^{211}At IT decay (4.23 μs) 1971Ma36

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	B. Singh, S. Singh, H. X. Nguyen and M. Patial	NDS 114, 661 (2013)	28-Feb-2013

Parent: ^{211}At: E=4816.2; $J^{\pi}=(39/2^-)$; $T_{1/2}=4.23$ μs *7*; %IT decay=100.0

1971Ma36: ^{204}Hg(^{11}B,4nγ), ^{208}Pb(^{7}Li,4nγ) E=41 MeV, and ^{209}Bi(α,2nγ) E=34 MeV. Measured: Eγ, Iγ, Ice, $\gamma\gamma$, excit (delayed and in-beam); (beam)(γ)(t); $\gamma\gamma$(t); (beam)(γ)(θ) (in beam); γ(θ,H,t) (with a liquid ^{204}Hg target). Comparison with shell-model calculations.

2009Ba28: ^{9}Be(^{238}U,X) E=1 GeV/nucleon, ^{211}At isomer populated and separated in fragmentation reaction using FRS at GSI facility, measured γ rays using RISING array of Ge detectors. Following γ rays in spectral figure 2 of the paper: 204, 253, 435, 511, 689, 1067, 1535. All the γ rays are in agreement with those from 1971Ma36.

^{211}At Levels

The level scheme proposed by 1971Ma36 is based on the $\gamma\gamma$-coin data. Configurations are based on shell-model calculations.

E(level)	J^{π}[†]	$T_{1/2}$	Comments
0.0[‡]	$9/2^-$		
1067.1[‡]	$(13/2)^-$		
1320.6[‡]	$(17/2)^-$		
1416.6[‡]	$(21/2)^-$	≈50 ns	$T_{1/2}$: from γ(t), $\gamma\gamma$(t).
1927.8	$(23/2)^-$		Configuration=$\pi(h^2_{9/2}f_{7/2})$ (1971Ma36).
2617.2	$(25/2^+)$		Configuration=$\pi(h^2_{9/2}i_{13/2})$ (1971Ma36).
2641.4	$(29/2)^+$	≈70 ns	Configuration=$\pi(h^2_{9/2}i_{13/2})$ (1971Ma36). $T_{1/2}$: from (713.6γ)(t).
4177.4	$(31/2^+)$	≤10 ns	$T_{1/2}$: (1536γ)(203.7γ,435.1γ)(t). Tentative configuration= $\pi h^3_{9/2}\otimes\nu(g_{9/2}p^{-1}_{1/2})$ (1971Ma36).
4381.1	$(33/2^+)$		Tentative configuration= $\pi(h^2_{9/2}f_{7/2})\otimes\nu(g_{9/2}p^{-1}_{1/2})$ (1971Ma36).
4816.2	$(39/2^-)$	4.23 μs *7*	g=0.72 *7* (1971Ma36) Tentative configuration= $\pi(h^2_{9/2}i_{13/2})\otimes\nu(g_{9/2}p^{-1}_{1/2})$ (1971Ma36). $T_{1/2}$: from γ(t) in 2001Ba79. Other: 4.2 μs *4* (1971Ma36) from γ(t), pulsed beam. g: from (^{11}B)(γ)(θ,H,t) (1971Ma36), pulsed beam.

[†] From Adopted Levels.

[‡] Member of $\pi h^3_{9/2}$ configuration.

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γ(^{211}At)

