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Description and Analysis of the Second Spectrum of Tantalum, Ta II

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The spectrum has been observed from 2000.73 to 7813.40 A. There are 2,629 lines listed, of which 1,890 have been classified. Observed Zeeman patterns are recorded, as well as g-values. These have aided greatly in the work on analysis. The 61 known even levels have been grouped into 26 terms from the $5d^3\ 6s$, $5d^2\ 6s^2$ and $5d^4$ configurations. The odd levels number 164; they have no assigned term designations. No series have been found, but the ionization potential is estimated to be between 16.0 and 16.5 electron volts.

1. Introduction

During the period 1930–1940 the concave-grating and quartz-prism spectrographs of the National Bureau of Standards were used to record photographically the spectra of several elements throughout the region from 1950 A in the ultraviolet to approximataly 13000 A in the infrared. The purpose of the investigations was to acquire data for descriptions of the spectra sufficiently extensive and homogeneous to serve for the analysis of their term-structures. These descriptions as finally tabulated comprise the wavelengths of the spectral lines, their estimated intensities, and their Zeeman effects. Thus far results have been published for the first and second spectra of chromium, Cr I and Cr II, [1],[1] and for the second spectrum of molybdenum, Mo II [2]. This paper presents similar results for the second spectrum of tantalum, Ta II. A subsequent paper will present results for Ta I. It is of interest to note that no detailed description of this spectrum has appeared since the publication of volume 6 of Kayser's Handbuch der Spectroscopie in 1912 [3], although the M.I.T. Tables of Wavelengths [4] do contain new wavelengths and estimated intensities for some of the stronger lines of Ta II.

2. Experimental Procedures

In the spectroscopy laboratory of this Bureau it was a common practice, whenever a spectrograph was adjusted for a given spectral region, to photograph the spectra of several elements during a period of observation. Thus, tantalum was one of the elements investigated concurrently with chromium and molybdenum. It is, therefore, unnecessary to repeat the statements, in the earlier papers, concerning the instruments, techniques, and accessories employed in making the observations. The electrodes used in the light-sources for this investigation were tantalum rods of high purity procured from the Fansteel Co. The only impurities detected in them, from measurements of the spectrograms, were a small amount of niobium (columbium), and a possible trace of wolfram (tungsten).

[1] Figures in brackets indicate the literature references at the end of this paper.

The first observations of the Zeeman effect for this Bureau's work on the spectra of tantalum were made for us by B. E. Moore who used the electromagnet and grating-spectrograph of the Brace Laboratory of the University of Nebraska. His first results showed well-resolved patterns for many of the stronger lines of both Ta I and Ta II. However, his untimely death in 1925, brought to an end his cooperation in the work. With the acquisition of a Weiss water-cooled magnet by the NBS the work was continued here. Our first observations were made with the 21-ft concave grating ruled by Rowland with 20,000 lines per inch. The low reflectance of this instrument in the short-wave regions limited its use to the visible spectrum. Subsequently additional observations were made with the large Hilger E 185 quartz-prism spectrograph, and with the grating-spectrograph carrying the concave grating ruled by R. W. Wood with 30,000 lines per inch. Thus observations of the Zeeman effect, at fields of approximately 35,000 oersteds were obtained for lines of Ta I and Ta II in the spectral range from 2180 to 8300 A. Subsequently the excellent plates obtained at M.I.T. under the direction of G. R. Harrison were sent to the NBS for measurement and study. All lines from 2300 to 7700 A, showing magnetic broadening or splitting, were measured even though many of them were overlaid by the Zeeman patterns of adjacent lines.

3. Results

3.1. Wavelengths, Intensities, and Zeeman Effects

The results of this investigation are presented in tables 1, 2, and 3. The wavelengths listed in the first column of table 1 are, in general, mean values derived from measurements of two or more spectrograms. A few lines, measured only once on a more-strongly exposed plate, have been kept because their reality has been indicated by the term-analysis. Many of the lines exhibit hyperfine structure, which is designated by the letter c after the estimated intensity in the second column. The wavelengths adopted for such lines are weighted means of the

components measured in the complex patterns. It is recognized that this is not a strictly legitimate procedure because in most of the complex lines the fainter components are not fully resolved; but the adopted wavelength is sufficiently close to the undetermined real value to serve the requirements for identification and classification.

The intensities of the lines are estimated values based on the strength of photographic blackening they produce. The number 1 is assigned to the weakest lines measurable on a spectrogram, the stronger ones being graded on a linear scale relative to the faintest. It is obvious that intensities derived in this manner are not comparable in spectral regions that require different types of photographic emulsions to record them. The lines owe their complexity to a nuclear spin of 7/2, measured by McMillan and Grace [5], for the isotope 181, in which all but 0.01 of the nuclear mass is concentrated.

The wave-numbers of the lines in the third column were taken from Kayser's Tabelle der Schwingungszahlen, but have been corrected by the small amounts necessary for conformity with Edlén's [6] formula for the index of refraction of air. These numbers are the basis for the analysis of the term-structure of Ta II, and are equal to the differences between the energy-levels of the Ta atom involved in the production of the spectral lines. These level-differences are given in column 4. In the last column are given the Zeeman patterns from either the M.I.T. or the NBS spectrograms. Those given to only two places of decimals are from the NBS plates; all others from those made at M.I.T. The type of shading in unresolved magnetic patterns, which gives a clue to the J- and g-values of the combining levels, are indicated by letters with the significance, A=◹◺, B=◺◹, C=△, D=□.

3.2. The Systems of Energy Levels

Analysis of Ta II was begun independently and almost simultaneously at three laboratories. When G. R. Harrison of the M.I.T. Spectroscopy Laboratory learned that the problem had been undertaken at the Spectroscopy Laboratory of the NBS he suggested that a joint announcement be made of the first results that had been obtained, and that the necessary continuation of the work be carried on at the NBS with the aid of the M.I.T. data. This suggestion was realized in part in the paper, "Preliminary list of terms of Ta II," [7]. At the same time a similar and somewhat more extensive paper by van den Berg [8] was issued by the Zeeman Laboratory of the University of Amsterdam. This earlier work showed that the prominent low even terms of Ta II arise in the electron configurations $5d^3\,6s$, $5d^2\,6s^2$, and $5d^4$, the clue to their identity having been found in well-resolved Zeeman patterns that are in very close accord with those from levels with Landé g-values.

The further procedure of unravelling the spectrum has followed the conventional practices of combing the spectrum for pairs and groups of lines separated by established level-differences, and of tying together related lines that exhibit the same g-values. These operations have been somewhat tedious; but as the structure of the spectrum began to unfold the work received guidance from the calculations of Trees et al., [9] which narrowed the limits of search for the levels expected theoretically.

In table 2 are listed the low even terms upon which the spectrum is built. The ground state $a\,{}^5\mathrm{F}$ arises in the electron configuration $5d^3(^4\mathrm{F})6s$; but interspersed among its components are levels from the ${}^3\mathrm{F}$ and ${}^3\mathrm{P}$ terms of $5d^2\,6s^2$, which thus becomes a strong competitor of $5d^3\,6s$ in governing the energetic processes of the atom. All of the $5d^36s$ terms have been found; and likewise all but ${}^1\mathrm{S}$ of $5d^2\,6s^2$. The configuration $5d^4$ requires more energy to excite its levels, with the result that only six of its 16 theoretically possible terms have been detected completely or partially. Resolved Zeeman patterns of a small number of unclassified lines indicate that transitions to undetected $5d^4$ levels do occur, but the connecting links have not yet been found.

The g-values that are assigned to the levels in table 2 are, for most of them, mean values derived from two to twenty well-resolved Zeeman patterns. They are sufficiently close to LS-values to justify the designation of the levels with the LS notation, although a study, by Trees [9, 10, 11] of the configuration interaction in tantalum indicates that most of the levels of table 2 are of mixed parentage.

The odd levels in table 3 reveal the extent to which the excited states of the ionized atom have departed from LS-coupling. A few of the lowest odd levels might be uniquely designated with LS-symbols, but to apply this mode of designation to the others would be meaningless. It has seemed best, therefore, for sake of brevity, to give as the designation of the line in table 1 the first three figures of the level-value and the appropriate inner quantum number.

3.3. Series and Ionization Potential

No high levels have been found that can be ascribed unambiguously to the configurations $5d^6\,ns$ and $5d^2\,6sns$. It is impossible, therefore, at this stage of the analysis of Ta II, to calculate an ionization-potential from series-forming terms. An ionization potential of 7.88 ev has been found for the neutral Ta atom; for neutral W this value is 7.98 ev. For the homologous atoms Nb and Mo the estimated second ionization potentials are a little more than twice the first. If this ratio is of physical significance we may expect, therefore, that the ionization potential of singly ionized tantalum lies between 16 and 16.5 ev, which is essentially the same as the interpolated value given by Finkelnburg and Humbach [12].

During its progress the work described above has been aided with observational material from various individuals, and consultations with others. As stated previously, the late B. E. Moore, of the University of Nebraska, made the first magnetic observations that were of significance in analyzing the

spectra Ta I and Ta II. Later G. R. Harrison and W. J. Hitchcock of M.I.T. made available their Zeeman observations and the results which they had obtained from them. At the NBS, R. E. Trees has made numerous theoretical calculations to verify and identify the levels found for the low configurations and to predict the probable positions of others; R. Zalubas has obtained and measured several spectrograms to improve the description of Ta II in the region 2500 to 1950 A; and Mrs. Ruth Peterson has made extensive calculations and tabulations of the data. It is a pleasure for me to acknowledge my indebtedness to them and also to others who have made contributions to this work.

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
7813.40	2	12795.01		
7733.92	2	12926.05		
7606.07	4	13143.78		
7510.64	2	13310.78	$e\ ^3P_2$—413(1)	
6736.86	1	14839.61		
11.75	1	14895.13	$c\ ^3F_3$—385(2)	
6598.80	4	15150.08		**(0.00,** 0.22, 0.16) 0.54 *A*
97.09	5	15154.03	$c\ ^3P_2$—385(1)	
67.94	3	15221.27		
34.22	2	15299.82	$d\ ^3F_4$—468(3)	
00.81	5	15378.45	$b\ ^3G_4$—466(4)	
6496.20	1	15389.36		
05.76	3	15506.64	$c\ ^3F_2$—385(1)	
6374.86	10	15682.38		**(0.00,** 0.27) **1.21,** 1.44
69.04	18	15696.61	$a\ ^1D_2$—292(2)	(0.59, **1.19**) 0.00, **0.52, 1.10,** 1.72
11.50	1	15839.71	$b\ ^3G_4$—440(4)	
6286.85	1	15901.82		
80.22	4	15918.61	$c\ ^3P_1$—421(2)	
73.54	1	15935.55	$c\ ^1D_2$—489(3)	
39.91	1	16021.44	$b\ ^3D_2$—466(4)	
6187.75	3	16156.49		
61.00	2	16226.64		
57.50	5	16235.86	$b\ ^3G_3$—430(2)	
46.46	3	16265.03	$b\ ^3G_4$—444(3)	
34.82	10	16295.89		(0.00) 1.10
22.58	3	16328.46	$c\ ^1G_4$—514(4)	
10.37	1	16361.09	$b\ ^3H_5$—417(4)	
6079.18	3	16445.03	$b\ ^3D_2$—468(2)	
42.47	1	16544.94	$b\ ^3D_3$—471(3)	
17.71	2	16613.02	$c\ ^3F_3$—402(2)	
5989.34	1	16691.70		
80.86	5	16715.37	$b\ ^3G_4$—435(3)	
79.61	1	16718.87		
72.96	1	16737.48	$b\ ^1G_4$—421(4)	
63.72	1	16763.41	$b\ ^3D_2$—471(3)	
53.85	1	16791.20	$c\ ^3P_2$—448(3)	
19.99	1	16887.24	$b\ ^3D_1$—468(2)	
5891.18	1	16969.83	$c\ ^1G_4$—521(3)	
78.31	7	17006.98	$d\ ^3F_2$—468(2)	
62.27	1	17053.51		
38.98	3	17121.50	$b\ ^3H_4$—415(3)	
33.85	1	17136.59		
5798.32	2	17241.59		
94.35	1	17253.41	$a\ ^1F_3$—421(4)	
90.78	2	17264.04		
86.72	1	17276.17	$b\ ^3H_4$—417(5)	
82.90	1	17287.57	$c\ ^1D_2$—503(3)	
53.43	3	17376.12	$c\ ^3F_2$—403(1)	
51.78	15	17381.10	$a\ ^3P_2$—292(2)	(0.91, **1.80**) . . . , **0.52, 1.40,** 2.34
38.10	1	17422.54		

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
5735.53	8	17430.34	$b\ ^3G_3$—442(2)	**(0.00,** 0.39) **0.00***w*, 0.46, 0.85
35.21	2	17431.32	$d\ ^3F_4$—489(3)	
30.44	4	17445.83		
18.33	8	17482.77	$a\ ^1H_6$—417(5)	
16.07	3	17489.69	$a\ ^3G_3$—292(2)	
04.72	12	17524.48	$c\ ^3F_3$—411(2)	(0.000) 0.964
5088.62	1	17574.08	$b\ ^1G_4$—429(3)	
60.32	1	17661.95		
57.40	3	17671.06	d^3F_3— 475(2)	
49.61	1	17695.43		
37.82	1	17732.43		
36.43	8	17736.81	$a\ ^5D_1$—312(1)	
35.95	8	17738.32		
20.19	2	17788.06	$b\ ^3G_5$—490(5)	
04.46	1	17837.98	$b\ ^3D_1$—478(0)	
00.63	18	17850.18	$b\ ^1D_2$—411(2)	
5578.61	1	17927.06	$a\ ^3H_5$—361(4)	
74.46	15	17933.98	$c\ ^3F_3$ -415(3)	
72.20	1	17941.25		
69.80	10	17948.98	$a\ ^1P_1$—413(1)	
62.18	4	17973.57	$c\ ^3P_0$—413(1)	
57.32	4	17989.29	$a\ ^5D_3$—337(2)	
52.64	8	18004.46	$d\ ^3F_4$—495(3)	
52.10	5	18006.20	$b\ ^3G_3$—448(3)	
51.65	4	18007.66		
51.27	3	18008.90		
05.39	7	18158.97	$b\ ^1G_4$—435(3)	
5494.42	7	18195.23	$a\ ^1F_3$—430(2)	
92.94	2	18200.13	$c\ ^3P_1$—444(0)	
71.74	5	18270.65		
63.22	8	18299.14	$c\ ^1D_2$—513(1)	
51.98	3	18336.87		
41.98	3	18370.56	$b\ ^3D_2$—487(1)	
39.40	10	18379.27	$d\ ^3F_3$—482(2)	
16.62	1	18456.57	$b\ ^3D_3$—490(2)	
09.67	6	18480.28	$b\ ^3G_4$—466(4)	
5378.90	4	18585.99		
77.45	3	18591.01	$b\ ^3H_6$—440(4)	
73.62	2	18604.26		
69.73	5	18617.73	$b\ ^3G_3$—454(2)	
69.19	4	18619.64	$b\ ^3G_5$—498(5)	
67.44	4	18625.66	$c\ ^3F_3$—415(3) $c\ ^3F_4$—417(5)	
55.82	7	18666.09	$b\ ^3G_4$—468(3)	
51.10	2	18682.55		
44.57	8	18705.38		
37.24	1	18731.07		
32.66	1	18747.15	$a\ ^1P_1$—421(2)	
27.06	1	18766.86		
21.15	7	18787.71		
20.89	2	18789.33		
18.66	7	18796.50		
06.67	1	18838.97		
01.53	2	18857.23		
01.16	3	18858.55	$b\ ^1D_2$—421(2)	
5292.44	2	18889.62		
90.32	7	18897.19	$c\ ^1G_4$—540(5)	
86.15	2	18912.10	$b\ ^3D_3$—495(3)	
66.48	7	18982.72		(0.00 *W*) 0.93 *A*
60.67	25	19003.70	$b\ ^3G_4$—471(3)	(0.000 *W*) 0.999
55.47	4	19022.48	$b\ ^3D_3$—496(3)	(0.59) 1.16

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
5250. 60	5	19040. 14	$c\ {}^3F_4$—421(4)	
49. 29	7	19044. 91	$b\ {}^1G_4$—444(3)	(0.00 *w*) 1.56
48. 62	3	19047. 31		
46. 44	4	19055. 23	$c\ {}^1G_4$—542(4)	
37. 53	125*c*	19087. 66	$a\ {}^3D_1$—337(2)	(0.00) 0.77 *w*
30. 97	12	19111. 60	$b\ {}^3H_4$—435(3)	(0.00 *w*) 0.94 *w*
29. 91	5	19115. 47	$b\ {}^3G_4$—472(4)	(0.51 *B*) 1.22 *w*
29. 38	4	19117. 39	$b\ {}^3D_1$—490(2)	(**0.00,** 0.36) 1.45
28. 96	4	19118. 92	$d\ {}^3F_2$—489(3)	
03. 70	15*c*	19211. 74	$a\ {}^5D_2$—337(1) $b\ {}^3H_5$—446(4)	(**0.00,** 1.33) 1.58, **2.74**
01. 38	12	19220. 31	$a\ {}^5D_2$—337(2)	(0.72, **1.40**) 0.08, **0.81, 1.52,** 2.25
5196. 01	6	19236. 83	$d\ {}^3F_2$—490(2)	(0.46, **0.98**) 0.39, **0.89, 1.39,** . . .
93. 80	10*c*	19248. 36	$d\ {}^3P_1$—511(2)	(0.00) 1.14*W*
70. 09	6	19336. 65	$a\ {}^5P_2$—312(1)	(0.00) 1.35
65. 88	7	19352. 38		(0.00) 1.12
41. 39	5	19444. 59	$c\ {}^3F_3$—430(2)	(0.00) 1.13
40. 06	1	19449. 60	$b\ {}^1G_4$—448(3)	
39. 40	3	19452. 12		(0.00) 1.44
35. 55	2	19466. 69		(0.00) 1.07
22. 54	5	19516. 11		(0.00) 0.77
11. 51	3	19558. 22	$b\ {}^3G_3$—463(2)	
09. 36	90*c*	19566. 49	$b\ {}^3F_3$—292(2)	(0.534, **1.071** *W*) 0.000, **0.523, 1.064,** 1.600*w*
04. 33	1	19585. 74	$d\ {}^3P_1$—515(2)	
03. 80	5	19587. 80		(0.00) 1.14
01. 85	40	19595. 26	$a\ {}^3D_2$—367(3)	(0.00 *W*) 1.10*w*
5097. 24	20*c*	19613. 00	$b\ {}^3P_1$—369(1) $a\ {}^3G_4$—323(3)	(0.00 *w*) 1.031*w*
85. 35	4	19658. 86	$a\ {}^1P_1$—430(2)	(0.00) 1.06
84. 36	2	19662. 70	$a\ {}^1P_1$—430(0)	
56. 70	25	19770. 22	$b\ {}^3P_2$—382(3) $b\ {}^1D_2$—430(2)	(0.508) 1.111
44. 87	150	19816. 59	$b\ {}^3G_3$—466(4)	(**0.000,** 0.389, 0.751, 1.125) 0.508, 0.892, 1.245, 1.618, 1.986, **2.363**
34. 98	4*c*	19855. 51	$b\ {}^3P_1$—372(2)	
29. 59	12	19876. 80	$c\ {}^3F_4$—429(3)	(0.000 *w*) 0.799*wA*
13. 62	3	19940. 11	$c\ {}^3P_1$—461(1)	(0.000 *w*) 1.354*w*
4999. 20	15	19997. 63	$b\ {}^3H_4$—444(3)	(0.000) 1.075*B*
93. 24	15	20021. 48	$b\ {}^3G_3$—468(2)	
89. 98	10	20034. 56	$b\ {}^3P_2$—385(1)	(**0.000,** 0.973) 1.442, **2.415**
64. 78	12*c*	20136. 28	$c\ {}^3F_2$—430(2)	(0.67) 0.96
62. 34	8*c*	20146. 16	$a\ {}^1D_2$—337(1)	
59. 58	15*c*	20157. 35		(0.183 *W*) 1.187*W*
53. 87	1	20180. 62		
52. 94	1	20184. 38		
50. 77	3	20193. 23	$b\ {}^3H_4$—446(4)	
46. 04	8	20212. 57	$b\ {}^3G_3$—514(4)	(0.000) 1.129
41. 55	12	20230. 93	$a\ {}^5D_1$—337(1)	(1.232) 0.275, 1.512
39. 36	2	20239. 89	$a\ {}^5D_1$—337(2)	
34. 03	10*c*	20261. 74	$a\ {}^3H_4$—361(4)	(0.00*W*) 1.19
06. 94	4	20373. 61	$a\ {}^3G_4$—330(5)	
03. 76	3	20386. 84	$a\ {}^3D_3$—361(4)	
4895. 40	8	20421. 64		
91. 37	1	20438. 47	$c\ {}^1D_2$—534(3)	
90. 27	3	20443. 05	$a\ {}^5P_2$—323(3)	
88. 66	7	20449. 80	$b\ {}^5D_2$—510(3)	(0.24) 1.26
88. 35	6	20451. 07	$a\ {}^5D_3$—361(2)	(**0.000,** 0.533, 1.038) 1.460, 1.978, **2.477**
85. 79	7	20461. 82	$b\ {}^3P_2$—389(3) $c\ {}^3F_4$—435(3)	(0.00*w*) 0.47*w*
79. 88	6	20486. 59	$b\ {}^3G_5$—517(5)	(0.000) 1.170

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length air	Intensity and notes	Wave number	Term combination	Zeeman pattern
4876.40	2	20501.18		(0.00) 1.07
73.19	3	20514.70		
66.79	2	20541.70	$c\ ^3P_1$—467(2)	
64.48	50c	20551.42	$a\ ^5G_3$—323(3)	(0.00*W*) 0.93 *w*
61.03	3	20566.03		(0.000) 0.986
60.51	3	20568.24	$b\ ^3D_1$—505(1)	
59.29	2	20573.38	$b\ ^3D_2$—511(2)	(0.00) 1.12
58.38	7	20577.27	$a\ ^1F_3$—454(2)	(**0.000,** 0.189, 0.372) **0.613,** 0.783, 0.959, . . .
55.51	8	20589.42	$d\ ^3F_4$—521(3)	(0.000*W*) 1.114*w*
43.84	5	20639.00	$c\ ^3F_2$—442(2)	(**0.000,** 0.174, 0.351) **0.719,** 0.906, 1.070, . . .
38.54	1	20661.60		(0.000*W*) 1.225
37.00	2	20668.20	$b\ ^3D_2$—510(3)	
32.95	1	20685.50	$b\ ^3G_3$—475(2)	
32.50	1	20687.43	$d\ ^3F_2$—505(1)	
29.67	10	20699.56	$b\ ^3P_0$—369(1)	(0.000) 0.686*w*
24.98	4	20719.70	$c\ ^1D_2$—537(1)	
08.26	6	20791.72	$b\ ^3D_2$—511(2)	(0.592) 1.045, 1.367
06.37	3	20799.92	$a\ ^1P_1$—442(1)	
05.87	12	20802.09	$b\ ^3F_4$—392(3)	
04.03	10	20810.03	$c\ ^3F_3$—444(3)	(0.129, 0.254, **0.390**) 0.683, 0.819, **0.939, 1.065,** 1.213, 1.333
4798.57	2	20833.72		
94.09	15	20853.18	$a\ ^1P_1$—442(2)	(0.000) 1.302*w*
93.28	3	20856.73		
89.43	4	20873.47	$b\ ^3H_5$—462(4)	(0.00) 1.57
85.68	4	20889.82	$b\ ^3G_4$—490(5)	
78.25	8	20922.33	$c\ ^3F_4$—440(4)	(0.306*w*) 0.974*w*
65.18	4	20979.70		
64.71	4	20981.77		
61.42	7	20996.24	$b\ ^5G_3$—478(3)	(0.360, 0.698, **1.036**) 0.488, **0.844, 1.200,** 1.552, 1.913
60.79	5	20999.04		(0.000*w*) 1.252*w*
59.31	2	21005.59	$c\ ^3F_3$—446(4)	
52.36	3	21036.76	$c\ ^3P_2$—490(2)	
51.96	7	21038.03	$a\ ^5D_3$—367(3)	(0.559, **0.937**) . . ., **1.159, 1.458,** 1.754
36.75	35	21105.60	$a\ ^5D_0$—337(1)	(0.000) 0.270
31.27	8	21130.05		(0.000*w*) 0.704*w*
28.96	5	21140.39	$b\ ^3P_1$—385(2)	(0.000) 0.996*B*
26.84	5c	21149.89		
24.54	3	21160.15	$b\ ^3P_1$—385(1)	
17.93	8	21189.80	$a\ ^3D_3$—397(4)	
15.28	7c	21201.71		
12.37	2	21214.83	$c\ ^3F_3$—448(3)	
11.79	1	21217.42		
08.66	10	21231.52	$b\ ^3H_4$—466(4)	(**0.000,** 0.152, 0.315, 0.465, 0.620) **0.425,** 0.588, 0.744, 0.898, 1.056, 1.208
08.07	1	21234.17	$b\ ^3D_1$—511(2)	
04.54	3	21240.12	$b\ ^3F_4$—397(4)	(0.000*W*) 1.231*w*
4698.46	3	21277.63	$c\ ^3F_2$—442(1)	(**0.000,** 0.442) 0.699, **1.158***w*
86.79	5	21280.60	$c\ ^3F_2$—442(2)	
84.04	3	21243.10		
83.07	20	21347.54	$a\ ^3D_2$—385(2); $c\ ^3F_4$—444(3)	(0.235, **0.402**) 0.864, **1.040, 1.232,** 1.404
79.64	3	21363.20	$b\ ^3D_1$—513(1)	(0.057) 1.017
78.01	10	21370.64	$c\ ^1G_4$—565(5); $b\ ^3G_4$—495(3)	(0.00*W*) 1.47*B*
74.93	2	21384.70		
70.78	2	21403.72		
67.24	4	21419.96		
65.94	1	21425.89		

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
4657.75	3	21463.57		
57.03	2	21466.89		
37.45	5	21557.52	*a* $^3H_6$—397(4)	(0.000*w*) 0.541*A*
29.24	5c	21595.76	*b* $^2F_3$—361(2)	(0.000*w*) 1.004*A*
23.67	5	21621.78	*c* $^1D_2$—546(3) *a* $^1F_3$—464(2)	**(0.000,** 0.123, 0.252) **0.702***w*, 0.813
10.79	10	21682.17	*a* $^5D_2$—361(2)	(0.511, **1.029**) 0.430, **0.951, 1.471,** 1.992
4591.74	10	21772.16	*b* $^3G_4$—499(4)	(0.315, 0.472, **0.637**) 0.647, 0.819, 0.979, **1.129, 1.283,** 1.454, 1.503, 1.769.
89.32	8	21783.61	*b* $^1G_4$—471(3	(0.000) 1.092
85.03	10	21803.99	*b* $^3P_2$—403(1)	**(0.000,** 0.212) 1.404, **1.619**
81.89	10	21818.94	*b* $^3H_6$—478(6)	(0.478, 0.640, 0.798, **0.961**) . . ., 1.088, **1.257, 1.406,** 1.576, 1.740
80.03	10	21827.81	*a* $^1P_1$—452(1)	(0.353*W*) 1.191*W*
79.45	12	21830.56		(0.000) 1.396
79.32	25	21831.18	*a* $^5P_2$—337(1)	
78.21	2	21836.47	*c* $^1G_4$—569(4)	
77.52	4	21839.79	*a* $^5P_3$—337(2)	
74.85	6	21852.52	*c* $^3P_0$—452(1)	(0.000) 1.463
62.99	3	21909.31	*c* $^1G_4$—570(3)	
57.65	3	21934.98		
56.81	3	21939.03	*b* $^1D_2$—452(1)	**(0.000,** 0.353) **0.761,** 1.100
50.90	2	21967.54	*b* $^3G_5$—532(5)	(0.00) 1.06
49.93	4	21972.19		
48.08	7	21981.12	*a* $^1F_3$—468(2)	**(0.000,** 0.118, 0.239) **0.799,** 0.916, 1.035
35.77	8	22040.78	*a* $^3P_1$—454(2)	(0.000) 0.485
30.00	12	22068.89	*a* $^1H_5$—462(5)	(0.376, 0.580, **0.776**) 0.616, 0.815, **1.014, 1.212,** 1.398, 1.595
18.03	5	22127.82	*a* $^3D_2$—392(3)	(0.000*W*) 1.014*A*
14.16	4	22146.32		
13.57	10	22149.22	*b* $^3G_4$—503(3)	**(0.000,** 0.224, 0.435, 0.649) **0.394,** 0.615, 0.842, 1.045
06.74	12	22182.77	*b* $^5F_2$—367(3)	(0.303, **0.555**) 0.835, **0.997, 1.168,** . . .
00.64	10	22212.85	*b* $^5H_4$—466(4)	(0.445, 0.676, **0.906**) 0.432, 0.656, 0.873, **1.093, 1.320,** 1,553, 1.760
4493.45	2	22248.89		(0.000*w*) 0.962*w*
92.82	2	22251.47	*b* $^3G_3$—490(2)	
89.30	40	22268.94	*a* $^5D_2$—367(3)	**(0.000,** 0.300, 0595*w*) **0.562***w*, 0.871*w*, 1.172, 1.466
88.25	1	22274.13		
87.84	1	22276.20		
86.92	1	22280.75		
82.00	4	22305.22	*c* $^5F_2$—452(1)	**(0.00,** 0.80) **0.00,** 0.80
79.82	2	22316.04		
79.18	3	22319.23		
78.05	3	22324.88		
77.61	4	22327.07		
74.67	7	22341.75	*b* $^3G_4$—505(5)	(0.000*W*) 1.214*W*
65.65	6	22386.87	*b* $^3D_2$—530(2)	**(0.000,** 0.211, 0.434) **0.817,** 1.031, 1.252, 1.466
63.34	3	22398.46	*b* $^3H_4$—468(3)	
60.80	5	22411.22	*a* $^1F_3$—472(4)	**(0.000,** 0.215, 0.428, 0.652) 0.983, 1.197, 1.397, 1.612, **1.827**
59.15	6	22419.52	*a* $^1H_5$—466(4) *a* $^3H_4$—382(3)	**(0.000,** 0.205, **0.400,** 0.585) **0.239,** 0.407, . . .
57.95	4	22425.53	*a* $^3F_3$—292(2)	
40.71	4	22512.62	*a* $^5D_4$—397(4)	(0.000*W*) 1.276
39.64	4	22518.04	*c* $^3F_2$—454(2)	
37.81	3	22527.32		(**0.000***W*, 0.109) 1.684*W B*?
25.34	2	22590.78	*a* $^3D_3$—441(2)	(0.00) 1.02
22.94	10	22603.05	*a* $^3D_1$—372(2)	**(0.000,** 0.222*w*) 0.445*w*, **0.632**
22.49	3	22605.35	*b* $^3D_2$—530(2)	
21.36	1	22611.14		
20.24	6	22616.88	*a* $^1D_2$—361(2)	(0.168, **0.320**) 0.777, **0.942, 1.115,** 1.272
18.06	4	22628.01	*b* $^3F_2$—323(3)	

