

Spectrum of Sn^{5+} in the Region 500–1300 Å

Alexander Ryabtsev *, Rimma Kildiyarova and Edward Kononov

Institute of Spectroscopy, Russian Academy of Sciences, Moscow 108840, Russia; rimma@isan.troitsk.ru (R.K.); kononov@isan.troitsk.ru (E.K.)

* Correspondence: ryabtsev@isan.troitsk.ru; Tel.: +7-495-851-0225

Received: 3 October 2017; Accepted: 8 November 2017; Published: 18 November 2017

Abstract: The spectrum of tin, excited in a vacuum spark, was recorded in the region 500–1131 Å on a 6.65-m normal incidence spectrograph. The transitions between $4d^85s$, $4d^86s$, $4d^85p$ and $4d^85d$ excited configurations in Sn VI were studied. More than 500 lines of the $4d^85p$ – $4d^85d$ and $4d^85p$ – $4d^86s$ were identified with the aid of the Cowan code calculations. 67 energy levels (out of 70 possible levels of the $4d^85d$ configuration) and all but two $4d^86s$ levels were found. The wavelength of the $4d^85s$ – $4d^85p$ transitions in the region 839–1131 Å were re-measured and supplemented by Sn VI lines in the region 1131–1300 Å measured previously by Srivastava et al. (1977) for optimisation of the energy level values. The SnVI line list in the region 500–1300 Å contains now 741 lines with calculated transition probabilities.

Keywords: vacuum ultraviolet; ion spectra; wavelengths; energy levels; transition probabilities; parametric calculations

1. Introduction

The five times ionized tin has the ground state configuration $4d^9$. The resonance $4d^9$ – $4d^85p$ transitions and the transitions between first excited configurations $4d^85s$ and $4d^85p$ were studied in [1,2]. All levels of these configurations were established. Later, 85 transitions from the $4d^84f$ and $4d^86p$ configurations to the ground $4d^9\ ^2D_{3/2,5/2}$ levels were identified [3]. In the $4d^8(4f + 6p)$ configuration complex, 63 of the total 126 levels have been established. Recently, we reported the preliminary results of a study of the $4d^85p$ – $4d^85d$ transitions in the region 680–850 Å [4]. In this article, we describe extensive analysis of the Sn^{5+} spectrum in the region 500–1131 Å resulting in identification of the $4d^85p$ – $4d^85d$ and of the $4d^85p$ – $4d^86s$ transitions and location of almost all levels of the $4d^85d$ and $4d^86s$ configurations.

2. Experimental Details

The spectrum of tin was recorded on the SWR plates using the 6.65-m normal incidence spectrograph of the Institute of Spectroscopy. With 1200 L/mm grating it has plate factor 1.25 Å/mm. The spectrum was excited in a vacuum spark discharge with electric parameters of the circuit: $C = 7500\ \mu\text{F}$, $U = 220\ \text{V}$ and $L = 8$ and $25\ \mu\text{H}$. The plates were measured on an Epson Expression 10000XL scanner (Seiko Epson Corporation, Suwa, Japan). It was found [5], that a flatbed scanner, in their case Epson Expression XL11000, can have periodic errors with an amplitude up to 0.05 mm in the direction perpendicular to the linear detector in scanner (horizontally on the scanner bed) and almost no errors in the direction parallel to the detector. Therefore, our plates were scanned in a position vertically on the scanner bed.

The wavelengths were calculated using the impurity lines of aluminum, oxygen, silicon and carbon of different stages of the ionization [6] as the references. One standard deviation of the reference lines 0.006 Å was adopted as the measurement uncertainty for sharp unblended lines. Relative intensity of the lines is affected by wavelength dependence of the spectrograph effectivity and

photoplate sensitivity, which were not taken into account. The saturation effects strongly influenced the intensities of strong lines. Thus, the measured intensities have mostly qualitative character.

3. Results

The analysis was guided by the Cowan code [7] calculations of the energy levels and transition probabilities. The matrices of the $4d^9 + 4d^8(5s-7s) + 4d^8(5d-7d) + 4d^75s^2$ and $4d^85p + 4d^86p + 4d^84f + 4d^85f + 4p^5d^{10}$ configurations were used respectively for the even and odd levels. The energy parameters for the $4d^85s$ and $4d^85p$ configurations were obtained by a fitting of the calculated energy levels to the levels known from [2]. Initial energy parameters in the $4d^85d$ and $4d^86s$ configurations for the $4d-4d$ and $4d-6s$ interactions were obtained by a scaling of the corresponding ab initio Hartree–Fock integrals on the ratios of fitted to Hartree–Fock parameters (scaling factors) obtained for the Sn VI $4d^85s$ configuration. The scaling factors for the $4d-5d$ interaction parameters were taken from In V [8]. The levels of the $4d^84f + 4d^86p$ configurations were predicted with the energy parameters from [3]. All parameters of the other unknown configurations were kept at the Hartree–Fock values. Thus, the predicted spectrum was used for the identification of the Sn VI lines with the aid of the IDEN code [9].

Identified lines of the $4d^85p-4d^85d$ and $4d^85p-4d^86s$ transitions in the region 510–1052 Å with calculated transition probabilities are presented in Table A1 (see Appendix A at the end of the document). It contains 518 newly identified lines, 24 of which are doubly identified. Previously identified lines of the $4d^85s-4d^85p$ transitions [2] falling in our region (up to 1131 Å) were re-measured and listed in Table A1 in comparison with previous measurements. They are supplemented by sixty lines from 1137 Å through 1276 Å from [2] for completeness of the $4d^85s-4d^85p$ transition array.

The energy levels of the $4d^85d$ and $4d^86s$ configurations found from the identified lines are given in Table A2. Kramida's code LOPT [10] was used for the optimization of the level energies. In the optimization procedure, doubly classified, masked, blended, wide and weak lines were given a reduced weight. The uncertainties of the levels relative to each other given by LOPT are also listed. For consistency with our wavelength measurements, previously known $4d^85s$ and $4d^85p$ levels were also optimized and are given in Tables A2 and A3. A difference with previous values for the $4d^85p$ level energies is shown in Figure 1.

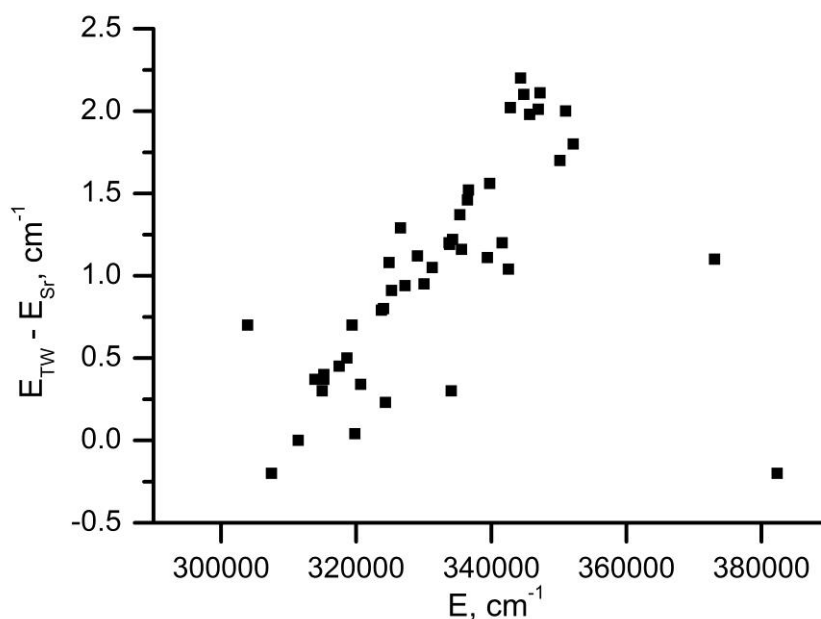


Figure 1. Difference between the level energies of the $4d^85p$ configuration measured in this work (E_{TW}) and the energies E_{Sr} published by Srivastava et al. [2].

Although our wavelengths for the $4d^85s-4d^85p$ transitions generally agree with previous measurements [2] within mutual measurement uncertainties, linear systematic shift exists up to 0.015 Å in going from longer to shorter wavelengths. It is reflected in a trend of the difference for the level energies visible in Figure 1. The 311.827 Å line of the $4d^9\ ^2D_{5/2}-4d^85p\ (^3F_2)D_{5/2}$ transition [1] was used for a connection of the levels of the excited configurations to the ground level. With estimated 0.005 Å uncertainty of this line [1] it gives 5 cm^{−1} for the uncertainties of excited levels relative to the ground level.

As it is often the case for the ions with the $4d^k$ ground state configuration, the designation of a level by the first component of its eigenvector is sometimes ambiguous (see, for example, 237,695.74 and 242,240.86 cm^{−1} levels having first component respectively 52% and 47% from the same $5s(3P)^4P_{3/2}$ level). For this reason, the energy level value is given in Table A1 in addition to the designation by the first eigenvector component.

The configuration interaction within the low lying excited configurations included in the calculation is seen in the eigenvector composition limited to three components only for two levels. The $5d(1G)^2H_{9/2}$ at 475,041.6 cm^{−1} has 25% contribution from the levels of the $4d^75s^2$ configuration and the $6s(1D)^2D_{5/2}$ level at 509,540.7 cm^{−1} is mixed with the $5d(1S)^2D_{5/2}$ level.

The energy parameters and rms level deviations obtained after final fitting of the known levels are given in Table A4. As in preliminary calculations, the matrices of the $4d^9 + 4d^8(5s-7s) + 4d^8(5d-7d) + 4d^75s^2$ and $4d^85p + 4d^86p + 4d^84f + 4d^85f + 4p^5d^{10}$ configurations were used. Only parameters of known configurations are listed in Table A4. The parameters of unknown $4d^8nl$ configurations were tied at the Hartree–Fock ratios with the corresponding parameters of these configurations. Their average energies E_{av} were shifted with respect to the Hartree–Fock energies on the values obtained for $4d^85p$ and $4d^86s$ configurations. Hartree–Fock average energies are defined such that the ground level energy of the $4d^9 + 4d^8(5s-7s) + 4d^8(5d-7d) + 4d^75s^2$ configurations is equal to zero. Ab initio E_{av} for the ground level configuration $4d^9$ in this case appears to be equal to 5338 cm^{−1}. The average energy of the $4d^75s^2$ configuration was taken lower by 6500 cm^{−1} than the one given by the ab initio calculation. This value was estimated from the shift of the $4d^85s^2$ configuration in SnV [11] calculated with similar set of the configurations as in Sn VI. All configuration interaction parameters were fixed on values obtained with scaling by 0.85 of the Hartree–Fock integrals.

Good consistency of all relevant energy parameters for all studied configurations within the limit of their uncertainties should be noted. Due to extended set of interacting odd configurations rms deviation of the fitting for the $4d^85p$ levels 61 cm^{−1} is 2.5 times smaller than in the one configuration approximation (151 cm^{−1}) in the work by Srivastava et al. [2].

Acknowledgments: The work was supported by the Russian Foundation for Basic Research, grant No. 16-02-00753a.

Author Contributions: All authors contributed equally to this work.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Identified lines of the transitions between $4d^85s$, $4d^86s$, $4d^85p$ and $4d^85d$ configurations in the spectrum of Sn^{5+} .

I ^a	$\frac{gA_{\nu}}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	$\sigma\text{-c}$, (Å) ^c	λ_p (Å) ^d	$\lambda-\lambda_p$, (Å)	ν (cm ^{−1})	Lower Level		Upper Level	
							Designation	E (cm ^{−1})	Designation	E (cm ^{−1})
13	97	510.301	−0.017			195,962.8	$5p(^3F)^4D_{7/2}$	303,941.8	$6s(^3P)^4P_{5/2}$	499,898.2
17	49	526.120	−0.002			190,070.9	$5p(^1D)^2D_{3/2}$	315,238.1	$6s(^3P)^4P_{1/2}$	505,308.4
8	170	530.922	−0.006			188,351.7	$5p(^3F)^4D_{3/2}$	317,515.30	$6s(^3P)^4P_{3/2}$	505,864.7
10	171	540.276	−0.008			185,090.5	$5p(^3F)^4F_{7/2}$	326,592.68	$6s(^1G)^2G_{9/2}$	511,680.3
32	362	548.289	−0.008			182,385.6	$5p(^3F)^4D_{3/2}$	317,515.30	$6s(^3P)^4P_{5/2}$	499,898.2
29	471	550.079	−0.006			181,792.0	$5p(^3P)^4P_{1/2}$	324,074.7	$6s(^3P)^4P_{3/2}$	505,864.7
21	242	550.541	−0.001			181,639.4	$5p(^3F)^4D_{5/2}$	311,448.43	$6s(^3F)^2F_{5/2}$	493,087.6
13	208	550.851	−0.007			181,537.2	$5p(^3P)^4P_{3/2}$	323,773.57	$6s(^3P)^4P_{1/2}$	505,308.4
25	143	553.679	−0.002			180,610.2	$5p(^3P)^4P_{5/2}$	325,255.34	$6s(^3P)^4P_{3/2}$	505,864.7
13	64	555.613	0.008			179,981.5	$5p(^3F)^4F_{3/2}$	330,063.75	$6s(^1D)^2D_{3/2}$	510,047.7
21	201	555.942	−0.007			179,875.0	$5p(^3F)^2D_{5/2}$	320,690.13	$6s(^3P)^2P_{3/2}$	500,562.7
121	926	556.772	−0.001			179,606.6	$5p(^3F)^4D_{5/2}$	311,448.43	$6s(^3F)^4F_{7/2}$	491,054.8
36	427	558.007	−0.003			179,209.2	$5p(^3F)^2D_{5/2}$	320,690.13	$6s(^3P)^4P_{5/2}$	499,898.2
34	251	559.423	0.001			178,755.6	$5p(^3P)^4P_{5/2}$	331,291.85	$6s(^1D)^2D_{3/2}$	510,047.7
391	2652	559.757	−0.004			178,649.0	$5p(^3F)^4D_{7/2}$	303,941.8	$6s(^3F)^4F_{9/2}$	482,589.5
46	346	561.529	−0.005			178,085.1	$5p(^3F)^4G_{5/2}$	315,004.02	$6s(^3F)^2F_{5/2}$	493,087.6
265	3014	561.912	0.001			177,963.9	$5p(^1G)^2H_{9/2}$	333,754.8	$6s(^1G)^2G_{7/2}$	511,718.9
54	655	562.032	−0.001			177,925.7	$5p(^1G)^2H_{9/2}$	333,754.8	$6s(^1G)^2G_{9/2}$	511,680.3
240	1433	562.275db	−0.004			177,849.0	$5p(^1G)^2F_{7/2}$	333,832.6	$6s(^1G)^2G_{9/2}$	511,680.3
240	851	562.275db	0.001			177,849.0	$5p(^1D)^2D_{3/2}$	315,238.1	$6s(^3F)^2F_{5/2}$	493,087.6
208	846	564.511db	0.019			177,144.4	$5p(^3F)^4G_{5/2}$	315,004.02	$6s(^3F)^4F_{3/2}$	492,154.4
208	894	564.511db	−0.008			177,144.4	$5p(^3F)^4G_{7/2}$	313,912.99	$6s(^3F)^4F_{7/2}$	491,054.8
196	1441	564.868	0.002			177,032.5	$5p(^3F)^4G_{7/2}$	313,912.99	$6s(^3F)^4F_{5/2}$	490,946.0
44	283	565.250	0.011			176,912.9	$5p(^1D)^2D_{3/2}$	315,238.1	$6s(^3F)^4F_{3/2}$	492,154.4
13	112	565.643	−0.003			176,789.9	$5p(^3P)^4P_{3/2}$	323,773.57	$6s(^3P)^2P_{3/2}$	500,562.7
285	2178	566.203	0.001			176,615.2	$5p(^3F)^4G_{9/2}$	307,476.0	$6s(^3F)^2F_{7/2}$	484,091.6
76	611	567.777	−0.003			176,125.5	$5p(^3P)^4P_{3/2}$	323,773.57	$6s(^3P)^4P_{5/2}$	499,898.2

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ⁻¹)	Lower Level		Upper Level	
							Designation	E (cm ⁻¹)	Designation	E (cm ⁻¹)
48	390	568.022	0.004			176,049.5	5p(³ F) ⁴ G _{5/2}	315,004.02	6s(³ F) ⁴ F _{7/2}	491,054.8
76	584	568.369	−0.001			175,942.2	5p(³ F) ⁴ G _{5/2}	315,004.02	6s(³ F) ⁴ F _{5/2}	490,946.0
18	175	568.838	0.013			175,796.8	5p(³ F) ⁴ F _{3/2}	330,063.75	6s(³ P) ⁴ P _{3/2}	505,864.7
54	240	569.127db	0.001			175,707.7	5p(¹ D) ² D _{3/2}	315,238.1	6s(³ F) ⁴ F _{5/2}	490,946.0
54	174	569.127db	0.001			175,707.7	5p(¹ G) ² F _{7/2}	333,832.6	6s(¹ D) ² D _{5/2}	509,540.7
278	1435	571.054	−0.004			175,114.7	5p(³ F) ⁴ G _{9/2}	307,476.0	6s(³ F) ⁴ F _{9/2}	482,589.5
79	782	571.277	0.000			175,046.4	5p(³ P) ⁴ D _{7/2}	336,634.02	6s(¹ G) ² G _{9/2}	511,680.3
106	191	572.608db	−0.002			174,639.6	5p(³ F) ⁴ D _{3/2}	317,515.30	6s(³ F) ⁴ F _{3/2}	492,154.4
106	796	572.608db	0.011			174,639.6	5p(³ P) ⁴ P _{5/2}	325,255.34	6s(³ P) ⁴ P _{5/2}	499,898.2
9	59	572.833	0.006			174,570.9	5p(³ P) ⁴ P _{5/2}	331,291.85	6s(³ P) ⁴ P _{3/2}	505,864.7
43	616	573.245	−0.001			174,445.4	5p(³ P) ² D _{5/2}	335,602.72	6s(¹ D) ² D _{3/2}	510,047.7
104	473	574.904	−0.013			173,941.9	5p(³ P) ² D _{5/2}	335,602.72	6s(¹ D) ² D _{5/2}	509,540.7
109	549	576.604	0.005			173,429.3	5p(³ F) ⁴ D _{3/2}	317,515.30	6s(³ F) ⁴ F _{5/2}	490,946.0
11	95	577.165	−0.003			173,260.6	5p(³ F) ² F _{7/2}	319,827.76	6s(³ F) ² F _{5/2}	493,087.6
16	208	577.822	0.002			173,063.8	5p(³ F) ² D _{3/2}	336,476.33	6s(¹ D) ² D _{5/2}	509,540.7
68	398	578.887	0.000			172,745.2	5p(³ F) ⁴ D _{1/2}	319,409.18	6s(³ F) ⁴ F _{3/2}	492,154.4
160	707	579.231	0.001			172,642.8	5p(³ F) ⁴ D _{5/2}	311,448.43	6s(³ F) ² F _{7/2}	484,091.6
46	514	581.568	−0.003			171,949.0	5p(¹ D) ² D _{5/2}	339,770.87	6s(¹ G) ² G _{7/2}	511,718.9
16	169	582.126	0.003			171,784.1	5p(¹ D) ² P _{1/2}	334,079.8	6s(³ P) ⁴ P _{3/2}	505,864.7
33	431	582.806	−0.001			171,583.6	5p(³ P) ² P _{3/2}	334,281.53	6s(³ P) ⁴ P _{3/2}	505,864.7
173	646	583.197db	−0.015			171,468.8	5p(³ F) ² D _{5/2}	320,690.13	6s(³ F) ⁴ F _{3/2}	492,154.4
173	892	583.197db	0.018			171,468.8	5p(³ F) ² F _{5/2}	329,088.51	6s(³ P) ² P _{3/2}	500,562.7
53	413	584.396	0.004			171,116.9	5p(³ F) ² F _{7/2}	319,827.76	6s(³ F) ⁴ F _{5/2}	490,946.0
6	104	586.116	0.000			170,614.6	5p(¹ D) ² P _{3/2}	339,432.97	6s(¹ D) ² D _{3/2}	510,047.7
10	114	586.510	−0.004			170,500.1	5p(³ F) ⁴ F _{3/2}	330,063.75	6s(³ P) ² P _{3/2}	500,562.7
50	383	586.981	0.005			170,363.2	5p(³ F) ² D _{5/2}	320,690.13	6s(³ F) ⁴ F _{7/2}	491,054.8
44	341	587.284	0.005			170,275.4	5p(¹ D) ² D _{5/2}	339,770.87	6s(¹ D) ² D _{3/2}	510,047.7
22	130	587.341	−0.010			170,258.8	5p(³ F) ² D _{5/2}	320,690.13	6s(³ F) ⁴ F _{5/2}	490,946.0
85	459	587.619	0.001			170,178.3	5p(³ F) ⁴ G _{7/2}	313,912.99	6s(³ F) ² F _{7/2}	484,091.6
27	283	587.864	0.001			170,107.4	5p(¹ D) ² P _{3/2}	339,432.97	6s(¹ D) ² D _{5/2}	509,540.7
23	348	588.389	−0.004			169,955.6	5p(³ P) ⁴ D _{1/2}	335,354.1	6s(³ P) ⁴ P _{1/2}	505,308.4

