Interesting lines in the infrared solar spectrum.
II. Unblended lines between $\lambda 1.0$ and $\lambda 1.8$ μm[*]

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Abstract. — We list 603 spectral lines between 1.0 and 1.8 μm that are judged to be relatively unblended from a visual inspection of spectra of the quiet sun. Much of the atomic data of relevance to studies of solar and stellar magnetism, convection and atmospheric structure are also provided. Particular attention is paid to blending by telluric lines. We determine the level of blending both in the presence and the absence of telluric lines. We also describe how telluric blends may be removed from spectra with high spectral resolution.

Key words: lines: profiles — lines: identification — atomic data — Sun: infrared

1. Introduction

The present paper forms the second of a series that explores the infrared solar spectrum by identifying spectral lines of interest. The aim of this series is to produce a compilation of spectral lines which can be used to determine abundances and thermal properties of the atmosphere of the sun and of solar-type stars, or to investigate their magnetic and velocity fields. Such investigations profit greatly from the use of unblended lines and, as a consequence, numerous lists of unblended optical spectral lines exist (e.g. Holweger 1967; Stenflo & Lindegren 1977; Rutten & Van der Zalm 1984). The situation in the infrared is less satisfactory. In the present paper we list the unblended lines, as identified from a visual inspection of Fourier-transform-spectrometer (FTS) data, in the infrared J and H-bands, i.e. in the wavelength ranges $1.00 - 1.34$ μm and $1.49 - 1.80$ μm. The present paper may be considered to be an extension of the work by Solanki et al. (1990, henceforth called Paper I) in different respects. Firstly, it is an extension towards shorter wavelengths (we did not consider the J-band at all in Paper I). Secondly, we distinguish between telluric and solar blends. This is topical, since the work of Livingston & Wallace (1991), Wallace & Livingston (1991) and Wallace et al. (1993) has demonstrated the feasibility of removing telluric blends from infrared solar spectra observed from the ground. This extension has led to a doubling of the listed H-band lines.

There are a number of reasons for investigating the spectral range $1.00 - 1.34$ μm. The continuum opacity is similar to that in the visible (the J band lies between the opacity maximum near 0.8 μm and the opacity minimum at 1.6 μm), but the temperature sensitivity of the Planck function is lower, while the Zeeman sensitivity of the spectral lines is larger (a 1.2 μm line is roughly twice as Zeeman sensitive as a line of equal strength and Landé factor at 0.6 μm). Although the Zeeman sensitivity of lines in the H-band ($1.5 - 1.8$ μm) is even larger, the spectral region $1.00 - 1.34$ μm is spectrally richer in the sense that the spectral lines in the J-band cover a much wider range of properties than lines in the H-band. For example, compare the excitation potentials of the lines listed in Table 1 with those listed in Table 3. Obviously, the lines in the J-band span a much broader interval of temperature sensitivities. They are also formed over a larger range of heights. Finally, the J-band is not so dominated by Fe I lines as the H-band.

Unfortunately, the J-band is less clean, as far as telluric absorption is concerned, than the optical or even the H-band. Since this is one of the major disadvantages of the investigated wavelength range, we discuss the implications of telluric blends and simple ways of compensating for them in Sect. 3.

2. Unblended lines

Table 1 lists the 308 lines between 1.00 and 1.34 μm that appear to be unblended upon visual inspection of three

spectra of the quiet sun. One of the spectral atlases we use was compiled by Delbouille et al. (1981) based on observations obtained at an heliocentric angle of almost zero with the McMath telescope on Kitt Peak and the Fourier transform spectrometer (FTS) on 5 May 1979 and on 26 Oct. 1979. The water vapour column was $5.7 - 7.7$ mm for the employed spectra, which is not untypical for Kitt Peak. Observations made at drier sites (e.g. Jungfraujoch, space, or even Kitt Peak at a drier period) may well reveal additional unblended lines. The other spectral atlases we consider are those of Livingston & Wallace (1991), covering roughly $1.1 - 5.4$ μm and of Wallace et al. (1993), covering roughly $0.7 - 1.1$ μm. By comparing 2 spectra obtained at different atmospheric column masses, these authors were able to extrapolate to the solar spectrum at zero atmospheric column mass. These spectra, therefore, provide us with a source for determining unblended lines without any telluric contamination (except for the wavelengths at which the telluric absorption is complete and no information on the solar spectrum reaches the earth).

In spite of the problems posed by telluric absorption, the Delbouille et al. (1981) atlas is well suited for the work in hand. The wavelengths have been carefully calibrated, the spectral resolution is very high ($\lambda/\Delta\lambda = 1.9 - 2.5 \ 10^6$ for the J-band) and the signal-to-noise ratio is excellent. This last point is particularly remarkable, since the spectral region around 1.1 μm lies in an instrumental no-man's-land: both CCDs, whose peak sensitivity lies at shorter wavelengths, and InSb detectors, whose sensitivity peaks at longer wavelengths, are relatively insensitive around 1.1 μm.

The considerable advantage of the quiet sun spectra published by Livingston & Wallace (1991) and Wallace et al. (1993) is that they are unaffected by telluric blends. This advantage is somewhat offset by the lower S/N ratio and minor distortions to the line profiles caused by wavelength shifts between the two spectra used to remove the telluric contamination. The spectral resolving power of these spectra, which were obtained with the FTS at the McMath telescope on 18 Dec. 1990 and on 26 and 27 June 1983, respectively, is 600 000 for $\lambda \geq 1.22$ μm, 150 000 for $1.22 > \lambda > 1.1$ μm (Livingston & Wallace 1991) and 660 000 for shorter wavelengths (Wallace et al. 1993)[1]. Since a given spectral line may be sufficiently pure (i.e. unblended) for a certain type of analysis, but not for a more sensitive one, we have also listed lines that are not totally free of blends. Thus, Table 1 should contain almost all lines which are relatively unblended in the J-band under normal atmospheric conditions, as well as the relatively unblended lines in the absence of terrestrial absorption. For some analyses a more rigorous selection will have to be made from among these lines. Therefore, following Pa-

per I, we have added a "blending index" to Table 1. This index mirrors our subjective impression of the amount of blending (see below). The structure of Table 1 is identical to that of Table 1 of Paper I, except that we now list two blending indices, one derived from the Delbouille et al. (1981) atlas and one from the atlases of Livingston & Wallace (1991) and Wallace et al. (1993). The latter is an estimate of the blending in the absence of telluric lines. We have also included lines into Table 1 that are reasonably unblended only in the Livingston & Wallace and the Wallace et al. atlases.

Column 1 gives the solar wavelength (Å, in air), $\lambda_\odot$, of the lines. Whenever possible $\lambda_\odot$ has been determined from the Delbouille et al. (1981) atlas. If the line is too strongly blended in their spectra, then we have obtained the wavelength from the Livingston & Wallace or Wallace et al. spectra[2]. Column 2 lists the corresponding vacuum wavenumbers, $\sigma_\odot$ (in cm^{-1}). The conversion from wavenumber to wavelength is made using Edlén's (1953) formula. The blending index is tabulated in Col. 3. It is calibrated by comparing with the lines listed in Paper I and those listed by Solanki et al. (1986): 0 = no detectable blend, 1 = minor blending, 2 = significant blending, 3 = complete blending. Subcolumn I contains the blending index derived from the Delbouille et al. (1981) spectral atlas and subcolumn II the blending index determined from the Livingston & Wallace (1991) and Wallace et al. (1993) atlases.

Columns 4 and 5 show the relevant ions and diatomic molecules that we identify as the sources of the solar spectral lines, together with their laboratory wavelengths, λ_{lab} (taken from e.g. Biémont et al. 1985a, b, 1986; Kurucz 1991c). The identification rests to a large extent on the intensities and on the correspondence between $\lambda_\odot$ and λ_{lab}, which is often (but not always) better than 0.03 Å. A sizeable fraction of this difference is probably of solar origin (cf. Nadeau 1988). In some cases no direct laboratory measurement of the wavelength is available and wavelength values calculated from the difference between measured or calculated energy levels have been listed under λ_{lab}. All lines found in the literature with λ_{lab} sufficiently close to $\lambda_\odot$ are listed, except those fulfilling one of the following conditions. Lines found to be too weak when calculated using gf values from Kurucz & Peytremann (1975) or Kurucz (1991c) are listed separately in Table 2, while unlikely candidates for which not much more than their laboratory wavelength is known (e.g. As I λ 10575.02 Å), are removed completely from the lists. Whenever multiple identifications of a given solar line are possible we have listed them in what we think is the order of decreasing probability, based on their calculated equivalent widths (wherever possible) and proximity of wavelengths. In a few cases an unlikely identification, if it is the only one

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[1] The resolving power at the shorter wavelengths of the Livingston & Wallace atlas was reduced by Doppler filtering in order to ensure a high S/N value.

[2] All $\lambda_\odot$ values were only corrected for Doppler shifts. As in Paper I, the gravitational redshift was not removed.

known, has been retained in Table 1. Such identifications are marked by an $^\alpha$ just following the ion and must be considered with caution.

Column 6 lists the atomic and molecular transitions, whenever known, and Col. 7 indicates their sources. The notation of the terms in the identified transitions follows the National Bureau of Standards (NBS) compilations of atomic energy levels, Kurucz (1991c) and Nave et al. (1994). The final digits of the wavelengths corresponding to the listed transitions (calculated on the basis of available energy levels) are presented in Col. 14 of Table 1, marked $\lambda_{\rm calc}$. A small $|\lambda_{\rm calc} - \lambda_{\rm lab}|$ is a necessary (but not sufficient) condition for the identification of a particular transition with an observed spectral line. Only transitions with $|\lambda_{\rm calc} - \lambda_{\rm lab}| \leq 0.5$ Å have been retained. The much lower precision with which the energy of some atomic levels, especially of highly excited ones is known explains the often larger discrepancy between $\lambda_{\rm calc}$ and $\lambda_\odot$ than between $\lambda_{\rm lab}$ and $\lambda_\odot$. All the transitions due to iron group elements have been checked with the newest atomic energy levels available. This has led to the rejection of some previous identifications, either due to the fact that one of the levels is no longer present in the NBS tables, or that $|\lambda_{\rm lab} - \lambda_{\rm calc}| > 0.5$ Å. Column 8 contains the excitation potential of the lower level of the transition, $\chi_{\rm e}$, in eV. Most of the tabulated values are from Kurucz (1991c). The effective Landé factor calculated from the listed transitions, $g_{\rm eff}^{\rm calc}$, is presented in Col. 9, while the effective Landé factor derived empirically from laboratory measurements, $g_{\rm eff}^{\rm emp}$, is listed in Col. 10 for those lines for which such data are available. The importance of empirical Landé factors has been pointed out by, e.g., Landi Degl'Innocenti (1982), Solanki & Stenflo (1985), Solanki (1987) and Mathys (1989). The $g_{\rm eff}$ values have been calculated using the equation

$$g_{\rm eff} = \frac{1}{2}(g_l + g_u) + \frac{1}{4}(g_l - g_u)(J_l(J_l+1) - J_u(J_u+1)) \quad (1)$$

(Shenstone & Blair 1929), which is independent of the coupling scheme. Here J_u and J_l are the total angular momentum quantum numbers of the upper and lower levels involved in the transition, respectively, while g_u and g_l are the corresponding Landé factors. The g_u and g_l resulting from the standard LS-coupling formula are used for calculating $g_{\rm eff}^{\rm calc}$, except those taken from Johansson & Learner (1990). For $g_{\rm eff}^{\rm emp}$, g_u and g_l are mostly taken from the measured values listed by Sugar & Corliss (1985). If only either g_l or g_u is available from laboratory measurements, the missing atomic level Landé factor is assumed to be represented by its calculated value. A question mark has been placed behind such $g_{\rm eff}^{\rm emp}$ values. We expect that even in such situations $g_{\rm eff}^{\rm emp}$ is to be preferred to the $g_{\rm eff}^{\rm calc}$ values.

Columns 11-13 of Table 1 contain X_π, X_σ and Y_σ, the second and third order coefficients of the expansion of a spectral line according to its Zeeman moments (cf. Mathys & Stenflo 1987). They are defined as follows:

$$
\begin{aligned}
X_\pi &= (g_l - g_u)^2(3s - d^2 - 2)/10, \\
X_\sigma &= (g_l - g_u)^2(8s - d^2 - 12)/80, \\
Y_\sigma &= (g_l - g_u)^3 d(4 - d^2)/160, \quad (2)
\end{aligned}
$$

where

$$
\begin{aligned}
s &= J_l(J_l + 1) + J_u(J_u + 1), \\
d &= J_l(J_l + 1) - J_u(J_u + 1). \quad (3)
\end{aligned}
$$

The third order moment of the π-component is identically zero. The Y_σ value refers to the red σ-component. The corresponding value for the blue σ-component is $-Y_\sigma$. The X_π and X_σ coefficients represent, respectively, the scatter of the π- and σ-components about their centres of gravity (Landi Degl'Innocenti 1982, 1985). Still higher order moments may be obtained from the tables published by Mathys & Stenflo (1987). We have used the $g_{\rm eff}^{\rm calc}$ values to calculate X_π, X_σ and Y_σ.

Finally, Col. 15 lists the logarithm of the statistically weighted oscillator strengths $\log(gf)$ of the corresponding atomic lines. Most of them are taken from Kurucz (1991c). Values obtained from other sources are marked.

Some of the identifications made in Table 1 may be due to the chance coincidence of $\lambda_{\rm calc}$ and $\lambda_{\rm lab}$. For most of the identifications it was possible to calculate the equivalent width of the lines by means of a solar atmospheric model (Holweger & Müller 1974) and compare the results with the observed equivalent widths (cf. Biémont 1976). This procedure has allowed us to rule out some transitions giving a negligible contribution to the observed line, i.e. transitions whose equivalent width is smaller than 1 mÅ. These rejected identifications are listed in Table 2. It should be noted that for other temperatures and chemical abundance ratios (on other stars) it cannot be ruled out that the rejected transitions give a more significant contribution to the spectra.

Table 3 has exactly the same structure as Table 1. It lists the 295 unblended lines in the H-band between 1.49 μm and 1.80 μm. It differs from Table 1 of Paper I mainly in that it distinguishes between telluric and solar blends, also lists lines that are relatively clean only after the removal of the telluric contamination and provides $\log(gf)$ values whenever available. The importance of telluric blending even in the relatively clean H-band is indicated by the fact that this table contains more than twice as many lines as Table 1 of Paper I. Practically all of the new entries are lines that are unblended only after removal of the telluric spectrum.

Finally, Table 4 is the H-band counterpart of Table 2.

3. Discussion

In the present paper we have compiled, identified and provided atomic data for the unblended lines between 1.00 and 1.80 μm, thus extending the spectral region investigated in Paper I to shorter wavelengths. Although our current knowledge of the atomic structure relevant for line identifications is still incomplete, recent investigations (e.g. Litzén & Vergés 1976; Litzén 1976; Biémont 1976; Biémont et al. 1985a, b 1986; Biémont & Brault 1987a, b; Johansson & Learner 1990; Kurucz 1991a-c; Nave et al. 1994) have substantially improved the picture. In particular, the extensive compilation by Kurucz (1991a-c) of relevant atomic data of more then 400 000 individual atomic lines from the extreme UV to the far IR have led to a considerable improvement. Thus almost all the lines in Table 1 could be, at least tentatively, identified with particular atomic or molecular transitions. Nevertheless, improvements in term structure of the high-lying states of Fe I and other iron group elements should be continued. It is likely that, given further atomic data, a number of the identifications will have to be revised.

Since blending by telluric lines is relatively important in the J and K-bands, we now discuss it in greater detail. In addition to the deep and broad absorption separating the analyzed wavelength ranges there are also numerous atmospheric absorption features inside each spectral region (e.g., near 1.12 and 1.32 μm). Consider first the effect of telluric line blending on the polarized Stokes parameters. As already pointed out in Paper I, Stokes Q, U and V are affected by telluric blends: In the extreme case when all the light at a particular wavelength is absorbed in the earth's atmosphere no Stokes Q, U or V signal is left. Nevertheless Stokes Q, U and V are affected quite differently from Stokes I. Whereas the I profile of a solar spectral line is seemingly strengthened by a telluric blend (i.e. the total absorption is increased), the Q, U and V profiles can only be weakened by it, or, for that matter, by any unpolarized blend: an unpolarized blend can only destroy polarization, it cannot create any.

In addition, the quantitative influence of a telluric blend is often much larger on the Stokes I profile than on Q, U or V, particularly if both lines are not very deep. The relative reduction in Stokes Q, U or V at a given wavelength equals the fraction of the solar intensity (at that wavelength) which is absorbed in the earth's atmosphere. Consider, e.g., a visible or near infrared solar line with a central depth corresponding to 10% of the continuum value, which is blended with a telluric line whose depth is also approximately 10% of the continuum intensity. Now, although the I profile shape is completely distorted (its depth may change by a factor of up to 2) the Q, U, V signals are reduced by a relative amount of the order of 10%. Thus, in this example, there is an order of magnitude difference in the effects on the I profile, on the one hand, and the Q, U, V profiles on the other. Consequently, for many

purposes the Q, U, V profiles of numerous spectral lines which are considerably blended by telluric lines can still be used with sufficient accuracy (cf. Rüedi et al. 1995, Paper III of the present series). Recall that this is only true as long as the telluric absorption is not too strong.

