RP12

WAVE LENGTHS AND ZEEMAN EFFECTS IN YTTRIUM SPECTRA

By William F. Meggers

ABSTRACT

The wave lengths corresponding to approximately 1,000 lines photographed in the arc and spark spectra of yttrium were measured relative to secondary standards in the iron spectrum. The values extend from 2127.99A in the ultra-violet to 9494.81A in the infra-red. Comparison of relative intensities and other characteristics of lines in the different sources permitted a sharp discrimination between four classes of lines; about 500 are ascribed to neutral atoms (constituting the YtI spectrum), 240 originate with singly ionized atoms (YtII spectrum), 10 belong to doubly ionized atoms (YtIII spectrum), and most of the remainder describe the band spectrum characteristic of molecular compounds, presumably yttrium oxide. Measurements of Zeeman effects (photographed by Moore) for 220 yttrium lines ranging in wave length from 3173A to 6896A are included.

CONTENTS

I. INTRODUCTION

Wave-length measurements in the arc spectrum of scandium (Z=21) were published last year.[1] Many lines due to ionized atoms were observed in the arc, and on the basis of these measurements a fairly complete analysis of the ScI and ScII spectra was made.[2] Yttrium (Z=39) is a chemical analogue of scandium and should exhibit similar spectral characteristics, but attempts to analyze the structures of its spectra were only partially successful, and it was deemed essential to obtain new observational data. The observations reported in this paper consist of wave-length measurements and line intensity estimates in the ordinary arc and spark spectra of yttrium and additional data on the magnetic resolutions of the stronger lines.

[1] Meggers, B. S. Sci. Paper No. 549, 22, p. 61; 1927.

[2] Russell and Meggers, B. S. Sci. Paper No. 558, 22, p. 330; 1927.

II. EXPERIMENTAL

1. WAVE LENGTHS

Yttrium (Yt=89.33; Z=39), like scandium, is usually associated with some of the "rare earth" family of elements and is extremely difficult to obtain absolutely free from traces of the latter. This may account for a considerable number of the differences, especially among fainter lines, noted in various descriptions of yttrium spectra. The material used in the present investigation was purified with great care and patience by J. F. T. Berliner, of the Bureau of Chemistry, Department of Agriculture. Several grams of very pure yttrium oxalate kindly supplied for spectroscopic studies sufficed for numerous exposures for descriptions of arc and spark spectra and for the long exposures required in extending the observations of Zeeman effects. A portion of the same material was used by Doctor King and Miss Carter [3] for their study of the electric furnace spectra of yttrium.

The spectrograms from which the new wave-length values are derived were obtained by the same procedure which has been successfully used in other cases [4] where only small amounts of salts are available. Rods of pure silver were used as electrodes, yttrium salt was placed upon the lower electrode for the production of the arc spectrum, and the same rods were then used for the spark exposures. Sufficient yttrium was thus fused on the ends of the rods in the first case to give excellent spectra also in the second. Comparison arc and spark spectra of pure silver were photographed adjacent to those of yttrium and silver, so that lines due to the electrodes or to the atmospheric gases could be recognized at once, thus avoiding the necessity of measuring and subsequently eliminating these lines.

For the excitation of the arc spectrum an electric arc of 4 to 6 amperes direct current from a circuit with 220 volts potential difference was used. The spark spectra were produced by a 40,000-volt transformer consuming about a kilowatt, condensers of 0.006 microfarads capacity being placed in the secondary circuit in parallel with the spark.

The wave-length interval from 2500A in the ultra-violet into the infra-red (9500A) was investigated with large diffraction gratings. while the shorter wave portion to 2100A was photographed with a large quartz spectrograph. The concave gratings were mounted in parallel light as described in earlier publications.[5] For the red and infra-red regions a 6-inch grating rules by Anderson with 7,500 lines per inch, giving a scale of 10A per millimeter was employed, while the remainder of the range was recorded for the most part with a similar

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[3] King and Carter, Astrophys. J., **65**, p. 86; 1927.

[4] Meggers, B. S. Sci. Paper, No. 499, **20**, p. 19; 1925.

[5] Meggers and Burns, B. S. Sci. Paper, No. 441, **18**, p. 191; 1922.

grating ruled by Rowland, with 20,000 lines per inch, which gave a dispersion of about 3.6A per millimeter in the first-order spectrum. The stronger lines between 3000 and 6000A were measured in the second-order spectrum of the latter grating, but many of the fainter lines, especially the somewhat hazy spark lines between 2500 and 3800A appeared only on spectrograms made with the first grating. The quartz spectrograph is one of the autocollimating type (E_1) made by Adam Hilger; its scale ranges from about 1.5A to 2.7A per millimeter in the interval of wave lengths for which it was used. The arc spectrum of iron was recorded with each yttrium spectrogram to supply the standard wave lengths from which the values for yttrium lines were derived by interpolation.

All the spectrograms were made on photographic plates of thin glass which could be bent to fit the focal curves of the spectrographs. The plates were sensitized [6] with pinaverdol, pinacyanol, dicyanin, or neocyanin to photograph the longer wave portions. Whereas previous attempts to photograph the arc spectrum of yttrium in the infra-red failed to record any lines of wave length exceeding 7881A, the use of neocyanin in the present case extended the wave-length data to 9495A. The exposure times ranged from a few minutes for the ultra-violet to an hour for the intra-red.

2. ZEEMAN EFFECTS

The spectrograms for the study of Zeeman-effects of yttrium lines were all made in 1924 at the Brace Laboratory of Physics, University of Nebraska, by the late Prof. B. E. Moore. The exposures were made on long strips of Eastman film adjusted to the focal curve of a concave grating spectrograph giving a scale of about 2.5A per millimeter in the first order. A 5,000-volt transformer was employed by Moore for producing sparks between carbon plates impregnated with yttrium solutions and inserted between the pole pieces of the electromagnet. The magnetic field strength was of the order of 28,000 gausses per square centimeter; it was determined from the separations of the magnetic components of sodium lines (D_1 and D_2) or of calcium lines (H and K) which were present as impurities. Separate exposures were made for the parallel and for the perpendicular components; all of the measurements and calculations were made at this bureau.

III. RESULTS

Various observers have already described limited portions of the arc and spark spectra of yttrium. The most reliable results up to the year 1911 are quoted by Kayser in his Handbuch der Spectroscopic, Volume VI; they are by Kayser [7] (arc spectrum 2227.849 to

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[6] Walters and Davis, B. S. Sci. Paper, No. 422, **17**, p. 353; 1921.

[7] Kayser, Abhandl. Berlin Akad., **30**, p. 633; 1903.

6701.188A), by Eberhard [8] (arc spectrum 2760.17 to 4527.95A), by Eder and Valenta [9] (arc spectrum 5466.669 to 6815.6A), and by Exner and Haschek [10] (arc spectrum 2422.30 to 6795.71A and spark spectrum 2191.35 to 6795.70A). These values are all based on Rowland's system of standard wave lengths.

More recent measurements have been made on the international scale of wave lengths by Eder [11] (arc spectrum 2231.55 to 7881.69A), by Kiess [12] (arc spectrum 5503.474 to 7881.868A), and by Yntema and Hopkins [13] (arc spectrum 2243.02 to 4199.26A). Admitting that these observations are superior in many respects to the earlier ones, it is, nevertheless, obvious that they have certain shortcomings as descriptions suitable for a complete analysis of arc and spark spectra. They all refer to the arc spectrum without any indication as to which lines belong to ionized atoms, and, furthermore, they cover their respective wave-length intervals with somewhat different scales of intensities and with many disagreements as to the fainter lines.

The only extensive data on Zeeman effects of yttrium lines are those published by Moore [14] in 1908. These give complex patterns for 12 lines; 14 lines were observed as quartets in the magnetic field and 74 as triplets. The lines range from 3130A to 5663A. A few additional observations were published by Meggers and Moore [15] in 1925.

The results of our determinations of approximately 1,000 wave lengths in the arc and spark spectra of yttrium and of Zeeman effects for 220 lines are presented in Table 1. Wave lengths on the international angstrom scale appear in the first column, and the estimated relative intensities of the lines in the arc and spark are given in the second. Certain other symbols appearing in the intensity column are explained below.

The probable errors of my wave-length determinations are usually less than 0.01A for the stronger lines between 3000 and 6000A, but the errors for the remaining lines are somewhat larger, since they were measured for the most part on smaller scale spectrograms. It was especially difficult to obtain accurate values for lines marked *h*, *l*, *hl*, or *nl;* because of their broad and unsymmetrical character the measured effective wave length depends somewhat on the exposure; that is, lines shaded toward the red were invariably measured as having longer wave lengths in stronger exposures. The probable error for such lines averages about 0.05A.

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8 Eberhard, Zeitschr. wiss. Phot., **7**, p. 245; 1909.

