^{123}Sb IT decay (61 μs) 2009Wa02,2008Jo03

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 174, 1 (2021)	15-Apr-2021

Parent: ^{123}Sb: E=2613.7 *4*; J$^{\pi}$=(23/2$^+$); $T_{1/2}$=61 μs *5*; %IT decay=100.0

^{123}Sb-J$^{\pi}$,$T_{1/2}$: From Adopted Levels. Adopted $T_{1/2}$ from this study.

A complete level scheme from 2009Wa02 is presented in the ^{122}Sn(^{7}Li,α2nγ) dataset, where multiple isomers are populated in that reaction.

2009Wa02: ^{123}Sb isomers were produced in two experiments: ^{122}Sn(^{7}Li,α2nγ) E=54 MeV ^{7}Li beam from the 14UD Pelletron at the Australian National University on a target of 3.5 mg/cm^2 enriched ^{122}Sn. γ rays were detected with the CAESAR array of six Ge detectors with BGO anti-Compton shields and two LEPS detectors; conversion electrons were detected with a cooled Si(Li) detector. Measured Eγ, Iγ, E(ce), I(ce), $\gamma\gamma$-coin, $\gamma\gamma(\theta)$, γ(t), $\gamma\gamma$(t). The second experiment Yb,Lu,W,Os(^{136}Xe,X) with E=6.0-6.2 MeV/nucleon ^{136}Xe beam from ATLAS facility at Argonne. γ rays were detected with the GAMMASPHERE array of 100 Compton-suppressed Ge detectors. Measured Eγ, Iγ, $\gamma\gamma$-coin. Deduced levels, J, π, isomer $T_{1/2}$, conversion coefficients, γ-ray multipolarities, mixing ratios, branching ratios, transition strengths. Comparisons with theoretical calculations. Systematics of neighboring Sb isotopes.

2008Jo03: ^{123}Sb isomers were produced by ^{27}Al(^{178}Hf,X) with E=1150 MeV beam provided by ATLAS facility at Argonne on a ^{27}Al frame supporting a ^{208}Pb target for other experiments. γ rays were detected with the GAMMASPHERE array of 101 Compton-suppressed HPGe detectors. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma\gamma(\theta)$, γ(t), $\gamma\gamma$(t). Deduced levels, J, π, isomer halflives, γ-ray multipolarities, mixing ratios. Pulsed beam with short pulses of ≈0.5 ns width and separated by 82.5 ns.

^{123}Sb Levels

E(level)†	J$^{\pi}$‡	$T_{1/2}$#	Comments
0.0@	7/2$^+$		
160.21 *24*	5/2$^+$		
1030.23 *21*	9/2$^+$		
1088.54@ *21*	11/2$^+$	0.52 ps *+5−4*	
1260.32 *21*	(9/2$^+$)		
1655.93 *18*	11/2$^-$		
2037.57 *23*	(15/2)$^-$	37.3 ns *8*	$T_{1/2}$: from $\gamma\gamma$(t) (2009Wa02).
2044.2@ *3*	(15/2)$^+$		
2238.0 *3*	(19/2$^-$)	214 ns *3*	$T_{1/2}$: from $\gamma\gamma$(t) (2009Wa02).
2338.3 *3*	(15/2$^+$)		
2385.5 *3*	(17/2,19/2)$^-$		
2486.0@ *3*	(19/2)$^+$	0.7 ns *2*	$T_{1/2}$: from centroid-shift analysis (2009Wa02). Other: 7.9 ns *4* from 2006JoZY is discrepant; no $T_{1/2}$ is reported for this level by 2008Jo03, which supersedes 2006JoZY.
2613.7@ *4*	(23/2$^+$)	61 μs *5*	$T_{1/2}$: unweighted average of 65 μs *1* (2009Wa02), 52 μs *3* (2008Jo03) and 66 μs *4* (2007Ju06).

† From a least-squares fit to γ-ray energies, assuming ΔEγ=0.3 keV where not given.

‡ From Adopted Levels. The same assignments are proposed by 2008Jo03 and/or 2009Wa02 based on $\gamma\gamma(\theta)$, γ-ray intensity balance, analog states in ^{121}Sb, and known assignments for low-lying states, except that these assignments are placed inside parenthesis by the evaluator if there is no firm evidence from other studies.

From Adopted Levels. Values from this study are indicated in comments.

@ Band(A): g.s. band.