The second point we wish to stress is that it is possible to remove the influence of telluric blends, as long as these are not too strong, by combining two spectra which differ exclusively in the amount of telluric absorption. This technique has been used to produce clean spectral atlases of the quiet sun (Livingston & Wallace 1991; Wallace et al. 1993) and of a umbra (Wallace & Livingston 1991). See Hall (1974), Saar & Linsky (1985) and Paper III for other techniques to tackle this problem. Unfortunately, these techniques work perfectly only for solar features that do not, at the spatial resolution of the observations, change over a period of a few hours. Some very special spectral lines, such as the Ti I multiplet at 2.2 μm, constitute exceptions since they disappear outside sunspots, so that nearly simultaneous observations of the quiet sun provide clean templates of the telluric absorptions to be removed. Thus we are left with the problem of removing telluric blends when observing, e.g., with high spatial resolution (since small-scale features tend to evolve relatively rapidly).

We propose the following solution, which works if the spectral resolution is sufficiently large. In order to remove a telluric blend care must be taken to observe an unblended telluric line of the same molecular species as the blend as nearly contemporaneously as possible. Let the observed spectrum be $I_\lambda^{\mathrm{obs}}(x)$, the purely solar spectrum $I_\lambda^{\odot}$, the blending telluric line profile $I_\lambda^{\mathrm{tb}}(x)$ and the profile of the unblended telluric line $I_\lambda^{\mathrm{tu}}(x)$. The strength of the telluric absorption is parameterized by x and is related to the zenith distance angle z by $x \sim \sec z$. Then we can determine $I_\lambda^{\odot}$ from $I_\lambda^{\mathrm{obs}}(x)$ if $I_\lambda^{\mathrm{tb}}(x)$ is known for the x at the time of the observations:

$$I_\lambda^{\odot} = \frac{I_\lambda^{\mathrm{obs}}(x)}{I_\lambda^{\mathrm{tb}}(x)}. \tag{4}$$

In order to determine $I_\lambda^{\mathrm{tb}}(x)$, first $I_\lambda^{\mathrm{tb}}(x_0)$ and $I_\lambda^{\mathrm{tu}}(x_0)$ must be formed, with x_0 being some reference value of x (e.g. $x_0 = 1$). This can be done by applying standard procedures (e.g. Böhm -Vitense 1989) to 2 or more spectra of the quiet sun observed at different x values. For λ between 0.7 and 5.4 μm Livingston & Wallace (1991) and Wallace et al. (1993) have produced such a purely telluric spectrum. Now, we can determine x of the observed spectrum by comparing $I_\lambda^{\mathrm{tu}}(x)$ with $I_\lambda^{\mathrm{tu}}(x_0)$:

$$\frac{x}{x_0} = \frac{\ln(I_\lambda^{\mathrm{tu}}(x))}{\ln(I_\lambda^{\mathrm{tu}}(x_0))}. \tag{5}$$

Using the obtained x/x_0 ratio $I_\lambda^{\mathrm{tb}}(x)$ may then be

determined:

$$I_\lambda^{\text{tb}}(x) = \left(I_\lambda^{\text{tb}}(x_0)\right)^{x/x_0}. \tag{6}$$

Inserting this into Eq. (4) then gives the tellurically un-blended profile of the observed solar feature. This technique requires that the blending telluric line lies at the same wavelength in both spectra. This can be achieved by calibrating the wavelength scale of the reference telluric spectrum such that the unblended telluric line has the same wavelength in both spectra. The reliability of the proposed technique is expected to improve if more than one unblended telluric line $I_\lambda^{\text{tu}}(x)$ is measured, and possibly if reference spectra at different x_0 are used. Ideally, the reference spectra should be obtained with the same instrument as the solar spectrum of interest, so that they have the same spectral resolution and spectral stray light. It is also possible to use reference spectra having higher spectral resolution by degrading them first using the appropriate instrumental profile.

If Stokes Q, U, V are measured, then it is best to carry out the correction directly on the originally measured $I \pm Q$, $I \pm U$, $I \pm V$ profiles and to form Q, U, V only from the corrected spectra (see Paper III for a successful application to I and V). The above procedure can, of course, also be applied to the removal of telluric blends from stellar spectra, although most of these will not have the necessary spectral resolution to resolve the often very narrow telluric features.

Another relatively general but complex way of removing telluric blends has been described by Lallement et al. (1993).

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*NSRDS-NBS: National Standard Reference Data Series - National Bureau of Standards

Table 1. Lines judged to be relatively unblended from a visual examination (J band)

1 $\lambda_\odot$ (Å)	2 $\sigma_\odot$ (cm⁻¹)	3 Blend‡ I)	II)	4 Ion	5 λ_{lab} (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 g_{eff}^{calc}	10 g_{eff}^{emp}	11 X_π	12 X_σ	13 Y_σ	14 λ_{calc} (Å)	15 $\log(gf)$
10003.093	9994.168	1	1	Ti I	10003.099	$a\,^3D_2 - x\,^3D_2^o$	[1,10]	2.16	1.167	1.17	0.000	0.000	0.000	.099	−1.14
10009.158	9988.112	1–2	1–2	CN	10009.15 †	2,1 P_1 48	[9]	0.80						.15	
10011.736	9985.540	2–3	1	Ti I	10011.824	$a\,^3D_1 - x\,^3D_1^o$	[1,10]	2.15	0.500	0.50?	0.000	0.000	0.000	.825	−1.26
10017.417	9979.877	2	1	CN	10017.44 †	2,1 Q_1 56	[9]	0.99						.44	
10019.795	9977.509	1–2	1–2	Fe I	10019.792	$w\,^5D_2^o - f\,^5G_3$	[1,10,17] ⋆	5.48	0.333	0.751	0.544	0.408	0.238	.793	−1.60
10022.276	9975.039	2–3 ∘	1	Fe I	10022.287	$w\,^5D_0^o - g\,^5F_1$	[9,10,17]	5.51	0.750	0.658?	2.250	0.563	0.000	.289	−2.67
10032.859	9964.517	1	1	Fe I	10032.858	$w\,^5D_1^o - f\,^5G_2$	[1,10,17] ⋆	5.51	−0.250	−0.158?	0.817	0.613	0.476	.859	−1.79
10034.498	9962.889	1–2	1–2	Ti I	10034.480	$b\,^3F_4 - z\,^3G_5^o$	[1,10]	1.46	1.100	1.11	0.012	0.009	0.001	.480	−2.00
10035.743	9961.653	1–2	1–2	CN	10035.74 †	1,0 Q_1 68	[9]	1.08						.74	
10036.650	9960.753	1	0–1	Sr II	10036.66	$4d\,^2D_{3/2} - 5p\,^2P_{3/2}^o$	[9,11,15]	3.04	1.067			0.583	0.171	0.000	.65	−1.31 b
10057.197	9940.403	1–2	1–2	CN	10057.19 †	1,0 P_1 61	[9]	0.88						.19	
10057.651	9939.955	1	1	Fe I	10057.643	$x\,^5F_4^o - f\,^5D_3$	[1,10,17] ♮	5.03	1.125	0.898	0.068	0.051	0.010	.641	−1.21
				Ti I	10057.69	$a\,^3D_3 - x\,^3D_3^o$	[7,9,10]	2.17	1.333	1.35	0.000	0.000	0.000	.765	−0.90
10061.246	9936.403	1	1	Ni I	10061.276	$y\,^3G_4^o - g\,^3F_3$	[1,10]	5.49	1.000	1.455	0.003	0.002	0.000	.276	−0.61
10065.053	9932.645	0	0	Fe I	10065.045	$y\,^3D_1^o - e\,^3F_2$	[9,10,17]	4.84	0.750	0.687	0.017	0.012	−0.001	.046	−2.10
10068.365	9929.377	1	1	Si I	10068.37	$4p\,^3P_2 - 4d\,^3D_3^o$	[9]	6.10	1.167			0.044	0.033	0.006	.33	
10070.521	9927.251	1–2	1–2	Fe I	10070.519	$w\,^5D_0^o - g\,^5F_1$	[9,10,17]	5.51	0.000		0.000	0.000	0.000	.521	−1.80
10071.818	9925.973	0–1	0–1	Fe I	10071.88		[9]								
10080.359	9917.563	0	0	Fe I	10080.437	$x\,^5F_1^o - f\,^7D_1$	[9,10]	5.10	1.500	1.497?	9.000	2.250	0.000	.437	−2.96
10081.394	9916.545	1–2	0–1	Fe I	10081.394	$a\,^3P_1 - z\,^5P_2^o$	[1,10,17]	2.42	2.000	2.003	0.067	0.050	−0.011	.394	−4.35
10089.769	9908.313	2	1	Fe I	10089.775	$w\,^5D_3^o - g\,^5F_3$	[1,10,17]	5.45	1.375	1.366?	0.438	0.141	0.000	.776	−1.60
10103.423	9894.923	1–2	1–2	CN	10103.44 †	2,1 Q_2 60	[9]	1.09						.44	
10120.447	9878.279	1–2	1–2	CN	10120.46 †	1,0 Q_1 71	[9]	1.18						.46	
10123.874	9874.935	0–1	0–1	C I	10123.87	$3p\,^1P_1 - 3d\,^1P_1^o$	[7,9,11]	8.54	1.000		0.000	0.000	0.000	.87	−0.33 b
10136.580	9862.557	1–2	1–2	CN	10136.60 †	2,1 Q_1 61	[9]	1.12						.60	
10137.098	9862.053	1	1	Fe I	10137.102	$z\,^5F_2^o - f\,^5D_1$	[1,10,17]	5.09	0.750	0.666	0.150	0.112	0.038	.101	−1.70
10149.075	9850.415	1	1	Fe I	10149.078	$x\,^5F_1^o - f\,^5D_0$	[1,10,17]	5.10	0.000	−0.006?	0.000	0.000	0.000	.076	−2.09
10149.812	9849.699	1	1	CN	10149.81 †	1,0 Q_1 72	[9]	1.21						.81	
				Mn I	10149.883	$z\,^4I_{13/2}^o - f\,^4G_{11/2}$	[10]	7.30	0.654	0.59?	0.225	0.169	0.060	.884	−2.97
10155.163	9844.509	0–1	0–1	Fe I	10155.165	$a\,^5P_3 - z\,^5F_3^o$	[1,10,17] ⋆	2.18	1.458	1.458	1.215	0.391	0.000	.163	−4.23
10167.470	9832.593	0–1	0	Fe I	10167.469	$a\,^5P_2 - z\,^5F_2^o$	[1,10,17] ⋆	2.20	1.417	1.412	2.361	0.729	0.000	.469	−4.06
				Co I	10167.525	$y\,^2D_{5/2}^o - e\,^2F_{7/2}$	[1,10]	4.47	1.071	1.082	0.007	0.006	0.000	.525	−0.59
10193.230	9807.745	0–1	0–1	Ni I	10193.228	$z\,^1P_1^o - e\,^3D_2$	[1,10]	4.09	1.250	1.125	0.017	0.012	−0.001	.228	−0.79
10195.109	9805.937	1	1	Fe I	10195.108	$a\,^3G_4 - z\,^3F_3^o$	[1,10,17]	2.73	1.000	0.999	0.003	0.002	0.000	.106	−3.70

1 $\lambda_\odot$ (Å)	2 $\sigma_\odot$ (cm⁻¹)	3 Blend‡ I)	II)	4 Ion	5 λ_{lab} (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 g_{eff}^{calc}	10 g_{eff}^{emp}	11 X_π	12 X_σ	13 Y_σ	14 λ_{calc} (Å)	15 $\log(gf)$
10216.321	9785.577	0	0	Fe I	10216.314	$y\,^3D_3^o - e\,^3F_4$	[1,10,17]	4.73	1.125	1.234	0.021	0.016	0.002	.313	−0.22
10218.410	9783.577	1	1	Fe I	10218.410	$c\,^3P_1 - z\,^3P_0^o$	[1,10,17]	3.07	1.500	1.466?	0.000	0.000	0.000	.408	−2.76 ♪
10230.778	9771.749	1	1	Fe I	10230.787	$e\,^5F_4 - 4f\,(7/2)[7/2]_3^o$	[17]	5.87	1.230	1.183?	0.019	0.014	0.002	.781	
				V I	10230.840	$e\,^4D_{7/2} - q\,^4G_{9/2}^o$	[10]	4.74	0.722			0.254	0.191	0.073	.840	−1.75
10252.553	9750.996	1	1	Fe I	10252.554	$e\,^5F_5 - 4f\,(9/2)[13/2]_6^o$	[17]	5.83	1.068	1.015?	0.063	0.047	0.009	.553	
10265.219	9738.964	0–1	0–1	Fe I	10265.220	$a\,^5P_1 - z\,^5F_1^o$	[1,10,17]	2.22	1.250	1.244	6.250	1.563	0.000	.219	−4.47
10283.770	9721.396	1–2	1	Fe I	10283.778	$w\,^5D_1^o - h\,^5D_1$	[9,10,17]	5.51	1.500	1.408?	0.000	0.000	0.000	.777	−1.84
				Cr I	10283.766	$w\,^5F_4^o - e\,^5G_3$	[10]	5.91	2.000	1.98?	0.563	0.423	−0.244	.766	−3.38
10288.943	9716.508	1–2	1–2	Si I	10288.94	$4s\,^3P_0^o - 4p\,^3S_1$	[7,9,11]	4.92	2.000		0.000	0.000	0.000	.920	−1.36 b
10301.409	9704.750	0–1	0–1	Si I	10301.38 †	$4p\,^3P_2 - 4d\,^1F_3^o$	[9,11]	6.10	0.667		0.278	0.208	0.087	.38	−1.66 b
10302.617	9703.612	0–1	0–1	Ni I	10302.611	$y\,^3D_1^o - e\,^3D_1$	[1,10]	4.27	0.500	0.506?	0.000	0.000	0.000	.611	−1.07
10307.452	9699.060	1–2	1–2	Fe I	10307.454	$d\,^3F_4 - u\,^5D_3^o$	[17]	4.59	0.875	1.030?	0.188	0.141	0.047	.455	−2.11
10327.343	9680.380	0	0	Fe I	10327.313	$e\,^5D_4 - 5p\,^3G_3^o$	[17]	5.54	2.625	2.630?	1.688	1.266	−1.266	.324	
				Sr II	10327.37	$4d\,^2D_{5/2} - 5p\,^2P_{3/2}^o$	[9,11]	1.84	1.100		0.019	0.014	0.002	.31	−0.35 b
10330.241	9677.664	0–1	0–1	Ni I	10330.246	$y\,^3F_3^o - e\,^3D_2$	[1,10]	4.11	1.000	1.301	0.011	0.008	0.001	.247	−1.23
10332.329	9675.708	1–2	1–2	Fe I	10332.329	$b\,^3D_1 - y\,^3D_1^o$	[1,10,17]	3.64	0.500	0.497?	0.000	0.000	0.000	.329	−2.94
10340.888	9667.700	0	0	Fe I	10340.886	$a\,^5P_2 - z\,^5F_3^o$	[1,10,17] ⋆	2.20	0.667	0.680	0.544	0.408	0.238	.885	−3.49
10343.832	9664.948	0	0	Ca I	10343.820	$4p\,^1P_1^o - 5s\,^1S_0$	[9,10]	2.93	1.000		0.000	0.000	0.000	.820	−0.41
10347.965	9661.088	0–1	0–1	Fe I	10347.966	$w\,^5D_2^o - f\,^5P_3$	[1,10,17]	5.39	1.250	1.230?	0.083	0.063	0.014	.967	−0.80
10353.808	9655.636	0–1	0–1	Fe I	10353.807	$w\,^5D_4^o - h\,^5D_4$	[9,10,17]	5.39	1.500	1.464	0.000	0.000	0.000	.806	−1.09
				Fe I	10353.839	$w\,^5D_1^o - f\,^3D_2$	[10]	5.51	1.000	1.093?	0.067	0.050	0.011	.839	−2.31
10362.703	9647.348	1	1	Fe I	10362.704	$w\,^5D_2^o - g\,^5F_3$	[9,10,17]	5.48	1.000	0.967?	0.100	0.075	0.019	.706	−2.47
10364.061	9646.084	0–1	0–1	Fe I	10364.062	$w\,^5D_3^o - f\,^5P_2$	[1,10,17]	5.45	1.167	1.129?	0.178	0.133	0.044	.063	−1.21
10371.273	9639.376	1	1	Si I	10371.269	$4s\,^3P_1^o - 4p\,^3S_1$	[9,11,15]	6.12	1.750		0.250	0.063	0.000	.27	−0.64 b
10378.616	9632.556	1–2	1–2	Ni I	10378.623	$y\,^3F_4^o - e\,^3D_3$	[1,10]	4.09	1.125	1.045	0.021	0.016	0.002	.623	−0.97
10388.741	9623.168	1	1	Fe I	10388.744	$w\,^5D_3^o - h\,^5D_3$	[1,10,17]	5.45	1.500	1.491?	0.000	0.000	0.000	.745	−1.30
10395.802	9616.632	0–1	0–1	Fe I	10395.797	$a\,^5P_3 - z\,^5F_4^o$	[1,10,17] ⋆	2.18	0.875	0.889	0.301	0.226	0.095	.796	−3.33
10396.814	9615.696	1	1	Ti I	10396.85	$a\,^5F_5 - z\,^5G_6^o$	[7,9,10]	0.85	1.167	1.13	0.031	0.023	0.003	.760	−1.54
10423.033	9591.508	0	0	Fe I	10423.030	$a\,^3G_5 - z\,^3F_4^o$	[1,10,17]	2.69	1.195	1.091	0.000	0.000	0.000	.028	−3.78
10423.746	9590.852	0	0	Fe I	10423.745	$c\,^3P_1 - z\,^3P_1^o$	[1,10,17]	3.07	1.500	1.481	0.000	0.000	0.000	.742	−2.92
10427.292	9587.590	0–1	0–1	?											
10455.456	9561.764	0–1	0–1	S I	10455.47	$4s\,^3S_1^o - 4p\,^3P_2$	[8,9,11]	6.86	1.250		0.150	0.112	0.038	.45	0.28 b
				Fe I	10455.478	$w\,^5D_4^o - g\,^5F_5$	[1,10]	5.39	1.200	1.216?	0.048	0.036	0.006	.478	−1.14
10456.764	9560.568	0–1	0–1	S I	10456.79	$4s\,^3S_1^o - 4p\,^3P_0$	[8,9,11]	6.86	2.000		0.000	0.000	0.000	.76	−0.42 b

