Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 112,1115 (2011)	31-Oct-2010

Q(β^-)=−925 *23*; S(n)=5.90×10^3 *5*; S(p)=2939 *11*; Q(α)=8348 *5* 2012Wa38
Note: Current evaluation has used the following Q record −925 23 *5897* 51 *2939* 11 *8348* 4 2009AuZZ.
Q(β^-)=−917 *27*, S(n)=5890 *50*, S(p)=2932 *17*, Q(α)=8348 *4* (2003Au03).
Assignment: ^{208}Pb(^{15}N,3n) excit (1970Bo13); parent of ^{216}Fr (1970Bo13,1987FuZT).

Calculations, compilations, systematics:
Alternating parity bands: 1993Sc11.
Heavy-ion emission: 1985Po14.
Level structure, odd-odd actinides: 1994So16.
Spontaneous emission of heavy ions: 1986Po06.
Other reactions:
2006Ho03: 209Bi(^{18}O,3n$\alpha\gamma$), E=90-94 MeV. Measured Eγ, Eα, $\alpha\gamma$ coin, $\gamma(\theta)$.
1999Bo52: ^{205}Tl(^{22}Ne,X), E<145 MeV.

^{220}Ac Levels

Bands A and B, C and D, and E and F form three sets of alternating parity bands. The parities of these bands are not known, but bands A, C, and E are of the same parity whereas bands B, D, and F are of opposite parity.

Cross Reference (XREF) Flags

A ^{224}Pa α decay
B ^{209}Bi(^{14}C,3nγ)

E(level)†	J$^\pi$‡	$T_{1/2}$	XREF	Comments
0	(3$^-$)	26.4 ms *2*	A	%α=100; %ε=5×10^{-4} J$^\pi$: proposed by 1996Li05, based on quadrupole-octupole configurations derived from π(h9/2) ν(i11/2) subshells. $T_{1/2}$: from 1990An19; other: 26.1 ms *5* (1970Bo13). %ε: From gross β-decay strength function (1973Ta30).
13.79 *13*			A	
28.0 *1*			A	
40.69 *10*			A	
68.71 *14*	(5$^-$)		A	J$^\pi$: HF=5 for α decay from (5$^-$) parent indicates L=0 α transition between same configurations (coupling of π(h9/2) ν(g9/2) subshells).
71.56 *20*			A	
108.51 *18*			A	
113.30 *20*			A	
145.6? *3*			A	
150.18 *14*			A	
153.00 *10*			A	
184.21 *16*			A	
233.81 *17*	(4$^+$,5$^+$,6$^+$)		A	J$^\pi$: E1 γ to (5$^-$) level.
263.22 *15*	(4$^+$,5$^+$,6$^+$)		A	J$^\pi$: E1 γ to (5$^-$) level.
312.0 *8*			A	
335.18 *20*			A	
356.1 *3*			A	
411.9 *7*			A	
0.0+x#@	J		B	
59.0+x[a] *2*	J+1		B	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{220}Ac Levels (continued)

E(level)†	Jπ‡	XREF	E(level)†	Jπ‡	XREF	E(level)†	Jπ‡	XREF
136.2+x@ 3	J+2	B	1120.1+x[d] 4	J+7	B	2223.6+x[a] 4	J+13	B
305.1+x[a] 3	J+3	B	1266.1+x& 3	J+9	B	2339.6+x[d] 5	J+(13)	B
401.3+x@ 3	J+4	B	1267.8+x[c] 4	J+8	B	2416.2+x[b] 4	J+14	B
507.1+x[b] 3	J+4	B	1372.9+x[a] 3	J+9	B	2431.3+x@ 4	J+14	B
554.6+x[c] 3	J+4	B	1485.2+x[d] 4	J+9	B	2637.0+x[c] 5	J+(14)	B
614.0+x[a] 3	J+5	B	1488.9+x[b] 4	J+10	B	2649.2+x& 4	J+(15)	B
625.3+x& 3	J+5	B	1534.5+x@ 4	J+10	B	2686.9+x[a] 4	J+(15)	B
731.1+x@ 3	J+6	B	1678.1+x& 4	J+11	B	2822.3+x[d] 5	J+(15)	B
774.0+x[b] 3	J+6	B	1704.3+x[c] 4	J+10	B	2909.9+x@ 4	J+(16)	B
779.1+x[d] 4	J+5	B	1790.2+x[a] 4	J+11	B	2916.5+x[b] 4	J+(16)	B
887.0+x[c] 4	J+6	B	1883.6+x[d] 4	J+11	B	3175.9+x[a] 4	J+(17)	B
914.1+x& 3	J+7	B	1935.1+x[b] 4	J+12	B	3180.6+x& 4	J+(17)	B
973.7+x[a] 3	J+7	B	1974.0+x@ 4	J+12	B	3405.6+x@ 4	J+(18)	B
1103.4+x[b] 3	J+8	B	2145.9+x& 4	J+13	B			
1113.0+x@ 3	J+8	B	2164.8+x[c] 4	J+(12)	B			

† From least squares fit to Eγ.

‡ For levels seen in ^{224}Pa α decay: for possible J^π assignments based on γ multipolarity, α HF, and shell model expectations, see ^{224}Pa α decay data set (1996Li05). For levels at x keV and above: the assignments are from (^{14}C,3nγ) data set (1991Sc19) and are based on γγ, γ multipolarity and band structure.

The authors suggest that J^π of level at x keV is relatively high, and thus this level is not the g.s. of ^{220}Ac (x≠0). This suggestion is based on the observation that the difference between the highest and lowest observed states is only 18 spin units, whereas much higher spins have been reached with this reaction in other nuclei. Also the γ rays seen in ^{224}Pa α decay were not seen in this study.

@ Band(A): band A; parity=π.

& Band(B): band B; parity=−π.

a Band(C): band C; parity=π.

b Band(D): band D; parity=−π.

c Band(E): band E; parity=π.

d Band(F): band F; parity=−π.

Adopted Levels, Gammas (continued)

γ(^{220}Ac)

All γ-ray data are from ^{224}Pa α decay (for levels seen in that decay) and from ^{209}Bi(^{14}C,3nγ) data set (for levels seen in that reaction).

