THE SPECTRUM OF SULPHUR, S II

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Abstract

One hundred and eighty-three lines are classified in the spectrum of S II. Thirty-three terms of the quartet system and thirty-six of the doublet system are determined and correlated with the electron configurations by means of the Hund theory. The *ionization potential* of the S II ion is fixed at 23.3 ± 0.1 volts.

EXPERIMENTAL WORK

THE sulphur spectrum above 2000A was obtained by passing a condensed THE sulphur spectrum above 20001, may obtain the Balmers eries predom-discharge through H₂S gas. At higher pressures the Balmers eries predominated but as the pressure was reduced towards the limiting value at which a discharge could sustain itself the hydrogen lines became relatively weak and the sulphur spectrum came out with great intensity. When the self induction of the discharge circuit was reduced to a minimum the lines of S II, III, IV and V appeared strongly on the plates. Insertion of sufficient self induction into the circuit to reduce the frequency of oscillation, and hence the instantaneous value of the current, to about one-tenth its former value completely suppressed all these except the S II lines. The visible and ordinary ultra-violet regions were photographed by means of a 7 meter concave grating in a Rowland mounting. In the ultra-violet these observations were supplemented by a plate taken on a Hilger quartz spectrograph E2. In the extreme ultra-violet the spectrum of a hot spark was photographed on a vacuum spectrograph with a grating of one meter radius. The exactness with which the data fit the series relationships gives a check on the accuracy of the measurements. The probable errors, estimated in this way are: for

Ele config	ctron guration	Prefix	Terms	Prefix	Terms	Prefix	Terms
	s ² p ³	a	4S 2D2D				
	<i>sp</i> ⁴	a b b	² D ² P ⁴ P ² P ²D²S				
S III ion	$s^2 p^2$		³ P		¹ D		15
SII	$s^2p^2 \cdot ms$	ms ms	*P *P	ms'	${}^{2}D$	ms''	2S
	$s^2 p^2 \cdot mp$	тр тр	4S 4 P 4 D 2S2 P 2 D	mp'	${}^{2}P{}^{2}D{}^{2}F$	$mp^{\prime\prime}$	²P
	$s^2p^2 \cdot md$	md md	$^{4}P^{4}D^{4}F$ $^{2}P^{2}D^{2}F$	md'	${}^{2}S^{2}P^{2}D^{2}F^{2}\mathbf{G}$	md''	²D
	$s^2p^2\cdot mf$	${}^{mf}_{mf}$	${}^{4}D{}^{4}F{}^{4}G{}^{2}D{}^{2}F{}^{2}G$	mf'	$^{2}P^{2}D^{2}F^{2}G^{2}H$	$mf^{\prime\prime}$	² <i>F</i>

TABLE I. Predicted terms of S II.

the measurements on the large grating about 0.02A, on the quartz spectrograph about 0.3A, and on the vacuum spectrograph about 0.03A. Some of the weaker lines have been taken from old data appearing in Kayser's Handbuch der Spectroscopie. The probable error in these measurements appears to be about 0.2A.

PREDICTED TERMS

The spectrum of sulphur II should be similar to that of oxygen II containing a doublet and quartet system. Table I gives a summary of the predictions of the Hund theory. The notation used is standard excepting for the introduction of primes on the letter referring to the orbit of the excited electron. Unprimed terms are based on the ${}^{3}P$ state of the S III ion, singly primed terms on the ${}^{1}D$ state and doubly primed terms on the ${}^{1}S$ state. Those terms which have been observed are in bold face in the table.

TERM VALUES

Two members of both the series of terms ms^4P and ms^2P , m=4, 5, have been detected, thus making possible the determination of the term values and of the ionization potential. In fixing the terms $4s^4P$, and $4s^2P$, an increase of effective quantum number of 1.02 between the terms 4P and 5P has been assumed. This assumption is arbitrary except insofar as it is justified by analogy with the terms of O II and of other light elements. The term values calculated on this assumption are about 700 cm⁻¹ less than those determined by an ordinary Rydberg formula. The combination of the $4s^4P$ term with the low 4S term in the extreme ultra-violet fixes the ground term of the S II ion at 188824.5 cm⁻¹ giving an ionization potential of 23.3 ± 0.1 volts. The complete list of term values is given in Table II. Since no intercombinations

a45. 188824 5		$s^2 p^3$		a2 D	172622 0	Terms based on SIII ³ P			Terms based on SIII 1D		
	100024.0	$a^{2}P_{1}$	163983.1	a^2D_2	173655.4	3d4F	78058 19	$3d^2P_0$	s ² p ² ·3d 70360_37		
b4P3 b4P2 b4P1	109429.7 109066.6 108856.5	b ² P ₂ b ² P ₁	<i>sp</i> ⁴ 82908.36 82463.28			$3d^{4}F_{4}$ $3d^{4}F_{3}$ $3d^{4}F_{2}$	78316.02 78511.37 78647.67	$\frac{3d^2D_3}{3d^2D_2}$	69212.27 69265.17		
]	erms based o	n S III 3	Р 1	erms bas	ed on S III 1D						
4s4Ps	78556.17	4s2P2	$s^2 p^2 \cdot 4s$ 75045.88 75570.00	4s'2D3	66977.31 6697 8 87			3d2F4 3d2F3	73221.76 73703.11		
4s4P1	79264.00	4 5 1 1	13370.00	13 101	00970.07	AdA P.	33005 80		$s^2p^2 \cdot 4d$	11/20-	24171 53
5s4Ps 5s4P2 5s4P1	37828.16 38293.29 38566.02	$\frac{5s^2P_2}{5s^2P_1}$	$5^{2}p^{2} \cdot 5s$ 36596.42 37123.21			$4d^4P_2$ $4d^4P_1$	32795.14 32676.09			4d'2G4	24169.63
4p4S1	57795.79		s ² p ² · 4p	$4p'^2P_1$ $4p'^2P_1$	44883.79 45018.43	$4d^4D_4$ $4d^4D_3$ $4d^4D_2$ $4d^4D_1$	35410.80 35541.51 35622.66 35670.67	4d2D3 4d2D1	29679.53 29841.18		
$4p^4P_{1}$ $4p^4P_{2}$ $4p^4P_{1}$	58690.48 58966.43 59036.81	$4p^2P_2 \\ 4p^2P_1$	55107.43 55238.70	4p'2Ds 4p'2Ds	47798.45 47757.24	4d4F5 4d4F4 4d4F8	36208.98 36519.60 36729.90	4d ² F ₄ 4d ² F ₃	31903.37 32385.52		
$4p^{4}D_{4}$ $4p^{4}D_{2}$ $4p^{4}D_{2}$	60225.45 60591.48 60848.28	4p2D3 4p2D2	57320.17 57866.26	4¢′²F₄ 4¢′²F₃	$ \begin{array}{r} 48188.00\\ 48277.33 \end{array} $	4d4F 2 Ter	36864.80	g with a ²	$D, a^2 P, \text{ of } s^2$	b ⁸ config	uration
4p4D1	60999.51					2P2	48491.26 48491.6	² <i>P</i> ₁	48661.7	² x	55147.9

TABLE II. Term values.

between the doublet and quartet systems have been detected the term values given in the two systems have not been determined accurately relative to each other.