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
4413.89	8	22649.39	*a* $^3H_5$—408(6) *b* $^3F_3$—372(2)	
08.92	3	22674.90	*d* $^3F_4$—542(4)	(0.000) 1.160*w*
03.73	25	22701.66	*a* $^5D_1$—361(2)	(**0.000**, 0.562) **0.399**, 0.950, 1.509
01.13	4	22715.06		
00.32	5	22719.24	*b* $^3D_3$—533(4)	(**0.000**, 0.148, 0.310, 0.469) **0.644**, 0.794
4398.85	3	22726.84		
97.06	8	22736.09	*a* $^5D_2$—372(2) *b* $^3H_4$—471(3)	(**0.000**, 0.113, 0.240, . . .) 0.842*w A*
91.79	2	22763.37	*b* $^3G_3$—495(2)	
90.84	12	22768.28	*a* $^1P_1$—461(1)	(0.000*w*) 0.852*w*
86.77	4	22789.43	*a* $^5D_3$—385(2)	(**0.000**, 0.459) 1.455, 1.876, **2.309**
81.39	8	22817.40	*b* $^3G_3$—476(3)	(0.198, 0.379, **0.560**) 0.478, 0.665, **0.849**, **1.034**, 1.222, 1.390
76.75	5	22841.60	*b* $^3D_3$—534(3)	(0.069) 1.208
74.47	20	22853.50	*a* $^3H_4$—408(6)	(0.434) 1.120
74.21	50	22854.83	*b* $^3P_2$—413(1)	(**0.000**, **0.432**) **1.007**, 1.328
73.06	3	22860.84	*b* $^3D_1$—528(1)	
71.48	1	22869.10		
71.11	2	22871.08	*c* $^3F_3$—464(2)	
63.96	8	22908.51	*b* $^3G_4$—510(3)	(**0.000**, 0.101, 0.206, 0.314) **0.781**, 0.848, 0.969
62.51	2	22916.13		
60.02	4	22929.24	*b* $^3P_1$—403(1)	(0.000*w*) 1.282*B*
58.14	40	22939.13	*b* $^3G_5$—542(4)	(0.000) 1.126
56.42	2	22948.16		
54.27	3	22959.50		
50.21	8	22980.94	*d* $^3F_2$—528(1) *a* $^1P_1$—463(2)	(0.00) 1.48
47.88	15	22993.24	*a* $^5P_1$—337(1)	
46.53	10	23000.39	*a* $^3D_3$—415(3)	(**0.138**, **0.285**, **0.466**) 0.944, 1.085, **1.214**, **1.365**, 1.495, . . .
41.85	2	23025.17	*c* $^3F_3$—466(4)	(0.00) 1.78*B*
41.00	8	23029.68	*c* $^3P_2$—510(3)	(**0.000**, 0.211) **0.764**, 1.005, 1.203, 1.387, . . .
38.24	12	23044.36	*b* $^3H_5$—490(5)	(**0.000**, 0.096, 0.198, 0.290) **0.657**, 0.747, 0.835, 1.032, 1.105, . . .
37.61	4	23047.69	*b* $^3D_1$—530(2)	
35.21	2	23060.44	*b* $^3F_4$—415(3)	
31.15	6	23082.07		
28.79	7	23094.67		
27.58	5	23101.13		
26.21	3	23108.42	*b* $^3G_3$—490(4)	
24.65	5	23116.77	*d* $^3F_4$—546(3)	
21.05	4	23136.04	*a* $^3D_2$—403(1)	(0.000) 1.228*w*
20.38	2	23139.62		
17.86	2	23153.09	*c* $^3P_2$—511(2)	(0.000) 1.319
11.12	2	23180.33		
09.77	1	23196.58	*b* $^1D_2$—464(2)	
07.11	4	23210.88	*c* $^3F_3$—468(3)	
06.83	15	23212.43	*c* $^3F_4$—462(5)	(**0.000**, 0.170, 0.334, 0.516) 0.842, 1.018, 1.199, 1.366, 1.548, 1.722, **1.913**
05.28	3	23220.77		
03.52	15	23230.25	*c* $^3F_2$—468(2)	(0.000) 1.054
4294.02	12	23281.65	*b* $^3F_4$—417(4)	(0.000) 1.250
82.01	8	23346.96		(0.000) 0.996
80.85	3	23353.28	*a* $^1F_3$—482(2)	(0.00) 0.59
79.96	2	23358.13	*c* $^3P_1$—495(2)	
75.69	2	23381.45		
73.68	3	23392.48	*b* $^3H_4$—478(3)	(0.00) 0.34*A*
71.09	7	23406.62		
67.30	30	23427.45	*a* $^1D_2$—369(1)	(**0.00**, 0.35) 0.63, 1.18, **1.59**
65.05	2	23439.80		
64.43	1	23443.18		

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
4263.50	3	23448.32		
62.95	4	23451.32		(0.00) 1.26
61.63	4	23458.59	*c* $^3F_2$—463(2)	
55.92	2	23490.04	*c* $^3P_2$—515(2)	(0.00) 1.41
42.74	20	23563.02	*c* $^3F_2$—464(2) *c* $^3F_4$—466(4)	(0.357, 0.546, **0.721**) 0.667, 0.874, **1.032, 1.214,** 1.385, 1.562, 1.745
41.59	8	23569.15	*a* $^3D_3$—421(4)	(0.000) 1.132
35.93	15	23600.91	*a* $^1F_3$—484(4)	(**0.000,** 0.286, 0.572, 0.859) 0.996, **1.272,** 1.554, 1.826, **2.115**
35.51	7	23603.26	*d* $^3P_1$—555(2) *a* $^1H_5$—478(6)	(0.00) 1.42
30.87	40	23629.16	*b* $^3F_4$—421(4)	(0.000 *W*) 1.248
23.49	6	23670.44	*a* $^1D_2$—372(2)	(0.48, **0.98**) 0.11, **0.63, 1.16,** 1.65
20.09	3	23689.53	*b* $^3F_2$—382(3)	
19.70	1	23691.71		(0.00) 1.06
18.44	12	23698.79		(0.102) 1.186
13.43	4	23726.93	*a* $^3H_6$—417(5)	(0.00*W*) 0.92
13.02	2	23729.27		(0.16) 0.85
09.57	6	23748.71	*c* $^3F_4$—468(3)	(**0.00,** 0.16, 0.36, 0.53) **0.50,** 0.69, . . .
08.42	12	23755.20	*a* $^5D_1$—372(2)	(**0.000,** 0.892)—**0.267***w*,+0.611, 1.493
01.02	15*c*	23797.06	*a* $^1F_3$—486(2)	(0.00*w*) 0.81*w*
00.30	2	23801.10	*d* $^3F_2$—536 (2)	(0.00) 1.19
4190.51	10	23856.70		(0.000*w*) **1.244,** 1.738
87.43	10	23874.27	*b* $^1D_2$—471(3)	(0.000) 1.076
85.06	7	23887.81	*a* $^3D_1$—385(2)	(**0.000,** 0.169) **1.080,** 1.234
83.93	7	23894.22	*c* $^3F_3$—475(2)	(**0.000,** 0.220, 0.428) **0.636,** 0.815
82.43	8	23902.80	*c* $^3F_2$—468(3)	(**0.00,** 0.50, 1.03) 1.13, 1.65, **2.18**
81.64	8*c*	23907.35	*a* $^3D_1$—385(1)	(0.00) 1.20
79.06	15*c*	23922.07	*c* $^3F_3$—468(2)	(0.392, **0.792***w*) **1.098,** 1.497*w*
76.93	25*c*	23934.30	*b* $^3F_3$—385(2)	(0.000) 0.988
76.62	1	23936.09	*a* $^1H_6$—421(4)	(0.00) 0.98*B*
69.03	15*c*	23979.62	*b* $^1P_1$—413(1)	
62.67	60*c*	24016.28	*b* $^3F_2$—337(1)	
62.45	8*c*	24017.54	*a* $^1D_3$—397(4)	
61.20	12*c*	24024.77	*b* $^5D_3$—546(3) *b* $^1F_3$—337(2)	(0.282, **0.532**) . . . ?, 0.536, **0.807, 1.061**
59.02	3	24037.34	*b* $^3H_4$—484(4)	
58.51	3	24040.31	*a* $^1D_2$—385(1)	
55.40	7*c*	24058.29	*a* $^3G_4$—367(3)	(0.162*W*) 0.754*W*
52.19	5	24076.89	*c* $^3P_2$—521(3)	
39.52	7	24150.58	*b* $^1G_4$—495(3)	(**0.000,** 0.220, 0.432, 0.662) **0.438,** 0.657, 0.868, 1.090, 1.310
33.35	5	24186.65	*a* $^3D_2$—413(1)	(**0.00,** 0.71) **0.55,** 1.15
30.22	4	24204.95	*c* $^3F_3$—478(3)	(0.261, **0.382**) 1.18
24.65	8	24237.67	*b* $^3G_5$—555(5)	(0.000*W*) 0.871*A*
20.67	8	24261.03	*b* $^1G_4$—496(3)	(0.000) 1.196*w*
10.10	5	24323.44	*a* $^5D_3$—415(3)	(0.000) 1.183*B*
09.40	4	24327.57	*b* $^3G_4$—524(4) *a* $^5P_3$—367(3)	(0.121) 1.062
4099.42	8*c*	24386.81	*a* $^5D_0$—369(1)	(0.000) 0.682*w*
96.53	8*c*	24409.97	*a* $^3G_3$—361(2)	(0.000) 0.913*B*
94.60	3	24415.52		(**0.00,** 0.36, 0.75, 1.13) **0.73,** 1.10, . . .
86.17	2*c*	24465.88	*b* $^5F_4$—429(3)	(0.000) 0.797*w*
85.07	1	24472.48	*b* $^3H_5$—498(5)	(0.30, **0.52**) 0.27
84.13	2	24478.12	*a* $^5D_4$—417(5)	(0.000) 1.291*A*
75.50	10	24529.94	*b* $^3H_4$—489(3) *b* $^1D_2$—478(3)	(**0.00,** 0.30, 0.60, 0.91) **0.08,** 0.38, 0.68, 1.00
74.43	1	24536.38	*c* $^3P_2$—525(3)	(0.000) 1.454*w*
73.13	7*c*	24544.20	*a* $^5D_4$—417(4)	(0.00*W*) 1.19*W*
66.22	4	24585.95	*c* $^3F_2$—475(2)	(0.58, **1.19**) 0.00*w*, **0.71, 1.30,** 1.88
60.21	4	24622.33	*b* $^3H_4$—490(5)	(**0.000,** 0.237, 0.488, 0.739, 0.991) . . ., 1.702, 1.950, **2.195**
54.15	2	24659.14		

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
4050.00	3	24684.41		(0.073) 1.062
49.09	1	24689.91	*d* $^2F_2$—545(2)	
48.31	2	24694.70		(**0.000**, 0.291, 0.580) 1.149, 1.426, **1.712**
45.02	3c	24714.76	*b* $^3F_2$—392(3)	
40.47	4c	24742.61	*c* $^3F_4$—478(3)	(**0.000**, 0.168, 0.344, 0.522) **0.497**, 0.671, 0.846, 1.020, . . .
34.66	2c	24778.25	*b* $^3P_1$—421(2)	(0.00) 1.23
30.96	10c	24801.00	*a* $^1D_2$—392(3)	(**0.000**, 0.336, 0.662) **0.470***w*, 0.804, 1.137, 1.470
29.08	2	24812.58		(**0.000**, 0.427, 0.845) **0.077**, 0.548, 0.964, . . .
16.82	5	24888.27	*a* $^3P_2$—367(3)	(**0.000**, 0.252, 0.502) **0.666**, 0.914, 1.162, . . .
16.28	7	24891.64	*a* $^3D_4$—421(4)	(0.193*WA*) 1.234*W*
10.49	3	24927.55	*b* $^3D_3$—555(2) *b* $^1D_2$—482(2)	
10.24	5	24929.08	*b* $^1G_4$—503(3)	(**0.000**, 0.224, 0.451, 0.663) **0.640**, 0.849, 1.052
05.97	5	24955.69		(**0.000**, 0.269, 0.518) **0.696**, 0.950, 1.212, . . ., . . .
04.83	3	24962.77	*c* $^3P_1$—511(2)	(0.000*w*) 1.347*w*
3999.39	3c	24996.74	*a* $^3G_3$—367(3)	(0.358, **0.880**) 0.811, **1.314**, **1.815**, 2.332
92.44	10	25040.26	*a* $^5D_1$—385(2)	(**0.000**, 0.489) **0.513**, 1.007, 1.497
92.15	1	25042.05	*c* $^1D_2$—580(1)	(0.000) 0.850
90.76	10	25050.83	*b* $^3F_4$—435(3)	(**0.000**, 0.158, 0.329, 0.484) 0.952, 1.083, 1.229, 1.370, **1.504**
89.32	2	25059.81	*a* $^5D_1$—385(1)	(1.04) 0.50, 1.39
87.96	3	25068.41	*a* $^1F_3$—499(4)	(**0.000**, 0.260, 0.505) 1.073, 1.356, 1.578, **1.830**
87.82	2	25069.29	*b* $^3G_4$—532(5)	
86.21	3	25079.37		(0.000) 1.023
84.58	2	25089.65	*b* $^3H_4$—495(5) *c* $^1G_4$—602(3)	(0.00*wD*) 0.80*A*
84.26	12	25091.68	*c* $^3P_1$—513(1)	(0.623) 1.046, 1.336
80.99	25c	25112.28	*a* $^5P_3$—369(1)	(**0.000**, 0.868) 0.680, 1.418, **2.151**
75.64	8	25146.06	*b* $^3D_2$—555(2)	(0.000) 1.049
74.19	6	25156.22		(0.496) 1.225*W*
72.99	18c	25162.84	*b* $^3F_3$—397(4)	(**0.000**, 0.217, 0.442*w* 0.781*w*) 0.768, 0.996, 1.213, 1.399, 1.637*w*, **1.875***w*
70.57	10	25178.16	*b* $^3G_4$—533(4)	(0.148) 1.099*W*
69.70	2	25183.72	*b* $^3G_5$—564(5)	
64.96	4	25213.80	*b* $^3H_4$—496(3)	(0.000) 0.890
61.60	20	25235.18	*b* $^3D_3$—558(2)	
58.55	3	25254.63	*b* $^3G_4$—565(5)	(0.00*W*) 0.58
57.62	4	25260.58	*a* $^1P_1$—486(2)	(0.000) 1.130
56.35	2	25268.66		
54.68	5	25279.37	*b* $^3H_6$—506(6)	
52.70	7	25292.04	*b* $^3G_3$—521(3)	(0.478, **0.738**) 0.368, 0.593, **0.841**, **1.094**, 1.329
51.50	10c	25299.67	*c* $^3P_1$—515(2)	(**0.000**, 0.113) 1.196, **1.310**
44.85	10	25342.31	*c* $^3F_2$—489(3)	(0.195, 0.394, **0.602**) 0.675, 0.874, **1.071**, **1.271**, 1.462, 1.674
43.78	10	25349.23		(0.000) 0.867
42.84	5	25355.26	*a* $^5P_2$—372(2)	(0.84, **1.58**) 0.16, **0.64**, . . .
41.86	3	25361.52		(**0.00**, 0.22, 0.42) 0.89*A*
41.65	3	25362.91		
40.52	4	25370.20	*a* $^1P_1$—487(1)	(0.44) 0.75, 1.37
40.26	6	25371.86	*b* $^1D_2$—486(2)	(0.069) 1.133
36.68	10	25394.90	*c* $^3P_2$—487(1)	(0.000) 1.818
35.90	3	25399.93		
35.57	12	25402.11	*a* $^1D_2$—389(3)	(**0.000**, 0.122, 0.230) **0.763**, 0.874, 1.007, 1.142
32.85	1	25419.66		
27.92	5	25451.56	*a* $^1D_2$—440(4)	(**0.000**, 0.843) 1.600
26.48	7	25460.90		
26.02	12c	25463.88	*a* $^1G_2$—372(2) *a* $^5P_1$—361(2)	(0.00) 0.85*w*
24.56	5c	25473.38	*b* $^3D_2$—558(1)	(0.000) 1.066
24.15	2	25476.00		
22.44	60c	25487.09	*a* $^3F_3$—323(3)	(0.226, **0.359**) 0.817, **0.940**, **1.074**, 1.214

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wavelength λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
3917.62	8	25518.48	$b\ ^4D_3$—561(4)	(0.000) 1.316
15.97	2	25529.20	$d\ ^4F_4$—570(3)	(**0.000**, 0.284, 0.557, 0.846) **0.335**,, 0.590, 0.853, 1.142, 1.420, . . .
14.05	7	25541.78		
12.14	1	25554.22	$a\ ^4P_2$—312(1)	
10.48	5	25565.03	$b\ ^4D_1$—555(1) $a\ ^4G_4$—382(3)	(0.00) 1.24
06.01	2	25594.32		
03.15	1	25613.07	$b\ ^4D_2$—560(2)	(0.000) 1.066
02.10	2	25619.97		(0.000*w*) 0.000*w*
3899.91	2	25634.33		(0.00) 0.00
98.48	1	25643.73		
96.61	10c	25656.04		
95.97	2	25660.29	$a\ ^4H_3$—498(5)	
95.50	2	25663.39	$b\ ^4G_3$—524(4)	(**0.000**, 0.247) 1.592
93.31	8	25677.82		(0.00) 0.95
92.10	2	25685.77		
91.90	2	25687.08		
91.55	10	25689.43	$b\ ^4P_1$—430(2)	(**0.000**, 0.187) 0.844, **1.061**
90.16	1	25698.59		
89.42	20c	25703.52	$a\ ^4H_4$—415(3)	(0.000*W*) 1.071*wA*
88.68	20	25708.39	$d\ ^4F_3$—552(2)	(0.394*W*) 1.060*WD*
88.20	4	25711.56	$a\ ^4H_5$—499(4)	
85.32	8	25730.63		
84.56	3	25735.62	$a\ ^4D_2$—392(3)	(0.000*w*) 1.172*w*
84.18	2	25738.19	$c\ ^4F_3$—486(2) $a\ ^6D_2$—402(2)	
77.02	4	25785.03	$b\ ^4D_3$—490(2)	(0.204, **0.411**) 0.902, **1.111**, **1.315**, 1.518
73.38	10	25809.92	$a\ ^6D_2$—403(1)	(**0.000**, 0.242) 1.233, 1.466, **1.700**
72.01	2	25819.07	$a\ ^4H_5$—440(4)	(0.00) 1.04
70.64	35c	25828.20	$a\ ^6D_3$—415(3)	(0.254, 0.504, **0.778**) 0.687, 0.948, **1.202**, **1.454**, 1.711, 1.959
67.74	10	25847.56	$c\ ^4F_2$—487(1)	(0.000) 0.671
66.24	50c	25857.57	$a\ ^6H_4$ 417(5)	
62.89	2c	25880.03	$c\ ^4F_4$—489(3)	(**0.000**, 0.250, 0.523, 0.800, . . .) **0.536**, 0.790, 1.006, 1.258
62.62	2	25881.82		
61.96	3	25886.30		
60.50	7	25896.07	$b\ ^4D_1$—558(2) $a\ ^6D_2$—430(2)	
59.36	2c	25903.69		
57.56	15	25915.79	$b\ ^4D_1$—558(1) $c\ ^4F_3$—495(3)	(0.243, 0.475, **0.716**) 0.589, 0.836, **1.072**, **1.308**, 1.544, 1.771
56.93	3	25920.03		
56.33	10c	25924.05	$a\ ^4H_4$—417(4)	
54.83	2c	25934.11	$a\ ^6D_4$—385(1)	(0.000) 0.127, **0.476**
54.15	1	25938.71		
52.61	1	25949.06		
51.84	4	25954.24	$c\ ^4G_4$—611(4)	(0.137*w*) 1.049*w*
49.15	4	25972.42	$c\ ^4F_5$—490(5) $c\ ^4F_3$—495(2)	
45.62	3	25996.24		(0.000*W*) 1.067 *A*
43.02	2	26013.80		
42.70	2	26015.99	$d\ ^4F_2$—558(2)	
37.48	1	26051.37		
35.36	12	26065.75	$b\ ^4H_5$—514(4)	(0.000*WD*) 0.791 *A*
34.13	2	26074.11	$b\ ^4H_4$—505(5)	
33.74	100c	26076.80	$a\ ^4F_2$—292(2)	(0.220, **0.460**) 0.278, **0.517**, **0.743**, 0.977
31.17	15	26094.28	$b\ ^4G_4$—514(4)	(0.102*w*) 1.113*w*
30.00	2c	26102.28		(0.000*W*) 1.531 *A*
28.07	2	26115.40		
25.58	6c	26132.40	$b\ ^4F_4$—446(4)	(0.000*W*) 1.238*w*
23.82	8	26144.43		(0.000) 1.135

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
3822.72	5	26151.97	*c* $^3F_2$—490(2)	(0.603, **1.222**) 0.081, **0.696, 1.303,** 1.917
21.96	1	26157.14		
21.76	1	26158.54		
19.80	2	26171.93		
14.07	6	26211.30		(0.00) 0.88 *A*
09.39	2	26243.50		(0.00*w*) 1.00
08.09	7	26252.40		
07.79	3	26254.51		
07.49	5	26256.54	*a* $^3G_4$—389(3)	(0.000) 1.013 *A*
04.92	5c	26274.29	*a* $^5P_1$—369(1)	
04.06	3	26280.23		
03.11	4	26286.80		(0.00) 0.88
02.10	1	26293.78		
01.75	4	26296.20		
3798.71	12	26317.25	*c* $^3F_3$—499(4)	(**0.000,** 0.137, 0.281, 0.433) 1.219, 1.348, 1.490, **1.631**
97.62	4	26324.79	*c* $^1D_2$—593(2)	(0.18) 1.16
96.21	15c	26334.60	*b* $^3P_2$—448(3)	(**0.000,** 0.194, 0.442) **0.823,** 1.058, 1.258, 1.430
95.20	20c	26341.62	*b* $^3F_4$—448(3)	(0.000*w*) 1.228 *B*
91.60	15c	26366.59	*a* $^3F_4$—361(4)	(0.229*w*) 1.225*w*
88.98	2	26384.81	*a* $^3D_3$—435(1)	(0.000) 0.985
88.44	1	26388.57		(0.00*w*) 1.52 *B*
87.26	25c	26396.83	*a* $^5D_3$—421(4)	(**0.000,** 0.197, 0.412, 0.660) **0.581,** 0.799, 1.053, 1.266, 1.455, 1.655
86.94	2	26399.07	*a* $^3H_5$—445(5)	
85.84	3	26406.69		
85.36	4	26410.03		
83.58	2	26422.46		
82.91	50	26427.20	*a* $^5D_3$—421(2)	(**0.000,** 0.248, 0.500) 1.003, 1.212, 1.453, 1.703, **1.955**
82.19	1	26432.22		
81.54	2	26436.73	*c* $^1G_5$—615(6) *b* $^3D_3$—570(3)	(0.28) 1.36
81.08	2	26439.96	*c* $^3F_4$—495(5) *a* $^3H_5$—446(4)	(**0.000,** 0.178, 0.364, 0.534, 0.693) **0.159,** 0.339, 0.503, 0.660, 0.834, 0.940
79.14	20	26453.53	*c* $^3F_3$—495(3)	**0.000,** 0.282, 0.571, 0.852) **0.179,** 0.459, 0.744, 1.020, 1.308, 1.596
75.25	8	26480.77	*a* $^1P_1$—498(1)	(0.815*w*) 1.283, 1.990
74.41	15c	26486.68	*b* $^3F_2$—361(2)	(0.107, **0.216**) 0.837, **0.964, 1.067,** 1.187
73.98	2	26489.70	*c* $^3P_2$—545(2)	
71.17	5	26509.42	*d* $^3F_4$—580(4)	
70.45	3	26514.53	*b* $^3G_3$—533(4)	
70.03	7c	26517.43	*a* $^3D_1$—411(2) *a* $^5P_1$—372(2)	(**0.000,** 0.508) 0.610, **1.124**
68.98	5	26524.86		
68.70	20	26526.79	*a* $^5P_3$—389(3)	
66.43	10	26542.80	*c* $^1G_4$—616(3)	(**0.000,** 0.152, 0.305, 0.459) 0.921, 1.082, 1.228, 1.391, **1.539**
65.67	12	26548.18	*a* $^5D_1$—400(0)	(0.000) 1.504
63.44	60c	26563.89	*b* $^3F_3$—411(2) *c* $^3F_4$—496(3)	(**0.000,** 0.170, 0.377) **0.593,** 0.802, 0.998, 1.159
59.42	2	26592.30	*b* $^1D_2$—498(1)	
57.70	5	26604.48	*c* $^3P_2$—546(3)	
57.29	10c	26607.35	*d* $^3F_2$—564(3) *c* $^3F_2$—495(3)	(**0.00,** 0.58, 1.16) 0.74, 1.38, 1.94, **2.47**
56.88	20	26610.28	*a* $^1F_3$—514(4)	(**0.000,** 0.139, 0.283, 0.432) 0.983, 1.114, 1.255, 1.397, **1.545**
56.27	4c	26614.57	*a* $^5F_3$—292(2)	(**0.00,** 0.75) 0.29
53.32	5	26635.51		
52.70	6	26639.90	*a* $^5P_2$—385(2)	(0.463, **0.824**) 0.602, **1.002, 1.404,** . . .
52.53	5	26641.13	*b* $^5H_4$—510(3)	(0.00*W*) 0.67
51.36	6	26649.41		
50.51	3	26655.44	*b* $^3D_3$—570(3)	
49.92	10c	26659.66	*a* $^1P_2$—385(1)	
49.13	5	26665.25		(00.0) 0.88*w*
48.02	15c	26673.14	*a* $^1D_2$—402(2)	(0.000*W*) 1.100 *A*

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
3746.00	2	26687.56		
45.07	3	26694.16	*c* $^3F_2$—503(3)	(0.196, 0.414, **0.613**) . . . ?
43.80	1	26703.27		
40.55	4	26726.47		
37.50	15*c*	26748.22	*a* $^3G_2$—385(2)	(0.000*W*) 0.798*w*
33.95	4	26773.68	*b* $^3G_5$—580(4) *a* $^5D_4$—440(4)	(0.292) 1.169*w*
33.41	8	26777.57		(0.000, 0.194, 0.383, 0.560, **0.750**) 0.602, 0.845, 1.033, **1.219, 1.404,** 1.588, 1.738, . . .
21.94	25*c*	26860.10	*a* $^5P_3$—392(3) *a* $^5D_2$ 413(1)	(**0.000,** 0.293, 0.547) **0.917,** 1.169, 1.463, 1.768, 1.976
18.60	12*c*	26884.18	*a* $^3F_3$—337(2) *b* $^3P_1$—442(2)	(**0.000,** 0.309, 0.581) 0.047, 0.429, 0.865, 1.176, 1.395, 1.457, **1.651**
17.49	4	26892.24	*a* $^5F_3$—330(5)	
07.52	6	26964.56	*c* $^1G_4$—621(4)	(0.084*w*) 1.058*wD*
00.26	20*c*	27017.41	*a* $^3F_4$—367(3)	(0.000*W*) 1.324*w*
3699.98	8	27019.46	*b* $^1D_2$—503(3)	(0.00) 1.16
98.20	7	27047.10	*b* $^4H_4$—514(4)	(0.124, 0.265, 0.411, **0.560**) . . ., **0.999, 1.141,** 1.265, 1.406, 1.535
95.26	25*c*	27053.97	*c* $^1G_4$—622(5)	
94.50	50*c*	27059.53	*a* $^5D_2$—415(3) *b* $^3P_1$—444(0)	(**0.000,** 0.266, 0.531) **0.673,** 0.941, 1.201, 1.460, 1.710
92.62	12*c*	27073.32	*b* $^3F_2$ 367(3)	(**0.000,** 0.113, 0.236) **1.174,** 1.286, **1.404**
91.85	25	27078.98	*b* $^3H_5$—524(4)	(0.000) 0.969*w*
91.13	4	27084.24	*c* $^3P_2$—551(3)	(0.26) 1.13
90.77	10	27086.92	*a* $^3P_2$—389(3)	(**0.000,** 0.420, 0.840) **0.155,** 0.584, 1.013
90.23	1	27090.87	*a* $^3D_2$—442(2)	(0.00) 1.32*B*
89.60	8	27095.52		
89.25	3	27098.04		(**0.00,** 0.50) . . . , 1.41, **1.74**
88.25	2	27105.41		
82.22	12	27149.82	*c* $^3P_0$—505(1)	(0.000) 1.359
79.83	3	27167.47	*b* $^3D_3$—577(2)	(**0.000,** 0.202, 0.430) . . ., 1.464, **1.666**
76.09	10*c*	27195.05	*b* $^1G_4$—525(3) *a* $^3G_3$ 389(3)	(0.289*W*) 0.941*w*
73.28	8	27216.91	*b* $^3G_4$—553(4)	(0.109) 1.028*w*
73.07	4	27217.42	*d* $^3F_2$—570(3)	
70.96	5	27233.07	*b* $^3D_1$—571(1)	
69.84	2	27241.42		(0.00) 0.90
67.08	10	27261.89	*a* $^3D_3$—444(3)	
62.34	50	27297.19	*b* $^3F_2$—369(1)	(**0.000,** 0.377) 0.393, 0.687, 1.055, **1.424**
59.18	6	27320.72	*b* $^3H_4$—517(5)	(0.00*W*) 1.52*B*
58.40	2	27326.56		
56.64	5	27339.72	*b* $^3G_4$—555(5)	(**0.000,** 0.459) 1.119
56.51	10	27340.71		
54.81	50	27353.41	*a* $^5D_4$—445(5)	(0.000*W*) 1.440*W*
51.54	7	27377.87	*b* $^3G_3$—542(4) *b* $^3G_4$—555(3)	
49.32	7*c*	27394.58	*a* $^5D_4$—446(4)	(0.145, **0.522**) 1.201*w*
48.18	4	27403.14	*d* $^3P_1$—593(2)	(0.00) 1.29
45.88	10	27420.41	*a* $^5P_2$—392(3)	(**0.000,** 0.284) **0.574,** 0.866, 1.140
45.44	20	27423.09		(0.000*W*) 1.330
44.31	25	27432.20	*b* $^3H_6$—528(6)	(**0.000,** 0.098, 0.206, 0.309, 0.418, 0.517) 1.393, 1.464, 1.585, **1.675**
41.47	35	27453.60	*c* $^3F_3$—510(3)	(0.260*B*) 1.106*w*
40.79	3	27458.71		(0.000*W*) 1.243*w*
37.69	7*c*	27482.11		(0.000*w*) 0.786
34.34	2	27507.46	*c* $^3P_2$—555(2)	
31.93	25	27525.72	*a* $^3D_1$—421(2)	(**0.000,** 0.369) 0.838, 1.207, **1.573**
31.71	20	27527.41	*a* $^1H_5$—517(5)	(0.355, 0.473, **0.593**) . . . **0.988, 1.102,** 1.201
31.48	10	27529.14	*a* $^3G_3$—392(3)	(0.517, **0.762**) 0.687, **0.914, 1.139,** 1.380
30.01	15	27540.25	*b* $^3F_2$—372(2)	(0.438, **0.867**) 0.185, **0.613, 1.050,** 1.462
28.68	50*c*	27550.41		(0.407*B*) 0.782, **1.583***W*
26.10	5	27569.95	*a* $^1G_4$—417(4)	
24.17	25	27584.64	*a* $^1D_2$—411(2)	(0.101*B*) 1.129*w*