9 Eder and Valenta, Kaiser, Akad. wiss. Wien. Berlin, **199**, p. 9 and p. 519; 1910.

10 Exner and Haschek, Die Spectren der Elemente, Deuticke, Leipzig; 1911 and 1912.

11 Eder, Kaiser, Akad. Wiss., Wien, Ber., **125**, p. 383; 1916.

12 Kiess, B. S. Sci. Paper, No. 421, **17**, p. 318; 1921.

13 Yntema and Hopkins, J. Opt. Soc. Am., **6**, p. 121; 1922.

14 Moore, Astrophys, J., **28**, p. 1; 1908.

15 Meggers and Moore, J. Wash. Acad. Sci., **15**, p. 207; 1925.

My intensity estimates were made on an expanded scale more or less like that developed by King. Experience in classifying the lines in complex spectra has shown that such large-scale intensities are helpful in detecting multiplet structures, while the 1 to 10 scale which most spectroscopists have used is not very instructive. Comparison of estimated intensities in arc and spark spectra, especially when these are photographed side by side as in the present case, enables one to decide if the line belongs to spectrum I of neutral atoms, to spectrum II of singly ionized atoms, or to spectrum III of doubly ionized atoms. Lines of the YtII spectrum may be divided roughly into two classes—those which are nearly as strong in the arc as in the spark and those which appear weak in the arc but greatly enhanced in the spark. The latter are usually hazy and unsymmetrical in the spark. Lines belonging to doubly ionized atoms, YtIII are distinguished by being very strong in the spark, but either absent or extremely weak in the arc.

A small number of lines observed by Exner and Haschek and confirmed by King are included in column 1.

For purposes of comparison and to illustrate certain points of interest Eder's wave lengths and intensities for lines observed in the arc spectrum are given in the next two columns. After correcting some obvious typographical errors in Eder's wave lengths (4039, 4077, 4124 instead of 4030, 4076, 4025) there is, in general, good agreement between his values and mine for the stronger lines, but there are some unaccountable omissions in his list; for example, 3045, 3776, 4487 and a considerable number of faint lines present in his but absent from mine. Similar discrepancies as to the faint lines are noted in comparing any list of yttrium lines with any other of those mentioned above. Some of them may arise from differences in judgment in picking lines out of superposed band structures and certain others may represent unidentified impurities. Special attention is called to the systematic wave-length differences for lines which are shown by my intensity estimates to be hazy, unsymmetrical enhanced lines. For these the effective wave length as measured in the spark is usually from 0.1 to 0.2A greater than the value obtained from arc spectra in which most of the lines appear also but with relatively low intensity. A similar displacement of these enhanced lines was noted much earlier by Exner and Haschek [16] in their first description of the arc and spark spectra.

In column 5 of Table 1 the arc intensity estimates and furnace temperature classes published for yttrium lines by King and Carter [17] are quoted. Lines in Classes I and II appear at low temperature, 2,000° C. Those of Class I show a slower change from low to high

[16] Exner and Haschek, Wellenlangentabellen, Deuticke, Leipzig; 1902.

[17] King and Carter, Astrophys. J., **65**, p. 86; 1927.

temperature than those of Class II and as a rule are less conspicuous in the arc. Lines of Class III are usually well developed at medium temperatures, 2,200 to 2,300°, while lines clearly associated with high temperatures, 2,600 to 2,800°, are placed in Classes IV and V, those of Class V being absent or very faint in furnace spectra. The other symbols in column 5 have significance as follows: *d*, unresolved doublet; *n*, diffuse arc line; *A*, relatively stronger in the furnace than in the arc; *E*, enhanced line.

The vacuum wave numbers corresponding to the observed yttrium wave lengths are presented in column 6 of Table 1. They were taken from Kayser's Tabelle der Schwingungszahlen, and usually represent the mean wave length from columns 1 and 3, but in a few cases where considerable divergence exists the value in column 1 has been preferred.

Zeeman effects for 220 yttrium lines are found in column 7. These represent the more recent observations. They are not only more extensive, but also somewhat better quality than those published earlier. The patterns are presented in the standard notation for Zeeman effects; that is, the separations are expressed in decimal parts of *a*, the separation of a normal triplet, components polarized parallel to the magnetic field being inclosed in parentheses and followed by the perpendicular components. In complex patterns the strongest component of the group is printed in boldface type. A few lines for which the focus and exposure were best were just barely resolved when the neighboring components were separated by about $1/5a$, but many strong lines were regularly overexposed, so that the components could not be resolved even when separated by $1/4a$ or $1/3a$. For unresolved patterns an effort was made to measure the center of gravity of the unresolved group and to give some indication of the intensity distribution among the fused components. For this purpose, the notation used by Back [18] for distinguishing various types of intensity gradients is employed here. The letters A or B after a Zeeman effect mean that the pattern is complex but unresolved, and A indicates that the maximum intensity for perpendicular components is at the edge of a group, while B signifies that it is in the middle of the group. The distinction between strongest component inside or outside of the group is shown by A^1 and A^2, respectively. The complete interpretation of these Zeeman effects will be given in another paper [19] dealing with the spectral-series classification of yttrium lines.

In the last column an attempt is made to assign each observed wave length to its proper atomic or molecular source. This separation of lines into YtI, YtII, YtIII spectra, and assignment of bands to molecular orgin, is based primarily upon the relative intensities and

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[18] Back, Zeitschr. fur Phys., **15**, p. 212; 1923.

[19] Meggers and Russell, forth coming paper in B. S. Journal of Research.

other characteristics reported in column 2. It is supported by the temperature classification and further description in column 5 and by the Zeeman effects describing combinations of spectral terms having even multiplicity for YtI lines and odd multiplicity for YtII lines. The detailed correlation of all the descriptive data on yttrium lines presented above is reserved for a subsequent paper on the analysis of the arc and spark spectra of yttrium. The meaning of the symbols and abbreviations used in Table 1 is summarized as follows:

h=hazy (=*n* in King's column).
l=shaded to long wave lengths.
n=B. H.=band head.
p=part of band structure.
d=double.
c=complex.
E=enhanced line.
A=stronger in furnace than in arc.
A[1]=strongest *s*-components of Zeeman effect inside.
A[2]=strongest *s*-components of Zeeman effect outside.
B=strongest *s*-components of Zeeman effect in center.
w=wide.
E+*H*=Exner and Haschek.

TABLE 1.—*Wave lengths and Zeeman effects in yttrium spectra*

Meggers			Eder		King and Carter			
λ	Intensity		λ	Intensity arc	Arc intensity and temperature class	ν	Zeeman effect	Spectrum
	Arc	Spark						
2127.99	—	100				46977.8		III
2191.22	—	200				45622.4		III
2200.80	—	50				423.8		III
06.22	—	30				45312.2		III
31.	—	—	.55	1		44797.9		
43.06	25	50	.03	2		568.4		II
68.14	—	2h				44075.8		II
2284.5	—	100hl				43759.7		III
2327.30	—	20				42955.0		III
28.	—	—	.95	1		924.6		
31.	—	—	.63	1		875.3		
32.	—	—	.58	2		857.8		
40.8	1	10h	.79	1		707.4		II
49.	—	—	.69	1		545.8		
54.	—	—	.20	3		464.3		
55.	—	—	.40	1		442.6		
58.	—	—	.70	2		383.3		
61.	—	—	.81	2		327.5		
67.25	3	200				42230.2		III
85.	—	—	.24	2		41911.7		
2398.14	1	10hl	.06	2		686.8		II
2404.			.11	1		582.8		
13.92	—	3h	.94	1		413.6		II
14.68	5	100				400.8		III
17.4	1	5h	.29	1		355.0		II
22.22	20	50	.20	4		41272.1		II
57.			.93	½		40672.3		
60.			.11	1		636.3		
60.62	2	20	.60	2		628.0		II
2465.90	—	5h				40540.9		II

TABLE 1.—*Wave lengths and Zeeman effects in yttrium spectra*—Continued

Meggers λ	Meggers Intensity Arc	Meggers Intensity Spark	Eder λ	Eder Intensity arc	King and Carter Arc intensity and temperature class	ν	Zeeman effect	Spectrum
2479.			.09	1		40325.2		
79.			.80	1		313.7		
2490.4	1	—				40142.		I
2529.			.14	1		39527.3		
40.			.28	1		353.9		
47.			.56	1		241.5		
50.			.35	1		198.5		
54.			.87	1		39129.2		
64.3	—	1				38985.3		II
70.72			.72	1		888.0		
79.			.36	1		757.7		
93.			.76	1		542.5		
2594.			.88	1		525.9		
2612.			.38	1		267.9		
19.			.46	1		38164.4		
34.			.32	1		37949.2		I
47.			.74	½		756.8		
71.			.20	½		425.2		
72.			.08	1		412.9		
81.			.65	1		279.4		I
84.			.20	½		244.0		I
94.			.21	1		105.6		
2695.			.40	1		37089.2		
2705.			.85	1		36946.0		
10.			.15	1		887.4		
19.			.99	1		754.0		
23.			.00	3		713.3		I
30.			.06	1		618.4		I
33.			.93	1		566.6		
34.98	—	4h	.85	2		553.3		II
42.			.55	3		451.7		I
49.4	—	1	.23	1		361.9		II
50.40	—	3h	.20	2		348.9		II
55.			.79	1		276.5		
56.			.33	1		269.4		
60.			.10	3		36219.9		I
85.23	—	3	.19	2		35893.4		II
85.60	—	2	.58	2		888.5		II
2791.			.20	1		816.3		
2800.11	—	4	.12	2		702.3		II
07.			.66	1	1 III A	606.4		I
13.61	—	4h	.66	1	8 III	531.1		I+II
17.01	5	200	—	—		488.2		III
18.			.87	1	3 IV	464.8		I
22.			.56	1	10 IV	418.4		I
23.			.55	1		406.0		
24.			.48	1		394.3		
25.37	—	3h	—	—		383.2		II
26.38	1	5	—	—	1 IV A	370.6		II
34.57	—	5h	.39	1		269.5		II
40.98	1	5h	.84	1		189.7		II
42.5	—	1	—	—		170.0		II
50.7	—	2	—	—		068.8		II
54.45	2	15	.42	2	3 V E	022.9		II
56.32	1	6	.30	2	1 V	35000.0		II
57.			.87	1		34980.8		
58.06	1	4h	—	—		978.5		II
71.4	—	1h	.20	1		817.2		II
78.92	—	1	—	—		725.1		
83.85	—	2	—	—		665.7		
86.			.49	2	15 III	634.0		I
90.			.40	1	3 IV	587.2		I
91.			.32	1		576.2		
[97.70	1	5	.68	1	1 V	500.2		II
2898.93	1	3	.82	1	tr V	34486.0		II