DESCRIPTION OF TABLE III

Table III gives a complete list of all the lines which have been classified in S II. In the first column is given the intensity of each line on a scale running from 0 to 10. Since the photographs were taken on different spectrographs the intensities are not in all cases comparable. The intensities of lines measured on the large grating spectrograph are prefixed by the letter R, the intensities of those taken from Kayser's tables are prefixed by K, and of those measured on the quartz spectrograph by Q. In general lines marked K are weaker than 0 lines on the R scale and those marked Q are weaker than either the K or R lines. Lines below 2000A are measured on the vacuum spectrograph. The second column of the table gives the wave-lengths, the third the wave-numbers, and the fourth and fifth the series designation in the quartet and doublet systems respectively.

TABLE III. Classified lines of S II.

Int.	I. A. Air	ν	Quartets	Doublets
R1	5819.22	17179.68		$4sP_2-4pD_2$
R3	5664.73	17648.21	$3dF_2 - 4pD_1$	
R4	5659.95	17663.11	$3dF_3 - 4pD_2$	
R6	5646.98	17703.68	· · · · · ·	$4sP_1 - 4pD_2$
K2	5645.70	17707.68	$4sP_3 - 4pD_2$	
R5	5640.32	17724.58	$3dF_4 - 4pD_3$	
R8	5639.96	17725.71		$4sP_2 - 4\phi D_3$
R1	5616.63	17799.34	$3dF_2 - 4pD_2$	1 1 0
R6	5606.11	17832.74	$3dF_5 - 4pD_4$	
R1	5578.85	17919.88	$3dF_3 - 4pD_3$	
R4	5564.94	17964.67	$4sP_{3} - 4pD_{3}$	
K1	5558.91	17984.14	° 1 °	$4pP_2 - 5sP_1$
R1	5556.01	17993.54	$4sP_2 - 4pD_1$	1
K3	5536.76	18056.12	$3dF_2 - 4pD_3$	
R1	5526.22	18090.54	$3dF_4 - 4pD_4$	
K3	5518.76	18115.00	- 1 -	$4\phi P_1 - 5sP_1$
R5	5509.67	18144.88	$4sP_2 - 4pD_2$	
R5	5473.59	18264.49	$4sP_1 - 4pD_1$	
R10	5453.81	18330.72	$4sP_3 - 4\rho D_4$	
R9	5432.77	18401.71	$4sP_2 - 4\bar{\rho}D_3$	
R5	5428.64	18415.72	$4sP_1 - 4\rho D_2$	
K3	5400.83	18510.54	- ,	$4pP_2 - 5sP_2$
R5	5345.67	18701.54		$4s'D_2 - 4p'F_3$
R7	5320.70	18789.31		$4s'D_3 - 4p'F_4$
R4	5212.61	19178.92		$4s'D_3 - 4p'D_3$
K2	5201.35	19220.45		$4s'D_3 - 4p'D_2$
R2	5201.00	19221.73		$4s'D_2 - 4p'D_2$
K1	5125.78	19503.82	$4pS_2 - 5sP_2$?	
R2	5103.30	19589.72	$4sP_3 - 4pP_2$	
R0	5047.28	19807.14		$4sP_2 - 4pP_1$
R5	5032.41	19865.67	$4sP_{3}-4pP_{3}$	
R3	5014.03	19938.49		$4sP_2 - 4pP_2$
R4	5009.54	19956.36	$4sP_2-4pP_1$	
R1	5006.71	19967.64	$4pS_2 - 5sP_3$	
R3	4991.94	20026.72	$4sP_2 - 4pP_2$	
K0	4942.47	20227.17	$4sP_1 - 4pP_1$	
K5	4925.32	20297.60	$4sP_1 - 4pP_2$	
K4	4924.08	20302.71	$4sP_2 - 4pP_3$	
			and the second	

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TABLE III. (continued)

