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Fundamental Energy Levels of Neutral Promethium (Pm I)*

Joseph Reader and Sumner P. Davis**

Institute for Basic Standards, National Bureau of Standards, Washington, D.C. 20234

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The spectrum of atomic promethium has been observed with a variety of light sources and spectrographs. The Zeeman effect has also been recorded. Analysis of the spectrum shows that the ground configuration of the neutral promethium atom is $4f^56s^2$. The relative positions (in cm^{-1}) of the low levels of this configuration are:

$^6H^{\circ}_{5/2}$	0.00	$^6H^{\circ}_{13/2}$	3919.03	$^6F^{\circ}_{5/2}$	5872.84
$^6H^{\circ}_{7/2}$	803.82	$^6H^{\circ}_{15/2}$	5089.79	$^6F^{\circ}_{7/2}$	6562.86
$^6H^{\circ}_{9/2}$	1748.78	$^6F^{\circ}_{1/2}$	5249.48	$^6F^{\circ}_{9/2}$	7497.99
$^6H^{\circ}_{11/2}$	2797.10	$^6F^{\circ}_{3/2}$	5460.50	$^6F^{\circ}_{11/2}$	8609.21

This group represents all levels of $4f^56s^2$ expected below 14,000 cm^{-1}. From these results the following values of interaction parameters and their estimated uncertainties have been inferred:

$$\zeta_{4f}=925\pm 20\ cm^{-1} \qquad E^3=510\pm 20\ cm^{-1}$$

Data on 209 upper levels of even parity and 714 classified lines are given.

Key Words: Atomic spectroscopy, electronic energy levels, neutral atom, promethium, rare earth.

1. Introduction

In this paper we present the first results of our investigation to determine the electronic structure of neutral promethium.

Promethium was the last lanthanon element to be discovered. Since the early 1900's it was known that an element lying between neodymium and samarium with atomic number 61 remained to be discovered. A large number of attempts were made to find this element in nature without success. Two false claims of discovery resulted in the early names of illinium and florentium for element 61. The long sought-for element was finally identified in 1947, when Marinsky, Glendenin, and Coryell made a chemical separation of a new element from among the fission products of uranium. They chose the name *promethium* for element 61 ". . . after Prometheus, the Titan in Greek mythology who stole fire from heaven for the use of mankind." This name was chosen not only to symbolize the dramatic way in which the element could be produced in quantity as a result of man's harnessing of the energy of nuclear fission, but also to ". . . warn man of the impending danger of punishment by the vulture of war," [1].[1]

The first extensive work on the spectrum of Pm was carried out at the National Bureau of Standards by Meggers, Scribner, and Bozman [2], who published a list of 2249 Pm lines excited in arcs and sparks. Their attempts to separate the lines according to ionization state and to find spectral regularities were not successful. Their paper gives many of the details of the history of the discovery of Pm and of earlier spectroscopic studies.

Promethium is an entirely artificial element. All of its isotopes are radioactive, and none has ever been found in nature. In the several investigations of the promethium spectrum to date, including the present one, the samples have consisted of monoisotopic Pm^{147}. This is the only readily available form of Pm. It is produced in nuclear reactors as 2.6 percent of the fission products of uranium. Pm^{147} decays by β^- emission (0.22 MeV) into Sm^{147} with a half-life of 2.6 years.

The original paper of Meggers, Scribner, and Bozman suggested the existence of appreciable hyperfine structure in a number of Pm^{147} spectrum lines. This hfs was investigated by Klinkenberg and Tomkins [3] with a 9-meter grating spectrograph and later by Reader and Davis [4, 5] with Fabry-Perot interferometers. As a result of these investigations and others by the methods of paramagnetic resonance [6] and atomic beam resonance [7], it is known that the Pm^{147} nucleus has a spin $I=7/2$, a magnetic dipole moment $\mu_I=2.6$ nm, and an electric quadrupole moment

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**University of California, Berkeley 94720.

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

$Q \sim 0.7$ barn. These nuclear moments cause many Pm lines to appear with very broad and complex hyperfine structure which impedes attempts to describe the spectrum.

The ionization energy of the neutral promethium atom has been estimated [8] by an interpolation method to be 5.55 ± 0.02 eV.

2. Experimental Procedure

2.1. Light Sources

The construction of light sources was undertaken with the greatest care, because Pm, being radioactive, cannot be handled in the ordinary way. The first light source was a cooled hollow cathode, made for the investigation of hyperfine structure. Its use was essential for that work [4], but it was not used extensively in the present investigation.

The more useful sources were electrodeless discharge tubes, constructed especially for us by Earl Worden at the Lawrence Radiation Laboratory, Livermore. The promethium was obtained from Oak Ridge National Laboratory, and purified either there or at the Lawrence Radiation Laboratory, Berkeley. A spectrographic analysis was made prior to its use. A typical tube was constructed of a section of fused silica tubing 2 cm long with 7 mm o.d. and 5 mm i.d., containing 200 μg of PmI_3. A long handle was attached. No filling gas was admitted, since an initial heating of the tube released enough iodine to make subsequent starting of the discharge relatively easy.

Altogether, six of these tubes were used. Each tube was operated inside a microwave cavity, supplied with rf power by a magnetron at a frequency of 2450 MHz. The temperature of the tube (and hence intensity of the spectrum) was regulated by adjustment of power to the cavity and the amount of air-cooling. During operation, the discharge was a brilliant blue color.

2.2. Spectrographs

Our experimental investigation of the spectrum of promethium has extended over several years, and has included the taking of hundreds of spectrograms on several instruments, under many different conditions. As we gained experience and familiarity with the spectrum, each set of spectrograms was taken to provide specific information.

The 6.4-meter concave grating at Berkeley was used for preliminary testing of the light sources and identification of spectrum lines. The instrument has a plate factor of 1.25 Å/mm at 5000 Å in the first order.

The 3-meter Czerny-Turner plane-grating spectrograph at Berkeley was used for accurate wavelength measurements. This instrument has a grating of width 12.5 cm, ruled with 300 grooves/mm. It is used at angles of incidence and diffraction of approximately 64 deg. At 5000 Å the instrument is used in the 12th order, and the plate factor is 0.36 Å/mm.

A 3.4-meter Ebert plane-grating spectrograph at the Lawrence Radiation Laboratory, Berkeley, was used for some of the Zeeman spectrograms. The angles of use, orders, and plate factor of this instrument are about the same as for the 3-meter Czerny-Turner spectrograph just described.

The 9-meter concave grating spectrograph at the Argonne National Laboratory [9, 10] was used for the early spectrograms taken for wavelength measurements, temperature classification, and Zeeman effects. Spectrum lines were observed in orders as high as the eighth, although we generally confined our measurements to the third and fourth, in order to avoid overlapping orders. At these lower orders, overlapping could be prevented through the use of filters. The plate factor is about 0.45 Å/mm at 4000 Å in the fourth order.

2.3. Exposures

Three different magnets were used for the Zeeman spectrograms. Most of them were taken at Argonne, by using an electromagnet with iron pole-pieces, producing a field of 24,000 G. The discharge tube was excited in the cavity placed between the poles, perpendicular to the field.

The electromagnet used at the Radiation Laboratory produced a field of 29,000 G. A second magnet used there was a superconducting solenoid [11] operated at a field of 41,000 G. In this case, the source was operated in the cavity, but alined parallel to the magnetic field. A more stable operation of the discharge resulted with this orientation. A small mirror placed inside the solenoid permitted observation of the light emitted in a direction perpendicular to the field.

2.4. Exposures

The exposures made at Argonne were taken on 5×45 cm plates, with nine separate tracks on each plate. Thorium standard lines were placed on the top and bottom, with seven promethium exposures in-between. Each Pm exposure was taken at a different lamp temperature to help separate the spectra [12]. The intensities differed by as much as a factor of 80 from the weakest to the strongest exposures. These plates proved to be very valuable for spectrum separation, but the presence of small unexplained shifts made them less useful for absolute wavelength measurements. Since the wavelengths of most of the classified lines given in this paper are based on these exposures, it is possible that the present wavelengths may eventually have to be revised by a few thousandths of an angstrom. The Zeeman exposures included pi, sigma, and no-field lines. The field was calibrated by means of patterns belonging to several lines of Ca, Ag, and Cu which appeared on the plates.

The spectrograms taken at Berkeley for wavelength measurements were made on 10×25 cm plates, with the thorium and promethium lines overlapping, to eliminate any errors of measurement. A samarium spectrum was also included on these plates to identify impurity lines due to small amounts of Sm formed by the decay of Pm. Overlapping grating orders were

TABLE 1. *Theoretical predictions for the low-lying levels of the* $4f^{5}6s^{2}$ *configuration of* Pm I.[a]

Level	Calculated energy (cm^{-1})	Interval (cm^{-1})	Calculated *g*-value	Percentage composition
$^{6}\mathrm{H}^{\circ}_{5/2}$	0		0.297	96% ^{6}H
		816		
$^{6}\mathrm{H}^{\circ}_{7/2}$	816		0.829	97% ^{6}H
		953		
$^{6}\mathrm{H}^{\circ}_{9/2}$	1769		1.071	98% ^{6}H
		1046		
$^{6}\mathrm{H}^{\circ}_{11/2}$	2815		1.201	99% ^{6}H
		1109		
$^{6}\mathrm{H}^{\circ}_{13/2}$	3924		1.278	99% ^{6}H
		1146		
$^{6}\mathrm{H}^{\circ}_{15/2}$	5070		1.327	95% ^{6}H
$^{6}\mathrm{F}^{\circ}_{1/2}$	4915		−0.649	98% ^{6}F
		182		
$^{6}\mathrm{F}^{\circ}_{3/2}$	5097		1.057	
		381		
$^{6}\mathrm{F}^{\circ}_{5/2}$	5478		1.303	
		675		
$^{6}\mathrm{F}^{\circ}_{7/2}$	6153		1.389	
		924		
$^{6}\mathrm{F}^{\circ}_{9/2}$	7077		1.429	
		1094		
$^{6}\mathrm{F}^{\circ}_{11/2}$	8171		1.451	

[a] J. G. Conway and B. G. Wybourne; Phys. Rev. **130**, 2325 (1963).

separated by use of an external prism predisperser [13], which prevented light from the unwanted orders from entering the spectrograph. Each grating order was photographed separately.

Eastman Kodak spectroscopic plates were used for all exposures, processed in the recommended manner. Types 103a–O, 103a–F, 103–O, 103–F, and I–N were utilized. All but the first two were prefogged by exposures to weak light, prior to loading in the spectrograph.

2.5. Measurements

The plates were measured on two semiautomatic scanning comparators, one at the University of California and one at the National Bureau of Standards. Wavelengths for the thorium standards were taken from the work of Meggers and Stanley [14]. The estimated uncertainty of the wavelength measurements is about ±0.005 Å. At the present time some of our plates from Argonne and most of the plane-grating plates remain to be measured. When these measurements are complete, we expect to provide a full description of the Pm spectrum.

3. Analysis

In the neutral rare earths the ground configurations are generally of the type $4f^{N}6s^{2}$ or $4f^{N-1}5d6s^{2}$. Since the ground configurations in Nd I and Sm I are $4f^{4}6s^{2}$ and $4f^{6}6s^{2}$, respectively, it was expected that the ground configuration in neutral Pm would be $4f^{5}6s^{2}$. The lowest level of $4f^{4}5d6s^{2}$ was not expected to be less than 10,000 cm^{-1} above the lowest level of $4f^{5}6s^{2}$. The levels of $4f^{5}5d6s$ were expected to start at about 8500 cm^{-1} above the lowest level of $4f^{5}6s^{2}$. Prior to out beginning the Pm I analysis, Conway and Wybourne [15] had published theoretical predictions for the relative energies and *g*-values of the low levels of $4f^{5}6s^{2}$ by using hydrogenic ratios for the Slater parameters and interpolating values of ζ/F_2. These predictions proved to be very useful to us in carrying out the analysis. Their results for Pm I are summarized in table 1.

The first part of the analysis was carried out through the use of the Zeeman data. A large number of self-reversed lines showed resolved patterns involving levels having $J=5/2$ and $7/2$ and *g*-values of about 0.30 and 0.83, respectively. It was clear that these lines were transitions to the $4f^{5}6s^{2}\ ^{6}\mathrm{H}^{\circ}_{5/2}$ and $^{6}\mathrm{H}^{\circ}_{7/2}$ levels. After a certain amount of trial and error in searching for repeating differences involving these lines, the $^{6}\mathrm{H}^{\circ}_{5/2}-{}^{6}\mathrm{H}^{\circ}_{7/2}$ interval was found to be 803.82 cm^{-1}. About 15 upper even levels were established in this process. The good agreement between this result and the prediction of Conway and Wybourne showed that the predictions would be useful in extending the analysis.

