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Term Analysis of the Second Spectrum of Rhenium (Re II)

William F. Meggers, Miguel A. Catalán,[1,2] and Manuel Sales[2]

Wavelengths and estimated intensities of approximately 2,000 spectral lines emitted by singly ionized rhenium atoms were available for this analysis. Observed Zeeman patterns for 220 Re II lines facilitated finding and interpreting the first energy levels. The analysis continued until 49 low-even, and 85 high-odd levels were found. Transitions between these groups of levels account for 1,014 Re II lines including about 70 percent of the total observed intensity. The ground state of Re^+ is described by the spectral term $5d^5(a^6S)6s\ a^7S_3$.

1. Introduction

The term analysis of the first spectrum of rhenium (Re I) progressed intermittently since it began in 1931; it culminated in a recent report [1][3] on the present state of its analysis and interpretation. Two decades elapsed before the term analysis of the second spectrum of rhenium (Re II) could begin. The delay is explained by the lack of basic observations on this spectrum. No useful description of the Re II spectrum was available until 1952 when Meggers [2] published a description of the arc and spark spectra of rhenium including wavelength and intensity data for approximately 6,000 lines, about 4,200 of which were assigned to Re I, and nearly 1,800 to Re II (and possibly Re III). The wavelengths of spark-enhanced rhenium lines reported in that paper ranged from 2000.47 A to 6026.60 A. The spark spectrum of rhenium, like that of any heavy metal, is rich in the ultraviolet but gradually fades in the visible region, and vanishes in the orange. Because this spectrum is strong in the ultraviolet it would be expected to extend far beyond the violet limit of observation with large spectrographs at atmospheric pressure. In order to record the spectrum in the shorter-wave range Catalán made arc and spark spectrograms with a vacuum spectrograph at Princeton University; these spectrograms were measured in Madrid by Sales who thus extended the wavelength and intensity data of rhenium spectra to about 1500 A.

The splitting of spectral lines by magnetic fields (Zeeman effect) is extremely useful in analyses of complex spectra because it reveals (by the number of components) the inner-quantum numbers (J) of both levels, and usually identifies (by the splitting factors, g) the term types (l) and the multiplicity (r). In 1940, Zeeman spectrograms of rhenium were made [3] with the Bitter magnet and grating spectrographs in the Spectroscopy Laboratory of the Massachusetts Institute of Technology, but these spectrograms never yielded any information about Re II. By courtesy of G. R. Harrison in 1949 Meggers made new Zeeman spectrograms with the M. I. T. equipment and measured them at the National Bureau of Standards. Wavelengths of the Zeeman patterns were computed, and from these the inner-quantum numbers and the magnetic splitting factors of the first Re II energy levels were derived in 1950. A preliminary announcement of the Zeeman effect and first spectral terms of Re II was made [4] in 1952. When 22 low-even and 20 high-odd levels were established, the entire mass of Zeeman data was transferred to Madrid where Catalán and Sales continued the analysis until 1954 when it included about 830 classified lines resulting from transitions between 47 low-even and 69 high-odd levels. Most of the Zeeman data were exploited in this analysis. A final search among wavenumbers, at the Bureau disclosed several additional (provisional) levels that combined 7 or more times with other levels, so that a total of about 1,000 Re II lines could be classified. Details concerning the classified lines of Re II, the energy levels, the Zeeman patterns and magnetic splitting factors, are given below, followed by a brief discussion of spectral terms, and electron configurations.

2. Basic Data of Re II

The basic data of Re II consist of measured wavelengths and estimated relative intensities of more than 2,000 lines emitted by electric arcs and sparks between metallic electrodes. Nearly 1,800 of these have wavelengths between 2000 A and 6000 A which have been published by Meggers [2]; more than 1,000 lines of shorter wavelength (to 1500 A) were observed with a vacuum spectrograph by Catalán, but only the classified lines will be reported in this paper. The wavelength measurements were complicated by the hyperfine structure (hfs) exhibited by many rhenium lines. This has been discussed in the paper Term Analysis of the First Spectrum of Rhenium [1] and need not be repeated here. It suffices to say that in the cases of resolved hfs we have quoted the average wavelength published by Meggers [2].

By comparing the intensities of lines emitted by arcs and sparks, it was usually possible to identify the lines emitted by neutral atoms and by ions. In general, the intensities of Re I lines are greater in arc than in spark spectra, whereas Re II (and possibly Re III) lines appear stronger (or only) in spark spectrograms. Unfortunately there are no reliable criteria for differentiating Re II and Re III, so all the lines enhanced in spark spectra above 2000 A were included in the Re II list although a few may belong

[1] Deceased.
[2] Instituto de Optica, Madrid, Spain.
[3] Figures in brackets indicate the literature references at the end of this paper.

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to Re III. In the vacuum ultraviolet the arc spectrogram showed many more lines than the spark and there was insufficient information to assign the lines to successive spectra; for this reason only those lines that appear to satisfy combinations of Re II levels are reported.

The Zeeman-effect spectrograms at 81,000 oersteds, previously described [1, 4] yielded information concerning some 220 Re II lines. The Zeeman patterns of 85 of these were adequately recorded and resolved to yield J- and g-values for both atomic energy levels responsible for producing a spectral line. These initiated this analysis and interpretation of the Re II spectrum. The Zeeman patterns are of types 1, 2, 3, and 7 according to the description given by Back and Landé [5]. Type 1 occurs when the J-values are unequal and the level with the larger J has the smaller g; the strongest p-component is not displaced, and the strongest n-components have the smallest displacement. Type 2 occurs when J and g change in the same direction, in which case the strongest p-component is not displaced, but the strongest n-components have the largest displacement. Type 3 results from equal J-values but unequal g-values which produce a maximum displacement of the strongest p-components, and the displacements of two pairs of strong n-components are exactly equal to the g-values of the combining levels. Type 7 has only one (undisplaced) p-component, and two displaced n-components, either because one of the J-values is zero, or the two g-values are equal.

When Zeeman patterns of types 1, 2, and 3 were not resolved, only the wavelengths corresponding to the maximum intensity in both polarizations were measured. Then if the line is classified and the g-value of one level is known, the other may be calculated.

3. Classified Lines of Re II

The classified lines of Re II are listed in table 1 where information is given as to estimated relative intensity [2], wavelength [2], vacuum wavenumber, spectral-term combination, and Zeeman effect. In column 1, the intensity numbers of many lines shorter than 2000 A are followed by the letter a which indicates that the line was observed only in the arc spectrum. Because it is impossible to assign term symbols to many Re II energy levels these are represented in column 4 by the first 4 digits of their numerical value referred to the ground state as zero. The daggers attached to 7 wavelengths in column 2 mean that the line was also classified as Re I [1]. An asterisk attached to the Zeeman type in column 5 means that the Zeeman effect disagrees with the term combination of column 4. Numbers in column 6 express the separation of the resolved Zeeman components, or Δg, in Lorentz units. In columns 7 and 8, instead of giving all the observed Zeeman components, only the strongest parallel (p) and normal (n) components are shown; this information, combined with the g-values of columns 9 and 10, and the corresponding J-values in column 4, permit the calculation of the complete pattern. In columns 9 and 10, the g-values in parentheses are mean values from resolved patterns adopted to compute the other g-values from unresolved patterns when the types are indicated in column 5 and the J-values are known from column 4. After the Zeeman data of Re II were fully exploited in establishing energy levels some further progress was made in searching for additional levels by means of coincidences between wavenumber differences and known level intervals. About 830 Re II lines were thus explained by the end of 1954, but 900 lines with wavelengths greater than 2000 A still remained unclassified. In 1955 this search was continued at the Bureau by Jack Tech who found many provisional odd levels, nine of which have been retained in this analysis. In the meantime the possibility of applying electronic digital computers to systematic searches for atomic energy levels in complex atomic spectra had been tested with Tc I by Bozman [6] who used the IBM–604, and with Ru I by Kessler, Prusch, and Stegun [7] who employed the SEAC. Since more than half of the known Re II lines (mostly of low intensity) were still unclassified it appeared desirable to enlist the aid of an electronic computer in a final search for energy levels. This was done with an IBM–704 computer which displaced the machines previously used at the Bureau. Coding this problem for IBM–704 was successfully carried out by W. R. Bozman and C. Coleman, and searches for new levels of Re II were made by them. The first computer search was for possibly undiscovered high-odd levels between 40000 and 80000 K ($=cm^{-1}$) that could combine with the 47 low-even levels (0 to 37000 K), according to the selection rule $\Delta J=0, \pm 1$. The second search started with intervals between the known odd levels (44000 to 77000 K) and sought new even levels, both lower and higher, that might combine with those of opposite parity and thus account for observed Re II lines. These systematic computer searches were both disappointing and illuminating. Several hundred hypothetical levels were found, but when their combinations were displayed in a square array, they usually appeared to have a random distribution, they generally involved only 6 or 7 lines, and they often used the same line in two or more places. In other words, the great majority of predicted levels appeared to be based on accidental coincidences. This conclusion was confirmed by calculation of the number of probable coincidences to be expected among 900 unclassified Re II lines.

S. A. Goudsmit is credited [8] with having devised the following approximate formula for the most probable number of accidental coincidences, C, caused by a random distribution of L spectrum lines extending over a range of I wavenumber units: $C=2\epsilon(L^2/I)\times(I-d)/I$ if all pairs of lines having a wavenumber difference between $(d-\epsilon)$ and $(d+\epsilon)$ are regarded as coincident. If d is small compared with I, the second term may be neglected. Given 900 Re II lines with wavenumbers between 20000 and 50000 K, a tolerance of ± 0.2 K for coincidence

yields 6 or more chance coincidences for each value of d, depending on the size of d. Hundreds of such coincidences were found among the unclassified Re II lines but the energy levels calculated from them were discarded unless they accounted for lines in a nonrandom fashion, or combined with at least 8 other levels. This resulted in the discovery of only 2 additional low-even levels, and 3 odd levels. The search for high-even levels revealed nothing that could not be explained by chance coincidences. For example, the fact that such tentative high-even levels usually combined only with high-odd levels indicated that they were fortuitous because the density of unclassified Re II lines happens to be greatest below 2500 A. This was disappointing because it destroyed any hope of finding one or more spectral series that might be extrapolated to its limit and give an approximate value of the ionization potential of Re^+. This experience is a warning that many false levels may be found in complex spectra by searching with wavenumber intervals, unless the tolerance on coincidences is reduced sufficiently to exclude most accidentals, or unless the levels can be verified by Zeeman data.

When frustration ended the search for energy levels it was seen that the accepted levels account for 1,014 Re II lines listed in table 1. Only 33 of these lines are doubly classified. Although only half of the rhenium spark lines with wavelengths greater than 2000 A are classified in this analysis, these account for about 70 percent of the total observed intensity, and include almost all lines of intensity greater than 30. The combinations $a\,^7S_3$—$z\,^7P_{2,\ 3,\ 4}$ (2275.25, 2414.27, 1973.13 A), yield the strongest Re II lines, but whether they arise from an s–p or a d–p transition is still in doubt.

TABLE 1. *Classified lines of the second spectrum of rhenium* (Re II)

Intensity spark	Wavelength air	Wavenumber	Term combination	Zeeman type	Separation	Zeeman components		g	
						Strongest p	Strongest n	1st	2d
1	2	3	4	5	6	7	8	9	10
	A	*K*							
5*h*	5418. 37	18450. 60	3699_3—$z\,^5F^o_2$						
5*h*	5286. 68	18910. 21	$a\,^3G_4$—$z\,^7P^o_3$						
1*h*	5066. 60	19731. 60	3731_3—$z\,^7D^o_3$						
4*cw*	4909. 71	20362. 12	2907_2—$z\,^5P^o_1$						
10*cw*	4904. 33	20384. 46	$a\,^5P_3$—$z\,^7P^o_3$						
10*c*	4853. 73	20596. 96	$a\,^5P_2$—$z\,^7P^o_2$						
10*cw*	4703. 70	21253. 91	$a\,^3F_4$—$z\,^7P^o_3$						
100*c*	4673. 15	21392. 85	$a\,^3F_2$—$z\,^7P^o_2$						
8	4664. 01	21434. 78	3493_2—$z\,^5D^o_1$						
30*c*	4584. 49	21806. 57	$a\,^5P_2$—$z\,^7P^o_3$						
4*cw*	4542. 89	22006. 25	3738_2—$z\,^3P^o_2$						
20	4520. 97	22112. 94	3493_2—$z\,^7D^o_3$						
6	4502. 98	22201. 29	3493_2—$z\,^5D^o_2$						
100*c*	4481. 32	22308. 59	$a\,^3F_3$—$z\,^7P^o_2$						
5*h*	4475. 73	22336. 46	3699_3—$z\,^5D^o_3$						
2*h*	4473. 60	22347. 09	3731_3—*5966*$^o_3$						
10	4452. 68	22452. 08	3022_3—$z\,^5P^o_2$						
4*h*	4429. 76	22568. 25	3287_2—$z\,^5F^o_2$						
20	4423. 02	22602. 64	$a\,^3F_2$—$z\,^7P^o_3$ 3699_3—$z\,^5F^o_4$						
3*cwl*	4409. 56	22671. 63	2676_2—$z\,^5P^o_1$						
10*cwl*	4389. 60	22774. 72	2666_1—$z\,^5P^o_1$	3	0. 962	0. 962w	1. 462, 2. 424	1. 462	2. 424
2	4384. 44	22801. 52	3225_3—$z\,^7D^o_2$						
10*cwl*	4381. 00	22819. 43	3098_4—$z\,^5P^o_3$						
6	4356. 29	22948. 86	2972_2—$z\,^5P^o_2$						
2*h*	4335. 23	23060. 34	3398_3—$z\,^7D^o_3$						
9	4330. 69	23084. 52	3071_3—$z\,^5P^o_3$						
20*h*	4311. 68	23186. 29	3225_3—$z\,^5F^o_2$	1		0w	1. 105	(1. 114)	1. 09
4*h*	4248. 27	23532. 37	3606_5—$z\,^5F^o_4$						
4*cw*	4240. 18	23577. 27	3022_3—$z\,^5P^o_3$						
2*h*	4186. 26	23880. 95	3316_4—$z\,^7D^o_4$						
5*Hw*	4149. 46	24092. 73	3295_4—$z\,^7D^o_3$						
2*h*	4135. 43	24174. 46	3287_2—$z\,^7D^o_3$						
20*h*	4091. 96	24431. 28	3101_2—$z\,^5F^o_2$	3	. 340	0. 670	1. 078, 1. 418	1. 418	1. 078
2*h*	4088. 69†	24450. 83	3493_2—$z\,^3P^o_2$						
2	4085. 14	24472. 06	3295_4—$z\,^5F^o_3$						