TABLE 1.—*Wave lengths and Zeeman effects in yttrium spectra*—Continued

Meggers			Eder		King and Carter			
λ	Intensity: Arc	Intensity: Spark	λ	Intensity arc	Arc intensity and temperature class	ν	Zeeman effect	Spectrum
2901.			.48	1	6 III	34455.1		I
07.18	—	2	—	—		387.5		II
19.05	3	—	.06	3	20 II	247.7		I
29.			.00	1		131.4		I
30.15	1	6h	.03	2		118.7		II
30.8	—	2h	.77	1		110.7		II
35.			.91	1		34051.1		
43.			.58	1		33962.3		
45.92	4	150	—	—		935.4		III
48.39	5	1	.40	4	30 II	906.9		I
48.98	—	3h	.78	1		901.3		II
50.33	—	1h	—	—		884.6		II
53.28	—	3h	.14	1		851.6		II
56.04	1	5h	5.86	1		820.2		II
57.39	—	2h	—	—		803.7		II
64.96	5	1	.95	3	30 II	717.5		I
74.02	1	5h	3.91	1		615.4		II
74.59	6	1	.60	4	35 II	608.2		I
78.18	—	3h	7.99	1		568.6		II
80.7	2	20hl	.55	2	2 V E	540.3		II
82.20	—	2	—	—		522.5		II
84.25	10	2	.25	4	50 II	499.5		I
95.26	1	—	.25	2	10 III	376.4		I
2996.94	2	—	.94	3	20 III	357.7		I
3001.42	—	2	—	—		307.9		II
05.26	1	—	.25	2	12 III	265.4		I
06.0	1	2h	—	—		257.1		II
09.			.51	1		218.4		
18.			.95	2	6? III	114.5		I
21.76	2	—	.73	3	15 II	083.9		I
22.30	2	—	.27	3	12 II	077.9		I
23.50	—	2h	—	—		064.7		II
23.			.70	1		062.5		
23.			.99	1		059.3		
26.5	2	10hl	—	—		031.9		II
27.75	—	3	.68	1		33018.6		II
30.2	1	4h	.08	1		32992.2		II
36.7	3	25hl	.59	3		921.5		II
37.			.82	1		908.8		
38.			.46	1	4 III A	901.9		I
39.			.98	1		885.4		
44.			.84	2	5 III	832.9		I
45.36	4	1	—	—	20 II	827.3		I
47.			.11	1	3 III	808.5		I
47.			.41	1	3 III	805.2		I
49.			.86	1		778.9		
50.5	—	1h	—	—		772.0		II
51.			.52	1		761.0		
53.3	2	15hl	.26	2		742.2		II
54.			.41	1		730.1		
55.3	4	50hl	.21	3		721.0		II
56.			.33	1	2? III ?	709.5		I
59.			.50	2Dy	4 III	675.6		I
66.02	—	4h	5.83	1		607.2		II
67.			.27	1		592.8		
69.26	—	5h	.04	1		572.9		II
72.			.32	2	5 III	539.3		I
76.			.49	2	5 III	495.2		I
77.14	—	4h	6.95	1		489.3		II
78.64	—	4h	.57	1	2 V E	472.9		II
81.6	—	2h				441.3		II
82.16	—	3h	.16	1Al		435.4		II
86.9	5	30hl	.84	4	7 V	385.9		II
91.			.70	3	15 III	335.3		I
3093.76	1	10h	.75	3		32313.8		II

TABLE 1.—*Wave lengths and Zeeman effects in yttrium spectra*—Continued

Meggers			Eder		King and Carter			
λ	Intensity		λ	Intensity arc	Arc intensity and temperature class	ν	Zeeman effect	Spectrum
	Arc	Spark						
3095.			.49	1		32295.7		
95.88	3	4	.88	4	25 V E	291.6		II
3096.			.57	1	3 III	284.5		I
3103.3	—	2h	.25	1Dy?		214.7		II
03.			.69	2	4 IV	210.4		I
04.82	—	4h	.69	2		199.3		II
08.			.86	2	5 III	156.8		I
09.3	—	1	—	—		152.3		II
09.			.77	1Dy?		147.4		
10.65	—	2h	.50	1		139.0		II
11.80	1	—	.80	3	15 III	126.5		I
12.05	2	4	.03	3	18 V E	124.0		II
14.			.27	3	2 III	101.0		I
14.45	—	10h				099.1		II
18.			.50	1Ho?		057.4		
22.			.60	1		32015.3		
26.16	—	4h	.00	1	5 V E	31979.7		II
28.8	3	20hl	.74	3	5 V E	952.2		II
30.0	5	40hl	29.93	4	10 V E	940.0		II
33.			.15	1		907.6		
35.17	4	5	.16	4	25 V E	887.0		II
40.			.63	1Dy?		831.6		
41.			.16	1Ny?		826.2		
44.37	—	2h	.20	1		794.6		II
52.			.67	2	15n III	710.0		I
55.62	(1)	E+H	—	—	3 III A	680.4		I
57.			.50	1		661.5		
58.			.36	1		652.9		
59.			.47	1		641.7		
60.60	—	1h	.54	1Dy?		630.7		II
62.			.83	1Dy?		608.1		
64.			.76	1		588.9		
70.			.00	1Dy?		536.6		
71.			.69	2	4 III A	519.8		I
72.85	(1)	E+H	—	—	4 III A	508.3		I
73.07	6	100hl	.05	4	10 V E	506.2	(0.00)—	II
73.			.72	1		499.7		
74.			.36	1		493.3		
79.42	5	10	.40	4	40 V E	443.3	(0.00)—	II
82.42	1	3hl	.23	2		414.6		II
85.			.93	1	2 III A	379.0		I
88.			.75	1		351.2		
91.34	2	—	.29	3	15 III	326.0		I
93.48	—	2hl	.29	2		305.4		II
94.			.37	2	6 III	296.3		I
95.62	25	50	.61	6	100 III E	283.8	(0.95) 1.40	II
97.			.69	1		263.6		
3198.5	—	2h	.41	2		256.0		II
3200.28	25	50	.25	6	100 III E	238.4	(w) 1.26B	II
03.33	30	60	.32	6	100 III E	208.6	(0.00) 0.46	II
03.			.82	1		203.7		
06.			.22	1		180.4		
09.			.35	2	3 III A	150.0		I
11.			.26	1		131.5		
12.40	1	5hl	.28	2		121.0		II
14.			.04	1		104.5		
15.			.20	1Dy?		093.3		
16.70	50	100	.67	10	150 III E	079.0	(0.00) 0.98	II
17.			.80	1		068.2		
20.			.72	1		040.0		
21.			.50	1Dy?		032.5		
22.			.02	1		027.5		
23.			.28	1Dy?		31015.4		
25.17	1	5hl	.03	3		30997.9		II
3227.			.08	1		30978.9		

TABLE 1.—*Wave lengths and Zeeman effects in yttrium spectra*—Continued

Meggers			Eder		King and Carter			
λ	Intensity		λ	Intensity arc	Arc intensity and temperature class	ν	Zeeman effect	Spectrum
	Arc	Spark						
3227.			.69	1		30973.0		
31.20	—	2h	—	—		939.4		II
31.			.32	1		938.2		
32.00	—	3h	1.80	2		932.6		II
37.			.93	1		875.0		
39.			.29	1		862.1		
42.30	60	150	.28	15	200 III E	833.5	(0.00) 1.18	II
47.			.02	1		788.6		
51.			.29	2Dy?		748.2		I
52.28	1	—	.27	3	8 III	738.8		I
55.			.82	1		705.4		
56.			.20	1		701.8		
57.			.52	1		689.4		
61.			.23	1		654.5		
63.			.22	1		635.8		
64.			.77	3Ho?		621.2		
67.			.24	1		598.1		
67.			.81	1		592.7		
69.			.11	1		580.6		
69.			.40	1		577.9		
70.			.94	1		563.5		
71.			.13	1		561.7		
73.			.04	1		543.8		
75.			.56	2	2 IV	520.4		I
78.			.43	2	5 III A	493.6		I
79.			.35	1Er?		485.1		
80.			.13	2Dy?		477.8		
80.	?Ag	?Ag	.91	4	10 V E	470.6		II
81.			.98	1Ho?		460.7		
82.51	—	2	.45	3		456.0		II
82.			.77	1		453.3		
83.			.21	2		449.2		
83.			.85	1		443.3		
86.71	—	3h	.68	3		416.9		II
87.			.21	3	4 III	412.2		I
87.			.93	1Dy?		405.5		
90.			.11	1		385.4		
90.			.56	3		381.2		
90.			.96	1Ho?		377.5		
91.			.44	1Dy?		373.1		
93.			.44	2		354.7		
93.9	—	3h	.68	2		351.4		II
94.			.55	1		344.4		
3298.			.26	1		310.3		
3302.			.17	2		274.4		
02.			.56	½		270.8		
04.0	—	2h	3.86	1		258.3		II
04.			.32	½		254.7		
05.			.49	½		243.8		
05.			.90	½		240.3		
06.			.27	½		236.9		
07.			.61	½		224.6		
08.5	2	20hl	.47	3		216.7		II
08.			.84	1		213.4		
10.			.13	½		201.6		
12.5	—	4hl	.40	1		180.5		II
12.			.67	½		178.5		
15.			.40	½		153.6		
16.			.32	½		145.3		
17.			.03	½		138.8		
18.6	1	4hl	.52	2		124.9		II
19.8	1	15hl	.76	3		113.8		II
20.			.60	1		106.4		
23.			.18	1		083.0		
3327.89	50	100	.89	15	150 III E	30040.4	(0.00) 1.00	II