By continuing to use the Zeeman data and by using an electronic computer to search for constant differences between groups of strong lines, two sets of classified lines were built up. One group represented transitions to the $4f^{5}6s^{2}\ ^{6}\mathrm{H}^{\circ}_{5/2-13/2}$ group of levels; the other represented transitions to the $4f^{5}6s^{2}\ ^{6}\mathrm{F}^{\circ}_{1/2-7/2}$ levels. However the connection between these two groups was not known. After a considerable amount of searching for this connection, a few weak, resolved

TABLE 2. *Low levels of the* $4f^{5}6s^{2}$ *configuration of* Pm I

Level	Energy (cm^{-1})	Interval (cm^{-1})	*g*-value
$^{6}\mathrm{H}^{\circ}_{5/2}$	0.00		0.305
		803.82	
$^{6}\mathrm{H}^{\circ}_{7/2}$	803.82		0.831
		944.96	
$^{6}\mathrm{H}^{\circ}_{9/2}$	1748.78		1.079
		1048.32	
$^{6}\mathrm{H}^{\circ}_{11/2}$	2797.10		1.205
		1121.93	
$^{6}\mathrm{H}^{\circ}_{13/2}$	3919.03		1.307
		1170.76	
$^{6}\mathrm{H}^{\circ}_{15/2}$	5089.79		1.33
$^{6}\mathrm{F}^{\circ}_{1/2}$	5249.48		−0.68
		211.02	
$^{6}\mathrm{F}^{\circ}_{3/2}$	5460.50		1.051
		412.34	
$^{6}\mathrm{F}^{\circ}_{5/2}$	5872.84		1.293
		690.02	
$^{6}\mathrm{F}^{\circ}_{7/2}$	6562.86		1.385
		935.13	
$^{6}\mathrm{F}^{\circ}_{9/2}$	7497.99		1.440
		1111.22	
$^{6}\mathrm{F}^{\circ}_{11/2}$	8609.21		1.458

Zeeman patterns were found in the ultraviolet which proved to be transitions from upper levels known from combinations with $^6F^\circ$ levels down to the low $^6H^\circ$ levels. This established the energies of the $^6F^\circ$ levels relative to the ground state. The $^6H^\circ_{15/2}$, $^6F^\circ_{9/2}$, and $^6F^\circ_{11/2}$ levels were later established, thus bringing our knowledge of the low levels to its present state. According to a recent diagonalization by Conway [16] this group represents all levels of $4f^56s^2$ expected below 14000 cm^{-1}.

The results are given in tables 2, 3, and 4. Table 2 gives the energies and *g*-values of the odd levels. Table 3 gives the energies, *J*-values and *g*-values for the even levels. The classified lines are given in table 4. The estimated uncertainty in the values of the low levels given in table 2 is ±0.01 cm^{-1}. The estimated uncertainty in the values of the high levels given in table 3 is about ±0.03 cm^{-1}.

4. Discussion

The total number of self-reversed lines in Pm I is 122. Of these 120 have been classified as transitions to $4f^56s^2$. This makes it certain that the ground configuration of Pm I is $4f^56s^2$.

The eigenvectors given by Conway and Wybourne as a result of their diagonalization of $4f^5$ show the $^6H^\circ$ and $^6F^\circ$ terms to be nearly pure in *LS* coupling. We therefore would have expected a somewhat regular variation in intensity of the lines making transitions from a single upper level to several lower levels. However, according to our observations this is not the case. Figure 1 gives some of the more striking examples of the irregular intensities. Of special note are the lines from 26725.52(3/2). In this case the transition to $^6F^\circ_{3/2}$ is just barely visible on the plates. The complete absence of the line from 28186.31(7/2) to $^6H^\circ_{7/2}$ is also very striking. A similar set of puzzling intensities has been observed by Shenstone [17] in the $3d^64s-4p$ transitions of Co III. Here the anomalous intensities were found in groups of lines connecting terms of different multiplicity. In this connection Shenstone noted "Especially difficult to understand is the not uncommon habit of intersystem combinations of missing the central of three levels of successive *J*." Although this phenomenon has not yet been investigated theoretically, it is clear that it stems from the lack of pure *LS* coupling in the upper configurations. It is likely that a theoretical study of the transition probabilities for the $3d^64s-3d^64p$ array in Co III would shed more light on this problem.

ODD EVEN	$^6H^\circ$						$^6F^\circ$				
	5/2	7/2	9/2	11/2	13/2	15/2	1/2	3/2	5/2	7/2	9/2
21 348.22(7/2)	700	100	400								
22 294.96(9/2)		X	500	400							
26 181.98(13/2)				3	300	200					
26 725.52(3/2)	300						500	1	50		
28 169.71 (7/2)	X	300	100						X	X	X
28 186.31 (7/2)	200	X	200						X	500	50
29 002.94(3/2)	X						35	8	150		

FIGURE 1. *Anomalous intensities in* Pm I.
No observed transition = X.

No real effort has been made yet to understand the origin of the known upper levels in Pm I. However we note the following points. There are only two configurations which can make transitions to $4f^56s^2$ with appreciable intensity, namely $4f^56s6p$ and $4f^45d6s^2$. For the $4f^56s6p$ configuration, the strongest transitions to the $4f^56s^2$ $^6H^\circ$ and $^6F^\circ$ levels will originate from levels of the type $4f^5(^6H)6s6p$ and $4f^5(^6F)6s6p$. If we consider the levels of the type $4f^5(^6H)6s6p(J=5/2)$, we would expect them to fall into two groups: six of the type $4f^5(^6H)+6s6p(^3P)$ and two of the type $4f^5(^6H)+6s6p(^1P)$. This type of coupling (first described by Shenstone [18] in the case of the $3d^94s4p$ configuration of Cu I) will hold approximately here because the parameter which determines the $^1P-^3P$ splitting, $G_1(sp)$, is expected by interpolation from other rare earths to be about 2640 cm^{-1}, whereas ζ_p and ζ_f are only about 1000 cm^{-1}. The *f-s* and *f-p* interactions are much smaller (see Smith and Wybourne's treatment of the $4f^7(^8S)6s6p$ configuration in Eu I [19]) and for our purpose may be neglected. If one interpolates a value for the $4f^5(^6H)6s^2-4f^5(^6H)6s6p$ energy difference and uses the above parameters to estimate the level positions, one finds that the six ^3P type levels with $J=5/2$ will lie in the region 14000–16000 cm^{-1} and the two ^1P type levels with $J=5/2$ will lie at about 20000–21000 cm^{-1} [20]. Of the 27 observed upper levels with $J=5/2$, 22 make strong transitions to the ^6H group of lower levels. These 22 levels are distributed as follows: 14 between 20250 and 23550 cm^{-1}, 8 between 26600 and 28350 cm^{-1}. Thus of the observed levels with $J=5/2$, only 2 would be expected to belong to $4f^5(^6H)6s6p$. It should also be noted that none of the lines classified so far in Pm I shows the appreciable hyperfine structure which would be expected if one of the configurations contained a single 6*s* electron. Judd [21] has shown that it is possible for lines from certain levels of $4f^N6s6p$ configurations to $4f^N6s^2$ to show no hyperfine structure. However, there are too many levels here whose transitions show no *hfs* to believe that the theory is applicable here. The absence of *hfs* in these lines more likely is evidence of a closed 6*s* shell in both upper and lower configurations. In this case the hyperfine structures due to the 4*f* electron in the upper and lower levels have the same sign and about the same magnitude, so that the observed line shows no resolved structure. For these reasons we believe that most of the known upper levels belong to the $4f^45d6s^2$ configuration.

Comparison of the observed positions of the $4f^56s^2$ $^6H^\circ$ and $^6F^\circ$ levels with the calculations of Conway and Wybourne shows that their predictions for the intervals within each term are very good, generally within ±30 cm^{-1} of the observed levels. However, the predicted positions of the $^6F^\circ$ levels are too low by nearly 7 percent in every case. This discrepancy results from the fact that the calculated intervals within the individual terms are very sensitive to the value of the spin-orbit parameter, but rather insensitive to the electrostatic parameters. On the other hand the separation between the barycenters of terms is governed primarily by the electrostatic parameters. At the time of Conway and Wybourne's work there was no neutral rare earth with more than one known term of $4f^N 6s^2$. Therefore, information about the electrostatic parameters could be inferred from the known levels only through second order effects. Thus, a difference of only 7 percent between the predicted and observed $^6H^\circ - ^6F^\circ$ separation in Pm I can be considered to be fairly good agreement.

It is not possible to obtain reliable values for the electrostatic parameters E^1, E^2, and E^3 from the known levels, because only one term separation is available. However, we note that since the $^6H^\circ$ and $^6F^\circ$ terms are nearly pure in *LS* coupling, to a first approximation the energy difference between the $^6H^\circ$ and $^6F^\circ$ barycenters $\Delta E(^6F, ^6H)$ will be equal to $9E^3$ [22]. If we include the Trees $\alpha L(L+1)$ correction [23], to a very good first approximation we then have:

$$\Delta E(^6F, ^6H) = 9E^3 - 18\alpha.$$

If we use the known positions of the $^6F^\circ$ and $^6H^\circ$ levels to determine $\Delta E(^6F, ^6H)$, we find $\Delta E(^6F, ^6H) = 4167.92$ cm^{-1}. If we set $\alpha = 30$ cm^{-1} as indicated by the theoretical interpretation of the spectra of Ce III [24] and Pr III [25] we find $E^3 \sim 520$ cm^{-1}.

A preliminary value of ζ_{4f} can be obtained by considering the total widths of the $^6H^\circ$ and $^6F^\circ$ terms. To a first approximation the sum of these two widths is $91\zeta_{4f}$, which gives $\zeta_{4f} \sim 930$ cm^{-1}.

Crosswhite [26] has made a least squares fit of the $^6F^\circ$ and $^6H^\circ$ levels to the theoretical energy formulas by using hydrogenic ratios for the electrostatic parameters and a fixed value of 20 cm^{-1} for α. The parameters E^3 and ζ_{4f} were allowed to vary. A diagonalization with $E^3 = 510$ cm^{-1} and $\zeta_{4f} = 914$ cm^{-1} gave a mean error of 25 cm^{-1}. This could be reduced to about 8 cm^{-1} if slightly different values of ζ_{4f} were used for the two terms: 912 cm^{-1} for ^6H and 938 cm^{-1} for ^6F. Crosswhite notes that this is probably caused by a spin-other-orbit interaction. The *J*-dependence of this interaction is the same as that of the spin-orbit interaction. However, the spin-other-orbit interaction constant varies from term to term. Thus, this interaction will cause the spin-orbit constants derived from different terms of a configuration to appear to be slightly different. This effect was first treated for l^N configurations by Horie [27]; the principal aspects of the theory have been summarized by Wybourne [28]. Since spin-other-orbit effects cannot be observed by studying only one term of a configuration, the present results for Pm I provide a first opportunity to view their magnitude for the neutral rare earths.

The residual errors in the above calculation have a form very close to that expected from neglect of a spin-spin interaction. If an estimate of the spin-spin interaction energy is made by using Judd's [29] matrix elements and interpolated values of the radial integrals from the calculations of Blume, Freeman, and Watson [30], the mean error can be further reduced to about 2 cm^{-1}. When this is done the values of ζ_{4f} are changed to 910 cm^{-1} for $^6H^\circ$ and 940 cm^{-1} for $^6F^\circ$ [26].

In view of the uncertainties in the ratios of the electrostatic parameters, the value to be used for α, and the Hamiltonian needed to describe the levels, we give the values of E^3 and ζ_{4f} for the $4f^5 6s^2$ configuration of Pm I as:

$$\zeta_{4f} = 925 \pm 20 \text{ cm}^{-1}$$

$$E^3 = 510 \pm 20 \text{ cm}^{-1}$$

That this value of ζ_{4f} fits in well with other values of ζ_{4f} in the rare earths is shown by the plot in figure 2.

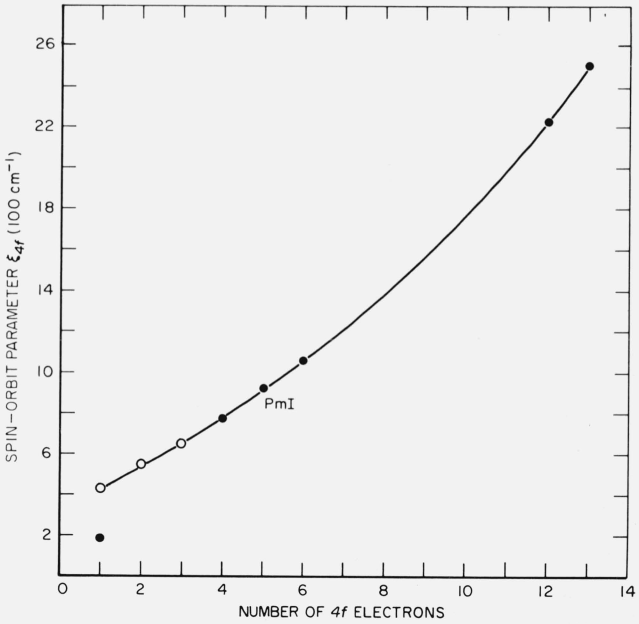

FIGURE 2. *Values of ζ_{4f} in the rare earths.*

The solid circles represent values derived from $4f^N 6s^2$ configurations of neutral atoms; the open circles are derived from $4f^N$ configurations of doubly ionized atoms. References: $N=1$, La I, H. N. Russell and W. F. Meggers, J. Res. NBS **9**, 625 (1932); $N=1$, La III, J. Sugar and V. Kaufman, J. Opt. Soc. Am. **55**, 1283 (1965); $N=2$, Ce III, N. Spector, J. Opt. Soc. Am. **55**, 492 (1965); $N=3$, Pr III, R. Trees, J. Opt. Soc. Am. **54**, 651 (1964); $N=4$, Nd I, J. G. Conway and B. G. Wybourne, Phys. Rev. **130**, 2325 (1963); $N=5$, Pm I, this paper; $N=6$, Sm I, J. G. Conway and B. G. Wybourne, Phys. Rev. **130**, 2325 (1963); $N=12$, Er I, J. Reader, unpublished calculations based on data of L. C. Marquet and S. P. Davis, J. Opt. Soc. Am. **55**, 471 (1965). This value of ζ_{4f} of 2237 cm^{-1} is nearly identical to the 2236 cm^{-1} value of ζ_{4f} derived from the $4f^{12}6s$ configuration of Er II by Z. Goldschmidt, J. Opt. Soc. Am. **53**, 594 (1963); $N=13$, Tm I, W. F. Meggers, Rev. Mod. Phys. **14**, 96 (1942). For simplicity, several values of ζ which have been published for $4f^N 6s$ configurations of singly ionized rare earths have not been included.

