International Atomic Energy Agency

INDC(CCP)-202/GA

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THE ATOMIC SPECTRUM AND ENERGY LEVELS OF THE PLUTONIUM NEUTRAL ATOM

By A.R. Striganov

September 1983

IAEA NUCLEAR DATA SECTION, WAGRAMERSTRASSE 5, A-1400 VIENNA

Reproduced by the IAEA in Austria
September 1983
83-4606

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L83-21762
Translated from Russian

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REVIEW*/

The author has compiled data on the spectrum of the neutral atom of plutonium, and gives the classified spectral lines, energy levels and their Grotrian diagram. The hyperfine structure and electron configurations of levels are considered.

The booklet is intended for scientists and engineers engaged in the study of actinides and using the emission spectra of plutonium for scientific and practical purposes.

FOREWORD

In the optical region of the emission spectrum of plutonium more than 10 000 spectral lines have been measured to date. About 40% of these lines have been classified and relegated to the spectra of atoms and simple ions. However, accessible publications do not by far contain all the results. This is obviously due to the fact that the atomic spectra of the actinide elements are very complex and require considerable time and labour for study and interpretation. Research work on these elements involves particular difficulties due to their high radioactivity.

The study of the plutonium spectrum began soon after microgram quantities of ^{239}Pu had been separated from irradiated uranium in nuclear reactors. The first emission spectra were obtained in the USA in 1944 and in the USSR in 1948. These studies were published in 1949 and in 1956, respectively. Major contributions to the study and classification of plutonium spectra were made by McNally from the Oak Ridge National Laboratory (USA); Bovey, Ridgley and Richards from the AERE, Harwell (UK); Blaise, Gerstenkorn and Bauche from the CNRS (France); Conway from Lawrence Radiation Laboratory, University of California (USA); and Fred and Tomkins from Argonne National Laboratory (USA). A.R. Striganov and L.A. Korostylera from the I.V. Kurchatov Institute of Atomic Energy (USSR) spent a long time on the study of the atomic spectra of plutonium.

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*/ By Dr. Yu. I. Korovin.

Since 1948 quite a large number of studies, based on different types of spectral instrument, have been published on the plutonium spectrum. To use these results it was necessary to compare and make a practical evaluation of the numerical data and then to choose the most reliable ones from among them. The author was the first to generalize the plutonium spectrum results in this manner.

The booklet contains a compilation of published data on the spectrum and energy levels of the plutonium neutral atom (Pu I). It presents a table of classified spectral lines supplemented by the author with 545 allowed transitions and refined by energy level calculation. The same table gives 1965 lines in the 25 000 - 3000 Å wavelength region, including all resonance and highest-intensity lines. Two other tables present 146 even and 165 odd energy levels, for each of which energy values in cm^{-1}, the quantum number of the total electron shell moment, and the Landé factor are indicated. The energy levels and transitions have been given for the first time on the Grotian diagram. A separate table contains the experimental data on isotopic shift and hyperfine splitting in the Pu I spectrum as measured by the interferometric technique. The information obtained on the plutonium atomic spectrum shows that the Pu I spectrum has been studied quite thoroughly.

The data provided in the reference booklet in conformity with All-Union State Standard 8.310-78 belong to the category of information material.

INTRODUCTION

Plutonium is one of the most important elements of the actinide series, which begins with thorium and ends with lawrentium and includes, like the rare-earth series, 14 of the heaviest elements. Actinides are characterized by the filling of the 5f-electron shell of the atom. Unlike the rare-earth series, there may be a competition here between the 5f- and 6d-shells, which is due to a weaker coupling of the 6d-electrons with the nucleus as a result of the strongly shielding action of the 5f-electrons. Therefore, for example, in the thorium atom the 5f-shell is not filled and the 90th electron goes into the 6d-shell. Incompletely filled 5f-shells occur also in the protactinium, uranium, neptunium and curium atoms.

It was in 1949 that Seaborg, on the basis of the chemical properties of actinides, the structural data on various compounds and the absorption and emission spectra, first postulated the electron configurations for the ground states of neutral atoms from thorium to curium. It was assumed that for plutonium the ground state was $5f^6 7s^2$, or possibly, $5f^5 6d7s^2$. Spectroscopic studies on the emission spectra of plutonium fully confirmed this prediction. It turned out that the lower energy levels of the plutonium neutral atom belonged to electron configurations $5f^6 7s^2$ and $5f^5 6d7s^2$, the ground state being $5f^6 7s^2\ {}^7F_0$. These results were obtained after a thorough and comprehensive study of the plutonium emission spectra.

When studying the atomic spectra of new elements the ultimate aim is to classify them and to determine the energy levels of the atoms and ions. For this purpose, it is necessary (1) to measure, as fully, reliably and accurately as possible, the line wavelengths over the whole optical spectrum region; (2) to identify or distinguish the neutral and ionized-atom lines in the spectrum; (3) to study Zeeman splitting in the spectra; (4) to study the isotopic shift and hyperfine structure of the spectral lines.

On the basis of a large number of studies on the plutonium atomic spectrum (all published before 1980 and considered in the survey in Ref. [1], the present author compiled tables of classified spectral lines, atomic energy levels, isotopic shifts and hyperfine structure. Many spectral line wavelengths have been verified and refined by energy level calculation. The table of spectral lines has been supplemented by allowed transitions, which have not so far been detected experimentally. Some corrections have been made in the energy levels.

It should be pointed out that in all the studies the plutonium isotope with the mass number 239 was the sample used for obtaining the spectrum. The spin of the ^{239}Pu nucleus is 1/2; the atomic levels for which the total moment of the electron shell J = 0 therefore are singlets. All other levels with $J \geqslant 1/2$ are doublets. Hence it follows that during the splitting of one of the levels the ^{239}Pu line will have a doublet structure and that during the splitting of the lower and upper levels the line may be the triplet or quartet type hyperfine structure. This may affect the convergence of the wavelength measurements if the spectral instruments used differ substantially in resolving power and spread. Moreover, the ^{239}Pu isotope samples may contain the ^{240}Pu isotope, in which case, some spectral lines will undergo isotopic shifts and have a two-component structure consisting of a bright ^{239}Pu line and a weak ^{240}Pu line. This may also affect agreement between the measurements made by different researchers. Unfortunately, none of the publications on the measurement of line wavelengths in the plutonium spectrum indicate the concentration of the ^{240}Pu isotope. However, if the content of this isotope is about 3-5%, the plutonium spectrum may reveal additional lines emitted by the excited atoms of ^{240}Pu.

Interferometric measurements show that the upper limits of the width of the hyperfine structure and isotopic shifts in the ^{239}Pu and ^{240}Pu spectra are 0.030 and 0.070 Å, respectively. Contemporary spectral instruments can measure wavelengths in ångströms up to the third significant decimal place with an error of 0.003-0.005 Å. Hence we can see how important it is for accurate measurements of wavelength in the plutonium spectrum to take into account hyperfine structure and the presence of ^{240}Pu in the samples used. For this reason, it should be noted that the use of ^{240}Pu with an even-even nucleus to obtain the plutonium spectrum would provide a more reliable measurement of the wavelength since the spectral lines of this isotope do not give hyperfine splitting and, when the sample has sufficient isotopic purity, the spectrum does not show the isotopic structure either.

The booklet gives the plutonium atom energy levels, data on all currently known classified spectral lines and generalized results on isotopic shifts and hyperfine structure obtained by the interferometric technique.

1. ENERGY LEVELS AND THE GROTRIAN DIAGRAM

Tables 1 and 2 give 146 even and 165 odd levels from Refs [2-6]. The first column of each table contains the electron configurations and spectroscopic notations for which these characteristics are known. Table 1 starts with the lowest multiplet $5f^6 7s^2\ {}^7F_{0-6}$, which consists of seven even levels. For the odd levels in Table 2 the electron configuration $5f^5 6d7s^2$ is lower. It comprises 15 levels with spectroscopic notations in the Jj coupling scheme for the spins of electron configuration $5f^5$ and 6d. The group of $5f^5$ electrons gives the basic multiplet ${}^6H_{J'}$ with levels for which J' = 5/2, 7/2, 9/2. Combination of J' and j = 3/2, 5/2 for the 6d-electron in the J'j coupling scheme gives the resulting values of J (notation $(J'j)_J$ is used [7]). Tables 1 and 2 then give the higher even and odd levels. For some of them possible electron configurations found from isotopic shifts are indicated. The second column of these tables contains the numerical values of energy level E in cm^{-1}. The average error for the lower levels is approximately (3 to 5) 10^{-2} cm^{-1} and for the upper levels (5 to 10) 10^{-2} cm^{-1}. The third and the fourth column give the quantum numbers of the total angular momentum J of electrons and the Landé factor g.

Figure 1 shows the energy-level diagram for the plutonium neutral atom in the region E = 0.35 000 cm^{-1}. Column I gives the levels of the lowest multiplet for electron configuration $5f^6 7s^2$ with ground state ${}^7F_0$ and column I^o the levels of the first excited odd configuration $5f^5 6d7s^2$. Columns II and II^o give the even and odd upper levels with possible electron configurations and columns III and III^o the even and odd levels whose configurations have not yet been established. In the 0-20 000 cm^{-1} energy region all the even and odd levels from Tables 1 and 2 are shown. For the energy scale adopted the upper levels are contiguous at places; therefore, not all of them are given in the diagram. Spectroscopic notations are given for the lower levels and only the quantum numbers J for the upper levels (more detailed data can be found in Tables 1 and 2). The characteristic transitions between levels, together with the wavelength (in ångströms) for each of them, are shown in the diagram.

2. CLASSIFIED SPECTRAL LINES

Table 3 gives the data on 1965 classified spectral lines of the plutonium neutral atom ranging from 3000 to 25 000 Å. The table includes the most characteristic and intensive lines, indicating for each line the wavelength in ångströms, the intensity on a nine-point scale in electrodeless high-frequency discharge and the corresponding upper and lower levels. Resonance lines with a lower ground level $5f^6 7s^2\ ^7F_o$ are denoted by the letter R. The table is based mainly on Refs [5,6], which supplied the experimental values of wavelength, the classification and the intensity evaluations. The wavelengths, denoted by the letter P, were obtained by the author by means of energy level calculation , with allowance for the rules of transition, but with account being taken only of transitions to lower levels with energies from 2203 to 15 000 cm^{-1}, which were not found experimentally in Refs [5,6]. P also denotes lines with wavelengths refined substantially by the above-mentioned calculation. Table 3 contains about 150 lines with experimentally measured wavelengths from Ref. [5], which were classified by the author on the basis of Tables 1 and 2. As a result, the number of classified lines in the Pu I spectrum increased by 64% over the number given in Ref. [6].

The mean error in the wavelength values in ångströms measured up to three decimal places is ± 0.003 Å [6]. In the long-wave region of the spectrum the wavelengths are given in ångström up to two places and one place after the decimal. The error in these cases is ± 0.02 and ± 0.2 Å, respectively.

3. ISOTOPIC SHIFT AND HYPERFINE SPLITTING

Table 4 gives the experimental data on isotopic shift and hyperfine splitting in the spectrum of Pu I. The table has been compiled from the results given in Refs [2,8,9], where measurements were carried out with a Fabry-Perot interferometer, a hollow-cathode discharge tube, samples of ^{239}Pu and a mixture of ^{239}Pu and ^{240}Pu. The data obtained showed satisfactory agreement. The first and second columns contain the line wavelengths in ångström and intensities from Table 3. Some lines, marked by asterisks, are taken directly from Refs [2,8,9]. The third and fourth columns give the width of the doublet hyperfine structure (HFS) of ^{239}Pu and the isotopic shift between components of ^{239}Pu and ^{240}Pu expressed in 10^{-3} cm^{-1}. Various types of HFS are denoted by "k" and "ϕ", meaning decreases towards the red and violet parts of the spectrum, respectively [1]. A negative isotopic shift indicates that the component of the higher ^{240}Pu isotope shifts in the spectrum towards lower wave numbers; when the shift is positive, the same component shifts towards higher wave numbers.

Table 4 gives 179 lines for Pu I. They also include non-classified lines. A mixed isotopic and hyperfine structure has been found in the case of 64 lines, while for the rest only an isotopic shift or hyperfine splitting has been measured [1]. The absence of HFS or isotopic shift is denoted by a dash. This means that either the distance between the corresponding components is very small and does not exceed the line width in the hollow cathode (approximately 2.0×10^{-3} cm^{-1}), or that the weak component does not show up in the spectrum under the given experimental conditions. In Refs [8,9] the isotopic shift of the spectral lines with a mixed structure was determined as the distance between the ^{240}Pu component and the middle of the doublet hyperfine splitting of ^{239}Pu, if the difference in the intensities of the HFS components was less than 20%. When the latter difference was greater, the shift was determined in relation to the "centre of gravity" of HFS. To reproduce the full mixed structure of a number of lines from Ref. [8], the fifth column gives the distances $\Delta\ell$ in 10^{-3} cm^{-1} between the neighbouring ^{239}Pu and ^{240}Pu components.

For ^{239}Pu the nuclear spin is $I = 1/2$; the levels with the quantum number $J = 0$ will therefore be singlets. All the other levels with $J \geq 1/2$ will be doublets. Hence the HFS of the lines can be singlets, doublets, triplets and quartets. Figure 2 shows schemes for possible transitions between the split levels of ^{239}Pu and HFS of lines. A doublet line structure is obtained when one of the levels is split. The intensity decrease is either towards the violet or towards the red part of the spectrum. In the case of a noticeable splitting of both levels with $J \geq 1/2$ a triplet line structure is obtained for the transition when $\Delta J = \pm 1$ and a quartet structure when $\Delta J = 0$. The intensity decrease here depends on the specific J values of the transition and can occur towards either red or violet.

If hyperfine splitting is absent, the energy levels of atoms undergo only one isotopic shift. This is always observed for isotopes with even-even nuclei since in this case the spin for all nuclei is zero and the atomic levels are singlets. A similar situation may occur also for the plutonium isotope ^{239}Pu with an even-odd nucleus when the internal quantum number of the atomic level $J = 0$ or HFS is immeasurably small. As an illustration, Fig. 3 shows the transition schemes and isotopic structure of lines when only one level experiences isotopic shift. When the energy levels of atoms are arranged in the manner characteristic of the volume isotopic effect, the negative line shift is due to the shift of the lower level, as is observed usually in the heavy element spectra. The positive line shift is due to the large isotopic shift of the upper atomic level. If both levels undergo isotopic shift, its value is equal to the difference between the shifts of the upper and lower levels. Hence it follows that from the direction of line shift we can at once say which of the levels (upper or lower) has the greater isotopic shift.

Lines with a mixed structure may exhibit both negative and positive shifts with different decreases in the intensity of the HFS components. The transition schemes in Fig. 4 can explain the different direction in shift of the ^{240}Pu component and the different types of HFS of ^{239}Pu. No structure with a positive isotopic shift and intensity decrease towards violet has been detected among the measured lines shown in Table 4.

4. DETERMINATION OF ELECTRON CONFIGURATIONS FROM ISOTOPIC SHIFT AND HYPERFINE SPLITTING

On the basis of experimental data on isotopic shift and hyperfine splitting in the Pu I spectrum it is possible to predict the most probable electron configurations of the upper and lower levels for some transitions of the spectral lines studied. However, if the electron configurations of the lower levels are known, those of the upper levels may in many cases be determined with a fair degree of accuracy [1].

It will be seen from Tables 4 and 3 that all lines with positive shifts belong to the transition $5f^6 7s^2$-$5f^5 6d7s^2$. Most of the lines mentioned exhibit a doublet HFS of small width (0.19-0.44 cm^{-1}) with an intensity decrease towards red. The value of the measured isotopic shifts varies within 0.060-0.160 cm^{-1}. To the same transition belong several lines for which isotopic shift has not been found either because the shift is small or because one HFS component of ^{239}Pu coincides with the ^{240}Pu line.

The $5f^6 7s^2$-$5f^6 7s7p$ transitions have a characteristic negative isotopic shift and HFS with the intensity of components decreasing towards red or violet. Table 4 shows more than 20 such lines with a negative isotopic shift within 0.032-0.187 cm^{-1}. The width of the doublet HFS of these lines varies from extremely low values to 0.132 cm^{-1}. Since the isotopic shift for the above transition reaches at the lower boundary the limit of resolution of the Fabry-Perot interferometer, it would be logical to relegate also to this transition all lines with the lower electron configuration $5f^6 7s^2$ for which no isotopic shift has been discovered. The reason is that there are seven lines without isotopic shift (7326, 5839, 5836, 5538, 4865, 4635 and 4208 Å) whose upper levels reappeared and were already relegated to the configuration $5f^6 7s7p$ on the basis of other lines with isotopic shift. An additional criterion for deciding that such lines belong to this transition is the width of the doublet HFS, which should be 0.044 cm^{-1}. If the HFS width is smaller than this value, the lines with isotopic shift may belong to the transition $5f^6 7s^2$-$5f^6 7s7p$ or to $5f^6 7s^2$-$5f^5 6d7s^2$.

It follows from Tables 3 and 4 that all lines belonging to transitions to the levels of the lower electron configuration $5f^6 6d7s^2$ have a negative isotopic shift. The value of the shift varies from 0.102 to 0.350 cm^{-1}. For seven lines, however, no isotopic shift was found (6891, 6274, 6032, 6000, 5937, 5119 and 4242 Å). Evidently, here too, one of the HFS components of ^{239}Pu coincides with the ^{240}Pu line. The HFS width varies from extremely low values, which could be measured, to 0.090 cm^{-1}. The intensity decreases towards red and violet of the components of doublet splitting are due, in the case of each transition, to the relative values of the internal quantum numbers of the upper and lower levels: the intensity decrease towards red occurs when $J_\ell/J_u < 1$ and towards violet when $J_\ell/J_u > 1$. Evaluations of the maximum contribution to the isotopic shift of levels and spectral lines [1] enable us to predict the electron configurations of the upper levels from the measured value of the isotopic line shift. All lines with isotopic shift from 0.100 to 0.190 cm^{-1} should be assigned to the transition $5f^5 6d7s^2$-$5f^5 6d7s7p$, and lines with greater shift (from 0.190 to 0.360 cm^{-1}) to the transition $5f^5 6d7s^2$-$5f^6 6d7s$. Lines with an intermediate isotopic shift of about 0.180–0.210 cm^{-1} may belong to either the former or the latter transition. The isotopic shift does not permit a more definite conclusion in the given case.

In Tables 1 and 2 the first column gives, for a number of upper levels, the electron configurations found by the author on the basis of isotopic shift and hyperfine doublet splitting. It was found that the odd levels 17615^o_2 and 18346^o_2 belonged to the configuration $5f^5 6d7s^2$, while in Ref. [2] they were relegated to $5f^6 7s7p$. The classification of the 5004 Å line with a positive shift is evidently wrong, since such lines should belong to the transition

$5f^6 7s^2$–$5f^6 6d7s^2$. In the case of the 5004 Å line one cannot rule out an experimental error due to superposition of isotopic shift and HFS and resulting perhaps in a wrong evaluation of the direction of isotopic shift. It is also to be noted that the 4155 Å line ($5f^6 7s^2 7F_1$–$26261^o{}_2$) with a high negative isotopic shift (–0.284 cm^{-1}) should be related to the transition $5f^5 6d7s^2$–$5f^6 6d7s$.

From the data considered it will be seen that the experimental values of the isotopic shifts of the individual spectral lines belonging to transitions between the levels of the same configurations are spread over a fairly wide range - from very high to extremely low values inaccessible for measurement. This scatter is due to the interaction of the neighbouring levels of the different electron configurations of identical parity resulting in the shifting of levels.

As we know, the isotopic shift of levels belonging to an electron configuration with two penetrating s^2-electrons decreases during interaction with the levels of configurations with one s-electron or with those without an s-electron. Conversely, the isotopic shift of the levels of configurations with one s-electron may increase during interaction with those with s^2-electrons. The extent of change in the shift of levels will depend on the mixture of interacting electron configurations. These variations in the shift of levels can be seen in the isotopic shift of the spectral lines since the line shift is equal to the difference between the shifts of the upper and lower levels. If their values are close together, the isotopic shift of the lines approaches the minimum measurable values.

The foregoing analysis of isotopic shifts of the classified lines in the Pu I spectrum shows that isotopic shift can be used to determine the electron configurations of the upper levels. However, this method is not universal and, in many cases, does not give a reliable and unambiguous answer. It is reliable for transitions between the electron configuration levels when there is no interaction between them. Uncertainty occurs in the case of transitions between mixed levels. As a result, the characteristic isotopic shift broadens into a wide band of shifts - through mixing of the neighbouring configurations. In this case, the question of determining electron configurations from isotopic shift becomes meaningless. Such a situation occurs in the Pu I spectrum for transitions $5f^6 7s^2$-$5f^6 6d7s^2$ and $5f^6 7s^2$-$5f^6 7s7p$ as well as for $5f^5 6d7s^2$-$5f^5 6d7s7p$ and $5f^5 6d7s^2$-$5f^6 6d7s$. The upper electron configurations in both cases have the same parity. As a result of interaction they form mixed levels. In the first case, the isotopic shift of the lines decreases to lower values, while in the second intermediate negative shifts are obtained (0.180-0.210 cm^{-1}).

At present there are many studies dealing with the calculation of the effect of level shift. Isotopic shift can evidently provide an experimental means of verifying such calculations. For this purpose, it is necessary to find the analytical dependence of the isotopic shift in levels with interaction of electron configurations.

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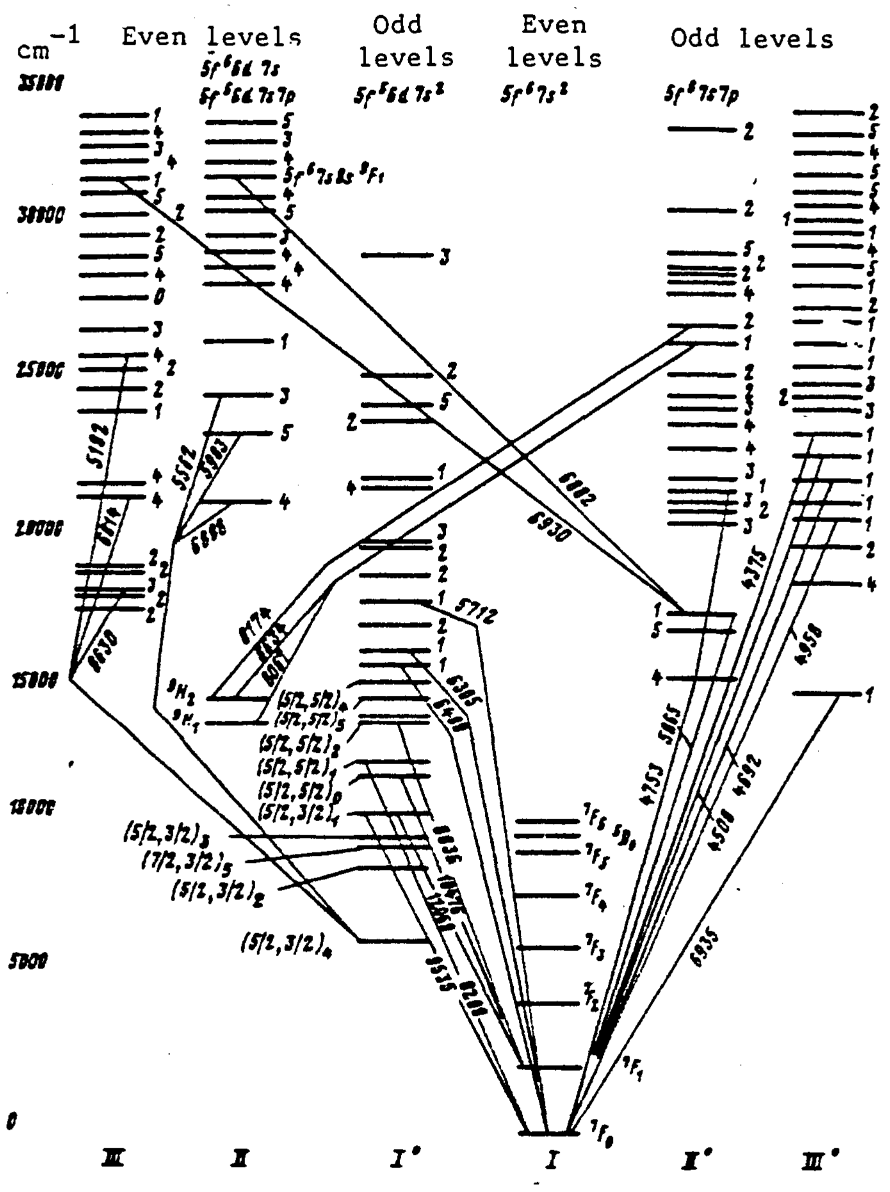

Fig. 1. Diagram of the energy levels of the plutonium neutral atom

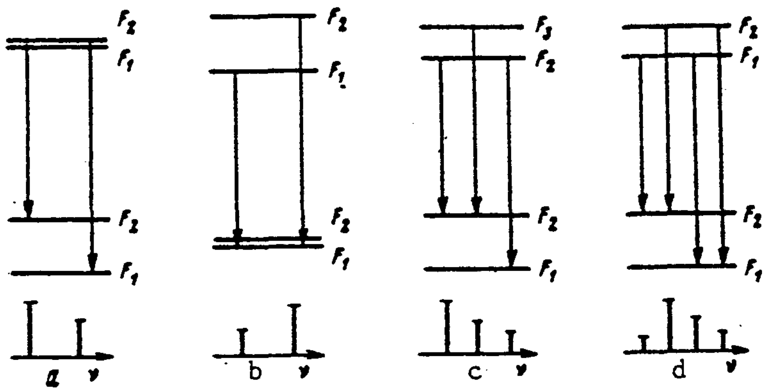

Fig. 2. Transition schemes in the presence of hyperfine splitting : (a, b) doublet structure with intensity decrease towards violet and red; (c, d) triplet and quartet structures of lines.

