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Spectrum of doubly ionized neon

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The spectrum of doubly ionized neon (Ne III), emitted from hollow-cathode and θ-pinch discharges, has been photographically recorded in the 430–12 000-Å wavelength range. The number of classified lines has been increased from about 100 to about 750, and the number of experimentally established energy levels from 60 to 230. The level scheme comprises levels in the $2s^22p^4$, $2s2p^5$, $2p^6$, $2s^22p^33s$-$8s$, $3p$-$5p$, $3d$-$5d$, $4f$-$8f$, and $5g$-$7g$ configurations. The experimentally observed level distributions are compared with the results of Hartree-Fock calculations and least-squares fits.

I. INTRODUCTION

The spectrum of doubly ionized neon Ne III was analyzed in the early 1930s by de Bruin,[1] von Keussler,[2] and Boyce.[3] The results of their work are summarized in atomic energy levels (AEL).[4] On the one hand, very little has been added to the analysis since then. On the other hand, a large number of reports dealing with various aspects of the Ne III spectrum have appeared through the years. Particularly around 1970, i.e., during the early days of beam-foil spectroscopy, reports on the observation of unclassified Ne III lines were frequent.[5–9] Even some of the laser lines observed at about the same time[10–12] and ascribed to Ne III remained unclassified. In this context, it should be pointed out that a large number of the unidentified lines ascribed to Ne III in the early work of Bloch, Bloch, and Déjardin[13] has been classified in the present work. Among these are, for instance, $4d$-$6f$ and $4p$-$5s$ transitions. More recently, two significant contributions to the analysis of the Ne III spectrum have appeared. In 1978 Beyer *et al.*[14] observed the $2p^6$-$2s2p^5$ transition in a study of ion-impact ionization of neon. The identification was later confirmed by Agentoft *et al.*[15] in collision spectroscopy and optical emission spectroscopy experiments. In 1985 Hansen *et al.*[16] reported all levels in the $2s^22p^3(3d+4s)$ configurations in connection with an investigation of the role of four-body effects in atomic spectra. The experimental identifications were based on the same observational material that has been used in the present study.

In the present study the number of classified lines has been increased from about 100 to about 750. At the same time, the number of experimentally established energy levels has been increased from about 60 to about 230 and comprises levels in the $2s^22p^4$, $2s2p^5$, $2p^6$, $2s^22p^33s$-$8s$, $3p$-$5p$, $3d$-$5d$, $4f$-$8f$, and $5g$-$7g$ configurations (Fig. 1). The observed level structure has been theoretically interpreted by Hartree-Fock (HF) calculations and parametric fits. The fit to the even levels included the configurations

$$2s^22p^4+2p^6+\{2s^22p^3+2p^5\}(3p+4p+5p+4f+5f)+2s2p^43s\ ,$$

while the fit to the odd levels included the configurations

$$2s2p^5+\{2s^22p^3+2p^5\}(3s+4s+5s+3d+4d+5d)+2s2p^43p\ .$$

The relative positions of the observed levels in the even and odd configurations are shown in greater detail in Figs. 2 and 3.

II. EXPERIMENTAL METHODS

Our first observations of the Ne III spectrum were made some twenty years ago in connection with an investigation of the second spectrum of neon. The light source used was a water-cooled, direct-current, hollow-cathode discharge tube.[17] The source was designed to carry high-current densities. When run at low pressures it emitted a fairly well developed Ne III spectrum. In fact, almost all known Ne III lines[1,3] were observed and could be measured with high accuracy. However, it turned out to be difficult to extend the analysis on the basis of these observations. The excitation energy in the direct-current hollow-cathode discharge was insufficient for an unambiguous ionic assignment of the observed lines. It was also clear that lines from weaker transitions or from transitions between high-lying levels would not be observable on the hollow-cathode exposures.

More recently, we have recorded the neon spectrum emitted from a θ-pinch discharge. This source[18] consists of a quartz tube, surrounded by a current loop and viewed end-on. Seven low-inductance capacitors (1.1 μF), connected in parallel and charged to 5–15 kV are discharged through the loop. The peak current at 10 kV is about 100 kA. The excitation energy in the source can be increased by lowering the gas pressure in the discharge tube and/or raising the discharge voltage. By comparing spectra recorded at different excitation energies, assignments of the lines to stages of ionization can be made.

The neon spectrum from the hollow-cathode source has been observed in the 430- to 12 000-Å range, while the θ-pinch exposures cover the wavelength range 430 to 5000 Å. In practice, the short-wavelength limit of the θ-pinch exposures is around 650 Å and is set by reabsorption of the emitted light in the cooler parts of the discharge tube.

In the 2000- to 12 000-Å range spectra were recorded on a 3.4-m Jarrell-Ash and a 3.5-m Präzisionsmessgeräte RSV spectrograph, both having a plane grating in the Ebert mounting. The spectra were observed in the first to the fourth diffraction orders with plate factors varying from 5.0 to 1.2 Å/mm. Below 2500 Å the spectrum was recorded on a 3-m normal-incidence vacuum spectrograph equipped with a concave grating and having a plate factor of 2.77 Å/mm in the first diffraction order.

The procedure for determining wavelengths from the recordings with the hollow-cathode light source has been discussed in detail elsewhere.[17] The θ-pinch spectrograms were calibrated by use of internal standards, mainly Ne II lines, but also such Ne III lines for which the wavelengths had already been accurately determined from the hollow-cathode spectrograms.

Generally speaking, the hollow-cathode exposures have been used for determining accurate wavelengths for high- and medium-intensity lines, while the θ-pinch exposures were of great value when looking for weaker lines and in the determination of the ionic origin of the observed lines. The lines in the θ-pinch spectrograms are wider and less well defined than in the hollow-cathode exposures and the attainable wavelength accuracy is correspondingly lower. The uncertainty in the wavelength determinations is a few thousandths of an angstrom for lines measured on the hollow-cathode spectrograms and a few hundredths of an angstrom for lines measured on the θ-pinch exposures.

Table I contains all identified Ne III lines. The intensity numbers in the first column are on a uniform scale only within limited wavelength ranges and are rough visual estimates of the photographic density of the lines.

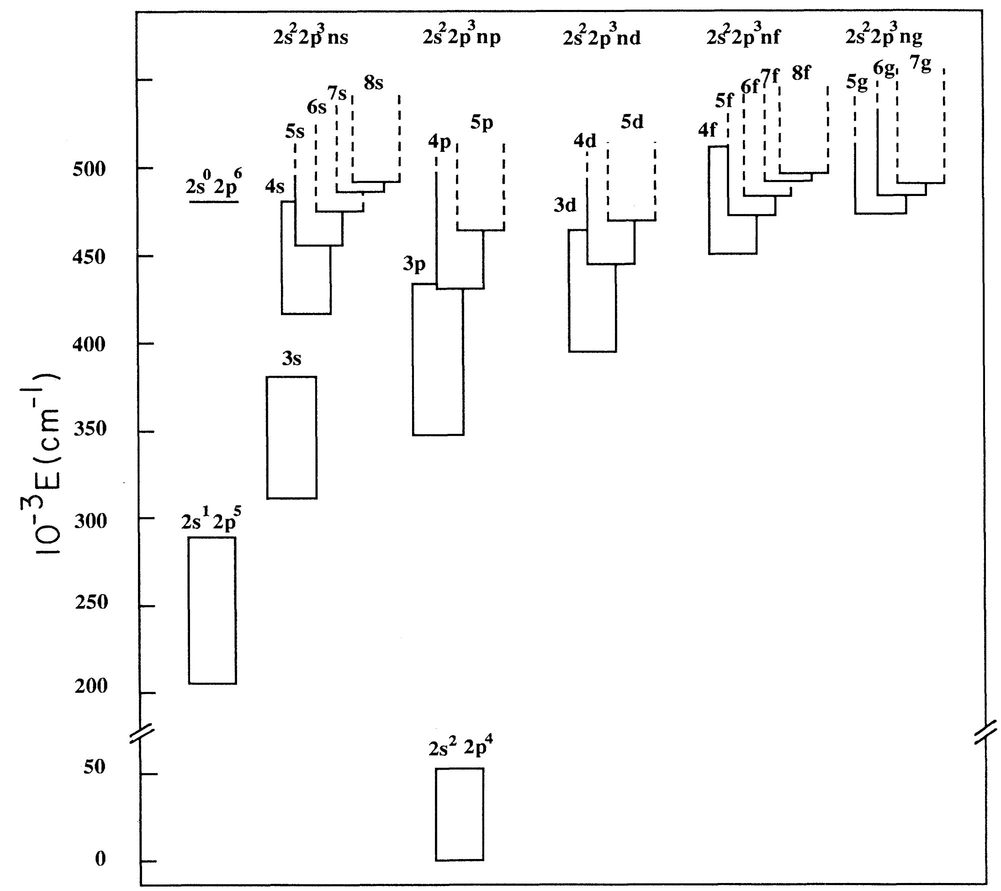

FIG. 1. Gross structure of the experimentally established Ne III level system. Dashed lines indicate that not all levels of the configuration have been observed.

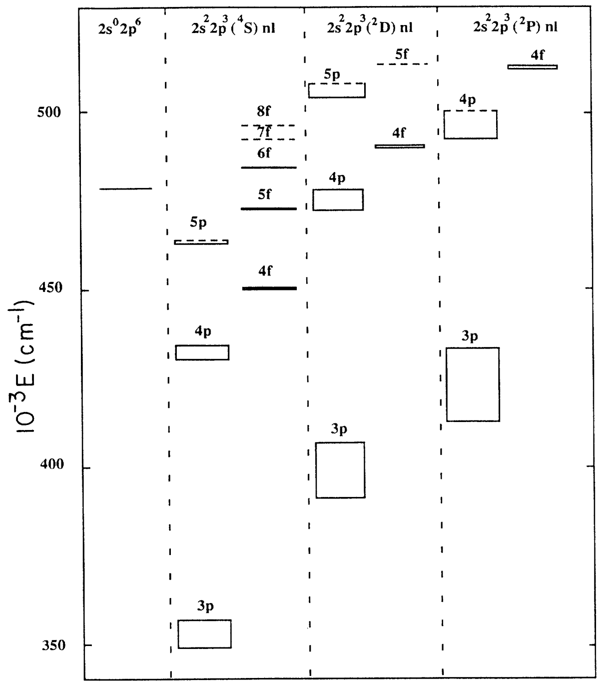

FIG. 2. Gross distribution of the observed even energy levels of Ne III (ground-state configuration excluded). Dashed lines indicate that not all levels of the group have been experimentally established.

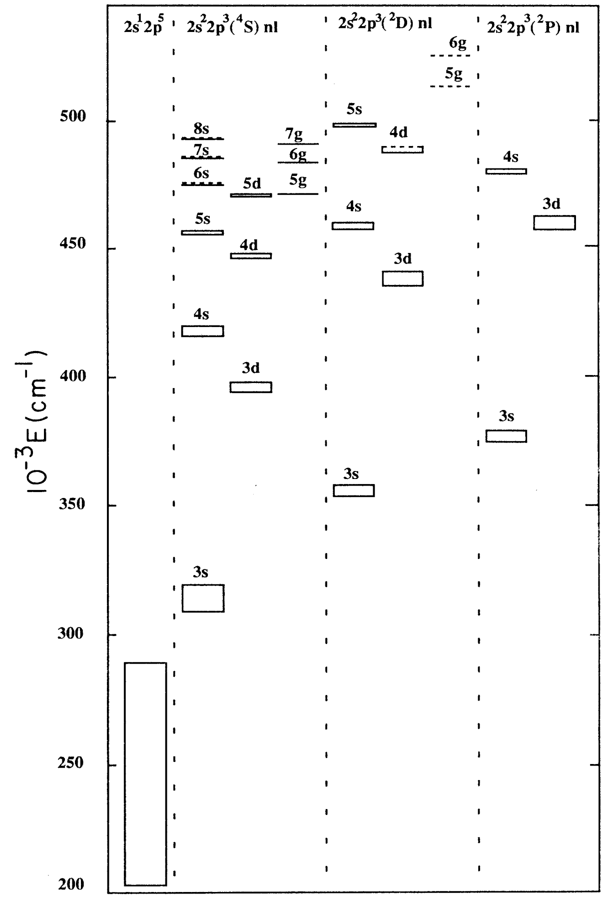

FIG. 3. Gross distribution of the observed odd energy levels of Ne III. Dashed lines indicate that not all levels of the group have been experimentally established.

As has previously been shown,[15] the relative intensities of the lines may be different when excited in the hollow-cathode discharge and in the θ-pinch discharge.

The experimentally established Ne III energy levels are given in Tables II and III. The level values were determined by a least-squares procedure using the wave numbers of the observed lines as input. In the fit the wave numbers were weighted according to their estimated accuracy. This means that the uncertainty in the relative values of the low-lying excited levels is of the order of 0.1 cm^{-1}. For the higher-lying levels, in particular for some $2s^22p^3nf$ and ng levels, the uncertainty in the values might amount to several tenths of a cm^{-1}. The excited level system is connected to the levels of the ground configuration via $2s^22p^4$-$2s2p^5$ and $2s2p^5$-$2s^22p^33p$ combinations. On an absolute scale, i.e., relative to the ground state, the uncertainty in the level values in the excited configurations is less than 1 cm^{-1}.

All $2s^22p^4$-$2s^22p^3nl$ combinations will appear below 400 Å, i.e., in a wavelength range that is not accessible with the spectrographs used [the $2s^22p^4\,^3P_2-2s^22p^3(^4S)3s\,^3S_1$ transition at 313.059 Å has been observed in the second diffraction order of the normal-incidence spectrograph]. However, by using the level values of Tables II and III and the Ritz combination principle the wavelengths of the $2s^22p^4$-$2s^22p^3nl$ transitions can be calculated with an uncertainty of less than 0.001 Å.

The numbers in parentheses following the level values in Tables II and III are a measure of the purities of the states in the LS-coupling scheme (the purity of a state is defined as the square of the eigenvector component giving name to the particular state, expressed in percent and determined in calculations to be described later). Most states are reasonably well described by LS designations.

It has not been possible to locate the quintet-level system relative to the triplet and singlet systems via experimentally observed lines. The relative position of the quintet system has been determined by requiring that the $(^4S)ng\,^5G$ and ^3G terms ($n=5$–7) coincide. The resulting uncertainty in the absolute position of the quintet system is estimated to be small, of the order of 1 or 2 cm^{-1}.

III. COMPARISON WITH PREVIOUS RESULTS

All but one of the Ne III lines reported by de Bruin[1] have been confirmed in the present study. In addition, 34 of the 45 unclassified lines assigned to the spark spectrum of neon by de Bruin have now been identified as Ne III transitions. Five of the remaining lines have previously been ascribed to Ne IV (Ref. 19) and two to Ne II.[17]

Although the ionic assignments made by de Bruin have been confirmed, the classifications have been changed for

TABLE I. Classified lines of Ne III. For lines with $\sigma < 50\,000$ cm^{-1} the wavelength in air is given. The intensity figures are visual estimates of the photographic density of the lines. The fourth column gives the difference between the observed wave number and the wave number calculated from the level values in Tables II and III by the Ritz combination principle. A $\sigma_{obs} - \sigma_{calc}$ value in parentheses indicates that the level value of one of the levels involved in the transition has been determined from this line alone.

Intensity[a]	λ (Å)	σ (cm^{-1}) σ_{obs}	$\sigma_{obs}-\sigma_{calc}$	Classification
1	313.059	319 428.6	−1.1	$2s^22p^4\,{}^3P_2\text{–}({}^4S)3s\,{}^3S_1$
9	379.308	263 638.0	(0.0)	$2s^22p^4\,{}^1D_2\text{–}2s2p^5\,{}^1P_1$
5	427.846	233 729.2	(0.0)	$2s^22p^4\,{}^1S_0\text{–}2s2p^5\,{}^1P_1$
9	488.108	204 872.6	0.1	$2s^22p^4\,{}^3P_2\text{–}2s2p^5\,{}^3P_1$
8	488.874	204 551.7	0.1	$2s^22p^4\,{}^3P_1\text{–}2s2p^5\,{}^3P_0$
12	489.505	204 288.2	−0.0	$2s^22p^4\,{}^3P_2\text{–}2s2p^5\,{}^3P_2$
7	489.646	204 229.0	−0.2	$2s^22p^4\,{}^3P_1\text{–}2s2p^5\,{}^3P_1$
8	490.314	203 951.0	0.0	$2s^22p^4\,{}^3P_0\text{–}2s2p^5\,{}^3P_1$
9	491.051	203 644.8	−0.1	$2s^22p^4\,{}^3P_1\text{–}2s2p^5\,{}^3P_2$
3	513.410	194 776.1	−2.7	$2s2p^5\,{}^3P_2\text{–}({}^2D)3p\,{}^3P_1$
8	513.657	194 682.4	−0.4	$2s2p^5\,{}^3P_2\text{–}({}^2D)3p\,{}^3P_2$
2	514.830	194 238.8	1.6	$2s2p^5\,{}^3P_1\text{–}({}^2D)3p\,{}^3P_0$
4	515.202	194 098.6	0.1	$2s2p^5\,{}^3P_1\text{–}({}^2D)3p\,{}^3P_2$
2	515.796	193 875.0	2.9	$2s2p^5\,{}^3P_0\text{–}({}^2D)3p\,{}^3P_1$
7	528.131	189 347.0	0.0	$2s2p^5\,{}^1P_1\text{–}2p^6\,{}^1S_0$
2	541.025	184 834.4	−0.6	$2s2p^5\,{}^3P_2\text{–}({}^2D)3p\,{}^3D_3$
2 *h b*	542.951	184 178.8	−2.6	$2s2p^5\,{}^3P_1\text{–}({}^2D)3p\,{}^3D_2$
2 *h b*	542.951	184 178.8	8.4	$2s2p^5\,{}^3P_1\text{–}({}^2D)3p\,{}^3D_1$
3	655.855	152 472.7	−0.3	$2s2p^5\,{}^3P_2\text{–}({}^4S)3p\,{}^3P_2$
1 *a* Ne III	655.907	152 460.7	−1.3	$2s2p^5\,{}^3P_2\text{–}({}^4S)3p\,{}^3P_1$
2 *b*	658.373	151 889.6	0.9	$2s2p^5\,{}^3P_1\text{–}({}^4S)3p\,{}^3P_2$
2 *b*	658.373	151 889.6	1.8	$2s2p^5\,{}^3P_1\text{–}({}^4S)3p\,{}^3P_0$
9	696.705	143 532.7	−0.9	$2s2p^5\,{}^1P_1\text{–}({}^2P)3p\,{}^1S_0$
9	764.725	130 766.0	−0.2	$2s2p^5\,{}^1P_1\text{–}({}^2P)3p\,{}^1D_2$
8	801.602	124 750.1	−0.7	$2s2p^5\,{}^1P_1\text{–}({}^2P)3p\,{}^1P_1$
1	820.991	121 804.0	(0.0)	$({}^4S)3p\,{}^5P_1\text{–}({}^4S)5d\,{}^5D_2$
3	821.205	121 772.3	(0.0)	$({}^4S)3p\,{}^5P_2\text{–}({}^4S)5d\,{}^5D_3$
5	821.570	121 718.2	0.7	$({}^4S)3p\,{}^5P_3\text{–}({}^4S)5d\,{}^5D_4$
0.5	828.290	120 730.7	0.6	$({}^2D)3s\,{}^3D_3\text{–}({}^2D)4p\,{}^3P_2$
12	831.844	120 214.8	0.2	$({}^4S)3s\,{}^5S_2\text{–}({}^4S)4p\,{}^5P_3$
9	831.963	120 197.6	−0.0	$({}^4S)3s\,{}^5S_2\text{–}({}^4S)4p\,{}^5P_2$
8	832.041	120 186.4	−0.4	$({}^4S)3s\,{}^5S_2\text{–}({}^4S)4p\,{}^5P_1$
6	841.186	118 879.8	0.4	$({}^2D)3s\,{}^3D_3\text{–}({}^2D)4p\,{}^3F_4$
3	841.344	118 857.4	0.4	$({}^2D)3s\,{}^3D_2\text{–}({}^2D)4p\,{}^3F_3$
0.5	841.429	118 845.4	0.5	$({}^2D)3s\,{}^3D_1\text{–}({}^2D)4p\,{}^3F_2$
0.5	844.135	118 464.4	−0.3	$({}^2P)3s\,{}^3P_1\text{–}({}^2P)4p\,{}^3D_2$
0.5	844.186	118 457.3	0.1	$({}^2P)3s\,{}^3P_0\text{–}({}^2P)4p\,{}^3D_1$
2	844.224	118 452.0	0.3	$({}^2P)3s\,{}^3P_2\text{–}({}^2P)4p\,{}^3D_3$
6	846.377	118 150.7	0.6	$({}^2D)3s\,{}^3D_3\text{–}({}^2D)4p\,{}^3D_3$
3	846.659	118 111.3	0.4	$({}^2D)3s\,{}^3D_2\text{–}({}^2D)4p\,{}^3D_2$
0.5	847.091	118 051.1	0.7	$({}^2D)3s\,{}^3D_1\text{–}({}^2D)4p\,{}^3D_1$
0	849.407	117 729.2	0.6	$({}^2P)3s\,{}^3P_2\text{–}({}^2P)4p\,{}^3S_1$
9	855.768	116 854.1	0.0	$2s2p^5\,{}^1P_1\text{–}({}^2D)3p\,{}^1D_2$
6	865.903	115 486.4	0.6	$({}^2P)3s\,{}^1P_1\text{–}({}^2P)4p\,{}^1D_2$
0	870.119	114 926.8	−0.9	$({}^4S)3s\,{}^3S_1\text{–}({}^4S)4p\,{}^3P_0$
1	870.235	114 911.5	−0.8	$({}^4S)3s\,{}^3S_1\text{–}({}^4S)4p\,{}^3P_1$
2	870.367	114 894.1	−0.4	$({}^4S)3s\,{}^3S_1\text{–}({}^4S)4p\,{}^3P_2$
4	873.023	114 544.5	−0.3	$({}^2D)3s\,{}^1D_2\text{–}({}^2D)4p\,{}^1F_3$
1	873.904	114 429.0	(0.0)	$({}^4S)3p\,{}^3P_1\text{–}({}^4S)5d\,{}^3D_2$
3	873.977	114 419.5	1.2	$({}^4S)3p\,{}^3P_2\text{–}({}^4S)5d\,{}^3D_3$
2	881.393	113 456.8	0.5	$({}^2D)3s\,{}^1D_2\text{–}({}^2D)4p\,{}^1P_1$
0	882.362	113 332.2	−0.1	$({}^2P)3s\,{}^1P_1\text{–}({}^2P)4p\,{}^1P_1$
0	917.715	108 966.3	1.0	$({}^2D)3p\,{}^3D_2\text{–}({}^2D)5s\,{}^3D_2$
2	918.534	108 869.2	−0.4	$({}^2D)3p\,{}^3D_3\text{–}({}^2D)5s\,{}^3D_3$

TABLE I. (*Continued*).

