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Revised and Extended Analysis of Doubly Ionized Antimony (Sb III)

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Abstract: ***Almost all the data used in this work is based on the plates taken on a 3m Normal Incidence Vacuum Spectrograph at the Physics Department, Saint Francis Xavier University, Antigonish, Nova Scotia, Canada. Four Configurations $5s^2 7p$, $5s^2 8p$, $5s^2 9p$ and $5s^2 5f$ of odd parity, and 13 levels of j=1/2 and 3/2 of even parity of $5p^2 5d$ are investigated in this paper. $5s^2 9s$ is also newly established level in even parity. The Hartree –Fock calculations with relativistic corrections and parametric levels fitting calculations were carried out to interpret the spectrum satisfactorily.***

Keywords: A.E.L atomic energy level, NIST national institute of standard and technology, VOL volume, Te- tellurium, La – lanthanum, LSF- least square fitted, HFR- Hartree fock ratio, E(obs)- observed energy level, LS Composition- least square Composition

1. Introduction

The electronic distribution for the ground state configurations of doubly ionized antimony is $5s^2$ 5p. The earlier analysis of Sb III was reported in Atomic energy levels VOL III [1] was revised by Arcimowicz et al [2] who reported more accurate energy level values for $5s^2$ nl levels. Recently configurations viz $5s^2 7p$, $5s^2 8p$, $5s^2 9p$, and one unknown level of $5s^2 5f$ are investigated in odd parity while 5 levels of j=1/2 and 8 levels of j=3/2 of $5p^2 5d$ are investigated in even parity configuration. Here $5s^2 9s\ ^2S_{1/2}$ is newly established at 177770 cm^{-1}

2. Experiment

The spectra of Sb were recorded on a 3m Normal Incidence Vacuum Spectrograph at Saint francis Xavier University Antigonish Nova Scotia Canada. For the wavelength from 300 Å to higher wavelength, the normal incident vacuum spectrogram is used. The spectrograph contains a 3m osmium coated holographic concave grating with 2400 lines/mm. It is blazed at 1200 Å. The inverse dispersion of the Spectrograph is 1.385Å/mm in the first order. The light source used for exciting the antimony ions plasma was mainly a triggered spark with different stages of ionization of Sb spectrum present on my spectrograms are separated out experimentally by observing the intensity variation of every individual line as a function of the inductance coil in the spark circuit.

3. Results and Discussions

The first work on this spectrum was published by Lang [1] in 1930. Two years later Lang and Vestine [2] reinvestigated SbIII along with SbII and rejected 5 of the previously published SbIII terms. Murakawa and Suwa [3] observed the antimony spectra from about 690Å to 6930Å using a condensed low – cathode discharge in the presence of neon. They however, retained two levels rejected by Lang and Vestine [2], namely the ^4P levels 54365 cm^{-1} and 57960 cm^{-1}. There were nine terms common in both the lists and two levels at 92948 cm^{-1} and 93417 cm^{-1} appear with different designations. They also calculated the ionization limit to be at 204248 cm^{-1}. Chan [4] presented a detailed analysis in his thesis but these observations were seriously lacking theoretical support. Arcimowicz, Joshi and Kaufman [5] published $5s^2 5p$ - ($5s5p^2$ + $5s^2 nl$) transition array in the region 602Å - 1946Å. They gave improved values to all the compiled levels in A.E.L [6]. They confirmed the revised level values of $5s5p^2$ $^4P_{1/2}$ and $^4P_{3/2}$ by Chan [4]. Though $^4P_{1/2}$ at 57960.6 cm^{-1} was already present in A.E.L as $^4P_{3/2}$ level. In all, they reported $5s5p^2$, $5s^2 ns$ (n = 6 - 8), $5s^2 nd$ (n = 5 - 7) configurations. Their analysis was supported by Hartree - Fock Calculations. Tauheed, Joshi and Pinnington [7] further confirmed the $5s5p^2$ $^4P_{1/2,3/2,5/2}$ levels in the study of inter-combination lines in the In I isoelectronic sequence from Sb III to La IX. A few more papers appeared in the literature either in the form of compilation, review or theoretical work of astrophysical interest [8-10]. Because of the evident interactions seen in the isoelectronic sequence Te IV- La VIII [13-17], large number of possibly interacting configurations were included into the configuration interaction code of R.D. Cowan [18] to get the *ab initio* calculations. Reasonably good predictions were achieved by using the scaling factor (the ratio of the LSF energy parameters to the HFR parameters) obtained by the interpolations from the neighbouring isoelectronic ions Te IV – La VIII [13-17]. The configurations included for the odd parity matrix were $5s^2$(5p, 6p, 7p, 8p, 9p), $5p^3$, 5s5p5d, 5s5p6s, $5s^2 4f$, $5s^2 5f$, $5p^2 4f$ and 5s5d4f, while for even parity systems $5s5p^2$, $5s^2$(6s, 7s, 8s, 9s), $5s^2$(5d, 6d, 7d) and $5s^2$(5g, 6g, 7g) and $5p^2 5d$. One electron structure of Sb III has already been reported by Arcimowicz, Joshi and Kaufman [5] but its major and complicated three electron system $5p^3$, 5s5p5d and 5s5p6s configurations published by tazeen [12]. Isoelectronic plots of the unperturbed levels ware quite helpful to spot out the transition within 1Å. This provided the shift from the *ab initio* calculations. Consequently my investigation here for odd parity system is $5s^2 7p$, $5s^2 8p$, $5s^2 9p$ and $5s^2 5f$ while for even parity system is $5p^2 5d$ and $5s^2 9s$. Eight levels in odd parity system and thirteen levels of j=1/2 and 3/2 of $5p^2 5d$ in even parity system are investigated. $5s^2 9s\ ^2S_{1/2}$ is newly investigated at 177770 cm^1. Total 22 levels have been investigated in this paper. Least Square fitted parameters for odd and even parity configurations are given in table 1 and table 2 while Observed levels of odd and

even configurations of Sb III along with their Least Square Fitted (LSF) Energy levels in cm^{-1} are given in table 3 and table 4

Table 1; Least Square Fitted (LSF) parameters for odd parity configurations of Sb III

