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The Third Spectrum of Krypton

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The spectrum characteristic of the Kr^{++} ion has been selected from the various krypton spectra excited in a Geissler tube discharge. The distinction between lines of Kr III or higher spark spectra and those of Kr II is based on the partial or complete suppression of the former by inductance in the discharge circuit. Wavelength measurements, based mainly upon observations with the Rowland grating at the Bureau of Standards, extend from λ2100 to λ7400. A total of 369 lines has been classified arising from 88 levels of Kr III. The low states of Kr^{++} are ^3P, ^1D and ^1S, due to the $4s^24p^4$ configuration. The higher excited states are built upon the ^4S, ^2D and ^2P states of Kr^{+++} by the addition of ns, np or nd to the normal $4s^24p^3$ configuration. All but 8 of the 76 levels comprising the first excited states have been found. The connection between these and the low states has been established by the use of J. C. Boyce's extreme ultraviolet data. Numerous inter-limit combinations have permitted precise evaluation of relative term values. Calculations based on the $4p^3(^4S)ns\,^3S^0$, and $4p^3(^4S)nd\,^3D^0$ and $^5D^0$, series have led to an estimated value of 298,020 cm^{-1} for the lowest $4p^4(^4S)\,^3P_2$ level, corresponding to an ionization potential of 36.8 volts.

THE wavelength data reported in this paper were obtained in the spectroscopy laboratory of the Bureau of Standards during a series of investigations of the spectra of krypton and the other rare atmospheric gases in various stages of ionization.[1, 2, 3] The spectra were obtained from Geissler tubes operated by a.c. transformers in a circuit containing a spark gap and condensers. Various amounts of self-inductance were inserted in the circuit for some exposures in order to distinguish between lines arising from different stages of ionization. Full details are given in the paper on Kr II[3], in which a selected list of spark lines arising from the Kr$^+$ ion was published. After this selection was made about 600 lines remained, which, judging by their behavior in the discharge, originate in Kr^{++} or higher stages. In the present investigation 369 of these including practically all the intense sharp lines are classified as Kr III. In view of the uncertain origin of the remaining lines the published list is confined to the classified lines.

In determining the stage of ionization in which a line originates, by aid of discharge behavior, the essential criterion is the weakening of intensity or complete suppression of higher spark lines when inductance is placed in the circuit. The method is not entirely critical because, for a given ion, lines from higher energy states are affected in much the same way as those from the next ion. L. Bloch, E. Bloch and G. Déjardin[4] made a selection of the rare gas lines on the basis of their length when the spectrograph slit was illuminated by an electrodeless discharge exposed end-on. This method is subject to the same limitations. In the paper quoted the lines are designated 1, 2 or 3, accordingly as they are regarded as belonging to the first, second or third spark spectrum. The identification of the lines marked 1 is practically perfect, but it was found in the course of this analysis that, not only the lines marked 2, but also a considerable number of those marked 3, belong to Kr III. Here again the basis of the distinction seems to be the elevation of energy states within the ion. On the whole the two methods of sorting show satisfactory agreement. It is now known also that the discharge conditions in an electrodeless discharge can be made to favor a certain ion by a proper selection of pressure and electrical excitation.

The wavelengths used in the analysis are based mainly on observations with the 21-ft. Rowland grating over the range from λ2400 to λ10,000. No Kr III lines are classified beyond λ7400. The probable error of the grating observations seldom exceeds 0.01A except in the case of very broad hazy lines which in general have not been accounted for by this analysis. The corresponding

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[1] Wm. F. Meggers, T. L. de Bruin and C. J. Humphreys, Bur. Standards J. Research **3**, 129 (1929); **7**, 643 (1931).

[2] Wm. F. Meggers and C. J. Humphreys, Bur. Standards J. Research **10**, 427 (1933).

[3] T. L. de Bruin, C. J. Humphreys and Wm. F. Meggers, Bur. Standards J. Research **11**, 409 (1933).

[4] L. Bloch, E. Bloch and G. Déjardin, Ann. de physique **10**, 461 (1924).

wave number precision ranges from 0.17 cm^{-1} at λ2400 to better than 0.02 cm^{-1} at λ7400. Quartz prism observations go down to λ2100 and overlap the ultraviolet region covered by the grating spectrographs. The fainter ultraviolet lines were observed only with the quartz instrument. The wavelengths in air, wave numbers in vacuum, estimated relative intensities, and identifications of the classified lines, are given in Table I. The relative intensities from the beginning of the list to λ2407 are estimated from quartz prism observations. The rest are based mainly on the grating observations. In any case the intensity estimates are comparable only over short ranges. Lines marked *h* or *H* are hazy or very broad and diffuse, respectively.

In addition to the experimental material just discussed, the author had at his disposal the wavelength measurements in the extreme ultraviolet, made by Professor J. C. Boyce, which the latter very kindly permitted him to use. These data were obtained by use of the electrodeless discharge and the two-meter vacuum spectrograph of the Carnegie Institution of Washington, at the Massachusetts Institute of Technology. The identified lines of the extreme ultraviolet are given in Table III of the following paper.[5] This material proved to be of inestimable value, not only for establishing the connection between terms which had already been found and the lowest states, but also for indicating the relative positions of the groups of terms converging to different limits based on the Kr^{+++} ion.

Two previous attempts at the analysis of Kr III have been reported. Acharya[6] supplemented published wavelengths with quartz prism observations and gave a list of terms part of which were identified as the quintets of the (^4S) system. A different partial analysis of the term system converging to the (^4S) limit has been published by Deb and Dutt.[7] We are in complete disagreement with both of these analyses. The wavelengths already published, consisting of the measurements of Baly,[8] and of Bloch, Bloch and Déjardin,[4] are hardly of sufficient precision for use in a term analysis.

The electron configurations of the Kr^{++} ion are obtained by adding the valence electron to the configuration, $4s^24p^3$, of the Kr^{+++} ion. The lowest states of the Kr^{+++} ion, ^4S, ^2D and ^2P, become accordingly the convergence limits of three sets of terms. The normal configuration of Kr^{++} is $4s^24p^4$, giving $(^4S)^3P$, $(^2D)^1D$ and $(^2P)^1S$ states. The configuration $4s4p^5$ yields $^3P^0$ and $^1P^0$. These latter terms combine both with those of the low and first excited states but all the lines lie in the Schumann region or extreme ultraviolet. The term scheme, predicted by the Hund theory, because of the addition of an electron to the $4s^24p^3$ configuration, is shown in Table II. When the principal quantum number of the valence electron is increased by one, the corresponding array is repeated. Bold-face type indicates that all or part of the levels of a term have been identified. The predicted arrays for *nf* electrons are omitted inasmuch as no such terms have been found.

Altogether 97 levels have been found including 68 of the 76 belonging to first excited states. Identifications are given for all but two of the observed terms. Inter-system and inter-limit combinations appear with considerable intensity. The relative values of the terms converging to the different ion limits are fixed by the inter-limit combinations in the range covered by this investigation and supported by such combinations in the extreme ultraviolet. Transitions between terms converging to different ion limits are associated theoretically with perturbations between terms separated by a small interval.[9] The rare gas spectra approach the *jj* type of coupling so that perturbations may be expected to occur between terms of like *j* values irrespective of *l* or *s*. Consequently in many cases there may be a sharing of configurations between different terms, leading to peculiar interval ratios, partial term inversions, or unusual combining intensities. The unusually high relative intensities of the inter-limit combinations among the higher terms among the first excited states converging to (^2D) and (^2P) have added to the difficulty of assigning these terms to their proper system. Table III contains the observed terms and their identifications, including those fixed only by extreme ultraviolet transitions.

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[5] J. C. Boyce, Phys. Rev. **47**, 718 (1935).
[6] D. P. Acharya, Ind. J. Phys. **5**, 385 (1930).
[7] S. C. Deb and A. K. Dutt, Zeits. f. Physik **67**, 138 (1931).
[8] E. C. C. Baly, Phil. Trans. **202**, 183 (1904).
[9] E. U. Condon, Phys. Rev. **36**, 1121 (1930).