Table 1. continued

1 $\lambda_\odot$ (Å)	2 $\sigma_\odot$ (cm⁻¹)	3 Blend‡ I)	II)	4 Ion	5 λ_{lab} (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 $g_{\text{eff}}^{\text{calc}}$	10 $g_{\text{eff}}^{\text{emp}}$	11 X_π	12 X_σ	13 Y_σ	14 λ_{calc} (Å)	15 $\log(gf)$
10459.420	9558.140	0-1	0-1	S I	10459.46	$4s\ ^3S^o_1 - 4p\ ^3P_1$	[8,9,11]	6.86	1.750		0.250	0.063	0.000	.41	0.06 b
10469.664	9548.788	1	1	Fe I	10469.654	$z\ ^3D^o_3 - d^8\ ^3P_2$	[10,17]	3.88	1.167	1.142?	0.044	0.033	0.006	.653	−1.23
10486.252	9533.683	0	0	Cr I	10486.212	$b\ ^5D_4 - z\ ^5D^o_4$	[9,10]	3.01	1.500	1.505	0.000	0.000	0.000	.212	−0.97
10496.126	9524.715	0-1	0-1	Ti I	10496.084	$a\ ^5F_4 - z\ ^5G^o_5$	[9,10]	0.84	1.100	1.05	0.033	0.025	0.003	.084	−1.65
10511.583	9510.709	0-1	0-1	P I	10511.584	$4s\ ^4P_{1/2} - 4p\ ^4D^o_{3/2}$	[5,9]	6.94	0.833		0.538	0.403	0.296	.57	−0.10 ι
10529.523	9494.505	1-2	1-2	P I	10529.522	$4s\ ^4P_{3/2} - 4p\ ^4D^o_{5/2}$	[5,9,11]	6.95	1.100		0.138	0.103	0.031	.47	0.27 ι
10530.523	9493.603	0-1	0-1	Ni I	10530.531	$y\ ^3F^o_3 - e\ ^3D_3$	[1,10]	4.11	1.208	1.267	0.438	0.141	0.000	.531	−1.19
10532.240	9492.055	0	0	Fe I	10532.236	$z\ ^3D^o_2 - d^8\ ^3P_1$	[9,10,17]	3.93	1.000	1.002?	0.067	0.050	0.011	.235	−1.53
10555.651	9471.003	1	1	Fe I	10555.651	$w\ ^5D^o_3 - g\ ^5F_4$	[1,10,17]	5.45	1.125	1.154?	0.068	0.051	0.010	.650	−1.69
10577.143	9451.759	0	0	Fe I	10577.141	$b\ ^3H_4 - z\ ^3G^o_3$	[1,10,17]	3.30	0.875	0.805	0.007	0.006	0.000	.140	−3.27
10581.572	9447.803	1-2	1-2	P I	10581.569	$4s\ ^4P_{5/2} - 4p\ ^4D^o_{7/2}$	[5,9]	6.99	1.214		0.066	0.050	0.010	.53	0.49 ι
10582.166	9447.273	1	1	Si I	10582.15	$4p\ ^1D_2 - 6s\ (3/2,1/2)^o_?$	[9,11]	6.22						.17	−1.01 b
10596.891	9434.145	1	1	P I	10596.900	$4s\ ^4P_{1/2} - 4p\ ^4D^o_{1/2}$	[5,9,11]	6.94	1.333		1.778	0.000	0.000	.86	−0.17 ι
10603.441	9428.317	1-2	1-2	Si I	10603.431	$4s\ ^3P^o_1 - 4p\ ^3P_2$	[9,11,15]	6.09	1.500		0.000	0.000	0.000	.43	−0.38 b
10611.682	9420.995	0	0	Fe I	10611.714	$5p\ ^7F^o_6 - sd\ ^7G_7$	[10]	6.17	1.214		0.049	0.037	0.006	.714	−0.34
10616.722	9416.523	0	0	Fe I	10616.723	$b\ ^3H_5 - z\ ^3G^o_4$	[1,10,17]	3.27	1.000	0.896	0.001	0.001	0.000	.721	−3.26
10627.651	9406.839	0-1	0	Si I	10627.65	$4p\ ^1P_1 - 4d\ ^3P_2$	[7,9,11]	5.86	1.750		0.150	0.112	−0.038	.65	0.00 b
				Ti I	10627.639	$z\ ^3S^o_1 - d\ ^3P_1$	[10]	3.09	1.750	1.745?	0.250	0.063	0.000	.640	−1.95
10635.971	9399.481	0-1	0-1	S I	10636.00	$4s'\ ^1D_2 - 4p'\ ^1F_3$	[9]	8.58	1.000		0.000	0.000	0.000	.00	
10672.142	9367.623	1-2 ◦	1	Cr I	10672.158	$b\ ^5D_3 - z\ ^5D^o_3$	[1,10]	3.01	1.500	1.524	0.000	0.000	0.000	.158	−1.37
10683.095	9358.019	1	1	C I	10683.08	$3s\ ^3P^o_1 - 3p\ ^3D_2$	[7,9,11]	7.48	1.000		0.067	0.050	0.011	.08	0.07 b
				Fe I	10683.113	$b\ ^3D_1 - y\ ^3D^o_2$	[10]	3.64	1.500	1.477?	0.267	0.200	−0.089	.113	−4.09
10685.361	9356.035	0-1	0-1	C I	10685.35	$3s\ ^3P^o_0 - 3p\ ^3D_1$	[7,9,11]	7.48	0.500		0.000	0.000	0.000	.34	−0.29 b
10689.721	9352.219	1-2	1-2	Si I	10689.72	$4p\ ^3D_1 - 4d\ ^3F^o_2$	[7,9,11]	5.95	0.750		0.017	0.012	−0.001	.72	−0.19 b
10691.262	9350.871	2	1-2	C I	10691.25	$3s\ ^3P^o_2 - 3p\ ^3D_3$	[9]	7.49	1.167		0.044	0.033	0.006	.24	0.36 b
				Ti II	10691.263	$e\ ^4F_{9/2} - 5p\ ^4G^o_{11/2}$	[10]	7.76	1.132		0.021	0.016	0.002	.263	0.75
10694.258	9348.251	0-1	0-1	Si I	10694.251	$4p\ ^3D_2 - 4d\ ^3F^o_3$	[9,11,15]	5.96	1.000		0.011	0.008	0.001	.25	−0.06 b
10707.345	9336.825	0-1	0-1	C I	10707.33	$3s\ ^3P^o_1 - 3p\ ^3D_1$	[7,9,11]	7.48	1.000		1.000	0.250	0.000	.32	−0.39 b
10725.187	9321.293	1	1	Fe I	10725.186	$b\ ^3D_2 - y\ ^3D^o_2$	[1,10,17]	3.64	1.167	1.159?	0.000	0.000	0.000	.186	−2.78
				Fe I	10725.186	$x\ ^3G^o_5 - 5d\ ^7G_4$	[17]	5.93	1.000	1.009?	0.048	0.036	0.006	.172	
10727.417	9319.355	2	1-2	Si I	10727.41	$4p\ ^3D_3 - 4d\ ^3F^o_4$	[9]	5.98	1.125		0.021	0.016	0.002	.41	0.06 b
10729.545	9317.507	1	1	C I	10729.53	$3s\ ^3P^o_2 - 3p\ ^3D_2$	[7,9,11]	7.49	1.333		0.378	0.117	0.000	.53	−0.34 b
10741.744	9306.925	0-1	0-1	Ti I	10741.77	$x\ ^5D^o_2 - f\ ^5F_3$	[7,10]	3.71	1.000	1.000?	0.100	0.075	0.019	.535	−0.40
				Si I	10741.73 †	$3d\ ^1F^o_3 - 6f\ 1/2[7/2]_4$	[9,11]	6.62						.73	−1.11 b

1 $\lambda_\odot$ (Å)	2 $\sigma_\odot$ (cm⁻¹)	3 Blend‡ I)	II)	4 Ion	5 λ_{lab} (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 $g_{\text{eff}}^{\text{calc}}$	10 $g_{\text{eff}}^{\text{emp}}$	11 X_π	12 X_σ	13 Y_σ	14 λ_{calc} (Å)	15 $\log(gf)$
10749.395	9300.301	0-1	0	Si I	10749.384	$4s\ ^3P^o_1 - 4p\ ^3P_1$	[9,11,15]	4.93	1.500		0.000	0.000	0.000	.39	−0.30 b
10753.009	9297.175	0	0	Fe I	10753.007	$z\ ^3D^o_1 - d^8\ ^3P_0$	[10,17]	3.96	0.500	0.513?	0.000	0.000	0.000	.005	−1.90
10762.270	9289.175	1	0-1	Ni I	10762.273	$y\ ^3D^o_3 - e\ ^3D_2$	[1,10]	4.15	1.500	1.311	0.044	0.033	−0.006	.273	−2.03
10780.697	9273.297	1-2	1-2	Fe I	10780.694	$b\ ^3H_6 - z\ ^3G^o_5$	[1,10,17]	3.24	1.083	0.958	0.008	0.006	0.000	.695	−3.41
10783.053	9271.271	0-1	0-1	Fe I	10783.051	$c\ ^3P_0 - z\ ^3P^o_1$	[1,10,17]	3.11	1.500	1.496?	0.000	0.000	0.000	.050	−2.60
10784.561	9269.975	0-1	0-1	Si I	10784.550	$4p\ ^3D_2 - 4d\ ^3F^o_2$	[9,11,15]	5.96	0.917		0.850	0.262	0.000	.57	−0.91 b
10786.865	9267.945	0	0	Si I	10786.856	$4s\ ^3P^o_1 - 4p\ ^3P_0$	[9,11,15]	4.93	1.500		0.000	0.000	0.000	.86	−0.39 b
10796.114	9260.055	1	1	Si I	10796.06	$3d\ ^3F^o_2 - 4f3/2[5/2]_2$	[9]	6.18						.11	−1.34 b
10801.363	9255.555	0	0	Cr I	10801.346	$b\ ^5D_1 - z\ ^5D^o_2$	[1,10]	3.01	1.500	1.506	0.000	0.000	0.000	.346	−1.72
10811.095	9247.223	3	0-1	Mg I	10811.09	$3d\ ^3D_3 - 5f\ ^3F^o_2$	[9]	5.95	2.000		0.711	0.533	−0.356	.09	
						$3d\ ^3D_3 - 5f\ ^3F^o_3$	[9]	5.95	1.208		0.438	0.141	0.000	.09	
						$3d\ ^3D_3 - 5f\ ^3F^o_4$	[9]	5.95	1.125		0.021	0.016	0.002	.09	
10818.279	9241.083	0-1	0-1	Fe I	10818.276	$z\ ^3D^o_1 - d^8\ ^3P_1$	[9,10,17]	3.96	1.000	1.007?	1.000	0.250	0.000	.274	−2.00
10827.103	9233.551	1	1	Si I	10827.09	$4s\ ^3P^o_2 - 4p\ ^3P_2$	[9,11]	4.95	1.500		0.000	0.000	0.000	.09	0.22 b
10838.983	9223.431	0-1	0	Ca I	10838.970	$4p'\ ^3P^o_2 - 3d^2\ ^3P_2$	[9,10]	4.88	1.500		0.000	0.000	0.000	.971	−0.03
10843.859	9219.283	2	0-1	Si I	10843.85	$4p\ ^1P_1 - 4d\ ^1D_2$	[9]	5.86	1.000		0.000	0.000	0.000	.86	−0.31 b
10846.789	9216.793	1-2	1-2	Ca I	10846.792	$3d4p\ ^3D^o_3 - 3d5s\ ^3D_3$	[10]	4.74	1.333		0.000	0.000	0.000	.792	−1.14
10849.456	9214.527	0-1	0	Fe I	10849.467	$e\ ^5D_4 - sp\ ^5D^o_3$	[9,10,17]	5.54	1.500	1.541	0.000	0.000	0.000	.467	−1.83
10861.593	9204.231	1-2	1	Ca I	10861.582	$4p'\ ^3P^o_0 - 3d^2\ ^3P_1$	[9,10]	4.88	1.500		0.000	0.000	0.000	.582	−0.61
10862.636	9203.347	2	1	Fe II	10862.644	$z\ ^4F^o_{5/2} - b\ ^4G_{7/2}$	[10]	5.59	0.929	0.878?	0.004	0.003	0.000	.644	−2.12
10879.877	9188.763	1-2	1-2	Ca I	10879.868	$4p'\ ^3P^o_1 - 3d^2\ ^3P_0$	[9,10]	4.88	1.500		0.000	0.000	0.000	.868	−0.62
10881.760	9187.173	2-3	1-2	Fe I	10881.760	$b\ ^3P_1 - z\ ^3F^o_2$	[10,17]	2.85	0.250	0.278	0.417	0.313	0.174	.759	−3.71
10882.809	9186.287	1	0-1	Si I	10882.802	$4p\ ^3D_3 - 4d\ ^3F^o_3$	[9,11,15]	5.98	1.208		0.438	0.141	0.000	.81	−0.87 b
10884.264	9185.059	1	1	Fe I	10884.265	$z\ ^3D^o_2 - d^8\ ^3P_2$	[10,17]	3.93	1.333	1.334?	0.378	0.117	0.000	.264	−1.97
10885.350	9184.143	0-1	0-1	Si I	10885.33	$3d\ ^3F^o_2 - 4f3/2[7/2]_3$	[9,11]	6.18						.33	0.04 b
10896.303	9174.911	0	0	Fe I	10896.302	$c\ ^3P_1 - z\ ^3P^o_2$	[1,10,17]	3.07	1.500	1.507	0.000	0.000	0.000	.298	−2.73
10905.712	9166.995	0-1	0	?											
10914.237	9159.835	1-2	1-2	Mg II	10914.23	$3d\ ^2D_{5/2} - 4p\ ^2P^o_{3/2}$	[9,11]	8.86	1.100		0.019	0.014	0.002	.24	0.02 b
10926.230	9149.781	2	1	CN	10926.24	$0,0\ R_2\ 8$	[9]	0.02						.28	
10951.778	9128.437	1-2	1-2	Mg II	10951.79	$3d\ ^2D_{3/2} - 4p\ ^2P^o_{1/2}$	[9,11,15]	8.86	0.833		0.004	0.003	0.000	.77	−0.23 b
10957.304	9123.833	3	0-1	Mg I	10957.31	$4p\ ^3P^o_1 - 5d\ ^3D_{2,1}$	[9]	5.93	1.000		0.347	0.110	−0.002	.31	
				Co I	10957.284	$x\ ^4F^o_{7/2} - e\ ^4P_{5/2}$	[10]	5.20	0.786	0.821	0.295	0.221	0.093	.284	−1.87
10963.454	9118.715	2	1	CN	10963.46	$0,0\ R_1\ 11$	[9]	0.03						.45	
				CN	10963.47 †	$0,0\ R_1\ 10$	[9]	0.03						.47	