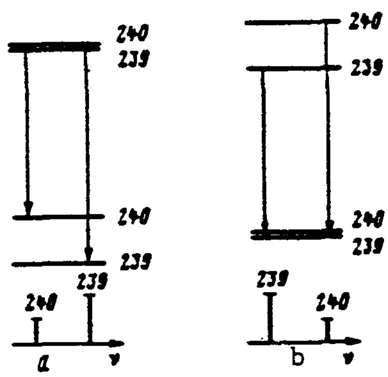

Fig. 3. Transition schemes in the presence of negative (a) and positive (b) isotope shifts.

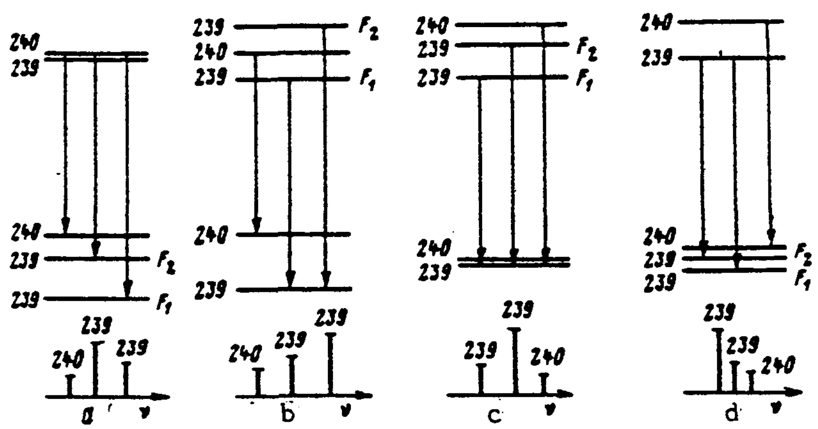

Fig. 4. Transition schemes with mixed line structure: (a, b) negative isotopic shift with the intensity of HFS components decreasing towards red and violet; (c, d) positive shift with the intensity of HFS decreasing towards red and violet.

APPENDICES

Table 1. Even levels

Electron configuration and spectroscopic notation	E, см$^{-1}$	J	g
$5f^6 7s^2\ ^7F$	0,00	0	
$5f^6 7s^2\ ^7F$	2203,55	1	1,495
$5f^6 7s^2\ ^7F$	4299,58	2	1,488
$5f^6 7s^2\ ^7F$	6144,38	3	1,475
$5f^6 7s^2\ ^7F$	7774,53	4	1,467
$5f^6 7s^2\ ^7F$	9179,12	5	1,458
$5f^6 7s^2\ ^5D$	9772,44	0	–
$5f^6 7s^2\ ^7F$	10238,30	6	1,424
$5f^6 6d7s\ ^9H$	13528,27	2	−0,59
$5f^6 6d7s\ ^9H$	14342,04	2	0,85
	17305,22	2	
	17776,57	2	
	17897,82	3	0,46
	18539,11	2	
	18718,88	2	
$(5f^5 6d7s7p)^*$	20828,49	4	0,35
	20988,15	4	1,35
	21417,55	4	0,80
$5f^6 6d7s$	23022,2	5	0,85
$5f^6 6d7s$	23129,55	5	1,17
	23601,26	1	0,57
	23806,23	1	0,09
	23966,44	3	0,74
$5f^5 6d7s7p$	24231,1	2	0,48
$5f\,6d7s7p$	24287,85	3	0,60
$5f\,6d7s7p$	24582,64	2	0,64
	24753,66	4	0,99
	24950,95	3	0,83
	25125,6	1	0,31
	25160,67	3	0,81
	25208,50	2	0,49
	25275,60	1	0,75
	25605,6	4	1,17
	25774,3	6	0,92
	25979,5	1	1,28
$5f^5 6d7s7p$	26093,6	1	−0,08
$(5f^5 6d7s7p)^*$	26205,61	3	0,68
	26290,4	5	1,13
$5f^5 6d7s7p$	26350,88	4	0,80
	26361,05	5	0,79
$(5f^6 6d7s)^*$	26407,43	2	0,96
	26431,12	3	0,79
	26449,54	3	0,92
	27311,4	5	1,04
	27558,5	0	–
	27597,51	4	0,92
	27728,76	3	1,05
	27972,73	4	1,01
	28118,09	3	1,26
	28135,8	2	1,11
	28295,3	4	1,14
$(5f^5 6d7s7p)^*$	28496,95	4	0,80
	28538,2	7	1,08
$5f^5 6d7s7p$	28733,07	4	1,04
$5f^6 6d7s$	28740,59	3	0,94
$5f^6 6d7s$	28793,9	3	1,11
$5f^5 6d7s7p$	28834,57	5	0,99
$5f^6 6d7s$	28906,28	5	1,16

Table 1 (continued)

Electron configuration and spectroscopic notation	E, см$^{-1}$	J	g
$5f^5 6d7s7p$	29009,52	4	0,72
$(5f^6 6d7s)^*$	29204,37	5	0,84
$5f^5 6d7s7p$	29554,57	3	0,82
	29625,01	2	0,89
	29645,7	1	0,69
	29854,47	1	1,09
	29886,18	3	1,27
$5f^5 6d7s7p$	30016,44	2	1,13
	30083,16	5	1,16
	30113,3	6	1,04
	30134,05	3	1,20
	30318,27	2	0,95
	30371,9	3	0,65
$5f^6 6d7s7p$	30394,99	4	0,92
$5f^5 6d7s7p$	30397,00	5	1,02
	30461,4	5	0,99
	30544,2	3	0,97
	30650,0	0	–
	30714,1	4	1,14
$5f^6 6d7s$	30764,3	6	0,98
	30779,59	3	0,88
$5f^6 6d7s$	30875,90	4	1,07
	31086,56	5	0,82
	31198,61	3	1,10
	31377,17	4	0,95
$5f^6 6d7s7p$	31413,21	3	0,75
	31451,71	4	1,06
	31471,48	1	2,20
	31535,98	5	1,02
$5f^6 7s8s$	31572,6	1	2,44
	31697,76	4	1,17
$5f^6 6d7s$	31820,64	4	1,24
	31984,7	3	1,10
$5f^6 6d7s$	32017,55	4	1,04
	32044,8	1	0,78
	32066,63	2	0,90
	32103,77	4	1,02
	32637,1	3	0,82
$5f^5 6d7s7p$	32669,04	3	1,00
	32809,86	4	0,89
	32869,21	5	0,92
	32968,88	4	1,09
	33033,78	3	0,92
	33089,0	5	1,08
$5f^5 6d7s7p$	33321,00	5	0,38
$5f^6 6d7s$	33418,71	5	0,86
	33490,78	5	1,08
	33498,00	3	0,78
	33564,03	1	0,34
	34006,65	0	–
$5f^5 6d7s7p$	34042,04	4	0,80
	34429,90	3	0,85
	34479,52	4	0,93
	34594,32	3	1,19
	34661,1	4	0,09
	34735,21	3	0,85
	34741,2	5	1,06
	34888,21	5	1,04
	34906,54	5	0,91
$5f^5 6d7s7p$	34920,33	3	0,97
	35054,54	3	1,00
	35070,15	5	0,86
$5f^5 6d7s7p$	35185,49	1	0,91
	35198,1	3	1,07
	35766,36	4	1,06
$5f^5 6d7s7p$	36021,15	3	1,05
	36170,13	4	0,94
	36204,36	3	1,20
	36254,79	5	1,04
	36291,92	3	0,99
	36420,3	5	1,04
	36436,31	3	1,10
	36528,02	3	0,93
	36609,93	2	1,03
	36627,80	4	1,01
	36677,0	4	1,15
$5f^6 6d7s$	36727,62	3	0,91
	37129,65	5	1,00
	37803,32	3	1,11
	38034,97	6	1,12
	38199,2	6	1,06
	38339,56	4	1,07
	38369,57	4	1,07
	38463,04	1	0,74

Table 1 (continued)

Electron configuration and spectroscopic notation	E, cm^{-1}	J	g	Electron configuration and spectroscopic notation	E, cm^{-1}	J	g
	39182,1	2	1,02		39507,54	3	0,86
$5f^5 6d7s7p$	39237,26	2	1,21		39981,22	3	0,88

N.B. The asterisks denote levels which may belong to configurations $5f^6 6d7s$ and $5f^5 6d7s7p$.

Table 2. Odd levels

Electron configuration and spectroscopic notation	E, cm^{-1}	J	g	Electron configuration and spectroscopic notation	E, cm^{-1}	J	g
$5f^5 6d7s^2$ $(5/2, 3/2)^\circ$	6313,65	4	0,48	$5f^5 6d7s^2$ $(5/2, 5/2)^\circ$	14853,14	4	0,83
$5f^5 6d7s^2$ $(5/2, 3/2)^\circ$	8767,90	2	0,36	$5f^5 6d^2 7s$	14911,82	4	0,46
$5f^5 6d7s^2$ $(7/2, 3/2)^\circ$	9386,60	5	0,78	$5f^5 6d7s^2$	15249,43	2	0,72
$5f^5 6d7s^2$ $(5/2, 3/2)^\circ$	9724,14	3	0,43	$5f^5 6d7s^2$	15406,99	1	0,90
$5f^5 6d7s^2$ $(5/2, 3/2)^\circ$	10486,70	1	0,36	$5f^5 6d7s^2$	15856,78	1	1,13
$5f^5 6d7s^2$ $(5/2, 5/2)^\circ$	11746,92	0	–	$5f^5 6d^2 7s$	16520,95	5	0,86
$5f^5 6d7s^2$ $(7/2, 3/2)^\circ$	11840,48	3	0,80	$5f^5 6d7s^2$	16734,15	2	0,94
$5f^5 6d7s^2$ $(7/2, 3/2)^\circ$	12159,21	4	0,84	$5f^6 7s7p$	17046,19	1	1,48
$5f^5 6d7s^2$ $(5/2, 5/2)^\circ$	12177,69	1	0,51	$5f^5 6d7s^2$	17500,98	1	2,22
$5f^5 6d7s^2$ $(7/2, 3/2)^\circ$	12322,38	2	0,99	$5f^5 6d7s^2$	17615,24	2	1,43
$5f^5 6d7s^2$ $(9/2, 3/2)^\circ$	12351,29	6	1,00	$5f^5 6d^2 7s$	18045.76	4	0,71
$5f^5 6d7s^2$ $(5/2, 5/2)^\circ$	13517,45	2	0,92	$5f^5 6d7s^2$	18346,85	2	1,54
$5f^5 6d7s^2$ $(5/2, 5/2)^\circ$	13726,44	3	1,21		19203,30	2	1,01
$5f^5 6d7s^2$ $(5/2, 5/2)^\circ$	14291,85	5	0,96	$5f^5 6d7s^2$	19281,67	2	1,83
	14416,06	1	0,68	$5f^5 6d7s^2$	19426,4	3	1,40
				$5f^6 7s7p$	19959,18	1	0,72
				$5f^6 7s7p$	20065,00	3	1,00
					20146,45	1	0,50
					20163,22	1	1,05
				$5f^6 7s7p$	20385,32	2	1,91
				$5f^6 7s7p$	20425,77	1	1,29
					20654,76	1	0,20
				$5f^6 7s7p$	20709,53	3	1,25
				$5f^6 7s7p$	21031,32	1	
				$5f^5 6d7s^2$	21227,69	4	
					21307,49	1	2,39
				$5f^5 6d7s^2$	21337,38	4	1,15
				$5f^6 7s7p$	21420,83	3	1,65

Table 2 (continued)

Electron configuration and spectroscopic notation	E, cm^{-1}	J	g	Electron configuration and spectroscopic notation	E, cm^{-1}	J	g
$5f^6 6d7s^2$	21515,04	1	1,16	$(5f^6 7s7p)$*	26633,43	1	1,12
$(5f^6 7s7p)$*	22176,35	1	1,10	$5f^5 6d7s^2$	26735,37	2	1,05
*	22417,06	2	1,62		27124,86	2	1,19
$5f^6 7s7p$	22429,9	4	1,31	$5f^6 7s7p$	27196,31	3	
	22509,42	5	1,30	$5f^6 7s7p$	27216,29	5	1,17
	22705,21	1			27257,18	2	1,13
	22837,05	3	1,04	$(5f^6 7s7p)$*	27491,13	2	
$5f^5 6d7s^2$	22849,11	1		$(5f^6 7s7p)$*	27536,17	3	
	23037,24	1	0,88	$5f^6 7s7p$	27643,64	4	1,30
	23125,71	2	1,42	$(5f^6 7s7p)$*	27651,16	2	
$5f^6 7s7p$	23274,81	4	1,60		27755,98	3	
$5f^5 6d7s^2$	23416,58	2	1,30		27887,95	1	0,86
	23720,70	3			27903,34	2	1,27
$5f^6 7s7p$	23766,31	1	2,14	$5f^6 7s7p$	27979,14	2	1,21
	23808,34	2			28210,07	2	0,86
$5f^5 6d7s^2$	23909,47	5	1,25	$5f^6 7s7p$	28268,32	1	1,26
$(5f^6 7s7p)$*	24012,26	6	1,25		28368,43	3	0,84
$5f^6 7s7p$	24091,25	3	1,20		28446,03	1	0,87
	24123,19	2		$5f^6 7s7p$	28471,04	2	1,08
	24158,74	2	1,24		28513,47	5	1,21
	24456,61	3	0,84		28565,95	2	0,96
$(5f^6 7s7p)$*	24653,34	1	0,82		28595,09	6	1,15
$(5f^6 7s7p)$*	24751,46	1	0,69		28722,24	3	
	24758,8	6	1,77		28738,97	1	1,94
$5f^5 6d7s^2$	24903,72	2		$5f^5 6d7s^2$	28906,23	3	1,21
$5f^6 7s7p$	25064,67	3	0,13	$5f^6 7s7p$	28951,82	5	1,26
	25121,89	1	1,44	$5f^6 7s7p$	29037,13	3	0,98
$5f^6 7s7p$	25328,98	3	1,32		29233,57	4	
$(5f^6 7s7p)$*	25397,17	1	0,78		29295,23	4	
$5f^6 7s7p$	25617,50	2			29315,30	3	
$(5f^6 7s7p)$*	25660,76	1	1,23		29571,30	1	
$(5f^6 7s7p)$*	25828,09	4	1,32		29643,45	1	
$5f^6 7s7p$	25870,69	2	1,18		29663,42	3	1,24
$5f^6 7s7p$	25921,01	1			29810,88	3	1,10
$5f^6 7s7p$	25959,82	1	1,01		29881,27	2	
	28008,97	3	0,87		30066,33	1	0,50
	26105,84	2			30131,43	3	1,19
	26208,91	3		$5f^6 7s7p$	30361,80	2	
	26250,12	1	1,26		30499,22	4	
	26261,81	2			30553,98	4	
	26317,74	4	1,15		30670,94	1	
$5f^6 7s7p$	26572,29	2	0,95		30681,25	2	

Table 2 (continued)

Electron configuration and spectroscopic notation	E, cm^{-1}	J	g
	30770,13	2	
	30899,50	5	1,09
	30929,42	1	2,26
	30974,63	3	1,05
	30984,09	1	1,10
	30997,23	5	1,22
	31115,67	4	
	31151,88	2	
	31162,62	1	1,30
	31233,32	4	1,12
	31343,38	4	1,12
	31358,26	4	1,16
	31505,35	5	
	31657,04	2	
	31724,83	2	
	31808,23	3	
	31829,88	3	
	32137,80	2	
	32263,21	4	1,17
	32552,32	2	0,98
$5f^{6}7s7p$	32728,56	3	
	32749,49	2	1,15
	32878,39	5	1,42
	32903,77	4	1,13
	32930,79	3	1,19
	32954,86	3	1,08
	32982,02	5	
	32985,11	2	0,77
	32988,53	3	1,16
$5f^{6}7s7p$	33028,81	2	1,00
	33070,63	2	0,67
	33075,84	2	2,31
	33507,70	2	1,16
	33558,49	4	
	33940,99	3	
	34497,28	3	
	35785,30	1	0,52
	36107,88	7	1,19

N.B. The asterisks denote levels which may belong to configurations $5f^{5}6d7s^{2}$ and $5f^{6}7s7p$.

Table 3. Classified spectral lines of Pu I

λ, Å	I	Transition
25164,9 *P*		$^{9}H_{1} - 17500^{\circ}_{1}$
24964,0		$^{9}H_{2} - 18346^{\circ}_{2}$
24793,0		$22417^{\circ}_{2} - 26449_{3}$
24683,9 *P*		$(5/2,5/2)^{\circ}_{3} - 17776_{2}$
24663,0 *P*		$^{7}F_{6} - 14291^{\circ}_{5}$
24646,5		$26261^{\circ}_{2} - 30318_{2}$
24603,8		$23909^{\circ}_{5} - 27972_{4}$
24587,8 *P*		$^{7}F_{4} - 11840^{\circ}_{3}$
24544,2		$25160_{3} - 29233^{\circ}_{4}$
24461,4 *P*		$^{9}H_{1} - 17615^{\circ}_{2}$
23967,1		$(5/2,5/2)^{\circ}_{3} - 17897_{3}$
23555,2		$21031^{\circ}_{1} - 25275$
23472,6 *P*		$(5/2,5/2)^{\circ}_{2} - 17776_{2}$
23448,1		$26290_{5} - 30553^{\circ}_{4}$
23269,0		$\{31724^{\circ}_{2} - 36021_{3}$; $28513^{\circ}_{5} - 32809_{4}$
23209,4		$16520^{\circ}_{5} - 20828_{4}$
23186,8		$28722^{\circ}_{3} - 33033_{3}$
22822,9 *P*		$(5/2,5/2)^{\circ}_{2} - 17897_{3}$
22800,5 *P*		$^{7}F_{4} - 12159^{\circ}_{4}$
22722,2		$17776_{2} - 22176^{\circ}_{1}$
22701,3		$23806_{1} - 28210^{\circ}_{2}$
22146,8		$23129_{5} - 27643^{\circ}_{4}$
22065,8		$27536^{\circ}_{3} - 32066_{2}$

Table 3 (continued)

λ, Å	I	Transition
21910,0		$28471^{\circ}_{2} - 33033_{2}$
21834,9		$21515^{\circ}_{1} - 26093_{1}$
21649,0 *P*		$(5/2,3/2)^{\circ}_{3} - {}^{9}H_{2}$
21415,4		$(5/2,3/2)^{\circ}_{1} - 18539_{2}$
21025,6		$26361_{5} - 31115^{\circ}_{4}$
21001,1 *P*		$(5/2,3/2)^{\circ}_{2} - {}^{9}H_{1}$
20931,5		$23720^{\circ}_{3} - 28496_{4}$
20865,2		$21417_{4} - 26208^{\circ}_{3}$
20772,8 *P*		$(5/2,5/2)^{\circ}_{3} - 18539_{2}$
20748,6		$\{28740_{3} - 33558^{\circ}_{3}$; $32985^{\circ}_{2} - 37803_{3}$
20747,3 *P*		$^{9}H_{1} - 18346^{\circ}_{2}$
20580,1		$25208_{2} - 30066^{\circ}_{1}$
20565,0 *P*		$^{9}H_{2} - 19203^{\circ}_{2}$
20417,0		$16520^{\circ}_{5} - 21417$
20273,4		$27972_{4} - 32903^{\circ}_{4}$
20238,9 *P*		$^{9}H_{2} - 19281^{\circ}_{2}$
20063,0 *P*		$(7/2,3/2)^{\circ}_{2} - 17305_{2}$
20024,8 *P*		$(5/2,5/2)^{\circ}_{3} - 18718_{2}$
19908,4 *P*		$(5/2,5/2)^{\circ}_{2} - 18539_{2}$
19900,0		$21337^{\circ}_{4} - 26361_{5}$
19887,2		$28471^{\circ}_{2} - 33498_{3}$
19785,5		$32982^{\circ}_{5} - 38334_{6}$
19553,9		$^{7}F_{5} - 14291^{\circ}_{5}$
19497,3		$(5/2,5/2)^{\circ}_{1} - 17305_{2}$
19454,6		$31115^{\circ}_{4} - 36254_{5}$
19433,2		$26361_{5} - 31505^{\circ}_{5}$
19220,0 *P*		$(5/2,5/2)^{\circ}_{2} - 18718_{2}$
18548,8		$28118_{3} - 33507^{\circ}_{2}$
18429,7 *P*		$^{7}F_{2} - 9724^{\circ}_{3}$
18394,1 *P*		$(7/2,3/2)^{\circ}_{3} - 17305_{2}$
18329,5 *P*		$(7/2,3/2)^{\circ}_{2} - 17305_{2}$
18090,4		$19426^{\circ}_{3} - 24950_{3}$
17935,1 *P*		$(5/2,3/2)^{\circ}_{2} - {}^{9}H_{2}$
17930,9 *P*		$(7/2,3/2)^{\circ}_{1} - 17897_{3}$
17855,8 *P*		$(5/2,5/2)^{\circ}_{1} - 17776_{2}$
17798,8 *P*		$^{9}H_{2} - 19959^{\circ}_{1}$
17742,8 *P*		$^{5}D_{0} - 15406^{\circ}_{1}$
17619,4 *P*		$^{7}F_{5} - 14853^{\circ}_{4}$
17616,0		$^{9}H_{1} - 19203^{\circ}_{2}$
17551,9 *P*		$^{7}F_{3} - 11840^{\circ}_{3}$
17468,7 *P*		$^{9}H_{2} - 20065^{\circ}_{3}$
17439,1 *P*		$^{7}F_{5} - 14911^{\circ}_{4}$
17421,0 *P*		$(7/2,3/2)^{\circ}_{3} - 17897_{3}$
17376,3 *P*		$^{9}H_{1} - 19281^{\circ}_{2}$
17223,6 *P*		$^{9}H_{2} - 20146^{\circ}_{1}$
17173,9 *P*		$^{9}H_{2} - 20163^{\circ}_{1}$
16897,2		$14911^{\circ}_{4} - 20828_{4}$
16841,5 *P*		$(7/2,3/2)^{\circ}_{3} - 17776_{3}$
16796,7 *P*		$^{7}F_{4} - 13726^{\circ}_{3}$
16731,0		$(5/2,5/2)^{\circ}_{4} - 20828_{4}$
16713,2		$20425^{\circ}_{1} - 26407_{2}$
16621,1 *P*		$^{7}F_{3} - 12159^{\circ}_{4}$
16543,0		$^{9}H_{2} - 20395^{\circ}_{2}$
16504,8		$(7/2,3/2)^{\circ}_{3} - 17897_{3}$
16459,7		$30553^{\circ}_{4} - 36627_{4}$
16452,6		$\{14911^{\circ}_{4} - 20988_{4}$; $32263^{\circ}_{4} - 38339_{4}$
16433,1		$^{9}H_{2} - 20425^{\circ}_{1}$
16431,1 *P*		$^{5}D_{0} - 15856^{\circ}_{1}$
16295,5 *P*		$(5/2,5/2)^{\circ}_{4} - 14853_{4}$
16182,1 *P*		$^{7}F_{3} - 12322^{\circ}_{2}$
16158,2 *P*		$^{7}F_{2} - 10486^{\circ}_{1}$
16129,9		$28722^{\circ}_{3} - 34920_{3}$
16081,2 *P*		$(7/2,3/2)^{\circ}_{2} - 18539_{2}$
15912,5 *P*		$^{7}F_{6} - 16520^{\circ}_{5}$
15837,2		$^{9}H_{2} - 20654^{\circ}_{1}$
15712,2		$(5/2,5/2)^{\circ}_{1} - 18539,2$
15700,8		$^{9}H_{2} - 20709^{\circ}_{3}$
15636,8		$24287_{3} - 30681^{\circ}_{2}$
15629,2 *P*		$(7/2,3/2)^{\circ}_{2} - 18718_{2}$
15545,7 *P*		$^{9}H_{1} - 19959^{\circ}_{1}$
15475,4		$26208^{\circ}_{3} - 32669_{3}$
15377,2		$16520^{\circ}_{5} - 23022_{5}$

Table 3 (continued)