TABLE 3. *Even levels of* Pm I. *Levels with asterisk are uncertain.*

Energy (cm^{-1})	J	g
17104.72	7/2	0.885
20006.04	3/2	0.068
20157.85	7/2	0.503
20265.98	5/2	0.527
20517.96	5/2	0.659
20567.76	5/2	0.910
20660.00	7/2	1.114
20675.81	5/2	1.075
20909.00	7/2	0.929
21100.10	7/2	1.319
21143.06	7/2	0.977
21237.49	9/2	0.841
21348.22	7/2	0.815
21371.05	7/2	0.927
21590.60	3/2	0.135
21625.45	9/2	1.117
21657.89*	5/2	1.01
21666.80	7/2	0.696
21732.93	9/2	1.137
21920.49	9/2	0.986
21946.12	3/2	−0.01
21976.26	7/2	1.218
22013.40	3/2	0.887
22080.08	5/2	0.571
22084.65	7/2	0.858
22205.44	9/2	0.974
22259.21	1/2	−0.32
22294.96	9/2	1.245
22301.24	5/2	0.976
22309.94	7/2	0.850
22355.68	9/2	1.374
22388.06	3/2	0.84
22414.17	11/2	1.12
22425.58	5/2	0.83
22446.20	11/2	1.531
22456.72	9/2	0.936
22522.90	5/2	0.735
22586.77	9/2	1.283
22654.34	7/2	0.84
22656.68	5/2	0.936
22761.33	11/2	1.296
22817.13	11/2	1.134
22905.24	5/2	1.16
22934.70	7/2	1.237
23006.35	11/2	
23033.95	11/2	1.0
23178.13	7/2	1.150
23188.54	5/2	1.48
23198.33	11/2	1.12
23276.10	9/2	0.83
23278.90	7/2	1.0
23334.10	5/2	0.571
23337.53	7/2	1.257
23345.07	11/2	1.323
23435.40	9/2	1.00
23443.79	5/2	0.784
23480.63	9/2	1.16
23501.57	11/2	1.283
23538.86	5/2	0.780
23550.60	11/2	1.170
23571.27	9/2	1.26
23584.31	7/2	1.123
23629.06	13/2	1.09
23712.56	7/2	1.181
23732.57	1/2	3.24
23740.42	13/2	
23743.96	7/2	1.111
23760.57	11/2	
23926.91	3/2	1.754
23938.76	13/2	1.044
24013.29*	13/2	1.29
24038.82	11/2	1.08
24071.03	9/2	1.12
24091.39	3/2	1.395
24122.41	13/2	
24180.80	13/2	1.28
24204.37	7/2	0.670
24234.42	9/2	
24245.66	13/2	1.14
24338.33	9/2	1.17
24418.44	7/2	1.124
24443.15	13/2	1.17
24443.57	9/2	1.037
24471.10	7/2	0.83
24503.45	11/2	1.22
24520.23	13/2	1.34
24533.27	11/2	1.183
24558.56	9/2	1.39
24627.53	9/2	0.961
24681.68	11/2	0.895
24705.25	15/2	1.102
24754.58	9/2	0.888
24770.04	13/2	1.17
24789.86	9/2	1.08
24884.90	11/2	
24912.34	11/2	1.29
25104.27	11/2	1.15
25306.07	15/2	1.21
25351.46	3/2	0.58
25357.24	11/2	
25402.61	11/2	1.211
25405.29	13/2	1.034
25448.28	9/2	1.14
25474.46	15/2	
25521.55*	9/2	0.910
25537.36	13/2	1.39
25618.77	15/2	1.13
25755.17	11/2	1.016
25919.50	13/2	1.26
26015.94	11/2	
26065.63	1/2	−0.36
26080.99	17/2	1.29
26096.75	17/2	1.25
26101.28	13/2	
26103.56	11/2	1.2
26181.98	13/2	1.55
26211.44	7/2	0.715
26237.84	9/2	1.43
26282.20	13/2	0.95
26285.02	7/2	0.877
26300.30	1/2	0.955
26456.26	13/2	
26468.80	1/2	−0.45
26479.61	3/2	0.731
26522.35	3/2	1.135
26545.85	17/2	1.14
26555.44	13/2	1.07
26591.40	13/2	1.10
26609.39	5/2	0.56
26630.56	5/2	0.32
26694.38	11/2	1.095
26695.79	5/2	
26703.97	13/2	1.30
26725.52	3/2	0.65
26830.74	3/2	0.794
26841.36	5/2	1.38
26955.22	15/2	
27036.66	5/2	0.931
27042.18	15/2	
27109.75	15/2	
27245.99	5/2	0.761
27272.46	7/2 9/2	0.8
27304.15*	15/2	1.44
27319.28	7/2	1.274
27334.48	5/2	0.947
27351.42	7/2	0.92
27383.92	15/2	
27468.45	3/2	0.21
27476.28	7/2	1.077
27512.95	5/2	0.913
27596.27	13/2	1.29
27621.74	7/2	
27685.89*	3/2	2.049
27829.89	9/2	1.024
27919.29	3/2	1.31
27923.37	5/2	0.869
27939.87	9/2	1.025
28008.09	7/2	
28030.99	13/2	1.39
28075.94	9/2	1.155
28084.28	5/2	0.904
28086.21	11/2	1.150
28150.73	7/2	1.071
28153.69	5/2	0.632
28169.71	7/2	0.9
28186.31	7/2	1.98
28196.56	1/2	2.44
28273.52	7/2	0.764
28274.21	9/2	1.055
28325.13	7/2	1.38
28338.98	5/2	0.963
28467.52	7/2	0.87
28490.35	9/2	1.123
28565.66	9/2	1.0
28607.33	9/2	1.079
28608.57	3/2	1.740
28657.02	1/2	0.29
28680.26	7/2	0.88
28994.90	11/2	1.30
29002.94	3/2	0.99
29074.03	9/2	
29129.60	9/2	1.162
29161.96	9/2	1.0
29242.64	11/2	1.259
29585.21	11/2	1.2
29595.58	9/2	1.04
29648.42*	9/2	
29705.77	11/2	
29757.69	11/2	
29784.08	9/2	
29856.72	11/2	1.10
29883.87	7/2	1.199
29908.90	9/2	
29960.42*	11/2	1.18
30008.40	11/2	1.28
30063.62	9/2	1.224
30251.50*	11/2 13/2	1.2
30281.98	13/2	
30374.95	11/2	1.226
30457.44	13/2	1.226
30541.28	11/2	
30726.26	9/2	
30785.03	9/2	
31103.24	11/2	
31846.70	11/2	
32022.32	9/2	
32435.06	13/2	
33180.50	15/2	1.285
33246.65	9/2	

TABLE 4. *Classified lines of* Pm I

The wavelengths are in air. Even levels are designated by the energy in cm⁻¹ followed by the *J*-value in parenthesis. Intensities are visual estimates on a scale of 1 to 1000.

C – complex
L – shaded to longer wavelengths
S – shaded to shorter wavelengths
W – wide
P – perturbed by close line, but resolved

U – perturbed by close line, but unresolved
D – double
B – blend
H – hazy
R1 – very widely reversed

R2 – widely reversed
R3 – moderately reversed
R4 – slightly reversed
R5 – barely detectably reversed
* – classification in doubt

λ (A)	*I*	σ (cm⁻¹)	Classification
6420.171	10	15571.61	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 24180.80 (13/2)*
6355.910	100*P*	15729.04	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 24338.33 (9/2)
6348.654	8	15747.02	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 22309.94 (7/2)
6335.048	100	15780.84	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 23278.90 (7/2)
6313.796	15	15833.95	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 24443.15 (13/2)*
6313.663	10	15834.29	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 24443.57 (9/2)
6311.586	85	15839.50	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 23337.53 (7/2)
6308.577	20	15847.05	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 23345.07 (11/2)
6302.377	60	15862.64	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 22425.58 (5/2)
6283.239	70	15910.96	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 24520.23 (13/2)
6278.104	2	15923.97	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 24533.27 (11/2)
6268.138	150	15949.29	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 24558.56 (9/2)
6263.942	10	15959.97	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 22522.90 (5/2)
6255.078	10	15982.59	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 23480.63 (9/2)
6246.909	50	16003.49	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 23501.57 (11/2)
6220.118	10	16072.42	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 24681.68 (11/2)
6219.809	50	16073.22	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 23571.27 (9/2)
6214.768	75	16086.25	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 23584.31 (7/2)
6208.146	80	16103.41	$^{6}\mathrm{F}^{\circ}_{5/2}$ – 21976.26 (7/2)
6193.898	200	16140.46	$^{6}\mathrm{F}^{\circ}_{5/2}$ – 22013.40 (3/2)
6186.089	2	16160.83	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 24770.04 (13/2)
6168.403	5	16207.17	$^{6}\mathrm{F}^{\circ}_{5/2}$ – 22080.08 (5/2)
6165.603	70	16214.53	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 23712.56 (7/2)
6153.685	80	16245.93	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 23743.96 (7/2)
6142.459	100	16275.62	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 24884.90 (11/2)
6132.934	40	16300.90	$^{6}\mathrm{H}^{\circ}_{7/2}$ – 17104.72 (7/2)
6132.125	200	16303.05	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 24912.34 (11/2)
6117.382	100	16342.34	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 22905.24 (5/2)
6085.359	150*P*	16428.34	$^{6}\mathrm{F}^{\circ}_{5/2}$ – 22301.24 (5/2)
6082.102	30*S*	16437.13	$^{6}\mathrm{F}^{\circ}_{5/2}$ – 22309.94 (7/2)
6053.356	150	16515.19	$^{6}\mathrm{F}^{\circ}_{5/2}$ – 22388.06 (3/2)
6039.646	30	16552.68	$^{6}\mathrm{F}^{\circ}_{5/2}$ – 22425.58 (5/2)
6032.252	90	16572.97	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 24071.03 (9/2)
6015.361	5	16619.50	$^{6}\mathrm{F}^{\circ}_{3/2}$ – 22080.08 (5/2)
6013.146	40	16625.63	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 23188.54 (5/2)
5980.648	100*D*	16715.97	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 23278.90 (7/2)
5973.373	10	16736.32	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 24234.42 (9/2)
5969.214	20	16747.98	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 25357.24 (11/2)
5960.957	3	16771.18	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 23334.10 (5/2)
5959.738	125	16774.61	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 23337.53 (7/2)
5953.095	100	16793.33	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 25402.61 (11/2)
5951.191	100	16798.71	$^{6}\mathrm{F}^{\circ}_{3/2}$ – 22259.21 (1/2)
5936.504	200	16840.26	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 24338.33 (9/2)
5922.221	3	16880.88	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 23443.79 (5/2)
5909.318	5	16917.74	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 23480.63 (9/2)
5905.899	100	16927.53	$^{6}\mathrm{F}^{\circ}_{3/2}$ – 22388.06 (3/2)
5899.630	20	16945.52	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 24443.57 (9/2)
5892.838	10*P*	16965.05	$^{6}\mathrm{F}^{\circ}_{3/2}$ – 22425.58 (5/2)
5877.354	30*C*	17009.74	$^{6}\mathrm{F}^{\circ}_{1/2}$ – 22259.21 (1/2)
5878.337	50	17021.38	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 23584.31 (7/2)
5869.549	30	17032.36	$^{6}\mathrm{F}^{\circ}_{5/2}$ – 22905.24 (5/2)
5859.865	50	17060.51	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 24558.56 (9/2)
5844.718	200*L*	17104.72	$^{6}\mathrm{F}^{\circ}_{5/2}$ – 17104.72 (7/2)
5833.183	125	17138.55	$^{6}\mathrm{F}^{\circ}_{1/2}$ – 22388.06 (3/2)
5829.407	50	17149.65	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 23712.56 (7/2)
5818.750	3*P*	17181.06	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 23743.96 (7/2)
5776.992	200	17305.25	$^{6}\mathrm{F}^{\circ}_{5/2}$ – 23178.13 (7/2)
5730.809	200	17444.70	$^{6}\mathrm{F}^{\circ}_{3/2}$ – 22905.24 (5/2)
5724.260	60	17464.66	$^{6}\mathrm{F}^{\circ}_{5/2}$ – 23337.53 (7/2)
5710.075	20	17508.05	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 24071.03 (9/2)*
5671.018	500	17628.62	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 26237.84 (9/2)
5657.260	300	17671.50	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 24234.42 (9/2)
5644.515	10	17711.40	$^{6}\mathrm{F}^{\circ}_{5/2}$ – 23584.31 (7/2)
5639.234	50	17727.98	$^{6}\mathrm{F}^{\circ}_{3/2}$ – 23188.54 (5/2)
5624.182	20	17775.43	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 24338.33 (9/2)
5603.922	125*L*	17839.69	$^{6}\mathrm{F}^{\circ}_{5/2}$ – 23712.56 (7/2)
5598.944	2	17855.55	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 24418.44 (7/2)
5597.807	10*H*	17859.18	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 25357.24 (11/2)
5594.077	100	17871.09	$^{6}\mathrm{F}^{\circ}_{5/2}$ – 23743.96 (7/2)
5591.080	35*C*	17880.67	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 24443.57 (9/2)*
5583.619	15	17904.56	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 25402.61 (11/2)*
5559.525	150*L*	17982.15	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 26591.40 (13/2)
5559.188	5	17983.24	$^{6}\mathrm{F}^{\circ}_{3/2}$ – 23443.79 (5/2)
5555.354	100	17995.66	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 24558.56 (9/2)
5546.769	10*U*	18023.51	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 25521.55 (9/2)
5537.379	200*C*	18054.07	$^{6}\mathrm{F}^{\circ}_{5/2}$ – 23926.91 (3/2)
5529.938	3	18078.36	$^{6}\mathrm{F}^{\circ}_{3/2}$ – 23538.86 (5/2)
5527.883	5	18085.09	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 26694.38 (11/2)*
5524.945	150	18094.70	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 26703.97 (13/2)
5487.381	20	18218.57	$^{6}\mathrm{F}^{\circ}_{5/2}$ – 24091.39 (3/2)
5484.872	10*U*	18226.90	$^{6}\mathrm{F}^{\circ}_{7/2}$ – 24789.86 (9/2)*
5471.313	150*C*	18272.07	$^{6}\mathrm{F}^{\circ}_{3/2}$ – 23732.57 (1/2)
5430.600	25	18409.06	$^{6}\mathrm{H}^{\circ}_{9/2}$ – 20157.85 (7/2)
5421.374	10	18440.38	$^{6}\mathrm{H}^{\circ}_{11/2}$ – 21237.49 (9/2)
5413.736	100*C*	18466.40	$^{6}\mathrm{F}^{\circ}_{3/2}$ – 23926.91 (3/2)
5408.846	100*C*	18483.09	$^{6}\mathrm{F}^{\circ}_{1/2}$ – 23732.57 (1/2)
5405.328	2	18495.12	$^{6}\mathrm{H}^{\circ}_{13/2}$ – 22414.17 (11/2)
5392.454	10	18539.28	$^{6}\mathrm{H}^{\circ}_{15/2}$ – 23629.06 (13/2)
5390.622	20	18545.58	$^{6}\mathrm{F}^{\circ}_{5/2}$ – 24418.44 (7/2)
5365.939	50	18630.89	$^{6}\mathrm{F}^{\circ}_{3/2}$ – 24091.39 (3/2)
5352.567	25*C*	18677.43	$^{6}\mathrm{F}^{\circ}_{1/2}$ – 23926.91 (3/2)
5334.737	200	18739.85	$^{6}\mathrm{F}^{\circ}_{9/2}$ – 26237.84 (9/2)
5305.840	75*S*	18841.91	$^{6}\mathrm{F}^{\circ}_{1/2}$ – 24091.39 (3/2)
5305.732	50*B*	18842.30	$^{6}\mathrm{H}^{\circ}_{13/2}$ – 22761.33 (11/2)
5303.854	7	18848.97	$^{6}\mathrm{H}^{\circ}_{15/2}$ – 23938.76 (13/2)
5290.064	15	18898.10	$^{6}\mathrm{H}^{\circ}_{13/2}$ – 22817.13 (11/2)
5286.398	2	18911.21	$^{6}\mathrm{H}^{\circ}_{9/2}$ – 20660.00 (7/2)
5252.679	25	19032.61	$^{6}\mathrm{H}^{\circ}_{15/2}$ – 24122.41 (13/2)
5230.058	10	19114.93	$^{6}\mathrm{H}^{\circ}_{13/2}$ – 23033.95 (11/2)
5227.747	20	19123.38	$^{6}\mathrm{H}^{\circ}_{11/2}$ – 21920.49 (9/2)
5218.879	100	19155.87	$^{6}\mathrm{H}^{\circ}_{15/2}$ – 24245.66 (13/2)
5217.699	30*P*	19160.20	$^{6}\mathrm{H}^{\circ}_{9/2}$ – 20909.00 (7/2)
5185.467	100	19279.30	$^{6}\mathrm{H}^{\circ}_{13/2}$ – 23198.33 (11/2)
5171.689	10	19330.66	$^{6}\mathrm{F}^{\circ}_{11/2}$ – 27939.87 (9/2)
5166.176	10*P*	19351.29	$^{6}\mathrm{H}^{\circ}_{9/2}$ – 21100.10 (7/2)
5165.623	150	19353.36	$^{6}\mathrm{H}^{\circ}_{15/2}$ – 24443.15 (13/2)
5165.443	100	19354.03	$^{6}\mathrm{H}^{\circ}_{7/2}$ – 20157.85 (7/2)
5150.995	150	19408.32	$^{6}\mathrm{H}^{\circ}_{11/2}$ – 22205.44 (9/2)
5146.298	500R3	19426.03	$^{6}\mathrm{H}^{\circ}_{13/2}$ – 23345.07 (11/2)
5145.126	400R4	19430.46	$^{6}\mathrm{H}^{\circ}_{15/2}$ – 24520.23 (13/2)