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
3622.37	1	27598.35		
21.62	8	27604.04	$a\ ^5D_4$—448(3)	(0.000w) 1.001A
19.96	4	27616.76		(0.000W) 0.672A
19.08	8	27623.47	$a\ ^1F_3$—524(4)	**(0.000,** 0.113, 0.230, 0.346) **1.217,** 1.328, **1.430**
14.51	15	27658.40	$a\ ^5D_2$—421(2)	(0.255, **0.509**) 0.959, **1.212, 1.467,** 1.719
13.41	30c	27666.83	$a\ ^3D_2$—448(3)	(0.000W) 1.305w
13.05	7	27669.56	$a\ ^5D_1$—411(2)	**(0.000,** 0.345) **0.811,** 1.156, 1.513
10.60	40	27688.35	$b\ ^3H_4$—521(3)	**(0.000,** 0.112, 0.232, 0.343) **0.632,** 0.756, 0.863, 0.980, 1.077
10.23	4	27691.20		
09.95	60c	27693.33	$a\ ^3H_4$—435(3)	(0.000w) 1.219w
08.56	10	27703.96	$a\ ^5D_0$—403(1)	(0.000) 1.253
3599.20	8	27776.04		(0.000D) 0.708w
90.80	7	27779.08	$b\ ^1D_2$—510(3)	(0.000w) 1.234 B
95.79	20c	27802.38	$a\ ^5P_1$—385(2)	**(0.000,** 1.356WD) **0.350**WD, 1.005, 2.355
94.13	4	27815.19	$c\ ^3P_2$—558(2)	(0.00) 1.30
93.73	10	27818.31	$a\ ^5D_3$—435(3)	(0.379, **0.751**) 0.328, 0.715, **1.087, 1.461,** 1.837, 2.205
93.53	8	27819.87	$b\ ^3G_3$—546(3)	(0.273) 0.936
93.14	7	27822.90		
92.44	5	27828.29	$b\ ^3D_1$—577(2)	(0.098) 1.143
91.61	5	27834.73	$c\ ^3P_2$—558(1)	(0.000w) 1.315w
90.50	8	27843.34	$c\ ^1D_2$—608(2)	(0.144) 1.072w
89.74	10	27849.22	$a\ ^5H_4$—437(5) $b\ ^1G_4$—532(5)	(0.000) 1.356B
88.42	7	27859.48	$b\ ^5P_1$—452(1) $c\ ^5F_3$—514(4)	(0.000w) 1.244B
87.14	3	27869.41	$b\ ^3D_2$—582(2)	
85.83	8c	27879.60	$a\ ^3D_1$—413(1)	(0.387) 1.491
82.86	4	27902.72	$a\ ^5F_4$—323(3) $b\ ^1D_2$—511(2)	**(0.000,** 0.363, 0.730, 1.083) . . ., 1.709, **2.018**
80.89	10	27918.03	$b\ ^3P_0$—442(1) $a\ ^1G_4$—421(4)	(0.000) 0.257, 1.717
79.42	300	27929.48	$b\ ^3H_5$—533(4)	(0.000w) 0.895A
77.42	5	27945.10	$c\ ^3P_0$—513(1)	(0.000) 1.045
75.78	20	27957.98	$b\ ^3G_4$—533(4)	(0.000) 1.089
73.42	125c	27976.39	$a\ ^3G_5$—397(4)	**(0.000,** 0.308, 0.610w, 0.924w) 0.000, . . ., 0.596, 0.912, 1.212, 1.500, 1.839w, **2.118**w.
71.52	25	27991.29	$c\ ^5F_4$—510(3)	**(0.000,** 0.088, 0.266, 0.393) **0.628,** 0.766, 0.898, 1.033, 1.168
71.15	20	27994.21	$a\ ^1D_2$—415(3)	**(0.000,** 0.100, 0.191) 1.400B
69.82	10	28004.64	$a\ ^3G_3$—408(6)	
66.84	10	28028.02		
66.37	6	28031.74	$b\ ^1D_2$—513(1)	(0.000) 1.14
65.57	250	28037.98	$b\ ^3H_6$—540(5)	(0.000 W) 0.782A
64.22	40c	28048.62	$a\ ^5P_2$—337(1)	**(0.000,** 1.039w) 1.324, **2.418**w
63.12	3	28057.31	$a\ ^5P_3$—337(2)	
62.08	10	28065.50	$a\ ^3D_2$—452(1)	**(0.000,** 0.248) **0.954,** 1.209, 1.463
61.27	15c	28071.88	$b\ ^5P_1$—454(2)	(0.000) 1.161w
60.87	20c	28075.04		
60.20	7	28080.26	$b\ ^1G_4$—534(3)	**(0.000,** 0.127, 0.258, 0.393) 0.749w
58.73	45c	28091.89	$a\ ^3D_3$—466(4)	**(0.000,** 0.148, 0.326, 0.503) **0.709,** 0.896, 1.040, 1.215, 1.358
56.94	3	28106.05	$b\ ^3D_1$—580(1)	(0.137) 1.005, 1.160
54.14	3	28128.18	$a\ ^1P_1$—515(2)	(0.000) 1.408
53.16	4c	28135.93		
52.83	3	28138.53		
52.45	7	28141.52	$a\ ^1F_3$—530(2)	**(0.00,** 0.47) **0.62,** 1.10
51.98	12	28145.26	$c\ ^5F_2$—510(3)	**(0.000,** 0.451, 0.899) 1.600, **2.053**
51.12	60c	28152.10	$b\ ^5F_4$—466(4)	(0.000W) 1.219w
50.91	30c	28153.74	$a\ ^3H_4$—440(4)	(0.000W) 1.44W
50.05	8	28160.55	$d\ ^5F_4$—596(5)	(0.150, 0.302, **0.449**) . . .?
42.22	75	28222.83		(0.000) 1.129
41.88	70	28225.52	$a\ ^5F_2$—292(2)	(0.489, **0.971**) 0.000, **0.513, 1.002,** 1.487

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
3539.20	7	28246.88		
37.98	2	28256.65		
36.96	3	28264.80		(**0.00,** 0.32, 0.65) 0.78, 1.14, 1.48, **1.81**
36.71	8	28266.81	*a* $^1H_5$—524(4)	(0.000) 0.736
35.40	35	28277.25	*a* $^3D_3$—468(3)	(0.316 *W*) 0.800, 0.926, 1.071, **1.198, 1.351,** . . .
34.36	3	28285.57	*b* $^3G_4$—564(5)	(0.00 *W*) 0.73 *A*
32.66	20*c*	28299.16	*c* $^3P_1$—545(2) *b* $^3G_3$—551(3)	(**0.000,** 0.297) **0.717,** 1.000
31.80	4*c*	28306.06	*d* $^3F_4$—598(5)	
31.13	10*c*	28311.47	*b* $^3D_1$—582(2)	
30.30	1	28318.07		
30.03	1	28320.27		
28.74	45*c*	28330.65	*b* $^3P_2$—468(3)	(**0.000,** 0.236, 0.430) **0.794***w*, 1.215, 1.484, . . .
28.27	4	28334.39	*c* $^1G_4$—634(4)	(0.000) 1.212
26.34	20*c*	28349.92	*b* $^3P_2$—468(2)	(0.346, 0.594, **0.810**) 0.760, **1.088, 1.435,** 1.733, 1.965
25.52	15	28356.50	*b* $^3G_4$—565(5)	(0.000 *W*) 0.881 *A*
25.07	3	28360.11		
24.72	2	28362.96		
24.55	6	28364.31		
23.16	90*c*	28375.47	*a* $^3P_1$—337(1)	(1.284) 0.267, 1.547
22.64	3	28379.65		
22.16	2	28383.55		
22.04	6	28384.49	*a* $^3P_1$—337(2)	(0.000) 0.920
21.47	50	28389.13		(0.000) 0.830
19.27	10	28406.87	*c* $^3P_2$—564(3)	(**0.000,** 0.178, 0.356) **0.840,** 1.015, 1.197
17.82	2	28418.53		
17.01	10	28425.10	*b* $^3G_5$—596(5)	(**0.000,** 0.150, 0.311, 0.477) 1.282, 1.440, **1.596**
15.04	3	28441.04	*a* $^3D_1$—430(0)	(0.000) 0.857
12.01	7*c*	28465.58	*a* $^5D_2$—429(3) *a* $^3G_3$—402(2)	
06.66	2	28508.98		
01.35	10	28552.28	*c* $^1G_4$—637(5) *b* $^3G_4$—563(4)	(**0.000,** 0.180, 0.366, 0.518) 0.837, 1.017, 1.200, **1.371, 1.566**
3499.06	25	28570.92	*b* $^3G_5$—598(5)	(0.000*w*) 1.010*w*
96.36	12	28592.98	*a* $^1D_2$—421(2)	(0.125, **0.207**) 1.057, **1.162, 1.260,** 1.361
95.98	10	28596.12	*a* $^1F_3$—534(3)	(0.258, 0.495, **0.732**) . . . ?
94.80	20*c*	28605.79	*c* $^3F_2$—515(2)	(0.600, **1.192**) 0.108, **0.699, 1.313,** 1.891
93.82	3	28613.76		
93.04	75	28620.14	*a* $^1H_5$—528(6)	(**0.000,** 0.156, 0.299, 0.449, 0.592, 0.767) 1.005, 1.148, 1.302, 1.446, 1.587, 1.769, **1.918**
87.80	25	28663.16	*a* $^5F_4$—330(5) *b* $^1G_4$—540(5)	(**0.000,** 0.110, 0.222, 0.332, 0.445) . . . , 1.541, 1.648, 1.766, **1.875**
87.31	20	28667.21	*c* $^1D_2$—616(3)	
87.16	20*c*	28668.38	*b* $^3P_2$—471(3)	(**0.000,** 0.350) 0.906
86.85	25	28670.96	*c* $^3F_4$—517(5)	(**0.000** *W*) 1.189, 1.312, 1.407, **1.498**
86.29	8	28675.58	*b* $^3F_4$—471(3)	
86.01	30	28677.85	*a* $^5D_1$—421(2)	(**0.000,** 0.297) **0.914,** 1.208, 1.504
82.82	8	28704.18	*a* $^5D_3$—444(3)	(0.539, 1.038, **1.559**) −0.093, 0.430, **0.941, 1.452,** 1.970, 2.477
81.74	5	28713.07		
80.04	15*c*	28727.10	*a* $^3D_3$—472(4)	(**0.000,** 0.162, 0.365) . . . ?
78.59	7	28739.04		
75.07	2	28768.15		
74.25	200*c*	28774.98	*c* $^3P_0$—521(1) *a* $^3H_4$—446(4) *a* $^1F_3$—536(2)	(0.471 *W*) 0.832, **1.031, 1.209,** 1.362
71.98	3	28793.73	*d* $^3F_4$—603(3)	(0.00) 1.17
70.99	50	28801.98	*b* $^3H_4$—532(5)	(**0.000,** 0.166, 0.341, 0.503, 0.677) . . . , 0.976, 1.146, 1.318, 1.488, 1.649, **1.831**
70.10	3	28809.34		
68.67	20	28821.21	*b* $^1G_4$—542(4)	(0.175 *B*) 1.117*w*
68.51	4	28822.57	*b* $^3G_4$—569(4)	(0.28) 1.11
68.05	4	28826.39	*b* $^1D_2$—521(3)	(0.000) 1.080
67.19	1	28833.53		

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
3466.75	7	28837.19		
65.82	20c	28844.94	*b* $^3F_2$—385(1)	(0.000) 1.055
62.49	50	28872.66	*c* $^3F_3$—524(4)	(0.000) 1.107
61.83	3c	28878.19	*a* $^3G_5$—417(5)	(0.00) 1.19
60.84	8	28886.46		**(0.00,** 0.28, 0.56) 0.74, 0.99, 1.29, **1.55**
59.22	35c	28900.00	*a* $^5D_3$—448(3)	**(0.000,** 0.197, 0.417, 0.667) **0.548,** 0.779, 1.030, 1.252, 1.447, 1.659
54.47	6	28939.71		
53.70	12c	28946.12	*b* $^3P_0$—452(1) *b* $^3D_2$—593(2)	(0.18) 1.11
50.89	10	28969.76		(0.000 *WD*) 0.802 *A*
49.50	4	28981.38		
46.86	150c	29003.62	*a* $^3G_4$—417(5)	**(0.000,** 0.213, 0.476, 0.743, 1.014) 0.801, 1.016, 1.234, 1.420, . . . **2.305**
46.27	25	29008.60	*a* $^1H_5$—532(5)	
45.20	7	29017.57	*d* $^3F_4$—605(5)	(0.000) 1.332
43.37	12	29033.00	*b* $^3H_4$—534(3)	**(0.000,** 0.241, 0.487, 0.733) **0.250,** 0.490, 0.722, 0.970, 1.212, 1.456
42.72	12	29038.50	*c* $^3F_4$—521(3)	(0.000*w*) 0.857*A*
41.40	35	29049.62	*a* $^5D_2$—435(3)	**(0.000,** 0.377, 0.765) **0.313,** 0.702, **1.087,** 1.469, . . .
40.32	85c	29058.74	*a* $^5D_3$—435(1)	(0.000) 1.471; (0.268) 0.827
39.70	20c	29063.99	*a* $^5D_4$—462(5)	(0.000) 1.192*w*
39.00	80c	29069.90	*a* $^3G_4$—417(4)	(0.216, 0.408, 0.796, **1.093**) 0.791, **1.017, 1.248,** 1.479
37.24	10	29084.74		
34.36	35	29109.16	*a* $^5D_3$—448(3)	(0.000, 0.203, 0.411, **0.629**) 0.852, 1.044, **1.252, 1.473,** 1.668, 1.879
33.39	20	29117.39	*a* $^1H_5$—533(4)	(0.00) 0.77
33.25	25c	29118.56	*a* $^5P_3$—415(3)	(0.403, 0.799, 1.118, **1.276**) 0.430, 0.801, **1.193, 1.583,** 1.980, 2.299
30.04	100	29138.18	*a* $^3F_2$—323(3)	**(0.000,** 0.229, 0.479) 0.000, 0.227, 0.511, 0.744, 0.967, 1.189, **1.476**
30.49	2	29141.97		
29.91	3	29146.95		
29.39	10	29151.38	*c* $^3P_2$—571(1)	**(0.000,** 0.407) **0.986,** 1.365, 1.721
28.78	15	29157.53		
28.36	5	29160.14		
27.39	2	29168.36		
25.74	4	29182.44		(0.00) 1.00
25.55	2	29184.02		
24.57	15	29192.38	*c* $^3F_2$—521(3)	**(0.000,** 0.401, 0.817) 0.714, 1.091, 1.475, 1.848, **2.238**
23.87	2	29198.37		
22.35	4	29211.31		
21.80	40c	29216.01	*a* $^3F_4$—389(3)	**(0.000,** 0.226, 0.448, 0.693) 0.770, 0.992, 1.221, 1.437, 1.662, **1.896**
20.93	7	29223.46		
18.83	3	29241.40		
17.50	2	29252.75		
17.02	40c	29256.86	*a* $^5F_1$—292(2)	**(0.000** *W*, 0.489*w*) 0.000*w*, 0.510, **1.003***w*
16.22	1	29263.73		
15.58	10	29269.24	*c* $^1D_2$—622(1) *a* $^5P_2$—411(2)	(0.000, 0.202, **0.488**) 0.916, 1.139, . . .
15.27	75	29271.87	*a* $^3D_3$—478(3) *b* $^3F_2$—389(3)	(0.000) 0.912
14.13	200c	29281.65	*a* $^3F_4$—361(4) *b* $^5G_3$—605(5)	(0.000*WD*) 1.292*w*
13.06	2	29290.78	*c* $^1D_2$—623(2)	
12.88	10	29292.38	*a* $^5G_6$—421(4)	
12.74	10	29293.53	*c* $^3P_1$—555(1)	(0.000) 1.459
10.74	7c	29310.72	*a* $^5P_1$—400(0)	(0.000) 2.416
10.42	15	29313.51	*b* $^5G_2$—561(4)	**(0.000,** 0.433, 0.860, 1.287) 0.000, 0.412, 0.851, 1.288, 1.706, **2.140, 2.555**
08.28	20c	29331.92	*b* $^3F_4$—478(3)	(0.000) 1.249
07.67	10	29337.18	*a* $^1F_3$—542(4)	(0.00 *W*) 1.67*B*
07.40	55c	29339.46	*a* $^1G_4$—435(3) *a* $^5P_3$—417(4)	**(0.000,** 0.341, 0.689, 1.032) **0.212,** 0.556, 0.877, 1.252
06.68	75	29345.71	*a* $^3F_3$—361(2)	**(0.000,** 0.131, 0.262) 0.941, 1.073, 1.201, **1.341**
02.93	40	29377.99	*a* $^3G_3$—411(2)	**(0.000,** 0.243, 0.510) **0.408,** 0.678, 0.910, 1.153, 1.383
01.69	7	29388.71	*b* $^5D_1$—593(2)	**(0.000,** 0.147) 1.005, 1.147, **1.285**

TABLE I. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length Å	Intensity and notes	Wave number	Term combination	Zeeman pattern
3400.45	3	29399.44	*a* $^1D_2$—429(3)	(0.000) 1.127
3399.20	45*c*	29410.29	*c* $^3F_4$—524(4)	(0.238) 1.071*w*
98.72	5	29414.42	*a* $^5D_4$—466(4)	
98.37	90*c*	29417.43	*a* $^4G_4$—421(4)	
97.60	10*c*	29424.14	*b* $^3F_3$—440(4)	(0.000) 1.346
96.69	1	29431.94		
96.17	15	29436.46		(**0.000,** 0.100, 0.191) 1.172, 1.258, **1.344**
95.39	35	29443.25	*c* $^3P_0$—528(1)	(0.000) 0.916
91.22	15	29479.47	*a* $^5P_3$—413(1)	(**0.000,** 0.466) **0.954,** 1.430, 1.909
90.46	10	29486.09		(0.000 *W*) 1.259*w*
90.20	50	29488.34		(0.389*w*) 1.158 *W D*
89.51	8	29494.36	*b* $^3H_6$—555(5) *a* $^1G_4$—437(5)	(0.000 *W D*) 1.373
89.12	5	29497.74	*c* $^3F_4$—525(3)	
88.62	8	29502.05	*c* $^1G_4$—646(3)	(0.000) 1.088
88.33	40	29504.62	*a* $^1D_2$—430(2)	(0.119) 1.099
87.91	2	29508.25	*d* $^3F_2$—593(2)	
86.53	20*c*	29520.24	*a* $^5P_1$—402(2)	(**0.000,** 1.219) **−0.078,** +1.139
85.44	8*c*	29529.76	*b* $^1D_2$—528(1)	(**0.000,** 0.199) 0.907, 1.115, **1.313**
83.18	15	29549.54	*a* $^3F_4$—392(3)	(0.00) 1.38
82.31	2	29557.07		(0.36, 0.75) . . .
80.37	2	29574.10	*d* $^3F_4$—611(4)	(0.00) 0.93
79.51	100*c*	29581.58	*a* $^3P_0$—337(1)	(0.00) 0.00, **0.31**
78.58	10	29589.74	*a* $^5D_1$—430(2)	(**0.000,** 0.448) **0.638,** 1.074
78.17	20	29593.29	*a* $^5D_1$—430(0)	(0.000) 1.500*w*
77.18	5	29601.97		
76.78	6	29605.49	*b* $^3F_2$—392(3)	(0.00) 0.62
76.47	75	29608.26	*a* $^3D_2$—467(2)	(**0.000,** 0.307, 0.613) **0.127,** 0.412, 0.713, 1.033, 1.333
75.75	4	29614.52		
75.60	20	29615.86	*a* $^3H_4$—464(5) *b* $^3H_4$—540(5)	(**0.000,** 0.216, 0.454, 0.665, 0.889) . . ., 1.626, 1.833, **2.067**
75.47	5	29617.03	*b* $^3D_2$—602(3)	(0.14) 1.36
73.68	2	29632.69		
72.42	4*c*	29643.79	*c* $^3P_1$—558(1) *a* $^3H_5$—478(6)	(**0.000,** 0.208, 0.396, 0.610, . . .) 1.107, 1.295, 1.477, **1.728,** . . .
71.53	50*c*	29651.62	*c* $^3F_2$—525(3)	
69.55	2	29669.02	*a* $^3D_3$—482(2)	
69.27	12	29671.50	*a* $^3H_5$—478(5)	
68.74	20	29676.19	*a* $^5F_3$—323(3)	(0.251, **0.516**) 0.473, 0.711, **0.960, 1.237,** 1.501, 1.765
68.44	40	29678.84	*a* $^5P_2$—415(3)	(**0.000,** 0.222, 0.452) **0.766,** 0.991, 1.213, . . .
67.50	40*c*	29687.07	*a* $^5P_3$—421(4)	(**0.000,** 0.339, 0.675, 1.037) **0.256,** 0.586, 0.917, 1.248, 1.593
67.08	5	29690.78		(**0.00,** 0.57) 1.40
64.74	8*c*	29711.42	*a* $^5D_2$—442(1)	(**0.000,** 1.222) 1.460, **2.671**
64.19	4	29716.30	*b* $^1D_2$—530(2)	(0.37, **0.73**) 1.24
63.71	15*c*	29720.53	*a* $^5D_3$—454(2)	(**0.000,** 0.304, 0.590) 1.160, 1.460, 1.768, **2.061**
63.42	35	29723.10	*b* $^3P_2$—482(2) *c* $^3F_2$—533(4)	(0.000) 1.129
60.67	8	29747.41	*c* $^3P_2$—577(2)	(0.315, **0.643**) 0.686, **1.013, 1.352,** 1.667
58.76	40*c*	29764.34	*a* $^5D_2$—442(2)	(0.216) 1.468, 1.733
57.69	40	29773.81	*b* $^3H_4$—542(4)	(0.170, 0.319, 0.476, **0.641**) 0.490, 0.648, 0.791, **0.959, 1.092,** 1.272, 1.435, . . .
56.20	15*c*	29787.06	*a* $^3G_5$—415(3)	(0.64, **0.98**) 0.58, **0.90, 1.22,** 1.58
53.92	3	29807.33	*a* $^3D_1$—444(0)	(0.000) 0.852
53.06	2	29814.97		
52.20	15*c*	29822.63	*a* $^1H_5$—540(5)	(0.785, **0.978**) 0.670, 0.855, **1.040, 1.227,** 1.449, 1.646
50.74	15	29835.53	*b* $^3D_3$—602(3)	(0.00) 1.35
49.21	150*c*	29849.22	*a* $^3H_5$—478(6) *b* $^3F_3$—444(3)	(0.000 *W D*) 0.971*w*
48.65	10	29854.21		(0.00) 1.23
46.26	35	29875.54	*b* $^3G_4$—580(4) *a* $^3H_6$—478(5)	(0.000) 1.046
43.73	5	29898.13		(**0.00,** 0.69) 0.78

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
3341.35	4	29919.38	*b* $^3D_2$—603(3)	
40.87	20	29923.73	*b* $^3G_3$—567(4)	(**0.000**, 0.354, 0.721, 1.069) 1.194, 1.552, 1.912, **2.272**
39.91	100*c*	29932.33	*a* $^3F_3$—367(3)	(0.253 *B*) 1.131*w*
39.56	5	29935.48	*a* $^5D_2$—444(3)	(**0.00**, **0.54**) 1.02, **1.60**
39.29	20	29937.90	*a* $^5D_4$—471(3)	(0.000*w*) 1.371*w*
38.69	3	29943.23		
34.96	35*c*	29976.73	*b* $^3F_4$—484(4)	(0.000 *W*) 1.249
34.14	25	29984.14	*a* $^1D_2$—435(3)	(0.000) 1.065
33.10	45*c*	29993.50	*a* $^1D_2$—435(1)	(0.000*w D*) 0.925 *W*
32.85	30*c*	29995.74	*b* $^1G_4$—553(4)	(0.230 *B*) 0.992 *D*
32.68	50*c*	29997.24	*a* $^3F_4$—397(4)	(0.000) 1.221
32.29	12	30000.76	*a* $^3D_2$—471(3)	(0.00) 0.94
31.48	15*c*	30008.10	*a* $^3G_3$—417(4)	(**0.000**, 0.349, 0.687, 1.048) 0.911, **1.248**, 1.563, . . .
30.99	250*c*	30012.51		(0.000 *W D*) 1.197 *W*, 1.582 *W B*
28.63	2	30033.76	*c* $^1D_2$—630(2)	(0.09) 1.05
26.86	25	30049.68	*a* $^5D_4$—472(4)	(0.000*w*) 1.186
24.61	3	30070.06		(0.147) 1.061
23.68	12*c*	30078.50	*a* $^5D_1$—435(1)	(0.000) 1.498 *B*
23.23	5*c*	30082.59	*c* $^3F_2$—530(2)	
23.06	8	30084.04	*c* $^1G_4$—652(4)	(0.54) 1.10
22.30	25	30091.00	*b* $^3H_5$—555(5)	(0.108) 1.045
19.15	10	30119.56	*b* $^1G_4$—555(5)	(0.000) 1.037
16.95	15*c*	30139.52	*b* $^3P_1$—475(2)	(0.000) 1.322
15.58	3	30152.00	*c* $^3F_4$—532(5)	(0.000 *W*) . . . ; (0.00) 1.50
14.85	15*c*	30158.60	*b* $^3G_3$—569(4)	(**0.000**, 0.285, 0.583, 0.907) 1.133, 1.430, 1.725, **1.971**
14.41	10	30162.57	*d* $^3F_4$—616(3)	(**0.000**, 0.192, 0.399, 0.573) 0.810, 0.959, 1.116, 1.293, **1.467**, . . .
14.06	50*c*	30165.79	*b* $^3P_2$—486(2)	(0.304, **0.622**) 0.833, **1.142**, 1.446, 1.744
13.49	5	30171.00	*b* $^1D_2$—534(3)	(**0.000**, 0.111, 0.217) 1.313, **1.420**
07.58	3	30224.87	*a* $^1G_4$—444(3)	(0.00) 1.05
06.04	8	30238.98	*a* $^1P_1$—536(2)	(0.000 *W D*) 1.362 *W D*
05.69	3	30242.15		
05.23	2	30246.34		(0.00) 1.35
04.37	25	30254.24	*a* $^3G_4$—429(3) *b* $^3F_3$—448(3)	
03.65	8	30260.82	*c* $^3F_4$—533(4)	(0.256 *B*) 0.935
02.54	12	30271.01		(0.00) 1.42
01.78	3	30278.00	*a* $^5P_2$—421(2)	(0.00) 1.40
01.08	12	30284.41	*a* $^3H_5$—484(4)	(**0.000**, 0.171, 0.345, 0.529, 0.692) **0.386**, 0.575, 0.747, 0.923, . . .
3298.86	7*c*	30304.81		(0.00) 1.40
95.45	7	30336.12		(0.27) 0.94
94.92	15*c*	30341.06	*a* $^1P_1$—537(1)	(0.00) 1.29
94.20	6	30347.61	*d* $^3P_1$—622(1)	(0.35) 0.60, 0.99
93.93	25	30350.17	*b* $^1D_2$—536(2)	(**0.000**, 0.469) **0.926**, 1.340
93.32	20*c*	30355.73	*a* $^3G_3$—421(4)	(**0.000**, 0.351, 0.694) 1.257, 1.638, 2.15
92.25	1	30365.59	*c* $^3P_0$—537(1)	
91.57	5	30371.90	*c* $^3F_2$—533(2)	
90.76	12	30379.33	*a* $^1G_4$—445(5)	(0.00) 1.20
90.02	10	30386.19	*a* $^3G_3$—421(2)	(**0.000**, 0.282, 0.544) **0.330**, 0.623, 0.910
88.98	8*c*	30395.84		
88.80	10	30397.52	*d* $^3F_2$—602(3)	(**0.000**, 0.343, 0.681) 0.862, 1.188, 1.533, **1.877**
88.57	10	30399.63	*a* $^3F_3$—372(2)	(**0.000**, 0.192, 0.559, 0.926) 1.415, 1.758, **2.113**
87.76	15*c*	30407.06	*b* $^3G_4$—585(5)	(0.000 *W*) 1.339*w*
86.31	8*c*	30420.52	*a* $^1G_4$—446(4)	
85.61	20	30426.98	*a* $^3D_2$—475(1)	(0.594 *B*) 1.201 *D*
85.10	50*c*	30431.74	*a* $^5P_1$—411(2)	(**0.000**, 1.074) **0.000***w*, 1.160
83.73	10*c*	30444.44	*a* $^3H_4$—462(5)	(0.00) 0.72 *A*
82.93	4*c*	30451.85	*b* $^1D_2$—537(1)	(0.00) 1.08
82.20	2	30458.60		(0.000) 1.352
81.82	2	30462.13	*b* $^3P_2$—489(3)	(0.00) 1.25
81.52	10	30464.89	*b* $^3D_2$—608(2)	(0.00) 1.11
81.23	20*c*	30467.57		(0.00 *W*) 0.89

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
3281.08	3	30469.04	$b\ ^2F_4$—489(3)	
80.60	2	30473.40		
80.01	4	30478.91		(0.00) 1.05
79.72	7	30481.61	$d\ ^3F_2$—603(3)	(**0.00**, 0.31, 0.61) 1.12, 1.50, **1.83**
78.26	5c	30495.21		(0.00) 1.52
77.44	1	30502.88		(0.00) 0.99
77.03	8	30506.68	$c\ ^1G_4$—656(3)	(0.00) 1.19
76.51	30c	30511.46	$a\ ^1F_3$—553(4)	(0.000*w*) 1.132*w*
75.97	10	30516.48	$b\ ^3D_1$—604(1)	(0.34) 0.75, 1.06
75.66	60c	30519.36	$a\ ^3P_2$—361(2)	(**0.383, 0.782**) 0.559, **0.963, 1.344**, 1.755
74.92	90c	30526.34	$a\ ^3F_3$—337(1) $a\ ^3D_2$—490(2)	(**0.000**, 0.582) **0.748**, 1.491
73.96	75	30535.23	$a\ ^3F_2$—337(2)	
73.13	20	30543.01	$b\ ^3F_2$—402(2)	(0.19) *B*) 1.211*w*
71.13	50c	30561.65	$b\ ^3F_4$—490(5)	(0.000) 1.214
69.34	20c	30578.41		(0.000*w*) 1.041*w*
69.16	12	30580.04	$b\ ^3P_2$—490(2)	(0.154, **0.280**) 1.175, **1.300, 1.472**, 1.625
68.72	15c	30584.23	$d\ ^3F_4$—621(4)	(0.00) 1.01
66.28	5	30607.06		(0.00) 0.97
65.51	50	30614.25	$b\ ^3F_3$—403(1)	(**0.000**, 0.200) **0.840**, 1.057, 1.246
62.64	25c	30641.22		
62.53	18c	30642.21	$a\ ^3P_1$—413(1)	(0.495) 1.825*w*, 2.365*w*
62.14	7	30645.92	$a\ ^1D_2$—442(1)	(**0.00**, 0.85) 1.08, **1.96**
61.49	35c	30652.01	$b\ ^3H_6$—566(6)	(0.181) 1.091*W*
60.97	18	30656.92	$a\ ^3D_3$—478(3)	(0.000) 1.195
60.55	15	30660.83	$a\ ^5D_3$—463(2)	(**0.000**, 0.179, 0.375) 1.475, 1.650, **1.837**
59.19	5	30673.61	$a\ ^1F_3$—555(3)	
57.50	5	30689.58	$b\ ^3P_1$—480(0)	(0.000) 1.186
56.85	25	30695.62	$b\ ^3H_4$—551(3)	(**0.000**, 0.266, 0.539, 0.795) **0.187**, 0.457, 0.719, 0.996, 1.249, 1.509
56.50	12	30699.00	$a\ ^1D_2$—442(2)	(0.147, **0.279**) 0.978, **1.112, 1.257**, 1.381
56.28	2	30701.07		
55.76	12	30705.94		(0.000) 0.617
53.36	20	30728.61	$b\ ^3H_6$—561(4)	(**0.000**, 0.215, 0.438, 0.657, 0.895) **0.150**, 0.379, 0.618, 0.851, 1.060
53.12	50	30730.86	$a\ ^5D_1$—442(1)	(1.261) 0.247, 1.501
52.26	60c	30738.98	$a\ ^5D_2$—452(1)	(0.000) 1.477
50.94	4	30751.44		
50.47	8	30755.95		(0.00) 1.71*B*
48.83	1	30771.46		
47.29	2	30786.05		
41.69	12	30839.23	$a\ ^5G_4$—435(3)	(0.000) 0.954
40.94	250	30846.37	$a\ ^3P_1$—361(2)	(**0.000**, 0.611) **0.339**, 0.944, 1.527
40.70	15	30848.64	$b\ ^5G_5$—621(4) $b\ ^3P_1$—482(2)	
38.90	10c	30865.79	$b\ ^3F_2$—454(2)	(0.00) 0.94
38.54	25	30869.20	$a\ ^5G_6$—437(5) $a\ ^3H_5$—490(5)	(0.128, 0.269, 0.412, 0.568, **0.712**) 0.582, 0.719, 0.879, 1.011, 1.147, **1.297**, 1.426, 1.567, 1.710, 1.834
38.27	3	30871.76		(0.00) 1.17
35.13	5	30901.70		(0.000*WD*) 0.662*A*
34.68	10	30906.04	$d\ ^3P_1$—628(1)	
33.91	25	30913.44	$c\ ^3F_3$—545(2)	(0.000*w*) 1.098*w*
31.98	10	30931.89	$d\ ^3F_4$—624(4)	(0.000*w*) 1.115
31.34	12	30937.94	$b\ ^3G_3$—622(5)	(0.000*w*) 0.917*w*
29.89	100	30951.83	$a\ ^5D_2$—454(2)	(0.302, **0.613**) 0.870, **1.160, 1.479**, 1.775
29.10	10	30959.46	$a\ ^5D_1$—444(0)	(0.000) 1.488
28.77	12	30962.59	$b\ ^3G_3$—577(2)	
28.42	35	30966.98	$c\ ^3F_4$—540(5)	(**0.000**, 0.172, 0.357, 0.533, 0.730) 1.279, 1.453, 1.650, 1.834, **2.031**
26.93	100c	30980.30	$a\ ^3H_4$—468(3)	(0.000*WD*) 1.036*WD*
25.94	10	30989.77	$a\ ^1F_3$—558(2)	(**0.000**, 0.333, 0.696) **0.275**, 0.646, . . .
22.22	20	31025.56		(0.000*w*) 0.949*B*
21.12	15	31036.12	$b\ ^3P_3$—495(3)	(0.000*W*) 0.938, 1.382*W*
19.21	15	31054.59	$a\ ^3D_2$—482(2)	(0.218, **0.461**) 0.978, **1.208, 1.443**, 1.665
18.08	3	31065.51	$b\ ^1G_4$—564(5)	(0.00) 0.94
17.61	2	31070.03	$b\ ^3D_3$—616(3)	