E_i(level)	J_i^π	E_γ	I_γ[‡]	E_f	J_f^π	Mult.	δ	α[†]	Comments
13.79		(13.8)		0	(3$^-$)				
28.0		28.0[#] *1*		0	(3$^-$)	[E1]		3.34 *6*	α(L)=2.50 *5*; α(M)=0.634 *11*; α(N+..)=0.202 *4* α(N)=0.163 *3*; α(O)=0.0340 *6*; α(P)=0.00487 *8*; α(Q)=0.000164 *3*
40.69		40.7 *1*		0	(3$^-$)	M1+E2	0.18	70.3 *12*	α(L)=52.7 *9*; α(M)=13.21 *22*; α(N+..)=4.45 *8* α(N)=3.50 *6*; α(O)=0.795 *14*; α(P)=0.1388 *23*; α(Q)=0.00860 *14* Mult.: Reported as M1 in 1996Li05. Evaluators adopted M1+E2 for transition-intensity balance purposes.
68.71	(5$^-$)	28.0[#] *1*		40.69		M1		143 *3*	α(L)=108.4 *19*; α(M)=26.1 *5*; α(N+..)=8.86 *16* α(N)=6.93 *13*; α(O)=1.61 *3*; α(P)=0.298 *6*; α(Q)=0.0266 *5*
71.56		57.8 *2*		13.79					
108.51		67.8 *2*		40.69		M1		10.63 *18*	α(L)=8.05 *14*; α(M)=1.93 *4*; α(N+..)=0.655 *11* α(N)=0.512 *9*; α(O)=0.1191 *20*; α(P)=0.0220 *4*; α(Q)=0.00196 *4*
113.30		113.3 *2*		0	(3$^-$)	(E2)		6.07 *10*	α(K)=0.266 *4*; α(L)=4.25 *7*; α(M)=1.163 *19*; α(N+..)=0.388 *7* α(N)=0.309 *5*; α(O)=0.0675 *11*; α(P)=0.01059 *18*; α(Q)=5.02×10^{-5} *8*
145.6?		74.0[&] *2*		71.56					
150.18		109.5 *1*		40.69		M1		13.07	α(K)=10.43 *15*; α(L)=2.00 *3*; α(M)=0.480 *7*; α(N+..)=0.1628 *24* α(N)=0.1272 *19*; α(O)=0.0296 *5*; α(P)=0.00547 *8*; α(Q)=0.000486 *7*
153.00		39.5[&]		113.30					
		81.5 *3*	≤28	71.56		M1		6.22 *11*	α(L)=4.71 *9*; α(M)=1.129 *20*; α(N+..)=0.383 *7* α(N)=0.300 *6*; α(O)=0.0697 *13*; α(P)=0.01288 *23*; α(Q)=0.001145 *21*
		139.2 *1*	45 *4*	13.79		M1		6.65	α(K)=5.32 *8*; α(L)=1.003 *15*; α(M)=0.241 *4*; α(N+..)=0.0817 *12* α(N)=0.0638 *9*; α(O)=0.01484 *21*; α(P)=0.00275 *4*; α(Q)=0.000243 *4*
		153.0 *1*	100 *7*	0	(3$^-$)	M1		5.08	α(K)=4.07 *6*; α(L)=0.766 *11*; α(M)=0.184 *3*; α(N+..)=0.0623 *9* α(N)=0.0487 *7*; α(O)=0.01133 *16*; α(P)=0.00209 *3*; α(Q)=0.000186 *3*
184.21		170.5 *3*	30 *5*	13.79		M1		3.74	α(K)=3.00 *5*; α(L)=0.563 *9*; α(M)=0.1349 *20*; α(N+..)=0.0458 *7* α(N)=0.0358 *6*; α(O)=0.00832 *13*; α(P)=0.001539 *23*; α(Q)=0.0001364 *21*
		184.2 *2*	100 *8*	0	(3$^-$)	M1		3.01	α(K)=2.41 *4*; α(L)=0.452 *7*; α(M)=0.1083 *16*; α(N+..)=0.0368 *6* α(N)=0.0287 *5*; α(O)=0.00668 *10*; α(P)=0.001236 *18*; α(Q)=0.0001095 *16*
233.81	(4$^+$,5$^+$,6$^+$)	165.1 *1*		68.71	(5$^-$)	E1		0.1458	α(K)=0.1150 *17*; α(L)=0.0234 *4*; α(M)=0.00563 *8*; α(N+..)=0.00187 *3* α(N)=0.001476 *21*; α(O)=0.000333 *5*; α(P)=5.76×10^{-5} *9*; α(Q)=3.64×10^{-6} *6*
263.22	(4$^+$,5$^+$,6$^+$)	113.1 *2*	32 *3*	150.18		E1		0.360	α(K)=0.278 *4*; α(L)=0.0623 *10*; α(M)=0.01506 *23*; α(N+..)=0.00498 *8* α(N)=0.00394 *6*; α(O)=0.000880 *13*; α(P)=0.0001488 *22*; α(Q)=8.47×10^{-6} *13*

$^{220}_{89}Ac_{131}$-3

Adopted Levels, Gammas (continued)

γ(^{220}Ac) (continued)