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ⁻¹)	Lower Level		Upper Level	
							Designation	E (cm ⁻¹)	Designation	E (cm ⁻¹)
32	305	589.032	−0.001			169,770.1	5p(¹ D) ² D _{5/2}	339,770.87	6s(¹ D) ² D _{5/2}	509,540.7
46	368	590.770	0.001			169,270.6	5p(³ P) ⁴ P _{5/2}	331,291.85	6s(³ P) ² P _{3/2}	500,562.7
444	3727	591.235	0.007			169,137.3	5p(¹ G) ² H _{11/2}	342,540.9	6s(¹ G) ² G _{9/2}	511,680.3
24	228	592.101	0.003			168,890.2	5p(³ P) ⁴ D _{5/2}	342,827.90	6s(¹ G) ² G _{7/2}	511,718.9
29	314	592.301	−0.003			168,833.0	5p(³ F) ² D _{3/2}	336,476.33	6s(³ P) ⁴ P _{1/2}	505,308.4
43	336	593.101	0.004			168,605.2	5p(³ P) ⁴ P _{5/2}	331,291.85	6s(³ P) ⁴ P _{5/2}	499,898.2
88	796	593.730	0.001			168,426.8	5p(³ P) ² P _{3/2}	341,620.5	6s(¹ D) ² D _{3/2}	510,047.7
59	356	593.895	0.003			168,379.9	5p(³ P) ⁴ P _{3/2}	323,773.57	6s(³ F) ⁴ F _{3/2}	492,154.4
640	3702	597.554	0.002			167,349.0	5p(³ F) ⁴ G _{11/2}	315,239.91	6s(³ F) ⁴ F _{9/2}	482,589.5
29	42	598.188	0.004			167,171.4	5p(³ P) ⁴ P _{3/2}	323,773.57	6s(³ F) ⁴ F _{5/2}	490,946.0
648	3051	599.888	0.001			166,697.9	5p(³ F) ⁴ G _{9/2}	324,356.63	6s(³ F) ⁴ F _{7/2}	491,054.8
48	213	601.862	0.003			166,151.0	5p(³ F) ⁴ F _{5/2}	324,902.96	6s(³ F) ⁴ F _{7/2}	491,054.8
78	484	602.072	0.002			166,093.2	5p(¹ D) ² D _{5/2}	339,770.87	6s(³ P) ⁴ P _{3/2}	505,864.7
198	856	602.176	0.004			166,064.4	5p(¹ G) ² F _{7/2}	333,832.6	6s(³ P) ⁴ P _{5/2}	499,898.2
187	1006	602.253	−0.001			166,043.3	5p(³ F) ⁴ F _{5/2}	324,902.96	6s(³ F) ⁴ F _{5/2}	490,946.0
21	241	602.413	0.004			165,999.0	5p(¹ D) ² F _{7/2}	345,680.16	6s(¹ G) ² G _{9/2}	511,680.3
11	77	602.865	0.003			165,874.5	5p(¹ D) ² P _{3/2}	339,432.97	6s(³ P) ⁴ P _{1/2}	505,308.4
319	1949	603.019	0.003			165,832.3	5p(³ F) ² G _{7/2}	327,254.46	6s(³ F) ² F _{5/2}	493,087.6
13	52	603.130	−0.008			165,801.6	5p(³ P) ⁴ P _{5/2}	325,255.34	6s(³ F) ⁴ F _{7/2}	491,054.8
88	102	603.536	0.002			165,690.2	5p(³ P) ⁴ P _{5/2}	325,255.34	6s(³ F) ⁴ F _{5/2}	490,946.0
280	1192	604.438	0.000			165,442.9	5p(³ F) ⁴ F _{9/2}	318,648.6	6s(³ F) ² F _{7/2}	484,091.6
46	336	606.212	0.005			164,958.7	5p(³ P) ² D _{5/2}	335,602.72	6s(³ P) ² P _{3/2}	500,562.7
163	945	606.956	0.002			164,756.6	5p(¹ G) ² F _{5/2}	346,961.72	6s(¹ G) ² G _{7/2}	511,718.9
292	1428	608.045	0.003			164,461.4	5p(³ F) ⁴ F _{7/2}	326,592.68	6s(³ F) ⁴ F _{7/2}	491,054.8
46	146	608.661	0.001			164,295.1	5p(³ P) ² D _{5/2}	335,602.72	6s(³ P) ⁴ P _{5/2}	499,898.2
467	1787	608.781	0.004			164,262.8	5p(³ F) ² F _{7/2}	319,827.76	6s(³ F) ² F _{7/2}	484,091.6
51	252	609.437	0.002			164,085.9	5p(³ F) ² D _{3/2}	336,476.33	6s(³ P) ² P _{3/2}	500,562.7
306	1039	610.275	0.000			163,860.5	5p(¹ D) ² F _{7/2}	345,680.16	6s(¹ D) ² D _{5/2}	509,540.7
54	121	610.504	0.005			163,799.1	5p(³ F) ² G _{7/2}	327,254.46	6s(³ F) ⁴ F _{7/2}	491,054.8
84	230	611.995	0.006			163,400.0	5p(³ F) ² D _{5/2}	320,690.13	6s(³ F) ² F _{7/2}	484,091.6
232	1358	612.507	0.002			163,263.5	5p(³ P) ⁴ D _{7/2}	336,634.02	6s(³ P) ⁴ P _{5/2}	499,898.2

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ⁻¹)	Lower Level		Upper Level	
							Designation	E (cm ⁻¹)	Designation	E (cm ⁻¹)
59	467	613.178	0.005			163,084.7	5p(¹ G) ² F _{5/2}	346,961.72	6s(¹ D) ² D _{3/2}	510,047.7
61	274	613.258	0.009			163,063.6	5p(³ F) ² F _{5/2}	329,088.51	6s(³ F) ⁴ F _{3/2}	492,154.4
160	988	613.361	0.003			163,036.1	5p(³ P) ⁴ D _{5/2}	342,827.90	6s(³ P) ⁴ P _{3/2}	505,864.7
61	178	613.407	0.000			163,024.0	5p(³ F) ⁴ F _{3/2}	330,063.75	6s(³ F) ² F _{5/2}	493,087.6
68	118	614.109	−0.011			162,837.7	5p(³ P) ⁴ S _{3/2}	347,213.07	6s(¹ D) ² D _{3/2}	510,047.7
33	65	614.384	−0.011			162,764.6	5p(³ F) ² F _{7/2}	319,827.76	6s(³ F) ⁴ F _{9/2}	482,589.5
21	184	615.086	0.000			162,579.0	5p(¹ G) ² F _{5/2}	346,961.72	6s(¹ D) ² D _{5/2}	509,540.7
29	140	616.043	0.005			162,326.3	5p(³ P) ⁴ S _{3/2}	347,213.07	6s(¹ D) ² D _{5/2}	509,540.7
35	300	618.066	0.003			161,794.9	5p(³ P) ⁴ P _{5/2}	331,291.85	6s(³ F) ² F _{5/2}	493,087.6
50	466	620.624	0.006			161,128.3	5p(¹ D) ² P _{3/2}	339,432.97	6s(³ P) ² P _{3/2}	500,562.7
23	103	621.246	0.011			160,966.7	5p(³ P) ² D _{3/2}	344,338.7	6s(³ P) ⁴ P _{1/2}	505,308.4
30	210	621.579	0.007			160,880.5	5p(³ F) ⁴ F _{3/2}	330,063.75	6s(³ F) ⁴ F _{5/2}	490,946.0
14	102	621.650	0.001			160,862.2	5p(³ P) ⁴ P _{5/2}	331,291.85	6s(³ F) ⁴ F _{3/2}	492,154.4
298	2258	622.279	0.003			160,699.5	5p(¹ G) ² G _{7/2}	351,018.7	6s(¹ G) ² G _{7/2}	511,718.9
15	84	623.195	0.007			160,463.5	5p(¹ D) ² P _{3/2}	339,432.97	6s(³ P) ⁴ P _{5/2}	499,898.2
68	562	625.448	−0.005			159,885.4	5p(¹ D) ² P _{1/2}	350,163.5	6s(¹ D) ² D _{3/2}	510,047.7
109	445	626.620	−0.005			159,586.4	5p(¹ G) ² G _{9/2}	352,133.8	6s(¹ G) ² G _{7/2}	511,718.9
542	2488	626.775	−0.001			159,546.8	5p(¹ G) ² G _{9/2}	352,133.8	6s(¹ G) ² G _{9/2}	511,680.3
197	230	628.183	−0.002			159,189.2	5p(³ F) ⁴ F _{5/2}	324,902.96	6s(³ F) ² F _{7/2}	484,091.6
21	79	629.154	−0.005			158,943.5	5p(³ P) ² P _{3/2}	341,620.5	6s(³ P) ² P _{3/2}	500,562.7
117	530	629.577	−0.002			158,836.7	5p(³ P) ⁴ P _{5/2}	325,255.34	6s(³ F) ² F _{7/2}	484,091.6
68	337	630.303	−0.009			158,654.0	5p(³ P) ⁴ S _{3/2}	347,213.07	6s(³ P) ⁴ P _{3/2}	505,864.7
56	187	633.415	−0.006			157,874.3	5p(³ P) ² P _{3/2}	334,281.53	6s(³ F) ⁴ F _{3/2}	492,154.4
123	168	634.630	−0.004			157,572.1	5p(³ F) ⁴ D _{7/2}	303,941.8	5d(³ P) ⁴ F _{9/2}	461,513.0
48	127	635.073	−0.004			157,462.2	5p(³ F) ⁴ D _{5/2}	311,448.43	5d(¹ D) ² F _{7/2}	468,909.5
22	89	636.035	−0.008			157,224.1	5p(¹ G) ² F _{7/2}	333,832.6	6s(³ F) ⁴ F _{7/2}	491,054.8
24	136	636.652	−0.006			157,071.8	5p(³ P) ⁴ D _{5/2}	342,827.90	6s(³ P) ⁴ P _{5/2}	499,898.2
48	176	637.742	−0.012			156,803.2	5p(³ P) ⁴ D _{1/2}	335,354.1	6s(³ F) ⁴ F _{3/2}	492,154.4
33	43	641.040	0.002			155,996.4	5p(³ F) ⁴ F _{7/2}	326,592.68	6s(³ F) ⁴ F _{9/2}	482,589.5
41	124	642.034	−0.016			155,754.9	5p(³ P) ² S _{1/2}	344,811.6	6s(³ P) ² P _{3/2}	500,562.7

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ⁻¹)	Lower Level		Upper Level	
							Designation	E (cm ⁻¹)	Designation	E (cm ⁻¹)
25	15	642.445	0.000			155,655.3	5p(¹ D) ² D _{3/2}	315,238.1	5d(³ P) ⁴ P _{5/2}	470,893.4
23	45	643.727	−0.008			155,345.3	5p(³ P) ² D _{5/2}	335,602.72	6s(³ F) ⁴ F _{5/2}	490,946.0
51	205	647.367	−0.009			154,471.8	5p(³ F) ² D _{3/2}	336,476.33	6s(³ F) ⁴ F _{5/2}	490,946.0
17	25	649.580	−0.009			153,945.7	5p(³ F) ⁴ G _{5/2}	315,004.02	5d(³ P) ⁴ F _{3/2}	468,947.5
18	37	650.575	−0.003			153,710.1	5p(¹ D) ² D _{3/2}	315,238.1	5d(³ P) ⁴ F _{3/2}	468,947.5
28	37	651.810	−0.017			153,418.9	5p(³ F) ⁴ D _{7/2}	303,941.8	5d(³ F) ² D _{5/2}	457,356.8
58	99	654.449	−0.002			152,800.3	5p(³ P) ⁴ P _{5/2}	331,291.85	6s(³ F) ² F _{7/2}	484,091.6
40	147	654.926	−0.017			152,689.0	5p(³ P) ⁴ S _{3/2}	347,213.07	6s(³ P) ⁴ P _{5/2}	499,898.2
19	44	661.968	0.004			151,064.8	5p(³ F) ² F _{7/2}	319,827.76	5d(³ P) ⁴ P _{5/2}	470,893.4
18	14	662.027	0.005			151,051.2	5p(³ F) ⁴ F _{5/2}	324,902.96	5d(¹ G) ² G _{7/2}	475,955.3
37	62	662.703	−0.010			150,897.2	5p(¹ D) ² D _{3/2}	315,238.1	5d(³ P) ⁴ F _{3/2}	466,132.9
28	6	664.617	0.005			150,462.5	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(¹ S) ² P _{3/2}	382,342.2
163	41	668.151	0.007			149,666.8	5p(³ F) ⁴ D _{3/2}	317,515.30	5d(¹ D) ² D _{5/2}	467,183.6
225	376	671.710	0.005			148,873.7	5p(³ F) ⁴ D _{3/2}	317,515.30	5d(³ P) ⁴ F _{5/2}	466,390.2
282	72	672.861	−0.007			148,619.1	5p(³ F) ⁴ D _{3/2}	317,515.30	5d(³ P) ⁴ F _{3/2}	466,132.9
66	69	674.104	0.000			148,345.1	5p(³ F) ⁴ D _{5/2}	311,448.43	5d(³ P) ⁴ D _{7/2}	459,793.5
68	136	677.978	0.000			147,497.4	5p(³ P) ⁴ P _{3/2}	323,773.57	5d(³ P) ⁴ P _{1/2}	471,270.9
66	68	678.156	−0.005			147,458.7	5p(³ P) ⁴ D _{7/2}	336,634.02	6s(³ F) ² F _{7/2}	484,091.6
17	42	678.633	0.004			147,355.1	5p(³ F) ² F _{7/2}	319,827.76	5d(¹ D) ² D _{5/2}	467,183.6
81	76	679.292	0.002			147,212.2	5p(³ F) ⁴ D _{7/2}	303,941.8	5d(³ F) ⁴ F _{5/2}	451,154.4
39	225	679.606	0.003			147,144.0	5p(³ P) ⁴ P _{1/2}	324,074.7	5d(³ P) ² P _{3/2}	471,219.3
22	59	679.722	0.004			147,119.0	5p(³ P) ⁴ P _{3/2}	323,773.57	5d(³ P) ⁴ P _{5/2}	470,893.4
65	45	680.892	0.003			146,866.1	5p(³ F) ² F _{5/2}	329,088.51	5d(¹ G) ² G _{7/2}	475,955.3
220	489	681.558	0.005			146,722.7	5p(³ F) ⁴ D _{1/2}	319,409.18	5d(³ P) ⁴ F _{3/2}	466,132.9
53	22	682.628	0.003			146,492.7	5p(³ F) ² D _{5/2}	320,690.13	5d(¹ D) ² D _{5/2}	467,183.6
20	20	682.779	0.001			146,460.4	5p(³ F) ⁴ D _{7/2}	303,941.8	5d(³ F) ⁴ H _{9/2}	450,402.3
99	937	683.331				146,342.0	5p(¹ G) ² F _{5/2}	346,961.72	5d(³ F) ² D _{3/2}	493,303.7
63	233	684.660	0.003			146,057.8	5p(³ F) ⁴ F _{7/2}	326,592.68	5d(¹ G) ² F _{7/2}	472,651.2
189	13	684.986	0.010			145,988.4	5p(³ F) ⁴ F _{5/2}	324,902.96	5d(³ P) ⁴ P _{5/2}	470,893.4
69	78	685.151	0.011			145,953.2	5p(³ P) ⁴ D _{7/2}	336,634.02	6s(³ F) ⁴ F _{9/2}	482,589.5
69	139	685.359	−0.003			145,909.0	5p(³ F) ⁴ D _{5/2}	311,448.43	5d(³ F) ² D _{5/2}	457,356.8

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ⁻¹)	Lower Level		Upper Level	
							Designation	E (cm ⁻¹)	Designation	E (cm ⁻¹)
243	175	686.334	−0.007			145,701.6	5p(³ F) ² D _{5/2}	320,690.13	5d(³ P) ⁴ F _{5/2}	466,390.2
129	172	688.899	0.008			145,159.1	5p(³ F) ⁴ D _{3/2}	317,515.30	5d(³ P) ⁴ P _{1/2}	462,676.0
22	1	689.622	0.002			145,007.0	5s(³ F) ² F _{5/2}	237,334.76	5p(¹ S) ² P _{3/2}	382,342.2
79	39	690.387	0.005			144,846.4	5p(³ F) ⁴ G _{5/2}	315,004.02	5d(³ P) ⁴ D _{3/2}	459,851.5
39	125	692.203	0.003			144,466.3	5p(³ P) ⁴ P _{5/2}	325,255.34	5d(³ P) ² F _{5/2}	469,722.2
81	89	692.986	−0.011			144,303.0	5p(³ F) ⁴ F _{7/2}	326,592.68	5d(³ P) ⁴ P _{5/2}	470,893.4
215	370	694.411	−0.002			144,006.9	5p(³ F) ⁴ F _{5/2}	324,902.96	5d(¹ D) ² F _{7/2}	468,909.5
55	60	697.296	−0.005			143,411.1	5p(³ P) ⁴ P _{3/2}	323,773.57	5d(¹ D) ² D _{5/2}	467,183.6
73	164	697.899	0.007			143,287.1	5p(¹ D) ² D _{3/2}	315,238.1	5d(³ P) ⁴ D _{1/2}	458,526.7
87	178	698.221	−0.017			143,221.1	5p(³ P) ⁴ P _{3/2}	323,773.57	5d(³ P) ⁴ P _{3/2}	466,991.1
111	380	698.414	0.004			143,181.5	5p(³ F) ⁴ F _{5/2}	324,902.96	5d(¹ D) ² F _{5/2}	468,085.2
359	657	699.706	−0.004			142,917.2	5p(³ P) ⁴ P _{1/2}	324,074.7	5d(³ P) ⁴ P _{3/2}	466,991.1
66	77	699.978	0.013			142,861.7	5p(³ F) ⁴ F _{9/2}	318,648.6	5d(³ P) ⁴ F _{9/2}	461,513.0
135	146	701.198	0.017			142,613.1	5p(³ P) ⁴ P _{3/2}	323,773.57	5d(³ P) ⁴ F _{5/2}	466,390.2
300	222	703.043	−0.018			142,238.8	5p(³ F) ⁴ D _{7/2}	303,941.8	5d(³ F) ⁴ P _{5/2}	446,177.0
717	781	703.232	0.000			142,200.5	5p(¹ G) ² H _{9/2}	333,754.8	5d(¹ G) ² G _{7/2}	475,955.3
990	367	704.334mR	−0.002			141,978.2	5p(³ P) ⁴ P _{1/2}	324,074.7	5d(³ P) ⁴ D _{1/2}	466,052.9
90	64	704.585	0.004			141,927.5	5p(³ P) ⁴ P _{5/2}	325,255.34	5d(¹ D) ² D _{5/2}	467,183.6
127	26	704.726	0.002			141,899.1	5p(³ F) ⁴ D _{7/2}	303,941.8	5d(³ F) ² G _{9/2}	445,841.4
399	476	705.201	0.002			141,803.6	5p(³ F) ⁴ D _{3/2}	317,515.30	5d(³ F) ² F _{5/2}	459,319.4
402	99	705.775	−0.014			141,688.1	5p(³ F) ² F _{7/2}	319,827.76	5d(³ P) ⁴ F _{9/2}	461,513.0
974	2609	707.781	0.001			141,286.7	5p(¹ G) ² H _{9/2}	333,754.8	5d(¹ G) ² H _{9/2}	475,041.6
327	406	708.173db	−0.007			141,208.5	5p(³ F) ⁴ F _{3/2}	330,063.75	5d(³ P) ⁴ P _{1/2}	471,270.9
327	262	708.173db	0.002			141,208.5	5p(¹ G) ² F _{7/2}	333,832.6	5d(¹ G) ² H _{9/2}	475,041.6
49	95	708.446	0.008			141,154.0	5p(³ F) ⁴ F _{3/2}	330,063.75	5d(³ P) ² P _{3/2}	471,219.3
94	124	708.598	−0.003			141,123.7	5p(³ F) ² F _{7/2}	319,827.76	5d(³ P) ² F _{7/2}	460,950.8
33	65	709.052	0.003			141,033.5	5p(³ P) ⁴ P _{5/2}	331,291.85	5d(¹ D) ² P _{3/2}	472,326.0
82	168	709.167	0.005			141,010.5	5p(³ F) ⁴ D _{3/2}	317,515.30	5d(³ P) ⁴ D _{1/2}	458,526.7
65	130	709.313	0.008			140,981.5	5p(³ F) ⁴ F _{7/2}	326,592.68	5d(³ P) ⁴ F _{7/2}	467,575.7
782	728	709.419db	0.008			140,960.4	5p(³ F) ⁴ D _{7/2}	303,941.8	5d(³ F) ² F _{7/2}	444,903.9
782	505	709.419db	−0.022			140,960.4	5p(³ F) ⁴ D _{5/2}	311,448.43	5d(³ F) ⁴ F _{5/2}	452,404.5