Table 1. continued

1 $\lambda_\odot$ (Å)	2 $\sigma_\odot$ (cm⁻¹)	3 Blend‡ I)	II)	4 Ion	5 λ_{lab} (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 g^{calc}_{eff}	10 g^{emp}_{eff}	11 X_π	12 X_σ	13 Y_σ	14 λ_{calc} (Å)	15 log(gf)
10982.077	9103.252	2-3	1-2	Si I	10982.06	$3d\ ^3F^o_3 - 4f\ 3/2[7/2]_4$	[9]	6.19						.06	−0.05 b
10984.550	9101.203	2-3	1	Si I	10984.53	$3d\ ^3F^o_3 - 4f\ 3/2[7/2]_3$	[9]	6.19						.53	−0.50 b
				CN	10984.54	$0,0\ Q_2\ 12$	[9]	0.03						.55	
				CN	10984.60	$0,0\ P_2\ 7$	[9]	0.01						.71	
10990.326	9096.419	2	0-1	CN	10990.34	$0,0\ R_1\ 21$	[9]	0.11						.33	
10995.659	9092.007	2-3	0-1	CN	10995.69	$0,0\ R_1\ 22$	[9]	0.12·						.67	
11000.655	9087.878	2 °	1	CN	11000.68	$0,0\ Q_1\ 7$	[9]	0.01						.67	
11001.478	9087.198	2	1	CN	11001.49	$0,0\ R_1\ 23$	[9]	0.13						.48	
11006.091	9083.390	2	1	CN	11006.09	$0,0\ Q_1\ 9$	[9]	0.02						.10	
11009.601	9080.494	2-3	1	CN	11009.61	$0,0\ Q_1\ 10$	[9]	0.03						.62	
11014.540	9076.423	2	1	CN	11014.58	$0,0\ R_1\ 25$	[9]	0.15						.53	
				CN	11014.62 †	$0,0\ P_1\ 4$	[9]	0.00						.62	
11015.531	9075.606	2-3	1	Cr I	11015.62	$y\ ^7P^o_3 - e\ ^7S_3$	[9,10]	3.45	1.958		0.049	0.016	0.000	.66	−2.36 b
11021.369	9070.798	1-2	1	CN	11021.38	$0,0\ Q_2\ 17$	[9]	0.07						.40	
11026.781	9066.346	2	1	Fe I	11026.790	$z\ ^3F^o_3 - 3d^8\ ^3P_2$	[10,17]	3.94	0.667	0.672?	0.278	0.208	0.087	.789	−2.90
				Ni I	11026.852	$x\ ^3P^o_1 - h\ ^3F_2$	[10]	5.85	0.250		0.417	0.313	0.174	.853	−1.64
11029.485	9064.124	2	1	CN	11029.52	$0,0\ R_1\ 27$	[9]	0.18						.49	
11029.983	9063.714	3	1	CN	11029.99	$0,0\ Q_2\ 18$	[9]	0.08						3.00	
11030.860	9062.994	3	1	CN	11030.87	$0,0\ P_1\ 7$	[9]	0.01						.85	
11054.263	9043.806	2-3	1	Zn I	11054.25	$4p\ ^1P^o_1 - 5s\ ^1S_0$	[9]	5.80	1.000		0.000	0.000	0.000	.25	
11075.258	9026.662	2	0-1	CN	11075.29	$0,0\ R_1\ 32$	[9]	0.25						.24	
11104.488	9002.902	2-3	0-1	CN	11104.49	$0,0\ P_2\ 18$	[9]	0.08						.53	
11105.329	9002.221	2-3	1	CN	11105.37	$0,0\ R_2\ 36$	[9]	0.31						.36	
11114.280	8994.970	2-3 °	1-2	CN	11114.33	$0,0\ Q_2\ 26$	[9]	0.16						.33	
11119.803	8990.502	2 °	1-2	Fe I	11119.798	$b\ ^3P_1 - z\ ^3D^o_1$	[2,10,17]	2.85	1.000	1.001	1.000	0.250	0.000	.797	−2.20 j
11153.363	8963.450	2	1	CN	11153.39	$0,0\ Q_2\ 29$	[9]	0.20						.40	
11158.751	8959.122	3	1	CN	11158.78	$0,0\ Q_1\ 28$	[9]	0.19						.77	
11173.737	8947.107	2-3	1-2	CN	11173.77	$0,0\ R_1\ 40$	[9]	0.38						.73	
11175.863	8945.405	2-3	1	CN	11175.88	$0,0\ P_2\ 23$	[9]	0.13						.90	
11207.655	8920.030	2	1	CN	11207.67	$0,0\ P_2\ 25$	[9]	0.15						.69	
11227.993	8903.873	2-3	1	CN	11228.03	$0,0\ Q_2\ 34$	[9]	0.28						.03	
11228.793	8903.238	2-3	1	CN	11228.82	$0,0\ Q_1\ 33$	[9]	0.26						.79	
11238.487	8895.559	2-3	1	CN	11238.52	$0,0\ R_2\ 45$	[9,12]	0.48						.51	
11308.398	8840.564	3	1-2	Si I	11308.48	$3d\ ^3F^o_3 - 4f\ 1/2[5/2]_3$	[9,11,12]	6.19						.37	−0.79 b

1 $\lambda_\odot$ (Å)	2 $\sigma_\odot$ (cm⁻¹)	3 Blend‡ I)	II)	4 Ion	5 λ_{lab} (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 g^{calc}_{eff}	10 g^{emp}_{eff}	11 X_π	12 X_σ	13 Y_σ	14 λ_{calc} (Å)	15 log(gf)
11367.636	8794.495	3	0-1	CN	11367.64	$0,0\ Q_1\ 41$	[9,12]	0.40						.63	
11387.381	8779.247	2	1	CN	11387.38	$0,0\ Q_1\ 42$	[9,12]	0.42						.39	
11388.538	8778.355	2	1-2	Fe I	11388.540	$e\ ^5D_2 - t\ ^5P^o_2$	[17]	5.62	1.667	1.602	0.378	0.117	0.000	.539	−0.71
11390.121	8777.135	1-2	1-2	S I	11390.14	$3d\ ^5D^o_4 - 4f\ ^5F_4$	[9,11,12]	8.42	1.425		0.266	0.087	0.000	.127	
						$3d\ ^5D^o_4 - 4f\ ^5F_5$	[9,11,12]	8.42	1.200		0.048	0.036	0.006	.127	
11390.770	8776.635	3 °	1-2	Cr I	11390.749	$z\ ^5P^o_2 - c\ ^5D_2$	[3,10]	3.32	1.667	1.665?	0.378	0.117	0.000	.737	−0.49
11393.899	8774.224	2-3	1	CN	11393.89	$0,0\ Q_2\ 43$	[9]	0.44						.93	
11407.667	8763.635	3	1-2	CN	11407.67 †	$0,0\ Q_1\ 43$	[9]	0.44						.67	
11422.333	8752.383	1-2 •	1	Fe I	11422.323	$a\ ^5P_2 - z\ ^5D^o_1$	[2,10,17]	2.20	2.000	1.983	0.067	0.050	−0.011	.320	−2.70 j
11428.514	8747.649	2-3	1-2	CN	11428.49	$0,0\ Q_1\ 44$	[9]	0.46						.53	
11436.573	8741.485	2	1-2	CN	11436.54	$0,0\ Q_2\ 45$	[9]	0.48						.61	
11449.931	8731.286	3	1	CN	11449.93 †	$0,0\ Q_1\ 45$	[9,12]	0.48						.93	
11465.315	8719.571	3	0-1	Si I	11465.32 †	$3d\ ^3F^o_4 - 4f\ 1/2[5/2]_3$	[9]	6.21						.32	−2.43 b
11475.749	8711.644 *	3	0-1	Fe I	11475.767	$e\ ^5D_4 - 5p\ ^5F^o_4$	[2,12,17]	5.54	1.425	1.426?	0.266	0.087	0.000	.767	
11479.328	8708.927	2-3	1-2	CN	11479.31	$0,0\ P_1\ 38$	[9,12]	0.35						.31	
				CN	11479.34 †	$1,1\ Q_2\ 29$	[9]	0.45						.34	
11481.432	8707.331	2-3	0-1	CN	11481.41	$0,0\ Q_2\ 47$	[9,12]	0.52						.49	
11522.234	8676.497	3	1	Fe I	11522.214	$b\ ^3H_6 - z\ ^5G^o_5$	[1,10]	3.24	0.917	1.033	0.070	0.052	0.010	.214	−3.41
11526.065	8673.613	3	1	CN	11526.07	$0,0\ P_1\ 40$	[9,12]	0.38						.06	
11528.572	8671.727	2-3 °	1	CN	11528.56	$0,0\ Q_2\ 49$	[9]	0.57						.61	
11550.335	8655.388	3	1	CN	11550.31	$0,0\ P_1\ 41$	[9,12]	0.40						.29	
11553.021	8653.376	3	1	CN	11552.98	$0,0\ Q_2\ 50$	[9,12]	0.59						3.03	
11572.526	8638.791	1-2	0	Fe I	11572.517	$e\ ^7G_7 - 5f\ 9/2[15/2]^o_8$	[2,17]	6.28						.525	
11578.005	8634.703	2	1	CN	11578.04 †	$0,0\ Q_2\ 51$	[9,12]	0.62						.04	
11588.699	8626.735	3	1	Ni I	11588.712	$y\ ^3D^o_2 - e\ ^3D_2$	[1,4,10]	4.24	1.167	1.138	0.000	0.000	0.000	.696	−1.43
11591.506	8624.646	2	1	Si I	11591.51	$3d\ ^3P^o_1 - 4f\ 3/2[3/2]_2$	[9,11,12]	6.27						.47	−0.90 b
11592.322	8624.039	3	1	Si I	11592.39	$3d\ ^3P^o_1 - 4f\ 3/2[3/2]_1$	[9,11,12]	6.27						.29	−1.05 b
11593.618	8623.074	2-3	1-2	Fe I	11593.591	$a\ ^5P_1 - z\ ^5D^o_0$	[2,10,17]	2.22	2.500	2.499?	0.000	0.000	0.000	.590	−2.45 j
11603.597	8615.659	2-3	1	CN	11603.64 †	$0,0\ Q_2\ 52$	[9]	0.64						.64	
11607.585	8612.699	1-2	0	Fe I	11607.575	$a\ ^5P_2 - z\ ^5D^o_2$	[2,10,17]	2.20	1.667	1.662	0.378	0.117	0.000	.574	−2.01 j
11615.765	8606.634	2-3	0-1	CN	11615.77 †	$0,0\ Q_1\ 52$	[9,12]	0.64						.77	
11619.293	8604.020	2-3	0-1	C I	11619.29	$3p\ ^3D_1 - 3d\ ^3D^o_1$	[9,11,12]	8.64	0.500		0.000	0.000	0.000	.307	−0.50 b
11627.556	8597.906	1-2	1-2	Si I	11627.53	$4p\ ^3D_2 - 3p^3\ ^3P^o_1$	[11,14]	5.96	1.000		0.067	0.050	0.011	.528	−2.88 b
11628.892	8596.918	2-3 °	1	C I	11628.83	$3p\ ^3D_2 - 3d\ ^3D^o_2$	[8,11]	8.64	1.167		0.000	0.000	0.000	.822	−0.09 b

Table 1. continued

1 λ☉ (Å)	2 σ☉ (cm⁻¹)	3 Blend‡ I)	II)	4 Ion	5 λ_lab (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 g_{eff}^{calc}	10 g_{eff}^{emp}	11 X_π	12 X_σ	13 Y_σ	14 λ_calc (Å)	15 log(gf)
11629.791	8596.254	2–3 °	1–2	CN	11629.80 †	0,0 Q_2 53	[9,12]	0.66						.80	
11640.960	8588.006	2–3	0–1	Si I	11640.982	$3d\ ^3P_0 - 4f'\ [3/2]_1$	[9,11,12]	6.27						.941	−0.95 b
11641.817	8587.374	1–2	1	CN	11641.81 †	0,0 Q_1 53	[9,12]	0.66						.81	
				Fe I	11641.801	$d\ ^3F_3 - y\ ^3G_3^o$	[1,10,17]	4.58	0.917	0.924?	0.778	0.250	0.000	.801	−2.95
11647.956	8582.848	2–3	1	C I	11647.994	$3p\ ^3D_2 - 3d\ ^3D_1^o$	[9,11,12]	8.64	1.500		0.267	0.200	−0.089	.981	−0.99 b
11659.699	8574.204	2–3	1–2	C I	11659.677	$3p\ ^3D_3 - 3d\ ^3D_3^o$	[9,11,12]	8.65	1.333		0.000	0.000	0.000	.676	0.10 b
11669.648	8566.894	2	1–2	C I	11669.626	$3p\ ^3S_1 - 3d\ ^3P_2^o$	[9,11,12]	8.77	1.250		0.150	0.112	0.038	.640	−0.24 b
				Fe I	11669.642	$y\ ^5P_3^o - e\ ^5D_2$	[2,10,17]	4.56	1.833	1.819	0.044	0.033	−0.006	.628	−2.59
				Fe I	11669.642	$f\ ^5F_5 - 5f\ (7/2)[13/2]_6^o$	[17]	6.34						.650	
11680.463	8558.962	3	1–2	CN	11680.47 †	0,0	[12]							.47	
11683.995	8556.374	3	1–2	CN	11683.99 †	0,0 Q_2 55	[9,12]	0.71						.99	
11695.758	8547.769	3	1	CN	11695.76 †	0,0 Q_1 55	[9,12]	0.71						.76	
11708.328	8538.592	2	0–1	CN	11708.33 †	0,0 P_1 47	[9,12]	0.52						.33	
11712.012	8535.906	0–1	0–1	Ca I	11711.989	$4s4d\ ^3D_1^o - 4s8p\ ^3P_0^o$	[10]	4.68	0.500		0.000	0.000	0.000	.989	−1.47
				CN	11712.01 †	0,0 Q_2 56	[9,12]	0.74						.01	
11723.675	8527.414	3	1–2	CN	11723.67 †	0,0 Q_1 56	[9,12]	0.74						.67	
11740.656	8515.081	2–3	1	CN	11740.66 †	0,0 Q_2 57	[9,12]	0.77						.66	
11748.237	8509.586	1 *	0–1	C I	11748.19	$3p\ ^3D_1 - 3d\ ^3F_2^o$	[9]	8.60	0.750		0.017	0.012	−0.001		0.35 b
				Fe I	11748.224		[2]								
11753.323	8505.904	2	1–2	C I	11753.315	$3p\ ^3D_3 - 3d\ ^3F_4^o$	[9,11,12]	8.65	1.125		0.021	0.016	0.002	.315	0.69 b
11754.791	8504.842	2–3 °	1–2	C I	11754.766	$3p\ ^3D_2 - 3d\ ^3F_3^o$	[9,11,12]	8.64	1.000		0.011	0.008	0.001	.780	0.44 b
11781.364	8485.659	3	1	CN	11781.38 †	0,0 P_2 50	[9,12]	0.59						.38	
11783.289	8484.272	2–3 °	0	Fe I	11783.267	$b\ ^3P_2 - z\ ^3D_3^o$	[2,10,17]	2.83	1.167	1.144	0.044	0.033	0.006	.264	−1.57 j
11793.191	8477.149	3	1–2	Fe I	11793.228		[2,13]								
11799.879	8472.344	0–1	0–1	CN	11799.87 †	0,0 Q_2 59	[9,12]	0.76						.87	
11801.046	8471.506	2–3 °	0–1	C I	11801.08	$3p\ ^3D_3 - 3d\ ^3F_3^o$	[7,11]	8.65	1.208		0.438	0.141	0.000	.083	−2.39 b
11828.186	8452.068	2	1–2	Mg I	11828.171	$3p\ ^1P_1^o - 4s\ ^1S_0$	[9,13]	4.35	1.000		0.000	0.000	0.000	.185	−0.29 b
11838.994	8444.352	2	0–1	Ca II	11838.997	$5s\ ^2S_{1/2} - 5p\ ^2P_{3/2}^o$	[10,12]	6.47	1.167		0.111	0.083	0.028	.997	0.28
11848.726	8437.416	2	1	C I	11848.721	$3p\ ^3D_2 - 4s\ ^3P_2^o$	[9,11,12]	8.64	1.333		0.378	0.117	0.000	.707	−0.68 b
11862.966	8427.288	2	1	C I	11862.992	$3p\ ^3D_1 - 4s\ ^3P_1^o$	[9,11,12]	8.64	1.000		1.000	0.250	0.000	3.006	−0.74 b
11863.923	8426.608	1–2	1	Si I	11863.935	$4p\ ^3D_3 - 3p^3\ ^3P_2^o$	[9,11,12]	5.98	1.167		0.044	0.033	0.006	.920	−2.73 b
11879.574	8415.507	3	1	Fe I	11879.540	$e\ ^5D_2 - 5p\ ^5F_2^o$	[10]	5.62	1.250	1.252?	0.850	0.262	0.000	.540	−1.92
				C I	11879.584	$3p\ ^3D_1 - 4s\ ^3P_0^o$	[9,11,12]	8.64	0.500		0.000	0.000	0.000	.584	−0.64 b
11882.859	8413.181	2	0–1	Fe I	11882.847	$a\ ^5P_2 - z\ ^5D_3^o$	[2,10,17]	2.20	1.167	1.180	0.178	0.133	0.044	.846	−1.67 j