E_i(level)	J_i^π	E_γ	I_γ[‡]	E_f	J_f^π	Mult.	α[†]	Comments
263.22	(4$^+$,5$^+$,6$^+$)	154.7 *2*	18 *4*	108.51				
		194.5 *1*	100 *6*	68.71	(5$^-$)	E1	0.0986	α(K)=0.0782 *11*; α(L)=0.01544 *22*; α(M)=0.00371 *6*; α(N+..)=0.001235 *18* α(N)=0.000974 *14*; α(O)=0.000220 *3*; α(P)=3.84×10^{-5} *6*; α(Q)=2.53×10^{-6} *4*
312.0		298.2 *7*		13.79				
335.18		151.0 *2*	100 *30*	184.21				
		182.0 *4*	≈60	153.00				
		294.7 *5*	≈50	40.69				
		335.0 *7*	≈24	0	(3$^-$)			
356.1		247.6 *3*	86 *24*	108.51				
		287.4 *3*	100 *24*	68.71	(5$^-$)			
		315.8 *7*	≈19	40.69				
411.9		398.0 *10*	≈100	13.79				
		412.0 *10*	≈100	0	(3$^-$)			
59.0+x	J+1	59.0 *2*		0.0+x	J	M1	16.0 *3*	α(L)=12.08 *21*; α(M)=2.90 *5*; α(N+..)=0.984 *17* α(N)=0.769 *14*; α(O)=0.179 *3*; α(P)=0.0331 *6*; α(Q)=0.00294 *5*
136.2+x	J+2	77.3 *2*		59.0+x	J+1	M1	7.25 *12*	α(L)=5.49 *9*; α(M)=1.317 *21*; α(N+..)=0.447 *8* α(N)=0.349 *6*; α(O)=0.0813 *13*; α(P)=0.01503 *24*; α(Q)=0.001336 *22*
305.1+x	J+3	168.9 *2*	56.5 *13*	136.2+x	J+2	M1+E2	2.5 *14*	α(K)=1.6 *15*; α(L)=0.64 *7*; α(M)=0.16 *3*; α(N+..)=0.055 *9* α(N)=0.044 *7*; α(O)=0.0098 *13*; α(P)=0.00167 *10*; α(Q)=8.E−5 *7*
		246.0 *2*	100.0 *13*	59.0+x	J+1	E2	0.301	α(K)=0.1073 *16*; α(L)=0.1426 *21*; α(M)=0.0384 *6*; α(N+..)=0.01284 *19* α(N)=0.01022 *15*; α(O)=0.00225 *4*; α(P)=0.000363 *6*; α(Q)=5.90×10^{-6} *9*
401.3+x	J+4	96.3 *2*	21.5 *21*	305.1+x	J+3	M1(+E2)	8 *5*	α(L)=6 *3*; α(M)=1.6 *9*; α(N+..)=0.5 *3* α(N)=0.42 *24*; α(O)=0.09 *5*; α(P)=0.015 *8*; α(Q)=0.0004 *3*
		265.0 *2*	100.0 *21*	136.2+x	J+2	E2	0.236	α(K)=0.0924 *13*; α(L)=0.1057 *16*; α(M)=0.0284 *4*; α(N+..)=0.00949 *14* α(N)=0.00755 *11*; α(O)=0.001665 *24*; α(P)=0.000270 *4*; α(Q)=4.94×10^{-6} *7*
507.1+x	J+4	202.1 *2*		305.1+x	J+3	E1	0.0900	α(K)=0.0715 *11*; α(L)=0.01403 *20*; α(M)=0.00337 *5*; α(N+..)=0.001122 *16* α(N)=0.000885 *13*; α(O)=0.000200 *3*; α(P)=3.50×10^{-5} *5*; α(Q)=2.33×10^{-6} *4*
554.6+x	J+4	249.5 *2*	85 *8*	305.1+x	J+3	M1	1.287	α(K)=1.033 *15*; α(L)=0.193 *3*; α(M)=0.0461 *7*; α(N+..)=0.01565 *23* α(N)=0.01223 *18*; α(O)=0.00284 *4*; α(P)=0.000526 *8*; α(Q)=4.66×10^{-5} *7*
		418.5 *2*	100 *8*	136.2+x	J+2			
614.0+x	J+5	106.9 *2*	100.0 *13*	507.1+x	J+4	E1	0.097 *1*	
		212.7 *2*	23.9 *9*	401.3+x	J+4	M1(+E2)	1.3 *8*	α(K)=0.9 *8*; α(L)=0.281 *21*; α(M)=0.0713 *14*; α(N+..)=0.0240 *6* α(N)=0.0190 *4*; α(O)=0.00429 *18*; α(P)=0.00074 *9*; α(Q)=4.E−5 *4*
		309.0 *2*	57.2 *13*	305.1+x	J+3	E2	0.1464	α(K)=0.0677 *10*; α(L)=0.0581 *9*; α(M)=0.01547 *22*; α(N+..)=0.00518 *8* α(N)=0.00412 *6*; α(O)=0.000911 *13*; α(P)=0.0001490 *22*; α(Q)=3.45×10^{-6} *5*
625.3+x	J+5	224.0 *2*		401.3+x	J+4	E1	0.0707	α(K)=0.0563 *8*; α(L)=0.01087 *16*; α(M)=0.00261 *4*; α(N+..)=0.000870 *13* α(N)=0.000685 *10*; α(O)=0.0001555 *22*; α(P)=2.73×10^{-5} *4*; α(Q)=1.86×10^{-6} *3*

$^{220}_{89}Ac_{131}$-4

Adopted Levels, Gammas (continued)

γ(^{220}Ac) (continued)

E_i(level)	J_i^π	E_γ	I_γ[‡]	E_f	J_f^π	Mult.	α[†]	Comments
731.1+x	J+6	105.9 *2*	68 *3*	625.3+x	J+5	E1	0.0979	α(L)=0.0741 *11*; α(M)=0.0179 *3*; α(N+..)=0.00592 *9* α(N)=0.00469 *7*; α(O)=0.001045 *16*; α(P)=0.000176 *3*; α(Q)=9.81×10^{-6} *15*
		117.1 *2*	13 *7*	614.0+x	J+5	M1	10.86	α(K)=8.69 *13*; α(L)=1.648 *25*; α(M)=0.395 *6*; α(N+..)=0.1342 *20* α(N)=0.1049 *16*; α(O)=0.0244 *4*; α(P)=0.00451 *7*; α(Q)=0.000400 *6*