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ^{−1})	Lower Level		Upper Level	
							Designation	E (cm ^{−1})	Designation	E (cm ^{−1})
63	23	711.287	0.004			140,590.2	5p(³ F) ⁴ F _{7/2}	326,592.68	5d(¹ D) ² D _{5/2}	467,183.6
959	1385	712.588	0.004			140,333.6	5p(³ F) ⁴ D _{5/2}	311,448.43	5d(³ F) ⁴ F _{7/2}	451,782.8
15	2	713.776	0.007			140,099.9	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(¹ S) ² P _{3/2}	382,342.2
26	66	715.099	0.004			139,840.7	5p(³ F) ⁴ D _{3/2}	317,515.30	5d(³ F) ² D _{5/2}	457,356.8
29	91	715.204	0.004			139,820.3	5p(³ F) ² F _{5/2}	329,088.51	5d(¹ D) ² F _{7/2}	468,909.5
975	2795	715.648	0.001			139,733.6	5p(³ F) ⁴ D _{7/2}	303,941.8	5d(³ F) ⁴ F _{9/2}	443,675.5
88	138	715.793	0.004			139,705.3	5p(³ F) ⁴ D _{5/2}	311,448.43	5d(³ F) ⁴ F _{5/2}	451,154.4
38	140	716.325	0.000			139,601.5	5p(³ P) ⁴ P _{5/2}	331,291.85	5d(³ P) ⁴ P _{5/2}	470,893.4
39	125	717.266	0.004			139,418.4	5p(¹ G) ² F _{7/2}	333,832.6	5d(¹ G) ² F _{5/2}	473,251.7
269	503	717.544	0.005			139,364.3	5p(³ F) ⁴ D _{5/2}	311,448.43	5d(³ F) ⁴ P _{3/2}	450,813.7
42	98	717.772	0.006			139,320.1	5p(³ P) ⁴ D _{7/2}	336,634.02	5d(¹ G) ² G _{7/2}	475,955.3
128	58	718.162	0.020			139,244.3	5p(³ F) ⁴ D _{5/2}	311,448.43	5d(³ F) ⁴ H _{7/2}	450,696.6
495	469	718.892	0.002			139,103.0	5p(³ F) ² D _{5/2}	320,690.13	5d(³ P) ⁴ D _{7/2}	459,793.5
179	325	719.275	0.000			139,028.9	5p(³ F) ⁴ G _{7/2}	313,912.99	5d(³ F) ⁴ G _{7/2}	452,941.9
242	603	719.467	0.003			138,991.8	5p(³ P) ⁴ P _{5/2}	331,291.85	5d(³ P) ² F _{7/2}	470,284.2
169	380	719.777	0.000			138,931.8	5p(³ F) ⁴ G _{5/2}	315,004.02	5d(³ F) ² G _{7/2}	453,935.8
234	325	719.943	0.013			138,900.0	5p(³ P) ⁴ P _{3/2}	323,773.57	5d(³ P) ⁴ P _{1/2}	462,676.0
172	443	720.021	−0.005			138,884.8	5p(³ F) ⁴ F _{3/2}	330,063.75	5d(³ P) ⁴ F _{3/2}	468,947.5
564	1574	720.366	0.001			138,818.4	5p(¹ G) ² F _{7/2}	333,832.6	5d(¹ G) ² F _{7/2}	472,651.2
43	92	721.242	−0.001			138,649.7	5p(³ F) ⁴ G _{7/2}	313,912.99	5d(³ F) ⁴ G _{9/2}	452,562.5
250	558	721.348	0.000			138,629.3	5p(³ F) ² D _{5/2}	320,690.13	5d(³ F) ² F _{5/2}	459,319.4
137	308	721.487	−0.007			138,602.7	5p(³ P) ⁴ P _{1/2}	324,074.7	5d(³ P) ⁴ P _{1/2}	462,676.0
149	72	722.067	0.001			138,491.3	5p(³ F) ⁴ G _{7/2}	313,912.99	5d(³ F) ⁴ F _{5/2}	452,404.5
442	839	722.265	0.004			138,453.3	5p(¹ D) ² D _{3/2}	315,238.1	5d(³ F) ² P _{1/2}	453,692.1
138	293	722.393	0.008			138,428.9	5p(³ P) ⁴ P _{5/2}	331,291.85	5d(³ P) ² F _{5/2}	469,722.2
215	688	722.517db	0.013			138,405.0	5p(³ P) ⁴ D _{7/2}	336,634.02	5d(¹ G) ² H _{9/2}	475,041.6
215	199	722.517db	−0.015			138,405.0	5p(³ F) ⁴ D _{3/2}	317,515.30	5d(³ F) ⁴ F _{3/2}	455,917.5
239	538	722.722	−0.002			138,365.9	5p(³ F) ⁴ G _{9/2}	307,476.0	5d(³ F) ² G _{9/2}	445,841.4
29	105	723.350	0.003			138,245.7	5p(¹ D) ² P _{1/2}	334,079.8	5d(¹ D) ² P _{3/2}	472,326.0
124	378	724.137	−0.002			138,095.5	5p(³ F) ² F _{5/2}	329,088.51	5d(¹ D) ² D _{5/2}	467,183.6
38	85	724.412	0.008			138,042.9	5p(³ P) ² P _{3/2}	334,281.53	5d(¹ D) ² P _{3/2}	472,326.0

Table A1. Cont.

I ^a	$\frac{gA_r}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ^{−1})	Lower Level		Upper Level	
							Designation	E (cm ^{−1})	Designation	E (cm ^{−1})
201	673	724.524	−0.001			138,021.7	5p(³ F) ⁴ F _{3/2}	330,063.75	5d(¹ D) ² F _{5/2}	468,085.2
248	578	724.965	0.001			137,937.6	5p(³ F) ⁴ G _{5/2}	315,004.02	5d(³ F) ⁴ G _{7/2}	452,941.9
124	210	725.323	0.001			137,869.6	5p(³ F) ⁴ G _{7/2}	313,912.99	5d(³ F) ⁴ F _{7/2}	451,782.8
195	187	725.619	0.003			137,813.3	5p(¹ D) ² D _{3/2}	315,238.1	5d(³ F) ⁴ P _{1/2}	453,052.0
31	155	726.490	0.004			137,648.1	5p(³ P) ² D _{5/2}	335,602.72	5d(¹ G) ² F _{5/2}	473,251.7
256	438	726.650	−0.001			137,617.9	5p(³ P) ⁴ P _{5/2}	331,291.85	5d(¹ D) ² F _{7/2}	468,909.5
248	522	727.123	0.004			137,528.3	5p(³ F) ² F _{7/2}	319,827.76	5d(³ F) ² D _{5/2}	457,356.8
436	698	727.653	−0.001			137,428.1	5p(³ F) ⁴ G _{9/2}	307,476.0	5d(³ F) ² F _{7/2}	444,903.9
31	72	727.798	−0.001			137,400.7	5p(³ F) ⁴ G _{5/2}	315,004.02	5d(³ F) ⁴ F _{5/2}	452,404.5
62	220	727.865	−0.004			137,388.2	5p(³ P) ⁴ P _{3/2}	323,773.57	5d(³ P) ² D _{3/2}	461,161.0
26	81	728.324	0.000			137,301.6	5p(³ F) ² F _{5/2}	329,088.51	5d(³ P) ⁴ F _{5/2}	466,390.2
477	732	728.579	0.005			137,253.4	5p(³ F) ⁴ D _{5/2}	311,448.43	5d(³ F) ² P _{3/2}	448,702.9
379	481	728.629	−0.014			137,244.1	5p(³ F) ⁴ G _{7/2}	313,912.99	5d(³ F) ⁴ F _{5/2}	451,154.4
411	514	729.034	−0.008			137,167.9	5p(¹ D) ² D _{3/2}	315,238.1	5d(³ F) ⁴ F _{5/2}	452,404.5
213	439	729.459	−0.008			137,087.8	5p(³ P) ⁴ P _{1/2}	324,074.7	5d(³ P) ² D _{3/2}	461,161.0
86	244	729.608	0.005			137,059.8	5p(¹ G) ² F _{7/2}	333,832.6	5d(³ P) ⁴ P _{5/2}	470,893.4
121	360	729.663	−0.006			137,049.6	5p(³ P) ² D _{5/2}	335,602.72	5d(¹ G) ² F _{7/2}	472,651.2
989	722	731.095db	−0.013			136,781.1	5p(³ F) ⁴ G _{5/2}	315,004.02	5d(³ F) ⁴ F _{7/2}	451,782.8
989	2362	731.095db	0.013			136,781.1	5p(³ F) ⁴ G _{7/2}	313,912.99	5d(³ F) ⁴ H _{7/2}	450,696.6
994	5150	731.226	−0.008			136,756.7	5p(³ F) ⁴ D _{7/2}	303,941.8	5d(³ F) ⁴ D _{5/2}	440,697.0
36	291	731.399	0.006			136,724.4	5p(³ F) ⁴ G _{5/2}	315,004.02	5d(³ F) ⁴ P _{3/2}	451,729.5
883	1883	731.544	0.008			136,697.2	5p(³ F) ⁴ G _{5/2}	315,004.02	5d(³ F) ² F _{5/2}	451,702.7
28	75	731.970	0.000			136,617.6	5p(³ P) ⁴ D _{7/2}	336,634.02	5d(¹ G) ² F _{5/2}	473,251.7
32	76	732.153	0.000			136,583.5	5p(³ P) ⁴ P _{5/2}	325,255.34	5d(³ P) ² D _{5/2}	461,838.9
48	94	732.451	0.008			136,527.9	5p(¹ G) ² H _{9/2}	333,754.8	5d(³ P) ² F _{7/2}	470,284.2
566	621	732.563db	0.007			136,507.0	5p(³ F) ⁴ D _{1/2}	319,409.18	5d(³ F) ⁴ F _{3/2}	455,917.5
566	1011	732.563db	−0.002			136,507.0	5p(¹ G) ² F _{7/2}	333,832.6	5d(¹ D) ² G _{9/2}	470,339.2
997	1503	732.641	−0.006			136,492.5	5p(¹ D) ² D _{3/2}	315,238.1	5d(³ F) ⁴ P _{3/2}	451,729.5
1000	6013	732.659	0.001			1,361,489.1	5p(³ F) ⁴ G _{7/2}	3,131,912.99	5d(³ F) ⁴ H _{9/2}	4,501,402.3
704	1207	732.791	0.000			136,464.6	5p(¹ D) ² D _{3/2}	315,238.1	5d(³ F) ² F _{5/2}	451,702.7
988	4048	732.970	−0.007			136,431.2	5p(³ F) ⁴ D _{7/2}	303,941.8	5d(³ F) ⁴ D _{7/2}	440,371.7
59	90	733.894	−0.008			136,259.6	5p(³ F) ⁴ F _{5/2}	324,902.96	5d(³ P) ² D _{3/2}	461,161.0

Table A1. Cont.

I ^a	$\frac{gA}{10^7 \text{ s}^{-1}}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ^{−1})	Lower Level		Upper Level	
							Designation	E (cm ^{−1})	Designation	E (cm ^{−1})
990	4285	734.224	0.007			136,198.1	5p(³ F) ⁴ G _{9/2}	307,476.0	5d(³ F) ⁴ F _{9/2}	443,675.5
703	811	734.479	−0.003			136,150.9	5p(³ F) ⁴ G _{5/2}	315,004.02	5d(³ F) ⁴ F _{5/2}	451,154.4
499	1108	734.866	−0.007			136,079.1	5p(³ P) ⁴ P _{3/2}	323,773.57	5d(³ P) ⁴ D _{3/2}	459,851.5
385	975	735.198	−0.003			136,017.7	5p(³ P) ⁴ D _{7/2}	336,634.02	5d(¹ G) ² F _{7/2}	472,651.2
32	96	735.356	0.003			135,988.6	5p(³ F) ⁴ F _{3/2}	330,063.75	5d(³ P) ⁴ D _{1/2}	466,052.9
410	244	735.753	0.006			135,915.2	5p(¹ D) ² D _{3/2}	315,238.1	5d(³ F) ⁴ F _{5/2}	451,154.4
29	123	736.020	−0.004			135,865.9	5p(³ P) ⁴ D _{1/2}	335,354.1	5d(³ P) ² P _{3/2}	471,219.3
34	149	736.105	−0.002			135,850.1	5p(³ F) ² D _{3/2}	336,476.33	5d(¹ D) ² P _{3/2}	472,326.0
520	38	736.319db	0.009			135,810.6	5s(¹ D) ² D _{5/2}	246,529.84	5p(¹ S) ² P _{3/2}	382,342.2
520	567	736.319db	−0.005			135,810.6	5p(³ F) ⁴ G _{5/2}	315,004.02	5d(³ F) ⁴ P _{3/2}	450,813.7
115	140	736.510	0.007			135,775.4	5p(³ P) ⁴ P _{1/2}	324,074.7	5d(³ P) ⁴ D _{3/2}	459,851.5
972	3916	736.961db	0.001			135,692.4	5p(³ F) ⁴ G _{5/2}	315,004.02	5d(³ F) ⁴ H _{7/2}	450,696.6
972	881	736.961db	0.017			135,692.4	5p(³ P) ⁴ P _{5/2}	325,255.34	5d(³ P) ² F _{7/2}	460,950.8
58	220	737.369	−0.004			135,617.3	5p(³ P) ² D _{5/2}	335,602.72	5d(³ P) ² P _{3/2}	471,219.3
589	675	737.593	−0.002			135,576.0	5p(¹ D) ² D _{3/2}	315,238.1	5d(³ F) ⁴ P _{3/2}	450,813.7
327	618	737.758	0.000			135,545.7	5p(³ P) ⁴ P _{3/2}	323,773.57	5d(³ F) ² F _{5/2}	459,319.4
136	190	737.808	0.000			135,536.6	5p(³ F) ⁴ D _{3/2}	317,515.30	5d(³ F) ⁴ P _{1/2}	453,052.0
64	165	739.149	0.000			135,290.7	5p(³ P) ² D _{5/2}	335,602.72	5d(³ P) ⁴ P _{5/2}	470,893.4
50	105	739.496	0.000			135,227.3	5p(³ F) ² D _{5/2}	320,690.13	5d(³ F) ⁴ F _{3/2}	455,917.5
197	265	740.204	0.002			135,098.0	5p(³ P) ⁴ P _{5/2}	331,291.85	5d(³ P) ⁴ F _{5/2}	466,390.2
996	9838	740.302	0.002			135,080.0	5p(³ F) ⁴ G _{9/2}	307,476.0	5d(³ F) ² H _{11/2}	442,556.3
165	99	741.008	−0.016			134,951.4	5p(³ F) ⁴ F _{5/2}	324,902.96	5d(³ P) ⁴ D _{3/2}	459,851.5
418	387	741.345	−0.004			134,889.9	5p(³ F) ⁴ D _{3/2}	317,515.30	5d(³ F) ⁴ F _{5/2}	452,404.5
989	10,770	741.807	−0.001			134,805.9	5p(¹ G) ² H _{9/2}	333,754.8	5d(¹ G) ² I _{11/2}	468,560.6
280	371	742.103	0.005			134,752.1	5p(³ P) ⁴ P _{3/2}	323,773.57	5d(³ P) ⁴ D _{1/2}	458,526.7
979	2449	742.232	−0.001			134,728.7	5p(³ F) ⁴ D _{5/2}	311,448.43	5d(³ F) ⁴ P _{5/2}	446,177.0
453	1500	742.495	0.003			134,681.0	5p(³ P) ² D _{5/2}	335,602.72	5d(³ P) ² F _{7/2}	470,284.2
183	423	742.572	−0.006			134,667.1	5p(³ P) ² P _{3/2}	334,281.53	5d(³ P) ⁴ F _{3/2}	468,947.5
820	1752	743.282	−0.002			134,538.5	5p(³ P) ⁴ P _{5/2}	325,255.34	5d(³ P) ⁴ D _{7/2}	459,793.5
443	680	743.744	−0.016			134,454.8	5p(³ P) ⁴ P _{1/2}	324,074.7	5d(³ P) ⁴ D _{1/2}	458,526.7
128	160	744.702	0.006			134,281.9	5p(³ F) ⁴ D _{1/2}	319,409.18	5d(³ F) ² P _{1/2}	453,692.1
46	94	744.830	0.003			134,258.9	5p(³ P) ⁴ D _{7/2}	336,634.02	5d(³ P) ⁴ P _{5/2}	470,893.4

Table A1. Cont.

I ^a	$\frac{gA_r}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ⁻¹)	Lower Level		Upper Level	
							Designation	E (cm ⁻¹)	Designation	E (cm ⁻¹)
989	768	745.080	0.003			134,213.7	5p(³ F) ⁴ D _{3/2}	317,515.30	5d(³ F) ⁴ P _{3/2}	451,729.5
252	202	745.227	0.001			134,187.2	5p(³ F) ⁴ D _{3/2}	317,515.30	5d(³ F) ² F _{5/2}	451,702.7
275	53	745.602	-0.001			134,119.7	5p(³ P) ² D _{5/2}	335,602.72	5d(³ P) ² F _{5/2}	469,722.2
191	525	745.908	-0.004			134,064.7	5p(³ P) ⁴ P _{5/2}	325,255.34	5d(³ F) ² F _{5/2}	459,319.4
210	331	746.580	0.004			133,944.1	5p(¹ D) ² D _{3/2}	315,238.1	5d(³ F) ⁴ D _{1/2}	449,182.9
254	799	747.363	-0.001			133,803.8	5p(³ P) ² P _{3/2}	334,281.53	5d(¹ D) ² F _{5/2}	468,085.2
286	596	747.478	0.003			133,783.2	5p(¹ G) ² H _{11/2}	342,540.9	5d(¹ G) ² G _{9/2}	476,324.7
136	285	747.692	-0.010			133,744.9	5p(¹ G) ² F _{7/2}	333,832.6	5d(³ P) ⁴ F _{7/2}	467,575.7
313	346	747.950	0.001			133,698.8	5p(³ F) ⁴ G _{5/2}	315,004.02	5d(³ F) ² P _{3/2}	448,702.9
858	716	748.275db	0.012			133,640.8	5p(³ F) ⁴ D _{1/2}	319,409.18	5d(³ F) ⁴ P _{1/2}	453,052.0
858	870	748.275db	-0.009			133,640.8	5p(³ F) ⁴ D _{3/2}	317,515.30	5d(³ F) ⁴ F _{5/2}	451,154.4
171	200	748.539	-0.001			133,593.6	5p(³ P) ⁴ D _{1/2}	335,354.1	5d(³ P) ⁴ F _{3/2}	468,947.5
635	1012	748.599	0.002			133,582.9	5p(³ P) ⁴ P _{3/2}	323,773.57	5d(³ F) ² D _{5/2}	457,356.8
992	3984	749.183m5	-0.009			133,478.7	5p(¹ G) ² H _{11/2}	342,540.9	5d(¹ G) ² H _{11/2}	476,018.0
797	873	749.307	-0.007			133,456.7	5p(³ F) ⁴ D _{5/2}	311,448.43	5d(³ F) ² F _{7/2}	444,903.9
966	2282	750.150	0.000			133,306.7	5p(³ P) ² D _{5/2}	335,602.72	5d(¹ D) ² F _{7/2}	468,909.5
855	371	750.193	-0.003			133,299.0	5p(³ F) ⁴ D _{3/2}	317,515.30	5d(³ F) ⁴ P _{3/2}	450,813.7
94	69	750.489	-0.003			133,246.4	5p(³ F) ² D _{3/2}	336,476.33	5d(³ P) ² F _{5/2}	469,722.2
298	12	752.082	-0.018			132,964.1	5s(³ P) ² P _{3/2}	249,381.16	5p(¹ S) ² P _{3/2}	382,342.2
824	477	752.466db	-0.019			132,896.3	5p(¹ D) ² P _{3/2}	339,432.97	5d(¹ D) ² P _{3/2}	472,326.0
824	896	752.466db	-0.003			132,896.3	5p(³ F) ⁴ G _{9/2}	307,476.0	5d(³ F) ⁴ D _{7/2}	440,371.7
240	485	753.289	-0.004			132,751.1	5p(³ F) ² F _{5/2}	329,088.51	5d(³ P) ² D _{5/2}	461,838.9
84	109	754.272	-0.008			132,578.1	5p(³ F) ² F _{7/2}	319,827.76	5d(³ F) ⁴ F _{5/2}	452,404.5
73	152	754.396db	-0.007			132,556.4	5p(¹ D) ² D _{5/2}	339,770.87	5d(¹ D) ² P _{3/2}	472,326.0
73	74	754.396db	0.007			132,556.4	5p(¹ G) ² F _{7/2}	333,832.6	5d(³ P) ⁴ F _{5/2}	466,390.2
42	108	754.497	0.002			132,538.6	5p(³ F) ² G _{7/2}	327,254.46	5d(³ P) ⁴ D _{7/2}	459,793.5
240	185	754.712	-0.001			132,500.8	5p(¹ G) ² H _{11/2}	342,540.9	5d(¹ G) ² H _{9/2}	475,041.6
492	1227	754.813	-0.004			132,483.1	5p(³ P) ² D _{5/2}	335,602.72	5d(¹ D) ² F _{5/2}	468,085.2
82	136	755.800	0.003			132,310.2	5p(³ P) ² P _{3/2}	341,620.5	5d(³ P) ² P _{1/2}	473,931.2
213	373	756.011	0.013			132,273.2	5p(³ P) ⁴ D _{7/2}	336,634.02	5d(¹ D) ² F _{7/2}	468,909.5
596	453	756.067	0.004			132,263.4	5p(³ F) ⁴ G _{7/2}	313,912.99	5d(³ F) ⁴ P _{5/2}	446,177.0