1 λ☉ (Å)	2 σ☉ (cm⁻¹)	3 Blend‡ I)	II)	4 Ion	5 λ_lab (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 g_{eff}^{calc}	10 g_{eff}^{emp}	11 X_π	12 X_σ	13 Y_σ	14 λ_calc (Å)	15 log(gf)
11884.102	8412.300	1	0–1	Fe I	11884.085	$a\ ^5P_1 - z\ ^5D_2^o$	[2,10,17]	2.22	1.000	1.005	0.600	0.450	0.300	.084	−2.08 j
11890.496	8407.776	1	1	Fe I	11890.490	$e\ ^5D_4 - 5p\ ^5F_5^o$	[2,10,17]	5.54	1.200	1.196?	0.048	0.036	0.006	.490	−0.42
11892.890	8406.085	1	1	C I	11892.90 †	$3p\ ^3D_2 - 4s\ ^3P_1$	[6]	8.63	1.000		0.067	0.050	0.011	.90	−0.28 ς
				Ti I	11892.869	$b\ ^3F_2 - z\ ^3D_1^o$	[1,10]	1.43	0.750	0.755?	0.017	0.012	−0.001	.869	−1.73
11895.777	8404.045	2	0	C I	11895.741	$3p\ ^3D_3 - 4s\ ^3P_2^o$	[9,11,12]	8.65	1.167		0.044	0.033	0.006	.755	0.03 b
11900.025	8401.044	3	0–1	Si I	11900.055 †	$4p\ ^3D_2 - 4d\ ^1D_2^o$	[11,14]	5.96	1.083		0.094	0.029	0.006	.055	−2.61 b
11923.192	8384.721	2	0–1	Fe I	11923.190		[2,12]								
11949.763	8366.077	1–2	1	Ca II	11949.745	$5s\ ^2S_{1/2} - 5p\ ^2P_{1/2}^o$	[10,12]	6.47	1.333		0.444	0.000	0.000	.74	−0.02
11955.954	8361.745	2	0–1	Ca I	11955.955	$4s5s\ ^1S_0 - 4s6p\ ^1P_1^o$	[10,13]	4.13	1.000		0.000	0.000	0.000	.956	−0.14
11959.421	8359.321	2	1	CN	11959.41 †	0,0 Q_2 64	[9,12]	0.96						.41	
11973.116	8349.759	3	1–2	Fe I	11973.050	$3p\ ^5P_3 - z\ ^5D_4^o$	[2,10,17]	2.18	1.250	1.256	0.083	0.063	0.014	.047	−1.48 j
11984.229	8342.017	3	0–1	Si I	11984.196	$4s\ ^3P_0^o - 4p\ ^3D_2$	[11,12,13]	4.93	1.000		0.067	0.050	0.011	.197	0.19 b
11991.583	8336.901	1	1	Si I	11991.570	$4s\ ^3P_0^o - 4p\ ^3D_1$	[11,13,15]	5.95	0.500		0.000	0.000	0.000	.569	−0.16 b
12031.527	8309.223	2–3	0	Si I	12031.517	$4s\ ^3P_2^o - 4p\ ^3D_3$	[11,12,13]	4.95	1.167		0.044	0.033	0.006	.504	0.44 b
12038.794	8304.207 *	3	1–2	CN	12038.79 †	0,0	[12]							.79	
12039.838	8303.487	3	0–1	Mg I	12039.820	$3d\ ^1D_2 - 5p\ ^1P_1^o$	[11,12]	5.75	1.000		0.000	0.000	0.000	.862	−2.33 b
12045.144	8299.829	2	1	CN	12045.11 †	0,0	[12]							.11	
12053.091	8294.357	1	0	Fe I	12053.083	$y\ ^5P_3^o - e\ ^5D_3$	[2,10,17]	4.56	1.583	1.585	0.194	0.063	0.000	.083	−1.54 j
12057.923	8291.033	1–2	1	CN	12057.91 †	0,0	[12]							.91	
12074.111	8279.917	1	0–1	CN	12074.11 †	0,0	[12]							.11	
12080.426	8275.589	1–2	1–2	Si I	12080.391 †	$3d\ ^3P_2^o - 4f\ [5/2]_2$	[11,14]	6.26						.391	−2.23 b
12092.218	8267.519 *	3	0–1	Fe I	12092.239	$e\ ^5D_3 - 5p\ ^3F_4^o$	[2,12,17]	5.59	0.875	0.863?	0.188	0.141	0.047	.239	
12093.847	8266.405	2–3	1	CN	12093.84 †	0,0	[12]							.84	
12099.535	8262.519	2	1–2	Fe I	12099.527		[2,12]								
12105.844	8258.213	0–1	0–1	Ca I	12105.841	$5p\ ^1P_1^o - 6d\ ^1D_2$	[10,13]	4.55	1.000		0.000	0.000	0.000	.842	−1.84
12117.882	8250.009	1	0–1	CN	12117.88 †	0,0	[12]							.88	
12119.500	8248.908	2–3	0–1	Fe I	12119.495	$d\ ^3F_4 - y\ ^3G_5^o$	[2,10,17]	4.59	1.100	1.121?	0.012	0.009	0.001	.496	−2.02
12133.987	8239.059	2	0–1	?											
12175.754	8210.797	3	1	Si I	12175.749 †		[11,12]	6.62						.749	−2.82 b
12178.311	8209.073	3	1	?											
12190.104	8201.131 *	3	1–2	Fe I	12190.099	$b\ ^3D_1 - y\ ^3F_2^o$	[2,10,17]	3.64	0.750	0.782?	0.017	0.012	−0.001	.100	−2.33 j
12213.339	8185.529	2	0–1	Fe I	12213.333	$y\ ^5P_1^o - e\ ^5D_0$	[2,10,17]	4.64	2.500	2.502?	0.000	0.000	0.000	.337	−1.95
12227.120	8176.303	1–2	0–1	Fe I	12227.113	$y\ ^5P_2^o - e\ ^5D_2$	[2,10,17]	4.61	1.667	1.670	0.378	0.117	0.000	.114	−1.46
12264.392	8151.455	2–3	1–2	Fe II ª	12264.353	$6s\ ^6D_{9/2} - 5p\ ^4G_{9/2}$	[10]	12.61	1.359		2.295	0.752	0.000	.354	−4.11

Table 1. continued

1 λ☉ (Å)	2 σ☉ (cm⁻¹)	3 Blend‡ I)	II)	4 Ion	5 λlab (Å)	6 Transition	7 Ref.	8 χe (eV)	9 g_{eff}^{calc}	10 g_{eff}^{emp}	11 X_π	12 X_σ	13 Y_σ	14 λcalc (Å)	15 log(gf)
12270.712	8147.257	2	0-1	Si I	12270.693 †	$4s\,^3P^o_2 - 4p\,^3D_2$	[11,12,13]	4.95	1.333		0.378	0.117	0.000	.693	−0.41 b
12283.279	8138.922	1-2	0-1	Fe I	12283.296	$n\,^7F^o_6 - 7s\,^7D_5$	[17]	6.17	1.250		0.070	0.052	0.010	.299	
12293.910	8131.884	1-2	1-2	?											
12314.105	8118.547	2	1-2	C I	12314.086 †	$3d\,^3D^o_1 - 5f\,[5/2]_2$	[11]	9.71						.086	−0.07 b
12342.922	8099.593	1	1	Fe I	12342.914	$y\,^5P^o_1 - e\,^5D_1$	[2,10,17]	4.64	2.000	2.010	1.000	0.250	0.000	.916	−1.56
12390.172	8068.705	0	0	Si I	12390.165	$4s\,^1P^o_1 - 4p\,^3P_1$	[11,12]	5.08	1.250		0.250	0.063	0.000	.154	−1.87 b
12395.838	8065.017	1-2	1-2	Si I	12395.834	$4s\,^3P^o_2 - 4p\,^3D_1$	[11,12]	4.95	2.000		0.600	0.450	−0.300	.832	−1.63 b
12417.924	8050.673	0	0	Mg I	12417.929	$4p\,^3P^o_0 - 6s\,^3S_1$	[11,12]	5.93	2.000		0.000	0.000	0.000	.912	−1.66 b
12423.022	8047.369	1-2	1-2	Mg I	12423.029	$4p\,^3P^o_1 - 6s\,^3S_1$	[12]	5.93	1.750		0.250	0.063	0.000	2.998	−1.18 b
12432.267	8041.385	1-2	1-2	K I	12432.244	$4p\,^2P^o_{1/2} - 5s\,^2S_{1/2}$	[11,12,13]	1.61	1.333		0.444	0.000	0.000	.274	−0.46 b
12449.424	8030.303	3	1	Ni I	12449.416		[4,12]								
12457.053	8025.385	0-1	0-1	?											
12460.702	8023.035	1-2	1-2	Ti I	12460.616	$d\,^3P_0 - p\,^3D^o_1$	[10]	4.24	0.500		0.000	0.000	0.000	.616	−2.40
12476.956	8012.583	1-2	1-2	?											
12499.876	7997.891	1	1	Fe II α	12499.858	$5p\,^4F_{3/2} - 5s\,^2P_{5/2}$	[10]	11.29	2.200		1.111	0.833	−0.714	.858	−3.48
12510.528	7991.081	1	1	Fe I	12510.519	$x\,^5D^o_3 - e\,^3F_4$	[2,10,17]	4.96	0.875	0.964	0.188	0.141	0.047	.521	−1.65
12524.967	7981.869	0-1	0-1	?											
12532.846	7976.851	0	0	Cr I	12532.838	$a\,^5P_2 - y\,^5P^o_3$	[1,3,10]	2.71	1.500	1.491	0.044	0.033	0.006	.817	−1.87
12549.501	7966.265	0	0	C I	12549.48 †	$3p\,^3P_0 - 3d\,^3P^o_1$	[7,11]	8.85	1.500		0.000	0.000	0.000	.48	−1.01 b
12557.007	7961.503	0	0	Fe I	12556.999	$a\,^3P_2 - z\,^5D^o_2$	[2,10,17]	2.28	1.500	1.505	0.000	0.000	0.000	.999	−3.63 j
12583.953	7944.455	0-1	0	Si I	12583.977 †	$3d\,^1F_3 - 5f\,[7/2]_4$	[11,12]	6.62						.977	−1.01 b
12601.508	7933.388 *	3	0-1	C I	12601.489 †	$3p\,^3P_2 - 3d\,^3P^o_1$	[11,12]	8.85	1.500		0.000	0.000	0.000	.489	−0.89 b
12615.935	7924.315	1-2 °	0-1	Fe I	12615.926	$y\,^5P^o_1 - e\,^5D_2$	[2,10,17]	4.64	1.000	1.004	0.600	0.450	0.300	.928	−1.60
12634.978	7912.372	2	1	?											
12638.717	7910.031	2	0	Fe I	12638.706	$y\,^5P^o_3 - e\,^5D_4$	[2,10,17]	4.56	1.250	1.264	0.083	0.063	0.014	.706	−0.86
12648.744	7903.761	3	1	Fe I	12648.742	$y\,^5P^o_2 - e\,^5D_3$	[2,10,17]	4.61	1.167	1.180	0.178	0.133	0.044	.744	−1.14 j
12679.148	7884.808	2-3	1	Na I	12679.145	$3d\,^2D_{5/2} - 5f\,^2F^o_{7/2}$	[11,12,13]	3.62	1.071		0.007	0.006	0.000	.144	−0.04 b
12749.865	7841.075	2	1	Al I β	12749.906	$3d\,^2D_{5/2} - 5p\,^2P^o_{3/2}$	[11,12]	4.02	1.100		0.019	0.014	0.002	.835	−2.21 b
12789.546	7816.747	3 °	1	?											
12807.162	7805.995	1-2	1-2	Fe I	12807.150	$b\,^3D_2 - y\,^3F^o_3$	[2,10,17]	3.64	1.000	1.005?	0.011	0.008	0.001	.153	−2.52
12808.252	7805.331	2	1-2	Fe I	12808.244	$x\,^5D^o_2 - e\,^5F_2$	[2,10,17]	4.99	1.250	1.246	0.850	0.262	0.000	.244	−1.54
12831.414	7791.242	3	1-2	Ti I	12831.437	$b\,^3F_2 - z\,^3F^o_2$	[10,13]	1.43	0.667	0.670	0.000	0.000	0.000	.437	−1.55
12840.581	7785.679	1-2	1-2	Fe I	12840.574	$z\,^5D^o_3 - e\,^5F_3$	[2,10,17]	4.96	1.375	1.370	0.438	0.141	0.000	.576	−1.50
12847.050	7781.759	1-2	1	Ti I	12847.029	$b\,^3F_3 - z\,^3F^o_3$	[1,10]	1.44	1.083	1.075	0.000	0.000	0.000	.030	−1.43

1 λ☉ (Å)	2 σ☉ (cm⁻¹)	3 Blend‡ I)	II)	4 Ion	5 λlab (Å)	6 Transition	7 Ref.	8 χe (eV)	9 g_{eff}^{calc}	10 g_{eff}^{emp}	11 X_π	12 X_σ	13 Y_σ	14 λcalc (Å)	15 log(gf)
12879.778	7761.986	1	0	Fe I	12879.769	$a\,^3P_2 - z\,^5D^o_3$	[2,10,17]	2.28	1.500	1.494	0.000	0.000	0.000	.769	−3.46 j
				Co I	12879.772	$w\,^4G^o_{7/2} - e\,^2G_{9/2}$	[10]	5.50	1.333	1.323	0.062	0.047	−0.009	.771	−1.48
12896.123	7752.148	1	0-1	Fe I	12896.119	$z\,^5D^o_2 - e\,^5F_4$	[2,10,17]	4.91	1.425	1.410	0.266	0.087	0.000	.119	−1.58
12909.079	7744.368	0-1	0	Ca I	12909.070	$4p\,^3F^o_2 - 3d^2\,^3F_2$	[10,13]	4.43	0.667	0.711?	0.000	0.000	0.000	.070	−0.43
12910.099	7743.756	1-2	0	Cr I	12910.089	$a\,^5P_3 - y\,^5P^o_2$	[3,10,13]	2.71	1.500	1.364	0.044	0.033	0.006	.059	−1.75
12916.321	7740.026	1-2	1	Fe I	12916.316		[2,12]								
12932.331	7730.444	1	1	Ni I	12932.327	$a\,^1G_4 - z\,^5F^o_3$	[1,4,10]	2.74	0.625	0.663	0.188	0.141	0.047	.302	−3.90
12933.013	7730.036	1	1	Fe I	12933.006	$x\,^5D^o_2 - e\,^5F_1$	[2,10,17]	5.02	1.000	0.007?	0.000	0.000	0.000	.006	−1.73
12934.674	7729.043	2-3	0	Fe I	12934.667	$w\,^5D^o_4 - e\,^7G_5$	[2,10,17]	5.39	1.100	1.153	0.085	0.064	0.014	.667	−0.82
12937.030	7727.636	0-1	0-1	Cr I	12937.018	$a\,^5P_1 - y\,^5P^o_2$	[3,10]	2.71	1.500	1.504	0.267	0.200	0.089	6.956	−1.89
13006.700	7686.243	2-3	0-1	Fe I	13006.688	$b\,^3G_4 - z\,^3F^o_3$	[2,10,17]	2.99	1.000	0.991	0.003	0.002	0.000	.686	−4.12
13014.846	7681.432	0-1	0-1	Fe I	13014.842	$w\,^5D^o_3 - f\,^5F_3$	[2,10,17]	5.45	1.375	1.366?	0.438	0.141	0.000	.840	−1.75
13029.542	7672.768	2	0-1	Si I	13029.573 †	$4p\,^3P_1 - 3p^3\,^3P^o_0$	[11,12]	6.08	1.500		0.000	0.000	0.000	.573	−2.41 b
13030.975	7671.925	3	0-1	Si I	13030.966 †	$4p\,^3P_0 - 3p^3\,^3P^o_1$	[11,12]	6.08	1.500		0.000	0.000	0.000	.966	−2.40 b
13033.558	7670.404	0-1	0-1	Ca I	13033.555	$4p\,^3F^o_3 - 3d^2\,^3F_3$	[10,13]	4.44	1.083	1.080?	0.000	0.000	0.000	.555	−0.27
13039.658	7666.816 *	3	1	Fe I	13039.652	$x\,^5G^o_6 - e\,^5H_7$	[2,10,17]	5.66	1.143	1.192	0.022	0.016	0.002	.650	−2.40
13053.640	7658.604	1	0-1	Zn I	13053.58	$5s\,^3S_1 - 5p\,^3P^o_2$	[16]	6.65	1.250		0.150	0.112	0.038		
13098.919	7632.130	2-3 °•	1	Fe I	13098.876	$z\,^5D^o_1 - e\,^5F_2$	[2,10,17]	5.01	0.750	0.738	0.150	0.112	0.038	.876	−1.48
13123.440	7617.870	1-2	0	Al I β	13123.440	$4s\,^2S_{1/2} - 4p\,^2P^o_{3/2}$	[6,13]	3.14	1.167		0.111	0.083	0.028	.411	0.21 ç
13134.937	7611.202	2-3	0-1	Ca I	13134.942	$3d4p\,^3F^o_4 - 3d^2\,^3F_4$	[10,13]	4.45	1.250	1.247?	0.000	0.000	0.000	.942	−0.12
13147.929	7603.681	3	0	Fe I	13147.922	$w\,^5D^o_2 - f\,^5F_5$	[2,10,17]	5.39	1.200	1.168	0.048	0.036	0.006	.922	−1.08
13150.773	7602.037	2-3	0-1	Al I β	13150.785	$4s\,^2S_{1/2} - 4p\,^2P^o_{1/2}$	[6,13]	3.14	1.333		0.444	0.000	0.000	.753	−0.09 ç
13154.560	7599.848	3	1	Si I	13154.530 †	$3d\,^1F_3 - 6p\,^1D_2$	[11,14]	6.62	1.000		0.011	0.008	0.001	.530	−2.68 b
13176.905	7586.961	2	0	Si I	13176.906	$4p\,^1P_1 - 5s\,^1P^o$	[11,12,13]	5.86	1.000		0.000	0.000	0.000	.889	−0.50 b
13201.161	7573.020	3	1-2	Cr I	13201.144	$a\,^5P_2 - y\,^5P^o_1$	[1,3,10]	2.71	1.500	1.514	0.267	0.200	0.089	.161	−1.82
13212.445	7566.552	3	0	Ni I	13212.458	$a\,^1G_4 - z\,^3D^o_3$	[1,4,10]	2.74	0.500	0.525	0.333	0.250	0.111	.416	−2.58
13264.179	7537.041	2	1	Ni I	13264.172		[4,12]								
13291.783	7521.389 *	3	1	Fe I	13291.786	$w\,^5D^o_2 - f\,^5F_2$	[10,12,17]	5.48	1.250	1.250	0.850	0.262	0.000	.786	−1.92
13293.834	7520.227	2	0	Mn I	13293.795	$a\,^6D_{7/2} - z\,^6P^o_{7/2}$	[1,10]	2.14	1.651	1.649	0.149	0.048	0.000	.795	−1.61
13317.997	7506.584	2-3	1-2	Ca I	13317.984	$4s4d\,^1D_2 - 4s5f\,^1F^o_3$	[10,13]	4.62	1.000		0.000	0.000	0.000	.984	0.56
13319.055	7505.987	2	0-1	Mn I	13319.068	$a\,^6D_{7/2} - z\,^6P^o_{5/2}$	[1,10,13]	2.14	1.214	1.220	0.200	0.150	0.052	8.944	−1.62
13352.177	7487.367	1-2	0	Fe I	13352.176	$e\,^7D_5 - n\,^7F^o_4$	[17]	5.31	1.800	1.755?	0.048	0.036	−0.006	.172	−0.74
13392.110	7465.041	1-2\	0	Fe I	13392.102	$e\,^7D_4 - n\,^7P^o_3$	[17]	5.35	1.250	1.262?	0.213	0.160	0.057	.102	−0.17