Conf.	parameter	LSF	Acc.	HF	LSF/HF
$5s^2$ 5p	E0($5s^2$ 5p)	8221.9	73.0	8196.0	
	zeta(5p)	4130.1	93.0	4127.3	1.001
$5s^2$ 6p	E0($5s^2$ 6p)	120822.9	73.0	120852.3	**1.000**
	Zeta(6p)	1022.0	92.0	1022.8	**0.999**
$5s^2$ 7p*	**E0($5s^2$ 7p)**	**157392.7**	**188.0**	**157416.8**	**1.000**
	zeta(7p)	**677.2**	**245.0**	**444.4**	**1.524**
$5s^2$ 8p*	**E0($5s^2$ 8p)**	**174553.2**	**75.0**	**174810.2**	**0.998**
	zeta(8p)	**267.3**	**93.0**	**237.5**	**1.125**
$5s^2$ 9p*	**E0($5s^2$ 9p)**	**184253.3**	**74.0**	**184587.8**	**0.998**
	zeta(9p)	**133.3**	**93.0**	**142.1**	**0.938**
5s5p6s	E0(5s 5p 6s)	169756.2	72.0	166404.3	1.021
	Zeta(5p)	5218.5	151.0	4549.1	1.147
	G1(5s, 5p)	41574.9	192.0	58320.2	0.713
	G0(5s, 6s)	2428.6	290.0	3219.1	0.754
	G1(5p, 6s)	2885.8	772.0	5151.9	0.560
4f5s5d	E0(4f 5s 5d)	306821.9	(fixed)	306813.2	1.000
	zeta(4f)	226.5	(fixed)	226.6	1.000
	zeta(5d)	4.7	(fixed)	4.7	1.000
	F2(4f, 5d)	20613.7	(fixed)	24251.5	0.850
	F4(4f, 5d)	13214.2	(fixed)	15546.2	0.850
	G3(4f, 5s)	14446.1	(fixed)	19261.5	0.750
	G1(4f, 5d)	7432.2	(fixed)	9909.6	0.750
	G3(4f, 5d)	21812.8	(fixed)	29083.8	0.750
	G5(4f, 5d)	13537.2	(fixed)	18049.7	0.750
	G2(5s, 5d)	9536.0	(fixed)	12714.8	0.750
$5p^3$	E0(5p3)	163806.3	144.0	165153.3	0.991
	F2(5p, 5p)	34180.0	859.0	43077.6	0.793
	alfa(5p)	270.2	73.0		
	zeta(5p)	4113.0	(fixed)	4113.0	1.000
5s5p5d	E0(5s 5p 5d)	169042.4	42.0	166261.6	1.017
	zeta(5p)	4406.2	(fixed)	4406.2	1.000
	zeta(5d)	187.3	(fixed)	187.4	0.999
	F2(5p, 5d)	20736.0	686.0	28935	0.717
	G1(5s, 5p)	41169.9	141.0	57770.1	0.713
	G2(5s, 5d)	11720.0	567.0	17289.0	0.678
	G1(5p, 5d)	23002.0	509.0	31020.0	0.742
	G3(5p, 5d)	20734.4	299.0	19447.8	1.066
4f $5p^2$	E0(4f 5p2)	294244.0	23.0	294248.3	1.000
	F2(5p, 5p)	38124.6	(fixed)	44852.5	0.850
	alfa(5p)	1.0	24.0		
	zeta(4f)	4557.0	43.0	4555.6	1.000
	zeta(5p)	4.3	20.0	3.6	1.194
	F2(4f, 5p)	16287.4	312.0	19222.2	0.847
	G2(4f, 5p)	10243.2	166.0	13656.1	0.750
	G4(4f, 5p)	6765.3	285.0	9061.2	0.747
$5p^2$ 5f	E0(5p2 5f)	319920.8	21.0	319926.8	1.000
	F2(5p, 5p)	38415.0	217.0	45254.9	0.849
	alfa(5p)	4.6	19.0		
	zeta(5p)	4622.8	82.0	4626.0	0.999
	zeta(5f)	3.3	17.0	2.8	1.179
	F2(5p, 5f)	7306.6	225.0	8610.0	0.849
	G2(5p, 5f)	4870.1	192.0	6506.9	0.748
	G4(5p, 5f)	3300.6	330.0	4445.0	0.743
4f $5s^2$	E0(4f $5s^2$)	141569.4	73.0	141691.4	0.999
	zeta(4f)	0.0	41.0	2.4	0.000
$5s^2$ 5f*	**E0($5s^2$ 5f)**	**168158.2**	**77.0**	**166064.1**	**1.013**
	zeta(5f)	**1.8**	**(fixed)**	**1.8**	**1**
$5s^2$ 5p -5s 5p 6s	R0(5s, 5s; 5s, 6s)	2255	(fixed)	3006.7	0.75
	R1(5s, 5p; 5p, 6s)	1346.3	(fixed)	1795.1	0.75
	R0(5s, 5p; 6s, 5p)	144.5	(fixed)	192.6	0.75