Intensity[a]	λ (Å)	σ (cm^{-1}) σ_{obs}	$\sigma_{obs}-\sigma_{calc}$	Classification
5	925.038	108 103.6	4.0	$(^4S)3p\ ^5P_1-(^4S)5s\ ^5S_2$
8	925.306	108 072.4	0.8	$(^4S)3p\ ^5P_2-(^4S)5s\ ^5S_2$
10	925.760	108 019.4	0.8	$(^4S)3p\ ^5P_3-(^4S)5s\ ^5S_2$
0	937.748	106 638.5	−1.1	$(^2D)3p\ ^3F_2-(^2D)5s\ ^3D_1$
1	938.043	106 604.9	−0.2	$(^2D)3p\ ^3F_3-(^2D)5s\ ^3D_2$
1	938.454	106 558.2	−0.0	$(^2D)3p\ ^3F_4-(^2D)5s\ ^3D_3$
2	944.672	105 856.9	0.0	$(^2D)3p\ ^1F_3-(^2D)5s\ ^1D_2$
2 *w*	986.448	101 373.8	−0.5	$(^4S)3d\ ^5D-(^4S)8f\ ^5F$
m N III		101 030		$(^4S)3p\ ^3P_1-(^4S)5s\ ^3S_1$
m N III		101 020		$(^4S)3p\ ^3P_0-(^4S)5s\ ^3S_1$
m N III		101 019		$(^4S)3p\ ^3P_2-(^4S)5s\ ^3S_1$
1	1014.512	98 569.54	0.00	$(^2D)3p\ ^3D_2-(^2D)4d\ ^3F_3$
1	1015.145	98 508.05	0.00	$(^2D)3p\ ^3D_3-(^2D)4d\ ^3F_4$
6	1015.392	98 484.18	0.50	$2s2p^5\ ^1P_1-(^2D)3p\ ^1P_1$
7	1020.602	97 981.34	1.78	$(^4S)3p\ ^5P_1-(^4S)4d\ ^5D_2$
8	1020.944	97 948.55	−0.63	$(^4S)3p\ ^5P_2-(^4S)4d\ ^5D_3$
9	1021.511	97 894.23	(0.00)	$(^4S)3p\ ^5P_3-(^4S)4d\ ^5D_4$
7	1027.047	97 366.57	−0.26	$(^4S)3s\ ^3S_1-(^2P)3p\ ^3P_2$
5	1027.521	97 321.59	−0.21	$(^4S)3s\ ^3S_1-(^2P)3p\ ^3P_1$
2	1027.832	97 292.21	0.00	$(^4S)3s\ ^3S_1-(^2P)3p\ ^3P_0$
4 *ul*	1034.886	96 628.99	0.17	$(^4S)3d\ ^5D-(^4S)7f\ ^5F$
1	1035.695	96 553.48	0.10	$(^2D)3p\ ^3F_2-(^2D)4d\ ^3G_3$
m N IV		96 514		$(^2D)3p\ ^3F_3-(^2D)4d\ ^3G_4$
0	1036.574	96 471.64	−0.04	$(^2D)3p\ ^3F_4-(^2D)4d\ ^3G_5$
2	1049.933	95 244.17	−0.11	$(^2D)3p\ ^1F_3-(^2D)4d\ ^1G_4$
0	1073.750	93 131.54	0.40	$(^4S)3d\ ^3D_3-(^4S)7f\ ^3F_4$
1	1083.130	92 325.00	−1.19	$(^2D)3p\ ^1D_2-(^2D)5s\ ^1D_2$
3	1093.030	91 488.80	−0.13	$(^4S)3p\ ^3P_2-(^4S)4d\ ^3D_3$
2	1093.106	91 482.41	0.40	$(^4S)3p\ ^3P_1-(^4S)4d\ ^3D_2$
8 *ul*	1119.601	89 317.50	1.01	$(^4S)3d\ ^5D-(^4S)6f\ ^5F$
0.5 *a* Ne III	1164.972	85 838.95	−2.00	$(^4S)3d\ ^3D_1-(^4S)6f\ ^3F_2$
3	1165.014	85 835.91	−0.21	$(^4S)3d\ ^3D_2-(^4S)6f\ ^3F_3$
5	1165.181	85 823.58	0.15	$(^4S)3d\ ^3D_3-(^4S)6f\ ^3F_4$
4	1200.489	83 299.38	−0.32	$(^4S)3p\ ^3P_1-(^2D)3d\ ^3S_1$
5	1200.638	83 289.02	0.28	$(^4S)3p\ ^3P_2-(^2D)3d\ ^3S_1$
3	1204.883	82 995.59	−0.26	$(^4S)3p\ ^3P_1-(^2D)3d\ ^3P_0$
6 *b*	1205.811	82 931.76	−0.19	$(^4S)3p\ ^3P_2-(^2D)3d\ ^3P_1$
6 *b*	1205.811	82 931.76	−1.06	$(^4S)3p\ ^3P_0-(^2D)3d\ ^3P_1$
5	1207.431	82 820.46	−0.72	$(^4S)3p\ ^3P_1-(^2D)3d\ ^3P_2$
8	1207.575	82 810.62	0.40	$(^4S)3p\ ^3P_2-(^2D)3d\ ^3P_2$
9	1231.645	81 192.23	−0.01	$(^2D)3s\ ^3D_3-(^4S)4p\ ^3P_2$
7 *a* Ne III	1231.818	81 180.83	0.16	$(^2D)3s\ ^3D_2-(^4S)4p\ ^3P_1$
6 *a* Ne III	1231.866	81 177.66	1.74	$(^2D)3s\ ^3D_1-(^4S)4p\ ^3P_0$
6	1232.101	81 162.20	−0.63	$(^2D)3s\ ^3D_2-(^4S)4p\ ^3P_2$
1 *b* O III	1236.728	80 858.51	−0.38	$(^2D)3p\ ^3P_2-(^2P)4s\ ^3P_2$
0.5	1248.917	80 069.38	0.22	$(^4S)3p\ ^3P_2-(^2D)3d\ ^3D_3$
12	1255.022	79 679.89	−0.12	$(^4S)3s\ ^3S_1-(^2D)3p\ ^3P_0$
18	1255.683	79 637.92	0.55	$(^4S)3s\ ^3S_1-(^2D)3p\ ^3P_1$
25	1257.201	79 541.78	0.43	$(^4S)3s\ ^3S_1-(^2D)3p\ ^3P_2$
10	1288.004	77 639.51	−0.40	$(^2D)3d\ ^3F_3-(^2D)5f\ ^3G_4$
10	1289.569	77 545.30	−0.11	$(^2D)3d\ ^3F_4-(^2D)5f\ ^3G_5$
25 *ul*	1295.572	77 185.96	−0.08	$(^4S)3d\ ^5D-(^4S)5f\ ^5F$
9	1305.091	76 623.02	0.41	$(^2D)3d\ ^3G_4-(^2D)5f\ ^1H_5$
6	1305.265	76 612.77	0.28	$(^2D)3d\ ^3G_3-(^2D)5f\ ^1G_4$
7	1305.374	76 606.38	0.12	$(^2D)3d\ ^3G_5-(^2D)5f\ ^3G_5$
15	1305.589	76 593.80	0.63	$(^2D)3d\ ^3G_5-(^2D)5f\ ^3H_6$
12 *db b* O I	1306.029	76 568.00	2.71	$(^2D)3d\ ^3G_4-(^2D)5f\ ^3H_5$
10	1306.130	76 562.05	−0.07	$(^2D)3d\ ^3G_3-(^2D)5f\ ^3H_4$

TABLE I. (*Continued*).

Intensity[a]	λ (Å)	σ (cm^{-1}) σ_{obs}	$\sigma_{obs}-\sigma_{calc}$	Classification
5	1307.890	76 459.03	0.00	$(^2D)3d\ ^3F_2$–$(^2P)4f\ ^3G_3$
4	1308.239	76 438.66	−0.04	$(^2D)3d\ ^1G_4$–$(^2D)5f\ ^1G_4$
9	1308.468	76 425.27	−0.16	$(^2D)3d\ ^1G_4$–$(^2D)5f\ ^1H_5$
7	1308.716	76 410.77	−0.28	$(^2D)3d\ ^3F_3$–$(^2P)4f\ ^3G_4$
10 *ul*	1309.446	76 368.16	0.05	$(^2D)3d\ ^1G_4$–$(^2D)5f\ ^3H_5$
9	1309.732	76 351.47	−0.19	$(^2D)3d\ ^3F_4$–$(^2P)4f\ ^3G_5$
1	1329.244	75 230.71	−0.54	$(^2D)3d\ ^3D_3$–$(^2P)4f\ ^3F_4$
2	1334.130	74 955.22	−0.76	$(^2D)3p\ ^1D_2$–$(^2P)4s\ ^1P_1$
4	1354.112	73 849.11	−0.68	$(^4S)3d\ ^3D_1$–$(^2D)4p\ ^3F_2$
6	1354.325	73 837.50	0.36	$(^4S)3d\ ^3D_2$–$(^2D)4p\ ^3F_3$
8	1354.683	73 818.01	0.55	$(^4S)3d\ ^3D_3$–$(^2D)4p\ ^3F_4$
10	1356.624	73 712.41	0.48	$(^4S)3d\ ^3D_1$–$(^4S)5f\ ^3F_2$
12	1356.711	73 707.64	0.28	$(^4S)3d\ ^3D_2$–$(^4S)5f\ ^3F_3$
15	1356.954	73 694.45	0.36	$(^4S)3d\ ^3D_3$–$(^4S)5f\ ^3F_4$
15	1375.024	72 726.00	−0.17	$(^2D)3p\ ^1P_1$–$(^2D)4s\ ^1D_2$
9	1382.677	72 323.45	0.40	$(^2D)3d\ ^1F_3$–$(^2D)5f\ ^1G_4$
3	1383.344	72 288.60	−0.16	$(^2D)3d\ ^1D_2$–$(^2P)4f\ ^1F_3$
5	1383.656	72 272.32	−0.36	$(^2D)3d\ ^1F_3$–$(^2D)5f\ ^3H_4$
2	1395.804	71 643.29	−0.44	$(^2D)3p\ ^3D_1$–$(^2D)4s\ ^1D_2$
9 *b*	1406.820	71 082.29	−0.01	$(^2D)3p\ ^3D_1$–$(^2P)3d\ ^3D_2$
9 *b*	1406.820	71 082.29	−1.05	$(^2D)3p\ ^3D_2$–$(^2P)3d\ ^3D_3$
12 *b*	1407.047	71 070.84	−0.46	$(^2D)3p\ ^3D_2$–$(^2P)3d\ ^3D_2$
12 *b*	1407.047	71 070.84	0.53	$(^2D)3p\ ^3D_1$–$(^2P)3d\ ^3D_1$
7	1407.278	71 059.16	−0.15	$(^2D)3p\ ^3D_2$–$(^2P)3d\ ^3D_1$
15	1408.175	71 013.88	−0.12	$(^2D)3p\ ^3D_3$–$(^2P)3d\ ^3D_3$
8	1408.413	71 001.91	−0.05	$(^2D)3p\ ^3D_3$–$(^2P)3d\ ^3D_2$
m Ne III		69 958		$(^2P)3p\ ^3S_1$–$(^2P)4s\ ^3P_0$
9	1429.434	69 957.78	−0.27	$(^2P)3p\ ^3S_1$–$(^2P)4s\ ^3P_2$
8	1429.511	69 953.98	−0.12	$(^2P)3p\ ^3S_1$–$(^2P)4s\ ^3P_1$
2	1441.188	69 387.20	0.14	$(^2D)3p\ ^3D_2$–$(^2P)3d\ ^3P_2$
3	1442.632	69 317.75	0.03	$(^2D)3p\ ^3D_3$–$(^2P)3d\ ^3P_2$
4	1448.193	69 051.58	0.74	$(^2D)3p\ ^3D_1$–$(^2P)3d\ ^1D_2$
10	1448.438	69 039.87	0.03	$(^2D)3p\ ^3D_2$–$(^2P)3d\ ^1D_2$
2	1449.899	68 970.32	−0.18	$(^2D)3p\ ^3D_3$–$(^2P)3d\ ^1D_2$
9	1450.183	68 956.81	−0.18	$(^2D)3p\ ^3D_1$–$(^2D)4s\ ^3D_1$
7	1450.412	68 945.95	−0.04	$(^2D)3p\ ^3D_2$–$(^2D)4s\ ^3D_1$
8	1450.626	68 935.74	−0.03	$(^2D)3p\ ^3D_2$–$(^2D)4s\ ^3D_3$
6	1450.906	68 922.47	0.03	$(^2D)3p\ ^3D_1$–$(^2D)4s\ ^3D_2$
9	1451.138	68 911.44	0.00	$(^2D)3p\ ^3D_2$–$(^2D)4s\ ^3D_2$
m Ne III		68 912		$(^2P)3p\ ^3D_1$–$(^2P)4s\ ^1P_1$
15	1452.082	68 866.65	0.22	$(^2D)3p\ ^3D_3$–$(^2D)4s\ ^3D_3$
5	1452.586	68 842.73	0.63	$(^2D)3p\ ^3D_3$–$(^2D)4s\ ^3D_2$
5 *a* Ne III	1455.056	68 725.88	−0.75	$(^2D)3p\ ^3F_2$–$(^2P)3d\ ^3D_2$
5 *a* Ne III	1455.122	68 722.76	−0.44	$(^2D)3p\ ^3F_3$–$(^2P)3d\ ^3D_3$
9	1455.291	68 714.79	0.15	$(^2D)3p\ ^3F_2$–$(^2P)3d\ ^3D_1$
10	1455.356	68 711.73	0.56	$(^2D)3p\ ^3F_3$–$(^2P)3d\ ^3D_2$
15	1455.549	68 702.59	−0.05	$(^2D)3p\ ^3F_4$–$(^2P)3d\ ^3D_3$
1	1457.390	68 615.82	0.02	$(^2D)3d\ ^3F_2$–$(^2D)5p\ ^3F_2$
2	1458.564	68 560.57	0.02	$(^2D)3d\ ^3F_3$–$(^2D)5p\ ^3F_3$
25	1459.443	68 519.31	0.09	$(^4S)3p\ ^5P_1$–$(^4S)4s\ ^5S_2$
m Ne III		68 494		$(^2D)3d\ ^3F_4$–$(^2D)5p\ ^3F_4$
30	1460.105	68 488.23	0.13	$(^4S)3p\ ^5P_2$–$(^4S)4s\ ^5S_2$
40	1461.237	68 435.18	0.03	$(^4S)3p\ ^5P_3$–$(^4S)4s\ ^5S_2$
18	1473.051	67 886.33	−0.18	$(^2D)3p\ ^1F_3$–$(^2D)4s\ ^1D_2$
12	1474.905	67 800.98	−0.38	$(^4S)3d\ ^5D_4$–$(^4S)5p\ ^5P_3$
10	1475.086	67 792.64	−0.07	$(^4S)3d\ ^5D_3$–$(^4S)5p\ ^5P_2$
9	1475.161	67 789.21	0.03	$(^4S)3d\ ^5D_2$–$(^4S)5p\ ^5P_2$
8	1475.258	67 784.75	−0.85	$(^4S)3d\ ^5D_2$–$(^4S)5p\ ^5P_1$

TABLE I. (*Continued*).

Intensity[a]	λ (Å)	σ (cm^{-1}) σ_{obs}	$\sigma_{obs}-\sigma_{calc}$	Classification
9	1475.308	67 782.45	−0.10	$(^4S)3d\ ^5D_1$–$(^4S)5p\ ^5P_1$
10	1480.266	67 555.43	−0.05	$(^2D)3d\ ^3G_5$–$(^2D)5p\ ^3F_4$
8	1480.572	67 541.48	−0.00	$(^2D)3d\ ^3G_4$–$(^2D)5p\ ^3F_3$
8	1480.745	67 533.57	−0.00	$(^2D)3d\ ^3G_3$–$(^2D)5p\ ^3F_2$
12	1481.842	67 483.56	0.09	$(^2P)3p\ ^3D_3$–$(^2P)4s\ ^3P_2$
5 *a* Ne III	1482.451	67 455.85	0.00	$(^2P)3p\ ^3D_1$–$(^2P)4s\ ^3P_0$
11	1482.540	67 451.80	−0.22	$(^2P)3p\ ^3D_2$–$(^2P)4s\ ^3P_1$
6	1486.522	67 271.10	0.05	$(^2D)3d\ ^3D_3$–$(^2D)5p\ ^3F_4$
9 *b* 2×Ne I	1487.444	67 229.43	−0.05	$(^2D)3d\ ^3D_2$–$(^2D)5p\ ^3F_2$
10	1491.239	67 058.34	−0.88	$(^2P)3p\ ^1P_1$–$(^2P)4s\ ^1P_1$
6	1499.364	66 694.94	−0.23	$(^2D)3p\ ^3F_2$–$(^2P)3d\ ^1D_2$
9	1499.710	66 679.55	−0.16	$(^2D)3p\ ^3F_3$–$(^2P)3d\ ^1D_2$
9	1501.468	66 601.47	0.15	$(^2D)3p\ ^3F_2$–$(^2D)4s\ ^3D_1$
8	1502.061	66 575.21	−0.43	$(^2D)3p\ ^3F_3$–$(^2D)4s\ ^3D_3$
7	1502.265	66 566.16	−0.62	$(^2D)3p\ ^3F_2$–$(^2D)4s\ ^3D_2$
12	1502.520	66 554.87	−0.21	$(^2D)3p\ ^3F_4$–$(^2D)4s\ ^3D_3$
9	1502.598	66 551.42	0.11	$(^2D)3p\ ^3F_3$–$(^2D)4s\ ^3D_2$
2	1507.996	66 313.19	−0.40	$(^2D)3p\ ^3F_2$–$(^2P)3d\ ^3F_2$
3	1508.343	66 297.92	−0.20	$(^2D)3p\ ^3F_3$–$(^2P)3d\ ^3F_2$
4	1509.417	66 250.75	−0.55	$(^2D)3p\ ^3F_3$–$(^2P)3d\ ^3F_3$
6	1509.882	66 230.34	−0.40	$(^2D)3p\ ^3F_4$–$(^2P)3d\ ^3F_3$
8	1511.480	66 160.30	−0.36	$(^2D)3p\ ^3F_4$–$(^2P)3d\ ^3F_4$
7	1522.441	65 683.97	−0.24	$(^4S)3d\ ^3D_1$–$(^4S)5p\ ^3P_1$
9	1522.537	65 679.84	0.24	$(^4S)3d\ ^3D_2$–$(^4S)5p\ ^3P_1$
6	1522.694	65 673.07	−0.49	$(^4S)3d\ ^3D_2$–$(^4S)5p\ ^3P_2$
10	1522.988	65 660.40	−0.47	$(^4S)3d\ ^3D_3$–$(^4S)5p\ ^3P_2$
10	1531.548	65 293.40	−0.22	$(^2D)3p\ ^1F_3$–$(^2P)3d\ ^1D_2$
9	1534.575	65 164.62	−0.61	$(^2D)3p\ ^1F_3$–$(^2D)4s\ ^3D_2$
2	1540.555	64 911.68	−0.36	$(^2D)3p\ ^1F_3$–$(^2P)3d\ ^3F_2$
7	1570.733	63 664.54	−0.05	$(^2D)3s\ ^3D_3$–$(^2P)3p\ ^3P_2$
4	1572.573	63 590.06	−0.08	$(^2D)3s\ ^3D_2$–$(^2P)3p\ ^3P_1$
0.5	1573.806	63 540.25	−0.20	$(^2D)3s\ ^3D_1$–$(^2P)3p\ ^3P_0$
8	1584.686	63 103.97	−0.12	$(^2P)3p\ ^3P_0$–$(^2P)4s\ ^3P_1$
m Ne III		63 079		$(^2P)3p\ ^3P_1$–$(^2P)4s\ ^3P_0$
20	1585.391	63 075.91	0.38	$(^4S)3p\ ^3P_1$–$(^4S)4s\ ^3S_1$
m Ne III		63 074		$(^2P)3p\ ^3P_1$–$(^2P)4s\ ^3P_1$
25	1585.655	63 065.42	−0.01	$(^4S)3p\ ^3P_0$–$(^4S)4s\ ^3S_1$
25	1585.680	63 064.41	−0.15	$(^4S)3p\ ^3P_2$–$(^4S)4s\ ^3S_1$
10	1586.456	63 033.58	0.17	$(^2P)3p\ ^3P_2$–$(^2P)4s\ ^3P_2$
6	1586.550	63 029.83	0.37	$(^2P)3p\ ^3P_2$–$(^2P)4s\ ^3P_1$
4	1597.535	62 596.42	(0.00)	$(^4S)4p\ ^5P_3$–$(^4S)8s\ ^5S_2$
18	1604.731	62 315.73	0.05	$(^2D)3s\ ^1D_2$–$(^2P)3p\ ^1D_2$
11	1634.890	61 166.18	0.00	$(^2D)3p\ ^3P_2$–$(^2P)3d\ ^3D_3$
5	1635.213	61 154.10	−0.04	$(^2D)3p\ ^3P_2$–$(^2P)3d\ ^3D_2$
9	1637.789	61 057.94	−0.18	$(^2D)3p\ ^3P_1$–$(^2P)3d\ ^3D_2$
m Ne III		61 046		$(^2D)3p\ ^3P_1$–$(^2P)3d\ ^3D_1$
12	1638.166	61 043.87	0.03	$(^2P)3p\ ^1D_2$–$(^2P)4s\ ^1P_1$
6	1639.249	61 003.56	0.07	$(^2D)3p\ ^3P_0$–$(^2P)3d\ ^3D_1$
m 2×O III		59 870		$(^2P)3s\ ^3P_1$–$(^4S)4p\ ^3P_0$
m 2×O III		59 854		$(^2P)3s\ ^3P_1$–$(^4S)4p\ ^3P_1$
m 2×O III		59 854		$(^2P)3s\ ^3P_0$–$(^4S)4p\ ^3P_1$
7	1671.222	59 836.45	0.15	$(^2P)3s\ ^3P_1$–$(^4S)4p\ ^3P_2$
10	1671.411	59 829.68	−0.01	$(^2P)3s\ ^3P_2$–$(^4S)4p\ ^3P_2$
7	1687.991	59 242.03	0.00	$(^2D)3s\ ^3D_3$–$(^2P)3p\ ^3D_2$
15	1688.776	59 214.48	−0.05	$(^2D)3s\ ^3D_3$–$(^2P)3p\ ^3D_3$
m Ne III		59 213		$(^2D)3s\ ^3D_2$–$(^2P)3p\ ^3D_1$
13	1688.822	59 212.88	0.26	$(^2D)3s\ ^3D_2$–$(^2P)3p\ ^3D_2$
10	1689.374	59 193.51	0.31	$(^2D)3s\ ^3D_1$–$(^2P)3p\ ^3D_1$

TABLE I. (*Continued*).