Table 2. Possible blends rejected as too weak

λ☉ (Å)	Ion	λlab (Å)	χe (eV)	log(gf)	λ☉ (Å)	Ion	λlab (Å)	χe (eV)	log(gf)	λ☉ (Å)	Ion	λlab (Å)	χe (eV)	log(gf)
10009.158	Cr II	10009.220	12.12	−3.98	10729.545	Ni I	10729.574	5.33	−3.06	11753.323	Mn II	11753.328	12.39	0.33
10019.795	Cr II	10019.794	13.11	−0.26	10762.270	Ti I	10762.311	4.67	−3.74	11783.289	Fe I	11783.208	5.70	−4.12
10032.859	V I	10032.846	4.73	−3.39	10818.279	Fe II	10818.318	13.00	−1.62	11863.923	Cr II	11863.851	13.32	−2.08
	Cr II	10032.856	13.12	−3.37	10861.593	Co I	10861.642	5.59	−3.96	11882.859	Sc I	11882.860	4.65	−3.49
10035.743	Mn II	10035.797	6.91	−4.80	10879.877	Sc I	10879.928	5.20	−2.98	11892.890	Mn II	11892.868	13.21	−3.81
10057.197	Mn I	10057.200	6.54	−3.93	10884.264	Ti II	10884.252	8.12	−0.89	11984.229	Cr I	11984.181	6.74	−3.44
10065.053	Cr II	10065.037	13.10	−2.30	10926.230	Ni II	10926.220	15.07	−3.10	11991.583	Fe II	11991.520	11.66	−2.54
10068.365	V II	10068.413	10.00	−1.82	10984.550	Fe II	10984.566	12.09	−2.45	12057.923	Mn I	12057.913	5.98	−2.28
10120.447	Cr I	10120.497	4.24	−3.96	11001.478	Sc I	11001.537	4.57	−3.35	12074.111	Sc I	12074.049	5.78	−3.28
10136.580	Ni II	10136.608	12.55	−3.57	11021.369	Sc I	11021.428	4.54	−2.35	12133.987	Ni II	12134.016	15.02	−3.14
10155.163	Cr II	10155.245	13.13	−2.84	11029.983	Cr I	11030.001	2.54	−6.20	12178.311	Cr I	12178.271	6.05	−3.40
10252.553	Ca I	10252.546	4.77	−8.72	11105.329	Ni II	11105.342	15.14	−0.15	12270.712	Ni II	12270.692	15.14	−1.17
10302.617	Mn I	10302.694	5.92	−3.51		Co II	11105.342	5.05	−4.93	12283.279	Co II	12283.191	5.47	−6.72
10327.343	Fe I	10327.313	5.54	−3.45	11119.803	Ni II	11119.881	15.14	−0.15	12342.922	Ni II	12342.911	15.14	−2.10
	V I	10327.364	1.06	−5.65	11153.363	Cr II	11153.414	13.24	−1.73	12449.424	Cr II	12449.367	13.36	−1.56
10332.329	Mn I	10332.359	7.11	−2.79	11173.737	Co I	11173.696	5.70	−3.83	12460.702	Co I	12460.679	5.40	−3.95
10347.965	Ti I	10347.951	5.02	−2.63	11175.863	Fe II	11175.851	12.35	−2.20	12532.846	Sc I	12532.832	4.59	−2.60
10353.808	Ni II	10353.825	15.06	−3.14		Ni II	11175.882	15.97	−1.04	12638.717	Ti I	12638.723	3.71	−3.84
10364.061	Mn I	10364.044	5.91	−3.20	11207.655	Ni II	11207.681	15.98	−2.71	12847.050	Cr II	12847.049	13.33	−1.69
10371.273	Ca II	10371.323	9.68	−1.47	11367.636	Cr I	11367.656	4.61	−1.76	12896.123	Fe II	12896.081	10.45	−2.49
10395.802	Cr II	10395.837	12.58	−0.90	11436.573	Cr I	11436.605	5.71	−3.71	12916.321	Fe II	12916.260	10.33	−3.87
10396.814	V II	10396.885	10.00	−1.57	11449.931	Fe I	11449.982	6.11	−3.83	12937.030	Cr I	12936.973	6.23	−2.67
	Sc II	10396.896	9.43	−0.38	11465.315	Si I	11465.32 †	6.21	−2.43 b		Mn II	12937.056	12.48	−2.95
10423.746	Fe II	10423.814	12.17	−0.73		Ni II	11465.356	15.98	−2.28	13030.975	Cr II	13030.915	10.75	−0.79
10455.456	Fe II	10455.539	12.22	−2.67	11522.234	Mg I	11522.20 †	6.12	−3.62 b	13033.558	Fe I	13033.480	13.05	−3.62
10459.420	Ni II	10459.475	13.14	−3.80	11572.526	Ni II	11572.527	13.97	−3.17	13039.658	Fe II	13039.705	12.75	−0.84
10486.252	Sc I	10486.278	4.68	−2.76	11647.956	V I	11647.966	4.87	−0.85		Mn II	13039.736	7.76	−6.02
10530.523	Co I	10530.527	10.24	−3.93	11659.699	Co I	11659.745	5.67	−3.39	13134.937	Cr II	13134.940	13.37	−3.00
10555.651	Fe II	10555.666	12.28	−3.49	11680.463	Co I	11680.533	5.70	−2.89	13176.905	Cr I	13176.888	5.83	−3.72
10582.166	Ti I	10582.162	4.18	−3.67	11695.758	V I	11695.742	1.22	−8.80	13212.445	Cr II	13212.432	13.63	−3.74
10603.441	Ti I	10603.510	4.69	−3.37	11740.656	V I	11740.698	5.16	−3.30	13291.783	Ni II	13291.833	15.87	−1.91
10627.651	V I	10627.730	1.95	−4.23		Mn II	11740.671	12.39	0.53	13317.997	Fe I	13318.004	3.65	−6.25
10683.095	Fe II	10683.174	12.46	−2.83	11748.237	V I	11748.287	5.22	−3.86	13319.055	Fe II	13319.033	13.19	−2.77
10685.361	Cr I	10685.390	6.03	−2.54		Cr I	11748.315	5.56	−3.95					

References:

[1] = Biémont (1976)
[2] = Biémont et al. (1985a)
[3] = Biémont et al. (1985b)
[4] = Biémont et al. (1986)
[5] = Biémont et al. (1994)
[6] = Biémont & Grevesse (1973)
[7] = Striganov & Sventitskii (1968)
[8] = Zaidel', Prokof'ev, Raiskii, Slavnyi, Shreider (1970)
[9] = Swensson et al. (1970)

[10] = Kurucz (1991c)
[11] = Kurucz & Peytremann (1975)
[12] = Livingston & Wallace (1991)
[13] = Wallace & Livingston (1991)
[14] = Martin & Zalubas (1983)
[15] = Reader et al. (1980)
[16] = Hall (1974)
[17] = Nave et al. (1994)

Notes to tables I and II:

* (in column: $\sigma_\odot$): The wavenumber of this line was taken from the purely solar component of the Livingston & Wallace (1991) spectral atlas due to the too strong telluric blending of the line in the Delbouille et al. (1981) spectral atlas.

‡ (in column: Blend): Subcolumn marked I) lists the blending index derived from the Delbouille et al. (1981) spectral atlas and II) the blending index determined from the Wallace et al. (1993) atlas (spectral region $1.0 - 1.1$ μm) and from the Livingston & Wallace (1991) atlas ($1.1 - 1.8$ μm). The latter blends were obtained from the purely solar component of the observed spectrum.

° (in subcolumn: I): In the Delbouille et al. (1981) atlas these lines look less blended than the values given here, but according to the Wallace et al. (1993) and the Livingston & Wallace (1991) atlases the lines are blended with a telluric line having almost the same wavelength, so that the blends show no readily visible effects.

* Line is blended according to Biémont et al. (1985a).

α (in column: Ion): According to the available $log(gf)$ this identification is extremely unlikely.

β According to Biémont & Brault (1987a,b) this line is a blend of different hyperfine components.

† (in column: λ_{lab}): For this line no laboratory wavelength is available in the above references therefore the calculated wavelength has been written instead.

* (in column: Ref.): This transition involves a change in orbital angular momentum $\Delta L > 1$, making the identification uncertain. Such identifications are listed only where no other possible identification is known.

♮ The order of the multiple line identifications represents their probable contribution to the line (e.g. due to the huge equivalent width of the primary identification, the secondary (blend) probably provides only a very small contribution to the line).

? (in column: g_{eff}^{emp}): If only g_l or g_u is available from laboratory measurements, the missing atomic level Landé factor is assumed to be represented by its LS coupling value.

♭ (in column: $log(gf)$): This $log(gf)$ value has been taken from the compilation by Kurucz & Peytremann (1975).

ℐ This $log(gf)$ value was derived from Nave et al. (1994).

ι This $log(gf)$ value was obtained from Biémont et al. (1994).

ς This $log(gf)$ value has been taken from Biémont & Grevesse (1973). All other $log(gf)$ values are from Kurucz (1991c).

Table 3. Lines judged to be relatively unblended from a visual examination (H band)

1 $\lambda_\odot$ (Å)	2 $\sigma_\odot$ (cm⁻¹)	3 Blend‡ I)	II)	4 Ion	5 λ_{lab} (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 $g_{\text{eff}}^{\text{calc}}$ ¶	10 $g_{\text{eff}}^{\text{emp}}$	11 X_π	12 X_σ	13 Y_σ	14 λ_{calc} (Å)	15 $\log(gf)$
14929.153	6696.474 *	3	1	Fe I	14929.151	$w\ ^5D_2^o - f\ ^5D_1$	[2,12,19]	5.48	1.500	1.467	0.000	0.000	0.000	.153	−2.00
14933.698	6694.435	3	0-1	CN	14933.67 †	0,1	[14]							.67	
14959.169	6683.037	3 °	1-2	Fe I	14959.224	$g\ ^5D_4 - 5p\ ^5D_3^o$	[2,17,19]	6.37	1.500		0.000	0.000	0.000	.222	
14979.719	6673.867	2	1-2	Fe I	14979.707	$n\ ^7F_6^o - 5d\ ^7D_5$	[2,17,19]	6.17	1.250		0.070	0.052	0.010	.698	
14982.819	6672.488	1-2	1	Fe I	14982.805	$e\ ^7P_4 - 4f\,(7/2)[11/2]_5^o$	[19]	6.26	0.310	0.640?	1.106	0.829	0.664	.805	
14988.781	6669.834	3	0-1	Fe I	14988.780	$n\ ^7F_6^o - 5d\ ^7F_6$	[2,17,19]	6.17	1.500		0.000	0.000	0.000	.782	
15017.716	6656.983	0-1	1	Fe I	15017.702	$n\ ^7P_4^o - 5d\ ^7F_5$	[17,19]	6.22	1.000		0.300	0.225	0.094	.704	
15025.015	6653.749	2-3	1-2	Mg I	15024.99	$4s\ ^3S_1 - 4p\ ^3P_2^o$	[15]	5.11	1.250		0.150	0.112	0.038	.99	
15067.021	6635.199	1-2	1	Fe I	15066.961	$e\ ^5D_2 - u\ ^3D_3^o$	[12,19] ♮	5.62	1.167	1.109	0.044	0.033	0.006	.961	−1.37
				Ca I	15067.041	$4s4d\ ^1D_2 - 3d4p\ ^1P_1$	[12]	4.62	1.000		0.000	0.000	0.000	.041	−2.18
15077.296	6630.677	2	1	Fe I	15077.291	$e\ ^5D_3 - u\ ^5P_3^o$	[12,15,19]	5.59	1.583	1.588?	0.194	0.063	0.000	.289	−0.51
				Fe I	15077.291	$a\ ^5P_3 - z\ ^7P_3^o$	[2,12,19]	2.18	1.792	1.787	0.438	0.141	0.000	.291	−4.20 ♪
15120.552	6611.708	3	1-2	Fe I	15120.509	$w\ ^5D_3^o - f\ ^5D_3$	[2,12,19]	5.45	1.500	1.548	0.000	0.000	0.000	.507	−0.80 ♪
15122.392	6610.904	1-2	1-2	Fe I	15122.382	$e\ ^5D_2 - u\ ^5P_3^o$	[2,12,19]	5.62	1.667	1.668?	0.378	0.117	0.000	.380	−0.38
15173.596	6588.595	2	1-2	Ni I	15173.585	$e\ ^1D_2 - 5p\ ^3D_1^o$	[1,4,12]	5.49	1.250	1.295?	0.150	0.112	−0.038	.583	−0.69
15176.720	6587.239	0-1	0-1	Fe I	15176.717	$e\ ^5F_3 - 5p\ ^3D_2^o$	[8,12,19]	5.92	1.333	1.305?	0.011	0.008	−0.001	.715	−1.26
15183.023	6584.504	3	0-1	Si I	15182.92 †		[14]							.92	
				Fe I	15182.922	$f\ ^7D_1 - 4f\,(3/2)[5/2]_2$	[19]	6.33	−0.101		2.563	1.923	2.649	.927	
15194.499	6579.531	1-2	1-2	Fe I	15194.492	$a\ ^5P_1 - z\ ^7P_2^o$	[12,19]	2.22	2.250	2.250	0.017	0.012	0.001	.492	−4.78
15201.574	6576.469	1	0-1	Fe I	15201.563	$3d^64s4p\ ^5F_2^o - f\ ^7D_3$	[8]	5.49	2.500	2.383?	0.900	0.675	−0.506	.796	
15207.545	6573.887	0	0	Fe I	15207.530	$e\ ^7D_3 - n\ ^7D_2^o$	[19]	5.39	1.500	1.510?	0.100	0.075	0.019	.525	0.21
15213.038	6571.513	2	1-2	Fe I	15213.026	$e\ ^7P_2 - 4f\,(5/2)[5/2]_3$	[2,11,19]	6.31	0.403		1.490	1.117	1.078	.024	
15219.637	6568.664	1	0-1	Fe I	15219.622	$e\ ^5D_3 - t\ ^5D_2^o$	[1,12,19]	5.59	1.500	1.516?	0.000	0.000	0.000	.620	−0.82 ♪
15224.741	6566.462	1	1	Fe I	15224.731	$e\ ^5F_2 - 5p\ ^5D_1^o$	[2,19]	5.96	0.750	0.737?	0.150	0.112	0.038	.733	
15239.737	6560.000	3 °	1	Fe I	15239.714	$g\ ^5D_3 - 5p\ ^5D_2^o$	[2,17,19]	6.42	1.500		0.000	0.000	0.000	.714	
15243.560	6558.355	1-2	1-2	Si I	15243.59 †	$3d\ ^3D_3^o - 6p\ ^3P_2$	[7,13]	6.73	1.167		0.044	0.033	0.006	.59	−0.60 ♭
15244.988	6557.741	2	0-1	Fe I	15244.973	$e\ ^5D_3 - u\ ^5F_3^o$	[12,15,19]	5.59	1.375	1.379?	0.438	0.141	0.000	.975	−0.09
15246.503	6557.089	2	1-2	Fe I	15246.495	$c\ ^3F_3 - z\ ^5D_3^o$	[1,2,12]	4.14	1.292	1.285	1.215	0.391	0.000		−3.67
				Fe I	15246.498	$f\ ^5D_1 - 6p\ ^5P_2^o$	[17,19]	6.31	2.000		0.067	0.050	−0.011	.498	
15301.562	6533.495	1-2 °	0-1	Fe I	15301.562	$e\ ^5F_3 - 5p\ ^3F_3^o$	[19]	5.92	1.167	1.159?	0.194	0.063	0.000	.560	
15343.809	6515.506	3	1	Fe I	15343.802	$e\ ^5D_0 - u\ ^5P_1^o$	[2,12,19]	5.65	2.500	2.633?	0.000	0.000	0.000	.790	−0.69
15348.951	6513.323	3	1-2	Fe I	15348.968	$v\ ^5P_3^o - 6s\ ^5D_4$	[19]	5.95	1.250	1.281?	0.083	0.063	0.014	.968	
				Mn I	15348.888	$i\ ^6D_{3/2} - y\ ^2D_{5/2}^o$	[12]	7.01	0.700	0.770?	0.467	0.350	0.194	.888	−1.21
15361.163	6508.145	2	1	Si I	15361.16	$4p\ ^3D_1 - 5s\ ^3P_2^o$	[7,8,13]	5.95	2.000		0.600	0.450	−0.300	.59	−1.99 ♭