λ, A°	I	Transition
15339,6 P		$^7F_4 - 14291^{\circ}_5$
15284,1		$(5/2,5/2)^{\circ}_1 - 18718_2$
		$(5/2,5/2)^{\circ}_5 - 20828_4$
15232,5		$26105^{\circ}_2 - 32669_3$
15229,6		$^7F_1 - 8767^{\circ}_2$
		$(5/2,5/2)^{\circ}_4 - 21417_4$
15127,6		$16520^{\circ}_5 - 23129_5$
15105,8 P		$^9H_1 - 20146_1$
15067,6 P		$^9H_1 - 20163_1$
14980,3		$27755^{\circ}_3 - 34429_3$
14945,5		$^9H_2 - 21031^{\circ}_1$
14925,5 P		$(5/2,5/2)^{\circ}_5 - 20988_4$
14924,3 P		$(7/2,5/2)^{\circ}_3 - 18532_2$
14745,9		$26205_3 - 32985^{\circ}_2$
14694,0		$23966_3 - 30770^{\circ}_2$
14676,6		$19281^{\circ}_2 - 26093_1$
14662,3		$(5/2,3/2)^{\circ}_1 - 17305_2$
14629,0		$31505^{\circ}_5 - 38339_4$
14579,5		$^9H_2 - 20385^{\circ}_2$
14534,3 P		$(7/2,3/2)^{\circ}_3 - 18718_2$
14494,4		$^9H_1 - 20425^{\circ}_1$
14427,4		$25208_2 - 32137^{\circ}_2$
14353,0		$^9H_2 - 21307^{\circ}_1$
14123,2 P		$^7F_4 - 14853^{\circ}_4$
14122,8 P		$^9H_2 - 21420^{\circ}_3$
14029,9 P		$(5/2,5/2)^{\circ}_5 - 21417_4$
14028,7		$^9H_1 - 20654^{\circ}_1$
14007,1 P		$^7F_4 - 14911^{\circ}_4$
13937,4 P		$^9H_2 - 21515^{\circ}_1$
13881,3		$18718_2 - 25921^{\circ}_1$
13744,4 P		$^5D_0 - 17046^{\circ}_1$
13714,1		$(5/2,3/2)^{\circ}_1 - 17776_2$
13616,9 P		$^7F_5 - 16520^{\circ}_5$
13559,2 P		$^7F_3 - 13517^{\circ}_2$
13366,9 P		$14911_4 - 21417_4$
13324,6		$^9H_1 - 21031^{\circ}_1$
13269,0		$21417_4 - 28951^{\circ}_5$
13257,5		$^7F_2 - 11840^{\circ}_3$
13249,9		$17615^{\circ}_2 - 25160_3$
13200,5		$22509^{\circ}_5 - 30083_5$
13187,1		$(5/2,3/2)^{\circ}_3 - 17305_2$
13185,4 P		$^7F_3 - 13726^{\circ}_3$
13030,9		$21337^{\circ}_4 - 29009_4$
12985,1		$31808^{\circ}_3 - 39507_3$
12935,6 P		$^5D_0 - 17500^{\circ}_1$
12851,6		$^9H_1 - 21307^{\circ}_1$
12789,3		$17305_9 - 25121^{\circ}_1$
12760,9 P		$^9H_2 - 22176^{\circ}_1$
12689,9		$^7F_2 - 12177^{\circ}_1$
12517,3 P		$^9H_1 - 21515^{\circ}_1$
12461,1 P		$^7F_2 - 12322^{\circ}_2$
12445,3		$26008^{\circ}_3 - 34042_4$
12422,2		$26449_3 - 34497^{\circ}_3$
12415,4		$(5/2,3/2)^{\circ}_3 - 17776_2$
		$(5/2,3/2)^{\circ}_1 - 18539_2$
12380,7		$^9H_2 - 22417^{\circ}_2$
12326,6		$14911^{\circ}_4 - 23022_5$
12252,4		$28368^{\circ}_3 - 36528_3$
12231,2		$(5/2,3/2)^{\circ}_3 - 17897_3$
12165,5 P		$14911^{\circ}_4 - 23129_5$
12144,4		$(5,2,3/2)^{\circ}_1 - 18718_2$
12079,2 P		$(5/2,5/2)^{\circ}_4 - 23129_5$
12069,4		$^7F_1 - 10486^{\circ}_1$
11975,8		$26572^{\circ}_2 - 34920_3$
11970,2		$15249^{\circ}_2 - 23601_1$
11953,9 P		$^9H_2 - 22705^{\circ}_1$
11922,6		$26208^{\circ}_3 - 34594_3$
11784,8		$23022_5 - 31505^{\circ}_5$
11767,4 P		$^9H_2 - 22837^{\circ}_3$
11751,7 P		$^9H_2 - 22849^{\circ}_1$
11710,3		$(5/2,3/2)^{\circ}_2 - 17305_2$
11697,8		$19426^{\circ}_3 - 27972_4$
11654,9		$24091^{\circ}_3 - 32669_3$
11560,4		$^9H_1 - 22176^{\circ}_1$

Table 3 (continued)

λ, A°	I	Transition
11547,6		$18539_2 - 27196^{\circ}_3$
11531,9		$(7/2,3/2)^{\circ}_4 - 20828_4$
11522,5		$29663^{\circ}_3 - 38339_4$
11502,1		$19426^{\circ}_3 - 28118_3$
11497,5 P		$^9H_2 - 23037^{\circ}_1$
11479,6 P		$^7F_3 - 14853^{\circ}_4$
11479,2		$21307^{\circ}_1 - 30016_2$
11457,2		$15856^{\circ}_1 - 24582_2$
11451,3		$(5/2,5/2)^{\circ}_5 - 23022_5$
11430,4 P		$^7F_4 - 16520^{\circ}_5$
11402,7 P		$^7F_2 - 14911^{\circ}_4$
11381,7 P		$^9H_2 - 23125^{\circ}_2$
11341,5		$(5/2,3/2)^{\circ}_3 - 18539_2$
11323,3 P		$(7/2,3/2)^{\circ}_4 - 20988_4$
11312,2		$(5/2,5/2)^{\circ}_5 - 23129_5$
11275,1 P		$^7F_5 - 18045^{\circ}_4$
11247,0 P		$^9H_1 - 22417^{\circ}_2$
11122,9 P		$(7/2,3/2)^{\circ}_3 - 20828_4$
11114,8		$(5/2,3/2)^{\circ}_3 - 18718_2$
11097,6		$(5/2,3/2)^{\circ}_2 - 17776_2$
11037,4		$21337^{\circ}_4 - 30394_4$
11016,8 P		$^9H_2 - 23416^{\circ}_2$
10979,8 P		$^7F_3 - 15249^{\circ}_2$
10970,0		$(5/2,5/2)^{\circ}_4 - 23966_3$
10950,2		$(5/2,3/2)^{\circ}_2 - 17897_3$
10928,7 P		$(7/2,3/2)^{\circ}_3 - 20988_4$
10893,9 P		$^9H_1 - 22705^{\circ}_1$
10845,6		$^7F_2 - 13517^{\circ}_2$
10798,2		$(7/2,3/2)^{\circ}_4 - 21417_4$
10746,6		$25617^{\circ}_2 - 34920_3$
10734,7		$23720^{\circ}_3 - 33033_3$
10725,6 P		$^9H_1 - 22849^{\circ}_1$
10711,5		$15249^{\circ}_2 - 24582_2$
10679,0		$20654^{\circ}_1 - 30016_2$
10662,5		$14911^{\circ}_4 - 24287_3$
		$30131^{\circ}_3 - 39507_3$
10659,6 P		$^9H_2 - 23720^{\circ}_3$
10627,9		$24091^{\circ}_3 - 33498_3$
10608,2		$^9H_2 - 23766^{\circ}_1$
10605,1 P		$^7F_2 - 13726^{\circ}_3$
10596,4		$(5/2,5/2)^{\circ}_4 - 24287_3$
10560,9 P		$^9H_2 - 23808^{\circ}_2$
10513,5 P		$^9H_1 - 23037^{\circ}_1$
10475,6		$^7F_1 - 11746^{\circ}_0$
		$23125^{\circ}_2 - 32669_3$
10438,8		$(7/2,3/2)^{\circ}_3 - 21417_4$
10416,5 P		$^9H_1 - 23125^{\circ}_2$
10342,7		$19959^{\circ}_1 - 29625_2$
10334,7		$16734^{\circ}_2 - 26407_2$
10254,6 P		$^9H_2 - 24091^{\circ}_3$
10231,5		$(5/2,3/2)^{\circ}_2 - 18539_2$
10220,9 P		$^9H_2 - 24123^{\circ}_2$
10183,9 P		$^9H_2 - 24158^{\circ}_2$
10157,9 P		$14911^{\circ}_4 - 24753_4$
10111,9		$26317^{\circ}_4 - 36204_3$
10110,2 P		$^9H_1 - 23416^{\circ}_9$
10097,8		$(5/2,5/2)^{\circ}_4 - 24753_4$
10046,7		$(5/2,3/2)^{\circ}_2 - 18718_2$
		$24091^{\circ}_3 - 34042_4$
10038,4		$15249^{\circ}_2 - 25208_2$
10023,2		$^7F_1 - 12177^{\circ}_1$
9958,294 P		$14911_4 - 24950_3$
9914,161 P		$(5/2,5/2)^{\circ}_2 - 23601_1$
9900,424		$(5/2,5/2)^{\circ}_4 - 24950_3$
9884,019 P		$^9H_2 - 24456^{\circ}_3$
9882,154 P		$^7F_2 - 14416^{\circ}_1$
9879,857 P		$^7F_1 - 12322^{\circ}_2$
9813,990 P		$^5D_0 - 19959^{\circ}_1$
9764,817 P		$^9H_1 - 23766^{\circ}_1$
9762,936 P		$(5/2,5/2)^{\circ}_3 - 23966_3$
9754,519 P		$14911^{\circ}_4 - 25160_3$
9733,264 P		$^7F_4 - 18045^{\circ}_4$
9724,892 P		$^9H_1 - 23808^{\circ}_2$
9716,660 P		$(5/2,5/2)^{\circ}_2 - 23806_1$
9698,985 P		$(5/2,5/2)^{\circ}_4 - 25160_3$

Table 3 (continued)

λ, Å	I	Transition	λ, Å	I	Transition
9695,538	P	$^9H_2 - 24653^o_1$	8987,693	P	$27216^o_5 - 38339_4$
9636,833,	P	$^5D_0 - 20146^o_1$	8986,854	P	$18539_2 - 29663^o_3$
9621,278	P	$^5D_0 - 20163^o_1$	8986,239	P	$^9H_1 - 24653^o_1$
9604,049	P	$^9H_2 - 24751^o_1$	8979,347	P	$20065^o_3 - 31198_3$
9581,883	P	$17776_2 - 28210^o_2$	8907,676	P	$^9H_1 - 24751^o_1$
9567,678	P	$(5/2,5/2)^o_2 - 23966_3$	8906,628	P	$(5/2,5/2)^o_3 - 24950_3$
9555,954	P	$(5/2,5/2)^o_5 - 24753_4$	8879,440	P	$^5D_0 - 21031^o_1$
9547,923	P	$17897_3 - 28368^o_3$	8875,396	P	$(5/2,5/2)^o_3 - 20988_4$
9533,272	P	$^7F_0 - 10486^o_1$	8866,383	P	$^9H_2 - 25617^o_2$
9516,95	P	$(5/2,5/2)^o_3 - 24231_2$	8864,261	P	$18346^o_2 - 29625_2$
9465,838	P	$(5/2,5/2)^o_3 - 24287_3$	8863,721	P	$(7/2,3/2)^o_2 - 23601_1$
9465,593	P	$^9H_2 - 24903^o_2$	8851,997	P	$14911^o_4 - 26205_3$
9440,486	P	$^7F_3 - 16734^o_9$	8843,849	P	$23125^o_2 - 34429_3$
9435,898	P	$^9H_1 - 24123^o_2$	8838,516	P	$21417_4 - 32728^o_3$
9404,340	P	$^9H_1 - 24158^o_2$	8836,33	P	$(5/2,5/2)^o_5 - 25605_4$
9384,161	P	$^5D_0 - 20425^o_1$	8836,260	P	$^7F_1 - 13517^o_2$
9368,71	P	$(9/2,3/2)^o_6 - 23022_5$	8832,496	P	$^9H_2 - 25660^o_1$
9348,69	P	$14911^o_4 - 25605_4$	8831,880	P	$23274^o_4 - 34594_3$
9348,062	P	$17776_2 - 28471^o_2$	8820,713	P	$23720^o_3 - 35054_3$
9331,33	P	$(5/2,5/2)^o_2 - 24231_2$	8814,243	P	$18539_2 - 29881^o_2$
9323,538	P	$^9H_2 - 25064^o_3$	8809,543	P	$20065^o_3 - 31413_3$
9297,61		$(5/2,5/2)^o_4 - 25605_4$	8806,238	P	$(5/2,5/2)^o_4 - 26205_3$
9282,159	P	$(5/2,5/2)^o_2 - 24287_3$	8788,448	P	$^9H_1 - 24903^o_2$
9275,39	P	$(9/2,3/2)^o_6 - 23129_5$	8786,07		$14911^o_4 - 26290_5$
9274,022	P	$^9H_2 - 25121^o_1$	8773,543	P.	$17305_2 - 28446^o_1$
9208,798	P	$(5/2,5/2)^o_3 - 24582_2$	8759,878	P	$18718_2 - 30131^o_3$
9203,03	P	$(7/2,3/2)^o_4 - 23022_5$	8751,428	P	$(5/2,5/2)^o_1 - 23601_1$
9186,695	P	$^5D_0 - 20654^o_1$	8743,826	P	$(5/2,5/2)^o_2 - 24950_3$
9130,043	P	$^7F_2 - 15249^o_2$	8743,268	P	$(5/2,5/2)^o_3 - 25160_3$
9113,002	P	$(7/2,3/2)^o_4 - 23129_5$	8740,92	P	$(5/2,5/2)^o_4 - 26290_5$
9099,217	P	$^9H_2 - 25328^o_3$	8739,577	P	$14911^o_4 - 26350_4$
9065,980	P	$(5/2,5/2)^o_3 - 24753_4$	8737,414	P	$(7/2,3/2)^o_5 - 20828_4$
9043,073	P	$^9H_2 - 25397^o_1$	8731,814	P	$14911^o_4 - 26361_5$
9034,872	P	$(5/2,5/2)^o_2 - 24582_2$	8729,869	P	$16520^o_5 - 27972_4$
9025,596	P	$16520^o_5 - 27597_4$	8722,968	P	$21417_4 - 32878^o_5$
9003,008	P	$(5/2,5/2)^o_3 - 20828_4$	8715,348	P	$^7F_3 - 17615^o_2$
9000,527	P	$^7F_2 - 15406^o_1$	8706,846		$(5/2,5/2)^o_3 - 25208_2$
			8706,51	P	$(5/2,5/2)^o_5 - 25774_6$

Table 3 (continued)

λ, Å	I	Transition	λ, Å	I	Transition
8705,489	P	$(7/2,3/2)^o_2 - 23806_1$	8476,112	P	$23125^o_2 - 34920_3$
8694,972	P	$(5/2,5/2)^o_4 - 26350^o_4$	8467,060	P	$(7/2,3/2)^o_4 - 23966_3$
8687,288	P	$(5/2,5/2)^o_4 - 26361_5$	8433,411	P	$(5/2,5/2)^o_0 - 23601_1$
8686,610	P	$18045^o_4 - 29554_3$	8424,506	P	$^9H_2 - 26208^o_3$
8678,699	P	$14911^o_4 - 26431_3$	8423,063	P	$^9H_1 - 25397^o_1$
8671,848	P	$27979^o_2 - 39507_3$	8415,77	P	$(5/2,5/2)^o_3 - 25605_4$
8671,660	P	$^9H_2 - 25870^o_2$	8400,079	P	$^7F_3 - 18045^o_4$
8666,849	P	$^5D_0 - 21307^o_1$	8395,352	P	$^9H_2 - 26250^o_1$
8664,844	P	$14911^o_4 - 26449_3$	8394,94		$(7/2,3/2)^o_2 - 24231_2$
8664,085	P	$17776_2 - 29315^o_3$	8387,119	P	$^9H_2 - 26261^o_2$
8662,000	P	$26261^o_2 - 37803_3$	8355,084	P	$(7/2,3/2)^o_2 - 24287_3$
8657,093	P	$21420^o_3 - 32968_4$	8347,738	P	$16520^o_5 - 28496_4$
8650,239	P	$^7F_2 - 15856_1$	8344,895	P	$27257^o_2 - 39237_2$
8645,802	P	$25064^o_3 - 36627_4$	8334,300	P	$19203^o_2 - 31198_3$
8635,946	P	$19203^o_2 - 30779_3$	8332,02	P	$(5/2,5/2)^o_5 - 26290_5$
8634,712	P	$(5/2,5/2)^o_4 - 26431_3$	8309,610	P	$(7/2,3/2)^o_5 - 21417_4$
8633,975	P	$^9H_2 - 25921^o_1$	8297,458	P	$^7F_5 - 21227^o_4$
8630,100	P	$(5/2,3/2)^o_4 - 17897_3$	8294,19		$(5/2,5/2)^o_1 - 24231_2$
8623,063	P	$^9H_1 - 25121^o_1$	8290,261	P	$(5/2,5/2)^o_5 - 26350_4$
8621,000		$(5/2,5/2)^o_4 - 26449_3$	8290,068	P	$(5/2,5/2)^o_0 - 23806_1$
8617,170	P	$(7/2,3/2)^o_5 - 20988_4$	8283,275	P	$(5/2,5/2)^o_5 - 26361_5$
8615,203	P	$27903^o_2 - 39507_3$	8269,551	P	$^9H_1 - 25617^o_2$
8612,27	P	$(5/2,5/2)^o_2 - 25125_1$	8244,503	P	$(7/2,3/2)^o_3 - 23966_3$
8608,378	P	$23274^o_4 - 34888_5$	8242,681	P	$(7/2,3/2)^o_4 - 24287_3$
8605,132	P	$^9H_2 - 25959^o_1$	8240,065	P	$^9H_1 - 25660^o_1$
8597,170	P	$(5/2,5/2)^o_1 - 23806_1$	8227,20		$15406^o_1 - 27558$
8586,330	P	$(5/2,5/2)^o_2 - 25160_3$	8222,600	P	$^7F_5 - 21337^o_4$
8585,711	P	$(7/2,3/2)^o_2 - 23966_3$	8218,49		$22429^o_4 - 34594_3$
8579,93	P	$^7F_4 - 19426^o_3$	8213,866	P	$24456^o_3 - 36627_4$
8568,880	P	$^9H_2 - 26008^o_3$	8209,481	P	$^7F_0 - 12177^o_1$
8551,202	P	$(5/2,5/2)^o_2 - 25208_2$	8201,318	P	$19281^o_2 - 31471_1$
8549,475	P	$(5/2,3/2)^o_3 - 21417_4$	8192,809	P	$^7F_3 - 18346^o_2$
8515,361	P	$21227^o_4 - 32968_4$	8187,818	P	$19203^o_2 - 31413_3$
8515,249	P	$20988_4 - 32728^o_3$	8186,074	P	$^7F_1 - 14416^o_1$
8513,662	P	$^5D_0 - 21515^o_1$	8174,200	P	$^9H_2 - 26572^o_2$
8502,402	P	$(5/2,5/2)^o_2 - 25275_1$	8154,191	P	$(7/2,3/2)^o_2 - 24582_2$
8498,319	P	$^9H_2 - 26105^o_2$	8148,926	P	$19203^o_2 - 31471_1$

Table 3 (continued)

λ, A°	I	Transition	λ, A°	I	Transition
8146,974 *P*		${}^7F_6 - 22509^{\circ}_{5}$	7857,556 *P*		$(5/2,5/2)^{\circ}_{3} - 26449_3$
8134,148 *P*		${}^7F_4 - 20065^{\circ}_{3}$	7851,114 *P*		${}^9H_1 - 26261^{\circ}_{2}$
8133,85		$19281^{\circ}_{2} - 31572_1$	7845,803 *P*		$(7/2,3/2)^{\circ}_{3} - 24582_2$
8133,538 *P*		${}^9H_2 - 26633^{\circ}_{1}$	7844,442 *P*		$(5/2,5/2)^{\circ}_{4} - 27597_4$
8118,856 *P*		$16520^{\circ}_{5} - 28834_5$	7843,065 *P*		${}^7F_2 - 17046_1$
8103,089 *P*		$27643^{\circ}_{4} - 39981_3$	7820,847 *P*		${}^9H_2 - 27124^{\circ}_{2}$
8102,662 *P*		$17305_2 - 29643^{\circ}_{1}$	7815,393 *P*		$(7/2,3/2)^{\circ}_{4} - 24950_3$
8099,911 *P*		${}^9H_1 - 25870^{\circ}_{2}$	7808,39 *P*		$(7/2,3/2)^{\circ}_{2} - 25125_1$
8090,223 *P*		$26105^{\circ}_{2} - 38463_1$	7787,055 *P*		$(7/2,3/2)^{\circ}_{2} - 25160_3$
8071,847 *P*		$16520^{\circ}_{5} - 28906_5$	7777,375 *P*		${}^9H_2 - 27196^{\circ}_{3}$
8068,40 *P*		$(7/2,3/2)^{\circ}_{3} - 24231_2$	7764,479 *P*		$(5/2,5/2)^{\circ}_{4} - 27728_3$
8067,022 *P*		${}^9H_1 - 25921^{\circ}_{1}$	7758,153		$(7/2,3/2)^{\circ}_{2} - 25208_2$
8066,637 *P*		${}^9H_2 - 26735^{\circ}_{2}$	7755,830 *P*		$(5/2,5/2)^{\circ}_{2} - 26407$
8062,56 *P*		$14911^{\circ}_{4} - 27311_5$	7750,046 *P*		$24903^{\circ}_{2} - 37803_3$
8059,758 *P*		${}^5D_0 - 22176^{\circ}_{1}$	7741,895 *P*		$(7/2,3/2)^{\circ}_{3} - 24753_4$
8059,082 *P*		$(5/2,5/2)^{\circ}_{1} - 24582_2$	7741,602 *P*		$(5/2,5/2)^{\circ}_{2} - 26431_3$
8041,837 *P*		${}^9H_1 - 25959^{\circ}_{1}$	7740,721 *P*		${}^9H_2 - 27257^{\circ}_{2}$
8039,884 *P*		${}^7F_2 - 16734^{\circ}_{2}$	7730,575 *P*		$(5/2,5/2)^{\circ}_{2} - 26449_3$
8039,270 *P*		$18539_2 - 30974^{\circ}_{3}$	7730,169 *P*		${}^5D_0 - 22705^{\circ}_{1}$
8031,618 *P*		$(7/2,3/2)^{\circ}_{3} - 24287_3$	7728,835 *P*		${}^7F_4 - 20709^{\circ}_{3}$
8024,57 *P*		$(5/2,5/2)^{\circ}_{4} - 27311_5$	7721,13 *P*		$(5/2,5/2)^{\circ}_{1} - 25125_1$
8022,15 *P*		$(5/2,5/2)^{\circ}_{2} - 25979_1$	7717,964 *P*		$(7/2,3/2)^{\circ}_{2} - 25275_1$
8011,150 *P*		$(5/2,5/2)^{\circ}_{3} - 26205_3$	7689,327 *P*		$(7/2,3/2)^{\circ}_{4} - 25160_3$
8005,119 *P*		$16520^{\circ}_{5} - 29009_4$	7678,62 *P*		$(5/2,5/2)^{\circ}_{5} - 27311_5$
7987,792 *P*		$17500^{\circ}_{1} - 30016_2$	7672,008 *P*		$(5/2,5/2)^{\circ}_{1} - 25208_2$
7953,045 *P*		$20988_4 - 33558^{\circ}_{4}$	7664,273 *P*		${}^9H_1 - 26572^{\circ}_{2}$
7952,489 *P*		$23720^{\circ}_{3} - 36291_3$	7663,145 *P*		${}^7F_1 - 15249^{\circ}_{2}$
7949,40 *P*		$(5/2,5/2)^{\circ}_{2} - 26093_1$	7655,493 *P*		${}^7F_3 - 19203^{\circ}_{2}$
7948,470 *P*		${}^9H_1 - 26105^{\circ}_{2}$	7654,326 *P*		$14911^{\circ}_{4} - 27972_4$
7937,820 *P*		$(7/2,3/2)^{\circ}_{4} - 24753_4$	7645,102 *P*		${}^5D_0 - 22849^{\circ}_{1}$
7918,963 *P*		$(5/2,5/2)^{\circ}_{3} - 26350_4$	7632,705 *P*		$(5/2,5/2)^{\circ}_{1} - 25275_1$
7916,373 *P*		$(7/2,3/2)^{\circ}_{2} - 24950_2$	7628,482 *P*		${}^9H_1 - 26633^{\circ}_{1}$
7883,650 *P*		$(5/2,5/2)^{\circ}_{3} - 26407_2$	7625,393 *P*		$(7/2,3/2)^{\circ}_{3} - 24950_3$
7880,720 *P*		$14911^{\circ}_{4} - 27597_4$	7623,014 *P*		$(5/2,3/2)^{\circ}_{2} - 23601_1$
7879,194 *P*		$(5/2,5/2)^{\circ}_{2} - 26205_3$	7620,091		$(5/2,5/2)^{\circ}_{4} - 27972_4$
7868,947 *P*		{ $21337^{\circ}_{4} - 34042_4$	7609,825 *P*		${}^7F_3 - 19281^{\circ}_{3}$
		{ $(5/2,5/2)^{\circ}_{3} - 26431_3$	7577,041 *P*		${}^9H_2 - 27536^{\circ}_{3}$
7858,328 *P*		${}^9H_1 - 26250^{\circ}_{1}$	7572,859 *P*		${}^7F_2 - 17500^{\circ}_{1}$

