Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	S. -c. Wu	NDS 108,1057 (2007)	1-Mar-2007

Q(β^-)=2004 *7*; S(n)=4559 *8*; S(p)=4491 *4*; Q(α)=7950 *3* 2012Wa38
Note: Current evaluation has used the following Q record 2002 8 *4559* 8 *4491* 4 *7950* 3 2003Au03.

Calculations:
n-p interaction energy: 1990Mo11.
Spontaneous emission of heavy ions: 1986Po06.

^{216}At Levels

All information about excited levels in this nucleus (except the 413-keV level) comes from ^{220}Fr α decay.

Cross Reference (XREF) Flags

A ^{220}Fr α decay

E(level)†	J$^\pi$	$T_{1/2}$	XREF	Comments
0.0‡	1$^-$	0.30 ms *3*	A	%α=100; %ε<3×10^{-7}; %β^-<6×10^{-3} J$^\pi$: HF=2.3 for α decay to g.s. of ^{212}Bi with J=1 indicates same configuration. π=− from shell model (in this case, the evaluator considers shell model a strong argument). $T_{1/2}$: from 1951Me10. %ε,%β^-: from log *ft*>5.9 for β^- or ε: %ε(g.s.)<2.5×10^{-7}, %β^- (g.s.)<7.9×10^{-5} and %β^- (465 level)<3.2×10^{-5}. From log *ft*>3.6 for β^- to any level above the 465 level, %β^-<6.3×10^{-3} to any single level in this range.
44.59‡ *4*	(2)$^-$		A	J$^\pi$: M1 γ to 1$^-$ g.s.; proposed configurations suggests 2$^-$.
57.11‡ *15*	(4)$^-$		A	E(level): possibly a (4)$^-$ isomeric state which decays by a 7488-keV α to a 381-keV (6$^-$) level in ^{212}Bi (1994Li10,1996Sh05). J$^\pi$: M1 γ from 199.2 (3)$^-$ level; no γ to 1$^-$ g.s. suggests 4$^-$.
105.89‡ *5*	(0)$^-$		A	J$^\pi$: M1 γ to 1$^-$ g.s.; E2 γ to (2)$^-$ 44.59 level.
122.0‡ *2*	(5)$^-$		A	J$^\pi$: M1 γ to 57.11 (4)$^-$ level; no α decay from 1$^+$ ^{220}Fr suggests high L change for α decay; proposed configuration suggests 5$^-$.
153.4# *1*	(2)$^-$		A	J$^\pi$: M1 γ to 1$^-$ g.s.; proposed configuration.
160.73# *5*	(1)$^-$		A	J$^\pi$: M1 γ to 1$^-$ g.s.; M1 γ to (2)$^-$ level; proposed configuration.
169.3‡ *1*	(3$^-$)		A	J$^\pi$: γ's to (2)$^-$ and (4)$^-$ levels; proposed configuration.
199.2# *2*	(3)$^-$		A	J$^\pi$: M1 γ's to (2)$^-$ and (4)$^-$ levels.
208.0 *1*	(1,2)$^-$		A	J$^\pi$: M1 γ to (2)$^-$ level; γ to 1$^-$ g.s.
234.6 *2*	(1,2$^-$)		A	J$^\pi$: γ to (0)$^-$ level.
254.8 *4*			A	
278.2# *2*	(4)$^-$		A	J$^\pi$: M1 γ to (5)$^-$ level; γ to (2)$^-$ level.
302.8 *2*	(1,2$^-$)		A	J$^\pi$: γ to (0)$^-$ level.
317 *3*			A	E(level): from Eα.
381.1 *2*	(2$^-$,3$^-$)		A	J$^\pi$: γ to 1$^-$ g.s.; γ to (4)$^-$ level.
413?	(9$^-$)	0.1 ms *syst*		%α=100 1971Br13 report a 7960α with $T_{1/2}$ characteristic of ^{220}Fr in a ^{224}Ac source (absence of this group in $\alpha\alpha$ with ^{212}Po rules out assignment to ^{220}Fr itself). Iα/Iα(^{216}At g.s. α)=2.8×10^{-4}. This α group may feed the 250-keV, (9$^-$)

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Adopted Levels, Gammas (continued)

^{216}At Levels (continued)

E(level)[†]	XREF	Comments
		isomer in ^{212}Bi, in which case one predicts, on the basis of systematics (HF=2.2), a 9^- isomer in ^{216}At at 413 keV with $T_{1/2}\approx 0.1$ ms (1980Sc26). %α: from systematics (1980Sc26).
421.5 *4*	A	
479.3	A	

[†] From least squares fit to Eγ.
[‡] Band(A): Possible Configuration=$((\pi\ h_{9/2})^{+3}(\nu\ g_{9/2})^{+5})$ (1996Sh05).
[#] Band(B): Possible Configuration=$((\pi\ h_{9/2})^{+3}(\nu\ g_{9/2})^{+4}(\nu\ i_{11/2})) + ((\pi\ h_{9/2})^{+2}(\pi\ f_{7/2})(\nu\ g_{9/2})^{+5})$ (1996Sh05).