TABLE 1.—*Wave lengths and Zeeman effects in yttrium spectra*—Continued

Meggers			Eder		King and Carter			
λ	Intensity Arc	Intensity Spark	λ	Intensity arc	Arc intensity and temperature class	ν	Zeeman effect	Spectrum
3330.9	2	20hl	.88	2	3 V E	30013.4		II
33.6	—	2h	.42	1		29989.8		II
35.			.20	2	8n V	974.6		I
36.3	1	4hl	.18	1		965.3		II
37.85	1	—	.82	2		950.9		I
38.			.76	1		943.7		
40.			.37	3	7 III	928.2		I
40.			.98	½		922.8		
41.			.85	1		915.0		
44.			.53	2	4n V	891.0		I
49.			.26	1		848.8		I
52.			.64	½		818.7		
53.			.56	½		810.5		
54.			.57	2	10d? III	801.5		I
54.81	(1)	E+H	—	—		799.4		I
58.			.94	2	5 III	762.8		I
62.00	4	30hl	1.99	5	20 V E	735.7	(0.00) 1.10	II
64.77	1	—	.79	2	7 III	711.1		I
77.			.72	2	6 III	597.3		I
80.1	—	5hl	—	—		576.5		II
82.			.83	½	5 V	552.6		I
83.			.06	1	7 V	550.6		I
88.59	1	—	.58	2	15 III	502.3		I
89.81	(2)	E+H	—	—	5 IV ?	491.7		I
94.97	(2)	E+H	—	—	4 III	446.9		I
3397.05	2	—	.03	3	15 III	429.0		I
3407.7	—	3h	—	—		336.9		II
07.82	2	—	—	—		335.9		
09.9	1	4hl	—	—		318.0		II
12.47	2	—	.47	2	12 III	295.9		I
14.5	(2)	E+H	—	—	8n III	278.5		I
29.4	—	3h	—	—		151.3		II
31.01	(2)	E+H	—	—	6 V	137.6		I
31.67	(2)	E+H	—	—	5 III	132.0		I
33.			.02	1		120.6		
33.79	(2)	E+H	—	—	6n IV	114.0		I
37.95	1	—	—	—	8n IV	29078.8		I
48.82	8	10	.81	4	35 V E	28987.2	(0.72) 1.20 Bw	II
50.95	2	—	.94	2	12 III	969.2		I
55.94	4c	1	—	—		927.4		
56.10			—	—		926.1		
57.1	1	4hl	—	—		917.7		II
61.0	2	20hl	—	—	4 V ?	885.1		II
67.88	4	5	.88	4	20 V E	827.8		II
70.3	—	5hl	—	—		807.7		II
71.7	1	—	—	—	10n V ?	796.1		I
73.18	(2)	E+H	—	—	5 III	783.8		I
84.06	2	—	.06	2	10 III	694.0		I
84.89	2	—	—	—		687.1		
85.73	4	1	.73	4	40 III	680.2	(0.00) 1.15	I
96.08	40	80	.09	8	150 III E	595.3	(0.00) 0.62	II
3498.94	2	—	—	—	10n III	571.9		I
3500.60	1	—	—	—	7 III	558.4		I
01.95	2	—	—	—	2 IV	547.4		I
06.47	(2)	E+H	—	—	6 III	510.6		I
08.0	2	8hl	—	—		498.2		II
10.54	1	—	—	—	8 III	477.5		I
11.19	2	—	.20	3	15 III	472.2		I
12.88	3	—	.90	2	20 III	458.5	(—) 1.50 A[2]	I
21.54	1	—	—	—	6 III	388.6		I
31.71	3 Dy?		.65	2		307.1		
44.0	1	3hl	.03	4		208.5		II
44.			.93	3		201.3		
46.0	2	5hl	—	—		192.8		II
3549.02	50	100	8.99	6	150 III E	28168.9	(0.00) 1.52 A[2]	II

TABLE 1.—*Wave lengths and Zeeman effects in yttrium spectra*—Continued

Meggers			Eder		King and Carter			
λ	Intensity Arc	Intensity Spark	λ	Intensity arc	Arc intensity and temperature class	ν	Zeeman effect	Spectrum
3551.80	2	—	—	—	8 III ?	28146.7		I
52.70	10	2	.69	4	40 I	139.6	(0.80) 0.45, 1.00, 1.54	I
56.1	1	5hl	—	—		112.7		II
58.76	2	1	—	—	5 II	091.7		I
59.65	1	1	—	—		28084.7		
71.43	4	2	.44	1	10 II	27992.0	(—) 1.22	I
73.77	2	2	—	—		973.7		
76.06	5	2	.04	2	12 III	955.8	(—) 1.30	I
84.53	60	100	.51	4	150 III ? E	889.8	(**0.00**, 0.60) 0.54, 1.15, **1.74**	II
87.75	5	2	.75	1	20 III	864.7	(0.00) 0.95	I
89.68	2	—	—	—	5? III ?	849.7		I
89.91	3	2	—	—		847.9		
90.30	2	—	—	—		844.9		
3592.93	25	5	.91	4	200 II	824.6	(0.00) 0.84	I
3600.74	100	300	.72	6	500 III E	764.2	(0.00) 1.31	II
01.93	75	100	.91	5	200 III E	755.1	(0.00) 0.55	II
05.4	2	10hl	—	—		728.3		II
08.			.84	1		701.9		
11.06	100	200	.05	10	400 III E	684.9	(0.00) 1.16	II
12.34	2	—	—	—		675.0		
12.70	2	—	—	—		672.3		
18.8	1	—	.77	1		625.8		I
20.95	50	10	.94	6	400 II	609.3	(0.00) 1.10 A[1]	I
21.86	2	1	—	—		602.3		
22.19	2	1	—	—		599.8		
28.71	50	100	.70	5	150 III E	550.2	(**0.00**, 0.59) 0.58, 1.16, **1.72**	II
33.13	100	200	.11	8	300 III E	516.7	(0.00) 0.91	II
35.4	3	20hl	.32	1		499.8	(w ?) 1.03	II
39.28	1	—	.27	3		470.2	(—) 1.39	I
40.34	1	1	—	—		462.2		
43.4	1	3hl	—	—		439.1		II
45.40	2	1	—	—		424.0	(—) 1.32	
50.45	—	2h	—	—		386.1		II
53.60	2	2	—	—		362.5		II
64.62	100	150	.59	10	200 III E	280.3	(0.00) 1.50 A[2]	II
65.75	1	—	—	—		271.8		I
68.5	5	50hl	.48	3	3 V E	251.4	(0.00) 1.07	II
75.6	1	5hl	—	—		198.7		II
84.9	1	5hl	—	—		130.1		II
89.2	—	2h	—	—		098.5		II
92.52	3	1	.54	6	8 III	074.0		I
94.80	1	—	—	—		057.4		
96.6	3	25hl	—	—		044.2	(—) 1.12	II
3699.14	3	3	—	—		27025.6		II
3702.84	2	1	—	—		26998.6		
03.3	1	5hl	—	—		995.3		II
10.30	200	500	.30	15	800 III E	944.4	(w) 1.15 A[1]	II
14.3	1	5hl	—	—		915.3		II
17.0	1	7hl	6.94	1		896.0		II
18.09	2	—	.14	3	5 IV	887.7		I
21.40	3	4	—	—		864.0		II
24.			.76	2		839.8		
27.0	2	20hl	—	—		823.6		II
38.61	2	—	.62	2	4 III	740.3		I
47.55	30	40	.55	3	20 III E	676.6	(0.44) 0.48, 0.94	II
49.89	2	—	—	—		659.9		I
58.9	1	3hl	—	—		596.0		II
62.97	2	3	—	—		567.2		
74.33	150	300	.33	5	200 III E	487.3	(0.00) 1.05	II
3776.56	50	75	—	—	40 III E	26471.6	(0.00) 1.31	II

