for the branches of the (1,0), (1,1) and (2,1) bands of the $^2\Sigma \rightarrow {}^2\Sigma$ system. These assignments have been made with the aid of the usual combination differences between the several bands of this and the $^2\Pi \rightarrow {}^2\Sigma$ system in the visible red, the lower $^2\Sigma$ state being common to both. The constants of the rotational energy terms are evaluated from the averages of the $\Delta_2 T_1$ and $\Delta_2 T_2$ differences by the semigraphical method in every case. We list these constants for the two $^2\Sigma$ states in Table II. Our values $B_0 = 3.3496$ and

TABLE II. *Constants from the quantum analysis of the infrared $^2\Sigma \rightarrow {}^2\Sigma$ system of BaH (cm^{-1} units).*

NORMAL $^2\Sigma$ STATE	UPPER $^2\Sigma$ STATE	
$B_0 = 3.3496$	$B_0 = 3.232$	$\gamma_0 = -4.88$ for $K < 12$
$B_1 = 3.2839$	$B_1 = 3.1609$	$\gamma_1 = -4.78$ "
$D = -1.10 \times 10^{-4}$	$B_2 = 3.0915$	$\gamma_2 = -4.66$ "
$\alpha = 0.066$	$D = -1.11 \times 10^{-4}$	
$\gamma = +0.186$	$\alpha = 0.070$	

$B_1 = 3.2839$ for the normal state agree exactly with the values $B_0 = 3.3495$ and $B_1 = 3.284$ given by Funke.[3]

The most interesting feature of these bands is the large size of the spin doubling in the upper $^2\Sigma$ state. This, the largest doubling recorded for any $^2\Sigma$ state, is due to the strong "pure precession" interaction with the $^2\Pi$ state but 1460 cm^{-1} below it. The magnitude of the Λ-doubling in the $\Pi_{1\frac{1}{2}}$ component of this $^2\Pi$ state is also evidence for this interaction.[5] With increasing rotational energy the constant γ of the spin doubling relation $\Delta\nu_{12}(K) = \gamma(K+\frac{1}{2})$ decreases for all vibrational states, the values for the highest K levels being -4.61, -4.52 and -4.39 for $v = 0$, 1 and 2, respectively. Similar change of the rate of variation of $\Delta\nu_{12}$ with K has been noted in the corresponding $^2\Sigma$ states of CaH and SrH. Probably the perturbing influence of neighboring energy levels is responsible for this departure from the usual linear relation.

Our partial analysis of the $^2\Pi_{\frac{1}{2}} \rightarrow {}^2\Sigma$ sub-band at 10,600A reveals the following facts. The R_1 and Q_1 branch heads occur at 10,603.33A and 10,746.37A, respectively. In the R_1 branch a perturbation centering at $R_1(10\frac{1}{2})$ is evident. In the discussion of another perturbation in the $^2\Pi_{1\frac{1}{2}c}$ levels at $J = 20\frac{1}{2}$ the nature of the possible perturbing levels has been considered.[5] Upper state combination differences between the R_1 lines and the few P_1 lines observed for low K levels yield the value 3.12 for $B_0^*, _{-\frac{1}{2}}$. The position of the Q_1 branch head would locate the $^2\Pi_{\frac{1}{2}}$ origin at about 9285 cm^{-1}. Since the $^2\Pi_{1\frac{1}{2}}$ origin comes at about 9910 cm^{-1}, the coupling constant A for this state must be then about 625 cm^{-1}. This agrees fairly well with the value $A = 640$ assumed in our previous discussion of this $^2\Pi$ state.

[5] W. W. Watson, Phys. Rev. **47**, 213 (1935).

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Analysis of the Spectrum of Se II

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An analysis of the spectrum of Se II is given with additions and corrections to that by Krishnamurty and Rao. The spectrum of selenium in this investigation was excited in a hollow cathode discharge with a helium atmosphere. Wave-length measurements were made in the region 500 to 2600A with a 1.5-meter grating vacuum spectrograph. New terms belonging to the $4s^24p^25p$ configuration have been found and identified. Several other terms, probably associated with the $4s^24p^24d$ and $4s^24p^25d$ configurations, have been found and J values assigned, but it has been found impossible at present to assign L and S values to them. Tables of all term values and line classifications known at present are listed.

INTRODUCTION

THE first extensive investigation of Se II was made by Bloch and Bloch[1] who published quite an accurate and complete list of wave-lengths in the visible and ultraviolet regions of the spectrum from 6679–2197A. Lacroute[2] extended their earlier measurements into the vacuum region to 1235A. Recently two articles

[1] Leon and Eugene Bloch, Comptes rendus **185**, 761 (1927); Ann. de physique **13**, 233 (1930).

[2] M. P. Lacroute, J. de phys. et rad. **9**, 180 (1928).

TABLE I. *Term values of Se II.*

Configuration	Term Symbol	J Value	Relative Term Value
$4s^24p^3$	^4S	$1\frac{1}{2}$	0
	^2D	$1\frac{1}{2}$	13168.2 (K & R)
	^2D	$2\frac{1}{2}$	13784.4 (K & R)
	^2P	$\frac{1}{2}$	23038.3 (K & R)
	^2P	$1\frac{1}{2}$	23894.8 (K & R)
$4s4p^4$	^4P	$2\frac{1}{2}$	83876.7 (K & R)
	^4P	$1\frac{1}{2}$	85579.5 (K & R)
	^4P	$\frac{1}{2}$	86437.7 (K & R)
$4s^24p^2(^3P)5s$	^4P	$\frac{1}{2}$	95270.0 (K & R)
—	1	$\frac{1}{2}$	96517.4
—	2	$2\frac{1}{2}$	96655.3
$4s^24p^2(^3P)5s$	^4P	$1\frac{1}{2}$	96753.3 (K & R)
—	3	$\frac{1}{2}$	98118.2
$4s^24p^2(^3P)5s$	^4P	$2\frac{1}{2}$	98674.4 (K & R)
	^2P	$\frac{1}{2}$	98896.1 (K & R)
—	4	$1\frac{1}{2}$	99368.5
$4s4p^4$	^2P	$1\frac{1}{2}$	100295.1 (K & R)
$4s^24p^2(^3P)5s$	^2P	$1\frac{1}{2}$	101356.0 (K & R)
—	5	$2\frac{1}{2}$	101631.5
—	6	$1\frac{1}{2}$	104694.4
—	7	$1\frac{1}{2}$	104873.7
—	8	$\frac{1}{2}$	105258.0
—	9	$\frac{1}{2}$	105973.8
$4s^24p^2(^1D)5s$	^2D	$2\frac{1}{2}$	108355.7 (K & R)
	^2D	$1\frac{1}{2}$	108449.8 (K & R)
—	10	$2\frac{1}{2}$	108833.9
—	11	$2\frac{1}{2}$	110297.4
—	12	$1\frac{1}{2}$	112403.4
$4s^24p^2(^3P)5p$	^4P	$\frac{1}{2}$	113048.7 (K & R)
	^4D	$\frac{1}{2}$	114299.0 (K & R)
	^4D	$1\frac{1}{2}$	114711.7 (K & R)
	^4D	$2\frac{1}{2}$	116068.1 (K & R)
	^4P	$1\frac{1}{2}$	116776.6 (K & R)
	^2S	$\frac{1}{2}$	117406.0
	^2D	$1\frac{1}{2}$	117739.6 (K & R)
	^4D	$3\frac{1}{2}$	117798.7 (K & R)
	^4P	$2\frac{1}{2}$	118398.0 (K & R)
	^4S	$1\frac{1}{2}$	119308.5 (K & R)
	13	$\frac{1}{2}$	119343
$4s^24p^2(^3P)5p$	^2D	$2\frac{1}{2}$	120387.1 (K & R)
—	14°	$1\frac{1}{2}$	121051.5
$4s^24p^2(^3P)5p$	^2P	$\frac{1}{2}$	121273.2
	^2P	$1\frac{1}{2}$	121381.9
—	15	$2\frac{1}{2}$	121730
—	16	$2\frac{1}{2}$	122720
—	17	$1\frac{1}{2}$	123323
—	18°	$2\frac{1}{2}$	126329.7
—	19	$1\frac{1}{2}$	126464.7
$4s^24p^2(^1D)5p$	^2D	$2\frac{1}{2}$	127415.7
—	20	$\frac{1}{2}$	127867.5
$4s^24p^2(^1D)5p$	^2D	$1\frac{1}{2}$	127921.4
—	21°	$2\frac{1}{2}$	127984.3
—	22	$1\frac{1}{2}$	129010.4
$4s^24p^2(^1D)5p$	23°–^2F(?)	$2\frac{1}{2}$	131165.4
	^2P	$1\frac{1}{2}$	132189.6
—	24	$2\frac{1}{2}$	133867.1
$4s^24p^2(^3P)6s$	^4P	$\frac{1}{2}$	134042.9 (K & R)
	^4P	$1\frac{1}{2}$	135635.6 (K & R)
—	25	$1\frac{1}{2}$	136188.2
$4s^24p^2(^3P)6s$	^4P	$2\frac{1}{2}$	137669.1 (K & R)
$5d$	^4F	$1\frac{1}{2}$	138365.7 (K & R)
$6s$	^2P	$\frac{1}{2}$	138525.7
—	26	$2\frac{1}{2}$	138535.9
—	27	$1\frac{1}{2}$	138711.0
$4s^24p^2(^3P)5d$	^4F	$2\frac{1}{2}$	138923.1 (K & R)
	^4F	$3\frac{1}{2}$	140011.8 (K & R)
—	28	$1\frac{1}{2}$	140131.3
—	29	$1\frac{1}{2}$	140745.8
—	30	$2\frac{1}{2}$	140930.1
$4s^24p^2(^3P)6s$	^2P	$1\frac{1}{2}$	140939 9
—	31	$2\frac{1}{2}$	140946.0
$4s^24p^2(^3P)5d$	^4F	$4\frac{1}{2}$	141710.1 (K & R)
—	32	$2\frac{1}{2}$	142171.0
—	33	$1\frac{1}{2}$	142302.2
—	34	$1\frac{1}{2}$	142374.1
—	35	$2\frac{1}{2}$	143341.7
—	36	$2\frac{1}{2}$	143919.5