$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Int.	I. A. Air	ν	Quartets	Doublets
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	R2	4917.15	20331.33		$4sP_1 - 4pP_1$
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	R0	4901.30	20397.07	$4pP_{3}-5sP_{2}$	- 2 -
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	R0	4900.47	20400.53	$4\bar{p}P_2 - 5sP_1$	
$ \begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	R1	4885.62	20462.53		$4sP_1 - 4pP_2$
R3 4824.03 20/12.19 $4pP_1 - 5sP_2$ (Blend) $4pD_2 - 5sP$ R9 4815.52 20760.41 $4sP_a - 4pS_a$ $3dD_a - 4p'F_a$ R3 4791.97 20862.43 $4pP_a - 5sP_a$ $3dD_a - 4p'F_a$ R3 4791.97 20862.43 $4pP_a - 5sP_a$ $3dD_a - 4p'F_a$ R3 4755.07 21024.32 $3dD_a - 4p'F_a$ R4 4668.59 21138.21 $4pP_a - 5sP_a$ $3dD_a - 4p'B_a$ R5 4656.75 21468.21 $4sP_1 - 4pS_a$ $3dD_a - 4p'D_a$ R5 4552.37 21960.44 $4s'D_a - 4pL_a$ $4s'D_a - 4p'A_a$ R5 4552.37 21960.44 $4s^2D_a - 4pL_a$ R5 4552.37 21960.44 $4s^2D_a - 4pL_a$ R5 4552.37 21960.44 $4s^2D_a - 4pL_a$ R1 4508.93 22172.03 $4pP_1 - 4dF_a$? K1 4492.32 2228.16 $4pD_a - 5sP_a$ R7 4463.58 22397.28 $4pD_a - 5sP_a$ R4 4456.39 22327.67 $4pP_a - 4dD_a$ R4 4318.64 23606.77 </td <td>R0</td> <td>4835.81</td> <td>20673.30</td> <td>$4pP_2 - 5sP_2$</td> <td></td>	R0	4835.81	20673.30	$4pP_2 - 5sP_2$	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	K3	4824.03	20723.79		$4pD_3-5sP_2$
$ \begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	R2	4819.55	20743.05	$4pP_1 - 5sP_2$ (Blend)	$4pD_2 - 5sP_1$
$\begin{array}{rcrcrcrc} R3 & 4/91, 9/1 & 20802, 43 & 4pP_3 - 5sP_3 & 3dD_3 - 4p'F_3 \\ R3 & 4755, 07 & 21024, 32 & 3dD_3 - 4p'F_4 \\ R0 & 4729, 45 & 21138, 21 & 4pP_2 - 5sP_3 & 4pD_2 - 5sP_3 \\ R0 & 4700, 19 & 21269, 80 & 4sP_2 - 4pS_2 & 4pD_2 - 5sP_4 \\ R4 & 4668, 59 & 21413, 77 & 3dD_3 - 4p'D_3 \\ R5 & 4656, 75 & 21468, 21 & 4sP_1 - 4pS_2 & 3dD_2 - 4p'D_3 \\ R5 & 4656, 75 & 21468, 21 & 4sP_1 - 4pS_2 & 3dD_2 - 4p'D_3 \\ R5 & 4552, 37 & 21960, 44 & 4sP_1 - 4dF_3 & 4s'D_2 - 4p'D_3 \\ R6 & 4524, 66 & 22093, 46 & 4s'D_2 - 5sP_1 & 4s'D_2 - 4p'D_3 \\ R1 & 4508, 93 & 22172, 03 & 4pP_1 - 4dF_3 & 4s'D_2 - 4p'D_4 \\ R5 & 4485, 42 & 22282, 211 & 4pD_4 - 5sP_1 & 4s'D_2 - 4p'D_4 \\ R6 & 4483, 42 & 22282, 10 & 4pD_4 - 5sP_3 & 4pD_4 - 5sP_3 & 849D_4 - 4dP_4 & 4pP_3 - 4dD_4 & 8486, 60 & 2107, 62 & 4pP_3 - 4dD_4 & 8496, 60 & 4294, 39 & 23279, 67 & 4pP_3 - 4dD_4 & 8496, 60 & 4294, 76 & 4297, 76 & 23434, 81 & 429D_4 - 4dF_5 & 84148, 105 & 24018, 81 & 4202, 82 & 83661, 59 & 4pD_4 - 4dF_6 & 8466, 76 & 23424, 93 & 4pD_4 - 4dF_5 & 849D_4 - 4dF_5 & 8466, 77 & 24948, 85 & 4pD_4 - 4dF_5 & 84148, 95 & 4pD_4 - 4dF_5 & 84146, 90 & 24107, 62 & 8498, 95 & 4pD_4 - 4dD_4 & 8496, 80 & 8468, 92 & 4pD_4 - 4dD_4 & 8496, 80 & 8468, 92 & 4pD_4 - 4dD_4 & 8466, 80 & 8468, 92 & 4pD_4 - 4dD_5 & 84666, 80 & 8$	R9 D2	4815.52	20760.41	$4sP_3 - 4pS_2$	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	K3 D2	4791.97	20862.43	$4pP_{3} - 5sP_{3}$	
RS 4135.01 21024.32 $3dD_3 - 4p^2 P_4$ RO 4729.45 21138.21 $4pP_2 - 5sP_3$ $3dD_3 - 4p^2 P_4$ R7 4716.25 21197.37 $4sP_2 - 4pS_2$ $3dD_3 - 4p^2 D_3$ R0 4700.19 21269.80 $4sP_1 - 4pS_2$ $3dD_3 - 4p^2 D_3$ R3 4666.75 21468.21 $4sP_1 - 4dF_2$ $3dD_2 - 4p^2 D_2$ R3 4668.59 21900.44 $4sP_1 - 4dF_2$? $3dD_2 - 4p^2 D_2$ R4 4552.37 21960.44 $4s^2 D_2 - 4dP_3$ $4s^2 D_2 - 4p^2 D_2$ R1 4524.65 22093.46 $4pD_2 - 5sP_1$ $4s^2 D_2 - 4p^2 D_3$ R1 4492.32 2228.10 $4pD_2 - 5sP_1$ $4s^2 D_2 - 4p^2 D_3$ R3 4486.63 22298.16 $4pD_2 - 5sP_2$ $3dP_2 - 4p^2 D_3$ R4 4432.37 22551.95 $3dP_2 - 5sP_3$ $3dP_2 - 4p^2 D_3$ R4 4433.84 23067.76 $4pP_3 - 4dD_3$ $4pP_3 - 4dD_3$ R6 4294.39 23279.67 $4pP_3 - 4dD_3$ $4p^2 D_3 - 4dP_3$ R4 4318.64 23148.95 $4pD_2 - 4dP_3$ $4p$	K2 D2	4703.34	20987.82		$3aD_2 - 4p F_3$