Intensity[a]	λ (Å)	σ (cm^{-1}) σ_{obs}	$\sigma_{obs}-\sigma_{calc}$	Classification
5	1689.611	59 185.22	0.10	$(^2D)3s\ ^3D_2$–$(^2P)3p\ ^3D_3$
7 *b*	1689.803	59 178.48	0.25	$(^2D)3p\ ^3D_1$–$(^4S)4d\ ^3D_1$
7 *b*	1689.803	59 178.48	0.11	$(^2D)3p\ ^3D_2$–$(^4S)4d\ ^3D_2$
8	1691.271	59 127.14	0.23	$(^2D)3p\ ^3D_3$–$(^4S)4d\ ^3D_3$
2	1691.377	59 123.41	0.73	$(^2D)3p\ ^3P_2$–$(^2P)3d\ ^1D_2$
9	1694.155	59 026.49	−0.17	$(^2D)3p\ ^3P_1$–$(^2P)3d\ ^1D_2$
12	1694.387	59 018.38	−0.23	$(^2D)3p\ ^3P_2$–$(^2D)4s\ ^3D_3$
7	1695.081	58 994.22	−0.06	$(^2D)3p\ ^3P_2$–$(^2D)4s\ ^3D_2$
8	1696.846	58 932.85	0.04	$(^2D)3p\ ^3P_1$–$(^2D)4s\ ^3D_1$
11	1697.846	58 898.17	−0.10	$(^2D)3p\ ^3P_1$–$(^2D)4s\ ^3D_2$
10	1698.081	58 889.99	−0.17	$(^2D)3p\ ^3P_0$–$(^2D)4s\ ^3D_1$
15	1776.180	56 300.59	0.29	$(^2D)3s\ ^1D_2$–$(^2P)3p\ ^1P_1$
3	1783.485	56 069.99	(0.00)	$(^4S)4p\ ^5P_3$–$(^4S)7s\ ^5S_2$
1	1799.933	55 557.62	0.65	$(^2P)3d\ ^3F_4$–$(^2D)5f\ ^3G_5$
1	1800.889	55 528.13	−0.15	$(^2P)3d\ ^3F_3$–$(^2D)5f\ ^3G_4$
5 *a* 2×C II	1807.309	55 330.89	0.85	$(^2D)3d\ ^3F_3$–$(^2D)4f\ ^3H_4$
10	1807.605	55 321.83	−0.20	$(^2D)3d\ ^3F_2$–$(^2D)4f\ ^3F_2$
m C II		55 299		$(^2D)3d\ ^3F_2$–$(^2D)4f\ ^3F_3$
m C II		55 297		$(^2D)3d\ ^3F_3$–$(^2D)4f\ ^1F_3$
25	1808.822	55 284.61	−0.10	$(^2D)3d\ ^3F_2$–$(^2D)4f\ ^3D_3$
12	1809.019	55 278.59	−0.10	$(^2D)3d\ ^3F_2$–$(^2D)4f\ ^3G_3$
8	1809.163	55 274.19	0.31	$(^2D)3d\ ^3F_4$–$(^2D)4f\ ^1H_5$
6	1809.636	55 259.73	−0.22	$(^2D)3d\ ^3F_3$–$(^2D)4f\ ^3F_3$
7	1809.893	55 251.88	−0.54	$(^2D)3d\ ^1S_0$–$(^2D)4f\ ^3P_1$
30 *b*	1810.125	55 244.80	−0.13	$(^2D)3d\ ^3F_3$–$(^2D)4f\ ^3D_3$
30 *b*	1810.125	55 244.80	0.05	$(^2D)3d\ ^3F_4$–$(^2D)4f\ ^1F_3$
10	1810.328	55 238.62	−0.29	$(^2D)3d\ ^3F_3$–$(^2D)4f\ ^3G_3$
12 *b* Ne IV	1810.465	55 234.43	−0.91	$(^2D)3d\ ^3F_3$–$(^2D)4f\ ^3G_4$
9	1810.663	55 228.40	0.10	$(^2D)3d\ ^1S_0$–$(^2D)4f\ ^1P_1$
8	1811.871	55 191.56	−0.14	$(^2D)3d\ ^3F_4$–$(^2D)4f\ ^3F_4$
40	1812.205	55 181.38	0.15	$(^2D)3d\ ^3F_4$–$(^2D)4f\ ^3G_5$
30	1822.468	54 870.64	(0.00)	$(^4S)3d\ ^5D_4$–$(^4S)4f\ ^5F_5$
25	1822.546	54 868.30	(0.00)	$(^4S)3d\ ^5D_3$–$(^4S)4f\ ^5F_4$
15	1822.652	54 865.10	(0.00)	$(^4S)3d\ ^5D_2$–$(^4S)4f\ ^5F_3$
10	1822.746	54 862.29	(0.00)	$(^4S)3d\ ^5D_1$–$(^4S)4f\ ^5F_2$
8	1822.806	54 860.48	(0.00)	$(^4S)3d\ ^5D_0$–$(^4S)4f\ ^5F_1$
8	1835.997	54 466.32	−0.06	$(^2P)3d\ ^3F_4$–$(^2P)4f\ ^3F_4$
5	1838.523	54 391.50	0.45	$(^2P)3d\ ^3F_3$–$(^2P)4f\ ^3F_3$
6	1839.284	54 368.98	−0.83	$(^2P)3d\ ^3F_3$–$(^2P)4f\ ^1F_3$
12	1839.479	54 363.23	0.00	$(^2P)3d\ ^3F_4$–$(^2P)4f\ ^3G_5$
12	1839.729	54 355.82	0.01	$(^2D)3p\ ^1D_2$–$(^2D)4s\ ^1D_2$
7 *us b*	1840.619	54 329.56	1.62	$(^2P)3d\ ^3F_2$–$(^2P)4f\ ^3F_2$
7 *us b*	1840.619	54 329.56	0.00	$(^2P)3d\ ^3F_3$–$(^2P)4f\ ^1G_4$
20	1841.353	54 307.88	−0.05	$(^2D)3d\ ^3G_4$–$(^2D)4f\ ^1H_5$
10	1841.640	54 299.42	0.00	$(^2P)3d\ ^3F_3$–$(^2P)4f\ ^3G_4$
45	1842.042	54 287.59	0.00	$(^2D)3d\ ^3G_3$–$(^2D)4f\ ^3H_4$
50	1842.101	54 285.83	(0.00)	$(^2D)3d\ ^3G_5$–$(^2D)4f\ ^3H_6$
m Ne II		54 278		$(^2D)3d\ ^3G_4$–$(^2D)4f\ ^1F_3$
10 *a* Ne III	1842.958	54 260.61	−0.19	$(^2P)3d\ ^3F_2$–$(^2P)4f\ ^3G_3$
40	1843.042	54 258.13	0.00	$(^2D)3d\ ^3G_4$–$(^2D)4f\ ^3H_5$
10	1843.592	54 241.93	−0.15	$(^2D)3d\ ^3G_5$–$(^2D)4f\ ^3G_5$
9	1844.456	54 216.53	0.27	$(^2D)3d\ ^3G_4$–$(^2D)4f\ ^3G_4$
m 2×N IV		54 202		$(^2D)3d\ ^3G_3$–$(^2D)4f\ ^3D_3$
10	1845.136	54 196.54	0.08	$(^2D)3d\ ^3G_3$–$(^2D)4f\ ^3G_3$
35	1848.060	54 110.79	0.04	$(^2D)3d\ ^1G_4$–$(^2D)4f\ ^1H_5$
m 2×N IV		54 091		$(^2D)4s\ ^3D_2$–$(^2P)4f\ ^3F_3$
20 *a* Ne II	1849.411	54 071.26	−0.71	$(^2D)4s\ ^3D_3$–$(^2P)4f\ ^3F_4$
25	1849.715	54 062.39	0.09	$(^2D)3d\ ^1G_4$–$(^2D)4f\ ^1G_4$

TABLE I. (*Continued*).

Intensity[a]	λ (Å)	σ (cm^{-1}) σ_{obs}	$\sigma_{obs}-\sigma_{calc}$	Classification
25	1849.764	54 060.96	0.00	$(^2D)3d\ ^1G_4$–$(^2D)4f\ ^3H_5$
9	1850.474	54 040.21	0.01	$(^2D)4s\ ^3D_1$–$(^2P)4f\ ^3F_2$
7	1851.235	54 018.00	−0.10	$(^2D)3d\ ^1G_4$–$(^2D)4f\ ^3G_5$
9	1851.785	54 001.94	0.08	$(^2D)3d\ ^3D_3$–$(^2D)4f\ ^1G_4$
7	1852.086	53 993.16	0.01	$(^2D)3d\ ^3D_2$–$(^2D)4f\ ^3P_2$
6	1852.300	53 986.94	−0.13	$(^2D)3d\ ^3D_3$–$(^2D)4f\ ^1D_2$
20	1852.945	53 968.13	0.00	$(^2D)3d\ ^3D_3$–$(^2D)4f\ ^3F_4$
10 *a* Ne II	1853.129	53 962.78	0.14	$(^2P)3d\ ^1D_2$–$(^2P)4f\ ^3F_3$
10	1853.285	53 958.25	−0.40	$(^2D)3d\ ^3D_3$–$(^2D)4f\ ^3G_4$
8	1853.523	53 951.32	0.00	$(^2D)3d\ ^3D_2$–$(^2D)4f\ ^1F_3$
10 *b*	1853.876	53 941.03	0.00	$(^2D)3d\ ^3D_1$–$(^2D)4f\ ^3D_1$
10 *b*	1853.876	53 941.03	−0.37	$(^2P)3d\ ^1D_2$–$(^2P)4f\ ^1F_3$
6	1854.126	53 933.76	0.19	$(^2D)3d\ ^3D_2$–$(^2D)4f\ ^3P_1$
m Ne IV		53 917		$(^2D)3d\ ^3D_2$–$(^2D)4f\ ^1D_2$
25	1854.826	53 913.40	0.01	$(^2D)3d\ ^3D_2$–$(^2D)4f\ ^3F_3$
10	1855.408	53 896.51	0.01	$(^2D)3d\ ^3D_2$–$(^2D)4f\ ^3D_2$
15	1855.618	53 890.41	0.01	$(^2D)3d\ ^3D_1$–$(^2D)4f\ ^3F_2$
3	1856.263	53 871.68	−0.23	$(^2D)3d\ ^3D_1$–$(^2D)4f\ ^1D_2$
6	1856.525	53 864.07	−0.08	$(^2D)3d\ ^3D_1$–$(^2D)4f\ ^1P_1$
4	1856.747	53 857.64	−0.10	$(^2P)3d\ ^1D_2$–$(^2P)4f\ ^1D_2$
2	1856.962	53 851.40	0.20	$(^2D)3d\ ^3D_1$–$(^2D)4f\ ^3D_2$
5 *w*	1859.176	53 787.28	−0.57	$(^2D)3p\ ^1D_2$–$(^2P)3d\ ^1F_3$
3	1865.069	53 617.31	−0.26	$(^2P)3d\ ^3P_1$–$(^2P)4f\ ^1D_2$
8 *b*	1865.138	53 615.34	(0.00)	$(^2P)3d\ ^3P_0$–$(^2P)4f\ ^3D_1$
8 *b*	1865.138	53 615.34	−0.08	$(^2P)3d\ ^3P_2$–$(^2P)4f\ ^3F_3$
9	1866.634	53 572.37	0.01	$(^2P)3d\ ^3P_1$–$(^2P)4f\ ^3D_2$
10	1869.463	53 491.29	(0.00)	$(^2P)3d\ ^3P_2$–$(^2P)4f\ ^3D_3$
6	1870.372	53 465.31	0.00	$(^2P)3d\ ^3P_2$–$(^2P)4f\ ^3D_2$
12	1880.209	53 185.57	0.01	$(^2P)3s\ ^1P_1$–$(^2P)3p\ ^1S_0$
0	1925.175	51 943.34	0.36	$(^2P)3d\ ^1F_3$–$(^2P)4f\ ^3F_4$
2	1925.371	51 938.05	0.33	$(^2P)3d\ ^1F_3$–$(^2P)4f\ ^3F_3$
8	1925.605	51 931.74	0.56	$(^2P)3d\ ^3D_2$–$(^2P)4f\ ^3F_3$
8	1925.785	51 926.87	−0.01	$(^2P)3d\ ^3D_1$–$(^2P)4f\ ^3F_2$
9	1925.884	51 924.22	−0.18	$(^2P)3d\ ^3D_3$–$(^2P)4f\ ^3F_4$
0	1926.044	51 919.89	0.75	$(^2P)3d\ ^3D_3$–$(^2P)4f\ ^3F_3$
4	1926.178	51 916.27	−0.21	$(^2P)3d\ ^1F_3$–$(^2P)4f\ ^1F_3$
7	1926.399	51 910.33	0.39	$(^2P)3d\ ^3D_2$–$(^2P)4f\ ^1F_3$
10 *us*	1927.648	51 876.69	0.46	$(^2P)3d\ ^1F_3$–$(^2P)4f\ ^1G_4$
2	1928.614	51 850.71	−0.12	$(^2D)3d\ ^1P_1$–$(^2D)4f\ ^3P_2$
6	1930.769	51 792.83	−0.23	$(^2P)3d\ ^3D_1$–$(^2P)4f\ ^3D_2$
12	1931.007	51 786.45	0.53	$(^2D)3p\ ^1P_1$–$(^2D)3d\ ^1D_2$
m Ne III		51 786		$(^2P)3d\ ^3D_1$–$(^2P)4f\ ^3D_1$
10	1931.431	51 775.08	0.20	$(^2D)3d\ ^1P_1$–$(^2D)4f\ ^1D_2$
9	1931.727	51 767.15	0.03	$(^2D)3d\ ^1P_1$–$(^2D)4f\ ^1P_1$
10	1932.212	51 754.16	−0.01	$(^2D)3d\ ^1P_1$–$(^2D)4f\ ^3D_2$
15	1945.300	51 405.95	(0.00)	$(^4S)3d\ ^3D_1$–$(^4S)4f\ ^3F_2$
25	1945.458	51 401.78	(0.00)	$(^4S)3d\ ^3D_2$–$(^4S)4f\ ^3F_3$
30	1946.007	51 387.28	(0.00)	$(^4S)3d\ ^3D_3$–$(^4S)4f\ ^3F_4$
4	1946.656	51 370.14	0.39	$(^2D)4s\ ^1D_2$–$(^2P)4f\ ^3F_3$
4	1947.456	51 349.04	0.53	$(^2D)4s\ ^1D_2$–$(^2P)4f\ ^1F_3$
4	1948.481	51 322.02	0.06	$(^2D)3d\ ^3P_2$–$(^2D)4f\ ^3P_2$
6	1950.746	51 262.43	0.06	$(^2D)3d\ ^3P_2$–$(^2D)4f\ ^3P_1$
9	1951.371	51 246.02	0.01	$(^2D)3d\ ^3P_2$–$(^2D)4f\ ^1D_2$
7	1951.509	51 242.40	0.21	$(^2D)3d\ ^3P_2$–$(^2D)4f\ ^3F_3$
10	1952.096	51 226.99	−0.19	$(^2D)3d\ ^3P_2$–$(^2D)4f\ ^3D_3$
9	1952.312	51 221.33	0.17	$(^2D)3d\ ^3P_2$–$(^2D)4f\ ^3G_3$
9	1953.115	51 200.27	0.05	$(^2D)3d\ ^3P_1$–$(^2D)4f\ ^3P_2$
9	1955.185	51 146.06	0.15	$(^2D)3d\ ^3P_1$–$(^2D)4f\ ^3P_0$

TABLE I. (*Continued*).

Intensity[a]	λ (Å)	σ (cm^{-1}) σ_{obs}	$\sigma_{obs}-\sigma_{calc}$	Classification
12 *b*	1955.409	51 140.20	−0.27	$(^2D)3d\ ^3P_0$–$(^2D)4f\ ^3D_1$
12 *b*	1955.409	51 140.20	−0.44	$(^2D)3d\ ^3P_1$–$(^2D)4f\ ^3P_1$
2	1956.030	51 123.96	−0.32	$(^2D)3d\ ^3P_1$–$(^2D)4f\ ^1D_2$
5	1956.319	51 116.41	−0.11	$(^2D)3d\ ^3P_1$–$(^2D)4f\ ^1P_1$
15	1956.748	51 105.21	0.01	$(^2D)3d\ ^1D_2$–$(^2D)4f\ ^1F_3$
m Ne III		51 103		$(^2D)3d\ ^3P_1$–$(^2D)4f\ ^3D_2$
20	1957.634	51 082.08	−0.05	$(^2D)3p\ ^1P_1$–$(^2D)3d\ ^1P_1$
7	1958.055	51 071.09	0.01	$(^2D)3d\ ^1D_2$–$(^2D)4f\ ^1D_2$
8	1958.206	51 067.14	−0.13	$(^2D)3d\ ^1D_2$–$(^2D)4f\ ^3F_3$
6	1958.339	51 063.67	0.08	$(^2D)3d\ ^3P_0$–$(^2D)4f\ ^1P_1$
9	1958.844	51 050.51	0.13	$(^2D)3d\ ^1D_2$–$(^2D)4f\ ^3D_2$
2	1959.001	51 046.42	0.19	$(^2D)3d\ ^1D_2$–$(^2D)4f\ ^3G_3$
10	1966.822	50 843.44	0.00	$(^2D)3d\ ^3S_1$–$(^2D)4f\ ^3P_2$
4	1968.931	50 788.99	−0.14	$(^2D)3d\ ^3S_1$–$(^2D)4f\ ^3P_0$
7	1969.123	50 784.04	0.18	$(^2D)3d\ ^3S_1$–$(^2D)4f\ ^3P_1$
7	1969.761	50 767.57	0.08	$(^2D)3d\ ^3S_1$–$(^2D)4f\ ^1D_2$
8	1972.263	50 703.18	−0.03	$(^2D)3p\ ^3D_1$–$(^2D)3d\ ^3P_0$
4	1974.327	50 650.16	−0.12	$(^2D)3p\ ^3D_1$–$(^2D)3d\ ^3P_1$
9	1974.757	50 639.13	−0.15	$(^2D)3p\ ^3D_2$–$(^2D)3d\ ^3P_1$
12	1982.237	50 448.06	−0.15	$(^2D)3p\ ^3D_3$–$(^2D)3d\ ^3P_2$
10	1999.431	49 998.02	−0.12	$(^2D)3d\ ^1F_3$–$(^2D)4f\ ^3H_4$
12	2000.714	49 965.96	−0.01	$(^2D)3d\ ^1F_3$–$(^2D)4f\ ^1F_3$
50	2001.491	49 946.58	−0.07	$(^2D)3d\ ^1F_3$–$(^2D)4f\ ^1G_4$
5	2002.243	49 927.82	−0.22	$(^2D)3d\ ^1F_3$–$(^2D)4f\ ^3F_3$
9	2002.842	49 912.88	−0.04	$(^2D)3d\ ^1F_3$–$(^2D)4f\ ^3F_4$
2	2012.042	49 684.70	0.25	$(^4S)4d\ ^5D$–$(^4S)8f\ ^5F$
6	2028.592	49 279.42	0.32	$(^2D)3p\ ^3P_2$–$(^4S)4d\ ^3D_3$
2	2033.310	49 165.09	−0.11	$(^2D)3p\ ^3P_1$–$(^4S)4d\ ^3D_2$
1	2035.529	49 111.50	0.09	$(^2D)3p\ ^3P_0$–$(^4S)4d\ ^3D_1$
10	2039.307	49 020.51	0.01	$(^2P)3d\ ^1P_1$–$(^2P)4f\ ^1D_2$
4	2041.200	48 975.06	−0.23	$(^2P)3d\ ^1P_1$–$(^2P)4f\ ^3D_2$
10	2052.586	48 703.42	0.01	$(^2P)3p\ ^1P_1$–$(^2P)3d\ ^1P_1$
15	2058.267	48 569.02	−0.04	$(^2P)3p\ ^3S_1$–$(^2P)3d\ ^3P_2$
12	2062.813	48 462.00	−0.01	$(^2P)3p\ ^3S_1$–$(^2P)3d\ ^3P_1$
9	2064.939	48 412.12	−0.20	$(^2P)3p\ ^3S_1$–$(^2P)3d\ ^3P_0$
50	2065.309	48 403.44	−0.10	$(^2D)3s\ ^1D_2$–$(^2D)3p\ ^1D_2$
4	2070.754	48 276.17	−0.29	$(^2P)3p\ ^1S_0$–$(^2P)4s\ ^1P_1$
25	2078.969	48 085.43	−0.06	$(^2D)3p\ ^1F_3$–$(^2D)3d\ ^1F_3$
13	2086.904	47 902.62	−0.03	$(^2D)3p\ ^3D_1$–$(^2D)3d\ ^3D_1$
10	2087.389	47 891.49	−0.16	$(^2D)3p\ ^3D_2$–$(^2D)3d\ ^3D_1$
10	2088.889	47 857.11	−0.24	$(^2D)3p\ ^3D_1$–$(^2D)3d\ ^3D_2$
15	2089.361	47 846.30	−0.05	$(^2D)3p\ ^3D_2$–$(^2D)3d\ ^3D_2$
10	2091.797	47 790.59	−0.17	$(^2P)3p\ ^3D_3$–$(^2P)3d\ ^3D_3$
12 *b*	2092.401	47 776.80	−0.21	$(^2D)3p\ ^3D_3$–$(^2D)3d\ ^3D_2$
12 *b*	2092.401	47 776.80	0.31	$(^2D)3p\ ^3D_2$–$(^2D)3d\ ^3D_3$
9	2093.522	47 751.21	−0.01	$(^2P)3p\ ^3D_2$–$(^2P)3d\ ^3D_2$
7	2094.076	47 738.59	0.05	$(^2P)3p\ ^3D_1$–$(^2P)3d\ ^3D_1$
30	2095.460	47 707.07	−0.08	$(^2D)3p\ ^3D_3$–$(^2D)3d\ ^3D_3$
15	2099.251	47 620.93	−0.02	$(^2D)3p\ ^1P_1$–$(^2D)3d\ ^1S_0$
7	2102.239	47 553.24	−0.23	$(^2D)3p\ ^1P_1$–$(^2D)3d\ ^3F_2$
9	2129.425	46 946.20	−0.06	$(^2D)3p\ ^1F_3$–$(^2D)3d\ ^1D_2$
3	2148.078	46 538.59	0.08	$(^2D)3p\ ^3D_1$–$(^2D)3d\ ^1S_0$
20	2149.869	46 499.84	0.04	$(^2D)3p\ ^3D_2$–$(^2D)3d\ ^3F_3$
30	2150.620	46 483.59	0.01	$(^2D)3p\ ^3D_3$–$(^2D)3d\ ^3F_4$
15	2151.200	46 471.07	0.04	$(^2D)3p\ ^3D_1$–$(^2D)3d\ ^3F_2$
12	2151.712	46 460.00	−0.02	$(^2D)3p\ ^3D_2$–$(^2D)3d\ ^3F_2$
10	2151.754	46 459.10	0.05	$(^2P)3p\ ^1P_1$–$(^2D)4s\ ^1D_2$
12	2153.085	46 430.39	−0.07	$(^2D)3p\ ^3D_3$–$(^2D)3d\ ^3F_3$

TABLE I. (*Continued*).