TABLE I. *Lines of krypton III.*

INT.	λ (air)	ν (vac.)	TRANSITION
1	2116.00	47243.96	$(^4S)5s\,^3S^0_1 - (^2D)5p\,^3P_1$
1	2129.75	46938.98	$(^4S)4d\,^3D^0_3 - (^2D)5p\,^3F_4$
1	2138.70	46742.58	$(^4S)4d\,^3D^0_3 - (^2D)5p\,^1F_3$
1	2142.49	46659.91	$(^2D)4d\,^1D^0_2 - (^2P)5p\,^1D_2$
2	2148.58	46527.67	$(^4S)5s\,^3S^0_1 - (^2D)5p\,^3P_2$
1	2158.43	46315.36	$(^4S)4d\,^3D^0_2 - (^2D)5p\,^1P_1$
3	2162.50	46228.20	$(^4S)4d\,^3D^0_3 - (^2D)5p\,^3F_3$
2	2170.83	46050.84	$(^4S)4d\,^3D^0_2 - (^2D)5p\,^3F_2$
1	2172.25	46020.73	$(^4S)4d\,^3D^0_2 - (^2D)5p\,^3D_3$
2	2215.60	45120.40	$(^4S)4d\,^3D^0_3 - (^2D)5p\,^3F_2$
1 —	2219.14	45048.45	$(^4S)4d\,^3D^0_1 - (^2D)5p\,^1P_1$
1	2230.69	44815.21	$(^2D)5s\,^3D^0_3 - (^2P)5p\,^3D_3$
1	2232.35	44781.89	$(^2D)5p\,^3D_3 - 2^0_2$
6	2259.76	44238.76	$(^4S)5p\,^5P_3 - (^4S)5d\,^3D^0_3$
3	2273.76	43966.40	$(^4S)4d\,^3D^0_3 - (^2D)5p\,^3D_2$
4	2279.79	43850.12	$(^2P)5p\,^3S_1 - (^2P)6s\,^1P^0_1$ $(^2D)5p\,^1P_1 - 1^0_1$
1	2290.52	43644.72	$(^2D)5p\,^3F_3 - 2^0_2$
3	2291.28	43630.25	$(^4S)4d\,^3D^0_1 - (^2D)5p\,^3D_2$
3	2299.15	43480.91	$(^2D)5p\,^3D_2 - (^2D)6s\,^1D^0_2$
2	2303.00	43408.23	$(^2D)4d\,^3F^0_3 - (^2D)5p\,^3P_2$
1	2317.87	43129.78	$(^2D)5p\,^1F_3 - 2^0_2$
1	2322.32	43047.14	$(^2D)4d\,^1D^0_2 - (^2P)5p\,^3D_2$
3	2329.22	42919.64	$(^4S)4d\,^3D^0_2 - (^2D)5p\,^3D_1$
6	2345.45	42622.67	$(^2D)5p\,^3D_1 - (^2D)5d\,^1D^0_2$
3	2358.48	42387.21	$(^2D)5p\,^3D_1 - (^2D)6s\,^3D^0_2$
3	2360.14	42357.40	$(^2D)5p\,^3D_3 - (^2D)6s\,^1D^0_2$
4	2361.82	42327.27	$(^2D)5p\,^3F_2 - (^2D)6s\,^1D^0_2$
3	2363.26	42301.48	$(^2P)5p\,^3S_1 - (^2P)6s\,^3P^0_2$
1	2364.70	42275.73	$(^4S)5s\,^3S^0_1 - (^2D)5p\,^3F_2$
4	2368.19	42213.43	$(^4S)5p\,^3P_1 - (^4S)6s\,^3S^0_1$
1	2376.69	42062.47	$(^2D)5p\,^1P_1 - (^2D)6s\,^1D^0_2$
1	2387.90	41865.03	$(^2D)5p\,^3D_2 - (^2D)6s\,^3D^0_3$
40	2393.94	41759.41	$(^4S)5p\,^3P_2 - (^4S)6s\,^3S^0_1$
4	2400.10	41652.24	$(^4S)4d\,^3D^0_1 - (^2D)5p\,^3D_1$
1	2401.58	41626.57	$(^2P)5p\,^1P_1 - (^2P)6s\,^3P^0_2$
2	2402.40	41612.36	$(^4S)4d\,^5D^0_1 - (^4S)5p\,^3P_2$
3	2402.96	41602.67	$(^4S)4d\,^5D^0_2 - (^4S)5p\,^3P_2$
1	2403.29	41596.96	$(^4S)5p\,^5P_2 - (^4S)5d\,^3D^0_2$
3	2403.65	41590.73	$(^4S)4d\,^5D^0_3 - (^4S)5p\,^3P_2$
10	2407.10	41531.12	$(^2D)5p\,^3D_3 - (^2D)5d\,^1G^0_4$
1	2414.78	41399.05	$(^2D)4d\,^3F^0_2 - (^2D)5p\,^3F_3$
1	2427.48	41182.47	$(^4S)4d\,^5D^0_0 - (^4S)5p\,^3P_1$
1	2428.92	41158.06	$(^4S)4d\,^5D^0_1 - (^4S)5p\,^3P_1$
1	2431.04	41122.17	$(^4S)5s\,^3S^0_1 - (^2D)5p\,^3D_2$
2	2434.64	41061.37	$(^2D)5d\,^1P^0_1 - (^2P)5p\,^3P_2$
6	2439.21	40984.45	$(^4S)5p\,^5P_1 - (^4S)5d\,^5D^0_2$
1	2439.78	40974.87	$(^2D)4d\,^3F^0_3 - (^2D)5p\,^3F_4$
6	2440.05	40970.34	$(^4S)5p\,^5P_1 - (^4S)5d\,^5D^0_1$
5	2440.89	40956.24	$(^4S)5p\,^5P_1 - (^4S)5d\,^5D^0_0$
4	2451.52	40778.67	$(^2D)4d\,^3F^0_3 - (^2D)5p\,^1F_3$
10	2452.29	40765.86	$(^4S)5p\,^5P_2 - (^4S)5d\,^5D^0_3$
8	2453.28	40749.41	$(^4S)5p\,^5P_2 - (^4S)5d\,^5D^0_2$
1	2453.74	40741.48	$(^2D)5p\,^3D_3 - (^2D)6s\,^3D^0_3$
3	2454.12	40735.47	$(^4S)5p\,^5P_2 - (^4S)5d\,^5D^0_1$
10*h*	2457.72	40675.80	$(^4S)5p\,^3P_2 - (^4S)5d\,^3D^0_3$
5*h*	2459.63	40644.22	$(^2D)5p\,^3D_2 - (^2D)5d\,^1D^0_2$
3	2462.76	40592.57	$(^2D)4d\,^3D^0_2 - (^2P)5p\,^3P_2$
6*h*	2468.43	40499.39	$(^2D)5p\,^3P_2 - 2^0_2$
4	2473.96	40408.81	$(^2D)5p\,^3D_2 - (^2D)6s\,^3D^0_2$
3*h*	2474.90	40393.47	$(^2D)5p\,^3F_3 - (^2D)5d\,^1G^0_4$