$ \begin{array}{rcrcrcrc} R0 & 4/29, 43 & 21138, 21 & 4pP_2 - 33F_3 \\ R7 & 4716, 25 & 21197, 37 & 4sP_2 - 4pS_2 \\ R0 & 4700, 19 & 21269, 80 & 4sP_2 - 4pS_2 \\ R4 & 4668, 59 & 21413, 77 & 3dD_2 - 4p'D_3 \\ R5 & 4556, 75 & 21468, 21 & 4sP_1 - 4pS_2 \\ R5 & 4552, 37 & 21960, 44 & 4sP_1 - 4pS_2 \\ R5 & 4552, 37 & 21960, 44 & 4s'D_2 - 4p'D_3 \\ R6 & 4524, 65 & 22009, 46 & 4pP_1 - 4dF_2 ? \\ R1 & 4508, 93 & 22172, 03 & 4pP_1 - 4dF_2 ? \\ R1 & 4492, 32 & 22284, 01 & 4pS_2 - 4dD_3 \\ R3 & 4486, 63 & 22282, 21 & 4pD_4 - 5sP_3 \\ R4 & 4456, 39 & 22433, 41 & 4pD_1 - 5sP_3 \\ R7 & 4463, 58 & 22397, 28 & 4pD_4 - 5sP_3 \\ R4 & 4456, 39 & 22433, 41 & 4pD_4 - 5sP_3 \\ R4 & 4456, 39 & 22433, 41 & 4pD_4 - 5sP_3 \\ R4 & 4431, 00 & 22561, 95 \\ R2 & 4402, 64 & 22707, 28 & 4pD_4 - 5sP_3 \\ R4 & 4318, 64 & 23148, 95 & 4pP_3 - 4dD_3 \\ R4 & 4318, 64 & 23148, 95 & 4pP_3 - 4dD_4 \\ R1 & 4294, 39 & 23279, 67 & 4pP_3 - 4dD_4 \\ R1 & 4294, 39 & 23279, 67 & 4pP_3 - 4dD_4 \\ R4 & 4286, 00 & 23343, 75 & 4pP_4 - 4dD_4 \\ R4 & 4286, 00 & 23343, 75 & 4pP_4 - 4dD_4 \\ R4 & 4286, 00 & 23343, 75 & 4pP_4 - 4dD_4 \\ R4 & 4280, 00 & 23343, 75 & 4pP_4 - 4dD_4 \\ R4 & 4280, 00 & 23343, 75 & 4pP_4 - 4dD_4 \\ R4 & 4280, 00 & 23343, 75 & 4pD_4 - 4dF_4 \\ R4 & 4217, 19 & 23705, 82 & 4pD_4 - 4dF_5 \\ R5 & 4106, 37 & 23983, 46 & 4pD_4 - 4dF_5 \\ R5 & 4106, 37 & 23983, 46 & 4pD_4 - 4dF_5 \\ R5 & 4106, 37 & 23983, 46 & 4pD_4 - 4dF_5 \\ R5 & 4106, 30 & 24071, 92 & 4pD_4 - 4dF_5 \\ R6 & 4032, 77 & 24789, 87 & 4pD_4 - 4dF_5 \\ R7 & 4028, 74 & 24118, 38 & 4pD_4 - 4dF_5 \\ R7 & 4028, 74 & 24118, 38 & 4pD_4 - 4dF_5 \\ R7 & 4028, 74 & 24118, 467 & 4pD_4 - 4dF_5 \\ R7 & 4028, 74 & 24184, 67 & 4pD_4 - 4dF_5 \\ R7 & 4028, 74 & 24814, 67 & 4pD_4 - 4dF_5 \\ R7 & 4028, 74 & 24814, 67 & 4pD_4 - 4dF_5 \\ R7 & 4028, 74 & 24814, 67 & 4pD_4 - 4dF_5 \\ R7 & 4028, 74 & 24814, 67 & 4pD_4 - 4dF_5 \\ R7 & 4028, 74 & 24814, 67 & 4pD_4 - 4dF_5 \\ R7 & 4028, 74 & 24814, 67 & 4pD_4 - 4dF_5 \\ R7 & 4028, 74 &$	KS DO	4755.07	21024.32		$3aD_3-4p^2F_4$
$ \begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	KU D 7	4729.45	21138.21	$4pP_2 - 5sP_3$	
R04700.1921205.80 $3dD_3 - 4p'D_2 - 3r$ R54658.5721418.21 $4sP_1 - 4pS_2$ R34668.5921413.77 $3dD_3 - 4p'D_2$ R54552.3721960.44 $3dD_2 - 4p'D_2$ R64524.6522093.46 $4s'D_2 - 4p'_1$ R14492.3222254.01 $4pS_2 - 4dD_3$ R34486.6322282.21 $4pD_2 - 5sP_1$ R64433.4222298.16 $4pD_1 - 5sP_1$ R74463.5822397.28 $4pD_1 - 5sP_1$ R34435.3922433.41 $4pD_1 - 5sP_3$ R44456.3922433.41 $4pD_1 - 5sP_3$ R34432.3722554.98 $4pD_2 - 5sP_3$ R44436.6423148.95 $4pD_3 - 4dD_3$ R44318.6423148.95 $4pP_3 - 4dD_3$ R44318.6423148.95 $4pP_3 - 4dD_3$ R64294.3923270.72 $4pP_3 - 4dD_3$ R44282.6023343.75 $4pP_2 - 4dD_3$ R44282.6023343.75 $4pP_2 - 4dD_3$ R44283.6423148.95 $4pD_4 - 4dF_4$ R44280.9423628.78 $4pD_4 - 4dF_4$ R44280.922366.159 $4pD_4 - 4dF_3$ R54168.372398.46 $4pD_4 - 4dF_4$ R44189.682486.19 $4pT_4 - 4dT_6$ R44189.682491.43 $3dP_2 - 4dF_3$ R54166.902407.62 $4pD_3 - 4dF_3$ R64207.7724944.50 $4pD_4 - 4dF_4$ R64207.77 <td>R/ PA</td> <td>4710.23</td> <td>21197.37</td> <td>$4sP_2 - 4pS_2$</td> <td></td>	R/ PA	4710.23	21197.37	$4sP_2 - 4pS_2$	
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$		4700.19	21209.80		$4pD_2 - 5SP_2$
R34603.17321406.21 $43F_1 - 4p3_2$ R34648.1421507.98 $3dD_2 - 4p'D_2$ R54552.3721960.44 $4s'D_2 - 4p'_2$ R64524.9622093.46 $4s'D_2 - 4p'_2$ R24524.6522094.98 $4s'D_2 - 5P_1$ R14492.3222254.01 $4pD_2 - 5sP_1$ R64483.4222298.16 $4pD_2 - 5sP_2$ R74463.5822397.28 $4pD_2 - 5sP_2$ R34432.3722554.98 $4pD_2 - 5sP_2$ R34432.3722554.98 $4pD_2 - 5sP_2$ R34333.8423067.76 $4pP_3 - 4dD_2$ R44318.6423148.95 $4pP_3 - 4dD_2$ R44282.6023343.75 $4pP_3 - 4dD_2$ R44283.094232279.67 $4pP_3 - 4dD_4$ R44283.6023343.75 $4pP_2 - 4dP_4$ R44283.09423628.78 $4pP_1 - 4dP_2$ R44283.09423628.78 $4pD_4 - 4dF_4$ R44189.6823861.59 $4pD_3 - 4dF_3$ R54168.3723983.46 $4pD_2 - 4dF_3$ R54168.3723983.46 $4pD_2 - 4dF_3$ R64122.2424118.38 $4pD_4 - 4dF_4$ R642267.7623424.93 $4pD_4 - 4dF_3$ R54168.3723983.46 $4pD_2 - 4dF_3$ R44189.6823861.59 $4pD_3 - 4dF_4$ R54168.3723983.46 $4pD_2 - 4dF_3$ R64294.39 $4pT_4 - 4dT_6$ R64205.24118.38 4	R4 D5	4008.39	21413.77	AD ADS	$3aD_{3}-4pD_{3}$
No $3dD_2 - 4pD_2 - 4p'_1$ R5 4552.37 21960.44 $4s'D_2 - 4p'_1$ R6 4524.96 22093.46 $4s'D_2 - 4p'_1$ R1 4508.93 22172.03 $4pP_1 - 4dF_2$?R3 4486.63 222282.11 $4pD_2 - 5sP_1$ R6 4432.32 22298.16 $4pD_3 - 5sP_2$ R7 4463.58 22397.28 $4pD_4 - 5sP_1$ R6 4432.37 22554.98 $4pD_4 - 5sP_1$ R3 $4436.63.2282.21$ $4pD_4 - 5sP_1$ R3 4432.37 22554.98 $4pD_4 - 5sP_2$ R3 4432.37 22554.98 $4pD_4 - 5sP_2$ R3 4391.81 22763.28 $4pD_3 - 5sP_2$ R4 4433.84 23067.76 $4pP_3 - 4dD_2$ R4 4338.46 23148.95 $4pD_3 - 5sP_2$ R3 4391.81 22763.28 $4pD_3 - 5sP_2$ R4 4236.60 23343.75 $4pP_3 - 4dD_2$ R4 4238.60 23343.75 $4pP_3 - 4dD_2$ R4 4282.60 23343.75 $4pP_3 - 4dD_2$ R4 4282.60 23343.75 $4pD_4 - 4dF_4$ R4 42278.51 2366.07 $4pP_3 - 4dD_2$ R4 4230.94 23628.78 $4pD_4 - 4dF_4$ R4 4267.76 23424.93 $4pD_4 - 4dF_4$ R4 4267.76 23424.93 $4pD_4 - 4dF_4$ R4 4269.29 24016.47 $4pD_4 - 4dF_4$ R4 4250.29 24016.47 $4pD_4 - 4dF_4$ R4 4250.29 24016.47 <	RJ D2	4630.73	21400.21	$43r_1 - 4pS_2$	210 1610