TABLE 4. *Classified lines of* Pm I – Continued

λ (A)	*I*	σ (cm⁻¹)	Classification
5136.752	5	19462.13	$^6H^\circ_{7/2}$ −20265.98 (5/2)
5132.836	10*C*	19476.98	$^6F^\circ_{11/2}$ −28086.21 (11/2)
5129.749	200	19488.70	$^6H^\circ_{9/2}$ −21237.49 (9/2)
5127.342	400R3	19497.85	$^6H^\circ_{11/2}$ −22294.96 (9/2)
5111.431	40	19558.54	$^6H^\circ_{11/2}$ −22355.68 (9/2)
5105.170	50	19582.53	$^6H^\circ_{13/2}$ −23501.57 (11/2)
5100.766	400R3	19599.44	$^6H^\circ_{9/2}$ −21348.22 (7/2)
5096.601	50	19615.45	$^6H^\circ_{15/2}$ −24705.25 (15/2)
5096.181	200	19617.07	$^6H^\circ_{11/2}$ −22414.17 (11/2)
5094.831	400R3	19622.27	$^6H^\circ_{9/2}$ −21371.05 (7/2)
5092.418	200	19631.56	$^6H^\circ_{13/2}$ −23550.60 (11/2)
5087.872	10*C*	19649.10	$^6H^\circ_{11/2}$ −22446.20 (11/2)
5085.154	25	19659.61	$^6H^\circ_{11/2}$ −22456.72 (9/2)
5081.182	50	19674.98	$^6F^\circ_{7/2}$ −26237.84 (9/2)
5079.822	100	19680.24	$^6H^\circ_{15/2}$ −24770.04 (13/2)
5072.149	150	19710.02	$^6H^\circ_{13/2}$ −23629.06 (13/2)
5071.094	25	19714.12	$^6H^\circ_{7/2}$ −20517.96 (5/2)
5058.311	300R2	19763.93	$^6H^\circ_{7/2}$ −20567.76 (5/2)
5051.739	60	19789.65	$^6H^\circ_{11/2}$ −22586.77 (9/2)
5043.672	15	19821.30	$^6F^\circ_{9/2}$ −27319.28 (7/2)
5034.813	50L	19856.18	$^6H^\circ_{7/2}$ −20660.00 (7/2)
5030.805	200R3	19871.99	$^6H^\circ_{7/2}$ −20675.81 (5/2)
5029.624	50*C*	19876.66	$^6H^\circ_{9/2}$ −21625.45 (9/2)
5026.019	30	19890.91	$^6F^\circ_{3/2}$ −25351.46 (3/2)
5019.185	100	19918.00	$^6H^\circ_{9/2}$ −21666.80 (7/2)
5007.559	15	19964.24	$^6H^\circ_{11/2}$ −22761.33 (11/2)
5002.571	10	19984.15	$^6H^\circ_{9/2}$ −21732.93 (9/2)
4997.095	500R1	20006.04	$^6H^\circ_{5/2}$ −20006.04 (3/2)
4993.676	50	20019.74	$^6H^\circ_{13/2}$ −23938.76 (13/2)
4993.601	75	20020.04	$^6H^\circ_{11/2}$ −22817.13 (11/2)
4981.727	5*L*	20067.76	$^6F^\circ_{7/2}$ −26630.56 (5/2)
4975.162	5	20094.24	$^6H^\circ_{13/2}$ −24013.29 (13/2)*
4973.250	25	20101.97	$^6F^\circ_{1/2}$ −25351.46 (3/2)
4972.448	150R5	20105.21	$^6H^\circ_{7/2}$ −20909.00 (7/2)
4968.843	35*S*	20119.79	$^6H^\circ_{13/2}$ −24038.82 (11/2)
4965.600	5	20132.94	$^6F^\circ_{7/2}$ −26695.79 (5/2)
4959.461	700R1	20157.86	$^6H^\circ_{5/2}$ −20157.85 (7/2)
4956.053	100	20171.72	$^6H^\circ_{9/2}$ −21920.49 (9/2)
4948.286	125	20203.38	$^6H^\circ_{13/2}$ −24122.41 (13/2)
4946.851	100	20209.24	$^6H^\circ_{11/2}$ −23006.35 (11/2)
4945.127	125	20216.28	$^6H^\circ_{15/2}$ −25306.07 (15/2)
4942.390	40*S*	20227.48	$^6H^\circ_{9/2}$ −21976.26 (7/2)
4940.101	30	20236.85	$^6H^\circ_{11/2}$ −23033.95 (11/2)
4934.027	50	20261.77	$^6H^\circ_{13/2}$ −24180.80 (13/2)
4932.994	600R1	20266.01	$^6H^\circ_{5/2}$ −20265.98 (5/2)
4929.960	3	20278.48	$^6F^\circ_{7/2}$ −26841.36 (5/2)
4925.637	10*C*	20296.28	$^6H^\circ_{7/2}$ −21100.10 (7/2)
4918.283	400R4	20326.62	$^6H^\circ_{13/2}$ −24245.66 (13/2)
4917.008	2*C*	20331.90	$^6F^\circ_{9/2}$ −27829.89 (9/2)
4916.047	3*C*	20335.87	$^6H^\circ_{9/2}$ −22084.65 (7/2)
4915.234	125	20339.23	$^6H^\circ_{7/2}$ −21143.06 (7/2)
4904.278	300R4	20384.67	$^6H^\circ_{15/2}$ −25474.46 (15/2)*
4904.035	15*S*	20385.68	$^6F^\circ_{11/2}$ −28994.90 (11/2)
4900.296	400R3	20401.23	$^6H^\circ_{11/2}$ −23198.33 (11/2)
4897.663	3*P*	20412.20	$^6F^\circ_{5/2}$ −26285.02 (7/2)*
4892.516	700R2	20433.68	$^6H^\circ_{7/2}$ −21237.49 (9/2)
4890.549	10	20441.89	$^6F^\circ_{9/2}$ −27939.87 (9/2)*
4889.191	50*C*	20447.57	$^6H^\circ_{15/2}$ −25537.36 (13/2)
4887.018	500R3	20456.66	$^6H^\circ_{9/2}$ −22205.44 (9/2)
4885.070	25	20464.82	$^6F^\circ_{11/2}$ −29074.03 (9/2)
4882.946	1	20473.72	$^6F^\circ_{7/2}$ −27036.66 (5/2)
4881.674	2*C*	20479.06	$^6H^\circ_{11/2}$ −23276.10 (9/2)*
4872.416	700R2	20517.97	$^6H^\circ_{5/2}$ −20517.96 (5/2)
4871.845	30	20520.37	$^6F^\circ_{11/2}$ −29129.60 (9/2)
4870.957	50	20524.11	$^6H^\circ_{13/2}$ −24443.15 (13/2)
4869.801	400R4	20528.98	$^6H^\circ_{15/2}$ −25618.77 (15/2)
4866.147	100	20544.40	$^6H^\circ_{7/2}$ −21348.22 (7/2)
4865.724	500R2	20546.19	$^6H^\circ_{9/2}$ −22294.96 (9/2)
4865.302	300R3	20547.97	$^6H^\circ_{11/2}$ −23345.07 (11/2)
4862.183	100	20561.15	$^6H^\circ_{9/2}$ −22309.94 (7/2)
4860.745	700R1	20567.23	$^6H^\circ_{7/2}$ −21371.05 (7/2)
4860.619	400R3	20567.77	$^6H^\circ_{5/2}$ −20567.76 (5/2)
4858.210	25	20577.97	$^6F^\circ_{9/2}$ −28075.94 (9/2)
4856.687	100	20584.42	$^6H^\circ_{13/2}$ −24503.45 (11/2)
4855.787	75	20588.23	$^6F^\circ_{9/2}$ −28086.21 (11/2)
4852.727	350R3	20601.21	$^6H^\circ_{13/2}$ −24520.23 (13/2)
4851.808	50	20605.12	$^6F^\circ_{3/2}$ −26065.63 (1/2)
4851.379	35	20606.94	$^6H^\circ_{9/2}$ −22355.68 (9/2)
4849.663	20	20614.23	$^6H^\circ_{13/2}$ −24533.27 (11/2)
4844.012	200	20638.28	$^6H^\circ_{11/2}$ −23435.40 (9/2)
4841.379	15	20649.50	$^6F^\circ_{5/2}$ −26522.35 (3/2)
4840.626	100	20652.71	$^6F^\circ_{9/2}$ −28150.73 (7/2)
4838.919	400R4	20660.00	$^6H^\circ_{5/2}$ −20660.00 (7/2)
4837.655	800R1	20665.40	$^6H^\circ_{9/2}$ −22414.17 (11/2)
4835.220	10*S*	20675.80	$^6H^\circ_{5/2}$ −20675.81 (5/2)
4833.506	50	20683.14	$^6F^\circ_{7/2}$ −27245.99 (5/2)
4833.417	75	20683.52	$^6H^\circ_{11/2}$ −23480.63 (9/2)
4832.297	50	20688.31	$^6F^\circ_{9/2}$ −28186.31 (7/2)
4830.170	125*C*	20697.42	$^6H^\circ_{9/2}$ −22446.20 (11/2)
4828.524	20	20704.47	$^6H^\circ_{11/2}$ −23501.57 (11/2)
4827.716	400R3	20707.94	$^6H^\circ_{9/2}$ −22456.72 (9/2)
4821.054	40	20736.56	$^6F^\circ_{5/2}$ −26609.39 (5/2)
4817.116	400R4	20753.51	$^6H^\circ_{11/2}$ −23550.60 (11/2)
4816.438	75	20756.43	$^6F^\circ_{7/2}$ −27319.28 (7/2)
4816.131	7P	20757.75	$^6F^\circ_{5/2}$ −26630.56 (5/2)
4815.000	50*C*	20762.63	$^6H^\circ_{13/2}$ −24681.68 (11/2)
4812.914	100	20771.63	$^6F^\circ_{7/2}$ −27334.48 (5/2)
4812.323	100	20774.18	$^6H^\circ_{11/2}$ −23571.27 (9/2)
4811.850	50*P*	20776.22	$^6F^\circ_{9/2}$ −28274.21 (9/2)
4809.536	700R2	20786.22	$^6H^\circ_{13/2}$ −24705.25 (15/2)
4808.994	30	20788.56	$^6F^\circ_{7/2}$ −27351.42 (7/2)
4802.618	30*C*	20816.16	$^6F^\circ_{1/2}$ −26065.63 (1/2)
4801.356	900R1	20821.63	$^6H^\circ_{7/2}$ −21625.45 (9/2)
4801.051	100	20822.95	$^6F^\circ_{5/2}$ −26695.79 (5/2)
4800.083	3	20827.15	$^6F^\circ_{9/2}$ −28325.13 (7/2)
4799.491	150	20829.72	$^6H^\circ_{15/2}$ −25919.50 (13/2)
4798.977	700R1	20831.95	$^6H^\circ_{11/2}$ −23629.06 (13/2)
4797.586	100	20837.99	$^6H^\circ_{9/2}$ −22586.77 (9/2)
4797.171	15	20839.79	$^6F^\circ_{3/2}$ −26300.30 (1/2)
4794.588	250	20851.02	$^6H^\circ_{13/2}$ −24770.04 (13/2)