2	2478.37	40336.92	$(^2P)5p\,^1D_2 - (^2P)6s\,^1P^0_1$
1	2481.04	40293.51	$(^2D)4d\,^3F^0_2 - (^2D)5p\,^3F_2$
2	2482.99	40261.87	$(^2D)4d\,^3F^0_2 - (^2D)5p\,^3D_3$
1	2487.03	40196.47	$(^2P)5p\,^3P_1 - (^2P)6s\,^1P^0_1$
2	2491.35	40126.78	$(^2D)4d\,^1P^0_1 - (^2P)5p\,^1D_2$
40	2494.01	40083.98	$(^4S)5p\,^5P_3 - (^4S)5d\,^5D^0_4$
15	2497.71	40024.50	$(^4S)5p\,^5P_3 - (^4S)5d\,^5D^0_3$
3	2498.77	40007.63	$(^4S)5p\,^5P_3 - (^4S)5d\,^5D^0_2$
8	2500.64	39977.71	$(^4S)5p\,^5P_1 - (^4S)6s\,^5S^0_2$
5*h*	2506.86	39878.53	$(^2D)5p\,^1F_3 - (^2D)5d\,^1G^0_4$
1	2507.84	39862.95	$(^2D)5p\,^3P_2 - 1^0_1$
1	2511.92	39798.20	$(^2D)4d\,^3D^0_2 - (^2P)5p\,^3P_1$
6*h*	2512.92	39782.37	$(^2D)5p\,^3P_1 - 2^0_2$
10	2512.42	39742.83	$(^4S)5p\,^5P_2 - (^4S)6s\,^5S^0_2$
6*h*	2519.29	39681.78	$(^2D)5p\,^3F_4 - (^2D)5d\,^1G^0_4$
2	2520.32	39665.57	$(^4S)5p\,^3P_1 - (^4S)5d\,^3D^0_1$
2*h*	2524.27	39603.51	$(^2D)5p\,^3F_3 - (^2D)6s\,^3D^0_3$
10	2524.97	39592.53	$(^2D)4d\,^3F^0_4 - (^2D)5p\,^3F_4$
2	2525.51	39584.06	$(^2D)4d\,^3D^0_1 - (^2P)5p\,^3P^0$
1	2529.52	39521.32	$(^2D)5p\,^3D_3 - (^2D)5d\,^1D^0_2$
1 —	2531.46	39491.02	$(^2D)5p\,^3F_2 - (^2D)5d\,^1D^0_2$
1	2537.16	39402.31	$(^2P)5p\,^3P_2 - (^2P)6s\,^1P^0_1$
6	2537.57	39395.95	$(^2D)4d\,^3F^0_4 - (^2D)5p\,^1F_3$
3*h*	2544.72	39285.26	$(^2D)5p\,^3D_3 - (^2D)6s\,^3D^0_2$
1	2546.36	39259.97	$(^2D)5s\,^3D^0_2 - (^2D)5p\,^1D_2$
1	2546.67	39255.18	$(^2D)5p\,^3F_2 - (^2D)6s\,^3D^0_2$
4*h*	2548.60	39225.46	$(^2D)5p\,^1P_1 - (^2D)5d\,^1D^0_2$
2	2549.51	39211.46	$(^4S)5p\,^3P_2 - (^4S)5d\,^3D^0_1$
2	2551.49	39181.03	$(^2D)5p\,^3P_0 - 1^0_1$
8	2553.16	39155.41	$(^2D)4d\,^3F^0_3 - (^2D)5p\,^3F_2$
1	2553.81	39145.44	$(^2D)5p\,^3P_1 - 1^0_1$
8	2554.25	39138.70	$(^2D)4d\,^3F^0_2 - (^2D)5p\,^3D_2$
10	2555.13	39125.22	$(^2D)4d\,^3F^0_3 - (^2D)5p\,^3D_3$
1	2557.55	39088.20	$(^2D)5p\,^1F_3 - (^2D)6s\,^3D^0_3$
5*h*	2558.00	39081.33	$(^2D)4d\,^3D^0_1 - (^2P)5p\,^1P_1$
30	2563.25	39001.29	$(^4S)5p\,^5P_3 - (^4S)6s\,^5S^0_2$
10*h*	2570.48	38891.60	$(^2D)5p\,^3F_4 - (^2D)6s\,^3D^0_3$
6	2571.19	38880.86	$(^2D)4d\,^3F^0_4 - (^2D)5p\,^3F_3$
3*h*	2586.78	38646.55	$(^2D)5p\,^3P_1 - (^2P)6s\,^3P^0_2$
3	2589.47	38606.40	$(^2D)4d\,^3D^0_3 - (^2P)5p\,^3P_2$
8	2604.35	38385.84	$(^2D)5s\,^1D^0_2 - (^2P)5p\,^1P_1$
1	2609.66	38307.74	$(^2D)4d\,^3D^0_1 - (^2P)5p\,^3D_2$
3	2615.19	38226.74	$(^2P)4d\,^3F^0_3 - (^2P)5p\,^3P_2$
1	2623.11	38111.33	$(^2D)4d\,^3G^0_3 - (^2D)5p\,^3P_2$
2*h*	2625.64	38074.61	$(^2D)5p\,^3P_2 - (^2D)6s\,^1D^0_2$
6	2628.08	38039.26	$(^4S)4d\,^5D^0_2 - (^4S)5p\,^5P_3$
25	2628.90	38027.40	$(^4S)4d\,^5D^0_3 - (^4S)5p\,^5P_3$
15	2630.66	38001.95	$(^2D)4d\,^3F^0_3 - (^2D)5p\,^3D_2$
60	2639.76	37870.91	$(^4S)4d\,^5D^0_4 - (^4S)5p\,^5P_3$
4*h*	2641.00	37853.18	$(^2P)5p\,^3P_2 - (^2P)6s\,^3P^0_2$
2	2641.74	37842.63	$(^2D)5s\,^3D^0_3 - (^2D)5p\,^1D_2$
4	2648.43	37746.99	$(^4S)5p\,^3P_1 - (^4S)5d\,^3D^0_2$
10	2648.69	37743.29	$(^2D)4d\,^3F^0_4 - (^2D)5p\,^3D_3$
1*h*	2650.96	37710.97	$(^2D)5s\,^1D^0_2 - (^2P)5p\,^3S_1$
4	2653.66	37672.60	$(^2D)4d\,^3D^0_3 - (^2P)5p\,^1D_2$
2	2658.00	37611.10	$(^2D)5s\,^1D^0_2 - (^2P)5p\,^3D_2$
20	2670.67	37432.68	$(^2D)4d\,^1D^0_2 - (^2D)5p\,^1D_2$
3	2672.79	37402.99	$(^2D)4d\,^3D^0_2 - (^2P)5p\,^3D_3$
8*h*	2676.00	37358.12	$(^2D)5p\,^3P_1 - (^2D)6s\,^1D^0_2$
15	2679.62	37307.66	$(^4S)4d\,^5D^0_1 - (^4S)5p\,^5P_2$
30	2680.32	37297.91	$(^4S)4d\,^5D^0_2 - (^4S)5p\,^5P_2$