Intensity[a]	λ (Å)	σ (cm^{-1})		Classification
		σ_{obs}	$\sigma_{obs}-\sigma_{calc}$	
20	2159.295	46 296.86	−0.02	$(^4S)3p\ ^5P_1-(^4S)3d\ ^5D_0$
30	2159.375	46 295.15	0.00	$(^4S)3p\ ^5P_1-(^4S)3d\ ^5D_1$
25	2159.515	46 292.15	0.05	$(^4S)3p\ ^5P_1-(^4S)3d\ ^5D_2$
18	2160.828	46 264.02	−0.01	$(^4S)3p\ ^5P_2-(^4S)3d\ ^5D_1$
30	2160.968	46 261.02	0.04	$(^4S)3p\ ^5P_2-(^4S)3d\ ^5D_2$
40	2161.136	46 257.43	−0.02	$(^4S)3p\ ^5P_2-(^4S)3d\ ^5D_3$
12	2163.450	46 207.95	−0.08	$(^4S)3p\ ^5P_3-(^4S)3d\ ^5D_2$
30	2163.614	46 204.46	−0.04	$(^4S)3p\ ^5P_3-(^4S)3d\ ^5D_3$
50	2163.734	46 201.89	0.06	$(^4S)3p\ ^5P_3-(^4S)3d\ ^5D_4$
0.5	2168.792	46 094.16	−0.32	$(^2P)3p\ ^3D_3-(^2P)3d\ ^3P_2$
18	2176.627	45 928.26	0.01	$(^2D)3s\ ^3D_1-(^2D)3p\ ^3P_0$
20	2177.697	45 905.69	−0.02	$(^2D)3s\ ^3D_2-(^2D)3p\ ^3P_1$
15	2178.651	45 885.58	−0.03	$(^2D)3s\ ^3D_1-(^2D)3p\ ^3P_1$
30	2180.863	45 839.05	−0.06	$(^2D)3s\ ^3D_3-(^2D)3p\ ^3P_2$
15	2182.262	45 809.68	−0.02	$(^2D)3s\ ^3D_2-(^2D)3p\ ^3P_2$
6	2183.222	45 789.52	−0.07	$(^2D)3s\ ^3D_1-(^2D)3p\ ^3P_2$
5	2186.550	45 719.85	0.09	$(^2P)3p\ ^3D_2-(^2P)3d\ ^1D_2$
10	2190.226	45 643.12	−0.07	$(^2P)3p\ ^3D_3-(^2D)4s\ ^3D_3$
5	2191.090	45 625.12	−0.10	$(^2P)3p\ ^3D_1-(^2D)4s\ ^3D_1$
1	2191.391	45 618.85	−0.01	$(^2P)3p\ ^3D_3-(^2D)4s\ ^3D_2$
6	2192.716	45 591.29	−0.07	$(^2P)3p\ ^3D_2-(^2D)4s\ ^3D_2$
2	2193.825	45 568.25	0.21	$(^4S)4s\ ^5S_2-(^4S)5p\ ^5P_3$
1	2194.118	45 562.16	0.11	$(^4S)4s\ ^5S_2-(^4S)5p\ ^5P_2$
0	2194.281	45 558.78	0.31	$(^4S)4s\ ^5S_2-(^4S)5p\ ^5P_1$
4	2194.862	45 546.73	−0.26	$(^2D)3p\ ^3F_2-(^2D)3d\ ^3D_1$
1	2197.052	45 501.32	−0.37	$(^2D)3p\ ^3F_2-(^2D)3d\ ^3D_2$
8	2197.789	45 486.06	−0.16	$(^2D)3p\ ^3F_3-(^2D)3d\ ^3D_2$
1	2198.334	45 474.79	−0.28	$(^4S)4p\ ^5P_1-(^4S)6s\ ^5S_2$
3	2198.831	45 464.52	0.25	$(^4S)4p\ ^5P_2-(^4S)6s\ ^5S_2$
5	2199.663	45 447.32	0.02	$(^4S)4p\ ^5P_3-(^4S)6s\ ^5S_2$
3	2201.167	45 416.27	−0.09	$(^2D)3p\ ^3F_3-(^2D)3d\ ^3D_3$
10	2202.161	45 395.77	−0.03	$(^2D)3p\ ^3F_4-(^2D)3d\ ^3D_3$
2 *b* Ne IV	2204.097	45 355.90	−0.02	$(^2D)3p\ ^3F_3-(^2D)3d\ ^1G_4$
m Ne III		45 338		$(^2P)3p\ ^3D_2-(^2P)3d\ ^3F_2$
15	2204.994	45 337.45	−0.04	$(^2P)3p\ ^3D_1-(^2P)3d\ ^3F_2$
9	2205.901	45 318.82	−0.03	$(^2P)3p\ ^3D_3-(^2P)3d\ ^3F_3$
18	2207.237	45 291.39	0.04	$(^2P)3p\ ^3D_2-(^2P)3d\ ^3F_3$
20	2209.316	45 248.77	−0.01	$(^2P)3p\ ^3D_3-(^2P)3d\ ^3F_4$
30	2211.815	45 197.65	0.06	$(^2D)3p\ ^3F_2-(^2D)3d\ ^3G_3$
10	2212.577	45 182.08	−0.04	$(^2D)3p\ ^3F_3-(^2D)3d\ ^3G_3$
40	2213.718	45 158.80	0.06	$(^2D)3p\ ^3F_3-(^2D)3d\ ^3G_4$
10	2214.728	45 138.20	0.02	$(^2D)3p\ ^3F_4-(^2D)3d\ ^3G_4$
50	2216.043	45 111.43	0.05	$(^2D)3p\ ^3F_4-(^2D)3d\ ^3G_5$
8 *h ul*	2224.552	44 938.90	−0.09	$(^4S)4d\ ^5D-(^4S)7f\ ^5F$
7 *b* Ne IV	2262.114	44 192.76	−0.03	$(^2D)3p\ ^3F_3-(^2D)3d\ ^3F_4$
18	2263.168	44 172.18	−0.05	$(^2D)3p\ ^3F_4-(^2D)3d\ ^3F_4$
6	2264.047	44 155.03	−0.10	$(^2D)3p\ ^3F_2-(^2D)3d\ ^3F_3$
16	2264.835	44 139.67	0.00	$(^2D)3p\ ^3F_3-(^2D)3d\ ^3F_3$
7	2265.904	44 118.85	−0.25	$(^2D)3p\ ^3F_4-(^2D)3d\ ^3F_3$
15	2266.085	44 115.33	−0.03	$(^2D)3p\ ^3F_2-(^2D)3d\ ^3F_2$
7 *b*	2266.877	44 099.92	−0.22	$(^2D)3p\ ^1F_3-(^2D)3d\ ^3D_2$
7 *b*	2266.877	44 099.92	0.03	$(^2D)3p\ ^3F_3-(^2D)3d\ ^3F_2$
0.5	2270.520	44 029.17	0.18	$(^4S)4s\ ^3S_1-(^4S)5p\ ^3P_2$
40	2273.580	43 969.91	0.07	$(^2D)3p\ ^1F_3-(^2D)3d\ ^1G_4$
12	2278.951	43 866.30	0.13	$(^2P)3p\ ^1P_1-(^2P)3d\ ^1D_2$
3 *b*	2283.834	43 772.51	0.19	$(^2P)3p\ ^1P_1-(^2D)4s\ ^3D_1$
3 *b*	2283.834	43 772.51	−0.15	$(^2D)3p\ ^1F_3-(^2D)3d\ ^3G_4$
0.5	2298.957	43 484.59	0.01	$(^2P)3p\ ^1P_1-(^2P)3d\ ^3F_2$

TABLE I. (*Continued*).

Intensity[a]	λ (Å)	σ (cm^{-1}) σ_{obs}	$\sigma_{obs}-\sigma_{calc}$	Classification
9	2303.891	43 391.48	0.19	$(^2P)3p\ ^1P_1$–$(^2D)4s\ ^3D_1$
10	2304.834	43 373.72	0.03	$(^2D)3p\ ^1F_3$–$(^2D)3d\ ^3G_4$
8	2305.459	43 361.96	0.26	$(^2P)3p\ ^1P_1$–$(^2P)3d\ ^3F_2$
12	2306.589	43 340.73	0.03	$(^2P)3p\ ^3P_0$–$(^2P)3d\ ^3D_1$
8	2307.233	43 328.63	−0.03	$(^2P)3p\ ^3P_1$–$(^2P)3d\ ^3D_2$
1 *w*	2320.836	43 074.69	−0.20	$(^4S)4d\ ^3D_3$–$(^4S)7f\ ^3F_4$
0 *w*	2341.858	42 688.06	0.03	$(^2P)3p\ ^1D_2$–$(^2P)3d\ ^1P_1$
15	2362.856	42 308.74	0.09	$(^2P)3s\ ^3P_1$–$(^2P)3p\ ^3P_2$
20	2363.223	42 302.16	0.12	$(^2P)3s\ ^3P_2$–$(^2P)3p\ ^3P_2$
13	2365.384	42 263.52	−0.10	$(^2P)3s\ ^3P_1$–$(^2P)3p\ ^3P_1$
14	2365.413	42 263.00	−0.05	$(^2P)3s\ ^3P_0$–$(^2P)3p\ ^3P_1$
15	2365.738	42 257.20	0.19	$(^2P)3s\ ^3P_2$–$(^2P)3p\ ^3P_1$
15	2367.036	42 234.03	0.01	$(^2P)3s\ ^3P_1$–$(^2P)3p\ ^3P_0$
8 *w*	2390.659	41 816.72	(0.00)	$(^4S)4f\ ^5F$–$(^4S)7g\ ^5G$
5 *w*	2392.388	41 786.50	(0.00)	$(^4S)4f\ ^3F$–$(^4S)7g\ ^3G$
9	2397.955	41 689.51	0.06	$(^2P)3p\ ^3P_1$–$(^2P)3d\ ^3P_2$
12	2400.553	41 644.39	−0.03	$(^2P)3p\ ^3P_2$–$(^2P)3d\ ^3P_2$
7	2402.421	41 612.02	0.03	$(^2P)3p\ ^3P_0$–$(^2P)3d\ ^3P_1$
5	2404.129	41 582.45	0.05	$(^2P)3p\ ^3P_1$–$(^2P)3d\ ^3P_1$
8	2406.738	41 537.38	0.01	$(^2P)3p\ ^3P_2$–$(^2P)3d\ ^3P_1$
7	2407.000	41 532.86	0.15	$(^2P)3p\ ^3P_1$–$(^2P)3d\ ^3P_0$
50	2412.819	41 432.70	0.02	$(^4S)3p\ ^3P_2$–$(^4S)3d\ ^3D_3$
40	2412.919	41 430.99	0.03	$(^4S)3p\ ^3P_1$–$(^4S)3d\ ^3D_2$
15	2413.193	41 426.28	−0.06	$(^4S)3p\ ^3P_1$–$(^4S)3d\ ^3D_1$
20	2413.558	41 420.02	0.02	$(^4S)3p\ ^3P_2$–$(^4S)3d\ ^3D_2$
30	2413.781	41 416.19	−0.06	$(^4S)3p\ ^3P_0$–$(^4S)3d\ ^3D_1$
m Ne III		41 415		$(^4S)3p\ ^3P_2$–$(^4S)3d\ ^3D_1$
8	2418.078	41 342.59	0.36	$(^2P)3p\ ^3P_1$–$(^2P)3d\ ^1D_2$
9	2421.849	41 278.23	0.26	$(^2P)3p\ ^3P_0$–$(^2D)4s\ ^3D_1$
8	2423.586	41 248.65	0.27	$(^2P)3p\ ^3P_1$–$(^2D)4s\ ^3D_1$
11	2425.619	41 214.07	0.23	$(^2P)3p\ ^3P_1$–$(^2D)4s\ ^3D_2$
12	2426.849	41 193.19	0.06	$(^2P)3p\ ^3P_2$–$(^2D)4s\ ^3D_3$
8	2428.276	41 168.99	0.19	$(^2P)3p\ ^3P_2$–$(^2D)4s\ ^3D_2$
15	2433.601	41 078.91	0.00	$(^2D)3p\ ^3P_2$–$(^2D)3d\ ^3S_1$
12	2439.294	40 983.05	0.16	$(^2D)3p\ ^3P_1$–$(^2D)3d\ ^3S_1$
11	2441.830	40 940.48	0.24	$(^2D)3p\ ^3P_0$–$(^2D)3d\ ^3S_1$
15	2454.926	40 722.10	−0.02	$(^2D)3p\ ^3P_2$–$(^2D)3d\ ^3P_1$
12	2457.519	40 679.13	0.09	$(^2D)3p\ ^3P_1$–$(^2D)3d\ ^3P_0$
9	2460.725	40 626.14	0.03	$(^2D)3p\ ^3P_1$–$(^2D)3d\ ^3P_1$
18	2462.287	40 600.37	−0.02	$(^2D)3p\ ^3P_2$–$(^2D)3d\ ^3P_2$
11	2463.315	40 583.43	−0.03	$(^2D)3p\ ^3P_0$–$(^2D)3d\ ^3P_1$
12	2468.125	40 504.34	−0.03	$(^2D)3p\ ^3P_1$–$(^2D)3d\ ^3P_2$
11	2471.826	40 443.70	0.03	$(^2P)3p\ ^1D_2$–$(^2D)4s\ ^1D_2$
30	2473.386	40 418.19	0.00	$(^2P)3s\ ^1P_1$–$(^2P)3p\ ^1D_2$
0.5 *w*	2492.913	40 101.62	0.15	$(^4S)4p\ ^5P_3$–$(^4S)5d\ ^5D_4$
1	2494.778	40 071.64	0.12	$(^2D)3p\ ^3P_2$–$(^2D)3d\ ^1P_1$
18	2507.037	39 875.71	0.00	$(^2P)3p\ ^1D_2$–$(^2P)3d\ ^1F_3$
0.5	2522.025	39 638.75	0.00	$(^2D)3s\ ^3D_2$–$(^2D)3p\ ^1F_3$
150	2589.997	38 598.54	−0.02	$(^4S)3s\ ^5S_2$–$(^4S)3p\ ^5P_3$
125	2593.553	38 545.62	0.01	$(^4S)3s\ ^5S_2$–$(^4S)3p\ ^5P_2$
100	2595.648	38 514.51	0.02	$(^4S)3s\ ^5S_2$–$(^4S)3p\ ^5P_1$
6	2597.285	38 490.24	−0.13	$(^2D)3d\ ^1P_1$–$(^2D)4p\ ^1D_2$
100	2610.006	38 302.65	0.01	$(^2D)3s\ ^3D_3$–$(^2D)3p\ ^3F_4$
40	2611.412	38 282.03	−0.05	$(^2D)3s\ ^3D_3$–$(^2D)3p\ ^3F_3$
4	2612.484	38 266.32	−0.30	$(^2D)3s\ ^3D_3$–$(^2D)3p\ ^3F_2$
100	2613.416	38 252.68	0.01	$(^2D)3s\ ^3D_2$–$(^2D)3p\ ^3F_3$
50	2614.473	38 237.21	0.01	$(^2D)3s\ ^3D_2$–$(^2D)3p\ ^3F_2$
75	2615.849	38 217.10	0.00	$(^2D)3s\ ^3D_1$–$(^2D)3p\ ^3F_2$

TABLE I. (*Continued*).

Intensity[a]	λ (Å)	σ (cm^{-1}) σ_{obs}	$\sigma_{obs}-\sigma_{calc}$	Classification
12	2635.708	37 929.16	−0.03	$(^2D)3p\ ^3P_2$–$(^2D)3d\ ^3D_2$
30	2638.655	37 886.81	0.04	$(^2P)3s\ ^3P_1$–$(^2P)3p\ ^3D_1$
75 *b*	2638.711	37 886.00	−0.09	$(^2P)3s\ ^3P_1$–$(^2P)3p\ ^3D_2$
75 *b*	2638.711	37 886.00	−0.21	$(^2P)3s\ ^3P_0$–$(^2P)3p\ ^3D_1$
20	2639.125	37 880.06	−0.10	$(^2P)3s\ ^3P_2$–$(^2P)3p\ ^3D_1$
30	2639.167	37 879.46	−0.02	$(^2P)3s\ ^3P_2$–$(^2P)3p\ ^3D_2$
50	2640.559	37 859.49	0.16	$(^2D)3p\ ^3P_2$–$(^2D)3d\ ^3D_3$
75	2641.084	37 851.97	−0.01	$(^2P)3s\ ^3P_2$–$(^2P)3p\ ^3D_3$
10	2642.223	37 835.65	−0.18	$(^2D)3p\ ^3P_0$–$(^2D)3d\ ^3D_1$
12	2642.402	37 833.08	−0.09	$(^2D)3p\ ^3P_1$–$(^2D)3d\ ^3D_2$
10 *b* Ne II	2645.645	37 786.71	0.13	$(^2D)3d\ ^1D_2$–$(^2D)4p\ ^1D_2$
7	2650.155	37 722.41	0.02	$(^2P)3p\ ^1D_2$–$(^2D)4s\ ^3D_2$
35 *ul*	2656.956	37 625.86	−0.80	$(^4S)4d\ ^5D$–$(^4S)6f\ ^5F$
125	2677.905	37 331.53	0.01	$(^4S)3s\ ^3S_1$–$(^4S)3p\ ^3P_2$
75	2677.971	37 330.61	−0.04	$(^4S)3s\ ^3S_1$–$(^4S)3p\ ^3P_0$
m Ne III		37 320		$(^2D)4s\ ^3D_3$–$(^2P)4p\ ^1D_2$
100	2678.691	37 320.58	0.02	$(^4S)3s\ ^3S_1$–$(^4S)3p\ ^3P_1$
8 *b* O III	2686.139	37 217.11	0.24	$(^2P)3d\ ^1D_2$–$(^2P)4p\ ^1D_2$
10 *b*	2699.610	37 031.40	−0.20	$(^2D)3d\ ^3D_3$–$(^2D)4p\ ^3P_2$
10 *b*	2699.610	37 031.40	0.76	$(^2D)3d\ ^3D_2$–$(^2D)4p\ ^3P_1$
6	2700.685	37 016.66	0.21	$(^2D)3d\ ^3D_1$–$(^2D)4p\ ^3P_0$
1	2703.958	36 971.86	0.09	$(^2P)3s\ ^1P_1$–$(^2P)3p\ ^3P_2$
5	2704.708	36 961.61	−0.13	$(^2D)3d\ ^3D_2$–$(^2D)4p\ ^3P_2$
0.5 *w*	2712.524	36 855.11	−0.27	$(^4S)4p\ ^3P_2$–$(^4S)5d\ ^3D_3$
12	2727.906	36 647.30	−0.05	$(^2D)3d\ ^1F_3$–$(^2D)4p\ ^1D_2$
9	2737.977	36 512.52	0.04	$(^2D)3d\ ^3F_2$–$(^2D)4p\ ^3F_2$
1	2738.545	36 504.94	0.50	$(^2D)3d\ ^3F_2$–$(^2D)4p\ ^3F_3$
1	2740.955	36 472.85	0.15	$(^2D)3d\ ^3F_3$–$(^2D)4p\ ^3F_2$
9	2741.574	36 464.61	−0.06	$(^2D)3d\ ^3F_3$–$(^2D)4p\ ^3F_3$
9	2746.103	36 404.47	−0.08	$(^2D)3d\ ^3F_4$–$(^2D)4p\ ^3F_4$
75 *b* Ne II	2763.063	36 181.03	0.24	$(^4S)3d\ ^3D_1$–$(^4S)4p\ ^3P_0$
25	2764.261	36 165.35	−0.07	$(^4S)3d\ ^3D_1$–$(^4S)4p\ ^3P_1$
40	2764.607	36 160.83	0.03	$(^4S)3d\ ^3D_2$–$(^4S)4p\ ^3P_1$
4	2765.635	36 147.38	−0.20	$(^4S)3d\ ^3D_1$–$(^4S)4p\ ^3P_2$
20	2765.973	36 142.97	0.00	$(^4S)3d\ ^3D_2$–$(^4S)4p\ ^3P_2$
75	2766.944	36 130.29	0.01	$(^4S)3d\ ^3D_3$–$(^4S)4p\ ^3P_2$
125	2777.630	35 991.29	0.00	$(^2D)3s\ ^3D_3$–$(^2D)3p\ ^3D_3$
50	2779.905	35 961.84	−0.04	$(^2D)3s\ ^3D_2$–$(^2D)3p\ ^3D_3$
50	2782.991	35 921.97	0.02	$(^2D)3s\ ^3D_3$–$(^2D)3p\ ^3D_2$
5	2784.406	35 903.71	0.03	$(^2P)3p\ ^3D_3$–$(^4S)4d\ ^3D_3$
100	2785.275	35 892.51	−0.03	$(^2D)3s\ ^3D_2$–$(^2D)3p\ ^3D_2$
40	2786.124	35 881.57	0.03	$(^2D)3s\ ^3D_2$–$(^2D)3p\ ^3D_1$
40	2786.834	35 872.43	0.00	$(^2D)3s\ ^3D_1$–$(^2D)3p\ ^3D_2$
75	2787.691	35 861.40	−0.03	$(^2D)3s\ ^3D_1$–$(^2D)3p\ ^3D_1$
m Ne III		35 858		$(^2P)3p\ ^3D_2$–$(^4S)4d\ ^3D_2$
5	2788.855	35 846.44	−0.03	$(^2P)3p\ ^3D_1$–$(^4S)4d\ ^3D_1$
m Ne II		35 802		$(^2D)3d\ ^1S_0$–$(^2D)4p\ ^1P_1$
5	2792.752	35 796.43	(0.00)	$(^4S)4d\ ^3D_1$–$(^4S)6f\ ^3F_2$
5 *w*	2793.629	35 785.19	0.11	$(^4S)4d\ ^3D_2$–$(^4S)6f\ ^3F_3$
7 *w*	2795.041	35 767.11	−0.07	$(^4S)4d\ ^3D_3$–$(^4S)6f\ ^3F_4$
25	2798.839	35 718.57	0.03	$(^2D)3d\ ^3F_3$–$(^2D)4p\ ^3D_2$
20	2798.887	35 717.96	0.02	$(^2D)3d\ ^3F_2$–$(^2D)4p\ ^3D_1$
40	2800.131	35 702.09	0.00	$(^2D)3d\ ^1G_4$–$(^2D)4p\ ^1F_3$
30	2802.236	35 675.28	0.03	$(^2D)3d\ ^3F_4$–$(^2D)4p\ ^3D_3$
4	2804.218	35 650.06	−0.40	$(^2D)3d\ ^1S_0$–$(^2D)4p\ ^3D_1$
6 *us*	2807.207	35 612.10	0.11	$(^2D)4s\ ^3D_3$–$(^2P)4p\ ^3P_2$
40	2818.816	35 465.45	0.05	$(^2D)3d\ ^3G_5$–$(^2D)4p\ ^3F_4$
30	2820.392	35 445.63	0.04	$(^2D)3d\ ^3G_4$–$(^2D)4p\ ^3F_3$

TABLE I. (*Continued*).

