^{123}Sb(γ,γ′) 2002Br05,1973Bo12,1978Be45

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

2002Br05: E<3.8 MeV photon beams were produced from bremsstrahlung at the bremsstrahlung NRF facility at the 4.3-MV Dynamitron accelerator of the Stuttgart University. Target was 2376 mg pill of Sb powder (98.0% in ^{123}Sb). Scattered photons were detected with three HPGe detectors (efficiency=100% relative to 3 in.×3 in. NaI(Tl) crystal). Measured Eγ, Iγ, $\sigma(E_\gamma,\theta)$, at θ=90°, 127° and 150°. Deduced levels, widths, B(E1)↑, γ-ray branching ratios. Comparisons with available data.

1973Bo12: E=0.6-3.0 MeV photon beams were produced from bremsstrahlung with electrons provided from the 4-MV Van de Graaff in the High Voltage Research Laboratory at MIT. Target was 1600 g natural antimony. Scattered photons were detected with a 40-cm^3 Ge(Li) detector. Measured Eγ, Iγ, $\sigma(E_\gamma)$. Deduced levels, J, π, widths, B(E2). Comparisons with theoretical calculations.

1978Be45: photon sources were produced via V(n,γ) and Ti(n,γ) reactions with thermal neutrons provided by the IRR-2 reactor at the Nuclear Research Centre, Israel. Target was natural Sb. Scattered photons were detected with NaI detectors. Measured Eγ, Iγ, γ(θ). Deduced levels, spins.

1981Ca10: E=0.5-1.65 MeV photons were produced by bremsstrahlung with electrons provided by the accelerator of the Pierre and Marie Curie University. Natural Sb target. Scattered photons were detected with a 50-cm^3 Ge(Li) detector. Measured Eγ, γ(θ), $\sigma(E_\gamma)$. Deduced levels, J, π, $T_{1/2}$, widths, γ-ray transition strengths, mixing ratios, branching ratios. Comparisons with available data.

^{123}Sb Levels

Quoted values of $g\Gamma_0^2/\Gamma$ are in units of eV. Γ is the total width, Γ_0 is the decay width to g.s. and statistical factor g=(2J+1)/(2J(g.s.)+1).

E(level)[†]	Jπ[@]	$T_{1/2}$	$g\Gamma_0^2/\Gamma$[a]	Comments
0.0	7/2+[&]			
160.3 *3*	5/2+[&]			
1030.5 *3*	9/2	0.190 ps *+16−14*	0.00300 *23*	$T_{1/2}$: from $g\Gamma_0$=0.0030 eV *23* if Γ_0/Γ=1.0. $g\Gamma_0^2/\Gamma$: weighted average of 0.00302 *23* (2002Br05), 0.00296 *27* (1981Ca10) and 0.0030 *3* (1973Bo12), assuming Γ_0/Γ=1.0.
1088.8 *5*	9/2	0.53 ps *+5−4*	0.00107 *9*	Jπ: 11/2+ in Adopted Levels. $T_{1/2}$: from $g\Gamma_0$=0.00107 eV *7* if Γ_0/Γ=1.0. $g\Gamma_0^2/\Gamma$: weighted average of 0.00112 *15* (2002Br05), 0.00106 *9* (1981Ca10) and 0.0010 *2* (1973Bo12), assuming $\Gamma(\gamma_0)/\Gamma$=1.0.
1181.5 *25*	11/2		<0.0002[c]	Jπ: (7/2,9/2)+ in Adopted Levels.
1262.5 *20*			<0.0002[c]	
1336 *4*			<0.00017[c]	
1424.8 *4*			0.00039 *12*	
1509.0 *4*			0.00103 *18*	E(level): not reported in 1973Bo12, 1978Be45.
1513.5 *3*	7/2		0.0021[b] *4*	Jπ: (3/2,5/2)+ quoted in 1973Bo12. $g\Gamma_0$=0.00295 eV *39* (2002Br05), 0.0038 eV *8* (1973Bo12).
1643 *3*			0.00013[b] *6*	
1764.3 *3*			0.00204 *24*	
1777.7 *4*			0.00161 *23*	E(level): other: 1778 *2* with $g\Gamma_0^2/\Gamma$=0.0016 eV *6* unassigned to ^{121}Sb or ^{123}Sb by 1973Bo12.
1896.4 *3*			0.00190 *24*	E(level): other: 1897 *2* with $g\Gamma_0^2/\Gamma$=0.0015 eV *5* unassigned to ^{121}Sb or ^{123}Sb by 1973Bo12.
2011.6 *4*			0.00063 *16*	
2026 *3*			0.0012[b] *4*	
2033 *3*			<0.0004[c]	
2036.4 *4*			0.00072 *17*	