7	2680.72	37292.35	$(^4S)5p\,^3P_2 - (^4S)5d\,^3D^0_2$
40	2681.19	37285.95	$(^4S)4d\,^5D^0_3 - (^4S)5p\,^5P_2$
15	2690.23	37160.53	$(^2D)4d\,^3F^0_2 - (^2D)5p\,^3D_1$
20	2694.81	37097.37	$(^4S)4d\,^5D^0_0 - (^4S)5p\,^5P_1$
25	2696.59	37072.89	$(^4S)4d\,^5D^0_1 - (^4S)5p\,^5P_1$
25	2697.30	37063.13	$(^4S)4d\,^5D^0_2 - (^4S)5p\,^5P_1$
3	2698.07	37052.55	$(^2P)4d\,^3F^0_2 - (^2P)5p\,^3P_1$
2*h*	2698.71	37043.77	$(^2P)5p\,^1D_2 - (^2P)6s\,^3P^0_1$
1	2708.34	36912.06	$(^2P)4d\,^3F^0_2 - (^2P)5p\,^1D_2$
1	2709.02	36902.79	$(^2P)5p\,^3P_1 - (^2P)6s\,^3P^0_1$
2	2710.27	36885.78	$(^4S)5p\,^3P_1 - (^4S)5d\,^5D^0_1$
7	2715.19	36818.94	$(^2D)4d\,^3D^0_2 - (^2P)5p\,^1P_1$
5	2730.41	36613.72	$(^2D)4d\,^1P^0_1 - (^2P)5p\,^3S_1$
2*h*	2741.84	36461.09	$(^4S)5p\,^3P_2 - (^4S)5d\,^5D^0_3$
5*h*	2742.05	36458.30	$(^2D)5p\,^3P_2 - (^2D)6s\,^3D^0_3$
3	2743.03	36445.14	$(^4S)5p\,^3P_2 - (^4S)5d\,^5D^0_2$
2	2744.05	36431.73	$(^4S)5p\,^3P_2 - (^4S)5d\,^5D^0_1$
10	2750.36	36348.15	$(^2D)5s\,^1D^0_2 - (^2P)5p\,^3D_1$
8	2756.53	36266.80	$(^2P)4d\,^3D^0_2 - (^2P)5p\,^3P_2$
2	2765.90	36143.94	$(^2D)4d\,^3D^0_2 - (^2P)5p\,^3S_1$
4*h*	2768.54	36109.48	$(^2P)5p\,^3P_2 - (^2P)6s\,^3P^0_1$
2	2785.26	35892.72	$(^4S)5p\,^3P_1 - (^4S)6s\,^5S^0_2$
20	2806.07	35626.56	$(^2D)4d\,^3S^0_1 - (^2P)5p\,^3S_1$
25	2811.67	35555.60	$(^2D)5s\,^3D^0_1 - (^2D)5p\,^3P_1$
15	2813.97	35526.54	$(^2D)4d\,^3S^0_1 - (^2P)5p\,^3D_2$
15	2814.48	35520.10	$(^2D)5s\,^3D^0_1 - (^2D)5p\,^3P_0$
2	2817.53	35481.66	$(^2D)4d\,^3G^0_3 - (^2D)5p\,^1F_3$
4*h*	2820.95	35438.64	$(^4S)5p\,^3P_2 - (^4S)6s\,^5S^0_2$
6	2822.63	35417.55	$(^2D)4d\,^3D^0_3 - (^2P)5p\,^3D_3$
6	2829.41	35332.69	$(^2P)4d\,^3D^0_2 - (^2P)5p\,^1D_2$
6	2835.94	35251.33	$(^2D)4d\,^1P^0_1 - (^2P)5p\,^3D_1$
30	2841.00	35188.55	$(^2D)5s\,^3D^0_2 - (^2D)5p\,^3P_1$
30	2851.16	35063.16	$(^2D)4d\,^3G^0_4 - (^2D)5p\,^1F_3$
2	2853.22	35037.85	$(^2P)4d\,^3F^0_3 - (^2P)5p\,^3D_3$
5*h*	2856.09	35002.64	$(^2D)5p\,^3P_2 - (^2D)6s\,^3D^0_2$
4	2859.05	34966.40	$(^2D)4d\,^3G^0_3 - (^2D)5p\,^3F_3$
50	2870.61	34825.60	$(^2P)4d\,^3F^0_4 - (^2P)5p\,^3D_3$
5	2872.85	34798.45	$(^2P)5s\,^3P^0_1 - (^2P)5p\,^3P_2$
2	2874.24	34781.62	$(^2D)4d\,^3D^0_2 - (^2P)5p\,^3D_1$
2	2884.55	34657.31	$(^2P)4d\,^3F^0_2 - (^2P)5p\,^3D_3$
100	2892.18	34565.89	$(^2D)4d\,^3G^0_5 - (^2D)5p\,^3F_4$
40	2893.68	34547.97	$(^2D)4d\,^3G^0_4 - (^2D)5p\,^3F_3$
1*h*	2895.92	34521.25	$(^2D)5p\,^3P_1 - (^2D)5d\,^1D^0_2$
20	2900.04	34472.21	$(^2D)5s\,^3D^0_2 - (^2D)5p\,^3P_2$
30	2909.17	34364.02	$(^4S)5s\,^5S^0_2 - (^4S)5p\,^3P_2$
6*h*	2915.78	34286.13	$(^2D)5p\,^3P_1 - (^2D)6s\,^3D^0_2$
10	2917.67	34263.92	$(^2D)4d\,^3S^0_1 - (^2P)5p\,^3D_1$
10	2934.00	34073.22	$(^2P)4d\,^3F^0_2 - (^2P)5p\,^1P_1$
20	2935.23	34058.95	$(^2D)4d\,^3D^0_3 - (^2P)5p\,^3D_2$
4	2938.56	34020.35	$(^2P)5s\,^3P^0_0 - (^2P)5p\,^3P_1$
15	2939.91	34004.73	$(^2P)5s\,^3P^0_1 - (^2P)5p\,^3P_1$
10	2948.13	33909.92	$(^4S)5s\,^5S^0_2 - (^4S)5p\,^3P_1$
4	2952.09	33864.44	$(^2P)5s\,^3P^0_1 - (^2P)5p\,^1D_2$
50	2952.56	33859.05	$(^2D)4d\,^3G^0_3 - (^2D)5p\,^3F_2$
3	2955.20	33828.80	$(^2D)4d\,^3G^0_3 - (^2D)5p\,^3D_3$
20	2968.31	33679.40	$(^2P)4d\,^3F^0_3 - (^2P)5p\,^3D_2$
60	2992.22	33410.29	$(^2D)4d\,^3G^0_4 - (^2D)5p\,^3D_3$
2	2993.27	33398.57	$(^2P)4d\,^3F^0_2 - (^2P)5p\,^3S_1$
20	2996.60	33361.45	$(^2D)4d\,^1D^0_2 - (^2D)5p\,^3P_1$
6	3002.24	33298.78	$(^2P)4d\,^3F^0_2 - (^2P)5p\,^3D_2$