		329.7 *2*	100 *5*	401.3+x	J+4	E2	0.1210	α(K)=0.0594 *9*; α(L)=0.0455 *7*; α(M)=0.01207 *18*; α(N+..)=0.00404 *6* α(N)=0.00321 *5*; α(O)=0.000712 *10*; α(P)=0.0001170 *17*; α(Q)=2.98×10^{-6} *5*
774.0+x	J+6	159.9 *2*	100.0 *12*	614.0+x	J+5	E1	0.1575	α(K)=0.1240 *18*; α(L)=0.0254 *4*; α(M)=0.00611 *9*; α(N+..)=0.00203 *3* α(N)=0.001602 *23*; α(O)=0.000361 *6*; α(P)=6.23×10^{-5} *9*; α(Q)=3.91×10^{-6} *6*
		266.9 *2*	17.6 *12*	507.1+x	J+4	E2	0.231	α(K)=0.0911 *13*; α(L)=0.1027 *15*; α(M)=0.0276 *4*; α(N+..)=0.00922 *14* α(N)=0.00734 *11*; α(O)=0.001618 *24*; α(P)=0.000262 *4*; α(Q)=4.86×10^{-6} *7*
779.1+x	J+5	224.5 *2*		554.6+x	J+4			
887.0+x	J+6	107.9 *2*	100 *4*	779.1+x	J+5	E1	0.412 *2*	
		332.4 *2*	70 *4*	554.6+x	J+4	E2	0.1181	α(K)=0.0584 *9*; α(L)=0.0441 *7*; α(M)=0.01171 *17*; α(N+..)=0.00392 *6* α(N)=0.00311 *5*; α(O)=0.000690 *10*; α(P)=0.0001135 *16*; α(Q)=2.93×10^{-6} *5*
914.1+x	J+7	140.2 *2*	5.7 *18*	774.0+x	J+6	M1	6.52	α(K)=5.22 *8*; α(L)=0.983 *15*; α(M)=0.236 *4*; α(N+..)=0.0800 *12* α(N)=0.0625 *10*; α(O)=0.01454 *22*; α(P)=0.00269 *4*; α(Q)=0.000238 *4*
		183.1 *2*	100 *3*	731.1+x	J+6	E1	0.1138	α(K)=0.0901 *13*; α(L)=0.0180 *3*; α(M)=0.00432 *7*; α(N+..)=0.001438 *21* α(N)=0.001134 *17*; α(O)=0.000256 *4*; α(P)=4.46×10^{-5} *7*; α(Q)=2.89×10^{-6} *5*
		288.7 *2*	21.5 *24*	625.3+x	J+5			
973.7+x	J+7	199.7 *2*	100.0 *20*	774.0+x	J+6	E1	0.0926	α(K)=0.0735 *11*; α(L)=0.01446 *21*; α(M)=0.00347 *5*; α(N+..)=0.001156 *17* α(N)=0.000911 *13*; α(O)=0.000206 *3*; α(P)=3.60×10^{-5} *6*; α(Q)=2.39×10^{-6} *4*
		242.7[&] *2*	<16	731.1+x	J+6			
		359.7 *2*	41.8 *20*	614.0+x	J+5	E2	0.0945	α(K)=0.0498 *7*; α(L)=0.0330 *5*; α(M)=0.00872 *13*; α(N+..)=0.00292 *5* α(N)=0.00232 *4*; α(O)=0.000515 *8*; α(P)=8.52×10^{-5} *12*; α(Q)=2.45×10^{-6} *4*
1103.4+x	J+8	129.7 *2*	100 *5*	973.7+x	J+7	E1	0.260	α(K)=0.203 *3*; α(L)=0.0436 *7*; α(M)=0.01051 *16*; α(N+..)=0.00348 *5* α(N)=0.00275 *4*; α(O)=0.000617 *9*; α(P)=0.0001053 *16*; α(Q)=6.24×10^{-6} *9*
		189.3[@] *2*	19[@] *3*	914.1+x	J+7			
		329.4 *2*	38 *5*	774.0+x	J+6	E2	0.1213	α(K)=0.0595 *9*; α(L)=0.0456 *7*; α(M)=0.01212 *18*; α(N+..)=0.00406 *6* α(N)=0.00322 *5*; α(O)=0.000714 *11*; α(P)=0.0001174 *17*; α(Q)=2.99×10^{-6} *5*
1113.0+x	J+8	140.2 *3*	2.4 *11*	973.7+x	J+7	M1	6.52	α(K)=5.22 *8*; α(L)=0.983 *15*; α(M)=0.236 *4*; α(N+..)=0.0800 *13* α(N)=0.0625 *10*; α(O)=0.01454 *23*; α(P)=0.00269 *5*; α(Q)=0.000238 *4*
		199.8 *2*	100.0 *23*	914.1+x	J+7	E1	0.0925	α(K)=0.0734 *11*; α(L)=0.01444 *21*; α(M)=0.00347 *5*; α(N+..)=0.001155 *17* α(N)=0.000910 *13*; α(O)=0.000206 *3*; α(P)=3.60×10^{-5} *6*; α(Q)=2.39×10^{-6} *4*
		382.9 *2*	32.7 *19*	731.1+x	J+6	E2	0.0796	α(K)=0.0440 *7*; α(L)=0.0264 *4*; α(M)=0.00695 *10*; α(N+..)=0.00233 *4* α(N)=0.00185 *3*; α(O)=0.000411 *6*; α(P)=6.83×10^{-5} *10*; α(Q)=2.14×10^{-6} *3*
1120.1+x	J+7	233.0 *2*		887.0+x	J+6	E1	0.0645	α(K)=0.0514 *8*; α(L)=0.00987 *14*; α(M)=0.00237 *4*; α(N+..)=0.000789 *12* α(N)=0.000622 *9*; α(O)=0.0001412 *20*; α(P)=2.48×10^{-5} *4*; α(Q)=1.705×10^{-6} *24*
1266.1+x	J+9	152.2 *2*	100 *3*	1113.0+x	J+8	E1	0.177	α(K)=0.1393 *20*; α(L)=0.0288 *5*; α(M)=0.00694 *10*; α(N+..)=0.00230 *4* α(N)=0.00182 *3*; α(O)=0.000409 *6*; α(P)=7.05×10^{-5} *11*; α(Q)=4.36×10^{-6} *7*
		162.7 *2*	9.9 *19*	1103.4+x	J+8	(M1)	4.27	α(K)=3.42 *5*; α(L)=0.643 *10*; α(M)=0.1541 *23*; α(N+..)=0.0523 *8* α(N)=0.0409 *6*; α(O)=0.00951 *14*; α(P)=0.00176 *3*; α(Q)=0.0001558 *23*