E_γ	I_γ[‡][@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α[†][#]	$I_{(\gamma+ce)}$[@]	Comments
(24.2)		2641.4	$(29/2)^+$	2617.2	$(25/2^+)$	[E2]		7.23×10^3	76 *10*	ce(L)/(γ+ce)=0.742 *8*; ce(M)/(γ+ce)=0.196 *4* ce(N)/(γ+ce)=0.0505 *10*; ce(O)/(γ+ce)=0.00983 *20*; ce(P)/(γ+ce)=0.000967 *20* α(L)=5.37×10^3 *8*; α(M)=1421 *20*; α(N)=365 *6*; α(O)=71.1 *10*; α(P)=6.99 *10* E_γ: from E(level) difference. $I_{(\gamma+ce)}$: from intensity balances at 2617 and 2641 levels; weighted average of 73 *11* (from intensity balance at 2641 level) and 79 *10* ((from intensity balance at 2617 level).
96.0 *5*	7 *2*	1416.6	$(21/2)^-$	1320.6	$(17/2)^-$	E2		9.0 *3*		α(L)=6.65 *19*; α(M)=1.79 *5*; α(N+..)=0.560 *16* α(N)=0.461 *14*; α(O)=0.090 *3*; α(P)=0.0091 *3* α(L)exp=6.4 *20*; α(M)exp=1.5 *5* Mult.: from ce data. α: α excludes α(K), K-shell binding energy =95.73 keV.
203.7 *5*	40 *4*	4381.1	$(33/2^+)$	4177.4	$(31/2^+)$	M1+E2	0.8 *4*	1.2 *3*		α(K)exp=0.9 *3*; α(L)exp=0.30 *6*; α(M)exp=0.06 *2* α(K)=0.9 *3*; α(L)=0.230 *4*; α(M)=0.0570 *17* α(N)=0.0148 *5*; α(O)=0.00306 *5*; α(P)=0.00038 *3* Mult.,δ: from α(K)exp. α(L)exp and α(M)exp are consistent with M1 or E2.
253.5 *5*	82	1320.6	$(17/2)^-$	1067.1	$(13/2)^-$	E2		0.223	100	ce(K)/(γ+ce)=0.0808 *11*; ce(L)/(γ+ce)=0.0752 *12*; ce(M)/(γ+ce)=0.0198 *4* ce(N)/(γ+ce)=0.00512 *9*; ce(O)/(γ+ce)=0.001021 *17*; ce(P)/(γ+ce)=0.0001103 *18* α(K)=0.0987 *15*; α(L)=0.0920 *15*; α(M)=0.0242 *4*; α(N)=0.00626 *11*; α(O)=0.001248 *21* α(K)exp=0.08 *2*; α(M)exp=0.026 *5*; A_2=+0.24 *2* Mult.: from ce and γ(θ) data.
435.1 *5*	89 *10*	4816.2	$(39/2^-)$	4381.1	$(33/2^+)$	E3		0.184		α(K)exp=0.09 *2*; α(L)exp=0.07 *2*; α(M)exp=0.020 *6*; A_2=+0.3 *1* α(K)=0.0780 *11*; α(L)=0.0787 *12*; α(M)=0.0210 *4* α(N)=0.00547 *9*; α(O)=0.001103 *17*; α(P)=0.0001236 *19* Mult.: from α(K)exp. α(L)exp and α(M)exp do not give unique multipolarity.
511.2 *5*	105 *15*	1927.8	$(23/2)^-$	1416.6	$(21/2)^-$	M1		0.1306		α(L)=0.01952; α(M)=0.0138 α(K)=0.1062 *16*; α(L)=0.0185 *3*; α(M)=0.00438 *7* α(N)=0.001133 *17*; α(O)=0.000243 *4*; α(P)=3.36×10^{-5} *5* α(K)exp=0.12 *3*; α(L)exp=0.020 *5*; A_2=−0.20 *3* Mult.: from ce and γ(θ) data.
689.4 *5*	79 *10*	2617.2	$(25/2^+)$	1927.8	$(23/2)^-$	(E1)		0.00562		α(K)exp=0.013 *10*

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$\gamma(^{211}At)$ (continued)

E_γ	I_γ[‡][@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[†][#]	Comments
								α(K)=0.00464 *7*; α(L)=0.000749 *11*; α(M)=0.0001750 *25* α(N)=4.51×10^{-5} *7*; α(O)=9.56×10^{-6} *14*; α(P)=1.290×10^{-6} *19*
713.6 *5*	23 *5*	2641.4	(29/2)$^+$	1927.8	(23/2)$^-$	E3	0.0417	Mult.: α(K)exp consistent with E1 or E2, but ΔJ^π requires E1. α(K)exp=0.05 *4* α(K)=0.0265 *4*; α(L)=0.01140 *17*; α(M)=0.00293 *5* α(N)=0.000762 *11*; α(O)=0.0001565 *23*; α(P)=1.89×10^{-5} *3*
1067.1 *5*	109 *11*	1067.1	(13/2)$^-$	0.0	9/2$^-$	(E2)	0.00683	Mult.: α(K)exp consistent with M1, E2, E3, E4. E3 from Adopted Levels. α(K)=0.00540 *8*; α(L)=0.001086 *16*; α(M)=0.000261 *4* α(N)=6.75×10^{-5} *10*; α(O)=1.422×10^{-5} *20*; α(P)=1.87×10^{-6} *3* α(K)exp=0.004 *2*; A_2=+0.22 *4* Mult.: α(K)exp gives E2 or E1, but ΔJ^π requires E2; also $\gamma(\theta)$ consistent ΔJ=2, quadrupole.
1536 *1*	97 *10*	4177.4	(31/2$^+$)	2641.4	(29/2)$^+$			