have been published giving an analysis of Se II, one by Bartelt[3] and the other by Krishnamurty and Rao.[4] Bartelt[3] has identified several of the same terms as Krishnamurty and Rao[4] although his assignment of L and S values differs somewhat from theirs. He also has given term values for several higher terms, but it is doubtful whether his values are correct as he has used several lines of Se II which have been preferably otherwise assigned in the present investigation, and some of the other lines used by him have been identified as belonging to Se I and Se III. Many of the errors in Bartelt's work arose from his lack of ultraviolet data to correlate the values of the terms assigned from visible data. The analysis by Krishnamurty and Rao[4] seems to be the more accurate. In this paper, some corrections and additions are made to their analysis.

Experimental

A hollow cathode discharge tube with a water-cooled aluminum cathode, and with helium gas to maintain the discharge, was used to produce the spectrum of Se II in the ultraviolet region. The discharge tube was connected to a 1.5-meter grating vacuum spectrograph, the grating of which was ruled with 15,000 lines to the inch, giving a dispersion of 11.2A per mm. The region photographed was from 500 to 2600A. Helium and aluminum lines were used as standards of measurement.

In the visible region, Bloch and Bloch's[1] wave-length measurements were found to be very accurate and were used chiefly in calculating term values. Their method of excitation was the electrodeless discharge. Dr. J. E. Ruedy had taken some electrodeless discharge photographs of selenium in this laboratory, and measurements from his plates were used to check the measurements by Bloch and Bloch. Several important lines were also found on his plates which were not given at all by Bloch and Bloch.

Discussion of the Analysis

In this analysis, it was found that the assignments of a majority of term values agreed with the classification of Krishnamurty and

[3] O. Bartelt, Zeits. f. Physik **91**, 444 (1934).
[4] S. G. Krishnamurty and K. R. Rao, Proc. Roy. Soc. **A149**, 56 (1935).