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ⁻¹)	Lower Level		Upper Level	
							Designation	E (cm ⁻¹)	Designation	E (cm ⁻¹)
957	3087	756.127	−0.007			132,253.0	5p(³ F) ² D _{5/2}	320,690.13	5d(³ F) ⁴ G _{7/2}	452,941.9
124	281	756.749	−0.002			132,144.3	5p(³ P) ⁴ P _{3/2}	323,773.57	5d(³ F) ⁴ F _{3/2}	455,917.5
820	1069	756.977db	0.025			132,104.4	5p(³ P) ² P _{3/2}	334,281.53	5d(³ P) ⁴ F _{5/2}	466,390.2
820	1665	756.977db	−0.017			132,104.4	5p(³ P) ⁴ P _{5/2}	325,255.34	5d(³ F) ² D _{5/2}	457,356.8
97	187	757.161	0.001			132,072.3	5p(³ F) ² F _{5/2}	329,088.51	5d(³ P) ² D _{3/2}	461,161.0
80	151	757.267	−0.004			132,053.8	5p(¹ D) ² P _{1/2}	334,079.8	5d(³ P) ⁴ F _{3/2}	466,132.9
946	1653	757.466	−0.002			132,019.1	5p(³ F) ⁴ D _{5/2}	311,448.43	5d(³ F) ² P _{3/2}	443,467.1
355	817	757.724	−0.007			131,974.2	5p(¹ D) ² P _{1/2}	334,079.8	5d(³ P) ⁴ D _{1/2}	466,052.9
901	1542	757.983	−0.004			131,929.0	5p(³ F) ⁴ G _{7/2}	313,912.99	5d(³ F) ² G _{9/2}	445,841.4
986	3234	758.368	0.001			131,862.1	5p(³ F) ² F _{5/2}	329,088.51	5d(³ P) ² F _{7/2}	460,950.8
263	296	758.513	0.006			131,836.9	5p(¹ D) ² P _{3/2}	339,432.97	5d(³ P) ⁴ P _{1/2}	471,270.9
396	159	758.867db	−0.023			131,775.4	5p(³ P) ² P _{3/2}	334,281.53	5d(³ P) ⁴ D _{1/2}	466,052.9
396	516	758.867db	−0.002			131,775.4	5p(³ F) ⁴ F _{3/2}	330,063.75	5d(³ P) ² D _{5/2}	461,838.9
54	43	758.989	−0.003			131,754.2	5p(³ F) ⁴ G _{9/2}	318,648.6	5d(³ F) ⁴ H _{9/2}	450,402.3
705	1040	759.218	−0.001			131,714.5	5p(³ F) ² D _{5/2}	320,690.13	5d(³ F) ⁴ F _{5/2}	452,404.5
516	782	759.485	−0.003			131,668.1	5p(³ F) ⁴ D _{3/2}	317,515.30	5d(³ F) ⁴ D _{1/2}	449,182.9
105	283	759.684	−0.014			131,633.7	5p(³ P) ² P _{3/2}	341,620.5	5d(¹ G) ² F _{5/2}	473,251.7
342	545	761.009	0.000			131,404.5	5p(³ F) ⁴ D _{1/2}	319,409.18	5d(³ F) ⁴ P _{3/2}	450,813.7
334	536	762.262	−0.005			131,188.4	5p(³ F) ⁴ D _{3/2}	317,515.30	5d(³ F) ² P _{3/2}	448,702.9
423	1022	762.641	−0.005			131,123.3	5p(¹ D) ² D _{5/2}	339,770.87	5d(³ P) ⁴ P _{5/2}	470,893.4
506	554	762.817	−0.002			131,093.0	5p(³ F) ² D _{5/2}	320,690.13	5d(³ F) ⁴ F _{7/2}	451,782.8
575	701	763.406	−0.005			130,991.8	5p(³ F) ⁴ G _{7/2}	313,912.99	5d(³ F) ² F _{7/2}	444,903.9
172	164	763.715	0.000			130,939.0	5p(¹ D) ² D _{3/2}	315,238.1	5d(³ F) ⁴ P _{5/2}	446,177.0
139	16	764.406	0.007			130,820.5	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(¹ S) ² P _{1/2}	373,062.5
684	1648	764.645	−0.005			130,779.7	5p(³ P) ⁴ D _{1/2}	335,354.1	5d(³ P) ⁴ F _{3/2}	466,132.9
932	112	765.121	0.003			130,698.3	5p(³ P) ⁴ D _{1/2}	335,354.1	5d(³ P) ⁴ D _{1/2}	466,052.9
218	81	765.333	0.000			130,662.1	5p(³ P) ⁴ P _{5/2}	325,255.34	5d(³ F) ⁴ F _{3/2}	455,917.5
436	845	765.437	0.002			130,644.3	5p(¹ D) ² F _{7/2}	345,680.16	5d(¹ G) ² G _{9/2}	476,324.7
288	148	765.679	−0.009			130,602.9	5p(³ F) ⁴ G _{11/2}	315,239.91	5d(³ F) ² G _{9/2}	445,841.4
970	2272	765.848	0.002			130,574.2	5p(³ F) ² F _{7/2}	319,827.76	5d(³ F) ⁴ H _{9/2}	450,402.3
464	312	766.005	−0.002			130,547.4	5p(³ P) ⁴ P _{5/2}	331,291.85	5d(³ P) ² D _{5/2}	461,838.9

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ^{−1})	Lower Level		Upper Level	
							Designation	E (cm ^{−1})	Designation	E (cm ^{−1})
707	1237	766.203	−0.002			130,513.7	5p(¹ D) ² D _{5/2}	339,770.87	5d(³ P) ² F _{7/2}	470,284.2
97	179	766.493	−0.001			130,464.4	5p(³ F) ² D _{5/2}	320,690.13	5d(³ F) ⁴ F _{5/2}	451,154.4
45	152	766.729	−0.003			130,424.2	5p(³ P) ⁴ D _{5/2}	342,827.90	5d(¹ G) ² F _{5/2}	473,251.7
193	272	767.603	−0.003			130,275.7	5p(¹ D) ² F _{7/2}	345,680.16	5d(¹ G) ² G _{7/2}	475,955.3
305	403	767.862	−0.005			130,231.7	5p(³ F) ² F _{5/2}	329,088.51	5d(³ F) ² F _{5/2}	459,319.4
42	62	768.489	−0.011			130,125.4	5p(³ F) ² D _{5/2}	320,690.13	5d(³ F) ⁴ P _{3/2}	450,813.7
72	5	769.191	−0.002			130,006.8	5p(³ F) ² D _{5/2}	320,690.13	5d(³ F) ⁴ H _{7/2}	450,696.6
956	2225	769.738	−0.003			129,914.3	5p(³ F) ² D _{3/2}	336,476.33	5d(³ P) ⁴ F _{5/2}	466,390.2
741	449	770.491	0.003			129,787.3	5p(³ F) ⁴ F _{3/2}	330,063.75	5d(³ P) ⁴ D _{3/2}	459,851.5
281	200	770.644db	0.005			129,761.7	5p(³ F) ⁴ G _{7/2}	313,912.99	5d(³ F) ⁴ F _{9/2}	443,675.5
281	106	770.644db	−0.033			129,761.7	5p(³ P) ⁴ D _{7/2}	336,634.02	5d(³ P) ⁴ F _{5/2}	466,390.2
824	1304	771.257	0.003			129,658.4	5p(³ P) ⁴ P _{5/2}	331,291.85	5d(³ P) ² F _{7/2}	460,950.8
355	569	771.614	0.001			129,598.6	5p(³ P) ² P _{3/2}	341,620.5	5d(³ P) ² P _{3/2}	471,219.3
74	44	772.116	0.002			129,514.2	5p(¹ D) ² P _{3/2}	339,432.97	5d(³ P) ⁴ F _{3/2}	468,947.5
737	178	773.028	0.001			129,361.4	5p(¹ D) ² F _{7/2}	345,680.16	5d(¹ G) ² H _{9/2}	475,041.6
966	2892	773.318	−0.014			129,312.9	5p(³ F) ⁴ G _{11/2}	315,239.91	5d(³ F) ⁴ G _{11/2}	444,550.5
280	150	773.515	−0.009			129,279.9	5p(³ P) ⁴ P _{3/2}	323,773.57	5d(³ F) ⁴ P _{1/2}	453,052.0
157	749	774.998	0.002			129,032.5	5p(³ F) ⁴ F _{5/2}	324,902.96	5d(³ F) ² G _{7/2}	453,935.8
647	1663	775.232	0.000			128,993.6	5p(¹ G) ² F _{5/2}	346,961.72	5d(¹ G) ² G _{7/2}	475,955.3
811	697	777.118	−0.001			128,680.7	5p(³ P) ⁴ P _{5/2}	325,255.34	5d(³ F) ² G _{7/2}	453,935.8
694	533	777.419m3	0.001			128,630.7	5p(³ P) ⁴ P _{3/2}	323,773.57	5d(³ F) ⁴ F _{5/2}	452,404.5
114	233	777.625	−0.003			128,596.7	5p(¹ D) ² P _{1/2}	334,079.8	5d(³ P) ⁴ P _{1/2}	462,676.0
117	196	777.850	0.001			128,559.5	5p(³ P) ⁴ P _{5/2}	331,291.85	5d(³ P) ⁴ D _{3/2}	459,851.5
885	1665	778.215	0.015			128,499.2	5p(³ P) ⁴ P _{5/2}	331,291.85	5d(³ P) ⁴ D _{7/2}	459,793.5
957	2136	779.995	0.000			128,206.0	5p(³ F) ⁴ G _{9/2}	324,356.63	5d(³ F) ⁴ G _{9/2}	452,562.5
109	188	780.649	0.019			128,098.6	5p(³ P) ² P _{3/2}	341,620.5	5d(³ P) ² F _{5/2}	469,722.2
95	146	780.856	0.006			128,064.6	5p(³ P) ⁴ D _{5/2}	342,827.90	5d(³ P) ⁴ P _{5/2}	470,893.4
951	1421	781.021	0.009			128,037.5	5p(³ F) ⁴ F _{5/2}	324,902.96	5d(³ F) ⁴ G _{7/2}	452,941.9
816	719	781.180db	0.008			128,011.5	5p(³ F) ² D _{5/2}	320,690.13	5d(³ F) ² P _{3/2}	448,702.9
816	475	781.180db	−0.032			128,011.5	5p(¹ G) ² F _{7/2}	333,832.6	5d(³ P) ² D _{5/2}	461,838.9
91	161	781.317	−0.011			127,989.0	5p(³ P) ² D _{3/2}	344,338.7	5d(¹ D) ² P _{3/2}	472,326.0

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ⁻¹)	Lower Level		Upper Level	
							Designation	E (cm ⁻¹)	Designation	E (cm ⁻¹)
969	11,450	781.935				127,887.9	5p(³ F) ⁴ G _{11/2}	315,239.91	5d(³ F) ⁴ H _{13/2}	443,127.8
945	2991	782.451m2	0.008			127,803.5	5p(¹ D) ² D _{5/2}	339,770.87	5d(³ P) ⁴ F _{7/2}	467,575.7
863	1694	782.773	−0.003			127,751.0	5p(¹ D) ² P _{3/2}	339,432.97	5d(¹ D) ² D _{5/2}	467,183.6
956	3131	783.214	0.008			127,679.1	5p(¹ G) ² F _{7/2}	333,832.6	5d(³ P) ⁴ F _{9/2}	461,513.0
49	120	783.884	0.010			127,569.9	5p(¹ D) ² F _{7/2}	345,680.16	5d(¹ G) ² F _{5/2}	473,251.7
216	298	783.966	0.005			127,556.5	5p(³ P) ² P _{3/2}	334,281.53	5d(³ P) ² D _{5/2}	461,838.9
966	1835	784.580m	−0.003			127,456.7	5p(³ P) ⁴ D _{5/2}	342,827.90	5d(³ P) ² F _{7/2}	470,284.2
755	365	784.767	−0.001			127,426.3	5p(³ F) ⁴ G _{9/2}	324,356.63	5d(³ F) ⁴ F _{7/2}	451,782.8
142	232	785.055	0.008			127,379.6	5p(³ P) ⁴ P _{3/2}	323,773.57	5d(³ F) ⁴ F _{5/2}	451,154.4
966	964	785.285	0.005			127,342.4	5p(³ F) ⁴ F _{7/2}	326,592.68	5d(³ F) ² G _{7/2}	453,935.8
912	1142	785.453	0.008			127,315.1	5p(³ F) ⁴ G _{11/2}	315,239.91	5d(³ F) ² H _{11/2}	442,556.3
320	445	785.591	0.002			127,292.7	5p(³ F) ⁴ F _{3/2}	330,063.75	5d(³ F) ² D _{5/2}	457,356.8
960	1428	786.206db	0.033			127,193.1	5p(¹ S) ² P _{3/2}	382,342.2	6s(¹ D) ² D _{5/2}	509,540.7
960	2898	786.206db	−0.002			127,193.1	5p(³ F) ⁴ F _{9/2}	318,648.6	5d(³ F) ² G _{9/2}	445,841.4
969	11,350	786.571				127,134.1	5p(¹ G) ² H _{11/2}	342,540.9	5d(¹ G) ² I _{13/2}	469,675.0
440	712	786.904	0.006			127,080.3	5p(¹ D) ² P _{1/2}	334,079.8	5d(³ P) ² D _{3/2}	461,161.0
77	130	787.159	0.006			127,039.2	5p(³ P) ⁴ P _{3/2}	323,773.57	5d(³ F) ⁴ P _{3/2}	450,813.7
967	7283	788.117db?				126,884.7	5p(³ F) ² G _{7/2}	327,253.81	5d(³ F) ² H _{9/2}	454,138.5
967	9617	788.117db				126,884.7	5p(³ F) ⁴ G _{9/2}	324,356.63	5d(³ F) ⁴ H _{11/2}	451,241.3
124	305	788.475db	−0.003			126,827.0	5p(³ F) ⁴ F _{5/2}	324,902.96	5d(³ F) ⁴ P _{3/2}	451,729.5
124	90	788.475db	0.012			126,827.0	5p(³ F) ² F _{5/2}	329,088.51	5d(³ F) ⁴ F _{3/2}	455,917.5
687	548	788.637	−0.008			126,801.0	5p(³ F) ⁴ F _{5/2}	324,902.96	5d(³ F) ² F _{5/2}	451,702.7
62	49	789.030	0.007			126,737.9	5p(³ P) ⁴ P _{1/2}	324,074.7	5d(³ F) ⁴ P _{3/2}	450,813.7
93	84	789.269	0.003			126,699.5	5p(¹ D) ² P _{3/2}	339,432.97	5d(³ P) ⁴ F _{3/2}	466,132.9
523	1117	789.384	0.002			126,681.1	5p(³ F) ² G _{7/2}	327,254.46	5d(³ F) ² G _{7/2}	453,935.8
59	71	789.776	0.007			126,618.1	5p(¹ D) ² D _{5/2}	339,770.87	5d(³ P) ⁴ F _{5/2}	466,390.2
668	887	790.738	0.003			126,464.2	5p(³ P) ² P _{3/2}	341,620.5	5d(¹ D) ² F _{5/2}	468,085.2
778	988	791.093m2	0.002			126,407.4	5p(³ P) ² S _{1/2}	344,811.6	5d(³ P) ² P _{3/2}	471,219.3
960	882	791.459m2	0.002			126,349.0	5p(³ F) ² F _{7/2}	319,827.76	5d(³ F) ⁴ P _{5/2}	446,177.0
744	1925	791.825	−0.003			126,290.5	5p(¹ G) ² F _{5/2}	346,961.72	5d(¹ G) ² F _{5/2}	473,251.7
840	1688	792.069	−0.002			126,251.7	5p(³ F) ⁴ F _{5/2}	324,902.96	5d(³ F) ⁴ F _{5/2}	451,154.4
83	217	792.908w	0.010			126,118.1	5p(³ P) ⁴ D _{5/2}	342,827.90	5d(³ P) ⁴ F _{3/2}	468,947.5

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ⁻¹)	Lower Level		Upper Level	
							Designation	E (cm ⁻¹)	Designation	E (cm ⁻¹)
226	927	793.144	0.006			126,080.6	5p(³ P) ⁴ D _{5/2}	342,827.90	5d(¹ D) ² F _{7/2}	468,909.5
514	443	793.365	0.002			126,045.4	5p(³ F) ⁴ G _{9/2}	324,356.63	5d(³ F) ⁴ H _{9/2}	450,402.3
960	2738	793.567	0.002			126,013.3	5p(³ F) ² F _{7/2}	319,827.76	5d(³ F) ² G _{9/2}	445,841.4
958	4909	793.831	−0.010			125,971.4	5p(³ F) ⁴ F _{7/2}	326,592.68	5d(³ F) ⁴ G _{9/2}	452,562.5
700	63	793.871	−0.02			125,965.0	5p(¹ G) ² F _{7/2}	333,832.6	5d(³ P) ⁴ D _{7/2}	45,9793.5
967	6737	794.272	0.003			125,901.4	5p(³ F) ⁴ F _{9/2}	318,648.6	5d(³ F) ⁴ G _{11/2}	444,550.5
650	1011	794.574	0.001			125,853.6	5p(³ F) ⁴ F _{3/2}	330,063.75	5d(³ F) ⁴ F _{3/2}	455,917.5
309	428	794.839	0.001			125,811.7	5p(³ F) ⁴ F _{7/2}	326,592.68	5d(³ F) ⁴ F _{5/2}	452,404.5
115	265	794.960	0.007			125,792.5	5p(³ F) ⁴ F _{5/2}	324,902.96	5d(³ F) ⁴ H _{7/2}	450,696.6
123	279	795.092	0.000			125,771.6	5p(¹ D) ² P _{1/2}	334,079.8	5d(³ P) ⁴ D _{3/2}	459,851.5
211	162	795.619	−0.005			125,688.3	5p(³ F) ² G _{7/2}	327,254.46	5d(³ F) ⁴ G _{7/2}	452,941.9
637	1158	796.418	0.006			125,562.2	5p(³ P) ² P _{3/2}	341,620.5	5d(¹ D) ² D _{5/2}	467,183.6
400	682	796.891	−0.006			125,487.7	5p(¹ G) ² F _{7/2}	333,832.6	5d(³ F) ² F _{5/2}	459,319.4
549	38	797.073m2	0.000			125,459.0	5p(¹ D) ² D _{3/2}	315,238.1	5d(³ F) ⁴ D _{5/2}	440,697.0
126	43	797.191	0.005			125,440.5	5p(³ P) ⁴ P _{5/2}	325,255.34	5d(³ F) ⁴ H _{7/2}	450,696.6
899	2360	797.558	0.005			125,382.7	5p(³ P) ² D _{3/2}	344,338.7	5d(³ P) ² F _{5/2}	469,722.2
399	474	797.687	0.000			125,362.5	5p(³ F) ² D _{3/2}	336,476.33	5d(³ P) ² D _{5/2}	461,838.9
533	699	797.778	−0.001			125,348.2	5p(³ P) ² D _{5/2}	335,602.72	5d(³ P) ² F _{7/2}	460,950.8
901	2111	798.046	−0.001			125,306.1	5p(¹ G) ² G _{7/2}	351,018.7	5d(¹ G) ² G _{9/2}	476,324.7
901	339	798.046	0.012			125,306.1	5p(³ F) ² G _{7/2}	327,254.46	5d(³ F) ⁴ G _{9/2}	452,562.5
432	542	798.685	−0.006			125,205.8	5p(³ P) ⁴ D _{7/2}	336,634.02	5d(³ P) ² D _{5/2}	461,838.9
824	1766	798.780	−0.005			125,190.9	5p(³ F) ⁴ F _{7/2}	326,592.68	5d(³ F) ⁴ F _{7/2}	451,782.8
833	772	799.291db	0.013			125,110.8	5p(³ P) ⁴ S _{3/2}	347,213.07	5d(¹ D) ² P _{3/2}	472,326.0
833	640	799.291db	−0.005			125,110.8	5p(³ F) ⁴ F _{7/2}	326,592.68	5d(³ F) ² F _{5/2}	451,702.7
955	2519	799.514	0.001			125,076.0	5p(³ F) ² F _{7/2}	319,827.76	5d(³ F) ² F _{7/2}	444,903.9
421	335	799.766	0.008			125,036.6	5p(³ P) ² P _{3/2}	334,281.53	5d(³ F) ² F _{5/2}	459,319.4
906	1224	799.832	0.004			125,026.3	5p(³ F) ⁴ F _{9/2}	318,648.6	5d(³ F) ⁴ F _{9/2}	443,675.5
916	3170	800.399	−0.007			124,937.7	5p(¹ G) ² G _{7/2}	351,018.7	5d(¹ G) ² G _{7/2}	475,955.3
959	4260	800.787	0.012			124,877.1	5p(³ P) ⁴ D _{7/2}	336,634.02	5d(³ P) ⁴ F _{9/2}	461,513.0
946	1609	800.976	−0.002			124,847.7	5p(³ F) ² F _{5/2}	329,088.51	5d(³ F) ² G _{7/2}	453,935.8
949	2289	801.601m2	−0.016			124,750.3	5p(³ P) ⁴ D _{5/2}	342,827.90	5d(³ P) ⁴ F _{7/2}	467,575.7