$^{220}_{89}Ac_{131}$-5

Adopted Levels, Gammas (continued)

γ(^{220}Ac) (continued)

E_i(level)	J_i^π	E_γ	I_γ[‡]	E_f	J_f^π	Mult.	α[†]	Comments
1266.1+x	J+9	351.9 *2*	45 *3*	914.1+x	J+7	E2	0.1004	α(K)=0.0521 *8*; α(L)=0.0358 *5*; α(M)=0.00946 *14*; α(N+..)=0.00317 *5* α(N)=0.00252 *4*; α(O)=0.000558 *8*; α(P)=9.22×10^{-5} *13*; α(Q)=2.58×10^{-6} *4*
1267.8+x	J+8	147.7 *2*	100 *6*	1120.1+x	J+7	E1	0.191	α(K)=0.1495 *22*; α(L)=0.0311 *5*; α(M)=0.00750 *11*; α(N+..)=0.00249 *4* α(N)=0.00196 *3*; α(O)=0.000442 *7*; α(P)=7.60×10^{-5} *11*; α(Q)=4.67×10^{-6} *7*
		380.8 *2*	96 *6*	887.0+x	J+6	E2	0.0808	α(K)=0.0444 *7*; α(L)=0.0269 *4*; α(M)=0.00709 *10*; α(N+..)=0.00238 *4* α(N)=0.00188 *3*; α(O)=0.000419 *6*; α(P)=6.97×10^{-5} *10*; α(Q)=2.16×10^{-6} *3*
1372.9+x	J+9	259.2 *2*	8.2 *18*	1113.0+x	J+8	M1	1.158	α(K)=0.929 *14*; α(L)=0.1731 *25*; α(M)=0.0415 *6*; α(N+..)=0.01407 *20* α(N)=0.01100 *16*; α(O)=0.00256 *4*; α(P)=0.000473 *7*; α(Q)=4.19×10^{-5} *6*
		269.6 *2*	100.0 *23*	1103.4+x	J+8	D		
		399.1 *2*	15.5 *18*	973.7+x	J+7	E2	0.0713	α(K)=0.0405 *6*; α(L)=0.0228 *4*; α(M)=0.00599 *9*; α(N+..)=0.00201 *3* α(N)=0.001593 *23*; α(O)=0.000355 *5*; α(P)=5.92×10^{-5} *9*; α(Q)=1.95×10^{-6} *3*
1485.2+x	J+9	217.4 *2*	100 *9*	1267.8+x	J+8	E1	0.0758	α(K)=0.0604 *9*; α(L)=0.01170 *17*; α(M)=0.00281 *4*; α(N+..)=0.000936 *14* α(N)=0.000738 *11*; α(O)=0.0001673 *24*; α(P)=2.93×10^{-5} *5*; α(Q)=1.98×10^{-6} *3*
		365.0 *2*	19 *9*	1120.1+x	J+7			
1488.9+x	J+10	116.0 *2*	56 *4*	1372.9+x	J+9	E1	0.340	α(K)=0.263 *4*; α(L)=0.0583 *9*; α(M)=0.01409 *21*; α(N+..)=0.00466 *7* α(N)=0.00369 *6*; α(O)=0.000824 *13*; α(P)=0.0001396 *21*; α(Q)=8.01×10^{-6} *12*
		222.8 *2*	29 *5*	1266.1+x	J+9	(M1)	1.76	α(K)=1.415 *21*; α(L)=0.264 *4*; α(M)=0.0633 *9*; α(N+..)=0.0215 *3* α(N)=0.01680 *24*; α(O)=0.00391 *6*; α(P)=0.000723 *11*; α(Q)=6.40×10^{-5} *10*
		385.5 *2*	100 *5*	1103.4+x	J+8	E2	0.0782	α(K)=0.0434 *6*; α(L)=0.0258 *4*; α(M)=0.00678 *10*; α(N+..)=0.00227 *4* α(N)=0.00180 *3*; α(O)=0.000401 *6*; α(P)=6.67×10^{-5} *10*; α(Q)=2.11×10^{-6} *3*
1534.5+x	J+10	268.4 *2*	100 *5*	1266.1+x	J+9	E1	0.0465	α(K)=0.0373 *6*; α(L)=0.00701 *10*; α(M)=0.001677 *24*; α(N+..)=0.000560 *8* α(N)=0.000441 *7*; α(O)=0.0001004 *15*; α(P)=1.78×10^{-5} *3*; α(Q)=1.257×10^{-6} *18*
		420.6 *2*	18 *5*	1113.0+x	J+8	(E2)	0.0622	α(K)=0.0365 *6*; α(L)=0.0191 *3*; α(M)=0.00499 *7*; α(N+..)=0.001672 *24* α(N)=0.001325 *19*; α(O)=0.000296 *5*; α(P)=4.95×10^{-5} *7*; α(Q)=1.744×10^{-6} *25*
1678.1+x	J+11	143.6 *2*	89 *5*	1534.5+x	J+10	E1	0.204	α(K)=0.1597 *23*; α(L)=0.0335 *5*; α(M)=0.00806 *12*; α(N+..)=0.00267 *4* α(N)=0.00211 *3*; α(O)=0.000475 *7*; α(P)=8.15×10^{-5} *12*; α(Q)=4.97×10^{-6} *8*
		189.3[@] *2*	13[@] *4*	1488.9+x	J+10	M1+E2	1.8 *11*	α(K)=1.2 *11*; α(L)=0.423 *8*; α(M)=0.108 *8*; α(N+..)=0.0364 *25* α(N)=0.0288 *22*; α(O)=0.0065 *3*; α(P)=0.00111 *4*; α(Q)=6.E−5 *5*
		412.0 *2*	100 *5*	1266.1+x	J+9	E2	0.0656	α(K)=0.0380 *6*; α(L)=0.0205 *3*; α(M)=0.00536 *8*; α(N+..)=0.00180 *3* α(N)=0.001424 *20*; α(O)=0.000318 *5*; α(P)=5.31×10^{-5} *8*; α(Q)=1.82×10^{-6} *3*
1704.3+x	J+10	219.1 *2*	100 *6*	1485.2+x	J+9	E1	0.0744	α(K)=0.0593 *9*; α(L)=0.01148 *17*; α(M)=0.00275 *4*; α(N+..)=0.000918 *13* α(N)=0.000724 *11*; α(O)=0.0001641 *24*; α(P)=2.88×10^{-5} *4*; α(Q)=1.95×10^{-6} *3*
		436.5 *2*	50 *6*	1267.8+x	J+8			
1790.2+x	J+11	256[&]		1534.5+x	J+10			
		301.2 *2*	100 *3*	1488.9+x	J+10	(E1)	0.0358	α(K)=0.0288 *4*; α(L)=0.00533 *8*; α(M)=0.001274 *18*; α(N+..)=0.000426 *6* α(N)=0.000335 *5*; α(O)=7.65×10^{-5} *11*; α(P)=1.359×10^{-5} *20*; α(Q)=9.84×10^{-7} *14*
		417.3 *2*	17 *3*	1372.9+x	J+9			
1883.6+x	J+11	179.3 *2*	100 *7*	1704.3+x	J+10	E1	0.1197	α(K)=0.0947 *14*; α(L)=0.0190 *3*; α(M)=0.00456 *7*; α(N+..)=0.001516 *22* α(N)=0.001196 *17*; α(O)=0.000270 *4*; α(P)=4.69×10^{-5} *7*; α(Q)=3.03×10^{-6} *5*
		398.4 *2*	72 *7*	1485.2+x	J+9			

$^{220}_{89}Ac_{131}$-6

Adopted Levels, Gammas (continued)

γ(^{220}Ac) (continued)