γ(^{123}Sb)

E_γ[‡]	I_γ[@a]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[&]	δ[&]	α[†]	Comments
100.4		2486.0	(19/2)$^+$	2385.5	(17/2,19/2)$^-$	E1		0.187	α(K)=0.1612 *23*; α(L)=0.0206 *3*; α(M)=0.00405 *6* α(N)=0.000768 *11*; α(O)=7.12×10^{-5} *10* E_γ: from figure 1 of 2009Wa02, 100.5 in table II. I_γ: I(100.4γ)/I(441.9γ)=1.4 *1*/97 *3* (2009Wa02). Mult.: from α(exp)=0.1 *2* in 2009Wa02.
127.8[#] *3*	60 *5*	2613.7	(23/2$^+$)	2486.0	(19/2)$^+$	(E2)		0.691 *12*	B(E2)(W.u.)=0.0044 *4* α(K)=0.525 *9*; α(L)=0.1338 *23*; α(M)=0.0274 *5* α(N)=0.00504 *9*; α(O)=0.000393 *7* E_γ: others: 127.4 (2009Wa02), 127.6 (2007Ju06). Mult.: O+Q from $\gamma\gamma(\theta)$ and α(exp)=0.76 *13* (weighted average of 0.85 *15*, 0.75 *14* and 0.69 *13* from different γ gates) in 2008Jo03; and also from $\gamma\gamma(\theta)$ in 2009Wa02. δ(O/Q)=−0.06 *+18−21* from (128γ)(1089γ)(θ): A_2=+0.14 *5*, A_4=0.00 *6* in 2008Jo03; δ=+0.01 *6* from (127γ)(442γ)(θ)+(127γ)(956γ)(θ)+(127γ)(1089γ)(θ): A_2=+0.106 *25*, A_4=+0.006 *36* in 2009Wa02.
147.5		2385.5	(17/2,19/2)$^-$	2238.0	(19/2$^-$)	D			Mult.: M1 or E1 from α(exp)=0.2 *2* (2009Wa02).
147.6	1.8 *3*	2486.0	(19/2)$^+$	2338.3	(15/2$^+$)	[E2]		0.416	B(E2)(W.u.)=5.1 *+24−14* α(K)=0.325 *5*; α(L)=0.0737 *11*; α(M)=0.01505 *21* α(N)=0.00278 *4*; α(O)=0.000222 *4* I_γ: from I(441.9γ)=109 *11* (2008Jo03) and I(147.6γ)/I(441.9γ)=1.6 *2*/97 *3* (2009Wa02).
160.2		160.21	5/2$^+$	0.0	7/2$^+$	M1+E2	0.078 *10*	0.1672	α(K)=0.1442 *21*; α(L)=0.0185 *3*; α(M)=0.00366 *6* α(N)=0.000706 *11*; α(O)=6.95×10^{-5} *10*
200.4	100	2238.0	(19/2$^-$)	2037.57	(15/2)$^-$	[E2]		0.1435	B(E2)(W.u.)=0.197 *4* α(K)=0.1164 *17*; α(L)=0.0218 *3*; α(M)=0.00441 *7* α(N)=0.000823 *12*; α(O)=6.93×10^{-5} *10* E_γ: other: 201.0 (2007Ju06).
347.9		2385.5	(17/2,19/2)$^-$	2037.57	(15/2)$^-$				
375.7	1.6 *4*	2613.7	(23/2$^+$)	2238.0	(19/2$^-$)	[M2]		0.0671	B(M2)(W.u.)=4.3×10^{-5} *+13−11* α(K)=0.0572 *8*; α(L)=0.00802 *12*; α(M)=0.001605 *23* α(N)=0.000310 *5*; α(O)=3.02×10^{-5} *5* I_γ: from I(127.8γ)=60 *5* (2008Jo03) and I(375.7γ/127.8γ)=2.6 *6*/97.4 *11* (2009Wa02).
381.6		2037.57	(15/2)$^-$	1655.93	11/2$^-$	E2		0.01727	α(K)=0.01461 *21*; α(L)=0.00214 *3*; α(M)=0.000428 *6* α(N)=8.11×10^{-5} *12*; α(O)=7.44×10^{-6} *11* E_γ: other: 381.7 (2007Ju06). Mult.,δ: (382γ)(626γ)(θ): A_2=−0.045 *7*, A_4=−0.003 *10* gives δ(O/Q)=−0.07 *2* in 2009Wa02; but M2 and M3 ruled out by RUL.
395.6		1655.93	11/2$^-$	1260.32	(9/2$^+$)				

^{123}Sb IT decay (61 μs) 2009Wa02,2008Jo03 (continued)

$\gamma(^{123}$Sb) (continued)