$5s^2$ 5p -$5p^3$	R1(5s, 5s; 5p, 5p)	42513.7	(fixed)	56684.9	0.75
$5s^2$ 5p -5s 5p 5d	R1(5s, 5p; 5p, 5d)	30082.4	(fixed)	40109.9	0.75
	R2(5s, 5p; 5d, 5p)	20804.3	(fixed)	27739.1	0.75
$5s^2$ 5p -4f 5s 5d	R3(5s, 5p; 4f, 5d)	13944.6	(fixed)	18592.8	0.75
	R2(5s, 5p; 5d, 4f)	11311.9	(fixed)	15082.5	0.75
$5s^2$ 6p -5s 5p 6s	R1(5s, 6p; 5p, 6s)	15594.4	(fixed)	20792.6	0.75
	R0(5s, 6p; 6s, 5p)	2244.6	(fixed)	2992.8	0.75
$5s^2$ 6p -5s 5p 5d	R1(5s, 6p; 5p, 5d)	3749.8	(fixed)	4999.7	0.75
	R2(5s, 6p; 5d, 5p)	3044	(fixed)	4058.6	0.75
$5s^2$ 6p -4f 5s 5d	R3(5s, 6p; 4f, 5d)	2858.7	(fixed)	3811.6	0.75
	R2(5s, 6p; 5d, 4f)	658.8	(fixed)	878.4	0.75
$5s^2$ 7p -5s 5p 6s	R1(5s, 7p; 5p, 6s)	7476.5	(fixed)	9968.6	0.75
	R0(5s, 7p; 6s, 5p)	1341	(fixed)	1788	0.75
$5s^2$ 7p -5s 5p 5d	R1(s, 7p; 5p, 5d)	1921.9	(fixed)	2562.5	0.75
	R2(5s, 7p; 5d, 5p)	1301.2	(fixed)	1735	0.75
$5s^2$ 7p -4f 5s 5d	R3(5s, 7p; 4f, 5d)	1207.2	(fixed)	1609.6	0.75
	R2(5s, 7p; 5d, 4f)	664.5	(fixed)	886	0.75
$5s^2$ 8p -5s 5p 6s	R1(5s, 8p; 5p, 6s)	4874.7	(fixed)	6499.6	0.75
	R0(5s, 8p; 6s, 5p)	934.6	(fixed)	1246.2	0.75
$5s^2$ 8p -5s 5p 5d	R1(5s, 8p; 5p, 5d)	1326.2	(fixed)	1768.2	0.75
	R2(5s, 8p; 5d, 5p)	755.7	(fixed)	1007.6	0.75
$5s^2$ 8p -4f 5s 5d	R3(5s, 8p; 4f, 5d)	791.6	(fixed)	1055.5	0.75
	R2(5s, 8p; 5d, 4f)	535.7	(fixed)	714.2	0.75
$5s^2$ 9p -5s 5p 6s	R1(5s, 9p; 5p, 6s)	3555.6	(fixed)	4740.8	0.75
	R0(5s, 9p; 6s, 5p)	703.8	(fixed)	938.4	0.75
$5s^2$ 9p -5s 5p 5d	R1(5s, 9p; 5p, 5d)	1001	(fixed)	1334.7	0.75
	R2(5s, 9p; 5d, 5p)	508.6	(fixed)	678.1	0.75
$5s^2$ 9p -4f 5s 5d	R3(5s, 9p; 4f, 5d)	582.2	(fixed)	776.2	0.75
	R2(5s, 9p; 5d, 4f)	431.3	(fixed)	575	0.75
5s 5p 6s -$5p^3$	R1(5s, 6s; 5p, 5p)	1037.1	(fixed)	1382.8	0.75
5s 5p 6s -5s 5p 5d	R2(5p, 6s; 5p, 5d)	8907.3	(fixed)	11876.4	0.75
	R1(5p, 6s; 5d, 5p)	3645.7	(fixed)	4860.9	0.75
5s 5p 6s -4f 5s 5d	R2(5p, 6s; 4f, 5d)	6957.2	(fixed)	9276.2	0.75
	R3(5p, 6s; 5d, 4f)	7930.3	(fixed)	10573.7	0.75
$5p^3$ -5s 5p 5d	R1(5p, 5p; 5s, 5d)	29507.9	(fixed)	39343.8	0.75
$5p^3$ -4f $5p^2$	R2(5p, 5p; 4f, 5p)	17635.7	(fixed)	23514.2	0.75
$5p^3$ -$5p^2$ 5f	R2(5p, 5p; 5p, 5f)	12423.9	(fixed)	16565.2	0.75
5s 5p 5d -4f $5p^2$	R3(5s, 5d; 4f, 5p)	22016.2	(fixed)	29354.9	0.75
	R1(5s, 5d; 5p, 4f)	9163.7	(fixed)	12218.3	0.75
5s 5p 5d -$5p^2$ 5f	R1(5s, 5d; 5p, 5f)	11664.2	(fixed)	15552.3	0.75
	R3(5s, 5d; 5f, 5p)	6637.9	(fixed)	8850.6	0.75
5s 5p 5d -4f 5s 5d	R2(5p, 5d; 4f, 5d)	21947.2	(fixed)	29263	0.75
	R4(5p, 5d; 4f, 5d)	12963.4	(fixed)	17284.6	0.75
	R1(5p, 5d; 5d, 4f)	15840.7	(fixed)	21121	0.75
	R3(5p, 5d; 5d, 4f)	10392.4	(fixed)	13856.6	0.75
5s 5p 5d -4f $5s^2$	R2(5p, 5d; 4f, 5s)	20472.9	(fixed)	27297.2	0.75
	R1(5p, 5d; 5s, 4f)	10131.6	(fixed)	13508.8	0.75
5s 5p 5d -$5s^2$ 5f	R1(5p, 5d; 5s, 5f)	11695.4	(fixed)	15593.8	0.75
	R2(5p, 5d; 5f, 5s)	7354.6	(fixed)	9806.1	0.75
4f $5p^2$ -$5p^2$ 5f	R2(4f, 5p; 5p, 5f)	0	(fixed)	0	
	R4(4f, 5p; 5p, 5f)	7291	(fixed)	9721.4	0.75
	R0(4f, 5p; 5f, 5p)	6932	(fixed)	9242.6	0.75
	R2(4f, 5p; 5f, 5p)	4654.7	(fixed)	6206.3	0.75
4f $5p^2$ -4f 5s 5d	R1(5p, 5p; 5s, 5d)	31439.3	(fixed)	41919.1	0.75
4f $5p^2$ -4f $5s^2$	R1(5p, 5p; 5s, 5s)	44058	(fixed)	58744	0.75
$5p^2$ 5f -$5s^2$ 5f	R1(5p, 5p; 5s, 5s)	0	(fixed)	0	
4f 5s 5d -4f $5s^2$	R2(4f, 5d; 4f, 5s)	0	(fixed)	0	
4f 5s 5d -4f $5s^2$	R3(4f, 5d; 5s, 4f)	0	(fixed)	0	
4f 5s 5d -$5s^2$ 5f	R3(4f, 5d; 5s, 5f)	44377.3	(fixed)	59169.7	0.75
4f 5s 5d -$5s^2$ 5f	R2(4f, 5d; 5f, 5s)	10587.1	(fixed)	14116.2	0.75
Sigma = 96.0					

Table 2: Least square fitted (LSF) parameters in cm^{-1} for even Parity Configurations of SbIII					
Configuration	Parameter	LSF	Acc.	HF	LSF/HF
$5s\ 5p^2$	E0($5s\ 5p^2$)	79606.2	141.0	77879.2	1.024
	F^2(5p, 5p)	36541.8	(fixed)	42990.4	0.850
	alfa(5p)	107.2	85.0		
	zeta(5p)	1980.6	265.0	4115.4	0.481
	G1(5s, 5p)	44979.2	409.0	56437.2	0.797
$5s^2$ 8s	E0($5s^2$ 8s)	165302.6	259.0	169872.0	0.972
$5s^2$ 9s	**E0($5s^2$ 9s)**	**177767.7**	**259.0**	**181668.8**	**0.977**
$5s^2$ 5d	E0($5s^2$ 5d)	97394.7	309.0	100550.9	0.966
	zeta(5d)	173.0	(fixed)	173.1	0.999
$5s^2$ 6d	E0($5s^2$ 6d)	144412.7	188.0	149515.7	0.964
	zeta(6d)	94.9	147.0	69.7	1.362
$5s^2$ 7d	E0($5s^2$ 7d)	166023.1	187.0	170760.9	0.971
	zeta(7d)	46.4	147.0	35.6	1.303
$5s^2$ 5g	E0($5s^2$ 5g)	164302.1	183.0	168566.1	0.973
	zeta(5g)	0.3	(fixed)	0.3	1.000
$5s^2$6g	E0($5s^2$ 6g)	176540.0	183.0	180812.8	0.975
	zeta(6g)	0.1	(fixed)	0.2	0.500
$5s^2$ 7g	E0($5s^2$ 7g)	183924.0	183.0	188198.1	0.976
	zeta(7g)	0.0	(fixed)	0.1	0.000
$5p^2$ 5d	**E0($5p^2$ 5d)**	**249724.4**	**51.0**	**249749.8**	**1.000**
	F2(5p, 5p)	**37459.5**	**580.0**	**44136.6**	**0.849**
	alfa(5p)	**7.3**	**37.0**		
	zeta(5p)	**4411.5**	**138.0**	**4383.8**	**1.006**
	zeta(5d)	**222.9**	**79.0**	**203.8**	**1.094**
	F2(5p, 5d)	**25560.6**	**500.0**	**29897.3**	**0.855**
	G1(5p, 5d)	**24398.4**	**209.0**	**32591.1**	**0.749**
	G3(5p, 5d)	**15241.3**	**517.0**	**20437.7**	**0.746**
$5s\ 5p^2$-$5s^2$ 6s	R1(5p,5p;5s, 6s)	1752.9	(fixed)	2337.1	0.750
$5s\ 5p^2$ -$5s^2$ 7s	R1(5p, 5p; 5s, 7s)	1271.3	(fixed)	1695.1	0.750
$5s\ 5p^2$ -$5s^2$ 8s	R1(5p, 5p; 5s, 8s)	952.2	(fixed)	1269.6	0.750
$5s\ 5p^2$ -$5s^2$ 9s	R1(5p, 5p; 5s, 9s)	741.4	(fixed)	988.5	0.750
$5s\ 5p^2$ -$5s^2$ 5d	R1(5p, 5p; 5s, 5d)	28808.6	(fixed)	38411.5	0.750
$5s\ 5p^2$ -$5s^2$ 6d	R1(5p, 5p; 5s, 6d)	13802.4	(fixed)	18403.2	0.750
$5s\ 5p^2$ -$5s^2$ 7d	R1(5p, 5p; 5s, 7d)	8866.3	(fixed)	11821.7	0.750
$5s\ 5p^2$-$5p^2$ 5d	R1(5s, 5p; 5p, 5d)	30866.1	(fixed)	41154.7	0.750
	R2(5s, 5p;5d, 5p)	21353.5	(fixed)	28471.4	0.750
$5s^2$ 5d-$5p^2$ 5d	R1(5s, 5s; 5p, 5p)	43437.8	(fixed)	57917.0	0.750
Sigma = 259.00					