TABLE 1.—*Wave lengths and Zeeman effects in yttrium spectra*—Continued

Meggers			Eder		King and Carter			
λ	Intensity		λ	Intensity arc	Arc intensity and temperature class	ν	Zeeman effect	Spectrum
	Arc	Spark						
3777.28	2	2	—	—		26466.6		
82.3	5	50hl	—	—		431.5		II
85.62	3	3	—	—		408.3		II
88.70	100	200	.69	5	100 III E	386.8	(0.00) 0.82	II
3792.5	2	10hl	—	—		360.4		II
3800.03	2	1	—	—		308.1		
00.9	2	15hl	—	—		302.1		II
08.7	—	1h	—	—		248.3		II
12.0	1	5hl	—	—		225.5		II
13.8	—	2hl	—	—		213.2		II
18.34	40	60	.37	3	20 III E	181.9	(0.36, **0.76**) 0.40, **0.79, 1.20,** 1.57	II
24.8	1	5hl	—	—		137.8		II
25.			.91	1		130.2		
32.89	50	100	.87	2	30 III E	082.7	(0.66) 0.69, 0.90, **1.10, 1.30,** 1.51, 1.72	II
40.			.43	1		26031.4		
46.5	1	3h	—	—		25990.3		II
48.2	?	8hl	—	—		978.8		II
72.3	?	5hl	—	—		817.2		II
78.28	15	20	.27	1	20 V ? E	777.4		II
87.76	2	—	—	—	5 III	714.5		I
87.			.93	2		713.4		
90.			.13	1		698.8		
90.86	}4c	—	{—	—		694.0		
91.08			—	—		692.6		
92.			.41	2		683.8		I
3896.8	1	10hl	—	—		654.8		II
3900.			.27	1		632.0		I
04.59	2	—	.59	2	5 III	603.7		I
18.24	2	—	—	—	4 III	514.5		I
30.10	3	—	—	—		437.5		I
30.66	15	15	.65	3	10 V E	433.8	(w) 1.06 B	II
38.47	2	1	—	—		383.4		
42.48	1	—	—	—		357.6		I
44.68	2Dy?	—	—	—		343.4		I
46.21	3	2	.20	2		333.7		II
50.35	150	200	.35	5	50 III E	307.1	(**0.00**, 0.46) 0.45, 0.97, **1.49**	II
51.59	10	5	.60	3	8 V E	299.1	(w) 1.28 A^2	II
55.08	3	—	.09	3	5 III	276.8		I
62.19	2	1	—	—		231.4		
67.7	3	15hl	—	—		196.4		II
68.42	5Dy?	10	—	—		191.8		
70.62	2	1	—	—		177.9		
73.	—	—	.45	2		160.0		
74.61	1	—	—	—		152.6		
78.59	2Dy?	2	—	—		127.4		
82.59	100	150	.60	8	100 III E	102.2	(0.28) 1.03 B	II
87.48	2	—	.50	1	4 III	071.4	(—) 1.00	I
94.52	2	—	—	—		027.2		
3997.43	1	1	—	—		25009.0		II
4029.84	2	—	.86	1	3 IV	24807.8	(—) 0.96	I
39.83	20	?	.83	5	60 II	746.6	(w) 1.40 A^2	I
47.64	40	3	.65	6	80 II	698.8	(0.00) 0.84	I
64.99	2	2	5.02	1		593.3		II
77.36	100	5	.39	8	300 II	518.7	(0.00) 1.00	I
80.93	2	—	.93	1	5 III	497.3		I
81.20	3	—	.23	1	9 II	495.6		I
83.71	50	3	.71	5	100 II	480.6	(0.76) 0.53, **1.01**, 1.51	I
4095.39	1	—	—	—		410.8		
4102.38	150	10	.38	10	350 II	369.2	(0.00) 1.08	I
4103.79	2	—	—	—		24360.9		

TABLE 1.—*Wave lengths and Zeeman effects in yttrium spectra*—Continued

Meggers			Eder		King and Carter			
λ	Intensity Arc	Intensity Spark	λ	Intensity arc	Arc intensity and temperature class	ν	Zeeman effect	Spectrum
4106.39	3	—	.39	1		24345.4		
10.80	3	—	.81	2	5 III	319.3		I
24.91	20	15	.93	5	20 III E	236.1	(0.00) 1.14	II
27.57	2	2	—	—		220.5		II
28.30	150	10	.32	10	300 II	216.2	(0.22) 1.15	I
42.84	100	6	.87	10	200 II	131.2	(0.00) 0.82	I
44.56	1	—	—	—		121.2		
57.63	5	—	.63	2	6 III	045.4		I
64.98	2	1	—	—		24003.0		
67.51	50	3	.52	8	100 II	23988.4	(—, 0.51, **0.85**) 0.40, 0.74, **1.08**, 1.40, 1.73	I
73.34	2	?	—	—		954.9		II
74.14	30	2	.14	4	100 II	950.3	(0.00) 1.10 A[1]	I
77.54	100	125	.51	5	125 III E	930.9	(0.44) 0.90 B	II
90.06	3	—	—	—		859.3		
91.28	1	—	—	—		852.4		I
4199.27	10	5	.28	3	8 V E	806.9	(0.00) 0.63, 1.51, **2.41**	II
4204.69	20	10	.70	4	20 V E	776.3	(0.00) 1.48	II
13.			.01	½	6 IV	729.3		I
13.53	2	—	.54	½	5 III ?	726.4		I
17.80	5	—	.79	2	10 III	702.4	(—) 1.06	I
20.62	10	1	.62	3	30 III	686.6	(w?) 1.03 B	I
24.25	3	—	.23	2	4 III	666.3	(—) 1.21	I
29.22	2	—	.18	2	2 III	638.5		I
32.53	2	—	.54	2	1 III	619.9		I
35.73	40	20	.71	8	40 IV E	602.1		II
35.94	20	—	—	—	100 II	600.9		I
37.12	(1)	E+H	—	—		594.3		I
49.87	1	—	—	—	1 III	523.5		I
50.37	1	—	.35	1	1 III	520.8		I
51.20	10	1	.18	5	40 III	516.2	(0.00) 0.96	I
54.35	1	—	—	—		498.8		I
56.43	1	—	—	—		487.3		
64.88	—	1h	—	—		440.7		II
66.89	1	—	.90	2	1 III	429.7		I
72.12	2	—	.13	2	2 III	401.0	(0.00) 1.14	I
74.16	1	—	.20	1	1 III A	389.7		I
79.3	2	5hl	—	—		361.8		II
91.03	2	—	.05	3	2 III	297.8	(—) 0.85	I
4296.66	2Ce?	—	—	—		267.4		
4300.34	2	—	.37	1	2 III	247.4	(—) 0.82	I
02.30	20	2	.30	6	50 III	236.9	(0.52 w) 1.04 A[2]	I
07.70	1	—	—	—		207.7		
09.62	70	50	.61	8	125 III E	197.4	(w) 1.15 A[1]	II
15.47	2	—	.49	3	2 III	165.9	(—) 1.43?	I
16.30	2	—	.30	3	3 III	161.5		I
17.87	1	—	—	—		153.1		I
18.21	1	—	—	—		151.2		I
22.29	1	—	.31	1	2 III	129.3	(0.00) 1.22	I
22.54	2	—	—	—		128.1		
24.57	1	—	.61	1		117.1		
29.89	1	—	—	—	1 III	088.8		I
30.78	5	—	.78	3	10 III	084.1	(0.00) 0.73	I
37.28	2	—	.32	1	2 III	049.4	(—) 1.13 B	I
44.64	3	—	.65	1	4 III	010.4	(—) 0.83 A[2]	I
45.60	1	—	—	—		005.3		
46.13	1	—	.16	1	1 III	23002.5		I
48.78	25	?	.79	6	60 III	22988.5	(0.00) 1.10	I
52.33	2	—	.34	2	5 III	969.8	(—) 1.27	I
52.71	4	—	.65	2	4 III	967.9	(—) 0.96	I
4353.63	2	—	—	—		22962.9		I

TABLE 1.—*Wave lengths and Zeeman effects in yttrium spectra*—Continued

Meggers			Eder		King and Carter			
λ	Intensity		λ	Intensity arc	Arc intensity and temperature class	ν	Zeeman effect	Spectrum
	Arc	Spark						
4354.35	2	—	—	—		22959.1		
54.98	1	—	—	—		955.8		
57.73	6	—	.73	3	10 III	941.3	(—) 0.98	I
58.73	40	30	.72	5	50 III E	936.1	(0.94) 0.48, **1.46**	II
61.18	1	—	—	—		923.2		I
64.01	2	?	—	—		908.3		II
64.17	1	?	—	—		907.4		II
64.41	—	2h	—	—		906.2		
66.03	5	—	.04	3	10 III	897.7	(0.00) 1.18	I
70.96	1	—	.98	1	1 III	871.8	(—) 0.98	I
71.44	1	—	—	—		869.4		
71.78	1	—	—	—		867.6		
74.94	200	300	.95	8	300 III E	851.0	(0.15) 0.95	II
75.61	3	—	.60	1	8 III	847.6		I
78.59	1	—	—	—		832.0		
79.33	3	—	.35	2	6 III	828.1	(—) 1.19 A^{2}	I
84.80	2	—	—	—		799.7		I
85.48	2	—	.48	1	3 III	796.1	(—) 1.36	I
87.74	4	—	.75	3	8 III	784.4	(—) 0.63 A^{1}	I
94.01	2	—	.02	2	3 III	751.9	(—) 1.17 B	I
94.66	2	—	.68	2	2 III	748.5		I
97.79	(2)	E+H	—	—	3 III	732.3		I
4398.02	75	50	.03	6	100 III E	731.1	(**0.00**, 0.32) **0.79**, 1.10, 1.41	II
4401.13	2	—	—	—		715.1		I
04.85	3	—	—	—		695.9		I
09.3	1	—	—	—		673.0		
09.7	1	—	—	—		670.9		I
11.20	1	—	—	—		663.2		
15.37	2	—	.38	2	3 III	641.8	(w) 1.23 Bw	I
17.44	2	—	.45	1	2 III	631.2	(—) 1.22	I
21.74	1	—	—	—	1 IV	609.2		I
22.59	50	30	.60	8	80 III E	604.8	(0.00) 0.51	II
32.92	1	—	—	—	1 IV	552.2		I
36.13	1	—	.14	1		535.8		I
37.35	5	—	.33	3	10 III	529.7	(—) 0.90	I
43.66	7	—	.65	3	15 III	497.7	(—) 1.70 A^{2}	I
45.31	3	—	.30	1	3 IV	489.3	(—) 0.62	I
46.63	8	—	.64	3	15 III	482.6	(0.00) 1.32	I
59.01	1	—	—	—		420.2		I
65.27	3	—	.26	3	1 IV	388.8	(0.00) 0.92	I
65.4	—	10h	—	—		388.1		II
72.79	2	—	.77	1	2n IV	351.2		I
73.88	5	—	.89	3	7 III	345.7	(—) 1.05	I
75.73	10	1	.71	3	20 III	336.5	(0.50) 1.29 Bw	I
76.37	2					333.3		
76.95	10	1	.97	4	25 III	330.3	(—) 1.66 A^{2}	I
77.45	10	1	.46	3	25 III	327.9	(—) 0.00, 0.78, 1.54	I
78.99	1	—	—	—	2 IV	320.2		I
84.44	2	—	—	—	5 II ?	293.1	(—) 1.06	I
87.28	8	—	—	—	20 III	279.0	(w) 1.20 Bw	I
87.47	15	1	—	—	40 III	278.0	(—) 0.60	I
88.90	1	—	—	—		270.9		
91.75	3	—	—	—	5 III	256.8		I
4492.42	3	—	—	—	4 III	253.5	(—) 1.48	I
4505.95	25	2	.96	8	50 II	186.7	(0.00) 0.90	I
13.58	3	—	.58	2	4 III	149.3	(—) 1.24	I
14.02	5	—	.01	2	8 III	147.0	(—) 1.31	I
22.05	2	—	.05	½	3 III	107.7	(—) 1.79	I
27.24	40	2	.26	5	80 II	082.3	(0.00) 1.15 A^{1}	I
27.79	30	2	.81	3	50 II	079.6	(0.00) 1.05 A^{1}	I
28.10	2	—	—	—	3 III	078.1		I
33.50	1	—	—	—	1 IV	051.8		I
34.09	3	—	—	—	3 III	049.0		I
4536.31	1	—	—	—		22038.2		I