TABLE I.—*Continued*

INT.	λ (air)	ν (vac.)	TRANSITION
50	3022.30	33077.78	$(^2P)4d^3D^0_2-(^2P)5p^3D_3$
80	3024.45	33054.27	$(^2D)5s^3D^0_3-(^2D)5p^3P_2$
6	3044.80	32833.36	$(^2D)4d^1G^0_4-(^2D)5p^3F_4$
50	3046.93	32810.40	$(^2P)5s^3P^0_2-(^2P)5p^3P_2$
30	3056.72	32705.33	$(^2D)4d^3G^0_3-(^2D)5p^3D_2$
3	3062.43	32644.35	$(^2D)4d^1D^0_2-(^2D)5p^3P_2$
60	3063.13	32636.89	$(^2D)4d^1G^0_4-(^2D)5p^1F_3$
40	3097.16	32278.30	$(^4S)4d^3D^0_2-(^4S)5p^3P_2$
60	3112.25	32121.81	$(^2D)4d^1G^0_4-(^2D)5p^3F_3$
30	3120.61	32035.76	$(^2P)4d^3F^0_2-(^2P)5p^3D_1$
20	3122.46	32016.78	$(^2P)5s^3P^0_2-(^2P)5p^3P_1$
100	3124.39	31997.00	$(^2D)5s^1D^0_2-(^2D)5p^1D_2$
10	3136.20	31876.51	$(^2P)5s^3P^0_2-(^2P)5p^1D_2$
15	3139.58	31842.20	$(^2D)5s^3D^0_2-(^2D)5p^1F_3$
60	3141.35	31824.26	$(^4S)4d^3D^0_2-(^4S)5p^3P_1$
20	3141.88	31818.89	$(^2P)4d^3D^0_2-(^2P)5p^3S_1$
9	3144.32	31794.20	$(^2P)5s^1P^0_1-(^2P)5p^3P_2$
10	3151.75	31719.25	$(^2P)4d^3D^0_2-(^2P)5p^3D_2$
1*h*	3156.63	31670.21	$(^2D)5p^1D_2-(^2D)6s^3D^0_3$
20	3170.93	31527.40	$(^2P)5s^3P^0_1-(^2P)5p^3P_0$
100	3189.11	31347.68	$(^4S)4d^3D^0_3-(^4S)5p^3P_2$
80	3191.21	31327.05	$(^2D)5s^3D^0_2-(^2D)5p^3F_3$
20	3220.62	31040.99	$(^2P)5s^3P^0_0-(^2P)5p^1P_1$
10	3222.24	31025.38	$(^2P)5s^3P^0_1-(^2P)5p^1P_1$
3	3223.74	31010.94	$(^4S)4d^3D^0_1-(^4S)5p^3P_2$
20	3224.85	31000.27	$(^2P)5s^1P^0_1-(^2P)5p^3P_1$
2*h*	3235.21	30901.01	$(^2D)4d^1P^0_1-(^2D)5p^1D_2$?
40	3239.52	30859.89	$(^2P)5s^1P^0_1-(^2P)5p^1D_2$
40	3240.44	30851.14	$(^2D)5s^3D^0_1-(^2D)5p^1P_1$
300	3245.69	30801.23	$(^4S)5s^5S^0_2-(^4S)5p^5P_3$
5	3246.62	30792.41	$(^2P)4d^3D^0_1-(^2P)5p^3P_2$
150	3264.81	30620.86	$(^2D)5s^3D^0_3-(^2D)5p^3F_4$
100	3268.48	30586.48	$(^2D)5s^3D^0_1-(^2D)5p^3F_2$
30	3271.65	30556.84	$(^4S)4d^3D^0_1-(^4S)5p^3P_1$
2	3279.42	30484.44	$(^2D)5s^3D^0_2-(^2D)5p^1P_1$
3	3285.25	30430.35	$(^2D)4d^3D^0_2-(^2D)5p^1D_2$
30	3285.89	30424.42	$(^2D)5s^3D^0_3-(^2D)5p^1F_3$
1	3292.21	30366.02	$(^2P)5s^3P^0_0-(^2P)5p^3S_1$
4	3293.88	30350.62	$(^2P)5s^3P^0_1-(^2P)5p^3S_1$
30	3304.75	30250.80	$(^2P)5s^3P^0_1-(^2P)5p^3D_2$
20	3308.16	30219.61	$(^2D)5s^3D^0_2-(^2D)5p^3F_2$
1*h*	3308.73	30214.41	$(^2D)5p^1D_2-(^2D)6s^3D^0_2$
50	3311.47	30189.41	$(^2D)5s^3D^0_2-(^2D)5p^3D_3$
200	3325.75	30059.79	$(^4S)5s^5S^0_2-(^4S)5p^5P_2$
60	3330.76	30014.58	$(^2D)4d^1D^0_2-(^2D)5p^1F_3$
10	3332.50	29998.90	$(^2P)4d^3D^0_1-(^2P)5p^3P_1$
50	3342.48	29909.33	$(^2D)5s^3D^0_3-(^2D)5p^3F_3$
10	3348.17	29858.51	$(^2P)4d^3D^0_1-(^2P)5p^1D_2$
100	3351.93	29825.02	$(^4S)5s^5S^0_2-(^4S)5p^5P_1$
40	3374.96	29621.50	$(^2P)5s^3P^0_2-(^2P)5p^3D_3$
20	3388.93	29499.40	$(^2D)4d^1D^0_2-(^2D)5p^3F_3$
15	3396.58	29432.96	$(^2D)5s^3D^0_1-(^2D)5p^3D_2$
10	3428.83	29156.14	$(^2P)4d^1F^0_3-(^2P)5p^1D_2$
100	3439.46	29066.03	$(^2D)5s^3D^0_2-(^2D)5p^3D_2$
6	3442.86	29037.33	$(^2P)5s^3P^0_2-(^2P)5p^1P_1$
8	3446.85	29003.72	$(^2P)5s^3P^0_0-(^2P)5p^3D_1$
10	3448.71	28988.07	$(^2P)5s^3P^0_1-(^2P)5p^3D_1$
3	3471.02	28801.76	$(^2D)5s^3D^0_3-(^2D)5p^3F_2$
70	3474.65	28771.67	$(^2D)5s^3D^0_3-(^2D)5p^3D_3$
1−	3485.08	28685.56	$(^2P)5p^1P_1-1^0_1$
100	3488.59	28656.70	$(^2D)4d^1D^0_2-(^2D)5p^1P_1$
8	3492.80	28622.16	$(^2D)4d^3D^0_1-(^2D)5p^3P_1$
10	3497.13	28586.73	$(^2D)4d^3D^0_1-(^2D)5p^3P_0$
200	3507.42	28502.86	$(^4S)5s^3S^0_1-(^4S)5p^3P_2$
15	3514.55	28445.04	$(^2D)4d^3D^0_3-(^2D)5p^1D_2$
4	3521.11	28392.05	$(^2D)4d^1D^0_2-(^2D)5p^3F_2$
5	3524.78	28362.49	$(^2P)5s^3P^0_2-(^2P)5p^3S_1$
2	3537.20	28262.90	$(^2P)5s^3P^0_2-(^2P)5p^3D_2$
20	3549.42	28165.60	$(^2P)4d^3D^0_3-(^2P)5p^3P_2$
2	3562.09	28065.50	$(^2P)4d^3F^0_3-(^2D)5p^1D_2$
100	3564.23	28048.57	$(^4S)5s^3S^0_1-(^4S)5p^3P_1$
15	3567.72	28021.13	$(^2P)5s^1P^0_1-(^2P)5p^1P_1$
2	3579.95	27925.41	$(^2D)5s^1D^0_2-(^2D)5p^3P_1$
5*h*	3582.48	27905.69	$(^2D)4d^3D^0_1-(^2D)5p^3P_2$
1	3598.04	27785.01	$(^4S)4d^3D^0_3-(^4S)5p^5P_3$
2	3603.96	27739.45	$(^4S)4d^3D^0_2-(^4S)5p^5P_1$
5	3611.06	27684.83	$(^2P)4d^3F^0_2-(^2D)5p^1D_2$
20	3615.82	27648.39	$(^2D)5s^3D^0_3-(^2D)5p^3D_2$
1	3632.5	27521.43	$(^2P)4d^3D^0_1-(^2P)5p^3P_0$
30	3641.34	27454.62	$(^2D)5s^3D^0_1-(^2D)5p^3D_1$
1	3655.77	27346.26	$(^2P)5s^1P^0_1-(^2P)4d^3S_1$
4	3670.23	27238.52	$(^2D)4d^1D^0_2-(^2D)5p^3D_2$
1	3671.14	27231.77	$(^2P)4d^3D^0_3-(^2P)5p^1D_2$
4	3674.23	27208.87	$(^2D)5s^1D^0_2-(^2D)5p^3P_2$
30	3690.65	27087.81	$(^2D)5s^3D^0_2-(^2D)5p^3D_1$
5	3696.69	27043.56	$(^4S)4d^3D^0_3-(^4S)5p^5P_2$
2	3699.98	27019.44	$(^2P)4d^3D^0_1-(^2P)5p^1P_1$
5	3726.32	26828.53	$(^2D)4d^1P^0_1-(^2D)5p^3P_1$
2	3769.69	26519.87	$(^2D)4d^3F^0_2-(^4S)5p^3P_2$
15	3792.70	26358.98	$(^2D)4d^3D^0_2-(^2D)5p^3P_1$
7	3809.16	26245.08	$(^2P)4d^3D^0_1-(^2P)5p^3D_2$
1	3829.57	26105.21	$(^2P)4d^3D^0_2-(^2D)5p^1D_2$
2	3835.37	26065.73	$(^2D)4d^3F^0_2-(^4S)5p^3P_1$
3	3847.49	25983.63	$(^2P)5s^1P^0_1-(^2P)5p^3D_1$