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
3217.37	12	31072.27	$b\ ^3H_4$—555(5) $a\ ^5F_3$—337(2)	(0.000 *WD*) 1.228 *WD*
17.22	6	31073.71		(0.00) 1.20
16.15	75	31084.06	$a\ ^3P_2$—429(3)	(**0.000**, 0.300, 0.615) **0.512**, 0.818, 1.114, 1.396
15.32	15c	31092.16	$b\ ^4P_2$—495(2)	(0.00 *W*) 1.54
15.13	10	31093.99		(0.00) 1.33
13.91	150	31105.80	$a\ ^3D_2$—468(3) $a\ ^3P_2$—367(3)	(**0.000**, 0.172, 0.364) **0.788**, 1.012, . . .
13.70	20	31107.78	$b\ ^3H_5$—565(5)	(0.31) 1.13 *D*
13.29	1	31111.80	$d\ ^3P_1$—630(2)	
12.00	2	31124.22	$c\ ^3F_4$—542(4) $a\ ^5D_4$—468(2)	
11.62	2	31127.89	$a\ ^1P_1$—545(2)	(0.000) 1.027
10.73	10	31136.58	$b\ ^1G_4$—565(5)	(0.000 *W*) 1.100 *D*
09.76	50c	31145.98	$b\ ^3P_2$—496(3)	(**0.000**, 0.430, 0.862) **0.190**, 0.624, 1.043
09.42	5	31149.30	$a\ ^1F_3$—560(2)	(0.00) 1.00
09.03	25	31153.08	$b\ ^3F_4$—496(3)	(**0.000**, 0.201, 0.399, 0.596) . . .
08.83	10	31155.00	$a\ ^1H_5$—553(4)	(0.000) 0.676
08.08	1	31162.31		
05.28	20c	31189.49	$a\ ^3P_2$—430(2)	
04.58	10	31196.28	$b\ ^3G_5$—624(4)	(0.000) 1.087
02.96	2	31212.08	$a\ ^1F_1$—312(1)	
00.18	90c	31239.23	$b\ ^1D_2$—545(2) $a\ ^5D_4$—484(4)	(0.183 *W*, 0.228) 1.200 *W D*
3199.21	60	31248.70	$b\ ^3H_6$—566(6)	(0.000*w* 1.271 *B*
98.93	75	31251.43		(0.000*w*) 0.885 *A*
96.72	8	31273.06	$a\ ^1F_3$—561(4)	
96.52	15	31275.02	$a\ ^1D_2$—448(3)	(**0.000**, 0.153, 0.297) . . ., 1.179, 1.322, **1.469**
96.08	25c	31279.32	$a\ ^1H_5$—555(5)	(0.293*w*) 0.852, 1.132*w*
95.28	20c	31287.12	$a\ ^4F_3$—323(3)	(0.000*w*) 0.940*w*
95.13	6	31288.63	$b\ ^3D_2$—616(3)	(0.00) 0.86
94.83	75c	31291.48	$b\ ^3P_1$—486(2)	(0.000) 1.114
94.19	2	31297.83	$a\ ^3G_3$—430(2)	
93.97	7c	31299.97	$a\ ^3G_4$—440(4)	(0.129, 0.280, 0.437, **0.569**) 1.032 *W D*
93.16	15	31307.89	$c\ ^3P_2$—593(2) $b\ ^3P_0$—475(1)	(0.000) 1.502
92.55	2	31313.89		
90.92	7	31329.85	$a\ ^3P_2$—369(1)	(**0.000**, 0.640) . . ., 1.337, **1.981**
90.00	7	31338.94	$b\ ^3H_6$—567(4)	(0.00 *D*) 0.58 *A*
89.19	20	31346.87		(0.000) 1.144
87.09	10	31367.48	$b\ ^1G_4$—567(4)	(0.380*w*) 1.146*w D*
85.17	25c	31386.39	$b\ ^3P_2$—498(1)	(**0.000**, 0.548) **0.905***w*, 1.442, 1.989
84.73	2	31390.74		
82.95	8	31408.33		(0.000*w*) 1.109*w*
79.73	25c	31440.12	$a\ ^5P_1$—421(2)	(0.00) 1.24
79.44	12	31443.02	$a\ ^5D_3$—471(3)	(0.42, 0.80, **1.14**) 0.37, 0.75, **1.11**, **1.50**, 1.87, 2.17
79.12	8	31446.13	$b\ ^3G_3$—582(2)	(**0.00**, 0.84, 1.56) −**0.80**, +0.06, 1.64, 2.44
77.56	10	31461.55		(0.00) 0.63*w*
77.27	2	31464.45		(0.00) 0.86 *A*
75.53	10	31481.68		(0.000) 0.737
74.49	2	31492.05	$b\ ^3D_3$—621(4)	(0.00 *W*) 0.46
72.88	25	31508.01	$c\ ^3F_3$—551(3)	
70.77	8	31529.00		(0.00) 1.14
68.96	15c	31547.01	$a\ ^3D_1$—461(1)	(0.517) 0.912, 1.390
68.17	75	31554.81	$a\ ^5D_3$—472(4)	(**0.000**, 0.271, 0.503, 0.836) **0.367**, 0.653, 0.919, 1.197, 1.468, 1.727, 1.988
66.71	60c	31569.40	$a\ ^3P_2$—440(4)	(**0.000**, 0.491, **0.972**, 1.457) −0.364, +0.141, 0.639, **1.118**
66.36	40	31572.83	$a\ ^3P_2$—372(2)	(0.000, 0.719, **1.436**) −0.113, **0.610**, **1.333**, 2.053
65.80	4c	31578.43		
65.50	3	31581.47		(0.433, **0.653**) . . .?
64.34	15	31592.97		(0.00) 1.19

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
3163.12	40c	31605.22	c $^3F_2$—545(2) a $^5D_0$—442(1)	(**0.098**, 0.316) **1.071**, 1.269, 1.454
62.86	20c	31607.86	a $^5D_1$—487(1)	(**0.000**, 0.428) 0.712, 1.149, **1.576**
61.90	2	31617.36		
61.72	4	31619.20		
57.95	70c	31656.95	a $^5P_1$—369(1)	(0.877) 0.670, 1.546
57.64	50c	31660.03		(0.447, 0.675, **0.929**) 0.582, 0.818, 1.039, **1.267**, 1.504, 1.743, 1.949
57.19	5	31664.59	b $^3F_2$—413(1)	(**0.00**, 0.86) 0.23, . . .
56.74	50c	31669.05	a $^5P_2$—435(3)	(**0.000**, 0.356, 0.698) **0.408***w*, 0.750, 1.075
56.58	10	31670.65		(0.00) 1.04)
56.37	2	31672.79	b $^3G_4$—598(5)	(0.00) 1.18
56.14	4	31675.10	b $^1G_4$—570(3)	
55.69	6	31679.66	a $^3D_2$—461(1)	(0.000*w*) 1.498 *A*
55.35	5	31682.99		(0.00) 1.17
55.24	50	31684.16	a $^3F_3$—385(2)	(0.000 *W D*) 1.181*w B*
53.92	12	31697.42	a $^5F_4$—361(4)	(. . ., 0.334, 0.509, **0.696**) . . ., 1.484, 1.662, 1.839
53.76	15c	31698.98		(0.00 *W*) 0.92
53.07	5c	31705.94	b $^3F_3$—462(4)	(0.000 *W*) 1.109 *A*
52.69	7	31709.78	b $^3H_4$—561(4)	(0.96, **1.20**) . . ., 1.15, 1.55, 1.83, 2.23
51.65	15	31720.21	c $^3F_2$—546(3)	(**0.000**, 0.227, 0.468) 0.716, 0.942, **1.160**
51.16	50c	31725.12	a $^3G_4$—444(3)	(0.000 *W*) 1.182*w*
50.54	20c	31731.37	a $^5D_4$—489(3)	(0.000 *WD*) 1.057*w*
47.70	20c	31760.03	a $^3D_1$—463(2)	(0.00) 0.210*B*
45.99	20c	31777.28	a $^3G_3$—435(3)	(0.166, 0.337, **0.531**) 0.651, **0.834**, **1.008**, 1.257
44.86	30c	31788.70	a $^5D_3$—475(2)	(**0.000**, 0.169, 0.361) 1.288, 1.462, 1.631, **1.824**
44.32	10	31794.13	a $^3D_2$—489(3)	(0.000) 1.358*B*
42.95	75	31808.07	a $^3F_4$—415(3)	(0.000) 1.243
42.36	20c	31814.01	b $^3P_2$—503(3)	(**0.000**, 0.201, 0.410) **0.772**, 1.039
41.69	8	31820.77	b $^3F_4$—503(3)	(0.000) 1.226
41.37	80c	31824.00	a $^5D_4$—490(5)	(0.000*w*) 1.327*w*
40.33	4	31834.56	c $^3P_1$—580(1)	(0.180) 1.134, 1.342
39.84	20	31839.57	b $^3D_3$—624(4)	(0.268*w*) 1.193*w*
38.75	7	31850.63	d $^3F_2$—616(3)	(0.000*WD*) 1.042
38.04	5	31857.76		(0.000) 1.026
37.43	75	31863.95	a $^3D_1$—464(2) b $^3F_2$—415(3)	(**0.000**, 0.163, 0.331) 0.892, 1.051, 1.198, 1.358, **1.521**
36.72	4	31871.19		(0.33) 1.67
35.83	120c	31880.22	a $^5G_4$—445(5)	(**0.000**, 0.253, 0.551, 0.877, 1.187) 1.017, 1.272, 1.525, 1.860, 2.153, **2.469**
35.53	5	31883.30	a $^1F_3$—567(4)	
35.20	15	31886.65	a $^1D_2$—454(2)	(0.123) 1.111*w*
34.80	5	31890.71	b $^3D_2$—622(1)	(**0.00**, 0.48) 0.58, 1.13, **1.55**
33.89	50	31899.95	a $^3P_1$—372(2)	(**0.000**, 0.949) −**0.309**, +0.631, 1.556
32.86	3	31910.46	b $^3F_3$—464(2)	
31.86	90c	31920.73	a $^3G_4$—446(4)	(0.220, **0.772**) . . . ?
31.60	90c	31923.33	c $^3F_3$—555(3)	
30.80	8	31931.46	c $^3F_2$—555(2)	(0.00*w*) 1.13
28.59	10	31954.04	d $^3F_4$—634(4)	(0.29) 1.10*w*
27.74	100c	31962.74	a $^3F_4$—417(5)	(0.000*w*) 1.264*w*
26.87	7	31971.58	a $^5D_2$—454(2)	(**0.000**, 0.341) **0.781**, 1.148, 1.503
26.59	7c	31974.45	a $^3H_4$—478(3)	(0.000*w*) 1.107
24.62	50c	31994.66	a $^5P_3$—444(3)	(0.670, 1.326, **1.976***w*) . . . 0.327, **0.936**, **1.560**, 2.237, 2.912
23.46	3	32006.55	a $^3H_4$—478(5)	
22.78	15c	32013.42	b $^3F_4$—505(5)	(**0.000**, 0.156, 0.330) 1.17*B*
22.32	18	32018.22	b $^3H_4$—564(5)	(**0.000**, 0.205, 0.410, 0.622) **0.852**, 0.568, 0.778, 0.976, 1.186
21.26	40c	32029.03	a $^3F_4$—417(4)	(0.139) 1.236*A*
21.09	7	32030.79	b $^3P_2$—505(1)	
20.13	2	32040.62	c $^3P_1$—582(2)	
19.64	5	32045.73	c $^3F_4$—551(3)	(0.000) 1.302*B*
19.12	10	32050.99		(**0.000**, 0.188) 1.231, 1.397, **1.582**
17.74	10	32065.24	b $^3F_3$—466(4)	(**0.000**, 0.210, 0.421, 0.645) **0.960**, 1.188, 1.377
16.70	15	32075.96	b $^3G_4$—602(3)	(**0.000**, 0.123, 0.265, 0.387) **0.655**, 0.803, 0.927
15.42	20	32089.12	b $^3H_4$—595(5) a $^1G_4$—462(5)	(0.000) 1.005

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
3114.45	8	32099.13	$a\ ^6D_3$—478(3)	(0.269, 0.523, **0.804**) 0.932, **1.186**, **1.447**, 1.699
12.88	50	32115.27		(0.247) 1.088*WD*
12.58	6	32118.35	$a\ ^1F_3$—569(4)	(**0.000**, 0.165, 0.319, 0.475) . . . , 1.266, 1.434, **1.626**
11.35	2	32131.11	$a\ ^3F_3$—389(3)	(0.242) 0.633, **0.865**, **1.111**, 1.340.
10.81	90c	32136.69		(0.263*w*) 1.185*w*
09.93	6c	32145.72	$a\ ^1P_1$—555(2)	(0.00) 0.94
09.81	10	32146.98	$c\ ^3P_0$—555(1)	(0.000) 1.395
09.04	3c	32154.98		(**0.00**, 0.38) **0.77**, 1.14
08.58	45c	32159.66	$b\ ^3G_4$—603(3)	(0.000*w*) 0.832
06.11	3	32185.27		
05.63	50	32190.20	$a\ ^4P_2$—446(4)	(**0.000**, 0.345, 0.675, 1.033) **0.230**, 0.575, 0.909, 1.251, 1.603
04.70	6c	32199.89	$c\ ^3F_2$—551(3)	(**0.00**, 0.55, 1.13) . . . , 0.72, 1.22, 1.81, **2.48**
02.90	7	32218.56	$b\ ^3P_1$—495(2) $b\ ^3G_5$—634(4)	(0.00) **1.15**
01.47	10	32233.46	$b\ ^1D_2$—555(1)	(0.000, 0.293) **0.822**, 1.097, 1.423
01.22	7	32236.02		
01.04	100c	32237.86	$a\ ^4G_3$—440(4)	(**0.000**, 0.205, 0.448, 0.713) 0.683, 0.916, 1.117, 1.346, 1.598, **1.857**
3099.83	20c	32250.43	$b\ ^3F_3$—468(3)	(0.211, 0.406, **0.668**) 0.564, 0.784, **1.003**, **1.209**, 1.436, 1.667
99.22	2	32256.86	$b\ ^1D_2$—555(2)	(0.00) 1.10
97.98	25c	32269.69	$b\ ^3F_2$—468(2)	(0.000*w*) 0.875*w*
96.88	8c	32281.19	$c\ ^3P_2$—603(3)	(**0.000**, 0.218, 0.444) **0.692**, 0.943
96.13	10	32289.04	$d\ ^4F_4$—638(4)	(0.000) 1.128
95.50	15	32295.56	$a\ ^1H_6$—565(5)	(0.000) 1.008
95.21	10	32298.61	$c\ ^3F_4$—553(4)	(0.000) 1.033
94.60	40c	32304.94	$a\ ^5D_4$—495(3)	(**0.000**, 0.149, 0.306, 0.470) **0.717**, 0.889, 1.066
93.14	7	32320.20	$b\ ^3H_4$—567(4)	(0.49, **0.76**) 0.43, **0.85**, **1.29**, **1.79**
91.90	8	32333.19	$b\ ^3D_1$—622(1)	(0.39) 0.60, 1.00
91.58	15	32336.50	$a\ ^5D_2$—468(3)	(**0.000**, 0.253, 0.550) **0.656**, 0.948, 1.240
90.48	10	32348.04	$a\ ^5F_4$—367(3)	(**0.000**, 0.185, 0.341, 0.501) 1.317, 1.501, **1.663**
90.14	20c	32351.59	$a\ ^5P_1$—430(2)	(0.000) **0.251**, 1.056
89.86	5	32354.64	$b\ ^3D_1$—623(2)	
89.74	15c	32355.83	$a\ ^5D_2$—468(2)	(0.75*B*) 0.68, **1.07**, **1.49**, 1.89, 2.38
88.84	4	32365.22		
88.69	10	32366.77		(0.00) 1.15
88.60	10	32367.73	$a\ ^3D_2$—495(3)	(0.000) 1.059
87.76	100c	32376.57	$a\ ^3F_4$—421(4)	(0.020*w*) 1.254*w*
87.08	4	32383.65	$a\ ^4P_2$—442(2)	
85.65	10	32398.68	$c\ ^3F_3$—560(2)	(**0.00**, 0.70) 1.13
84.06	10	32415.40	$a\ ^4D_4$—496(3)	(**0.000**, 0.147, 0.291, 0.439) 1.030, 1.171, 1.312, 1.460, **1.613**
83.39	25	32422.40	$c\ ^3F_4$—555(5)	(0.000 *w*) 0.098 *w*
83.19	6	32424.50	$a\ ^3D_3$—495(2)	(0.34, **0.73**) 0.88, **1.26**, **1.64**, . . .
82.06	90c	32436.42	$b\ ^3G_5$—637(5) $b\ ^3D_3$—630(2) $a\ ^1H_6$—566(6)	(0.00*w*) 1.40*w*
80.53	1	32452.55	$d\ ^3F_2$—622(1)	
79.56	75c	32462.80	$b\ ^3F_3$—421(2)	(0.124, **0.323**) 0.846, **1.035**, **1.215**, 1.391
79.40	4	32464.43	$a\ ^3F_3$—392(3)	(0.00) 1.11
78.47	10	32474.19	$d\ ^2F_3$—623(2)	(0.157, **0.826**) 0.673, **0.829**, **0.988**, 1.138
78.10	25c	32478.17	$a\ ^3D_3$—496(3)	(0.58) 0.71*w*
76.80	8c	32491.88	$a\ ^3G_3$—442(2)	(**0.00**, 0.39) . . .?
76.32	20	32496.89	$a\ ^3D_3$—482(2)	(0.000) 1.468
75.31	2	32507.60	$a\ ^3H_5$—506(6)	(0.000*WD*) 1.350*B*
74.90	20c	32511.94	$b\ ^3P_1$—498(1)	(0.809) 1.922
74.23	25	32519.02		
74.13	15c	32520.04	$a\ ^3D_2$—510(3)	(0.424*W*) 1.316*W*
73.87	20	32522.87	$b\ ^2G_3$—593(2)	(**0.000**, 0.284, 0.604) **0.252**, 0.573, 0.846
73.50	8	32526.72	$a\ ^1H_6$—567(4)	(0.00) 0.77
70.96	15	32553.69	$b\ ^3G_6$—638(4)	(0.000) 1.127
69.93	8	32564.55	$b\ ^1D_2$—558(2)	(0.229, **0.433**) 0.947, **1.162**, **1.368**, 1.554
68.77	8	32576.92		(0.00) 0.99
68.45	7	32580.32		(0.000*w*) 1.349
67.60	5	32589.29		
65.58	5	32610.78		

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length Å air	Intensity and notes	Wave number	Term combination	Zeeman pattern
3065.25	8	32614.27	$a\ ^1D_2$—461(1) $c\ ^3F_2$—555(3)	(0.000, 0.252) **0.869**, 1.105, 1.352
64.79	125c	32619.20	$a\ ^3H_4$—484(4)	(0.445) 1.186
64.17	6c	32625.78	$a\ ^1G_4$—468(3)	(0.00) 1.22
64.08	8	32626.77	$b\ ^3H_5$—580(4)	(0.00) 1.35
63.68	1	32631.60	$c\ ^1D_2$—656(3)	
63.49	8	32633.02	$a\ ^5D_0$—452(1)	(0.00) 1.45
62.52	35c	32643.40	$a\ ^3D_3$—511(2)	(0.000) 1.278
61.44	20	32654.92	$b\ ^3D_3$—630(2)	(0.082) 0.755
60.65	50c	32663.26	$a\ ^5G_3$—444(3)	(0.000w) 0.910w
59.63	15	32674.17	$a\ ^5D_2$—471(3)	(0.000, 0.377, 0.751) **0.336**, 0.707, 1.102, 1.487
58.73	12	32683.83	$a\ ^5F_2$—337(2)	(0.000, **0.341**) 0.537, **0.869**, **1.176**, 1.482
57.23	150c	32699.88	$a\ ^5D_1$—461(1) $b\ ^3F_3$—472(4)	(**0.000**, 0.198, 0.413, 0.656) 0.988, 1.176, 1.382, 1.616, **1.849**
56.62	75c	32706.37	$a\ ^5D_4$—499(4)	(0.167w) 1.216w
56.12	40	32711.68	$a\ ^5H_4$—506(6)	(0.000wD) 1.153 B
55.48	2	32718.53	$a\ ^5D_2$—498(1)	(**0.00**, 0.81) **0.46**, 1.32, 2.03
53.10	50	32744.12	$a\ ^5D_3$—484(4)	(**0.000**, 0.195, 0.399, 0.615) **0.840**, 1.067, 1.265, 1.458, 1.656, 1.856
52.59	125	32749.52		(0.000WD) 0.624A
51.46	15	32761.63	$a\ ^3G_4$—454(5) $a\ ^1H_5$—569(4)	(**0.000**, 0.128, 0.251, 0.392, 0.525) **0.450**, 0.620, 0.739, 0.864, 1.004
45.51	2	32825.68	$b\ ^3P_2$—513(1)	
45.37	25c	32827.20	$a\ ^1D_2$—463(2)	(0.224, **0.440**) 0.913, **1.112**, **1.316**, . . .
44.13	3c	32840.55	$a\ ^3P_1$—435(1)	(0.98) 1.60
42.92	4	32853.63		(0.00) 1.16
42.45	100c	32858.73	$a\ ^3G_3$—446(4)	(**0.000**, 0.336, 0.679) 0.232, 0.568, 0.916, 1.256, 1.537, . . .
42.07	100c	32862.79	$a\ ^3P_0$—369(1)	(0.000) 0.679
40.72	50c	32877.44	$a\ ^3P_2$—385(1)	(**0.000**, 0.878) 0.477, 1.326, **2.187**w
39.85	50	32886.83	$a\ ^3D_1$—475(2)	(**0.000**, 0.444) 0.863, 1.272, **1.736**
39.44	4	32891.25	$b\ ^3D_1$—628(1)	
37.51	100c	32912.12	$a\ ^1F_3$—397(4) $a\ ^3D_1$—463(2)	(0.102, 0.308, **0.470**) . . .?
36.61	50	32921.84	$a\ ^1F_3$—577(2)	(0.000w) 0.923 A
35.53	7c	32933.57	$b\ ^3F_3$—475(2)	(**0.000**, 0.288, 0.593) **0.429**, 0.710
34.91	10	32940.29	$b\ ^5G_4$—611(4) $a\ ^3D_3$—486(2)	(**0.000**, 0.328, 0.628) 1.471, 1.784, **2.105**
34.01	5c	32950.08	$c\ ^3F_3$—558(1)	(**0.00**, 0.74) **0.00**, 0.74
33.12	15c	32959.78	$a\ ^3P_2$—448(3)	(**0.000**, 0.183, 0.385) **0.892**, 1.069, 1.246
32.77	1	32963.55	$a\ ^1G_4$—471(3)	(0.000) 1.021
32.34	6	32968.24	$a\ ^3D_1$—475(1)	(0.652) 0.865, 1.507
31.22	40c	32980.63	$a\ ^3D_3$—515(2)	(0.000w) 1.324 A
30.68	8	32986.25	$b\ ^3F_4$—514(4)	(0.366w) 1.274w
29.70	2	32996.98	$a\ ^3F_2$—361(2)	(0.44) 0.93 D
28.44	25	33010.74	$a\ ^3P_2$—454(2)	(0.00) 0.84
27.62	30	33019.63	$a\ ^5D_2$—475(2)	(0.213, **0.370**) 1.105, **1.273**, **1.480**, 1.652
24.29	2	33056.02	$b\ ^1D_2$—563(3)	
23.94	2	33059.81	$c\ ^3F_4$—561(4)	
23.20	5	33067.88	$a\ ^3G_3$—448(3)	(0.00) 1.11
22.56	50	33074.90	$a\ ^3G_4$—472(4)	(0.496 B) 1.110
21.80	70	33083.28	$a\ ^5D_4$—503(3)	(0.000 W) 1.031w
21.18	4	33090.04	$c\ ^3F_2$—560(2)	
20.52	5	33097.22	$b\ ^3D_1$—630(2)	(0.000) 1.225w
20.17	50	33101.06	$a\ ^5D_1$—475(1)	(0.000) 1.460
19.34	8	33110.22		
18.70	5	33117.24	$c\ ^3P_1$—593(2)	(**0.000**, 0.197) **0.919**, 1.150, 1.360
18.29	10	33121.66	$d\ ^3F_4$—646(3)	(0.125) 1.086
16.07	25	33146.10	$a\ ^3D_3$—503(3)	(0.000w) 1.363 B
15.84	4	33148.56	$c\ ^3G_4$—682(3)	(0.00) 1.17
15.17	10	33156.01	$b\ ^1D_2$—564(1) $b\ ^3P_1$—505(1)	(0.000w) 1.306w
14.94	20	33158.45	$b\ ^3H_5$—585(5)	(0.304) 1.088]W

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
3013.78	3	33171.26	*a* $^1F_3$—580(4)	(0.00) 1.16
12.55	125c	33184.84	*a* $^3P_1$—385(2)	(**0.000**, 0.561) **0.460**, 1.012, 1.544; (0.957) 2.046*w*
11.87	10	33192.25	*b* $^3G_4$—613(5)	(0.76) 1.26
11.49	15	33196.52	*b* $^3D_3$—638(4)	(0.00) 0.84
10.80	125c	33204.09	*a* $^3P_1$—385(1) *a* $^3H_4$—490(5)	(0.376 *W*) 1.289, 1.750 *W*
09.97	7	33213.27	*a* $^3F_4$—429(3)	(0.000*w*) 1.533 *B*
09.65	2	33216.80	*a* $^1D_2$—467(2) *d* $^3F_2$—630(2)	(0.279, **0.554**) 0.550, **0.816**, **1.118**, 1.376
09.16	1	33222.21		(**0.000**, 0.93) 1.53, **2.42**
05.74	40	33259.97	*b* $^3F_4$—517(5)	(**0.000** *W D*) 0.683 *W*
04.92	50	33269.06	*b* $^3F_2$—429(3)	(0.000*w*) 1.229
04.72	10	33271.30	*a* $^1D_2$—468(3)	(0.000*w*) 1.385*w*
04.32	5c	33275.71	*a* $^3D_1$—505(5)	(0.000) 1.084*w*
02.98	50	33290.51	*a* $^1D_2$—468(2)	(0.000) 1.108
02.68	5	33293.86	*a* $^3H_4$—514(4)	(0.000*w*) 1.009*w*
01.73	1	33304.45	*a* $^3P_2$—389(3)	
2999.38	125c	33330.53	*a* $^5D_4$—478(3)	(**0.000**, 0.266, 0.564) **0.624**, 0.931, 1.196, 1.460, 1.728
98.69	3	33338.18		(0.262 *W*) 1.147 *W*
97.28	75c	33353.85	*a* $^5D_3$—490(2)	(0.312*w*) 1.192 *W D*
96.88	7	33358.33	*a* $^5P_2$—452(1)	(**0.000**) 1.408*w*
96.49	25	33362.70	*a* $^5D_2$—505(1)	(**0.000**, 0.163) **0.754**, 0.898, 1.067
95.99	3	33368.18	*c* $^3F_4$—564(5)	(**0.000**, 0.166, 0.322, 0.482) . . .?
95.43	30	33374.48	*b* $^3F_3$—430(2)	(0.000) 1.061
92.95	12	33402.11	*a* $^3F_3$—402(2)	(0.000 *W*) 1.017 *B*
92.69	10	33404.97	*a* $^1F_3$—582(2)	(0.000) 0.989
92.01	4	33412.56		
89.83	5	33437.01	*a* $^3D_1$—480(0)	(0.000) 0.856
89.63	20	33439.19	*c* $^3F_4$—565(5)	(0.000) 0.890
88.72	10	33449.38		(0.000) 0.915
87.12	2	33467.30		(0.00) 1.04
86.81	50c	33470.73	*a* $^5F_3$—361(4)	(0.000*W*) 0.907*A*
84.83	12c	33492.98	*a* $^5P_1$—442(1)	(0.135) 0.255, 2.376
84.55	10	33496.07	*b* $^3G_3$—603(3)	
83.73	2	33505.32		
80.78	1	33538.51	*a* $^3D_1$—481(2)	
80.12	15c	33545.92	*a* $^5P_1$—442(2)	(**0.00**, 1.13) **0.00***w*, 1.24
79.14	10c	33556.94	*a* $^5F_3$—397(4)	(0.00) 1.81
78.20	50	33567.52	*a* $^3D_3$—521(3) *a* $^3H_6$—517(5)	
77.85	10c	33571.50	*a* $^5P_2$—454(2)	(0.53) 1.32*w*
76.99	50c	33581.16	*a* $^3G_4$—462(4)	(0.000*w*) 1.004*W*
76.76	10	33583.79	*a* $^3F_2$—367(3)	(**0.000**, 0.420, 0.842) 0.945, 1.374, 1.814, **2.265**
76.22	200c	33589.80	*a* $^3G_4$—462(5)	(**0.000**, 0.187, 0.406, 0.606, 0.823) 1.004, 1.202, 1.409, 1.611, 1.795, **2.050**
75.74	1	33596.29	*a* $^3D_1$—482(2)	
74.88	2	33605.05		
74.54	50	33608.86	*a* $^1D_2$—471(3)	
73.65	10	33618.85		(**0.000**, 0.347, 0.658) **0.453**, 0.713, 0.997, 1.303
73.52	8c	33620.41	*b* $^3P_2$—521(3)	(**0.00**, 0.40) . . . ?
72.90	8	33627.37	*b* $^3F_4$—521(3)	(0.00*W*) 1.41*w*
72.85	6	33627.93		
72.75	7	33629.07		(0.00) 1.08
71.96	15	33637.99	*a* $^3P_2$—392(3)	(0.00*W*) 0.77*A*
71.62	10	33641.83	*b* $^3F_3$—482(2) *b* $^3G_5$—649(6)	(0.00) 1.31*B*
71.48	8	33643.46		(0.00) 0.98
70.90	1	33650.01	*c* $^3P_2$—616(3)	
70.46	6	33654.97	*b* $^3P_2$—521(1)	(**0.000**, 0.183) 1.281*w*
69.04	40c	33671.04	*c* $^3F_4$—567(4)	(0.000*W D*) 1.794*W D*