Intensity[a]	λ (Å)	σ (cm^{-1}) σ_{obs}	$\sigma_{obs}-\sigma_{calc}$	Classification
5	2820.924	35 438.95	0.35	$(^2D)3d\ ^3G_4$–$(^2D)4p\ ^3F_4$
30	2821.617	35 430.24	−0.01	$(^2D)3d\ ^3G_3$–$(^2D)4p\ ^3F_2$
100	2822.895	35 414.20	0.02	$(^4S)3d\ ^5D_4$–$(^4S)4p\ ^5P_3$
10	2823.112	35 411.48	−0.04	$(^4S)3d\ ^5D_3$–$(^4S)4p\ ^5P_3$
2	2823.382	35 408.09	0.10	$(^4S)3d\ ^5D_2$–$(^4S)4p\ ^5P_3$
75	2824.461	35 394.57	0.02	$(^4S)3d\ ^5D_3$–$(^4S)4p\ ^5P_2$
25	2824.749	35 390.96	−0.06	$(^4S)3d\ ^5D_2$–$(^4S)4p\ ^5P_2$
10	2825.003	35 387.78	−0.18	$(^4S)3d\ ^5D_1$–$(^4S)4p\ ^5P_2$
40	2825.307	35 383.97	−0.04	$(^2P)3s\ ^3P_1$–$(^2P)3p\ ^3S_1$
30	2825.347	35 383.47	0.02	$(^2P)3s\ ^3P_0$–$(^2P)3p\ ^3S_1$
15	2825.588	35 380.45	0.23	$(^4S)3d\ ^5D_2$–$(^4S)4p\ ^5P_1$
75 *b*	2825.843	35 377.26	−0.14	$(^2P)3s\ ^3P_2$–$(^2P)3p\ ^3S_1$
75 *b*	2825.843	35 377.26	0.10	$(^4S)3d\ ^5D_1$–$(^4S)4p\ ^5P_1$
2	2825.989	35 375.43	−0.01	$(^4S)3d\ ^5D_0$–$(^4S)4p\ ^5P_1$
12	2827.951	35 350.89	−0.01	$(^2P)3d\ ^3F_4$–$(^2P)4p\ ^3D_3$
4 *w*	2828.623	35 342.50	0.47	$(^2D)3d\ ^3G_5$–$(^4S)5f\ ^3F_4$
5 *w*	2830.790	35 315.44	−0.38	$(^2D)3d\ ^3G_4$–$(^4S)5f\ ^3F_3$
3	2832.633	35 292.47	0.09	$(^2D)3d\ ^3G_3$–$(^4S)5f\ ^3F_2$
10	2833.051	35 287.26	0.00	$(^2P)3d\ ^3F_3$–$(^2P)4p\ ^3D_2$
5	2833.554	35 280.99	0.17	$(^2P)3d\ ^3F_3$–$(^2P)4p\ ^3D_3$
5	2836.832	35 240.23	−0.21	$(^2P)3d\ ^3F_2$–$(^2P)4p\ ^3D_2$
10	2837.376	35 233.47	−0.01	$(^2P)3d\ ^3F_2$–$(^2P)4p\ ^3D_1$
15	2840.732	35 191.84	−0.11	$(^2P)3d\ ^1F_3$–$(^2P)4p\ ^1D_2$
5	2841.563	35 181.55	0.57	$(^2D)3d\ ^3D_3$–$(^2D)4p\ ^3F_4$
4	2846.652	35 118.67	0.55	$(^2D)3d\ ^3D_2$–$(^2D)4p\ ^3F_3$
3	2849.687	35 081.26	0.41	$(^2D)3d\ ^3D_1$–$(^2D)4p\ ^3F_2$
9 *ul*	2851.129	35 063.52	0.15	$(^2P)3d\ ^1D_2$–$(^2P)4p\ ^1P_1$
4	2857.343	34 987.27	0.02	$(^2D)4s\ ^3D_2$–$(^2P)4p\ ^3D_2$
8	2859.845	34 956.66	0.18	$(^2D)4s\ ^3D_3$–$(^2P)4p\ ^3D_3$
3	2860.724	34 945.92	0.18	$(^2D)4s\ ^3D_1$–$(^2P)4p\ ^3D_1$
125	2866.719	34 872.85	0.01	$(^2D)3s\ ^1D_2$–$(^2D)3p\ ^1F_3$
4	2867.842	34 859.19	0.34	$(^2P)3d\ ^1D_2$–$(^2P)4p\ ^3D_2$
9	2874.456	34 778.99	0.01	$(^2D)3s\ ^3D_1$–$(^2D)3p\ ^1P_1$
5	2884.191	34 661.60	0.19	$(^2P)3d\ ^3P_0$–$(^2P)4p\ ^3D_1$
5 *w*	2887.329	34 623.93	−0.05	$(^2D)4s\ ^1D_2$–$(^2P)4p\ ^1D_2$
75	2893.108	34 554.78	−0.01	$(^2D)3p\ ^1D_2$–$(^2D)3d\ ^1F_3$
25 *w ul*	2895.053	34 531.56	(0.00)	$(^4S)4f\ ^5F$–$(^4S)6g\ ^5G$
20 *w ul*	2897.665	34 500.43	(0.00)	$(^4S)4f\ ^3F$–$(^4S)6g\ ^3G$
8 *w h b*	2898.487	34 490.65	−0.72	$(^2D)4f\ ^3H_5$–$(^2D)6g\ ^3I_6$
8 *w h b*	2898.487	34 490.65	0.62	$(^2D)4f\ ^1G_4$–$(^2D)6g\ ^3I_5$
8 *w h b*	2898.487	34 490.65	0.17	$(^2D)4f\ ^3H_6$–$(^2D)6g\ ^3I_7$
8 *w h b* Ne II	2899.156	34 482.69	−0.64	$(^2D)3d\ ^3D_2$–$(^2D)4p\ ^1P_1$
12	2901.768	34 451.65	−0.03	$(^2D)3d\ ^3D_3$–$(^2D)4p\ ^3D_3$
8	2902.592	34 441.87	0.03	$(^2D)3d\ ^3D_3$–$(^2D)4p\ ^3D_2$
8	2902.906	34 438.15	0.12	$(^2D)3d\ ^3D_1$–$(^2D)4p\ ^1P_1$
75	2905.890	34 402.79	−0.02	$(^2P)3s\ ^1P_1$–$(^2P)3p\ ^1P_1$
12 *b*	2907.629	34 382.21	0.39	$(^2D)3d\ ^3D_2$–$(^2D)4p\ ^3D_3$
10	2908.496	34 371.96	−0.02	$(^2D)3d\ ^3D_2$–$(^2D)4p\ ^3D_2$
8	2909.564	34 359.35	−0.09	$(^2D)3d\ ^3P_2$–$(^2D)4p\ ^3P_1$
8 *b* Ne II	2911.875	34 332.08	0.47	$(^2D)3d\ ^3D_2$–$(^2D)4p\ ^3D_1$
7	2912.313	34 326.92	0.24	$(^2D)3d\ ^3D_1$–$(^2D)4p\ ^3D_2$
10	2915.402	34 290.55	0.00	$(^2D)3d\ ^3P_2$–$(^2D)4p\ ^3P_2$
8	2915.764	34 286.29	−0.02	$(^2D)3d\ ^3D_1$–$(^2D)4p\ ^3D_1$
7 *ul*	2917.263	34 268.67	−0.15	$(^2D)3d\ ^3P_1$–$(^2D)4p\ ^3P_0$
4	2919.909	34 237.62	−0.08	$(^2D)3d\ ^3P_1$–$(^2D)4p\ ^3P_1$
8	2924.417	34 184.84	0.07	$(^2D)3d\ ^3P_0$–$(^2D)4p\ ^3P_1$
m Ne II		34 168		$(^2D)3d\ ^3P_1$–$(^2D)4p\ ^3P_2$
6	2945.626	33 938.72	−0.16	$(^2P)3d\ ^3P_0$–$(^2P)4p\ ^3S_1$

TABLE I. (*Continued*).

Intensity[a]	λ (Å)	σ (cm^{-1}) σ_{obs}	$\sigma_{obs}-\sigma_{calc}$	Classification
7	2947.957	33 911.89	−0.15	$(^2D)3d\ ^3S_1$–$(^2D)4p\ ^3P_0$
9	2949.945	33 889.03	−0.16	$(^2P)3d\ ^3P_1$–$(^2P)4p\ ^3S_1$
9	2950.643	33 881.02	0.10	$(^2D)3d\ ^3S_1$–$(^2D)4p\ ^3P_1$
9	2956.649	33 812.20	0.17	$(^2D)3d\ ^3S_1$–$(^2D)4p\ ^3P_2$
9	2959.287	33 782.05	−0.09	$(^2P)3d\ ^3P_2$–$(^2P)4p\ ^3S_1$
1 *w*	2964.783	33 719.43	0.27	$(^2D)3p\ ^1D_2$–$(^2D)3d\ ^3S_1$
7	2986.941	33 469.30	0.00	$(^2P)3d\ ^3D_2$–$(^2P)4p\ ^3P_1$
7	2987.357	33 464.64	0.22	$(^2P)3d\ ^3D_3$–$(^2P)4p\ ^3P_2$
5	2988.022	33 457.20	(0.00)	$(^2P)3d\ ^3D_1$–$(^2P)4p\ ^3P_0$
50	2991.737	33 415.65	0.08	$(^2D)3p\ ^1D_2$–$(^2D)3d\ ^1D_2$
5 *b* O III	2996.486	33 362.70	0.33	$(^2D)3p\ ^1D_2$–$(^2D)3d\ ^3P_1$
5 *a* Ne II	3007.542	33 240.06	−0.58	$(^2D)3p\ ^1D_2$–$(^2D)3d\ ^3P_2$
7	3011.805	33 193.01	0.21	$(^2P)3d\ ^3F_4$–$(^2D)4f\ ^3G_5$
3	3018.102	33 123.76	0.05	$(^2P)3d\ ^3F_3$–$(^2D)4f\ ^3G_4$
2	3020.135	33 101.46	−0.03	$(^2P)3d\ ^3F_2$–$(^2D)4f\ ^3F_3$
3 *h*	3026.386	33 033.09	1.18	$(^2P)3d\ ^3D_2$–$(^2P)4p\ ^1P_1$
3	3051.817	32 757.84	0.01	$(^2P)3d\ ^1D_2$–$(^2D)4f\ ^1F_3$
m Ne II		32 725		$(^2D)3d\ ^1D_2$–$(^2D)4p\ ^1F_3$
20	3056.111	32 711.81	0.04	$(^2D)3p\ ^1D_2$–$(^2D)3d\ ^1P_1$
10	3091.186	32 340.65	−0.35	$(^2D)3d\ ^1P_1$–$(^2D)4p\ ^1P_1$
8	3105.728	32 189.23	−0.05	$(^2D)3d\ ^1P_1$–$(^2D)4p\ ^3D_1$
10	3152.602	31 710.65	0.03	$(^2D)3d\ ^3P_2$–$(^2D)4p\ ^3D_3$
10 *b* Ne II	3159.947	31 636.94	−0.27	$(^2D)3d\ ^1D_2$–$(^2D)4p\ ^1P_1$
9	3165.012	31 586.32	−0.12	$(^2D)3d\ ^1F_3$–$(^2D)4p\ ^1F_3$
2	3169.804	31 538.57	−0.11	$(^2D)3d\ ^3P_1$–$(^2D)4p\ ^3D_1$
10 *ul b* Ne II	3173.598	31 500.86	1.64	$(^2P)3p\ ^3P_0$–$(^4S)4d\ ^3D_1$
6 *b*	3175.174	31 485.23	−0.25	$(^2D)3d\ ^1D_2$–$(^2D)4p\ ^3D_1$
6 *b*	3175.174	31 485.23	−0.52	$(^2D)3d\ ^3P_0$–$(^2D)4p\ ^3D_1$
10	3175.633	31 480.68	−0.09	$(^2P)3p\ ^3P_1$–$(^4S)4d\ ^3D_2$
10 *ul b* Ne II	3176.633	31 470.77	1.14	$(^2P)3p\ ^3P_1$–$(^4S)4d\ ^3D_1$
15	3178.335	31 453.92	0.30	$(^2P)3p\ ^3P_2$–$(^4S)4d\ ^3D_3$
7	3180.165	31 435.82	0.09	$(^2P)3p\ ^3P_2$–$(^4S)4d\ ^3D_2$
6	3289.994	30 386.44	−0.19	$(^2D)3d\ ^1F_3$–$(^2D)4p\ ^3D_2$
9	3307.436	30 226.20	0.07	$(^2P)3d\ ^1P_1$–$(^2P)4p\ ^1P_1$
100	3328.695	30 033.16	−0.02	$(^2D)3s\ ^1D_2$–$(^2D)3p\ ^1P_1$
12	3341.219	29 920.59	−0.06	$(^2P)3p\ ^1S_0$–$(^2P)3d\ ^1P_1$
6	3366.101	29 699.43	−0.12	$(^2P)3p\ ^3S_1$–$(^2D)3d\ ^3P_2$
4	3652.396	27 371.49	0.04	$(^2P)3p\ ^3D_1$–$(^2D)3d\ ^3P_0$
5	3659.387	27 319.20	0.00	$(^2P)3p\ ^3D_2$–$(^2D)3d\ ^3P_1$
8	3665.527	27 273.44	0.03	$(^2D)4p\ ^1P_1$–$(^2D)5s\ ^1D_2$
8	3672.033	27 225.12	0.15	$(^2P)3p\ ^3D_3$–$(^2D)3d\ ^3P_2$
3	3675.754	27 197.56	0.09	$(^2P)3p\ ^3D_2$–$(^2D)3d\ ^3P_2$
6	3699.266	27 024.70	0.31	$(^2D)3d\ ^3D_3$–$(^4S)5p\ ^3P_2$
m Ne II		26 960		$(^2D)3d\ ^3D_2$–$(^4S)5p\ ^3P_1$
4 *a* Ne II	3732.041	26 787.37	0.07	$(^2D)4p\ ^3D_1$–$(^2D)5s\ ^3D_2$
10	3737.662	26 747.09	0.16	$(^2D)4p\ ^3D_2$–$(^2D)5s\ ^3D_2$
6	3741.360	26 720.65	0.07	$(^2D)4p\ ^3D_2$–$(^2D)5s\ ^3D_3$
12	3742.751	26 710.72	−0.02	$(^2D)4p\ ^3D_3$–$(^2D)5s\ ^3D_3$
8 *b* Ne II	3750.610	26 654.75	0.17	$(^2D)4p\ ^1P_1$–$(^2D)5s\ ^3D_1$
12	3771.652	26 506.05	0.00	$(^2P)3s\ ^1P_1$–$(^2D)3p\ ^1D_2$
10	3782.465	26 430.28	−0.06	$(^4S)4p\ ^5P_1$–$(^4S)5s\ ^5S_2$
12	3783.942	26 419.96	0.42	$(^4S)4p\ ^5P_2$–$(^4S)5s\ ^5S_2$
15	3786.488	26 402.20	−0.38	$(^4S)4p\ ^5P_3$–$(^4S)5s\ ^5S_2$
10 *a* Ne II	3817.973	26 184.48	−0.48	$(^2D)4p\ ^1F_3$–$(^2D)5s\ ^1D_2$
12	3843.323	26 011.77	0.01	$(^2D)4p\ ^3F_2$–$(^2D)5s\ ^3D_1$
12	3844.969	26 000.64	−0.15	$(^2D)4p\ ^3F_3$–$(^2D)5s\ ^3D_2$
12	3847.850	25 981.17	−0.28	$(^2D)4p\ ^3F_4$–$(^2D)5s\ ^3D_3$
9 *b* O III	3848.847	25 974.44	−0.01	$(^2D)4p\ ^3F_3$–$(^2D)5s\ ^3D_3$

TABLE I. (*Continued*).

Intensity[a]	λ (Å)	σ (cm^{-1})		Classification
		σ_{obs}	$\sigma_{obs}-\sigma_{calc}$	
10	3872.945	25 812.83	−0.22	$(^4S)4p\ ^3P_2$–$(^2P)3d\ ^3D_3$
5	3874.722	25 800.99	−0.02	$(^4S)4p\ ^3P_2$–$(^2P)3d\ ^3D_2$
9	3877.427	25 782.99	−0.18	$(^4S)4p\ ^3P_1$–$(^2P)3d\ ^3D_2$
6	3879.180	25 771.34	0.16	$(^4S)4p\ ^3P_1$–$(^2P)3d\ ^3D_1$
6	3881.521	25 755.80	−0.02	$(^4S)4p\ ^3P_0$–$(^2P)3d\ ^3D_1$
4	3907.396	25 585.24	0.03	$(^2D)4d\ ^3F_3$–$(^2D)5f\ ^1G_4$
10	3909.659	25 570.44	0.27	$(^2D)4d\ ^3F_3$–$(^2D)5f\ ^3G_4$
10 *h b*	3917.241	25 520.94	0.00	$(^2D)4d\ ^3F_4$–$(^2D)5f\ ^3G_5$
10 *h*	3917.242	25 520.94	0.16	$(^2D)4p\ ^1F_3$–$(^2D)5s\ ^3D_3$
35 *ul*	3921.032	25 496.28	0.07	$(^4S)4d\ ^5D$–$(^4S)5f\ ^5F$
8 *h*	3956.597	25 267.09	0.15	$(^2D)4d\ ^3G_4$–$(^2D)5f\ ^1H_5$
5 *h*	3959.910	25 245.96	0.00	$(^2D)4d\ ^3G_5$–$(^2D)5f\ ^3G_5$
9 *h*	3960.616	25 241.46	−0.20	$(^2D)4d\ ^3G_3$–$(^2D)5f\ ^3G_4$
12 *h*	3962.014	25 232.55	−0.32	$(^2D)4d\ ^3G_5$–$(^2D)5f\ ^3H_6$
10 *a* Ne III	3965.617	25 209.62	0.00	$(^2D)4d\ ^3G_4$–$(^2D)5f\ ^3H_5$
8 *h a* Ne III	3966.123	25 206.41	0.08	$(^2D)4d\ ^3G_3$–$(^2D)5f\ ^3H_4$
4	3972.790	25 164.11	−0.14	$(^2D)4d\ ^1G_4$–$(^2D)5f\ ^1G_4$
10 *h*	3974.887	25 150.83	−0.15	$(^2D)4d\ ^1G_4$–$(^2D)5f\ ^1H_5$
7	3981.703	25 107.79	−0.04	$(^2D)4d\ ^1G_4$–$(^2D)5f\ ^3G_5$
9 *h*	3983.963	25 093.54	−0.12	$(^2D)4d\ ^1G_4$–$(^2D)5f\ ^3H_5$
3	4067.352	24 579.08	−0.11	$(^2P)3s\ ^3P_1$–$(^2D)3p\ ^3P_1$
3	4084.417	24 476.39	−0.17	$(^2P)3s\ ^3P_2$–$(^2D)3p\ ^3P_2$
1	4116.942	24 283.02	−0.32	$(^2D)3d\ ^3P_2$–$(^4S)5p\ ^3P_2$
2 *h ul*	4138.331	24 157.52	0.35	$(^2D)4p\ ^3P_2$–$(^2D)5s\ ^3D_2$
8	4142.879	24 131.00	0.18	$(^2D)4p\ ^3P_2$–$(^2D)5s\ ^3D_3$
2 *h ul*	4146.965	24 107.22	−0.05	$(^2D)4p\ ^3P_1$–$(^2D)5s\ ^3D_1$
4 *w us*	4150.187	24 088.51	0.24	$(^2D)4p\ ^3P_1$–$(^2D)5s\ ^3D_2$
2 *h*	4152.283	24 076.35	0.19	$(^2D)4p\ ^3P_0$–$(^2D)5s\ ^3D_1$
1 *w h*	4198.613	23 810.68	−0.18	$(^2D)3d\ ^3S_1$–$(^4S)5p\ ^3P_1$
4 *w*	4199.594	23 805.12	−0.15	$(^4S)4d\ ^3D_1$–$(^2D)4p\ ^3F_2$
4 *w us*	4202.918	23 786.29	0.20	$(^4S)4d\ ^3D_2$–$(^2D)4p\ ^3F_3$
6 *w us*	4207.323	23 761.39	0.18	$(^4S)4d\ ^3D_3$–$(^2D)4p\ ^3F_4$
10	4224.073	23 667.17	−0.24	$(^4S)4d\ ^3D_1$–$(^4S)5f\ ^3F_2$
12 *ul*	4226.061	23 656.04	−0.28	$(^4S)4d\ ^3D_2$–$(^4S)5f\ ^3F_3$
15	4229.348	23 637.66	−0.18	$(^4S)4d\ ^3D_3$–$(^4S)5f\ ^3F_4$
12 *ul*	4261.982	23 456.66	0.04	$(^4S)4p\ ^3P_2$–$(^4S)5s\ ^3S_1$
10 *ul*	4265.222	23 438.84	0.06	$(^4S)4p\ ^3P_1$–$(^4S)5s\ ^3S_1$
8 *ul*	4268.048	23 423.32	−0.10	$(^4S)4p\ ^3P_0$–$(^4S)5s\ ^3S_1$
100 *w ul*	4452.787	22 451.54	(0.00)	$(^4S)4f\ ^5F$–$(^4S)5g\ ^5G$
25	4458.763	22 421.45	(0.00)	$(^4S)4f\ ^3F_4$–$(^4S)5g\ ^3G_5$
20	4458.862	22 420.95	(0.00)	$(^4S)4f\ ^3F_3$–$(^4S)5g\ ^3G_4$
15	4458.937	22 420.58	(0.00)	$(^4S)4f\ ^3F_2$–$(^4S)5g\ ^3G_3$
50 *w us b*	4460.536	22 412.54	1.17	$(^2D)4f\ ^1G_4$–$(^2D)5g\ ^3I_5$
50 *w us b*	4460.536	22 412.54	0.17	$(^2D)4f\ ^3H_6$–$(^2D)5g\ ^3I_7$
50 *w us b*	4460.536	22 412.54	−0.72	$(^2D)4f\ ^3H_5$–$(^2D)5g\ ^3I_6$
3 *w*	4471.041	22 359.88	(0.00)	$(^2D)4f\ ^3H_4$–$(^2D)5g\ ^3I_5$
0.5 *w*	4628.874	21 597.48	0.16	$(^4S)4f\ ^3F$–$(^4S)5d\ ^3D$
6 *w*	4793.779	20 854.54	−0.19	$(^2D)3p\ ^3P_2$–$(^4S)4s\ ^3S_1$
4 *w*	4815.930	20 758.62	−0.09	$(^2D)3p\ ^3P_1$–$(^4S)4s\ ^3S_1$
6 *w*	4842.499	20 644.73	−0.28	$(^4S)4f\ ^5F_5$–$(^4S)5d\ ^5D_4$
8	5142.804	19 439.23	0.01	$(^2P)3d\ ^1D_2$–$(^2D)4p\ ^1D_2$
m Ne I		16 108		$(^4S)4d\ ^5D_4$–$(^4S)5p\ ^5P_3$
3	6209.084	16 100.98	0.00	$(^4S)4d\ ^5D_3$–$(^4S)5p\ ^5P_2$
3	6210.180	16 098.14	0.00	$(^4S)4d\ ^5D_2$–$(^4S)5p\ ^5P_1$
1	6277.496	15 925.51	−0.04	$(^2D)4p\ ^3F_2$–$(^2D)4d\ ^3G_3$
1	6283.582	15 910.09	0.01	$(^2D)4p\ ^3F_3$–$(^2D)4d\ ^3G_4$

TABLE I. (*Continued*).

Intensity[a]	λ (Å)	σ (cm^{-1}) σ_{obs}	$\sigma_{obs}-\sigma_{calc}$	Classification
1	6289.587	15 894.90	0.00	$(^2D)4p\ ^3F_4$–$(^2D)4d\ ^3G_5$
4	6406.584	15 604.63	0.00	$(^4S)4d\ ^3D_3$–$(^4S)5p\ ^3P_2$
3	6886.936	14 516.24	0.00	$(^4S)4s\ ^3S_1$–$(^4S)4p\ ^3P_1$
5	6895.410	14 498.40	0.00	$(^4S)4s\ ^3S_1$–$(^4S)4p\ ^3P_2$

[a] *a* denotes affected by; *b*, blended (by); *db*, double line; *h*, hazy; *m*, masked by; *ul*, unsymmetric towards longer wavelengths; *us*, unsymmetric towards shorter wavelengths; and *w*, wide.

TABLE II. Even energy levels of Ne III. The numbers in parentheses indicate the purities (in %) of the states derived in least-squares fits.