E_i(level)	J_i^π	E_γ	I_γ ‡	E_f	J_f^π	Mult.	α †	Comments
1935.1+x	J+12	144.9 *2*	54 *3*	1790.2+x	J+11	E1	0.200	α(K)=0.1564 *23*; α(L)=0.0327 *5*; α(M)=0.00788 *12*; α(N+..)=0.00261 *4* α(N)=0.00206 *3*; α(O)=0.000464 *7*; α(P)=7.97×10^{-5} *12*; α(Q)=4.87×10^{-6} *7*
		257.2 *2*	20.1 *25*	1678.1+x	J+11	M1	1.183	α(K)=0.950 *14*; α(L)=0.177 *3*; α(M)=0.0424 *6*; α(N+..)=0.01438 *21* α(N)=0.01124 *16*; α(O)=0.00261 *4*; α(P)=0.000483 *7*; α(Q)=4.28×10^{-5} *6*
		446.2 *2*	100 *4*	1488.9+x	J+10	E2	0.0536	α(K)=0.0325 *5*; α(L)=0.01564 *22*; α(M)=0.00407 *6*; α(N+..)=0.001366 *20* α(N)=0.001082 *16*; α(O)=0.000242 *4*; α(P)=4.07×10^{-5} *6*; α(Q)=1.537×10^{-6} *22*
1974.0+x	J+12	295.8 *2*	100 *4*	1678.1+x	J+11	E1	0.0373	α(K)=0.0300 *5*; α(L)=0.00556 *8*; α(M)=0.001330 *19*; α(N+..)=0.000445 *7* α(N)=0.000350 *5*; α(O)=7.98×10^{-5} *12*; α(P)=1.417×10^{-5} *20*; α(Q)=1.022×10^{-6} *15*
		439.4 *2*	23 *4*	1534.5+x	J+10			
2145.9+x	J+13	171.9 *2*	59 *4*	1974.0+x	J+12	E1	0.1324	α(K)=0.1045 *15*; α(L)=0.0211 *3*; α(M)=0.00507 *8*; α(N+..)=0.001687 *25* α(N)=0.001331 *19*; α(O)=0.000301 *5*; α(P)=5.21×10^{-5} *8*; α(Q)=3.33×10^{-6} *5*
		210.8 *3*	<21	1935.1+x	J+12			
		467.8 *2*	100 *4*	1678.1+x	J+11	E2	0.0477	α(K)=0.0296 *5*; α(L)=0.01339 *19*; α(M)=0.00347 *5*; α(N+..)=0.001166 *17* α(N)=0.000923 *13*; α(O)=0.000207 *3*; α(P)=3.49×10^{-5} *5*; α(Q)=1.391×10^{-6} *20*
2164.8+x	J+(12)	281.0 *2*	100 *13*	1883.6+x	J+11			
		460.6 *2*	45 *13*	1704.3+x	J+10			
2223.6+x	J+13	288.5 *2*	100 *5*	1935.1+x	J+12	E1	0.0395	α(K)=0.0317 *5*; α(L)=0.00590 *9*; α(M)=0.001411 *20*; α(N+..)=0.000472 *7* α(N)=0.000371 *6*; α(O)=8.46×10^{-5} *12*; α(P)=1.501×10^{-5} *22*; α(Q)=1.078×10^{-6} *16*
		433.5 *2*	22 *5*	1790.2+x	J+11			
2339.6+x	J+(13)	174.8 *2*	67 *17*	2164.8+x	J+(12)			
		456.1 *2*	100 *17*	1883.6+x	J+11			
2416.2+x	J+14	192.6 *2*	79 *7*	2223.6+x	J+13	E1	0.1009	α(K)=0.0800 *12*; α(L)=0.01583 *23*; α(M)=0.00380 *6*; α(N+..)=0.001266 *18* α(N)=0.000998 *15*; α(O)=0.000226 *4*; α(P)=3.94×10^{-5} *6*; α(Q)=2.59×10^{-6} *4*
		270.0 *5*	<18	2145.9+x	J+13			
		481.1 *2*	100 *7*	1935.1+x	J+12	E2	0.0445	α(K)=0.0281 *4*; α(L)=0.01223 *18*; α(M)=0.00317 *5*; α(N+..)=0.001063 *15* α(N)=0.000841 *12*; α(O)=0.000189 *3*; α(P)=3.19×10^{-5} *5*; α(Q)=1.312×10^{-6} *19*
2431.3+x	J+14	285.4 *2*	61 *20*	2145.9+x	J+13	E1	0.0405	α(K)=0.0325 *5*; α(L)=0.00606 *9*; α(M)=0.001448 *21*; α(N+..)=0.000484 *7* α(N)=0.000381 *6*; α(O)=8.68×10^{-5} *13*; α(P)=1.539×10^{-5} *22*; α(Q)=1.103×10^{-6} *16*
		457.2 *2*	100 *20*	1974.0+x	J+12			
2637.0+x	J+(14)	297.4 *2*		2339.6+x	J+(13)			
		472.0 *2*		2164.8+x	J+(12)			
2649.2+x	J+(15)	217.8 *2*	100 *9*	2431.3+x	J+14			
		233.2 *3*	27 *9*	2416.2+x	J+14			
		503.3 *2*	93 *9*	2145.9+x	J+13			
2686.9+x	J+(15)	270.7 *2*	100 *5*	2416.2+x	J+14			
		463.3 *2*	20 *5*	2223.6+x	J+13			
2822.3+x	J+(15)	185.0 *3*		2637.0+x	J+(14)			
		482.9 *2*		2339.6+x	J+(13)			
2909.9+x	J+(16)	260.8 *2*	100 *16*	2649.2+x	J+(15)	(E1)	0.0497	α(K)=0.0398 *6*; α(L)=0.00751 *11*; α(M)=0.00180 *3*; α(N+..)=0.000600 *9* α(N)=0.000473 *7*; α(O)=0.0001076 *16*; α(P)=1.90×10^{-5} *3*; α(Q)=1.336×10^{-6} *19*
		478.5 *2*	55 *16*	2431.3+x	J+14			

$^{220}_{89}Ac_{131}$-7

Adopted Levels, Gammas (continued)

γ(^{220}Ac) (continued)

E_i(level)	J_i^π	E_γ	I_γ‡	E_f	J_f^π	Mult.	α†	Comments
2916.5+x	J+(16)	229.5 *2*	100 *16*	2686.9+x	J+(15)			
		500.3 *2*	100 *16*	2416.2+x	J+14	(E2)	0.0406	α(K)=0.0260 *4*; α(L)=0.01079 *16*; α(M)=0.00279 *4*; α(N+..)=0.000936 *14* α(N)=0.000740 *11*; α(O)=0.0001661 *24*; α(P)=2.82×10^{-5} *4*; α(Q)=1.209×10^{-6} *17*
3175.9+x	J+(17)	259.3 *2*		2916.5+x	J+(16)			
		489.1 *2*		2686.9+x	J+(15)			
3180.6+x	J+(17)	270.3 *5*		2909.9+x	J+(16)			
		531.4 *2*		2649.2+x	J+(15)			
3405.6+x	J+(18)	224.7 *4*		3180.6+x	J+(17)			
		495.8 *2*		2909.9+x	J+(16)			

† Additional information 1.
‡ Relative Iγ from level.
# Possible doublet.
@ Multiply placed with intensity suitably divided.
& Placement of transition in the level scheme is uncertain.

$^{220}_{89}Ac_{131}$-8

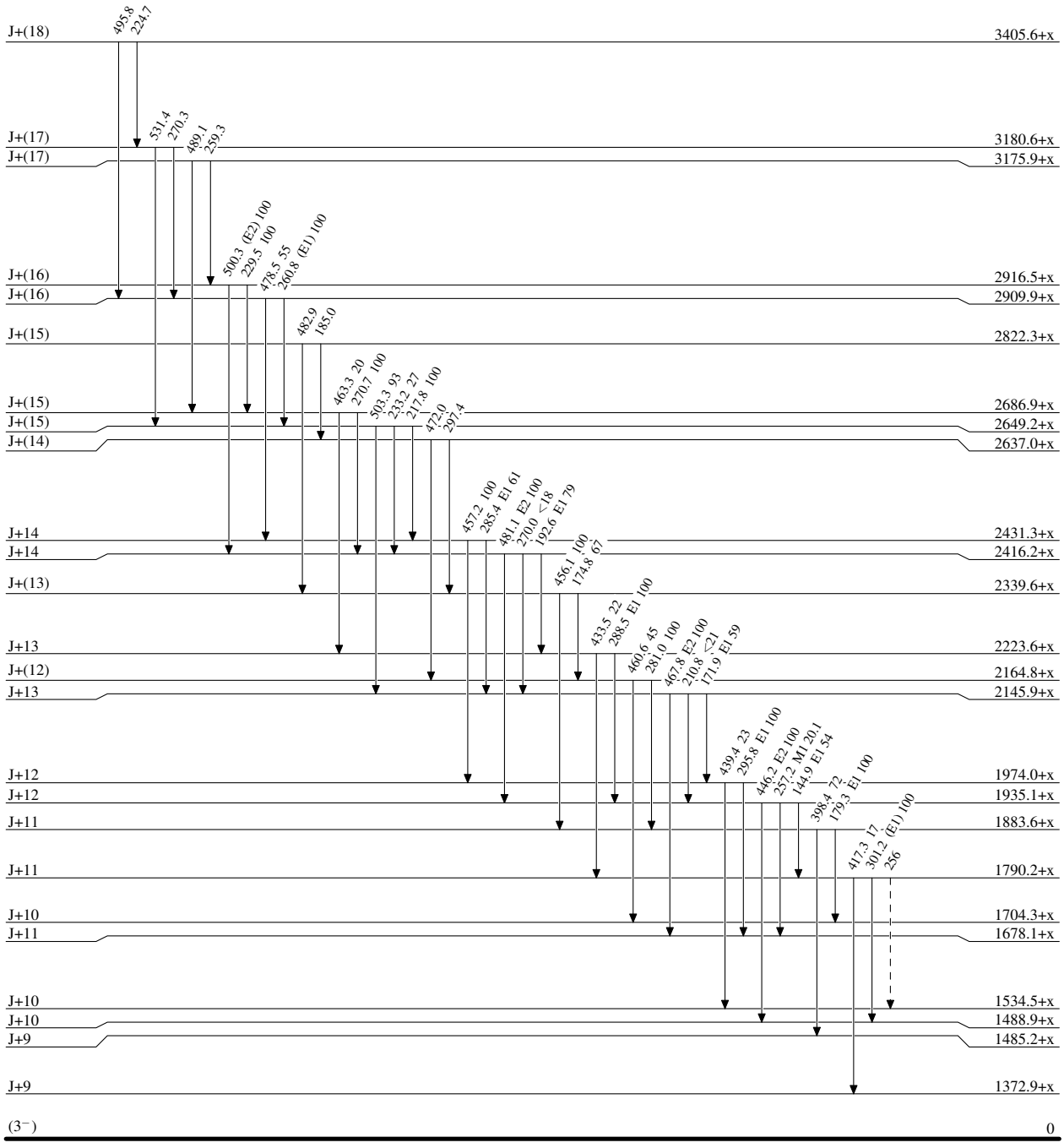
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