No4524.9622093.464s'D_3-4p'.R24524.6522094.984s'D_3-4p'.K14508.9322172.03 $4pP_1-4dF_2$?K14508.9322172.03 $4pP_2-5sP_1$ R34486.6322282.21 $4pD_2-5sP_2$ R64483.4222298.16 $4pD_3-5sP_2$ R74463.5822397.28 $4pD_4-5sP_3$ R44450.3922433.41 $4pD_1-5sP_1$ R34432.3722554.98 $4pD_1-5sP_2$ R24431.0022561.95 $3dP_2-4p'D_3$ K24402.6422707.28 $4pD_1-5sP_3$ R34391.8127663.28 $4pD_3-4dD_3$ R64294.3923270.67 $4pP_3-4dD_4$ R14291.4323295.72 $4pP_3-4dD_4$ R44282.602343.75 $4pP_2-4dD_2$ R44285.102366.07 $4pP_3-4dP_4$ R44287.512366.07 $4pP_3-4dP_4$ R44287.5223443.75 $4pP_2-4dP_3$ R44280.9423628.78 $4pP_2-4dP_3$ R44280.9224061.47 $4pD_4-4dF_4$ R44287.0524071.92 $4pD_3-4dF_3$ R54168.3723983.46 $4pD_2-4dF_3$ R54168.3723983.46 $4pD_2-4dF_3$ R54168.9524071.92 $4pD_3-4dF_4$ R6432.772478.87 $4pD_4-4dP_3$ R6432.772478.87 $4pD_4-4dP_3$ R6432.772478.87 $4pD_4-4dF_4$ R6432.	R5	4552 37	21307.98		$JuD_2 - 4pD_2$
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R6	4524 06	21900.44		$43 D_2 - 4p \Gamma_1$ $4a' D_2 - 4b' P$
XiXiXiXiYiYiK14508.9322172.03 $4pP_1 - 4dF_2$? $4sD_2 - 4dD_3$ R34486.6322282.21 $4pD_2 - 5sP_1$ $4pS_2 - 4dD_3$ R64483.4222298.16 $4pD_3 - 5sP_2$ $3dP_2 - 4p'D_3$ R74463.5822397.28 $4pD_4 - 5sP_3$ $3dP_2 - 4p'D_3$ R34432.3722554.98 $4pD_2 - 5sP_2$ $3dP_2 - 4p'D_3$ R24431.0022561.95 $3dP_2 - 4dD_3$ R34331.8122703.28 $4pD_3 - 5sP_2$ $3dP_2 - 4p'D_3$ R44333.8423067.76 $4pP_3 - 4dD_3$ R44318.6423148.95 $4pP_3 - 4dD_3$ R44318.6423148.95 $4pP_2 - 4dD_1$ R44282.6023343.75 $4pP_2 - 4dD_1$ R44282.6023343.75 $4pP_2 - 4dD_2$ R44280.9423626.72 $4pP_1 - 4dD_1$ R54269.7223414.17 $4pP_1 - 4dD_2$ R64267.7623424.93 $4pP_2 - 4dP_3$ R44230.9423628.78 $4pD_2 - 4dF_3$ R44189.6823861.59 $4pD_3 - 4dF_3$ R54168.372398.46 $4pD_2 - 4dF_3$ R54168.372398.46 $4pD_2 - 4dF_3$ R64032.7724789.87 $4pD_3 - 4dF_3$ R74028.7424107.62 $4pD_4 - 4dP_4$ R64032.7724789.87 $4pD_2 - 4dF_3$ R64032.7724789.87 $4pD_2 - 4dF_3$ R74028.7424814.67<	R2	4524 65	22093.40		$\begin{array}{c} +3 D_3 - 4p \Gamma_2 \\ 4 \circ' D_2 - 4 \wedge' D \end{array}$
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	K1	4508 93	22172 03	$4bP_1 - 4dF_2$?	43 D ₂ -4p 1 2
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	K 1	4492 32	22254 01	$\frac{1}{4hS_{a}}$	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R3	4486.63	22282 21	$4bD_{0} - 5sP_{1}$	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R6	4483 42	22298 16	$4bD_{2} - 5sP_{2}$	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R7	4463.58	22397 28	$4bD_{4}-5sP_{2}$	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R4	4456.39	22433 41	$4D_{1} - 5SP_{1}$	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R3	4432.37	22554.98	$4pD_{2}-5sP_{2}$	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R2	4431.00	22561.95	17.2 2 001 2	$3dP_{2}-4p'D_{3}$
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	K2	4402.64	22707.28	$4\rho D_1 - 5sP_2$	501 2 1p 25 5
R14333.8423067.76 $4pP_3 - 4dD_2$ R44318.6423148.95 $4pP_3 - 4dD_3$ R64294.3923279.67 $4pP_3 - 4dD_4$ R14291.4323295.72 $4pP_2 - 4dD_1$ R44282.6023343.75 $4pP_2 - 4dD_2$ R44282.6023343.75 $4pP_1 - 4dD_1$ R54269.7223414.17 $4pP_1 - 4dD_2$ R64267.7623424.93 $4pP_2 - 4dP_3$ R44217.1923705.82 $4pD_4 - 4dF_4$ R44189.6823861.59 $4pD_3 - 4dF_3$ R54168.3723983.46 $4pD_2 - 4dF_2$ R104162.6424016.47 $4pD_4 - 4dF_6$ R104153.0524071.92 $4pD_3 - 4dF_3$ R54146.9024107.62R84145.0524118.38 $4pD_2 - 4dF_3$ R74028.7724789.87 $4pD_4 - 4dP_3$ R64032.7724789.87 $4pD_4 - 4dP_3$ R64032.7724944.50 $3dF_4 - 4p'I_3$ R63993.4925033.70 $3dF_4 - 4p'I_3$ R53998.7425000.84 $4pS_2 - 4dP_2$ R63993.4925033.70 $3dF_4 - 4p'I_3$ R43979.8125119.75 $4pS_2 - 4dP_1$	R3	4391.81	22763.28	$4pD_{3} - 5sP_{3}$	
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	R1	4333.84	23067.76	$4p\dot{P}_{3}-4dD_{2}$	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R4	4318.64	23148.95	$4pP_{3} - 4dD_{3}$	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R6	4294.39	23279.67	$4pP_{3} - 4dD_{4}$	