E_γ[‡]	I_γ[@a]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[&]	δ[&]	α[†]	Comments
441.9[#] *3*	109 *11*	2486.0	(19/2)$^+$	2044.2	(15/2)$^+$	E2		0.01110	B(E2)(W.u.)=1.3 *+5−3* α(K)=0.00944 *14*; α(L)=0.001335 *19*; α(M)=0.000266 *4* α(N)=5.06×10^{-5} *8*; α(O)=4.71×10^{-6} *7* E_γ: others: 441.7 (2009Wa02), 441.9 (2007Ju06). Mult.: δ(O/Q)=−0.08 *+14−18* from (442γ)(1089γ)(θ): A_2=+0.13 *4*, A_4=−0.07 *6* in 2008Jo03; Q from $\gamma\gamma(\theta)$ in 2009Wa02; M2, M3 ruled out by RUL.
567.4		1655.93	11/2$^-$	1088.54	11/2$^+$				
625.7		1655.93	11/2$^-$	1030.23	9/2$^+$	(E1)		1.51×10^{-3}	α(K)=0.001316 *19*; α(L)=0.0001577 *22*; α(M)=3.10×10^{-5} *5* α(N)=5.97×10^{-6} *9*; α(O)=5.89×10^{-7} *9* Mult.: D from $\gamma\gamma(\theta)$ in 2009Wa02. Additional information 1.
949.0		2037.57	(15/2)$^-$	1088.54	11/2$^+$	[M2]		0.00475	α(K)=0.00410 *6*; α(L)=0.000518 *8*; α(M)=0.0001026 *15* α(N)=1.98×10^{-5} *3*; α(O)=1.97×10^{-6} *3* I_γ: I(949.0γ/381.6γ)=1.5 *4*/95.9 *24* (2009Wa02).
955.8[#] *3*	112 *9*	2044.2	(15/2)$^+$	1088.54	11/2$^+$	E2		1.51×10^{-3}	α(K)=0.001307 *19*; α(L)=0.0001630 *23*; α(M)=3.22×10^{-5} *5* α(N)=6.19×10^{-6} *9*; α(O)=6.06×10^{-7} *9* E_γ: other: 955.6 (2009Wa02). Mult.: δ(O/Q)=−0.10 *+17−25* from (956γ)(1089γ)(θ): A_2=+0.15 *4*, A_4=0.00 *6* (2008Jo03); Q from $\gamma\gamma(\theta)$ in 2009Wa02; M2 and M3 ruled out by RUL, since they would require an isomeric halflife.
1007.3		2037.57	(15/2)$^-$	1030.23	9/2$^+$	[E3]		0.00281	α(K)=0.00241 *4*; α(L)=0.000326 *5*; α(M)=6.48×10^{-5} *9* α(N)=1.241×10^{-5} *18*; α(O)=1.191×10^{-6} *17* I_γ: I(1007.3γ/381.6γ)=2.5 *4*/95.9 *24* (2009Wa02).
1030.2		1030.23	9/2$^+$	0.0	7/2$^+$	M1+E2	−0.54 *5*	1.51×10^{-3} *2*	α(K)=0.001316 *21*; α(L)=0.0001591 *25*; α(M)=3.13×10^{-5} *5* α(N)=6.05×10^{-6} *10*; α(O)=6.03×10^{-7} *10*
1088.6[#] *3*	100	1088.54	11/2$^+$	0.0	7/2$^+$	E2		1.13×10^{-3}	B(E2)(W.u.)=19.6 *11* α(K)=0.000984 *14*; α(L)=0.0001212 *17*; α(M)=2.39×10^{-5} *4* α(N)=4.60×10^{-6} *7*; α(O)=4.53×10^{-7} *7* E_γ: other: 1088.6 (2009Wa02). Mult.: Q from $\gamma\gamma(\theta)$ in 2009Wa02 and 2008Jo03.
1100.1		1260.32	(9/2$^+$)	160.21	5/2$^+$				
1249.7		2338.3	(15/2$^+$)	1088.54	11/2$^+$				
1260.3		1260.32	(9/2$^+$)	0.0	7/2$^+$				
1655.9		1655.93	11/2$^-$	0.0	7/2$^+$	[M2]		1.25×10^{-3}	α(K)=0.001036 *15*; α(L)=0.0001262 *18*; α(M)=2.49×10^{-5} *4* α(N)=4.81×10^{-6} *7*; α(O)=4.81×10^{-7} *7*; α(IPF)=5.73×10^{-5} *8*

† Additional information 2.
‡ From 2009Wa02, unless otherwise noted.

$^{123}_{51}Sb_{72}$-3

$\gamma(^{123}$Sb) (continued)

[#] From 2008Jo03.
[@] Relative intensities within the band from 2008Jo03.
[&] From Adopted Gammas. Assignments and arguments from this study are given in comments, where available.
[a] Absolute intensity per 100 decays.