- - - - - - ► γ Decay (Uncertain)



$^{220}_{89}Ac_{131}$

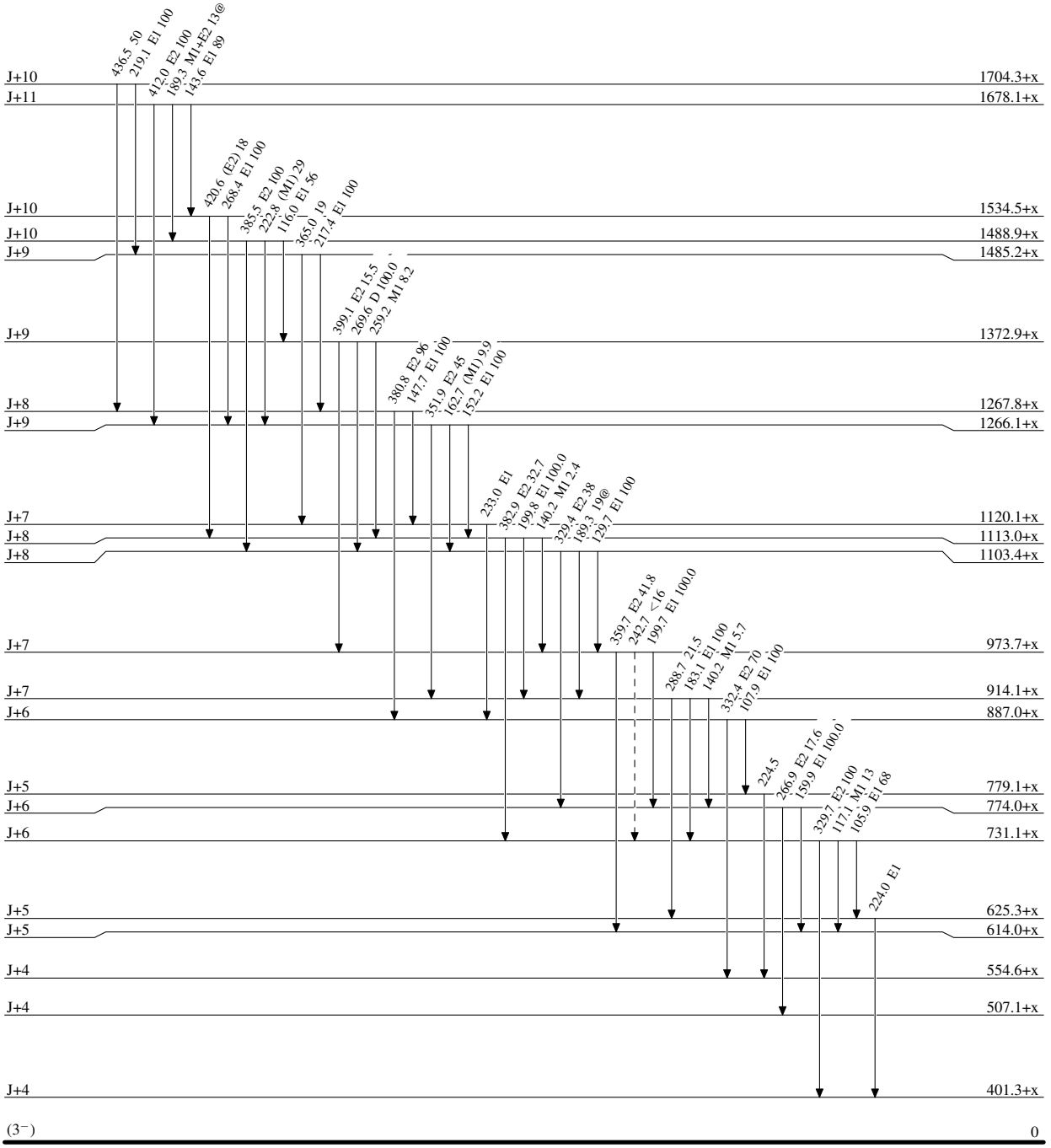
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided

- - - - - - ► γ Decay (Uncertain)