Table 3: Observed and Least Square Fitted (LSF) Energy levels in cm^{-1} for Odd Parity Configurations of SbIII			
E(obs)	**E(LSF)**	**diff.**	**LS-composition.**
J=1/2			
0	1	-1	98% $5s^2\ 5p\ ^2P$
119014.7	119014	0.7	99% $5s^2\ 6p\ ^2P$
155 676.5*	**155675**	**1.5**	**50% $5s^2$ 7p 2P + 33% 5s 5p 6s $(^3P)^4P$+ 7% 5s 5p 6s $(^3P)^2P$ + 4% 5s 5p 5d $(^3P)^4D$**
155893.5	155874	19.5	76% 5s 5p 5d $(^3P)^4D$ + 10% $5s^2$ 7p ^2P+ 9% 5s 5p 5d $(^3P)^4P$
156626	156623	3	59% 5s 5p 6s $(^3P)^4P$ + 31% $5s^2$ 7p ^2P+ 8% 5s 5p 5d $(^3P)^4D$
160086	160140	-54	84% 5s 5p 5d $(^3P)^4P$ + 9% 5s 5p 5d $(^3P)^4D$
161334	161368	-34	38% 5s 5p 6s $(^3P)^2P$ + 23% $5p^3$ <1>2P+ 23% 5s 5p 5d $(^3P)^2P$ + 7% $5s^2$ 7p ^2P
164317	164310	7	49% 5s 5p 6s $(3P)^2P$ + 30% $5p^3$ <1>2P+ 14% 5s 5p 5d $(^3P)^2P$ + 4% 5s 5p 5d $(1P)^2P$
174176.5*	**174176**	**0.5**	**98% $5s^2$ 8p ^2P**
182729	182805	-76	48% 5s 5p 5d $(^3P)^2P$ + 23% 5s 5p 5d $(1P)^2P$+ 20% $5p^3$ <1>^2P + 6% 5s 5p 6s $(^1P)^2P$
183940.4*	**183940**	**0.4**	**98% $5s^2$ 9p ^2P**
191620	191558	62	73% 5s 5p 6s $(1P)^2P$ + 9% $5p^3$ <1>^2P+ 7% 5s 5p 5d $(3P)^2P$ + 7% 5s 5p 5d $(1P)^2P$
195372	195490	-118	61% 5s 5p 5d $(1P)^2P$ + 16% 5s 5p 6s $(1P)^2P$+ 15% $5p^3$ <1>^2P
	288960	-	71% 4f $5p^2$ (<2>$^3P)^4D$ + 21% 4f $5p^2$ (<2>$^1D)^2P$+ 8% 4f 5s 5d $(^1F)^2P$
	294700	-	44% 4f $5p^2$ (<2>1D)^2P + 29% 4f $5p^2$ (<2>$^3P)^4D$+ 26% 4f 5s 5d $(^1F)^2P$
	308610	-	97% 4f 5s 5d $(^3F)^4D$
	309246	-	97% 4f 5s 5d $(^3F)4P$
	316024	-	89% $5p^2$ 5f (<2>3P)^4D + 8% $5p^2$ 5f (<2>$^1D)^2P$
	317220	-	93% 4f 5s 5d $(^3F)^2P$