λ, A°	I	Transition	λ, A°	I	Transition
7571,699 *P*		${}^7F_1 - 15406^{\circ}_{1}$	7273,69 *P*		$(5/2,3/2)^{\circ}_{1} - 24231_2$
7570,077 *P*		$14911^{\circ}_{4} - 28118_3$	7262,75 *P*		$(7/2,3/2)^{\circ}_{3} - 25605_4$
7569,601 *P*		${}^9H_1 - 26735^{\circ}_{2}$	7259,52 *P*		$(7/2,3/2)^{\circ}_{2} - 26093_1$
7544,63 *P*		${}^7F_5 - 22429^{\circ}_{4}$	7258,076 *P*		${}^7F_6 - 24012^{\circ}_{6}$
7536,673 *P*		${}^5D_0 - 23037^{\circ}_{1}$	7243,43 *P*		$(5/2,5/2)^{\circ}_{1} - 25979_1$
7536,588 *P*		$(5/2,5/2)^{\circ}_{4} - 28118_3$	7233,242 *P*		$14911^{\circ}_{4} - 28733_4$
7526,95		${}^7F_3 - 19426^{\circ}_{3}$	7229,308 *P*		$14911^{\circ}_{4} - 28740_3$
7513,530 *P*		$(5/2,5/2)^{\circ}_{5} - 27597_4$	7208,843 *P*		${}^9H_2 - 28210^{\circ}_{2}$
7511,576 *P*		${}^9H_2 - 27651^{\circ}_{2}$	7207,262 *P*		$(5/2,5/2)^{\circ}_{3} - 27594_4$
7507,886 *P*		${}^7F_2 - 17615^{\circ}_{2}$	7204,676 *P*		$16520^{\circ}_{5} - 30397_5$
7505,705 *P*		$(5/2,3/2)^{\circ}_{1} - 23806_1$	7202,663 *P*		$(5/2,5/2)^{\circ}_{4} - 28773_4$
7505,333 *P*		$(7/2,3/2)^{\circ}_{2} - 25160_3$	7201,54 *P*		$14911^{\circ}_{4} - 28793_3$
7499,642 *P*		${}^7F_5 - 22509^{\circ}_{5}$	7200,951 *P*		$(7/2,3/2)^{\circ}_{2} - 26205_3$
7487,514 *P*		$20654^{\circ}_{1} - 34006_0$	7198,663 *P*		$(5/2,5/2)^{\circ}_{4} - 28740_3$
7478,480 *P*		$(7/2,3/2)^{\circ}_{3} - 25208_2$	7184,04 *P*		$(5/2,5/2)^{\circ}_{1} - 26093_1$
7472,51 *P*		$(5/2,5/2)^{\circ}_{0} - 25125_1$	7181,609 *P*		${}^7F_3 - 20065_3$
7469,84 *P*		$14911^{\circ}_{4} - 28295_4$	7180,511 *P*		$14911^{\circ}_{4} - 28834_5$
7452,879 *P*		${}^9H_2 - 27755^{\circ}_{3}$	7172,08 *P*		$(9/2,3/2)^{\circ}_{6} - 26290_5$
7447,85 *P*		$(9/2,3/2)^{\circ}_{6} - 25774_6$	7171,21 *P*		$(5/2,5/2)^{\circ}_{4} - 28793_3$
7437,21 *P*		$(5/2,5/2)^{\circ}_{4} - 28295_4$	7159,884 *P*		${}^9H_1 - 27491^{\circ}_{2}$
7434,88 *P*		$(7/2,3/2)^{\circ}_{4} - 25605_4$	7155,968 *P*		$17500^{\circ}_{1} - 31471_1$
7431,151 *P*		${}^7F_4 - 21227^{\circ}_{4}$	7150,374 *P*		$(5/2,5/2)^{\circ}_{4} - 28834_5$
7389,669 *P*		$(5/2,5/2)^{\circ}_{0} - 25275_1$	7144,017 *P*		${}^5D_0 - 23766^{\circ}_{1}$
7380,269 *P*		${}^9H_2 - 27887^{\circ}_{1}$	7143,716 *P*		$14911^{\circ}_{4} - 28906_5$
7371,894 *P*		${}^9H_2 - 27902^{\circ}_{2}$	7139,10 *P*		$(5/2,5/2)^{\circ}_{5} - 28295_4$
7371,052 *P*		${}^7F_4 - 21337^{\circ}_{4}$	7135,913 *P*		$(9/2,3/2)^{\circ}_{6} - 26361_5$
7358,963 *P*		$14911^{\circ}_{4} - 28496_4$	7118,690 *P*		${}^9H_2 - 28268^{\circ}_{1}$
7352,760 *P*		${}^9H_1 - 27124^{\circ}_{2}$	7117,299 *P*		$(7/2,3/2)^{\circ}_{1} - 26205_3$
7331,72 *P*		$(7/2,3/2)^{\circ}_{5} - 23022_5$	7116,858 *P*		${}^7F_2 - 18346^{\circ}_{2}$
7330,944 *P*		${}^9H_2 - 27949^{\circ}_{2}$	7116,757 *P*		$19959^{\circ}_{1} - 34006_0$
7327,312 *P*		$(5/2,5/2)^{\circ}_{4} - 28496_4$	7113,885 *P*		$(5/2,5/2)^{\circ}_{4} - 28906_5$
7325,975 *P*		${}^7F_4 - 21420^{\circ}_{3}$	7097,768 *P*		$(7/2,3/2)^{\circ}_{2} - 26407_2$
7322,256 *P*		${}^7F_1 - 15856^{\circ}_{1}$	7092,410 *P*		${}^7F_5 - 23274^{\circ}_{4}$
7320,18 *P*		$(7/2,3/2)^{\circ}_{2} - 25979_2$	7092,284 *P*		$(5/2,3/2)^{\circ}_{1} - 24582_1$
7312,648 *P*		${}^7F_6 - 23909^{\circ}_{5}$	7091,400 *P*		$14911^{\circ}_{4} - 29009_4$
7307,457 *P*		$(5/2,5/2)^{\circ}_{5} - 27972_4$	7089,64 *P*		$(7/2,3/2)^{\circ}_{4} - 26290_5$
7274,454 *P*		$(7/2,3/2)^{\circ}_{5} - 23129_5$	7088,236 *P*		${}^9H_2 - 28446_1$

Table 3 (continued)

λ, A°	I	Transition	λ, A°	I	Transition
7085,850		$(7/2,3/2)^{\circ}_{2} - 26431_{3}$	6864,486 *P*		$(5/2,3/2)^{\circ}_{3} - 24287_{3}$
7078,901 *P*		$^9H_1 - 27651^{\circ}_{2}$	6864,261 *P*		$^9H_2 - 28906^{\circ}_{3}$
7075,690 *P*		$^9H_2 - 28471^{\circ}_{2}$	6863,809 *P*		$^7F_3 - 20709^{\circ}_{3}$
7062,005 *P*		$(5/2,5/2)^{\circ}_{4} - 29009_{4}$	6862,961 *P*		$(7/2,3/2)^{\circ}_{3} - 26407_{2}$
7044,443 *P*	7	$(7/2,3/2)^{\circ}_{4} - 26350_{4}$	6862,05 *P*		$(5/2,5/2)^{\circ}_{3} - 28295_{4}$
7039,192 *P*	6	$(7/2,3/2)^{\circ}_{4} - 26361_{5}$	6851,818 *P*	4	$(7/2,3/2)^{\circ}_{3} - 26431_{3}$
7037,783 *P*		$(5/2,5/2)^{\circ}_{5} - 28496_{4}$	6847,124 *P*		$(5/2,5/2)^{\circ}_{2} - 28118_{3}$
7034,708 *P*		$(5/2,5/2)^{\circ}_{2} - 27728_{3}$	6843,178 *P*		$(7/2,3/2)^{\circ}_{3} - 26449_{3}$
7028,476 *P*	6	$^9H_2 - 28565^{\circ}_{2}$	6840,664 *P*		$(5/2,5/2)^{\circ}_{5} - 28906_{5}$
7025,596 *P*		$(5/2,5/2)^{\circ}_{1} - 26407_{2}$	6838,83 *P*		$(5/2,5/2)^{\circ}_{2} - 28135_{2}$
7024,18 *P*		$(5/2,5/2)^{\circ}_{0} - 25979_{1}$	6829,21 *P*		$(5/2,3/2)^{\circ}_{1} - 25125_{1}$
7020,070 *P*	6	$^7F_3 - 20385^{\circ}_{2}$	6827,433 *P*		$14911^{\circ}_{4} - 29554_{3}$
7019,401 *P*		$(5/2,3/2)^{\circ}_{3} - 23966_{3}$	6821,54 *P*		$^7F_4 - 22429^{\circ}_{4}$
7017,434 *P*		$(5/2,5/2)^{\circ}_{3} - 27972_{4}$	6812,661 *P*	6	$(5/2,3/2)^{\circ}_{4} - 20988_{4}$
7004,838 *P*		$(7/2,3/2)^{\circ}_{4} - 26431_{3}$	6809,274 *P*		$^9H_1 - 28210^{\circ}_{2}$
6995,809 *P*		$(7/2,3/2)^{\circ}_{4} - 26449_{3}$	6803,116 *P*		$^9H_2 - 29037^{\circ}_{3}$
6994,722 *P*		$14911^{\circ}_{4} - 29204_{5}$	6800,82 *P*		$(5/2,5/2)^{\circ}_{4} - 29554_{3}$
6968,33 *P*	5	$(5/2,5/2)^{\circ}_{0} - 26093_{1}$	6792,678 *P*		$(5/2,5/2)^{\circ}_{5} - 29009_{4}$
6966,121 *P*		$(5/2,5/2)^{\circ}_{4} - 29204_{5}$	6790,773 *P*		$(5/2,3/2)^{\circ}_{1} - 25208_{2}$
6962,167 *P*		$^9H_1 - 27887^{\circ}_{1}$	6786,830 *P*		$^7F_5 - 23909^{\circ}_{5}$
6959,380 *P*		$(7/2,3/2)^{\circ}_{3} - 26205_{3}$	6784,739 *P*	7	$^7F_4 - 22509^{\circ}_{5}$
6954,568 *P*		$^9H_1 - 27903^{\circ}_{2}$	6782,365 *P*		$^9H_1 - 28268^{\circ}_{2}$
6952,087 *P*		$^9H_2 - 28722^{\circ}_{3}$	6768,378 *P*		$(5/2,5/2)^{\circ}_{3} - 28496_{4}$
6946,556 *P*		$(5/2,5/2)^{\circ}_{3} - 28118_{3}$	6759,962 *P*	5	$(5/2,3/2)^{\circ}_{1} - 25275^{\circ}_{1}$
6944,008 *P*		$^9H_2 - 28738^{\circ}_{1}$	6739,801 *P*	7	$^7F_5 - 24012^{\circ}_{6}$
6938,00 *P*		$(5/2,5/2)^{\circ}_{3} - 28135_{2}$	6739,701 *P*		$(5/2,3/2)^{\circ}_{2} - 23601_{1}$
6934,794 *P*	5*R*	$^7F_0 - 14416^{\circ}_{1}$	6735,487 *P*	7	$^7F_1 - 17046^{\circ}_{1}$
6930,357 *P*	6	$17046^{\circ}_{1} - 31471_{1}$	6728,297 *P*	6	$(5/2,3/2)^{\circ}_{3} - 24582_{2}$
6922,711 *P*		$(5/2,5/2)^{\circ}_{5} - 28733_{4}$	6718,169 *P*		$^5D_0 - 24653^{\circ}_{1}$
6918,089 *P*		$^9H_1 - 27979^{\circ}_{2}$	6707,882 *P*	6	$^7F_2 - 19203^{\circ}_{2}$
6891,32 *P*	7	$(5/2,3/2)^{\circ}_{3} - 24231_{2}$	6703,924 *P*		$(5/2,5/2)^{\circ}_{5} - 29204_{5}$
6889,708 *P*	6	$(7/2,3/2)^{\circ}_{3} - 26350_{4}$	6701,569 *P*		$^9H_1 - 28446^{\circ}_{1}$
6887,600 *P*		$(5/2,3/2)^{\circ}_{4} - 20828_{4}$	6690,353 *P*		$^9H_1 - 28471_{2}$
6884,91	6	$^7F_6 - 24758^{\circ}_{6}$	6682,60 *P*		$(9/2,3/2)^{\circ}_{6} - 27311_{5}$
6882,12 *P*	6	$17046^{\circ}_{1} - 31572_{1}$	6676,728 *P*		$^9H_2 - 29315^{\circ}_{3}$
6880,130 *P*	7	$^7F_1 - 16734_{2}$	4218,365	8	$^7F_5 - 32878^{\circ}_{5}$
6874,396 *P*		$(5/2,5/2)^{\circ}_{5} - 28834$	4217,78 *P*		$(7/2,3/2)^{\circ}_{5} - 33089^{\circ}_{5}$

Table 3 (continued)

λ, A°	I	Transition	λ, A°	I	Transition
4215,120	7	$^7F_1 - 25921^{\circ}_{1}$	4151,422	9	$(5/2,3/2)^{\circ}_{4} - 30394_{4}$
4213,856	8	$^7F_5 - 32903^{\circ}_{4}$	4151,073	9	$(5/2,3/2)^{\circ}_{4} - 30397_{5}$
4212,750	5	$^7F_4 - 31505^{\circ}_{5}$	4148,966	8	$(7/2,3/2)^{\circ}_{4} - 36254_{5}$
4211,678	8	$^7F_3 - 29881^{\circ}_{2}$	4148,624	3	$(5/2,5/2)^{\circ}_{5} - 38389_{4}$
4210,572	7	$(5/2,5/2)^{\circ}_{5} - 38034_{6}$	4147,506	2	$(7/2,3/2)^{\circ}_{5} - 33490_{5}$
4208,230	9	$^7F_1 - 25959^{\circ}_{1}$	6676,238 *P*		$14911^{\circ}_{4} - 29886_{3}$
4206,446	9*R*	$^7F_0 - 23766^{\circ}_{1}$	6674,161 *P*		$^5D_0 - 24751^{\circ}_{1}$
4205,898	9	$(5/2,3/2)^{\circ}_{4} - 30083_{5}$	6672,795 *P*	7	$^7F_2 - 19281^{\circ}_{2}$
4205,108	9	$(5/2,3/2)^{\circ}_{3} - 33498_{3}$	6661,882 *P*		$(5/2,5/2)^{\circ}_{3} - 28733_{4}$
4199,994	6	$^7F_5 - 32982^{\circ}_{5}$	6658,546 *P*		$(5/2,5/2)^{\circ}_{3} - 28740_{3}$
4196,899	6	$(5/2,3/2)^{\circ}_{4} - 30134_{3}$	6651,736 *P*	6	$(5/2,3/2)^{\circ}_{3} - 24753_{4}$
4189,609	4	$(7/2,5/2)^{\circ}_{4} - 36021_{3}$	6650,179 *P*		$(5/2,5/2)^{\circ}_{4} - 29886_{3}$
4188,329	8	$(5/2,3/2)^{\circ}_{2} - 32637_{3}$	6648,127 *P*		$^9H_1 - 28565_{2}$
4186,081	2	$(7/2,3/2)^{\circ}_{2} - 36204_{3}$	6647,840 *P*		$(5/2,3/2)^{\circ}_{2} - 23806_{1}$
4182,731	9	$(5/2,3/2)^{\circ}_{2} - 32669_{3}$	6637,162 *P*		$^7F_4 - 22837^{\circ}_{3}$
4182,518	9	$^7F_1 - 26105^{\circ}_{2}$	6634,97 *P*		$(5/2,5/2)^{\circ}_{3} - 28793_{3}$
4182,300	4	$(9/2,3/2)^{\circ}_{6} - 36254_{5}$	6628,015 *P*		$^7F_3 - 21227^{\circ}_{4}$
4181,624	5	$(5/2,5/2)^{\circ}_{5} - 38199_{6}$	6618,979 *P*	3	$(5/2,3/2)^{\circ}_{4} - 21417_{4}$
4181,089	9	$^7F_2 - 28210^{\circ}_{2}$	6614,525 *P*		$24123^{\circ}_{2} - 39237_{2}$
4178,404	8	$(7/2,3/2)^{\circ}_{3} - 35766_{4}$	6608,959 *P*	7	$^7F_2 - 19426^{\circ}_{3}$
4176,921	8	$(7/2,3/2)^{\circ}_{5} - 33321_{5}$	6597,88 *P*		$(7/2,3/2)^{\circ}_{4} - 27311_{5}$
4170,918	9	$^7F_2 - 28268^{\circ}_{1}$	6589,556 *P*		$14911^{\circ}_{4} - 30085_{5}$
4170,794	7	$(7/2,3/2)^{\circ}_{2} - 36291_{3}$	6580,161 *P*	7	$^7F_3 - 21337^{\circ}_{4}$
4167,750	9	$^7F_3 - 30131^{\circ}_{3}$	6577,761 *P*		$(5/2,3/2)^{\circ}_{2} - 23966_{3}$
4167,604	7	$15249^{\circ}_{2} - 39237_{2}$	6572,505 *P*		$^9H_1 - 28738^{\circ}_{1}$
4163,598 *P*		$(7/2,5/2)^{\circ}_{4} - 36170_{4}$	6567,525 *P*		$14911^{\circ}_{4} - 30134_{3}$
4159,928	9	$(7/2,3/2)^{\circ}_{5} - 33418_{5}$	6567,132 *P*		$(5/2,5/2)^{\circ}_{2} - 28740_{3}$
4159,652	8	$^7F_4 - 31808^{\circ}_{3}$	6565,550 *P*	7	$(5/2,3/2)^{\circ}_{3} - 24950_{3}$
4157,672	1	$(7/2,3/2)^{\circ}_{4} - 36204_{3}$	6564,496 *P*		$^9H_2 - 29571^{\circ}_{1}$
4157,438	9	$^7F_1 - 26250^{\circ}_{1}$	6564,166 *P*		$(5/2,5/2)^{\circ}_{4} - 30083_{5}$
4157,335	6	$14416^{\circ}_{1} - 38463_{1}$	6544,245 *P*	7	$^7F_3 - 21420^{\circ}_{3}$
4157,227 *P*	3	$(5/2,5/2)^{\circ}_{5} - 38339_{4}$	6544,20	7	$(5/2,5/2)^{\circ}_{2} - 28793_{3}$
4155,907	6	$^7F_4 - 31829^{\circ}_{3}$	6542,305 *P*		$(5/2,5/2)^{\circ}_{4} - 30134_{3}$
4155,411	9	$^7F_1 - 26261^{\circ}_{2}$	6541,377 *P*		$(5/2,5/2)^{\circ}_{3} - 29009_{4}$
4153,580	7	{ $^7F_2 - 28368^{\circ}_{3}$ { $(9/2,3/2)^{\circ}_{6} - 36420_{5}$	6535,240 *P*	7	$^7F_1 - 17500^{\circ}_{1}$
			6533,540 *P*		$^9H_2 - 29643^{\circ}_{1}$
4152,176		$(5/2,5/2)^{\circ}_{3} - 37803_{9}$	6525,024 *P*		$^9H_2 - 29663^{\circ}_{3}$
			6513,091 *P*		$^5D_0 - 25121^{\circ}_{1}$

Table 3 (continued)

λ, Å	I	Transition	λ, Å	I	Transition
6505,628 *P*		$(7/2,3/2)^{\circ}_{5} - 24753^{\circ}_{4}$	6329,079 *P*		$(7/2,3/2)^{\circ}_{2} - 28118_{3}$
6499,81 *P*	6	$(5/2,5/2)^{\circ}_{1} - 27558_{0}$	6326,43 *P*		$14911^{\circ}_{4} - 30714_{4}$
6489,024 *P*		$(7/2,3/2)^{\circ}_{2} - 27728_{3}$	6322,00 *P*		$(7/2,3/2)^{\circ}_{2} - 28135_{2}$
6488,767	7*R*	$^{7}F_{0} - 15406^{\circ}_{1}$	6321,951 *P*		$(7/2,3/2)^{\circ}_{4} - 27972_{4}$
6486,788 *P*	7	$^{7}F_{1} - 17615^{\circ}_{2}$	6321,463 *P*		$(5/2,3/2)^{\circ}_{2} - 24582_{2}$
6476,349 *P*		$(5/2,3/2)^{\circ}_{3} - 25160^{\circ}_{3}$	6318,76 *P*		$(5/2,5/2)^{\circ}_{5} - 30113_{6}$
6475,610 *P*		$(7/2,3/2)^{\circ}_{4} - 27597_{4}$	6316,116 *P*		$(5/2,5/2)^{\circ}_{3} - 29554_{3}$
6466,47 *P*		$14911^{\circ}_{4} - 30371_{3}$	6308,646 *P*		$^{7}F_{2} - 20146^{\circ}_{1}$
6465,18 *P*		$(5/2,3/2)^{\circ}_{2} - 24231_{2}$	6304,703 *P*	7*R*	$^{7}F_{0} - 15856^{\circ}_{1}$
6462,823 *P*		$^{9}H_{2} - 29810_{3}$	6303,02 *P*		$(5/2,5/2)^{\circ}_{4} - 30714_{4}$
6456,841 *P*		$14911^{\circ}_{4} - 30394_{4}$	6300,337 *P*		$14911^{\circ}_{4} - 30779_{3}$
6456,129 *P*		$(5/2,3/2)^{\circ}_{3} - 25208_{2}$	6294,89 *P*		$(5/2,3/2)^{\circ}_{3} - 25605_{4}$
6456,002 *P*		$14911^{\circ}_{4} - 30307_{5}$	6292,203 *P*	6	$(7/2,3/2)^{\circ}_{3} - 27728_{3}$
6452,83 *P*		$(5/2,3/2)^{\circ}_{1} - 25979_{1}$	6292,188 *P*	6	$^{5}D_{0} - 25660^{\circ}_{4}$
6449,860		$21227^{\circ}_{4} - 36727_{3}$	6288,130 *P*		$(5/2,5/2)^{\circ}_{3} - 29625_{2}$
6449,714 *P*	8	$^{7}F_{4} - 23274^{\circ}_{4}$	6279,377 *P*	7	$(5/2,3/2)^{\circ}_{1} - 26407_{2}$
6443,537 *P*		$(5/2,3/2)^{\circ}_{2} - 24287_{3}$	6277,123 *P*		$(5/2,5/2)^{\circ}_{4} - 30779_{3}$
6442,02 *P*		$(5/2,5/2)^{\circ}_{4} - 30371_{3}$	6273,798 *P*		$16734^{\circ}_{2} - 32669_{3}$
6436,578 *P*	6	$19203^{\circ}_{2} - 34735_{3}$	6269,359 *P*		$^{7}F_{4} - 23720^{\circ}_{3}$
6433,547 *P*		$^{9}H_{2} - 29881^{\circ}_{2}$	6264,67 *P*		$(5/2,5/2)^{\circ}_{1} - 28135_{2}$
6432,462 *P*		$(5/2,5/2)^{\circ}_{4} - 30394_{4}$	6262,326 *P*		$14911^{\circ}_{4} - 30875_{4}$
6431,630 *P*		$(5/2,5/2)^{\circ}_{4} - 30397_{5}$	6240,559 *P*		$^{9}H_{2} - 30361_{2}$
6429,25 *P*		$14911^{\circ}_{4} - 30461_{5}$	6239,390 *P*		$(5/2,5/2)^{\circ}_{4} - 30875_{4}$
6421,018 *P*		$(7/2,3/2)^{\circ}_{4} - 27728_{3}$	6233,804 *P*		$(5/2,5/2)^{\circ}_{2} - 29554_{3}$
6416,84 *P*		$^{7}F_{5} - 24758^{\circ}_{6}$	6231,507 *P*		$^{9}H_{1} - 29571^{\circ}_{1}$
6405,65 *P*		$(5/2,3/2)^{\circ}_{1} - 26093_{1}$	6223,181 *P*		$15406^{\circ}_{1} - 31471_{1}$
6405,09 *P*		$(5/2,5/2)^{\circ}_{4} - 30461_{5}$	6214,961	7	$^{7}F_{2} - 20385^{\circ}_{2}$
6402,452 *P*	5	$15856^{\circ}_{1} - 31471_{1}$	6208,246 *P*		$(5/2,5/2)^{\circ}_{5} - 30394_{4}$
6398,342 *P*		$^{5}D_{0} - 25397^{\circ}_{1}$	6207,471 *P*		$(5/2,5/2)^{\circ}_{5} - 30397_{5}$
6395,20 *P*		$14911^{\circ}_{4} - 30544_{3}$	6206,542 *P*		$(5/2,5/2)^{\circ}_{5} - 29625_{2}$
6384,092 *P*		$^{7}F_{2} - 19959^{\circ}_{1}$	6203,607 *P*		$^{9}H_{1} - 29643^{\circ}_{1}$
6371,28 *P*		$(5/2,5/2)^{\circ}_{4} - 30544_{3}$	6199,371 *P*		$^{7}F_{2} - 20425^{\circ}_{1}$
6361,26	6	$15856^{\circ}_{1} - 31572_{1}$	6198,56 *P*		$(5/2,5/2)^{\circ}_{2} - 29645_{1}$
6357,828 *P*		$^{9}H_{2} - 30066^{\circ}_{1}$	6197,043 *P*		$(7/2,3/2)^{\circ}_{3} - 27972_{3}$
6344,616 *P*		$(7/2,3/2)^{\circ}_{3} - 27597_{4}$	6196,010	7	$^{7}F_{4} - 23909^{\circ}_{5}$
6341,240 *P*	7	$^{7}F_{2} - 20065^{\circ}_{3}$	6195,56 *P*		$(7/2,3/2)^{\circ}_{4} - 28295_{4}$
6331,613 *P*		$^{9}H_{2} - 30131^{\circ}_{3}$	6192,801	7	$^{7}F_{1} - 18346^{\circ}_{2}$
6330,843 *P*		$(5/2,5/2)^{\circ}_{5} - 30083_{5}$	6190,781		$^{5}D_{0} - 25921^{\circ}_{1}$