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ⁻¹)	Lower Level		Upper Level	
							Designation	E (cm ⁻¹)	Designation	E (cm ⁻¹)
735	547	802.025	0.002			124,684.3	5p(³ F) ² D _{3/2}	336,476.33	5d(³ P) ² D _{3/2}	461,161.0
462	5048	802.189	0.001			124,658.9	5p(¹ D) ² F _{7/2}	345,680.16	5d(¹ D) ² G _{9/2}	470,339.2
67	57	802.398	0.011			124,626.4	5p(³ P) ⁴ P _{1/2}	324,074.7	5d(³ F) ² P _{3/2}	448,702.9
67	114	802.398	-0.005			124,626.4	5p(³ P) ⁴ P _{5/2}	331,291.85	5d(³ F) ⁴ F _{3/2}	455,917.5
91	118	802.543	0.001			124,603.9	5p(¹ D) ² F _{7/2}	345,680.16	5d(³ P) ² F _{7/2}	470,284.2
647	888	803.025	-0.005			124,529.1	5p(³ F) ² G _{7/2}	327,254.46	5d(³ F) ⁴ F _{7/2}	451,782.8
18	29	803.232	0.002			124,497.0	5p(³ P) ⁴ D _{1/2}	335,354.1	5d(³ P) ⁴ D _{3/2}	459,851.5
46	40	803.548	0.001			124,448.0	5p(³ F) ² G _{7/2}	327,254.46	5d(³ F) ² F _{5/2}	451,702.7
193	134	804.774	-0.006			124,258.5	5p(¹ G) ² F _{5/2}	346,961.72	5d(³ P) ² P _{3/2}	471,219.3
212	204	805.063	-0.001			124,214.0	5p(³ F) ² D _{5/2}	320,690.13	5d(³ F) ² F _{7/2}	444,903.9
943	3860	805.208m2	-0.004			124,191.5	5p(¹ G) ² G _{9/2}	352,133.8	5d(¹ G) ² G _{9/2}	476,324.7
454	883	805.565	-0.004			124,136.5	5p(³ P) ² S _{1/2}	344,811.6	5d(³ P) ⁴ F _{3/2}	468,947.5
167	207	805.777	0.000			124,103.9	5p(³ F) ⁴ F _{7/2}	326,592.68	5d(³ F) ⁴ H _{7/2}	450,696.6
952	315	806.074	-0.002			124,058.1	5p(³ P) ⁴ S _{3/2}	347,213.07	5d(³ P) ⁴ P _{1/2}	471,270.9
875	1438	806.296	-0.006			124,023.9	5p(¹ G) ² G _{7/2}	351,018.7	5d(¹ G) ² H _{9/2}	475,041.6
434	397	807.053	0.000			123,907.7	5p(³ F) ⁴ F _{9/2}	318,648.6	5d(³ F) ² H _{11/2}	442,556.3
960	5636	807.213	0.008			123,883.0	5p(¹ G) ² G _{9/2}	352,133.8	5d(¹ G) ² H _{11/2}	476,018.0
629	512	807.420	0.013			123,851.3	5p(³ F) ² F _{5/2}	329,088.51	5d(³ F) ⁴ G _{7/2}	452,941.9
425	395	807.697	0.006			123,808.7	5p(³ F) ⁴ F _{7/2}	326,592.68	5d(³ F) ⁴ H _{9/2}	450,402.3
339	1081	807.963	-0.002			123,768.0	5p(¹ D) ² P _{1/2}	350,163.5	5d(³ P) ² P _{1/2}	473,931.2
121	214	808.286	-0.012			123,718.6	5p(³ P) ² D _{5/2}	335,602.72	5d(³ F) ² F _{5/2}	459,319.4
635	1400	808.527	-0.009			123,681.8	5p(³ P) ⁴ S _{3/2}	347,213.07	5d(³ P) ⁴ P _{5/2}	470,893.4
159	232	808.857	-0.019			123,631.2	5p(³ F) ⁴ F _{3/2}	330,063.75	5d(³ F) ² P _{1/2}	453,692.1
66	155	809.296	-0.012			123,564.1	5p(³ P) ⁴ D _{5/2}	342,827.90	5d(³ P) ⁴ F _{5/2}	466,390.2
37	56	809.555	-0.003			123,524.7	5p(¹ G) ² F _{7/2}	333,832.6	5d(³ F) ² D _{5/2}	457,356.8
206	469	810.045	-0.015			123,449.9	5p(³ P) ⁴ P _{5/2}	325,255.34	5d(³ F) ² P _{3/2}	448,702.9
588	1135	810.874	-0.009			123,323.8	5p(¹ G) ² F _{5/2}	346,961.72	5d(³ P) ² F _{7/2}	470,284.2
204	334	811.400	-0.005			123,243.7	5p(¹ D) ² P _{3/2}	339,432.97	5d(³ P) ⁴ P _{1/2}	462,676.0
385	1043	811.484	-0.011			123,231.0	5p(¹ D) ² F _{7/2}	345,680.16	5d(¹ D) ² F _{7/2}	468,909.5
519	1207	811.946	-0.010			123,160.9	5p(³ P) ⁴ D _{7/2}	336,634.02	5d(³ P) ⁴ D _{7/2}	459,793.5
141	242	813.614	-0.004			122,908.4	5p(¹ G) ² G _{9/2}	352,133.8	5d(¹ G) ² H _{9/2}	475,041.6

Table A1. Cont.

I ^a	$\frac{gA}{10^7 \text{ s}^{-1}}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ⁻¹)	Lower Level		Upper Level	
							Designation	E (cm ⁻¹)	Designation	E (cm ⁻¹)
215	475	814.019	−0.015			122,847.2	5p(³ P) ² D _{3/2}	344,338.7	5d(¹ D) ² D _{5/2}	467,183.6
189	229	814.469	−0.016			122,779.4	5p(³ F) ² D _{5/2}	320,690.13	5d(³ F) ² P _{3/2}	443,467.1
312	1004	816.254	−0.012			122,510.9	5p(³ P) ⁴ S _{3/2}	347,213.07	5d(³ P) ² F _{5/2}	469,722.2
244	417	816.944	−0.010			122,407.5	5p(¹ D) ² P _{3/2}	339,432.97	5d(³ P) ² D _{5/2}	461,838.9
200	502	817.370	−0.019			122,343.7	5p(³ F) ⁴ F _{3/2}	330,063.75	5d(³ F) ⁴ F _{5/2}	452,404.5
106	385	819.750	−0.018			121,988.4	5p(¹ G) ² F _{5/2}	346,961.72	5d(³ P) ⁴ F _{3/2}	468,947.5
64	261	820.004	−0.019			121,950.6	5p(¹ G) ² F _{5/2}	346,961.72	5d(¹ D) ² F _{7/2}	468,909.5
640	1450	821.523	−0.014			121,725.2	5p(³ F) ⁴ F _{9/2}	318,648.6	5d(³ F) ⁴ D _{7/2}	440,371.7
640	682	821.523	0.019			121,725.2	5p(¹ D) ² P _{3/2}	339,432.97	5d(³ P) ² D _{3/2}	461,161.0
278	413	822.019	−0.011			121,651.6	5p(³ P) ⁴ P _{5/2}	331,291.85	5d(³ F) ⁴ G _{7/2}	452,941.9
321	230	822.125	0.000			121,636.0	5p(³ P) ² P _{3/2}	334,281.53	5d(³ F) ⁴ F _{3/2}	455,917.5
80	128	822.305	−0.008			121,609.3	5p(³ F) ² F _{5/2}	329,088.51	5d(³ F) ⁴ H _{7/2}	450,696.6
40	106	824.803	0.001			121,241.1	5p(³ P) ² S _{1/2}	344,811.6	5d(³ P) ⁴ D _{1/2}	466,052.9
202	162	825.820	−0.008			121,091.8	5p(³ F) ⁴ F _{3/2}	330,063.75	5d(³ F) ⁴ F _{5/2}	451,154.4
28	43	826.051	−0.016			121,057.9	5p(³ P) ² P _{3/2}	341,620.5	5d(³ P) ⁴ P _{1/2}	462,676.0
177	183	826.983	0.002			120,921.4	5p(³ P) ⁴ P _{5/2}	325,255.34	5d(³ F) ⁴ P _{5/2}	446,177.0
25	3	828.993	−0.005			120,628.3	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ P) ⁴ S _{3/2}	347,213.07
24	109	829.101	0.010			120,612.5	5p(¹ G) ² F _{5/2}	346,961.72	5d(³ P) ⁴ F _{7/2}	467,575.7
25	34	829.434	−0.005			120,564.1	5p(³ P) ⁴ D _{1/2}	335,354.1	5d(³ F) ⁴ F _{3/2}	455,917.5
202	344	829.577	0.004			120,543.4	5p(³ F) ² F _{7/2}	319,827.76	5d(³ F) ⁴ D _{7/2}	440,371.7
423	1816	829.759	0.003			120,516.9	5p(¹ G) ² G _{9/2}	352,133.8	5d(¹ G) ² F _{7/2}	472,651.2
25	87	829.946	0.008			120,489.8	5p(³ P) ⁴ P _{5/2}	331,291.85	5d(³ F) ⁴ F _{7/2}	451,782.8
245	143	830.415	−0.022			120,421.7	5p(¹ D) ² P _{3/2}	339,432.97	5d(³ P) ⁴ D _{3/2}	459,851.5
285	424	831.828	0.008			120,217.2	5p(³ P) ² P _{3/2}	341,620.5	5d(³ P) ² D _{5/2}	461,838.9
479	529	834.884	0.006			119,777.1	5p(³ P) ⁴ S _{3/2}	347,213.07	5d(³ P) ⁴ P _{3/2}	466,991.1
173	318	835.787	0.006			119,647.8	5p(³ P) ⁴ P _{5/2}	325,255.34	5d(³ F) ² F _{7/2}	444,903.9
69	170	836.493	0.013			119,546.7	5p(¹ D) ² D _{5/2}	339,770.87	5d(³ F) ² F _{5/2}	459,319.4
54	91	836.543	0.007			119,539.6	5p(³ P) ² P _{3/2}	341,620.5	5d(³ P) ² D _{3/2}	461,161.0
28	8	836.675	0.008			119,520.7	5p(³ P) ⁴ P _{5/2}	331,291.85	5d(³ F) ⁴ P _{3/2}	450,813.7
28	102	838.589	0.006			119,247.9	5p(³ F) ⁴ F _{7/2}	326,592.68	5d(³ F) ² G _{9/2}	445,841.4
102	144	839.118	−0.011			119,172.8	5p(¹ G) ² F _{5/2}	346,961.72	5d(³ P) ⁴ F _{3/2}	466,132.9
102	127	839.118	0.031			119,172.8	5p(³ P) ⁴ S _{3/2}	347,213.07	5d(³ P) ⁴ F _{5/2}	466,390.2

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ⁻¹)	Lower Level		Upper Level	
							Designation	E (cm ⁻¹)	Designation	E (cm ⁻¹)
31	5	839.347	0.000	839.355	−0.008	119,140.2	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(¹ G) ² G _{7/2}	351,018.7
145	485	840.269	0.011			119,009.5	5p(³ P) ⁴ D _{5/2}	342,827.90	5d(³ P) ² D _{5/2}	461,838.9
7	16	840.529	−0.004			118,972.7	5p(¹ D) ² P _{1/2}	334,079.8	5d(³ F) ⁴ P _{1/2}	453,052.0
127	102	840.916	0.013			118,918.0	5p(³ P) ⁴ S _{3/2}	347,213.07	5d(³ P) ⁴ F _{3/2}	466,132.9
208	216	841.887	0.023			118,780.7	5p(¹ D) ² P _{1/2}	350,163.5	5d(³ P) ⁴ F _{3/2}	468,947.5
627	132	842.027	0.000	842.035	−0.008	118,761.0	5s(³ F) ⁴ F _{9/2}	217,872.98	5p(³ P) ⁴ D _{7/2}	336,634.02
38	202	842.251	0.003			118,729.4	5p(¹ G) ² F _{7/2}	333,832.6	5d(³ F) ⁴ G _{9/2}	452,562.5
232	309	843.436	0.010			118,562.7	5p(³ F) ⁴ F _{5/2}	324,902.96	5d(³ F) ² P _{3/2}	443,467.1
21	63	845.049	0.012			118,336.3	5p(³ P) ⁴ D _{1/2}	335,354.1	5d(³ F) ² P _{1/2}	453,692.1
102	549	845.948	0.008			118,210.6	5p(³ P) ⁴ P _{5/2}	325,255.34	5d(³ F) ² P _{3/2}	443,467.1
57	242	846.584	0.009			118,121.7	5p(³ P) ² P _{3/2}	334,281.53	5d(³ F) ⁴ F _{5/2}	452,404.5
190	37	848.704	0.007	848.717	−0.013	117,826.7	5s(³ F) ⁴ F _{7/2}	221,943.15	5p(¹ D) ² D _{5/2}	339,770.87
70	8	849.239	0.005	849.253	−0.014	117,752.6	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ P) ² D _{3/2}	344,338.7
44	261	849.631	−0.002			117,698.2	5p(³ P) ⁴ D _{1/2}	335,354.1	5d(³ F) ⁴ P _{1/2}	453,052.0
17	55	851.716	0.007			117,410.0	5p(³ P) ⁴ P _{5/2}	331,291.85	5d(³ F) ² P _{3/2}	448,702.9
7	67	853.125	−0.002			117,216.0	5p(³ F) ² D _{3/2}	336,476.33	5d(³ F) ² P _{1/2}	453,692.1
19	82	854.069	0.014			117,086.6	5p(³ F) ² F _{5/2}	329,088.51	5d(³ F) ⁴ P _{5/2}	446,177.0
20	49	855.268	0.008			116,922.4	5p(³ P) ⁴ P _{3/2}	323,773.57	5d(³ F) ⁴ D _{5/2}	440,697.0
282	44	855.466w	−0.022	855.507	−0.041	116,895.3	5s(³ F) ² F _{7/2}	230,069.48	5p(¹ G) ² F _{5/2}	346,961.72
8	34	855.684	−0.011			116,865.5	5p(¹ G) ² F _{7/2}	333,832.6	5d(³ F) ⁴ H _{7/2}	450,696.6
16	138	856.349	0.007			116,774.8	5p(¹ G) ² G _{9/2}	352,133.8	5d(¹ D) ² F _{7/2}	468,909.5
58	113	857.820	0.008			116,574.6	5p(³ F) ² D _{3/2}	336,476.33	5d(³ F) ⁴ P _{1/2}	453,052.0
77	349	858.910	0.001			116,426.6	5p(¹ G) ² G _{9/2}	352,133.8	5d(¹ G) ² I _{11/2}	468,560.6
101	16	860.274	0.002	860.292	−0.018	116,242.0	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ P) ⁴ D _{5/2}	342,827.90
8	20	863.305	−0.008			115,833.9	5p(¹ D) ² F _{7/2}	345,680.16	5d(³ P) ⁴ F _{9/2}	461,513.0
15	74	863.449	0.006			115,814.6	5p(³ F) ² F _{5/2}	329,088.51	5d(³ F) ² F _{7/2}	444,903.9
62	16	864.965	−0.007	864.985	−0.020	115,611.6	5s(³ F) ² F _{7/2}	230,069.48	5p(¹ D) ² F _{7/2}	345,680.16
14	44	865.419	0.005			115,551.0	5p(³ P) ² D _{5/2}	335,602.72	5d(³ F) ⁴ F _{5/2}	451,154.4
36	134	866.080db	0.001			115,462.8	5p(³ P) ⁴ S _{3/2}	347,213.07	5d(³ P) ⁴ P _{1/2}	462,676.0
36	37	866.080db	−0.024			115,462.8	5p(³ P) ⁴ D _{1/2}	335,354.1	5d(³ F) ⁴ P _{3/2}	450,813.7
481	77	867.046	0.003	867.061	−0.015	115,334.2	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(³ P) ⁴ S _{3/2}	347,213.07
7	52	867.973	0.000			115,210.9	5p(³ P) ² D _{5/2}	335,602.72	5d(³ F) ⁴ P _{3/2}	450,813.7
25	128	868.690	0.004			115,115.8	5p(³ P) ⁴ P _{5/2}	325,255.34	5d(³ F) ⁴ D _{7/2}	440,371.7

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ^{−1})	Lower Level		Upper Level	
							Designation	E (cm ^{−1})	Designation	E (cm ^{−1})
33	5	871.518	−0.010	871.549	−0.031	114,742.4	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(³ P) ⁴ D _{5/2}	342,827.90
526	92	871.909	0.000	871.928	−0.019	114,690.9	5s(³ F) ⁴ F _{7/2}	221,943.15	5p(³ P) ⁴ D _{7/2}	336,634.02
18	83	876.396	0.005			114,103.7	5p(³ F) ⁴ F _{7/2}	326,592.68	5d(³ F) ⁴ D _{5/2}	440,697.0
6	28	876.715	0.003			114,062.2	5p(³ P) ⁴ D _{7/2}	336,634.02	5d(³ F) ⁴ H _{7/2}	450,696.6
11	24	877.276	−0.001			113,989.2	5p(¹ G) ² F _{5/2}	346,961.72	5d(³ P) ² F _{7/2}	460,950.8
45	44	878.972	−0.007			113,769.2	5p(³ P) ⁴ D _{7/2}	336,634.02	5d(³ F) ⁴ H _{9/2}	450,402.3
364	36	879.824	0.003	879.839	−0.015	113,659.1	5s(³ F) ⁴ F _{7/2}	221,943.15	5p(³ P) ² D _{5/2}	335,602.72
17	34	884.259	0.005			113,089.0	5p(³ P) ⁴ D _{5/2}	342,827.90	5d(³ F) ⁴ F _{3/2}	455,917.5
24	81	885.186	0.008			112,970.6	5p(¹ D) ² P _{3/2}	339,432.97	5d(³ F) ⁴ F _{5/2}	452,404.5
82	79	885.826	0.006			112,889.0	5p(¹ G) ² F _{5/2}	346,961.72	5d(³ P) ⁴ D _{3/2}	459,851.5
39	8	886.147	−0.005	886.159	−0.012	112,848.1	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(¹ D) ² P _{3/2}	339,432.97
971	47	886.860	0.008	886.862	−0.002	112,757.4	5s(³ F) ² F _{7/2}	230,069.48	5p(³ P) ⁴ D _{5/2}	342,827.90
155	128	887.259	−0.001			112,706.7	5p(³ F) ² D _{3/2}	336,476.33	5d(³ F) ⁴ D _{1/2}	449,182.9
53	139	891.460	−0.002			112,175.5	5p(³ P) ⁴ P _{5/2}	331,291.85	5d(³ F) ² P _{3/2}	443,467.1
18	63	892.780	−0.007			112,009.7	5p(¹ G) ² F _{7/2}	333,832.6	5d(³ F) ² G _{9/2}	445,841.4
26	54	893.685	−0.006			111,896.3	5p(³ P) ² P _{3/2}	334,281.53	5d(³ F) ⁴ P _{5/2}	446,177.0
42	11	895.382	−0.001	895.395	−0.013	111,684.2	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(¹ D) ² D _{5/2}	339,770.87
12	3	898.099	−0.001	898.124	−0.025	111,346.3	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(¹ D) ² P _{3/2}	339,432.97
205	10	900.022	−0.004			111,108.4	5p(³ P) ⁴ D _{5/2}	342,827.90	5d(³ F) ² G _{7/2}	453,935.8
89	15	901.305	−0.007	901.317	−0.025	110,950.2	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(³ P) ⁴ D _{5/2}	342,827.90
71	9	901.507	0.003			110,925.4	5p(¹ D) ² D _{5/2}	339,770.87	5d(³ F) ⁴ H _{7/2}	450,696.6
900	153	909.996	0.002	910.004	−0.008	109,890.6	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ F) ² D _{3/2}	336,476.33
943	165	910.090	−0.008	910.104	−0.014	109,879.3	5s(³ F) ² F _{5/2}	237,334.76	5p(³ P) ⁴ S _{3/2}	347,213.07
120	31	912.187	0.003	912.191	−0.004	109,626.6	5s(³ F) ² F _{5/2}	237,334.76	5p(¹ G) ² F _{5/2}	346,961.72
980	204	913.095	−0.002	913.104	−0.009	109,517.6	5s(³ P) ⁴ P _{3/2}	237,695.74	5p(³ P) ⁴ S _{3/2}	347,213.07
25	5	914.230	−0.001	914.236	−0.006	109,381.7	5s(³ F) ⁴ F _{9/2}	217,872.98	5p(³ F) ² G _{7/2}	327,254.46
492	74	914.505	−0.001	914.501	0.004	109,348.8	5s(³ F) ⁴ F _{7/2}	221,943.15	5p(³ P) ⁴ P _{5/2}	331,291.85
861	38	915.698	0.009			109,206.4	5p(³ P) ⁴ D _{7/2}	336,634.02	5d(³ F) ² G _{9/2}	445,841.4
295	13	917.291	0.004	917.293	−0.002	109,016.7	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ P) ² D _{5/2}	335,602.72
860	52	919.796	−0.001	919.802	−0.006	108,719.8	5s(³ F) ⁴ F _{9/2}	217,872.98	5p(³ F) ⁴ F _{7/2}	326,592.68
948	85	922.986	0.012	922.603	0.017	108,344.0	5s(³ F) ² F _{5/2}	237,334.76	5p(¹ D) ² F _{7/2}	345,680.16
99	23	926.596	0.006	926.606	−0.010	107,921.9	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(¹ D) ² P _{1/2}	350,163.5

Table A1. Cont.