	327109	-	66% $5p^2$ 5f (<2>^{1}D)^{2}P + 19% 4f 5s 5d (^{1}F)^{2}P+ 7% $5p^2$ 5f (<2>^{3}P)^{4}D + 6% 4f $5p^2$ (<2>^{1}D)^{2}P
	331553	-	45% 4f 5s 5d (^{1}F)^{2}P + 25% $5p^2$ 5f (<2>^{1}D)^{2}P+ 25% 4f $5p^2$ (<2>^{1}D)^{2}P
J=3/2			
6061.5	6063	-1.5	98% $5s^2$ 5p ^{2}P
120491.9	120492	-0.1	99% $5s^2$ 6p ^{2}P
145734	145911	-177	49% $5p^3$ <3>^{2}D + 40% 5s 5p 5d (^{3}P)^{2}D+ 4% $5p^3$ <1>^{2}P
151592	151592.1	-0.1	90% $5p^3$ <3>^{4}S + 4% $5p^3$ <1>^{2}P
152303	152345	-42	86% 5s 5p 5d (^{3}P)^{4}F + 10% 5s 5p 5d (^{3}P)^{4}D
	155703	-	52% 5s 5p 5d (^{3}P)^{4}D + 34% 5s 5p 5d (^{3}P)^{4}P+ 9% 5s 5p 5d (^{3}P)^{4}F
156766.0*	**156773**	**-7**	**76% $5s^2$ 7p ^{2}P + 12% 5s 5p 6s (^{3}P)^{4}P+ 6% 5s 5p 6s (^{3}P)^{2}P**
158592	158553	39	65% 5s 5p 6s (^{3}P)^{4}P+ 16% $5s^2$ 7p 2P+ 10% 5s 5p 5d (^{3}P)^{4}D + 6% 5s 5p 5d (^{3}P)^{4}P
160217	160258	-41	56% 5s 5p 5d (^{3}P)^{4}P + 26% 5s 5p 5d (^{3}P)^{4}D+ 12% 5s 5p 6s (^{3}P)^{4}P
163327	163487	-160	39% 5s 5p 5d (^{3}P)^{2}P + 32% $5p^3$ <1>2P+ 5% 5p3 <3>^{4}S + 4% 5s 5p 6s (^{3}P)^{2}P
168460	168450	10	79% 5s 5p 6s (^{3}P)^{2}P + 6% $5p^3$ <1>2P+ 5% 5s 5p 6s (3P)^{4}P
171169	171262	-93	43% 5s 5p 5d (^{3}P)^{2}D + 29% $5p^3$ <3>^{2}D+ 22% 5s 5p 5d (^{1}P)^{2}D
174725.0*	**174725.6**	**-0.6**	**96% $5s^2$ 8p ^{2}P**
182966	182913	53	43% 5s 5p 5d (^{3}P)^{2}P + 29% $5p^3$ <1>2P+ 14% 5s 5p 5d (^{1}P)^{2}P + 8% 5s 5p 5d (^{1}P)^{2}D
184208.0*	**184207**	**1**	**97% $5s^2$ 9p ^{2}P**
190916	190791	125	47% 5s 5p 6s (^{1}P)^{2}P + 22% 5s 5p 5d (^{1}P)^{2}D+ 19% 5s 5p 5d (^{1}P)^{2}P + 4% $5p^3$ <1>^{2}P
192739	193000	-261	38% 5s 5p 5d (^{1}P)^{2}D + 35% 5s 5p 6s (^{1}P)^{2}P+ 9% $5p^3$ <3>^{2}D + 5% 5s 5p 5d (^{3}P)^{2}D
196189	196086	103	53% 5s 5p 5d (^{1}P)^{2}P + 15% $5p^3$ <1>^{2}P+ 10% 5s 5p 6s (^{1}P)^{2}P + 8% 5s 5p 5d (^{1}P)^{2}D
	287611	-	54% 4f $5p^2$(<2>^{3}P)^{4}F + 20% 4f $5p^2$ (<2>^{3}P)^{2}D+ 18% 4f $5p^2$ (<2>^{3}P)^{4}D + 6% 4f $5p^2$ (<2>^{1}D)^{2}D
	287902	-	45% 4f $5p^2$(<2>^{3}P)^{4}D + 31% 4f $5p^2$ (<2>^{1}D)^{2}D+ 14% 4f 5s 5d (^{1}F)^{2}D + 6% 4f $5p^2$ (<2>^{1}D)^{2}P
	290063	-	43% 4f $5p^2$ (<2>^{3}P)^{2}D + 20% 4f $5p^2$ (<2>^{1}D)^{2}P+ 15% 4f $5p^2$ (<2>^{1}D)^{2}D + 8% 4f 5s 5d (^{1}F)^{2}D
	292872	-	44% 4f $5p^2$ (<2>^{3}P)^{4}F +17% 4f $5p^2$(<2>^{3}P)^{4}D+ 16% 4f $5p^2$ (<2>^{3}P)^{2}D +12% 4f $5p^2$ (<2>^{1}D)^{2}D
	294951	-	39% 4f $5p^2$(<2>^{1}D)^{2}P + 23% 4f 5s 5d (^{1}F)^{2}P+ 19% 4f $5p^2$ (<2>^{3}P)^{2}D + 15% 4f $5p^2$ (<2>^{3}P)^{4}D
	300380	-	100% 4f 5s 5d (^{3}F)^{4}F
	305856	-	96% 4f 5s 5d (^{3}F)^{2}D
	308578	-	91% 4f 5s 5d (^{3}F)^{4}D + 9% 4f 5s 5d (^{3}F)^{4}P
	309173	-	91% 4f 5s 5d (^{3}F)^{4}P + 9% 4f 5s 5d (^{3}F)^{4}D
	313031	-	60% $5p^2$ 5f (<2>^{3}P)^{4}F + 22% $5p^2$ 5f (<2>^{3}P)^{4}D+ 17% $5p^2$ 5f (<2>^{3}P)^{2}D