1 $\lambda_\odot$ (Å)	2 $\sigma_\odot$ (cm⁻¹)	3 Blend‡ I)	II)	4 Ion	5 λ_{lab} (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 $g_{\text{eff}}^{\text{calc}}$ ¶	10 $g_{\text{eff}}^{\text{emp}}$	11 X_π	12 X_σ	13 Y_σ	14 λ_{calc} (Å)	15 $\log(gf)$
15376.850	6501.506	2-3 °•	1	Si I	15376.831	$3d\ ^3D_2^o - 6p\ ^3P_1$	[7,13]	6.72	1.000		0.067	0.050	0.011	.94	−0.29 ♭
				Fe I	15376.926		[2]								
15381.976	6499.339	2	1	Fe I	15381.967	$b\ ^3D_2 - z\ ^5G_2^o$	[2,18]	3.64	0.750	0.751?	2.361	0.729	0.000	.217	
15451.329	6470.167	2	1-2	Fe I	15451.308	$g\ ^5D_2 - 5p\ ^5D_1^o$	[17,19]	6.45	1.500		0.000	0.000	0.000	.306	
15459.331	6466.818	1-2	1	Fe I	15459.311		[2]								
15469.801	6462.441	1	0-1	S I	15469.80	$4p\ ^3P_1 - 5s\ ^3S_1^o$	[13,14]	8.05	1.750		0.250	0.063	0.000	.816	−0.22 ♭
15485.453	6455.909	1-2	1-2	Fe I	15485.461	$n\ ^7P_3^o - 5d\ ^7F_3$	[17,19]	6.28	1.708		1.215	0.391	0.000	.459	
15499.408	6450.097	1	1	Fe I	15499.392	$e\ ^7F_4 - (3/2)[7/2]_3^o$	[11]	6.35	2.150	2.442?	0.562	0.422	−0.244	.386	
15522.640	6440.443	2	1	Fe I	15522.614	$f\ ^5D_0 - 4f\,(5/2)[1/2]_1^o$	[19]	6.32	1.085		0.000	0.000	0.000	.612	
				Co I	15522.600	$4s4p\ ^4F_{3/2}^o - g\ ^4P_{5/2}$	[12]	6.21	2.500	2.373?	1.512	1.134	−1.134	.600	−2.76
15524.326	6439.744	0-1	0-1	Fe I	15524.311	$u\ ^5D_4^o - f\ ^5P_3$	[19]	5.79	1.250	0.852?	0.083	0.063	0.014	.313	
15527.235	6438.537	1-2	1	Fe I	15527.211	$f\ ^7D_2 - 6p\ ^5P_2^o$	[17,19]	6.32	1.917		0.094	0.029	0.000	.211	
15531.769	6436.658	1-2	1-2	Fe I	15531.758	$e\ ^5D_1 - u\ ^5F_1^o$	[1,12,19]	5.64	0.750	0.759?	2.250	0.563	0.000	.751	−0.35
				Fe I	15531.756	$e\ ^7F_6 - (9/2)[15/2]_7^o$	[2,11]	6.68	0.668	0.698?	0.415	0.312	0.151	.812	
15534.257	6435.627	1	1	Fe I	15534.247	$e\ ^5D_1 - u\ ^5P_2^o$	[10,12,19]	5.64	2.000	1.991?	0.067	0.050	−0.011	.245	−0.42
15540.591	6433.004	1	1	Ni I	15540.596		[4]								
15542.089	6432.384	1 °	0-1	Fe I	15542.083	$e\ ^5D_1 - t\ ^5D_0^o$	[1,12,19]	5.64	1.500	1.518?	0.000	0.000	0.000	.081	−0.46
				Si I	15542.016	$3p4d\ ^1D_2 - 3p6f\ (7/2)_3$	[?]	6.73							
15543.779	6431.685	1	1	Ti I	15543.68	$a\ ^3G_4 - z\ ^3G_4^o$	[1,12]	1.88	1.050	1.06	0.000	0.000	0.000	.720	−1.22
15557.786	6425.894	0	0	Si I	15557.81	$4p\ ^3D_2 - 5s\ ^3P_2^o$	[7,8]	5.96	1.333		0.378	0.117	0.000	.78	
15565.251	6422.812	1	1	Fe I	15565.231	$f\ ^7D_2 - 4f\,(5/2)[1/2]_1^o$	[19]	6.32	2.458	2.224?	0.502	0.377	−0.230	.224	
				Fe II	15565.232	$4p\ ^4S_{5/2}^o - 104761.10\,\text{cm}^{-1}$	[12]	12.19						.23	−2.92
15566.749	6422.194	0-1	0-1	Fe I	15566.729	$e\ ^5G_3 - 4f\,(3/2)[7/2]_4^o$	[11,19]	6.35	1.832	1.266?	0.403	0.302	−0.147	.727	
15579.009	6417.103	1-2	1-2	Fe I	15579.086	$f\ ^7D_2 - 6p\ ^5D_2^o$	[2,19]	6.32	1.750		0.850	0.262	0.000	.081	
15588.264	6413.330	0-1	0-1	Fe I	15588.259	$3d^64s4p\ ^5F_2^o - f\ ^5D_2$	[8]	5.49	1.250	1.366	0.850	0.263	0.000	.627	
				Fe I	15588.264	$g\ ^5D_4 - 5p\ ^5D_4^o$	[17,19]	6.37	1.500		0.000	0.000	0.000	.264	
15591.520	6411.991	1	1	Fe I	15591.497	$e\ ^7F_6 - 4f\,(9/2)[13/2]_7^o$	[11,19]	6.24	1.104	1.134?	0.094	0.071	0.016	.495	
						$e\ ^7F_2 - 4f\,(1/2)[5/2]_3^o$	[19]	6.36	0.688		0.264	0.198	0.080	.502	
15593.743	6411.077	1	1	Fe I	15593.752	$x\ ^5F_4^o - e\ ^5F_5$	[1,12,19]	5.03	1.500	1.607	0.012	0.009	−0.001	.752	−2.09
15598.889	6408.962	1	1	Fe I	15598.876	$e\ ^7F_6 - 4f\,(9/2)[11/2]_5^o$	[11,19]	6.24	1.665	1.630?	0.030	0.023	−0.003	.874	
				Ti I	15599.035	$e\ ^3F_4 - o\ ^3D_3^o$	[1,12]	4.69	1.125	1.175?	0.368	0.276	0.129	.035	0.37 ♭
15604.240	6406.764	0-1	0-1	Fe I	15604.225	$e\ ^7F_6 - 4f\,(9/2)[11/2]_6^o$	[11,19]	6.24	1.467	1.462?	0.112	0.037	0.000	.225	
15605.685	6406.171	1-2	1-2	Ni I	15605.657		[4]								
15611.151	6403.928	0	0	Fe I	15611.138	$a\ ^1P_1 - z\ ^3P_2^o$	[1,12,19] **	3.42	1.750	1.831	0.150	0.113	−0.038	.148	−3.89

Table 3. continued

1 $\lambda_\odot$ (Å)	2 $\sigma_\odot$ (cm⁻¹)	3 Blend‡ I)	II)	4 Ion	5 λ_{lab} (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 g_{eff}^{calc} ¶	10 g_{eff}^{emp}	11 X_π	12 X_σ	13 Y_σ	14 λ_{calc} (Å)	15 log(gf)
15621.679	6399.612	1	0-1	Fe I	15621.659	$e\ ^5D_4 - t\ ^5D_4^o$	[1,12,19]	5.54	1.500	1.494	0.000	0.000	0.000	.654	−0.36
15648.518	6388.636	0-1	0-1	Fe I	15648.515	$e\ ^7D_1 - n\ ^7D_1^o$	[19]	5.43	3.000	3.001?	0.000	0.000	0.000	.510	−0.67
15652.889	6386.852	0	0	Fe I	15652.874	$f\ ^7D_5 - 4f\ (9/2)[7/2]_4^o$	[11,19]	6.25	1.802	1.532?	0.049	0.037	−0.006	.876	
15662.031	6383.124	1	0-1	Fe I	15662.018	$e\ ^5F_5 - 5p\ ^5F_4^o$	[19]	5.83	1.500	1.563?	0.012	0.009	−0.001	.018	
				Fe II	15662.013	$4s4p\ ^2G_{7/2}^o - 3d^64d\ ^2H_{9/2}$	[12]	12.35	0.944		0.002	0.001	0.000	.033	−2.23
15671.023	6379.461	1-2 °	1-2	Fe I	15670.999	$f\ ^7D_1 - 4f\ (5/2)[3/2]_2^o$	[2,11,19]	6.33	0.544		1.608	1.206	1.316	1.006	
15723.609	6358.126	1-2	0	Fe I	15723.593	$e\ ^5D_2 - u\ ^5P_3^o$	[1,12,19]	5.62	1.833	1.830?	0.044	0.033	−0.006	.588	−0.14
15729.777	6355.633	2-3	1-2	Fe I	15729.763	$e\ ^5F_4 - sp3\ ^5F_5^o$	[19]	5.87	1.500	0.827?	0.030	0.023	−0.003	.768	
15731.428	6354.965	2-3	1	Fe I	15731.414	$e\ ^3D_1 - 5p\ ^3D_1^o$	[2,17,19]	6.45	0.500		0.000	0.000	0.000	.414	
15733.515	6354.123	2-3	1	Fe I	15733.511	$f\ ^5D_4 - 4f\ (9/2)[5/2]_3^o$	[2,11,19]	6.25	1.242	1.277?	0.089	0.067	0.015	.513	
15749.006	6347.873	2	0-1	Mg I	15748.988	$4p\ ^3P_0^o - 4d\ ^3D_2$	[13,15]	5.93	1.000		0.067	0.050	0.011	.988	−0.06 b
				Ti I	15748.963	$p\ ^3D_3^o - e\ ^3D_2$	[12]	5.25	1.500		0.044	0.033	−0.006	.963	−1.42
15774.084	6337.781	3	1	Fe I	15774.070	$f\ ^7D_4 - 4f\ (7/2)[9/2]_5^o$	[19]	6.30	0.936	1.088?	0.272	0.204	0.081	.072	
15789.018	6331.786	1	0-1	Fe I	15789.000	$f\ ^7D_4 - 4f\ (9/2)[9/2]_4^o$	[11,19]	6.25	1.461	1.468?	0.072	0.023	0.000	8.998	
15821.721	6318.698	1-2	1-2	Fe I	15821.712	$e\ ^5D_1 - t\ ^5D_1^o$	[9,12,19]	5.64	1.500	1.509?	0.000	0.000	0.000	.712	−0.86
				Cr I	15821.736		[2]								
15822.834	6318.254	1-2	1-2	Fe I	15822.821	$e\ ^5D_1 - u\ ^5F_2^o$	[1,12,19]	5.64	0.750	0.741?	0.150	0.113	0.038	.818	0.07
15837.660	6312.339	1-2	1-2	Fe I	15837.643	$e\ ^7F_5 - 4f\ (7/2)[9/2]_6^o$	[19]	6.30	1.456	1.458?	0.138	0.045	0.000	.648	
				Si I	15837.659 †	$3p4d\ ^3F_3 - 3p7f\ (7/2)_4$	[13]	7.12						.659	−1.46 b
15840.211	6311.323	0-1	0-1	Fe I	15840.195	$e\ ^7F_2 - 4f\ (3/2)[7/2]_3^o$	[11,19]	6.36	0.634		0.300	0.225	0.097	.195	
15858.730	6303.953	2-3 °	0-1	Fe I	15858.661	$e\ ^5D_3 - v\ ^3F_3^o$	[2,19]	5.59	1.292	1.302	1.215	0.391	0.000	.658	
15860.233	6303.355	0	0	Cr I	15860.214	$e\ ^5S_2 - w\ ^5P_2^o$	[1]	4.70	1.917	1.90?	0.094	0.029	0.000		
15863.738	6301.963	2	1-2	Fe I	15863.714	$e\ ^7P_4 - 4f\ (9/2)[5/2]_3^o$	[2,11,19]	6.26	1.867	1.455?	0.018	0.014	−0.001	.711	
15868.544	6300.054	2	1	Fe I	15868.526	$e\ ^5D_3 - t\ ^5D_3^o$	[2,12,19]	5.59	1.500	1.504?	0.000	0.000	0.000	.526	0.05
15871.459	6298.897	0-1	0-1	Fe I	15871.452		[2]								
15873.852	6297.947	0-1	0-1	?											
15901.526	6286.987	0-1	0-1	Fe I	15901.520	$e\ ^5F_3 - 5p\ ^5F_2^o$	[19]	5.92	1.500	1.472?	0.100	0.075	−0.019	.523	−0.53
15904.397	6285.852	1	1	Fe I °	15904.397	$v\ ^5P_2^o - f\ ^3D_1$	[12]	5.97	2.500	2.360?	1.067	0.800	−0.711	.397	−3.32
15906.060	6285.195	1	1	Fe I	15906.044	$e\ ^5D_2 - u\ ^5F_3^o$	[1,12,19]	5.62	1.000	0.997?	0.100	0.075	0.019	.044	0.18
				Mg I	15905.90	$5p\ ^3P_0^o - 10d\ ^3D_2$	[7,13]	6.73	1.000		0.067	0.050	0.011	.91	−1.71 b
						$5p\ ^3P_1^o - 10d\ ^3D_1$	[7,13]	6.73	1.000		1.000	0.250	0.000	.91	−2.01 b
15911.318	6283.118	1	1	Fe I	15911.304	$e\ ^5F_4 - 5p\ ^5F_3^o$	[19]	5.87	1.500	1.51	0.030	0.023	−0.003	.307	−1.80
15912.581	6282.619	2-3 °	1	Mg I	15912.60	$5p\ ^3P_2^o - 10d\ ^3D_1$	[7,13]	6.73	2.000		0.600	0.450	−0.300	.59	−3.19 b
						$5p\ ^3P_2^o - 10d\ ^3D_2$	[7,13]	6.73	1.333		0.378	0.117	0.000	.59	−2.18 b

1 $\lambda_\odot$ (Å)	2 $\sigma_\odot$ (cm⁻¹)	3 Blend‡ I)	II)	4 Ion	5 λ_{lab} (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 g_{eff}^{calc} ¶	10 g_{eff}^{emp}	11 X_π	12 X_σ	13 Y_σ	14 λ_{calc} (Å)	15 log(gf)
						$5p\ ^3P_2^o - 10d\ ^3D_3$	[7,13]	6.73	1.167		0.044	0.033	0.006	.59	−1.26 b
				Fe I	15912.594	$e\ ^7G_3 - 4f\ (1/2)[7/2]_4^o$	[11,19]	6.38	1.835	1.719?	0.214	0.161	−0.057	.597	
15928.176	6276.468	0-1	0-1	Fe I	15928.168	$e\ ^3F_4 - t\ ^3G_4^o$	[8,12,19]	5.95	1.150	1.236	0.472	0.154	0.000	.163	−0.97
15929.493	6275.949	2	1-2	Fe I	15929.477	$f\ ^5D_1 - 4f\ (7/2)[1/2]_2^o$	[2,19]	6.31	1.500	1.662?	0.000	0.000	0.000	.474	
15934.035	6274.160	0-1	0-1	Fe I	15934.022	$f\ ^5D_1 - 4f\ (7/2)[3/2]_2^o$	[11,19]	6.31	1.257 °	1.176?	0.016	0.012	0.001	.022	
15941.854	6271.083	1-2	1-2	Fe I	15941.848	$e\ ^3D_3 - sp\ ^3D_3^o$	[17]	6.36	1.333		0.000	0.000	0.000		
15943.867	6270.291	1	1	Fe I	15943.851	$g\ ^5D_4 - 4f\ (3/2)[9/2]_5^o$	[2,19]	6.37	1.056	1.082?	0.105	0.079	0.019	.848	
				Fe I	15943.851	$g\ ^5F_4 - 5f\ (7/2)[11/2]_5^o$	[19]	6.62						.869	
15945.286	6269.733	1	1	Fe I	15945.259		[2]								
15960.080	6263.921	1	1	Si I	15960.04	$4p\ ^3D_3 - 5s\ ^3P_2^o$	[7,8,13]	5.98	1.167		0.044	0.033	0.006	.06	0.13 b
15964.878	6262.039	1	1	Fe I	15964.869	$e\ ^5F_3 - 5p\ ^3G_4^o$	[9,12,19]	5.92	0.750 °	0.771?	0.120	0.090	0.024	.866	−0.21
15971.254	6259.539	2 °	1	Fe I	15971.253	$e\ ^3D_2 - 5p\ ^3P_2^o$	[2,17,19]	6.42	1.333		0.378	0.117	0.000	.250	
15972.979	6258.863	2	1	?											
15980.756	6255.817	2	1-2	Fe I	15980.728	$e\ ^5G_6 - 4f\ (9/2)[15/2]_7^o$	[11,15,19]	6.26	1.169	1.115	0.016	0.012	0.001	.728	
15997.736	6249.177	2	1-2	Fe I	15997.725	$w\ ^5F_2^o - f\ ^3D_3$	[2,18]	5.49	1.667	1.383?	0.178	0.133	−0.044		
				Fe I	15997.728	$e\ ^5F_3 - t\ ^5P_3^o$	[19]	5.92	1.458	1.452?	1.215	0.391	0.000	.725	
16009.634	6244.533	2	1-2	Fe I	16009.615	$e\ ^7D_1 - n\ ^7D_2^o$	[19]	5.43	1.500	1.499?	0.600	0.450	0.300	.610	−0.55
16021.696	6239.832	3	1	C I	16021.62		[14]								
				Fe I	16021.710	$x\ ^3D_3^o - e\ ^7G_3$	[19]	5.61	1.250	1.298	0.194	0.063	0.000	.684	
16029.425	6236.823	2	1-2	Fe I	16029.422	$e\ ^7F_4 - 4f\ (5/2)[11/2]_5^o$	[2,11,19]	6.35	0.729	0.495?	0.317	0.238	0.102	.427	
16037.834	6233.553	2-3	1	Fe I	16037.826	$e\ ^5G_6 - 4f\ (9/2)[13/2]_6^o$	[19]	6.26	1.319	1.328?	0.020	0.007	0.000	.823	
				Fe I	16037.816	$b\ ^3F_4 - z\ ^5F_5^o$	[15]	2.56	1.700	1.727	0.108	0.081	−0.020	8.125	
				Ca I	16037.844	$4s6p\ ^3P_2^o - 4s15d\ ^1D_2$	[12]	5.27	1.250		0.850	0.262	0.000	.844	−5.28
16051.757	6228.146	1	1	Fe I	16051.741	$e\ ^5G_6 - 4f\ (9/2)[11/2]_6^o$	[11,19]	6.26	1.082	1.143?	0.071	0.053	0.011	.738	
16060.042	6224.933	3	1	Si I	16060.024	$4p\ ^3D_1 - 5s\ ^3P_0$	[13,15]	5.95	0.500		0.000	0.000	0.000	.008	−0.44 b
16070.216	6220.992	1-2	1-2	Fe I	16070.185	$e\ ^5F_2 - 5p\ ^5G_2^o$	[19]	5.96	0.667	0.662?	1.511	0.467	0.000	.182	
16073.866	6219.579	3	1	Fe I	16073.869	$e\ ^7F_1 - 4f\ (5/2)[3/2]_2^o$	[2,11,19]	6.35	1.294	0.799?	0.011	0.008	0.001	.872	
16075.930	6218.781	2 °	0-1	Fe I	16075.922	$e\ ^5G_3 - 4f\ (5/2)[7/2]_4^o$	[19]	6.35	2.040	1.474?	0.606	0.454	−0.272	.919	
16088.754	6213.824	2-3 °	1	Fe I	16088.736	$e\ ^5G_3 - 4f\ (5/2)[5/2]_3^o$	[2,11,19]	6.35	1.142	1.331?	1.426	0.458	0.000	.736	
16094.818	6211.483	2	1-2	Si I	16094.800	$4p\ ^3D_2 - 5s\ ^3P_1$	[13,15]	5.96	1.000		0.067	0.050	0.011	.787	−0.11 b
16102.413	6208.553	2 °	0-1	Fe I	16102.408	$e\ ^5F_4 - 5p\ ^5G_5^o$	[12,19]	5.87	1.100	1.138?	0.033	0.025	0.003	.411	0.16
				Fe I	16102.408	$e\ ^5G_3 - 4f\ (5/2)[3/2]_2^o$	[2,11,19]	6.35	0.470	1.225?	0.318	0.239	0.106	.395	
16126.088	6199.438	3	1	?											
16150.763	6189.967	1-2	0-1	Ca I	16150.763	$5p\ ^3P_1^o - 5d\ ^3D_2$	[7,12]	4.53	1.000		0.067	0.050	0.011	.763	0.36