λ, Å	I	Transition	λ, Å	I	Transition
6186,500 *P*	6	$(5/2,5/2)^{\circ}_{3} - 29886_{3}$	6067,132 *P*		$^{5}D_{0} - 26250^{\circ}_{1}$
6182,74 *P*		$(5/2,5/2)^{\circ}_{5} - 30461_{5}$	6065,737 *P*		$(5/2,3/2)^{\circ}_{3} - 27205_{3}$
6180,764 *P*		$14911^{\circ}_{4} - 31086_{5}$	6065,072 *P*	7	$(9/2,3/2)^{\circ}_{6} - 28834_{5}$
6176,13 *P*		$(9/2,3/2)^{\circ}_{6} - 28538_{7}$	6059,296 *P*		$(5/2,5/2)^{\circ}_{2} - 30016_{2}$
6175,938 *P*		$^{5}D_{0} - 25959^{\circ}_{1}$	6058,415 *P*		$14911^{\circ}_{4} - 31413_{3}$
6163,90 *P*		$(7/2,3/2)^{\circ}_{5} - 25605_{4}$	6056,099 *P*	7	$(5/2,3/2)^{\circ}_{2} - 25275_{1}$
6158,421 *P*	5	$(5/2,5/2)^{\circ}_{4} - 31086_{5}$	6050,114 *P*		$(5/2,5/2)^{\circ}_{4} - 31377_{4}$
6143,564 *P*		$^{7}F_{3} - 22417^{\circ}_{2}$	6044,981 *P*		$^{9}H_{1} - 30066^{\circ}_{1}$
6141,704 *P*		$(7/2,3/2)^{\circ}_{3} - 28118_{3}$	6044,312 *P*		$14911^{\circ}_{4} - 31451_{4}$
6138,75	7	$^{7}F_{3} - 22429^{\circ}_{4}$	6038,800 *P*		$(9/2,3/2)^{\circ}_{6} - 28906_{5}$
6138,241 *P*		$14911^{\circ}_{4} - 31198_{3}$	6036,948 *P*		$(5/2,5/2)^{\circ}_{4} - 31413_{3}$
6137,032 *P*		$(5/2,5/2)^{\circ}_{3} - 30016_{2}$	6032,063 *P*		$18346^{\circ}_{2} - 34920_{3}$
6135,04 *P*		$(7/2,3/2)^{\circ}_{3} - 28135_{2}$	6031,924 *P*		$(7/2,3/2)^{\circ}_{4} - 28733_{4}$
6126,983 *P*		$^{7}F_{4} - 24091^{\circ}_{3}$	6031,280 *P*		$21227^{\circ}_{4} - 37803_{3}$
6122,412 *P*		$^{9}H_{2} - 30670^{\circ}_{1}$	6029,189 *P*		$(7/2,3/2)^{\circ}_{4} - 28740_{3}$
6119,369 *P*		$(5/2,5/2)^{\circ}_{2} - 29854_{1}$	6028,218 *P*		$(5/2,5/2)^{\circ}_{5} - 30875_{4}$
6119,100 *P*		$(7/2,3/2)^{\circ}_{4} - 28496_{4}$	6027,008 *P*		$^{9}H_{2} - 30929^{\circ}_{1}$
6118,549 *P*		$^{9}H_{2} - 30681^{\circ}_{2}$	6025,391 *P*		$(5/2,5/2)^{\circ}_{3} - 30318_{2}$
6116,206 *P*		$(5/2,5/2)^{\circ}_{4} - 31198_{3}$	6022,945 *P*		$(5/2,5/2)^{\circ}_{4} - 31451_{4}$
6113,390 *P*		$^{9}H_{1} - 29881^{\circ}_{2}$	6016,409 *P*		$(5/2,5/2)^{\circ}_{2} - 30134_{3}$
6112,574 *P*		$^{7}F_{2} - 20654^{\circ}_{1}$	6013,674 *P*		$14911^{\circ}_{4} - 31535_{5}$
6111,66 *P*		$(5/2,3/2)^{\circ}_{2} - 25125_{1}$	6012,740 *P*	7	$(5/2,3/2)^{\circ}_{3} - 26350_{4}$
6107,514 *P*		$(5/2,5/2)^{\circ}_{2} - 29886_{3}$	6010,626 *P*		$^{9}H_{2} - 30974^{\circ}_{3}$
6102,630 *P*		$23125^{\circ}_{2} - 39507_{3}$	6009,86 *P*		$(7/2,3/2)^{\circ}_{4} - 28793_{3}$
6100,45 *P*		$(7/2,3/2)^{\circ}_{5} - 25774_{6}$	6007,209 *P*		$^{9}H_{2} - 30984^{\circ}_{3}$
6100,277 *P*		$22849^{\circ}_{1} - 39237_{2}$	6005,96 *P*		$(5/2,5/2)^{\circ}_{3} - 30371_{3}$
6098,558 *P*		$(5/2,3/2)^{\circ}_{2} - 25160_{3}$	6004,712 *P*		$^{7}F_{5} - 25828$
6093,042 *P*		$(5/2,5/2)^{\circ}_{3} - 30134_{3}$	6002,008	6	$(7/2,3/2)^{\circ}_{3} - 28496_{4}$
6092,173 *P*	7	$^{7}F_{2} - 20709^{\circ}_{3}$	5999,795 *P*		$20065^{\circ}_{3} - 36727_{3}$
6089,108 *P*		$(7/2,3/2)^{\circ}_{2} - 28740_{3}$	5997,658 *P*		$(5/2,5/2)^{\circ}_{3} - 30394_{4}$
6087,61 *P*		$(5/2,5/2)^{\circ}_{5} - 30714_{4}$	5995,210 *P*		$(7/2,3/2)^{\circ}_{4} - 28834_{5}$
6085,445 *P*		$^{9}H_{2} - 30770^{\circ}_{2}$	5992,794 *P*		$^{7}F_{4} - 24456^{\circ}_{3}$
6080,816 *P*		$(5/2,3/2)^{\circ}_{2} - 25208_{2}$	5992,521 *P*		$(5/2,5/2)^{\circ}_{4} - 31535_{5}$
6075,57 *P*		$(7/2,3/2)^{\circ}_{3} - 28295_{4}$	5992,360 *P*		$(5/2,3/2)^{\circ}_{3} - 26407_{2}$
6071,675 *P*		$14911^{\circ}_{4} - 31377_{4}$	5988,990 *P*		$^{7}F_{3} - 22837^{\circ}_{3}$
6071,458 *P*		$21337^{\circ}_{4} - 37803_{3}$	5983,862 *P*		$(5/2,3/2)^{\circ}_{3} - 26431_{3}$
6069,41 *P*		$(7/2,3/2)^{\circ}_{2} - 28793_{3}$	5983,31	7	$(5/2,3/2)^{\circ}_{4} - 23022_{5}$
6069,06 *P*		$(5/2,5/2)^{\circ}_{5} - 30764_{6}$	5978,949 *P*		$17776_{2} - 34497^{\circ}_{3}$

Table 3 (continued)

λ, A°	I	Transition	λ, A°	I	Transition
5977,273 *P*		$(5/2,3/2)^{o}_{3} - 26449_{3}$	5855,58 *P*		$14911^{o}_{4} - 31984_{3}$
5975,008 *P*	6	$^{7}F_{2} - 21031^{o}_{1}$	5853,823 *P*	6	$^{7}F_{1} - 19281^{o}_{2}$
5970,72		$19426^{o}_{3} - 36170_{4}$	5851,356 *P*	3	$(5/2,5/2)^{o}_{5} - 31377_{4}$
5969,538 *P*		$(7/2,3/2)^{o}_{4} - 28906_{5}$	5845,79		$19426^{o}_{3} - 36528_{3}$
5963,563 *P*		$16734^{o}_{2} - 33498_{3}$	5844,374 *P*		$14911^{o}_{4} - 32017_{4}$
5955,715 *P*		$14911^{o}_{4} - 31697_{4}$	5839,075 *P*	7	$^{7}F_{2} - 21420^{o}_{3}$
5952,604 *P*		$(5/2,5/2)^{o}_{5} - 31086_{5}$	5835,947 *P*	6	$^{7}F_{3} - 23274^{o}_{4}$
5950,440 *P*		$(5/2,5/2)^{o}_{2} - 30318_{2}$	5835,55 *P*		$(5/2,5/2)^{o}_{4} - 31984_{3}$
5947,248 *P*		$^{9}H_{2} - 31151^{o}_{2}$	5833,158 *P*		$^{7}F_{5} - 26317^{o}_{4}$
5945,105 *P*		$(5/2,3/2)^{o}_{4} - 23129_{5}$	5831,780 *P*		$^{9}H_{1} - 30670_{1}$
5944,43 *P*		$(5/2,5/2)^{o}_{3} - 30544_{3}$	5829,471 *P*		$(5/2,5/2)^{o}_{3} - 30875_{4}$
5943,450 *P*		$^{9}H_{2} - 31162^{o}_{1}$	5828,275 *P*		$^{9}H_{1} - 30681^{o}_{2}$
5938,879 *P*		$^{9}H_{1} - 30361^{o}_{2}$	5825,938 *P*		$(5/2,5/2)^{o}_{5} - 31451_{4}$
5937,076 *P*		$18346^{o}_{2} - 35185_{1}$	5824,395 *P*		$(5/2,5/2)_{4} - 32017_{4}$
5934,968 *P*		$(5/2,5/2)^{o}_{4} - 31697_{4}$	5822,823 *P*		$(7/2,3/2)^{o}_{3} - 29009_{4}$
5932,964 *P*		$(7/2,3/2)^{o}_{4} - 29009_{4}$	5815,064 *P*		$14911^{o}_{4} - 32103_{4}$
5931,989 *P*		$(9/2,3/2)^{o}_{6} - 29204_{5}$	5808,42 *P*		$(5/2,3/2)^{o}_{2} - 25979_{1}$
5931,49 *P*		$(5/2,5/2)^{o}_{2} - 30371_{3}$	5807,123 *P*	6	$^{7}F_{2} - 21515^{o}_{1}$
5929,206 *P*		$^{5}D_{0} - 26633^{o}_{1}$	5801,485 *P*		$(7/2,3/2)^{o}_{2} - 29554_{3}$
5918,115 *P*	6	$(7/2,3/2)^{o}_{3} - 28733_{4}$	5798,231 *P*		$^{9}H_{1} - 30770^{o}_{2}$
5915,481 *P*		$(7/2,3/2)^{o}_{3} - 28740_{3}$	5797,468 *P*		$(5/2,5/2)^{o}_{5} - 31535_{5}$
5914,19 *P*		$(7/2,3/2)^{o}_{5} - 26290_{5}$	5795,284 *P*		$(5/2,5/2)^{o}_{4} - 32103_{4}$
5912,434 *P*		$14911^{o}_{4} - 31820_{4}$	5791,419 *P*		$(5/2,5/2)^{o}_{2} - 30779_{3}$
5907,588		$19281^{o}_{2} - 36204_{3}$	5788,046 *P*		$^{7}F_{3} - 23416^{o}_{2}$
5896,89 *P*		$(7/2,3/2)^{o}_{3} - 28793_{3}$	5782,041 *P*		$^{7}F_{4} - 25064^{o}_{3}$
5893,105	6	$(7/2,3/2)^{o}_{5} - 26350_{4}$	5777,866 *P*		$(7/2,3/2)^{o}_{2} - 29625_{2}$
5891,986 *P*		$(5/2,5/2)^{o}_{4} - 31820_{4}$	5773,739 *P*		$^{9}H_{2} - 31667^{o}_{2}$
5889,574 *P*		$(7/2,3/2)^{o}_{5} - 26361_{5}$	5770,97 *P*		$(7/2,3/2)^{o}_{2} - 29645_{1}$
5888,347 *P*		$^{7}F_{6} - 27216^{o}_{5}$	5770,21	7	$(5/2,3/2)^{o}_{2} - 26093_{1}$
5887,188 *P*		$^{7}F_{3} - 23125^{o}_{2}$	5751,222 *P*		$^{9}H_{2} - 31724^{o}_{2}$
5880,809 *P*	6	$^{7}F_{1} - 19203^{o}_{2}$	5747,066 *P*	5	$(7/2,3/2)^{o}_{4} - 29554_{3}$
5877,987 *P*		$^{7}F_{2} - 21307_{1}$	5745,155 *P*		$^{9}H_{1} - 30929^{o}_{1}$
5877,179 *P*		$19281^{o}_{2} - 36291_{3}$	5743,583 *P*		$(5/2,5/2)^{o}_{5} - 31697_{4}$
5871,47 *P*		$(5/2,5/2)^{o}_{2} - 30544_{3}$	5733,108 *P*	5	$(5/2,3/2)^{o}_{2} - 26205_{3}$
5865,142 *P*		$(7/2,3/2)^{o}_{4} - 29204_{5}$	5729,950 *P*	4	$(5/2,5/2)^{o}_{1} - 29625_{2}$
5864,788 *P*	5*R*	$^{7}F_{0} - 17046^{o}_{1}$	5723,760 *P*		$^{9}H_{2} - 31808^{o}_{3}$
5862,394 *P*		$(5/2,5/2)^{o}_{3} - 30779_{3}$	5723,17 *P*		$(5/2,5/2)^{o}_{1} - 29645_{1}$
5855,95	5	$(5/2,3/2)^{o}_{1} - 27558^{o}$	5721,805	5	$(5/2,5/2)^{o}_{3} - 31198_{3}$

Table 3 (continued)

λ, A°	I	Transition	λ, A°	I	Transition
5716,673 *P*		$^{9}H_{2} - 31829^{o}_{3}$	5611,239 *P*		$21420^{o}_{3} - 39237_{2}$
5712,379	9*R*	$^{7}F_{0} - 17500^{o}_{1}$	5604,214	5	$(5/2,5/2)^{o}_{1} - 30016_{2}$
5703,343	6	$(5/2,5/2)^{o}_{5} - 31820_{4}$	5593,355	8	$(5/2,3/2)^{o}_{3} - 27597_{4}$
5702,264	5	$(7/2,3/2)^{o}_{2} - 29854_{1}$	5592,308	9	$^{7}F_{2} - 22176^{o}_{1}$
5696,007	6	$22429^{o}_{4} - 39981_{3}$	5586,364 *P*		$(5/2,5/2)^{o}_{2} - 31413_{3}$
5694,976	8	$^{7}F_{4} - 25328^{o}_{3}$	5585,652 *P*	8	$14911^{o}_{4} - 32809_{4}$
5691,946	7	$(7/2,3/2)^{o}_{2} - 29886_{3}$	5585,44 *P*		$(5/2,5/2)^{o}_{0} - 29645_{1}$
5687,902	7	$^{7}F_{3} - 23720^{o}_{3}$	5577,584	8	$(7/2,3/2)^{o}_{4} - 30083_{5}$
5672,632 *P*		$^{9}H_{1} - 31151^{o}_{2}$	5577,259	9	$(7/2,3/2)^{o}_{5} - 27311_{5}$
5669,178 *P*		$^{9}H_{1} - 31162^{o}_{1}$	5571,697	7	$^{7}F_{1} - 20146^{o}_{1}$
5667,505	9	$(5/2,3/2)^{o}_{2} - 26407_{2}$	5570,471	9	$^{7}F_{3} - 24091^{o}_{3}$
5664,44 *P*		$(5/2,3/2)^{o}_{1} - 28135_{2}$	5568,233 *P*		$(5/2,5/2)^{o}_{2} - 31471_{1}$
5663,888	5	$(5/2,5/2)^{o}_{3} - 31377_{4}$	5567,400 *P*		$(5/2,5/2)^{o}_{4} - 32809_{4}$
5663,250	8	$(5/2,3/2)^{o}_{4} - 23966_{3}$	5567,192 *P*	8	$14911^{o}_{4} - 32869_{5}$
5659,892	8	$(5/2,3/2)^{o}_{2} - 26431_{3}$	5566,493	6	$^{7}F_{1} - 20163^{o}_{1}$
5659,674	6	$^{7}F_{3} - 23808^{o}_{2}$	5562,916	7	$(5/2,5/2)^{o}_{3} - 31697_{4}$
5655,563	6	$(5/2,5/2)^{o}_{1} - 29854_{1}$	5561,984	9	$(5/2,3/2)^{o}_{4} - 24287_{3}$
5654,168	7	$(5/2,5/2)^{o}_{2} - 31198_{3}$	5561,787 *P*		$(7/2,3/2)^{o}_{4} - 30134_{3}$
5654,001	7	$(5/2,3/2)^{o}_{2} - 26449_{3}$	5560,565	5	$^{7}F_{3} - 24123^{o}_{2}$
5652,375 *P*		$(5/2,5/2)^{o}_{3} - 31413_{3}$	5555,281 *P*		$(7/2,3/2)^{o}_{2} - 30318_{2}$
5650,046 *P*		$(7/2,3/2)^{o}_{2} - 30016_{2}$	5552,567	8	$(5/2,3/2)^{o}_{3} - 27728_{3}$
5643,657 *P*		$(7/2,3/2)^{o}_{3} - 29554_{3}$	5549,584 *P*	9	$^{7}F_{3} - 24158^{o}_{2}$
5641,557	7	$18045^{o}_{4} - 35766_{4}$	5549,044	8	$(5/2,5/2)^{o}_{4} - 32869_{5}$
5640,09 *P*		$(5/2,5/2)^{o}_{3} - 31451_{4}$ $14911^{o}_{4} - 32637_{5}$	5542,567 *P*	8	$^{7}F_{5} - 27216^{o}_{5}$
5639,960 *P*	7	$(5/2,5/2)^{o}_{5} - 32017_{4}$	5539,928	6	$(7/2,3/2)^{o}_{3} - 29886_{3}$ $(9/2,3/2)^{o}_{6} - 30397_{5}$
5639,556 *P*		$(7/2,3/2)^{o}_{4} - 29886_{3}$	5538,77 *P*		$(7/2,3/2)^{o}_{2} - 30371_{3}$
5638,017	8	$(9/2,3/2)^{o}_{6} - 30083_{5}$	5537,540	9	$^{7}F_{4} - 25828^{o}_{4}$
5630,472 *P*	7	$^{7}F_{1} - 19959^{o}_{1}$	5537,04 *P*		$(5/2,5/2)^{o}_{2} - 31572_{1}$
5629,948 *P*	6	$14911^{o}_{4} - 32669_{3}$	5536,458 *P*		$14911^{o}_{4} - 32968_{4}$
5628,467	9	$(9/2,3/2)^{o}_{6} - 30113_{6}$	5525,097 *P*		$(5/2,5/2)^{o}_{3} - 31820_{4}$
5621,494	6	$(5/2,5/2)^{o}_{4} - 32637$	5521,032	7	$(5/2,5/2)^{o}_{0} - 29854_{1}$
5621,302 *P*		$(7/2,3/2)^{o}_{3} - 29625_{2}$	5520,227	7	$(9/2,3/2)^{o}_{6} - 30461_{5}$
5617,756 *P*		$^{9}H_{2} - 32137^{o}_{2}$	5518,604	5	$^{5}D_{0} - 27887_{1}$
5613,806 *P*		$20654^{o}_{1} - 38463_{1}$	5518,528 *P*		$(5/2,5/2)^{o}_{4} - 32968_{4}$
5612,734 5612,659 *P*	8	$(7/2,3/2)^{o}_{2} - 30134_{3}$ $(5/2,5/2)^{o}_{5} - 32103_{4}$	5518,007	8	$^{7}F_{2} - 22417^{o}_{2}$
			5516,633 *P*		$14811^{o}_{4} - 33033_{3}$
5611,406 *P*		$(5/2,5/2)^{o}_{4} - 32669_{3}$	5514,561 *P*		$^{9}H_{1} - 31657^{o}_{2}$

Table 3 (continued)

λ, A°	I	Transition	λ, A°	I	Transition
5510,977	7	$(5/2,5/2)^{\circ}_{1} - 30318_{2}$	5423,131	7	$^{7}F_{4} - 26208^{\circ}_{3}$
5505,511	5	$18045^{\circ}_{4} - 36204_{3}$	5421,478	8	$(5/2,3/2)^{\circ}_{4} - 24753_{4}$
5500,311 *P*		$(7/2,3/2)^{\circ}_{3} - 30016_{2}$	5418,187	9	$^{7}F_{1} - 20654_{1}$
5499,907	8	$14911^{\circ}_{4} - 33089_{5}$	5418,153 *P*		$16734^{\circ}_{2} - 35185_{1}$
5498,850	6	$(5/2,5/2)^{\circ}_{4} - 33033_{3}$	5416,432	7	$(7/2,3/2)^{\circ}_{2} - 30779_{3}$
5498,474	9	$^{7}F_{1} - 20385^{\circ}_{2}$	5414,306 *P*		$(5/2,5/2)^{\circ}_{4} - 33321_{5}$
5494,025	7	$^{9}H_{1} - 31724^{\circ}_{2}$	5414,275	9	$^{7}F_{5} - 27643^{\circ}_{4}$
5489,877 *P*		$^{9}H_{2} - 32552^{\circ}_{2}$	5413,47 *P*		$(5/2,5/2)^{\circ}_{2} - 31984_{3}$
5489,678	8	$(7/2,3/2)^{\circ}_{5} - 27597_{4}$	5412,037	7	$(5/2,5/2)^{\circ}_{1} - 30650_{0}$
5489,153	7	$(7/2,3/2)^{\circ}_{4} - 30371_{3}$	5410,403	8	$(7/2,3/2)^{\circ}_{3} - 30318_{2}$
5486,411	8	$(7/2,3/2)^{\circ}_{2} - 30544_{3}$	5405,104 *P*		$^{5}D_{0} - 28268^{\circ}_{1}$
5486,299	9	$^{7}F_{1} - 20425^{\circ}_{1}$	5401,889 *P*	9	$14911^{\circ}_{4} - 33418_{5}$
5482,603	9	$^{7}F_{4} - 26008^{\circ}_{3}$	5398,645 *P*		$(5/2,5/2)^{\circ}_{5} - 32809_{4}$
5482,18 *P*		$(5/2,5/2)^{\circ}_{4} - 33089_{5}$	5395,91 *P*		$(5/2,5/2)^{\circ}_{2} - 32044_{1}$
5481,601	8	$(7/2,3/2)^{\circ}_{4} - 30397_{5}$	5394,75 *P*		$(7/2,3/2)^{\circ}_{3} - 30371_{3}$
5479,066	6	$18045^{\circ}_{4} - 36291_{3}$	5392,974	9	$^{7}F_{2} - 22837^{\circ}_{3}$
5478,351		$(5/2,3/2)^{\circ}_{3} - 27972_{4}$	5391,318	8	$^{7}F_{4} - 26317^{\circ}_{4}$
5475,418	6	$(5/2,5/2)^{\circ}_{3} - 31984_{3}$	5389,600	5	$\{ 16520^{\circ}_{5} - 35070_{5}$
5470,386	8	$^{7}F_{6} - 28513^{\circ}_{5}$			$\{ (5/2,5/2)^{\circ}_{2} - 32066_{2}$
5465,617 *P*		$(5/2,5/2)^{\circ}_{3} - 32017_{4}$	5389,467	5	$^{7}F_{2} - 22849^{\circ}_{1}$
5464,890	7	$(7/2,3/2)^{\circ}_{3} - 30134_{3}$	5388,043	4	$(7/2,3/2)^{\circ}_{3} - 30394_{4}$
5462,317	7	$(7/2,3/2)^{\circ}_{4} - 30461_{5}$	5387,91 *P*		$(7/2,3/2)^{\circ}_{4} - 30714_{4}$
5459,323	9	$^{7}F_{3} - 24456^{\circ}_{3}$	5384,822	9	$(5/2,5/2)^{\circ}_{4} - 33418_{5}$
5456,946	6	$16734^{\circ}_{2} - 35054_{3}$	5383,170	8	$(5/2,3/2)^{\circ}_{3} - 28295_{4}$
5455,629	5	$20065^{\circ}_{3} - 38389_{4}$	5381,423	9	$(5/2,5/2)^{\circ}_{5} - 32869_{5}$
5450,990 *P*		$(5/2,5/2)^{\circ}_{3} - 32066_{2}$	5380,935 *P*	8	$14911^{\circ}_{4} - 33490_{5}$
5446,075	9	$^{7}F_{6} - 28595^{\circ}_{6}$	5378,860	6	$(7/2,3/2)^{\circ}_{5} - 27972_{4}$
5439,994	5	$(5/2,5/2)^{\circ}_{3} - 32103_{4}$	5378,844 *P*		$14911^{\circ}_{4} - 33498_{3}$
5437,728	8	$(7/2,3/2)^{\circ}_{4} - 30544_{3}$	5378,101 *P*		$^{9}H_{2} - 32930^{\circ}_{3}$
5437,529 *P*		$16520^{\circ}_{5} - 34906_{5}$	5372,095 *P*		$^{9}H_{1} - 32137^{\circ}_{2}$
5437,225	7	$^{9}H_{2} - 32728^{\circ}_{3}$	5371,146 *P*		$^{9}H_{2} - 32954^{\circ}_{3}$
5435,050	5	$(5/2,3/2)^{\circ}_{3} - 28118_{3}$	5368,873	6	$(7/2,3/2)^{\circ}_{4} - 30779_{3}$
5431,635	8	$^{7}F_{2} - 22705^{\circ}_{1}$	5364,088	9	$(5/2,3/2)^{\circ}_{4} - 24950_{3}$
5431,085	6	$^{9}H_{2} - 32749^{\circ}_{2}$	5364,000	6	$(5/2,5/2)^{\circ}_{4} - 33490_{5}$
5430,560 *P*		$14911^{\circ}_{4} - 33321_{5}$	5362,436	8	$^{9}H_{2} - 32985^{\circ}_{2}$
5429,82 *P*		$(5/2,3/2)^{\circ}_{3} - 28135_{2}$	5362,209 *P*		$21337^{\circ}_{4} - 39981_{3}$
5429,44 *P*		$(9/2,3/2)^{\circ}_{6} - 30764_{6}$	5361,915 *P*		$(5/2,5/2)^{\circ}_{4} - 33498_{3}$

Table 3 (continued)