I ^a	$\frac{gA_r}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ^{−1})	Lower Level		Upper Level	
							Designation	E (cm ^{−1})	Designation	E (cm ^{−1})
469	102	926.857	0.007	926.854	0.003	107,891.5	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(¹ D) ² D _{5/2}	339,770.87
13	37	928.543	0.004	928.550	−0.007	107,695.6	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ P) ² P _{3/2}	334,281.53
62	124	929.769	0.008	929.762	0.007	107,553.6	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(¹ D) ² P _{3/2}	339,432.97
31	5	930.109	0.014	930.096	0.013	107,514.2	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(³ P) ² D _{5/2}	335,602.72
362	215	932.266	0.015	932.264	0.002	107,265.5	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(³ P) ⁴ D _{1/2}	335,354.1
48	75	933.566	−0.002	933.567	−0.001	107,116.1	5s(³ P) ⁴ P _{3/2}	237,695.74	5p(³ P) ² S _{1/2}	344,811.6
71	25	934.209	−0.008			107,042.4	5p(³ P) ⁴ D _{7/2}	336,634.02	5d(³ F) ⁴ F _{9/2}	443,675.5
348	267	934.589	0.003	934.588	0.001	106,998.9	5s(³ P) ⁴ P _{1/2}	240,213.79	5p(³ P) ⁴ S _{3/2}	347,213.07
66	82	937.712	0.003	937.718	−0.006	106,642.6	5s(³ P) ⁴ P _{3/2}	237,695.74	5p(³ P) ² D _{3/2}	344,338.7
21	40	938.404	0.005	938.408	−0.004	106,563.9	5s(³ F) ² F _{7/2}	230,069.48	5p(³ P) ⁴ D _{7/2}	336,634.02
92	1	939.109	−0.002	939.109	0	106,483.9	5s(³ F) ⁴ F _{9/2}	217,872.98	5p(³ F) ⁴ G _{9/2}	324,356.63
69	177	941.673	0.007	941.678	−0.005	106,193.9	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(³ P) ² P _{3/2}	334,281.53
11	6	943.459	0.000	943.467	−0.008	105,993.0	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(¹ D) ² P _{1/2}	334,079.8
21	45	947.568	0.000	947.578	−0.010	105,533.3	5s(³ F) ² F _{7/2}	230,069.48	5p(³ P) ² D _{5/2}	335,602.72
147	169	947.931	0.002	947.940	−0.009	105,492.9	5s(³ F) ² F _{5/2}	237,334.76	5p(³ P) ⁴ D _{5/2}	342,827.90
26	16	949.565	−0.001	949.575	−0.010	105,311.4	5s(³ F) ⁴ F _{7/2}	221,943.15	5p(³ F) ² G _{7/2}	327,254.46
57	68	951.181	−0.003	951.189	−0.008	105,132.5	5s(³ P) ⁴ P _{3/2}	237,695.74	5p(³ P) ⁴ D _{5/2}	342,827.90
372	288	952.633	0.000	952.640	−0.007	104,972.2	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(³ P) ⁴ S _{3/2}	347,213.07
451	472	954.606	0.002	954.614	−0.008	104,755.2	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(³ P) ⁴ D _{7/2}	336,634.02
19	56	954.918	−0.002	954.926	−0.008	104,721.1	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(¹ G) ² F _{5/2}	346,961.72
67	78	955.052	0.000	955.051	0.001	104,706.3	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ P) ⁴ P _{5/2}	331,291.85
373	121	955.572	0.001	955.587	−0.015	104,649.4	5s(³ F) ⁴ F _{7/2}	221,943.15	5p(³ F) ⁴ F _{7/2}	326,592.68
106	52	956.045db	0.002	956.052	−0.007	104,597.6	5s(³ P) ⁴ P _{1/2}	240,213.79	5p(³ P) ² S _{1/2}	344,811.6
106	70	956.045db	0.002	956.052	−0.007	104,597.6	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(³ F) ² D _{3/2}	336,476.33
26	44	957.039	−0.001	957.050	−0.011	104,489.0	5s(¹ D) ² D _{5/2}	246,529.84	5p(¹ G) ² G _{7/2}	351,018.7
11	23	958.906	0.002	958.907	−0.001	104,285.5	5s(³ F) ² F _{5/2}	237,334.76	5p(³ P) ² P _{3/2}	341,620.5
53	89	960.383	−0.002	960.392	−0.009	104,125.1	5s(³ P) ⁴ P _{1/2}	240,213.79	5p(³ P) ² D _{3/2}	344,338.7
138	90	960.954	−0.002			104,063.2	5p(³ P) ⁴ D _{7/2}	336,634.02	5d(³ F) ⁴ D _{5/2}	440,697.0
102	122	963.730	−0.004	963.739	−0.009	103,763.5	5s(³ F) ² F _{7/2}	230,069.48	5p(¹ G) ² F _{7/2}	333,832.6
11	1	964.460	0.004	964.462	−0.002	103,684.9	5s(³ F) ² F _{7/2}	230,069.48	5p(¹ G) ² H _{9/2}	333,754.8
154	119	966.385	−0.002	966.392	−0.007	103,478.4	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ F) ⁴ F _{3/2}	330,063.75

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ⁻¹)	Lower Level		Upper Level	
							Designation	E (cm ⁻¹)	Designation	E (cm ⁻¹)
981	2331	966.790	−0.001	966.794	−0.004	103,435.1	5s(¹ G) ² G _{9/2}	248,698.76	5p(¹ G) ² G _{9/2}	352,133.8
830	327	967.945	0.005	967.950	−0.005	103,311.7	5s(³ F) ⁴ F _{7/2}	221,943.15	5p(³ P) ⁴ P _{5/2}	325,255.34
978	481	968.738m	−0.002	968.77	−0.032	103,227.1	5s(¹ G) ² G _{7/2}	248,906.98	5p(¹ G) ² G _{9/2}	352,133.8
135	144	968.943	−0.003			103,205.3	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(³ P) ⁴ P _{5/2}	331,291.85
473	56	971.256	0.004	971.252	0.004	102,959.4	5s(³ F) ⁴ F _{7/2}	221,943.15	5p(³ F) ⁴ F _{5/2}	324,902.96
18	26	974.925	−0.012	974.944	−0.019	102,572.0	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(³ P) ² S _{1/2}	344,811.6
19	31	975.576	−0.005	975.587	−0.011	102,503.5	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ F) ² F _{5/2}	329,088.51
971	539	976.436	0.002	976.438	−0.002	102,413.3	5s(³ F) ⁴ F _{7/2}	221,943.15	5p(³ F) ⁴ G _{9/2}	324,356.63
97	87	977.320	−0.007	977.331	−0.011	102,320.6	5s(¹ G) ² G _{9/2}	248,698.76	5p(¹ G) ² G _{7/2}	351,018.7
980	2023	979.320	0.001	979.326	−0.006	102,111.6	5s(¹ G) ² G _{7/2}	248,906.98	5p(¹ G) ² G _{7/2}	351,018.7
26	34	979.669	−0.002	979.678	−0.009	102,075.3	5s(³ P) ⁴ P _{3/2}	237,695.74	5p(¹ D) ² D _{5/2}	339,770.87
491	261	980.615	0.001	980.622	−0.007	101,976.8	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(³ F) ⁴ F _{3/2}	330,063.75
292	89	980.827	−0.006	980.830	−0.003	101,954.7	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(¹ G) ² F _{7/2}	333,832.6
292	76	980.827	0.001	980.830	−0.003	101,954.7	5s(³ F) ⁴ F _{9/2}	217,872.98	5p(³ F) ² F _{7/2}	319,827.76
277	361	982.925	0.001	982.928	−0.003	101,737.2	5s(³ P) ⁴ P _{3/2}	237,695.74	5p(¹ D) ² P _{3/2}	339,432.97
49	157	986.127	−0.001	986.132	−0.005	101,406.8	5s(³ P) ⁴ P _{1/2}	240,213.79	5p(³ P) ² P _{3/2}	341,620.5
46	67	987.923	−0.001	987.929	−0.006	101,222.4	5s(³ F) ² F _{7/2}	230,069.48	5p(³ P) ⁴ P _{5/2}	331,291.85
119	33	988.481	0.006	988.485	−0.004	101,165.3	5s(³ P) ² P _{1/2}	248,997.61	5p(¹ D) ² P _{1/2}	350,163.5
225	166	990.091	0.008	990.097	−0.006	101,000.8	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(³ F) ² F _{5/2}	329,088.51
982	469	992.240m	0.003	992.273	0.008	100,782.1	5s(³ P) ² P _{3/2}	249,381.16	5p(¹ D) ² P _{1/2}	350,163.5
981	1612	992.304	0.001	992.305	−0.001	100,775.6	5s(³ F) ⁴ F _{9/2}	217,872.98	5p(³ F) ⁴ F _{9/2}	318,648.6
158	115	993.217	0.003	993.225	−0.008	100,682.9	5s(¹ D) ² D _{5/2}	246,529.84	5p(³ P) ⁴ S _{3/2}	347,213.07
975	680	993.358	0.003	993.364	−0.006	100,668.7	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ F) ² G _{7/2}	327,254.46
634	569	994.164	0.001	994.172	−0.008	100,587.0	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(³ P) ⁴ D _{5/2}	342,827.90
156	242	995.702	0.003	995.711	−0.009	100,431.6	5s(¹ D) ² D _{5/2}	246,529.84	5p(¹ G) ² F _{5/2}	346,961.72
768	297	999.926	−0.002	999.944	−0.018	100,007.4	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ F) ⁴ F _{7/2}	326,592.68
17	34	1005.905	0.004	1005.908	−0.003	99,412.9	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(³ P) ⁴ P _{5/2}	331,291.85
809	865	1007.061	0.004	1007.072	−0.011	99,298.9	5s(³ F) ² F _{5/2}	237,334.76	5p(³ P) ⁴ D _{7/2}	336,634.02
40	61	1007.865	−0.005	1007.876	−0.011	99,219.7	5s(³ P) ⁴ P _{1/2}	240,213.79	5p(¹ D) ² P _{3/2}	339,432.97
977	1687	1008.571	0.001	1008.580	−0.009	99,150.2	5s(¹ D) ² D _{5/2}	246,529.84	5p(¹ D) ² F _{7/2}	345,680.16
202	220	1012.347	0.002	1012.357	−0.010	98,780.4	5s(³ P) ⁴ P _{3/2}	237,695.74	5p(³ F) ² D _{3/2}	336,476.33
18	34	1012.690	0.000	1012.707	−0.017	98,746.9	5s(³ F) ⁴ F _{7/2}	221,943.15	5p(³ F) ² D _{5/2}	320,690.13

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ^{−1})	Lower Level		Upper Level	
							Designation	E (cm ^{−1})	Designation	E (cm ^{−1})
431	48	1013.484	0.003	1013.494	−0.010	98,669.5	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ P) ⁴ P _{5/2}	325,255.34
989	983	1015.291	0.004	1015.276	0.015	98,493.9	5s(¹ S) ² S _{1/2}	283,847.9	5p(¹ S) ² P _{3/2}	382,342.2
819	687	1017.120	0.006	1017.124	−0.004	98,316.8	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ F) ⁴ F _{5/2}	324,902.96
74	80	1017.624	−0.002	1017.636	−0.012	98,268.2	5s(³ F) ² F _{5/2}	237,334.76	5p(³ P) ² D _{5/2}	335,602.72
24	30	1018.169	−0.001	1018.180	−0.011	98,215.5	5s(³ P) ² P _{1/2}	248,997.61	5p(³ P) ⁴ S _{3/2}	347,213.07
119	96	1018.480	−0.003	1018.492	−0.012	98,185.5	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(³ F) ⁴ F _{3/2}	330,063.75
914	811	1019.816	−0.022	1019.847	−0.031	98,056.9	5s(¹ G) ² G _{7/2}	248,906.98	5p(¹ G) ² F _{5/2}	346,961.72
311	235	1021.376	−0.002	1021.388	−0.012	97,907.1	5s(³ P) ⁴ P _{3/2}	237,695.74	5p(³ P) ² D _{5/2}	335,602.72
976	1009	1021.611	0.000	1021.620	−0.008	97,884.6	5s(³ F) ⁴ F _{7/2}	221,943.15	5p(³ F) ² F _{7/2}	319,827.76
37	48	1022.161	−0.001	1022.172	−0.012	97,832.0	5s(³ P) ² P _{3/2}	249,381.16	5p(³ P) ⁴ S _{3/2}	347,213.07
77	80	1022.400	−0.002	1022.413	−0.013	97,809.0	5s(¹ D) ² D _{5/2}	246,529.84	5p(³ P) ² D _{3/2}	344,338.7
228	344	1024.796	0.002	1024.803	−0.007	97,580.4	5s(³ P) ² P _{3/2}	249,381.16	5p(¹ G) ² F _{5/2}	346,961.72
690	511	1025.324	−0.002	1025.333	−0.009	97,530.2	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(¹ D) ² D _{5/2}	339,770.87
987	2967	1027.041	−0.001	1027.043	−0.002	97,367.1	5s(³ F) ⁴ F _{9/2}	217,872.98	5p(³ F) ⁴ G _{11/2}	315,239.91
544	330	1028.694	−0.007	1028.709	−0.015	97,210.6	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(³ F) ² F _{5/2}	329,088.51
206	177	1028.899	0.009	1028.894	0.005	97,191.2	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(¹ D) ² P _{3/2}	339,432.97
361	25	1028.952db	0.019	1028.965	−0.013	97,186.3	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ P) ⁴ P _{3/2}	323,773.57
361	76	1028.952db	−0.013	1028.965		97,186.3	5s(³ F) ² F _{7/2}	230,069.48	5p(³ F) ² G _{7/2}	327,254.46
21	4	1029.142	0.001	1029.153	−0.011	97,168.3	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(³ P) ⁴ P _{5/2}	325,255.34
366	165	1031.126	0.000	1031.133	−0.007	96,981.4	5s(¹ G) ² G _{9/2}	248,698.76	5p(¹ D) ² F _{7/2}	345,680.16
26	64	1031.492	−0.002	1031.504	−0.012	96,947.0	5s(³ F) ² F _{5/2}	237,334.76	5p(³ P) ² P _{3/2}	334,281.53
96	49	1032.877	−0.009	1032.899	−0.022	96,816.9	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(³ F) ⁴ F _{5/2}	324,902.96
63	76	1033.339	−0.005	1033.354	−0.015	96,773.7	5s(¹ G) ² G _{7/2}	248,906.98	5p(¹ D) ² F _{7/2}	345,680.16
982	759	1034.073	0.005	1034.082	−0.009	96,705.0	5s(³ F) ⁴ F _{7/2}	221,943.15	5p(³ F) ⁴ F _{9/2}	318,648.6
983	1029	1036.024	0.004	1036.027	−0.003	96,522.8	5s(³ F) ² F _{7/2}	230,069.48	5p(³ F) ⁴ F _{7/2}	326,592.68
165	100	1037.505	−0.011	1037.512	−0.007	96,385.1	5s(³ P) ⁴ P _{3/2}	237,695.74	5p(¹ D) ² P _{1/2}	334,079.8
42	49	1038.441	−0.002	1038.449	−0.008	96,298.2	5s(¹ D) ² D _{5/2}	246,529.84	5p(³ P) ⁴ D _{5/2}	342,827.90
187	232	1038.825	0.000	1038.832	−0.007	96,262.6	5s(³ P) ⁴ P _{1/2}	240,213.79	5p(³ F) ² D _{3/2}	336,476.33
12	6	1041.801	0.003	1041.803	−0.002	95,987.6	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(³ P) ⁴ P _{1/2}	324,074.7

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ^{−1})	Lower Level		Upper Level	
							Designation	E (cm ^{−1})	Designation	E (cm ^{−1})
303	305	1043.694	0.005	1043.700	−0.006	95,813.5	5s(³ P) ² P _{1/2}	248,997.61	5p(³ P) ² S _{1/2}	344,811.6
791	282	1045.078	0.001	1045.086	−0.008	95,686.6	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(³ P) ⁴ P _{3/2}	323,773.57
23	40	1047.887	0.003	1047.895	−0.008	95,430.1	5s(³ P) ² P _{3/2}	249,381.16	5p(³ P) ² S _{1/2}	344,811.6
973	804	1048.480	−0.003	1048.485	−0.005	95,376.2	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(³ F) ² G _{7/2}	327,254.46
980	590	1048.855	−0.010	1048.860	−0.005	95,342.0	5s(³ P) ² P _{1/2}	248,997.61	5p(³ P) ² D _{3/2}	344,338.7
57	189	1050.575	−0.001	1050.580	−0.005	95,186.0	5s(³ F) ² F _{7/2}	230,069.48	5p(³ P) ⁴ P _{5/2}	325,255.34
305	213	1051.083	0.004	1051.089	−0.006	95,139.9	5s(³ P) ⁴ P _{1/2}	240,213.79	5p(³ P) ⁴ D _{1/2}	335,354.1
12	8	1052.443	−0.002			95,017.0	5p(¹ D) ² F _{7/2}	345,680.16	5d(³ F) ⁴ D _{5/2}	440,697.0
92	105	1053.102	0.000	1053.105	−0.003	94,957.5	5s(³ P) ² P _{3/2}	249,381.16	5p(³ P) ² D _{3/2}	344,338.7
573	303	1054.477	−0.003	1054.483	−0.006	94,833.7	5s(³ F) ² F _{7/2}	230,069.48	5p(³ F) ⁴ F _{5/2}	324,902.96
867	298	1055.808	0.000	1055.812	−0.004	94,714.2	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(³ F) ⁴ F _{7/2}	326,592.68
985	1833	1060.591	0.001	1060.593	−0.002	94,287.0	5s(³ F) ² F _{7/2}	230,069.48	5p(³ F) ⁴ G _{9/2}	324,356.63
84	74	1062.648	0.001	1062.647	0.001	94,104.6	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ F) ² D _{5/2}	320,690.13
12	40	1063.060	−0.003	1063.065	−0.005	94,068.0	5s(³ P) ⁴ P _{1/2}	240,213.79	5p(³ P) ² P _{3/2}	334,281.53
567	470	1064.313	−0.003	1064.310	0.003	93,957.3	5s(³ F) ² F _{5/2}	237,334.76	5p(³ P) ⁴ P _{5/2}	331,291.85
158	166	1064.728	0.002	1064.729	−0.001	93,920.7	5s(¹ G) ² G _{7/2}	248,906.98	5p(³ P) ⁴ D _{5/2}	342,827.90
976	35	1065.363	0.014	1065.354	−0.011	93,864.7	5s(³ P) ⁴ P _{1/2}	240,213.79	5p(¹ D) ² P _{1/2}	334,079.8
981	2702	1065.618	−0.001	1065.616	0.002	93,842.2	5s(¹ G) ² G _{9/2}	248,698.76	5p(¹ G) ² H _{11/2}	342,540.9
346	306	1068.419	−0.002	1068.418	0.001	93,596.2	5s(³ P) ⁴ P _{3/2}	237,695.74	5p(³ P) ⁴ P _{5/2}	331,291.85
389	407	1070.128	−0.001	1070.130	−0.002	93,446.8	5s(³ P) ² P _{3/2}	249,381.16	5p(³ P) ⁴ D _{5/2}	342,827.90
806	486	1070.929	−0.001	1070.931	−0.002	93,376.9	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(³ P) ⁴ P _{5/2}	325,255.34
39	34	1071.103	0.002	1071.102	0.001	93,361.7	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(³ P) ² D _{5/2}	335,602.72
636	202	1072.478	0.003	1072.483	−0.005	93,242.0	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ F) ² F _{7/2}	319,827.76
636	279	1072.478	−0.011	1072.483		93,242.0	5s(¹ D) ² D _{5/2}	246,529.84	5p(¹ D) ² D _{5/2}	339,770.87
25	24	1073.958	−0.004	1073.966	−0.008	93,113.6	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(³ P) ⁴ D _{1/2}	335,354.1
62	27	1074.562	−0.003	1074.567	−0.005	93,061.1	5s(³ F) ⁴ F _{7/2}	221,943.15	5p(³ F) ⁴ G _{5/2}	315,004.02
286	210	1076.392	0.002	1076.387	0.005	92,903.0	5s(¹ D) ² D _{5/2}	246,529.84	5p(¹ D) ² P _{3/2}	339,432.97
327	209	1078.410	−0.001	1078.411	−0.001	92,729.1	5s(³ F) ² F _{5/2}	237,334.76	5p(³ F) ⁴ F _{3/2}	330,063.75
827	462	1079.872	−0.004	1079.873	−0.001	92,603.6	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(³ F) ² D _{5/2}	320,690.13
319	650	1084.133	−0.003	1084.132	0.001	92,239.6	5s(³ P) ² P _{3/2}	249,381.16	5p(³ P) ² P _{3/2}	341,620.5