Designation	E (cm^{-1})					
$2s^22p^4\ ^3P_2$	0.0 (100)					
$^3P_1$	643.3 (100)					
$^3P_0$	921.5 (100)					
$^1D_2$	25 838.7 (100)					
$^1S_0$	55 747.5 (98)					
$2p^6\ ^1S_0$	478 823.7 (96)					
	$n=3$	$n=4$	$n=5$	$n=6$	$n=7$	$n=8$
$2s^22p^3(^4S)np\ ^5P_3$	348 478.01 (99)	430 094.03 (99)	462 481.21 (99)			
$^5P_2$	348 425.06 (99)	430 077.06 (99)	462 475.22 (99)			
$^5P_1$	348 393.94 (99)	430 066.26 (99)	462 471.64 (99)			
$^3P_2$	356 761.18 (95)	434 324.14 (96)	463 854.74 (96)			
$^3P_1$	356 750.22 (95)	434 341.98 (96)	463 860.77 (96)			
$^3P_0$	356 760.31 (95)	434 357.35 (95)				
$(^2D)np\ ^3F_4$	391 434.54 (100)	472 011.32 (98)	504 101.40 (100)			
$^3F_3$	391 413.98 (100)	472 018.32 (95)	504 114.20 (99)			
$^3F_2$	391 398.52 (100)	472 026.35 (91)	504 129.68 (100)			
$^3D_3$	389 123.19 (97)	471 282.02 (99)				
$^3D_2$	389 053.85 (97)	471 272.19 (99)				
$^3D_1$	389 042.85 (91)	471 231.81 (80)				
$^3P_2$	398 971.01 (92)	473 861.95 (92)				
$^3P_1$	399 067.03 (93)	473 930.84 (93)				
$^3P_0$	399 109.67 (93)	473 961.95 (93)				
$^1F_3$	392 800.07 (100)	472 471.99 (100)				
$^1D_2$	406 330.76 (88)	477 532.91 (97)				
$^1P_1$	387 960.41 (86)	471 383.53 (80)				
$(^2P)np\ ^3D_3$	412 346.43 (96)	492 946.10 (98)				
$^3D_2$	412 373.93 (96)	492 952.54 (97)				
$^3D_1$	412 374.62 (95)	492 945.58 (95)				
$^3P_2$	416 796.49 (95)	493 601.61 (91)				
$^3P_1$	416 751.46 (95)	493 594.45 (66)				
$^3P_0$	416 721.87 (95)	493 570.36 (92)				
$^3S_1$	409 871.85 (97)	492 223.05 (98)				
$^1D_2$	420 242.90 (88)	495 310.56 (97)				
$^1P_1$	414 227.52 (89)	493 157.06 (69)				
$^1S_0$	433 010.28 (95)					
$2s^22p^3(^4S)nf\ ^5F_5$		449 550.49 (100)				
$^5F_4$		449 550.81 (100)				
$^5F_3$		449 551.14 (100)	471 869.42 (100)	483 999.87	491 312.20	496 057.66
$^5F_2$		449 551.39 (100)				
$^5F_1$		449 551.30 (100)				

TABLE II. (*Continued*).

Designation	E (cm^{-1})					
$^3F_4$		449 581.14 (100)	471 887.95 (98)	484 017.29	491 325.00	
$^3F_3$		449 582.96 (100)	471 888.54 (95)	484 017.30		
$^3F_2$		449 582.51 (100)	471 888.49 (91)	484 017.51		
$(^2D)nf\,^3H_6$		490 831.75 (100)	513 139.09 (100)			
$^3H_5$		490 830.86 (58)	513 138.01 (57)			
$^3H_4$		490 883.69 (100)	513 158.23 (99)			
$^3G_5$		490 788.00 (100)	513 152.18 (96)			
$^3G_4$		490 788.99 (54)	513 193.56 (51)			
$^3G_3$		490 792.56 (80)				
$^3F_4$		490 798.47 (63)				
$^3F_3$		490 813.59 (62)				
$^3F_2$		490 835.91 (52)				
$^3D_3$		490 798.58 (65)				
$^3D_2$		490 796.71 (25)				
$^3D_1$		490 886.53 (95)				
$^3P_2$		490 893.36 (95)				
$^3P_1$		490 833.77 (84)				
$^3P_0$		490 839.05 (100)				
$^1H_5$		490 880.65 (59)	513 195.33 (58)			
$^1G_4$		490 832.20 (83)	513 208.60 (80)			
$^1F_3$		490 851.52 (79)				
$^1D_2$		490 817.41 (54)				
$^1P_1$		490 809.66 (84)				
$(^2P)nf\,^3G_5$		511 958.44 (95)				
$^3G_4$		511 964.70 (74)				
$^3G_3$		511 972.91 (79)				
$^3F_4$		512 061.59 (77)				
$^3F_3$		512 056.33 (42)				
$^3F_2$		512 040.04 (64)				
$^3D_3$		511 932.20 (73)				
$^3D_2$		511 906.22 (87)				
$^3D_1$		511 899.51 (93)				
$^1G_4$		511 994.84 (75)				
$^1F_3$		512 035.09 (39)				
$^1D_2$		511 951.43 (66)				

TABLE III. Odd energy levels of Ne III. The numbers in parentheses indicate the purities (in %) of the states derived in least-squares fits.

Designation	E (cm^{-1})					
$2s2p^5\,^3P_2$	204 288.2 (98)					
$^3P_1$	204 872.5 (98)					
$^3P_0$	205 194.9 (98)					
$^1P_1$	289 476.73 (96)					
	$n=3$	$n=4$	$n=5$	$n=6$	$n=7$	$n=8$
$2s^22p^3(^4S)ns\,^5S_2$	309 879.45 (99)	416 913.17 (100)	456 496.60 (100)	475 541.33	486 164.02	492 690.45
$^3S_1$	319 429.66 (99)	419 825.74 (100)	457 780.76 (100)			
$(^2D)ns\,^3D_3$	353 131.90 (99)	457 989.62 (67)	497 992.77 (100)			
$^3D_2$	353 161.31 (99)	457 965.29 (56)	498 019.11 (100)			
$^3D_1$	353 181.42 (99)	457 999.84 (67)	498 038.11 (100)			
$^1D_2$	357 927.23 (100)	460 686.58 (77)	498 656.95 (100)			
$(^2P)ns\,^3P_2$	374 494.45 (97)	479 829.90 (96)				
$^3P_1$	374 487.84 (97)	479 825.95 (96)				
$^3P_0$	374 488.40 (97)	479 830.47 (96)				
$^1P_1$	379 824.72 (96)	481 286.74 (94)				

TABLE III. (*Continued*).

Designation	E (cm^{-1})				
$2s^22p^3(^4S)nd\ ^5D_4$	394 679.85 (100)	446 372.24 (100)	470 195.50 (100)		
$^5D_3$	394 682.51 (100)	446 374.24 (100)	470 197.4 (100)		
$^5D_2$	394 686.04 (100)	446 373.50 (100)	470 198.00 (100)		
$^5D_1$	394 689.10 (100)				
$^5D_0$	394 690.82 (100)				
$^3D_3$	398 193.86 (99)	448 250.11 (95)	471 179.52 (98)		
$^3D_2$	398 181.18 (99)	448 232.22 (95)	471 179.2 (98)		
$^3D_1$	398 176.56 (99)	448 221.08 (95)			
$(^2D)nd\ ^3G_5$	436 545.92 (100)	487 906.22 (100)			
$^3G_4$	436 572.72 (100)	487 928.39 (99)			
$^3G_3$	436 596.11 (100)	487 951.90 (100)			
$^3F_4$	435 606.77 (98)	487 631.24 (99)			
$^3F_3$	435 553.65 (98)	487 623.39 (99)			
$^3F_2$	435 513.88 (98)				
$^3D_3$	436 830.34 (96)				
$^3D_2$	436 900.20 (96)				
$^3D_1$	436 945.50 (96)				
$^3P_2$	439 571.40 (98)				
$^3P_1$	439 693.13 (96)				
$^3P_0$	439 746.06 (98)				
$^3S_1$	440 049.92 (98)				
$^1G_4$	436 769.90 (100)	488 044.35 (100)			
$^1F_3$	440 885.55 (99)				
$^1D_2$	439 746.33 (96)				
$^1P_1$	439 042.53 (95)				
$^1S_0$	435 581.36 (100)				
$(^2P)nd\ ^3F_4$	457 595.21 (97)				
$^3F_3$	457 665.28 (96)				
$^3F_2$	457 712.10 (94)				
$^3D_3$	460 137.19 (58)				
$^3D_2$	460 125.15 (64)				
$^3D_1$	460 113.16 (65)				
$^3P_2$	458 440.91 (96)				
$^3P_1$	458 333.86 (98)				
$^3P_0$	458 284.17 (98)				
$^1F_3$	460 118.61 (89)				
$^1D_2$	458 093.69 (59)				
$^1P_1$	462 930.93 (96)				
$2s^22p^3(^4S)ng\ ^5G$			472 002.44	484 082.46	491 367.62
$^3G_5$			472 002.59		
$^3G_4$			472 003.91	484 082.50	491 368.57
$^3G_3$			472 003.09		
$(^2D)ng\ ^3I_{7,6}$			513 244.12	525 322.23	
$^3I_5$			513 243.57		

about 30% of the lines. The changes are not restricted to changes in L and S values, but also involve changes in J values and configuration assignments of the states involved. Except for the $(^2P)3s\ ^1P_1$ level, all levels based on the ^2P parent state[4] have been rejected.

Prior to the present investigation, no combinations between excited singlet and triplet states had been observed and the singlet terms were located with respect to the ground state by means of forbidden nebular lines. In particular, Bowen[20] determined the wave number of the $2s^22p^4\ ^3P_2$–$2s^22p^4\ ^1D_2$ combination to be 25 840.8±0.1 cm^{-1}.

In the present study, a large number of singlet-triplet intercombination lines have been observed and the singlet system is accurately connected to the triplet systems. In particular, the $2s2p^5\ ^1P_1$ level is connected to the ground level $2s^22p^4\ ^3P_2$ with an uncertainty of less than 1 cm^{-1}. The $2s^22p^4\ ^1D_2$–$2s2p^5\ ^1P_1$ combination has been observed in the second and third diffraction orders of the normal-incidence spectrograph. The measured wave number of the line, 263 638.0±1.0 cm^{-1}, agrees perfectly with the value reported by Boyce.[3] Taken together, the experimental data lead to a calculated value of the $2s^22p^4\ ^3p_2-2s^22p^4\ ^1D_2$ interval of 25 838.7±1.5 cm^{-1}

(Table II), i.e., slightly smaller than the value reported by Bowen.[20]

Denis, Desesquelles, and Dufay[5] studied the spectrum of multiply ionized neon, excited by the beam-foil technique, in the wavelength range 2000–6000 Å. They reported six unidentified lines assigned with certainty to Ne III. These lines have now been classified (e.g., three of them with $4f$-$5g$ transitions), whereas none of the lines ascribed with some doubt to Ne III has been classified. In a subsequent study, Denis, Ceyzériat, and Dufay[7] extended the observations into the vacuum-ultraviolet wavelength range and identified a line at 1247 Å as being due to the $(^4S)3p\ ^3P$–$(^2D)3d\ ^3D$ transition. We have only observed the $^3P_2$-$^3D_3$ component of this multiplet. Even this component is extremely weak and it is doubtful whether we are observing the line that was reported by Denis and co-workers (a strong C III line at 1247.3 Å might interfere with the observations). Eight of the unidentified neon lines reported by Fink, Bashkin, and Bickel[6] can be identified with transitions within the $4p$-$5s$, $4d$-$5f$, and $4f$-$5g$ transition arrays.

In 1971, Liu *et al.*[8] determined Landé g values for excited states of neutral and ionized neon atoms. In particular, they observed an unidentified spectral line at 4452 Å belonging to Ne III (also observed by Denis, Desesquelles, and Dufay[5] and Fink, Bashkin and Bickel[6]). The g value of the upper state involved was determined to be 1.00±0.04. The line has now been identified as the unresolved $(^4S)4f\ ^5F$–$(^4S)5g\ ^5G$ combination.

Liu and Church[9] obtained $g=0.94\pm0.06$ for the upper state of an unidentified transition at 2867 Å (already observed by Bloch, Bloch, and Déjardin[13]). The line has now been ascribed to the $(^2D)3s\ ^1D_2$–$(^2D)3p\ ^1F_3$ transition. The $(^2D)3p\ ^1F_3$ state is calculated to be 100% pure and the theoretical g value of the upper state is 1.00. Liu and Church studied a second Ne III line at 2778 Å and concluded that the identification of the line as the $(^2D)3s\ ^3D_3$–$(^2D)3p\ ^3D_3$ combination needed revision. However, the identification, originally proposed by de Bruin,[1] has been confirmed in the present study.

Based on theoretical calculations and electron-spectroscopy studies of $2s^22p^3nln'l'$ autoionizing states of Ne I Ogurtsov and co-workers[21] suggested that the tabulated values[4] of the excitation energies of the $2s^22p^3(^4S)3s\ ^5S$ and ^3S states of Ne III were too high by 1.1 and 0.5 eV, the uncertainty being 0.2 eV. In the present analysis the $2s^22p^3(^4S)3s\ ^5S$ level value has been reduced by 0.5 eV, whereas the ^3S level value remains essentially unchanged. Thus a discrepancy of about 0.6 eV remains between the excitation energies suggested by Ogurtsov and co-workers and the values found in optical spectroscopy.

The excitation of Ne III by electron impact has been studied by Smirnov and Sharonov[22] and later by Samoilov, Smirnov, and Starikova.[23] The latter group measured the excitation cross section of 33 Ne III lines resulting from electron impact (with simultaneous ionization). Twenty-two of these lines, located in the 2900- to 6900-Å wavelength range, could not be identified because spectroscopic data did not exist at the time. None of the unidentified Ne III lines reported by Samoilov, Smirnov, and Starikova has been observed in the present study. In the wavelength range below 5000 Å we observed the spectrum excited in the θ-pinch discharge and our Ne III spectrum in this region seems very well developed. A further puzzling observation is that the wavelengths of all unidentified Ne III lines above 5000 Å, reported by Samoilov, Smirnov, and Starikova agree to better than 1 Å with the wavelengths of strong Ne I lines.[24]

Table IV shows the neon laser lines below 3000 Å according to the compilation of Beck, Englisch, and Gürs.[25] The first two columns give the ionic assignments and the wavelengths of the laser lines, while in the third column the identifications of the Ne III lines according to the present analysis are given. The ambiguity with regard to the ionic assignment of the laser lines at 2065 and 2373 Å has now been resolved. The 2065-Å line corresponds to the $(^2D)3s\ ^1D_2$–$(^2D)3p\ ^1D_2$ transition in Ne III, while the assignment by Lindeberg[19] of the 2373-Å line to Ne IV has been confirmed. The 2065-Å line was also observed by Hesser[26] in electron-excitation experiments on neon and assigned to Ne III.

All Ne III laser lines below 3000 Å are now identified and found to be due to $3s$-$3p$ transitions. For the lines at 2065, 2473, and 2866 Å the identifications are new compared with AEL.[4] All three lines correspond to singlet-singlet transitions. By comparing characteristic isoelectronic laser transitions, Marling[12] tentatively classified the 2473- and 2866-Å lines as transitions in the Ne III singlet system. The identification of the 2866-Å line as $(^2D)3s\ ^1D_2$–$(^2D)3p\ ^1F_3$ has been confirmed by the present study, whereas the identification of the 2473-Å line as $(^2D)3s\ ^1D_2$–$(^2D)3p\ ^1D_2$ has been changed to $(^2P)3s\ ^1P_1$–$(^2P)3p\ ^1D_2$.

Above 3000 Å the list of neon laser lines[25] contains only one line ascribed to Ne III, namely a line at 3331.14 Å. This line is not present in our spectrograms. The closest Ne III line corresponds to the very strong $(^2D)3s\ ^1D_2$–$(^2D)3p\ ^1P_1$ transition at 3328.695 Å, while the closest Ne II line is a line of moderate intensity at 3330.734 Å. Dana, Laures, and Rocherolles[27] identified the line with the $(^2P)3s\ ^1P_1$–$(^2P)3p\ ^3D_2$ transition in Ne III by applying the Ritz combination principle to the energy-level values listed in AEL.[4] However, the upper level of the transition has not been confirmed in the present analysis.

IV. THEORETICAL INTERPRETATION

When interpreting the observed energy-level structures we used the algorithms and computer programs developed by Cowan.[28] Starting with Hartree-Fock values for all the radial integrals, but treating some of them as free parameters, we performed least-squares fits between the experimental energy-level values and the eigenvalues obtained when diagonalizing the energy matrices. In this way improved values for the radial integrals as well as for the eigenvectors were obtained.

A. Even configurations

It is well known that the $(^1S$-$^1D)$-to-$(^1D$-$^3P)$ interval ratio in the $2s^22p^4$ configuration in the O I isoelectronic se-

TABLE IV. Neon laser lines below 3000 Å. Asterisk denotes uncertainty.

Laser data[a] Ionic assignment	Wavelength (Å)	Spontaneous data[b] Ion	Classification
Ne^{3+}	2018.424	3^+	
Ne^{3+}	2022.186	3^+	
Ne^{3+} *	2065.304[c]	2^+	$(^2D)3s\ ^1D_2-(^2D)3p\ ^1D_2$
Ne^{2+}	2177.705	2^+	$(^2D)3s\ ^3D_2-(^2D)3p\ ^3P_1$
Ne^{2+}	2180.858	2^+	$(^2D)3s\ ^3D_3-(^2D)3p\ ^3P_2$
Ne^{4+}	2265.7	$>3^+$	
Ne^{3+}	2285.793	3^+	
Ne^{3+}	2357.980	3^+	
Ne^{3+} *	2373.200	3^+	
Ne^{2+}	2473.398	2^+	$(^2P)3s\ ^1P_1-(^2P)3p\ ^1D_2$
Ne^{2+}	2609.982	2^+	$(^2D)3s\ ^3D_3+(^2D)3p\ ^3F_4$
Ne^{2+}	2613.4	2^+	$(^2D)3s\ ^3D_2+(^2D)3p\ ^3F_3$
Ne^{2+}	2677.918	2^+	$(^4S)3s\ ^3S_1-(^4S)3p\ ^3P_2$
Ne^{2+}	2678.690	2^+	$(^4S)3s\ ^3S_1-(^4S)3p\ ^3P_1$
Ne^{2+}	2777.634	2^+	$(^2D)3s\ ^3D_3-(^2D)3p\ ^3D_3$
Ne^{2+}	2866.726	2^+	$(^2D)3s\ ^1D_2-(^2D)3p\ ^1F_3$

[a]According to Beck, Englisch, and Gürs (Ref. 25).
[b]Present analysis.
[c]Ascribed with certainty to Ne^{2+} by Hesser (Ref. 26).

quence deviates from the theoretical value of 1.5.[29] A similar deviation is also observed in $2s^22p^3$ (the parent configuration for most of the observed excited states of Ne III) where the (^2P-^2D)-to-(^2D-^4S) ratio is predicted to be 0.67, and the observed ratio is 0.50. In parametric fits a common approach to circumvent this type of problem is to include the effective configuration-interaction parameter α in the calculations.[28]

The main cause of the distorted intervals in the $2s^22p^4$ ($2s^22p^3$) configuration is the $2s^22p^4\leftrightarrow 2p^6$ ($2s^22p^3\leftrightarrow 2p^5$) interaction, i.e., the $2s^2\leftrightarrow 2p^2$ correlation. The importance of this correlation is known from theoretical studies of, e.g., the ground state of beryllium. In the parametric fit to the even configurations of Ne III we have omitted α and included the interaction with the $2p^5nl$ ($nl=2$–$5p$, 4–$5f$) configurations to account explicitly for the $2s^2\leftrightarrow 2p^2$ correlation.

The major effect of the $2s^2\leftrightarrow 2p^2$ correlation is a downward shift of the $2s^22p^4\ ^1S_0$ and $2s^22p^3(^2P)nl$ levels by about 6000 cm^{-1}. As the interaction affects all terms based on the $2s^22p^3\ ^2P$ parent state by the same amount, the improved level fit obtained by including this interaction could also be obtained by including α. However, a drawback of using α is that it does not improve on the eigenvectors.

In the final fit to the even configurations we included the following configurations: $2s^22p^4+\{2s^22p^3+2p^5\}(3p+4p+5p+4f+5f)+2p^6+2s2p^43s$. The configuration interaction integrals between $2s2p^43s$ and, say, the $2s^22p^33p$ configuration are much smaller than the $2s^22p^33p\leftrightarrow 2p^53p$ integral. On the other hand, whereas the $2p^5nl$ configurations are very high, the lowest levels of $2s2p^43s$ are much closer to observed levels.

Table V illustrates the influence from $2s2p^43s$ and $2p^53p$ on the level positions in the $2s^22p^33p$ configuration. The second column of the table shows the difference between the term values calculated using the parameters obtained in the final fit (Tables VI and VII) and those obtained by putting all interactions with $2s2p^43s$ equal to zero while all other parameters are kept unchanged (it is worth noting that in the final fit the configuration interaction integrals involving $2s2p^43s$ were

TABLE V. Estimate of the influence from $2s2p^43s$ and $2p^53p$ on the term positions in $2s^22p^33p$. CI denotes configuration interaction.

$2s^22p^33p$	Term shift ($1000\ cm^{-1}$) $2s2p^43s$ CI=0[a]	$2s2p^43s+2p^53p$ CI=0[b]
$(^4S)^5P$	0.8	0.8
^3P	0.3	0.4
$(^2D)^1P$	1.5	1.8
^3D	1.1	1.2
^3F	0.0	0.0
^1F	0.0	0.0
^3P	1.0	1.0
^1D	0.0	0.4
$(^2P)^3S$	1.4	7.5
^3D	0.1	6.2
^1P	0.2	6.0
^3P	0.5	6.5
^1D	0.0	5.7
^1S	0.0	6.2

[a]The numbers in the second column are the difference between the term values calculated using the parameter values obtained in the final least-squares fit and those obtained by putting all interactions with $2s2p^43s$ equal to zero.
[b]The numbers in the third column were obtained by putting the interactions with both $2s2p^43s$ and $2p^53p$ equal to zero.

TABLE VI. Energy parameters (in cm^{-1}) for the $2s^22p^4+\{2s^22p^3+2p^5\}(3p+4p+5p+4f+5f)+2p^6+2s2p^43s$ configurations of Ne III. The last column shows the ratios between the parameter values obtained in the least-squares fit and those obtained in Hartree-Fock calculations.