TABLE 1. *Classified lines of the second spectrum of rhenium* (Re II)—Continued

Intensity spark	Wavelength air	Wavenumber	Term combination	Zeeman type	Separation	Zeeman components		g	
						Strongest p	Strongest n	1st	2d
1	2	3	4	5	6	7	8	9	10
	A	*K*							
2*h*	4051. 45	24675. 55	3738_2—*6205*$^{\circ}_{2}$	-----	------	------	----------	------	------
3	4043. 10	24726. 51	3071_3—*z* $^5F^{\circ}_2$	2	0. 180	0	1. 624	1. 264	1. 084
3	4042. 78	24728. 47	3493_2—*5966*$^{\circ}_{3}$	7a,1	------	0h	1. 132	(1. 23)	1. 19
1*h*	4041. 11	24738. 69	3731_3—*6205*$^{\circ}_{2}$	-----	------	------	----------	------	------
5*h*	4032. 35	24792. 42	3225_3—*z* $^7D^{\circ}_3$	-----	------	------	----------	------	------
20*c*6	4031. 42	24798. 15	*a* $^5G_3$—*z* $^7P^{\circ}_2$	-----	------	------	----------	------	------
2*h*	4025. 56	24834. 24	3022_3—*z* $^7D^{\circ}_2$	-----	------	------	----------	------	------
6*h*	4024. 040	24843. 63	3220_4—*z* $^7D^{\circ}_3$	-----	------	------	----------	------	------
10*h*	4020. 860	24863. 27	3606_5—*z* $^5F^{\circ}_5$	3	------	0. 193h	1. 178w	(1. 21)	1. 16
4*h*	4018. 016	24880. 88	3225_3—*z* $^5D^{\circ}_2$	-----	------	------	----------	------	------
10*h*	4009. 94	24930. 98	2774_3—*z* $^5P^{\circ}_2$	1	. 616	0	0	1. 232	1. 848
3*Hw*	3988. 63	25064. 18	3699_3—*6205*$^{\circ}_{2}$	-----	------	------	----------	------	------
10*h*	3984. 28	25091. 54	*a* $^5G_2$—*z* $^7P^{\circ}_2$	-----	------	------	----------	------	------
3*Hw*	3971. 63	25171. 50	3225_3—*z* $^5F^{\circ}_3$	-----	------	------	----------	------	------
2*Hw*	3964. 11	25219. 21	3022_3—*z* $^5F^{\circ}_2$	-----	------	------	----------	------	------
3*c*	3963. 53	25222. 95	3220_4—*z* $^5F^{\circ}_3$	-----	------	------	----------	------	------
5*h*	3939. 381	25377. 53	2977_0—*z* $^7D^{\circ}_1$	7a	2. 272	0	2. 272	0/0	2. 272
10*h*	3915. 382	25533. 08	3738_2—*6291*$^{\circ}_{3}$	2	0. 166	0	1. 570	1. 072	1. 238
2*cwl*	3900. 24	25632. 18	2942_1—*z* $^7D^{\circ}_2$	-----	------	------	----------	------	------
2*h*	3893. 59	25675. 97	3398_3—*5966*$^{\circ}_{3}$	-----	------	------	----------	------	------
7*cws*	3888. 92	25706. 80	2809_4—*z* $^5P^{\circ}_3$	-----	------	------	----------	------	------
5*h*	3886. 21	25724. 72	3731_3—*6304*$^{\circ}_{3}$	-----	------	------	----------	------	------
6*Hw*	3873. 501	25809. 13	3731_3—*6312*$^{\circ}_{4}$	-----	------	------	----------	------	------
5*h*	3858. 528	25909. 26	2676_2—*z* $^5P^{\circ}_2$	-----	------	------	----------	------	------
2*h*	3856. 72	25921. 42	3699_3—*6291*$^{\circ}_{3}$	-----	------	------	----------	------	------
10*Hw*	3847. 72	25982. 05	2907_2—*z* $^7D^{\circ}_3$	-----	------	------	----------	------	------
10*h*	3839. 540	26037. 40	3101_2—*z* $^7D^{\circ}_3$	1	------	0	0. 572	(1. 42)	1. 14
20*cw*	3836. 786	26056. 09	2774_3—*z* $^5P^{\circ}_3$	-----	------	------	----------	------	------
2*h*	3832. 92	26082. 38	3738_2—*6346*$^{\circ}_{2}$	-----	------	------	----------	------	------
8*h*	3830. 525	26098. 69	*a* $^5P_2$—*z* $^5P^{\circ}_1$	1	0. 758	0	. 912	1. 670	2. 428
2*h*	3826. 55	26125. 79	3101_2—*z* $^5D^{\circ}_2$	-----	------	------	----------	------	------
2*Hw*	3825. 30	26134. 32	3699_3—*6312*$^{\circ}_{4}$	-----	------	------	----------	------	------
2	3821. 43	26160. 80	3316_4—*z* $^5D^{\circ}_3$	-----	------	------	----------	------	------
100*cw*	3800. 95	26301. 75	*a* $^5G_2$—*z* $^7P^{\circ}_3$	2	1. 137	0	4. 055	0. 644	1. 781
2	3791. 57	26366. 81	2907_2—*z* $^5F^{\circ}_2$	-----	------	------	----------	------	------
3*h*	3782. 95	26426. 89	3316_4—*z* $^5F^{\circ}_4$	-----	------	------	----------	------	------
2*h*	3776. 70	26470. 62	3699_3—*6346*$^{\circ}_{2}$	-----	------	------	----------	------	------
15*cw*	3773. 018	26496. 50	3316_4—*5966*$^{\circ}_{3}$	2	------	0w	1. 185h	(1. 188)	1. 189
1*h*	3758. 51	26598. 73	2977_0—*z* $^5D^{\circ}_1$	-----	------	------	----------	------	------
4*h*	3752. 15	26643. 82	2972_2—*z* $^5D^{\circ}_1$	-----	------	------	----------	------	------
200*h*	3742. 257	26714. 26	*a* $^5S_2$—*z* $^7P^{\circ}_2$	3	0. 463	0. 927	1. 714, 2. 177	1. 714	2. 177
5*Hcw*	3732. 058	26787. 24	*a* $^3F_4$—*z* $^7P^{\circ}_4$	-----	------	------	----------	------	------
10*Hcw*	3731. 662	26790. 10	3287_2—*5966*$^{\circ}_{3}$	-----	------	------	----------	------	------
5*Hc*	3730. 89	26795. 64	3606_5—*z* $^5D^{\circ}_4$	-----	------	------	----------	------	------
10*h*	3714. 51	26913. 80	3022_3—*z* $^5D^{\circ}_2$	2	------	0w	1. 525	(1. 398)	1. 33
5*h*	3710. 22	26944. 91	2942_1—*z* $^5D^{\circ}_1$	-----	------	------	----------	------	------
30*h*	3698. 565	27029. 82	3738_2—*6441*$^{\circ}_{2}$	3	. 260	0. 522	0. 810, 1. 070	1. 070	0. 810
20*h*	3697. 932	27034. 45	2676_2—*z* $^5P^{\circ}_3$	2	. 555	0	2. 754	1. 089	1. 644
10*h*	3692. 783	27072. 14	3225_3—*z* $^5D^{\circ}_3$	3	------	0. 063	1. 123	1. 114	1. 135
8*h*	3685. 803	27123. 41	3220_4—*z* $^5D^{\circ}_3$	1	------	0w	0. 928	(1. 08)	1. 13
15*cw*	3674. 87	27204. 10	3022_3—*z* $^5F^{\circ}_3$	3	. 325	0. 975	1. 056, 1. 381	1. 381	1. 056
7*h*	3668. 496	27251. 37	3234_5—*z* $^5F^{\circ}_4$	7	------	0h	1. 125h	(1. 15)	1. 16
3*h*	3660. 17	27313. 36	2774_3—*z* $^7D^{\circ}_2$	-----	------	------	----------	------	------
7*h*	3656. 834	27338. 27	3225_3—*z* $^5F^{\circ}_4$	2	------	0w	1. 314	(1. 114)	1. 15
10*hc*	3647. 544	27407. 90	3225_3—*5966*$^{\circ}_{3}$	-----	------	------	----------	------	------

TABLE 1. *Classified lines of the second spectrum of rhenium* (Re II)—Continued

Intensity spark	Wavelength air	Wavenumber	Term combination	Zeeman type	Separation	Zeeman components		g	
						Strongest p	Strongest n	1st	2d
1	2	3	4	5	6	7	8	9	10
	A	*K*							
7*h*	3640. 75	27459. 05	3220_4—*5966*$^{\circ}_3$	-----	------	------	----------	------	------
3*H*	3626. 80	27564. 66	*a* $^3G_4$—*z* $^5P^{\circ}_3$	-----	------	------	----------	------	------
4*h*	3624. 11	27585. 12	3738_2—*6496*$^{\circ}_3$	-----	------	------	----------	------	------
2*c*	3609. 330	27698. 07	2774_3—*z* $^5F^{\circ}_2$	-----	------	------	----------	------	------
3*h*	3601. 600	27757. 52	3316_4—*z* $^5F^{\circ}_5$	7b	------	0	1. 182	(1. 188)	1. 187
1	3595. 600	27803. 84	2666_1—*z* $^5D^{\circ}_0$	-----	------	------	----------	------	------
6*h*	3581. 434	27913. 81	*a* $^5P_3$—*z* $^5P^{\circ}_2$	-----	------	------	----------	------	------
300*cw*	3580. 15	27923. 82	*a* $^5S_2$—*z* $^7P^{\circ}_3$	7a,2	------	0w	1. 820	(1. 71)	1. 75
2*Hw*	3576. 93	27948. 96	3699_3—*6494*$^{\circ}_3$	-----	------	------	----------	------	------
3*h*	3573. 263	27977. 64	3493_2—*6291*$^{\circ}_3$	-----	------	------	----------	------	------
2*h*	3562. 634	28061. 11	2907_2—*z* $^5D^{\circ}_2$	-----	------	------	----------	------	------
2*h*	3561. 83	28067. 44	3398_3—*6205*$^{\circ}_2$	-----	------	------	----------	------	------
7*h*	3556. 935	28106. 07	3493_2—*6304*$^{\circ}_3$	-----	------	------	----------	------	------
3*cw*	3546. 33	28190. 11	3738_2—*6557*$^{\circ}_3$	-----	------	------	----------	------	------
30*h*	3542. 735	28218. 71	3606_5—*z* $^7D^{\circ}_5$	1*	------	0w	1. 044	------	------
4*h*	3538. 36	28253. 61	3731_3—*6557*$^{\circ}_3$	-----	------	------	----------	------	------
3*H*	3532. 69	28299. 0	3098_4—*z* $^7D^{\circ}_4$	-----	------	------	----------	------	------
3*h*	3530. 41	28317. 22	3101_2—*z* $^5D^{\circ}_3$	-----	------	------	----------	------	------
5*h*	3527. 118	28343. 64	3606_5—*6440*$^{\circ}_4$	-----	------	------	----------	------	------
1*h*	3525. 64	28355. 54	3731_3—*6567*$^{\circ}_2$	-----	------	------	----------	------	------
6	3523. 170	28375. 42	3101_2—*z* $^3P^{\circ}_2$	3	------	0. 234	?	(1. 42)	1. 54
5	3509. 432	28486. 49	2666_1—*z* $^7D^{\circ}_1$	3	0. 804	. 803	1. 466, 2. 270	1. 466	2. 270
7*h*	3497. 696	28582. 07	3234_5—*z* $^5F^{\circ}_5$	-----	------	------	----------	------	------
3*Hw*	3493. 863	28613. 43	3098_4—*z* $^5F^{\circ}_4$	-----	------	------	----------	------	------
40*h*	3486. 183	28676. 46	2676_2—*z* $^5F^{\circ}_2$	7	------	0w	1. 088	(1. 09)	1. 08
4*cws*	3485. 35	28683. 31	3098_4—*5966*$^{\circ}_3$	-----	------	------	----------	------	------
6	3473. 688	28779. 62	2666_1—*z* $^5F^{\circ}_2$	-----	------	------	----------	------	------
3*h*	3455. 680	28929. 57	3731_3—*6624*$^{\circ}_3$	-----	------	------	----------	------	------
4*h*	3452. 649	28954. 97	2809_4—*z* $^7D^{\circ}_3$	-----	------	------	----------	------	------
30*c*	3446. 43	29007. 22	*a* $^5D_3$—*z* $^7P^{\circ}_2$	1	0. 700	0	0. 081	1. 481	2. 181
2*cw*	3440. 52	29057. 04	3022_3—*z* $^7D^{\circ}_4$	-----	------	------	----------	------	------
15*h*	3434. 834	29105. 14	3022_3—*z* $^5D^{\circ}_3$	3	. 245	0. 730	1. 133, 1. 380	1. 380	1. 133
30*cws*	3433. 828	29113. 67	*a* $^5D_1$—*z* $^7P^{\circ}_2$	2	------	0	2. 869	1. 505	2. 187
2*h*	3427. 964	29163. 47	3022_3—*z* $^3P^{\circ}_2$	-----	------	------	----------	------	------
5	3417. 274	29254. 70	3699_3—*6624*$^{\circ}_3$	2*	. 207	0	1. 473	0. 852	1. 059
3	3411. 507	29304. 15	2774_3—*z* $^7D^{\circ}_3$	-----	------	------	----------	------	------
10*c*	3407. 79	29336. 11	*a* $^5P_2$—*z* $^5P^{\circ}_2$	-----	------	------	----------	------	------
20	3403. 718	29371. 22	3022_3—*z* $^5F^{\circ}_4$	1	. 213	0	0. 553	1 400	1. 188
2	3395. 650	29440. 99	3022_3—*5966*$^{\circ}_3$	-----	------	------	----------	------	------
100*cw*	3379. 063	29585. 50	*a* $^5D_2$—*z* $^7P^{\circ}_2$	3	. 660	1. 317	1. 528, 2. 187	1. 528	2. 187
10*h*	3367. 924	29683. 36	2774_3—*z* $^5F^{\circ}_3$	-----	------	------	----------	------	------
2	3365. 168	29707. 66	2666_1—*z* $^5D^{\circ}_1$	-----	------	------	----------	------	------
2*h*	3360. 879	29745. 60	3316_4—*6291*$^{\circ}_3$	-----	------	------	----------	------	------
20*c*	3338. 574	29944. 31	3098_4—*z* $^5F^{\circ}_5$	-----	------	------	----------	------	------
2*c*	3332. 849	29995. 73	3731_3—*6731*$^{\circ}_3$	-----	------	------	----------	------	------
4	3331. 336	30009. 36	3731_3—*6732*$^{\circ}_4$	-----	------	------	----------	------	------
4*cw*	3329. 412	30026. 70	2963_4—*5966*$^{\circ}_3$	2	------	0w	1. 090	1. 14	(1. 19)
1*h*	3324. 20	30073. 77	3493_2—*6501*$^{\circ}_1$	-----	------	------	----------	------	------
30*cw*	3318. 780	30122. 89	*a* $^3G_3$—*z* $^5F^{\circ}_2$	-----	------	------	----------	------	------
15*c*	3317. 754	30132. 20	*a* $^3F_2$—*z* $^5P^{\circ}_2$	3	0. 616	1. 231	1. 200, 1. 816	1. 200	1. 816
5	3308. 468	30216. 77	*a* $^5D_3$—*z* $^7P^{\circ}_3$	-----	------	------	----------	------	------
20	3308. 38	30217. 57	*a* $^5G_4$—*z* $^7P^{\circ}_4$	-----	------	------	----------	------	------
5*cw*	3304. 542	30252. 68	2907_2—*z* $^5D^{\circ}_3$	-----	------	------	----------	------	------
50*cw*	3303. 208	30264. 89	*a* $^5D_4$—*z* $^7P^{\circ}_3$	1	. 310	0	0. 556	1. 486	1. 796
1	3301. 274	30282. 61	2676_2—*z* $^7D^{\circ}_3$	-----	------	------	----------	------	------

TABLE 1. *Classified lines of the second spectrum of rhenium* (Re II)—Continued

Intensity spark	Wavelength air	Wavenumber	Term combination	Zeeman type	Separation	Zeeman components		g	
						Strongest p	Strongest n	1st	2d
1	2	3	4	5	6	7	8	9	10
	A	*K*							
10*c*	3299. 790	30296. 24	$a\ ^5P_3$—$z\ ^7D^0_2$	1	. 386	0	0. 630	1. 403	1. 790
2*h*	3298. 535	30307. 76	3606_5—6637^0_4	-----	------	------	----------	-------	------
5*cw*	3298. 184	30310. 98	2907_2—$z\ ^3P^0_2$	-----	------	------	----------	-------	------
3	3286. 636	30417. 46	3398_3—6440^0_4	-----	------	------	----------	-------	------
7*h*	3268. 278	30588. 34	2907_2—5966^0_3 3287_2—6346^0_2	-----	------	------	----------	-------	------
3*h*	3263. 297	30635. 02	3493_2—6557^0_3	7a, 2	------	0	1. 251	(1. 23)	1. 24
5*h*	3261. 424	30652. 62	3220_4—$z\ ^5D^0_4$	3	0. 206	0. 821	1. 085, 1. 291	1. 085	1. 291
9*h*	3254. 936	30713. 71	2977_0—6048^0_1	7a	1. 128	0	1. 128	0/0	1. 128
1	3252. 482	30736. 89	3493_2—6567^0_2	-----	------	------	----------	-------	------
2	3251. 548†	30745. 71	$a\ ^5P_1$—$z\ ^5D^0_0$	-----	------	------	----------	-------	------
1*h*	3250. 142	30759. 02	2972_2—6048^0_1	-----	------	------	----------	-------	------
80	3246. 311	30795. 31	$a\ ^5D_2$—$z\ ^7P^0_3$	2	0. 263	0	2. 318	1. 528	1. 791
15*l*	3244. 464	30812. 84	$a\ ^3G_4$—$z\ ^7D^0_3$	7a, 2	------	0	1. 101	(1. 12)	1. 11
10*cw*	3241. 910	30837. 12	3220_4—6304^0_3	-----	------	------	----------	-------	------
1	3238. 470	30869. 88	3225_3—6312^0_4	-----	------	------	----------	-------	------
2*H*	3229. 804	30952. 70	3398_3—6494^0_3	-----	------	------	----------	-------	------
2	3227. 76	30972. 30	3738_2—6835^0_3	-----	------	------	----------	-------	------
10*hl*	3226. 37	30985. 64	3606_5—6704^0_5	3*	. 181	0. 881	0. 96, 1. 14	0. 96	1. 14
3	3220. 258	31044. 45	3101_2—6205^0_2	-----	------	------	----------	-------	------
50*c*	3219. 906	31047. 84	$a\ ^3F_3$—$z\ ^5P^0_2$	1	. 559	0	. 145	1. 263	1. 821
5*h*	3218. 653	31059. 93	2942_1—6048^0_1	-----	------	------	----------	-------	------
6*h*	3213. 168	31112. 95	3316_4—$z\ ^7D^0_3$	-----	------	------	----------	-------	------
1*h*	3203. 560	31206. 26	3225_3—6346^0_2	-----	------	------	----------	-------	------
3	3198. 330	31257. 28	$a\ ^3F_2$—$z\ ^5P^0_3$	-----	------	------	----------	-------	------
2*h*	3197. 59	31264. 52	3606_5—6732^0_4	-----	------	------	----------	-------	------
15	3195. 206	31287. 84	2963_4—$z\ ^5F^0_5$	2	------	0w	1. 365	1. 14	(1. 18)
1	3192. 852	31310. 91	3493_2—6624^0_3 3731_3—6862^0_2	-----	------	------	----------	-------	------
2*h*	3175. 094	31486. 02	3738_2—6886^0_3	-----	------	------	----------	-------	------
2*h*	3173. 604	31500. 80	2809_4—$z\ ^5F^0_4$	-----	------	------	----------	-------	------
7*h*	3170. 074	31535. 88	3287_2—6441^0_2 (2774_3—$z\ ^7D^0_4$)	3	0. 247	0. 498	0. 813, 1. 060	1. 060	0. 813
8*h*	3166. 609	31570. 39	2809_4—5966^0_3	7a, 2	------	0	1. 276h	(1. 22)	1. 20
1*H*	3155. 209	31684. 5	3398_3—6567^0_2	-----	------	------	----------	-------	------
1	3151. 498	31721. 8	$a\ ^5P_1$—$z\ ^5F^0_2$	-----	------	------	----------	-------	------
1*h*	3143. 974	31797. 7	3316_4—6496^0_3	-----	------	------	----------	-------	------
2	3142. 018	31817. 5	$a\ ^3G_3$—$z\ ^5D^0_2$	-----	------	------	----------	-------	------
6	3138. 796	31850. 2	2774_3—$z\ ^5F^0_4$	7a, 1	------	0	1. 120	(1. 23)	1. 20
1*h*	3138. 663	31851. 5	3731_3—6917^0_2	-----	------	------	----------	-------	------
4*cw*	3136. 178	31876. 7	3098_4—$z\ ^5D^0_4$	-----	------	------	----------	-------	------
20	3131. 952	31919. 8	2774_3—5966^0_3	7, 3	------	0	1. 200	(1. 23)	1. 18
7*h*	3130. 203	31937. 6	3234_5—$z\ ^7D^0_5$	-----	------	------	----------	-------	------
2	3127. 521	31965. 0	3731_3—6928^0_4	-----	------	------	----------	-------	------
2*h*	3123. 622	32004. 8	2314_1—$z\ ^7D^0_1$	-----	------	------	----------	-------	------
2	3118. 002	32062. 6	3234_5—6440^0_4	-----	------	------	----------	-------	------
3*c*	3117. 652	32066. 2	3287_2—6494^0_3	2	------	0	1. 920w	1. 08	1. 36
2	3116. 720	32075. 7	3220_4—$z\ ^7D^0_3$	-----	------	------	----------	-------	------
2*h*	3113. 350	32110. 5	3398_3—6610^0_3	-----	------	------	----------	-------	------
2*h*	3110. 326	32141. 7	3071_3—$z\ ^5D^0_4$	-----	------	------	----------	-------	------
2	3109. 983	32145. 2	3098_4—6312^0_4	-----	------	------	----------	-------	------
6	3109. 576	32149. 4	3225_3—6440^0_4	-----	------	------	----------	-------	------
2*h*	3109. 156	32153. 8	3225_3—6441^0_3	-----	------	------	----------	-------	------
3*c*	3107. 298	32173. 0	$a\ ^3F_3$—$z\ ^5P^0_3$	-----	------	------	----------	-------	------
2*h*	3106. 948	32176. 6	3699_3—6917^0_2	-----	------	------	----------	-------	------
7*h*	3105. 082	32196. 0	3606_5—6825^0_5	-----	------	------	----------	-------	------
20*c*	3103. 260	32214. 83	$a\ ^5S_2$—$z\ ^5P^0_1$	-----	------	------	----------	-------	------
20	3103. 055	32216. 96							