TABLE 1.—*Wave lengths and Zeeman effects in yttrium spectra*—Continued

Meggers			Eder		King and Carter			
λ	Intensity: Arc	Intensity: Spark	λ	Intensity arc	Arc intensity and temperature class	ν	Zeeman effect	Spectrum
4537.16	2	—	—	—	2 III	22034.0		I
39.60	1	—	—	—	1 III	022.2		I
42.03	3	—	.04	1		22010.4	(—) 0.93	I
44.31	6	—	.32	3	10 III	21999.4		I
54.46	2	—	—	—	2 III	950.4		I
55.29	2	—	.32	2		946.3		I
59.37	7	—	.37	4	10 III	926.7	(—) **1.03**, 2.04	I
61.8	2n?	—	—	—		915.0		I
64.37	2	—	.41	1	4 III	902.6	(—) 0.91	I
64.93	2	—	.95	2	2 IV ?	900.0		I
70.65	2	—	.69	2	3n III	872.5		I
73.55	6	—	.58	4	10 III	858.7	(—) 1.20	I
78.87	1	—	—	—	1 III	833.3		I
81.32	2	—	.32	1	6 II A	821.7		I
81.77	1	—	.77	1	3 III A	819.5		I
82.15	1	—	.18	1	2 III	817.7		I
85.			.33	1		802.6		
90.			.80	3	1 V	776.6		I
94.			.00	1	15 II ?	761.4		I
4596.54	10	—	.56	5	12 III	749.4	(—) 1.34	I
4601.27	1	—	.30	1	2 III	727.0		I
03.7	2nl?	—	—	—		715.6		
04.79	6	—	.81	3	10 III	710.4	(—) 1.26	I
07.94	3	—				695.6		
13.00	2	—	.00	1	4 III	671.8		I
36.50	(1)	E+H	—	—	1 IV	562.0		I
43.69	50	5	.70	5	150 I	528.6	(0.00) 0.89	I
49.5	3nl	—	—	—		501.7		Mol
50.1	5nl	—	—	—		498.9		Mol
52.13	1	—	—	—		489.5		I
53.78	2	—	—	—	4 III	481.9		I
58.32	10	—	.32	3	12 III	461.0	(0.00) 0.94	I
58.88	3	—	—	—	6 III	458.4	(—) 1.00	I
66.38	1	—	—	—	3 III	423.9		I
66.84	2	—	—	—	3 III	421.8		I
67.47	4	—	—	—	8 III	418.9	(—) 0.84	I
70.82	2	—	—	—	4 III A	403.5	(—) 0.87	I
74.84	45	5	.84	5	125 I	381.5	(0.00) 1.06	I
78.36	2	—	.34	1	3 III	369.1		I
82.32	30	20	.31	5	20 V E	351.0	(0.89) 0.52, **0.95**, **1.40**, 1.84	II
89.77	3	—	.76	1	4 III	317.1		I
91.			.97	1	1 III A	307.1		I
96.81	6	—	.80	2	8 III	285.1	(0.00) 0.97	I
4699.			.24	2	1 III ?	274.1		I
4701.00	1	—	.98	2	2 III	266.2		I
04.			.64	1		249.7		I
08.84	1+p	—	—	—	3 III ?	230.7		I
25.84	2	—	—	—	3 III	154.4		I
28.52	10	1	.53	4	20 III ?	142.4	(0.67) 1.29	I
32.35	3	—	.39	2	3 III ?	125.2		I
34.52	—	5h	—	—		115.6		II
41.40	5	—	.41	3	8 III	084.9	(0.00) 1.04	I
44.6	2nl	—	—	—		070.7		Mol
52.79	10	1	.78	3	12 III	21034.4	(0.00) 1.90 A²w	I
60.98	30	3	.99	5	40 I	20998.2	(0.50, **0.80**) 0.40, 0.72, **1.04**, 1.36, 1.69	I
80.			.18	2	1 III	913.9		I
81.04	10	1	.04	3	10 III	910.1	(0.00) 1.45 A²	I
86.58	30	20	.57	4	10 IV E	885.9	(0.65w) 1.20 Bw	II
86.88	10	—	.90	2	10 III	884.6		I
4799.30	15	2	.31	4	15 III	20830.5	(w) 1.52 A²	I

TABLE 1.—*Wave lengths and Zeeman effects in yttrium spectra*—Continued

Meggers			Eder		King and Carter			
λ	Intensity Arc	Intensity Spark	λ	Intensity arc	Arc intensity and temperature class	ν	Zeeman effect	Spectrum
4804.31	3	—	.31	3	4 III	20808.8		I
04.81	5	—	.81	3	6 III	806.7		I
17.38	5nl	—	.41	1 BH		752.3		Mol
18.18	10nl	—	.20	1 BH		748.9		Mol
19.64	7	1	.64	3	10 III	742.7	(**0.31**, 0.95) 0.64, 1.28, **1.93**	I
21.62	1	—	.62	1	2 IV	734.1		I
22.12	6	1	.12	2	8 III	732.0	(w) 0.90	I
23.31	40	30	.32	4	12 V E	726.9	(0.46, **0.99**) 0.17, **0.64, 1.13**, 1.62	II
26.			.25	½		714.3		
29.36	—	10h	—	—		700.9		II
39.13	2	—	.16	1	3 III	659.3	(**0.34**, 0.96)—	I
39.87	60	6	.86	6	60 II	656.0	(0.00) 1.30	I
42.03	2nl ?	—	—	—		646.7		Mol
42.84	5nc ?	—	—	—		643.3		Mol
45.67	50	5	.68	4	50 II	631.2	(0.00) 1.20	I
52.69	40	4	.69	4	50 II	601.4	(0.00) 1.01	I
54.26	1	—	—	—	4 III	594.6		I
54.87	100	150	.88	10	70 V E	592.1	(0.00) 0.72	II
56.70	2	—	.70	2	3 III	584.4	(w?) 1.28	I
59.85	25	2	.83	4	40 II	571.1	(0.00) 0.40	I
63.			.11	2	1 III	557.2	(—) 0.80	I
64.			.71	1		550.5		
79.			.64	2	4 III	487.6	(0.70) 2.28	I
81.44	2	2	.44	2		480.0		II
83.69	150	200	.69	8	80 V E	470.6	(0.00) 1.11 A[1]	II
86.29	3	—	.26	2	4 III	459.8	(0.00) 1.24	I
86.65	3	—	.64	2	3 III	458.2	(0.00) 0.84	I
4893.44	8	2	.44	3	6 III A	429.8	(**0.32**, 0.95) 0.70, 1.30, **1.90**	I
4900.13	125	150	.11	8	80 III E	402.0	(0.00) 0.97 A[1]	II
06.11	8	1	.10	3	6 III A	377.1	(0.00) 1.50 A[2]	I
09.00	2	—	.00	2	2 III	365.1	(0.00) 1.18	I
12.03	1	—	.07	2	tr III A ?	352.4		I
14.81	1	—	—	—		341.0		I
21.88	10	2	.85	3	10 III A	311.8	(0.35) **0.95**, 1.66	I
26.32	1	—	.30	1	tr III A	293.5		I
28.21	2	—	.24	2	1 III	285.6		I
30.93	3	—	.95	2	2 III	274.5	(0.00) 0.83	I
36.			.70	1		250.8		
48.54	1	—	—	—	tr IV	202.4		I
50.66	3	—	.63	2	2 III	193.8	(0.00) 0.96	I
70.			.10	1		114.7		
74.30	5	1	.31	3	10 III ?	097.7	(0.00) 1.08	I
79.			.24	1		077.8		
4982.13	15	15l	.12	5	8 V E	20066.2	(w) 1.56 A[2]	II
5006.96	6	—	.97	3	10 IV	19966.6	(0.00) 0.87	I
24.3	2nl	—	—	—		897.7		Mol
25.2	3nl	—	—	—		894.2		Mol
49.7	2nl	—	—	—		797.7		Mol
50.6	2nl	—	.65	1		794.1		Mol
68.			.82	2		723.0		
70.21	2	—	.18	3	5 V	717.6		I
72.19	3	1	.19	2	5 IV	709.9		I
87.42	50	100l	.42	10	150 V E	650.9	(0.00) 1.22	II
5088.18	1	—	—	—	3 V	647.9		I
5103.70	1	—	—	—		588.2		I
19.12	10	20l	.10	5	15 V E	529.2	(**0.00**, 0.40) 1.39, **1.92**	II
23.21	30	50l	.21	6	40 V E	513.6	(0.00) 0.52 A[1]	II
28.42	1	—	—	—		493.8		I
35.20	4	2	.20	3	25 III	468.0	(0.00) 1.02	I
5196.43	5	10l	.43	3	2 V E	19238.6		II