	316004	-	65% $5p^2$ 5f(<2>^{3}P)^{4}D + 14% $5p^2$ 5f (<2>^{3}P)^{2}D+ 8% $5p^2$ 5f (<2>^{3}P)^{4}F + 6% $5p^2$ 5f (<2>^{1}D)^{2}P
	316776	-	44% $5p^2$ 5f(<2>^{3}P)^{2}D + 23% $5p^2$ 5f (<2>^{3}P)^{4}F+ 19% 4f 5s 5d (^{3}F)^{2}P + 5% $5p^2$ 5f (<2>1D)^{2}D
	316978	-	73% 4f 5s 5d (^{3}F)^{2}P + 18% $5p^2$ 5f (<2>^{3}P)^{2}D
	325339	-	41% 4f 5s 5d (1F)^{2}D + 32% 5p2 5f (<2>1D)^{2}D+ 19% 4f 5p2 (<2>1D)^{2}D
	327000	-	49% $5p^2$ 5f (<2>1D)^{2}P + 19% $5p^2$ 5f (<2>1D)^{2}D+ 12% 4f 5s 5d (1F)^{2}P + 6% 4f 5s 5d (1F)^{2}D
	327508	-	40% $5p^2$ 5f (<2>1D)^{2}D + 17% $5p^2$ 5f (<2>1D)^{2}P+ 16% 4f 5s 5d (1F)^{2}D + 9% 4f $5p^2$ (<2>1D)^{2}D
	331628	-	45% 4f 5s 5d (1F)^{2}P + 25% 4f $5p^2$ (<2>1D)^{2}P+ 25% $5p^2$ 5f (<2>1D)^{2}P
J=5/2			
136269	136264	5	95% 4f $5s^2$ ^{2}F
147542	147482	60	54% $5p^3$ <3>2D + 44% 5s 5p 5d (3P)^{2}D
153430	153618	-188	65% 5s 5p 5d (3P)^{4}F + 24% 5s 5p 5d (3P)^{4}D+ 9% 5s 5p 5d (3P)^{4}P
-	155591	-	56% 5s 5p 5d (3P)^{4}P + 26% 5s 5p 5d (3P)^{4}F+ 14% 5s 5p 5d (3P)^{4}D
160114	159916	198	61% 5s 5p 5d (3P)^{4}D + 30% 5s 5p 5d (3P)^{4}P+ 7% 5s 5p 5d (3P)^{4}F
163831	163853	**-22**	98% 5s 5p 6s (3P)^{4}P
166113.0*	**166427.6**	**-314.6**	**88% $5s^2$ 5f ^{2}F + 7% 5s 5p 5d (3P)^{2}F**
167412	167201	211	86% 5s 5p 5d (3P)^{2}F + 6% $5s^2$ 5f ^{2}F
171792	171875	-83	42% 5s 5p 5d (3P)^{2}D + 27% 5s 5p 5d (1P)^{2}D+ 25% $5p^3$ <3>^{2}D
192178	191977	201	91% 5s 5p 5d (1P)^{2}F
193338	193434	-96	68% 5s 5p 5d (1P)^{2}D + 16% $5p^3$ <3>^{2}D+ 12% 5s 5p 5d (3P)^{2}D
	282179	-	69% 4f $5p^2$(<2>3P)^{4}G + 8% 4f $5p^2$ (<2>3P)^{2}D+ 7% 4f $5p^2$ (<2>1D)^{2}F + 5% 4f $5p^2$ (<2>3P)^{4}F
	285151	-	40% 4f $5p^2$ (<2>1D)^{2}F +19% 4f 5s 5d (1F)^{2}F+ 17% 4f $5p^2$ (<2>3P)^{2}D + 16% 4f $5p^2$ (<2>3P)^{4}G
	285931	-	34% 4f $5p^2$(<2>3P)^{2}D +17% 4f $5p^2$ (<2>1D)^{2}D+14% 4f $5p^2$ (<2>1D)^{2}F +14% 4f $5p^2$ (<2>3P)^{4}F
	286787	-	67% 4f $5p^2$ (<2>3P)^{4}D + 11% 4f $5p^2$ (<2>1D)^{2}D+ 11% 4f $5p^2$ (<2>3P)^{4}F + 5% 4f 5s 5d (1F)^{2}D
	290608	-	26% 4f $5p^2$ (<2>3P)^{2}D+21% 4f $5p^2$ (<2>3P)^{4}F+18% 4f $5p^2$ (<2>3P)^{2}F +18% 4f $5p^2$ (<2>1D)^{2}D
	293148	-	44% 4f $5p^2$ (<2>3P)^{4}F +27% 4f $5p^2$ (<2>3P)^{4}D+ 10% 4f $5p^2$ (<2>1D)^{2}D + 7% 4f 5s 5d (1F)^{2}D
	296993	-	70% 4f $5p^2$ (<2>3P)^{2}F + 13% 4f $5p^2$ (<2>3P)^{2}D+ 5% 4f 5s 5d (1F)^{2}D
-	300429	-	100% 4f 5s 5d (3F)^{4}F
-	305842	-	96% 4f 5s 5d (3F)^{2}D
-	307332	-	100% 4f 5s 5d (3F)^{4}G
-	308543	-	80% 4f 5s 5d (3F)^{4}D + 19% 4f 5s 5d (3F)^{4}P
	309010		49% $5p^2$ 5f(<2>3P)^{4}G + 13% $5p^2$ 5f (<2>3P)^{4}F+ 12% 4f 5s 5d (3F)^{2}F + 10% $5p^2$ 5f (<2>3P)^{2}D
-	309030	-	78% 4f 5s 5d (3F)^{4}P + 19% 4f 5s 5d (3F)^{4}D
-	309347	-	77% 4f 5s 5d (3F)^{2}F + 10% 5p2 5f (<2>3P)4G+ 4% 4f 5p2 (<2>1D)^{2}F