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ^{−1})	Lower Level		Upper Level	
							Designation	E (cm ^{−1})	Designation	E (cm ^{−1})
113	232	1086.476	0.000	1086.474	0.002	92,040.7	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(³ P) ² P _{3/2}	334,281.53
974	621	1087.313	0.000	1087.311	0.002	91,969.9	5s(³ F) ⁴ F _{7/2}	221,943.15	5p(³ F) ⁴ G _{7/2}	313,912.99
118	68	1088.203	0.004	1088.196	0.007	91,894.7	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(³ P) ⁴ P _{3/2}	323,773.57
453	241	1088.857	−0.006	1088.850	0.007	91,839.4	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(¹ D) ² P _{1/2}	334,079.8
170	136	1089.882	0.008	1089.872	0.010	91,753.1	5s(³ F) ² F _{5/2}	237,334.76	5p(³ F) ² F _{5/2}	329,088.51
666	547	1094.186	0.007	1094.177	0.009	91,392.2	5s(³ P) ⁴ P _{3/2}	237,695.74	5p(³ F) ² F _{5/2}	329,088.51
833	266	1095.025	0.002	1095.018	0.007	91,322.1	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(³ F) ⁴ D _{1/2}	319,409.18
939	324	1099.749	0.000	1099.745	0.005	90,929.8	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ F) ⁴ D _{3/2}	317,515.30
366	334	1100.552	0.005	1100.545	0.007	90,863.5	5s(¹ G) ² G _{7/2}	248,906.98	5p(¹ D) ² D _{5/2}	339,770.87
844	348	1103.503	0.002	1103.492	0.012	90,620.5	5s(³ F) ² F _{7/2}	230,069.48	5p(³ F) ² D _{5/2}	320,690.13
38	43	1105.759	−0.004	1105.757	0.002	90,435.7	5s(³ P) ² P _{1/2}	248,997.61	5p(¹ D) ² P _{3/2}	339,432.97
10	1	1105.915	−0.004			90,422.8	5p(¹ G) ² G _{9/2}	352,133.8	5d(³ F) ² H _{11/2}	442,556.3
88	86	1106.325	0.004	1106.322	0.003	90,389.3	5s(³ P) ² P _{3/2}	249,381.16	5p(¹ D) ² D _{5/2}	339,770.87
188	209	1111.775	0.003	1111.776	−0.001	89,946.3	5s(¹ D) ² D _{5/2}	246,529.84	5p(³ F) ² D _{3/2}	336,476.33
671	312	1112.107	0.003	1112.107	0	89,919.4	5s(³ F) ² F _{5/2}	237,334.76	5p(³ F) ² G _{7/2}	327,254.46
863	326	1114.100	−0.003	1114.099	0.001	89,758.5	5s(³ F) ² F _{7/2}	230,069.48	5p(³ F) ² F _{7/2}	319,827.76
950	750	1116.031	−0.003	1116.027	0.004	89,603.2	5s(³ F) ⁴ F _{9/2}	217,872.98	5p(³ F) ⁴ G _{9/2}	307,476.0
943	780	1117.252	−0.001	1117.246	0.005	89,505.4	5s(³ F) ⁴ F _{7/2}	221,943.15	5p(³ F) ⁴ D _{5/2}	311,448.43
425	106	1118.211	−0.002	1118.211	0	89,428.6	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(³ F) ⁴ D _{3/2}	317,515.30
259	49	1120.353	0.004	1120.352	0.001	89,257.6	5s(³ F) ² F _{5/2}	237,334.76	5p(³ F) ⁴ F _{7/2}	326,592.68
362	358	1120.889m2	−0.004	1120.897	−0.008	89,214.9	5s(¹ S) ² S _{1/2}	283,847.9	5p(¹ S) ² P _{1/2}	373,062.5
927	476	1122.669	−0.007	1122.673	−0.004	89,073.4	5s(¹ D) ² D _{5/2}	246,529.84	5p(³ P) ² D _{5/2}	335,602.72
87	55	1125.970	−0.009	1125.968	0.002	88,812.3	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(³ F) ² D _{5/2}	320,690.13
967	242	1127.996	−0.003	1127.993	0.003	88,652.8	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(¹ D) ² D _{3/2}	315,238.1
560	162	1128.931	−0.003	1128.928	0.003	88,579.3	5s(³ F) ² F _{7/2}	230,069.48	5p(³ F) ⁴ F _{9/2}	318,648.6
963	388	1130.983	−0.002	1130.981	0.002	88,418.6	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ F) ⁴ G _{5/2}	315,004.02
770	413	1137.198	−0.002	1137.198		87,935.4	5s(¹ G) ² G _{9/2}	248,698.76	5p(³ P) ⁴ D _{7/2}	336,634.02
630	167	1137.382	−0.008	1137.382		87,921.2	5s(³ F) ² F _{5/2}	237,334.76	5p(³ P) ⁴ P _{5/2}	325,255.34
810	147	1138.647	−0.008	1138.647		87,823.5	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(³ F) ⁴ F _{3/2}	330,063.75
480	73	1139.574	−0.005	1139.574		87,752.1	5s(¹ D) ² D _{5/2}	246,529.84	5p(³ P) ² P _{3/2}	334,281.53

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ⁻¹)	Lower Level		Upper Level	
							Designation	E (cm ⁻¹)	Designation	E (cm ⁻¹)
140	9	1139.897	−0.002	1139.897		87,727.2	5s(¹ G) ² G _{7/2}	248,906.98	5p(³ P) ⁴ D _{7/2}	336,634.02
690	87	1141.962	−0.005	1141.962		87,568.6	5s(³ F) ² F _{5/2}	237,334.76	5p(³ F) ⁴ F _{5/2}	324,902.96
80	5	1142.075	−0.004	1142.075		87,559.9	5s(³ P) ⁴ P _{3/2}	237,695.74	5p(³ P) ⁴ P _{5/2}	325,255.34
190	14	1143.130	−0.005	1143.130		87,479.1	5s(³ P) ² P _{1/2}	248,997.61	5p(³ F) ² D _{3/2}	336,476.33
860	603	1145.109	−0.006	1145.109		87,327.9	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ F) ⁴ G _{7/2}	313,912.99
770	222	1145.422	−0.017	1145.422		87,304.1	5s(¹ D) ² D _{5/2}	246,529.84	5p(¹ G) ² F _{7/2}	333,832.6
730	124	1147.425	−0.006	1147.425		87,151.7	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(¹ D) ² D _{3/2}	315,238.1
40	3	1148.166	−0.003	1148.166		87,095.4	5s(³ P) ² P _{3/2}	249,381.16	5p(³ F) ² D _{3/2}	336,476.33
730	408	1150.518	−0.003	1150.518		86,917.4	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(³ F) ⁴ G _{5/2}	315,004.02
450	68	1151.436	−0.006	1151.436		86,848.1	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(³ F) ² F _{5/2}	329,088.51
100	6	1153.454	−0.005	1153.454		86,696.1	5s(¹ G) ² G _{7/2}	248,906.98	5p(³ P) ² D _{5/2}	335,602.72
780	247	1156.881	−0.007	1156.881		86,439.3	5s(³ F) ² F _{5/2}	237,334.76	5p(³ P) ⁴ P _{3/2}	323,773.57
740	220	1157.681	−0.008	1157.681		86,379.6	5s(³ P) ⁴ P _{3/2}	237,695.74	5p(³ P) ⁴ P _{1/2}	324,074.7
400	34	1157.993	0.002	1157.993		86,356.3	5s(³ P) ² P _{1/2}	248,997.61	5p(³ P) ⁴ D _{1/2}	335,354.1
650	302	1159.799	−0.004	1159.799		86,221.8	5s(³ P) ² P _{3/2}	249,381.16	5p(³ P) ² D _{5/2}	335,602.72
450	24	1161.742	0.003	1161.742		86,077.6	5s(³ P) ⁴ P _{3/2}	237,695.74	5p(³ P) ⁴ P _{3/2}	323,773.57
940	1239	1161.867	0.006	1161.867		86,068.4	5s(³ F) ⁴ F _{9/2}	217,872.98	5p(³ F) ⁴ D _{7/2}	303,941.8
110	1	1163.148	−0.009	1163.148		85,973.6	5s(³ P) ² P _{3/2}	249,381.16	5p(³ P) ⁴ D _{1/2}	335,354.1
780	144	1167.714	−0.009	1167.714		85,637.4	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(³ F) ⁴ D _{3/2}	317,515.30
940	844	1169.146	0.005	1169.146		85,532.5	5s(³ F) ⁴ F _{7/2}	221,943.15	5p(³ F) ⁴ G _{9/2}	307,476.0
690	162	1172.556	0.002	1172.556		85,283.8	5s(³ P) ² P _{1/2}	248,997.61	5p(³ P) ² P _{3/2}	334,281.53
850	671	1174.626	0.005	1174.626		85,133.5	5s(¹ G) ² G _{9/2}	248,698.76	5p(¹ G) ² F _{7/2}	333,832.6
500	40	1175.352	0.018	1175.352		85,080.9	5s(³ P) ² P _{1/2}	248,997.61	5p(¹ D) ² P _{1/2}	334,079.8
790	155	1177.381	0.004	1177.381		84,934.3	5s(³ F) ² F _{7/2}	230,069.48	5p(³ F) ⁴ G _{5/2}	315,004.02
280	20	1177.500	−0.001	1177.500		84,925.7	5s(¹ G) ² G _{7/2}	248,906.98	5p(¹ G) ² F _{7/2}	333,832.6
200	28	1177.858	0.007	1177.858		84,899.9	5s(³ P) ² P _{3/2}	249,381.16	5p(³ P) ² P _{3/2}	334,281.53
680	20	1178.371	0.000	1178.371		84,862.9	5s(³ F) ⁴ F _{5/2}	226,585.52	5p(³ F) ⁴ D _{5/2}	311,448.43
860	1402	1178.581	0.000	1178.581		84,847.8	5s(¹ G) ² G _{7/2}	248,906.98	5p(¹ G) ² H _{9/2}	333,754.8
740	76	1179.778	0.004	1179.778		84,761.7	5s(¹ D) ² D _{5/2}	246,529.84	5p(³ P) ⁴ P _{5/2}	331,291.85
450	19	1192.448	−0.003	1192.448		83,861.1	5s(³ P) ⁴ P _{1/2}	240,213.79	5p(³ P) ⁴ P _{1/2}	324,074.7
800	127	1192.695	−0.003	1192.695		83,843.7	5s(³ F) ² F _{7/2}	230,069.48	5p(³ F) ⁴ G _{7/2}	313,912.99

Table A1. Cont.

I ^a	$\frac{gA}{(10^7 \text{ s}^{-1})}$	λ (Å) ^b	o-c, (Å) ^c	λ_p (Å) ^d	$\lambda - \lambda_p$, (Å)	ν (cm ⁻¹)	Lower Level		Upper Level	
							Designation	E (cm ⁻¹)	Designation	E (cm ⁻¹)
730	101	1196.753	0.005	1196.753		83,559.4	5s(³ P) ⁴ P _{1/2}	240,213.79	5p(³ P) ⁴ P _{3/2}	323,773.57
530	64	1197.123	0.004	1197.123		83,533.6	5s(¹ D) ² D _{5/2}	246,529.84	5p(³ F) ⁴ F _{3/2}	330,063.75
1000	221	1199.631db	0.009	1199.631		83,359.0	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(¹ D) ² D _{3/2}	315,238.1
1000	20	1199.631db	0.037	1199.631		83,359.0	5s(³ F) ⁴ F _{3/2}	228,086.86	5p(³ F) ⁴ D _{5/2}	311,448.43
740	63	1203.003	0.003	1203.003		83,125.3	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(³ F) ⁴ G _{5/2}	315,004.02
770	99	1204.618	0.009	1204.618		83,013.9	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(³ P) ⁴ P _{5/2}	325,255.34
510	28	1204.902	0.001	1204.902		82,994.3	5s(³ P) ⁴ P _{3/2}	237,695.74	5p(³ F) ² D _{5/2}	320,690.13
120	37	1209.752	0.008	1209.752		82,661.6	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(³ F) ⁴ F _{5/2}	324,902.96
450	44	1211.271	0.011	1211.271		82,557.9	5s(¹ D) ² D _{5/2}	246,529.84	5p(³ F) ² F _{5/2}	329,088.51
420	41	1213.824	0.009	1213.824		82,384.3	5s(¹ G) ² G _{7/2}	248,906.98	5p(³ P) ⁴ P _{5/2}	331,291.85
700	60	1219.004	0.004	1219.004		82,034.2	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(³ F) ⁴ G _{7/2}	313,912.99
250	30	1219.514	−0.018	1219.514		81,999.9	5s(³ F) ⁴ F _{7/2}	221,943.15	5p(³ F) ⁴ D _{7/2}	303,941.8
860	68	1220.852	0.010	1220.852		81,910.0	5s(³ P) ² P _{3/2}	249,381.16	5p(³ P) ⁴ P _{5/2}	331,291.85
650	74	1221.992	0.004	1221.992		81,833.6	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(³ P) ⁴ P _{1/2}	324,074.7
510	16	1223.794	0.005	1223.794		81,713.1	5s(³ P) ⁴ P _{3/2}	237,695.74	5p(³ F) ⁴ D _{1/2}	319,409.18
700	94	1228.820	0.001	1228.820		81,378.9	5s(³ F) ² F _{7/2}	230,069.48	5p(³ F) ⁴ D _{5/2}	311,448.43
630	42	1247.191	0.006	1247.191		80,180.2	5s(³ F) ² F _{5/2}	237,334.76	5p(³ F) ⁴ D _{3/2}	317,515.30
760	76	1252.830	0.004	1252.830		79,819.3	5s(³ P) ⁴ P _{3/2}	237,695.74	5p(³ F) ⁴ D _{3/2}	317,515.30
780	105	1256.755	−0.002	1256.755		79,570.0	5s(³ P) ⁴ P _{5/2}	231,878.53	5p(³ F) ⁴ D _{5/2}	311,448.43
730	77	1262.698	−0.002	1262.698		79,195.5	5s(³ P) ⁴ P _{1/2}	240,213.79	5p(³ F) ⁴ D _{1/2}	319,409.18
120	12	1272.984	0.002	1272.984		78,555.6	5s(¹ G) ² G _{9/2}	248,698.76	5p(³ F) ² G _{7/2}	327,254.46
270	17	1274.699	−0.010	1274.699		78,449.9	5s(³ P) ⁴ P _{3/2}	242,240.86	5p(³ F) ² D _{5/2}	320,690.13
290	25	1275.950	0.002	1275.950		78,373.0	5s(¹ D) ² D _{5/2}	246,529.84	5p(³ F) ⁴ F _{5/2}	324,902.96

Notes: ^a Relative intensity; ^b Observed wavelengths: ?—questionable line; db—doubly identified; m—masked by close lying strong line; w—wide line; mR—masked by close lying strong line, calculated Ritz value is listed; m2—blended by second order line; m3 and m5—blended respectively by the Sn III [12] and Sn V [11] lines. Above 1131 Å the measurements by Srivastava et al. [2] were used; ^c Difference between the observed wavelength and the wavelength derived from the final level energies (Ritz wavelength). A blank value indicates that the upper level is derived from that line only; ^d Previous measurements by Srivastava et al. [2].

Table A2. Level energies (in cm^{-1}) of the $4d^85s$, $4d^86s$ and $4d^85d$ configurations of Sn VI.

E ^a	Unc. ^b	N ^c	o-c ^d	J	Eigenvector Composition ^e		
217,872.98	0.20	9	21	9/2	99%5s(³ F) ⁴ F	1%5s(¹ G) ² G	
221,943.15	0.21	17	48	7/2	77%5s(³ F) ⁴ F	21%5s(³ F) ² F	1%5s(¹ G) ² G
226,585.52	0.13	22	−2	5/2	89%5s(³ F) ⁴ F	8%5s(¹ D) ² D	2%5s(³ P) ⁴ P
228,086.86	0.16	21	41	3/2	75%5s(³ F) ⁴ F	22%5s(¹ D) ² D	2%5s(³ P) ² P
230,069.48	0.13	19	−43	7/2	77%5s(³ F) ² F	22%5s(³ F) ⁴ F	1%5s(¹ G) ² G
231,878.53	0.14	22	46	5/2	38%5s(³ P) ⁴ P	31%5s(¹ D) ² D	27%5s(³ F) ² F
237,334.76	0.15	18	−105	5/2	53%5s(³ F) ² F	43%5s(³ P) ⁴ P	3%5s(³ F) ⁴ F
237,695.74	0.14	17	14	3/2	52%5s(³ P) ⁴ P	20%5s(¹ D) ² D	15%5s(³ F) ⁴ F
240,213.79	0.16	12	−40	1/2	97%5s(³ P) ⁴ P	3%5s(¹ S) ² S	
242,240.86	0.16	20	11	3/2	47%5s(³ P) ⁴ P	28%5s(¹ D) ² D	18%5s(³ P) ² P
246,529.84	0.17	17	−59	5/2	60%5s(¹ D) ² D	18%5s(³ F) ² F	17%5s(³ P) ⁴ P
248,698.76	0.19	7	−38	9/2	98%5s(¹ G) ² G	1%5s(³ F) ⁴ F	
248,906.98	0.18	11	38	7/2	97%5s(¹ G) ² G	2%5s(³ F) ² F	
248,997.61	0.21	9	44	1/2	98%5s(³ P) ² P	2%5s(¹ S) ² S	
249,381.16	0.18	14	22	3/2	67%5s(³ P) ² P	30%5s(¹ D) ² D	3%5s(³ F) ⁴ F
283,847.9	0.4	2	0	1/2	94%5s(¹ S) ² S	3%5s(³ P) ⁴ P	2%5s(³ P) ² P
440,371.7	0.6	5	−158	7/2	81%5d(³ F) ⁴ D	13%5d(³ F) ⁴ F	3%5d(³ P) ⁴ D
440,697.0	0.3	6	−35	5/2	44%5d(³ F) ⁴ P	44%5d(³ F) ⁴ D	4%5d(³ F) ⁴ F
442,556.3	0.4	4	−32	11/2	46%5d(³ F) ² H	42%5d(³ F) ⁴ H	10%5d(³ F) ⁴ G
443,127.8	0.8	1	84	13/2	98%5d(³ F) ⁴ H	2%5d(¹ G) ² I	
443,467.1	0.7	5	−38	3/2	37%5d(³ F) ² P	30%5d(³ F) ⁴ D	16%5d(³ F) ⁴ P
443,675.5	0.6	5	53	9/2	41%5d(³ F) ⁴ F	38%5d(³ F) ⁴ G	10%5d(³ F) ² G
444,550.5	0.9	2	−1	11/2	76%5d(³ F) ⁴ G	22%5d(³ F) ² H	1%5d(¹ G) ² H
444,903.9	0.4	8	30	7/2	53%5d(³ F) ² F	19%5d(³ F) ⁴ F	13%5d(³ F) ⁴ G
445,841.4	0.4	9	110	9/2	41%5d(³ F) ² G	38%5d(³ F) ⁴ F	9%5d(³ F) ⁴ H
446,177.0	0.5	8	58	5/2	47%5d(³ F) ⁴ P	18%5d(³ F) ⁴ D	8%5d(³ F) ² D
448,702.9	0.7	7	−60	3/2	51%5d(³ F) ² P	36%5d(³ F) ⁴ D	7%5d(³ P) ⁴ D
449,182.9	0.5	3	−152	1/2	77%5d(³ F) ⁴ D	10%5d(³ F) ⁴ P	6%5d(³ P) ⁴ D
450,402.3	0.4	7	−5	9/2	64%5d(³ F) ⁴ H	20%5d(³ F) ² G	12%5d(³ F) ² H
450,696.6	0.4	11	9	7/2	43%5d(³ F) ⁴ H	31%5d(³ F) ⁴ G	13%5d(³ F) ² F
450,813.7	0.4	11	−22	3/2	30%5d(³ F) ⁴ P	28%5d(¹ D) ² D	18%5d(³ F) ⁴ F
451,154.4	0.4	11	83	5/2	41%5d(³ F) ⁴ F	28%5d(³ F) ⁴ G	11%5d(³ F) ² F
451,241.3	0.8	1	−194	11/2	57%5d(³ F) ⁴ H	30%5d(³ F) ² H	13%5d(³ F) ⁴ G
451,702.7	0.5	6	83	7/2	32%5d(³ F) ⁴ F	26%5d(³ F) ² F	14%5d(³ F) ⁴ H
451,729.5	0.6	4	−34	5/2	32%5d(³ F) ² F	20%5d(¹ D) ² F	17%5d(³ F) ⁴ G
451,782.8	0.4	8	−182	3/2	46%5d(³ F) ⁴ P	22%5d(³ F) ⁴ F	11%5d(³ F) ⁴ D
452,404.5	0.4	12	−11	5/2	22%5d(³ F) ⁴ F	19%5d(³ F) ² D	16%5d(³ F) ⁴ G
452,562.5	0.7	4	63	9/2	35%5d(³ F) ² H	35%5d(³ F) ⁴ G	13%5d(³ F) ² G
452,941.9	0.6	7	87	7/2	34%5d(³ F) ⁴ G	17%5d(³ F) ⁴ F	16%5d(³ F) ⁴ H
453,052.0	0.5	7	192	1/2	44%5d(³ F) ⁴ P	28%5d(³ F) ² P	14%5d(¹ D) ² P
453,692.1	0.8	5	31	1/2	46%5d(³ F) ² P	28%5d(³ F) ⁴ P	20%5d(¹ D) ² S
453,935.8	0.3	7	67	7/2	54%5d(³ F) ² G	23%5d(¹ D) ² F	12%5d(³ P) ⁴ D
454,139.1?	0.8	1	25	9/2	26%5d(³ F) ² H	24%5d(¹ D) ² G	18%5d(³ F) ⁴ G
455,917.5	0.3	11	29	3/2	39%5d(³ F) ⁴ F	18%5d(³ F) ² D	14%5d(¹ D) ² P
457,356.8	0.4	8	−93	5/2	28%5d(³ P) ⁴ D	24%5d(³ F) ² D	19%5d(³ F) ⁴ G
458,526.7	1.0	4	58	1/2	58%5d(³ P) ⁴ D	19%5d(¹ D) ² P	11%5d(³ F) ² P
459,319.4	0.5	9	−99	5/2	29%5d(³ F) ² F	16%5d(³ P) ⁴ D	12%5d(³ F) ⁴ D
459,793.5	0.7	7	70	7/2	53%5d(³ P) ⁴ D	24%5d(³ F) ² G	8%5d(³ F) ⁴ G
459,851.5	0.5	10	5	3/2	57%5d(³ P) ⁴ D	10%5d(³ P) ⁴ P	9%5d(¹ G) ² D
460,950.8	0.4	6	−33	7/2	34%5d(³ P) ² F	23%5d(¹ D) ² G	19%5d(³ F) ⁴ H

Table A2. Cont.