λ, A°	I	Transition	λ, A°	I	Transition
5361,448 *P*		$^{9}H_{2} - 32988^{\circ}_{3}$	5238,564 *P*		$18045^{\circ}_{4} - 37129_{5}$
5353,655	8	$^{5}D_{0} - 28446^{\circ}_{1}$	5236,662 *P*	6	$\{ 20146^{\circ}_{1} - 39237_{2}$
5352,680 *P*		$(5/2,5/2)^{\circ}_{5} - 32968_{4}$			$\{ (7/2,3/2)^{\circ}_{2} - 31413_{3}$
5349,896		$^{9}H_{2} - 33028^{\circ}_{2}$	5233,075	8	$^{7}F_{1} - 21307^{\circ}_{1}$
5345,05 *P*		$(7/2,3/2)^{\circ}_{3} - 30544_{3}$	5231,311	6	$(7/2,3/2)^{\circ}_{5} - 28496_{4}$
5342,250	8	$^{7}F_{6} - 28951^{\circ}_{5}$	5230,755 *P*		$17615^{\circ}_{2} - 36727_{3}$
5341,338 *P*		$(7/2,3/2)^{\circ}_{4} - 30875_{4}$	5229,476	8	$^{7}F_{2} - 23416^{\circ}_{2}$
5337,927	8	$^{9}H_{2} - 33070^{\circ}_{2}$	5228,75 *P*		$(5/2,5/2)^{\circ}_{2} - 32637_{3}$
5336,459 *P*		$^{9}H_{2} - 33075^{\circ}_{2}$	5226,795 *P*		$(5/2,5/2)^{\circ}_{5} - 33418_{5}$
5336,040 *P*		$(9/2,3/2)^{\circ}_{6} - 31086_{5}$	5225,877 *P*	6	$14911^{\circ}_{4} - 34042_{4}$
5335,631	8	$^{7}F_{2} - 23037^{\circ}_{1}$	5223,663	9	$(5/2,3/2)^{\circ}_{1} - 29625_{2}$
5329,185	6	$^{7}F_{3} - 24903^{\circ}_{2}$	5220,725 *P*		$(7/2,3/2)^{\circ}_{2} - 31471_{1}$
5325,361	8	$(5/2,3/2)^{\circ}_{3} - 28496_{4}$	5220,048 *P*	6	$(5/2,5/2)^{\circ}_{2} - 32669_{3}$
5318,46 *P*		$(5/2,5/2)^{\circ}_{5} - 33089_{5}$	5218,01 *P*		$(5/2,3/2)^{\circ}_{1} - 29645_{1}$
5310,311	9	$^{7}F_{2} - 23125^{\circ}_{2}$	5216,241 *P*		$^{9}H_{2} - 33507^{\circ}_{2}$
5309,812	8	$^{7}F_{1} - 21031^{\circ}_{1}$	5211,053	8	$^{7}F_{3} - 25328^{\circ}_{3}$
5304,402	9	$(5/2,3/2)^{\circ}_{4} - 25160_{3}$	5211,040 *P*		$(9/2,3/2)^{\circ}_{6} - 31535_{5}$
5296,93 *P*		$(7/2,3/2)^{\circ}_{3} - 30714_{4}$	5209,896 *P*		$(5/2,5/2)^{\circ}_{4} - 34042_{4}$
5296,194 *P*		$(7/2,3/2)^{\circ}_{2} - 31198_{3}$	5207,175 *P*		$(5/2,5/2)^{\circ}_{5} - 33490_{5}$
5287,060	8	$(7/2,3/2)^{\circ}_{5} - 28295_{4}$	5202,002	9	$(7/2,3/2)^{\circ}_{4} - 31377_{4}$
5286,54 *P*		$(5/2,5/2)^{\circ}_{3} - 32637_{3}$	5201,153	7	$^{9}H_{1} - 32749^{\circ}_{2}$
5283,847	5	$^{7}F_{3} - 25064^{\circ}_{3}$	5195,400 *P*		$(5/2,5/2)^{\circ}_{3} - 32968_{4}$
5281,888	8	$(7/2,3/2)^{\circ}_{4} - 31086_{5}$	5193,30 *P*		$(7/2,3/2)^{\circ}_{2} - 31572_{1}$
5278,612	8	$(7/2,3/2)^{\circ}_{3}\ 30779_{3}$	5192,280	6	$(7/2,3/2)^{\circ}_{4} - 31413_{3}$
5277,636	6	$(5/2,5/2)^{\circ}_{3} - 32669_{3}$	5183,828	3	$(5/2,3/2)^{\circ}_{3} - 29009_{4}$
5272,659	8	$(5/2,3/2)^{\circ}_{2} - 27728_{3}$	5183,397 *P*		$16734^{\circ}_{2} - 36021_{3}$
5271,912 *P*	6	$19426^{\circ}_{3} - 38389_{4}$	5182,020	5	$(5/2,3/2)^{\circ}_{4} - 25605_{4}$
5270,970	7	$^{5}D_{0}\ 28738^{\circ}_{1}$	5181,572 *P*	8	$(5/2,5/2)^{\circ}_{1} - 31471_{1}$
5263,163 *P*		$17615^{\circ}_{2} - 36609_{2}$	5177,934	6	$(5/2,5/2)^{\circ}_{3} - 33033_{3}$
5259,220	9	$(5/2,3/2)^{\circ}_{3} - 28733_{4}$	5176,815	6	$^{7}F_{1} - 21515^{\circ}_{1}$
5257,141 *P*		$(5/2,3/2)^{\circ}_{3} - 28740_{3}$	5170,700 *P*		$^{7}F_{5} - 28513^{\circ}_{5}$
5255,041 *P*		$^{9}H_{1} - 32552^{\circ}_{2}$	5167,462 *P*	8	$(7/2,3/2)^{\circ}_{5} - 28733_{4}$
5253,639	7	$(5/2,5/2)^{\circ}_{5} - 33321_{5}$	5166,452	9	$(5/2,3/2)^{\circ}_{2} - 28118_{3}$
5251,903 *P*		$(7/2,3/2)^{\circ}_{3} - 30875_{4}$	5164,349	7	$(7/2,3/2)^{\circ}_{3} - 31198_{3}$
5250,804 *P*		$(7/2,3/2)^{\circ}_{4} - 31198_{3}$	5062,06 *P*		$14911^{\circ}_{4} - 34661_{4}$
5242,43 *P*		$(5/2,3/2)^{\circ}_{3} - 28793_{3}$	5161,749	7	$\{ (5/2,3/2)^{\circ}_{1} - 29854_{1}$
5238,685	6	$(5/2,5/2)^{\circ}_{3} - 32809_{4}$			$\{ (5/2,3/2)_{2} - 28135_{2}$

Table 3 (continued)

λ, Å	I	Transition	λ, Å	I	Transition
5159,380	5	$(7/2,3/2)^\circ_4 - 31535_5$	5061,832 *P*		$(5/2,5/2)^\circ_5 - 34042_4$
5154,55 *P*		$(5/2,5/2)^\circ_1 - 31572_1$	5058,884	8	$^7F_4 - 27536^\circ_3$
5148,954	9	$^7F_5 - 28595^\circ_6$	5056,361 *P*		$(5/2,5/2)^\circ_3 - 33498_3$
5147,589	8	$^7F_2 - 23720^\circ_3$	5056,051	5	$^7F_5 - 28951_5$
5147,414	8	$^7F_4 - 27196^\circ_3$	5051,208	8	$^7F_2 - 24091^\circ_3$
5142,116	9	$^7F_4 - 27216^\circ_5$	5049,408	5	$^5D_0 - 29571^\circ_1$
5140,487	8	$(7/2,3/2)^\circ_5 - 28834_5$	5047,105	6	$(5/2,5/2)^\circ_4 - 34661_4$
5138,246 *P*		$18346^\circ_2 - 37803_3$	5044,558	9	$(7/2,3/2)^\circ_5 - 29204_5$
5138,144	8	$^9H_1 - 32985^\circ_2$	5043,141 *P*		$14911^\circ_4 - 34735_3$
5135,541	9	$^7F_2 - 23766^\circ_1$	5043,111	5	$^7F_2 - 24123^\circ_2$
5133,837	8	$^7F_3 - 25617^\circ_2$	5042,61 *P*		$(7/2,3/2)^\circ_4 - 31984_3$
5126,629	7	$^9H_1 - 33028^\circ_2$	5042,56 *P*		$(5/2,5/2)^\circ_0 - 31572_1$
5124,449	5	$^7F_2 - 23808^\circ_2$	5041,62 *P*		$14911^\circ_4 - 34741_5$
5122,476	5	$(5/2,5/2)^\circ_2 - 33033_3$	5041,289	9	$(5/2,3/2)^\circ_3 - 29554_3$
5122,050	5	1 $14911^\circ_4 - 34429_3$	5041,050	8	$(5/2,3/2)^\circ_1 - 30318_2$
5121,603	8	$(7/2,3/2)^\circ_5 - 28906_3$	5034,533 *P*		$(7/2,3/2)^\circ_3 - 31697_4$
5118,973	9	$(5/2,3/2)^\circ_1 - 30016_2$	5034,267 *P*		$(7/2,3/2)^\circ_4 - 32017_4$
5117,148 *P*		$(7/2,5/2)^\circ_3 - 31377_4$	5034,056 *P*		$^7F_2 - 24158^\circ_2$
5116,701	4	$(7/2,3/2)^\circ_4 - 31697_4$	5032,669	6	$^7F_3 - 26008^\circ_3$
5115,650	8	$^9H_1 - 33070^\circ_2$	5032,080	6	$(5/2,5/2)^\circ_1 - 32044_1$
5114,301 *P*		$^9H_1 - 33075^\circ_2$	5031,544	7	$^7F_4 - 27643^\circ_4$
5109,060	6	$14911^\circ_4 - 34479_4$	5031,055 *P*		$^5D_0 - 29643^\circ_1$
5107,725 *P*		$(7/2,3/2)^\circ_3 - 31413_3$	5028,255 *P*		$(5/2,5/2)^\circ_4 - 34735_3$
5106,676 *P*		$(5/2,5/2)^\circ_4 - 34429_3$	5026,73 *P*		$(5/2,5/2)^\circ_4 - 34741_5$
5100,869	5	$^9H_2 - 33940^\circ_3$	5026,519 *P*		$(5/2,5/2)^\circ_1 - 32066_2$
5097,699 *P*	7	$(7/2,3/2)^\circ_3 - 31451_4$	5025,738	7	$(5/2,3/2)^\circ_4 - 26205_3$
5094,651	8	$(7/2,3/2)^\circ_5 - 29009_4$	5023,487	8	$(5/2,3/2)^\circ_3 - 29625_2$
5093,764 *P*		$(5/2,5/2)^\circ_4 - 34479_4$	5012,513	7	$(7/2,3/2)^\circ_4 - 32103_4$
5084,693 *P*		$(7/2,3/2)^\circ_4 - 31820_4$	5008,812	7*R*	$^7F_0 - 19959^\circ_1$
5084,45 *P*		$(7/2,3/2)^\circ_2 - 31984_3$	5008,254	8	$^7F_3 - 26105^\circ_2$
5079,240 *P*		$14911^\circ_4 - 34594_3$	5005,443	5	$(5/2,3/2)^\circ_2 - 28740_3$
5078,922	8	$^7F_3 - 25828^\circ_4$	5005,405	7	$^7F_1 - 22176^\circ_1$
5068,97 *P*		$(7/2,3/2)^\circ_2 - 32044_1$	5004,533	7	$14911^\circ_4 - 34888_5$
5068,418	7	$(5/2,5/2)^\circ_0 - 31471_1$	5004,386	8	$(5/2,3/2)^\circ_4 - 26290_5$
5067,952	8	$^7F_3 - 25870^\circ_2$	5003,753 *P*		$^9H_1 - 33507^\circ_2$
5064,142 *P*		$(5/2,5/2)^\circ_4 - 34594_3$	5003,570 *P*		$(7/2,3/2)^\circ_3 - 31820_4$
5063,355 *P*		$(7/2,3/2)^\circ_2 - 32066_2$	5003,472 *P*		$(5/2,5/2)^\circ_2 - 33498_3$
5062,06 *P*		$14911^\circ_4 - 34661_4$	5003,232	7	$^7F_4 - 27755^\circ_3$

Table 3 (continued)

λ, Å	I	Transition	λ, Å	I	Transition
4999,926 *P*	5	$14911^\circ_4 - 34906_5$	4921,168	8	$(7/2,3/2)^\circ_2 - 32637_3$
4996,480 *P*		$14911^\circ_4 - 34920_3$	4920,955 *P*		$(5/2,5/2)^\circ_3 - 34042_4$
4992,108	6	$(5/2,3/2)^\circ_2 - 28793_3$	4913,787	6	$(5/2,5/2)^\circ_4 - 35198_3$
4989,853	5	$(5/2,5/2)^\circ_4 - 34888_5$	4913,440 *P*		$(7/2,3/2)^\circ_2 - 32669_3$
4989,295	8	$(5/2,3/2)^\circ_4 - 26350_4$	4911,753	8	$^7F_2 - 24653^\circ_1$
4986,991 *P*		$(5/2,5/2)^\circ_2 - 33564_1$	4907,98 *P*		$(5/2,5/2)^\circ_5 - 34661_4$
4986,774	8	$(5/2,3/2)^\circ_4 - 26361_5$	4898,213 *P*		$(5/2,3/2)^\circ_3 - 30134_3$
4985,296 *P*		$(5/2,5/2)^\circ_4 - 34906_5$	4894,416	8*R*	$^7F_0 - 20425^\circ_1$
4985,031	8	$^7F_5 - 29233^\circ_4$	4893,896 *P*		$^7F_3 - 26572^\circ_2$
4982,527	6	$^7F_3 - 26208^\circ_3$	4888,801	5	$(5/2,5/2)^\circ_5 - 34741_5$
4981,870 *P*		$(5/2,5/2)^\circ_4 - 34920_3$	4888,194	7	$^7F_2 - 24751^\circ_1$
4969,740	8	$18346^\circ_2 - 38463_1$ $^7F_5 - 29295^\circ_4$	4881,96 *P*		$(7/2,3/2)^\circ_4 - 32637_3$
4969,429 *P*	8	$^7F_3 - 26261_2$	4876,291 *P*		$^7F_1 - 22705^\circ_1$
4969,419 *P*	8	$(5/2,3/2)^\circ_4 - 26431_3$	4874,349 *P*		$(7/2,3/2)^\circ_4 - 32669_3$
4964,873 *P*	8	$(5/2,3/2)^\circ_4 - 26449_3$	4872,427 *P*		$(9/2,3/2)^\circ_6 - 32869_5$
4963,193	4	$14911^\circ_4 - 35054_3$	4863,67		$19426^\circ_3 - 39981_3$
4962,83 *P*		$(7/2,3/2)^\circ_3 - 31984_3$	4855,165	6	$^7F_3 - 26735^\circ_2$
4962,262	6*R*	$^7F_0 - 20146^\circ_1$	4854,435	7	$^7F_4 - 28368^\circ_3$
4960,098	8	$^9H_2 - 34497^\circ_3$	4854,398		$(5/2,3/2)^\circ_3 - 30318_2$
4959,652	6	$^7F_2 - 24456^\circ_3$	4853,895	7	$(5/2,5/2)^\circ_5 - 34888_5$
4959,346 *P*		$14911^\circ_4 - 35070_5$	4852,040	8	$^7F_2 - 24903^\circ_2$
4958,428	6	$(5/2,3/2)^\circ_3 - 29886_3$	4849,556 *P*		$(5/2,5/2)^\circ_5 - 34906_5$
4958,136	7*R*	$^7F_0 - 20163^\circ_1$ $(5/2,3/2)^\circ_1 - 30650_0$	4842,306	6	$^7F_1 - 22849_1$
			4841,797	7	$(5/2,3/2)^\circ_3 - 30371_3$
			4841,122	7	$(7/2,3/2)^\circ_4 - 32809_4$
4955,643	8	$^7F_3 - 26317^\circ_4$	4840,148 *P*	*R*	$^7F_0 - 20654^\circ_1$
4954,801		$^7F_1 - 22417^\circ_2$	4838,637	8	$^7F_4 - 30899^\circ_5$
4954,739	6	$(7/2,3/2)^\circ_3 - 32017_4$	4836,383	2	$(5/2,3/2)^\circ_3 - 30394_4$
4952,137 *P*		$(5/2,5/2)^\circ_5 - 34479_4$	4830,372 *P*		$(7/2,3/2)^\circ_5 - 30083_5$
4948,772 *P*		$(5/2,5/2) - 35054_3$	4829,667 *P*	5	$19281^\circ_2 - 39981_3$
4944,950 *P*		$(5/2,5/2)^\circ_4 - 35070_5$	4828,770	1	$(5/2,5/2)^\circ_3 - 34429_3$
4933,663	8	$(7/2,3/2)^\circ_3 - 32103_4$	4827,237 *P*		$(7/2,3/2)^\circ_4 - 32869_5$
4928,07 *P*		$14911^\circ_4 - 35198_3$	4826,911 *P*		$(7/2,3/2)^\circ_2 - 33033_3$
4926,604 *P*		$(5/2,3/2)^\circ_3 - 30016_2$	4823,34 *P*		$(7/2,3/2)^\circ_5 - 30113_6$
4926,238	6	$18045^\circ_4 - 38339_4$	4820,808	7	$(9/2,3/2)^\circ_6 - 33089_5$
4926,217 *P*		$^5D_0 - 30066^\circ_1$	4820,498	2	$^7F_4 - 28513^\circ_3$
4925,25 *P*		$(5/2,5/2)^\circ_0 - 32044_1$	4817,216 *P*		$(5/2,5/2)^\circ_3 - 34479_4$

Table 3 (continued)

λ, Å	I	Transition	λ, Å	I	Transition
4815,850	3	$^7F_6 - 30997^\circ_5$	4745,343	6	$(9/2,3/2)^\circ_6 - 33418_5$
4814,439	8	$^7F_2 - 25064^\circ_3$	4744,956	5	$16734^\circ_2 - 37803_3$
4813,424	2	$14416^\circ_1 - 35185_1$	4743,670	4	$(7/2,3/2)^\circ_5 - 30461_5$
4811,369 P		$(5/2,5/2)^\circ_5 - 35070_5$	4743,210	1	$(5/2,3/2)^\circ_2 - 34594_3$
4809,419	8	$(5/2,3/2)^\circ_2 - 29554_3$	4741,18 P		$(5/2,3/2)^\circ_1 - 31572_1$
4807,13 P		$(7/2,3/2)^\circ_3 - 32637_3$	4741,029	4	$(5/2,3/2)^\circ_2 - 29854_1$
4804,112	8	$(7/2,3/2)^\circ_4 - 32968_4$	4738,555	8	$^7F_2 - 25397^\circ_1$
4801,701	2	$(5/2,3/2)^\circ_3 - 30544_3$	4735,899		$14911^\circ_4 - 36021_3$
4801,196	8	$^7F_2 - 25121^\circ_1$	4735,128	2	$^7F_3 - 27257^\circ_2$
4799,758 P		$(7/2,5/2)^\circ_3 - 32669_3$	4733,928	6	$(5/2,3/2)^\circ_2 - 29886_3$
4798,585	8	$^7F_1 - 23037^\circ_1$	4731,642	8	$(7/2,3/2)^\circ_3 - 32968_4$
4793,806	3	$14911^\circ_4 - 35766_4$	4730,911	8	$^7F_4 - 28906^\circ_5$
4793,204	6	$(5/2,3/2)^\circ_2 - 29625_2$	4729,182	1	$(9/2,3/2)^\circ_6 - 33490_5$
4790,758	1	$(5/2,5/2)^\circ_3 - 34594_3$	4726,416 P		$(5/2,3/2)^\circ_3 - 30875_4$
4789,179 P		$(7/2,3/2)^\circ_4 - 33033_3$	4725,251 P		$^5D_0 - 30929^\circ_1$
4788,436	7	$(5/2,3/2)^\circ_2 - 29645_1$	4724,173	7	$(7/2,3/2)^\circ_4 - 33321_5$
4785,546 P	1	$18346^\circ_2 - 39237_2$	4722,789 P		$(5/2,5/2)^\circ_4 - 36021_3$
4783,677	0	$^5D_0 - 30670^\circ_1$	4721,091 P		$(7/2,3/2)^\circ_2 - 33498_3$
4780,509	2	$(5/2,5/2)^\circ_2 - 34429_3$	4720,723	9	$^7F_4 - 28951^\circ_5$
4780,351	3	$(5/2,5/2)^\circ_4 - 35766_4$	4718,616	8	$15249^\circ_2 - 36436_3$
4778,269	8	$^7F_1 - 23125^\circ_2$	4717,152 P		$(7/2,3/2)^\circ_3 - 33033_3$
2776,575	6	$(7/2,3/2)^\circ_4 - 33089_5$	4717,023	0	$(5/2,5/2)^\circ_3 - 34920_3$
4775,42 P		$(5/2,5/2)^\circ_3 - 34661_4$	4712,757	8	$^7F_1 - 23416$
4772,445	5	$^7F_4 - 28722^\circ_3$	4711,714 P		$(5/2,5/2)^\circ_2 - 34735_3$
4767,524 P		$(7/2,5/2)^\circ_3 - 32809_4$	4706,425	2	$(7/2,3/2)^\circ_2 - 33564_1$
4767,438	3	$(9/2,3/2)^\circ_6 - 33321_5$	4704,885	6	$(5/2,3/2)^\circ_2 - 30016_2$
4765,019	7	$^7F_3 - 27124^\circ_2$	4702,727 P		$14911^\circ_4 - 36170_4$
4764,039	6	$(5/2,3/2)^\circ_1 - 31471_1$	4702,463 P		$(7/2,3/2)^\circ_4 - 33418_5$
4762,815	7	$(5/2,3/2)^\circ_3 - 30714_4$	4701,786	2	$^7F_4 - 29037^\circ_3$
4761,057	8	$(5/2,3/2) - 27311_5$	4700,790	7	$^7F_6 - 31505^\circ_5$
4758,656	8	$(7/2,3/2)^\circ_5 - 30394_4$	4697,091	7	$(5/2,3/2)^\circ_4 - 27597_4$
4758,586 P	6	$(5/2,5/2)^\circ_3 - 34735_3$	4695,167 P		$14911^\circ_4 - 36204_3$
4758,211	8	$(7/2,3/2)^\circ_5 - 30397_5$	4691,857	6R	$^7F_0 - 21307^\circ_1$
4753,923	9	$^7F_2 - 25328^\circ_3$	4689,781 P		$(5/2,5/2)^\circ_4 - 36170_4$
4753,498	8R	$^7F_0 - 21031^\circ_1$	4689,578	9	$^7F_2 - 25617^\circ_2$
4750,965	4	$15249^\circ_2 - 36291_3$	4689,093	8	$^7F_5 - 30499^\circ_4$
4748,846	8	$^7F_3 - 27196^\circ_3$	4687,407	7	$(7/2,3/2)^\circ_5 - 30714_4$
4748,040	8	$(5/2,3/2)^\circ_3 - 30779_3$	4687,338 P		$(5/2,5/2)^\circ_3 - 35054_3$

Table 3 (continued)

λ, Å	I	Transition	λ, Å	I	Transition
4686,563	6	$(7/2,3/2)^\circ_4 - 33490_5$	4632,669	8	$(5/2,3/2)^\circ_1 - 32066_2$
4684,952	6	$(7/2,3/2)^\circ_4 - 33498_3$	4631,943 P		$(5/2,5/2)^\circ_4 - 36436_3$
4684,073 P		$14911^\circ_4 - 36254_5$	4627,451	9	$(5/2,3/2)^\circ_2 - 30371_3$
4683,253	8	$^7F_3 - 27491^\circ_2$	4627,328	5	$^7F_1 - 23808^\circ_2$
4682,262 P		$(5/2,5/2)^\circ_4 - 36204_3$	4625,860	9	$^7F_3 - 27755^\circ_3$
4680,228 P		$15249^\circ_2 - 36609_2$	4624,866 P		$14911^\circ_4 - 36528_3$
4680,084	5	$^7F_2 - 25660^\circ_1$	4623,752	5	$^7F_2 - 25921^\circ_1$
4678,990	8	$(5/2,3/2)^\circ_2 - 30134_3$	4620,982 P	2	$18346^\circ_2 - 39981_3$
4677,086	8	$^7F_5 - 30553^\circ_4$	4617,008	9	$(9/2,3/2)^\circ_3 - 31377_4$
4676,470	9	$(7/2,3/2)^\circ_5 - 30764_6$	4616,042 P	8	$(7/2,3/2)^\circ_3 - 33498_3$
4675,951	3	$14911^\circ_4 - 36291_3$	4615,721		$(5/2,3/2)^\circ_4 - 27972_4$
4674,574 P		$(5/2,5/2)^\circ_1 - 33564_1$	4615,461	8	$^7F_2 - 25959^\circ_1$
4673,725	7	$^5D_0 - 31162^\circ_1$	4613,806	4	$(5/2,5/2)^\circ_2 - 35185_1$
4673,388	8	$^7F_3 - 27536^\circ_3$	4612,339	6	$(5/2,5/2)^\circ_4 - 36528_3$
4671,229 P	7	$(5/2,5/2)^\circ_4 - 36254_5$	4611,096	4	$(5/2,5/2)^\circ_2 - 35198_3$
4670,954	8	$(5/2,5/2)^\circ_2 - 34920_3$	4609,359	9	$(5/2,3/2)^\circ_3 - 31413_3$
4668,302	8	$(5/2,3/2)^\circ_4 - 27728_3$	4607,017	9	$(7/2,3/2)^\circ_5 - 31086_5$
4663,139 P		$(5/2,5/2)^\circ_4 - 36291_3$	4605,018	8	$^7F_2 - 26008^\circ_3$
4662,165	8	$^9H_2 - 35787^\circ_1$	4603,614 P	5	$14911^\circ_4 - 36627_4$
4658,735	8	$^7F_4 - 29233^\circ_4$	4602,847	3	$(7/2,3/2)^\circ_2 - 34042_4$
4656,082	5	$(5/2,5/2)^\circ_3 - 35198_3$	4602,679	8	$^7F_5 - 30899^\circ_5$
4655,338	8	$(5/2,3/2)^\circ_3 - 31198_3$	4601,164	8	$(5/2,3/2)^\circ_3 - 31451_4$
4655,380 P		$(5/2,5/2)^\circ_5 - 35766_4$	4600,879	8	$16734^\circ_2 - 38463_2$
4652,175	8	$(7/2,3/2)^\circ_5 - 30875_4$	4594,542	9	$^7F_3 - 27903^\circ_2$
4650,018	8	$^7F_3 - 27643^\circ_4$	4593,20 P		$14911^\circ_4 - 36677$
4648,407	8	$^7F_3 - 27651^\circ_2$	4591,226	4	$(5/2,5/2)^\circ_4 - 36627_4$
4648,064	8	$14911^\circ_4 - 36420_5$	4590,86 P		$(5/2,3/2)^\circ_2 - 30544_3$
4646,828	7	$16520^\circ_5 - 38034_6$	4584,952	7	$(5/2,3/2)^\circ_4 - 28118_3$
4646,603	8R	$^7F_0 - 21515^\circ_1$	4584,568	8	$^7F_2 - 26105^\circ_2$
4645,394	8	$^7F_4 - 29255^\circ_4$	4582,549 P	4	$14911^\circ_4 - 36727_3$
4644,570 P	4	$14911^\circ_4 - 36436_3$	4582,253	3	$(5/2,5/2)^\circ_0 - 33564_1$
4641,846	5	$(5/2,5/2)^\circ_2 - 35054_3$	4582,074	9	$^7F_5 - 30997^\circ_5$
4641,038	8	$^7F_4 - 29315^\circ_3$	4581,958		$16520^\circ_5 - 38339_4$
4638,992 P		$(5/2,3/2)^\circ_2 - 30318_2$	4580,85 P		$(5/2,5/2)^\circ_4 - 36677_4$
4637,280	3	$(5/2,3/2)^\circ_1 - 32044_1$	4579,788	8	$(5/2,5/2)^\circ_1 - 34006_0$
4636,334	8	$^7F_1 - 23766^\circ_1$	4578,582	9	$^7F_3 - 27979^\circ_2$
4635,387	7	$(5/2,5/2)^\circ_4 - 36420_5$	4571,495	3	$16520^\circ_5 - 38389_4$
4634,525	8	$^7F_2 - 25870^\circ_2$	4570,268	3	$(5/2,5/2)^\circ_4 - 36727_3$