TABLE 4. *Classified lines of* Pm I—Continued

λ (A)	*I*	σ (cm⁻¹)	Classification
4794.207	50	20852.68	$^{6}F^{\circ}_{5/2}-26725.52$ (3/2)
4791.840	35*C*	20862.98	$^{6}H^{\circ}_{7/2}-21666.80$ (7/2)
4782.081	150R4	20905.55	$^{6}H^{\circ}_{9/2}-22654.34$ (7/2)
4781.292	900R1	20909.00	$^{6}H^{\circ}_{5/2}-20909.00$ (7/2)
4780.285	150	20913.41	$^{6}F^{\circ}_{7/2}-27476.28$ (7/2)
4776.699	100R5	20929.11	$^{6}H^{\circ}_{7/2}-21732.93$ (9/2)
4773.458	700R1	20943.32	$^{6}H^{\circ}_{11/2}-23740.42$ (13/2)*
4771.916	150	20950.09	$^{6}F^{\circ}_{7/2}-27512.95$ (5/2)
4770.142	150	20957.88	$^{6}F^{\circ}_{5/2}-26830.74$ (3/2)
4768.866	25	20963.48	$^{6}H^{\circ}_{11/2}-23760.57$ (11/2)
4767.719	60	20968.53	$^{6}F^{\circ}_{5/2}-26841.36$ (5/2)
4766.024	5*C*	20975.99	$^{6}F^{\circ}_{11/2}-29585.21$ (11/2)
4763.670	2	20986.35	$^{6}F^{\circ}_{11/2}-29595.58$ (9/2)
4762.569	700R1	20991.20	$^{6}H^{\circ}_{15/2}-26080.99$ (17/2)
4762.309	5*C*	20992.35	$^{6}F^{\circ}_{9/2}-28490.35$ (9/2)
4762.095	75U	20993.29	$^{6}H^{\circ}_{13/2}-24912.34$ (11/2)
4758.996	800R1	21006.96	$^{6}H^{\circ}_{15/2}-26096.75$ (17/2)
4758.694	150	21008.29	$^{6}F^{\circ}_{3/2}-26468.80$ (1/2)
4757.968	5	21011.50	$^{6}H^{\circ}_{15/2}-26101.28$ (13/2)
4757.732	500R2	21012.54	$^{6}H^{\circ}_{11/2}-22761.33$ (9/2)
4756.247	90D	21019.10	$^{6}F^{\circ}_{3/2}-26479.61$ (3/2)
4751.701	20	21039.21	$^{6}F^{\circ}_{11/2}-29648.42$ (9/2)*
4749.076	70D	21050.84	$^{6}F^{\circ}_{1/2}-26300.30$ (1/2)
4747.268	3*C*	21058.86	$^{6}F^{\circ}_{7/2}-27621.74$ (7/2)
4746.595	30	21061.84	$^{6}F^{\circ}_{3/2}-26522.35$ (3/2)
4745.282	10*P*	21067.67	$^{6}F^{\circ}_{9/2}-28565.66$ (9/2)
4745.128	350R2	21068.35	$^{6}H^{\circ}_{9/2}-22817.13$ (11/2)
4739.776	200*C*	21092.15	$^{6}H^{\circ}_{15/2}-26181.98$ (13/2)
4738.779	2	21096.58	$^{6}F^{\circ}_{11/2}-29705.77$ (11/2)
4737.987	500R2	21100.11	$^{6}H^{\circ}_{5/2}-21100.10$ (7/2)
4735.915	75*C*	21109.34	$^{6}F^{\circ}_{9/2}-28607.33$ (9/2)
4734.274	800R1	21116.66	$^{6}H^{\circ}_{7/2}-21920.49$ (9/2)
4728.678	400R3	21141.65	$^{6}H^{\circ}_{11/2}-23938.76$ (13/2)
4728.361	700R1	21143.06	$^{6}H^{\circ}_{5/2}-21143.06$ (7/2)
4727.144	10	21148.50	$^{6}F^{\circ}_{11/2}-29757.69$ (11/2)
4727.062	300	21148.87	$^{6}F^{\circ}_{3/2}-26609.39$ (5/2)
4723.722	125	21163.83	$^{6}F^{\circ}_{5/2}-27036.66$ (5/2)
4722.332	40*D*	21170.06	$^{6}F^{\circ}_{3/2}-26630.56$ (5/2)
4721.752	30*B*	21172.66	$^{6}H^{\circ}_{7/2}-21976.26$ (7/2)
4719.607	2	21182.28	$^{6}F^{\circ}_{9/2}-28680.26$ (7/2)
4718.800	100	21185.90	$^{6}H^{\circ}_{9/2}-22934.70$ (7/2)
4717.351	75	21192.41	$^{6}H^{\circ}_{15/2}-26282.20$ (13/2)
4712.058	50	21216.21	$^{6}H^{\circ}_{11/2}-24013.29$ (13/2)*
4711.368	125*C*	21219.32	$^{6}F^{\circ}_{1/2}-26468.80$ (1/2)
4708.968	150	21230.14	$^{6}F^{\circ}_{1/2}-26479.61$ (3/2)
4706.401	100	21241.72	$^{6}H^{\circ}_{11/2}-24038.82$ (11/2)
4705.114	100	21247.52	$^{6}F^{\circ}_{11/2}-29856.72$ (11/2)
4702.886	10*W*	21257.59	$^{6}H^{\circ}_{9/2}-23006.35$ (11/2)
4701.242	1	21265.03	$^{6}F^{\circ}_{3/2}-26725.52$ (3/2)
4700.803	100*C*	21267.01	$^{6}F^{\circ}_{7/2}-27829.89$ (9/2)
4699.508	200	21272.87	$^{6}F^{\circ}_{1/2}-26522.35$ (3/2)
4699.276	150	21273.92	$^{6}H^{\circ}_{11/2}-24071.03$ (9/2)
4698.761	150	21276.25	$^{6}H^{\circ}_{7/2}-22080.08$ (5/2)
4697.749	30*C*	21280.83	$^{6}H^{\circ}_{7/2}-22084.65$ (7/2)
4696.796	500R2	21285.16	$^{6}H^{\circ}_{9/2}-23033.95$ (11/2)
4693.589	40*L*	21299.70	$^{6}F^{\circ}_{11/2}-29908.90$ (9/2)
4687.952	20	21325.31	$^{6}H^{\circ}_{11/2}-24122.41$ (13/2)
4682.920	700R1	21348.22	$^{6}H^{\circ}_{5/2}-21348.22$ (7/2)
4682.266	150	21351.20	$^{6}F^{\circ}_{11/2}-29960.42$ (11/2)*
4680.223	2	21360.52	$^{6}F^{\circ}_{7/2}-27923.37$ (5/2)
4678.918	60	21366.48	$^{6}H^{\circ}_{15/2}-26456.26$ (13/2)
4678.093	400R5	21370.25	$^{6}F^{\circ}_{3/2}-26830.74$ (3/2)
4677.916	500R2	21371.06	$^{6}H^{\circ}_{5/2}-21371.05$ (7/2)
4677.456	200	21373.16	$^{6}F^{\circ}_{5/2}-27245.99$ (5/2)
4675.764	5*C*	21380.89	$^{6}F^{\circ}_{3/2}-26841.36$ (5/2)
4675.148	35	21383.71	$^{6}H^{\circ}_{11/2}-24180.80$ (13/2)
4674.420	500R4	21387.04	$^{6}H^{\circ}_{13/2}-25306.07$ (15/2)
4671.759	400	21399.22	$^{6}F^{\circ}_{11/2}-30008.40$ (11/2)
4671.234	500R2	21401.63	$^{6}H^{\circ}_{7/2}-22205.44$ (9/2)
4665.188	400R2	21429.36	$^{6}H^{\circ}_{9/2}-23178.13$ (7/2)
4663.455	600R2	21437.33	$^{6}H^{\circ}_{11/2}-24234.42$ (9/2)
4663.261	300R4	21438.22	$^{6}H^{\circ}_{13/2}-25357.24$ (11/2)
4661.729	25*U*	21445.26	$^{6}F^{\circ}_{7/2}-28008.09$ (7/2)*
4661.476	40*C*	21446.43	$^{6}F^{\circ}_{5/2}-27319.28$ (7/2)
4661.012	60	21448.56	$^{6}H^{\circ}_{11/2}-24245.66$ (13/2)
4660.794	500R3	21449.56	$^{6}H^{\circ}_{9/2}-23198.33$ (11/2)
4659.745	2	21454.40	$^{6}F^{\circ}_{11/2}-30063.62$ (9/2)
4659.383	300	21456.06	$^{6}H^{\circ}_{15/2}-26545.85$ (17/2)
4658.169	75	21461.65	$^{6}F^{\circ}_{5/2}-27334.48$ (5/2)
4657.301	50	21465.66	$^{6}H^{\circ}_{15/2}-26555.44$ (13/2)
4655.046	500R5	21476.05	$^{6}F^{\circ}_{1/2}-26725.52$ (3/2)
4654.496	400	21478.59	$^{6}F^{\circ}_{5/2}-27351.42$ (7/2)
4653.413	400R3	21483.59	$^{6}H^{\circ}_{13/2}-25402.61$ (11/2)
4652.834	5	21486.26	$^{6}H^{\circ}_{13/2}-25405.29$ (13/2)
4650.525	500	21496.93	$^{6}F^{\circ}_{9/2}-28994.90$ (11/2)
4650.421	600R5	21497.41	$^{6}H^{\circ}_{7/2}-22301.24$ (5/2)
4649.508	600	21501.63	$^{6}H^{\circ}_{15/2}-26591.40$ (13/2)
4648.537	50	21506.12	$^{6}H^{\circ}_{7/2}-22309.94$ (7/2)
4647.028	600R3	21513.11	$^{6}F^{\circ}_{7/2}-28075.94$ (9/2)
4645.234	40	21521.41	$^{6}F^{\circ}_{7/2}-28084.28$ (5/2)
4643.959	200	21527.32	$^{6}H^{\circ}_{9/2}-23276.10$ (9/2)
4643.355	700R2	21530.13	$^{6}H^{\circ}_{9/2}-23278.90$ (7/2)
4640.961	400R3	21541.23	$^{6}H^{\circ}_{11/2}-24338.33$ (9/2)
4638.672	100	21551.86	$^{6}H^{\circ}_{7/2}-22355.68$ (9/2)
4633.473	300*B*	21576.04	$^{6}F^{\circ}_{9/2}-29074.03$ (9/2)
4633.452	600R3	21576.14	$^{6}F^{\circ}_{3/2}-27036.66$ (5/2)
4632.353	10*P*	21581.26	$^{6}F^{\circ}_{1/2}-26830.74$ (3/2)
4630.930	200	21587.89	$^{6}F^{\circ}_{7/2}-28150.73$ (7/2)
4630.742	15	21588.77	$^{6}H^{\circ}_{9/2}-23337.53$ (7/2)
4630.349	125	21590.60	$^{6}H^{\circ}_{5/2}-21590.60$ (3/2)
4629.127	150	21596.30	$^{6}H^{\circ}_{9/2}-23345.07$ (11/2)
4627.595	400R3	21603.45	$^{6}F^{\circ}_{5/2}-27476.28$ (7/2)
4625.289	500R2	21614.22	$^{6}H^{\circ}_{15/2}-26703.97$ (13/2)
4624.409	900*W*	21618.33	$^{6}H^{\circ}_{13/2}-25537.36$ (13/2)
4623.675	700R1	21621.76	$^{6}H^{\circ}_{7/2}-22425.58$ (5/2)
4623.310	500	21623.47	$^{6}F^{\circ}_{7/2}-28186.31$ (7/2)
4621.571	500	21631.61	$^{6}F^{\circ}_{9/2}-29129.60$ (9/2)
4619.750	500R4	21640.13	$^{6}F^{\circ}_{5/2}-27512.95$ (5/2)
4618.487	400R4	21646.05	$^{6}H^{\circ}_{11/2}-24443.15$ (13/2)
4618.398	200	21646.47	$^{6}H^{\circ}_{11/2}-24443.57$ (9/2)
4617.023	600R1	21652.91	$^{6}H^{\circ}_{7/2}-22456.72$ (9/2)
4615.961	50*SP*	21657.89	$^{6}H^{\circ}_{5/2}-21657.89$ (5/2)
4614.670	2	21663.96	$^{6}F^{\circ}_{9/2}-29161.96$ (9/2)
4614.059	150	21666.82	$^{6}H^{\circ}_{5/2}-21666.80$ (7/2)
4612.787	10	21672.80	$^{6}F^{\circ}_{11/2}-30281.98$ (13/2)
4609.846	500R3	21686.62	$^{6}H^{\circ}_{9/2}-23435.40$ (9/2)
4607.062	150	21699.73	$^{6}H^{\circ}_{13/2}-25618.77$ (15/2)
4605.657	600R2	21706.35	$^{6}H^{\circ}_{11/2}-24503.45$ (11/2)
4604.739	400*C*	21710.67	$^{6}F^{\circ}_{7/2}-28273.52$ (7/2)
4604.593	400	21711.36	$^{6}F^{\circ}_{7/2}-28274.21$ (9/2)