	312355	-	36% $5p^2$ 5f(<2>3P)^{2}D +34% $5p^2$ 5f (<2>3P)^{4}G+ 20% $5p^2$ 5f (<2>3P)^{4}D + 9% $5p^2$ 5f (<2>3P)^{4}F
	313601	-	34% $5p^2$ 5f (<2>3P)^{2}D + 32% $5p^2$ 5f (<2>3P)^{4}D+ 18% $5p^2$ 5f (<2>3P)^{4}F + 11% $5p^2$ 5f (<2>3P)^{2}F
	316014	-	31% $5p^2$ 5f (<2>3P)^{4}F + 30% $5p^2$ 5f (<2>3P)^{4}D+ 18% 4f $5p^2$ (<0>1S)^{2}F + 6% $5p^2$ 5f (<2>1D)^{2}D
	316838	-	45% 4f $5p^2$(<0>1S)^{2}F + 19% $5p^2$ 5f (<2>3P)^{4}F+ 10% 4f 5s 5d (1F)^{2}F + 6% $5p^2$ 5f (<2>3P)^{4}D
	318691	-	64% $5p^2$ 5f (<2>3P)^{2}F+12% $5p^2$ 5f (<2>1D)^{2}F+6% $5p^2$ 5f (<2>1D)^{2}D + 4% $5p^2$ 5f (<2>3P)^{2}D
-	323327	-	44% 4f 5s 5d (1F)^{2}F + 25% 4f $5p^2$ (<2>1D)^{2}F+ 15% 4f $5p^2$ (<0>1S)^{2}F + 8% 5p2 5f (<2>1D)2F
-	325307	-	46% 4f 5s 5d (1F)^{2}D + 27% $5p^2$ 5f (<2>1D)^{2}D+ 21% 4f $5p^2$ (<2>1D)^{2}D
	325745	-	70% $5p^2$ 5f (<2>1D)^{2}F + 7% 4f $5p^2$ (<0>1S)^{2}F+ 6% $5p^2$ 5f (<2>3P)^{2}F
	328248	-	57% $5p^2$ 5f (<2>1D)^{2}D + 17% 4f 5s 5d (1F)^{2}D+ 11% 4f $5p^2$ (<2>1D)^{2}D + 5% $5p^2$ 5f (<2>3P)^{2}D
	343870	-	93% $5p^2$ 5f (<0>1S)^{2}F
J=7/2			
136213	136220	-7	95% 4f $5s^2$ ^{2}F
155398	155371	27	73% 5s 5p 5d (3P)^{4}F + 24% 5s 5p 5d (3P)^{4}D
-	159786	-	74% 5s 5p 5d (3P)^{4}D+ 25% 5s5p 5d (3P)^{4}F
163592.0*	**163255**	**337**	**90% $5s^2$ 5f ^{2}F + 4% 5s 5p 5d (3P)^{2}F**
172745	172681	64	93% 5s 5p 5d (3P)^{2}F + 4% 5s2 5f ^{2}F
191048	190906	142	94% 5s 5p 5d (1P)^{2}F
	282772	-	22% 4f $5p^2$ (<2>3P)^{2}G +19% 4f $5p^2$ (<2>1D)^{2}G+17% 4f $5p^2$ (<2>3P)^{4}G +15% 4f $5p^2$ (<2>3P)^{4}D
	283453	-	37% 4f 5p2(<2>3P)^{4}G +34% 4f $5p^2$ (<2>1D)^{2}G+13% 4f 5s 5d (1F)^{2}G + 5% 4f $5p^2$ (<2>3P)^{4}D
	285079	-	44% 4f 5p2 (<2>1D)^{2}F +21% 4f 5s 5d (1F)^{2}F+17% 4f $5p^2$ (<2>3P)^{4}G +10% 4f $5p^2$ (<2>3P)^{4}F
	286221	-	56% 4f $5p^2$ (<2>3P)^{4}D +17% 4f $5p^2$ (<2>3P)^{4}G+ 9% 4f $5p^2$ (<2>3P)^{4}F + 7% 4f $5p^2$ (<2>1D)^{2}F
	290120	-	62% 4f $5p^2$ (<2>3P)^{2}G + 13% 4f $5p^2$ (<2>3P)^{2}F+ 10% 4f $5p^2$ (<2>1D)^{2}G + 7% 4f 5s 5d (1F)^{2}G
	292932	-	67% 4f $5p^2$ (<2>3P)^{4}F + 15% 4f $5p^2$ (<2>3P)^{4}D+ 7% 4f $5p^2$ (<2>3P)^{4}G + 4% 4f 5s 5d (1F)^{2}F
	297804	-	76% 4f $5p^2$ (<2>3P)^{2}F + 7% 4f $5p^2$ (<2>3P)^{2}G+ 4% 4f 5s 5d (3F)^{2}G
	298203	-	99% 4f 5s 5d (3F)^{4}H
	300499	-	100% 4f 5s 5d (3F)^{4}F
	301793	-	89% 4f 5s 5d (3F)^{2}G + 7% 4f $5p^2$ (<2>1D)^{2}G
	307434	-	100% 4f 5s 5d (3F)^{4}G
	308628	-	97% 4f 5s 5d (3F)^{4}D
	309420	-	25% $5p^2$ 5f(<2>3P)^{4}G +21% $5p^2$ 5f (<2>3P)^{4}D+ 20% $5p^2$ 5f (<2>3P)^{4}F + 14% 4f 5s 5d (3F)^{2}F
	309515	-	75% 4f 5s 5d (3F)^{2}F + 6% $5p^2$ 5f (<2>3P)^{4}G
	312475	-	49% $5p^2$ 5f (<2>3P)^{4}D + 46% $5p^2$ 5f (<2>3P)^{4}G
	313559	-	72% $5p^2$ 5f(<2>3P)^{2}G +12% $5p^2$ 5f (<2>3P)^{4}G+ 5% $5p^2$ 5f (<2>1D)^{2}G + 5% $5p^2$ 5f (<2>3P)^{4}D
	315848	-	33% $5p^2$ 5f(<2>3P)^{4}F + 30% 4f $5p^2$ (<0>1S)^{2}F+ 13% $5p^2$ 5f (<2>1D)^{2}F + 8% $5p^2$ 5f (<2>3P)^{4}D
	316691	-	35% 4f $5p^2$ (<0>1S)^{2}F + 31% $5p^2$ 5f (<2>3P)^{4}F+8% 4f 5s 5d (1F)^{2}F + 6% $5p^2$ 5f (<2>3P)^{2}F
	318783	-	60% $5p^2$ 5f (<2>3P)^{2}F +18% $5p^2$ 5f (<2>1D)^{2}G+7% 4f $5p^2$ (<0>1S)^{2}F + 4% $5p^2$ 5f (<2>1D)^{2}F
	322980	-	60% 4f 5s 5d (1F)^{2}G + 24% 4f $5p^2$ (<2>1D)^{2}G+ 5% 4f 5s 5d (1F)^{2}F
	323276	-	41% 4f 5s 5d (1F)^{2}F+ 23% 4f $5p^2$ (<2>1D)^{2}F+ 16% 4f $5p^2$ (<0>1S)^{2}F + 6% 4f 5s 5d (1F)^{2}G
	325448	-	53% $5p^2$ 5f(<2>1D)^{2}F + 26% $5p^2$ 5f (<2>1D)^{2}G+ 8% $5p^2$ 5f (<2>3P)^{4}F + 4% 4f $5p^2$ (<0>1S)^{2}F
	326200	-	44% $5p^2$ 5f(<2>1D)^{2}G + 25% $5p^2$ 5f (<2>1D)^{2}F+ 20% $5p^2$ 5f (<2>3P)^{2}F + 7% $5p^2$ 5f (<2>3P)^{2}G
	343676	-	93% $5p^2$ 5f (<0>1S)^{2}F
J= 9/2			
	159069	-	100% 5s 5p 5d (3P)^{4}F
	284056	-	51% 4f $5p^2$ (<2>1D)^{2}G + 20% 4f 5s 5d (1F)^{2}G+ 11% 4f $5p^2$ (<2>3P)^{4}G + 6% 4f $5p^2$ (<2>1D)^{2}H
	285580	-	44% 4f $5p^2$ (<2>3P)^{4}G + 18% 4f $5p^2$ (<2>1D)^{2}H+ 13% 4f $5p^2$ (<2>3P)^{4}F +10% 4f 5s 5d (1F)^{2}H
	286710	-	31% 4f $5p^2$(<2>1D)^{2}H + 27% 4f $5p^2$ (<2>3P)^{4}G+ 19% 4f 5s 5d (1F)^{2}H + 13% 4f $5p^2$ (<2>3P)^{2}G
	292769	-	74% 4f $5p^2$(<2>3P)^{4}F + 14% 4f $5p^2$ (<2>3P)^{4}G+ 5% 4f 5s 5d (1F)^{2}G + 5% 4f 5p2 (<2>1D)^{2}G
	293882	-	81% 4f $5p^2$ (<2>3P)^{2}G + 6% 4f 5s 5d (1F)^{2}H
	298339	-	100% 4f 5s 5d (3F)^{4}H
	300590	-	99% 4f 5s 5d (3F)^{4}F
	301868	-	92% 4f 5s 5d (3F)^{2}G + 6% 4f $5p^2$ (<2>1D)^{2}G
	307560	-	100% 4f 5s 5d (3F)^{4}G
	311704	-	70% 4f 5s 5d (3F)^{2}H + 19% 4f $5p^2$ (<2>1D)^{2}H+ 10% 4f 5s 5d (1F)^{2}H
	312575	-	64% $5p^2$ 5f (<2>3P)^{4}G + 27% $5p^2$ 5f (<2>3P)^{4}F+ 8% $5p^2$ 5f (<2>3P)^{2}G
	315709	-	39% $5p^2$ 5f (<2>3P)^{4}F + 29% $5p^2$ 5f (<2>3P)^{4}G+ 15% $5p^2$ 5f(<2>3P)^{2}G + 12% $5p^2$ 5f (<2>1D)^{2}G
	317379	-	63% 5p2 5f (<2>3P)^{2}G + 23% $5p^2$ 5f (<2>3P)4F+ 8% $5p^2$ 5f (<2>1D)^{2}H
	322819	-	63% 4f 5s 5d (1F)^{2}G + 24% 4f $5p^2$ (<2>1D)2G+ 5% $5p^2$ 5f (<2>1D)^{2}G
	324847	-	77% 5p2 5f (<2>1D)^{2}G + 10% $5p^2$ 5f (<2>3P)^{4}F+ 4% 4f 5s 5d (1F)^{2}G
	325465	-	52% 4f 5s 5d (1F)^{2}H + 26% 4f 5s 5d (3F)^{2}H+ 21% 4f $5p^2$ (<2>1D)^{2}H
	326282	-	80% 5p2 5f (<2>1D)^{2}H + 11% 5p2 5f (<2>3P)^{2}G
J=11/2			
	285280	-	45% 4f $5p^2$ (<2>1D)^{2}H + 31% 4f $5p^2$ (<2>3P)^{4}G+ 23% 4f 5s 5d (1F)^{2}H
	290682	-	69% 4f $5p^2$ (<2>3P)^{4}G + 15% 4f $5p^2$ (<2>1D)^{2}H+ 15% 4f 5s 5d (1F)^{2}H
	298511	-	100% 4f 5s 5d (3F)^{4}H