Table 3 (continued)

λ, A°	I	Transition	λ, A°	I	Transition
4569,463 *P*	6	$(5/2,5/2)^{\circ}_{5} - 36170_{4}$	4484,358	9	$(5/2,3/2)^{\circ}_{3} - 32017_{4}$
4568,547	9	$(7/2,3/2)^{\circ}_{4} - 34042_{4}$	4484,110 *P*		$(5/2,5/2)^{\circ}_{3} - 36021_{3}$
4567,265	9	$^{7}F_{4} - 29663^{\circ}_{3}$	4480,814	7	$(7/2,3/2)^{\circ}_{5} - 31697_{4}$
4562,988	8	$^{7}F_{2} - 26208^{\circ}_{3}$	4478,959	5	$(7/2,3/2)^{\circ}_{4} - 34479_{4}$
4560,828	5	$^{7}F_{1} - 24123^{\circ}_{2}$	4477,769	5	$^{7}F_{5} - 31505^{\circ}_{5}$
4557,570	7	$18045^{\circ}_{4} - 39981_{3}$	4477,685	5	$^{7}F_{3} - 28471^{\circ}_{2}$
4557,305	7	$^{7}F_{5} - 31115^{\circ}_{4}$	4476,241	8	$^{7}F_{2} - 26633^{\circ}_{1}$
4554,421 *P*		$^{7}F_{2} - 26250^{\circ}_{1}$	4475,827	4	$(5/2,5/2)^{\circ}_{5} - 36627_{4}$
4553,460	9	$^{7}F_{1} - 24158^{\circ}_{2}$	4474,529	5	$(5/2,3/2)^{\circ}_{3} - 32066_{2}$
4552,016	9	$^{7}F_{2} - 26261^{\circ}_{2}$	4471,624	5	$^{7}F_{4} - 30131^{\circ}_{3}$
4551,854	4	$(5/2,5/2)^{\circ}_{5} - 36254_{5}$	4467,086	8	$(5/2,3/2)^{\circ}_{3} - 32103_{4}$
4549,671	7	$(5/2,3/2)^{\circ}_{3} - 31697_{4}$	4465,960	1	$(5/2,5/2)^{\circ}_{5} - 36677_{4}$
4547,985	2	$(5/2,3/2)^{\circ}_{4} - 28295_{4}$	4465,016	7	$(9/2,3/2)^{\circ}_{6} - 34741_{5}$
4546,155 *P*		$(7/2,3/2)^{\circ}_{5} - 31377_{4}$	4460,478 *P*		$(7/2,3/2)^{\circ}_{2} - 34735_{3}$
4541,748	4	$(5/2,3/2)^{\circ}_{2} - 30779_{3}$	4459,166 *P*		$(5/2,3/2)^{\circ}_{4} - 28733_{4}$
4536,685	3	$^{7}F_{4} - 29810^{\circ}_{3}$	4458,725	7	$^{7}F_{3} - 28565^{\circ}_{2}$
4535,943	4	$(5/2,5/2)^{\circ}_{3} - 35766_{4}$	4457,660	9	$(5/2,3/2)^{\circ}_{4} - 28740_{3}$
4533,011	9	$^{7}F_{5} - 31233^{\circ}_{4}$	4456,910	8	$(5/2,3/2)^{\circ}_{2} - 31198_{3}$
4530,791	5	$(7/2,3/2)^{\circ}_{5} - 31451_{4}$	4456,248	5	$(7/2,3/2)^{\circ}_{5} -31820_{4}$
4530,659	9	$^{7}F_{3} - 28210^{\circ}_{2}$	4456,047 *P*		$(7/2,5/2)^{\circ}_{4} - 34594_{3}$
4524,338	9	$(5/2,3/2)^{\circ}_{3} - 31820_{4}$	4455,888	9	$^{7}F_{2} - 26735^{\circ}_{2}$
4522,078 *P*		$(7/2,3/2)^{\circ}_{2} - 34429_{3}$	4454,344 *P*		$(5/2,5/2)^{\circ}_{3} - 36170_{4}$
4517,829	2	$(5/2,5/2)^{\circ}_{5} - 36420_{5}$	4453,114	9	$^{7}F_{1} - 24653^{\circ}_{1}$
4513,536	8	$(7/2,3/2)^{\circ}_{5} - 31535_{5}$	4447,535	3	$(5/2,5/2)^{\circ}_{3} - 36204_{3}$
4510,545	8	$^{7}F_{5} - 31343^{\circ}_{4}$	4447,075	9	$(5/2,3/2)^{\circ}_{4} - 28793_{3}$
4508,035	6*R*	$^{7}F_{0} - 22176^{\circ}_{1}$	4442,806	2	$(7/2,3/2)^{\circ}_{4} - 34681_{4}$
4507,466	7	$^{7}F_{5} - 31358^{\circ}_{1}$	4442,570	1	$16734^{\circ}_{2} - 39237_{2}$
4506,633	9	$(5/2,3/2)^{\circ}_{4} - 28496_{4}$	4442,460	9	$(5/2,5/2)^{\circ}_{2} - 36021_{3}$
4504,463	2	$14416^{\circ}_{1} - 36609_{2}$	4439,066	9	$(5/2,3/2)^{\circ}_{4} - 28834_{5}$
4502,925	2	$(7/2,3/2)^{\circ}_{3} - 34042_{4}$	4435,893	8	$(9/2,3/2)^{\circ}_{6} - 34888_{5}$
4499,628 *P*	8	$14911^{\circ}_{4} - 37129_{5}$	4433,735	8	$^{7}F_{1} - 24751^{\circ}_{1}$
4498,377	8	$^{7}F_{3} - 28368^{\circ}_{3}$	4432,606	4	$15249^{\circ}_{2} - 37803_{3}$
4491,681	8	$^{9}H_{1} - 35785^{\circ}_{1}$	4432,307	7	$(9/2,3/2)^{\circ}_{6} - 34906_{5}$
4490,98 *P*		$(5/2,3/2)^{\circ}_{3} - 31984_{3}$	4430,285	1	$(5/2,5/2)^{\circ}_{3} - 36291_{3}$
4488,945	1	$(7/2,3/2)^{\circ}_{4} - 34429_{3}$	4428,439 *P*		$(7/2,3/2)^{\circ}_{4} - 34735_{3}$
4488,695 *P*		$(7/2,3/2)^{\circ}_{2} - 34594_{3}$	4427,866	6	$^{7}F_{3} - 28722^{\circ}_{3}$
4488,518	4	$^{7}F_{2} - 26572^{\circ}_{3}$	4427,035	2	$(7/2,3/2)^{\circ}_{4} - 34741_{5}$
4487,765	9	$(5/2,5/2)^{\circ}_{4} - 371$[illegible]	4424,980	9	$(5/2,3/2)^{\circ}_{4} - 28906_{5}$

Table 3 (continued)

λ, A°	I	Transition	λ, A°	I	Transition
4423,937 *P*		$(7/2,3/2)^{\circ}_{2} - 34920_{3}$	4365,326 *P*		$(5/2,5/2)^{\circ}_{3} - 36627_{4}$
4422,318	4	$15856^{\circ}_{1} - 38463_{1}$	4363,504	6	$(7/2,3/2)^{\circ}_{4} - 35070_{5}$
4417,473	8	$(7/2,3/2)^{\circ}_{5} - 32017_{4}$	4363,125	5	$(5/2,3/2)^{\circ}_{3} - 32637_{3}$
4415,895	7	$(7/2,3/2)^{\circ}_{5} - 34479_{4}$	4362,069	8	$^{7}F_{1} - 25121^{\circ}_{1}$
4415,690	7	$^{7}F_{6} - 32878^{\circ}_{5}$	4361,992	7	$(5/2,5/2)^{\circ}_{2} - 36436_{3}$
4414,675	9	$(5/2,3/2)^{\circ}_{2} - 31413_{3}$	4357,842		$(5/2,3/2)^{\circ}_{3} - 32669_{3}$
4406,572	4	$(5/2,3/2)^{\circ}_{2} - 36204_{3}$	4356,039	1	$(5/2,5/2)^{\circ}_{4} - 37803_{3}$
4404,860	9	$(5/2,3/2)^{\circ}_{4} - 29009_{4}$	4355,96 *P*		$(5/2,5/2)^{\circ}_{3} - 36677_{4}$
4404,018	8	$^{7}F_{1} - 24903^{\circ}_{2}$	4354,634	3	$^{7}F_{2} - 27257^{\circ}_{2}$
4403,357	4	$(5/2,3/2)^{\circ}_{2} - 31471_{1}$	4346,366	6	$(5/2,5/2)^{\circ}_{3} - 36727_{3}$
4403,021	8*R*	$^{7}F_{0} - 22705^{\circ}_{1}$	4345,126	1	$(5/2,5/2)^{\circ}_{1} - 35185_{1}$
4402,117	5	$(5/2,5/2)^{\circ}_{3} - 36436_{3}$	4344,591	3	$(5/2,5/2)^{\circ}_{2} - 36528_{3}$
4400,714	8	$(7/2,3/2)^{\circ}_{5} - 32103_{4}$	4339,578 *P*	*R*	$^{7}F_{0} - 23037^{\circ}_{1}$
4400,393 *P*	8	$(9/2,3/2)^{\circ}_{6} - 35070_{5}$	4339,284	6	$(7/2,3/2)^{\circ}_{4} - 35198_{3}$
4399,254	8	$^{7}F_{4} - 30499^{\circ}_{4}$	4336,027	8	$15406^{\circ}_{1} - 38463_{1}$
4398,425	2	$(7/2,3/2)^{\circ}_{4} - 34888_{5}$	4332,043	7	$(5/2,3/2)^{\circ}_{1} - 33564_{1}$
4397,844 *P*		$(7/2,3/2)^{\circ}_{2} - 35054_{3}$	4331,566	7	$(7/2,3/2)^{\circ}_{3} - 34920_{3}$
4395,572	7	$^{7}F_{6} - 32982^{\circ}_{5}$	4330,764	6	$^{7}F_{5} - 32263^{\circ}_{4}$
4394,890	8	$(7/2,3/2)^{\circ}_{4} - 34906_{5}$	4330,461	9	$(5/2,3/2)^{\circ}_{3} - 32809_{4}$
4393,622 *P*	5	$(7/2,3/2)^{\circ}_{3} - 34594_{3}$	4329,817	8	$^{7}F_{3} - 29233^{\circ}_{4}$
4392,220	3	$(7/2,3/2)^{\circ}_{4} - 34920_{3}$	4329,192	0	$(5/2,5/2)^{\circ}_{2} - 36609_{2}$
4392,070	9	$^{7}F_{3} - 28906^{\circ}_{3}$	4323,114	0	$^{7}F_{4} - 30899^{\circ}_{5}$
4389,636	2	$(5/2,5/2)^{\circ}_{2} - 36291_{3}$	4318,284	8	$^{7}F_{3} - 29295^{\circ}_{4}$
4388,678	8	$^{7}F_{4} - 30553^{\circ}_{4}$	4314,558	7	$^{7}F_{3} - 29315^{\circ}_{3}$
4384,406 *P*	6	$(5/2,5/2)^{\circ}_{3} - 36528_{3}$	4310,702	8	$^{7}F_{2} - 27491^{\circ}_{2}$
4383,358	4	$(5/2,3/2)^{\circ}_{2} - 31572_{1}$	4310,307	8	$^{7}F_{1} - 25397^{\circ}_{1}$
4380,749	4	$(7/2,3/2)^{\circ}_{3} - 34661_{4}$	4309,115	4	$^{7}F_{4} - 30974^{\circ}_{3}$
4379,858	9	$^{7}F_{2} - 27124^{\circ}_{2}$	4307,380	3	$^{7}F_{4} - 30984^{\circ}_{3}$
4377,463	4	$(5/2,5/2)^{\circ}_{5} - 37129_{5}$	4307,227	5	$(5/2,5/2)^{\circ}_{2} - 36727_{3}$
4375,308	6*R*	$^{7}F_{0} - 22849^{\circ}_{1}$	4306,609		$15249^{\circ}_{2} - 38463_{1}$
4370,21 *P*		$(7/2,3/2)^{\circ}_{2} - 35198_{3}$	4306,561 *P*		$(7/2,3/2)^{\circ}_{3} - 35054_{3}$
4368,738	5	$(5/2,5/2)^{\circ}_{3} - 36609_{2}$	4305,911	5	$(5/2,3/2)^{\circ}_{2} - 31984_{3}$
4367,364	9	$(5/2,3/2)^{\circ}_{4} - 29204_{5}$	4304,917	8	$^{7}F_{4} - 30997^{\circ}_{5}$
4367,206 *P*		$14911^{\circ}_{4} - 37803_{3}$	4302,350	9	$^{7}F_{2} - 27536^{\circ}_{3}$
4366,972	7	$^{7}F_{3} - 29037^{\circ}_{3}$	4301,532	8	$(5/2,3/2)^{\circ}_{4} - 29554_{3}$
4366,589 *P*		$(7/2,3/2)^{\circ}_{3} - 34735_{3}$	4300,844	9	$(5/2,3/2)^{\circ}_{3} - 32968_{4}$
4366,475 *P*		$(7/2,3/2)^{\circ}_{4} - 35054_{3}$	4300,404	7	$16734^{\circ}_{2} - 39981_{3}$
4366,203	8	$^{7}F_{2} - 27196^{\circ}_{3}$	4294,89 *P*	7	$(5/2,3/2)^{\circ}_{2} - 32044_{1}$

λ, A°	I	Transition
4292,872 *P*		$(5/2,3/2)^{\circ}_{2} - 32066_{2}$
4288,874	7	$(5/2,3/2)^{\circ}_{3} - 33033_{3}$
4283,078	6	$^7F_4 - 31115^{\circ}_{4}$
4281,148	9	$^7F_2 - 27651^{\circ}_{2}$
4280,06 *P*		$(7/2,3/2)^{\circ}_{3} - 35198_{3}$
4275,862		$15856^{\circ}_{1} - 39237_{2}$
4269,754	9	$^7F_1 - 25617^{\circ}_{2}$
4268,054	9	$(7/2,3/2)^{\circ}_{5} - 32809_{4}$
4267,242 *P*	2	$14911^{\circ}_{4} - 38339_{4}$
4265,271 *P*		$(5/2,5/2)^{\circ}_{0} - 35185_{1}$
4262,024	9	$^7F_2 - 27755^{\circ}_{3}$
4261,862	9	$^7F_1 - 25660^{\circ}_{1}$
4261,598	9	$^7F_4 - 31233^{\circ}_{4}$
4258,159	6	$14911^{\circ}_{4} - 38389_{4}$
4257,272	5	$(7/2,3/2)^{\circ}_{5} - 32869_{5}$
4256,580	7	$(5/2,5/2)^{\circ}_{4} - 38339_{4}$
4250,662	9	$^7F_3 - 29663^{\circ}_{3}$
4250,510	8	$(5/2,3/2)^{\circ}_{1} - 34006_{0}$
4247,522	6	$(5/2,5/2)^{\circ}_{4} - 38389_{4}$
4241,823	8	$^7F_4 - 31343^{\circ}_{4}$
4240,968	7	$(5/2,3/2)^{\circ}_{4} - 29886_{3}$
4239,293	9	$(7/2,3/2)^{\circ}_{5} - 32968_{4}$
4239,020	8	$^7F_4 - 31358^{\circ}_{4}$
4238,206	9	$^7F_2 - 27887^{\circ}_{1}$
4235,422	8	$^7F_2 - 27903^{\circ}_{2}$
4234,812 *P*	7	$(7/2,3/2)^{\circ}_{4} - 35766_{4}$
4224,186	9	$^7F_3 - 29810^{\circ}_{3}$
4224,086	9	$^7F_1 - 25870^{\circ}_{2}$
4221,862	9	$^7F_2 - 27979^{\circ}_{2}$
4218,433	2	$(7/2,3/2)^{\circ}_{2} - 36021_{3}$
4145,812 *P*		$(7/2,3/2)^{\circ}_{2} - 36436_{3}$
4142,599	5	$(7/2,3/2)^{\circ}_{4} - 36291_{3}$
4140,213	8	$^7F_2 - 28446^{\circ}_{1}$
4140,013	9	$(5/2,3/2)^{\circ}_{4} - 30461_{5}$
4135,945	9	$^7F_2 - 28471^{\circ}_{2}$
4134,376	4	$(7/2,3/2)^{\circ}_{3} - 36021_{3}$
4130,110	8	$(7/2,3/2)^{\circ}_{2} - 36528_{3}$
4128,094	9	$^7F_3 - 30361^{\circ}_{2}$
4125,889	6	$(5/2,3/2)^{\circ}_{4} - 30544_{3}$
4120,680	7	$(7/2,3/2)^{\circ}_{4} - 36420_{5}$
4119,851 *P*		$(5/2,3/2)^{\circ}_{2} - 33033_{2}$
4119,775	9	$^7F_2 - 28565^{\circ}_{2}$
4117,954	8	$(7/2,3/2)^{\circ}_{4} - 36436_{3}$
4116,459 *P*		$(5/2,5/2)^{\circ}_{2} - 37803_{3}$
4116,174 *P*		$(7/2,3/2)^{\circ}_{2} - 36609_{2}$
4111,040	8	$(5/2,3/2)^{\circ}_{3} - 34042_{4}$
4109,061	7	$(7/2,3/2)^{\circ}_{3} - 36170_{4}$
4104,813	6	$^7F_3 - 30499_{4}$
4103,204		$(7/2,3/2)^{\circ}_{3} - 36204_{3}$
4102,466	8	$^7F_1 - 26572^{\circ}_{2}$
4102,447 *P*		$(7/2,3/2)^{\circ}_{4} - 36528_{3}$
4100,678	7	$^7F_5 - 33558^{\circ}_{4}$
4097,118	8	$(5/2,3/2)^{\circ}_{4} - 30714_{4}$
4096,335	3	$(7/2,3/2)^{\circ}_{2} - 36727_{3}$
4095,601	9	$^7F_3 - 30553^{\circ}_{4}$
4093,419	5	$^7F_2 - 28722^{\circ}_{3}$
4092,205	8	$^7F_1 - 26633^{\circ}_{1}$
4091,810	4	$(5/2,5/2)^{\circ}_{1} - 36609_{2}$
4090,598	8	$^7F_2 - 28738^{\circ}_{1}$
4088,592	7	$(7/2,3/2)^{\circ}_{3} - 36291_{3}$
4086,166	7	$(5/2,3/2)^{\circ}_{4} - 30779_{3}$
4085,727	6	$(7/2,3/2)^{\circ}_{4} - 36627_{4}$
4082,363	8	$^7F_4 - 32263^{\circ}_{4}$
4077,52 *P*		$(7/2,3/2)^{\circ}_{4} - 36677_{4}$
4075,189	8	$^7F_1 - 26735^{\circ}_{2}$
4074,357	5	$^7F_3 - 30681^{\circ}_{2}$
4070,159	9	$(5/2,3/2)^{\circ}_{4} - 30875_{4}$
4069,116	8	$(7/2,3/2)^{\circ}_{4} - 36727_{3}$
4064,599 *P*		$14911^{\circ}_{4} - 39507_{3}$
4064,581 *P*		$(7/2,3/2)^{\circ}_{3} - 36436_{3}$
4062,795	8	$^7F_2 - 28906^{\circ}_{3}$
4061,732	5	$(5/2,5/2)^{\circ}_{3} - 38339_{4}$
4059,636	8	$^7F_3 - 30770^{\circ}_{2}$
4055,103	9*R*	$^7F_0 - 24653^{\circ}_{1}$
4054,925	3	$(5/2,5/2)^{\circ}_{4} - 39507_{3}$
4054,754 *P*		$(7/2,3/2)^{\circ}_{5} - 34042_{4}$
4053,500	7	$(5/2,5/2)^{\circ}_{3} - 38389_{4}$
4049,485	4	$(7/2,3/2)^{\circ}_{3} - 36528_{3}$
4047,641	3	$(5/2,3/2)^{\circ}_{1} - 35185_{1}$
4046,496 *P*		$(5/2,3/2)^{\circ}_{3} - 34429_{3}$
4042,509	9	$(5/2,3/2)^{\circ}_{2} - 33498_{3}$
4041,282	9	$^7F_2 - 29037^{\circ}_{3}$
4039,015	8*R*	$^7F_0 - 24751^{\circ}_{1}$
4038,371	9	$(5/2,3/2)^{\circ}_{3} - 34479_{4}$
4036,095	7	$(7/2,3/2)^{\circ}_{3} - 36609^{\circ}_{3}$
4035,522	7	$(5/2,3/2)^{\circ}_{4} - 31086_{5}$
4034,654	4	$(9/2,3/2)^{\circ}_{6} - 37129_{5}$
4033,176	4	$(7/2,3/2)^{\circ}_{3} - 36627_{4}$
4031,751	8	$(5/2,3/2)^{\circ}_{2} - 33564_{1}$
4027,679	2	$14416^{\circ}_{1} - 39237_{2}$
4026,207	8	$^7F_3 - 30974^{\circ}_{3}$
4025,183	6	$(7/2,3/2)^{\circ}_{3} - 36677_{4}$
4024,606	8	$^7F_3 - 30984^{\circ}_{3}$
4022,237 *P*		$15249^{\circ}_{2} - 39981_{3}$
4019,750	7	$(5/2,3/2)^{\circ}_{3} - 34594_{3}$
4017,365	8	$(5/2,3/2)^{\circ}_{4} - 31198_{3}$
4017,165 *P*		$(7/2,3/2)^{\circ}_{3} - 36727_{3}$
4011,495	8	$^7F_1 - 27124^{\circ}_{2}$
4008,97 *P*		$(5/2,5/2)^{\circ}_{3} - 38463_{1}$
4007,592 *P*		$(5/2,5/2)^{\circ}_{2} - 38463_{1}$
4006,227	8	$^7F_4 - 32728^{\circ}_{3}$
4003,603 *P*		$(7/2,3/2)^{\circ}_{4} - 31129_{5}$
4003,470	7	$^7F_3 - 31115^{\circ}_{4}$
3997,695 *P*		$^7F_3 - 31151^{\circ}_{2}$
3997,069	7	$(5/2,3/2)^{\circ}_{3} - 34735_{3}$
3996,354	7	$^7F_2 - 29315^{\circ}_{3}$
3994,498 *P*		$(5/2,5/2)^{\circ}_{1} - 39237_{2}$
3990,215	8	$^7F_1 - 27257^{\circ}_{2}$
3988,733	7	$(5/2,3/2)^{\circ}_{4} - 31377_{4}$
3987,798 *P*		$14911^{\circ}_{4} - 39981_{3}$
3984,689	6	$^7F_3 - 31233^{\circ}_{4}$
3984,067	7	$(7/2,3/2)^{\circ}_{5} - 34479_{4}$
3983,000	8	$(5/2,3/2)^{\circ}_{4} - 31413_{3}$
3982,322	7	$^7F_4 - 32878^{\circ}_{5}$
3979,470	8*R*	$^7F_0 - 25121^{\circ}_{1}$
3978,479	7	$(5/2,5/2)^{\circ}_{4} - 39981_{3}$
3978,302 *P*		$^7F_4 - 32903^{\circ}_{4}$
3976,901	7	$(5/2,3/2)^{\circ}_{4} - 31451_{4}$
3974,034	7	$^7F_4 - 32930^{\circ}_{3}$
3970,228	7	$^7F_4 - 32954^{\circ}_{3}$
3967,727	8	$(5/2,3/2)^{\circ}_{3} - 34920_{3}$
3967,268	8	$^7F_3 - 31343^{\circ}_{4}$
3965,952	7	$^7F_4 - 32982^{\circ}_{5}$
3964,947 *P*		$^7F_3 - 31358^{\circ}_{4}$
3964,936	9	$^7F_4 - 32988_{3}$
3963,615	7	$(5/2,3/2)^{\circ}_{4} - 31535_{5}$
3955,871	8	$^7F_2 - 29571^{\circ}_{1}$
3955,441	7	{ $(5/2,3/2)^{\circ}_{2} - 34042_{4}$ { $(7/2,3/2)^{\circ}_{5} - 34661_{4}$
3953,389	7	$^7F_1 - 27491^{\circ}_{2}$
3946,705	7	$(5/2,3/2)^{\circ}_{3} - 35054_{3}$
3944,606	7	$^7F_2 - 29643^{\circ}_{1}$
3942,937	8	$(7/2,3/2)^{\circ}_{5} - 34741_{5}$
3941,503	8	$^7F_2 - 29663^{\circ}_{3}$
3938,388	7	$(5/2,3/2)^{\circ}_{4} - 31697_{4}$
3936,318	7*R*	$^7F_0 - 25397^{\circ}_{1}$
3928,529	8	$^7F_1 - 27651^{\circ}_{2}$
3927,28 *P*		$(5/2,5/2)^{\circ}_{3} - 39182_{2}$
3924,523	6	$(5/2,3/2)^{\circ}_{3} - 35198_{3}$
3923,391	6	$(7/2,3/2)^{\circ}_{2} - 37803_{3}$
3920,218	7	$(7/2,3/2)^{\circ}_{5} - 34888_{5}$
3919,390	8	$(5/2,3/2)^{\circ}_{4} - 31820_{4}$
3918,796 *P*		$(5/2,5/2)^{\circ}_{3} - 39237_{2}$
3918,702	8	$^7F_2 - 29810^{\circ}_{3}$
3918,511	7	$^7F_3 - 31657^{\circ}_{2}$
3917,408	7	$(7/2,3/2)^{\circ}_{5} - 34906_{5}$
3908,127	7	$^7F_3 - 31724^{\circ}_{2}$
3907,932	8	$^7F_2 - 29881^{\circ}_{1}$
3898,432	6	$(7/2,3/2)^{\circ}_{4} - 37803_{3}$
3895,890	9*R*	$^7F_0 - 25660^{\circ}_{1}$
3895,701	7	$(5/2,3/2)^{\circ}_{2} - 34429_{3}$
3895,427	7	$^7F_3 - 31808^{\circ}_{3}$