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^{123}Sb(γ,γ') 2002Br05,1973Bo12,1978Be45 (continued)

^{123}Sb Levels (continued)

E(level)[†]	$g\Gamma_0^2/\Gamma$[a]	Comments
2047.6 *3*	0.00351 *34*	
2059.0 *6*	0.00129 *27*	
2115 *3*	0.0014[b] *7*	
2137.9 *8*	0.00096 *27*	
2170.0 *6*	0.00040 *17*	
2230.3 *4*	0.00199 *29*	
2235.0 *6*	0.00072 *27*	
2238.6 *6*	0.00055 *23*	
2252.0 *6*	0.00046 *18*	
2270.0 *7*	0.00082 *21*	
2273.7 *5*		$g\Gamma_0$=0.00236 eV *41* (2002Br05).
2278.7 *5*		$g\Gamma_0$=0.00206 eV *47* (2002Br05).
2283.3 *7*	0.00095 *21*	
2292.1 *8*	0.00068 *19*	
2296.6 *4*	0.00219 *27*	
2300.8 *5*	0.00136 *22*	
2306.4 *3*	0.00275 *29*	
2322.3 *3*	0.00505 *43*	E(level): other: 2321 *2* with $g\Gamma_0^2/\Gamma$=0.0053 eV *15* unassigned to ^{121}Sb or ^{123}Sb by 1973Bo12.
2329.5 *3*	0.00395 *37*	
2371.3 *3*	0.00537 *43*	
2423.0 *4*		$g\Gamma_0$=0.00391 eV *63* (2002Br05).
2429.3 *3*	0.00223 *30*	E(level): other: 2429 *2* with $g\Gamma_0^2/\Gamma$=0.0025 eV *7* unassigned to ^{121}Sb or ^{123}Sb by 1973Bo12.
2447.3 *6*		$g\Gamma_0$=0.00233 eV *53* (2002Br05).
2455.4 *6*	0.00152 *46*	
2459.1 *4*	0.00317 *52*	
2472 *3*	0.0053[b] *12*	
2507.3 *6*	0.00081 *23*	
2521.8 *3*	0.00494 *43*	
2597.7 *4*	0.00193 *27*	
2605.9 *8*	0.00066 *21*	
2620.1 *4*	0.00295 *33*	
2647.4 *4*		$g\Gamma_0$=0.00482 eV *98* (2002Br05).
2701.6 *5*	0.00157 *31*	
2756.7 *4*	0.00308 *40*	
2843.1 *10*	0.00090 *35*	
2860.6 *9*	0.00098 *35*	
2883.1 *5*	0.00167 *33*	
2904.9 *5*	0.00202 *37*	
2919.0 *6*	0.00132 *34*	
2934.6 *7*	0.00206 *44*	
2989.0 *6*	0.00198 *52*	
3000.8 *5*	0.00349 *99*	
3017.3 *3*	0.0150 *11*	
3056.8 *3*	0.00653 *66*	
3062.6 *4*	0.00223 *41*	
3098.1 *7*	0.00124 *36*	
3147.9 *5*	0.00069 *25*	
3152.4 *6*	0.00077 *27*	
3158.5 *10*	0.00080 *36*	
3184.5 *4*	0.00603 *68*	
3190.6 *3*	0.00096 *24*	
3198.2 *5*	0.00230 *45*	
3209.8 *8*	0.00074 *32*	
3228.4 *9*	0.00416 *82*	
3277.6 *10*	0.00140 *61*	
3281.1 *6*		$g\Gamma_0$=0.00361 eV *102* (2002Br05).