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2968. 64	10	33675. 66		(**0.000**, 0.165, 0.345, 0.519) **0.370**, 0.522, 0.668
68. 29	75c	33679. 60	$a\ ^3G_3$—454(2)	(**0.000**, 0.250, 0.568, 0.850) . . . ?
67. 81	5c	33685. 01	$a\ ^3H_4$—495(3)	(**0.000**, 0.197, 0.391, 0.615) **0.699**, 0.929, 1.134, 1.319, 1.501
66. 18	3	33703. 60	$d\ ^3F_4$—652(4)	(0.000*w*) 1.369*W*
65. 93	50c	33706. 39	$a\ ^3F_1$—337(1)	(0.269) 0.165, 0.383
65. 14	250c	33715. 33	$a\ ^5F_1$—337(2)	(**0.000**, 0.748) 0.771, **1.554***W*
64. 02	50c	33728. 16	$a\ ^5D_2$—482(2)	(0.000*w*) 1.453
62. 20	2	33748. 84		(0.00) 1.55
61. 47	3	33757. 12		(0.000) 0.669
60. 71	3	33765. 78	$b\ ^1D_2$—570(3)	(**0.000**, 0.283, 0.571) 1.369, 1.695, . . .
60. 37	7	33769. 72		(0.000*w*) 0.951*w*
60. 12	7	33772. 53		(0.000*w*) 0.787*B*
58. 61	3c	33789. 74	$a\ ^1P_1$—571(1)	(0.572*w*) 2.082
58. 12	10	33795. 37	$a\ ^3H_4$—496(3)	(0.000*w*) 1.339*W*
57. 88	50	33798. 09	$a\ ^3F_4$—435(3)	(**0.000**, 0.150, 0.272, 0.416) 0.945, 1.082, 1.215, 1.358, 1.501, **1.650**
56. 84	100c	33810. 07	$a\ ^5D_3$—495(3)	(0.171, 0.355, **0.493**) 0.975, 1.141, **1.304**, **1.473**, 1.637, 1.802
56. 43	10	33814. 73	$c\ ^3P_0$—571(1) $a\ ^3G_5$—466(4) $a\ ^1H_5$—580(4)	(0.000*w*) 0.894*A*
55. 79	3	33822. 04	$b\ ^3P_1$—511(2)	(0.00) 1.31*A*
55. 32	50	33827. 38	$b\ ^3H_4$—598(5)	(0.000*WD*) 1.319*B*
54. 92	8c	33831. 97		
53. 97	1	33842. 84	$a\ ^5D_4$—510(3)	(**0.000**, 0.150) . . . ?
53. 00	100	33853. 96	$b\ ^3F_3$—435(3)	(0.000*w*) 1.116
51. 90	75	33866. 56	$a\ ^5D_2$—495(2)	(0.000*w*) 1.372*WD*
49. 92	70c	33889. 26	$b\ ^3F_3$—484(4)	(**0.000**, 0.263, 0.541, 0.884) 0.726, 1.003 ,1.264, 1.521, 1.834, **2.178**
49. 02	30	33899. 66		(0.000*WD*) 1.451
48. 53	10	33905. 28	$a\ ^5D_2$—510(3) $c\ ^3F_4$—569(4)	(0.414) 0.903
47. 21	4	33920. 50	$a\ ^5D_3$—496(3)	(0.43, 0.93, **1.36**) 0.22, 0.60, **1.09**, **1.60**, . . .
45. 59	60	33939. 09	$a\ ^3D_3$—524(4)	(**0.000**, 0.241, 0.489, 0.752) **0.347**, 0.604, 0.845, 1.080
44. 83	100	33947. 89		(0.000) 1.166
44. 57	50c	33950. 86	$b\ ^3G_4$—621(4) $b\ ^3P_1$—513(1)	(0.000) 1.065
44. 27	3	33954. 40	$a\ ^1D_2$—475(2)	(0.40) 1.04
43. 48	5c	33963. 44	$d\ ^3F_4$—654(3)	(0.00*w*) 1.06*w*
43. 09	20	33967. 95	$b\ ^3G_5$—662(4)	(0.376 *B*) 1.174 *D*
38. 02	75c	34026. 60	$a\ ^5D_3$—525(3)	(0.216 *B*) 1.349 *D*
37. 80	12	34029. 14	$a\ ^5D_2$—511(2) $b\ ^3D_3$—646(3)	(0.179, 0.350, **0.549**) 0.717, 0.897, **1.062**, **1.240**, 1.417, 1.614
36. 95	50	34039. 00	$a\ ^5D_1$—475(2) $a\ ^3D_1$—486(2)	(**0.000**, 0.209) **1.044**, 1.296*w* (**0.000**, 0.222) 1.434*w*
36. 74	10	34041. 38	$b\ ^3G_5$—608(2)	(**0.000**, 0.273, 0.546) **0.292**, 0.584, 0.857, 1.123
35. 95	10	34050. 61	$a\ ^3F_2$—372(2)	(0.138, **0.257**) 0.475, **0.608**, **0.745**, 0.872
35. 62	10	34054. 42		(0.059) 1.023
32. 91	30c	34085. 88	$b\ ^3F_3$—486(2)	(**0.000**, 0.175, 0.337) **0.607**, 0.786, 0.954, 1.104, 1.285, 1.419
31. 69	5	34100. 00		(**0.000**, 0.094) **0.439**, 0.532
29. 93	20	34120. 55	$a\ ^5D_1$—475(1)	(0.000) 1.506
29. 45	15	34126. 14	$d\ ^3F_4$—656(3) $a\ ^3G_4$—468(3)	(**0.000**, 0.203, 0.376, 0.560) **0.467**, 0.643, 0.844
28. 94	2	34132. 06	$c\ ^3F_2$—570(3)	
28. 29	3	34139. 68	$b\ ^3H_4$—585(5)	
27. 51	15	34148. 72	$a\ ^1D_1$—487(1)	(0.107) 0.798
26. 72	20c	34158. 00	$a\ ^3D_2$—513(1)	(**0.000**, 0.184) **1.077**, 1.261, 1.422
26. 60	7	34159. 35	$b\ ^3P_1$—515(2)	(0.00) 1.32
25. 55	8	34171. 63	$c\ ^3F_3$—577(2) $a\ ^5D_2$—486(2)	(0.341, **0.644**) 0.835, **1.126**, **1.492**, 1.781
22. 85	50c	34203. 12		(0.000*w*) 0.885 *D*
22. 28	30c	34209. 78	$a\ ^3P_2$—466(4)	
22. 13	40	34211. 39	$a\ ^5D_3$—499(4)	(**0.000**, 0.248, 0.494, 0.747) **0.449**, 0.694, 0.955, 1.202, 1.436, 1.692, 1.968
21. 44	8	34219. 66		(0.000) 0.818
18. 96	200c	34248. 75	$a\ ^5D_4$—514(4)	(0.239*w*) 1.131 *W*
18. 09	12	34258. 92	$a\ ^3F_4$—440(4)	(0.402 *B*) 1.168 *D*

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2917.56	50	34265.16	a $^1G_4$—484(4) a $^1D_2$—478(3)	(0.000*w*) 1.360 *B*
16.81	1	34274.02	c $^3P_2$—623(2)	
16.55	15*c*	34277.10		(**0.00**, 0.34) 1.25, **1.52**
14.73	50	34298.43	*b* $^3G_4$—624(4)	(0.000 *WD*) 0.847*w*
14.66	20*c*	34299.28	a $^5P_2$—461(1)	(0.000) 1.475 *D*
14.10	4	34305.81		(**0.000**, 0.230) 1.405, 1.616, **1.858**
13.99	30	34307.14	*a* $^3H_6$—524(4)	(0.000) 1.101
13.44	30	34313.63	a $^3F_3$—411(2)	(0.000*w*) 0.970 *A*
12.41	40	34325.77	a $^5D_1$—478(0)	(0.000) 1.515
11.88	2	34332.02		
10.86	3	34344.05		(0.000) 1.466 *B*
10.67	2	34346.29	*a* $^1H_5$—585(5)	(0.00) 1.22
09.02	12	34365.80	*a* $^3D_3$—515(2)	(0.158) 1.232
07.33	30*c*	34385.72	*a* $^1P_1$—577(2)	(**0.000**, 0.217) **0.889**, 1.055
06.92	3	34390.63		(0.000) 1.014
05.24	100	34410.51	*a* $^3P_2$—385(1)	(0.000) 0.472
04.88	20	34414.76	*a* $^5P_3$—468(2)	(**0.000**, 0.498) 1.127, 1.600, 2.079, **2.597**
04.41	2	34420.34	*c* $^3F_3$—580(4)	
04.08	20*c*	34424.20	*b* $^3H_5$—598(5)	(0.00*w*) 1.09
01.87	50	34450.46	*a* $^5G_5$—472(4)	(0.141) 1.087
01.67	4	34452.84	*a* $^5D_1$—490(2)	
01.31	15*c*	34457.14	*a* $^5D_2$—530(2)	
00.74	75	34463.84	*a* $^5G_4$—471(3)	(0.000*w*) 0.875*w*
2899.20	50	34482.18	*a* $^1F_3$—593(2)	(**0.000**, 0.174, . . .) **0.622**, 0.799, 0.996, 1.179
98.69	3	34488.25		(0.18) 1.13
97.99	2	34496.61	*b* $^1D_2$—577(2)	(0.00) 1.13
97.73	4	34499.65	*b* $^3F_3$—490(2)	(**0.000**, 0.313, 0.644) **0.345**, 0.673, 0.996, 1.320
96.84	2	34510.28	*b* $^3P_2$—530(2)	(0.000*w*) 1.461
96.38	20	34515.74	*b* $^3F_2$—442(1)	(**0.000**, 0.799) 0.248, 1.049, **1.343**
96.04	7	34519.78	*a* $^3G_3$—462(4)	
95.48	30	34526.41		(**0.000**, 0.155, 0.297) **0.360**, 1.139, 1.289
93.77	10	34546.83	a $^5F_4$—389(3)	(**0.000**, 0.342, 0.681, 1.013) 0.827, 1.162, 1.497, 1.840, **2.175**
91.99	2	34568.08		(0.23) 1.11
91.36	15	34575.64	a $^3G_4$—472(4) a $^3P_2$—402(2)	(0.188, **0.385**) . . ., **1.149**, **1.336**, 1.524, 1.719
90.53	3	34585.63	a $^5D_2$—490(2)	(0.31) 1.57
90.26	50*c*	34588.85	a $^5F_3$—372(2) a $^5D_1$—480(0)	(**0.000**, 0.622, 1.247) 0.000, 0.614, 1.240, 1.866, **2.491**
88.40	20	34611.12	*b* $^3D_3$—652(4)	(0.000) 1.179
87.69	2	34619.60	a $^3G_3$—463(2)	
87.16	2	34625.96		
86.34	6	34635.81	*c* $^3P_1$—608(2)	(**0.000**, 0.209) **0.923**, 1.137, 1.330
85.40	40*c*	34647.03	*a* $^3P_2$—403(1)	(0.097) 1.395
84.65	25*c*	34656.06	*a* $^3H_4$—505(5)	(0.000) 1.123*w*
84.30	12	34660.26	*a* $^3H_5$—528(6)	(0.000*w*) 1.467*B*
82.83	8	34678.01		
82.32	25	34684.09	*a* $^3F_4$—444(3)	(**0.000**, 0.278, 0.562, 0.835) 0.659, 0.939, 1.222, 1.496, 1.777, **2.051**
82.00	8	34687.95	*c* $^3P_0$—580(1)	(0.000) 1.133
81.60	50	34692.82	*a* $^3P_1$—400(0)	(0.000) 1.549
80.57	4	34705.14		(0.000) 0.508
79.09	35	34722.99	*a* $^3P_2$—415(3)	(0.246, **0.385**) 0.824, 0.936, **1.083**, **1.208**, 1.347, **1.462**
78.21	18*c*	34733.65	a $^5P_3$—471(3) a $^5P_1$—454(2)	(0.000) 1.117 *W D*
77.67	100	34740.19	*b* $^5F_2$—444(3)	(0.000*w*) 0.992*w B*
77.54	25	34741.71	*b* $^3F_4$—532(5)	
77.06	25	34747.53	*a* $^3D_1$—482(2)	(0.000) 1.385
74.83	12	34774.45		(0.000) 1.081
74.33	30*c*	34780.54	*b* $^3P_1$—521(1)	(0.409) 1.17, 1.608

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2873.56	40	34789.82	*a* $^3D_2$—533(4)	(0.00*w*) 1.64
72.16	1	34806.79		
71.89	1	34810.06	*d* $^3F_2$—646(3) *c* $^3P_2$—628(1)	
71.59	5	34813.72		(0.00) 1.20
70.87	6	34822.47		(0.000) 0.956
69.51	15c	34838.98	*a* $^3F_4$—445(5)	(0.000*W*) 1.399*w*
69.02	6	34844.93	*a* $^5P_3$—472(4)	(**0.000**, 0.396) **0.775**, 1.197, 1.602
68.64	25	34849.53	*b* $^3F_4$—533(4) *a* $^1G_4$—490(5)	(0.392*B*) 1.132*D*
68.14	20	34855.52	*b* $^1G_4$—602(3)	(0.000*w*) 0.893*B*
67.83	7c	34859.39		(**0.000**, 0.176, 0.369, 0.539) . . .?
67.41	150c	34864.40	*a* $^5H_6$—528(6)	(0.000*W*) 1.163*w*
66.85	7	34871.20	*b* $^3D_3$—654(3)	(0.00) 1.42
66.26	18c	34878.47	*a* $^3G_5$—466(4)	(**0.000**, 0.280, 0.586) 1.223, 1.499, 1.789, 2.102
66.14	35c	34879.84	*a* $^5F_4$—392(3) *a* $^3F_4$—446(4)	(0.000*w*) 1.282*w*
65.70	50	34885.23		(0.000*w*) 1.035*A*
65.32	85	34889.85	*a* $^5D_4$—521(3)	(0.000*w*) 1.328*W*
64.26	7	34902.82	*a* $^3P_1$—402(2)	(**0.000**, 0.395) **0.751**, 1.159, 1.571
63.54	10	34911.56	*a* $^3D_3$—534(3)	(0.00*w*) 1.24
63.44	20	34912.80		(0.264*B*) 1.105*D*
62.52	12	34923.96		(0.000) 1.112
61.24	10	34939.65	*b* $^1G_4$—603(3)	(0.00) 1.01
60.88	75	34943.99	*a* $^3F_3$—417(4)	(**0.000**, 0.172, 0.358, 0.542) . . ., 0.901, 1.075, 1.259, 1.436, 1.637, **1.829**
59.94	8	34955.55	*b* $^3F_3$—495(3) *a* $^5P_2$—468(3)	(**0.000**, 0.221, 0.453) **0.766**, 0.984
59.72	12	34958.17	*c* $^3F_4$—580(4)	(0.059) 1.056
59.14	20c	34965.28	*b* $^3P_2$—534(3) *a* $^3D_1$—496(2)	(0.000) 0.755 (0.000) 2.305
58.75	20	34970.05		
58.43	125	34973.99	*a* $^3P_1$—403(1)	(0.317) 1.223, 1.556
57.34	8	34987.33	*a* $^3D_2$—521(1)	(**0.000**, 0.399) **0.853**, 1.227
56.68	50	34995.40	*a* $^5D_0$—475(1)	(0.000) 1.502
55.85	2	35005.55		(0.00) 1.21
55.34	20c	35011.75	*b* $^3F_3$—495(2)	(**0.000**, 0.587, 1.155, 1.678) **0.441**, 0.984, 1.581
55.18	5	35013.75	*d* $^3F_4$—665(4)	(0.00) 1.10
54.79	6	35018.60		(0.000) 0.846
54.21	2	35025.68		(0.00) 0.90*A*
53.54	8	35033.85	*b* $^3D_3$—656(3)	(0.264, 0.504, **0.753**) 0.501, 0.766, **1.032**, **1.274**, 1.492, 1.754
53.18	10	35038.26	*b* $^3P_0$—513(1)	(0.00) 1.046
52.94	10	35041.32	*a* $^5D_2$—495(3)	(**0.000**, 0.161, 0.335) **0.989**, 1.120, 1.288, 1.466
52.34	150	35048.68	*a* $^5H_5$—532(5)	(0.274*B*) 1.109 *W D*
50.98	40	35065.40	*b* $^3F_3$—496(3)	(0.389*B*) 1.239 *W D*
49.92	10	35078.40	*d* $^3F_4$—66c(5)	
49.86	12	35079.08	*a* $^5P_2$—475(2)	(**0.000**, 0.325, 0.654) 0.967, 1.297, **1.604**, . . . ?
49.51	1	35083.43	*a* $^5G_2$—468(2)	
49.06	8	35089.02	*a* $^5F_4$—448(3)	(0.000) 1.172
48.89	20c	35091.13	*a* $^5D_3$—536(2)	(0.000*w*) 1.350*w*
48.33	15	35097.98	*a* $^5D_2$—495(2)	(0.197) 1.513*D*
47.65	20	35106.31	*a* $^1D_2$—486(2)	(0.000) 1.114
46.54	5c	35120.05	*a* $^5G_4$—478(3)	
44.60	10	35144.06	*b* $^3P_2$—536(2)	
44.46	200	35145.75	*a* $^5F_3$—361(2)	(0.139*B*) 0.988*w*
43.98	4	35151.68	*a* $^5D_2$—496(3)	
43.51	110c	35157.50	*a* $^5H_5$—533(4)	(0.000) 1.083
41.61	8	35180.95		(0.000) 1.112
40.79	8	35191.13	*a* $^3D_1$—486(2)	(**0.000**, 0.368) **0.770**, 1.143
40.39	75	35196.13		(0.000) 1.038
39.91	10	35202.01		(0.000*w*) 0.889*w*

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2838.78	2	35216.06	*a* $^{1}D_{2}$—487(1)	(**0.000**, 0.362) 0.795, 1.104, **1.477**
38.23	175c	35222.87	*a* $^{5}H_{4}$—510(3)	(0.000*w*) 1.101*w*
37.11	7	35236.82		
36.35	7	35246.16	*b* $^{3}P_{2}$—537(1)	(**0.000**, 0.199) 1.407, **1.633**
35.84	30c	35252.60	*a* $^{3}H_{6}$—532(5)	(0.000*w*) 1.069*WB*
35.29	25c	35259.39	*a* $^{3}D_{1}$—498(1) *b* $^{3}H_{6}$—596(5)	(1.209) 1.995 (**0.000**, 1.081) 0.880
35.10	20c	35261.78	*a* $^{3}D_{4}$—524(4)	(0.283) 1.081*B*
33.78	7	35278.20	*b* $^{3}G_{5}$—665(4)	(0.000) 1.314
33.06	1	35287.19	*b* $^{3}G_{3}$—621(4)	
32.70	50c	35291.63	*a* $^{3}F_{3}$—421(4)	(**0.000**, 0.191, 0.380, 0.581) 0.893, 1.074, 1.258, 1.460, 1.639, **1.866**
32.54	15	35293.62	*a* $^{5}P_{2}$—471(3)	
31.97	8	35300.76	*a* $^{5}D_{1}$—487(1)	(0.751) 0.751, 1.491
31.75	2	35303.47		
31.47	4	35307.01		
30.40	10	35320.28	*b* $^{3}G_{4}$—634(4)	
30.26	25	35321.99	*a* $^{3}F_{2}$—421(2)	(**0.000**, 0.126, 0.289, 0.492) **0.798**, 0.934, 1.081, 1.214
29.79	30	35327.97	*a* $^{3}F_{4}$—397(4)	(0.478*B*) 0.841, **1.059**, **1.316**, 1.572
29.19	12	35335.41	*a* $^{3}F_{2}$—385(2)	(0.277, **0.526**) . . . ?
28.58	75	35343.04	*b* $^{3}G_{5}$—666(5)	(0.000*WD*) 1.028
28.09	12c	35349.20	*a* $^{5}D_{4}$—525(3)	
27.59	60c	35355.38	*a* $^{3}F_{2}$—385(1)	(**0.000**, 0.243) 0.457, 0.748, **1.032***w*
27.47	10c	35356.90	*b* $^{3}F_{3}$—499(4)	(**0.000**, 0.209, 0.430, 0.680) 0.996, 1.202, 1.427, 1.664, **1.902**
26.30	3	35371.54	*a* $^{1}F_{3}$—602(3)	
25.75	1	35378.42		
24.64	12	35392.28	*a* $^{5}D_{2}$—498(1)	(**0.000**, 0.532) **0.934**, 1.485, 2.024
24.36	5	35395.83		
23.82	20c	35402.55	*a* $^{3}G_{3}$—471(3) *a* $^{1}D_{2}$—489(3)	(0.254) 1.002
23.61	3	35405.24	*b* $^{3}H_{4}$—598(5)	
23.07	15	35412.05	*a* $^{5}D_{2}$—525(3)	(**0.000**, 0.201, 0.403) 1.226, 1.411, 1.597, **1.792**
20.71	6	35441.61	*b* $^{1}G_{4}$—496(3)	(**0.000**, 0.341, 0.695) **0.325**, 0.671, 0.998, 1.309
20.08	3	35449.58	*b* $^{3}P_{1}$—528(1)	(0.258) 1.449
19.93	1	35451.44		
19.52	15c	35456.62		
19.13	70c	35461.51	*a* $^{5}P_{1}$—461(1)	(1.026) 1.365, 2.382
18.35	20	35471.29	*a* $^{5}D_{2}$—511(2)	(0.000*w*) 1.655*B*
17.10	200	35487.11	*a* $^{3}P_{2}$—411(2)	(0.171, **0.389**) 0.959, **1.160**, **1.352**, 1.567
15.72	2	35504.44		
15.00	25	35513.55	*a* $^{5}G_{3}$—472(4)	
14.46	20	35520.28	*a* $^{1}D_{2}$—490(2)	(0.147, 0.332, **0.508**) 0.985, **1.216**, **1.403**, 1.600
14.30	90c	35522.35	*a* $^{5}F_{5}$—417(5)	(0.715) 1.605*W*
13.52	3	35532.19		
13.05	2	35538.19	*b* $^{3}G_{4}$—637(5)	
12.63	6	35543.44	*b* $^{3}F_{2}$—452(1)	(**0.000**, 0.408) **0.657**, 1.055, 1.451
11.70	125c	35555.20	*b* $^{3}F_{4}$—540(5)	(0.000*W*) 1.212*B*
11.33	15	35559.83		(**0.000**, 0.178, 0.341) **0.899**, 1.060, 1.240
10.48	3	35570.62		
09.94	15	35577.44	*b* $^{3}H_{6}$—615(6)	(0.208*w*) 1.147
09.06	15c	35588.61	*a* $^{5}F_{5}$—417(4)	(0.000*W*) 0.472*w*
08.31	25	35598.13	*b* $^{3}H_{5}$—616(6)	(0.000) 1.185
07.75	12	35605.17	*a* $^{5}D_{1}$—490(2)	(**0.000**, 0.193) **1.113**, 1.312, 1.508
07.39	30	35609.73		(0.000*w*) 0.872*A*
07.23	5	35611.79	*a* $^{1}H_{5}$—598(5)	
05.90	15c	35628.67	*a* $^{5}F_{3}$—382(3) *a* $^{5}H_{4}$—514(4)	(0.000*w*) 1.109
05.46	3	35634.28	*b* $^{3}G_{3}$—624(4)	
05.33	15c	35635.96	*b* $^{3}P_{1}$—530(2)	(**0.000**, 0.299) 1.774

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2805.07	8	35639.21	$a\ ^5P_2$—475(2) $a\ ^3C_3$—484(4)	(0.242*B*) 1.342*D*
04.58	3	35645.46		
04.01	20	35652.71	$a\ ^5D_3$—542(4)	(**0.000**, 0.198, 0.430, 0.639) **0.531**, 0.738, 0.940, 1.145, 1.349
03.80	10	35655.38	$b\ ^3G_4$—638(4) $a\ ^3D_2$—528(1)	
02.93	3	35666.44		
02.34	10	35673.93	$a\ ^5P_1$—463(2)	
00.53	15	35697.01	$a\ ^5P_2$—413(1)	(**0.000**, 0.548) **0.782**, 1.322, 1.893
2799.27	35	35713.06	$b\ ^5F_4$—542(4)	(0.328*Wd*) 1.034*D*
98.72	40	35720.13	$a\ ^5P_3$—475(1) $b\ ^1G_4$—611(4)	(0.206*B*) 0.865*D*
97.76	200	35732.40	$a\ ^1G_4$—499(4) $a\ ^5F_2$—367(3)	(**0.000**, 0.170, 0.355) 0.820, 0.995, 1.176, 1.351, **1.523**
96.58	5	35747.41	$a\ ^3G_3$—475(2)	
96.08	20	35753.80	$a\ ^5D_3$—514(4)	(**0.000**, 0.343, 0.670, **1.005**) **0.105**, **0.413**, . . .
95.20	70c	35765.01	$a\ ^3G_4$—484(4)	(0.235, 0.482, 0.818, **1.100**) 0.205, 0.501, 0.778, **1.014**, **1.254**, 1.501, 1.771, 2.040.
94.10	8	35779.15		(0.000*w*) 1.087*w*
93.86	20	35782.25	$a\ ^3F_2$—389(3)	(**0.000**, 0.251, 0.519) 0.480, 0.735, 0.992, 1.241, **1.509**
93.47	4	35787.19	$a\ ^5P_3$—482(2)	(**0.000**, 0.096, 0.198) . . .?
91.84	10	35808.14	$a\ ^5D_3$—515(2) $b\ ^3H_4$—602(3)	(**0.000**, 0.239, 0.453, 0.664) **0.193**, 0.414, 0.593, 0.774, 0.976, 1.176
91.37	50	35814.18	$a\ ^3P_1$—411(2) $d\ ^5F_2$—656(3)	(**0.000**, 0.392) **0.754**, 1.164, 1.551
89.16	30	35842.58	$a\ ^3D_2$—530(2)	(0.246, **0.522**) 0.941, **1.212**, **1.474**, 1.727
88.95	3	35845.20		
86.77	25	35873.20	$a\ ^5F_3$—385(2)	(**0.000**, 0.229, 0.476) 0.775, 1.004, 1.242, 1.484, **1.736**
85.29	8	35892.28	$b\ ^3H_4$—603(3)	(**0.000**, 0.168, 0.328, 0.513) **0.471**, 0.660, 0.843, 0.991, 1.139, 1.288, 1.453
84.96	75	35896.60	$a\ ^3P_2$—415(3)	(0.000*w*) 0.903*A*
84.46	2	35903.04	$a\ ^3D_1$—505(1)	
83.04	3	35921.38	$b\ ^3D_2$—665(4)	(0.000*WD*) 0.693*A*
81.90	12	35936.05	$a\ ^5F_5$—421(4)	(0.000*WD*) 1.841*B*
81.35	1	35943.20	$b\ ^3H_5$—613(5)	
81.14	7	35945.92	$a\ ^1P_1$—593(2)	(0.000*w*) 1.123
80.83	10	35949.92	$a\ ^5P_2$—478(3)	(**0.000**, 0.225, 0.435) **0.749**, 0.979, 1.196
80.34	50	35956.21	$a\ ^5F_2$—369(1)	(**0.000**, 0.333) 0.696, 0.995, **1.336**
79.46	2	35967.65		
79.06	2	35972.84	$b\ ^1G_4$—613(5)	
78.81	30	35976.02	$a\ ^1D_2$—495(3)	(**0.000**, 0.209, 0.413) 0.898, 1.099, 1.299, 1.497, **1.719**
76.91	6	36000.60	$a\ ^1F_3$—608(2)	(**0.000**, 0.160, 0.319) **0.653**, 0.802, 0.958, 1.145
76.70	20	36003.30	$a\ ^5D_4$—532(5)	(0.000*w*) 1.086
76.23	5	36009.42		
75.38	8	36020.52	$a\ ^3H_5$—642(4)	(0.000*w*) 0.940
75.10	30	36024.16	$a\ ^5P_1$—413(1)	(0.336) 1.530
74.56	40	36031.17		(**0.000**, 0.137, 0.286, 0.430, 0.562, 0.732) **0.288**, 0.412, 0.576, 0.711, 0.874, 1.024, 1.145
74.18	15	36036.10	$a\ ^5D_2$—505(1)	(0.000*wD*) 1.490
73.60	5	36043.65		
72.47	10	36058.25	$a\ ^3G_3$—478(3)	(0.258, 0.755*W*) 0.335, 0.632, **0.919**, **1.182**, 1.470, 1.787
72.24	2	36061.33	$c\ ^3P_1$—622(1)	
72.06	2	36063.66	$a\ ^5P_1$—467(2)	
71.82	75	36066.68	$a\ ^3H_6$—540(5)	(0.000*w*) 1.070*w*
70.54	1	36083.34	$c\ ^3P_1$—623(2)	
70.32	4	36086.28	$a\ ^1D_2$—496(3)	(0.000*w*) 0.909*A*
70.10	15	36089.19	$c\ ^1G_4$—712(5)	(**0.000**, 0.200, 0.423, 0.631, 0.892) 1.027, 1.223, 1.430, 1.630, 1.840, **2.097.**
69.65	5	36094.99	$a\ ^5D_3$—546(3)	(0.396, 0.574, 0.824, 1.217*w*) . . ., **0.928**, 1.320, 1.762
68.07	12	36115.54	$a\ ^5F_2$—392(3)	(**0.000**, 0.395, 0.788) 0.339, 0.732, 1.136, 1.532, 1.922

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2767.92	2	36117.51	$a\ ^4D_1$—495(2)	
67.10	15	36128.20	$a\ ^2F_2$—429(3)	(0.132) 1.083
66.79	1	36132.27	$a\ ^2D_2$—533(2)	
66.40	12	36137.39	$a\ ^6P_1$—468(2)	(0.000, 1.286w) −0.197, +1.091, 2.357
65.59	2	36147.95	$b\ ^2P_2$—546(3)	(0.000, 0.515, 1.048) 0.429, 0.929, 1.437
65.04	2	36155.19	$b^2\ F_4$—546(3)	(0.000, 0.295, 0.600, 0.907) 1.224, 1.525, 1.833, 2.124
63.36	30	36177.16	$a\ ^6F_1$—361(2)	(0.000, 0.934) 0.000, 0.934, 1.866
62.05	75	36194.27	$b\ ^2H_5$—622(5) $b\ ^4H_5$—616(6)	(0.000 W) 1.464
61.75	75	36199.54	$a\ ^4F_2$—372(2)	(0.384, 0.770) 0.249, 0.612, 1.005, 1.385
59.28	20	36230.59	$a\ ^6P_3$—486(2)	(0.000, 0.473, 0.990) 0.575, 1.130, 1.610, 2.067, 2.538
59.05	25	36233.65	$a\ ^2F_3$—430(2)	(0.000) 1.097
58.16	2	36245.36		
57.26	40	36257.20	$a\ ^2G_4$—489(3)	(0.000, 0.259, 0.549, 0.871) 0.149, 0.455, 0.774, 1.015, 1.269, 1.535, . . .
56.30	25	36269.75	$b\ ^4P_1$—536(2) $a\ ^4H_4$—521(3)	(0.000w) 1.149A
54.21	2	36297.27	$a\ ^2D_2$—534(3)	(0.000) 1.228
53.46	3	36307.20		
52.49	100	36319.96	$a\ ^6F_5$—389(3)	(0.240, 0.475, 0.762) 0.486, 0.744, 0.997, 1.239, 1.490, 1.768
51.98	3	36326.79	$a\ ^4D_2$—498(1)	(0.00) 0.93
50.35	100	36348.24	$a\ ^6P_2$—482(2)	(0.176) 1.125W
48.58	20	36371.70	$b\ ^4P_1$—537(1)	(0.098) 1.217
46.83	75	36394.81	$a\ ^6D_3$—521(3)	(0.000W) 1.197D
45.57	3	36411.50	$a\ ^6D_1$—498(1)	(0.485) 1.512, 1.984
43.98	1	36432.64		(0.000) 1.011, 1.294
42.23	15	36455.83	$a\ ^2G_4$—482(2)	(0.000, 0.524, 1.048) 0.000 w, 0.404, 0.913, 1.454
40.69	30	36476.34	$a\ ^4D_2$—536(2)	(0.162, 0.279) 1.042, 1.191, 1.343, 1.476
40.11	25	36484.09	$b\ ^2F_2$—461(1)	(0.00) 1.22
39.28	75	36495.42	$a\ ^2P_2$—421(2)	(0.175, 0.310) 1.045, 1.184, 1.371, 1.528
38.20	1	36509.61		
37.20	2	36522.89		
36.91	15	36526.69	$a\ ^2P_2$—489(3)	(0.332, 0.647, 0.999) 0.623, 0.944, 1.275, 1.598, 1.927, . . .
35.26	50	36548.83	$a\ ^4F_4$—462(5)	
33.67	2	36569.98	$a\ ^2D_1$—511(2)	
33.33	25	36574.54	$a\ ^4D_3$—551(3)	(0.260 B) 1.257D
31.26	8	36602.32		(0.000) 0.930
30.98	2	36606.11		
30.74	50	36609.30	$c\ ^2P_2$—646(3) $c\ ^2F_4$—596(5)	(0.000W) 1.151B
30.25	1	36615.86	$b\ ^2F_3$—511(2)	
29.93	3	36620.19	$c\ ^2P_1$—628(1)	(0.424) 0.911, 1.340
29.37	1	36627.69	$b\ ^4P_2$—551(3)	
28.79	15	36635.41		(0.000) 1.176
28.32	2	36641.78	$a\ ^2H_4$—524(4)	
27.44	75	36653.62	$a\ ^4F_3$—392(3)	(0.309) 1.198
26.85	4	36661.47		
26.41	2	36667.42		
26.01	15	36672.80	$b\ ^2H_4$—611(4)	(0.204) 1.038D
25.44	75	36680.49		(0.000W) 1.032D
24.09	12	36698.69	$a\ ^2D_1$—513(1)	(0.207) 0.841, 1.000
23.85	40	36701.83	$b\ ^2H_5$—621(4)	(0.00) 0.98
23.67	1	36704.30	$c\ ^2F_3$—603(3)	
23.49	2	36706.70		(0.000) 0.845
22.20	1	36724.09		
21.82	3	36729.23	$a\ ^2H_5$—525(3)	
21.16	1	36738.12		
20.05	10	36753.13		(0.113) 1.043
19.89	2	36755.26		
19.28	1	36763.60		