Table 3 (continued)

λ, A°	I	Transition	λ, A°	I	Transition
3895,30 *P*		$(5/2,5/2)^{\circ}_{2} - 39182_{2}$	3805,906	9	$^{7}F_{1} - 28471^{\circ}_{2}$
3894,387	7	$(5/2,3/2)^{\circ}_{4} - 31984_{3}$	3803,348	7	$(5/2,5/2)^{\circ}_{1} - 38463_{1}$
3892,424	8	$(7/2,3/2)^{\circ}_{5} - 35070_{5}$	3803,134 *P*		$(5/2,3/2)^{\circ}_{2} - 35054_{3}$
3892,421		$(9/2,3/2)^{\circ}_{6} - 38034_{6}$	3801,634		$(5/2,3/2)^{\circ}_{3} - 36021_{3}$
3892,295	8	$^{7}F_{1} - 27887^{\circ}_{1}$	3797,81 *P*		$(5/2,3/2)^{\circ}_{4} - 32637_{3}$
3889,963	7	$^{7}F_{1} - 27903^{\circ}_{2}$	3793,213 *P*		$(5/2,3/2)^{\circ}_{4} - 32669_{3}$
3889,376	8	$(5/2,3/2)^{\circ}_{4} - 32017_{4}$	3792,205	9	$^{7}F_{1} - 28565^{\circ}_{2}$
3886,952 *P*		$(5/2,5/2)^{\circ}_{2} - 39237_{2}$	3790,895	6	$^{7}F_{2} - 30670^{\circ}_{1}$
3879,875	8	$^{7}F_{2} - 30066^{\circ}_{1}$	3789,708	7	$(7/2,3/2)^{\circ}_{5} - 35766_{4}$
3878,531	9	$^{7}F_{1} - 27979^{\circ}_{2}$	3789,421	6	$^{7}F_{2} - 30681^{\circ}_{2}$
3877,739	7	$(5/2,5/2)^{\circ}_{3} - 39507_{3}$	3785,668	6	$^{7}F_{3} - 32552^{\circ}_{2}$
3877,276	7	$^{7}F_{4} - 33558^{\circ}_{4}$	3784,279	7	$(5/2,3/2)^{\circ}_{2} - 35185_{1}$
3876,353	8	$(5/2,3/2)^{\circ}_{4} - 32103_{4}$	3782,510	6	$(5/2,3/2)^{\circ}_{2} - 35198_{3}$
3870,888		$(5/2,3/2)^{\circ}_{2} - 34594_{3}$	3780,211	5	$(5/2,3/2)^{\circ}_{3} - 36170_{4}$
3870,794		$^{7}F_{2} - 30131^{\circ}_{3}$	3777,680	6	$(5/2,5/2)^{\circ}_{2} - 39981_{3}$
3868,704	5	$(9/2,3/2)^{\circ}_{6} - 38199_{6}$	3776,699	8	$^{7}F_{2} - 30770^{\circ}_{2}$
3864,448	8	$^{7}F_{6} - 36107^{\circ}_{7}$	3775,332 *P*		$(5/2,3/2)^{\circ}_{3} - 36204_{3}$
3856,803	6*R*	$^{7}F_{0} - 25921^{\circ}_{1}$	3773,048	6	$(5/2,3/2)^{\circ}_{4} - 32809_{4}$
3851,006	9*R*	$^{7}F_{0} - 25959^{\circ}_{1}$	3774,656	7	$(7/2,3/2)^{\circ}_{3} - 38339_{4}$
3850,567 *P*		$(7/2,3/2)^{\circ}_{3} - 37803_{3}$	3767,482	6	$^{7}F_{1} - 28738^{\circ}_{1}$
3849,898	7	$(5/2,3/2)^{\circ}_{2} - 34735_{3}$	3765,541		$(7/2,3/2)^{\circ}_{3} - 38389_{4}$
3846,529 *P*		$(5/2,5/2)^{\circ}_{2} - 39507_{3}$	3764,620	6	$(5/2,3/2)^{\circ}_{4} - 32869_{5}$
3846,047	7	$^{7}F_{3} - 32137^{\circ}_{2}$	3762,880	6	$(5/2,3/2)^{\circ}_{3} - 36291_{3}$
3844,091	8	$^{7}F_{1} - 28210^{\circ}_{2}$	3760,562	7	$^{7}F_{3} - 32728^{\circ}_{3}$
3843,152	5	$^{5}D_{0} - 35785^{\circ}_{1}$	3757,612	7	$^{7}F_{3} - 32749^{\circ}_{2}$
3838,798		$(5/2,3/2)^{\circ}_{3} - 35766_{4}$	3754,121	6	$^{7}F_{2} - 30929^{\circ}_{1}$
3835,881	8	$^{7}F_{2} - 30361^{\circ}_{2}$	3753,608	9*R*	$^{7}F_{0} - 26633^{\circ}_{1}$
3835,501	9	$^{7}F_{1} - 28268^{\circ}_{1}$	3750,329		$(5/2,3/2)^{\circ}_{4} - 32968_{4}$
3827,578	8	$^{7}F_{3} - 32263^{\circ}_{4}$	3747,755 *P*		$^{7}F_{2} - 30974^{\circ}_{3}$
3826,925 *P*		$(5/2,3/2)^{\circ}_{1} - 36609_{2}$	3746,432	5	$^{7}F_{2} - 30984^{\circ}_{3}$
3824,372 *P*		$(7/2,3/2)^{\circ}_{2} - 38463_{1}$	3742,544	6	$(5/2,3/2)^{\circ}_{3} - 36436_{3}$
3822,645		$(5/2,3/2)^{\circ}_{2} - 34920_{3}$	3741,994 *P*		$(5/2,5/2)^{\circ}_{0} - 38463_{1}$
3820,603	7	$^{7}F_{4} - 33940^{\circ}_{3}$	3741,438	6	$(5/2,3/2)^{\circ}_{4} - 33033_{3}$
3818,575 *P*		$(7/2,3/2)^{\circ}_{4} - 38339_{4}$	3741,066 *P*		$^{7}F_{4} - 34497^{\circ}_{3}$
3811,294 *P*		$(7/2,3/2)^{\circ}_{4} - 38389_{4}$	3735,942	7	$^{7}F_{3} - 32903^{\circ}_{4}$
3809,542	7	$^{7}F_{1} - 28446^{\circ}_{1}$	3733,73 *P*		$(5/2,3/2)^{\circ}_{4} - 33089_{5}$
3808,425 *P*	4*R*	$^{7}F_{0} - 26250^{\circ}_{1}$	3732,577 *P*		$(7/2,3/2)^{\circ} - 36170_{4}$
3807,749 *P*		$(5/2,5/2)^{\circ}_{3} - 39981_{3}$	3732,168	7	$^{7}F_{3} - 32930^{\circ}_{3}$

Table 3 (continued)

λ, A°	I	Transition	λ, A°	I	Transition
3729,743 *P*		$(5/2,3/2)^{\circ}_{3} - 36528_{3}$	3632,155 *P*		$(5/2,3/2)^{\circ}_{2} - 36291_{3}$
3728,820	7	$^{7}F_{3} - 32954^{\circ}_{3}$	3631,313	7	$^{7}F_{2} - 31829^{\circ}_{3}$
3724,613	7	$^{7}F_{3} - 32985^{\circ}_{2}$	3614,446	5	$(7/2,3/2)^{\circ}_{2} - 39981_{3}$
3724,141	7	$^{7}F_{3} - 32988^{\circ}_{3}$	3613,375 *P*		$(7/2,3/2)^{\circ}_{3} - 39507_{3}$
3723,004	7	$^{7}F_{2} - 31151^{\circ}_{2}$	3613,192	6	$(5/2,3/2)^{\circ}_{2} - 36436_{3}$
3721,99 *P*		$(7/2,3/2)^{\circ}_{2} - 39182_{2}$	3611,977	6	$^{7}F_{1} - 29881^{\circ}_{2}$
3721,532	6	$^{7}F_{2} - 31162^{\circ}_{1}$	3605,365	6	$(5/2,3/2)^{\circ}_{4} - 34042_{4}$
3720,815 *P*		$(7/2,3/2)^{\circ}_{5} - 36627_{4}$	3603,477	4	$(5/2,3/2)^{\circ}_{5} - 37129_{5}$
3718,564	7	$^{7}F_{3} - 33028^{\circ}_{2}$	3601,255	4	$(5/2,3/2)^{\circ}_{2} - 36528_{3}$
3718,372	5	$(5/2,3/2)^{\circ}_{3} - 36609_{2}$	3596,537	5	$^{7}F_{3} - 33940^{\circ}_{3}$
3715,895	6	$(5/2,3/2)^{\circ}_{3} - 36627_{4}$	3593,244	5	$(7/2,3/2)^{\circ}_{4} - 39981_{3}$
3714,360 *P*		$(7/2,3/2)^{\circ}_{2} - 39237_{2}$	3591,151	6	$^{7}F_{2} - 32137^{\circ}_{2}$
3712,781	7	$^{7}F_{3} - 33070^{\circ}_{2}$	3590,664	7	$(5/2,3/2)^{\circ}_{2} - 36609_{2}$
3712,073	6	$^{7}F_{3} - 33075^{\circ}_{2}$	3587,991	7	$^{7}F_{1} - 30066^{\circ}_{1}$
3709,102	7	$(5/2,3/2)^{\circ}_{3} - 36677_{4}$	3584,750	6*R*	$^{7}F_{0} - 27887^{\circ}_{1}$
3702,172 *P*		$(5/2,3/2)^{\circ}_{3} - 36727_{3}$	3575,553 *P*		$(5/2,3/2)^{\circ}_{2} - 36727_{3}$
3702,05 *P*		$(5/2,5/2)^{\circ}_{1} - 39182_{2}$	3573,429 *P*		$(5/2,3/2)^{\circ}_{1} - 38463_{1}$
3701,643 *P*		$(5/2,3/2)^{\circ}_{4} - 33321_{5}$	3560,341 *P*		$(5/2,3/2)^{\circ}_{3} - 37803_{3}$
3698,030	5	$(7/2,3/2)^{\circ}_{5} - 36420_{5}$	3555,651	8	$(5/2,3/2)^{\circ}_{4} - 34429_{3}$
3694,498 *P*		$(5/2,5/2)^{\circ}_{1} - 39237_{2}$	3552,559	6	$(7/2,3/2)^{\circ}_{3} - 39981_{3}$
3688,292	6	$(5/2,3/2)^{\circ}_{4} - 33418_{5}$	3550,342	7	$^{7}F_{1} - 30361^{\circ}_{2}$
3678,494	6	$(5/2,3/2)^{\circ}_{4} - 33490_{5}$	3549,397	6	$(5/2,3/2)^{\circ}_{4} - 34479_{4}$
3677,540 *P*		$(5/2,3/2)^{\circ}_{4} - 33498_{3}$	3538,470	6	$^{7}F_{2} - 32552^{\circ}_{2}$
3677,431 *P*		$(7/2,3/2)^{\circ}_{2} - 39509_{3}$	3536,529	7*R*	$^{7}F_{0} - 28268^{\circ}_{1}$
3669,865 *P*		$(7/2,3/2)^{\circ}_{5} - 36627_{4}$	3534,983	7	$(5/2,3/2)^{\circ}_{4} - 34594_{3}$
3668,234	6	$(5/2,3/2)^{\circ}_{2} - 36021_{3}$	3526,662	7	$(5/2,3/2)^{\circ}_{4} - 34661_{4}$
3663,274	6	$(7/2,3/2)^{\circ}_{5} - 36677_{4}$	3525,983	6	$^{7}F_{3} - 34497^{\circ}_{3}$
3656,39 *P*		$(7/2,3/2)^{\circ}_{5} - 39182_{2}$	3517,455	7	$(5/2,3/2)^{\circ}_{4} - 34735_{3}$
3655,489 *P*		$(7/2,3/2)^{\circ}_{4} - 39507_{3}$	3516,720	7	$(5/2,3/2)^{\circ}_{4} - 34741_{5}$
3654,269	6	$^{7}F_{2} - 31657^{\circ}_{2}$	3516,540	6	$^{7}F_{2} - 32728^{\circ}_{3}$
3653,474	5	$^{7}F_{3} - 33507^{\circ}_{2}$	3514,432	7*R*	$^{7}F_{0} - 28446^{\circ}_{1}$
3652,883	5	$^{7}F_{1} - 29571^{\circ}_{1}$	3513,927	7	$^{7}F_{2} - 32749^{\circ}_{2}$
3649,084 *P*		$(7/2,3/2)^{\circ}_{3} - 392372$	3511,781	6	$^{7}F_{1} - 30670^{\circ}_{1}$
3646,714	5	$^{7}F_{3} - 33558^{\circ}_{4}$	3510,521	6	$^{7}F_{1} - 30681^{\circ}_{2}$
3645,228	5	$^{7}F_{2} - 31724^{\circ}_{2}$	3499,604	7	$^{7}F_{1} - 30770^{\circ}_{2}$
3643,752	6	$(5/2,3/2)^{\circ}_{2} - 36204_{3}$	3498,611	5	$(5/2,3/2)^{\circ}_{4} - 34888_{5}$
3643,303	6	$^{7}F_{1} - 29643^{\circ}_{1}$	3496,358	6	$(5/2,3/2)^{\circ}_{4} - 34906_{5}$
3634,181	6	$^{7}F_{2} - 31808^{\circ}_{3}$	3494,695	6	$(5/2,3/2)^{\circ}_{4} - 34920_{3}$

Table 3 (continued)

λ, A°	I	Transition	λ, A°	I	Transition
3493,624	6	$(5/2,3/2)^{o}_{3} - 38339_{4}$	3344,557	7	$(5/2,3/2)^{o}_{4} - 36204_{3}$
3491,693	6	$^{7}F_{2} - 32930^{o}_{3}$	3339,690	5	$^{7}F_{1} - 32137^{o}_{2}$
3489,598	7	$(7/2,3/2)^{o}_{5} - 38034_{4}$	3338,927	7	$(5/2,3/2)^{o}_{4} - 36254_{5}$
3488,764	7	$^{7}F_{2} - 32954^{o}_{3}$	3334,786	5	$(5/2,3/2)^{o}_{4} - 36291_{3}$
3487,529	7	$(5/2,3/2)^{o}_{3} - 38389_{4}$	3325,021	6R	$^{7}F_{0} - 30066^{o}_{1}$
3485,085	7	$^{7}F_{2} - 32985^{o}_{2}$	3320,573	7	$(5/2,3/2)^{o}_{4} - 36420_{5}$
3484,669	6	$^{7}F_{2} - 32988^{o}_{3}$	3318,806	6	$(5/2,3/2)^{o}_{4} - 36436_{3}$
3483,831	6	$(5/2,3/2)^{o}_{1} - 39182_{2}$	3310,560	6	$^{7}F_{2} - 34497^{o}_{3}$
3480,189	7	$^{7}F_{1} - 30929^{o}_{1}$	3308,731	7	$(5/2,3/2)^{o}_{4} - 36528_{3}$
3479,783	4	$^{7}F_{2} - 33028^{o}_{2}$	3304,060	7	$(5/2,3/2)^{o}_{3} - 39981_{3}$
3478,598	7R	$^{7}F_{0} - 28738^{o}_{1}$	3297,843	7	$(5/2,3/2)^{o}_{4} - 36627_{4}$
3478,373	7	$(5/2,3/2)^{o}_{4} - 35054_{3}$	3294,071	5	$^{7}F_{1} - 32552^{o}_{2}$
3477,198		$(5/2,3/2)^{o}_{1} - 39237_{2}$	32292,517	7	$(5/2,3/2)^{o}_{4} - 36677_{4}$
3476,487	7	$(5/2,3/2)^{o}_{4} - 35070_{5}$	3287,018	6	$(5/2,3/2)^{o}_{4} - 36727_{3}$
3474,722	4	$^{7}F_{2} - 33070^{o}_{2}$	3287,00 P		$(5/2,3/2)^{o}_{2} - 39182_{4}$
3474,082	7	$^{7}F_{2} - 33075^{o}_{2}$	3280,255 P		$(5/2,3/2)^{o}_{2} - 39237_{2}$
3469,714	7	$(7,2,3/2)^{o}_{5} - 38199_{6}$	3272,815 P		$^{7}F_{1} - 32749^{o}_{2}$
3461,113	6	$(5/2,3/2)^{o}_{4} - 35198_{3}$	3259,479	6R	$^{7}F_{0} - 30670^{o}_{1}$
3453,445	7	$^{7}F_{1} - 31151^{o}_{2}$	3252,192 P		$(5/2,3/2)^{o}_{2} - 39507_{3}$
3452,898	7	$(7/2,3/2)^{o}_{5} - 38339_{4}$	3247,788	6	$^{7}F_{1} - 32985^{o}_{2}$
3452,229	7	$^{7}F_{1} - 31162^{o}_{1}$	3244,131 P		$(5/2,3/2)^{o}_{4} - 37129_{5}$
3446,942	8	$(7/2,3/2)^{o}_{5} - 38389_{4}$	3243,157 P		$^{7}F_{1} - 33028^{o}_{2}$
3442,082 P		$(5/2,3/2)^{o}_{3} - 37803_{3}$	3238,781	5	$^{7}F_{1} - 33070^{o}_{2}$
3422,722	7	$^{7}F_{2} - 33507^{o}_{2}$	3238,216 P		$^{7}F_{1} - 33075^{o}_{2}$
3394,318	7	$(5/2,3/2)^{o}_{4} - 35766_{4}$	3232,229	7R	$^{7}F_{0} - 30929^{o}_{1}$
3394,208	6	$^{7}F_{1} - 31657^{o}_{2}$	3208,045		$^{7}F_{0} - 31162^{o}_{1}$
3393,655	7	$(5/2,3/2)^{o}_{3} - 39182_{2}$	3202,810	7	$(5/2,3/2)^{o}_{2} - 39981_{3}$
3387,346	6	$(5/2,3/2)^{o}_{3} - 39237_{2}$	3193,552	7	$^{7}F_{1} - 33507^{o}_{2}$
3386,420	6	$^{7}F_{1} - 31724^{o}_{2}$	3175,124 P		$^{7}F_{2} - 35785^{o}_{1}$
3380,689	6R	$^{7}F_{0} - 29571^{o}_{1}$	3174,727 P		$(5/2,3/2)^{o}_{4} - 37803_{3}$
3372,697	6	$^{7}F_{2} - 33940^{o}_{3}$	3121,567 P		$(5/2,3/2)^{o}_{4} - 38339_{4}$
3372,450	6R	$^{7}F_{0} - 29643^{o}_{1}$	3116,700 P		$(5/2,3/2)^{o}_{4} - 38389_{4}$
3366,587 P		$(5/2,3/2)^{o}_{2} - 38463_{1}$	3011,726 P		$(5/2,3/2)^{o}_{4} - 39507_{3}$
3365,188	7	$(5/2,3/2)^{o}_{4} - 36021_{4}$	2976,958		$^{7}F_{1} - 35785^{o}_{1}$
3356,602	7	$(5/2,3/2)^{o}_{3} - 39507_{3}$	2969,351 P		$(5/2,3/2)^{o}_{4} - 39981_{3}$
3348,390	6	$(5/2,3/2)^{o}_{4} - 36170_{4}$			

Table 4. Isotopic shift and hyperfine splitting in the Pu I spectrum

λ, A°	I	HFS width, 10^{-3} cm^{-1}, and its type	IS[1/] 10^{-3} cm^{-1}	Δℓ, 10^{-3} cm^{-1}	λ, A°	I	HFS width, 10^{-3} cm^{-1}, and its type	IS[1/] 10^{-3} cm^{-1}	Δℓ, 10^{-3} cm^{-1}
7572,859		19	+60		5937,076		48	–	
7571,699		42к	–		5918,115	6	48к	–103	79
7526,95		33к	+80		5864,788	5	65к	–74	30
7507,886		25к	–		5853,823	6	–	+163	
7431,151		33к	+75		5839,075	7	61к	–	
7325,975		53к	–		5835,947	6	71	–	
7322,256		37к	+133		5807,123	6	–	+107	
7116,858		37к	+75		5770,21	7	40ф	–143	130
7020,070		76к	–		5747,066	5	44ф	–183	161
6891,32	7	25ф	–		5733,108	5	64к	–189	153
6887,600		75ф	–192		5712,379	9	20к	+58	
6880,130	7	23к	–		5709,528	7	30к	191	175
6739,801	7	28	–		5667,505	9	102к	–206	136
6672,795	7	-	+162		5630,472	7	20	–125	
6647,87*		30	+163	149	5628,467	9	50к	–123	98
6628,015		39к	+82	63	5592,308	9	36ф	–	
6608,959	7	38к	+81	62	5590,511	9	–	–122	
6580,161	7	32	+124	108	5577,259	9	–	–78	
6576,06*		62	–92	61	5570,471	9	–	–107	
6544,245	7	56к	–32		5561,984	9	55ф	–166	143
6535,240	7	22к	+61	54	5549,584	9	44ф	–118	96
6488,767	7	42к	+122	108	5538,046	8	39ф	–	
6486,788	7	25к	+126	119	5537,540	9	32к	–	
6473,84*		37	+155	137	5510,669	9	–	–100	
6449,714	8	65	56	24	5498,474	9	81к	–	
6341,240	7		–150		5486,299	9	76к	–	
6304,703	7	37к	+132	120	5309,812	8	66к	–	
6279,377	7	98	–199	134	5269,819	9	109к	–111	
6273,798		73	–		5258,638	7	40к	–	
6233,18*			–323		5229,476	8	–	–	
6214,961	7	80к	–		5135,541	8	118к	–147	
6196,010		40	+65	45	5126,629	7	–	–	
6192,801	7	40к	+78	62	5118,973	9	–	–	
6175,938	7	74к	–187	150	5089,944	8	36к	–	
6138,75	7	55	–		5078,922	8	38к	–115	
6127,88	7	98	–		5058,884	8	20к	+60	
6119,25*		47к	+59	33	5044,558	9	40к	–217	197
6105,31*		52к	–		5004,386	8	–	+155	
6100,277		62к	–183	152	4986,774	8	–	–235	
6092,173	7	50к	–		4911,753	8	–	–	
6032,063		44к	–		4894,416	8	74к	–	
6012,740	7	32к	–132		4888,194	7	-	-	
5999,795		48	–		4852,040	8	25к	+110	
5995,210		31	–150	135	4814,439	8	66к	-	
5983,31	7	28к	–212	194	4799,070	9	35	–170	
5945,105	5		–350		4780,973	9	39	–	

Table 4. Isotopic shift and hyperfine splitting in the PuI spectrum

λ, A°	I	HFS width, 10^{-3} cm^{-1}, and its type	IS[1/] 10^{-3}cm^{-1}	Δℓ, 10^{-3} cm^{-1}	λ, A°	I	HFS width, 10^{-3}cm^{-1}, and its type	IS[1/] 10^{-3}cm^{-1}	Δℓ, 10^{-3} cm^{-1}
4753,923	9	58к	–		4310,702	8	–	–	
4741,772		82	–		4310,307	8	–	–	
4738,555	8	–	–		4302,350	9	–	–	
4735,396	9	93к	–		4281,148	9	31к	–	
4720,723	9	67к	–		4269,764	9	83к	−89	40
4716,533	8	82	−99	58	4261,862	9	30к	–	
4712,757	8	44к	–		4261,138	9	67к	–	
4695,229	8	46к	–		4232,317	9	–	−388	
4693,133	8	49к	–		4224,086	9	–	−84	
4689,578	9	73к	−88	52	4221,862	9	–	82	
4685,974	8	64	–		4208,230	9	–	–	
4676,470	9	91к	−221	176	4206,446	9	126к	−153	69
4673,388	8	27к	–		4183,482	9	–	−246	
4650,018	8	–	−85		4181,089	9	–	−83	
4646,603	8	37к	–		4176,921	8	68	−183	149
4646,176	6	–	+113		4172,425	9	–	+82	
4636,334	8	132к	–		4170,918	9	36ф	−134	123
4634,525	8	72к	–		4159,928	9	–	−264	
4625,62*		–	−93		4155,411	9	53ф	−284	257
4624,800	9	–	102		4154,747	9	103к	–	
4572,638	8	70	–		4151,422	9	–	−173	
4569,108	7	101	–		4151,073	9	–	−102	
4566,615	9	–	−112		4140,013	9	–	−197	
4553,460	9	35	−109	93	4135,945	9	–	−112	
4524,338	9	52ф	−306	280	4132,990	8	–	−62	
4506,633	9	–	−192		4128,094	9	–	−98	
4484,358	9	–	−240		4121,13*		89	–	
4478,630	9	–	−90		4114,884	9	–	−156	
4476,241	8	–	–		4111,040	8	–	−149	
4461,170	9	58	−172	143	4102,466	8	51к	–	
4457,660	9	35ф	−261	245	4101,913	9	44ф	−246	226
4455,888	9	–	+78		4097,118	8	–	−93	
4453,114	9	–	–		4092,205	8	–	–	
4447,075	9	54ф	−285	263	4085,834	8	–	−94	
4442,460	9	97	–		4079,549	8	65	–	
4433,735	8	–	–		4073,026	9	–	−58	
4424,980	9	29ф	−221		4070,159	9	–	−268	
4414,675	9	33	−130	119	4055,103	9	–	–	
4409,500	9	–	–		4041,282	9	54к	–	
4404,860	9	42ф	−169		4039,015	8	–	–	
4392,070	9	–	+60		4010,476	8	–	151	
4372,99*		–	−154		4010,088	8	110	–	
4367,364	9	46к	−205	186	3983,008	8	–	−128	
4366,203	8	50к	–						

1/ IS = isotope shift

N.B. "k" stands for red and "ф" for violet