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^{123}Sb(γ,γ') 2002Br05,1973Bo12,1978Be45 (continued)

^{123}Sb Levels (continued)

E(level)[†]	J^{π}[@]	$g\Gamma_0^2/\Gamma$[a]	Comments
3294.2 *3*			$g\Gamma_0$=0.00912 eV *102* (2002Br05).
3331.9 *5*		0.00556 *80*	
3351.7 *6*		0.00078 *32*	
3385.7 *7*		0.00366 *72*	
3399.7 *9*		0.00132 *43*	
3412.3 *10*		0.00117 *44*	
3418.3 *10*		0.00140 *49*	
3427.6 *9*		0.00149 *48*	
3476.2 *6*		0.00151 *52*	
6417.6[‡] *17*	9/2		
6760.3[‡] *14*	7/2		
6874.7[#] *16*	7/2		
7163.8[#] *16*	7/2		
7309.6[#] *17*	9/2		

[†] From a least-squares fit to γ-ray energies.
[‡] Excited by γ lines from V(n,γ) source in 1978Be45.
[#] Excited by γ lines from Ti(n,γ) source in 1978Be45.
[@] From $\gamma(\theta)$ in 1978Be45, unless otherwise noted. Spin of the excited levels by dipole excitations from $7/2^+$ g.s. are expected to be (5/2,7/2,9/2).
[&] From Adopted Levels.
[a] From 2002Br05, unless otherwise noted.
[b] From 1973Bo12.
[c] Upper limit given by 1973Bo12.

γ(^{123}Sb)

A_2 values given in comments are from 1978Be45.

E_γ[†]	I_γ	E_i(level)	J_i^{π}	E_f	J_f^{π}	Comments
1030.5 *3*		1030.5	9/2	0.0	$7/2^+$	E_γ: weighted average of 1030.6 *3* (2002Br05), 1030 *1* (1973Bo12), 1029.5 *10* (1981Ca10).
1088.8 *5*		1088.8	9/2	0.0	$7/2^+$	E_γ: weighted average of 1089.0 *3* (2002Br05), 1089 *1* (1973Bo12), and 1086.5 *10* (1981Ca10).
1353.4 *4*	56[&] *11*	1513.5	7/2	160.3	$5/2^+$	I_γ: other: I(1353γ)/I(1513γ)=34/66=0.52 (1973Bo12).
1424.8 *4*		1424.8		0.0	$7/2^+$	
1509.0 *4*		1509.0		0.0	$7/2^+$	
1513.4 *3*	100[&]	1513.5	7/2	0.0	$7/2^+$	E_γ: other: 1512 *2* (1973Bo12).
1643[‡] *3*		1643		0.0	$7/2^+$	
1764.3 *3*		1764.3		0.0	$7/2^+$	
1777.7 *4*		1777.7		0.0	$7/2^+$	
1896.4 *3*		1896.4		0.0	$7/2^+$	
2011.6 *4*		2011.6		0.0	$7/2^+$	
2026[‡] *3*		2026		0.0	$7/2^+$	
2033[‡] *3*		2033		0.0	$7/2^+$	
2036.4 *4*		2036.4		0.0	$7/2^+$	
2047.6 *3*		2047.6		0.0	$7/2^+$	

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^{123}Sb(γ,γ') 2002Br05,1973Bo12,1978Be45 (continued)

γ(^{123}Sb) (continued)