TABLE 1. *Classified lines of the second spectrum of rhenium* (Re II)—Continued

Intensity spark	Wavelength air	Wavenumber	Term combination	Zeeman type	Separation	Zeeman components		g	
						Strongest p	Strongest n	1st	2d
1	2	3	4	5	6	7	8	9	10
	A	*K*							
2*cw*	3099.064	32258.5	3398_3—6624°_3	-----	-----	-----	-----	-----	-----
15	3096.312	32287.1	$a\ ^5P_3$—$z\ ^7D^\circ_3$	3	0.282	0.835	1.138, 1.420	1.420	1.138
4*cw*	3095.314	32297.6	2314_1—$z\ ^5F^\circ_2$	-----	-----	-----	-----	-----	-----
3*c*	3092.607	32325.8	3071_3—6304°_3	-----	-----	-----	-----	-----	-----
10	3092.288	32329.2	2972_2—6205°_2	-----	-----	-----	-----	-----	-----
1	3091.356	32338.9	3493_2—6727°_1	-----	-----	-----	-----	-----	-----
6	3087.854	32375.6	$a\ ^5P_3$—$z\ ^5D^\circ_3$	-----	-----	-----	-----	-----	-----
10	3080.660	32451.2	3101_2—6346°_2	3	-----	0.148	1.459w	1.422	1.496
4	3080.048	32457.6	3731_3—6977°_4	-----	-----	-----	-----	-----	-----
3*cw*	3074.657	32514.5	$a\ ^3F_2$—$z\ ^7D^\circ_2$	-----	-----	-----	-----	-----	-----
15	3066.020	32606.1	$a\ ^3F_2$—$z\ ^7D^\circ_1$	1	1.068	0	0.138	1.206	2.274
15	3063.762	32630.2	2942_1—6205°_2	1	0.194	0	.980	1.368	1.174
4	3061.930	32649.7	$a\ ^5P_1$—$z\ ^5D^\circ_1$	3	.619	0.763	1.284, 1.903	1.903	1.284
15	3058.149	32690.1	3022_3—6291°_3	3	.150	.452	1.246, 1.396	1.396	1.246
2*h*	3057.538	32696.6	3287_2—6557°_3	-----	-----	-----	-----	-----	-----
5*h*	3055.004	32723.7	2666_1—$z\ ^3P^\circ_2$	-----	-----	-----	-----	-----	-----
1	3053.88	32735.7	3220_4—6494°_3 3699_3—6972°_3	-----	-----	-----	-----	-----	-----
5*cw*	3048.036	32798.5	3287_2—6567°_2	-----	-----	-----	-----	-----	-----
3*h*	3046.644	32813.5	3606_5—$6887^\circ_{3,4}$	-----	-----	-----	-----	-----	-----
7	3044.969	32831.5	2809_4—$z\ ^5F^\circ_5$	1	-----	0w	1.027	(1.22)	1.18
1*h*	3039.804	32887.3	2762_4—6052°_3	-----	-----	-----	-----	-----	-----
2	3038.812	32898.1	2676_2—5966°_3	-----	-----	-----	-----	-----	-----
1	3038.694	32899.3	$a\ ^3F_2$—$z\ ^5F^\circ_2$	-----	-----	-----	-----	-----	-----
10	3038.368	32902.9	3022_3—6312°_4	1	0.12	0	0.921	1.40	1.28
3*h*	3035.776	32931.0	3316_4—6610°_3	-----	-----	-----	-----	-----	-----
15*cws*	3026.555	33031.3	$a\ ^5P_2$—$z\ ^5D^\circ_1$	-----	.38	0	2.027h	1.65	1.27
3*c*	3025.36	33044.3	$a\ ^3G_4$—$z\ ^7D^\circ_4$	-----	-----	-----	-----	-----	-----
2*c*	3022.194	33079.0	3316_4—6624°_3	-----	-----	-----	-----	-----	-----
7	3012.36	33186.9	2972_2—6291°_3	-----	-----	-----	-----	-----	-----
2*h*	3010.977	33202.2	3316_4—6637°_4	-----	-----	-----	-----	-----	-----
8*c*	3009.362	33220.0	2963_4—6285°_4 3606_5—6928°_4	-----	-----	-----	-----	-----	-----
2*cw*	3008.984	33224.2	3287_2—6610°_3	-----	-----	-----	-----	-----	-----
8*c*	3008.826	33225.9	2314_1—$z\ ^5D^\circ_1$	3	.187	0.168h	1.104, 1.291	1.104	1.291
7*h*	3007.62	33239.2	3022_3—6346°_2	1	-----	0w	1.168	(1.398)	1.51
3*c*	3002.633†	33294.4	$a\ ^3G_5$—$z\ ^7D^\circ_4$	-----	-----	-----	-----	-----	-----
3*h*	3000.828	33314.5	3225_3—6557°_3	-----	-----	-----	-----	-----	-----
4*h*	2999.947	33324.2	3398_3—6731°_3	-----	-----	-----	-----	-----	-----
5*h*	2998.700	33338.1	3398_3—6732°_4	-----	-----	-----	-----	-----	-----
6	2996.842	33358.8	$a\ ^3G_4$—$z\ ^5F^\circ_4$	-----	-----	-----	-----	-----	-----
2	2996.182	33366.1	3220_4—6557°_3	-----	-----	-----	-----	-----	-----
4	2996.074†	33367.3	3316_4—6653°_5	-----	-----	-----	-----	-----	-----
10*h*	2992.746	33404.4	2963_4—6304°_3	-----	-----	-----	-----	-----	-----
5*h*	2990.926	33424.7	3098_4—6440°_4	-----	-----	-----	-----	-----	-----
5	2990.604	33428.3	$a\ ^3G_4$—5966°_3	1	-----	0w	0.962	(1.12)	1.17
3	2990.433	33430.3	$a\ ^3F_3$—$z\ ^7D^\circ_2$	-----	-----	-----	-----	-----	-----
3	2985.207	33488.7	2963_4—6312°_4	-----	-----	-----	-----	-----	-----
50*c*	2980.90	33537.1	$a\ ^5G_3$—$z\ ^5P^\circ_2$	1	0.710	0	1.096, 1.812	1.110	1.820
2*cw*	2977.148	33579.4	3295_4—6653°_5	-----	-----	-----	-----	-----	-----
10*cw*	2974.563	33608.1	$a\ ^3G_5$—$z\ ^5F^\circ_4$	7	-----	0	1.221	(1.22)	1.22
2*h*	2971.734	33640.6	2907_2—6271°_1	-----	-----	-----	-----	-----	-----
10*c*	2967.415	33689.9	3071_3—6440°_4	-----	-----	-----	-----	-----	-----
2*h*	2967.018	33694.1	3071_3—6441°_3	-----	-----	-----	-----	-----	-----
80*cw*	2957.907	33797.8	$a\ ^5P_2$—$z\ ^5D^\circ_2$	3	.363	0.725	1.312, 1.675	1.675	1.312
8*c*	2955.730	33822.7	2666_1—6048°_1	-----	-----	-----	-----	-----	-----
10*c*	2954.99	33831.2	$a\ ^5G_2$—$z\ ^5P^\circ_2$	-----	-----	-----	-----	-----	-----

TABLE 1. *Classified lines of the second spectrum of rhenium* (Re II)—Continued

Intensity spark	Wavelength air	Wavenumber	Term combination	Zeeman type	Separation	Zeeman components		g	
						Strongest p	Strongest n	1st	2d
1	2	3	4	5	6	7	8	9	10
	A	*K*							
2*h*	2954. 454	33837. 3	2907_2—*6291*$^{\circ}_3$	-----	------	------	----------	------	------
3*h*	2952. 982	33854. 2	3287_2—*6673*$^{\circ}_2$	-----	------	------	----------	------	------
3*h*	2950. 731	33880. 0	3316_4—*6704*$^{\circ}_5$	-----	------	------	----------	------	------
8*h*	2943. 794	33959. 9	3098_4—*6494*$^{\circ}_3$	1	0. 158	0	0. 72	1. 197	1. 355
3*h*	2941. 141	33990. 5	3225_3—*6624*$^{\circ}_3$	-----	------	------	----------	------	------
50*cl*	2940. 974	33992. 4	2314_1—*z* $^5D^{\circ}_2$	2	0. 19	0	1. 463cw	1. 08	1. 27
3	2939. 557	34008. 8	*a* $^3G_3$—*z* $^5D^{\circ}_3$	-----	------	------	----------	------	------
40	2934. 529	34067. 1	*a* $^3G_3$—*z* $^3P^{\circ}_2$	1	.620	0	0. 900, 1. 519	0. 899	1. 519
7*h*	2933. 542	34078. 5	3731_3—*7139*$^{\circ}_2$	-----	------	------	----------	------	------
6*h*	2932. 657	34088. 8	*a* $^5P_2$—*z* $^5F^{\circ}_3$	-----	------	------	----------	------	------
1*h*	2929. 044	34130. 8	3731_3—*7144*$^{\circ}_3$	-----	------	------	----------	------	------
5*h*	2927. 852	34144. 8	3316_4—*6731*$^{\circ}_3$	-----	------	------	----------	------	------
20*h*	2926. 661	34158. 7	3316_4—*6732*$^{\circ}_4$	-----	------	------	----------	------	------
10*h*	2926. 134	34164. 8	3220_4—*6637*$^{\circ}_4$	7*	------	0	1. 071	------	------
10*h*	2925. 703	34169. 9	3234_5—*6651*$^{\circ}_5$	3	------	0. 164	1. 120	1. 11	1. 14
6*h*	2922. 694	34205. 0	3493_2—*6914*$^{\circ}_3$	1	. 147	0	0. 789	1. 230	1. 083
1*h*	2917. 173	34269. 8	3220_4—*6647*$^{\circ}_4$	-----	------	------	----------	------	------
20	2916. 731	34275. 0	*a* $^3G_3$—*z* $^5F^{\circ}_4$	2	. 267	0	1. 974	0. 910	1. 177
2*cwl*	2915. 643	34287. 7	*a* $^5G_4$—*6052*$^{\circ}_3$	-----	------	------	----------	------	------
5	2913. 639	34311. 3	2774_3—*6205*$^{\circ}_2$	7*	------	0	1. 227	------	------
3*h*	2912. 025	34330. 3	3220_4—*6653*$^{\circ}_5$	-----	------	------	----------	------	------
7*hc*	2910. 818	34344. 6	*a* $^3G_3$—*5966*$^{\circ}_3$	-----	------	------	----------	------	------
4*hc*	2909. 127	34364. 5	3398_3—*6835*$^{\circ}_3$	-----	------	------	----------	------	------
2	2907. 231	34387. 0	2907_2—*6346*$^{\circ}_2$	-----	------	------	----------	------	------
2*h*	2906. 11	34400. 2	3287_2—*6727*$^{\circ}_1$	-----	------	------	----------	------	------
2*cw*	2905. 854	34403. 2	3699_3—*7139*$^{\circ}_2$	-----	------	------	----------	------	------
6*h*	2904. 982	34413. 5	3731_3—*7173*$^{\circ}_2$	-----	------	------	----------	------	------
6	2902. 886	34438. 4	3287_2—*6731*$^{\circ}_3$	-----	------	------	----------	------	------
6	2900. 012	34472. 5	3225_3—*6673*$^{\circ}_2$	1?	0. 166	0	0. 776	1. 108	1. 274
10*c*	2897. 242	34505. 5	*a* $^3F_2$—*z* $^7D^{\circ}_3$	7*	------	0h	1. 079h	------	------
3*h*	2892. 724	34559. 4	3101_2—*6557*$^{\circ}_3$	-----	------	------	----------	------	------
10*c*	2892. 093	34566. 9	*a* $^5P_3$—*z* $^5D^{\circ}_3$	3	. 273	0. 826	1. 140, 1. 413	1. 413	1. 140
10*cw*	2889. 832	34594. 0	*a* $^3F_2$—*z* $^5D^{\circ}_2$	-----	------	------	----------	------	------
40*c*	2888. 06	34615. 3	*a* $^5D_1$—*z* $^5P^{\circ}_1$	3	. 907	. 909	1. 502, 2. 406	1. 500	2. 407
10*h*	2886. 774	34630. 6	3731_3—*7194*$^{\circ}_2$	-----	------	------	----------	------	------
2*h*	2885. 710	34643. 4	2963_4—*z* $^7D^{\circ}_5$	-----	------	------	----------	------	------
20*h*	2884. 244	34661. 0	3101_2—*6567*$^{\circ}_2$	2*	------	. 209	1. 295	------	------
2*h*	2882. 367	34683. 6	2972_2—*6440*$^{\circ}_4$	-----	------	------	----------	------	------
60*h*	2881. 874	34689. 5	*a* $^3G_4$—*z* $^5F^{\circ}_5$	2	------	0w	1. 390	(1. 12)	1. 18
8*h*	2880. 630	34704. 4	3234_5—*6704*$^{\circ}_5$	-----	------	------	----------	------	------
3*h*	2877. 528	34741. 9	3022_3—*6496*$^{\circ}_3$	-----	------	------	----------	------	------
30	2875. 698	34764. 0	2809_4—*z* $^5D^{\circ}_4$	3	------	0. 21	1. 26w	1. 23	1. 28
2	2871. 432	34815. 6	3731_3—*7213*$^{\circ}_2$	-----	------	------	----------	------	------
2	2871. 102	34819. 6	2809_4—*6291*$^{\circ}_3$	-----	------	------	----------	------	------
7*h*	2870. 000	34833. 0	*a* $^5P_3$—*z* $^5F^{\circ}_4$	1	0. 759	0	0. 445	1. 409	1. 168
4*c*	2869. 200	34842. 7	3220_4—*6704*$^{\circ}_5$	-----	------	------	----------	------	------
2*H*	2866. 294	34878. 1	3398_3—*6886*$^{\circ}_3$	-----	------	------	----------	------	------
3*h*	2865. 554	34887. 1	3398_3—*6887*$^{\circ}_4$	-----	------	------	----------	------	------
10*h*	2864. 280	34902. 6	*a* $^5P_3$—*5966*$^{\circ}_3$	-----	------	------	----------	------	------
10*c*	2861. 260	34939. 4	*a* $^3G_5$—*z* $^5F^{\circ}_5$	7*	------	0w	1. 028	------	------
20*h*	2860. 550	34948. 1	2809_4—*6304*$^{\circ}_3$	1	------	0w	0. 880	(1. 22)	1. 33
2	2859. 92	34955. 8	3699_3—*7194*$^{\circ}_2$	-----	------	------	----------	------	------
15*cw*	2859. 87	34956. 4	*a* $^5G_2$—*z* $^5P^{\circ}_3$	2	. 998	0	3. 634	0. 640	1. 638
2*h*	2857. 662	34983. 4	3234_5—*6732*$^{\circ}_4$	-----	------	------	----------	------	------
8*h*	2857. 575	34984. 5	2942_1—*6441*$^{\circ}_2$	-----	------	------	----------	------	------