	307706	-	100% 4f 5s 5d (3F)^{4}G
	312083	-	71% 4f 5s 5d (3F)^{2}H + 19% 4f 5p^2 (<2>1D)2H+ 10% 4f 5s 5d (1F)2H+89% 5p2 5f (<2>3P)^{4}G
	315347	-	10% 5p2 5f (<2>1D)^{2}H
	325343	-	52% 4f 5s 5d (1F)^{2}H + 26% 4f 5s 5d (3F)^{2}H+ 21% 4f 5p^2 (<2>1D)^{2}H
	325998	-	89% 5p^2 5f (<2>1D)^{2}H + 10% 5p^2 5f (<2>3P)^{4}G
J=13/2			
	298715	-	100% 4f 5s 5d (3F)^{4}H

Table 4: Observed and Least Square Fitted (LSF) Energy levels in cm-1 for Even Parity Configurations of SbIII

E(obs)	E(LSF)	Diff.	LS-composition.
J=1/2			
57961	57927	34	99% 5s 5p^2 (<2>3P)^{4}P
	95871	-	76% 5s 5p^2 (<0>1S)^{2}S + 13% 5s 5p^2 (<2>3P)^{2}P+ 10% 5s^2 6s ^{2}S
	98827	-	84% 5s^2 6s 2S + 12% 5s 5p^2 (<2>3P)^{2}P
	100492	-	73% 5s 5p^2 (<2>3P)^{2}P + 19% 5s 5p^2 (<0>1S)^{2}S+ 6% 5s^2 6s ^{2}S
143131	143131	0	100% 5s^2 7s ^{2}S
165307	165307	0	100% 5s^2 8s ^{2}S
177770.0*	**177775**	**-5**	**100% 5s2 9s ^{2}S**
238683.7*	**238826**	**-142.3**	**84% 5p^2 5d (<2>3P)^{4}D + 13% 5p^2 5d (<2>3P)^{2}P**
244470.5*	**244672**	**-201.5**	**75% 5p^2 5d (<2>3P)^{2}P + 14% 5p^2 5d (<2>3P)^{4}D+ 8% 5p^2 5d (<2>1D)^{2}P**
249031.7*	**248751**	**280.7**	**94% 5p^2 5d (<2>3P)^{4}P**
264054.7*	**263898**	**156.7**	**89% 5p^2 5d (<2>1D)^{2}S + 9% 5p^2 5d (<2>1D)^{2}P**
265643.4*	**265928**	**-284.6**	**78% 5p^2 5d (<2>1D)^{2}P + 10% 5p^2 5d (<2>3P)^{2}P+ 8% 5p^2 5d (<2>1D)^{2}S**
J=3/2			
60945	60977	-32	100% 5s 5p^2 (<2>3P)^{4}P
76528	76685	-157	73% 5s 5p2 (<2>1D)^{2}D + 25% 5s^2 5d ^{2}D
98824	98933	-109	69% 5s2 5d ^{2}D + 23% 5s 5p^2 (<2>1D)^{2}D+ 7% 5s 5p^2 (<2>3P)^{2}P
101954	101908	46	91% 5s 5p^2 (<2>3P)^{2}P
144685	144684	1	99% 5s^2 6d ^{2}D
166081	166081	0	100% 5s^2 7d ^{2}D
233164.8*	**233055**	**109.8**	**89% 5p^2 5d (<2>3P)^{4}F + 5% 5p^2 5d (<2>3P)^{4}D**
238216.0*	**238159**	**57**	**49% 5p^{2}5d (<2>3P)^{2}P+32% 5p^2 5d (<2>^{3}P)^{4}D+8% 5p^2 5d (<2>^{1}D)^{2}P+8% 5p^{2}5d (<2>^{3}P)^{4}F**
240998.0*	**240995**	**-3**	**56% 5p^2 5d (<2>3P)^{4}D + 32% 5p^2 5d (<2>3P)^{2}P+ 5% 5p^2 5d (<2>1D)^{2}P**
248166.0*	**248068**	**98**	**91% 5p^2 5d (<2>3P)^{4}P**
255363.0*	**255291**	**72**	**66% 5p^2 5d (<2>1D)^{2}D + 15% 5p^2 5d (<2>3P)^{2}D+ 10% 5p^2 5d (<0>1S)^{2}D**
258549.2*	**258543**	**6.2**	**55% 5p^2 5d (<2>3P)^{2}D + 28% 5p^2 5d (<2>1D)^{2}D+ 13% 5p^2 5d (<0>1S)^{2}D**
268366.0*	**268361**	**5**	**78% 5p^2 5d (<2>1D)^{2}P + 14% 5p^2 5d (<2>3P)^{2}P**
277299.8*	**277299**	**0.8**	**70% 5p^2 5d (<0>1S)^{2}D + 26% 5p^2 5d (<2>3P)^{2}D**
J=5/2			
64354.8	64323.1	31.7	99% 5s 5p^2 (<2>3P)^{4}P
77797	77647	150	73% 5s 5p^2 (<2>1D)^{2}D + 25% 5s^2 5d ^{2}D
100386	100319	67	73% 5s^2 5d ^{2}D + 25% 5s 5p^2 (<2>1D)^{2}D
144921	144921	0	99% 5s^2 6d ^{2}D
166197	166197	0	100% 5s^2 7d ^{2}D
	234530	-	87% 5p2 5d (<2>3P)^{4}F + 10% 5p^2 5d (<2>3P)^{4}D
	238524	-	35% 5p^2 5d (<2>1D)^{2}F + 32% 5p^2 5d (<2>3P)^{2}F+ 24% 5p^2 5d (<2>3P)^{4}D + 6% 5p^2 5d (<2>3P)^{4}F
	241345	-	54% 5p^2 5d (<2>3P)^{4}D +17% 5p^2 5d (<2>3P)^{2}F+15% 5p^2 5d (<2>1D)^{2}F +8% 5p^2 5d (<2>3P)^{4}P
	246595	-	82% 5p^2 5d (<2>3P)^{4}P + 9% 5p^2 5d (<2>3P)^{4}D+ 8% 5p^2 5d (<2>1D)^{2}D
	254727	-	68% 5p^2 5d (<2>1D)^{2}D + 19% 5p^2 5d (<2>3P)^{2}D+ 5% 5p^2 5d (<2>3P)^{4}P +5% 5p^2 5d (<0>1S)^{2}D
	261722	-	34% 5p^2 5d (<2>3P)^{2}D +27% 5p^2 5d (<2>3P)^{2}F+27% 5p^2 5d (<2>1D)^{2}F+10% 5p^2 5d(<2>1D)^{2}D
	265674	-	30% 5p^2 5d (<2>3P)^{2}D +21% 5p^2 5d (<2>1D)^{2}F+17% 5p^2 5d (<0>1S)^{2}D+17% 5p^2 5d (<2>3P)2F
	275478	-	73% 5p^2 5d (<0>1S)^{2}D + 16% 5p^2 5d (<2>3P)^{2}D+ 5% 5p^2 5d (<2>3P)^{2}F
J=7/2			
164302	164301	1	100% 5s^2 5g ^{2}G
176540	176540	0	100% 5s^2 6g ^{2}G
	183924	-	100% 5s^2 7g ^{2}G
	236689	-	90% 5p^2 5d (<2>3P)^{4}F + 9% 5p^2 5d (<2>3P)^{4}D
	240080	-	48% 5p^2 5d (<2>3P)^{4}D+28% 5p^2 5d (<2>1D)^{2}F+17% 5p^2 5d (<2>3P)^{2}F + 5% 5p^2 5d (<2>3P)^{4}F
	245513	-	42% 5p^2 5d (<2>3P)^{4}D+26% 5p^2 5d (<2>3P)^{2}F+24% 5p^2 5d (<2>1D)^{2}F +4% 5p^2 5d(<2>3P)^{4}F
	251712	-	91% 5p^2 5d (<2>1D)^{2}G + 8% 5p^2 5d (<2>1D)^{2}F
	264394	-	56% 5p^2 5d (<2>3P)^{2}F + 41% 5p^2 5d (<2>1D)^{2}F

J=9/2			
164302	164303	-1	100% $5s^2$ 5g ^{2}G
176540	176540	0	100% $5s^2$ 6g ^{2}G
* Shows new level			

4. Conclusions

One electron structure of Sb III has already been reported by Arcimowicz, Joshi and Kaufman [5] but its major and complicated three electron system $5p^3$, 5s5p5d and 5s5p6s configurations published by tazeen [12]. Isoelectronic plots of the unperturbed levels were quite helpful to spot out the transition within 1Å. This provided the shift from the *ab initio* calculations. Consequently my investigation here for odd parity system is $5s^27p$, $5s^28p$, $5s^29p$ and $5s^25f$, while for even parity system is $5p^25d$ and $5s^29s$. Eight levels for odd parity and thirteen levels of j=1/2 and 3/2 of $5p^25d$ in even parity are investigated. Here $5s^29s\ ^2S_{1/2}$ is newly established.

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