E_γ[†]	I_γ	E_i(level)	J_i^π	E_f	J_f^π
2059.0 *6*		2059.0		0.0	7/2$^+$
2112.9 *9*	27[&] *13*	2273.7		160.3	5/2$^+$
2115[‡] *3*		2115		0.0	7/2$^+$
2118.3 *6*	80[&] *24*	2278.7		160.3	5/2$^+$
2137.9 *8*		2137.9		0.0	7/2$^+$
2170.0 *6*		2170.0		0.0	7/2$^+$
2230.3 *4*		2230.3		0.0	7/2$^+$
2235.0 *6*		2235.0		0.0	7/2$^+$
2238.6 *6*		2238.6		0.0	7/2$^+$
2252.0 *6*		2252.0		0.0	7/2$^+$
2262.2 *6*	51[&] *12*	2423.0		160.3	5/2$^+$
2270.0 *7*		2270.0		0.0	7/2$^+$
2273.8 *5*	100[&]	2273.7		0.0	7/2$^+$
2278.7 *6*	100[&]	2278.7		0.0	7/2$^+$
2283.3 *7*		2283.3		0.0	7/2$^+$
2287.3 *10*	50[&] *17*	2447.3		160.3	5/2$^+$
2292.1 *8*		2292.1		0.0	7/2$^+$
2296.6 *4*		2296.6		0.0	7/2$^+$
2300.8 *5*		2300.8		0.0	7/2$^+$
2306.4 *3*		2306.4		0.0	7/2$^+$
2322.3 *3*		2322.3		0.0	7/2$^+$
2329.5 *3*		2329.5		0.0	7/2$^+$
2371.3 *3*		2371.3		0.0	7/2$^+$
2423.2 *4*	100[&]	2423.0		0.0	7/2$^+$
2429.3 *3*		2429.3		0.0	7/2$^+$
2447.2 *6*	100[&]	2447.3		0.0	7/2$^+$
2455.4 *6*		2455.4		0.0	7/2$^+$
2459.1 *4*		2459.1		0.0	7/2$^+$
2472[‡] *3*		2472		0.0	7/2$^+$
2487.0 *4*	196[&] *32*	2647.4		160.3	5/2$^+$
2507.3 *6*		2507.3		0.0	7/2$^+$
2521.8 *3*		2521.8		0.0	7/2$^+$
2597.7 *4*		2597.7		0.0	7/2$^+$
2605.9 *8*		2605.9		0.0	7/2$^+$
2620.1 *4*		2620.1		0.0	7/2$^+$
2647.4 *4*	100[&]	2647.4		0.0	7/2$^+$
2701.6 *5*		2701.6		0.0	7/2$^+$
2756.7 *4*		2756.7		0.0	7/2$^+$
2843.1 *10*		2843.1		0.0	7/2$^+$
2860.6 *9*		2860.6		0.0	7/2$^+$
2883.1 *5*		2883.1		0.0	7/2$^+$
2904.9 *5*		2904.9		0.0	7/2$^+$
2919.0 *6*		2919.0		0.0	7/2$^+$
2934.6 *7*		2934.6		0.0	7/2$^+$
2989.0 *6*		2989.0		0.0	7/2$^+$
3000.8 *5*		3000.8		0.0	7/2$^+$
3017.3 *3*		3017.3		0.0	7/2$^+$
3056.8 *3*		3056.8		0.0	7/2$^+$
3062.6 *4*		3062.6		0.0	7/2$^+$
3098.1 *7*		3098.1		0.0	7/2$^+$
3120.3 *8*	35[&] *16*	3281.1		160.3	5/2$^+$
3134.5 *8*	19[&] *6*	3294.2		160.3	5/2$^+$

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^{123}Sb(γ,γ′) 2002Br05,1973Bo12,1978Be45 (continued)

γ(^{123}Sb) (continued)