TABLE 4. *Classified lines of* Pm I – Continued

λ (A)	*I*	σ (cm⁻¹)	Classification
4602.957	400R3	21719.08	$^6H^\circ_{7/2}-22522.90$ (5/2)
4602.105	15*W*	21723.10	$^6H^\circ_{11/2}-24520.23$ (13/2)
4600.250	500R3	21731.86	$^6H^\circ_{9/2}-23480.63$ (9/2)
4599.338	35	21736.17	$^6H^\circ_{11/2}-24533.27$ (11/2)
4597.546	800R5	21744.64	$^6F^\circ_{9/2}-29242.64$ (11/2)
4596.646	400*C*	21748.90	$^6F^\circ_{5/2}-27621.74$ (7/2)
4595.822	400R4	21752.80	$^6H^\circ_{9/2}-23501.57$ (11/2)
4593.991	50	21761.47	$^6H^\circ_{11/2}-24558.56$ (9/2)
4593.817	200	21762.29	$^6F^\circ_{7/2}-28325.13$ (7/2)
4593.086	75	21765.76	$^6F^\circ_{11/2}-30374.95$ (11/2)
4589.456	125	21782.97	$^6H^\circ_{7/2}-22586.77$ (9/2)
4588.921	35	21785.51	$^6F^\circ_{3/2}-27245.99$ (5/2)
4585.487	300R3	21801.82	$^6H^\circ_{9/2}-23550.60$ (11/2)
4583.131	125	21813.03	$^6F^\circ_{5/2}-27685.89$ (3/2)*
4581.145	300	21822.49	$^6H^\circ_{9/2}-23571.27$ (9/2)
4579.478	300R3	21830.43	$^6H^\circ_{11/2}-24627.53$ (9/2)
4578.411	200R5	21835.52	$^6H^\circ_{9/2}-23584.31$ (7/2)
4578.285	300	21836.12	$^6H^\circ_{13/2}-25755.17$ (11/2)
4575.752	200	21848.21	$^6F^\circ_{11/2}-30457.44$ (13/2)
4575.267	400R1	21850.52	$^6H^\circ_{7/2}-22654.34$ (7/2)
4574.781	60	21852.85	$^6H^\circ_{7/2}-22656.68$ (5/2)
4572.148	300R5	21865.43	$^6H^\circ_{15/2}-26955.22$ (15/2)
4570.367	200*P*	21873.95	$^6F^\circ_{3/2}-27334.48$ (5/2)
4568.145	300R4	21884.59	$^6H^\circ_{11/2}-24681.68$ (11/2)
4563.960	50	21904.66	$^6F^\circ_{7/2}-28467.52$ (7/2)
4559.206	300R5	21927.50	$^6F^\circ_{7/2}-28490.35$ (9/2)
4558.253	50	21932.08	$^6F^\circ_{11/2}-30541.28$ (11/2)
4555.338	500R1	21946.12	$^6H^\circ_{5/2}-21946.12$ (3/2)
4554.034	300R3	21952.40	$^6H^\circ_{15/2}-27042.18$ (15/2)
4552.979	3	21957.48	$^6H^\circ_{11/2}-24754.58$ (9/2)
4551.672	60	21963.79	$^6H^\circ_{9/2}-23712.56$ (7/2)
4549.775	400R2	21972.95	$^6H^\circ_{11/2}-24770.04$ (13/2)
4549.088	175*D*	21976.27	$^6H^\circ_{5/2}-21976.26$ (7/2)
4545.173	200	21995.20	$^6H^\circ_{9/2}-23743.96$ (7/2)
4544.083	500R2	22000.47	$^6H^\circ_{13/2}-25919.50$ (13/2)
4543.598	20*C*	22002.82	$^6F^\circ_{7/2}-28565.66$ (9/2)
4542.539	75	22007.95	$^6F^\circ_{3/2}-27468.45$ (3/2)
4541.746	450R4	22011.79	$^6H^\circ_{9/2}-23760.57$ (11/2)
4541.415	300R5	22013.40	$^6H^\circ_{5/2}-22013.40$ (3/2)
4540.062	300*H*	22019.96	$^6H^\circ_{15/2}-27109.75$ (15/2)
4535.008	45*D*	22044.50	$^6F^\circ_{7/2}-28607.33$ (9/2)
4534.608	100	22046.44	$^6F^\circ_{5/2}-27919.29$ (3/2)
4533.759	25*U*	22050.57	$^6F^\circ_{5/2}-27923.37$ (5/2)
4533.378	50	22052.42	$^6F^\circ_{3/2}-27512.95$ (5/2)
4527.700	400R1	22080.08	$^6H^\circ_{5/2}-22080.07$ (5/2)
4526.762	250R5	22084.65	$^6H^\circ_{5/2}-22084.65$ (7/2)
4526.231	2	22087.24	$^6F^\circ_{9/2}-29585.21$ (11/2)
4526.116	250R4	22087.80	$^6H^\circ_{11/2}-24884.90$ (11/2)
4524.250	65	22096.91	$^6H^\circ_{13/2}-26015.94$ (11/2)
4524.115	50	22097.57	$^6F^\circ_{9/2}-29595.58$ (9/2)
4523.323	200	22101.44	$^6H^\circ_{7/2}-22905.24$ (5/2)
4520.502	100	22115.24	$^6H^\circ_{11/2}-24912.34$ (11/2)
4520.128	40	22117.06	$^6F^\circ_{11/2}-30726.26$ (9/2)
4520.052	5	22117.44	$^6F^\circ_{7/2}-28680.26$ (7/2)
4517.306	200	22130.88	$^6H^\circ_{7/2}-22934.70$ (7/2)
4516.418	20*CP*	22135.23	$^6F^\circ_{5/2}-28008.09$ (7/2)*
4513.313	25	22150.46	$^6F^\circ_{9/2}-29648.42$ (9/2)*
4508.148	1	22175.84	$^6F^\circ_{11/2}-30785.03$ (9/2)
4506.843	250	22182.26	$^6H^\circ_{13/2}-26101.28$ (13/2)
4506.379	60	22184.54	$^6H^\circ_{13/2}-26103.56$ (11/2)
4501.666	20*C*	22207.77	$^6F^\circ_{9/2}-29705.77$ (11/2)
4500.925	40	22211.42	$^6F^\circ_{5/2}-28084.28$ (5/2)
4500.330	350R2	22214.36	$^6H^\circ_{15/2}-27304.15$ (15/2)*
4499.398	150	22218.96	$^6F^\circ_{1/2}-27468.45$ (3/2)
4498.090	3	22225.42	$^6F^\circ_{3/2}-27685.89$ (3/2)*
4490.504	300R4	22262.97	$^6H^\circ_{13/2}-26181.98$ (13/2)
4487.493	20	22277.91	$^6F^\circ_{5/2}-28150.73$ (7/2)
4485.842	25	22286.11	$^6F^\circ_{9/2}-29784.08$ (9/2)
4485.052	300R3	22290.03	$^6H^\circ_{9/2}-24038.82$ (11/2)
4482.792	75*U*	22301.27	$^6H^\circ_{5/2}-22301.24$ (5/2)
4481.603	300R1	22307.19	$^6H^\circ_{11/2}-25104.27$ (11/2)
4481.047	15	22309.95	$^6H^\circ_{5/2}-22309.94$ (7/2)
4478.577	350R1	22322.26	$^6H^\circ_{9/2}-24071.03$ (9/2)
4471.271	15*D*	22358.73	$^6F^\circ_{9/2}-29856.72$ (11/2)
4470.382	25*P*	22363.18	$^6H^\circ_{13/2}-26282.20$ (13/2)
4468.155	250R2	22374.32	$^6H^\circ_{7/2}-23178.13$ (7/2)
4466.077	8*C*	22384.73	$^6H^\circ_{7/2}-23188.54$ (5/2)
4465.838	125*P*	22385.93	$^6F^\circ_{9/2}-29883.87$ (7/2)
4465.408	100*C*	22388.09	$^6H^\circ_{5/2}-22388.06$ (3/2)
4462.895	20*S*	22400.69	$^6F^\circ_{5/2}-28273.52$ (7/2)
4460.859	10	22410.92	$^6F^\circ_{9/2}-29908.90$ (9/2)
4457.945	30	22425.57	$^6H^\circ_{5/2}-22425.58$ (5/2)
4452.638	25	22452.30	$^6F^\circ_{5/2}-28325.13$ (7/2)
4451.985	100	22455.59	$^6H^\circ_{9/2}-24204.37$ (7/2)
4451.350	5	22458.79	$^6F^\circ_{3/2}-27919.29$ (3/2)
4450.628	10	22462.43	$^6F^\circ_{9/2}-29960.42$ (11/2)*
4450.544	50	22462.86	$^6F^\circ_{3/2}-27923.37$ (5/2)
4448.677	30	22472.28	$^6H^\circ_{7/2}-23276.10$ (9/2)
4448.126	75	22475.07	$^6H^\circ_{7/2}-23278.90$ (7/2)
4446.038	35	22485.62	$^6H^\circ_{9/2}-24234.42$ (9/2)
4444.376	75	22494.03	$^6F^\circ_{11/2}-31103.24$ (11/2)
4441.911	15	22506.51	$^6H^\circ_{15/2}-27596.27$ (13/2)
4441.136	3*L*	22510.44	$^6F^\circ_{9/2}-30008.40$ (11/2)
4440.995	3*L*	22511.16	$^6F^\circ_{7/2}-29074.03$ (9/2)
4438.682	300R2	22522.89	$^6H^\circ_{5/2}-22522.90$ (5/2)
4437.224	125	22530.29	$^6H^\circ_{7/2}-23334.10$ (5/2)
4436.546	300R3	22533.73	$^6H^\circ_{7/2}-23337.53$ (7/2)
4435.859	250R4	22537.22	$^6H^\circ_{13/2}-26456.26$ (13/2)
4431.354	100	22560.13	$^6H^\circ_{11/2}-25357.24$ (11/2)
4430.275	100	22565.63	$^6F^\circ_{9/2}-30063.62$ (9/2)
4430.054	10	22566.75	$^6F^\circ_{7/2}-29129.60$ (9/2)
4425.584	35	22589.54	$^6H^\circ_{9/2}-24338.33$ (9/2)
4424.577	25	22594.69	$^6F^\circ_{5/2}-28467.52$ (7/2)
4422.459	10	22605.51	$^6H^\circ_{11/2}-25402.61$ (11/2)
4421.935	75	22608.19	$^6H^\circ_{11/2}-25405.29$ (13/2)
4418.871	50	22623.86	$^6F^\circ_{3/2}-28084.28$ (5/2)*
4417.361	5*H*	22631.60	$^6H^\circ_{7/2}-23435.40$ (9/2)
4416.422	150	22636.40	$^6H^\circ_{13/2}-26555.44$ (13/2)
4415.724	150	22639.99	$^6H^\circ_{7/2}-23443.79$ (5/2)
4413.540	125	22651.19	$^6H^\circ_{11/2}-25448.28$ (9/2)
4412.924	75	22654.35	$^6H^\circ_{5/2}-22654.34$ (7/2)
4412.470	500R2	22656.68	$^6H^\circ_{5/2}-22656.68$ (5/2)
4409.938	125*S*	22669.69	$^6H^\circ_{9/2}-24418.44$ (7/2)
4409.416	400R4	22672.37	$^6H^\circ_{13/2}-26591.40$ (13/2)
4408.552	35	22676.82	$^6H^\circ_{7/2}-23480.63$ (9/2)
4405.370	10	22693.20	$^6F^\circ_{3/2}-28153.69$ (5/2)
4405.063	60	22694.78	$^6H^\circ_{9/2}-24443.57$ (9/2)
4399.722	50	22722.33	$^6H^\circ_{9/2}-24471.10$ (7/2)
4399.305	75	22724.48	$^6H^\circ_{11/2}-25521.55$ (9/2)
4397.262	150	22735.04	$^6H^\circ_{7/2}-23538.86$ (5/2)