$\gamma(^{216}$At)

All γ data are from ^{220}Fr α decay.

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.	α[†]
44.59	$(2)^-$	44.60 *5*		0.0	1^-	M1	24.6
105.89	$(0)^-$	61.3 *1*	23 *3*	44.59	$(2)^-$	E2	76.3
		105.88 *5*	100 *7*	0.0	1^-	M1	10.27
122.0	$(5)^-$	64.9 *1*		57.11	$(4)^-$	M1	8.18
153.4	$(2)^-$	96.4[‡]	<15	57.11	$(4)^-$	(E2)	9.00
		108.8 *1*	17.3 *23*	44.59	$(2)^-$	M1	9.51
		153.4 *1*	100 *8*	0.0	1^-	M1	3.58
160.73	$(1)^-$	54.8 *1*	3.9 *13*	105.89	$(0)^-$		
		116.2 *1*	9.2 *13*	44.59	$(2)^-$	M1	7.88
		160.7 *1*	100 *5*	0.0	1^-	M1	3.14
169.3	(3^-)	112.1 *2*	7 *3*	57.11	$(4)^-$		
		124.7 *1*	100 *9*	44.59	$(2)^-$		
199.2	$(3)^-$	(45.8)		153.4	$(2)^-$		
		142.1 *1*	100 *13*	57.11	$(4)^-$	M1	4.45
		154.5 *3*	50 *13*	44.59	$(2)^-$	M1	3.51
208.0	$(1,2)^-$	(47.3)		160.73	$(1)^-$		
		163.4 *1*	100 *3*	44.59	$(2)^-$	M1	2.99
		208.0 *4*	3.9 *17*	0.0	1^-		
234.6	$(1,2^-)$	128.7 *2*		105.89	$(0)^-$		
254.8		132.8 *3*		122.0	$(5)^-$		
278.2	$(4)^-$	156.1 *1*	100 *18*	122.0	$(5)^-$	M1	3.41
		221.1 *3*	18 *5*	57.11	$(4)^-$		
		233.6 *2*	32 *6*	44.59	$(2)^-$		
302.8	$(1,2^-)$	196.9 *2*	42 *11*	105.89	$(0)^-$		
		258.2 *2*	100 *21*	44.59	$(2)^-$		
		302.7 *4*	63 *11*	0.0	1^-		
381.1	$(2^-,3^-)$	173.0 *3*	19 *10*	208.0	$(1,2)^-$		
		182.1 *2*	16 *6*	199.2	$(3)^-$		
		323.9 *7*	32 *10*	57.11	$(4)^-$		
		381.0 *5*	100 *16*	0.0	1^-		
421.5		260.5 *5*	78 *33*	160.73	$(1)^-$		
		268.3 *4*	100 *33*	153.4	$(2)^-$		
479.3		318.6[‡] *4*		160.73	$(1)^-$		

[†] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation

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Adopted Levels, Gammas (continued)

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

based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
‡ Placement of transition in the level scheme is uncertain.