E_γ [†]	I_γ	E_i(level)	J^π_i	E_f	J^π_f	Comments
3147.9 *5*		3147.9		0.0	7/2+	
3152.4 *6*		3152.4		0.0	7/2+	
3158.5 *10*		3158.5		0.0	7/2+	
3184.5 *4*		3184.5		0.0	7/2+	
3190.6 *3*		3190.6		0.0	7/2+	
3198.2 *5*		3198.2		0.0	7/2+	
3209.8 *8*		3209.8		0.0	7/2+	
3228.4 *9*		3228.4		0.0	7/2+	
3277.6 *10*		3277.6		0.0	7/2+	
3281.4 *8*	100[&]	3281.1		0.0	7/2+	
3294.1 *3*	100[&]	3294.2		0.0	7/2+	
3331.9 *5*		3331.9		0.0	7/2+	
3351.7 *6*		3351.7		0.0	7/2+	
3385.6 *7*		3385.7		0.0	7/2+	
3399.6 *9*		3399.7		0.0	7/2+	
3412.2 *10*		3412.3		0.0	7/2+	
3418.2 *10*		3418.3		0.0	7/2+	
3427.5 *9*		3427.6		0.0	7/2+	
3476.1 *6*		3476.2		0.0	7/2+	
5236[#] *3*	5[#] *2*	6417.6	9/2	1181.5	11/2	
5248[#] *3*	4[#] *3*	6760.3	7/2	1513.5	7/2	
5329[#] *3*	4[#] *3*	6417.6	9/2	1088.8	9/2	
5362[@] *3*	2[@] *3*	6874.7	7/2	1513.5	7/2	
5386[#] *3*	26[#] *3*	6417.6	9/2	1030.5	9/2	A_2=−0.14 *11*.
5498[#] *3*	9[#] *2*	6760.3	7/2	1262.5		
5612[@] *3*	8[@] *3*	6874.7	7/2	1262.5		
5651[@] *3*	23[@] *4*	7163.8	7/2	1513.5	7/2	A_2=+0.40 *20*.
5728[#] *3*	22[#] *4*	6760.3	7/2	1030.5	9/2	A_2=−0.06 *13*.
5901[@] *3*	8[@] *3*	7163.8	7/2	1262.5		
5973[@] *3*	15[@] *3*	7309.6	9/2	1336		
6128[@] *3*	65[@] *3*	7309.6	9/2	1181.5	11/2	A_2=+0.01 *3*.
6221[@] *3*	14[@] *3*	7309.6	9/2	1088.8	9/2	A_2=−0.19 *9*.
6278[@] *3*	27[@] *3*	7309.6	9/2	1030.5	9/2	A_2=−0.22 *8*.
6418[#] *3*	138[#] *2*	6417.6	9/2	0.0	7/2+	A_2=+0.09 *3*.
6600[#] *3*	69[#] *3*	6760.3	7/2	160.3	5/2+	A_2=−0.14 *4*.
6714[@] *3*	3[@] *2*	6874.7	7/2	160.3	5/2+	
6760[#] *3*	100[#]	6760.3	7/2	0.0	7/2+	A_2=+0.17 *4*.
6874[@] *3*	32[@] *3*	6874.7	7/2	0.0	7/2+	A_2=+0.19 *13*.
7003[@] *3*	96[@] *4*	7163.8	7/2	160.3	5/2+	
7163[@] *3*	78[@] *3*	7163.8	7/2	0.0	7/2+	A_2=−0.17 *4*.
7310[@] *3*	100[@]	7309.6	9/2	0.0	7/2+	A_2=+0.06 *3*.

[†] From 2002Br05, unless noted otherwise. Note that Eγ values of many g.s. transitions, which are assumed as the only transitions from parent levels, are not explicitly given in 2002Br05. For those transitions, Eγ values are deduced by the evaluator from level energies in 2002Br05 (obtained from g.s. transition energies as stated in 2002Br05) with de-correction for recoil.

[‡] From 1973Bo12.

[#] γ rays depopulate the E(levels) photoexcited by V(n,γ) source in 1978Be45. Relative to I(6760γ)=100.