TABLE 4. *Classified lines of* Pm I – Continued

λ (A)	*I*	σ (cm⁻¹)	Classification
4397.124	150	22735.75	$^{6}F^{\circ}_{5/2}$ – 28608.57 (3/2)
4397.066	70*D*	22736.05	$^{6}F^{\circ}_{3/2}$ – 28196.56 (1/2)
4396.252	50*U*	22740.26	$^{6}H^{\circ}_{11/2}$ – 25537.36 (13/2)
4393.466	2*W*	22754.68	$^{6}H^{\circ}_{9/2}$ – 24503.45 (11/2)
4391.001	75	22767.45	$^{6}H^{\circ}_{7/2}$ – 23571.27 (9/2)
4389.473	75	22775.38	$^{6}H^{\circ}_{13/2}$ – 26694.38 (11/2)
4388.489	400R3	22780.49	$^{6}H^{\circ}_{7/2}$ – 23584.31 (7/2)
4387.718	35	22784.49	$^{6}H^{\circ}_{9/2}$ – 24533.27 (11/2)
4387.630	100	22784.94	$^{6}H^{\circ}_{13/2}$ – 26703.97 (13/2)
4383.305	100	22807.43	$^{6}F^{\circ}_{5/2}$ – 28680.26 (7/2)
4382.852	50	22809.78	$^{6}H^{\circ}_{9/2}$ – 24558.56 (9/2)
4369.700	25*U*	22878.44	$^{6}F^{\circ}_{3/2}$ – 28338.98 (5/2)*
4369.640	300R2	22878.75	$^{6}H^{\circ}_{9/2}$ – 24627.53 (9/2)
4364.583	100	22905.26	$^{6}H^{\circ}_{5/2}$ – 22905.24 (5/2)
4363.917	350R2	22908.76	$^{6}H^{\circ}_{7/2}$ – 23712.56 (7/2)
4359.322	80	22932.90	$^{6}H^{\circ}_{9/2}$ – 24681.68 (11/2)
4358.975	5	22934.73	$^{6}H^{\circ}_{5/2}$ – 22934.70 (7/2)
4357.943	100*S*	22940.16	$^{6}H^{\circ}_{7/2}$ – 23743.96 (7/2)
4357.745	75	22941.20	$^{6}H^{\circ}_{15/2}$ – 28030.99 (13/2)
4356.625	125*D*	22947.10	$^{6}F^{\circ}_{1/2}$ – 28196.56 (1/2)
4354.545	100*B*	22958.06	$^{6}H^{\circ}_{11/2}$ – 25755.17 (11/2)
4347.715	200	22994.12	$^{6}H^{\circ}_{15/2}$ – 27383.92 (15/2)
4345.510	50	23005.79	$^{6}H^{\circ}_{9/2}$ – 24754.58 (9/2)
4339.778	80	23036.18	$^{6}H^{\circ}_{13/2}$ – 26955.22 (15/2)
4338.856	60	23041.07	$^{6}H^{\circ}_{9/2}$ – 24789.86 (9/2)
4323.458	75	23123.13	$^{6}H^{\circ}_{13/2}$ – 27042.18 (15/2)
4322.156	150	23130.09	$^{6}F^{\circ}_{5/2}$ – 29002.94 (3/2)
4321.030	20	23136.12	$^{6}H^{\circ}_{9/2}$ – 24884.90 (11/2)
4318.797	400	23148.09	$^{6}F^{\circ}_{3/2}$ – 28608.57 (3/2)
4315.905	1*W*	23163.60	$^{6}H^{\circ}_{9/2}$ – 24912.34 (11/2)
4313.197	50	23178.14	$^{6}H^{\circ}_{5/2}$ – 23178.13 (7/2)
4311.255	40P	23188.58	$^{6}H^{\circ}_{5/2}$ – 23188.54 (5/2)
4310.858	2	23190.72	$^{6}H^{\circ}_{13/2}$ – 27109.75 (15/2)
4309.779	15	23196.52	$^{6}F^{\circ}_{3/2}$ – 28657.02 (1/2)
4305.638	200R5	23218.83	$^{6}H^{\circ}_{11/2}$ – 26015.94 (11/2)
4305.192	35	23221.24	$^{6}F^{\circ}_{7/2}$ – 29784.08 (9/2)
4303.889	200*C*	23228.27	$^{6}F^{\circ}_{9/2}$ – 30726.26 (9/2)
4298.848	40	23255.50	$^{6}F^{\circ}_{11/2}$ – 31846.70 (11/2)
4296.687	50	23267.20	$^{6}H^{\circ}_{7/2}$ – 24071.03 (9/2)
4294.529	20	23278.89	$^{6}H^{\circ}_{5/2}$ – 23278.90 (7/2)
4293.026	10	23287.04	$^{6}F^{\circ}_{9/2}$ – 30785.03 (9/2)
4289.872	4*P*	23304.16	$^{6}H^{\circ}_{11/2}$ – 26101.28 (13/2)
4289.448	100	23306.46	$^{6}H^{\circ}_{11/2}$ – 26103.56 (11/2)
4286.776	125	23320.99	$^{6}F^{\circ}_{7/2}$ – 29883.87 (7/2)
4284.368	300R5	23334.10	$^{6}H^{\circ}_{5/2}$ – 23334.10 (5/2)
4283.751	40*P*	23337.46	$^{6}H^{\circ}_{5/2}$ – 23337.53 (7/2)
4280.448	75	23355.47	$^{6}H^{\circ}_{9/2}$ – 25104.27 (11/2)
4279.787	50*U*	23359.07	$^{6}F^{\circ}_{1/2}$ – 28608.57 (3/2)
4275.061	3	23384.90	$^{6}H^{\circ}_{11/2}$ – 26181.98 (13/2)
4272.179	100*C*	23400.67	$^{6}H^{\circ}_{7/2}$ – 24204.37 (7/2)
4270.924	50*C*	23407.55	$^{6}F^{\circ}_{1/2}$ – 28657.02 (1/2)
4269.908	10	23413.12	$^{6}F^{\circ}_{11/2}$ – 32022.32 (9/2)
4264.321	300R3	23443.79	$^{6}H^{\circ}_{5/2}$ – 23443.79 (5/2)
4247.098	150R3	23538.86	$^{6}H^{\circ}_{5/2}$ – 23538.86 (5/2)
4246.451	8	23542.45	$^{6}F^{\circ}_{3/2}$ – 29002.94 (3/2)
4238.912	60	23584.32	$^{6}H^{\circ}_{5/2}$ – 23584.31 (7/2)
4235.147	15*S*	23605.28	$^{6}F^{\circ}_{9/2}$ – 31103.24 (11/2)
4233.467	50	23614.65	$^{6}H^{\circ}_{7/2}$ – 24418.44 (7/2)
4226.453	5	23653.84	$^{6}H^{\circ}_{9/2}$ – 25402.61 (11/2)
4225.504	60	23659.15	$^{6}H^{\circ}_{11/2}$ – 26456.26 (13/2)
4224.049	75R4	23667.30	$^{6}H^{\circ}_{7/2}$ – 24471.10 (7/2)
4222.272	200	23677.26	$^{6}H^{\circ}_{13/2}$ – 27596.27 (13/2)
4218.308	50R4	23699.51	$^{6}H^{\circ}_{9/2}$ – 25448.28 (9/2)
4215.984	60	23712.58	$^{6}H^{\circ}_{5/2}$ – 23712.56 (7/2)
4210.411	15	23743.96	$^{6}H^{\circ}_{5/2}$ – 23743.96 (7/2)
4208.727	35	23753.46	$^{6}F^{\circ}_{1/2}$ – 29002.94 (3/2)
4207.865	3	23758.33	$^{6}H^{\circ}_{11/2}$ – 26555.44 (13/2)
4205.303	125	23772.80	$^{6}H^{\circ}_{9/2}$ – 25521.55 (9/2)
4201.505	15*P*	23794.29	$^{6}H^{\circ}_{11/2}$ – 26591.40 (13/2)
4196.315	85	23823.72	$^{6}H^{\circ}_{7/2}$ – 24627.53 (9/2)
4183.396	150	23897.29	$^{6}H^{\circ}_{11/2}$ – 26694.38 (11/2)
4181.722	5	23906.85	$^{6}H^{\circ}_{11/2}$ – 26703.97 (13/2)
4174.056	50	23950.76	$^{6}H^{\circ}_{7/2}$ – 24754.58 (9/2)
4167.915	50	23986.05	$^{6}H^{\circ}_{7/2}$ – 24789.86 (9/2)
4164.379	10	24006.42	$^{6}H^{\circ}_{9/2}$ – 25755.17 (11/2)
4163.572	5	24011.07	$^{6}F^{\circ}_{5/2}$ – 29883.87 (7/2)
4149.687	20*CP*	24091.41	$^{6}H^{\circ}_{5/2}$ – 24091.39 (3/2)
4146.151	150R5	24111.96	$^{6}H^{\circ}_{13/2}$ – 28030.99 (13/2)
4137.064	2	24164.91	$^{6}H^{\circ}_{13/2}$ – 27383.92 (15/2)
4136.673	15	24167.20	$^{6}H^{\circ}_{13/2}$ – 28086.21 (11/2)
4130.322	2	24204.36	$^{6}H^{\circ}_{5/2}$ – 24204.37 (7/2)
4119.631	10	24267.17	$^{6}H^{\circ}_{9/2}$ – 26015.94 (11/2)
4104.818	5*P*	24354.74	$^{6}H^{\circ}_{9/2}$ – 26103.56 (11/2)
4102.807	2	24366.68	$^{6}F^{\circ}_{9/2}$ – 31846.70 (11/2)
4094.117	75	24418.40	$^{6}H^{\circ}_{5/2}$ – 24418.44 (7/2)
4085.306	200R5	24471.07	$^{6}H^{\circ}_{5/2}$ – 24471.10 (7/2)
4076.425	2	24524.37	$^{6}F^{\circ}_{9/2}$ – 32022.32 (9/2)
4074.455	100	24536.23	$^{6}H^{\circ}_{9/2}$ – 26285.02 (7/2)
4057.716	5	24637.45	$^{6}F^{\circ}_{11/2}$ – 33246.65 (9/2)
4056.565	200R3	24644.44	$^{6}H^{\circ}_{7/2}$ – 25448.28 (9/2)
4044.537	125	24717.72	$^{6}H^{\circ}_{7/2}$ – 25521.55 (9/2)
4031.260	100	24799.13	$^{6}H^{\circ}_{11/2}$ – 27596.27 (13/2)
4007.594	150	24945.57	$^{6}H^{\circ}_{9/2}$ – 26694.38 (11/2)
3986.768	200	25075.88	$^{6}H^{\circ}_{13/2}$ – 28994.90 (11/2)
3976.162	100	25142.77	$^{6}H^{\circ}_{11/2}$ – 27939.87 (9/2)
3968.364	100	25192.17	$^{6}H^{\circ}_{15/2}$ – 30281.98 (13/2)
3961.816	300	25233.81	$^{6}H^{\circ}_{11/2}$ – 28030.99 (13/2)
3954.759	300R5	25278.84	$^{6}H^{\circ}_{11/2}$ – 28075.94 (9/2)
3953.158	50	25289.08	$^{6}H^{\circ}_{11/2}$ – 28086.21 (11/2)
3947.771	300R5	25323.59	$^{6}H^{\circ}_{13/2}$ – 29242.64 (11/2)
3943.420	25	25351.52	$^{6}H^{\circ}_{5/2}$ – 25351.46 (3/2)*
3940.912	200	25367.66	$^{6}H^{\circ}_{15/2}$ – 30457.44 (13/2)
3934.714	20	25407.61	$^{6}H^{\circ}_{7/2}$ – 26211.44 (7/2)
3930.629	15	25434.02	$^{6}H^{\circ}_{7/2}$ – 26237.84 (9/2)
3926.704	75	25459.44	$^{6}F^{\circ}_{7/2}$ – 32022.32 (9/2)
3923.982	300	25477.10	$^{6}H^{\circ}_{11/2}$ – 28274.21 (9/2)
3923.352	400	25481.20	$^{6}H^{\circ}_{7/2}$ – 26285.02 (7/2)
3916.820	200	25523.69	$^{6}H^{\circ}_{9/2}$ – 27272.46
3904.745	75	25602.62	$^{6}H^{\circ}_{9/2}$ – 27351.42 (7/2)
3895.073	200	25666.19	$^{6}H^{\circ}_{13/2}$ – 29585.21 (11/2)
3890.971	250	25693.25	$^{6}H^{\circ}_{11/2}$ – 28490.35 (9/2)
3885.792	300R3	25727.49	$^{6}H^{\circ}_{9/2}$ – 27476.28 (7/2)
3882.598	35	25748.66	$^{6}F^{\circ}_{9/2}$ – 33246.65 (9/2)
3879.598	50	25768.56	$^{6}H^{\circ}_{11/2}$ – 28565.66 (9/2)
3876.863	200	25786.74	$^{6}H^{\circ}_{13/2}$ – 29705.77 (11/2)
3874.034	300	25805.57	$^{6}H^{\circ}_{7/2}$ – 26609.39 (5/2)
3873.336	300	25810.22	$^{6}H^{\circ}_{11/2}$ – 28607.33 (9/2)
3870.862	35	25826.72	$^{6}H^{\circ}_{7/2}$ – 26630.56 (5/2)
3869.073	75	25838.66	$^{6}H^{\circ}_{13/2}$ – 29757.69 (11/2)
3854.297	75	25937.71	$^{6}H^{\circ}_{13/2}$ – 29856.72 (11/2)