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2718.95	8	36768.01	$d\ ^3F_4$—682(3)	
17.26	2	36790.94	$b\ ^3H_5$—622(5) $a\ ^5P_2$—486(2)	
16.49	25	36801.36	$a\ ^5P_1$—475(2) $b\ ^3P_2$—464(2)	(**0.000**, 0.988*w*) **0.213**, 1.276, 2.357*w*
15.31	10	36817.30	$a\ ^3G_4$—495(5)	(0.000) 1.229*w*
15.14	3	36819.56	$b\ ^1G_4$—622(5)	(0.000) 1.017
14.79	3	36824.38	$a\ ^1F_3$—616(3)	
14.67	12	36826.02	$c\ ^3P_1$—630(2)	(0.000) 1.28
14.28	8	36831.20	$a\ ^3G_4$—495(3) $a\ ^5D_2$—513(1)	(**0.000**, 0.426) 1.064, 1.444, **1.879**
13.44	1	36842.64		(0.000*W*) 1.115*w*
12.59	3	36854.24	$a\ ^5D_3$—525(3)	(0.000*W*) 1.451
11.71	2	36866.12		(0.000) 1.072
10.73	40	36879.55	$a\ ^1H_5$—611(4)	(0.000) 0.947
10.12	12	36887.81	$b\ ^3F_4$—553(4)	(0.00) 1.19
09.27	125	36899.34	$a\ ^3G_3$—486(2) $a\ ^3F_4$—466(4)	(**0.000**, 0.228) **0.452**, 0.702, 0.935 (0.474) 1.215
08.73	1	36906.72	$a\ ^3D_1$—515(2)	
05.83	4	36946.31	$b\ ^1D_2$—602(3) $b\ ^3G_5$—682(5)	(0.000*D*) 1.267*w*
05.32	12	36953.22	$b\ ^3F_3$—515(2)	(**0.000**, 0.305, 0.620) **0.352**, 0.676, 0.985, 1.295, 1.608
03.99	15	36971.45	$a\ ^3D_2$—505(1)	(**0.000**, 0.257) **0.847**, 1.130, 1.398
03.69	15	36975.50	$a\ ^5D_4$—542(4)	(0.000*W*) 1.134*w*
02.78	35	36987.90	$a\ ^3F_3$—369(1)	(0.658) 0.000, 0.685
02.66	25	36989.64	$a\ ^3D_3$—555(3)	(0.300*w*) 1.396*D*
02.08	10	36997.61	$a\ ^3D_3$—555(2)	(**0.000**, 0.274, 0.570) 1.019, 1.308, . . ., . . .
01.07	25	37011.36	$b\ ^3F_4$—555(5)	(**0.000**, 0.171, 0.363, 0.528, 0.710) **0.359**, 0.522, 0.685, 0.869, 1.057, 1.230, 1.400, 1.603
2699.90	2	37027.45	$b\ ^3P_2$—555(1)	(0.000) 1.473
99.69	4	37030.33	$b\ ^1D_2$—603(3)	(0.000) 1.180
98.80	15	37042.48	$b\ ^3P_2$—555(3)	(0.000) 1.396
98.52	20	37046.34		(0.000) 1.259
98.30	10	37049.31	$b\ ^3H_6$—624(4) $b\ ^3F_4$—555(3)	(0.000) 1.044
98.01	3	37053.33	$a\ ^5F_2$—402(2)	(0.399, . . .) 0.749, 1.155
97.84	2	37055.70	$a\ ^3G_5$—498(5) $a\ ^5D_1$—505(1)	(0.000) 1.284
97.39	10	37061.88		
96.81	5	37069.79	$b\ ^3G_4$—652(4)	
96.52	1	37073.79	$a\ ^1P_1$—604(1)	
96.22	8	37077.93	$b\ ^1G_4$—624(4)	(0.000) 0.512
95.70	12	37085.04	$a\ ^5F_4$—468(3)	(0.000) 1.242
95.54	2	37087.31	$a\ ^3P_2$—489(3) $a\ ^3P_1$—478(0)	(**0.000**, 0.143, 0.305) **0.968**, 1.124, 1.289 (0.000) 1.157, 1.246*w*
94.52	100	37101.35	$a\ ^5F_1$—397(4)	(0.000*w*) 1.190*w*
92.83	20	37124.66	$a\ ^5F_2$—403(1)	(**0.000**, 0.489) **0.263**, 0.740, 1.230
91.80	25	37138.78	$a\ ^5F_4$—415(3)	(0.000*w*) 1.729*B*
90.79	1	37152.78		
90.49	2	37156.89	$a\ ^3P_2$—495(2)	(0.000) 1.585
90.36	3	37158.66	$b\ ^3P_1$—545(2)	(0.000*w*) 0.891
90.20	5	37160.91		(0.068) 0.992
89.81	1	37166.37		
89.27	50	37173.80	$a\ ^3F_3$—440(4)	(0.000*w*) 1.175*w*
88.75	1	37180.99	$a\ ^5G_4$—498(5)	
88.46	3	37184.95		(**0.000**, 0.445) 0.676, 1.101, **1.559**
87.46	4	37198.76		
87.00	2	37205.18	$a\ ^5P_2$—490(2)	(0.222) 1.333
86.59	2	37210.87	$a\ ^3P_2$—496(3)	

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2685.16	150	37230.64	$a\ {}^3P_0$—413(1) $a\ {}^5F_1$—372(2)	(0.000) 1.890 (**0.000**, 0.613*w*) 0.000*w*, 0.600*w* **1.212***w*
84.04	1	37246.22	$a\ {}^1F_3$—621(4)	
83.77	4	37249.91	$c\ {}^3F_3$—608(2)	(0.000*w*) 1.028
82.96	4	37261.26	$b\ {}^3H_4$—616(3)	(0.000*w*) 1.094*w*
81.25	25	37284.91	$a\ {}^5D_3$—530(2)	(0.000) 1.464
80.66	75	37293.17	$a\ {}^5F_4$—417(5)	(0.000*w*) 0.815*A*
80.06	75	37301.59	$a\ {}^3P_2$—429(3)	(**0.000**, 0.233, 0.461) **0.661**, 0.902, 1.126, 1.361, 1.586
79.77	2	37305.52	$a\ {}^3D_3$—558(2)	
79.26	5	37312.60	$c\ {}^3F_2$—602(3)	
78.81	50	37318.94	$a\ {}^3H_5$—555(5)	(0.000) 1.086
76.48	20	37351.44	$a\ {}^5P_1$—480(0)	(0.000) 2.394*w*
75.90	100	37359.45	$a\ {}^5F_4$—417(4)	(0.292*w*) 1.324*D*
75.73	50	37361.92	$a\ {}^1H_5$—615(6)	(0.000) 1.484*D*
75.54	3	37364.53		
74.85	3	37374.15		
74.19	30	37383.45	$a\ {}^3H_4$—532(5)	(0.000*w*) 1.158*A*
73.16	2	37397.74		
72.50	50	37406.97	$a\ {}^3P_2$—430(2)	(0.266, **0.562**) 0.563, 0.787, **1.056**, **1.330**, 1.625, . . .
71.76	2	37417.44	$a\ {}^5D_4$—546(3)	
71.40	5	37422.38	$a\ {}^3F_4$—471(3)	
71.00	5	37427.97	$a\ {}^3F_3$—442(2)	(**0.000**, 0.173, 0.349) **0.750**, 0.921, 1.103, 1.282
69.57	40	37448.07	$a\ {}^1F_3$—623(2)	(0.000) 0.953
68.40	5	37464.52	$a\ {}^3D_2$—560(2)	(0.000*w*) 1.124
67.40	5	37478.53	$b\ {}^3F_3$—471(3)	(0.000) 1.148
67.20	5	37480.15	$a\ {}^3D_2$—546(3)	(**0.000**, 0.265, 0.604) **0.352**, 0.648, 0.950
67.00	12	37484.17	$a\ {}^5F_2$—385(2)	(0.000) 1.000
66.41	30	37492.40	$a\ {}^3H_4$—533(4)	(0.000*w*) 1.076*D*
65.60	50	37503.81	$a\ {}^5F_3$—385(1)	(**0.000**, 0.520) 0.480, 0.998, **1.520**
64.25	75	37522.91	$a\ {}^3H_6$—555(5)	(0.000*W*) 1.743*B*
63.88	25	37528.00	$a\ {}^5D_1$—521(1)	(0.758) 0.845, 1.620
63.41	1	37534.73	$a\ {}^3F_4$—472(4)	
63.07	10	37539.42		
63.00	20	37540.47	$b\ {}^3F_3$—521(3)	(0.000) 1.048
62.96	8	37541.03		(0.000*w*) 1.048*w*
62.27	8	37550.79	$c\ {}^3F_2$—604(1)	(0.000) 0.714
60.81	3	37571.36		
59.40	40	37591.23	$a\ {}^5F_2$—402(2)	(0.000*w*) 1.320*A*
58.86	75	37598.99	$a\ {}^3F_3$—444(3)	(0.137, 0.277, **0.414**) 0.650, 0.780, **0.923**, **1.086**, 1.247, 1.370
58.14	50	37609.07	$a\ {}^3G_4$—503(3)	(**0.000**, 0.246, 0.511, 0.831) **0.138**, 0.542, 0.767, 1.015, 1.274, . . .
57.76	5	37614.42	$a\ {}^3H_4$—534(3)	(0.000*D*) 0.972*w*
56.16	20	37637.11	$a\ {}^1D_2$—511(2)	(0.245, **0.498**) 0.848, **1.107**, **1.358**, 1.594
55.34	25	37648.76	$b\ {}^3F_4$—561(4)	(0.000*D*) 1.271*w*
54.88	6	37655.34		(**0.000**, 0.338) **0.551**, 0.874, 1.208
54.51	3	37660.47	$a\ {}^5D_2$—521(1)	
54.34	3	37662.91		
53.45	6	37675.63	$b\ {}^3D_3$—682(3)	
52.46	3	37689.63		
51.23	125	37707.17	$a\ {}^5F_4$—421(4)	(0.280*B*) 1.330*D*
50.52	4	37717.27	$a\ {}^3P_2$—495(2)	(0.160, **0.303**) 1.305, **1.453**, **1.617**, 1.788
48.54	5	37745.48		
47.10	3	37766.00	$a\ {}^1D_2$—513(1)	
46.90	20	37768.78	$a\ {}^5G_3$—495(3)	(. . ., 0.391, 0.787, **1.246**) 0.070, 0.508, **0.894**, **1.316**, . . .
46.74	20	37771.02	$a\ {}^5P_2$—496(3)	(**0.000**, 0.457, 0.840) **0.161**, 0.678, . . .
45.91	15	37782.96		(0.270) 1.059
45.09	30	37794.61	$a\ {}^3F_3$—446(4)	(**0.000**, 0.196, 0.383, 0.577) 0.739, 0.911, 1.080, 1.252, 1.475, 1.682, **1.856**
44.58	100	37801.87	$a\ {}^3G_4$—505(5)	(0.000*W*) 1.168*A*
43.43	15	37818.37	$a\ {}^5F_5$—440(4)	(**0.000**, 0.260, 0.535, 0.779) 1.175, 1.379, 1.645, 1.931, 2.158, **2.428**
43.03	12	37824.12	$b\ {}^3F_2$—475(2) $b\ {}^5G_3$—646(3)	(0.247, **0.468**) 0.807, **1.058**, **1.285**, 1.524
42.91	2	37825.78	$a\ {}^5G_2$—495(2)	
42.70	5	37828.79		(0.000) 0.852

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2642.06	3	37838.04		
41.16	8	37850.85	$b\ {}^2P_2$—563(3) $a\ {}^3D_1$—513(1)	(0.463) 1.048, 1.508
40.61	12	37858.82		(0.000) 1.513
40.13	2	37865.64	$c\ {}^1D_2$—708(2)	(0.336, **0.622**) 0.412, **0.716**, **1.017**, 1.331
39.19	40	37879.16	$a\ {}^3G_3$—496(3)	
38.68	25	37886.45	$a\ {}^3P_2$—435(3)	(**0.000**, 0.246, 0.521) **0.546**, 0.827, 1.073, 1.315
37.94	30	37897.05	$a\ {}^3D_1$—551(3)	(0.000*W*) 1.026*A*
37.34	3	37905.72	$b\ {}^3F_2$—475(1)	(**0.000**, 0.454) . . .?
36.90	8	37912.09	$b\ {}^3F_3$—524(4)	(0.00) 1.49
36.67	3	37915.38	$a\ {}^1G_4$—521(3)	
36.46	2	37918.42	$a\ {}^5D_3$—536(2)	
36.30	2	37920.66		
35.59	200	37930.92	$a\ {}^5F_2$—389(3)	(0.000*W*) 0.979*w*
34.25	3	37950.20	$b\ {}^3P_2$—564(3)	(**0.000**, 0.254) **1.195**, 1.428
33.78	75	37956.94	$a\ {}^3H_5$—561(4) $b\ {}^3F_4$—564(5)	(**0.000**, 0.249, 0.434, 0.661, 0.846, 1.002) **0.316**, 0.511, 0.710, 0.856, 1.030
33.29	10	37964.02		(0.000) 1.247
32.60	2	37973.97	$a\ {}^1D_2$—515(2)	(0.192, **0.385**) 0.922, **1.116**, **1.299**, 1.528
32.27	25	37978.76	$a\ {}^1H_5$—622(5)	(0.280) 1.066
30.84	12	37999.29	$b\ {}^5F_3$—525(3)	(0.451, 0.720, **1.451**) 0.633, **1.016**, **1.414**, 1.850, 2.278
30.53	25	38003.88	$a\ {}^3F_3$—448(3)	(0.148, 0.354, **0.540**) 0.714, 0.906, **1.084**, **1.246**, 1.426, 1.602
30.18	3	38008.85		
29.99	2	38011.62	$a\ {}^5P_2$—498(1)	(**0.000**, 0.582) **0.850**, 1.401
29.21	1	38022.96	$c\ {}^3F_4$—611(4)	
28.84	50	38028.28	$b\ {}^5F_4$—566(5)	(**0.000**, 0.253, 0.495, 0.762, 1.049) **0.147**, 0.431, 0.733, 0.968, 1.220, 1.465, 1.758, 2.020
26.74	3	38058.67	$a\ {}^5D_1$—515(2)	
26.44	2	38063.00	$a\ {}^5P_1$—487(1)	
25.70	3	38073.80	$c\ {}^3F_3$—616(3)	
25.33	6	38079.06	$a\ {}^5F_4$—478(3)	(0.000) 1.314
21.49	5	38134.92	$b\ {}^3F_2$—478(3)	(**0.000**, 0.149, 0.285) 1.213, 1.360, 1.479
20.45	5	38150.06	$a\ {}^5D_4$—553(4)	(0.307, 0.476, **0.630**) 0.558, 0.691, 0.849, **1.004**, **1.174**, 1.351, 1.534, . . .
19.04	2	38170.54	$a\ {}^5G_2$—499(4)	
18.98	20	38171.47		(**0.000**, 0.283, 0.575, 0.890, 1.169) 1.209, 1.476, 1.759, 2.067, 2.362
18.87	2	38173.02		(0.000*w*) 1.091*A*
18.62	1	38176.59	$b\ {}^3P_1$—555(2)	(0.000*w*) 0.996*B*
17.65	8	38190.86	$a\ {}^1F_3$—630(2)	
17.22	30	38197.14	$a\ {}^3D_1$—528(1)	(0.000*w*) 0.875
16.12	2	38213.21		
15.46	3	38222.80	$a\ {}^3P_1$—435(1)	(0.000) 0.884
14.94	25	38230.35		
13.50	1	38251.45		(0.000*w*) 1.162
12.62	50	38264.39	$a\ {}^5F_2$—392(3)	(0.000*W*) 1.423*B*
11.99	20	38273.56	$a\ {}^5D_4$—555(5)	(0.000*w*) 0.782*w*
10.92	12	38289.27	$b\ {}^3H_6$—637(5)	(0.237) 1.076*w*
09.37	6	38311.94	$a\ {}^5D_3$—555(3)	(**0.000**, 0.269, 0.512, 0.804) **0.462**, 0.687, 0.924, 1.182, 1.431, 1.696
08.18	3	38329.52	$a\ {}^5D_2$—528(1)	(0.000) 1.098
07.84	100	38334.48		(0.000 *W*) 1.241*w*
06.43	100	38355.20	$a\ {}^3H_4$—542(4)	(0.000) 1.144
06.12	30	38359.73	$a\ {}^1D_2$—555(1)	(**0.000**, 0.228) **0.975**, 1.173, 1.392
05.58	1	38367.72	$a\ {}^5P_1$—490(2)	
05.11	10	38374.63	$a\ {}^3D_2$—555(3) $a\ {}^3F_3$—415(3)	
04.74	4	38380.11	$b\ {}^3G_4$—665(4)	
04.52	20	38383.29	$a\ {}^3D_2$—555(2)	(**0.000**, 0.615) 0.853, 1.464, **2.080**
03.49	125	38398.48	$a\ {}^5F_5$—445(5)	(0.442) 1.330*D*
02.96	15	38406.37	$b\ {}^3H_5$—638(4) $b\ {}^3G_3$—662(4)	(0.000*w*) 0.848*A*
01.68	3	38425.15		(**0.000**, 0.168, 0.358) **0.877**, 1.055

TABLE I. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2601.04	20	38434.72	*b* $^4G_4$—638(4)	(0.00) 0.99
00.73	20	38439.26	*a* $^5P_2$—503(3) *a* $^5F_5$—446(4)	(0.000*D*) 1.839*WB*
2598.72	1	38468.97	*a* $^5H_6$—564(5)	
98.19	75	38476.80	*a* $^5H_5$—566(6)	(0.000) 1.127
97.80	5	38482.61		
97.75	10	38483.35		(**0.000**, 0.128) **1.160**, 1.292
97.71	2	38484.00	*b* $^2P_1$—558(2)	(**0.000**, 0.182) 1.349, **1.525**
96.99	2	38494.65		(0.000) 1.018
96.46	75	38502.53	*a* $^5F_3$—411(2)	(0.000*w*) 1.325
96.14	10	38507.18	*a* $^3D_3$—570(3)	(0.00) 1.39
95.58	50	38515.46	*a* $^5F_1$—385(2)	(**0.000***w*, 0.963) 0.000*w*, 0.957, **1.959**
94.43	10	38532.53	*b* $^3F_2$—482(2)	(0.382, **0.756**) 0.689, **1.089**, **1.461**, 1.800
94.25	20	38535.28	*a* $^5F_1$—385(1)	(0.000) 0.455*A*
93.95	4	38539.78	*a* $^3H_5$—565(5)	
93.68	50	38543.67	*a* $^5F_4$—429(3)	(**0.000**, 0.212, 0.448, 0.677) 0.779, 0.999, 1.224, 1.446, 1.650, 1.888, **2.111**
93.45	15	38547.12	*a* $^3G_5$—503(3)	(0.391, 0.763, **1.135**) 0.509, **0.891**, **1.280**, 1.636
92.54	50	38560.62	*a* $^1D_2$—521(3)	(0.000) 1.079
92.13	2	38566.84	*a* $^3H_5$—567(4)	(0.000*w*) 0.741*w*
91.06	2	38582.69		(0.000) 1.353
90.20	20	38595.53	*a* $^1D_2$—521(1)	(**0.000**, 0.520) **0.616**, 1.110, 1.613
89.81	25	38601.27	*a* $^3P_2$—442(2)	(0.169) 1.361
89.12	3	38611.66	*c* $^3F_4$—616(3)	
88.83	15	38615.24	*a* $^3F_3$—454(2)	(0.000*w*) 0.958
88.08	4	38627.16		
87.35	10	38638.05	*a* $^3P_2$—510(3)	(0.452, 0.885, **1.353**) 0.286, 0.707, **1.143**, **1.605**, 2.042, 2.518
86.98	10	38643.52	*b* $^3P_1$—560(2)	(0.000*w*) 0.891*w*
86.41	10	38652.07		
85.47	2	38666.18	*b* $^3G_3$—654(3)	
84.49	75	38680.76	*a* $^5D_1$—521(1) *a* $^5H_6$—566(6)	(0.342) 1.168*WD*
84.02	75	38687.84		(0.000*w*) 1.195*w*
82.52	10	38710.21	*a* $^3D_3$—558(1)	(**0.000**, 0.211) **1.007**, 1.219, 1.438
81.61	15	38723.90	*a* $^3F_4$—484(4)	(0.156) 1.232
81.50	4	38725.61	*a* $^5D_4$—513(1)	(0.000) 1.047
80.60	25	38739.16		(**0.000**, 0.230, 0.458, 0.688, 0.918) **0.218**, 0.454, 0.682, 0.912, 1.144, 1.366, 1.603, . . .
79.06	40	38762.26	*a* $^5P_3$—511(2) *b* $^3F_3$—533(4)	(0.000*W*) 1.323*WB*
78.25	40	38774.44	*a* $^3G_4$—514(4)	(0.346*W*) 1.070*WD*
77.37	100	38787.63		(0.000*w*) 1.407
76.75	8	38796.98	*a* $^3H_4$—546(3)	
76.44	25	38801.60	*a* $^3H_5$—569(4)	(0.000*w*) 1.025
76.06	8	38807.43	*a* $^5D_3$—545(2)	(**0.000**, 0.433, 0.868) 1.023, 1.460, **1.889**
75.23	12	38819.86		(0.000*W*) 1.403*w*
74.64	3	38828.78	*b* $^3G_3$—656(3)	
74.09	1	38837.06		
73.70	2	38842.95	*c* $^3F_3$—624(4)	
73.20	8	38850.44	*a* $^3D_2$—560(2)	(0.205, **0.440**) 0.773, **1.008**, **1.250**, 1.467
71.52	20	38875.86	*a* $^1P_1$—442(1)	(1.308) 0.255, 1.554
71.28	3	38879.49	*a* $^3P_1$—495(2)	
70.94	3	38884.63	*b* $^3F_3$—534(3)	
70.82	3	38886.44	*c* $^3P_2$—669(1)	
70.60	6	38889.78	*a* $^1P_1$—622(1)	
69.99	2	38898.97	*b* $^3H_5$—649(6)	(0.000*w*) 1.224*A*
69.13	40	38912.07	*a* $^1P_1$—623(2) *a* $^3F_3$—415(3)	(0.133) 1.213*w*
68.04	15	38928.49	*a* $^3P_1$—442(2)	(**0.000**, 0.301) **0.936**, 1.245, 1.538
66.52	1	38951.53	*a* $^1F_3$—638(4)	
65.11	4	38973.06	*a* $^3F_2$—421(2)	(0.000, 0.168) **0.670**, 0.826

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2564.91	5	38976.09	*b* $^3F_2$—486(2)	(0.160) 1.104
62.63	6	39010.75		
62.22	15	39017.00	*a* $^3D_1$—536(2)	(**0.000**, 0.484) 0.892, 1.344, **1.834**
61.82	1	39023.05	*b* $^1D_2$—623(2)	
61.16	10	39033.14	*c* $^3F_4$—621(4)	(0.121) 1.056
60.44	5	39044.05	*a* $^5P_3$—514(4)	(**0.000**, 0.488) **0.874**, 0.881
60.16	4	39048.38	*a* $^3G_4$—517(5)	(0.225) 1.182*W*
59.87	20	39052.84	*b* $^3H_4$—634(4)	(0.000) 0.948
59.15	3	39063.82	*b* $^3F_3$—536(2)	(**0.000**, 0.351, 0.723) **0.295**, 0.662, 1.013
58.34	15	39076.10		(0.000) 1.181
57.71	50	39085.81	*b* $^3F_2$—487(1)	(**0.000**, 0.303) 0.745, 1.040, **1.389**
57.26	4	39092.64		(0.000) 0.850
56.88	2	39098.38	*a* $^5P_3$—515(2)	(**0.000**, 0.306, 0.624) 1.287, 1.578, 1.903, **2.248**
56.51	30	39104.10	*a* $^3P_1$—444(0)	(0.000) 1.547
55.53	4	39119.15	*a* $^3D_1$—537(1)	(0.404) 0.846, 1.261
55.34	4	39122.08	*c* $^3F_4$—622(5)	
54.90	30	39128.68	*a* $^5F_4$—435(3)	(**0.000**, 0.256, 0.516) 0.579, 0.836, 1.098, 1.350, 1.560, 1.914, **2.203**
54.63	50	39132.94	*a* $^5F_3$—417(4)	(0.000) 1.285
54.02	2	39142.14		(**0.000**, 0.176) 1.263, **1.406**
53.52	12	39149.85	*a* $^5D_2$—536(2)	(0.243) 1.412*D*
53.19	40	39154.97		(0.000*w*) 0.940*D*
52.61	3	39163.81		
52.00	1	39173.20	*a* $^5P_1$—498(1)	
51.73	25	39177.28	*a* $^5P_2$—448(3)	(0.000*w*) 1.139
50.36	5	39198.42	*a* $^5P_2$—510(3)	(**0.000**, 0.257) **0.619**, 0.894, 1.155, 1.414
50.11	7	39202.25	*a* $^5F_2$—402(2)	(0.143, **0.292**) 0.856, **1.010**, **1.147**, 1.311
49.20	10	39216.16	*a* $^3F_4$—489(3)	(0.000) 1.148
48.97	1	39219.78	*a* $^5D_4$—564(5)	(0.000) 1.165
47.81	1	39237.66	*a* $^3D_3$—577(2)	
47.66	5	39239.96	*b* $^3P_2$—555(1)	(0.000) 1.406
46.32	6	39260.58	*b* $^1G_4$—534(3)	(**0.000**, 0.224) **0.907**, 1.138
45.68	1	39270.45	*b* $^3H_4$—637(5)	
45.50	75	39273.25	*a* $^5F_2$—403(1)	(**0.000**, 0.251) **0.741**, 1.003, 1.252
44.91	3	39282.36	*a* $^3D_2$—564(3)	
44.37	75	39290.60	*a* $^5D_4$—565(5)	(**0.000**, 0.209, 0.391, 0.628, 0.873) **0.169**, 0.345, 0.558, 0.786, 0.937, 1.158
43.33	2	39306.76	*a* $^3G_3$—510(3)	(0.749, 0.999, **1.269**) 0.922, 1.176, **1.430**, **1.680**, 1.925, 2.162
43.18	3	39308.98	*a* $^5F_4$—490(5)	
42.74	6	39315.93		
42.36	25	39321.76	*a* $^5P_2$—511(2)	(0.180*w*) 1.336*w*
40.60	10	39348.99	*a* $^5D_1$—528(1)	(0.596) 0.914, 1.501
39.37	1	39368.01	*c* $^3F_2$—622(1)	(0.000) 0.747
38.75	2	39377.65		
38.56	2	39380.50	*c* $^3F_4$—624(4)	(0.000*W*) 1.087*w*
37.96	75	39389.95	*b* $^3F_3$—490(2)	(0.240, **0.546**) 0.761, **1.043**, **1.311**, 1.576
37.16	6	39402.34	*a* $^5D_4$—551(3)	(0.176, 0.408, **0.644**) 0.821, 1.025, **1.254**, **1.477**, 1.703, 1.928
36.30	20	39415.64	*a* $^3G_4$—521(3)	(0.000*W*) 0.855
35.36	4	39430.20	*a* $^3G_3$—511(2)	(**0.000**, 0.438, 0.868) **0.000***w*, 0.511, 0.941
34.73	2	39440.11	*c* $^3F_3$—630(2)	
34.22	1	39448.04	*a* $^1P_1$—628(1)	
34.04	25	39450.79	*a* $^1D_2$—530(2) *a* $^5P_2$—513(1)	(**0.000**, 0.390) 1.048, 1.404, **1.818**
33.76	2	39455.23	*a* $^5F_3$—462(4)	(**0.000**, 0.200) 1.366, **1.545**
32.37	20	39476.90	*a* $^1H_5$—637(5)	(0.433*w*) 1.086*W*
32.13	100	39480.58	*a* $^5F_2$—421(4)	(0.000) 1.293
31.71	2	39487.13	*a* $^3D_3$—580(4)	
31.10	3	39496.69		(0.000*w*) 1.027*A*
30.18	6	39511.03	*a* $^5F_3$—421(2)	(0.000*w*) 1.259*A*
29.50	12	39521.62	*a* $^5D_4$—567(4)	(0.101) 1.189
29.16	6	39526.86		(0.214) 1.106
28.62	10	39535.39	*a* $^5D_1$—530(2)	(0.000) 1.447
27.85	1	39547.42	*b* $^5F_4$—580(4)	

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2527.34	30	39555.46	$a\ ^3F_3$—463(2)	(**0.000**, 0.251) **0.589**, 0.846, 1.032
27.06	2	39559.80	$b\ ^1D_2$—628(1)	(**0.000**, 0.206) . . . ?
26.03	50	39575.91	$a\ ^3P_2$—452(1)	(0.000*w*) 1.212*A*
25.50	6	39584.25		
25.11	10	39590.33	$b\ ^3P_0$—558(1)	(0.000) 1.414
24.84	8	39594.48	$a\ ^1H_5$—638(4)	
23.90	5	39609.24		
23.56	4	39614.63		(**0.000**, 0.372, 0.735, 1.122) 0.288, 0.649, 1.056, 1.444
22.88	3	39625.30	$b\ ^3F_3$—542(4)	(0.000*w*) 2.163*w*
21.05	25	39654.10	$a\ ^3H_4$—555(5)	(0.000*w*) 0.943*w*
20.75	2	39658.83	$a\ ^5P_2$—515(2)	
20.08	10	39669.31		
19.04	15	39685.78	$a\ ^5P_3$—521(3)	
18.88	1	39688.24		
18.64	5	39692.06	$a\ ^3H_4$—555(3)	
18.33	2	39696.92		
18.16	1	39699.65		
17.58	12	39708.77	$d\ ^3F_4$—712(5)	(0.000) 1.101
17.34	1	39712.52	$a\ ^3G_3$—514(4)	
17.21	4	39714.55		(0.000) 1.216
16.78	3	39721.43	$a\ ^3D_3$—582(2)	(**0.000**, 0.300) 0.955, **1.313**
15.58	5	39740.27	$a\ ^1D_2$—533(2)	(0.249, **0.519**) 0.882, **1.131**, **1.377**, 1.639
14.55	12	39756.53	$a\ ^5D_4$—569(4)	(0.173*w*) 1.147*w*
13.89	30	39766.97	$a\ ^3G_3$—515(2)	(**0.000**, 0.381, 0.788) **0.160**, 0.530, 0.907, 1.293
13.43	2	39774.29	$b\ ^3P_2$—582(2)	
13.10	15	39779.52	$a\ ^3F_2$—429(3)	(**0.000**, 0.368, 0.741) 0.368, 0.754, 1.127, 1.491, **1.863**
12.83	5	39783.76	$a\ ^1F_3$—646(3)	
12.60	2	39787.48	$a\ ^5G_4$—524(4)	
12.49	12	39789.17	$a\ ^3P_2$—454(2)	(0.340*w*) 0.910*w*
11.64	50	39802.65		(0.00) 1.49
11.10	2	39811.12		
10.90	3	39814.43	$a\ ^3F_2$—466(4)	
10.68	75	39817.89	$a\ ^5P_1$—505(1)	(1.014) 1.335, 2.390*W*
10.49	3	39820.93	$b\ ^3H_5$—652(4) / $b\ ^3P_1$—571(1)	
09.94	15	39829.56	$a\ ^5D_4$—570(3)	
08.92	15	39845.76	$b\ ^3F_2$—495(3)	(**0.000**, 0.252, 0.524) 0.809, 1.052, 1.309, 1.563, **1.822**
08.35	4	39854.84	$a\ ^3H_5$—580(4)	(0.000*w*) 1.209*w*
07.69	15	39865.28	$c\ ^5F_5$—634(4)	(0.174) 1.027
07.08	20	39875.09	$a\ ^3G_4$—525(3)	(**0.000**, 0.390, 0.782) **0.226**, 0.618, 1.010
06.45	10	39884.99	$a\ ^3F_2$—430(2)	(0.322, **0.636**) 0.420, **0.741**, **1.041**, 1.346
06.13	2	39890.10		
05.98	2	39892.47	$a\ ^5D_2$—570(3)	
05.48	2	39900.51	$a\ ^3F_4$—496(3)	(**0.000**, 0.188, 0.388) . . ., 1.417, 1.589, **1.787**
05.32	15	39903.01	$a\ ^3P_1$—452(1)	(0.116) 1.493
05.13	2	39906.06	$a\ ^1D_2$—534(3) / $a\ ^3D_1$—545(2)	(**0.000**, 0.181) 0.844, 1.016, **1.201**
03.88	3	39925.97	$c\ ^3F_2$—628(1)	(**0.000**, 0.203) **0.495**, 0.707, 0.906
03.01	50	39939.85		(0.000) 1.060
02.21	2	39952.66	$b\ ^3F_3$—545(2)	(0.000) 0.968
02.11	2	39954.23		
01.99	50	39956.14	$b\ ^3F_2$—496(3)	(0.000) 1.008
00.92	4	39973.20	$b\ ^5G_5$—712(5)	(0.000) 1.109
00.58	1	39978.70		
2499.74	1	39992.14		
99.24	3	40000.11	$a\ ^3F_3$—468(3)	(0.372*B*) 1.117*D*
98.34	12	40014.48	$a\ ^5F_4$—444(3)	(**0.000**, 0.397, 0.796, 1.195) 0.557, 0.949, 1.353, 1.725, 2.111, **2.521**