Parameter	Restrictions[a]	HF(E_{av})	Fitted	Ratio, fitted to HF
$2s^22p^4$				
E_{av}			13 732±39	
$F^2(2p,2p)$		114 664	103 831±330	0.9055±0.0029
ζ_{2p}		593	622±61	1.05±0.10
$2s^22p^33p$				
E_{av}			394 125±25	
$F^2(2p,2p)$		123 932	113 717±78	0.9176±0.0006
$F^2(2p,3p)$		15 856	15 982±170	1.008±0.011
$G^0(2p,3p)$		6 998	5 410±42	0.773±0.006
$G^2(2p,3p)$		6 437	5 386±77	0.837±0.012
ζ_{2p}	1	678	889±130	1.31±0.19
ζ_{3p}	fix	62	62	1.00
$2s^23p^34p$				
E_{av}			472 724±19	
$F^2(2p,2p)$	2	124 248	114 156±79	0.9185±0.0006
$F^2(2p,4p)$		5 194	6 094±400	1.17±0.08
$G^0(2p,4p)$		2 282	1 599±29	0.701±0.013
$G^2(2p,4p)$		2 196	2 351±82	1.07±0.04
ζ_{2p}	1	681	893±130	1.31±0.19
ζ_{4p}	fix	23	23	1.00
$2s^22p^35p$				
E_{av}			504 325±35	
$F^2(2p,2p)$	2	124 434	114 257±79	0.9185±0.0006
$F^2(2p,5p)$	fix	2 349	2 349	1.00
$G^0(2p,5p)$		1 039	567±51	0.55±0.05
$G^2(2p,5p)$	fix	1 014	1 014	1.00
ζ_{2p}	1	682	894±130	1.31±0.19
ζ_{5p}	fix	11	11	1.00
$2s^22p^34f$				
E_{av}			490 846±16	
$F^2(2p,2p)$	3	124 427	114 646±61	0.9214±0.0005
$F^2(2p,4f)$	fix	1 538	1 538	1.00
$G^2(2p,4f)$	fix	69	69	1.00
$G^4(2p,4f)$	fix	45	45	1.00
ζ_{2p}	1	683	895±130	1.31±0.19
ζ_{4f}	fix	0	0	1.00
$2s^22p^35f$				
E_{av}			513 166±21	
$F^2(2p,2p)$	3	124 428	114 646±61	0.9214±0.0005
$F^2(2p,5f)$	fix	786	786	1.00
$G^2(2p,5f)$	fix	54	54	1.00
$G^4(2p,5f)$	fix	35	35	1.00
ζ_{2p}	1	683	895±130	1.31±0.19
ζ_{5f}	fix	0	0	1.00
$2p^6$				
E_{av}			475 680±200	
$2p^53p$				
E_{av}	fix		834 000	
$2p^54p$				
E_{av}	fix		914 000	
$2p^55p$				
E_{av}	fix		946 000	
$2p^54f$				
E_{av}	fix		932 000	
$2p^55f$				
E_{av}	fix		954 000	
$2s2p^43s$				
E_{av}	fix		566 000	

TABLE VI. (*Continued*).

Parameter	Restrictions[a]	HF(E_{av})	Fitted	Ratio, fitted to HF
Configuration-interaction integrals				
$2s^22p^4$-$2s^22p^33p$				
$R^0(2p2p,2p3p)$	fix	937	937	1.00
$R^2(2p2p,2p3p)$	fix	17 703	17 703	1.00
$2s^22p^4$-$2s^22p^34p$				
$R^0(2p2p,2p4p)$	fix	511	511	1.00
$R^2(2p2p,2p4p)$	fix	9 582	9 582	1.00
$2s^22p^4$-$2s^22p^35p$				
$R^0(2p2p,2p5p)$	fix	341	341	1.00
$R^2(2p2p,2p5p)$	fix	6 309	6 309	1.00
$2s^22p^4$-$2s^22p^34f$				
$R^2(2p2p,2p4f)$	fix	1 648	1 648	1.00
$2s^22p^4$-$2s^22p^35f$				
$R^2(2p2p,2p5f)$	fix	1 483	1 483	1.00
$2s^22p^4$-$2p^6$				
$R^1(2s2s,2p2p)$		146 910	97 609±1200	0.664±0.008
$2s^22p^4$-$2p^53p$				
$R^1(2s2s,2p3p)$	fix	16 807	16 807	1.00
$2s^22p^4$-$2p^54p$				
$R^1(2s2s,2p4p)$	fix	8 564	8 564	1.00
$2s^22p^4$-$2p^55p$				
$R^1(2s2s,2p5p)$	fix	5 494	5 494	1.00
$2s^22p^4$-$2s2p^43s$				
$R^0(2p2p,2s3s)$	fix	7 359	7 359	1.00
$R^1(2s2p,2p3s)$	fix	18 145	18 145	1.00
$R^0(2s2p,3s2p)$	fix	3 177	3 177	1.00
$2s^22p^33p$-$2s^22p^34p$				
$R^2(2p3p,2p4p)$	4	7 685	5 818±1300	0.76±0.16
$R^0(2p3p,4p2p)$	5	3 988	2 660±120	0.67±0.03
$R^3(2p3p,4p2p)$	6	3 744	4 366±550	1.17±0.15
$2s^22p^33p$-$2s^22p^35p$				
$R^2(2p3p,2p5p)$	4	4 953	3 750±790	0.76±0.16
$R^0(2p3p,5p2p)$	5	2 682	1 789±80	0.67±0.03
$R^3(2p3p,5p2p)$	6	2 535	2 956±380	1.17±0.15
$2s^22p^33p$-$2s^22p^34f$				
$R^2(2p3p,2p4f)$	fix	−2 748	−2 748	1.00
$R^2(2p3p,4f2p)$	fix	−143	−143	1.00
$2s^22p^33p$-$2s^22p^35f$				
$R^2(2p3p,2p5f)$	fix	−2 168	−2 168	1.00
$R^2(2p3p,5f2p)$	fix	−122	−122	1.00
$2s^22p^33p$-$2p^53p$				
$R^1(2s2s,2p2p)$	7	153 685	110 202±76	0.7128±0.0005
$2s^22p^33p$-$2s2p^43s$				
$R^1(2s3p,2p3s)$	fix	33 609	33 609	1.00
$R^0(2s3p,3s2p)$	fix	6 357	6 357	1.00
$2s^22p^34p$-$2s^22p^35p$				
$R^2(2p4p,2p5p)$	4	3 270	2 475±520	0.76±0.16
$R^0(2p4p,5p2p)$	5	1 538	1 026±46	0.67±0.03
$R^3(2p4p,5p2p)$	6	1 492	1 740±220	1.17±0.15
$2s^22p^34p$-$2s^22p^34f$				
$R^2(2p4p,2p4f)$	fix	−186	−186	1.00
$R^2(2p4p,4f2p)$	fix	−98	−98	1.00
$2s^22p^34p$-$2s^22p^35f$				
$R^2(2p4p,2p5f)$	fix	−555	−555	1.00
$R^2(2p4p,5f2p)$	fix	−85	−85	1.00
$2s^22p^34p$-$2p^54p$				
$R^1(2s2s,2p2p)$	7	154 010	109 562±76	0.7128±0.0005
$2s^22p^34p$-$2s2p^43s$				

TABLE VI. (*Continued*).

Parameter	Restrictions[a]	HF(E_{av})	Fitted	Ratio, fitted to HF
$R^1(2s4p,2p3s)$	fix	14 210	14 210	1.00
$R^0(2s4f,3s2p)$	fix	3 620	3 620	1.00
$2s^22p^35p$-$2s^22p^34f$				
$R^2(2p5p,2p4f)$	fix	−198	−198	1.00
$R^2(2p5p,4f2p)$	fix	−70	−70	1.00
$2s^22p^35p$-$2s^22p^35f$				
$R^2(2p5p,2p5f)$	fix	−147	−147	1.00
$R^2(2p5p,5f2p)$	fix	−61	−61	1.00
$2s^22p^35p$-$2p^55p$				
$R^1(2s2s,2p2p)$	7	154 105	109 514±76	0.7128±0.0005
$2s^22p^35p$-$2s2p^43s$				
$R^1(2s5p,2p3s)$	fix	8 791	8 791	1.00
$R^0(2s5p,3s2p)$	fix	2 432	2 432	1.00
$2s^22p^34f$-$2s^22p^35f$				
$R^2(2p4f,2p5f)$	fix	892	892	1.00
$R^2(2p4f,5f2p)$	fix	61	61	1.00
$R^4(2p4f,5f2p)$	fix	40	40	1.00
$2s^22p^34f$-$2p^54f$				
$R^1(2s2s,2p2p)$	7	154 185	109 829±340	0.7128±0.002
$2s^22p^35f$-$2p^55f$				
$R^1(2s2s,2p2p)$	7	154 185	109 830±340	0.7128±0.002
$2p^6$-$2p^53p$				
$R^0(2p2p,2p3p)$	fix	3 712	3 712	1.00
$R^2(2p2p,2p3p)$	fix	16 121	16 121	1.00
$2p^6$-$2p^54p$				
$R^0(2p2p,2p4p)$	fix	2 036	2 036	1.00
$R^2(2p2p,2p4p)$	fix	8 671	8 671	1.00
$2p^6$-$2p^55p$				
$R^0(2p2p,2p5p)$	fix	1 349	1 349	1.00
$R^2(2p2p,2p5p)$	fix	5 699	1 699	1.00
$2p^6$-$2p^54f$				
$R^2(2p2p,2p4f)$	fix	1 740	1 740	1.00
$2p^6$-$2p^55f$				
$R^2(2p2p,2p5f)$	fix	1 563	1 563	1.00
$2p^6$-$2s2p^43s$				
$R^1(2p2p,2s3s)$	fix	16 984	16 984	1.00

[a]Parameters given equal numbers in this column are free to vary, but are restricted to common scale factors. Parameters marked "fix" have not been varied.

fixed at their HF values). Individual terms in $2s^22p^33p$ are shifted by amounts varying between 0 and 1500 cm^{-1}. In the same way, the third column shows that the main effect of the $2p^53p$ configuration is a downward shift of the $2s^22p^3(^2P)3p$ terms by about 6000 cm^{-1}.

The results of the theoretical interpretation of the even configurations are summarized in Tables VI and VII. The total number or radial integrals in the energy matrix used (165) is larger than the number of experimentally established energy levels (124). Thus all integrals cannot be treated as adjustable parameters in a least-squares fit to the observed levels. For those configurations in which no levels have been experimentally established all single-configuration integrals were fixed at their HF values and have not been included in Table VI (except for E_{av}). The same restrictions apply to configuration-interaction integrals connecting configurations with no observed levels. Also in configurations with known levels certain single-configuration parameters have been fixed at their HF values. This is true for, e.g., the exchange integrals in the $2s^22p^3nf$ configurations, which have a very small influence on the level positions. To further limit the number of free parameters, some parameters were locked together during the fitting procedure in the sense that the ratio between their values was fixed at the ratio between their HF values. Such parameters are indicated by a common number in the second column of Table VI.

Counting parameters locked together as one free parameter the number of free parameters in the fit described in Tables VI and VII is 25. The standard deviation of the least-squares fit $\Delta=[(E_{obs}-E_{calc})^2/(N-P)]^{1/2}$ with $N=124$ levels and $P=25$ adjustable parameters is 56

TABLE VII. Comparison between observed and calculated energy-level values (in cm^{-1}) and calculated percentage compositions for the $2s^22p^4+\{2s^22p^3+2p^5\}(3p+4p+5p+4f+5f)+2p^6+2s2p^43s$ configurations of Ne III. Eigenvector components larger than 5% are given.

J	E(obs)	E(calc)	E(obs)-E(calc)	Percentage composition
6	490 832	490 840	−8	100 $(^2D)4f\,^3H$
	513 139	513 161	−22	100 $(^2D)5f\,^3H$
5	449 550	449 548	3	100 $(^4S)4f\,^5F$
	471 869	471 871	−1	100 $(^4S)5f\,^5F$
	490 831	490 800	31	58 $(^2D)4f\,^3H$ +41 $(^2D)4f\,^1H$
	490 788	490 834	−46	100 $(^2D)4f\,^3G$
	490 881	490 841	39	59 $(^2D)4f\,^1H$ +41 $(^2D)4f\,^3H$
	511 958	511 970	−12	95 $(^2P)4f\,^3G$
	513 138	513 121	17	57 $(^2D)5f\,^3H$ +42 $(^2D)5f\,^1H$
	513 195	513 162	33	58 $(^2D)5f\,^1H$ +42 $(^2D)5f\,^3H$
	513 152	513 200	−48	96 $(^2D)5f\,^3G$
4	391 434	391 629	−195	100 $(^2D)3p\,^3F$
	449 551	449 548	3	100 $(^4S)4f\,^5F$
	449 581	449 583	−2	100 $(^4S)4f\,^3F$
	471 869	471 871	−1	100 $(^4S)5f\,^5F$
	471 888	471 895	−7	98 $(^4S)5f\,^3F$
	472 011	472 044	−32	98 $(^2D)4p\,^3F$
	490 789	490 769	20	54 $(^2D)4f\,^3G$ +30 $(^2D)4f\,^3F$ +16 $(^2D)4f\,^1G$
	490 884	490 798	85	100 $(^2D)4f\,^3H$
	490 798	490 835	−36	63 $(^2D)4f\,^3F$ +36 $(^2D)4f\,^3G$
	490 832	490 864	−32	83 $(^2D)4f\,^1G$ +10 $(^2D)4f\,^3G$ +7 $(^2D)4f\,^3F$
	504 101	504 099	3	100 $(^2D)5p\,^3F$
	511 965	511 955	10	74 $(^2P)4f\,^3G$ +14 $(^2P)4f\,^3F$ +7 $(^2P)4f\,^1G$
	511 995	511 991	4	75 $(^2P)4f\,^1G$ +14 $(^2P)4f\,^3G$ +6 $(^2P)4f\,^3F$
	512 062	512 048	14	77 $(^2P)4f\,^3F$ +13 $(^2P)4f\,^1G$ +7 $(^2P)4f\,^3G$
	513 158	513 120	39	99 $(^2D)5f\,^3H$
	513 194	513 187	7	51 $(^2D)5f\,^3G$ +42 $(^2D)5f\,^3F$ +5 $(^2D)5f\,^1G$
	513 209	513 219	−10	80 $(^2D)5f\,^1G$ +15 $(^2D)5f\,^3G$
3	348 478	348 453	25	99 $(^4S)3p\,^5P$
	389 123	389 157	−34	97 $(^2D)3p\,^3D$
	391 414	391 570	−156	100 $(^2D)3p\,^3F$
	392 800	392 894	−94	100 $(^2D)3p\,^1F$
	412 346	412 322	25	96 $(^2P)3p\,^3D$
	430 094	430 086	8	99 $(^4S)4p\,^5P$
	449 551	449 548	3	100 $(^4S)4f\,^5F$
	449 583	449 583	0	100 $(^4S)4f\,^3F$
	462 481	462 526	−44	99 $(^4S)5p\,^5P$
	471 282	471 321	−39	99 $(^2D)4p\,^3D$
	471 869	471 871	−1	100 $(^4S)5f\,^5F$
	471 889	471 893	−4	95 $(^4S)5f\,^3F$ +5 $(^2D)4p\,^3F$
	472 018	472 008	11	95 $(^2D)4p\,^3F$ +5 $(^4S)5f\,^3F$
	472 472	472 563	−91	100 $(^2D)4p\,^1F$
	490 793	490 761	31	80 $(^2D)4f\,^3G$ +13 $(^2D)4f\,^3F$ +6 $(^2D)4f\,^1F$
	490 799	490 791	7	65 $(^2D)4f\,^3D$ +23 $(^2D)4f\,^3F$ +9 $(^2D)4f\,^1F$
	490 814	490 841	−28	62 $(^2D)4f\,^3F$ +21 $(^2D)4f\,^3D$ +12 $(^2D)4f\,^3G$ +5 $(^2D)4f\,^1F$
	490 852	490 867	−15	79 $(^2D)4f\,^1F$ +14 $(^2D)4f\,^3D$ +5 $(^2D)4f\,^3G$
	492 946	492 950	−4	98 $(^2P)4p\,^3D$
	504 114	504 066	48	99 $(^2D)5p\,^3F$
	511 932	511 944	−12	73 $(^2P)4f\,^3D$ +11 $(^2P)4f\,^1F$ +9 $(^2P)4f\,^3F$
	511 973	511 949	24	79 $(^2P)4f\,^3G$ +8 $(^2P)4f\,^3F$ +7 $(^2P)4f\,^1F$
	512 035	512 012	23	39 $(^2P)4f\,^1F$ +39 $(^2P)4f\,^3F$ +18 $(^2P)4f\,^3D$
	512 056	512 043	13	42 $(^2P)4f\,^3F$ +40 $(^2P)4f\,^1F$ +15 $(^2P)4f\,^3G$
2	0	4	−4	100 $p^4\,^3P$
	25 839	25 837	2	100 $p^4\,^1D$
	348 425	348 409	16	99 $(^4S)3p\,^5P$
	356 761	356 730	32	95 $(^4S)3p\,^3P$

TABLE VII. (*Continued*).

J	E(obs)	E(calc)	E(obs)-E(calc)	Percentage composition
	389 054	389 020	34	97 $(^2D)3p\ ^3D$
	391 399	391 523	−124	100 $(^2D)3p\ ^3F$
	398 971	399 052	−81	92 $(^2D)3p\ ^3P$
	406 331	406 215	116	88 $(^2D)3p\ ^1D$ + 10 $(^2P)3p\ ^1D$
	412 374	412 370	4	96 $(^2P)3p\ ^3D$
	416 796	416 740	56	95 $(^2P)3p\ ^3P$
	420 243	420 196	47	88 $(^2P)3p\ ^1D$ + 10 $(^2D)3p\ ^1D$
	430 077	430 071	6	99 $(^4S)4p\ ^5P$
	434 324	434 309	15	96 $(^4S)4p\ ^3P$
	449 551	449 548	4	100 $(^4S)4f\ ^5F$
	449 583	449 583	0	100 $(^4S)4f\ ^3F$
	462 475	462 521	−45	99 $(^4S)5p\ ^5P$
	463 855	463 856	−1	96 $(^4S)5p\ ^3P$
	471 272	471 255	17	99 $(^2D)4p\ ^3D$
	471 869	471 871	−1	100 $(^4S)5f\ ^5F$
	471 888	471 890	−2	91 $(^4S)5f\ ^3F$ + 8 $(^2D)4p\ ^3F$
	472 026	471 981	45	91 $(^2D)4p\ ^3F$ + 8 $(^4S)5f\ ^3F$
	473 862	473 897	−36	92 $(^2D)4p\ ^3P$
	477 533	477 573	−40	97 $(^2D)4p\ ^1D$
	490 797	490 790	7	46 $(^2D)4f\ ^3F$ + 29 $(^2D)4f\ ^1D$ + 25 $(^2D)4f\ ^3D$
	490 893	490 842	51	95 $(^2D)4f\ ^3P$
	490 836	490 849	−13	52 $(^2D)4f\ ^3F$ + 30 $(^2D)4f\ ^3D$ + 16 $(^2D)4f\ ^1D$
	490 817	490 867	−50	54 $(^2D)4f\ ^1D$ + 41 $(^2D)4f\ ^3D$
	492 952	492 949	4	97 $(^2P)4p\ ^3D$
	493 602	493 579	22	91 $(^2P)4p\ ^3P$ + 5 $sp^4(^3P)3s\ ^3P$
	495 311	495 204	106	97 $(^2P)4p\ ^1D$
	504 130	504 044	86	100 $(^2D)5p\ ^3F$
	511 906	511 939	−33	87 $(^2P)4f\ ^3D$ + 5 $(^2D)5f\ ^3D$ + 5 $(^2P)4f\ ^3F$
	511 951	511 968	−16	66 $(^2P)4f\ ^1D$ + 28 $(^2P)4f\ ^3F$
	512 040	512 020	20	64 $(^2P)4f\ ^3F$ + 25 $(^2P)4f\ ^1D$ + 6 $(^2P)4f\ ^3D$
1	643	632	11	100 $p^4\ ^3P$
	348 394	348 380	13	99 $(^4S)3p\ ^5P$
	356 750	356 690	60	95 $(^4S)3p\ ^3P$
	387 960	387 931	30	86 $(^2D)3p\ ^1P$ + 7 $(^2P)3p\ ^1P$ + 6 $(^2D)3p\ ^3D$
	389 043	388 992	50	91 $(^2D)3p\ ^3D$ + 6 $(^2D)3p\ ^1P$
	399 067	399 105	−38	93 $(^2D)3p\ ^3P$
	409 872	409 709	162	97 $(^2P)3p\ ^3S$
	412 375	412 375	0	95 $(^2P)3p\ ^3D$
	414 228	414 274	−47	89 $(^2P)3p\ ^1P$ + 8 $(^2D)3p\ ^1P$
	416 751	416 693	58	95 $(^2P)3p\ ^3P$
	430 066	430 061	5	99 $(^4S)4p\ ^5P$
	434 342	434 319	23	96 $(^4S)4p\ ^3P$
	449 551	449 548	4	100 $(^4S)4f\ ^5F$
	462 472	462 517	−46	99 $(^4S)5p\ ^5P$
	463 861	463 861	0	96 $(^4S)5p\ ^3P$
	471 232	471 159	73	80 $(^2D)4p\ ^3D$ + 18 $(^2D)4p\ ^1P$
	471 384	471 435	−51	80 $(^2D)4p\ ^1P$ + 19 $(^2D)4p\ ^3D$
	471 869	471 871	−1	100 $(^4S)5f\ ^5F$
	473 931	473 960	−29	93 $(^2D)4p\ ^3P$
	490 810	490 829	−19	84 $(^2D)4f\ ^1P$ + 14 $(^2D)4f\ ^3P$
	490 887	490 862	25	95 $(^2D)4f\ ^3D$
	490 834	490 867	−34	84 $(^2D)4f\ ^3P$ + 13 $(^2D)4f\ ^1P$
	492 223	492 218	5	98 $(^2P)4p\ ^3S$
	492 946	492 941	5	95 $(^2P)4p\ ^3D$
	493 157	493 331	−174	69 $(^2P)4p\ ^1P$ + 25 $(^2P)4p\ ^3P$
	493 594	493 553	41	66 $(^2P)4p\ ^3P$ + 25 $(^2P)4p\ ^1P$
	511 900	511 936	−36	93 $(^2P)4f\ ^3D$ + 5 $(^2D)5f\ ^3D$
0	922	929	−8	100 $p^4\ ^3P$
	55 748	55 748	0	98 $p^4\ ^1S$

TABLE VII. (*Continued*).

J	E(obs)	E(calc)	E(obs)-E(calc)	Percentage composition
	356 760	356 684	76	95 $(^4S)3p\ ^3P$
	399 110	399 140	−30	93 $(^2D)3p\ ^3P$
	416 722	416 659	63	95 $(^2P)3p\ ^3P$
	433 010	433 073	−63	95 $(^2P)3p\ ^1S$
	434 357	434 330	27	95 $(^4S)4p\ ^3P$
	473 962	473 990	−28	93 $(^2D)4p\ ^3P$
	478 824	478 824	0	96 $p^6\ ^1S$
	490 839	490 871	−32	100 $(^2D)4f\ ^3P$
	493 570	493 449	121	92 $(^2P)4p\ ^3P$ + 5 $sp^4(^3P)3s\ ^3P$

TABLE VIII. Energy parameters (in cm^{-1}) for the $2s2p^5+\{2s^22p^3+2p^5\}(3s+4s+5s+3d+4d+5d)+2s2p\ ^43p$ configurations of Ne III. The last column shows the ratios between the parameter values obtained in the least-squares fit and those obtained in Hartree-Fock calculations.