E ^a	Unc. ^b	N ^c	o-c ^d	J	Eigenvector Composition ^e		
461,161.0	0.5	8	61	3/2	40%5d(3P) ² D	12%5d(3F) ² D	11%5d(1D) ² P
461,513.0	0.8	6	−49	9/2	55%5d(3P) ⁴ F	16%5d(1D) ² G	15%5d(3F) ² H
461,838.9	0.4	11	15	5/2	36%5d(3P) ² D	22%5d(1G) ² D	16%5d(3P) ⁴ D
462,676.0	0.6	7	0	1/2	41%5d(3P) ⁴ P	26%5d(1D) ² S	13%5d(3P) ² P
466,052.9	0.5	6	−8	1/2	30%5d(3P) ² P	29%5d(3P) ⁴ D	18%5d(1D) ² P
466,132.9	0.6	8	−37	3/2	49%5d(3P) ⁴ F	12%5d(1G) ² D	11%5d(3P) ⁴ D
466,390.2	0.6	12	−21	5/2	51%5d(3P) ⁴ F	13%5d(3P) ⁴ D	6%5d(1D) ² F
466,991.1	0.9	3	−17	3/2	44%5d(3P) ⁴ P	17%5d(3P) ² D	11%5d(3P) ⁴ D
467,183.6	0.5	10	−4	5/2	22%5d(3P) ⁴ P	20%5d(1D) ² D	17%5d(3P) ² F
467,575.7	0.9	5	5	7/2	39%5d(3P) ⁴ F	17%5d(3P) ⁴ D	12%5d(3P) ² F
468,085.2	0.5	5	110	5/2	37%5d(1D) ² F	25%5d(3P) ⁴ F	7%5d(3P) ² F
468,560.6	0.5	2	53	11/2	97%5d(1G) ² I	1%5d(3F) ² H	1%5d(3F) ⁴ H
468,909.5	0.5	10	141	7/2	34%5d(1D) ² F	29%5d(3P) ⁴ F	12%5d(1D) ² G
468,947.5	0.7	10	34	3/2	24%5d(3P) ⁴ F	23%5d(1G) ² D	22%5d(3P) ² P
469,675.02	0.8	1	−65	13/2	98%5d(1G) ² I	2%5d(3F) ⁴ H	
469,722.2	0.6	7	−60	5/2	54%5d(3P) ² F	28%5d(3P) ⁴ P	7%5d(3P) ⁴ F
470,284.2	0.4	7	6	7/2	44%5d(3P) ² F	29%5d(1D) ² G	11%5d(1D) ² F
470,339.2	0.7	2	−69	9/2	46%5d(1D) ² G	28%5d(3P) ⁴ F	11%5d(1G) ² G
470,893.4	0.4	12	92	5/2	35%5d(3P) ⁴ P	32%5d(1D) ² D	8%5d(1G) ² D
471,219.3	0.4	7	65	3/2	48%5d(3P) ² P	14%5d(1G) ² D	13%5d(1D) ² D
471,270.9	0.6	4	−56	1/2	38%5d(3P) ⁴ P	28%5d(1D) ² P	23%5d(1D) ² S
472,326.0	0.7	8	117	3/2	46%5d(1D) ² P	23%5d(3P) ⁴ P	17%5d(3P) ² P
472,651.2	0.5	5	50	7/2	85%5d(1G) ² F	5%5d(1D) ² F	2%5d(1D) ² G
473,251.7	0.6	7	85	5/2	78%5d(1G) ² F	6%5d(1D) ² F	6%5d(3P) ² F
473,931.2	0.7	2	−65	1/2	46%5d(3P) ² P	27%5d(1D) ² S	17%5d(1D) ² P
475,041.6	0.5	7	−7	9/2	60%5d(1G) ² H	25%4d ⁷ 5s ²	10%5d(1G) ² G
475,955.3	0.5	7	−67	11/2	97%5d(1G) ² H	1%5d(3F) ⁴ G	
476,018.0	1.1	2	−135	7/2	86%5d(1G) ² G	6%5d(1D) ² G	3%5d(1G) ² F
476,324.7	0.5	4	−149	9/2	76%5d(1G) ² G	12%5d(1G) ² H	7%5d(1D) ² G
482,589.5	1.0	6	−48	9/2	98%6s(3F) ⁴ F	2%6s(1G) ² G	
484,091.6	0.5	10	18	7/2	62%6s(3F) ² F	36%6s(3F) ⁴ F	2%6s(1G) ² G
487,660 *				5/2	35%5d(1G) ² D	25%5d(3P) ² D	23%5d(3F) ² D
490,946.0	0.6	12	−24	5/2	82%6s(3F) ⁴ F	12%6s(3F) ² F	4%6s(1D) ² D
491,054.8	0.6	10	−13	7/2	63%6s(3F) ⁴ F	37%6s(3F) ² F	
492,154.4	0.9	10	−8	3/2	65%6s(3F) ⁴ F	29%6s(1D) ² D	5%6s(3P) ² P
493,087.6	0.7	7	25	5/2	58%6s(3F) ² F	29%6s(1D) ² D	11%6s(3P) ⁴ P
493,303.7	1.1	1	−5	3/2	29%5d(3F) ² D	24%5d(1G) ² D	17%5d(1D) ² D
499,898.2	0.7	12	−37	5/2	60%6s(3P) ⁴ P	22%6s(3F) ² F	11%6s(3F) ⁴ F
500,562.7	0.7	10	31	3/2	41%6s(3P) ² P	26%6s(3F) ⁴ F	17%6s(1D) ² D
505,308.4	1.0	6	−36	1/2	96%6s(3P) ⁴ P	3%6s(1S) ² S	
505,864.7	0.8	10	31	3/2	80%6s(3P) ² P	17%6s(3P) ² P	2%6s(1D) ² D
507,492 *				1/2	98%6s(3P) ² P	2%6s(1S) ² S	
509,084 *				3/2	86%5d(1S) ² D	4%5d(3P) ² D	2%5d(3P) ⁴ F
509,540.7	0.7	9	110	5/2	52%6s(1D) ² D	25%6s(3P) ⁴ P	9%5d(1S) ² D
509,843 *				5/2	69%5d(1S) ² D	11%4d ⁷ 5s ²	7%5d(1D) ² D
510,047.7	0.7	9	55	3/2	52%6s(1D) ² D	36%6s(3P) ² P	8%6s(3F) ⁴ F
511,680.3	0.8	7	−51	9/2	98%6s(1G) ² G	2%6s(3F) ⁴ F	
511,718.9	0.7	6	−38	7/2	98%6s(1G) ² G	1%6s(3F) ² F	

Notes: ^a The star * indicates a calculated value for the level. Tentative value of the level is listed with the question mark; ^b The energy uncertainty relative to any other level of the 4d⁸5s, 4d⁸5s and 4d⁸5s configurations. The energy uncertainty relative to ground level 4d⁹2D_{5/2} is 5 cm^{−1}; ^c The number of spectral lines used for the determination of each level energy; ^d The difference between the observed and the calculated energies; ^e For the eigenvector composition, up to three components with the largest percentages in the LS—coupling scheme are listed.

Table A3. Level energies (in cm^{-1}) of the $4d^85p$ configuration of Sn VI.

E	Unc. ^a	N ^b	o-c ^c	J	Eigenvector Composition ^d		
303,941.8	0.5	14	−63	7/2	74%5p(³ F) ⁴ D	12%5p(³ F) ⁴ F	5%5p(³ F) ² F
307,476.0	0.3	9	−5	9/2	40%5p(³ F) ⁴ G	37%5p(³ F) ² G	22%5p(³ F) ⁴ F
311,448.43	0.17	20	−41	5/2	65%5p(³ F) ⁴ D	12%5p(³ P) ⁴ D	11%5p(³ F) ⁴ F
313,912.99	0.21	18	7	7/2	66%5p(³ F) ⁴ G	14%5p(³ F) ² G	14%5p(³ F) ⁴ F
315,004.02	0.18	21	−34	5/2	50%5p(³ F) ⁴ G	15%5p(¹ D) ² F	14%5p(³ F) ⁴ F
315,238.1	0.25	21	9	11/2	98%5p(³ F) ⁴ G	2%5p(¹ G) ² H	
315,239.91	0.50	5	−66	3/2	24%5p(¹ D) ² D	20%5p(³ F) ⁴ F	15%5p(³ F) ² D
317,515.30	0.19	25	−36	3/2	56%5p(³ F) ⁴ D	25%5p(³ P) ⁴ D	9%5p(³ P) ⁴ P
318,648.6	0.3	11	1	9/2	71%5p(³ F) ⁴ F	26%5p(³ F) ² G	1%5p(³ F) ⁴ G
319,409.18	0.23	9	2	1/2	56%5p(³ F) ⁴ D	28%5p(³ P) ⁴ D	9%5p(¹ D) ² P
319,827.76	0.24	19	60	7/2	58%5p(³ F) ² F	19%5p(³ F) ⁴ F	12%5p(³ F) ⁴ D
320,690.13	0.20	27	36	5/2	34%5p(³ F) ² D	28%5p(³ F) ⁴ G	12%5p(³ F) ⁴ F
323,773.57	0.19	28	87	3/2	46%5p(³ P) ⁴ P	22%5p(³ F) ⁴ F	9%5p(³ F) ² D
324,074.7	0.3	14	−75	1/2	86%5p(³ P) ⁴ P	4%5p(³ P) ² P	4%5p(¹ D) ² P
324,356.63	0.27	6	−8	9/2	58%5p(³ F) ⁴ G	35%5p(³ F) ² G	6%5p(³ F) ⁴ F
324,902.96	0.20	23	−1	5/2	33%5p(³ F) ⁴ F	22%5p(³ F) ² F	14%5p(³ F) ² D
325,255.34	0.19	28	59	5/2	39%5p(³ P) ⁴ P	28%5p(³ F) ² D	10%5p(³ F) ⁴ D
326,592.68	0.19	22	−22	7/2	45%5p(³ F) ⁴ F	25%5p(³ F) ² G	21%5p(³ F) ² F
327,254.46	0.18	15	−29	7/2	31%5p(³ F) ² G	30%5p(¹ D) ² F	16%5p(³ F) ⁴ G
329,088.51	0.24	23	−28	5/2	29%5p(³ F) ² F	25%5p(¹ D) ² F	18%5p(³ P) ² D
330,063.75	0.22	23	12	3/2	47%5p(³ F) ⁴ F	18%5p(³ F) ² D	13%5p(³ P) ⁴ P
331,291.85	0.18	33	13	5/2	21%5p(³ P) ⁴ P	16%5p(³ F) ⁴ F	14%5p(³ F) ⁴ G
333,754.8	0.3	8	68	7/2	43%5p(¹ G) ² F	20%5p(³ F) ² G	13%5p(¹ D) ² F
333,832.6	0.3	24	−29	9/2	91%5p(¹ G) ² H	7%5p(¹ G) ² G	1%5p(³ F) ² G
334,079.8	0.3	13	97	1/2	38%5p(¹ D) ² P	33%5p(³ P) ² P	8%5p(³ P) ⁴ P
334,281.53	0.19	20	65	3/2	31%5p(³ P) ² P	23%5p(³ P) ⁴ D	16%5p(³ F) ² D
335,354.1	0.25	16	88	1/2	53%5p(³ P) ⁴ D	29%5p(³ F) ⁴ D	8%5p(³ P) ² P
335,602.72	0.17	27	−12	5/2	26%5p(³ P) ² D	22%5p(³ F) ² F	17%5p(¹ D) ² D
336,476.33	0.17	19	20	3/2	32%5p(³ F) ² D	24%5p(³ P) ⁴ D	14%5p(¹ D) ² D
336,634.02	0.20	26	−33	7/2	53%5p(³ P) ⁴ D	28%5p(¹ G) ² F	6%5p(³ F) ² F
339,432.97	0.22	23	63	3/2	52%5p(¹ D) ² P	13%5p(³ P) ² D	11%5p(¹ D) ² D
339,770.87	0.23	19	91	5/2	28%5p(¹ D) ² D	27%5p(¹ G) ² F	15%5p(³ P) ⁴ D
341,620.5	0.3	16	34	3/2	51%5p(³ P) ² P	24%5p(¹ D) ² D	8%5p(³ P) ⁴ D
342,540.9	0.4	5	28	11/2	98%5p(¹ G) ² H	2%5p(³ F) ⁴ G	
342,827.90	0.21	23	0	5/2	40%5p(³ P) ⁴ D	39%5p(³ P) ² D	12%5p(¹ G) ² F
344,338.7	0.3	10	−66	3/2	66%5p(³ P) ² D	13%5p(³ P) ⁴ D	5%5p(¹ D) ² P
344,811.6	0.3	9	−6	1/2	71%5p(³ P) ² S	14%5p(³ P) ² P	6%5p(³ P) ⁴ D
345,680.16	0.24	16	−13	7/2	50%5p(¹ D) ² F	26%5p(³ P) ⁴ D	6%5p(¹ G) ² F
346,961.72	0.25	19	−132	5/2	49%5p(¹ G) ² F	13%5p(¹ D) ² D	13%5p(¹ D) ² F
347,213.07	0.24	21	−39	3/2	84%5p(³ P) ⁴ S	4%5p(¹ D) ² P	3%5p(³ P) ² P
350,163.5	0.7	6	−126	1/2	41%5p(¹ D) ² P	35%5p(³ P) ² P	16%5p(³ P) ² S
351,018.7	0.3	8	26	7/2	85%5p(¹ G) ² G	12%5p(¹ G) ² F	2%5p(¹ D) ² F
352,133.8	0.3	11	−6	9/2	92%5p(¹ G) ² G	7%5p(¹ G) ² H	1%5p(³ F) ⁴ F
373,062.5	0.5	2	31	1/2	90%5p(¹ S) ² P	4%5p(¹ D) ² P	3%5p(³ P) ⁴ D
382,342.2	0.7	7	−28	3/2	92%5p(¹ S) ² P	2%5p(¹ D) ² P	2%5p(³ P) ² D

Notes: ^a The energy uncertainty relative to any other level of the $4d^85p$, $4d^85s$ and $4d^85s$ configuration. The energy uncertainty relative to ground level $4d^92D_{5/2}$ is 5 cm^{-1} ; ^b The number of spectral lines used for the determination of each level energy; ^c The difference between the observed and the calculated energies; ^d For the eigenvector composition, up to three components with the largest percentages in the LS-coupling scheme are listed.

Table A4. Fitted (FIT) with their uncertainties (Unc.) and Hartree–Fock (HF) energy parameters in cm^{-1} of the $4d^85s$, $4d^86s$, $4d^85p$ and $4d^85d$ configurations in Sn VI calculated with the Cowan code.

Parameter	HF ^a	FIT	Unc. ^b	LSF/HF ^c
Even levels				
$E_{av}(4d^85s)$	240,747	236,921	21	−3826
$F^2(4d,4d)$	99,996	83,482	187	0.835
$F^4(4d,4d)$	66,520	58,677	329	0.882
α		56	7	
β		−658	116	
$\zeta(4d)$	3516	3668	18	1.043
$G^2(4d,5s)$	16,619	14,431	126	0.868
$E_{av}(4d^85d)$	460,364	460,888	12	524
$F^2(4d,4d)$	100,666	84,142	157	0.836
$F^4(4d,4d)$	67,026	59,155	274	0.883
α		56	f	
β		−658	f	
$\zeta(4d)$	3550	3651	13	1.028
$\zeta(5d)$	477	563	13	1.179
$F^1(4d,5d)$		193	81	
$F^2(4d,5d)$	21,744	19,488	120	0.896
$F^4(4d,5d)$	9797	8780	54	0.896
$G^0(4d,5d)$	5254	4606	13	0.877 ^d
$G^2(4d,5d)$	6445	5650	16	0.877 ^d
$G^4(4d,5d)$	5314	4658	13	0.877 ^d
$E_{av}(4d^86s)$	499,343	499,509	23	166
$F^2(4d,4d)$	100,724	84,353	269	0.837
$F^4(4d,4d)$	67,068	59,756	445	0.891
α		56	f	
β		−658	f	
$\zeta(4d)$	3553	3663	18	1.031
$G^2(4d,6s)$	4034	3404	30	0.844
σ	79			
Odd levels				
$E_{av}(4d^85p)$	332,959	330,809	10	−2150
$F^2(4d,4d)$	100,232	83,629	112	0.834
$F^4(4d,4d)$	66,698	59,244	164	0.888
α		44	4	
β		−458	62	
$\zeta(4d)$	3528	3626	14	1.028
$\zeta(5p)$	6101	6831	21	1.120
$F^2(4d,5p)$	34,436	29,734	88	0.863
$G^1(4d,5p)$	11,014	9929	50	0.901
$G^3(4d,5p)$	10,417	8843	218	0.849
σ	61			

Notes: ^a Hartree–Fock average energy for the ground level configuration $4d^9$ is 5338 cm^{-1} (see text); ^b f-parameters are fixed on the values obtained for the $4d^85s$ configuration; ^c For E_{av} the difference between fitted and ab initio values is given. Parameters $F^2(4d,5p)$ and $F^4(4d,5p)$ as well as $G^0(4d,5p)$, $G^2(4d,5p)$ and $G^4(4d,5p)$ are tied together at their Hartree–Fock ratios; ^d Parameters are linked at their Hartree–Fock ratios.

References

1. Joshi, Y.N.; Van Kleeef, T.A.M. $4d^9$ – $4d^8$ 5p transitions in Cd IV, Sn VI and the resonance lines of Sn V and Sb VI. *Can. J. Phys.* **1977**, *55*, 714–726. [[CrossRef](#)]
2. Srivastava, R.P.; Joshi, Y.N.; Van Kleeef, T.A.M. $4d^85p$ – $4d^85s$ transitions in Sn VI. *Can. J. Phys.* **1977**, *55*, 1936–1947. [[CrossRef](#)]

3. Churilov, S.S.; Kildiyarova, R.R.; Ryabtsev, A.N.; Kramida, A.E.; Joshi, Y.N. Analysis of the $4d^9-4d^8(4f + 6p)$ transition array of Sn VI. *Phys. Scr.* **1994**, *50*, 463–468. [[CrossRef](#)]
4. Kildiyarova, R.R.; Kononov, E.Y.; Ryabtsev, A.N. Spectrum of five times ionized tin (Sn VI) in the vacuum UV region. *EPJ Web Conf.* **2017**, *132*, 03019. [[CrossRef](#)]
5. Madison, W.; Nave, G. Evaluation of resolution and periodic errors of a flatbed scanner used for digitizing spectroscopic photographic plates. *Appl. Opt.* **2017**, *56*, 3744–3749.
6. Kelly, R. Atomic and Ionic Spectrum Lines below 2000 Angstroms: Hydrogen through Krypton. *J. Phys. Chem. Ref. Data* **1987**, *16* (Suppl. 1), 1–1678.
7. Cowan, R.D. *The Theory of Atomic Structure and Spectra*; University of California Press: Berkeley, CA, USA, 1981.
8. Swapnil; Tauheed, A. Spectral analysis of the fifth spectrum of indium: In V. *J. Quant. Spectrosc. Radiat. Transf.* **2016**, *168*, 102–141. [[CrossRef](#)]
9. Azarov, V.I. Formal approach to the solution of the complex-spectra identification problem. 2. Implementaton. *Phys. Scr.* **1993**, *48*, 656–667. [[CrossRef](#)]
10. Kramida, A.E. The program LOPT for least-squares optimization of energy levels. *Comput. Phys. Commun.* **2010**, *182*, 419–434. [[CrossRef](#)]
11. Van Kleef, T.A.M.; Joshi, Y.N. Analysis of the $4d^95d$, $4d^85s^2$ and $4d^96s$ configurations of In IV and Sn V. *Phys. Scr.* **1981**, *24*, 557–565. [[CrossRef](#)]
12. Haris, K.; Tauheed, A. Revised and extended analysis of doubly ionized tin: Sn III. *Phys. Scr.* **2012**, *85*, 055301. [[CrossRef](#)]



© 2017 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).