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2498.04	5	40019.32	*a* $^4F_3$—468(2)	(0.000) 1.018*w*
97.77	10	40023.65	*a* $^5F_1$—400(0)	(0.118) 0.000*w*, 1.018
97.51	2	40027.81	*a* $^3D_2$—571(1)	
97.15	2	40033.58		(0.090, **0.276**) . . . ?
96.24	10	40048.18	*b* $^5G_4$—682(5)	(0.000) 1.173
95.03	3	40067.60	*b* $^3F_3$—546(3)	(0.178*B*) 0.965*w*
94.33	8	40078.84	*b* $^3F_4$—585(5)	(0.000*D*) 0.761*A*
94.17	6	40081.41	*a* $^3P_0$—442(1)	(0.000) 0.262
93.97	7	40084.62	*a* $^1D_2$—536(2)	(0.224, **0.477**) 0.856, **1.091**, **1.329**, 1.562
93.56	2	40091.22		
93.14	2	40097.97		(0.00) 1.20
92.51	4	40108.10	*a* $^5F_5$—462(5)	(0.427, 0.661, **0.894**) 0.471, 0.617, 0.850, 1.026, **1.207**, **1.383**, 1.590, 1.810 . . .
92.16	12	40113.74	*a* $^5F_2$—411(2)	(0.295*B*) 1.093*D*
92.01	12	40116.15	*a* $^3P_1$—454(2)	(**0.000**, 0.397) **0.776**, 1.157, 1.542
90.74	2	40136.60		
90.27	20	40144.18	*a* $^5P_3$—525(3)	(0.406*w*) 1.165*D*
88.71	20	40169.40	*a* $^5F_4$—445(5) *a* $^5D_1$—536(2)	(0.000*W*) 1.049*A*
87.65	15	40186.49	*a* $^1D_2$—537(1)	(0.000*W*) 0.997*A*
87.34	8	40191.38	*a* $^3F_4$—499(4)	(0.000) 1.592
87.26	3	40192.76		
87.04	8	40196.34	*b* $^3F_2$—498(1)	(0.000) 1.049
86.81	5	40199.98	*c* $^3F_3$—638(4)	(0.000) 1.151
86.18	3	40210.21	*a* $^5F_4$—446(4)	(0.268*B*) 1.282*D*
85.37	4	40223.38	*a* $^5D_0$—528(1)	
84.75	10	40233.32	*a* $^5F_1$—402(2)	(**0.000**, 1.170) 1.097, 2.301
83.48	3	40253.89		(**0.000**, 0.228) 1.580, 1.775, **1.992**
82.60	30	40268.26	*b* $^3D_3$—708(2)	(0.000*W*) 1.621*B*
82.39	3	40271.60		
81.87	30	40280.04	*a* $^5P_2$—521(1)	(**0.000**, 0.231) **1.142**, 1.373, 1.604
81.15	3	40291.76	*a* $^3H_4$—561(4)	(**0.000**, 0.476, 0.945) 0.987, **1.437**
80.61	2	40300.46		
80.37	3	40304.43	*a* $^5F_1$—403(1)	(1.206) 0.000*D*, 1.281
79.59	12	40317.07	*a* $^5F_3$—429(3)	(0.378*B*) 1.202*D*
79.22	10	40323.17	*a* $^5F_2$—413(1)	(**0.000**, 0.877) **0.118**, 0.986, 1.883
78.45	1	40335.60		
78.33	3	40337.50	*a* $^3F_3$—471(3)	(0.000) 1.103
77.18	5	40356.28		(0.259) 1.200
76.69	40	40364.26	*a* $^5F_2$—435(3)	(**0.000**, 0.352, 0.689) 0.379, 0.745, 1.080, 1.414, **1.767**
76.11	3	40373.76	*a* $^5F_3$—435(1)	
75.32	50	40386.55	*a* $^4H_5$—585(5)	(0.257*B*) 1.103
74.33	5	40402.74	*c* $^3F_4$—634(4)	(0.000) 0.872
73.32	15	40419.30	*a* $^5F_4$—448(3)	(0.000*w*) 1.510*D*
73.12	15	40422.57	*a* $^5F_3$—430(2)	(**0.000**, 0.186, 0.376) 0.946, 1.166, 1.394, **1.622**
72.33	6	40435.47		
71.90	4	40442.49	*a* $^1G_4$—546(3)	
71.48	4	40449.36	*a* $^3F_3$—472(4)	
70.90	50	40458.82	*a* $^4F_5$—466(4)	(**0.000**, 0.166, 0.377, 0.592, 0.798) 1.024, 1.174, 1,408, 1.594, 1.822, 2.031, **2.214**
70.69	3	40462.29		
69.37	25	40483.96	*a* $^5P_1$—511(2)	(**0.000**, 1.021) **0.337**, 1.353, 2.376
68.42	40	40499.48	*a* $^3H_4$—563(3)	(**0.000**, 0.202, 0.436, 0.633) **0.364**, 0.546, 0.766, 0.995, 1.210, 1.417
68.10	2	40504.74		
67.38	15	40516.60	*a* $^3P_2$—461(1)	(0.000) 1.333
66.99	15	40522.98	*a* $^5F_2$—415(3)	(**0.000**, 0.200, 0.409) 0.812, 0.998, 1.189, 1.396, **1.621**
66.66	3	40528.46		
65.62	10	40547.20	*b* $^3F_3$—551(3)	(0.248, 0.520, **0.792**) 0.470, 0.743, **0.995**, **1.256**, 1.506, 1.758

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2464.92	3	40557.00		(**0.000**, 0.313, 0.606) 0.716, 1.036, **1.333**
64.24	10	40568.16	$a\ ^3F_4$—503(3)	(0.000w) 1.122A
63.83	50	40574.93	$a\ ^5P_3$—530(2)	(0.000w) 1.963B
62.88	12	40590.60	$a\ ^3H_6$—585(5)	(0.000w) 1.180
62.34	2	40599.58	$b\ ^3H_5$—666(5) $a\ ^3H_4$—564(5)	(0.000w) 1.119A
61.58	7	40612.03	$a\ ^5P_1$—513(1)	
61.06	15	40620.68	$c\ ^3F_4$—637(5)	(0.000) 2.375D
60.91	7	40623.05	$a\ ^3D_3$—577(2)	(0.156, **0.352**) 0.859, **1.033**, **1.213**, 1.414
60.00	10	40638.13	$a\ ^3G_4$—533(4)	(0.278) 1.067D
58.19	12	40668.03		(0.000) 0.851
58.02	7	40670.78	$a\ ^3H_4$—565(5)	
57.27	8	40683.32	$a\ ^1H_5$—649(5) $a\ ^3F_3$—475(2)	(**0.000**, 0.213, 0.433) **0.653**, 0.872, 1.081, 1.287, 1.468
56.62	5	40694.05	$b\ ^3P_1$—580(1)	(0.000) 1.161
55.97	8	40704.86	$a\ ^5P_2$—525(3)	(0.000) 1.391
54.70	15	40725.80	$a\ ^3G_3$—524(4)	(**0.000**, 0.193, 0.416, 0.629) 0.700, 0.904, 1.090, 1.328, 1.537, 1.726
54.50	2	40729.18	$a\ ^5P_2$—463(2)	(0.000) 1.274
53.98	15	40737.86	$c\ ^3F_4$—638(4)	(0.302B) 1.077D
52.60	10	40760.78	$a\ ^3G_4$—534(3)	(0.000W) 0.817w
51.64	2	40776.69		(0.000) 1.166
51.51	1	40778.84		
50.99	4	40787.42		
50.23	7	40800.19	$b\ ^3F_3$—553(4)	(0.000) 1.080
49.84	8	40806.67		
49.65	2	40809.80	$a\ ^5D_4$—580(4)	
49.45	25	40813.18	$a\ ^3G_3$—525(3)	(0.483, 0.974, **1.492**) 0.000, 0.411, **0.894**, **1.403**, 1.884, 2.365
48.99	10	40820.83	$a\ ^5P_1$—515(2)	(0.000) 1.300
47.79	4	40840.74		
47.61	10	40843.88	$a\ ^3P_1$—461(1)	(0.199) 1.359, 1.567
47.16	25	40851.24	$b\ ^3P_2$—593(2)	(0.286, **0.626**) 0.820, **1.131**, **1.444**, 1.764
46.56	20	40878.04		(0.000) 1.226
46.18	1	40884.40		
44.69	50	40892.59		(0.000w) 0.000w
44.24	4	40900.12	$b\ ^3P_1$—582(2)	
44.13	25	40901.93	$a\ ^3H_4$—567(4) $a\ ^5F_3$—435(3)	(0.357D) 1.109D
43.78	8	40907.77	$a\ ^5P_3$—533(4)	(0.000) 1.723
43.00	7	40920.88		
42.81	7	40924.03	$a\ ^3D_1$—555(2)	(**0.000**, 0.225) 0.844, 1.078, **1.300**
42.60	3	40927.53		
41.85	15	40940.08		(0.000w) 1.069A
41.34	12	40948.73	$a\ ^5P_2$—528(1)	(**0.000**, 0.514) 0.914, 1.407, 1.869
40.53	12	40962.24	$b\ ^3F_3$—555(3)	(0.446, 0.868, **1.349**) 0.561, **0.992**, **1.418**, 1.842
40.04	12	40970.60	$b\ ^3F_3$—555(2)	(0.000) 0.942
39.81	10	40974.43		(0.000w) 1.023A
39.14	1	40985.55		
38.93	3	40989.09		
38.64	20	40994.03	$a\ ^3F_3$—478(3)	(0.334B) 1.141D
38.21	25	41001.20		
38.04	2	41004.12		
37.75	15	41009.02	$a\ ^1H_6$—652(4)	(0.000w) 1.038WA
36.89	2	41023.40		
36.73	2	41026.20	$a\ ^5F_2$—442(1)	
36.51	25	41029.94	$a\ ^5P_3$—534(3)	(0.362, 0.719, **1.178**) 0.454, 0.837, **1.217**, **1.588**, 1.975, 2.393
36.31	2	41033.24	$c\ ^3F_3$—646(3) $a\ ^5D_2$—555(1)	
35.59	4	41045.30		(0.000w) 0.680B
34.93	5	41056.49	$a\ ^3P_1$—463(2) $a\ ^5D_2$—555(2)	(**0.000**, 0.247) **1.076**, 1.325, . . .

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2434.82	5	41058.34	$a\ ^5D_1$—545(2)	(**0.000**, 0.487) **0.552**, 1.029, 1.514
33.59	20	41079.13	$a\ ^3F_2$—442(2)	(0.504, **1.019**) 0.245, **0.744**, **1.248**, 1.754
33.03	8	41088.57	$a\ ^1D_2$—546(3)	(**0 000**, 0.180, 0.356) **0.569**, 0.772, 0.962, 1.179, 1.368
32.71	75	41093.92	$a\ ^5F_5$—472(4)	(**0.000**, 0.199, 0.407, 0.640, 0.849) 0.828, 1.022, 1.179, 1.369, 1.572, 1.820, 2.056, **2.278**.
31.97	12	41106.49	$a\ ^3D_2$—582(2)	(0.433, **0.877**) 0.740, **1.208**, 1.643
31.81	6	41109.16	$a\ ^3P_0$—452(1)	(0.000) 1.474
31.06	15	41121.93	$a\ ^3F_2$—421(2)	(0.201, **0.442**) 0.785, **0.989**, **1.213**, 1.435
30.51	15	41131.20	$b\ ^3H_6$—665(4)	
30.22	30	41136.04	$a\ ^5P_3$—530(2)	(0.000*w*) 1.133
29.68	25	41145.16	$a\ ^3F_1$—411(2)	(**0.000***w*, 1.128) 0.000*w*, 1.150, **2.268**
28.50	30	41165.19		
28.00	20	41173.60	$a\ ^3P_2$—468(3)	(0.000*w*) 0.973*D*
26.95	4	41191.46		
26.86	7	41192.97	$a\ ^3P_2$—468(2)	(0.393, **0.488**) 0.860, **1.101**, **1.334**, 1.596
26.53	4	41198.60	$b\ ^5F_4$—596(5)	(**0.000**, 0.265, 0.537, 0.820, 1.106) **0.958**, 1.222, . . .
25.91	30	41209.15	$a\ ^5P_3$—536(2)	(**0.000**, 0.258, 0.577) . . ., 1.093, 1.353, 1.532, 1.9, **2.2**
25.47	10	41216.61		(0.000*w*) 0.698*A*
25.20	12	41221.20		
25.13	3	41222.42		(0.000*w*) 1.568
24.97	3	41225.09	$b\ ^3G_4$—666(5)	(0.000) 0.966
24.58	2	41231.80	$a\ ^5D_1$—558(2)	(**0.000**, 0.486) 1.741
24.05	3	41240.70		
23.89	8	41243.51	$a\ ^5G_3$—530(2)	(**0.000**, 0.552, 1.102) **0.335**, 0.899, 1.470, 1.980
23.49	20	41250.32	$a\ ^3F_3$—444(3)	(**0.000**, 0.196, 0.398) 0.564, 0.753, 0.946, 1.128, **1.340**
21.85	50	41278.25	$b\ ^3F_2$—558(2)	(**0.000**, 0.317, 0.670) **0.324**, 0.674, 0.987, 1.306, 1.626
20.83	2	41295.67		(0.483) 1.212*C*
20.35	1	41303.78		
18.95	6	41327.76	$a\ ^5F_4$—510(3)	(**0.000***D*) 1.347*w*
18.77	20	41330.77		(0.000) 0.947
18.54	2	41334.74	$a\ ^5D_3$—570(3) $a\ ^5F_3$—481(2)	
18.31	3	41338.63		
18.10	10	41342.31		
17.85	30	41346.53		(0.332*w*) 1.138*D*
17.38	4	41354.54		
17.33	5	41355.39	$a\ ^5F_1$—413(1)	
17.15	7	41358.44	$b\ ^1D_2$—646(3)	(0.000) 1.023
16.89	25	41362.87	$a\ ^5F_5$—440(4)	(0.000*D*) 0.738*A*
16.73	1	41365.66		
15.83	1	41381.13		
15.70	1	41383.24	$b\ ^5F_2$—510(3)	
15.24	15	41391.11	$a\ ^3D_1$—560(2)	(0.000*w*) 1.044*A*
15.22	12	41391.48	$a\ ^5F_2$—482(2)	(**0.000**, 0.361, 741) **0.364**, 0.715
13.78	4	41416.16		
12.54	12	41437.58	$b\ ^3F_3$—560(2)	(0.000) 1.006
12.27	8	41442.13	$a\ ^3P_1$—521(1)	(0.764*D*) 1.618, 2.326
10.61	3	41470.63	$b\ ^5G_3$—682(3)	(0.539) 0.141, 0.770
09.80	5	41484.69		(**0.000**, 0.283, 0.610, 0.895) . . . , 1.475, 1.746, **2.041**
08.83	8	41501.24	$a\ ^5G_4$—542(4)	
08.50	5	41506.96	$b\ ^3F_2$—511(2)	(0.316, **0.625**) 0.722, **1.045**, **1.352**, 1.670
08.25	20	41511.27	$a\ ^3P_2$—471(3)	(**0.000**, 0.260, 0.529) **0.578**, 0.849, 1.092
07.76	10	41519.89	$a\ ^3P_1$—468(2)	(**0.000**, 0.458) **0.651**, 1.102, 1.562
07.54	1	41523.58	$a\ ^5D_3$—560(2)	
06.87	2	41535.07		
05.76	2	41554.26		
05.40	3	41560.52		(0.232) 0.672, 0.948
04.80	10	41570.82	$c\ ^3F_4$—646(3)	(0.000) 0.961
04.48	10	41576.38	$a\ ^5G_3$—533(4)	(**0.000**, 0.189, 0.381, 0.561) 0.897, 1.115, 1.283, 1.477, **1.643**
03.68	25	41590.22	$a\ ^5P_3$—534(3)	(**0.000**, 0.216, 0.455) **0.789**, 0.988, 1.220, 1.442
03.54	3	41592.71		(0.000*w*) 1.078
03.13	10	41599.70		(0.000*D*) 1.417

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2402.13	30	41617.06	$a\ ^6F_4$—442(2)	(0.000) 1.240
01.04	6	41635.88	$b\ ^3F_2$—513(1)	(0.000) 1.049
00.92	6	41638.03		
00.62	100	41643.16	$a\ ^4F_5$—478(6)	(0.000*D*) 1.175*D*
2399.94	15	41655.06	$a\ ^3F_2$—448(3)	(**0.000**, 0.516, 1.029) 0.247, 0.744, 1.254, 1.744, **2.248**
98.74	4	41675.86	$a\ ^4F_3$—665(4)	(0.000*w*) 1.441
98.34	6	41682.85		(0.000*w*) 1.211*w*
98.10	10	41686.97	$a\ ^3D_3$—602(3)	(0.390*w*) 1.275*D*
97.76	5	41692.81		
97.52	4	41697.07		(0.286, 0.609, **0.928**) 0.281, 0.614, **0.928**, **1.224**, 1.552, 1.957
97.44	3	41698.46	$a\ ^3G_3$—534(3)	
96.74	1	41710.59		(0.355) 1.177
95.94	3	41724.57	$c\ ^3F_2$—646(3)	(**0.000**, 0.388, 0.751) 1.101, 1.406, **1.807**
95.40	3	41733.94	$a\ ^3F_4$—514(4)	(0.393) 1.212
95.03	12	41740.42	$b\ ^3P_2$—602(3)	(**0.000**, 0.255, 0.556) **0.615**, 0.914, 1.178, 1.443, 1.732
94.77	1	41744.95		
94.65	5	41747.01	$b\ ^3F_4$—602(3)	(0.000) 1.320
93.27	7	41771.15	$a\ ^3D_2$—603(3)	(0.497*D*) 0.729, 0.941, **1.156**, **1.367**, . . .
92.70	6	41781.13	$b\ ^3P_0$—580(1)	(0.000) 1.143
92.29	3	41788.19	$a\ ^5F_3$—444(3)	(0.304, 0.612, **0.911**) 0.320, 0.636, **0.952**, **1.248**, 1.540, 1.851
90.71	5	41815.77		
90.43	2	41820.80		(0.000) 1.521
90.22	4	41824.37	$b\ ^4P_2$—603(3)	(**0.000**, 0.314, 0.635) **0.467**, 0.814, 1.130, 1.430
89.60	8	41835.29	$a\ ^3F_3$—486(2)	(0.000*w*) 1.021
89.11	10	41843.79	$b\ ^3F_3$—515(2)	(0.235, **0.487**) 0.806, **1.052**, **1.299**, 1.554
88.39	15	41856.45	$a\ ^5D_2$—563(3) $a\ ^3P_2$—475(2)	(0.000*w*) 1.303
87.54	5	41871.39	$a\ ^3F_4$—462(4) $a\ ^3P_2$—537(1)	(0.000) 1.508
87.35	2	41874.68	$c\ ^3F_3$—654(3)	
87.09	50	41879.28	$a\ ^4F_4$—462(5)	(0.579*D*) 0.627*W*
84.51	1	41924.59		
84.30	12	41928.21	$a\ ^6F_2$—429(3)	(0.000*w*) 1.314
83.74	15	41938.01	$a\ ^3P_2$—475(1)	(0.000*w*) 1.161
83.15	2	41948.42		(0.000) 0.985
81.55	40	41976.68	$b\ ^3P_1$—593(2)	(0.000) 1.122
81.14	50	41983.81	$a\ ^5F_3$—446(4)	(0.000) 1.298
79.80	2	42007.54	$a\ ^3F_4$—517(5)	
78.33	10	42033.52	$a\ ^6F_2$—430(2)	(0.116) 1.038
78.20	2	42035.78		
77.41	5	42049.71	$a\ ^3P_0$—461(1)	(0.000) 1.356
77.18	8	42053.78	$a\ ^4F_2$—452(1)	(**0.000**, 0.719) **0.000**, 0.741, 1.465
75.91	3	42076.22	$a\ ^5D_1$—555(2)	(**0.000**, 0.456) **0.578**, 1.025
74.69	5	42097.91	$a\ ^5P_3$—545(2)	(**0.000**, 0.578, 1.145) 0.990, 1.458, 2.140, **2.737**
74.20	3	42106.52		
73.92	20	42111.51	$a\ ^5P_1$—528(1)	(1.457*B*) 0.906, 2.394*w*
72.81	12	42131.23	$a\ ^5F_5$—489(3)	(0.187, 0.433, **0.595**) 0.683, 0.880, **1.072**, **1.274**, 1.495, 1.689
71.58	10	42153.18	$a\ ^5F_1$—421(2)	(**0.000**, 1.185) **1.185**, 2.340
71.06	10	42162.44		(**0.000**, 0.219, 0.453, 0.662) **0.326**, 0.548, 0.767, 1.020, 1.254, 1.487
70.77	12	42167.51	$a\ ^3P_2$—478(3)	(0.000*D*) 0.918*A*
70.52	1	42171.96	$b\ ^3F_3$—567(4)	
70.37	8	42174.64		(0.00) 1.35
69.85	7	42183.95	$a\ ^5P_1$—475(2)	(**0.000**, 0.266) **1.028**, 1.291, 1.540
69.53	4	42189.54	$a\ ^3H_4$—580(4)	(0.302) 1.058
69.34	8	42192.89	$a\ ^4F_3$—448(3)	(0.000) 1.236
68.78	2	42202.99	$b\ ^3H_5$—682(5)	
68.56	2	42206.85		(0.222) 1.137
68.22	5	42212.88	$a\ ^6P_3$—546(3)	(0.676, 1.335, **1.994**) 0.295, **0.954**, **1.620**, 2.262
67.71	4	42222.00		
67.26	15	42230.01	$a\ ^6F_4$—466(4)	(0.437*w*) 1.272*D*
66.18	1	42249.25	$a\ ^3F_2$—490(2)	(**0.000**, 0.235, 0.462) 0.633, . . .
65.29	2	42265.20	$a\ ^5P_1$—475(1)	(0.000) 1.507

TABLE I. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2364.26	40	42283.58	$a\ ^5F_5$—484(4)	(0.000w) 1.843B
63.47	1	42297.74	$a\ ^5P_1$—530(2)	
62.44	3	42316.20	$a\ ^1G_4$—565(5)	
			$a\ ^3D_3$—608(2)	
62.27	3	42319.21		
61.87	1	42326.43		
61.48	1	42333.44		
60.03	3	42359.39		
59.81	10	42363.30	$a\ ^3H_5$—605(5)	(0.791B) 0.408, 0.560, 0.732, **0.904, 1.081**, 1.253, 1.479, 1.656
59.46	7	42369.62	$b\ ^3P_2$—608(2)	(0.310, **0.619**) 0.777, **1.109, 1.428**, 1.772
59.17	8	42374.76	$a\ ^3F_4$—521(3)	(0.000D) 1.566B
59.08	4	42376.45		
58.68	2	42383.63	$a\ ^1D_1$—558(2)	
58.24	2	42391.56		
56.92	20	42415.24	$a\ ^5F_4$—468(3)	(0.000w) 1.030
56.48	8	42423.15	$a\ ^3G_4$—551(3)	(**0.000**, 0.237, 0.471, 0.700) 0.365A
56.07	20	42430.65	$b\ ^3F_3$—521(3)	(0.000) 1.136
55.67	6	42437.79		
55.58	12	42439.46	$a\ ^3G_3$—542(4)	(**0.000**, 0.229, 0.473, 0.703) 0.681, 0.920, 1.157, 1.416, **1.662, 1.880**
55.07	3	42448.60		
54.59	3	42457.25		
54.52	5	42458.51	$a\ ^1D_2$—560(2)	(0.217) 1.061
54.39	4	42460.82	$a\ ^3D_1$—596(5)	
54.11	4	42465.92	$b\ ^3F_2$—521(1)	(**0.000**, 0.558) **0.533**, 1.057
53.87	10	42470.31	$a\ ^3P_1$—478(0)	(0.000) 1.548
51.99	10	42504.14		(0.000w) 0.962w
51.74	1	42508.70	$a\ ^3P_2$—481(2)	
51.50	1	42513.04	$a\ ^3F_2$—435(3)	
51.16	1	42519.18		
50.92	3	42523.45		(**0.000**, 0.248, 0.513) 0.508A
50.06	3	42539.07		(0.000w) 1.174w
49.84	2	42543.10	$a\ ^1D_1$—560(2)	(**0.000**, 0.503) **0.510**, 0.986
49.52	1	42548.46	$a\ ^1D_2$—582(2)	
49.32	2	42552.52		
49.04	1	42557.56		(0.000w) 0.952w
48.62	7	42565.16	$a\ ^3P_2$—482(2)	(0.000 B) 1.367D
48.55	6	42566.50	$c\ ^3F_2$—654(3)	
48.45	3	42568.24	$a\ ^3D_1$—571(1)	(0.856) 1.782
48.06	3	42575.35		(0.000) 1.080
47.64	8	42582.89		
46.98	20	42594.90		(0.000w) 1.100B
46.44	5	42604.76		
46.32	2	42606.88	$a\ ^5D_4$—598(5)	(0.000w) 0.711, 0.830w
46.04	8	42612.04	$b\ ^3F_4$—611(4)	(0.408, 0.597, **0.813**) 0.425, 0.612; 0.806, **1.029, 1.221**, 1.425, 1.646, 1.855.
45.43	1	42623.05		
44.64	1	42637.41		
43.65	20	42655.38		(0.00w) 0.86w
43.49	7	42658.33	$a\ ^5P_2$—545(2)	(0.384, **0.800**w) 0.628, **1.022, 1.403**, 1.801
42.53	10	42675.87	$a\ ^3G_4$—553(4)	
41.62	12	42692.32	$a\ ^5P_3$—551(3)	(0.357, 0.714, **1.123**) 0.517, 0.881, **1.245, 1.590**, 1.942, 2.316
40.94	10	42704.85	$a\ ^3F_3$—495(3)	(0.222, 0.467, **0.712**) 0.612, 0.845, **1.086, 1.306**, 1.536, 1.760
40.30	10	42716.48		
40.04	10	42721.29	$a\ ^3H_4$—585(5)	(0.000) 1.100
39.34	1	42734.00	$a\ ^5P_1$—480(0)	(0.000) 1.576
38.65	8	42746.54	$a\ ^5F_4$—524(4)	(0.468B) 1.208D
38.28	15	42753.36	$a\ ^5F_4$—471(3)	(**0.000**, 0.238, 0.516, 0.791) . . ., 1.069, 1.324, 1.592, 1.902, **2.167**

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2337.82	2	42761.75	$a\ ^3F_3$—495(2)	
37.56	3	42766.61	$a\ ^3G_3$—545(2)	
37.18	4	42773.57	$a\ ^1P_2$—546(3)	(**0.000**, 0.478, 0.972) **0.000**, 0.451, 0.932, 1.413
36.55	8	42785.03		
35.75	15	42799.68	$b\ ^3H_5$—682(5) $a\ ^3G_4$—555(5)	(0.000*w*) 1.146*w*
35.49	3	42804.44	$a\ ^3F_2$—454(2)	
34.90	12	42815.30	$a\ ^3F_3$—496(3)	(0.123) 1.057
34.14	20	42829.27		(0.000*w*) 1.150*A*
33.87	12	42834.15	$a\ ^3F_4$—525(3)	(**0.000**, 0.198, 0.301, 0.502) **0.643**, 0.716, 0.887, 1.105, 1.349
33.08	2	42848.69	$c\ ^3P_2$—708(2)	
32.19	25	42865.02	$a\ ^5F_4$—472(4)	(0.60) 0.92
32.00	35	42868.53	$a\ ^5F_3$—490(5)	
31.30	20	42881.44	$a\ ^3G_3$—546(3)	(0.000) 0.886
30.82	5	42890.27	$b\ ^3F_2$—525(3)	(0.000*w*) 1.370
30.70	2	42892.41	$a\ ^3P_1$—482(2)	(0.000) 1.401
29.88	2	42907.59		
29.45	1	42915.36		
29.29	1	42918.37		
29.20	4	42919.95	$a\ ^3H_5$—611(4)	(0.000*w*) 1.226*w*
28.96	1	42924.45		
28.76	3	42928.21		(0.189) 1.153
28.57	1	42931.64	$a\ ^5P_1$—536(2)	
27.64	6	42948.79		
27.00	4	42960.60		
26.74	1	42965.33		
26.48	6	42970.29		
25.70	2	42984.70		
25.15	2	42994.85	$a\ ^5F_2$—461(1)	
24.33	2	43009.96	$a\ ^5D_4$—602(3)	(0.000) 1.221
23.90	20	43017.85		(0.00) 0.99
23.04	3	43033.75	$a\ ^5P_1$—537(1)	(1.128*w*) 1.248, 2.356
22.21	2	43049.21		
21.38	1	43064.65	$a\ ^5F_1$—430(2)	
21.17	4	43068.53	$a\ ^5F_1$—430(0)	(0.00) 0.00
20.93	1	43072.89	$a\ ^3D_2$—602(3)	
20.58	4	43079.44		
20.35	2	43083.75		
19.79	2	43094.08	$a\ ^5D_4$—603(3)	
19.51	3	43099.31		
19.25	2	43104.22	$b\ ^5P_1$—604(1)	
19.09	8	43107.19	$a\ ^5P_3$—555(3)	(0.440*D*) 1.526*D*
18.64	4	43115.45	$a\ ^5P_3$—555(2)	(**0.000**, 0.573, 1.148) 1.568, 2.062, **2.647**
18.48	2	43118.46	$a\ ^5P_3$ 487(1)	
17.66	2	43133.77	$b\ ^5F_2$—528(1)	(0.000*w*) 1.144
17.18	1	43142.59		
17.03	1	43145.37		(**0.000**, 0.393) 0.494, 0.884, **1.282**
16.70	3	43151.62		
16.42	4	43156.76	$a\ ^3D_2$—603(3)	(0.000*w*) 0.995
16.04	5	43163.81	$a\ ^3D_1$—577(2)	(0.000*w*) 0.587*A*
15.65	3	43171.15	$a\ ^3H_6$—613(5)	
15.45	10	43174.90	$a\ ^5F_2$—442(1)	(**0.000**, 0.750) 0.253, 0.998, 1.751
14.29	3	43196.52		
14.08	3	43200.36	$b\ ^3F_4$—616(3)	(**0.000**, 0.307, 0.621, 0.940) 1.554, 1.847, 2.172
12.93	2	43221.92		
12.82	7	43227.78	$a\ ^5F_3$—442(2)	(0.223, **0.507**) 0.752, **1.008**, **1.251**, 1.481
11.46	1	43249.34		
11.20	5	43254.28		
08.93	1	43296.71	$a\ ^5D_3$—577(2)	
08.63	2	43302.41		
08.51	4	43304.74	$a\ ^3P_2$—489(3)	(0.000) 1.207*A*