TABLE II. *Classified lines of Se II.*

INT.	λ(air)	ν(vac)	CLASSIFICATION
2	9816.63	10184.0	$4s^24p^2(^1D)5p\ ^2P_{1\frac{1}{2}}$ — 34
1	9265.41	10789.9	27 — $4s^24p^2(^1D)5p\ ^2D_{1\frac{1}{2}}$
0	9127.76	10952.6	$4s^24p^2(^1D)5s\ ^2D_{2\frac{1}{2}}$ — $(^3P)5p\ ^4S_{1\frac{1}{2}}$
2	8679.13	11518.7	8 — $^4P_{1\frac{1}{2}}$
1	8309.52	12031.1	$4s^24p^2(^1D)5s\ ^2D_{2\frac{1}{2}}$ — $^2D_{2\frac{1}{2}}$
1	8274.55	12081.9	6 — $^4P_{1\frac{1}{2}}$
1	8217.53	12165.7	$4s^24p^2(^3P)5p\ ^4D_{\frac{1}{2}}$ — 19
0	8172.00	12233.5	$^4P_{1\frac{1}{2}}$ — 22
1	7838.81	12753.5	$4s4p^4\ ^2P_{1\frac{1}{2}}$ — $4s^24p^2(^3P)5p\ ^4P_{\frac{1}{2}}$
1	7796.15	12823.3	$4s^24p^2(^1D)5s\ ^2D_{1\frac{1}{2}}$ — $^2P_{\frac{1}{2}}$
0	7772.42	12866.0	7 — $^2D_{1\frac{1}{2}}$
0	7724.04	12943.0	$4s^24p^2(^3P)5s\ ^2P_{1\frac{1}{2}}$ — $^4D_{\frac{1}{2}}$
0	7674.82	13026.0	$(^1D)5s\ ^2D_{2\frac{1}{2}}$ — $^2P_{1\frac{1}{2}}$
3	7391.99	13524.4	{ 7 — $^4P_{2\frac{1}{2}}$ { $4s^24p^2(^1D)5p\ ^2D_{2\frac{1}{2}}$ — $4s^24p^2(^3P)6s\ ^2P_{1\frac{1}{2}}$
2	7138.91	14003.9	$4s4p^4\ ^2P_{1\frac{1}{2}}$ — $5p\ ^4D_{\frac{1}{2}}$
1	6925.63	14435.1	7 — $^4S_{1\frac{1}{2}}$
00*d*	6715.51	14886.8	$4s^24p^2(^1D)5p\ ^2D_{2\frac{1}{2}}$ — 33
1	6695.78	14930.7	3 — $4s^24p^2(^3P)5p\ ^4P_{\frac{1}{2}}$
8	6534.95	15299.3	9 — $^2P_{\frac{1}{2}}$
8	6490.48	15402.9	$4s^24p^2(^3P)5s\ ^2P_{\frac{1}{2}}$ — $^4D_{\frac{1}{2}}$
6	6488.34	15408.0	9 — $^2P_{1\frac{1}{2}}$
6	6483.06	15420.6	{ $4s^24p^2(^3P)5s\ ^2P_{1\frac{1}{2}}$ — $^4P_{1\frac{1}{2}}$ { $(^1D)5p\ ^2D_{1\frac{1}{2}}$ — 35
9	6444.25	15513.4	7 — $4s^24p^2(^3P)5p\ ^2D_{2\frac{1}{2}}$
1	6416.33	15580.9	12 — 21°
3	6370.62	15692.7	6 — $4s^24p^2(^3P)5p\ ^2D_{2\frac{1}{2}}$
3	6338.14	15773.2	$4s4p^4\ ^2P_{1\frac{1}{2}}$ — $^4D_{2\frac{1}{2}}$
2	6326.87	15801.2	$4s^24p^2(^3P)5p\ ^2D_{2\frac{1}{2}}$ — 25
0	6263.32	15961.6	$^4P_{\frac{1}{2}}$ — 22
00	6242.35	16015.2	8 — $4s^24p^2(^3P)5p\ ^2P_{\frac{1}{2}}$
4	6233.73	16037.3	$4s^24p^2(^3P)5s\ ^4P_{2\frac{1}{2}}$ — $^4D_{1\frac{1}{2}}$
2	6228.69	16050.3	$^2P_{1\frac{1}{2}}$ — $^2S_{\frac{1}{2}}$
2	6206.29	16108.2	5 — $^2D_{1\frac{1}{2}}$
2	6183.74	16167.0	5 — $^4D_{3\frac{1}{2}}$
5	6135.04	16295.3	$4s^24p^2(^3P)5s\ ^4P_{1\frac{1}{2}}$ — $^4P_{\frac{1}{2}}$
0*d*	6131.99	16303.4	$5p\ ^2D_{1\frac{1}{2}}$ — $4s^24p^2(^3P)6s\ ^4P_{\frac{1}{2}}$
6	6123.49	16326.1	$^4S_{1\frac{1}{2}}$ — $^4P_{1\frac{1}{2}}$
6	6101.96	16383.7	$4s^24p^2(^3P)5s\ ^2P_{1\frac{1}{2}}$ — $4s^24p^2(^3P)5p\ ^2D_{1\frac{1}{2}}$
5	6096.12	16399.4	7 — $^2P_{\frac{1}{2}}$
5	6065.83	16481.3	$4s4p^4\ ^2P_{1\frac{1}{2}}$ — $^4P_{1\frac{1}{2}}$
10	6055.96	16508.1	7 — $^2P_{1\frac{1}{2}}$
1	6047.43	16531.4	1 — $^4P_{\frac{1}{2}}$
3	6030.12	16578.8	6 — $^2P_{\frac{1}{2}}$
1	6025.10	16592.7	3 — $^4D_{1\frac{1}{2}}$
1	6009.06	16636.9	$4s^24p^2(^3P)5p\ ^2S_{\frac{1}{2}}$ — $4s^24p^2(^3P)6s\ ^4P_{\frac{1}{2}}$
5	5990.92	16687.3	6 — $5p\ ^2P_{1\frac{1}{2}}$
2	5962.67	16766.4	5 — $^4P_{2\frac{1}{2}}$
00*d*	5922.66	16879.6	$4s^24p^2(^3P)5p\ ^4S_{1\frac{1}{2}}$ — 25
5	5886.34	16983.8	$^2P_{1\frac{1}{2}}$ — $4s^24p^2(^3P)5d\ ^4F_{1\frac{1}{2}}$
8	5866.27	17041.9	$5s\ ^2P_{1\frac{1}{2}}$ — $5p\ ^4P_{2\frac{1}{2}}$
1	5849.84	17089.8	$5p\ ^4P_{1\frac{1}{2}}$ — 24
5	5842.68	17110.7	$4s4p^4\ ^2P_{1\frac{1}{2}}$ — $4s^24p^2(^3P)5p\ ^2S_{\frac{1}{2}}$
2	5831.47	17143.6	$4s^24p^2(^3P)5p\ ^2P_{1\frac{1}{2}}$ — $6s\ ^2P_{\frac{1}{2}}$
3	5799.72	17237.5	$^4P_{2\frac{1}{2}}$ — $^4P_{1\frac{1}{2}}$
4	5790.03	17266.3	$^4P_{1\frac{1}{2}}$ — $^4P_{\frac{1}{2}}$
4	5784.76	17282.0	$^2D_{2\frac{1}{2}}$ — $^4P_{2\frac{1}{2}}$
3	5769.06	17329.0	27 — $5p\ ^2P_{1\frac{1}{2}}$
6	5747.62	17393.7	$4s^24p^2(^3P)5s\ ^4P_{2\frac{1}{2}}$ — $^4D_{2\frac{1}{2}}$
4	5733.05	17437.9	27 — $^2P_{\frac{1}{2}}$
4	5730.84	17444.6	$4s4p^4\ ^2P_{1\frac{1}{2}}$ — $^2D_{1\frac{1}{2}}$
6	5697.88	17545.5	$4s^24p^2(^3P)5s\ ^4P_{1\frac{1}{2}}$ — $^4D_{\frac{1}{2}}$
1	5672.52	17624.0	11 — $(^1D)5p\ ^2D_{1\frac{1}{2}}$
2	5655.49	17677.0	5 — $(^3P)5p\ ^2D_{1\frac{1}{2}}$
3	5652.37	17686.8	11 — 21°
6	5623.13	17778.8	$4s^24p^2(^3P)5s\ ^4P_{\frac{1}{2}}$ — $4s^24p^2(^3P)5p\ ^4P_{\frac{1}{2}}$
00	5616.65	17799.3	$5p\ ^4D_{2\frac{1}{2}}$ — 24
6	5591.16	17880.4	{ $(^3P)5s\ ^2P_{\frac{1}{2}}$ — $4s^24p^2(^3P)5p\ ^4P_{1\frac{1}{2}}$ { $(^1D)5s\ ^2D_{1\frac{1}{2}}$ — 18°
4	5586.37	17895.7	$(^3P)5p\ ^4P_{1\frac{1}{2}}$ — $4s^24p^2(^3P)6s\ ^4P_{1\frac{1}{2}}$
8	5566.93	17958.3	$5s\ ^4P_{1\frac{1}{2}}$ — $5p\ ^4D_{1\frac{1}{2}}$
3	5560.54	17978.9	$5p\ ^2D_{2\frac{1}{2}}$ — $5d\ ^4F_{1\frac{1}{2}}$
8	5522.42	18103.0	{ $4s^24p^2(^3P)5s\ ^4P_{2\frac{1}{2}}$ — $4s^24p^2(^3P)5p\ ^4P_{1\frac{1}{2}}$ { $4s4p^4\ ^2P_{1\frac{1}{2}}$ — $^4P_{2\frac{1}{2}}$
2	5484.08	18229.5	$4s^24p^2(^3P)5p\ ^4P_{\frac{1}{2}}$ — $6s\ ^4P_{1\frac{1}{2}}$
2	5455.58	18324.1	27 — 14°
3	5444.95	18360.5	$4s^24p^2(^3P)5p\ ^2D_{1\frac{1}{2}}$ — $4s^24p^2(^3P)6s\ ^4P_{2\frac{1}{2}}$
3	5401.01	18509.9	$5s\ ^2P_{\frac{1}{2}}$ — $5p\ ^2S_{\frac{1}{2}}$
2	5380.21	18581.5	10 — $(^1D)5p\ ^2D_{2\frac{1}{2}}$
9	5305.35	18843.7	$4s^24p^2(^3P)5s\ ^2P_{\frac{1}{2}}$ — $(^3P)5p\ ^2D_{1\frac{1}{2}}$
3	5301.03	18859.0	$5p\ ^4S_{1\frac{1}{2}}$ — $6s\ ^4P_{1\frac{1}{2}}$
4	5271.22	18965.7	$(^1D)5s\ ^2D_{1\frac{1}{2}}$ — $(^1D)5p\ ^2D_{2\frac{1}{2}}$
00	5257.96	19013.5	$4s4p^4\ ^2P_{1\frac{1}{2}}$ — $(^3P)5p\ ^4S_{1\frac{1}{2}}$
4	5253.63	19029.2	{ $4s^24p^2(^3P)5s\ ^4P_{\frac{1}{2}}$ — $^4D_{\frac{1}{2}}$ { 4 — $^4P_{2\frac{1}{2}}$
4	5253.07	19031.2	$4s^24p^2(^3P)5s\ ^2P_{1\frac{1}{2}}$ — $^2D_{2\frac{1}{2}}$
3	5245.17	19059.9	$(^1D)5s\ ^2D_{2\frac{1}{2}}$ — $(^1D)5p\ ^2D_{2\frac{1}{2}}$
0	5243.75	19065.0	$(^3P)5s\ ^4P_{2\frac{1}{2}}$ — $(^3P)5p\ ^2D_{1\frac{1}{2}}$
1	5237.62	19087.4	10 — $(^1D)5p\ ^2D_{1\frac{1}{2}}$
10	5227.51	19124.3	$4s^24p^2(^3P)5s\ ^4P_{2\frac{1}{2}}$ — $(^3P)5p\ ^4D_{3\frac{1}{2}}$
3	5187.68	19271.1	$5p\ ^4P_{2\frac{1}{2}}$ — $6s\ ^4P_{2\frac{1}{2}}$
3	5183.01	19288.4	3 — $5p\ ^2S_{\frac{1}{2}}$
7	5175.98	19314.6	$4s^24p^2(^3P)5s\ ^4P_{1\frac{1}{2}}$ — $^4D_{2\frac{1}{2}}$
3	5171.54	19331.2	$5p\ ^4D_{1\frac{1}{2}}$ — $6s\ ^4P_{\frac{1}{2}}$
0	5150.12	19411.6	$^4P_{1\frac{1}{2}}$ — 25
5	5142.14	19441.7	$5s\ ^4P_{\frac{1}{2}}$ — $4s^24p^2(^3P)5p\ ^4D_{1\frac{1}{2}}$
3	5134.31	19471.4	$4s^24p^2(^1D)5s\ ^2D_{1\frac{1}{2}}$ — $4s^24p^2(^1D)5p\ ^2D_{1\frac{1}{2}}$
3	5109.59	19565.6	$^2D_{2\frac{1}{2}}$ — $^2D_{1\frac{1}{2}}$
1	5109.11	19567.4	$(^3P)5p\ ^4D_{2\frac{1}{2}}$ — $(^3P)6s\ ^4P_{1\frac{1}{2}}$
4	5093.26	19628.3	$(^1D)5s\ ^2D_{1\frac{1}{2}}$ — 21°