40*H*	3868.70	25841.18	$(^2D)4d^3S^0_1-(^2D)5p^3P_1$
3	3874.04	25805.56	$(^2D)4d^3S^0_1-(^2D)5p^3P_0$
10	3898.70	25642.34	$(^2D)4d^3D^0_2-(^2D)5p^3P_2$
3	3913.90	25542.75	$(^2P)4d^1F^0_3-(^2P)5p^3D_2$
4	3938.53	25383.02	$(^2D)4d^3F^0_3-(^4S)5p^3P_2$
25	3957.67	25260.27	$(^2D)4d^1D^0_2-(^2D)5p^3D_1$
3	3979.05	25124.54	$(^2D)4d^3S^0_1-(^2D)5p^3P_2$
15	4002.61	24976.66	$(^2P)4d^3D^0_3-(^2P)5p^3D_3$
1	4027.17	24824.34	$(^2P)4d^1P^0_1-(^2P)5p^3P_2$
50	4067.37	24578.99	$(^2D)5s^1D^0_2-(^2D)5p^1F_3$
40	4131.33	24198.48	$(^4S)5s^3S^0_1-(^4S)5p^5P_2$
40	4154.46	24063.76	$(^2D)5s^1D^0_2-(^2D)5p^3F_3$
4*h*	4160.21	24030.50	$(^2P)4d^1P^0_1-(^2P)5p^3P_1$
15	4171.79	23963.79	$(^4S)5s^3S^0_1-(^4S)5p^5P_1$
2*h*	4184.59	23890.49	$(^2P)4d^1P^0_1-(^2P)5p^1D_2$
1*h*	4195.91	23826.04	$(^2P)5p^1P_1-(^2D)6s^3D^0_2$
20	4225.92	23656.83	$(^2D)4d^3D^0_3-(^2D)5p^3P_2$
25	4226.58	23653.15	$(^2D)4d^3D^0_1-(^2D)5p^3F_2$
2	4232.82	23618.28	$(^2P)4d^3D^0_3-(^2P)5p^3D_2$
1*h*	4233.72	23613.26	$(^2P)4d^3F^0_2-(^2D)5p^3P_1$
5*h*	4244.33	23554.24	$(^2P)4d^1D^0_2-(^2P)5p^1D_2$
10	4294.83	23277.28	$(^2P)4d^3F^0_3-(^2D)5p^3P_2$
9	4305.20	23221.22	$(^2D)5s^1D^0_2-(^2D)5p^1P_1$
8*h*	4344.24	23012.54	$(^2D)4d^3D^0_2-(^2D)5p^1F_3$
1	4360.63	22926.04	$(^2D)5s^1D^0_2-(^2D)5p^3D_3$
8	4378.68	22831.54	$(^2P)4d^3P^0_1-(^2P)5p^3P_2$
15	4443.28	22499.60	$(^2D)4d^3D^0_1-(^2D)5p^3D_2$
3	4443.72	22497.37	$(^2D)4d^3D^0_2-(^2D)5p^3F_3$
2	4518.64	22124.37	$(^2D)4d^1P^0_1-(^2D)5p^1P_1$
10	4536.46	22037.46	$(^2P)4d^3P^0_1-(^2P)5p^3P_1$
6	4537.25	22033.62	$(^2P)4d^3D^0_2-(^2D)5p^3P_1$
1*h*	4565.51	21897.24	$(^2P)4d^3P^0_1-(^2P)5p^1D_2$
1*h*	4621.40	21632.42	$(^2P)5s^1P^0_1-(^2D)5p^1D_2$
3	4673.80	21389.90	$(^2D)4d^3D^0_2-(^2D)5p^3F_2$
3*h*	4693.65	21299.44	$(^2P)4d^1D^0_2-(^2P)5p^3D_3$
10	4710.48	21223.34	$(^2D)4d^3D^0_3-(^2D)5p^3F_4$
4	4729.72	21137.01	$(^2D)4d^3S^0_1-(^2D)5p^1P_1$
2*h*	4749.00	21051.20	$(^2P)4d^1P^0_1-(^2P)5p^1P_1$
6	4754.48	21026.93	$(^2D)4d^3D^0_3-(^2D)5p^1F_3$
7	4789.74	20872.14	$(^2D)4d^3S^0_1-(^2D)5p^3F_2$
2*h*	4826.08	20714.98	$(^2P)4d^1D^0_2-(^2P)5p^1P_1$
1	4841.9	20647.30	$(^2P)4d^3F^0_3-(^2D)5p^1F_3$
2	4845.62	20631.45	$(^2P)4d^3F^0_4-(^2D)5p^3F_4$
1*h*	4873.87	20511.86	$(^2D)4d^3D^0_3-(^2D)5p^3F_3$
5*h*	4892.21	20434.97	$(^2P)4d^3F^0_4-(^2D)5p^1F_3$
6*h*	4906.28	20376.36	$(^2P)4d^1P^0_1-(^2P)5p^3S_1$
2	4940.21	20236.42	$(^2D)4d^3D^0_2-(^2D)5p^3D_2$
2	4965.78	20132.22	$(^2P)4d^3F^0_3-(^2D)5p^3F_3$
2*h*	4977.08	20086.51	$(^2D)4d^3G^0_3-(^4S)5p^3P_2$
10	4988.52	20040.45	$(^2P)4d^1D^0_2-(^2P)5p^3S_1$
20*h*	5016.45	19928.87	$(^2P)4d^1F^0_3-(^2D)5p^1D_2$
2*h*	5018.72	19919.86	$(^2P)4d^3F^0_4-(^2D)5p^3F_3$
2*h*	5042.86	19824.51	$(^2D)5s^1D^0_2-(^2D)5p^3D_1$
2	5061.46	19751.65	$(^2P)4d^3F^0_2-(^2D)5p^3F_3$
4	5069.96	19718.54	$(^2D)4d^3S^0_1-(^2D)5p^3D_2$
1*h*	5110.98	19560.29	$(^2P)4d^3P^0_1-(^2P)5p^3P_0$
2	5151.68	19405.75	$(^2P)4d^3P^0_2-(^2P)5p^3P_2$
3*h*	5152.01	19404.51	$(^2D)4d^3D^0_3-(^2D)5p^3F_2$
1	5160.09	19374.12	$(^2D)4d^3D^0_3-(^2D)5p^3D_3$
2	5257.83	19013.98	$(^2P)4d^1P^0_1-(^2P)5p^3D_1$
1	5263.18	18994.65	$(^2P)4d^3F^0_3-(^2D)5p^3D_3$
2*h*	5338.20	18727.71	$(^2D)4d^1P^0_1-(^2D)5p^3D_1$
2	5349.77	18687.21	$(^2P)4d^3D^0_2-(^2D)5p^1F_3$
1	5362.11	18644.20	$(^2P)4d^3F^0_2-(^2D)5p^3F_2$
4	5371.40	18611.96	$(^2P)4d^3P^0_2-(^2P)5p^3P_1$
2*h*	5381.39	18577.41	$(^2P)5s^3P^0_2-(^2D)5p^3P_1$
5	5412.19	18471.69	$(^2P)4d^3P^0_2-(^2P)5p^1D_2$
2*h*	5438.20	18383.34	$(^2P)4d^3P^0_1-(^2P)5p^3S_1$
1*h*	5475.49	18258.15	$(^2D)4d^3D^0_2-(^2D)5p^3D_1$
2	5477.66	18250.91	$(^2D)4d^3D^0_3-(^2D)5p^3D_2$
10	5501.43	18172.06	$(^2P)4d^3D^0_2-(^2D)5p^3F_3$
5	5597.32	17860.75	$(^2P)5s^3P^0_2-(^2D)5p^3P_2$
1*h*	5715.80	17490.52	$(^2P)4d^3F^0_2-(^2D)5p^3D_2$
1*h*	5873.50	17020.92	$(^2P)4d^3P^0_1-(^2P)5p^3D_1$
8*h*	5935.03	16844.46	$(^2P)5s^1P^0_1-(^2D)5p^3P_2$
10*h*	6037.17	16559.47	$(^2P)4d^3D^0_1-(^2D)5p^3P_1$
3*h*	6050.11	16524.06	$(^2P)4d^3D^0_1-(^2D)5p^3P_0$
10*h*	6078.38	16447.21	$(^2D)5s^3D^0_2-(^4S)5p^3P_2$
5*h*	6110.81	16359.92	$(^2D)5s^3D^0_1-(^4S)5p^3P_1$
1*h*	6164.76	16216.75	$(^2P)4d^3P^0_2-(^2P)5p^3D_3$
5	6250.98	15993.08	$(^2D)5s^3D^0_2-(^4S)5p^3P_1$
10*h*	6310.22	15842.94	$(^2P)4d^3D^0_1-(^2D)5p^3P_2$
2	6395.09	15632.68	$(^2P)4d^3P^0_2-(^2P)5p^1P_1$
1*h*	6444.70	15512.35	$(^2P)4d^3F^0_2-(^2D)5p^3D_1$
10*h*	6602.90	15140.69	$(^2P)4d^1F^0_3-(^2D)5p^3P_2$
10*h*	6651.75	15029.49	$(^2D)5s^3D^0_3-(^4S)5p^3P_2$
1*h*	6683.55	14957.98	$(^2P)4d^3P^0_2-(^2P)5p^3S_1$
1*h*	6728.41	14858.26	$(^2P)4d^3P^0_2-(^2P)5p^3D_2$
3*h*	6793.53	14715.83	$(^2P)5s^3P^0_2-(^2D)5p^3F_3$
1*H*	6818.13	14662.74	$(^2P)4d^1P^0_1-(^2D)5p^1D_2$
3*h*	6977.95	14326.91	$(^2P)4d^1D^0_2-(^2D)5p^1D_2$
2*h*	7057.45	14165.52	$(^2D)4d^1D^0_2-(^4S)5p^3P_1$
1*H*	7353.42	13595.37	$(^2P)4d^3P^0_2-(^2P)5p^3D_1$