TABLE I. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λ_{air}	Intensity and notes	Wave number	Term combination	Zeeman pattern
2308. 16	3	43311. 15	$a\ ^3F_2$—464(2) $a\ ^3D_2$—604(1)	(**0.000**, 0.545) 0.660, 1.192, **1.749**
06. 86	3	43335. 62	$a\ ^2P_1$—486(2) $a\ ^4F_2$—495(5)	(**0.000**, 0.409) **0.720**, 1.129, 1.517
05. 49	1	43361. 38	$a\ ^3G_3$—551(3)	
04. 75	3	43375. 30	$a\ ^3H_5$—613(5)	
03. 48	6	43399. 14	$a\ ^6F_2$—444(3)	(0.000*w*) 0.879*w*
03. 31	1	43402. 42	$a\ ^3H_4$—615(6)	
02. 92	6	43409. 69	$a\ ^3F_4$—478(3)	(0.000*D*) 1.721*B*
02. 39	1	43419. 76		
02. 23	6	43422. 74	$a\ ^3H_4$—616(6) $a\ ^3P_2$—490(2)	(0.000*w*) 1.330
01. 47	8	43437. 04	$a\ ^3G_4$—561(4)	(1.082*B*) 0.240, 0.499, 0.752, **1.008**, **1.250**, 1.522, 1.759, 2.012
01. 22	1	43441. 84	$a\ ^6F_4$—478(5)	
01. 07	2	43444. 63		
01. 02	1	43445. 61	$a\ ^3P_1$—487(1)	
00. 27	2	43459. 72	$b\ ^4F_3$—580(4)	(0.000*w*) 1.115*w*
2298. 95	6	43484. 73		(0.000*w*) 0.639*A*
98. 39	1	43495. 32	$b\ ^3P_1$—608(2)	(0.000) 1.114
98. 12	8	43500. 39	$a\ ^1D_2$—570(3)	(**0.000**, 0.295, 0.570) 1.093, 1.378, 1.643, **1.899**
97. 63	2	43509. 67		(0.000) 1.104
96. 81	40	43525. 20		(0.00*w*) 0.99*w*
96. 68	2	43527. 70	$c\ ^3F_4$—666(5)	(0.384*w*) 1.066*D*
95. 55	1	43549. 11	$c\ ^3P_0$—669(1)	(0.000) 0.000, 1.220
95. 22	4	43555. 48		(0.000*w*) 0.895*w*
93. 77	1	43582. 92	$a\ ^5P_3$—560(2)	
92. 56	15	43605. 94	$a\ ^4H_5$—615(6)	(0.362*w*) 1.138*D*
92. 14	4	43613. 98	$a\ ^3G_3$—553(4)	(0.000*D*) 1.297*A*
91. 50	1	43626. 15	$a\ ^4D_3$—593(2)	
91. 47	1	43626. 64	$a\ ^2H_6$—616(6)	
91. 00	1	43635. 61	$a\ ^1D_2$—571(1) $b\ ^1D_2$—669(1)	(**0.000**, 0.628) 0.490, . . .
90. 46	4	43645. 93	$a\ ^3G_4$—563(3)	
89. 93	3	43656. 02		
89. 43	2	43665. 53		
89. 18	15	43670. 28	$a\ ^2F_2$—468(2)	(0.342, **0.723**) 0.389, **0.739**, **1.097**, 1.447
88. 88	3	43676. 06	$a\ ^5P_2$—555(2)	
87. 28	12	43706. 57	$a\ ^5P_3$—561(4)	(**0.000**, 0.319, 0.664, 1.023) **0.277**, 0.594, 0.926, 1.268, 1.572
87. 01	1	43711. 73		
86. 60	3	43719. 59	$a\ ^5F_4$—534(3)	(0.000*w*) 1.214
85. 27	20	43744. 97	$a\ ^5F_3$—463(2)	(0.000*w*) 1.171*A*
85. 02	7	43749. 35	$a\ ^3P_1$—490(2)	(**0.000**, 0.257) 1.048, 1.266, 1.528
83. 67	2	43775. 58	$b\ ^5F_2$—534(3)	(0.00) 1.40
83. 40	1	43780. 91	$b\ ^4H_4$—682(5)	
83. 22	8	43784. 32	$a\ ^3G_5$—555(2)	(0.000) 0.706*A*
83. 07	1	43787. 16		
82. 21	3	43803. 60	$a\ ^5F_2$—448(3)	(**0.000**, 0.271, 0.518) 1.014, 1.264, 1.519, **1.760**
81. 54	4	43816. 44	$a\ ^3G_4$—565(5)	(0.000, 0.912*w*)
81. 32	3	43820. 71	$a\ ^5P_1$—545(2)	(0.000) 1.015
80. 58	5	43834. 92		(0.00*w*) 1.27*w*
78. 92	1	43866. 91	$b\ ^4H_4$—682(3)	
78. 33	2	43878. 21	$a\ ^2P_2$—495(3)	(0.00) 1.25
78. 11	2	43882. 52		(0.00) 1.18
75. 64	10	43930. 11	$a\ ^3H_6$—621(4)	(0.00) 1.19
74. 61	2	43950. 08		
74. 37	2	43954. 66	$b\ ^3F_2$—536(2)	(0.58) 1.16
72. 72	1	43986. 55	$a\ ^3H_4$—598(5)	
72. 59	20	43989. 02	$a\ ^3P_2$—496(3) $a\ ^3F_2$—471(3)	(**0.00**, 0.65) 0.68, **1.33**
71. 86	15	44003. 24	$a\ ^5F_3$—466(4) $a\ ^5P_2$—558(1)	(0.00) 1.16

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2271.27	1	44014.63		
71.05	2	44018.97	$a\ ^3H_5$ −622(5)	(0.00) 1.09
70.90	4	44021.76		(0.00) 1.09
69.56	5	44047.73	$a\ ^3G_4$—567(4)	(0.63) 1.15*w*
69.21	4	44054.66	$a\ ^3F_4$—484(4)	(0.00*w*) 1.29
67.50	2	44087.86		(0.00*w*) 0.70*w*
67.27	4	44092.31	$a\ ^3G_3$—558(2)	(0.00*w*) 0.82*w*
65.94	1	44118.23		
64.45	2	44127.14		
63.98	3	44156.38		(0.00) 1.04
62.29	25	44189.28	$a\ ^5F_3$—468(3)	(0.00) 1.15
61.62	12	44202.45	$a\ ^5F_2$—452(1)	**(0.00,** 0.48) **0.48, 1.00**
61.43	20	44206.09	$a\ ^5F_1$—442(1)	
60.57	5	44222.90	$a\ ^3H_4$—622(5)	(0.00) 1.43*A*
60.26	3	44229.09	$a\ ^3P_2$—498(1)	**(0.00,** 0.67) 0.71
59.59	5	44242.18	$a\ ^3F_3$—510(3)	(0.18) 1.13
59.12	3	44251.40	$a\ ^3G_3$—560(2)	(0.00) 0.81
58.74	5	44258.83	$a\ ^5F_1$—442(2)	**(0.00,** 1.24) **0.00, 1.24, 2.53**
57.55	3	44282.15		(0.41) 1.09
57.11	1	44290.73		
56.53	12	44302.07		(0.00) 1.20
55.77	20	44317.08	$a\ ^5P_3$—567(4)	(0.00*W*) 0.00*W*
55.60	2	44320.30	$a\ ^5F_5$—505(5)	
54.88	4	44334.45	$a\ ^5F_2$—475(2)	(1.09) 1.38
53.47	2	44362.24		
53.26	3	44366.34	$a\ ^5F_3$—511(2)	(0.00*w*) 0.78
52.80	3	44375.46	$a\ ^3G_3$—561(4)	(0.00*w*) 1.42*w*
52.06	2	44390.02	$a\ ^3H_4$—602(3)	
50.78	15	44415.38	$a\ ^5F_2$—454(2)	(0.36) 1.13
49.79	10	44434.74	$a\ ^5F_1$—444(0)	(0.00) 0.00
48.50	5	44460.37	$a\ ^5F_4$—542(4)	(0.30) 1.22
47.84	2	44473.38		
47.40	1	44482.11		
46.16	2	44506.72	$a\ ^3D_3$—630(2) $a\ ^5F_5$—506(6)	
43.87	6	44552.08	$a\ ^1P_3$—569(4)	(0.00*w*) 0.00*w*
43.47	2	44559.96	$b\ ^3P_2$—630(2)	
42.68	5	44575.74	$a\ ^5P_2$—564(3)	(0.00*w*) 1.01*w*
41.72	2	44594.86	$a\ ^5D_0$—571(1)	
39.48	20	44639.23	$a\ ^5F_4$—490(5) $a\ ^5F_3$—472(4)	(0.00) 1.20
39.01	5	44648.80	$a\ ^5F_5$—514(4)	(0.00) 1.20
38.60	1	44667.01	$a\ ^5P_2$—503(3)	
37.46	2	44679.62	$c\ ^5F_3$—682(3)	
36.29	4	44702.96	$a\ ^5F_3$—515(2)	(0.00) 0.84
35.94	3	44709.97		
35.69	3	44714.97	$a\ ^1D_2$—582(2)	
33.89	4	44751.08		
32.26	1	44783.81		
31.46	1	44799.75	$a\ ^5D_1$—582(2)	
30.86	3	44811.88		
30.69	1	44815.25	$a\ ^5P_1$—555(1)	
29.90	1	44831.11		
29.30	1	44843.27	$b\ ^3F_2$—545(2)	
29.03	1	44848.62		
27.85	50	44872.37	$a\ ^5F_4$—475(2)	(0.00) 1.22
27.23	10	44884.82	$a\ ^5D_4$—621(4)	

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2226.52	15	44899.18		(0.00*w*) 1.05, 1.72
25.42	3	44921.33		
24.91	1	44931.62	*a* $^2D_2$—634(4)	
23.56	1	44958.94	*b* $^2F_2$—546(3)	
23.31	10	44963.91		(0.00*w*) 1.55*w*
22.80	1	44974.31		
22.66	5	44979.23		
22.22	4	44986.05	*a* $^3G_3$—567(4) *a* $^3F_3$—481(2)	
20.70	15	45016.79		
19.41	10	45043.04	*a* $^3F_3$—482(2)	(1.42) . . .
18.93	1	45062.74		
18.39	6	45063.75		
17.84	15	45074.80		(0.00) 1.07
16.09	4	45110.43		
15.58	20	45120.77	*a* $^5F_4$—495(3)	(0.00) 1.41
14.53	25	45142.21		(0.00*w*) 1.30*w*
14.33	8	45146.36	*a* $^5P_1$—558(2)	(0.00) 0.00*w*
13.39	1	45165.52	*a* $^5P_1$—558(1)	
12.42	20	45185.40	*a* $^5P_2$—570(3)	(0.00) 1.42
11.96	1	45194.61		
11.66	2	45200.74		
10.20	6	45230.78	*a* $^5F_4$—496(3)	
10.04	5	45234.01	*a* $^5F_4$—452(1)	(1.45) 0.00, 1.43
09.03	3	45254.05	*a* $^3H_4$—611(4)	
07.99	2	45276.00		
07.64	3	45283.16		
07.36	3	45288.78		
07.13	10	45293.56	*a* $^3G_3$—570(3)	
07.04	5	45295.43		
06.54	4	45305.67	*a* $^5P_1$—560(2)	
05.86	1	45319.76	*a* $^5P_2$—571(1)	
05.49	1	45327.34	*b* $^3F_4$—638(4)	
04.09	5	45356.01	*a* $^5P_3$—577(2) *a* $^5F_2$—463(2)	
02.83	1	45381.95	*a* $^5F_4$—551(3)	
02.28	4	45393.24		
01.80	3	45403.22		
01.15	12	45416.54	*a* $^3F_3$—510(3)	(0.00) 1.03
00.43	8	45431.49		
2199.67	25	45447.26	*a* $^5F_1$—454(2)	(0.00, 1.12) 1.29, 2.39
97.77	1	45486.46	*a* $^1G_4$—596(5) *a* $^3F_2$—486(2)	
96.30	3	45516.90	*a* $^3H_3$—637(5)	
96.05	50	45522.04	*a* $^5F_4$—499(4)	(0.41) 1.40
95.23	1	45539.09	*a* $^3P_2$—511(2)	
93.88	25	45567.19	*a* $^5F_5$—517(5)	
93.22	15	45580.90	*a* $^5F_3$—482(2)	
92.47	2	45596.34		
91.99	4	45606.45		
90.97	2	45627.66		
90.62	2	45634.80	*a* $^3H_6$—638(4) *a* $^5F_4$—553(4)	
89.40	1	45660.38	*b* $^3F_3$—602(3)	
88.48	8	45679.57		
86.44	4	45722.06		
86.26	2	45725.91		
85.49	2	45742.00	*a* $^3G_5$—585(5)	
85.30	2	45746.10	*a* $^5D_2$—602(3)	

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2185.15	2	45759.11	$a\ ^2F_3$—525(3)	
84.68	8	45758.98	$a\ ^2F_4$—555(5)	
83.44	2	45784.96		
83.11	3	45791.80	$a\ ^1D_2$—593(2)	
82.72	50	45800.10	$a\ ^4F_2$—468(3)	(0.00) 1.53
81.80	4	45819.39	$a\ ^4F_3$—468(2)	
81.38	1	45828.15	$a\ ^4F_4$—484(4)	
80.87	8	45838.84	$a\ ^3H_6$—638(5) $a\ ^4P_3$—582(2)	
80.68	10	45842.90	$a\ ^3H_4$—616(3)	
80.18	3	45853.33	$b\ ^3F_2$—555(3)	
79.81	3	45861.20	$b\ ^3F_3$—555(2)	
79.55	25	45866.62	$a\ ^2P_1$—511(2)	
79.06	2	45876.88	$a\ ^4D_1$—593(2)	
79.98	1	45878.58		
78.03	4	45898.63	$a\ ^5F_4$—503(3)	
77.97	25	45899.94	$a\ ^4F_2$—490(2)	
77.20	1	45916.06	$a\ ^5P_2$—577(2)	
74.72	3	45968.46	$a\ ^4D_3$—616(3)	
73.42	2	45996.02	$a\ ^3P_1$—513(1)	
73.05	5	46003.81		
72.85	7	46008.08	$b\ ^3P_0$—622(1)	
72.15	15	46022.95	$a\ ^2F_3$—708(2)	
72.08	7	46024.39	$a\ ^5F_5$—486(2) $a\ ^2G_3$—577(2)	
71.02	1	46046.86		
70.65	2	46054.71		
69.15	10	46086.55		
67.02	1	46131.85		
66.76	3	46137.27	$a\ ^4F_2$—471(3)	
66.32	10	46146.86		
65.45	3	46165.29		
65.26	3	46169.34		
65.00	15	46174.92	$a\ ^5F_1$—461(1)	
64.77	1	46179.79	$a\ ^3F_4$—530(2)	
64.67	15	46181.86		
64.36	5	46188.45	$b\ ^3F_2$—558(1)	
64.12	1	46193.66	$a\ ^5P_2$—580(1)	
63.65	8	46203.65	$a\ ^3P_1$—515(2)	
62.65	5	46225.05		
62.45	2	46229.33		
62.26	7	46233.35		
62.04	4	46238.09		
61.88	10	46241.60	$a\ ^3F_4$—569(4)	
61.82	5	46242.80	$a\ ^3D_1$—608(2)	
61.26	7	46254.82	$a\ ^5D_4$—634(4)	
60.79	3	46264.82	$a\ ^3H_4$—621(4)	
60.36	4	46273.96		
59.63	6	46289.71	$b\ ^5F_1$—608(2)	
58.84	2	46306.62	$a\ ^5F_0$—524(4)	
58.42	25	46315.68		
58.19	3	46320.57	$a\ ^4F_3$—489(3)	
58.09	8	46322.71		
57.83	4	46328.27	$b\ ^3F_2$—560(2)	
57.66	1	46331.99		
56.91	6	46348.10		
56.65	1	46353.64	$a\ ^3H_4$—622(5)	

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2156.53	5	46356.28	a $^4F_2$—495(2)	
55.09	8	46387.15	a $^4F_1$—463(2)	
54.67	10	46396.17	a $^2F_4$—561(4)	
54.50	12	46399.85	a $^4P_2$—582(2)	
54.20	2	46406.44	a $^3P_0$—505(1)	
54.12	10	46408.08		
53.92	2	46412.34		
53.86	15	46413.68		
53.55	10	46420.36		
52.71	20	46438.40	a $^6F_2$—490(2)	
51.56	6	46463.29	a $^2P_2$—521(3)	
51.40	20	46466.74	a $^2F_2$—496(3)	
51.15	2	46472.14	a $^4D_4$—637(5)	
50.64	18	46483.12	a $^4F_2$—475(2)	
50.47	4	46486.84		
49.96	7	46497.78	a $^2P_2$—521(1)	
49.30	2	46512.14	a $^2F_3$—533(4)	
48.72	5	46524.71	b $^2F_3$—611(4)	
47.20	15	46557.60		
46.87	25	46564.78	a $^4F_2$—475(1)	
46.40	2	46575.08		
45.76	5	46588.86	a $^4D_1$—638(4)	
45.39	8	46596.94		
43.65	5	46634.67	a $^2F_4$—534(3)	
43.16	50	46645.46		
42.52	40	46659.42	a $^6F_5$—528(6)	
42.41	7	46661.79		
41.51	20	46681.36	a $^2D_2$—652(4)	
40.43	6	46704.86	a $^4F_4$—564(5)	
40.34	2	46706.83	a $^4F_2$—498(1)	
40.15	50	46711.06		
39.59	1	46723.16	a $^2H_5$—649(6)	
39.46	7	46726.10		
38.70	4	46742.62		
37.18	6	46775.88	a $^2F_4$—565(5)	
36.35	5	46794.05	a $^4F_2$—478(3)	
35.46	4	46813.46	a $^2F_3$—536(2)	
35.20	5	46819.16		
34.94	1	46824.95	a $^2P_1$—521(1)	
32.88	20	46870.15		
32.80	2	46871.93		
31.80	20	46893.98	a $^6F_3$—495(3)	
30.64	4	46919.36	a $^4D_2$—604(1)	
30.50	6	46922.48	a $^2P_2$—525(3)	
30.29	4	46927.19	a $^2H_5$—649(6)	
29.22	7	46950.69	a $^6F_2$—495(2)	
26.75	2	47005.25	a $^2F_2$—496(3)	
26.68	5	47006.89	a $^2F_4$—567(4) a $^2G_5$—598(5)	
26.33	3	47014.49	a $^2H_4$—712(5)	
24.82	20	47047.96	a $^6F_4$—532(5)	
24.56	4	47053.66		
23.45	1	47078.38	a $^6P_1$—577(2)	
21.88	2	47113.12	b $^2F_4$—616(3)	
20.91	6	47134.71	a $^2F_2$—503(3) a $^6F_2$—481(2)	
19.91	5	47156.90	a $^6F_5$—533(4)	

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length Å air	Intensity and notes	Wave number	Term combination	Zeeman pattern
2119.48	2	47166.53	a $^3P_2$—528(1)	
19.24	5	47171.81		
19.14	1	47174.03		
18.83	6	47180.89		
18.34	6	47191.84	a $^3F_2$—482(2)	
15.45	2	47256.35		
13.69	10	47295.65	a $^3F_3$—499(4)	
12.85	7	47314.45	a $^3F_4$—570(3)	
11.80	6	47337.98	a $^3F_4$—517(5)	
11.21	4	47351.16	a $^3F_2$—505(1)	
10.36	4	47370.18	b $^3F_2$—570(3)	
10.09	3	47376.29		
09.91	1	47380.35		
07.19	1	47441.62		
05.65	1	47476.27	a $^5P_2$—593(2)	
05.34	1	47483.19		
04.84	1	47494.38	a $^3P_1$—528(1)	
03.72	5	47519.77		
03.12	5	47533.30		
01.85	5	47562.07	a $^5P_1$ 582(2)	
00.80	1	47585.86		
00.55	2	47591.43		
00.32	5	47596.60	a $^5F_1$—475(1)	
2099.63	3	47612.42		
99.29	3	47620.13		
98.66	2	47634.42	a $^3H_4$ · 634(4)	
97.84	1	47652.99		
96.97	3	47672.69		
95.65	3	47702.78	a $^5F_3$—545(2)	
94.41	4	47731.00		
91.76	3	47791.44		
91.32	6	47801.47	a $^5F_1$—478(0)	
90.61	4	47817.73	a $^3F_3$—546(3)	
88.66	7	47862.34	a $^3F_5$—540(5)	
87.96	1	47878.45	a $^5D_{II}$—604(1)	
87.84	5	47881.09		
87.80	1	47882.12	b $^3F_3$—624(4)	
87.28	4	47894.00	a $^3F_2$—510(3)	
85.93	5	47925.06		
84.96	4	47947.38		
83.70	5	47976.28		
80.54	3	48049.16	a $^5F_2$—490(2)	
80.08	4	48059.81		
79.31	3	48077.46	a $^5F_4$—524(4)	
76.32	5	48146.83	a $^3F_2$—513(1)	
75.54	5	48164.94	a $^3F_4$—525(3)	
74.45	1	48190.18		
74.11	4	48197.98		
73.94	5	48202.07		
73.42	1	48214.12		
71.01	3	48270.24		
69.91	4	48295.96		
69.13	3	48314.14	a $^3P_1$—536(2)	
68.28	8	48333.85		
67.41	3	48354.35	a $^3F_2$—515(2)	
67.18	2	48359.68	a $^3H_5$—665(4) a $^5D_2$—628(1)	
66.63	4	48372.41		
65.30	5	48403.74		
64.76	2	48416.33	a $^3P_1$—537(1)	
64.19	4	48429.65	b $^3P_2$—669(1)	

TABLE 1. *Wavelengths, term combinations, and Zeeman effects of* Ta II—Continued

Wave length λair	Intensity and notes	Wave number	Term combination	Zeeman pattern
2063.34	5	48449.55	$a\ ^3P_2$—603(3)	
61.99	2	48481.26		
61.91	10	48483.13		
60.99	1	48504.84	$a\ ^5F_2$—495(3)	
60.05	2	48527.01	$a\ ^3G_4$—613(5)	
59.08	10	48549.90	$a\ ^3F_3$—553(4)	
58.84	2	48555.48	$a\ ^5F_3$—511(2)	
58.59	2	48561.47	$a\ ^5F_2$—495(2)	
57.61	2	48584.50	$b\ ^3F_2$—582(2)	
56.78	1	48604.15	$a\ ^3P_2$—604(1)	
55.76	6	48628.13	$a\ ^3H_4$—666(5)	
55.26	1	48640.02		
53.84	4	48673.74		
52.73	2	48699.99	$a\ ^3F_3$—528(1)	
51.54	2	48728.21		
51.17	1	48737.05		
50.28	1	48758.13	$a\ ^1D_2$—623(2)	
49.46	1	48777.68	$a\ ^3G_5$—616(6)	
47.40	8	48826.90	$a\ ^3F_4$—585(5)	
46.19	2	48855.60	$a\ ^5F_2$—498(1)	
44.66	5	48892.08	$a\ ^5F_3$—515(2)	
44.11	2	48905.45		
43.16	5	48927.90	$a\ ^3F_4$—533(4)	
40.61	5	48989.13	$a\ ^3G_4$—616(3)	
40.01	5	49003.53		
38.10	2	49049.45	$a\ ^3F_4$—534(3)	
35.89	3	49102.69	$a\ ^3G_3$—608(2)	
34.19	2	49143.81		
32.61	1	49181.96		
32.36	2	49187.94	$a\ ^3F_2$—560(2)	
31.53	2	49208.06		
31.17	1	49216.77		
30.62	1	49230.20		
30.25	1	49239.20	$b\ ^3F_4$—638(4)	
29.92	1	49247.05		
28.40	1	49284.05		
27.92	4	49295.64		
27.12	1	49315.16		
24.00	4	49391.10		
23.20	2	49410.72	$a\ ^5G_4$—621(4)	
22.66	1	49423.94		
22.21	1	49434.96		
20.74	1	49470.82	$a\ ^3P_2$—551(3)	
19.56	5	49499.65	$a\ ^5F_2$—505(1) $a\ ^3G_4$—622(5)	
19.18	1	49509.11	$a\ ^3D_3$—652(4)	
17.71	2	49545.12		
15.50	2	49599.56		
14.66	2	49620.17		
13.17	6	49656.86		
09.19	2	49755.11		
06.71	6	49816.60		
05.86	1	49837.83		
04.54	4	49870.56		
03.92	4	49885.92	$a\ ^3P_2$—555(3)	
03.16	1	49904.84		
02.28	2	49926.82	$a\ ^3G_3$—616(3)	
01.81	5	49938.72	$a\ ^5F_3$—525(3)	
01.17	2	49954.51		
00.73	4	49965.47		

TABLE 2. *Even terms of* Tb II

Electron configuration	Term symbol	Level	Δν	Observed g
$5d^2(^4F)6s$	$a\ ^5F_1$	0.00		0.000
	$^5F_2$	1031.36	1031.36	1.008
	$^5F_3$	2642.26	1610.90	1.250
	$^5F_4$	4415.79	1773.53	1.350
	$^5F_5$	6186.81	1771.02	1.410
	$b\ ^3F_2$	9690.47		1.047
	$^3F_3$	14581.07	4890.60	0.988
	$^3F_4$	18493.66	3912.59	1.227
$5d^2(^4P)6s$	$a\ ^5P_1$	10713.21		2.353
	$^5P_2$	11875.47	1162.26	1.426
	$^5P_3$	12435.85	560.38	1.594
	$b\ ^3P_0$	16288.04		
	$^3P_1$	17375.00	1086.96	1.170
	$^3P_2$	18500.62	1125.62	1.441
$5d^2(^2G)6s$	$a\ ^3G_3$	11767.16		0.908
	$^3G_4$	12705.33	938.17	1.013
	$^3G_5$	12830.79	125.46	1.280
	$a\ ^1G_4$	14205.48		0.994
$5d^2(^2D)6s$	$a\ ^3D_1$	14627.64		0.854
	$^3D_2$	17168.48	2540.84	1.204
	$^3D_3$	18553.83	1385.35	1.355
	$b\ ^1D_2$	23294.77		1.118
$5d^2(^2H)6s$	$a\ ^3H_4$	15851.12		0.916
	$^3H_5$	18186.04	2334.92	1.100
	$^3H_6$	17982.00	−204.04	1.146
	$a\ ^1H_5$	24226.20		1.000
$5d^2(^2F)6s$	$c\ ^3F_2$	22928.61		0.700
	$^3F_3$	23620.35	691.74	1.076
	$^3F_4$	23082.71	−537.64	1.026
	$a\ ^1F_3$	24869.58		0.995
$5d^2(^2P)6s$	$c\ ^3P_0$	23381.28		0.000
	$^3P_1$	26234.60	2853.32	1.332
	$^3P_2$	28044.14	1809.54	1.358
	$a\ ^1P_1$	23406.13		
$5d^2(^2D)6s$	$b\ ^3D_1$	29963.20		1.004
	$^3D_2$	30406.61	442.41	1.051
	$^3D_3$	30624.09	218.48	1.257
	$c\ ^1D_2$	33027.18		1.020
$5d^3$	$a\ ^4F_2$	3180.04		0.750
	$^4F_3$	6831.31	3651.27	1.098
	$^4F_4$	9746.28	2914.97	1.225
$5d^2\ 6s^2$	$a\ ^3P_0$	4124.85		0.000
	$^3P_1$	5330.77	1205.92	1.550
	$^3P_2$	5657.90	327.13	1.340
	$a\ ^1D_2$	13560.24		1.120
	$b\ ^1G_4$	25385.49		1.085
	$a\ ^1S_0$	. . .		
$5d^4$	$a\ ^5D_0$	12600.87		0.000
	$^5D_1$	13475.38	874.51	1.498
	$^5D_2$	14494.87	1019.49	1.476
	$^5D_3$	15726.15	1231.28	1.455
	$^5D_4$	17231.19	1505.04	1.191
	$b\ ^3H_4$	24432.83		0.985
	$^3H_5$	25414.13	981.30	1.060
	$^3H_6$	26010.70	596.57	1.117
	$b\ ^3G_3$	26829.13		0.850
	$^3G_4$	28165.40	1336.27	1.094
	$^3G_5$	31267.10	3101.70	
	$d\ ^3F_2$	29843.58		0.833
	$^3F_3$	. . .		
	$^3F_4$	31531.70		1.129
	$d\ ^3P_2$	. . .		
	$d\ ^3P_1$	31948.68		1.000
	$d\ ^3P_0$	. . .		
	$c\ ^1G_4$	35151.35		1.078

TABLE 3. *Odd levels of* Ta II

Level	J	Observed g	Level	J	Observed g	Level	J	Observed g	Level	J	Observed g
29256.87	2	0.511	45233.91	1	1.458	51073.92	3	1.156	57195.81	1	1.726
31212.13	1		45446.85	2	1.148	51197.42	2	1.359	57791.58	2	1.050
32318.44	3	0.976	45466.97	5	1.090	51326.31	1	1.047	58040.89	4	1.045
33706.47	1	0.285	46174.60	1	1.367	51479.86	4	1.095	58069.18	1	1.147
33715.27	2	0.823	46286.90	4		51534.28	2	1.299	58274.85	2	1.641
36112.97	4	1.180	46295.03	5	1.200	51753.70	5	1.102	58572.56	5	
36177.10	2	0.946	46387.16	2	1.323	52121.15	3	1.086	59351.96	2	1.180
36763.70	3	1.169	46491.44	2	1.060	52155.76	1	1.613	59692.16	5	
36987.71	1	0.685	46645.70	4	1.233	52492.98	4	1.101	59838.00	5	
37230.75	2	0.623	46776.78	2	0.773	52580.43	3	1.412	60241.07	3	1.176
38270.63	3	1.010	46831.35	3	1.214	52824.49	1	0.907	60325.15	3	1.151
38515.55	2	1.006	46850.64	2	1.110	52846.28	6	1.180	60479.60	1	0.662
38535.21	1	0.472	47168.90	3	1.096	53010.95	2	1.464	60549.32	5	0.904
38962.32	3	0.976	47280.89	4	1.190	53234.65	5	1.146	60870.30	2	1.130
39295.81	3	1.138	47514.52	2	1.284	53300.59	2	1.380	61105.69	4	1.007
39743.67	4	1.223	47595.98	1	1.520	53343.56	4	1.071	61357.45	5	
40023.68	0		47620.17	1		53465.79	3	1.216	61588.16	6	
40233.46	2	1.165	47801.03	0		53644.83	2	1.352	61608.62	6	
40304.78	1	1.225	47825.41	3	1.189	53746.80	1	1.234	61694.17	3	0.937
40835.45	6		47829.75	6	1.300	54048.81	5	1.260	62115.97	4	1.070
41144.94	2	1.152	47857.60	5		54206.69	4	1.157	62204.91	5	
41355.11	1	1.885	48064.57	0		54533.78	2	1.016	62296.25	1	0.600
41554.42	3	1.207	48166.15	2		54648.73	3	0.943	62317.92	2	0.986
41709.01	5	1.244	48223.08	2	1.446	55128.38	3	1.260	62463.43	4	1.167
41775.29	4	1.249	48470.41	4	1.276	55381.25	4	1.020	62854.50	1	0.908
42122.91	4	1.258	48666.56	2	1.131	55505.08	5	1.054	63080.46	2	1.106
42153.29	2	1.212	48776.29	1	0.746	55528.22	1	1.464	63485.65	4	
42959.55	3	1.120	48962.54	3	1.283	55543.11	3	1.430	63703.35	5	0.977
43064.86	2	1.041	49055.18	5	1.212	55551.60	2	1.031	63820.47	4	1.01
43068.72	0		49080.51	2	1.320	55859.32	2	1.343	64653.35	3	1.079
43544.46	3	1.059	49522.55	5	0.841	55878.70	1	1.425	64909.19	6	
43553.67	1		49536.24	3	1.317	56018.76	2	1.002	65225.24	4	
43700.05	5	1.147	49592.90	2	1.629	56142.53	4	1.270	65495.18	3	
44005.20	4	1.137	49646.62	3	1.048	56351.09	3	1.200	65657.89	3	1.013
44206.24	1	0.242	49886.51	5		56450.84	5	1.045	66545.40	4	
44259.20	2	1.256	49886.97	1	2.006	56450.95	3	1.195	66610.27	5	
44430.39	3	0.940	49937.74	4	1.207	56521.78	5	0.980	66930.35	1	1.746
44434.79	0		50314.43	3	1.281	56662.76	6		68213.70	5	
44585.17	5	1.297	50507.12	5	1.080	56753.05	4	1.197	68299.80	3	
44626.00	4	1.265	50531.17	1	1.370	56987.88	4	1.118	70892.62	2	0.719
44835.20	3	1.242	50693.61	6		57060.81	3	1.390	71240.50	5	1.214

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