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	R1	4291.43	23295.72	$4\dot{\rho}P_{2} - 4dD_{1}$	
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	R4	4282.60	23343.75	$4pP_{2} - 4dD_{2}$	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R4	4278.51	23366.07	$4\bar{\rho}P_1 - 4dD_1$	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R5	4269.72	23414.17	$4\bar{\rho}P_1 - 4dD_2$	
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	R6	4267.76	23424.93	$4pP_2 - 4dD_3$	
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	R4	4230.94	23628.78	-	$4p'D_3 - 4d'G_4$
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	R4	4217.19	23705.82	$4pD_4 - 4dF_4$	-
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	R4	4189.68	23861.59	$4pD_{3}-4dF_{3}$	
R104162.6424016.47 $4pD_4 - 4dF_5$ (Blend) $4p'F_4 - 4d'C_5$ R24162.2924018.49 $4pD_3 - 4dF_4$ $4p'F_4 - 4d'C_5$ R104153.0524071.92 $4pD_3 - 4dF_4$ $4p'F_3 - 4d'C_5$ R54146.9024107.62 $4pD_2 - 4dF_4$ $4p'F_3 - 4d'C_5$ R84142.2424134.74 $4pD_1 - 4dF_2$ $4pD_4 - 4dD_3$ R64032.7724789.87 $4pD_4 - 4dD_4$ R14009.3524934.67 $4pD_3 - 4dF_3$ R14007.7724944.50 $3dF_4 - 4p'T_4$ R53998.7425003.70 $4pD_3 - 4dD_2$ R53993.4925033.70 $3dF_4 - 4p'T_4$ R43979.8125119.75 $4pS_2 - 4dP_1$	R5	4168.37	23983.46	$4pD_2 - 4dF_2$	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R10	4162.64	24016.47	$4pD_4 - 4dF_5$ (Blend)	$4p'F_4 - 4d'G_5$
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R2	4162.29	24018.49		$4p'F_4 - 4d'G_4$
R54146.9024107.62 $4p'F_3-4d'c$ R84145.0524118.38 $4pD_2-4dF_3$ R84142.2424134.74 $4pD_1-4dF_2$ R24050.0824683.92 $4pD_4-4dD_3$ R64032.7724789.87 $4pS_2-4dP_3$ R74028.7424814.67 $4pD_4-4dD_4$ R14009.3524934.67 $4pD_3-4dP_2$ R24003.8724968.80 $4pD_3-4dD_2$ R53998.7425000.84 $4pS_2-4dP_2$ R63993.4925033.70 $3dF_4-4p'D_4$ R43979.8125119.75 $4pS_2-4dP_1$	R10	4153.05	24071.92	$4pD_3 - 4dF_4$	
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	R5	4146.90	24107.62		$4p'F_3 - 4d'G_4$
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	K8	4145.05	24118.38	$4pD_2 - 4dF_3$	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	K8	4142.24	24134.74	$4pD_1 - 4dF_2$	
K0 4052.77 24789.87 $4pS_2-4dP_3$ R7 4028.74 24814.67 $4pD_4-4dD_4$ R1 4009.35 24934.67 $4pD_3-4dF_3$ R1 4007.77 24944.50 $3dF_4-4p'A$ R2 4003.87 24968.80 $4pD_3-4dD_2$ R5 3998.74 25000.84 $4pS_2-4dP_2$ R6 3993.49 25033.70 $3dF_4-4p'A$ R5 3990.90 25049.95 $4pD_3-4dD_3$ R4 3979.81 25119.75 $4pS_2-4dP_1$	KZ DC	4050.08	24683.92	$4pD_4 - 4dD_3$	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	K0	4032.77	24789.87	$4pS_2-4dP_3$	
R1 4009.35 24934.67 $4pD_3-4dF_3$ R1 4007.77 24944.50 $3dF_4-4p'_1$ R2 4003.87 24968.80 $4pD_3-4dD_2$ R5 3998.74 25000.84 $4pS_2-4dP_2$ R6 3999.49 25033.70 $3dF_4-4p'_1$ R5 3990.90 25049.95 $4pD_3-4dD_3$ R4 3979.81 25119.75 $4pS_2-4dP_1$	K7 D4	4028.74	24814.67	$4pD_4 - 4dD_4$	4:0.470
R1 4007.77 24944.50 $3dF_4-4pT_1$ R2 4003.87 24968.80 $4pD_3-4dD_2$ R5 3998.74 25000.84 $4pS_2-4dP_2$ R6 3993.49 25033.70 $3dF_4-4pT_1$ R5 3990.90 25049.95 $4pD_3-4dD_3$ R4 3979.81 25119.75 $4pS_2-4dP_1$	K1 D1	4009.33	24934.07		$4pD_3 - 4dF_3$
RZ $4yD_3 - 4dD_2$ R5 3998.74 25000.84 $4pS_2 - 4dP_2$ R6 3993.49 25033.70 $3dF_4 - 4p'A$ R5 3990.90 25049.95 $4pD_3 - 4dD_3$ R4 3979.81 25119.75 $4pS_2 - 4dP_1$	К1 D)	400/.//	24944.50	1 + 17 4 3 7	$3dF_4 - 4p'F_3$
R5 3993.49 25033.70 $4pS_2 - 4dP_2$ R6 3993.49 25033.70 $3dF_4 - 4p'A_3$ R5 3990.90 25049.95 $4pD_3 - 4dD_3$ R4 3979.81 25119.75 $4pS_2 - 4dP_1$	K2 D5	4003.81	24908.80	$4pD_3-4aD_2$	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	К3 Р6	3998.74	25000.84	$4pS_2 - 4dP_2$	215 4115
R4 3979.81 25119.75 $4pS_2 - 4dP_1$	R5	3000 00	25035.70	160 430	$3ar_4 - 4pr_4$
112 0 - 401 - 40	R4	3070 81	23049.93	$4pD_3-4aD_3$	
$K_3 = 3970.67 = 25177.58 = 4 \pm D = 4 \pm D$	K3	3070 67	25119.75	$4p_{02} - 4ar_1$	
$K_2 = 3063 \ 00 = 25225 \ 72 = 40D_1 = 40D_1$	K2	3063 00	23111.30	$4pD_2 - 4aD_1$	
R0 3050 30 25306 82 $4pD_2 - 4dD_2$	RŐ	3050 30	25225.12	$4bD_2 - 4dD_2$	
R2 3946 94 25328 94 $4hD_1 = AdD_2$	R2	3946 94	25328 04	$4hD_2 - 4dD_3$	
K1 3944.91 25342.00 $\mu \mu \nu_1 - 4\mu \nu_1$ $3dP_e - 4h'P.$	Ř ĩ	3944 91	25342 00	$\pm pD_1 - \pm aD_1$	$3dP_{0}-4p'P_{1}$
K1 3939.75 25375.20 $4bD_1 - 4dD_2$	R Î	3939.75	25375 20	$4bD_1 - 4dD_2$	JUL 2 TP 1 1