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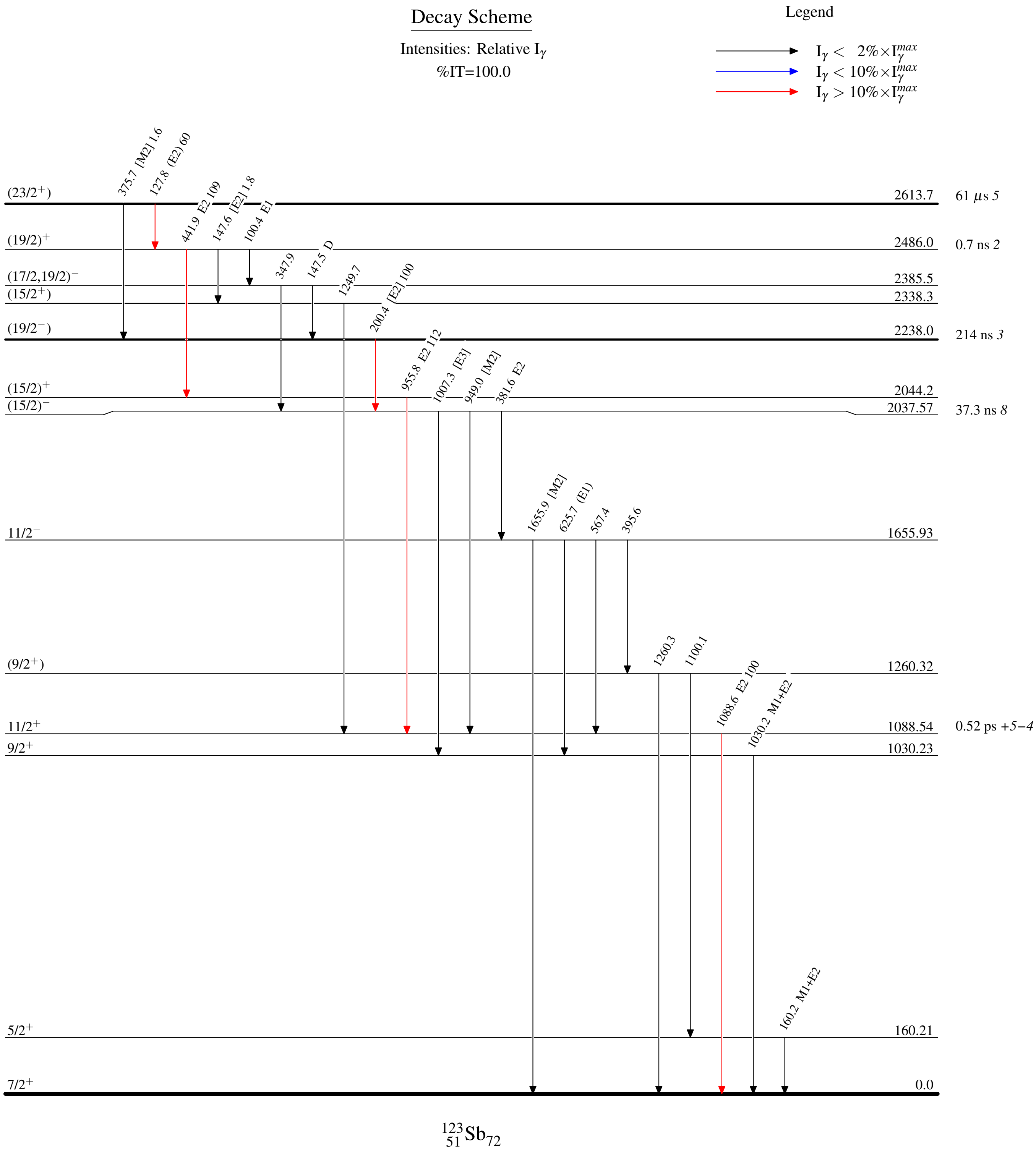
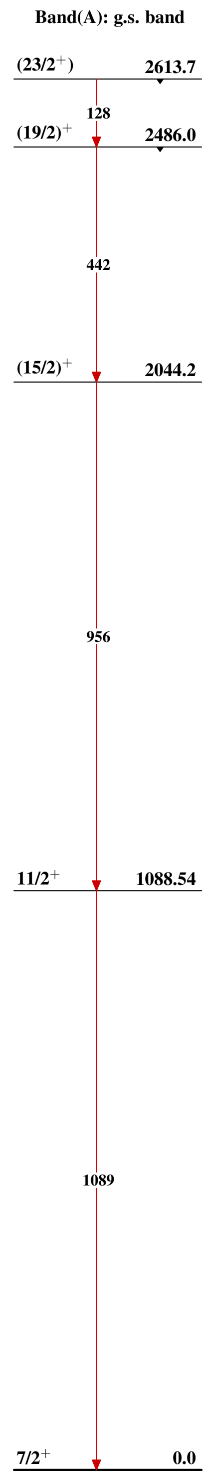


^{123}Sb IT decay (61 μs) 2009Wa02,2008Jo03



$^{123}_{51}Sb_{72}$