TABLE 1.—*Wave lengths and Zeeman effects in yttrium spectra*—Continued

Meggers			Eder		King and Carter			
λ	Intensity Arc	Intensity Spark	λ	Intensity arc	Arc intensity and temperature class	ν	Zeeman effect	Spectrum
5200.42	40	60	.41	10	60 V E	19223.9	(0.00) 0.72	II
05.73	50	80	.71	10	80 V E	204.3	(0.00) 1.07	II
28.56	2	—	.50	1		120.5		
40.80	4	2	.79	3	15 IV	19075.8	(0.00) 0.94	I
83.69	2	—	.66	1		18921.0		I
5289.82	4	5l	.81	4	4 V E	899.0	(w) 1.73 A²	II
5320.78	2	4	.77	2		789.0		II
25.84	1	—	—	—		771.2		I
27.12	1	—	—	—		766.7		
75.87	1	—	—	—		596.5		I
80.63	5	1	.61	3	15 III	580.1		I
88.40	1	—	.42	1		553.2		I
5390.82	2	—	.79	1		545.0		I
5402.78	20	50l	.78	6	20 V E	503.9	(0.00) 0.89	II
17.02	2	—	.03	2	3 IV ?	455.2		I
24.36	5	1	.37	3	20 III	430.2	(0.22, 0.66) 1.78 A²	I
38.24	20	2	.24	5	50 II	383.2	(0.00) 1.09 B?	I
66.46	50	10	.45	10	300 II	288.3	(0.00) 1.10	I
68.47	10	1	.46	4	40 III	281.6	(0.39) 1.04	I
69.19	1	—	—	—		279.2		I
73.40	10	20l	.38	5	10 V E	265.2	(0.00) 1.48	II
80.75	10	15l	.72	5	8 V E	240.7	(0.00) 1.48	II
91.46	—	2h	.44	3	1 V	205.1		I
93.18	5	1	.15	3	15 III	199.4	(0.22) 0.62	I
95.61	2	—	.57	3	8 III	191.4		I
5497.42	20	50	.41	5	25 V E	185.3	(0.00) 1.43	II
5501.			.52	1		171.8		
03.34	2	—	—	—	100{5 III / 25 II}	165.8		
03.47	10	2	.43	5		165.4	(0.00) 1.15	I
09.91	30	30l	.90	6	40 V E	144.1	(0.45) 0.76 Bw	II
13.66	5	1	.65	2	20 II	131.8	(0.65)—	I
21.59	10	—	.60	5	} 30 II+E {	105.7		I
21.70	2	20	—	—		105.3	(0.00) 1.46	II
26.75	2	—	.72	2	2 IV	088.8		I
27.56	40	4	.53	8	250 II	086.2	(0.00) 1.03 A¹	I
27.75	10	—	—	—		085.5		I
40.			.61	1		043.6		I
41.64	2	—	.63	2	3 III	040.2		I
44.61	15	10l	.60	5	25 III+E	030.5	(0.00) 1.50	II
46.02	8	10l	.02	4	3 V E	18026.0	(0.00) 1.46	II
56.44	5	1	.42	5	20 I A	17992.2	(0.00) 0.90	I
67.76	5	1	.74	2	15 II	955.6		I
77.43	10	2	.42	3	30 II	924.5	(0.00) 1.06	I
81.08	2	—	.07	1	3 IV	912.7		I
81.88	30	4	.86	5	150 II	910.2	(0.00) 0.92	I
90.96	2	—	.95	2	2 IV	881.1		I
5594.12	2	—	—	—	2 IV	871.0		I
5603.			.26	1		841.8		I
06.34	10	1	.32	3	20 II	832.0	(0.62) 1.20 Bw	I
10.36	1	2	.34	1		819.3		II
19.98	1	—	—	—		788.7		I
23.89	2	—	.90	1		776.3		I
30.15	20	2	.12	6	100 II	756.6	(0.00) 0.71 A²	I
32.25	2	—	.23	1	3 I A	750.0		I
32.92	1	—	.86	1		748.0		I
44.70	10	1	.68	4	20 II	710.9	(0.85) 1.10 Bw	I
46.70	1	—	.66	1		704.6		I
48.48	10	1	.45	4	20 II	699.0	(0.00) 1.06	I
60.			.90	1		660.1		I
5662.95	50	200	.95	8	50 V E	17653.8	(0.00) 0.98	II

TABLE 1.—*Wave lengths and Zeeman effects in yttrium spectra*—Continued

Meggers			Eder		King and Carter			
λ	Intensity		λ	Intensity arc	Arc intensity and temperature class	ν	Zeeman effect	Spectrum
	Arc	Spark						
5669.24	1	—	.19	1	1 IV	17634.2		I
75.29	5	1	.26	3	15 II	615.4	(1.14) 0.82 Bw	I
75.63	1	—	—	—	1 V	614.3		I
86.			.62	1	1 IV ?	580.3		I
5693.63	2	—	.62	1	2 II A	558.6		I
5706.75	15	1	.72	4	30 II	518.3	(0.00) 1.12	I
13.81	1h	—	—	—	3n IV	496.6		I
14.91	1h	—	—	—	3n IV	493.2		I
20.62	2	—	.60	2	3 IV	475.8	(1.23) 1.32	I
23.46	1	—	.43	2	1 IV	467.2		I
28.91	10	10l	.89	4	3 V E	450.5	(0.80w) 1.27 Bw	II
32.10	2	—	.08	1	3 II	440.8	(—) 1.35	I
40.22	1	—	—	—	1 III A	416.1		I
43.87	6	1	.85	3	15 III	405.1	(0.00) 1.28	I
63.58	1	—	—	—		345.5		I
64.22	1	—	—	—		343.6		
65.67	5	1	.63	3	12 III	339.3	(0.00) 1.18	I
73.95	2	—	.93	1	4 IV	314.4	(0.62) 0.48	I
81.69	5	5l	.68	4	2 V E	291.2	(0.00, 0.41) 0.73 A[1]	II
82.68	1	—				288.2		
87.70	1	—	.72	1	1 IV	273.2		I
5797.15	1	—	.16	1	1 IV A	245.2		I
5812.64	2	—	.692	1		199.1		I
18.58	2	—	—	—		181.6		
21.87	3	—	.891	2	4 III	171.8		I
32.25	2	—	.275	2	3 IV	141.3		I
44.			.60	1		105.1		
58.82	1n?l	—	—	—		063.6		
71.80	2	—	.851	1	2 IV	025.8		I
76.13	1	—	—	—		013.3		
79.94	2	—	.971	2	3 IV	17002.2		I
93.94	1h	—	4.043	1u		16961.8		
5895.			.89	1		956.3		
5902.93	4	—	.979	3	7 IV	936.0	(—)1.50	I
12.18	1hn?	—	.20	1BH		909.5		Mol
31.09	1nl		.12	1BH		855.6		Mol
39.06	5nl	—	.035	2BH		833.1		Mol
44.			.871	2		816.6		I
45.71	4	—	.729	4	6 IV	814.2	(0.00) 1.52 B?	I
50.00	3	—	.036	3	5 IV	802.0	(0.64)—	I
56.40	4nl	—	.383	1BH		784.1		
66.			.642	2		755.2		
72.1	100nl	5nl	.05	6BH		740.0		Mol
81.86	3	—	.920	3BH		712.5		I
87.6	80nl	4nl	.640	5BH		696.5		Mol
5992.12	2		—	—		684.0		
6003.6	60nl	3nl	.583	4BH		652.1		Mol
04.65	5	—	—			649.2		
07.64	2	—	.742	3		640.7	(0.00) 1.24	I
09.16	8	1	.227	5	10? IV	636.6	(0.00) 1.40	I
19.9	40nl	2nl	.87	4BH		607.0		Mol
23.40	4	—	.426	3	20? I A	597.3	(—) 0.60, 0.98, 1.36	I
24.26	1p?	—	.330	2u	? III	594.9		I
36.6	30nl	2nl	.600	3BH		561.0		Mol
40.			.283	1		550.9		I
53.8	20nl	1nl	.785	3BH		514.0		Mol
60.			.34	1		496.2		
72.8	5nl		.84	2BH		462.3		Mol
81.			.221	1		439.5		
87.99	2	—	8.010	3		412.2	(0.00) 1.52	I
89.4	10nl	—	.37	2BH		417.5		Mol
6096.8	8nl	—	.77	2BH		397.5		Mol
6107.8	5nl	—	.85	2BH		367.9		Mol
14.7	6nl	—	.760	2BH		349.4		Mol
6122.			.192	2		16329.5		