S. B. INGRAM

TABLE III. (continued) Int. I.A.Air ν Quartets Doublets $\begin{array}{c} 4pD_3 - 4dF_4\\ 3dF_4 - 4p'D_3\\ 3dF_3 - 4p'F_3\\ 4pP_2 - 4dD_3\\ 3dP_2 - 4p'P_2\\ 4dP_2 - 4dP_3\end{array}$ 3933.25 R7 25416.80 3932.29 25423.30 R3 R5 3931.90 25425.82 3931.50 25428.41 R1 R0 3924.07 25476.56 R6 3923.43 25480.71 $4pD_2 - 4dF_3$ K1 3918.16 25514.99 $3dF_3 - 4p'F_4$ 3906.95 3892.28 R1 25588.19 $bP_2 - 4pD_3$ R5 25684.63 $4pP_{3} - 4dP_{3}$ R4 3860.64 25895.13 $4pP_{3} - 4dP_{2}$ $3dF_3 - 4p'D_3 \\ 3dF_3 - 4p'D_2$ R0 3859.21 25904.72 R2 3853.08 25945.93 $\substack{ 4pP_2 - 4dP_3 \\ 4pP_1 - 4dP_2 \\ 4pP_2 - 4dP_1 }$ R3 3850.91 25960.55 R1 3809.65 26241.70**R**1 3802.61 26290.29 01 R1 3734.8 26767.9 $4sP_2 - 4p'F_3$ 3672.11 27224.58 $bP_1 - 4pP_1$ $4sP_2 - 4p'D_3$ 3669.03 R4 27247.43 $4sP_2 - 4p'D_2$ $bP_1 - 4pP_2$ K1 3663.36 27289.58 K1 R1 27355.633654.52 $bT_1 - 4pT_2$ $4pD_3 - 4dD_2$ $4pD_3 - 4dD_3$ $bP_2 - 4pP_1$ $bP_2 - 4pP_2$ 3638.17 27478.54 27640.13 27669.4 3616.90 R4 3613.1 27809.4 27800.93 27812.76 28025.53 30027.6 30162.09 3595.98 3594.45 3567.16 $4sP_1 - 4p'D_2 \\ 4pD_2 - 4dD_2$ $4sP_2 - 4p'P_1$ $4sP_2 - 4p'P_2$ $4sP_1 - 4p'P_1$ 3329.3 3314.47 30550.8 3272.3 $\begin{array}{c} 4sP_{1}-4p'P_{1} \\ 4sP_{1}-4p'P_{2} \\ 4pD_{3}-4d'G_{4} \\ bP_{2}-4p'F_{3} \\ bP_{1}-4p'P_{1} \\ bP_{1}-4p'P_{2} \\ bP_{2}-4p'P_{1} \\ bP_{2}-4p'P_{1} \\ bP_{2}-4p'P_{2} \end{array}$ 3257.9 30685.5 3015.7 33150.3 2886.9 34628.9 37442.4 2670.0 2660.3 37578.8 2638.1 37894.5 2629.1 38024.7 I.A. Vac 5 1259.53 79394.8 $aS_2 - bP_3$ 5 3 1253.79 79757.9 $aS_2 - bP_2$ 1250.50 79968.0 $aS_2 - bP_1$ 3 0 81028.0 $\substack{aP_2-bP_2\\aP_1-bP_2\\aP_2-bP_1}$ 1234.141233.36 81079.3 1 1227.45 81469.9 1226.70 81519.5 $aP_1 - bP_1$ 1221132 aP_2-4sP_1 aP_1-4sP_1 aP_2-4sP_2 1131.65 88366.5 1131.05 88413.1 1125.00 88888.6 88937.3 1124.39 1102.32 1096.57 $aP_1 - 4sP_2$ aD_3-bP_2 aD_2-bP_1 90717 7 91193.2 $aP_2 - 4s'D_{3,2}$ 1031.34 96961.3 1 2 2 0 1030.87 97004.9 $aP_1 - 4s'D_2$ 1019.53 98084.7 aD_2-4sP_1 1014.42 98578.0 $aD_3 - 4sP_2$ 1014.09 98610.2 $aD_2 - 4sP_2$ 1000.48 99952.3 $aD_2 - 3dF_3$ $aD_3 - 3dF_4$ 2 2 996.00 100401.9 0 968.37 103265.9 aD_3-3dP_2 $\int a\bar{D}_3 - 3dD_3$ 1 957.88 104397.5 aD_2-3dD_2 937.69 3 106644.8 $aD_3 - 4s'D_{3,2}$ 937.41 919.24 $aD_2 - 4s'D_{3,2}$ 3 106676.6 108785.8 1 aP_2-x