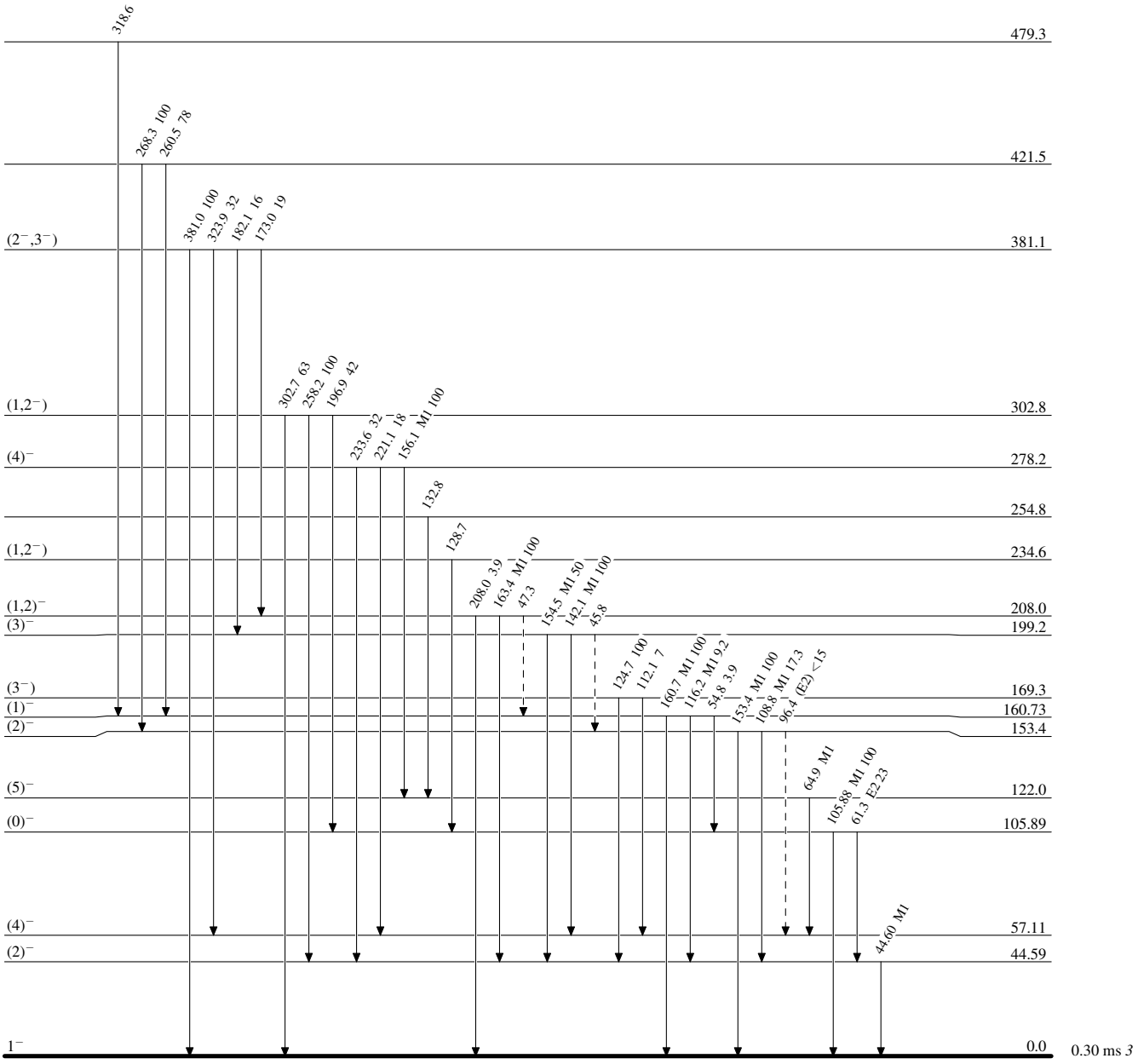
Adopted Levels, Gammas

Legend

Level Scheme

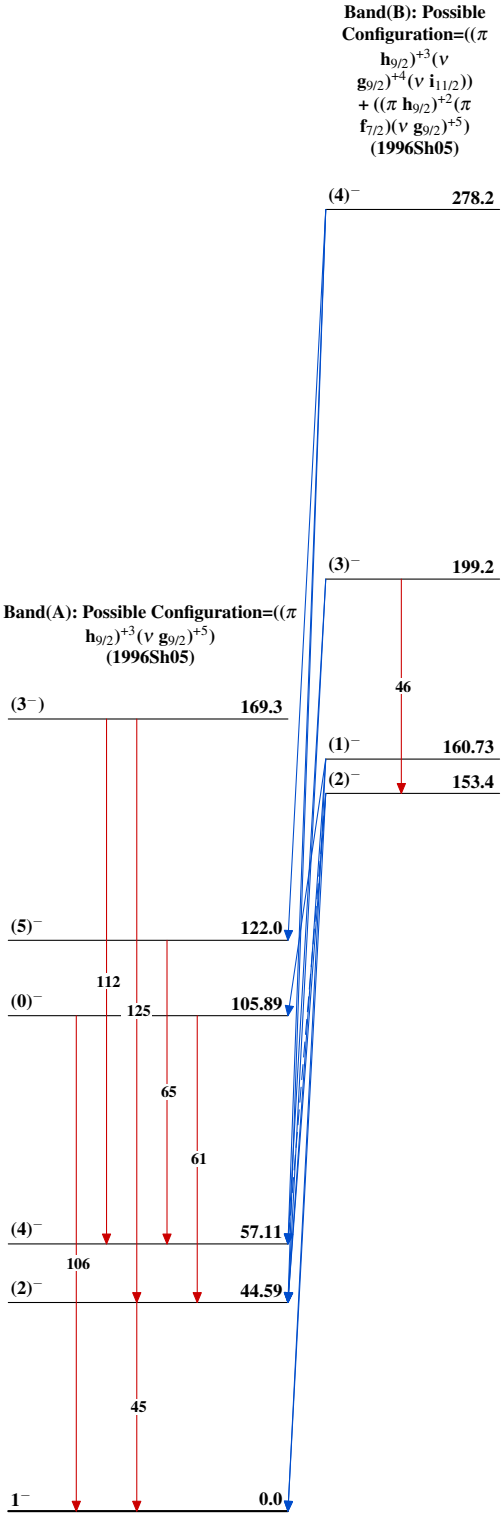
Intensities: Relative photon branching from each level

- - - - - - ► γ Decay (Uncertain)



$^{216}_{85}At_{131}$

Adopted Levels, Gammas



$^{216}_{85}At_{131}$