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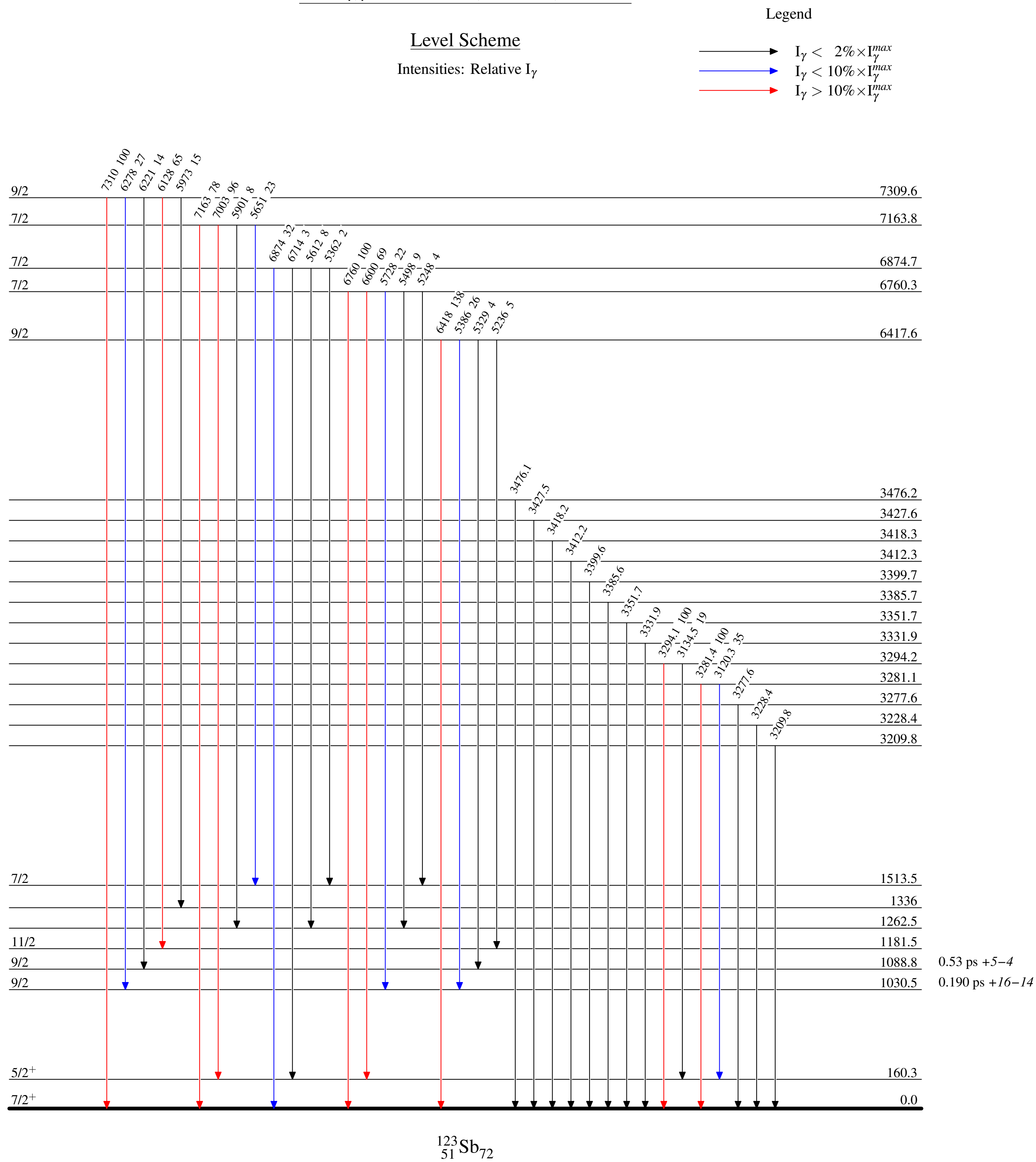
^{123}Sb(γ,γ') 2002Br05,1973Bo12,1978Be45 (continued)

γ(^{123}Sb) (continued)

[@] γ rays depopulate the E(levels) photoexcited by Ti(n,γ) source in 1978Be45. Relative to I(7310γ)=100.
[&] Relative intensities from each level (2002Br05).