TABLE 4. *Classified lines of* Pm I – Continued

λ (A)	*I*	σ (cm⁻¹)	Classification
3839.519	300	26037.54	$^6H^\circ_{7/2}-26841.36$ (5/2)
3838.951	250W	26041.39	$^6H^\circ_{13/2}-29960.42$ (11/2)*
3833.101	500R5	26081.14	$^6H^\circ_{9/2}-27829.89$ (9/2)
3831.891	150	26089.37	$^6H^\circ_{13/2}-30008.40$ (11/2)
3817.009	300	26191.09	$^6H^\circ_{9/2}-27939.87$ (9/2)
3816.033	75	26197.79	$^6H^\circ_{11/2}-28994.90$ (11/2)
3814.046	50	26211.44	$^6H^\circ_{5/2}-26211.44$ (7/2)
3810.932	400	26232.85	$^6H^\circ_{7/2}-27036.66$ (5/2)
3807.093	25	26259.30	$^6H^\circ_{9/2}-28008.09$ (7/2)
3804.538	75	26276.94	$^6H^\circ_{11/2}-29074.03$ (9/2)
3803.370	400	26285.01	$^6H^\circ_{5/2}-26285.02$ (7/2)
3797.292	75	26327.08	$^6H^\circ_{9/2}-28075.94$ (9/2)*
3796.513	300	26332.48	$^6H^\circ_{13/2}-30251.50$ *
3795.800	500	26337.43	$^6H^\circ_{9/2}-28086.21$ (11/2)
3792.125	100	26362.95	$^6H^\circ_{13/2}-30281.98$ (13/2)
3791.842	50	26364.92	$^6H^\circ_{11/2}-29161.96$ (9/2)
3783.806	100	26420.92	$^6H^\circ_{9/2}-28169.71$ (7/2)
3781.429	200	26437.52	$^6H^\circ_{9/2}-28186.31$ (7/2)
3780.768	300	26442.14	$^6H^\circ_{7/2}-27245.99$ (5/2)
3780.284	150	26445.53	$^6H^\circ_{11/2}-29242.64$ (11/2)
3776.986	250R4	26468.62	$^6H^\circ_{7/2}-27272.46$
3775.419	300P	26479.61	$^6H^\circ_{5/2}-26479.61$ (3/2)
3770.312	100P	26515.47	$^6H^\circ_{7/2}-27319.28$ (7/2)
3769.334	75S	26522.35	$^6H^\circ_{5/2}-26522.35$ (3/2)
3768.994	200P	26524.74	$^6H^\circ_{9/2}-28273.52$ (7/2)
3768.895	150	26525.44	$^6H^\circ_{9/2}-28274.21$ (9/2)
3767.052	40	26538.42	$^6H^\circ_{13/2}-30457.44$ (13/2)
3765.747	300	26547.61	$^6H^\circ_{7/2}-27351.42$ (7/2)
3761.678	200	26576.33	$^6H^\circ_{9/2}-28325.13$ (7/2)
3757.007	75	26609.37	$^6H^\circ_{5/2}-26609.39$ (5/2)
3755.190	50	26622.24	$^6H^\circ_{13/2}-30541.28$ (11/2)
3754.020	5	26630.54	$^6H^\circ_{5/2}-26630.56$ (5/2)
3748.122	150	26672.45	$^6H^\circ_{7/2}-27476.28$ (7/2)
3746.530	25	26683.78	$^6F^\circ_{7/2}-33246.65$ (9/2)
3744.846	35	26695.78	$^6H^\circ_{5/2}-26695.79$ (5/2)
3742.973	300R4	26709.14	$^6H^\circ_{7/2}-27512.95$ (5/2)
3741.629	150	26718.73	$^6H^\circ_{9/2}-28467.52$ (7/2)
3740.679	300	26725.51	$^6H^\circ_{5/2}-26725.52$ (3/2)
3738.433	200	26741.58	$^6H^\circ_{9/2}-28490.35$ (9/2)
3731.939	200	26788.10	$^6H^\circ_{11/2}-29585.21$ (11/2)
3727.938	300	26816.86	$^6H^\circ_{9/2}-28565.66$ (9/2)
3726.009	500	26830.74	$^6H^\circ_{5/2}-26830.74$ (3/2)
3724.534	100	26841.36	$^6H^\circ_{5/2}-26841.36$ (5/2)
3722.153	400	26858.53	$^6H^\circ_{9/2}-28607.33$ (9/2)
3715.219	200	26908.66	$^6H^\circ_{11/2}-29705.77$ (11/2)
3712.074	35	26931.46	$^6H^\circ_{9/2}-28680.26$ (7/2)
3708.064	75	26960.58	$^6H^\circ_{11/2}-29757.69$ (11/2)
3704.436	200	26986.99	$^6H^\circ_{11/2}-29784.08$ (9/2)
3699.079	75	27026.06	$^6H^\circ_{7/2}-27829.89$ (9/2)
3697.626	300R5	27036.68	$^6H^\circ_{5/2}-27036.66$ (5/2)
3687.381	200	27111.80	$^6H^\circ_{11/2}-29908.90$ (9/2)
3686.328	250	27119.54	$^6H^\circ_{7/2}-27923.37$ (5/2)
3684.088	25	27136.03	$^6H^\circ_{7/2}-27939.87$ (9/2)
3677.558	10	27184.21	$^6H^\circ_{13/2}-31103.24$ (11/2)
3674.848	200	27204.26	$^6H^\circ_{7/2}-28008.09$ (7/2)
3673.896	250	27211.31	$^6H^\circ_{11/2}-30008.40$ (11/2)
3669.218	300R5	27246.00	$^6H^\circ_{5/2}-27245.99$ (5/2)
3666.455	15	27266.54	$^6H^\circ_{11/2}-30063.62$ (9/2)
3665.702	20	27272.14	$^6H^\circ_{7/2}-28075.94$ (9/2)
3664.588	25	27280.43	$^6H^\circ_{7/2}-28084.28$ (5/2)
3658.578	75	27325.24	$^6H^\circ_{9/2}-29074.03$ (9/2)
3655.898	100	27345.27	$^6H^\circ_{15/2}-32435.06$ (13/2)
3655.678	50	27346.91	$^6H^\circ_{7/2}-28150.73$ (7/2)
3655.284	50	27349.86	$^6H^\circ_{7/2}-28153.69$ (5/2)
3655.077	20	27351.41	$^6H^\circ_{5/2}-27351.42$ (7/2)
3653.144	300	27365.89	$^6H^\circ_{7/2}-28169.71$ (7/2)
3646.844	300	27413.16	$^6H^\circ_{9/2}-29161.96$ (9/2)
3641.368	100	27454.39	$^6H^\circ_{11/2}-30251.50$ *
3639.503	300	27468.45	$^6H^\circ_{5/2}-27468.45$ (3/2)
3639.338	350	27469.70	$^6H^\circ_{7/2}-28273.52$ (7/2)
3639.249	150	27470.37	$^6H^\circ_{7/2}-28274.21$ (9/2)
3637.328	35	27484.88	$^6H^\circ_{11/2}-30281.98$ (13/2)
3636.136	20	27493.89	$^6H^\circ_{9/2}-29242.64$ (11/2)
3633.617	25	27512.95	$^6H^\circ_{5/2}-27512.95$ (5/2)
3632.512	3	27521.31	$^6H^\circ_{7/2}-28325.13$ (7/2)
3630.678	50	27535.21	$^6H^\circ_{7/2}-28338.98$ (5/2)*
3625.065	200	27577.85	$^6H^\circ_{11/2}-30374.95$ (11/2)
3619.304	5	27621.74	$^6H^\circ_{5/2}-27621.74$ (7/2)
3613.816	400R5	27663.69	$^6H^\circ_{7/2}-28467.52$ (7/2)
3610.835	75	27686.53	$^6H^\circ_{7/2}-28490.35$ (9/2)
3603.332	15	27744.18	$^6H^\circ_{11/2}-30541.28$ (11/2)
3601.038	100	27761.85	$^6H^\circ_{7/2}-28565.66$ (9/2)
3595.645	100	27803.49	$^6H^\circ_{7/2}-28607.33$ (9/2)
3591.392	75	27836.41	$^6H^\circ_{9/2}-29585.21$ (11/2)
3590.049	250	27846.82	$^6H^\circ_{9/2}-29595.58$ (9/2)
3586.236	50	27876.43	$^6H^\circ_{7/2}-28680.26$ (7/2)
3583.252	50	27899.64	$^6H^\circ_{9/2}-29648.42$ (9/2)*
3580.731	20	27919.29	$^6H^\circ_{5/2}-27919.29$ (3/2)
3580.209	100	27923.36	$^6H^\circ_{5/2}-27923.37$ (5/2)
3579.465	100	27929.16	$^6H^\circ_{11/2}-30726.26$ (9/2)
3577.348	25	27945.69	$^6H^\circ_{13/2}-31846.70$ (11/2)
3575.902	100	27956.99	$^6H^\circ_{9/2}-29705.77$ (11/2)
3571.949	100	27987.93	$^6H^\circ_{11/2}-30785.03$ (9/2)
3569.377	50	28008.10	$^6H^\circ_{5/2}-28008.09$ (7/2)
3569.271	100	28008.92	$^6H^\circ_{9/2}-29757.69$ (11/2)
3565.911	40	28035.32	$^6H^\circ_{9/2}-29784.08$ (9/2)
3559.695	500R5	28084.27	$^6H^\circ_{5/2}-28084.28$ (5/2)
3558.878	100	28090.72	$^6H^\circ_{15/2}-33180.50$ (15/2)
3553.264	300	28135.10	$^6H^\circ_{9/2}-29883.87$ (7/2)
3550.916	300	28153.70	$^6H^\circ_{5/2}-28153.69$ (5/2)
3550.109	35	28160.10	$^6H^\circ_{9/2}-29908.90$ (9/2)
3546.808	200	28186.31	$^6H^\circ_{5/2}-28186.31$ (7/2)
3543.627	50	28211.61	$^6H^\circ_{9/2}-29960.42$ (11/2)*
3536.282	50	28270.21	$^6H^\circ_{7/2}-29074.03$ (9/2)
3535.869	300	28273.51	$^6H^\circ_{5/2}-28273.52$ (7/2)
3531.795	75	28306.12	$^6H^\circ_{11/2}-31103.24$ (11/2)
3530.711	200	28314.82	$^6H^\circ_{9/2}-30063.62$ (9/2)
3529.426	2	28325.12	$^6H^\circ_{5/2}-28325.13$ (7/2)
3527.701	250	28338.97	$^6H^\circ_{5/2}-28338.98$ (5/2)*
3525.319	75	28358.12	$^6H^\circ_{7/2}-29161.96$ (9/2)
3511.772	20	28467.51	$^6H^\circ_{5/2}-28467.52$ (7/2)
3505.794	100	28516.05	$^6H^\circ_{13/2}-32435.06$ (13/2)
3494.457	5	28608.56	$^6H^\circ_{5/2}-28608.57$ (3/2)
3492.308	15	28626.16	$^6H^\circ_{9/2}-30374.95$ (11/2)
3485.722	50	28680.25	$^6H^\circ_{5/2}-28680.26$ (7/2)
3472.223	10	28791.75	$^6H^\circ_{7/2}-29595.58$ (9/2)
3472.132	25	28792.50	$^6H^\circ_{9/2}-30541.28$ (11/2)
3465.864	35	28844.58	$^6H^\circ_{7/2}-29648.42$ (9/2)*
3449.970	50	28977.46	$^6H^\circ_{9/2}-30726.26$ (9/2)
3449.639	25	28980.24	$^6H^\circ_{7/2}-29784.08$ (9/2)

TABLE 4. *Classified lines of* Pm I – Continued

λ (A)	I	σ (cm⁻¹)	Classification
3442.984	50	29036.25	$^6H^\circ_{9/2}$ – 30785.03 (9/2)
3437.803	15	29080.01	$^6H^\circ_{7/2}$ – 29883.87 (7/2)
3420.721	75	29225.22	$^6H^\circ_{11/2}$ – 32022.32 (9/2)
3416.680	40	29259.79	$^6H^\circ_{7/2}$ – 30063.62 (9/2)
3416.484	50	29261.47	$^6H^\circ_{13/2}$ – 33180.50 (15/2)
3405.661	3	29354.45	$^6H^\circ_{9/2}$ – 31103.24 (11/2)
3373.083	75	29637.95	$^6H^\circ_{11/2}$ – 32435.06 (13/2)
3345.327	20	29883.85	$^6H^\circ_{5/2}$ – 29883.87 (7/2)
3341.011	50	29922.46	$^6H^\circ_{7/2}$ – 30726.26 (9/2)
3334.464	75	29981.21	$^6H^\circ_{7/2}$ – 30785.03 (9/2)
3319.548	25	30115.92	$^6H^\circ_{9/2}$ – 31846.70 (11/2)
3302.264	25	30273.53	$^6H^\circ_{9/2}$ – 32022.32 (9/2)
3283.174	25	30449.56	$^6H^\circ_{11/2}$ – 33246.65 (9/2)
3202.305	25	31218.48	$^6H^\circ_{7/2}$ – 32022.32 (9/2)

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(Paper 71A6–475)