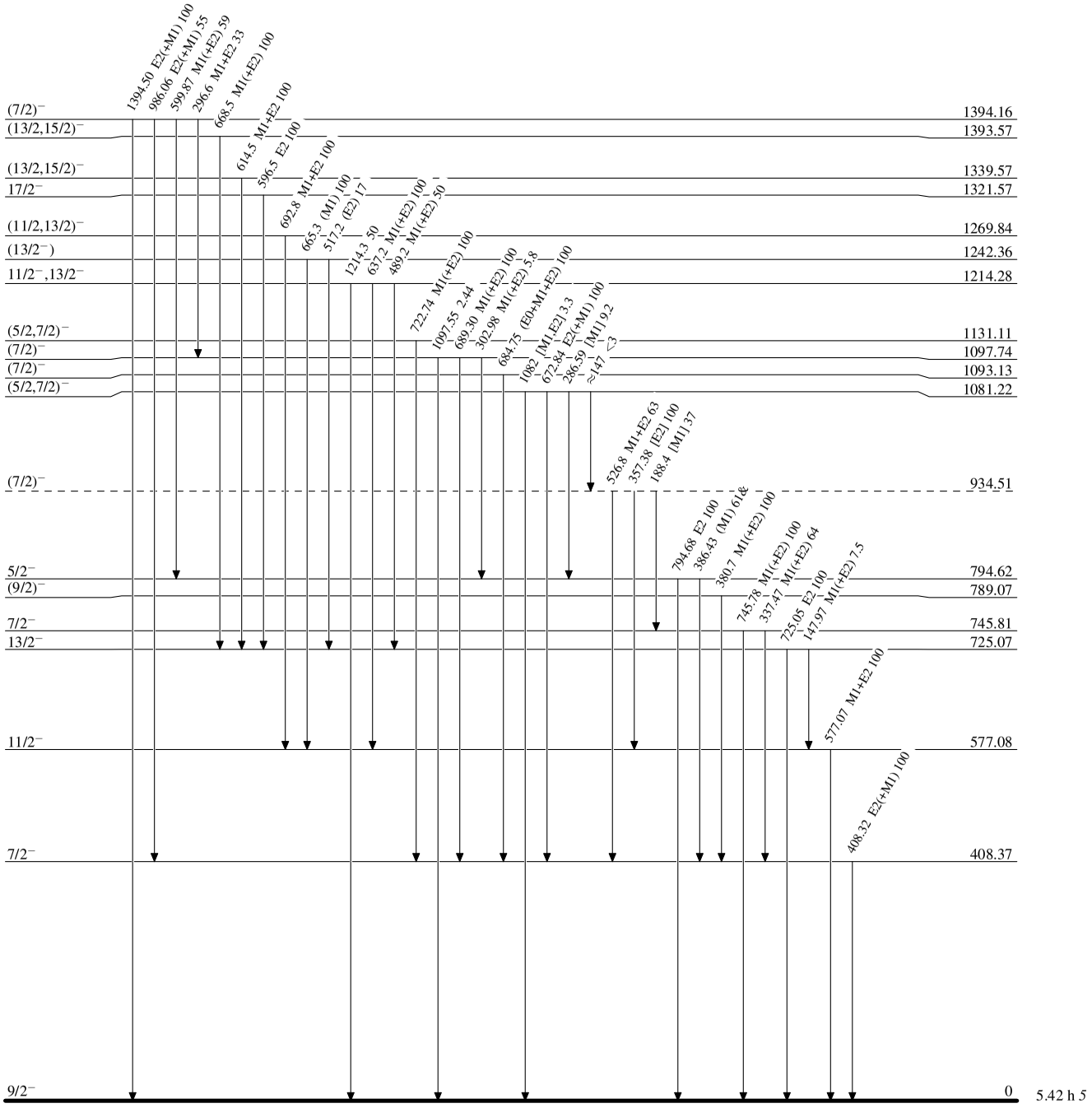
Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



$^{209}_{85}At_{124}$