TABLE II.—*Continued.*

INT.	λ(air)	ν(vac)	CLASSIFICATION		
6	5068.65	19723.6	$(^3P)5s\ ^4P_{2\frac{1}{2}}$	—	$4s^24p^2(^3P)5p\ ^4P_{2\frac{1}{2}}$
0*d*	5063.42	19744.0	$5p\ ^4D_{\frac{1}{2}}$ $^2D_{2\frac{1}{2}}$	— —	$6s\ ^4P_{\frac{1}{2}}$ 28
0*d*	5061.83	19750.2	5	—	$4s^24p^2(^3P)5p\ ^2P_{1\frac{1}{2}}$
4	5031.26	19870.2	$4s^24p^2(^3P)5p\ ^4D_{3\frac{1}{2}}$	—	$6s\ ^4P_{2\frac{1}{2}}$
3	5019.32	19917.0	$5s\ ^2P_{1\frac{1}{2}}$	—	$5p\ ^2P_{\frac{1}{2}}$
3	4992.75	20023.5	$^4P_{1\frac{1}{2}}$	—	$^4P_{1\frac{1}{2}}$
1	4992.03	20026.4	$^2P_{1\frac{1}{2}}$	—	$^2P_{1\frac{1}{2}}$
5	4975.66	20092.3	$4s4p^4\ ^2P_{1\frac{1}{2}}$	—	$^2D_{2\frac{1}{2}}$
0	4897.56	20412.7	$4s^24p^2(^3P)5s\ ^2P_{\frac{1}{2}}$	—	$^4S_{1\frac{1}{2}}$
0	4846.90	20626.0	$5p\ ^2D_{1\frac{1}{2}}$	—	$5d\ ^4F_{1\frac{1}{2}}$
9	4844.96	20634.3	$5s\ ^4P_{2\frac{1}{2}}$	—	$5p\ ^4S_{1\frac{1}{2}}$
8	4840.63	20652.7	$^4P_{1\frac{1}{2}}$	—	$^2S_{\frac{1}{2}}$
1	4809.61	20785.9	$5p\ ^2D_{1\frac{1}{2}}$	—	$6s\ ^2P_{\frac{1}{2}}$
1	4801.01	20823.1	$^4S_{1\frac{1}{2}}$	—	28
00	4785.10	20892.4	$^4P_{1\frac{1}{2}}$	—	$4s^24p^2(^3P)6s\ ^4P_{2\frac{1}{2}}$
2	4777.85	20924.1	$^4D_{1\frac{1}{2}}$	—	$^4P_{1\frac{1}{2}}$
3	4765.52	20978.2	$4s4p^4\ ^2P_{1\frac{1}{2}}$	—	$5p\ ^2P_{\frac{1}{2}}$
7	4763.65	20986.4	$4s^24p^2(^3P)5s\ ^4P_{1\frac{1}{2}}$	—	$^2D_{1\frac{1}{2}}$
2	4761.85	20994.3	$5p\ ^4P_{\frac{1}{2}}$	—	$6s\ ^4P_{\frac{1}{2}}$
6	4740.97	21086.9	$4s4p^4\ ^2P_{1\frac{1}{2}}$	—	$4s^24p^2(^3P)5p\ ^2P_{1\frac{1}{2}}$
2	4733.57	21119.8	$4s^24p^2(^3P)5p\ ^2S_{\frac{1}{2}}$	—	$6s\ ^2P_{\frac{1}{2}}$
0	4732.46	21124.8	$^4D_{3\frac{1}{2}}$	—	$5d\ ^4F_{2\frac{1}{2}}$
0	4719.32	21183.6	$^2D_{1\frac{1}{2}}$	—	$^4F_{2\frac{1}{2}}$
2	4718.23	21188.5	1	—	$5p\ ^2S_{\frac{1}{2}}$
2	4685.45	21336.7	$4s^24p^2(^3P)5p\ ^4D_{\frac{1}{2}}$	—	$6s\ ^4P_{1\frac{1}{2}}$
0	4663.47	21437.3	$^4S_{1\frac{1}{2}}$	—	29
6	4648.44	21506.6	$5s\ ^4P_{\frac{1}{2}}$	—	$4s^24p^2(^3P)5p\ ^4P_{1\frac{1}{2}}$
2	4630.56	21589.6	$5p\ ^4P_{1\frac{1}{2}}$	—	$5d\ ^4F_{1\frac{1}{2}}$
3	4628.12	21601.0	$^4D_{2\frac{1}{2}}$	—	$6s\ ^4P_{2\frac{1}{2}}$
2	4625.37	21613.9	$^4P_{2\frac{1}{2}}$	—	$5d\ ^4F_{3\frac{1}{2}}$
1	4623.74	21621.5	$^4S_{1\frac{1}{2}}$	—	30
2	4621.58	21631.6	$^4S_{1\frac{1}{2}}$	—	$4s^24p^2(^3P)6s\ ^2P_{1\frac{1}{2}}$
0	4620.86	21635.0	6	—	18°
2	4620.32	21637.5	$4s^24p^2(^3P)5p\ ^4S_{1\frac{1}{2}}$	—	31
5	4618.77	21644.7	$5s\ ^4P_{1\frac{1}{2}}$	—	$4s^24p^2(^3P)5p\ ^4P_{2\frac{1}{2}}$
0	4610.67	21682.8	4	—	14°
7	4604.34	21712.6	$4s^24p^2(^3P)5s\ ^4P_{2\frac{1}{2}}$	—	$4s^24p^2(^3P)5p\ ^2D_{2\frac{1}{2}}$
3	4599.96	21733.3	$5p\ ^4P_{2\frac{1}{2}}$	—	28
2	4597.93	21742.9	2	—	$4s^24p^2(^3P)5p\ ^4P_{2\frac{1}{2}}$
2	4596.59	21749.2	$4s^24p^2(^3P)5p\ ^4P_{1\frac{1}{2}}$	—	$6s\ ^2P_{\frac{1}{2}}$
0	4594.51	21759.0	$^4P_{1\frac{1}{2}}$	—	26
00	4589.07	21784.8	$^2D_{2\frac{1}{2}}$	—	32
2	4567.19	21889.2	$^4D_{\frac{1}{2}}$	—	25
6	4563.95	21904.7	4	—	$4s^24p^2(^3P)5p\ ^2P_{\frac{1}{2}}$
3	4561.75	21915.3	$4s^24p^2(^3P)5p\ ^2D_{2\frac{1}{2}}$	—	33
1	4552.64	21959.2	$^2P_{1\frac{1}{2}}$	—	35
2	4541.40	22013.5	4	—	$4s^24p^2(^3P)5p\ ^2P_{1\frac{1}{2}}$
4	4516.25	22136.0	$4s^24p^2(^3P)5s\ ^4P_{\frac{1}{2}}$	—	$^2S_{\frac{1}{2}}$
1	4514.11	22146.5	$5p\ ^4P_{1\frac{1}{2}}$	—	$5d\ ^4F_{2\frac{1}{2}}$