[†] Additional information 1.
[‡] Values given are delayed photon intensities from the 4.2−μs isomer. The reaction for these intensities is not stated by 1971Ma36. The authors also give prompt to delayed intensity ratios for reactions with 34-MeV α and 41-MeV ^{7}Li beams.
[#] Adjusted by evaluator to give α(L)(253.5γ)=0.0920 (theory, E2).
[@] Absolute intensity per 100 decays.

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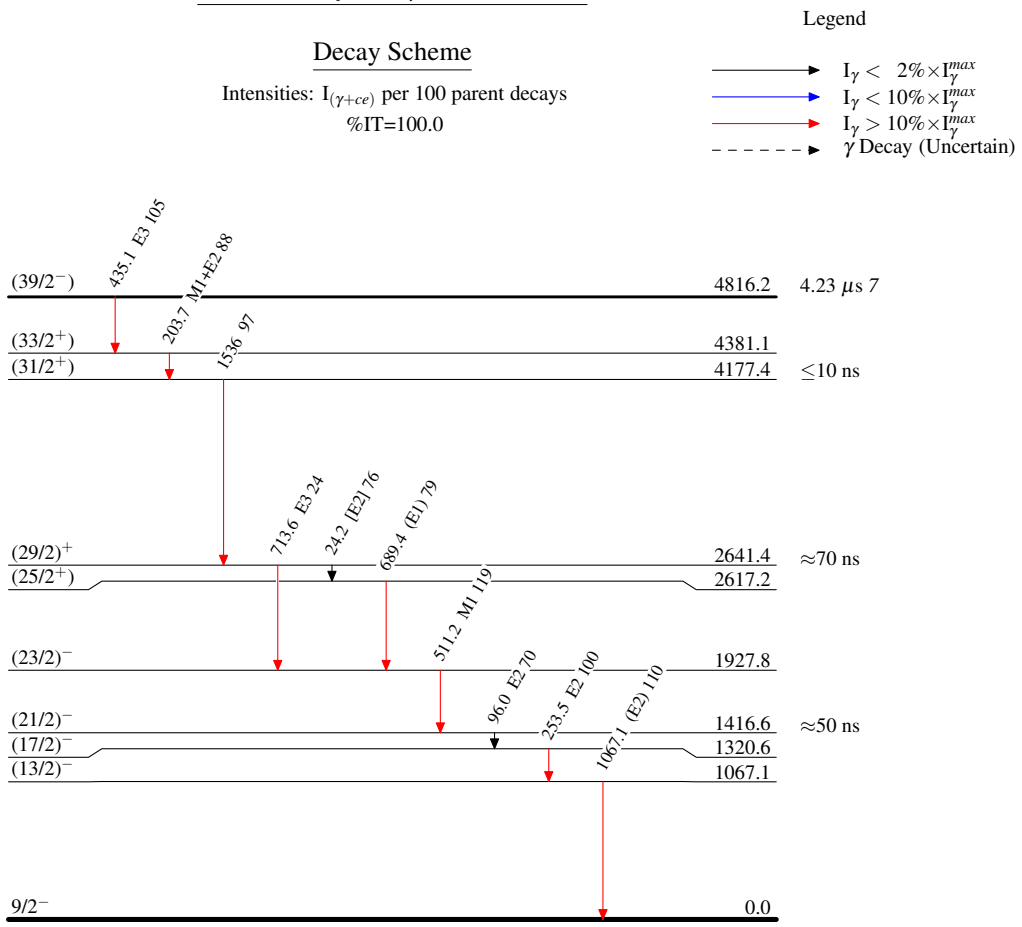
Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays

%IT=100.0



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