TABLE 1. *Classified lines of the second spectrum of rhenium* (Re II)—Continued

Intensity spark	Wavelength air	Wavenumber	Term combination	Zeeman type	Separation	Zeeman components		g	
						Strongest p	Strongest n	1st	2d
1	2	3	4	5	6	7	8	9	10
	A	*K*							
8*h*	2851. 720	35056. 3	3225_3—6731°_3	3	. 10	0. 31	----------	(1. 11)	1. 21
3	2850. 590	35070. 1	3225_3—6732°_4	-----	-----	-----	----------	-----	-----
6*c*	2849. 22	35087. 1	*a* $^5D_2$—*z* $^5P^\circ_1$	7*	-----	0	1. 513	-----	-----
10*h*	2848. 966	35090. 2	3316_4—6825°_5	7a, 1	-----	0	1. 119	(1. 188)	1. 17
7*h*	2847. 568	35107. 4	3220_4—6731°_3	-----	-----	-----	----------	-----	-----
1*h*	2844. 854	35140. 9	3699_3—7213°_2	-----	-----	-----	----------	-----	-----
5*h*	2843. 762	35154. 4	3738_2—7253°_2	-----	-----	-----	----------	-----	-----
2	2842. 588	35168. 9	2774_3—6291°_3	-----	-----	-----	----------	-----	-----
2*H*	2841. 669	35180. 3	3398_3—6917°_2	-----	-----	-----	----------	-----	-----
1	2841. 275	35185. 1	3316_4—6835°_3	-----	-----	-----	----------	-----	-----
4*h*	2840. 024	35200. 7	3493_2—7013°_1	-----	-----	-----	----------	-----	-----
4*cw*	2834. 782	35265. 7	3098_4—6624°_3	-----	-----	-----	----------	-----	-----
4*c*	2833. 05	35287. 3	2762_3—6291°_3	-----	-----	-----	----------	-----	-----
1*h*	2832. 857	35289. 7	2676_2—6205°_2	-----	-----	-----	----------	-----	-----
2*h*	2832. 540	35293. 6	3398_3—6928°_4	-----	-----	-----	----------	-----	-----
5*h*	2832. 245	35297. 4	2774_3—6304°_3	-----	-----	-----	----------	-----	-----
2*h*	2831. 854	35302. 2	3295_4—6825°_5	-----	-----	-----	----------	-----	-----
3*h*	2831. 752	35303. 4	2963_4—6494°_3	-----	-----	-----	----------	-----	-----
4*h*	2825. 50	35381. 6	2774_3—6312°_4	-----	-----	-----	----------	-----	-----
5*H*	2824. 939	35388. 6	*a* $^3F_4$—*z* $^7D^\circ_4$ 3098_4—6637°_4	-----	-----	-----	----------	-----	-----
5*h*	2824. 596	35392. 9	2666_1—6205°_2	1	0. 27	0	0. 901	1. 44	1. 17
3*h*	2822. 341	35421. 2	*a* $^3F_3$—*z* $^7D^\circ_3$	-----	-----	-----	----------	-----	-----
8	2821. 110	35436. 6	*a* $^3F_4$—*z* $^5D^\circ_3$	2	-----	0w	1. 690	(1. 275)	1. 14
60*cwl*	2819. 779	35453. 4	*a* $^5S_2$—*z* $^5P^\circ_2$	-----	-----	-----	----------	-----	-----
3*c*	2815. 31	35509. 6	*a* $^3F_3$—*z* $^5D^\circ_2$	-----	-----	-----	----------	-----	-----
20*h*	2813. 53	35532. 1	3098_4—6651°_5	7a, 1	-----	0	1. 137	(1. 188)	1. 18
10*h*	2809. 435	35583. 9	2942_1—6501°_1	3	0. 570	0. 574	0. 797, 1. 365	1. 366	0. 796
10*hl*	2803. 925	35653. 8	3071_3—6637°_4	2	. 345	0	2. 522	1. 142	1. 487
20*c*	2803. 28	35662. 1	*a* $^5D_0$—*z* $^5P^\circ_1$	7a	2. 452	0	2. 452c	0/0	2. 452
1	2802. 97	35666. 0	*a* $^5P_1$—*z* $^3P^\circ_2$	-----	-----	-----	----------	-----	-----
3*c*	2798. 918	35717. 6	3101_2—6673°_3	-----	-----	-----	----------	-----	-----
5*h*	2798. 870	35718. 2	2774_3—6346°_2	-----	-----	-----	----------	-----	-----
1*h*	2797. 208	35739. 4	3398_3—6972°_3	-----	-----	-----	----------	-----	-----
20*h*	2794. 632	35772. 4	*a* $^3F_4$—5966°_3	2	-----	0w	1. 527	(1. 275)	1. 191
5*h*	2789. 026	35844. 2	2972_2—6557°_3	-----	-----	-----	----------	-----	-----
10*h*	2782. 101	35933. 5	2907_2—6501°_1 2963_4—6557°_3	-----	-----	-----	----------	-----	-----
50*c*	2777. 797	35989. 2	*a* $^5P_2$—*z* $^5D^\circ_3$	1	0. 54	0	0. 05	1. 68	1. 14
2*h*	2768. 177	36114. 2	3316_4—6928°_4	-----	-----	-----	----------	-----	-----
30*h*	2765. 69	36146. 6	3022_3—6637°_4	-----	-----	-----	----------	-----	-----
7*h*	2765. 30	36151. 7	3493_2—7108°_2	-----	-----	-----	----------	-----	-----
1*h*	2760. 494	36214. 7	2338_5—*z* $^5F^\circ_4$	-----	-----	-----	----------	-----	-----
3*h*	2758. 418	36242. 0	2314_1—*z* $^3P^\circ_2$	-----	-----	-----	----------	-----	-----
4*h*	2757. 700	36251. 4	3022_3—6647°_3	-----	-----	-----	----------	-----	-----
2	2756. 806	36263. 2	3101_2—6727°_1	-----	-----	-----	----------	-----	-----
10*h*	2755. 854	36275. 7	2676_2—6304°_3	-----	-----	-----	----------	-----	-----
100*cws*	2753. 638	36304. 9	*a* $^5G_3$—*z* $^5F^\circ_2$	-----	-----	-----	----------	-----	-----
6*h*	2751. 620	36331. 5	3098_4—6731°_3	-----	-----	-----	----------	-----	-----
80*c*	2750. 564	36345. 5	3295_4—6930°_3 3098_4—6732°_4	1, 3*	-----	0. 402	1. 141	1. 543	1. 677
20*d*	2748. 55	36372. 1	2972_2—6610°_3	-----	-----	-----	----------	-----	-----
30*c*	2741. 967†	36459. 4	3493_2—7139°_2	-----	-----	-----	----------	-----	-----
2*h*	2734. 43	36559. 9	3316_4—6972°_3	-----	-----	-----	----------	-----	-----
300*cl*	2733. 04	36578. 5	*a* $^5S_2$—*z* $^5P^\circ_3$	7a, 1	-----	0w	1. 595w	(1. 71)	1. 67
6*cw*	2732. 398	36587. 1	*a* $^5G_4$—*z* $^7D^\circ_3$	-----	-----	-----	----------	-----	-----
150*cwl*	2731. 562	36598. 3	*a* $^5G_2$—*z* $^5F^\circ_2$	3	0. 436	0. 873	0. 650, 1. 086	0. 650	1. 086
2	2730. 911	36607. 0	3316_4—6977°_4	-----	-----	-----	----------	-----	-----

TABLE 1. *Classified lines of the second spectrum of rhenium* (Re II)—Continued

Intensity spark	Wavelength air	Wavenumber	Term combination	Zeeman type	Separation	Zeeman components		g	
						Strongest p	Strongest n	1st	2d
1	2	3	4	5	6	7	8	9	10
	A	*K*							
10*h*	2730. 658	36610. 4	3071_3—*6732*$^\circ_4$ 3225_3—*6886*$^\circ_3$	-----	------	------	----------	------	------
10	2730. 027	36618. 9	3225_3—*6887*$^\circ_4$	7a, 1	------	0	1. 053	(1. 114)	1. 10
2*h*	2729. 803	36621. 9	*a* $^3G_4$—*z* $^5D^\circ_4$	-----	------	------	----------	------	------
15*h*	2726. 870	36661. 3	2774_3—*6440*$^\circ_4$ 3220_4—*6886*$^\circ_3$	7b	------	0	1. 227	(1. 23)	1. 23
3*cl*	2726. 57	36665. 2	2774_3—*6441*$^\circ_2$	-----	------	------	----------	------	------
3*h*	2724. 253	36696. 5	2676_2—*6346*$^\circ_2$	-----	------	------	----------	------	------
3	2718. 659	36772. 0	3295_4—*6972*$^\circ_3$	-----	------	------	----------	------	------
10*cw*	2717. 670	36785. 3	*a* $^3F_4$—*z* $^5D^\circ_3$	2	------	0w	1. 126	(1. 20)	1. 17
2*c*	2716. 63	36799. 5	2666_1—*6346*$^\circ_2$	-----	------	------	----------	------	------
3	2716. 144	36806. 0	*a* $^3G_4$—*6304*$^\circ_3$	-----	------	------	----------	------	------
3*h*	2713. 828	36837. 4	2963_4—*6647*$^\circ_4$	-----	------	------	----------	------	------
15*c*	2713. 375	36843. 6	*a* $^3F_3$—*z* $^3P^\circ_2$	-----	------	------	----------	------	------
8*h*	2712. 646	36853. 5	3287_3—*6972*$^\circ_3$	-----	------	------	----------	------	------
6*h*	2711. 298	36871. 8	2809_4—*6496*$^\circ_3$	-----	------	------	----------	------	------
10*h*	2711. 008	36875. 7	2963_4—*6651*$^\circ_5$	-----	------	------	----------	------	------
2*h*	2710. 36	36884. 6	3225_3—*6914*$^\circ_3$	-----	------	------	----------	------	------
10*cw*	2709. 91	36890. 7	*a* $^3G_4$—*6312*$^\circ_4$	-----	------	------	----------	------	------
4*h*	2708. 322	36912. 3	3225_3—*6917*$^\circ_2$	7a, 1	------	0	0. 738	(1. 114)	1. 30
2*h*	2706. 39	36938. 7	3234_5—*6928*$^\circ_4$	-----	------	------	----------	------	------
1*h*	2701. 726	37002. 4	2972_2—*6673*$^\circ_2$	-----	------	------	----------	------	------
1*h*	2701. 556	37004. 8	3731_3—*7432*$^\circ_2$	-----	------	------	----------	------	------
8*c*	2700. 211	37023. 2	2907_2—*6610*$^\circ_3$	-----	------	------	----------	------	------
5	2700. 027	37025. 7	3225_3—*6928*$^\circ_4$	-----	------	------	----------	------	------
5	2699. 462	37033. 5	*a* $^3F_4$—*z* $^5F^\circ_5$	-----	------	------	----------	------	------
3*h*	2696. 298	37076. 9	3220_4—*6928*$^\circ_4$	-----	------	------	----------	------	------
1*h*	2695. 41	37089. 1	3022_3—*6731*$^\circ_3$	-----	------	------	----------	------	------
30	2693. 104	37120. 9	*a* $^3F_2$—*5966*$^\circ_3$	7a, 1	------	0	1. 166	(1. 20)	1. 19
30*cw*	2691. 694	37140. 3	*a* $^3G_5$—*6312*$^\circ_4$	2	------	0w	1. 062	(1. 26)	1. 31
3*cW*	2691. 262	37146. 3	*a* $^5P_2$—*6048*$^\circ_1$	-----	------	------	----------	------	------
3*h*	2687. 592	37197. 0	3493_2—*7213*$^\circ_2$	-----	------	------	----------	------	------
3*h*	2683. 688	37251. 1	3738_2—*7463*$^\circ_2$	-----	------	------	----------	------	------
6*h*	2682. 888	37262. 2	3287_2—*7013*$^\circ_1$	1	0. 561	0	0. 515	1. 076	1. 637
5*H*	2681. 838	37276. 8	3098_4—*6825*$^\circ_5$	-----	------	------	----------	------	------
2*h*	2677. 231	37341. 0	2314_1—*6048*$^\circ_1$	-----	------	------	----------	------	------
3*h*	2669. 354	37451. 1	3234_5—*6979*$^\circ_4$	-----	------	------	----------	------	------
4*h*	2667. 893	37471. 6	3225_3—*6972*$^\circ_3$	-----	------	------	----------	------	------
4*H*	2667. 54	37476. 6	2809_4—*6557*$^\circ_3$	-----	------	------	----------	------	------
1	2665. 688	37502. 6	2977_0—*6727*$^\circ_1$	-----	------	------	----------	------	------
1	2664. 556	37518. 6	3225_3—*6977*$^\circ_4$	-----	------	------	----------	------	------
1	2663. 159	37538. 2	3225_3—*6979*$^\circ_4$?	-----	------	------	----------	------	------
4	2662. 464	37548. 0	2972_2—*6727*$^\circ_1$	7b	------	0	1. 292	1. 292	1. 292
7	2660. 928	37569. 7	3220_4—*6977*$^\circ_4$	-----	------	------	----------	------	------
4	2659. 552	37589. 2	3220_4—*6979*$^\circ_4$	-----	------	------	----------	------	------
1	2659. 236	37593. 6	*a* $^3G_3$—*6291*$^\circ_3$	-----	------	------	----------	------	------
3*c*	2655. 048	37652. 9	*a* $^3F_3$—*z* $^7D^\circ_4$ 2907_2—*6673*$^\circ_2$	-----	------	------	----------	------	------
5*h*	2653. 485	37675. 1	2963_4—*6731*$^\circ_3$	-----	------	------	----------	------	------
6*h*	2652. 506	37689. 0	2963_4—*6732*$^\circ_4$	-----	------	------	----------	------	------
5	2651. 662	37701. 0	*a* $^3F_3$—*z* $^5D^\circ_3$	-----	------	------	----------	------	------
10*h*	2650. 197	37721. 8	*a* $^3G_3$—*6304*$^\circ_3$	-----	------	------	----------	------	------
50*h*	2648. 462	37746. 5	*a* $^5D_3$—*z* $^5P^\circ_2$	-----	------	------	----------	------	------

TABLE 1. *Classified lines of the second spectrum of rhenium* (Re II)—Continued

Intensity spark	Wavelength air	Wavenumber	Term combination	Zeeman type	Separation	Zeeman components		g	
						Strongest p	Strongest n	1st	2d
1	2	3	4	5	6	7	8	9	10
	A	*K*							
20	2647.578	37759.2	$a\ ^3F_3$—$z\ ^3P^\circ_2$	1	0.263	0	0.731	1.257	1.520
5	2644.266	37806.4	$a\ ^3G_3$—*6312*$^\circ_4$	2	.36	0	----------	(0.90)	1.26
30*cw*	2642.25	37835.4	$a\ ^5S_2$—$z\ ^7D^\circ_2$	3	------	0w	1.77	(1.71)	1.83
3	2641.300	37848.9	2942$_1$—*6727*$^\circ_1$	-----	------	------	----------	------	------
30	2641.021	37852.9	$a\ ^5D_1$—$z\ ^5P^\circ_2$	2	.326	0	2.148	1.496	1.822
7*h*	2638.147	37894.1	3098$_4$—*6887*$^\circ_4$	3	------	0.342	1.22w	1.18	1.26
150*c*	2637.006	37970.5	$a\ ^5G_3$—$z\ ^5F^\circ_3$	7, 3	------	0w	1.136	(1.12)	1.15
200*cwl*	2635.831	37927.4	$a\ ^5S_2$—$z\ ^7D^\circ_1$	1	.564	0	1.143	1.707	2.271
2*h*	2634.798	37942.3	$a\ ^3F_2$—*6048*$^\circ_1$	-----	------	------	----------	------	------
8	2633.084	37967.0	$a\ ^3F_3$—$z\ ^5F^\circ_4$	1	------	0w	0.945	(1.26)	1.18
20*c*	2632.16	37980.3	$a\ ^3F_2$—*6052*$^\circ_3$	-----	------	------	----------	------	------
30?	2630.861	37999.1	$a\ ^5G_3$—$z\ ^5D^\circ_2$	1	0.199	0	0.692	1.090	1.289
8	2630.436	38005.2	2809$_4$—*6610*$^\circ_3$	-----	------	------	----------	------	------
100*h*	2628.258	38036.7	$a\ ^5P_3$—$z\ ^3P^\circ_3$	3	------	0.220w	1.198w	1.234	1.161
3	2622.276	38123.5	3699$_3$—*7511*$^\circ_3$	-----	------	------	----------	------	------
3	2621.870	38129.3	3022$_3$—*6835*$^\circ_3$	-----	------	------	----------	------	------
2*h*	2620.937	38142.9	$a\ ^3G_3$—*6346*$^\circ_2$	-----	------	------	----------	------	------
10*hs*	2619.805	38159.4	3071$_3$—*6887*$^\circ_4$	-----	------	------	----------	------	------
4*h*	2619.082	38169.9	$a\ ^3G_4$—*6440*$^\circ_4$	-----	------	------	----------	------	------
150*cwl*	2616.720	38204.4	$a\ ^5G_2$—$z\ ^7D^\circ_3$	2	.66	0	1.131	0.65	1.131
5*h*	2615.59	38220.9	$a\ ^5S_2$—$z\ ^5F^\circ_2$	-----	------	------	----------	------	------
8*c*	2610.874	38289.9	$a\ ^5G_3$—$z\ ^5F^\circ_3$ 3101$_2$—*6930*$^\circ_3$	-----	------	------	----------	------	------
20*h*	2610.545	38294.8	$a\ ^3G_5$—$z\ ^7D^\circ_5$	-----	------	------	----------	------	------
2*h*	2610.120	38301.0	3098$_4$—*6928*$^\circ_4$	-----	------	------	----------	------	------
5	2609.839	38305.1	$a\ ^5G_5$—$z\ ^7D^\circ_4$	-----	------	------	----------	------	------
400	2608.501	38324.8	$a\ ^5D_2$—$z\ ^5P^\circ_2$	3	.299	0.595	1.526, 1.825	1.526	1.825
10	2606.480	38354.5	2774$_3$—*6610*$^\circ_3$	3	.18	.530	----------	(1.23)	1.41
8*h*	2593.048	38553.1	3225$_3$—*7081*$^\circ_3$	3	------	.116h	1.154h	1.13	1.17
60*cd*	2588.579	38619.7	$a\ ^5G_5$—$z\ ^5F^\circ_4$	-----	------	------	----------	------	------
1	2586.425	38651.9	3022$_3$—*6887*$^\circ_4$	-----	------	------	----------	------	------
4	2583.146	38700.9	$a\ ^5P_3$—*6346*$^\circ_2$	-----	------	------	----------	------	------
7*cw*	2582.870	38705.1	$a\ ^3G_4$—*6494*$^\circ_3$	-----	------	------	----------	------	------
10*cWs*	2582.111	38716.4	$a\ ^5P_2$—*6205*$^\circ_2$	-----	------	------	----------	------	------
4*h*	2581.166	38730.6	2774$_3$—*6647*$^\circ_4$	-----	------	------	----------	------	------
15*hl*	2580.311†	38743.4	2762$_3$—*6637*$^\circ_4$	-----	------	------	----------	------	------
4*h*	2580.102	38746.6	3098$_4$—*6972*$^\circ_3$	-----	------	------	----------	------	------
20	2576.238	38804.7	2676$_2$—*6557*$^\circ_3$	2	------	0w	1.494	(1.09)	1.23
1*h*	2575.664	38813.3	3098$_4$—*6979*$^\circ_4$	-----	------	------	----------	------	------
30	2575.317	38818.5	$a\ ^5G_4$—$z\ ^7D^\circ_4$	-----	------	------	----------	------	------
5*h*	2572.117	38866.8	$a\ ^5G_4$—$z\ ^5D^\circ_3$	-----	------	------	----------	------	------
300*cw*	2571.810	38871.5	$a\ ^5D_3$—$z\ ^5P^\circ_3$	3	0.21	0.64w	1.56w	1.46	1.67
3*h*	2570.186	38896.1	$a\ ^5G_6$—$z\ ^5F^\circ_5$	-----	------	------	----------	------	------
2*h*	2569.828	38901.5	2972$_2$—*6862*$^\circ_3$	-----	------	------	----------	------	------
3*h*	2569.192	38911.1	2314$_1$—*6205*$^\circ_2$	-----	------	------	----------	------	------
300	2568.638	38919.5	$a\ ^5D_4$—$z\ ^5P^\circ_3$	1	.157	0	0.925	1.479	1.636
4*hl*	2566.92	38945.5	3022$_3$—*6917*$^\circ_3$	-----	------	------	----------	------	------
60	2566.366	38953.9	2809$_4$—*6704*$^\circ_5$	2	------	0w	1.550	(1.22)	1.29
10	2565.582	38965.9	$a\ ^3F_4$—$z\ ^5D^\circ_4$	7b	------	0	1.283	1.28	1.28
4	2561.920	39021.5	$a\ ^3F_4$—*6291*$^\circ_3$	-----	------	------	----------	------	------
5*h*	2559.478	39058.8	3022$_3$—*6928*$^\circ_4$ 3071$_3$—*6977*$^\circ_4$	7a, 1	------	0	1.220	(1.398)	1.35
15	2557.694	39086.0	$a\ ^3G_3$—*6440*$^\circ_4$	2	0.313	0	2.146	0.894	1.207
20	2557.414	39090.3	$a\ ^3G_3$—*6441*$^\circ_3$	2	------	0w	1.050	(0.90)	0.82
200	2554.630	39132.9	$a\ ^5G_4$—$z\ ^5F^\circ_4$	7b	------	0w	1.183	1.18	1.18
100*cw*	2553.588	39148.8	$a\ ^5S_2$—$z\ ^5D^\circ_1$	-----	------	------	----------	------	------
100*cw*	2550.091	39202.5	$a\ ^5G_4$—*5966*$^\circ_3$	2	------	0w	1.207	(1.18)	1.17