INT.	λ(air)	ν(vac)	CLASSIFICATION		
1	4483.48	22297.9	$^4D_{2\frac{1}{2}}$	—	$^4F_{1\frac{1}{2}}$
2	4476.70	22331.6	10	—	23°
8	4467.60	22377.1	$4s^24p^2(^3P)5s\ ^4P_{2\frac{1}{2}}$ $^2P_{\frac{1}{2}}$	— —	14° $4s^24p^2(^3P)5p\ ^2P_{\frac{1}{2}}$
0	4449.56	22467.8	$5p\ ^4D_{2\frac{1}{2}}$	—	26
7	4449.15	22469.9	$5s\ ^4P_{\frac{1}{2}}$	—	$4s^24p^2(^3P)5p\ ^2D_{1\frac{1}{2}}$
8	4446.02	22485.8	$^2P_{\frac{1}{2}}$	—	$^2P_{1\frac{1}{2}}$
1	4436.96	22531.7	$5p\ ^4P_{2\frac{1}{2}}$	—	30
4	4434.92	22542.0	7 $4s^24p^2(^3P)5p\ ^4P_{2\frac{1}{2}}$	— —	$4s^24p^2(^1D)5p\ ^2D_{2\frac{1}{2}}$ $(^3P)6s\ ^2P_{1\frac{1}{2}}$
3	4433.74	22548.0	$^4P_{2\frac{1}{2}}$	—	31
5	4432.33	22555.2	$5s\ ^4P_{1\frac{1}{2}}$	—	$4s^24p^2(^3P)5p\ ^4S_{1\frac{1}{2}}$
3	4426.12	22586.8	$5p\ ^4P_{\frac{1}{2}}$	—	$6s\ ^4P_{1\frac{1}{2}}$
1	4415.14	22643.0	27	—	$5p\ ^4D_{2\frac{1}{2}}$
3	4413.16	22653.1	2	—	$^4S_{1\frac{1}{2}}$
0	4411.17	22663.4	8	—	$(^1D)5p\ ^2D_{1\frac{1}{2}}$
0	4402.51	22708.0	$4s^24p^2(^3P)5s\ ^4P_{2\frac{1}{2}}$	—	$(^3P)5p\ ^2P_{1\frac{1}{2}}$
6	4401.02	22715.7	$(^1D)5s\ ^2D_{1\frac{1}{2}}$	—	23°
2	4399.94	22721.2	6	—	$4s^24p^2(^1D)5p\ ^2D_{2\frac{1}{2}}$
2	4399.17	22725.2	$4s^24p^2(^3P)5p\ ^2S_{\frac{1}{2}}$	—	28
8	4382.87	22809.7	$(^1D)5s\ ^2D_{2\frac{1}{2}}$	—	23°
00	4372.69	22862.8	$(^3P)5p\ ^4S_{1\frac{1}{2}}$	—	32
4	4355.15	22954.9	$^2D_{2\frac{1}{2}}$	—	35
2	4354.64	22957.6	$^4D_{1\frac{1}{2}}$	—	$4s^24p^2(^3P)6s\ ^4P_{2\frac{1}{2}}$
2	4347.79	22993.7	$^4S_{1\frac{1}{2}}$	—	33
3	4345.41	23006.3	$^2D_{1\frac{1}{2}}$	—	29
4	4337.60	23047.7	7	—	$4s^24p^2(^1D)5p\ ^2D_{1\frac{1}{2}}$
7	4320.39	23139.6	$4s^24p^2(^3P)5p\ ^4P_{\frac{1}{2}}$	—	25
2	4318.91	23147.5	$^4D_{3\frac{1}{2}}$	—	31
4	4309.09	23200.2	$^2D_{1\frac{1}{2}}$	—	$4s^24p^2(^3P)6s\ ^2P_{1\frac{1}{2}}$
3	4307.95	23206.4	$^2D_{1\frac{1}{2}}$	—	31
2	4304.13	23227.0	6	—	$4s^24p^2(^1D)5p\ ^2D_{1\frac{1}{2}}$
4	4297.31	23263.9	3	—	$(^3P)5p\ ^2P_{1\frac{1}{2}}$
5	4280.36	23356.0	10	—	$(^1D)5p\ ^2P_{1\frac{1}{2}}$
7	4248.00	23533.9	$4s^24p^2(^3P)5p\ ^2S_{\frac{1}{2}}$	—	$(^3P)6s\ ^2P_{1\frac{1}{2}}$
3	4230.05	23633.7	$5s\ ^4P_{1\frac{1}{2}}$	—	$5p\ ^2D_{2\frac{1}{2}}$
3	4226.37	23654.3	$5p\ ^4D_{1\frac{1}{2}}$	—	$5d\ ^4F_{1\frac{1}{2}}$
6	4212.58	23731.8	2	—	$5p\ ^2D_{2\frac{1}{2}}$
0	4205.32	23772.7	$4s^24p^2(^3P)5p\ ^4P_{2\frac{1}{2}}$	—	32
4	4198.05	23813.9	$^4D_{1\frac{1}{2}}$	—	$4s^24p^2(^3P)6s\ ^2P_{\frac{1}{2}}$
3	4196.24	23824.2	$^4D_{1\frac{1}{2}}$	—	26
4	4194.55	23833.8	$(^1D)5s\ ^2D_{2\frac{1}{2}}$	—	$4s^24p^2(^1D)5p\ ^2P_{1\frac{1}{2}}$
1	4182.20	23904.2	$(^3P)5p\ ^4P_{2\frac{1}{2}}$	—	33
10	4180.94	23911.4	$4s^24p^2(^3P)5p\ ^4D_{3\frac{1}{2}}$	—	$4s^24p^2(^3P)5d\ ^4F_{4\frac{1}{2}}$
9	4175.32	23943.6	$^4D_{2\frac{1}{2}}$	—	$^4F_{3\frac{1}{2}}$
2	4169.65	23976.1	$^4P_{2\frac{1}{2}}$	—	34
00	4167.86	23986.4	$^4D_{1\frac{1}{2}}$	—	27
3	4165.66	23999.1	27	—	$4s^24p^2(^3P)5p\ ^4D_{1\frac{1}{2}}$
5	4159.75	24033.1	$4s^24p^2(^3P)5p\ ^4S_{1\frac{1}{2}}$	—	35
	4154.64	24062.7	$^4D_{2\frac{1}{2}}$	—	28