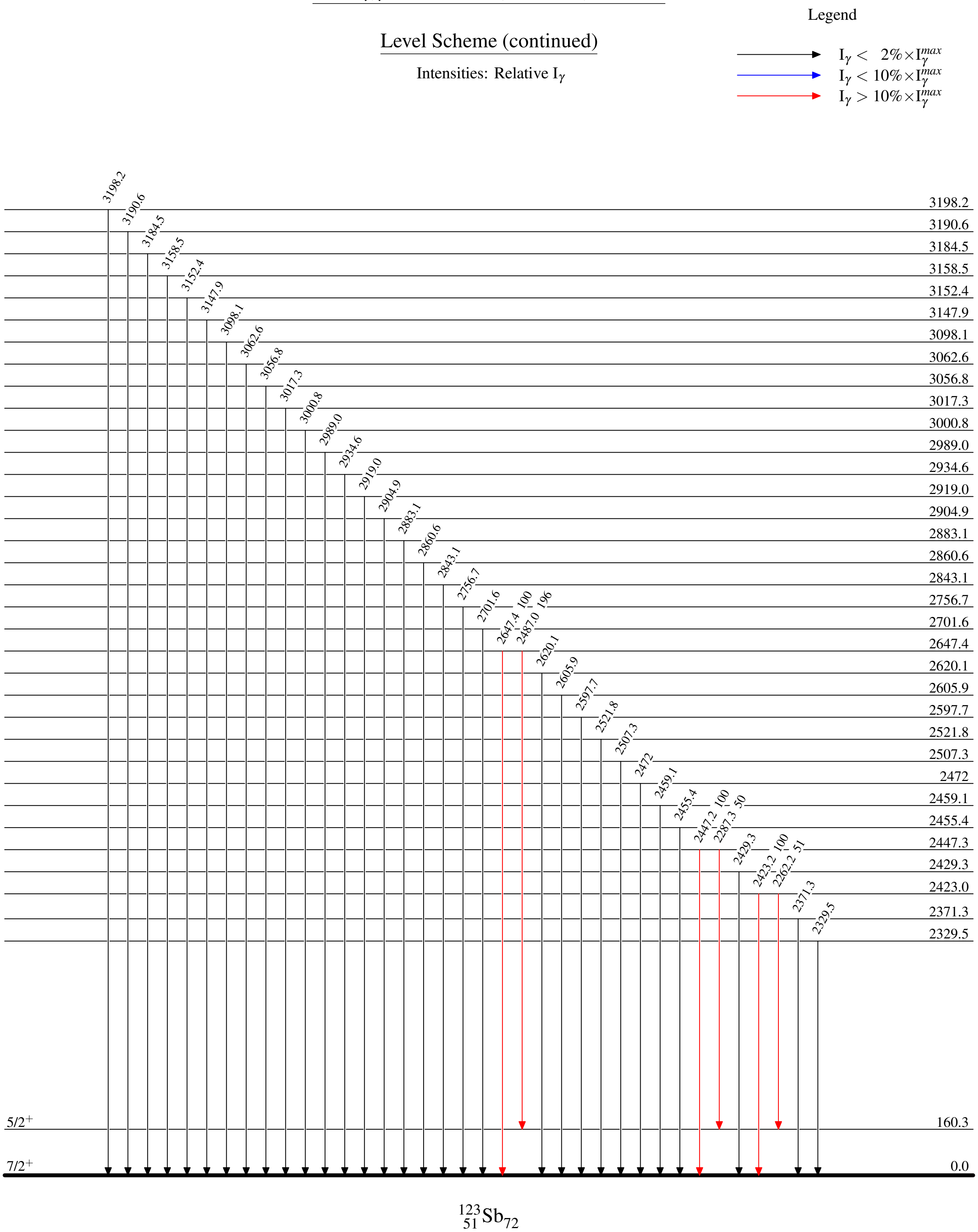
$^{123}Sb(\gamma,\gamma')$ 2002Br05,1973Bo12,1978Be45



$^{123}Sb(\gamma,\gamma')$ 2002Br05,1973Bo12,1978Be45

Level Scheme (continued)

Intensities: Relative I_γ



^{123}Sb(γ,γ′) 2002Br05,1973Bo12,1978Be45

Level Scheme (continued)

Intensities: Relative I_γ