$^{220}_{89}Ac_{131}$

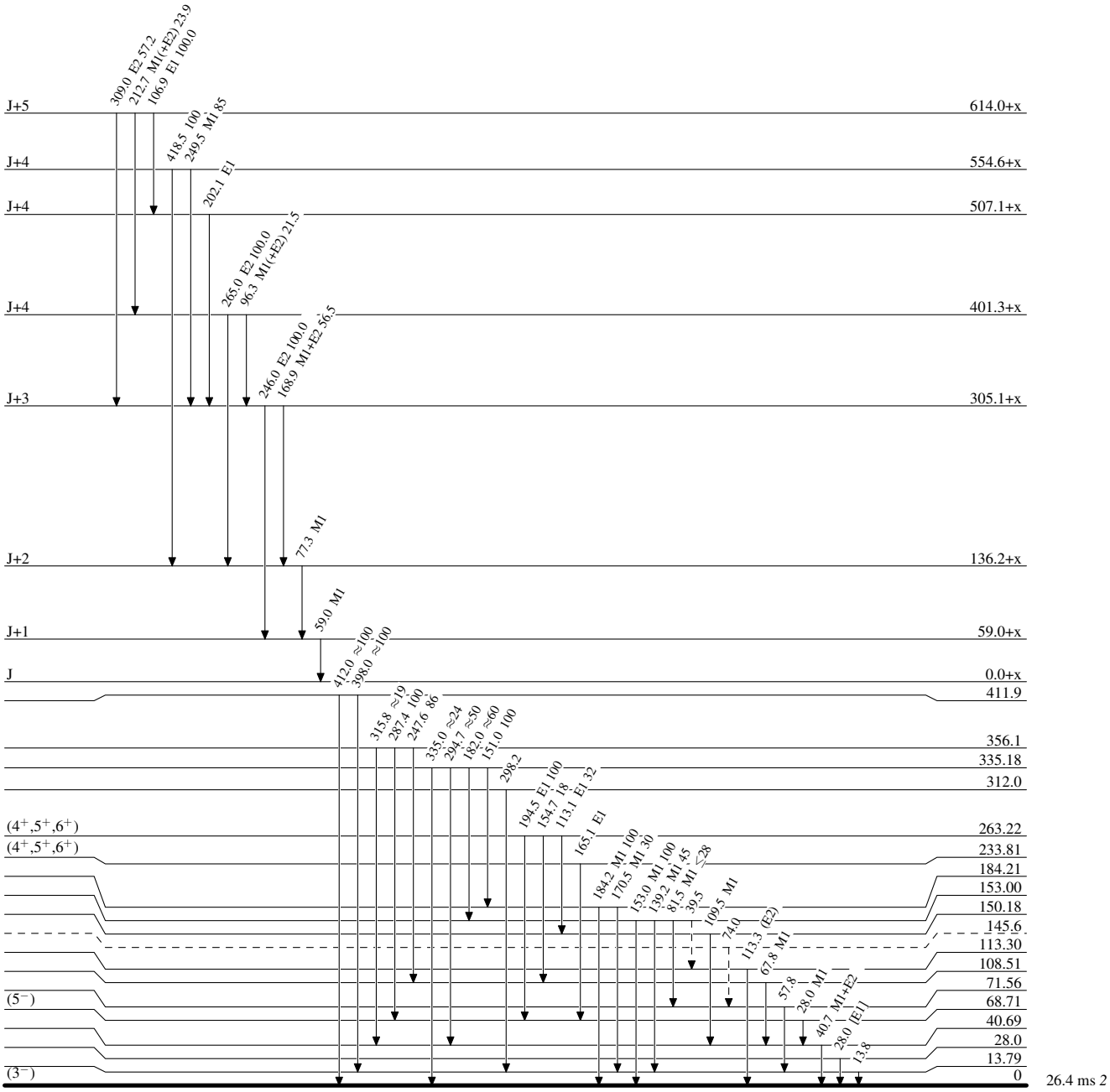
Adopted Levels, Gammas

Legend

Level Scheme (continued)

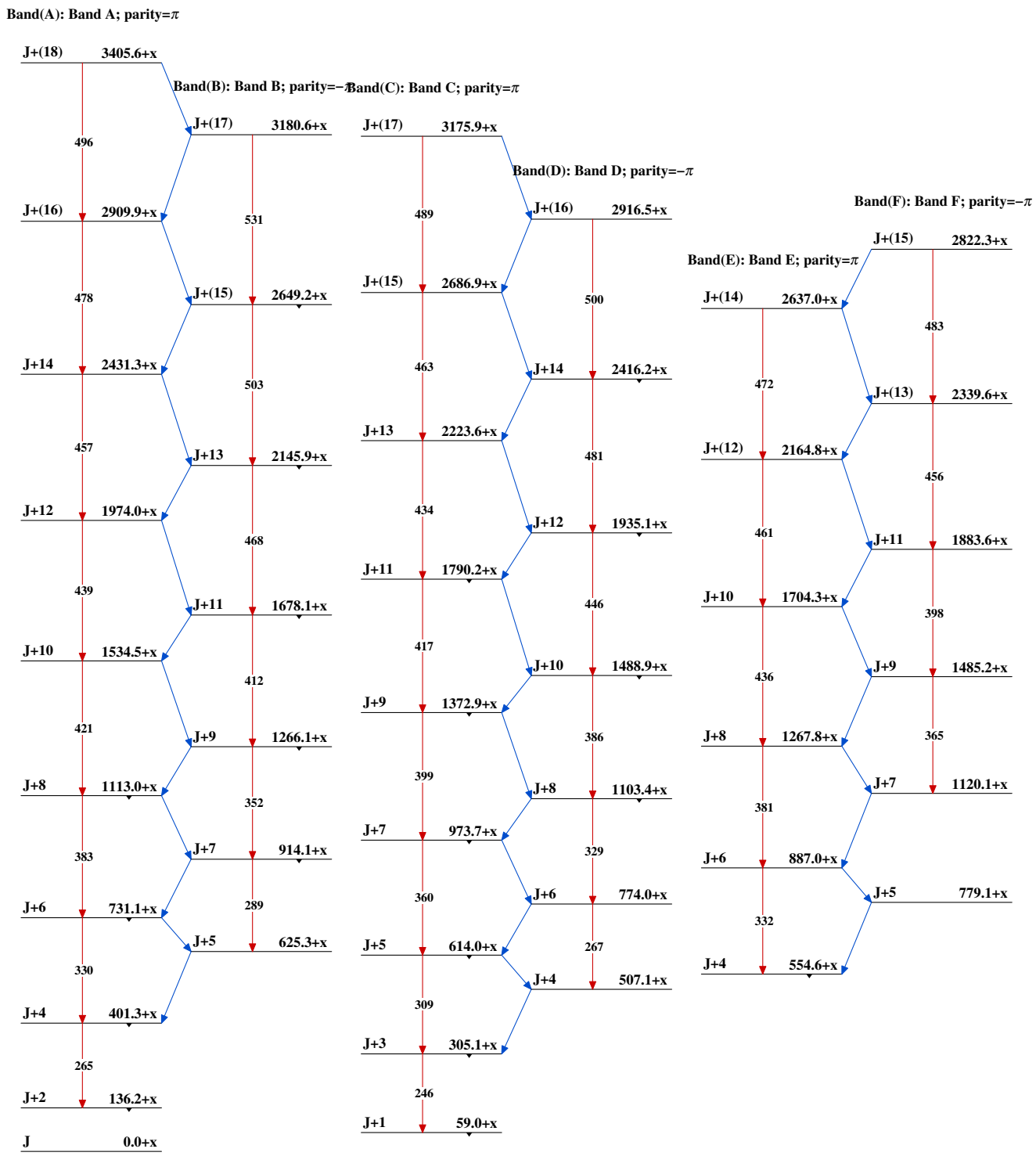
Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided

- - - - - - ► γ Decay (Uncertain)



$^{220}_{89}Ac_{131}$

Adopted Levels, Gammas



$^{220}_{89}Ac_{131}$