Parameter	Restrictions[a]	HF(E_{av})	Fitted	Ratio, fitted to HF
$2s2p^5$				
E_{av}			231 190±210	
$G^1(2s,2p)$		147 841	132 135±260	0.8938±0.0017
ζ_{2p}		582	607±93	1.04±0.16
$2s^22p^33s$				
E_{av}			355 627±47	
$F^2(2p,2p)$		123 588	112 968±230	0.9141±0.0019
$G^1(2p,3s)$	1	7 109	6 732±83	0.940±0.012
ζ_{2p}	2	676	572±340	0.85±0.50
$2s^22p^34s$				
E_{av}			459 225±49	
$F^2(2p,2p)$		124 180	114 124±150	0.9190±0.0012
$G^1(2p,4s)$	1	2 113	1 977±24	0.940±0.012
ζ_{2p}	2	681	576±350	0.85±0.51
$2s^22p^35s$				
E_{av}			498 231±45	
$F^2(2p,2p)$		124 322	114 204±150	0.9186±0.0012
$G^1(2p,5s)$	1	917	859±11	0.940±0.012
ζ_{2p}	2	682	577±350	0.85±0.51
$2s^22p^33d$				
E_{av}			437 675±39	
$F^2(2p,2p)$		124 094	114 039±120	0.9190±0.0010
$F^2(2p,3d)$	3	11 223	9 531±720	0.85±0.06
$G^1(2p,3d)$		6 137	6 118±130	1.00±0.02
$G^3(2p,3d)$		3 465	1 812±180	0.52±0.05
ζ_{2p}	2	681	577±350	0.85±0.51
ζ_{3d}	fix	2	2	1.00
$2s^22p^34d$				
E_{av}			488 278±110	
$F^2(2p,2p)$		124 273	114 280±310	0.9196±0.0025
$F^2(2p,4d)$	3	4 552	3 866±290	0.85±0.06
$G^1(2p,4d)$		3 024	2 348±380	0.78±0.13
$G^3(2p,4d)$		1 725	1 632±510	0.95±0.30
ζ_{2p}	2	682	577±350	0.85±0.51
ζ_{4d}	fix	1	1	1.00
$2s^22p^35d$				
E_{av}			511 631±120	
$F^2(2p,2p)$		124 349	114 145±310	0.9179±0.0025
$F^2(2p,5d)$	3	2 267	1 925±150	0.85±0.07
$G^1(2p,5d)$		1 611	1 049±190	0.65±0.12
$G^3(2p,5d)$	fix	924	924	1.00

TABLE VIII. (*Continued*).

Parameter	Restrictions[a]	HF(E_{av})	Fitted	Ratio, fitted to HF
ζ_{2p}	2	682	577±350	0.85±0.51
ζ_{5d}	fix	0	0	1.00
$2p^53s$				
E_{av}	fix		799 000	
$2p^54s$				
E_{av}	fix		902 000	
$2p^55s$				
E_{av}	fix		940 000	
$2p^53d$				
E_{av}	fix		877 000	
$2p^54d$				
E_{av}	fix		929 000	
$2p^55d$				
E_{av}	fix		953 000	
$2s2p^43p$				
E_{av}	fix		600 000	
Configuration-interaction integrals				
$2s2p^5$-$2s^22p^33s$				
$R^1(2p2p,2s3s)$	4	15 415	21 969±1800	1.43±0.11
$2s2p^5$-$2s^22p^34s$				
$R^1(2p2p,2s4s)$	4	8 043	11 462±910	1.43±0.11
$2s2p^5$-$2s^22p^35s$				
$R^1(2p2p,2s5s)$	4	5 200	7 411±590	1.43±0.11
$2s2p^5$-$2s^22p^33d$				
$R^1(2p2p,2s3d)$	5	−27 910	−25 077±920	0.90±0.03
$2s2p^5$-$2s^22p^34d$				
$R^1(2p2p,2s4d)$	5	−19 878	−17 860±660	0.90±0.03
$2s2p^5$-$2s^22p^35d$				
$R^1(2p2p,2s5d)$	5	−14 591	−13 111±480	0.90±0.03
$2s2p^5$-$2p^53s$				
$R^1(2s2p,2p3s)$	fix	20 357	20 357	1.00
$R^0(2s2p,3s2p)$	fix	3 545	3 545	1.00
$2s2p^5$-$2p^54s$				
$R^1(2s2p,2p4s)$	fix	10 488	10 488	1.00
$R^0(2s2p,4s2p)$	fix	1 831	1 831	1.00
$2s2p^5$-$2p^55s$				
$R^1(2s2p,2p5s)$	fix	6 755	6 755	1.00
$R^0(2s2p,5s2p)$	fix	1 180	1 180	1.00
$2s2p^5$-$2p^53d$				
$R^1(2s2p,2p3d)$	fix	−28 505	−28 505	1.00
$R^2(2s2p,3d2p)$	fix	−19 235	−19 235	1.00
$2s2p^5$-$2p^54d$				
$R^1(2s2p,2p4d)$	fix	−20 181	−20 181	1.00
$R^2(2s2p,4d2p)$	fix	−13 913	−13 913	1.00
$2s2p^5$-$2p^55d$				
$R^1(2s2p,2p5d)$	fix	−14 772	−14 772	1.00
$R^2(2s2p,5d2p)$	fix	−10 276	−10 276	1.00
$2s2p^5$-$2s2p^43p$				
$R^0(2s2p,2s3p)$	fix	2 986	2 986	1.00
$R^1(2s2p,3p2s)$	fix	17 333	17 333	1.00
$R^0(2p2p,2p3p)$	fix	3 911	3 911	1.00
$R^2(2p2p,2p3p)$	fix	16 863	16 863	1.00
$2s^22p^33s$-$2s^22p^34s$				
$R^1(2p3s,4s2p)$	fix	3 854	3 854	1.00
$2s^22p^33s$-$2s^22p^35s$				
$R^1(2p3s,5s2p)$	fix	2 528	2 528	1.00
$2s^22p^33s$-$2s^22p^33d$				

TABLE VIII. (*Continued*).

Parameter	Restrictions[a]	HF(E_{av})	Fitted	Ratio, fitted to HF
$R^2(2p3s,2p3d)$	6	8 690	7 362±360	0.85±0.04
$R^1(2p3s,3d2p)$	fix	−527	−527	1.00
$2s^22p^33s$-$2s^22p^34d$				
$R^2(2p3s,2p4d)$	6	4 344	3 680±180	0.85±0.04
$R^1(2p3s,4d2p)$	fix	−577	−577	1.00
$2s^22p^33s$-$2s^22p^35d$				
$R^2(2p3s,2p5d)$	6	2 694	2 282±110	0.85±0.04
$R^1(2p3s,5d2p)$	fix	−489	−489	1.00
$2s^22p^33s$-$2p^53s$				
$R^1(2s2s,2p2p)$	7	153 769	107 888±620	0.7006±0.0040
$2s^22p^33s$-$2s2p^43p$				
$R^1(2s3s,2p3p)$	fix	33 569	33 569	1.00
$R^1(2s3s,3p2p)$	fix	6 109	6 109	1.00
$2s^22p^34s$-$2s^22p^35s$				
$R^1(2p4s,5s2p)$	fix	1 391	1 391	1.00
$2s^22p^34s$-$2s^22p^33d$				
$R^2(2p4s,2p3d)$	6	2 653	2 248±110	0.85±0.04
$R^1(2p4s,3d2p)$	fix	−196	−196	1.00
$2s^22p^34s$-$2s^22p^34d$				
$R^2(2p4s,2p4d)$	6	2 566	2 173±110	0.85±0.04
$R^1(2p4s,4d2p)$	fix	−237	−237	1.00
$2s^22p^34s$-$2s^22p^35d$				
$R^2(2p4s,2p5d)$	6	1 739	1 473±80	0.85±0.04
$R^1(2p4s,5d2p)$	fix	−207	−207	1.00
$2s^22p^34s$-$2p^54s$				
$R^1(2s2s,2p2p)$	7	154 058	108 086±620	0.7006±0.0040
$2s^22p^34s$-$2s2p^43p$				
$R^1(2s4s,2p3p)$	fix	10 140	10 140	1.00
$R^1(2s4s,3p2p)$	fix	3 311	3 311	1.00
$2s^22p^35s$-$2s^22p^33d$				
$R^2(2p5s,2p3d)$	6	1 593	1 350±66	0.85±0.04
$R^1(2p5s,3d2p)$	fix	−107	−107	1.00
$2s^22p^35s$-$2s^22p^34d$				
$R^2(2p5s,2p4d)$	6	1 266	1 073±52	0.85±0.04
$R^1(2p5s,4d2p)$	fix	−138	−138	1.00
$2s^22p^35s$-$2s^22p^35d$				
$R^2(2p5s,2p5d)$	6	1 100	932±45	0.85±0.04
$R^1(2p5s,5d2p)$	fix	−122	−122	1.00
$2s^22p^35s$-$2p^55s$				
$R^1(2s2s,2p2p)$	7	154 131	108 142±620	0.7006±0.0040
$2s^22p^35s$-$2s2p^43p$				
$R^1(2s5s,2p3p)$	fix	6 057	6 057	1.00
$R^2(2s5s,3p2p)$	fix	2 171	2 171	1.00
$2s^22p^33d$-$2s^22p^34d$				
$R^2(2p3d,2p4d)$	8	6 176	5 201±1600	0.84±0.26
$R^1(2p3d,4d2p)$	9	4 298	4 891±550	1.14±0.13
$R^3(2p3d,4d2p)$	fix	2 439	2 439	1.00
$2s^22p^33d$-$2s^22p^35d$				
$R^2(2p3d,2p5d)$	8	4 148	3 493±1100	0.84±0.26
$R^1(2p3d,5d2p)$	9	3 131	3 562±400	1.14±0.13
$R^3(2p3d,5d2p)$	fix	1 779	1 779	1.00
$2s^22p^33d$-$2p^53d$				
$R^1(2s2s,2p2p)$	7	153 894	107 888±620	0.7006±0.0040
$2s^22p^33d$-$2s2p^43p$				
$R^1(2s3d,2p3p)$	fix	20 797	20 797	1.00
$R^1(2s3d,3p2p)$	fix	−1 031	−1 031	1.00
$2s^22p^34d$-$2s^22p^35d$				
$R^2(2p4d,2p5d)$	8	3 049	2 568±790	0.84±0.26
$R^1(2p4d,5d2p)$	9	2 206	2 509±280	1.14±0.13

TABLE VIII. (*Continued*).

Parameter	Restrictions[a]	HF(E_{av})	Fitted	Ratio, fitted to HF
$R^3(2p4d,5d2p)$	fix	1 262	1 262	1.00
$2s^22p^34d$-$2p^54d$				
$R^1(2s2s,2p2p)$	7	154 052	107 987±620	0.7006±0.0040
$2s^22p^34d$-$2s2p^43p$				
$R^1(2s4d,2p3p)$	fix	8 172	8 172	1.00
$R^1(2s4d,3p2p)$	fix	−895	−895	1.00
$2s^22p^35d$-$2p^55d$				
$R^1(2s2s,2p2p)$	7	154 118	108 046±620	0.7006±0.0040
$2s^22p^35d$-$2s2p^43p$				
$R^1(2s5d,2p3p)$	fix	4 631	4 631	1.00
$R^1(2s5d,3p2p)$	fix	−709	−709	1.00

[a]Parameters given equal numbers in this column are free to vary, but are restricted to common scale factors. Parameters marked "fix" have not been varied.

cm^{-1}.

Table VII shows a comparison between the observed level values and the level values calculated using the least-squares-fitted energy parameters of Table VI. The calculated eigenvector compositions of the observed levels are also included. The $2s^22p^33p$ configuration is well described in the *LS* coupling scheme, the lowest purity of any state being 86%. In $4p$ the $(^2P)4p\ ^3P_1$ and $^1P_1$ states are mixed and their *LS* purities less than 70%. All other states have purities exceeding 80%. The eigenvectors of the $(^2P)4p\ ^3P$ levels have contributions from $2s2p^43s\ ^3P$ amounting to 5%, whereas the contributions from $2p^5nl$ are less than 5% and are not shown in Table VII.

The *LS* designations of the $2s^22p^34f$ levels (Table II) are based on the observed intensity distribution in the $3d$-$4f$ transition array. Neither the observed intensities nor the theoretical calculations lead to fully unambiguous identifications for all states. In fact, in several cases the identifications suggested by the observations and by the calculations are contradictory. The $4f$ configuration is not particularly well described in the *LS* coupling scheme (Table VII). The $4f$ levels are found in three narrow groups, one for each parent term. The spin-orbit splittings of the parent terms are very small ($-45\ \mathrm{cm}^{-1}$ for ^2D, $6\ \mathrm{cm}^{-1}$ for ^2P) meaning that the j quantum number of the parent state is not a good quantum number and the $4f$ configuration of Ne III is not well described in the jK coupling scheme either. One reason for the difficulty in providing a good theoretical description of the observed level structure might be the inverted splitting of the $2s^22p^3\ ^2D$ parent term.

B. Odd configurations

In the fit to the odd configurations we included the configurations $2s2p^5+\{2s^22p^3+2p^5\}(3s+4s+5s+3d+4d+5d)+2s2p^43p$. The results of the fit are summarized in Tables VIII and IX. The standard deviation of the least-squares fit with $N=84$ levels included and $P=29$ free parameters is $61\ \mathrm{cm}^{-1}$. The definition of "free" parameters and the motivation for including the $2p^5nl$ and $2s2p^43p$ configurations are the same as discussed already in connection with the even configurations.

Strong mixing between the $(^2D)4s\ ^{1,3}D$ and the $(^2P)3d\ ^{1,3}D$ terms (cf. Fig. 3) reduces the purities of these states to around 60%, while all other observed $2s^22p^3ns$ and nd states have purities $\geq 89\%$. The mixing between the aforementioned $4s$ and $3d$ states is clearly seen in, e.g., the $3p$-$4s$ and $3p$-$3d$ transition arrays and also in the form of some relatively strong $(^2D)4s\ ^{1,3}D$–$(^2P)4f\ ^{1,3}F$ transitions.

The two largest discrepancies between the observed level values and those calculated using the fitted parameter values of Table VIII are found for the $(^2D)3d\ ^1D_2$ level at $439\,746\ \mathrm{cm}^{-1}$ and the $(^2D)3d\ ^3S_1$ level at $440\,050\ \mathrm{cm}^{-1}$. In fact, a much better fit can be obtained by interchanging the designations of the 439 746- $[(^2D)3d\ ^1D_2]$ and $439\,571$-cm^{-1} $[(^2D)3d\ ^3P_2]$ levels. However, the observed intensity distribution strongly supports the identification of the $439\,746$-cm^{-1} level as a $^1D_2$ level and the $439\,571$-cm^{-1} level as a $^3P_2$ level.

In a least-squares fit including α to $2s2p^5+2s^22p^3(3d+4s)$ the difference between observed and calculated positions of the $(^2D)3d\ ^3S_1$ level is of the order of $1000\ \mathrm{cm}^{-1}$. If the Rydberg series configuration interaction[30] is taken into account the discrepancy is reduced to about $500\ \mathrm{cm}^{-1}$. In our final fit (excluding α) the discrepancy is $454\ \mathrm{cm}^{-1}$, i.e., essentially unchanged. In all three calculations the $(^2D)3d\ ^3S_1$ level was excluded from the fit. The reason for this is that the fortuitous close coincidence between the $(^2D)3d\ ^3S_1$ and $^3P_1$ levels causes numerical problems in the least-squares fit.

In an elaborate theoretical study of the $2s^22p^33d$ configuration of Ne III, Hansen *et al.*[16] included two-, three-, and four-electron operators in the parametric fit and arrived at a very small mean error. In particular, the importance of effective four-electron operators was pointed out.

V. IONIZATION ENERGY

The ionization energy of Ne III has been determined by applying a two-parameter Ritz formula to the $(^4S)ng\ ^5G$

TABLE IX. Comparison between observed and calculated energy-level values (in cm^{-1}) and calculated percentage compositions for the $2s2p^5+\{2s^22p^3+2p^5\}(3s+4s+5s+3d+4d+5d)+2s2p^43p$ configurations[a] of Ne III. Eigenvector components larger than 5% are given.

J	E(obs)	E(calc)	E(obs)-E(calc)	Percentage composition
5	436 546	436 534	12	100 $(^2D)3d\ ^3G$
	487 906	487 906	0	100 $(^2D)4d\ ^3G$
4	394 680	394 680	0	100 $(^4S)3d\ ^5D$
	435 607	435 711	−105	98 $(^2D)3d\ ^3F$
	436 573	436 525	47	100 $(^2D)3d\ ^3G$
	436 770	436 759	10	100 $(^2D)3d\ ^1G$
	446 372	446 374	−2	100 $(^4S)4d\ ^5D$
	457 595	457 664	−69	97 $(^2P)3d\ ^3F$
	470 196	470 197	−2	100 $(^4S)5d\ ^5D$
	487 631	487 664	−33	99 $(^2D)4d\ ^3F$
	487 928	487 895	33	99 $(^2D)4d\ ^3G$
	488 044	488 094	−49	100 $(^2D)4d\ ^1G$
3	353 132	353 182	−50	99 $(^2D)3s\ ^3D$
	394 683	394 679	4	100 $(^4S)3d\ ^5D$
	398 194	398 205	−11	99 $(^4S)3d\ ^3D$
	435 554	435 646	−92	98 $(^2D)3d\ ^3F$
	436 596	436 516	80	100 $(^2D)3d\ ^3G$
	436 830	436 845	−15	96 $(^2D)3d\ ^3D$
	440 886	440 979	−93	99 $(^2D)3d\ ^1F$
	446 374	446 374	0	100 $(^4S)4d\ ^5D$
	448 250	448 255	−5	95 $(^4S)4d\ ^3D$
	457 665	457 713	−48	96 $(^2P)3d\ ^3F$
	457 990	458 018	−29	67 $(^2D)4s\ ^3D$ +31 $(^2P)3d\ ^3D$
	460 137	460 137	0	58 $(^2P)3d\ ^3D$ +30 $(^2D)4s\ ^3D$ +9 $(^2P)3d\ ^1F$
	460 119	460 182	−63	89 $(^2P)3d\ ^1F$ +6 $(^2P)3d\ ^3D$
	470 197	470 197	0	100 $(^4S)5d\ ^5D$
	471 180	471 178	2	98 $(^4S)5d\ ^3D$
	487 623	487 636	−12	99 $(^2D)4d\ ^3F$
	487 952	487 888	64	100 $(^2D)4d\ ^3G$
	497 993	497 995	−2	100 $(^2D)5s\ ^3D$
2	204 288	204 284	4	98 $sp^5\ ^3P$
	309 879	309 856	23	99 $(^4S)3s\ ^5S$
	353 161	353 171	−9	99 $(^2D)3d\ ^3D$
	357 927	357 945	−18	100 $(^2D)3s\ ^1D$
	374 494	374 475	19	97 $(^2P)3s\ ^3P$
	394 686	394 679	7	100 $(^4S)3d\ ^5D$
	398 181	398 190	−9	99 $(^4S)3d\ ^3D$
	416 913	416 919	−6	100 $(^4S)4s\ ^5S$
	435 514	435 596	−82	98 $(^2D)3d\ ^3F$
	436 900	436 870	30	96 $(^2D)3d\ ^3D$
	439 746	439 508	239	96 $(^2D)3d\ ^1D$
	439 571	439 663	−92	98 $(^2D)3d\ ^3P$
	446 374	446 374	0	100 $(^4S)4d\ ^5D$
	448 232	448 232	0	95 $(^4S)4d\ ^3D$
	456 497	456 580	−83	100 $(^4S)5s\ ^5S$
	457 712	457 745	−33	94 $(^2P)3d\ ^3F$
	457 965	457 991	−25	56 $(^2D)4s\ ^3D$ +27 $(^2P)3d\ ^3D$ +11 $(^2P)3d\ ^1D$
	458 094	458 117	−24	59 $(^2P)3d\ ^1D$ +18 $(^2D)4s\ ^1D$ +11 $(^2D)4s\ ^3D$
	458 441	458 314	127	96 $(^2P)3d\ ^3P$
	460 125	460 132	−7	64 $(^2P)3d\ ^3D$ +32 $(^2D)4s\ ^3D$
	460 687	460 682	5	77 $(^2D)4s\ ^1D$ +21 $(^2P)3d\ ^1D$
	470 198	470 197	1	100 $(^4S)5d\ ^5D$
	471 179	471 180	−1	98 $(^4S)5d\ ^3D$
	479 830	479 855	−25	96$(^2P)4s\ ^3P$
	498 019	497 983	36	100 $(^2D)5s\ ^3D$
	498 657	498 616	41	100 $(^2D)5s\ ^1D$

TABLE IX. (*Continued*).

J	E(obs)	E(calc)	E(obs)-E(calc)	Percentage composition
1	204 872	204 884	−12	98 $sp^5\,^3P$
	289 477	289 477	0	96 $sp^5\,^1P$
	319 430	319 429	1	99 $(^4S)3s\,^3S$
	353 181	353 165	16	99 $(^2D)3s\,^3D$
	374 488	374 468	20	97 $(^2P)3s\,^3P$
	379 825	379 849	−24	96 $(^2P)3s\,^1P$
	394 689	394 679	10	100 $(^4S)3d\,^5D$
	398 177	398 181	−5	99 $(^4S)3d\,^3D$
	419 826	419 718	108	100 $(^4S)4s\,^3S$
	436 946	436 886	60	96 $(^2D)3d\,^3D$
	439 043	439 003	40	95 $(^2D)3d\,^1P$
	439 693	439 733	−40	96 $(^2D)3d\,^3P$
	440 050	439 596	—[a]	98 $(^2D)3d\,^3S$
	448 221	448 217	4	95 $(^4S)4d\,^3D$
	457 781	457 834	−53	100 $(^4S)5s\,^3S$
	458 000	458 004	−5	67 $(^2D)4s\,^3D$ +31 $(^2P)3d\,^3D$
	458 334	458 247	87	98 $(^2P)3d\,^3P$
	460 113	460 127	−14	65 $(^2P)3d\,^3D$ +32 $(^2D)4s\,^3D$
	462 931	462 944	−13	96 $(^2P)3d\,^1P$
	479 826	479 848	−22	96 $(^2P)4s\,^3P$
	481 287	481 278	9	94 $(^2P)4s\,^1P$
	498 038	497 976	62	100 $(^2D)5s\,^3D$
0	205 195	205 187	8	98 $sp^5\,^3P$
	374 488	374 465	23	97 $(^2P)3s\,^3P$
	394 691	394 678	12	100 $(^4S)3d\,^5D$
	435 581	435 587	−5	100 $(^2D)3d\,^1S$
	439 746	439 755	−8	98 $(^2D)3d\,^3P$
	458 284	458 215	69	98 $(^2P)3d\,^3P$
	479 830	479 845	−15	96 $(^2P)4s\,^3P$

[a]The fortuitous close coincidence between the $(^2D)3d\,^3S_1$ and $^3P_1$ levels caused numerical problems and therefore the $(^2D)3d\,^3S_1$ level was excluded from the fit.

(n=5–7) level series. The value arrived at is 511 539±4 cm^{-1} (63.4227±0.0005 eV). The error limit takes into account the uncertainty in the connection between the quintet-level system and the ground level. The present value is about 2600 cm^{-1} lower than the previous experimental value,[4] but is close to the value of 511 800 extrapolated by Edlén.[31]

The $(^4S)ng\,^3G$ (n=5–7) level series yields the value 511 544 cm^{-1} for the ionization energy of Ne III, while the $(^4S)nf\,^5F$ level series give the values 511 538 (n=4–6), 511 533 (n=5–7), and 511 540 cm^{-1} (n=6–8).

Calculations of the ionization energy from the $(^4S)nf\,^3F_4$ series (n=4,5,6; n=5,6,7; n=4,6,7) indicate that the $(^4S)5f\,^3F$ term is perturbed and shifted downwards approximately 10 cm^{-1}. A possible perturber is the $(^2D)4p\,^3F$ term, which is located only 123 cm^{-1} above $(^4S)5f\,^3F$. For the J=4 levels the configuration-interaction calculation predicts a mixing of the order of 2.5%. According to a simple perturbation calculation such a mixing corresponds to a shift of 3 cm^{-1}. Experimentally, the appearance of $(^2D)3d\,^3G$–$(^4S)5f\,^3F$ and $(^4S)3d\,^3D$–$(^2D)4p\,^3F$ transitions also points towards a mixing between the $(^4S)5f\,^3F$ and $(^2D)4p\,^3F$ terms.

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