TABLE II.—*Continued.*

INT.	λ(air)	ν(vac)	CLASSIFICATION
4	4153.93	24066.8	$^4D_{\frac12}$ — $4s^24p^2(^3P)5d\ ^4F_{1\frac12}$
2	4138.99	24153.7	$^4P_{1\frac12}$ — 30
4	4137.31	24163.5	$^4P_{1\frac12}$ — $4s^24p^2(^3P)6s\ ^2P_{1\frac12}$
6	4136.28	24169.5	$^4P_{1\frac12}$ — 31
6	4126.57	24226.4	$^4D_{\frac12}$ — $4s^24p^2(^3P)6s\ ^2P_{\frac12}$
3	4114.35	24298.3	$5s\ ^4P_{1\frac12}$ — 14°
2	4097.91	24396.3	2 — 14°
6	4091.95	24431.4	$4s^24p^2(^3P)5p\ ^2D_{1\frac12}$ — 32
8	4070.16	24562.1	$^2D_{1\frac12}$ — 33
6	4062.06	24611.1	$^4S_{1\frac12}$ — 36
2	4058.20	24634.5	$^2D_{1\frac12}$ — 34
1	4047.77	24698.0	5 — 18°
3	4038.31	24755.8	1 — $4s^24p^2(^3P)5p\ ^2P_{\frac12}$
2	4019.50	24871.7	$4s^24p^2(^3P)5p\ ^4D_{2\frac12}$ — $6s\ ^2P_{1\frac12}$
6	4018.52	24877.8	$^4D_{2\frac12}$ — 31
6	4007.90	24943.7	$^2D_{1\frac12}$ — 35
5	4003.08	24973.7	$5s\ ^2P_{1\frac12}$ — 18°
3	3948.80	25317.0	$5p\ ^4P_{\frac12}$ — $4s^24p^2(^3P)5d\ ^4F_{1\frac12}$
1	3924.02	25476.9	$4s^24p^2(^3P)5p\ ^4P_{\frac12}$ — $4s^24p^2(^3P)6s\ ^2P_{\frac12}$
2	3917.06	25522.2	$^4P_{2\frac12}$ — 36
1	3916.49	25525.9	$^4P_{1\frac12}$ — 33
1	3913.81	25543.4	$^4D_{3\frac12}$ — 35
5	3877.28	25784.0	5 — $4s^24p^2(^1D)5p\ ^2D_{2\frac12}$
0	3839.91	26034.9	$4s4p^4\ ^2P_{1\frac12}$ — 18°
3	3836.25	26059.8	$4s^24p^2(^3P)5s\ ^2P_{1\frac12}$ — $4s^24p^2(^1D)5p\ ^2D_{1\frac12}$
2	3818.75	26179.2	$5p\ ^2D_{1\frac12}$ — 36
1	3811.62	26228.1	$^4D_{1\frac12}$ — $4s^24p^2(^3P)6s\ ^2P_{1\frac12}$
4	3793.63	26352.5	5 — 21°
3	3763.24	26565.3	{ $4s^24p^2(^3P)5s\ ^2P_{1\frac12}$ — $4s^24p^2(^1D)5p\ ^2D_{1\frac12}$ $5p\ ^4P_{1\frac12}$ — 35
3	3754.31	26628.5	$5s\ ^2P_{1\frac12}$ — 21°
4	3686.21	27120.4	$4s4p^4\ ^2P_{1\frac12}$ — $4s^24p^2(^1D)5p\ ^2D_{2\frac12}$
2	3639.40	27469.3	$^4P_{1\frac12}$ — $(^3P)5p\ ^4P_{\frac12}$
1	3623.30	27591.3	$4s^24p^2(^3P)5p\ ^4D_{1\frac12}$ — 33
4	3618.73	27626.1	$4s4p^4\ ^2P_{1\frac12}$ — $4s^24p^2(^1D)5p\ ^2D_{1\frac12}$
4	3610.50	27689.1	$^2P_{1\frac12}$ — 21°
00	3589.41	27851.8	$4s^24p^2(^3P)5p\ ^4D_{2\frac12}$ — 36
2	3588.16	27861.5	$4s4p^4\ ^4P_{\frac12}$ — $4s^24p^2(^3P)5p\ ^4D_{\frac12}$
0	3584.32	27891.4	$4s^24p^2(^3P)5p\ ^4P_{\frac12}$ — $6s\ ^2P_{1\frac12}$
1	3535.76	28274.4	$4s4p^4\ ^4P_{\frac12}$ — $5p\ ^4D_{1\frac12}$
4	3444.27	29025.5	$4s^24p^2(^3P)5s\ ^2P_{\frac12}$ — $(^1D)5p\ ^2D_{\frac12}$
4	3384.98	29533.8	5 — 23°
3	3353.67	29809.5	$4s^24p^2(^3P)5s\ ^2P_{1\frac12}$ — 23°
4	3242.19	30834.5	$4s4p^4\ ^4P_{2\frac12}$ — $4s^24p^2(^3P)5p\ ^4D_{1\frac12}$
3	3238.43	30870.3	$^2P_{1\frac12}$ — 23°
2	3228.17	30968.4	$^4P_{\frac12}$ — $4s^24p^2(^3P)5p\ ^2S_{\frac12}$
5	3204.58	31196.4	$^4P_{1\frac12}$ — $^4P_{1\frac12}$
2	3200.93	31231.9	$4s^24p^2(^3P)5s\ ^4P_{1\frac12}$ — 21°
7	3141.13	31826.5	$4s4p^4\ ^4P_{1\frac12}$ — $4s^24p^2(^3P)5p\ ^2S_{\frac12}$
6	3134.42	31894.6	$^2P_{1\frac12}$ — $(^1D)5p\ ^2P_{1\frac12}$
3	3108.54	32160.1	$^4P_{1\frac12}$ — $(^3P)5p\ ^2D_{1\frac12}$
3	3105.50	32191.6	$^4P_{2\frac12}$ — $^4D_{2\frac12}$

INT.	λ(air)	ν(vac)	CLASSIFICATION
4	3046.24	32817.9	$^4P_{1\frac12}$ — $^4P_{2\frac12}$
7	3041.31	32871.1	$^4P_{\frac12}$ — $^4S_{1\frac12}$
7	3038.66	32899.7	$^4P_{2\frac12}$ — $^4P_{1\frac12}$
6	2963.91	33729.4	$^4P_{1\frac12}$ — $^4S_{1\frac12}$
6	2952.28	33863.0	$^4P_{2\frac12}$ — $^2D_{1\frac12}$
2	2947.13	33922.2	$^4P_{2\frac12}$ — $^4D_{3\frac12}$
1	2934.18	34071.1	3 — $4s^24p^2(^1D)5p\ ^2P_{1\frac12}$
2	2905.07	34412.5	$4s^24p^2(^3P)5s\ ^4P_{1\frac12}$ — 23°
6	2895.88	34521.7	$4s4p^4\ ^4P_{2\frac12}$ — $4s^24p^2(^3P)5p\ ^4P_{2\frac12}$
0	2888.14	34614.3	$^4P_{\frac12}$ — 14°
2	2872.08	34807.8	$^4P_{1\frac12}$ — $4s^24p^2(^3P)5p\ ^2D_{2\frac12}$
5	2821.52	35431.5	$^4P_{2\frac12}$ — $^4S_{1\frac12}$
4	2738.16	36510.1	$^4P_{2\frac12}$ — $^2D_{2\frac12}$
1	2357.48	42405.2	$^4P_{1\frac12}$ — 21°
2	2113.95	47289.8	$^4P_{2\frac12}$ — 14°

INT.	λ(vac)	ν(vac)	CLASSIFICATION
2	1667.15	59982.6	$4s^24p^3\ ^2P_{1\frac12}$ — $4s4p^4\ ^4P_{2\frac12}$
4	1621.23	61681.6	$^2P_{1\frac12}$ — $^4P_{1\frac12}$
1	1598.95	62541.1	{ $^2P_{\frac12}$ — $^4P_{1\frac12}$ $^2P_{1\frac12}$ — $^4P_{\frac12}$
5	1426.65	70094.2	$^2D_{2\frac12}$ — $^4P_{2\frac12}$
2	1414.25	70708.7	$^2D_{1\frac12}$ — $^4P_{2\frac12}$
0	1401.01	71377.0	$^2P_{1\frac12}$ — $4s^24p^2(^3P)5s\ ^4P_{\frac12}$
0	1392.81	71797.3	$^2D_{2\frac12}$ — $4s4p^4\ ^4P_{1\frac12}$
1	1380.96	72413.2	$^2D_{1\frac12}$ — $^4P_{1\frac12}$
1	1372.51	72859.2	$^2P_{1\frac12}$ — $4s^24p^2(^3P)5s\ ^4P_{1\frac12}$
2	1364.83	73269.2	$^2D_{1\frac12}$ — $4s4p^4\ ^4P_{\frac12}$
0	1360.86	73482.9	$^2P_{\frac12}$ — 1
0	1356.57	73715.3	$^2P_{\frac12}$ — $4s^24p^2(^3P)5s\ ^4P_{1\frac12}$
1	1347.31	74222.0	$^2P_{1\frac12}$ — 3
0	1337.13	74787.0	$^2P_{1\frac12}$ — $4s^24p^2(^3P)5s\ ^4P_{2\frac12}$
3	1333.32	75001.0	$^2P_{1\frac12}$ — $^2P_{\frac12}$
7	1318.25	75858.1	$^2P_{\frac12}$ — $^2P_{\frac12}$
8	1308.89	76400.8	$^2P_{1\frac12}$ — $4s4p^4\ ^2P_{1\frac12}$
3	1294.41	77255.1	$^2P_{\frac12}$ — $^2P_{1\frac12}$
8	1290.97	77461.3	$^2P_{1\frac12}$ — $4s^24p^2(^3P)5s\ ^2P_{1\frac12}$
3	1286.41	77735.9	$^2P_{1\frac12}$ — 5
2	1276.84	78318.5	$^2P_{\frac12}$ — $4s^24p^2(^3P)5s\ ^2P_{1\frac12}$
3	1237.61	80800.6	$^2P_{1\frac12}$ — 11
7	1234.88	80979.7	$^2P_{1\frac12}$ — 12
2	1229.04	81364.4	$4s^24p\ ^2P_{1\frac12}$ — 13
3	1224.63	81657.2	$^2P_{\frac12}$ — 6
2	1221.94	81837.1	$^2P_{\frac12}$ — 7
2	1218.27	82083.6	$^2P_{1\frac12}$ — 8
4	1218.01	82101.1	$^2D_{1\frac12}$ — $4s^24p^2(^3P)5s\ ^4P_{\frac12}$
7	1205.69	82940.0	$^2P_{\frac12}$ —
3	1205.25	82970.5	$^2D_{2\frac12}$ — $4s^24p^2(^3P)5s\ ^4P_{1\frac12}$
0	1199.72	83352.7	$^2D_{1\frac12}$ — 1
2	1196.40	83584.4	$^2D_{1\frac12}$ — $4s^24p^2(^3P)5s\ ^4P_{1\frac12}$