TABLE 1. *Classified lines of the second spectrum of rhenium* (Re II)—Continued

Intensity spark	Wavelength air	Wavenumber	Term combination	Zeeman type	Separation	Zeeman components		g	
						Strongest p	Strongest n	1st	2d
1	2	3	4	5	6	7	8	9	10
	A	*K*							
3*h*	2548. 386	39228. 7	2963_4—*6886*$^{\circ}_{3}$						
7	2548. 020	39234. 4	*a* $^3F_4$—*6312*$^{\circ}_{4}$	7b		0	1. 262	1. 26	1. 26
2	2546. 450	39258. 6	3287_2—*7213*$^{\circ}_{3}$						
15*h*	2545. 258	39277. 0	2907_2—*6835*$^{\circ}_{3}$						
4*h*	2541. 651	39332. 7	2676_2—*6610*$^{\circ}_{3}$						
6	2541. 514	39334. 8	*a* $^3G_4$—*6557*$^{\circ}_{3}$						
3	2536. 398	39414. 2	2972_2—*6914*$^{\circ}_{3}$						
80	2534. 099	39449. 9	*a* $^5D_2$—*z* $^5P^{\circ}_{3}$	2		0w	1. 900	(1. 53)	1. 65
5*h*	2532. 536	39474. 2	3225_4—*7173*$^{\circ}_{5}$						
7*cw*	2532. 33	39477. 5	2338_5—*z* $^5D^{\circ}_{4}$						
3	2526. 536	39568. 0	2774_3—*6731*$^{\circ}_{3}$						
10	2526. 32	39571. 4	2314_1—*6271*$^{\circ}_{1}$	3	0. 43	0. 42	1. 11, 1. 55	1. 11	1. 54
4	2525. 653	39581. 8	2774_3—*6732*$^{\circ}_{4}$						
10*h*	2521. 691	39644. 0	*a* $^5D_1$—*z* $^5D^{\circ}_{0}$ *a* $^5P_3$—*6440*$^{\circ}_{4}$						
2*h*	2520. 658	39660. 3	3287_2—*7253*$^{\circ}_{2}$						
10*hw*	2518. 720	39690. 8	3225_3—*7194*$^{\circ}_{2}$						
2*h*	2517. 99	39702. 2	*a* $^5P_2$—*6304*$^{\circ}_{3}$						
2*h*	2515. 190	39746. 5	2338_5—*6312*$^{\circ}_{4}$						
2	2512. 414	39790. 4	2907_2—*6886*$^{\circ}_{3}$						
10	2511. 250	39808. 8	3738_2—*7719*$^{\circ}_{3}$	7*		0	1. 156		
20*cw*	2510. 11	39826. 8	*a* $^5S_2$—*z* $^7D^{\circ}_{3}$						
2*h*	2509. 50	39836. 6	3097_3—*7081*$^{\circ}_{3}$						
5*c*	2507. 854	39862. 7	*a* $^3G_4$—*6610*$^{\circ}_{3}$						
10	2506. 999	39876. 3	3225_3—*7213*$^{\circ}_{2}$						
4	2505. 210	39904. 8	3731_3—*7722*$^{\circ}_{3}$						
30*c*	2504. 595	39914. 6	*a* $^5S_2$—*z* $^5D^{\circ}_{2}$						
200*cw*	2502. 348	39950. 4	*a* $^5G_5$—*z* $^5F^{\circ}_{5}$	3		0. 391w	1. 239w	1. 28	1. 20
2	2501. 05	39971. 2	3287_2—*7284*$^{\circ}_{3}$						
1	2498. 566	40010. 9	*a* $^3G_4$—*6624*$^{\circ}_{3}$						
3*h*	2495. 386	40061. 9	*a* $^5G_4$—*6052*$^{\circ}_{3}$						
7	2495. 141	40065. 8	2666_1—*6673*$^{\circ}_{2}$						
1	2494. 609	40074. 4	3606_5—*7613*$^{\circ}_{4}$ 3398_3—*7406*$^{\circ}_{4}$						
1	2494. 517	40075. 8	3101_2—*7108*$^{\circ}_{2}$						
3*h*	2494. 217	40080. 7	3398_3—*7407*$^{\circ}_{3}$						
2	2493. 597	40090. 62	2963_4—*6972*$^{\circ}_{3}$						
1	2493. 461	40092. 8	2907_2—*6917*$^{\circ}_{2}$						
10	2491. 234	40128. 7	*a* $^5D_3$—*z* $^7D^{\circ}_{3}$	1	0. 319	0	0. 838	1. 476	1. 795
1	2490. 91	40133. 9	*a* $^3G_4$—*6637*$^{\circ}_{4}$						
3*h*	2490. 40	40142. 1	*a* $^5G_3$—*z* $^7D^{\circ}_{4}$						
50	2490. 161	40145. 9	3098_4—*7112*$^{\circ}_{4}$						
4	2489. 482	40156. 9	2963_4—*6979*$^{\circ}_{4}$						
30*l*	2489. 04	40164. 0	2809_4—*6825*$^{\circ}_{5}$	1		0w	. 934	(1. 22)	1. 16
6*c*	2488. 104	40179. 1	*a* $^5P_3$—*6494*$^{\circ}_{3}$						
4*cwl*	2486. 46	40205. 7	*a* $^5S_2$—*z* $^5F^{\circ}_{3}$						
2	2484. 406	40238. 9	*a* $^3G_4$—*6647*$^{\circ}_{4}$						
8*cw*	2481. 98	40278. 2	3225_3—*7253*$^{\circ}_{2}$						
6	2480. 631	40300. 2	3493_2—*7523*$^{\circ}_{2}$						
4	2479. 541	40317. 9	2314_1—*6346*$^{\circ}_{2}$						
80	2478. 99	40326. 8	*a* $^5D_1$—*z* $^7D^{\circ}_{1}$	3	0. 777	0. 778	1. 498, 2. 274	1. 498	2. 274
10*cl*	2478. 545	40334. 1	3398_3—*7432*$^{\circ}_{2}$						
10*c*	2476. 332	40370. 1	*a* $^3F_2$—*6291*$^{\circ}_{3}$	7		0	1. 340		
5*h*	2475. 470	40384. 2	3101_2—*7139*$^{\circ}_{3}$ 3316_4—*7355*$^{\circ}_{3}$						
30	2475. 172	40389. 0	*a* $^3F_4$—*z* $^7D^{\circ}_{5}$	2		0w	1. 443	(1. 275)	1. 31
1	2472. 78	40428. 1	*a* $^3F_3$—*6205*$^{\circ}_{2}$						
20	2471. 049	40456. 4	*a* $^5G_3$—*z* $^5F^{\circ}_{4}$	7a, 2		0	1. 264	(1. 12)	1. 16

TABLE 1. *Classified lines of the second spectrum of rhenium* (Re II)—Continued

Intensity spark	Wavelength air	Wavenumber	Term combination	Zeeman type	Separation	Zeeman components		g	
						Strongest p	Strongest n	1st	2d
1	2	3	4	5	6	7	8	9	10
	A	*K*							
50	2470. 610	40463. 6	$a\ ^5G_4$—$z\ ^5F_5^\circ$	7b	------	0	1. 178	1. 18	1. 18
100*cwl*	2469. 356	40484. 1	$a\ ^5G_2$—$z\ ^5D_3^\circ$	2	. 50	0	2. 150	0. 650	1. 150
7	2468. 480	40498. 5	$a\ ^3F_2$—6304_3°	-----	------	------	----------	-------	------
20*cl*	2467. 85	40508. 8	2676_2—6727_1°	-----	------	------	----------	-------	------
100*c*	2467. 574	40513. 4	$a\ ^5D_3$—$z\ ^5F_2^\circ$	2	. 412	0	2. 320	1. 492	1. 080
20*c*	2466. 810	40525. 9	$a\ ^5G_3$—5966_3°	-----	------	------	----------	-------	------
20*c*	2465. 80	40542. 5	$a\ ^5G_2$—$z\ ^3P_2^\circ$	-----	------	------	----------	-------	------
2	2462. 658	40594. 2	3738_2—7797_3°	-----	------	------	----------	-------	------
1	2459. 89	40640. 0	3220_4—7284_3°	-----	------	------	----------	-------	------
8	2458. 833	40657. 4	3731_3—7797_3°	-----	------	------	----------	-------	------
100*c*	2455. 827	40707. 2	$a\ ^5D_2$—$z\ ^7D_2^\circ$	3	0. 298	0. 672	1. 526, 1. 824	1. 526	1. 824
2	2455. 63	40710. 5	2942_1—7013_1°	-----	------	------	----------	-------	------
10	2455. 097	40719. 3	3101_2—7173_2°	-----	------	------	----------	-------	------
7	2450. 320	40798. 6	$a\ ^5D_2$—$z\ ^7D_1^\circ$	1	. 741	0	0. 754	1. 528	2. 269
20*c*	2449. 523†	40811. 9	$a\ ^3G_4$—6704_5°	-----	------	------	----------	-------	------
100*c*	2449. 033	40820. 1	$a\ ^5G_2$—5966_3°	2	. 543	0	2. 260	0. 631	1. 174
20	2444. 54	40895. 1	3316_4—7406_4°	-----	------	------	----------	-------	------
7*h*	2444. 14	40901. 8	3316_4—7407_3°	-----	------	------	----------	-------	------
10	2443. 10	40919. 2	$a\ ^3F_2$—6346_2°	3	. 289	0. 579	1. 198, 1. 487	1. 198	1. 487
1	2442. 64	40926. 9	$a\ ^3G_3$—6624_3°	-----	------	------	----------	-------	------
1	2442. 08	40936. 3	3101_2—7194_2°	-----	------	------	----------	-------	------
8	2438. 20	41001. 4	2762_3—6862_2°	-----	------	------	----------	-------	------
10	2437. 43	41014. 4	3071_3—7173_2°	-----	------	------	----------	-------	------
10	2436. 74	41026. 0	2338_5—6440_4°	7a, 1	------	0	1. 095	(1. 19)	1. 21
15	2435. 31	41050. 1	$a\ ^3G_3$—6637_4°	1*	------	0w	1. 14	-------	------
20*cw*	2434. 62	41061. 7	$a\ ^3G_5$—6704_5°	-----	------	------	----------	-------	------
40	2433. 741	41076. 5	$a\ ^3G_4$—6731_3°	-----	------	------	----------	-------	------
5	2433. 365	41082. 9	2972_2—7081_3°	-----	------	------	----------	-------	------
10*c*	2432. 87	41091. 2	$a\ ^3G_4$—6732_4° ($a\ ^5D_2$—$z\ ^5F_2^\circ$)	-----	------	------	----------	-------	------
5	2431. 068	41121. 7	2774_3—6886_3° 3101_2—7213_2°	-----	------	------	----------	-------	------
2	2430. 750	41127. 1	3398_3—7511_3°	-----	------	------	----------	-------	------
40	2430. 515	41131. 1	2774_3—6887_4°	-----	------	------	----------	-------	------
4	2429. 097	41155. 1	$a\ ^3G_3$—6647_4°	-----	------	------	----------	-------	------
15	2427. 148	41188. 1	2809_4—6928_4°	3	------	0. 160	1. 231d	1. 21	1. 25
9	2422. 60	41265. 4	2314_1—6441_2°	1	0. 28	0	0. 530	1. 09	0. 81
60	2421. 41	41285. 6	$a\ ^3F_3$—6291_3°	7, 3	------	0c	1. 249	(1. 26)	1. 24
15	2418. 392	41337. 2	$a\ ^5P_3$—6610_3°	7, 3	------	0c	1. 405	(1. 41)	1. 40
30	2418. 201	41340. 5	$a\ ^3G_5$—6732_4°	2	------	0w	1. 505	(1. 22)	1. 15
2	2417. 815	41347. 1	3220_4—7355_3°	-----	------	------	----------	-------	------
6	2417. 026	41360. 6	2972_2—7108_1°	-----	------	------	----------	-------	------
40	2416. 265	41373. 6	$a\ ^5D_0$—$z\ ^7D_1^\circ$	7a	2. 272	0	2. 272	0/0	2. 272
7	2414. 198	41409. 0	$a\ ^3G_3$—6673_2°	1	0. 37	0	----------	(0. 90)	1. 27
3*c*	2412. 974	41430. 0	3493_2—7636_3°	-----	------	------	----------	-------	------
20*c*	2411. 947	41447. 7	3287_2—7432_2°	-----	------	------	----------	-------	------
7	2409. 777	41485. 0	$a\ ^5P_3$—6624_3°	-----	------	------	----------	-------	------
20	2408. 989	41498. 6	$a\ ^3F_3$—6312_4°	7a, 2	------	0	1. 300	(1. 26)	1. 27
5	2408. 23	41511. 7	3295_4—7446_3°	-----	------	------	----------	-------	------
2	2406. 11	41548. 3	$a\ ^5D_1$—$z\ ^5D_1^\circ$	-----	------	------	----------	-------	------
7	2403. 87	41586. 9	2676_2—6835_3°	-----	------	------	----------	-------	------
50*c*	2403. 036	41601. 4	$a\ ^5P_2$—6494_3°	1	0. 306	0	0. 750	1. 668	1. 362
10*cw*	2398. 58	41678. 7	$a\ ^3F_4$—6557_3°	-----	------	------	----------	-------	------
60	2398. 420	41681. 4	2809_4—6977_4°	7, 3	------	0w	1. 231d	(1. 22)	1. 24
1	2396. 22	41719. 7	3234_5—7406_4°	-----	------	------	----------	-------	------
3	2395. 96	41724. 2	3022_3—7194_2°	-----	------	------	----------	-------	------
	2395. 41	41733. 8	2907_2—7081_3°	-----	------	------	----------	-------	------