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Int.	I. A. Air	ν	Quartets	Doublets
3	918.82	108835.0		aP_1-x
3	912.74	109560.7	aS_2-4sP_1	
3	910.49	109830.3	$aS_2 - 4sP_2$	
3	906.87	110269.0	aS_2-4sP_3	
1	867.50	115273.7		$aP_{2}-P_{1}$
1	867.15	115320.5		$aP_1 - P_1$
1	866.23	115443.3		$aP_2 - P_2$
0	865.87	115491.1		$aP_{1} - P_{2}$
2	843.82	118508.5		aD_2-x
0	800.04	124993.9		$aD_2 - P_1$
0	799.14	125134.6		$aD_3 - P_2$
0	798.92	125168.8		$aD_2 - P_2$
0	707.86	141271.0		aD_2-4dF_3
0	705.62	141720.1		$aD_3 - 4dF_4$
0	694.71	143944.9		aD_3-4dD_3
1	641.81	155810.0	aS_2-4dP_3	
0	640.93	156023.7	$aS_2 - 4dP_2$	
Ō	640.41	156149.9	$aS_2 - 4dP_1$	

TABLE III. (continued)

No intercombinations between the doublet and quartet systems have been identified. The reason is doubtless that the data available in the present work did not include accurate measurements on the weaker lines among which such intercombinations are to be expected. Table IV gives a list of

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Int.	I. A. Air	ν	Int.	I. A. Air	ν
1	5142.33	19441.04	2	4185.90	23883.02
2	5027.19	19886.30	5	4174.25	23949.67
0	5011.61	19948.12	4	4173.97	23951.28
2	4779.09	20918.65	2	3860.11	25898.68
3	4561.87	21914.71	4	3831.37	26092.95
4	4549.56	21974.01	3	3783.13	26425.66
6	4464.44	22392.96	1	3678.11	27180.17
2	4431.00	22561.95	2	3385.79	29526.76
2	4259.15	23472.28	1	3371.87	29648.65
3	4257.39	23481.98	1	3368.07	29682.10
1	4193.50	23839.73	0	3356.40	29785.30

TABLE IV. Unclassified lines of S II.

the only unclassified lines which can be definitely ascribed to S II. The group of lines in the region of 4200A probably involves the high ${}^{2}(S P D F G)$ terms of the $s^2p^2 \cdot 4d$ configuration but it has not been possible to resolve them into multiplets. One line requires special mention, 4162.64, one of the strongest lines in the spectrum. It is without question the leading line of the multiplet $4p^4D-4d^4F$ and probably masks the line $4p'^2F_4-4d'^2G_5$ which should also be a strong line very close to this position. This line has been used to fix both the $4d^4F_5$ and $4d'^2G_5$ levels. The assumption of this value of the ${}^{2}G_{5}$ level gives an inverted G term of separation 1.90 cm⁻¹, a very reasonable value since in O II this term is inverted and has a separation of 1.2 cm^{-1} .

No terms from the configuration $s^2p^2 \cdot 4f$ have been detected. Both the quartet and doublet terms based on the 3P state of S III should be hydrogenlike and hence have term values in the neighborhood of 27000. The doublet terms based on the ${}^{1}D$ term of S III should lie at about 15000. The combination of these terms with the terms of the $s^{2}p^{2} \cdot 4d$ configuration will give faint lines in the red or infra-red whereas the combinations with the observed terms of the $s^{2}p^{2} \cdot 3d$ configuration will give faint lines in the ultra-violet near 2000A where they might easily be missed.

Strong doublet lines in the extreme ultra-violet should arise from combinations between the low ${}^{2}D$ and ${}^{2}P$ terms and the doublet terms of the $s^{2}p^{2} \cdot 4s$ and $s^{2}p^{2} \cdot 3d$ configurations. These lines have been identified. The low terms should also combine strongly with the ${}^{2}P$, ${}^{2}D$ and ${}^{2}S$ terms of the sp^{4} configuration. An inverted ${}^{2}P$ term of separation 445 cm⁻¹ at 82000 cm⁻¹ which combines with the $s^{2}p^{2} \cdot 4p$ doublet terms is doubtless the ${}^{2}P$ term of this group. Another ${}^{2}P$ term near 48000 and an unclassified term, x, at 55147.9 give strong lines in the extreme ultra-violet in combination with the low doublet terms.

One component P_2 , of the $s^2p^2 \cdot 3d \, {}^2P$ term could be definitely fixed by combinations with the $s^2p^2 \cdot 4p$ terms and with a^2P_2 . The lines given by the P_1 member are doubtless too weak to be detected.

I am indebted to Dr. I. S. Bowen for the identification of two important multiplets in the extreme ultra-violet, $a^4S_2-b^4P_{321}$ and $a^4S_2-4sP_{321}$ which were taken from unpublished data of his.

Norman Bridge Laboratory of Physics, California Institute of Technology, May 4, 1928.