TABLE II.—*Continued.*

Int.	λ(vac)	ν(vac)	Classification			
10	1192.29	83872.4		$^4S_{1\frac{1}{2}}$ —	$4s4p^4$	$^4P_{2\frac{1}{2}}$
2	1183.99	84460.0		$^2P_{1\frac{1}{2}}$ —	$4s^24p^2(^1D)5s$	$^2D_{2\frac{1}{2}}$
3	1182.65	84556.1		$^2P_{1\frac{1}{2}}$ —		$^2D_{1\frac{1}{2}}$
4	1178.05	84886.2		$^2D_{2\frac{1}{2}}$ —	$(^3P)5s$	$^4P_{2\frac{1}{2}}$
1	1177.31	84939.6		$^2P_{1\frac{1}{2}}$ —	10	
2	1170.76	85414.6		$^2P_{\frac{1}{2}}$ —	$4s^24p^2(^1D)5s$	$^2D_{1\frac{1}{2}}$
8	1168.53	85577.4		$^4S_{1\frac{1}{2}}$ —	$4s4p^4$	$^4P_{1\frac{1}{2}}$
5	1166.53	85724.4		$^2D_{1\frac{1}{2}}$ —	$4s^24p^2(^3P)5s$	$^2P_{\frac{1}{2}}$
4	1157.31	86407.2		$^2P_{1\frac{1}{2}}$ —	11	
8	1156.91	86437.1		$^4S_{1\frac{1}{2}}$ —	$4s4p^4$	$^4P_{\frac{1}{2}}$
7	1155.99	86508.4		$^2D_{2\frac{1}{2}}$ —		$^2P_{1\frac{1}{2}}$
9	1141.94	87569.9		$^2D_{2\frac{1}{2}}$ —	$4s^24p^2(^3P)5s$	$^2P_{1\frac{1}{2}}$
0	1138.36	87845.3		$^2D_{2\frac{1}{2}}$ —	5	
1	1133.89	88191.9		$^2D_{1\frac{1}{2}}$ —	$4s^24p^2(^3P)5s$	$^2P_{1\frac{1}{2}}$
1	1130.48	88458.0		$^2D_{1\frac{1}{2}}$ —	5	
0	1129.79	88512.0	$4s^24p^3$	$^2P_{1\frac{1}{2}}$ —	12	
1	1119.04	89362.7		$^2P_{\frac{1}{2}}$ —	12	
3	1099.97	90911.4		$^2D_{2\frac{1}{2}}$ —	6	
8	1097.82	91089.2		$^2D_{2\frac{1}{2}}$ —	7	
1	1090.43	91707.1		$^2D_{1\frac{1}{2}}$ —	7	
5	1085.88	92090.8		$^2D_{1\frac{1}{2}}$ —	8	
4	1077.54	92804.3		$^2D_{1\frac{1}{2}}$ —	9	
9	1057.41	94570.3		$^2D_{2\frac{1}{2}}$ —	$4s^24p^2(^1D)5s$	$^2D_{2\frac{1}{2}}$
3	1052.09	95048.5		$^2D_{2\frac{1}{2}}$ —	10	
2	1050.57	95186.1		$^2D_{1\frac{1}{2}}$ —	$4s^24p^2(^1D)5s$	$^2D_{2\frac{1}{2}}$
10	1049.65	95270.0		$^4S_{1\frac{1}{2}}$ —	$(^3P)5s$	$^4P_{\frac{1}{2}}$
1	1047.67	95450.0		$^2P_{1\frac{1}{2}}$ —	13	
4	1045.31	95665.0		$^2D_{1\frac{1}{2}}$ —	10	
3	1038.36	96306.0		$^2P_{\frac{1}{2}}$ —	13	
3	1036.16	96509.8		$^2D_{2\frac{1}{2}}$ —	11	
10	1033.60	96749.1		$^4S_{1\frac{1}{2}}$ —	$4s^24p^2(^3P)5s$	$^4P_{1\frac{1}{2}}$
6	1029.56	97128.6		$^2D_{1\frac{1}{2}}$ —	11	
1	1022.11	97836.4		$^2P_{1\frac{1}{2}}$ —	15	
9	1014.01	98618.6		$^2D_{2\frac{1}{2}}$ —	12	
9	1013.40	98677.7		$^4S_{1\frac{1}{2}}$ —	$4s^24p^2(^3P)5s$	$^4P_{2\frac{1}{2}}$
3	1011.84	98830.3		$^2P_{1\frac{1}{2}}$ —	16	
2	1011.15	98897.5		$^4S_{1\frac{1}{2}}$ —	$4s^24p^2(^3P)5s$	$^2P_{\frac{1}{2}}$
1	997.14	100286.8		$^2P_{\frac{1}{2}}$ —	17	
2	997.06	100295.2		$^4S_{1\frac{1}{2}}$ —	$4s4p^4$	$^2P_{1\frac{1}{2}}$
0	986.71	101347.0	$4s^24p^3$	$^4S_{1\frac{1}{2}}$ —	$4s^24p^2(^3P)5s$	$^2P_{1\frac{1}{2}}$
6	983.94	101632.4		$^4S_{1\frac{1}{2}}$ —	5	
3	974.94	102570.4		$^2P_{1\frac{1}{2}}$ —	19	
2	961.77	103974.5		$^2P_{1\frac{1}{2}}$ —	20	
4	953.88	104835.4		$^2P_{\frac{1}{2}}$ —	20	
3	951.26	105123.4		$^2P_{1\frac{1}{2}}$ —	22	
2	950.02	105260.9		$^4S_{1\frac{1}{2}}$ —	8	
2	943.61	105976.0		$\{^4S_{1\frac{1}{2}}$ — $\{^2P_{\frac{1}{2}}$ —	9 22	