TABLE 1. *Classified lines of the second spectrum of rhenium* (Re II)—Continued

Intensity spark	Wavelength air	Wavenumber	Term combination	Zeeman type	Separation	Zeeman components		g	
						Strongest p	Strongest n	1st	2d
1	2	3	4	5	6	7	8	9	10
	A	*K*							
30	2389. 62	41834. 9	$a\ ^3F_3$—6346^0_2	1	. 231	0	0. 809	1. 271	1. 502
5*c*	2388. 319	41857. 7	3220_4—7406^0_4						
2	2387. 92	41864. 7	2314_1—6501^0_1						
100*cw*	2386. 895	41882. 7	$a\ ^5G_5$—$z\ ^5D^0_4$	2		0w	1. 303	(1. 26)	1. 25
15*c*	2385. 362	41909. 6	3022_3—7213^0_2						
10	2382. 07	41967. 4	$a\ ^5P_3$—6673^0_2						
2	2380. 63	41992. 9	$a\ ^3G_3$—6731^0_3						
5*c*	2379. 992	42004. 1	2972_2—7173^0_2						
3	2379. 587	42011. 3	2907_2—7108^0_2						
20	2379. 101	42019. 8	$a\ ^5D_2$—$z\ ^5D^0_1$	2	0. 234	0	1. 766	1. 532	1. 298
4	2378. 98	42021. 8	$a\ ^3G_4$—6825^0_5						
20	2378. 526	42030. 0	2774_3—6977^0_4	7a, 2		0w	1. 301h	(1. 23)	1. 25
3	2374. 57	42100. 0	2676_2—6886^0_3						
50	2373. 476	42119. 4	$a\ ^5D_3$—$z\ ^7D^0_3$	3	. 351	1. 053	1. 126, 1. 485	1. 481	1. 130
4	2371. 842	42148. 4	2762_3—6977^0_4						
1	2371. 69	42151. 2	$a\ ^5G_5$—6312^0_4						
100	2370. 762	42167. 7	$a\ ^5D_4$—$z\ ^7D^0_3$	2	. 343	0	2. 508	1. 479	1. 136
50*c*	2368. 527	42208. 1	$a\ ^5D_3$—$z\ ^5D^0_2$	1*		0w	1. 008		
1	2367. 75	42221. 4	2972_2—7194^0_2						
4*c*	2367. 16	42231. 9	$a\ ^5P_2$—6557^0_3						
40	2366. 078	42251. 1	$a\ ^5G_6$—$z\ ^7D^0_5$	1		0w	0. 899	(1. 24)	1. 31
1	2364. 91	42272. 0	$a\ ^3G_5$—6825^0_5						
5	2364. 125	42286. 0	3493_2—7722^0_3						
10	2362. 54	42314. 4	$a\ ^5D_1$—$z\ ^5D^0_2$						
10*c*	2361. 47	42333. 6	$a\ ^5P_2$—6567^0_2						
5	2359. 157	42375. 1	2676_2—6914^0_3 3225_3—7463^0_3						
3	2358. 022	42395. 4	$a\ ^5G_4$—$z\ ^5D^0_4$						
10*cw*	2357. 91	42397. 5	$a\ ^3F_2$—6494^0_3						
3	2357. 66	42402. 0	2676_2—6917^0_2						
40*c*	2355. 423	42442. 2	$a\ ^5S_2$—5966^0_3	1	0. 528	0	0. 110c	1. 694	1. 166
2	2351. 925	42505. 3	2666_1—6917^0_2						
3	2350. 653	42528. 3	2314_1—6567^0_2						
3	2349. 94	42541. 2	3101_2—7355^0_3						
10*cl*	2349. 61	42547. 2	$a\ ^5D_4$—$z\ ^5F^0_3$						
20	2346. 987	42594. 8	$a\ ^5D_0$—$z\ ^5D^0_1$						
10*c*	2345. 51	42621. 6	3022_3—7284^0_3						
1	2344. 544	42639. 1	$a\ ^3G_4$—6887^0_4						
10	2341. 31	42698. 0	$a\ ^5D_2$—$z\ ^7D^0_3$						
20	2340. 344	42715. 7	2809_4—7081^0_3						
50	2336. 923	42778. 2	$a\ ^3F_3$—6440^0_4	7a, 1		0w	1. 101w	(1. 26)	1. 22
15	2336. 47	42786. 4	$a\ ^5D_2$—$z\ ^5D^0_2$						
1	2333. 75	42836. 3	3071_3—7355^0_3						
2	2332. 51	42859. 0	3225_3—7511^0_3						
10	2331. 81	42871. 9	2907_2—7194^0_2						
10	2330. 878	42889. 1	$a\ ^3G_5$—6887^0_4						
8*cw*	2329. 89	42907. 2	$a\ ^5P_2$—6624^0_3						
2*c*	2325. 424	42989. 7	2338_5—6637^0_4						
10*c*	2324. 45	43007. 8	$a\ ^5P_1$—6673^0_2						
60	2323. 409	43027. 0	$a\ ^3F_2$—6557^0_3	2		0w	1. 427	(1. 20)	1. 28
10	2321. 75	43057. 8	3101_2—7407^0_3						
20	2317. 889	43129. 4	$a\ ^3F_3$—6567^0_2						
10*c*	2316. 49	43155. 5	2338_5—6653^0_5 $a\ ^3F_4$—6704^0_5						
2	2315. 186	43179. 8	3295_4—7613^0_4						
2	2314. 209	43198. 0	3316_4—7636^0_3						
3*c*	2310. 703	43263. 6	$a\ ^5S_2$—6048^0_1						

TABLE 1. *Classified lines of the second spectrum of rhenium* (Re II)—Continued

Intensity spark	Wavelength air	Wavenumber	Term combination	Zeeman type	Separation	Zeeman components		g	
						Strongest p	Strongest n	1st	2d
1	2	3	4	5	6	7	8	9	10
	A	*K*							
3	2308. 972	43296. 0	$a\ ^3G_5$—6928^0_4	-----	------	------	----------	------	------
15	2308. 658	43301. 89	$a\ ^5S_2$—6052^0_3	-----	------	------	----------	------	------
20*c*	2308. 45	43305. 8	$a\ ^5G_5$—$z\ ^7D^0_5$	-----	------	------	----------	------	------
10	2308. 060	43313. 1	$a\ ^3F_3$—6494^0_3	-----	------	------	----------	------	------
5	2307. 215	43329. 0	3022_3—7355^0_3	-----	------	------	----------	------	------
4	2306. 268	43346. 8	3071_3—7406^0_4	-----	------	------	----------	------	------
2	2305. 934	43353. 0	3071_3—7407^0_3	-----	------	------	----------	------	------
8	2305. 021	43370. 2	2676_2—7013^0_1	-----	------	------	----------	------	------
30*cw*	2303. 993	43389. 5	$a\ ^5P_2$—6673^0_2	-----	------	------	----------	------	------
6	2302. 345	43420. 6	$a\ ^3F_4$—6731^0_3	-----	------	------	----------	------	------
40*c*	2301. 815	43430. 6	$a\ ^5G_5$—6440^0_4	7a, 2	------	0h	1. 357	(1. 26)	1. 23
7	2301. 612	43434. 4	$a\ ^3F_4$—6732^0_4	-----	------	------	----------	------	------
10	2298. 586	43491. 6	a^3G_4—6972^0_3 3287_2—7636^0_3	-----	------	------	----------	------	------
100*cw*	2298. 094	43500. 9	2762_3—7112^0_4	7a, 2	------	0w	1. 314	1. 15	(1. 19)
1	2296. 09	43538. 8	$a\ ^3G_4$—6977^0_4	-----	------	------	----------	------	------
3	2295. 217	43555. 4	$a\ ^3G_3$—6887^0_3 $a\ ^3F_2$—6610^0_3	-----	------	------	----------	------	------
15	2295. 060	43558. 4	$a\ ^3G_4$—6979^0_4	-----	------	------	----------	------	------
10	2293. 678	43584. 7	2314_1—6673^0_2	-----	------	------	----------	------	------
10	2290. 196	43650. 9	2774_3—7139^0_2	-----	------	------	----------	------	------
60	2286. 608	43719. 4	$a\ ^5G_3$—$z\ ^5D^0_4$	7a, 2	------	0w	1. 626	(1. 12)	1. 25
1	2283. 69	43775. 2	$a\ ^5G_3$—6291^0_3	-----	------	------	----------	------	------
20	2282. 980	43788. 9	$a\ ^3G_5$—6977^0_4	-----	------	------	----------	------	------
10	2281. 406	43819. 1	$a\ ^5G_4$—$z\ ^7D^0_5$	-----	------	------	----------	------	------
1	2281. 07	43825. 4	2972_2—7355^0_3	-----	------	------	----------	------	------
2	2280. 00	43846. 1	3022_3—7407^0_3	-----	------	------	----------	------	------
1	2279. 87	43848. 5	$a\ ^3G_3$—6917^0_2	-----	------	------	----------	------	------
2	2278. 948	43866. 3	$a\ ^5P_3$—6862^0_2	-----	------	------	----------	------	------
1	2278. 635	43872. 4	$a\ ^5G_2$—6271^0_1	-----	------	------	----------	------	------
10	2277. 012	43903. 6	$a\ ^5G_3$—6304^0_3	-----	------	------	----------	------	------
1	2276. 41	43915. 3	3071_3—7463^0_3	-----	------	------	----------	------	------
500*c*	2275. 25	43937. 7	$a\ ^7S_3$—$z\ ^7P^0_2$	2*	------	0w	2. 00	------	------
10	2273. 98	43962. 2	$a\ ^3G_3$—6928^0_4	-----	------	------	----------	------	------
50	2272. 644	43988. 0	$a\ ^5G_3$—6312^0_4	-----	------	------	----------	------	------
5	2270. 928	44021. 2	3316_4—7719^0_3	-----	------	------	----------	------	------
10	2269. 793	44043. 3	2676_2—7081^0_3	-----	------	------	----------	------	------
2	2269. 228	44054. 2	3316_4—7722^0_3	-----	------	------	----------	------	------
40*c*	2268. 46	44069. 2	$a\ ^5G_2$—6291^0_3	-----	------	------	----------	------	------
2	2266. 387	44109 4	3225_3—7636^0_3	-----	------	------	----------	------	------
10	2266. 18	44113. 5	$a\ ^5P_3$—6887^0_4	-----	------	------	----------	------	------
3*h*	2265. 10	44134. 5	3098_4—7511^0_3	-----	------	------	----------	------	------
9*c*	2263. 748	44160. 8	3220_4—7636^0_3	-----	------	------	----------	------	------
50*c*	2261. 846	44198. 0	$a\ ^5G_2$—6304^0_3	-----	------	------	----------	------	------
30	2260. 500	44224. 3	3101_2—7523^0_2	-----	------	------	----------	------	------
8	2258. 55	44262. 5	3097_3—7523^0_2	-----	------	------	----------	------	------
15	2254. 196	44348. 0	3287_2—7722^0_3	-----	------	------	----------	------	------
8	2253. 28	44366. 0	$a\ ^3F_4$—6825^0_5	-----	------	------	----------	------	------
2	2252. 61	44379. 2	$a\ ^5P_3$—6914^0_3	-----	------	------	----------	------	------
10	2252. 154	44388. 1	2774_3—7213^0_2	-----	------	------	----------	------	------
40	2251. 593	44399. 2	$a\ ^5D_3$—$z\ ^5D^0_3$ $a\ ^5D_4$—$z\ ^7D^0_4$	-----	------	------	----------	------	------
15	2251. 148	44408. 0	$a\ ^3G_3$—6972^0_3 3022_3—7463^0_3	-----	------	------	----------	------	------

TABLE 1. *Classified lines of the second spectrum of rhenium* (Re II)—Continued

Intensity spark	Wavelength air	Wavenumber	Term combination	Zeeman type	Separation	Zeeman components		g	
						Strongest p	Strongest n	1st	2d
1	2	3	4	5	6	7	8	9	10
	A	*K*							
15	2250. 273	44425. 3	2963_4—7406°_4	-----	------	------	----------	-------	------
50	2248. 63	44457. 7	$a\ ^5D_3$—$z\ ^3P^\circ_2$	-----	------	------	----------	-------	------
10	2247. 948	44471. 2	$a\ ^3F_3$—6610°_3	-----	------	------	----------	-------	------
9	2247. 544	44479. 2	$a\ ^5G_4$—6494°_3	-----	------	------	----------	-------	------
10	2247. 326	44483. 5	$a\ ^5G_6$—6651°_5	-----	------	------	----------	-------	------
9*c*	2245. 43	44521. 0	$a\ ^5P_3$—6928°_4	-----	------	------	----------	-------	------
4	2244. 500	44539. 5	$a\ ^5P_3$—6930°_3	-----	------	------	----------	-------	------
5	2240. 00	44628. 9	2676_2—7139°_2	-----	------	------	----------	-------	------
10	2238. 169	44665. 5	$a\ ^5D_3$—$z\ ^5F^\circ_4$	-----	------	------	----------	-------	------
100*c*	2235. 803	44712. 7	$a\ ^5D_4$—$z\ ^5F^\circ_4$	-----	------	------	----------	-------	------
10	2234. 865	44731. 5	$a\ ^3F_2$—6727°_1	-----	------	------	----------	-------	------
3	2232. 964	44769. 6	$a\ ^3F_2$—6731°_3	-----	------	------	----------	-------	------
50	2232. 292	44783. 0	$a\ ^5D_4$—5966°_3	-----	------	------	----------	-------	------
8*c*	2231. 127	44806. 5	3316_4—7797°_3	-----	------	------	----------	-------	------
20	2229. 104	44847. 1	$a\ ^3F_3$—6647°_4	-----	------	------	----------	-------	------
20	2226. 048	44908. 7	2762_3—7253°_2	-----	------	------	----------	-------	------
7	2224. 851	44932. 8	3225_3—7719°_3	-----	------	------	----------	-------	------
5	2223. 20	44966. 3	$a\ ^5P_3$—6972°_3	-----	------	------	----------	-------	------
7*c*	2221. 845	44993. 6	2907_2—7407°_3	-----	------	------	----------	-------	------
5	2220. 920	45012. 3	3022_3—7523°_2	-----	------	------	----------	-------	------
2	2220. 69	45017. 0	3220_4—7722°_3	-----	------	------	----------	-------	------
1	2219. 75	45036. 2	$a\ ^5D_2$—$z\ ^3P^\circ_2$	-----	------	------	----------	-------	------
5*c*	2216. 52	45101. 7	$a\ ^3F_3$—6673°_2	-----	------	------	----------	-------	------
50	2216. 161	45109. 0	$a\ ^5G_4$—6557°_3	-----	------	------	----------	-------	------
1000*cw*	2214. 261	45147. 7	$a\ ^7S_3$—$z\ ^7P^\circ_3$	3	------	0. 545	1. 884w	1. 975	1. 793
7	2209. 320	45248. 6	$a\ ^3F_4$—6914°_3	-----	------	------	----------	-------	------
2	2208. 188	45271. 9	$a\ ^5G_3$—6441°_2	-----	------	------	----------	-------	------
3	2207. 376	45288. 5	$a\ ^5P_2$—6862°_2	-----	------	------	----------	-------	------
40	2206. 154	45313. 6	$a\ ^5D_2$—5966°_3	-----	------	------	----------	-------	------
20	2203. 579	45366. 5	2676_2—7213°_2	-----	------	------	----------	-------	------
2	2202. 695	45384. 7	3098_4—7636°_3	-----	------	------	----------	-------	------
10	2202. 19	45395. 1	$a\ ^5G_5$—6637°_4	-----	------	------	----------	-------	------
3	2199. 113	45458. 6	2809_4—7355°_3	-----	------	------	----------	-------	------
15	2197. 928	45483. 2	2314_1—6862°_2	-----	------	------	----------	-------	------
4	2197. 610	45489. 8	$a\ ^3G_3$—7081°_3	-----	------	------	----------	-------	------
10	2197. 373	45494. 6	$a\ ^5S_2$—6271°_1	-----	------	------	----------	-------	------
30*c*	2197. 130	45499. 7	$a\ ^5G_5$—6647°_4	-----	------	------	----------	-------	------
40	2195. 284	45537. 9	$a\ ^5G_5$—6651°_5	-----	------	------	----------	-------	------
10	2194. 433	45555. 6	2907_2—7463°_3	-----	------	------	----------	-------	------
15*c*	2193. 933	45566. 0	$a\ ^5G_2$—6441°_2	-----	------	------	----------	-------	------
20*c*	2192. 567	45594. 4	$a\ ^5D_3$—6052°_3	-----	------	------	----------	-------	------
50	2190. 260	45642. 41	$a\ ^5D_4$—6052°_3	-----	------	------	----------	-------	------
10	2188. 221	45684. 9	$a\ ^3F_3$—6731°_3	-----	------	------	----------	-------	------
4	2187. 556	45698. 8	$a\ ^3F_3$—6732°_4	-----	------	------	----------	-------	------
1	2184. 19	45769. 1	2676_2—7253°_2 3220_4—7797°_3	-----	------	------	----------	-------	------
15*c*	2183. 443	45784. 8	$a\ ^5G_4$—6624°_3	-----	------	------	----------	-------	------
2	2182. 374	45807. 3	$a\ ^3G_3$—7112°_4	-----	------	------	----------	-------	------
100*cw*	2181. 77	45819. 9	$a\ ^5S_2$—6304°_3	-----	------	------	----------	-------	------
4	2181. 430	45827. 1	$a\ ^5G_3$—6496°_3	-----	------	------	----------	-------	------
10	2180. 804	45840. 3	2879_3—7463°_3	-----	------	------	----------	-------	------
20	2178. 778	45882. 9	$a\ ^3F_4$—6977°_4	-----	------	------	----------	-------	------
100	2177. 851	45902. 4	2338_5—6928°_4	-----	------	------	----------	-------	------
20	2177. 579	45908. 1	$a\ ^5G_4$—6637°_3	-----	------	------	----------	-------	------
4	2177. 382	45912. 3	3022_3—7613°_4	-----	------	------	----------	-------	------
4	2174. 692	45969. 1	2809_4—7406°_4	-----	------	------	----------	-------	------