TABLE II. *Electron configurations and spectral terms for Kr III.*

ELECTRON CONFIGURATION	TERM LIMIT $4s^24p^3\,{}^4S$		TERM LIMIT $4s^24p^3\,{}^2D$					TERM LIMIT $4s^24p^3\,{}^2P$		
$4s^24p^4$	${}^3P$		${}^1D$					${}^1S$		
$4s^24p^3\ 5s$	${}^3S^0$	${}^5S^0$	${}^1D^0$			${}^3D^0$		${}^1P^0$		${}^3P^0$
$4s^24p^3\ 5p$	${}^3P$	${}^5P$		${}^1P$	${}^1D$	${}^1F$		${}^1S$	${}^1P$	${}^1D$
				${}^3P$	${}^3D$	${}^3F$		${}^3S$	${}^3P$	${}^3D$
$4s^24p^3\ 4d$	${}^3D^0$	${}^5D^0$	${}^1S^0$	${}^1P^0$	${}^1D^0$	${}^1F^0$	${}^1G^0$	${}^1P^0$	${}^1D^0$	${}^1F^0$
			${}^3S^0$	${}^3P^0$	${}^3D^0$	${}^3F^0$	${}^3G^0$	${}^3P^0$	${}^3D^0$	${}^3F^0$
$4s^24p^3\ 6s$	${}^3S^0$	${}^5S^0$	${}^1D^0$			${}^3D^0$		${}^1P^0$		${}^3P^0$
$4s^24p^3\ 5d$	${}^3D^0$	${}^5D^0$	${}^1S^0$	${}^1P^0$	${}^1D^0$	${}^1F^0$	${}^1G^0$	${}^1P^0$	${}^1D^0$	${}^1F^0$
			${}^3S^0$	${}^3P^0$	${}^3D^0$	${}^3F^0$	${}^3G^0$	${}^3P^0$	${}^3D^0$	${}^3F^0$
$4s4p^5$	${}^1P^0$	${}^3P^0$								

The principal evidence for the identifications is in the combining intensities. In the region studied we expect the strongest combinations to be $({}^4S)5s\,{}^5S^0{}_2-({}^4S)5p\,{}^5P_3$ and $({}^4S)5s\,{}^3S^0{}_1-({}^4S)5p\,{}^3P_2$. The strongest lines observed, ν, 30,801.14, and ν, 28,502.86, are assigned to these respective transitions. Trial arrays with constant differences involving these and other strong lines in the same region lead to the ${}^5P$ and ${}^3P$ intervals, which in turn appear in the $({}^4S)nd\,{}^5D^0-({}^4S)5p\,{}^5P$ and $({}^4S)nd\,{}^3D^0-({}^4S)5p\,{}^3P$ multiplets. Failure to find $({}^4S)5p\,{}^3P_0$ seems explainable only on the assumption that two of these ${}^3P$ levels have coalesced or else that the interval separating it from the other ${}^3P$ levels is abnormally large inasmuch as all lines of appreciable intensity in the expected range have been classified. We expect the odd terms to give far ultraviolet combinations with the $4s^24p^4$ terms. The clew to the identification of these low terms was found by Dr. Boyce in the multiplets, $({}^4S)s^2p^4\,{}^3P-sp^5\,{}^3P^0$, and $({}^2D)s^2p^4\,{}^1D-sp^5\,{}^3P^0$. The $s^2p^4\,{}^3P$ intervals, together with the separations between these and ${}^1D$, were found to occur repeatedly among the extreme ultraviolet data. In almost all cases these constant differences were found to be associated with real odd levels which combined with higher even levels to give lines in the visible and near ultraviolet.

Of the $({}^2D)$ odd terms those arising from $5s$ are expected to yield the most intense combinations. The interpretation of the second most intense group of lines among the data as combinations of $({}^2D)5s\,{}^3D^0$ and ${}^1D^0$ with $({}^2D)5p\,{}^3F$, ${}^3D$, ${}^3P$, and ${}^1F$, ${}^1D$, ${}^1P$, is thus supported. These multiplets are an outstanding feature of the observed spectrum. The remaining $({}^2D)$ odd levels fall into fairly well isolated groups and are identified on the basis of j values and combining intensities. The ${}^3G^0{}_5$ level is identified necessarily on the basis of a single combination, but is supported by a strong line in the expected position. The ${}^3P^0$, ${}^1F^0$, and ${}^1S^0$ terms of this group have not been found. Considerable assistance in placing the even $({}^2D)$ levels has been obtained from the isoelectronic spectrum, Se I, recently analyzed