Int.	λ(vac)	ν(vac)	Classification			
1	926.38	107947.1		$^2D_{2\frac{1}{2}}$ —	15	
0	922.90	108353.6		$^4S_{1\frac{1}{2}}$ —	$4s^24p^2(^1D)5s$	$^2D_{2\frac{1}{2}}$
5	921.12	108563.5		$^2D_{1\frac{1}{2}}$ —	15	
4	918.84	108833.5		$^4S_{1\frac{1}{2}}$ —	10	
2	917.94	108940.0		$^2D_{2\frac{1}{2}}$ —	16	
9	912.89	109542.2		$^2D_{2\frac{1}{2}}$ —	17	
2	907.81	110154.7		$\{^2D_{1\frac{1}{2}}$ — $\{^2P_{1\frac{1}{2}}$ —	17 $4s^24p^2(^3P)6s$	 $^4P_{\frac{1}{2}}$
8	906.63	110298.1		$^4S_{1\frac{1}{2}}$ —	11	
0	894.99	111732.7		$^2P_{1\frac{1}{2}}$ —	$4s^24p^2(^3P)6s$	$^4P_{1\frac{1}{2}}$
6	890.59	112285.4		$^2P_{1\frac{1}{2}}$ —	25	
5	887.48	112678.6		$^2D_{2\frac{1}{2}}$ —	19	
0	883.77	113151.6		$^2P_{\frac{1}{2}}$ —	25	
6	882.61	113300.8		$^2D_{1\frac{1}{2}}$ —	19	
0	872.27	114643.5		$^2P_{1\frac{1}{2}}$ —	26	
4	871.83	114701.0	$4s^24p^3$	$^2D_{1\frac{1}{2}}$ —	20	
2	871.02	114808.1		$^2P_{1\frac{1}{2}}$ —	27	
3	867.83	115229.5		$^2D_{2\frac{1}{2}}$ —	22	
0	865.90	115486.9		$^2P_{\frac{1}{2}}$ —	$4s^24p^2(^3P)6s$	$^2P_{\frac{1}{2}}$
00	864.59	115661.8		$^2P_{\frac{1}{2}}$ —	27	
1	855.81	116848.0		$^2P_{1\frac{1}{2}}$ —	29	
0	854.46	117033.0		$^2P_{1\frac{1}{2}}$ —	30	
0	854.35	117048.7		$^2P_{1\frac{1}{2}}$ —	$4s^24p^2(^3P)6s$	$^2P_{1\frac{1}{2}}$
4	849.60	117703.0		$^2P_{\frac{1}{2}}$ —	29	
4	844.00	118483.4		$^2P_{1\frac{1}{2}}$ —	34	
0	838.43	119271.3		$^2P_{\frac{1}{2}}$ —	33	
9	832.74	120085.4		$^2D_{2\frac{1}{2}}$ —	24	
8	828.48	120702.8		$^2D_{1\frac{1}{2}}$ —	24	
3	820.68	121850.6		$^2D_{2\frac{1}{2}}$ —	$4s^24p^2(^3P)6s$	$^4P_{1\frac{1}{2}}$
3	816.99	122401.1		$^2D_{2\frac{1}{2}}$ —	25	
00	814.86	122720.4		$^4S_{1\frac{1}{2}}$ —	16	
3	801.59	124742.5		$^2D_{2\frac{1}{2}}$ —	26	
1	800.54	124915.3		$^2D_{2\frac{1}{2}}$ —	27	
3	797.69	125362.3		$^2D_{1\frac{1}{2}}$ —	$4s^24p^2(^3P)6s$	$^2P_{\frac{1}{2}}$
4	786.49	127146.7		$^2D_{2\frac{1}{2}}$ —	30	
1	783.84	127577.1		$^2D_{1\frac{1}{2}}$ —	29	
0	782.66	127769.2		$^2D_{1\frac{1}{2}}$ —	$4s^24p^2(^3P)6s$	$^2P_{1\frac{1}{2}}$
00	782.09	127862.5		$^4S_{1\frac{1}{2}}$ —	20	
0	775.09	129016.5		$^4S_{1\frac{1}{2}}$ —	22	
2	774.43	129127.2	$4s^24p^3$	$^2D_{1\frac{1}{2}}$ —	33	
0	746.02	134045.5		$^4S_{1\frac{1}{2}}$ —	$4s^24p^2(^3P)6s$	$^4P_{\frac{1}{2}}$
0	737.30	135630.5		$^4S_{1\frac{1}{2}}$ —		$^4P_{1\frac{1}{2}}$
0	726.41	137663.3		$^4S_{1\frac{1}{2}}$ —		$^4P_{2\frac{1}{2}}$
00	721.88	138527.2		$^4S_{1\frac{1}{2}}$ —		$^2P_{\frac{1}{2}}$
0	710.47	140751.9		$^4S_{1\frac{1}{2}}$ —	29	
7	709.57	140930.4		$^4S_{1\frac{1}{2}}$ —	30	
3	697.65	143338.3		$^4S_{1\frac{1}{2}}$ —	35	
1	694.83	143920.0		$^4S_{1\frac{1}{2}}$ —	36	

Rao.[4] In addition, the $4s^24p^2(^3P)5p\ ^2S_{\frac{1}{2}}$ and $4s^24p^2(^1D)5p\ ^2D_{2\frac{1}{2}}$ and $^2P_{1\frac{1}{2}}$ terms have been found and identified. Also the terms a and c in the notation of Krishnamurty and Rao have been identified as $4s^24p^2(^3P)5p\ ^2P_{\frac{1}{2}}$ and $4s^24p^2(^1D)5p\ ^2D_{1\frac{1}{2}}$, respectively, and their $4s^24p^2(^3P)5p\ ^2P_{\frac{1}{2}}$ term has been changed to $4s^24p^2(^3P)5p\ ^2P_{1\frac{1}{2}}$.

A few changes have also been made in the assignment of higher term values. The $4s^24p^2(^3P)5d\ ^4P_{1\frac{1}{2}}$ and $^4F_{1\frac{1}{2}}$ terms have been reclassified as $4s^24p^2(^3P)6s\ ^2P_{1\frac{1}{2}}$ and $^2P_{\frac{1}{2}}$, respectively. This change has been made because certain transitions indicate that the latter term has a J value of $\frac{1}{2}$ and because this assignment gives the expected value for the doublet interval mentioned. The other assignments of Krishnamurty and Rao with respect to the $4s^24p^25d$ terms are questionable although the assignments of the ^4F terms with the above correction noted seem to be justified. However it is thought that their assignment of the $4s^24p^24d\ ^4F$ terms is incorrect as most of the lines used by them in determining those terms have been found both reasonable and necessary for other important transitions. It is also doubtful whether the α, b, and $4s^24p^25d\ ^4D_{3\frac{1}{2}}$ terms given by Krishnamurty and Rao are real as some of the lines used in their assignment are regarded as representing essentially other transitions as here reported, and at least one line, λ1259.5, probably belongs to sulphur instead of selenium.

Several new terms have been found in the course of this research which probably are associated with the $4s^24p^24d$, $4s^24p^25d$, and $4s^24p^25p$ configurations. These terms have only been assigned J values and numbers for notation purposes as it is impossible at present, and of somewhat questionable significance, to assign definite L and S values to them.

The analysis of Se II is rendered very difficult, because for the higher states, the multiplets from different configurations overlap considerably. The multiplets as a whole come closer together and the intervals within each multiplet become larger than those for the corresponding spectra of O II and S II. This is due to a breakdown in the Russell-Saunders coupling. As Bacher and Goudsmit[5] point out, when the Russell-Saunders coupling breaks down, it becomes impossible to distinguish between the different multiplets of the same configuration without ambiguity, and the use of symbols, except for the J value, is meaningless and oftentimes misleading.

The series limits were approximately determined by the Rydberg formula from the various members of the multiplets $4s^24p^25s\ ^4P$ and ^2P and $4s^24p^26s\ ^4P$ and ^2P. From these limits, an average value of 173,557 cm^{-1} was calculated as the interval between the ground states, $4s^24p^3\ ^4S_{1\frac{1}{2}}$, of Se II and, $4s^24p^2\ ^3P_0$, of Se III, which corresponds to an ionization potential of 21.3 volts. This is slightly lower than the value given by Krishnamurty and Rao[4] which is evidently based on an average of series limits calculated from the $4s^24p^25s$ and $4s^24p^26s\ ^4P$ terms and the $4s^24p^24d$ and $4s^24p^25d\ ^4F$ terms. Their value would be expected to be somewhat in error due to the fact that the assignment of the $4s^24p^24d\ ^4F$ term is probably incorrect.

Terms and Classified Lines

All of the terms thus far established are listed in Table I with the notations indicated as determined by the author. As the series limits are not very accurately known, all values are given relative to the ground state $4s^24p^3\ ^4S_{1\frac{1}{2}}$. The electron configuration, where known, is given in the first column, the term symbol, or a number, in the second column, the J value in column 3, and the relative term value in the last column. A (K & R) is placed after the terms which are here found to be in complete agreement with those given by Krishnamurty and Rao.[4]

All of the classified lines are collected in Table II. Relative intensities, based on a scale of 10 for a maximum, are given in column 1. Column 2 contains the wave-length measurements, and the wave numbers, all corrected to vacuum, are given in column 3. The last column contains the line classifications.

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[5] Bacher and Goudsmit, *Atomic Energy States* (1933), p. 11.