TABLE 1.—*Wave lengths and Zeeman effects in yttrium spectra*—Continued

Meggers			Eder		King and Carter			
λ	Intensity Arc	Intensity Spark	λ	Intensity arc	Arc intensity and temperature class	ν	Zeeman effect	Spectrum
6127.39	2p	—	.43	1BH		16315.6		Mol
32.1	80nl	6nl	.08	5BH		303.2		Mol
35.04	2	—	.056	2	? III	295.3	(0.00) 1.50	I
38.42	5	—	.456	3	15? I A	286.3	(0.39) 1.28B	I
48.4	70nl	5nl	.38	4BH		259.9		Mol
51.72	2	—	—	—		251.1		
62.			.203	1		223.5		
65.1	60nl	4nl	.059	4BH		216.0		Mol
82.2	50nl	3nl	.233	4BH		171.2		Mol
91.73	50	5	.726	6	100? I A	146.1	(0.00) 0.78	I
6199.8	40nl	2nl	.818	3BH		125.1		Mol
6217.9	20nl	1nl	.929	3BH		078.1		Mol
22.59	10	2	.585	5	50? I A	066.0	(**0.19,** 0.58) 1.75A^2	I
36.7	10nl	—	.690	2BH		16029.7		Mol
51.06	3	—	.045	2		15992.9		I
65.			.08	1		957.1		
75.01	5nl	—	.060	2BH		931.8		Mol
6295.46	3nl	—	.447	1BH		880.1		Mol
6316.20	2nl	—	.367	1BH		827.7		Mol
32.			.23	1		787.9		
38.12	3	—	.150	1	5 I	773.1		I
45.			.98	1		753.7		
57.38	1	—	—	—		725.4		
69.87	1	—	—	—		694.6		
87.08	2	—	—	—		652.3		
6396.			.36	1		629.6		
6402.01	10	2	.025	4	50 I A	615.8	(**0.21,** 0.60) 1.76A^2	I
05.59	1	—	—	—		607.1		
35.02	100	20	.030	7	500 I A	535.7	(0.00) 1.16	I
37.17	3	—	.200	2	5 IV ?	530.5		I
62.59	2	—	.58	1	8 III	469.4		I
82.6	1	—	—	—		421.7		
6493.8	1	—	.77	1	4 V	395.1		I
6501.3	2	—				377.3		I
05.			.44	1		367.5		
18.35	2	—	—	—		337.1		
35.88	2	—	—	—		295.9		
38.59	15	4	.599	4	35 III	289.6	(0.00) 1.12	I
53.88	2	—	—	—		253.9		
57.38	10	2	.435	3	30 I A	245.7	(0.00) 1.37A^2-	I
72.6	2	—	—	—		210.5		
76.86	5	1	.889	2	6 III	200.6	(—) 1.40	I
84.88	2	—	.898	1	5 II A	182.1		I
6595.04	1	—	—	—		158.7		
6602.			.40	1		141.8		
03.			.35	1		139.7		
13.74	25	20	.76	6	15 V E	115.8	(0.00) 1.24W	II
16.			.59	1		109.4		I
22.5	1	—	.50	1	2 IV ?	095.9		I
36.48	2	—	.49	3	2 IV ?	064.1		I
50.60	2	—	.60	2	8 IV	032.1	(0.20) 1.04	I
64.40	2	1	.37	4	3 IV ?	15001.0		I
83.			.26	1		14958.6		
87.57	25	5	.57	6	80 I	949.0	(0.52) 0.63B	I
91.84	2	1	.81	1	2 V	939.5		I
94.75	1	—	—	—	1 V	933.0		I
6699.26	2	1	.32	2	3 IV	922.8		I
6700.71	15	4	.71	5	20 III	919.7	(0.00) 0.89	I
13.19	4	2	.21	3	6 III	891.9		I
35.98	5	2	.99	4	7 III	841.6		I
50.			.26	1		810.2		
54.			.96	2		799.9		
61.			.50	1		785.5		
62.			.16	3		784.1		
6777.			.19	1		14751.3		

TABLE 1.—*Wave lengths and Zeeman effects in yttrium spectra*—Continued

Meggers			Eder		King and Carter			
λ	Intensity: Arc	Intensity: Spark	λ	Intensity arc	Arc intensity and temperature class	ν	Zeeman effect	Spectrum
6785.			.19	2		14733.9		
93.71	25	6	.72	4	80 I	715.4	(—) 1.10B	I
6795.41	20	30	.41	5	15 V E	711.8	(—) 0.83	II
6803.16	1	—	.12	1	1 V	695.0		I
15.16	2	2	.18	2	5 IV	669.1		II
32.49	3	4	.51	3	1 V E	631.9		II
45.24	5	2	.24	4	10 III	604.7	(—) 1.18	I
58.25	3	5	.22	1	1 V E	577.0		II
87.22	2	4	.24	4	8 IV	515.6	(—) 0.99	I
6896.00	5	10	.00	2	3 V E	497.2	(—) 2.21	II
6906.			.34	2		475.5		
08.26	2	—	.36	2	2 III	471.3		I
29.			.17	2		427.8		
33.55	2	2	.56	3	6 II A	418.7		I
50.30	4	4	.34	4	8 IV	383.9		I
51.68	1	3	.69	4	1 V E	381.1		II
53.			.37	3		377.6		
58.04	2	1	.11	2	4 I A	367.8		I
6979.88	4	2	.89	4	8 V ?	323.0		I
7008.95	3	2	.99	3	5 V	263.5		I
09.93	2	2	.93	2	4 V	261.6		I
35.18	3	2	.18	3	5 IV	210.3		I
52.95	4	3	.93	1	10 III	174.6		I
54.28	3	1	—	—	4 V	171.9		I
7075.17	2	1	—	—		130.0		I
7127.92	3h?	1	8.10	2	2 III ?	025.5		I
39.			.74	2		14002.4		
55.			.40	1		13971.6		
91.65	5	2	.68	4	10 III	901.2		I
93.74	1	1	—	—		897.2		II
7195.95	2	1	.94	2		892.9		I
7264.19	7	10	.14	5	8 IV E	762.4		II
7293.10	2	—	—	—		707.8		I
7303.2	1	—	—	—		688.9		I
30.62	2	—	—	—		637.3		
32.97	1	2	—	—		633.3		II
46.47	10	2	.28	4	10 III	608.2		I
88.46	1	1	—	—		530.9		II
7398.80	4	1	—	—		512.0		I
7406.23	1	2	—	—		498.4		II
50.32	5	5	.21	5	5 III ?E	418.5		II
55.20	2	—	—	—		409.8		I
72.2	2	—	—	—		379.3		I
78.8	2	—	—	—		367.5		I
86.4	1	—	—	—		353.9		I
7494.90	5	1	—	—		338.7		I
7526.0	1d	—	—	—		283.6		
36.73	3	1	—	—		264.2		I
53.28	1	—	—	—		235.6		
7563.13	10	4	—	—	5 V	218.4		I
7617.72	4	—	—	—		123.7		I
22.94	5	1	—	—		114.7		I
52.89	3	—	—	—		063.4		I
89.49	2	—	—	—		13001.2		I
7698.00	4	—	—	—		12986.8		I
7719.89	6	1	—	—	2 V	950.0		I
24.08	5	1	—	—	2 IV	943.0		I
88.42	3	—	—	—		836.1		I
7796.32	4	—	—	—		823.1		I
7802.52	2	—	—	—		812.9		I
12.16	5	1	—	—		797.0		I
23.94	1	—	—	—		777.8		I
55.52	7	1	—	—		726.4		I
70.04	2	—	—	—		702.9		I
7881.90	20	10	.69	2	10 V E	12683.8		II

TABLE 1.—*Wave lengths and Zeeman effects in yttrium spectra*—Continued

Meggers			Eder		King and Carter			
λ	Intensity		λ	Intensity arc	Arc intensity and temperature class	ν	Zeeman effect	Spectrum
	Arc	Spark						
7887.51	2		—	—		12675.0		I
7984.8	1		—	—		520.4		
7999.33	3		—	—		497.6		I
8025.60	3		—	—		456.7		I
8066.20	3		—	—		394.0		II
8134.9	3		—	—		289.3		I
65.5	2		—	—		243.3		I
8194.8	3Na?		—	—		199.5		
8211.71	4		—	—		174.4		I
31.23	2		—	—		145.5		I
47.4	1		—	—		121.7		
58.5	2		—	—		105.4		I
8297.07	2		—	—		049.2		I
8326.40	1		—	—		006.7		I
29.61	5		—	—		002.1		I
30.92	1		—	—		12000.2		I
44.43	10		—	—		11980.8		I
8365.64	4		—	—		950.4		I
8443.28	1		—	—		840.5		I
50.36	8		—	—		830.6		I
8475.64	3		—	—		795.3		I
8528.94	4		—	—		721.6		I
52.42	1		—	—		689.4		I
56.04	2d?		—	—		679.0		
75.77	2		—	—		657.6		I
8595.8	1		—	—		630.4		
8627.9	1		—	—		587.2		I
8658.4	1		—	—		546.3		I
8702.1	1?		—	—		488.3		
8759.24	1		—	—		413.4		I
8800.62	10		—	—		359.7		I
31.2	1		—	—		320.4		I
35.85	2		—	—		314.4		II
8876.6	1?		—	—		11262.5		
9231.58	8		—	—		10829.4		I
9392.7	1		—	—		643.6		I
9494.81	2		—	—		10529.2		I

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