TABLE III. *Kr III terms.*

ELECTRON CONFIGURATION		LIMIT ${}^4S_{3/2}$: 0	LIMIT ${}^2D_{3/2}$ ${}^2D_{5/2}$	LIMIT ${}^2P_{1/2}$ ${}^2P_{3/2}$
$4s^2$		${}^3P_2$ 298020		
$3d^{10}$	$4p$	${}^3P_1$ 293472	${}^1D_2$ 283376	${}^1S_0$ 264941
$4p^3$		${}^3P_0$ 292707		
			${}^3D^0{}_1$ 134749.99	${}^3P^0{}_0$ 119775.54
	$5s$	${}^5S^0{}_2$ 152300.00	${}^3D^0{}_2$ 134383.17	${}^3P^0{}_1$ 119759.88
		${}^3S^0{}_1$ 146438.74	${}^3D^0{}_3$ 132965.45	${}^3P^0{}_2$ 117771.90
			${}^1D^0{}_2$ 127119.98	${}^1P^0{}_1$ 116755.47
		${}^5P_1$ 122474.95	${}^3D_1$ 107295.36	${}^3D_1$ 90771.82
		${}^5P_2$ 122240.26	${}^3D_2$ 105317.07	${}^3D_2$ 89508.96
		${}^5P_3$ 121498.82	${}^3D_3$ 104193.76	${}^3S_1$ 89409.26
	$5p$		${}^3F_2$ 104163.51	${}^1P_1$ 88734.57
		${}^3P_0$ ———	${}^1P_1$ 103898.80	${}^3P_0$ 88232.55
		${}^3P_1$ 118390.17	${}^3F_3$ 103056.13	${}^3D_3$ 88150.43
		${}^3P_2$ 117935.88	${}^1F_3$ 102541.01	${}^1D_2$ 85895.48
			${}^3F_4$ 102344.56	${}^3P_1$ 85755.19
			${}^3P_2$ 99911.12	${}^3P_2$ 84961.44
			${}^3P_0$ 99229.89	${}^1S_0$ ———
			${}^3P_1$ 99194.51	
			${}^1D_2$ 95122.92	
		${}^5D^0{}_0$ 159572.32	${}^3F^0{}_2$ 144455.82	${}^3F^0{}_3$ 123188.34
		${}^5D^0{}_1$ 159547.88	${}^3F^0{}_3$ 143318.95	${}^3F^0{}_4$ 122976.02
		${}^5D^0{}_2$ 159538.08	${}^3F^0{}_4$ 141937.04	${}^3F^0{}_2$ 122807.72
		${}^5D^0{}_3$ 159526.22	${}^3G^0{}_3$ 138022.48	${}^3D^0{}_2$ 121228.17
		${}^5D^0{}_4$ 159369.73	${}^3G^0{}_4$ 137604.12	${}^3D^0{}_1$ 115754.00
			${}^3G^0{}_5$ 136910.45	${}^1F^0{}_3$ 115051.73
		${}^3D^0{}_2$ 150214.30	${}^1G^0{}_4$ 135177.93	${}^3D^0{}_3$ 113127.15
	$4d$	${}^3D^0{}_3$ 149283.56	${}^1D^0{}_2$ 132555.55	${}^1P^0{}_1$ 109785.72
		${}^3D^0{}_1$ 148947.01	${}^3D^0{}_1$ 127816.62	${}^1D^0{}_2$ 109449.70
			${}^1P^0{}_1$?126023.09	${}^3P^0{}_0$ ———
			${}^3D^0{}_2$ 125553.49	${}^3P^0{}_1$ 107792.76
			${}^3S^0{}_1$?125035.67	${}^3P^0{}_2$ 104367.20
			${}^3D^0{}_3$ 123567.95	
			${}^1F^0{}_3$ ———	
			${}^3P^0{}_0$ ———	
			${}^3P^0{}_1$ ———	
			${}^3P^0{}_2$ ———	
			${}^1S^0{}_0$ ———	
		${}^5S^0{}_2$ 82497.43	${}^3D^0{}_1$ ———	${}^3P^0{}_0$ ———
	$6s$		${}^3D^0{}_2$? 64908.37	${}^3P^0{}_1$ 48852.02
		${}^3S^0{}_1$ 76176.60	${}^3D^0{}_3$ 63452.80	${}^3P^0{}_2$ 47108.17
			${}^1D^0{}_2$? 61836.33	${}^1P^0{}_1$ 45558.88
		${}^5D^0{}_0$ 81518.71	${}^1D^0{}_2$? 64672.62	
		${}^5D^0{}_1$ 81504.70	${}^1G^0{}_4$ 62662.64	
		${}^5D^0{}_2$ 81490.68	$1^0{}_1$ 60048.87	
	$5d$	${}^5D^0{}_3$ 81474.36	$2^0{}_2$ 59411.68	
		${}^5D^0{}_4$ 81414.84		
		${}^3D^0{}_2$ 80643.34		
		${}^3D^0{}_1$ 78724.56		
		${}^3D^0{}_3$ 77260.07		
		${}^3P^0{}_2$ 182078		
$4s4p^5$		${}^3P^0{}_1$ 178639		
		${}^3P^0{}_0$ 176476		
		${}^1P^0{}_1$ 156144		

by Ruedy and Gibbs,[10] in which this set of terms is fully developed. Almost the same order of even (^2D) levels occurs in both spectra.

The even terms of the first excited state based on (^2P) are complete except for $5p\,^1S_0$. The relative positions make practically certain the interpretation of those of j value 2. $^3D_3$ has a unique j value among the group. Those with J value 1 are given the most plausible assignment on the basis of the combinations. This group has not been found in Se I.

Of the odd (^2P) levels those yielding the most intense combinations are assigned to $(^2P)5s\,^3P^0$ and $^1P^0$. The $(^2P)5d\,^3F^0$ levels seem to be quite certain because of the intensity distribution in the $(^2P)5d\,^3F^0-(^2P)5p\,^3D$ multiplet. The $^3F^0{}_4$ level is checked by interlimit combinations. Two levels assigned to the (^2D) system, $(^2D)4d\,^3S^0{}_1$, and $(^2D)4d\,^1P^0{}_1$, combine very strongly with the (^2P) even terms. The assignments are made therefore with reservations. The $(^2P)4d\,^3D^0$ levels show unexpected intervals but no other reasonable assignment seems possible. The remaining (^2P) odd terms $^3P^0$ and $^1D^0$ are supported by faint but numerous and numerically consistent combinations with no plausible alternatives.

It is not possible to estimate precisely the intervals between the various ion limits on the basis of the data here reported. Either the low terms of Kr IV or sufficiently long series for precise evaluation of the limits would be required. A fair estimate of the relative positions of the limits is obtained by extrapolation from the homologous spectra, Ne IV, and A IV. The centers of gravity of the term groups should also be separated by roughly the separation of the limits. Calculations based on series of which two members have been found indicate an interval of from 16,000 to 19,000 cm^{-1} between ^4S and ^2D and from 34,000 to 38,000 cm^{-1} between ^4S and ^2P. These intervals are to be regarded as approximations, however, because it is improbable that the series are well represented by a Rydberg formula and free from perturbations. Furthermore the identifications of the second series members are too uncertain to establish beyond doubt which of the levels of the doublet ion limit is approached in each case. These estimated intervals compare reasonably well with the separations between the groups of levels belonging to first excited states which are associated with the second series members and also with the intervals between the low terms, $^3P_2-{}^1D_2$, 14,644 cm^{-1}, and $^3P_2-{}^1S_0$, 33,079 cm^{-1}.

The absolute value of the terms is based on calculations of the limits of the $(^4S)nd\,^5D^0{}_3$, $(^4S)nd\,^3D^0{}_3$, and $(^4S)ns\,^3S^0{}_1$ series. The calculated limits expressed in terms of the position of $^5D^0{}_3$ are as follows:

$$\begin{aligned} {}^5D^0{}_3, &\quad 159{,}049\\ {}^3D^0{}_3+({}^5D^0{}_3-{}^3D^0{}_3), &\quad 159{,}751\\ {}^3S^0{}_1+({}^5D^0{}_3-{}^3S^0{}_1), &\quad 159{,}778. \end{aligned}$$

An earlier estimate was based on $(^4S)ns\,^5S^0{}_2$ which is expected to give the most regular series. Such a calculation, however, places $5s\,^5S^0{}_2$ at 146,000 and $4d\,^5D^0{}_3$ at 153,226 differing by 6300 from the average of the above values. It was assumed therefore that the $^5S^0{}_2$ series was perturbed more than the others which were chosen as the basis of the absolute values. The actual procedure was to add 6300 to 146,000 to bring it up to 152,300 to give the absolute value of $^5S^0{}_2$ and to fix all other levels by their relative positions. The calculation places the lowest level of Kr III, $(^4S)4s^24p^4\,^3P_2$ at 298,020, corresponding to an ionization potential of 36.8 volts. The experimental value given by Tate and Smith[11] is 38.7±0.5 volts.

In conclusion the author is very happy to acknowledge his indebtedness to all who have contributed to the progress of the analysis, in particular to Dr. Wm. F. Meggers of the Bureau of Standards, who collaborated in the experimental work and in the measurement of the spectrograms, to Dr. T. L. de Bruin,[12] of the University of Amsterdam, for making the first suggestions as to the identity of some of the (^4S) terms, and to Professor J. C. Boyce, of the Massachusetts Institute of Technology, for the use of his extreme ultraviolet data.

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[10] J. E. Ruedy and R. C. Gibbs, Phys. Rev. **46**, 880 (1934).

[11] J. T. Tate and P. T. Smith, Phys. Rev. **46**, 773 (1934).

[12] A letter, dated Amsterdam, 8 Jan. 1933, from Dr. de Bruin to Dr. Meggers contained the first Kr III regularities. These consisted of the combinations of $(^4S)5p\,^5P$, ^3P with $(^4S)5s\,^5S^0$, $^3S^0$, $6s\,^5S^0$, $^3S^0$, and $(^4S)4d\,^5D^0$, $^3D^0$, based on wavelength and intensity data obtained at the Bureau of Standards and confirmed by Zeeman effects of λλ3507.42 and 3564.23 observed at Physica. Some revisions of these identifications have been made.