TABLE 1. *Classified lines of the second spectrum of rhenium* (Re II)—Continued

Intensity spark	Wavelength air	Wavenumber	Term combination	Intensity spark	Wavelength air	Wavenumber	Term combination
1	2	3	4	1	2	3	4
	A	*K*			*A*	*K*	
30	2172. 618	46013. 0	$a\ ^5G_4$—6647°_4	80	2085. 76	47928. 8	$a\ ^5D_3$—$z\ ^5D^\circ_4$
2	2172. 094	46024. 1	2314_1—6917°_2	40*c*	2085. 14	47943. 1	2314_1—7108°_1
4	2171. 145	46044. 2	$a\ ^5D_4$—$z\ ^5F^\circ_5$	80	2083. 67	47976. 8	$a\ ^5D_4$—$z\ ^5D^\circ_4$
10	2170. 970	46047. 9	$a\ ^5P_3$—7081°_3	20	2083. 342	47984. 5	$a\ ^5D_3$—6291°_3
50	2170. 806	46051. 4	$a\ ^5G_4$—6651°_5	100*c*	2082. 234	48010. 0	$a\ ^5P_1$—7173°_2
2	2169. 77	46073. 4	$a\ ^5G_4$—6653°_5	40	2081. 26	48032. 4	$a\ ^5D_4$—6291°_3
5	2169. 240	46084. 6	$a\ ^3F_2$—6862°_3	8	2079. 33	48077. 1	$a\ ^3G_5$—7406°_4
40	2166. 880	46134. 8	$a\ ^5D_2$—6048°_1	8	2079. 05	48083. 6	$a\ ^5P_3$—7284°_3
2	2166. 52	46142. 5	3022_3—7636°_3	7	2078. 33	48100. 1	$a\ ^3F_3$—6972°_3
7	2163. 07	46216. 08	3097_3—7719°_3	20	2077. 78	48113. 1	$a\ ^5D_3$—6304°_3
10	2161. 914	46240. 7	$a\ ^5S_2$—6346°_2; 3098_4—7722°_3	20*c*	2076. 30	48147. 3	$a\ ^3F_3$—6977°_4
				50*c*	2075. 70	48161. 2	$a\ ^5D_4$—6304°_3
20	2158. 292	46318. 4	2774_3—7406°_4	20	2075. 11	48174. 8	$a\ ^5G_3$—6731°_3?
4*cs*	2158. 05	46323. 5	$a\ ^3F_2$—6886°_3	15*c*	2072. 88	48226. 7	$a\ ^5P_1$—7194°_2
2	2156. 103	46365. 4	$a\ ^5P_3$—7112°_4	30	2072. 62	48232. 8	$a\ ^3G_3$—7355°_3
3*c*	2153. 79	46415. 1	$a\ ^5P_1$—7013°_1; 2338_5—6979°_4	20	2072. 09	48245. 1	$a\ ^5D_4$—6312°_4
				10	2071. 175	48266. 4	$a\ ^3F_2$—7081°_3
2	2152. 98	46432. 6	$a\ ^5G_3$—6557°_3	60*c*	2069. 42	48307. 2	$a\ ^5G_5$—6928°_4
5	2152. 79	46436. 7	2762_3—7406°_4	40*c*	2067. 64	48348. 9	$a\ ^5S_2$—6557°_3
4	2149. 59†	46505. 8	3071_3—7722°_3	30*c*	2066. 91	48366. 0	$a\ ^5D_2$—6271°_1
20	2148. 261	46534. 6	$a\ ^5G_3$—6567°_2				
3	2148. 13	46537. 5	2809_4—7463°_3	15	2065. 83	48391. 2	2774_3—7613°_4; $a\ ^5P_2$—7173°_2
30	2145. 90	46585. 8	$a\ ^5G_4$—6704°_5	3	2065. 64	48395. 7	$a\ ^3G_4$—7463°_3
30	2144. 085	46625. 2	$a\ ^3F_2$—6917°_2	30	2064. 87	48413. 7	$a\ ^5G_4$—6887°_4
8*h*	2143. 96	46627. 9	$a\ ^3G_3$—7194°_2	20	2064. 16	48430. 4	$a\ ^5G_2$—6727°_1
4	2140. 190	46710. 1	$a\ ^5D_0$—6048°_1	80	2059. 75	48534. 0	$a\ ^5D_3$—6346°_2
3	2139. 45	46726. 1	$a\ ^5G_2$—6557°_3				
				5	2059. 33	48544. 0	$a\ ^3F_2$—7108°_2
4	2136. 701	46786. 3	2676_2—7355°_3	15	2058. 520	48563. 0	$a\ ^5D_2$—6291°_3
5	2136. 22	46796. 8	$a\ ^5P_2$—7013°_1	5	2058. 10	48572. 9	2666_1—7523°_2
10*c*	2134. 773	46828. 6	$a\ ^5G_2$—6567°_3	15*c*	2056. 59	48608. 6	$a\ ^5P_2$—7194°_2
20	2133. 776	46850. 4	$a\ ^5G_4$—6731°_3	20	2055. 25	48640. 3	$a\ ^5D_1$—6346°_2
9	2133. 122	46864. 8	$a\ ^5G_4$—6732°_4				
				50	2053. 597	48679. 4	$a\ ^5G_4$—6914°_3
6	2128. 773	46960. 05	$a\ ^5G_3$—6610°_3	10	2053. 10	48691. 2	$a\ ^5D_2$—6304°_3
4	2128. 53	46965. 9	3022_3—7719°_3	15	2050. 64	48749. 6	$a\ ^3G_3$—7407°_3
8	2128. 392	46969. 0	$a\ ^5P_3$—7173°_2	3	2048. 380	48803. 3	2314_1—7194°_2
2	2127. 28	46993. 5	3098_4—7797°_3	6	2047. 955	48813. 5	$a\ ^5P_1$—7253°_2
3	2126. 96	47000. 6	$a\ ^3F_3$—6862°_4				
				7	2047. 67	48820. 3	$a\ ^5G_4$—6928°_4
4	2126. 73	47005. 7	2762_3—7463°_3	6*h*	2046. 318	48852. 5	$a\ ^3F_2$—7139°_2
20	2122. 081	47108. 6	$a\ ^5G_3$—6624°_3	40	2042. 64	48940. 4	$a\ ^5D_0$—6271°_1
10	2121. 27	47126. 7	$a\ ^5D_3$—6205°_2	2	2040. 64	48988. 4	2314_1—7213°_2
1	2119. 67	47162. 2	2762_3—7463°_3	15	2036. 20	49095. 3	2809_4—7719°_3
15	2118. 671	47184. 4	$a\ ^3F_2$—6972°_3				
				10	2035. 51	49111. 8	$a\ ^5D_2$—6346°_2
5	2118. 54	47187. 4	$a\ ^5S_2$—6441°_2	2	2034. 824	49128. 5	2809_4—7722°_3
7	2116. 23	47238. 9	$a\ ^3F_3$—6886°_3	20	2034. 020	49147. 9	$a\ ^3G_3$—7446°_3
20*c*	2115. 51	47255. 0	$a\ ^5G_2$—6610°_3	20	2032. 59	49182. 5	2879_3—7797°_3
100	2114. 25	47283. 1	$a\ ^5G_5$—6825°_5	30	2032. 02	49196. 1	$a\ ^5P_2$—7253°_2
60	2111. 854	47336. 7	$a\ ^5G_3$—6647°_4				
				9	2027. 69	49301. 3	$a\ ^5P_3$—7406°_4
4	2102. 28	47552. 3	2963_4—7719°_3	3	2027. 45	49307. 2	$a\ ^5P_3$—7407°_3
8	2100. 85	47584. 7	2963_4—7722°_3	10	2027. 29	49311. 1	$a\ ^3G_3$—7463°_3
7	2100. 58	47590. 7	$a\ ^5G_3$—6673°_2	10	2026. 40	49332. 5	$a\ ^5G_4$—6979°_4
10	2097. 77	47654. 5	$a\ ^3F_3$—6928°_4	4	2024. 05	49389. 8	2314_1—7253°_2
15	2093. 792	47747. 3	2338_5—7112°_4				
				200	2023. 644	49399. 8	$a\ ^5D_4$—$z\ ^7D^\circ_5$
7	2091. 920	47787. 7	$a\ ^5S_2$—6501°_1	10*c*	2020. 475	49477. 3	$a\ ^5D_3$—6440°_4; 2774_3—7722°_3
30	2091. 535	47796. 5	$a\ ^5G_4$—6825°_5				
60*c*	2090. 20	47827. 1	$a\ ^3G_4$—7406°_4	4*c*	2020. 34	49480. 7	$a\ ^5D_3$—6441°_2
30*c*	2087. 67	47884. 9	$a\ ^5G_2$—6673°_2	10	2019. 97	49489. 7	$a\ ^5G_3$—6862°_2
10	2087. 30	47893. 4	$a\ ^5D_1$—6271°_1	30*c*	2019. 28	49506. 7	$a\ ^5S_2$—6673°_2

TABLE 1. *Classified lines of the second spectrum of rhenium* (Re II)—Continued

Intensity spark	Wavelength air	Wave-number	Term combination	Intensity spark	Wavelength vac	Wave-number	Term combination
1	2	3	4	1	2	3	4
	A	*B*			*A*	*B*	
40	2018.54	49524.8	$a\ ^5D_4$—*6440.4*	3*a*	1927.912	51869.6	$a\ ^3G_3$—*7719.3*
6	2017.08	49560.6	$a\ ^5P_3$—*7432.2*	5*a*	1926.93	51896.0	$a\ ^5D_2$—*6624.3*; $a\ ^5P_2$—*7523.2*
9	2015.91	49589.4	$a\ ^3F_2$—*7213.2*				
4	2013.02	49660.6	2389_4—*7355.3*	5*a*	1926.569	51905.7	$a\ ^5D_1$—*6673.2*
10	2011.82	49706.2	$a\ ^5P_3$—*7446.3*	5*a*	1926.096	51918.5	$a\ ^5S_2$—*6914.3*
				15*a*	1925.05	51946.7	$a\ ^5S_2$—*6917.2*
100	2009.92	49737.1	$a\ ^5G_3$—*6887.4*				
2	2008.67	49768.1	$a\ ^3F_3$—*7139.2*	5*a*	1913.60	52257.5	$a\ ^5G_3$—*7139.2*
6	2004.14	49880.6	2809_4—*7797.3*	12*a*	1908.98	52384.0	$a\ ^5D_3$—*6731.3*; $a\ ^5G_4$—*7284.3*
				10*a*	1908.48	52397.7	$a\ ^5D_3$—*6732.4*
	vac			6*a*	1907.385	52427.8	$a\ ^5P_3$—*7719.3*
				5*a*	1907.10	52435.6	$a\ ^3F_3$—*7406.4*
25	1999.50	50012.5	$a\ ^5D_3$—*6494.3*				
3*a*	1998.77	50030.8	$a\ ^5G_2$—*6887.4*; $a\ ^5G_3$—*6917.2*	10*a*	1906.73	52445.8	$a\ ^5D_4$—*6732.4*
				15	1906.49	52452.4	$a\ ^5D_1$—*6727.1*
				3*a*	1906.19	52460.7	$a\ ^5P_3$—*7722.3*
30	1997.60	50060.1	$a\ ^5D_4$—*6494.3*	5*a*	1905.689	52474.5	$a\ ^3F_4$—*7636.3*?
1*a*	1996.663	50083.5	$a\ ^5D_4$—*6496.3*	12*ha*	1904.55	52505.8	$a\ ^5S_2$—*6972.3*
10*a*	1995.87	50103.5	$a\ ^3F_3$—*7173.2*				
3*a*	1994.785	50130.7	$a\ ^3G_4$—*7636.3*	2*a*	1902.916	52550.9	$a\ ^5G_2$—*7139.2*
25	1994.24	50144.4	$a\ ^5G_3$—*6928.4*	5*a*	1901.40	52592.8	$a\ ^5G_3$—*7173.2*
				10*a*	1899.14	52655.4	$a\ ^3G_3$—*7797.3*
3*a*	1993.480	50163.5	$a\ ^5G_3$—*6930.3*	100	1898.36	52677.0	$a\ ^7S_3$—$z\ ^5P_2^3$
6*a*	1993.189	50170.9	$a\ ^3F_4$—*7406.4*	3*a*	1897.825	52691.9	$a\ ^3F_2$—*7523.2*
12*cwa*	1992.53	50187.5	$a\ ^5D_1$—*6501.1*				
15*a*	1988.19	50297.0	$a\ ^5G_2$—*6914.3*	20	1893.60	52809.5	$a\ ^5G_3$—*7194.2*
2*a*	1987.984	50302.2	$a\ ^3F_2$—*7284.3*	20	1889.85	52914.3	$a\ ^5S_2$—*7013.1*
				10*a*	1888.17	52961.3	$a\ ^5D_2$—*6731.3*
10*da*	1985.95	50353.7	$a\ ^5P_3$—*7511.3*	1*a*	1886.650	53004.0	$a\ ^3F_3$—*7463.3*
10*a*	1981.89	50456.9	$a\ ^5G_2$—*6930.3*	10*a*	1885.843	53026.7	$a\ ^5P_2$—*7636.3*
5*a*	1981.217	50474.0	$a\ ^5P_3$—*7523.2*				
15	1976.67	50590.1	$a\ ^5D_2$—*6494.3*	3*a*	1883.546	53091.3	$a\ ^5G_4$—*7355.3*
5*a*	1974.86	50636.5	$a\ ^5G_3$—*6977.4*	10*a*	1883.12	53103.4	$a\ ^5G_2$—*7194.2*
				20	1879.26	53212.4	$a\ ^5P_3$—*7797.3*
25	1974.65	50641.9	$a\ ^5D_3$—*6557.3*	10*a*	1876.58	53288.4	$a\ ^5G_2$—*7213.2*
5*a*	1973.986	50658.9	$a\ ^5D_2$—*6501.1*	1*a*	1875.118	53330.0	$a\ ^3F_4$—*7722.3*
150	1973.13	50680.9	$a\ ^7S_3$—$z\ ^7P_4^3$	100*ha*	1871.812	53424.2	$a\ ^5D_3$—*6835.3*
3*a*	1972.776	50690.0	$a\ ^5D_4$—*6557.3*	1*a*	1869.172	53499.6	$a\ ^5D_0$—*6727.1*
5*a*	1970.84	50739.8	$a\ ^3F_4$—*7463.3*	1*a*	1865.657	53600.4	$a\ ^5G_4$—*7406.4*
				1*a*	1862.219	53699.4	$a\ ^5D_3$—*6862.4*
10*a*	1970.68	50743.9	$a\ ^5D_3$—*6567.2*	10*a*	1861.94	53707.4	$a\ ^5G_3$—*7284.3*
10*a*	1966.55	50850.5	$a\ ^5D_1$—*6567.2*				
3*a*	1962.58	50953.3	$a\ ^3G_4$—*7719.3*	200	1858.65	53802.5	$a\ ^7S_3$—$z\ ^5P_3^3$
25	1954.29	51169.5	$a\ ^5D_3$—*6610.3*	5*a*	1856.49	53865.1	$a\ ^5S_2$—*7108.1*
1*a*	1952.830	51207.7	2676_2—*7797.3*	25	1854.00	53937.4	$a\ ^5D_3$—*6886.3*
				40	1853.70	53946.2	$a\ ^5D_3$—*6887.4*
12*a*	1952.45	51217.7	$a\ ^5D_4$—*6610.3*; $a\ ^3F_3$—*7284.3*	40	1852.35	53985.5	$a\ ^5D_4$—*6886.3*
				5*a*	1851.81	54001.2	$a\ ^5G_2$—*7284.3*
20	1951.84	51233.7	$a\ ^5D_0$—*6501.1*	20	1849.04	54082.1	$a\ ^3F_4$—*7797.3*
3*a*	1948.65	51317.6	$a\ ^5D_3$—*6624.3*	6*a*	1846.060	54169.4	$a\ ^5G_4$—*7463.3*
25	1948.48	51322.1	$a\ ^5D_2$—*6567.2*	4*a*	1845.916	54173.6	$a\ ^5S_2$—*7139.2*
12*a*	1944.02	51439.8	$a\ ^5D_3$—*6637.4*	15*a*	1844.61	54212.0	$a\ ^5D_3$—*6914.3*
15*a*	1942.19	51488.3	$a\ ^5D_4$—*6637.4*	12*a*	1842.98	54259.9	$a\ ^5D_4$—*6914.3*
5*a*	1940.769	51526.0	$a\ ^3F_2$—*7407.3*	12*a*	1840.05	54346.3	$a\ ^5D_1$—*6917.2*
25	1940.04	51545.3	$a\ ^5D_3$—*6647.4*	18	1839.81	54353.4	$a\ ^5D_3$—*6928.4*
30*a*	1938.224	51593.6	$a\ ^5D_4$—*6647.4*	8*a*	1838.198	54401.1	$a\ ^5D_4$—*6928.4*
1*a*	1937.857	51603.4	$a\ ^5P_3$—*7636.3*	3*a*	1837.73	54415.0	$a\ ^5G_3$—*7355.3*
20	1936.79	51631.8	$a\ ^5D_4$—*6651.5*	10*a*	1837.56	54420.0	$a\ ^5D_4$—*6930.3*
10*a*	1935.94	51654.5	$a\ ^5D_4$—*6653.5*	100*a*	1834.319	54516.1	$a\ ^5D_2$—*6886.3*
20*h*	1935.32	51671.0	$a\ ^5G_3$—*7081.3*	5*a*	1830.32	54635.3	$a\ ^5P_2$—*7797.3*
25	1932.43	51748.3	$a\ ^5D_2$—*6610.3*	5*a*	1829.992	54645.05	$r\ ^3F_2$—*7719.3*
4*a*	1931.372	51776.7	$a\ ^5P_2$—*7511.3*	20	1825.13	54790.6	$^5D_2$—*6914.3*

TABLE 1. *Classified lines of the second specturum of rhenium* (Re II)—Continued

Intensity spark	Wavelength vac	Wave-number	Term combination	Intensity spark	Wavelength vac	Wave-number	Term combination
1	2	3	4	1	2	3	4
	A	*B*			*A*	*B*	
5*a*	1824. 85	54799. 0	*a* $^5D_3$—*6972*$^{\circ}_3$	3*da*	1748. 129	57204. 0	*a* $^5D_3$—*7213*$^{\circ}_2$
12*a*	1823. 28	54846. 2	*a* $^5D_4$—*6972*$^{\circ}_3$ *a* $^5D_3$—*6977*$^{\circ}_4$	3*a*	1747. 42	57227. 2	*a* $^5G_3$—*7636*$^{\circ}_3$
				5*ha*	1744. 853	57311. 4	*a* $^5D_0$—*7108*$^{\circ}_1$
3*da*	1821. 681	54894. 3	*a* $^5D_4$—*6977*$^{\circ}_4$	5*a*	1738. 74	57512. 9	*a* $^5G_4$—*7797*$^{\circ}_3$
18	1821. 03	54914. 0	*a* $^5D_4$—*6979*$^{\circ}_4$	2*a*	1738. 458	57522. 2	*a* $^5G_2$—*7636*$^{\circ}_3$
50	1816. 19	55060. 3	*a* $^7S_3$—*z* $^7D^{\circ}_2$				
				5*a*	1735. 93	57606. 0	*a* $^5D_3$—*7253*$^{\circ}_2$
1*a*	1812. 149	55183. 1	*a* $^5G_3$—*7432*$^{\circ}_3$	100	1725. 20	57964. 3	*a* $^5D_4$—*7284*$^{\circ}_3$
10*a*	1810. 80	55224. 2	*a* $^5G_2$—*7407*$^{\circ}_3$?	5*a*	1704. 40	58671. 7	*a* $^5D_4$—*7355*$^{\circ}_3$
1*a*	1807. 873	55313. 6	*a* $^5D_1$—*7013*$^{\circ}_1$	1*a*	1690. 903	59140. 0	*a* $^5D_3$—*7407*$^{\circ}_3$
5*a*	1807. 37	55329. 0	*a* $^5G_3$—*7446*$^{\circ}_3$	40	1686. 87	59281. 4	*a* $^7S_3$—*z* $^7D^{\circ}_4$
5*a*	1802. 54	55477. 3	*a* $^5G_2$—*7432*$^{\circ}_2$				
				60	1685. 49	59329. 9	*a* $^7S_3$—*z* $^5D^{\circ}_3$
10*a*	1797. 82	55622. 9	*a* $^5S_2$—*7284*$^{\circ}_3$	25	1683. 86	59387. 4	*a* $^7S_3$—*z* $^3P^{\circ}_2$
10*a*	1796. 184	55673. 6	*a* $^5G_4$—*7613*$^{\circ}_4$	10*a*	1680. 67	59500. 1	*a* $^5D_1$—*7432*$^{\circ}_2$
50*a*	1792. 53	55787. 1	*a* $^5G_2$—*7463*$^{\circ}_3$	30	1677. 98	59595. 5	*a* $^7S_3$—*z* $^5F^{\circ}_4$
3*a*	1787. 994	55928. 6	*a* $^5D_4$—*7081*$^{\circ}_3$	50	1676. 01	59665. 5	*a* $^7S_3$—*5966*$^{\circ}_3$
5*a*	1777. 11	56271. 1	*a* $^5G_2$—*7511*$^{\circ}_3$				
				25	1666. 66	60000. 2	*a* $^5S_2$—*7722*$^{\circ}_3$
2*a*	1771. 202	56458. 8	*a* $^5D_2$—*7081*$^{\circ}_3$	15*a*	1646. 05	60751. 5	*a* $^5S_2$—*7797*$^{\circ}_3$
10*a*	1770. 97	56466. 2	*a* $^5D_3$—*7139*$^{\circ}_2$	15*a*	1632. 53	61254. 6	*a* $^5D_4$—*7613*$^{\circ}_4$
3*a*	1767. 65	56572. 3	*a* $^5D_1$—*7139*$^{\circ}_2$	20*a*	1590. 87	62858. 7	*a* $^7S_3$—*z* $^5D^{\circ}_4$
5*a*	1762. 84	56726. 6	*a* $^5G_4$—*7719*$^{\circ}_4$?	3*a*	1584. 97	63092. 7	*a* $^5D_4$—*7797*$^{\circ}_3$
5*a*	1762. 56	56735. 7	*a* $^5D_2$—*7108*$^{\circ}_1$?				
				12	1584. 10	63127. 3	*a* $^7S_3$—*6312*$^{\circ}_4$
5*a*	1759. 13	56846. 3	*a* $^5S_2$—*7407*$^{\circ}_3$	30	1552. 65	64406. 0	*a* $^7S_3$—*6440*$^{\circ}_4$
3*a*	1753. 83	57018. 1	*a* $^5D_3$—*7194*$^{\circ}_2$	3	1539. 84	64941. 8	*a* $^7S_3$—*6494*$^{\circ}_3$
2*a*	1753. 020	57044. 4	*a* $^5D_2$—*7139*$^{\circ}_2$	5	1525. 03	65572. 5	*a* $^7S_3$—*6557*$^{\circ}_3$
18	1752. 85	57049. 9	*a* $^7S_3$—*z* $^7D^{\circ}_3$				
200	1750. 14	57138. 3	*a* $^7S_3$—*z* $^5D^{\circ}_2$				

4. Energy Levels of Re II

This term analysis of the second spectrum of rhenium yielded more or less information concerning 49 even and 83 odd energy levels as shown in table 2. In column 3, CS stands for Catalán and Sales, M for Meggers, and T for Tech. During the course of the analysis deliberate effort was made to group the levels in spectral terms according to the general rules governing *g*- values, and level intervals. In the case of Re I [1] the interpretation of levels was guided by that for Mn I, and similar clues as to the interpretation of Re II were sought by comparison with the homologous spectra Mn II [9], and Tc II [10]. Indeed the ground states of these three homologous spectra are identical, $d^5(a^6S)s\ a^7S_3=0.0$, except that the principal quantum numbers of *d* and *s* electrons increase by one unit in successive periods. Likewise the companion term $d^5(a^6S)s\,a^5S_2$ is comparable in the three spectra except that it increases from 9472.9 K in Mn II, to 12617.2 K in Tc II, to 17223.5 K in Re II. The analogies end here, for the next even level, $a\ ^5D_4$, in Mn II starts at 14325.6 K, in Tc II at 3461.3 K, and in Re II at 14882.6 K. In Mn II and Tc II these levels certainly arise from d^6 because they are completely inverted. If the $a\ ^5D$ term of Re II arose from d^6 it would have very large negative intervals but since its intervals are relatively small and predominantly positive it must be ascribed to d^4s^2. Theoretically, of course, d^6 and d^4s^2 produce the same number and types of spectral terms, viz, ^5D, ^{3}(HGFDP)^1(IGFDS)^3(FP) ^{1}(GDS), composed of 34 energy levels. A much larger family of even terms consisting of 74 levels theoretically arises from the d^5s configuration which produces ^7S, ^5S, ^{5}(GD) ^{3}(GD) ^{3}(IGFDS)^1(IGFDS) ^{5}(FP) ^{3}(FP) ^{3}(HGFDP) ^{1}(HGFDP) ^3D, ^1D. Thus the total number of levels expected from these two configurations of optical electrons is 108, whereas only 49 have been found in Re II. Moreover, the intervals between levels and terms is so large that strong configuration interaction may account for large deviations from Landé *g*-values, and for many interval and intensity anomalies. For these reasons in Atomic Energy Levels [10, p. 168] electron configurations and spectral term designations were cautiously given for only 6 low-even terms of Re II. Rather than list the remainder as miscellaneous levels in table 2, the advice of R. E. Trees was taken to attempt to group the levels and assign term symbols in a probable but provisional manner. However, since some terms are incomplete and many higher ones are missing, the provisionally designated terms have been omitted in the term combinations

TABLE 2. *Energy levels and spectral terms of Re* II

Config.	Desig.	Finder	J	Level value	Interval	Obs. g
$5d^5(^6S)6s$	$a\ ^7S$	M 50	3	0.0		2.05
$5d^4\ 6s^2$	$a\ ^5D$	M 50	0	13777.3		0/0
					1046.7	
		M 50	1	14824.0		1.50
					−471.8	
		M 50	2	14352.2		1.53
					578.3	
		M 50	3	14930.5		1.48
					−47.9	
		M 50	4	14882.6		1.48
$5d^5(^6S)6s$	$a\ ^5S$	M 50	2	17223.5		1.71
$5d^5(^4G)6s$	$a\ ^5G$	M 50	2	18845.8		0.64
					293.9	
		M 50	3	19139.7		1.12
					1323.5	
		M 50	4	20463.2		1.18
					513.2	
		CS 54	5	20976.4		1.26
					1254.7	
		CS 54	6	22031.1		1.24
$5d^5(^4P)6s$	$a\ ^5P$	CS 54	1	23722.4		1.903
					−381.6	
		M 50	2	23340.8		1.67
					1422.3	
		M 50	3	24763.1		1.41
$5d^4\ 6s^2$	$a\ ^3F$	M 50	2	22544.7		1.20
					−915.6	
		M 50	3	21629.1		1.26
					2264.4	
		CS 54	4	23893.5		1.275
$5d^4\ 6s^2$	$a\ ^3H$		4			
		CS 54	5	23381.2		1.19
			6			
$5d^4\ 6s^2$	$a\ ^3G$	M 50	3	25321.2		0.90
					916.1	
		CS 54	4	26237.3		1.12
					−249.8	
		CS 54	5	25987.5		1.22
$5d^4\ 6s^2$	$a\ ^3P$		0			
		CS 50	1	26664.3		1.46
			2			
$5d^4\ 6s^2$	$a\ ^3D$	M 50	1	23146.2		1.10
					3621.4	
		M 50	2	26767.6		1.09
					987.4	
		M 50	3	27746.0		1.23
$5d^5(a\ ^2F)6s$	$b\ ^3F$	CS 54	4	28095.3		1.22
					467.6	
		M 57	3	27627.7		
					−1449.6	
		M 50	2	29077.3		
$5d^5(^4D)6s$	$b\ ^5D$	M 50	0	29773.2		0/0
					−346.0	
		CS 54	1	29427.2		1.368
					1585.6	
		M 50	2	31012.8		1.42
					−788.0	
		M 50	3	30224.8		1.398
					2732.5	
		CS 54	4	32957.3		1.54
$5d^4\ 6s^2$	$a\ ^1G$	M 57	4	29638.9		
$5d^5(^2D)6s$	$b\ ^3D$		1			
		CS 54	2	29728.1		1.292
			3			
$5d^5(^4F)6s$	$a\ ^5F$		5			
		CS 54	4	30982.5		1.188
					265.0	
		CS 54	3	30717.5		1.26
					−2158.3	
		CS 54	2	32875.8		1.96
			1			
$5d^5(^4G)6s$	$b\ ^3G$	CS 54	3	32257.8		1.114
					−51.3	
		CS 54	4	32206.5		1.08
					138.2	
		CS 54	5	32344.7		1.15
$5d^5(a\ ^2G)6s$	$c\ ^3G$	CS 54	3	33989.8		
					−820.5	
		CS 54	4	33169.3		1.188
					2894.2	
		CS 54	5	36063.5		1.21
$5d^5(^4D)6s$	$b\ ^3D$		1			
		CS 54	2	34937.2		1.23
					2056.2	
		CS 54	3	36993.4		
$5d^5(b\ ^2F)6s$	$c\ ^3F$		4			
		CS 54	3	37318.5		
					−63.5	
		CS 54	2	37382.0		1.071
$5d^4\ 6s(^6D)6p$	$z\ ^7P°$	M 50	2	*43987.7*		2.19
					1209.8	
		M 50	3	*45147.5*		1.79
					5533.4	
		CS 54	4	*50680.9*		

Config.	Desig.	Finder	J	Level value	Interval	Obs. g
$5d^4\ 6s(^6D)6p$	$z\ ^5P°$	M 50	1	*49439.3*		2.42
					3237.7	
		M 50	2	*52677.0*		1.82
					1125.1	
		M 50	3	*53802.1*		1.66
$5d^4\ 6s(^6D)6p$	$z\ ^5D°$	T 55	0	*54468.0*		
					1904.1	
		M 50	1	*56372.1*		1.291
					766.5	
		M 50	2	*57138.6*		1.30
					2191.3	
		M 50	3	*59329.9*		1.145
					3529.1	
		CS 54	4	*62859.0*		1.27
$5d^4\ 6s(^6D)6p$	$z\ ^7D°$	M 50	1	*55150.8*		2.27
					−91.6	
		M 50	2	*55059.2*		1.81
					1991.0	
		M 50	3	*57050.2*		1.135
					2231.6	
		CS 54	4	*59281.8*		1.625
					5000.5	
		CS 54	5	*64282.3*		1.31
$5d^4\ 6s(^6D)6p$	$z\ ^5F°$	M 50	2	*55444.0*	1985.4	1.083
		CS 54	3	*57429.4*		1.056
					2166.7	
		M 50	4	*59596.1*		1.177
					1330.7	
		CS 54	5	*60926.8*		1.18
		M 50	2	*59588.3*		1.520
		M 50	3	*59665.8*		1.19
		CS 54	1	*60487.2*		1.128
		M 57	3	*60525.0*		
		CS 54	2	*62057.3*		1.17
		CS 54	1	*62717.8*		1.52
		M 50	3	*62914.9*		1.243
		CS 54	3	*63043.3*		1.34
		CS 54	4	*63127.7*		1.27
		M 50	2	*63464.2*		1.50
		M 50	4	*64407.2*		1.21
		CS 54	2	*64411.4*		0.812
		M 50	3	*64942.2*		1.36
		T 55	3	*64966.9*		
		CS 54	1	*65011.0*		0.796
		CS 54	3	*65572.3*		1.28
		CS 54	2	*65674.0*		
		CS 54	3	*66100.3*		1.40
		CS 54	3	*66248.1*		
		CS 54	4	*66381.2*		1.38
		CS 54	4	*66476.2*		
		CS 54	5	*66514.6*		1.18
		CS 54	5	*66536.7*		
		CS 54	2	*66730.5*		1.274
		T 55	5	*67049.1*		1.29
		CS 54	1	*67276.1*		1.292
		CS 54	3	*67314.0*		1.194
		CS 54	4	*67328.1*		1.15
		CS 54	5	*68259.5*		1.16
		T 55	3	*68554.3*		
		M 57	2	*68629.4*		
		CS 54	3	*68868.0*		
		CS 54	4	*68876.7*		
		CS 54	3	*69142.5*		1.083
		CS 54	2	*69170.0*		1.30
		CS 54	4	*69285.6*		1.35
		CS 54	3	*69502.8*		1.677
		CS 54	3	*69729.2*		
		CS 54	4	*69776.3*		1.25
		CS 54	4	*69796.2*		
		CS 54	1	*70137.8*		1.637
		T 55	3	*70811.0*		1.17
		T 55	1	*71088.7*		
		CS 54	4	*71128.5*		1.19
		CS 54	2	*71396.8*		
		M 57	2	*71732.1*		
		CS 54	2	*71949.0*		1.40
		CS 54	2	*72134.3*		
		CS 54	2	*72536.3*		
		CS 54	3	*72846.6*		
		CS 54	3	*73553.9*		
		T 55	4	*74064.4*		
		CS 54	3	*74070.8*		
		CS 54	2	*74323.3*		
		CS 54	3	*74469.2*		
		T 55	3	*74633.0*		
		CS 54	3	*75117.0*		
		CS 54	2	*75237.1*		
		CS 54	4	*76137.1*		
		CS 54	3	*76567.2*		
		T 55	3	*77190.7*		
		M 57	3	*77223.4*		
		T 55	3	*77975.9*		

of table 1 where they are represented by the first four digits of the energy levels.

According to the above, the low even terms of Re II resemble those of the isoelectronic spectrum W I [10, p. 156] more closely than those of the homologous spectrum Mn II. For the same reason, it appears that the lower odd terms of *Re* II should be attributed to $d^4\ s\ p$, as in W I, rather than to $d^5\ p$, as in Mn II. This arrangement avoids double electron jumps to produce the strong Re II lines involving $d^4 s^2\ a\ {}^5\mathrm{D}$. It also explains why $d^5({}^4P)p\ y\ {}^5F_3^\circ$ could not be found [10] despite diligent search; the two other levels, 55059.2 and 55150.8, assigned to this term have been reassigned to $d^4 s({}^6\mathrm{D})p\ z\ {}^7\mathrm{D}$, and the doubtful designations, $z\ {}^5\mathrm{G}^\circ$ and $z\ {}^3P^\circ$ have been abandoned. Beyond the first five odd terms shown in table 2, no attempt to group and designate the remaining levels has been made, because to do so would be highly arbitrary.

Since no spectral series could be found among the available lines of Re II, we tentatively adopt the ionization potential of 16.6 ± 0.5 electron v extrapolated by Finkelnburg and Humbach [11]. This corresponds to a series limit at about 133900 K.

5. References

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