Table 3. continued

1 $\lambda_\odot$ (Å)	2 $\sigma_\odot$ (cm⁻¹)	3 Blend‡ I)	II)	4 Ion	5 λ_{lab} (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 g_{eff}^{calc} ¶	10 g_{eff}^{emp}	11 X_π	12 X_σ	13 Y_σ	14 λ_{calc} (Å)	15 $\log(gf)$
16155.268	6188.241	2-3	1	Ca I	16155.236	$5p\ ^3P_1^o - 5d\ ^3D_1$	[12]	4.53	1.000		1.000	0.250	0.000	.236	-0.12
16171.919	6181.869	3 °	0	Fe I	16171.932	$e\ ^7G_3 - 4f(3/2)[7/2]_3^o$	[2,11,19]	6.38	1.117	1.155?	0.070	0.023	0.000	.935	
16174.996	6180.693	2	1-2	Fe I	16174.978	$e\ ^7G_3 - 4f(3/2)[7/2]_4^o$	[2,11,19]	6.38	1.458	1.342?	0.040	0.030	-0.005	.978	
						$f\ ^5F_4 - (3/2)[7/2]_3^o$	[11]	6.38	1.775	1.787?	0.240	0.180	-0.068	5.00	
16178.016	6179.539	2-3	1-2	Fe I	16177.998	$f\ ^5F_4 - 4f(3/2)[7/2]_4^o$	[2,11,19]	6.38	1.317	1.319?	0.053	0.017	0.000	.995	
16180.929	6178.427	2	1-2	Fe I	16180.910	$e\ ^7P_3 - 4f(9/2)[3/2]_2^o$	[2,11,19]	6.28	1.782	1.323?	0.029	0.022	0.003	.905	
16195.078	6173.029	1	1	Fe I	16195.062	$e\ ^7S_3 - 4f(1/2)[7/2]_4^o$	[11,19]	6.39	0.585	0.70?	0.961	0.721	0.544	.065	
16197.040	6172.281	2	1-2	Ca I	16197.075	$5p\ ^3P_2^o - 5d\ ^3D_3$	[12]	4.53	1.167		0.044	0.033	0.006	.075	0.64
16198.510	6171.721	1-2	1-2	Fe I	16198.505	$e\ ^7D_2 - n\ ^7D_3^o$	[19]	5.41	1.500	1.491?	0.100	0.075	0.019	.502	-0.52
16207.768	6168.196	1-2 °	0-1	Fe I	16207.746	$e\ ^5G_4 - 4f(7/2)[11/2]_5^o$	[19]	6.32	1.510	1.334?	0.069	0.052	-0.010	.746	
16215.708	6165.175	0-1	0-1	Si I	16215.68	$4p\ ^3D_1 - 3d\ ^3D_1^o$	[7,8]	5.95	0.500		0.000	0.000	0.000	.67	
16225.640	6161.402	0	0	Fe I	16225.619	$a\ ^5P_3 - z\ ^7P_4^o$	[10]	2.18	1.875	1.869	0.021	0.016	-0.002	.956	
				Fe I	16225.623	$e\ ^7G_3 - 4f(3/2)[9/2]_4^o$	[19]	6.38	1.295	1.179?	0.008	0.006	0.000	.620	
16227.130	6160.836	1	1	Fe I	16227.087	$z\ ^3H_5^o - f\ ^5G_6$	[2]	5.83	2.083	1.981	0.630	0.473	-0.284	.215	
16231.673	6159.112	0	0	Fe I	16231.653	$f\ ^5F_4 - 4f(3/2)[9/2]_5^o$	[11,19]	6.38	1.356	1.346?	0.000	0.000	0.000	.650	
16235.980	6157.478	0-1	0	Fe I	16235.969	$e\ ^5F_3 - sp3\ ^5D_2^o$	[19]	5.92	1.000	0.972?	0.100	0.075	0.019	.969	
16241.866	6155.246	1-2	1-2	Si I	16241.84	$4p\ ^3D_2 - 3d\ ^3D_3^o$	[7,13]	5.96	1.500		0.044	0.033	-0.006	.83	-1.20 b
16277.496	6141.773	2	0-1	Fe I	16277.485	$f\ ^7D_2 - 6p\ ^7F_2^o$	[2,17,19]	6.32	1.750	1.672?	0.850	0.262	0.000	.485	
16284.793	6139.021	1 °	0-1	Fe I	16284.772	$f\ ^5F_3 - 4f(1/2)[7/2]_4^o$	[11,19]	6.40	1.710		0.102	0.076	-0.019	.775	
				Ti I	16284.799	$d\ ^3P_1 - v\ ^3P_2^o$	[12]	4.26	1.500		0.000	0.000	0.000	.799	-1.94
16292.851	6135.985	1-2 °	1	Fe I	16292.848	$e\ ^5F_3 - sp3\ ^5D_3^o$	[19]	5.92	1.375	1.356	0.438	0.141	0.000	.845	-0.83
16310.508	6129.342	1-2 °	0	Ni I	16310.497	$e\ ^3D_3 - w\ ^3P_2^o$	[1,4,12]	5.28	1.167	1.18?	0.044	0.033	0.006	.504	0.07
16316.347	6127.149	1-2 °	0-1	Fe I	16316.325	$e\ ^7G_7 - 4f(9/2)[15/2]_8^o$	[11,19]	6.28	1.192		0.035	0.026	0.004	.325	
16318.715	6126.260	1	1	Fe I	16318.701	$e\ ^5F_3 - sp3\ ^5F_4^o$	[19]	5.92	1.500	1.521?	0.030	0.023	-0.003	.696	
16324.463	6124.103	3 °	0	Fe I	16324.459	$e\ ^7D_3 - n\ ^7D_4^o$	[19]	5.39	1.500	1.492?	0.030	0.023	0.003	.454	-0.62
				Fe I	16324.459	$t\ ^5D_2^o - 6s\ ^5F_1$	[19]	6.40	2.250		1.350	1.012	-1.013	.480	
16331.528	6121.453	2	0-1	Fe I	16331.529	$e\ ^5F_1 - 5p\ ^3D_2^o$	[2,12,19]	5.98	1.750	1.746?	0.817	0.613	-0.476	.526	-1.33
16356.412	6112.140	2-3	1-2	Ni I	16356.402	$w\ ^3F_3^o - e\ ^3G_3$	[4,18]	5.53	0.917		0.778	0.250	0.000		
16363.114	6109.637	2	1-2	Ni I	16363.080	$e\ ^3D_3 - 5p\ ^3F_4^o$	[15]	5.28	1.125	1.115?	0.021	0.016	0.002	.189	
16377.417	6104.302	2	1-2	Fe I	16377.393	$f\ ^7D_1 - 4f(7/2)[5/2]_2^o$	[2,11,19]	6.33	0.984		1.084	0.813	0.728	.404	
						$e\ ^7G_4 - 4f(5/2)[9/2]_4^o$	[19]	6.37	1.258	1.277?	0.083	0.027	0.000	.393	
16384.158	6101.790	1	1	Fe I	16384.144	$e\ ^7F_2 - 4f(5/2)[5/2]_3^o$	[11,19]	6.36	1.236		0.028	0.021	0.003	.147	
16388.811	6100.058 ·	3	0-1	Na I	16388.792	$4p\ ^2P_{3/2}^o - 6s\ ^2S_{1/2}$	[18]	3.75	1.167		0.111	0.083	0.028	.858	
				Ni I	16388.737		[4]								

1 $\lambda_\odot$ (Å)	2 $\sigma_\odot$ (cm⁻¹)	3 Blend‡ I)	II)	4 Ion	5 λ_{lab} (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 g_{eff}^{calc} ¶	10 g_{eff}^{emp}	11 X_π	12 X_σ	13 Y_σ	14 λ_{calc} (Å)	15 $\log(gf)$
16394.400	6097.978	0	0	Fe I	16394.391	$e\ ^5F_2 - 5p\ ^5G_3^o$	[2,19]	5.96	0.833	0.843?	0.011	0.008	0.001	.391	
16396.327	6097.261	3	0-1	Fe I	16396.311	$e\ ^7G_7 - 4f(9/2)[11/2]_6^o$	[2,11,19]	6.28	1.415		0.000	0.000	0.000	.311	
16398.199	6096.565	3	1	Fe I	16398.169	$e\ ^5F_3 - 5p\ ^5G_4^o$	[19]	5.92	1.000	1.021?	0.030	0.023	0.003	.169	
16403.377	6094.644 *	3	1-2		16403.381		[2]								
16404.620	6094.179	0-1	0-1	Fe I	16404.600	$e\ ^7G_4 - 4f(5/2)[11/2]_5^o$	[11,19]	6.37	1.129	1.053?	0.016	0.012	0.001	.605	
				Ti I	16404.563	$e\ ^3G_4 - p\ ^3F_4^o$	[12]	5.13	1.150		0.472	0.154	0.000	.563	-0.07
16407.818	6092.991	2	0-1	Fe I	16407.791	$f\ ^5D_2 - 4f(9/2)[3/2]_1^o$	[2,11,19]	6.29	1.119	1.290?	0.347	0.261	0.132	.791	
				Ti I	16407.797	$x\ ^3G_5^o - b\ ^3G_4$	[12]	3.72	1.500	1.470?	0.108	0.081	-0.020	.797	-3.26
16434.979	6082.922	3	0-1	Si I	16434.93	$4p\ ^3D_2 - 3d\ ^3D_1^o$	[13,14]	5.96	1.500		0.267	0.200	-0.089	.926	-1.47 b
16436.632	6082.310	0-1	0-1	Fe I	16436.626	$e\ ^5F_3 - 5p\ ^3D_3^o$	[9,12,19]	5.92	1.292	1.285?	0.049	0.016	0.000	.626	-0.02
16440.421	6080.908	1	0-1	Fe I	16440.402	$f\ ^5D_2 - 4f(9/2)[5/2]_2^o$	[11,19]	6.29	1.611	1.668?	0.168	0.052	0.000	.399	
16444.840	6079.274	1	0-1	Fe I	16444.818	$e\ ^5F_5 - 5p\ ^5F_5^o$	[9,12,19]	5.83	1.400	1.410?	0.000	0.000	0.000	.818	0.52
16466.944	6071.114	2-3	0	Fe I	16466.927	$e\ ^7S_3 - 4f(3/2)[7/2]_4^o$	[2,11,19]	6.39	0.208	0.33?	1.542	1.157	1.106	.927	
16468.511	6070.533	1-2	1-2	Fe II	16468.527	$z\ ^6D_{5/2}^o - c\ ^2F_{5/2}$	[12] *	4.82	1.257	1.255?	3.232	1.024	0.000	.359	
16474.094	6068.479	1	0-1	Fe I	16474.085	$e\ ^3F_3 - t\ ^3G_3^o$	[8,12,19]	6.02	0.917	1.014	0.778	0.250	0.000	.082	-0.96 j
16486.686	6063.844	1	0-1	Fe I	16486.669	$e\ ^5F_5 - 5p\ ^5G_6^o$	[9,12,19]	5.83	1.167	1.114?	0.031	0.023	0.003	.672	0.72
16506.303	6056.637	3	0-1	Fe I	16506.298	$e\ ^5F_4 - 5p\ ^3G_4^o$	[2,12,19]	5.95	1.150	1.169?	0.472	0.154	0.000	.298	-0.51
16517.251	6052.623	0-1	0	Fe I	16517.228	$e\ ^5G_5 - 4f(9/2)[13/2]_6^o$	[11,19]	6.29	1.401	1.167?	0.010	0.008	-0.001	.225	
				Fe II	16517.225	$d\ ^2F_{7/2} - z\ ^4G_{7/2}^o$	[2]	6.81	1.063	1.056?	0.233	0.076	0.000	.425	
16524.494	6049.970	2	1-2	Fe I	16524.471	$f\ ^5F_5 - 4f(7/2)[13/2]_6^o$	[2,11,19]	6.34	0.924	0.964?	0.129	0.097	0.026	.471	
				Fe I	16524.466	$e\ ^5F_1 - t\ ^5P_1^o$	[15]	5.98	1.250	1.254?	6.250	1.563	0.000		
16532.004	6047.221	2-3	0	Fe I	16531.989	$e\ ^5G_5 - 4f(9/2)[11/2]_5^o$	[2,11,19]	6.29	1.350	1.397?	0.496	0.163	0.000	.989	
16539.212	6044.586	1-2	1-2	Fe I	16539.195	$f\ ^5F_5 - 4f(7/2)[11/2]_5^o$	[19]	6.34	1.335	1.327?	0.301	0.099	0.000	.195	
16544.699	6042.581	2	0-1	Fe I	16544.672	$f\ ^5F_5 - 4f(7/2)[9/2]_5^o$	[19]	6.34	1.406	1.398?	0.003	0.001	0.000	.672	
16550.396	6040.501	3	1	Ni I	16550.384		[4]								
16552.018	6039.909	2	0	Fe I	16551.997	$f\ ^5F_2 - 4f(1/2)[7/2]_3^o$	[19]	6.41	1.108	1.141?	0.005	0.003	0.000	.997	
16559.711	6037.103	2	1-2	Fe I	16559.682	$f\ ^5F_3 - 4f(3/2)[7/2]_4^o$	[2,11,19]	6.40	1.333		0.003	0.002	0.000	.682	
16584.475	6028.089	1-2 °	1	Ni I	16584.438	$e\ ^3D_2 - 3d^84s4p\ ^1P_1^o$	[4]	5.31	1.250	1.128?	0.017	0.012	-0.001	.8	
16586.057	6027.514	1-2 °	1	Fe I	16586.054	$e\ ^5D_2 - t\ ^5D_3^o$	[2,12,19]	5.62	1.500	1.497?	0.000	0.000	0.000	.054	-0.94
16607.649	6019.677	2	1-2	Fe I	16607.636	$e\ ^7F_3 - 6p\ ^5D_3^o$	[2,17,19]	6.34	1.500	1.499?	0.000	0.000	0.000	.633	
16612.786	6017.816	1-2	1-2	Fe I	16612.766	$f\ ^5F_3 - 4f(3/2)[9/2]_4^o$	[2,11,19]	6.40	1.170		0.003	0.002	0.000	.766	
16619.730	6015.302	3	1	Fe I	16619.745	$e\ ^5D_3 - t\ ^5D_4^o$	[2,12,19]	5.59	1.500	1.453	0.000	0.000	0.000	.739	-1.74
16645.883	6005.851	0-1	0-1	Fe I	16645.877	$e\ ^5F_2 - 5p\ ^5F_2^o$	[19]	5.96	1.000	0.996?	0.000	0.000	0.000	.880	
16648.244	6004.999	3	1	Fe I	16648.205	$5p\ ^3G_5^o - 5d\ ^3G_5$	[2,19]	6.55	1.200		0.000	0.000	0.000	.205	

Table 3. continued

1 $\lambda_\odot$ (Å)	2 $\sigma_\odot$ (cm⁻¹)	3 Blend‡ I)	3 Blend‡ II)	4 Ion	5 λ_{lab} (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 g_{eff}^{calc} ¶	10 g_{eff}^{emp}	11 X_π	12 X_σ	13 Y_σ	14 λ_{calc} (Å)	15 log(gf)
16661.393	6000.260	1	0	Fe I	16661.376	$e\ ^7F_3 - 4f\ (7/2)[7/2]^o_4$	[11,19]	6.34	0.965	0.967?	0.137	0.103	0.029	.384	
16665.490	5998.785	1	0-1	Fe I	16665.484	$e\ ^3F_3 - 5p\ ^5D^o_2$	[19]	6.02	0.667	0.714?	0.278	0.208	0.087	.487	
16673.715	5995.826	1	0	Ni I	16673.702	$3d^95p\ ^1F^o_3 - f\ ^3G_4$	[4] ††	6.03	1.125	1.08?	0.007	0.006	0.000	.2	
				Co I	16673.398	$x\ ^4G^o_{11/2} - f\ ^4F_{9/2}$	[1,12]	5.15	1.136		0.021	0.016	0.002	.398	−0.93 b
16680.809	5993.276	1-2 *	0-1	Si I	16680.77 †	$4p\ ^3D_3 - 3d\ ^3D^o_3$	[7,13] ‡	5.98	1.333		0.000	0.000	0.000	.77	−0.50 b
				Fe I	16680.836	$g\ ^5D_3 - 5p\ ^5D^o_4$	[17,19]	6.42	1.500	1.512?	0.000	0.000	0.000	.836	
16685.582	5991.562	1-2	0-1	Fe I	16685.541	$e\ ^7F_3 - 6p\ ^7F^o_2$	[2,17,19]	6.34	1.500	1.498?	0.000	0.000	0.000	.547	
16693.106	5988.861	0-1	0-1	Fe I	16693.080	$f\ ^5F_1 - 4f\ (1/2)[5/2]^o_2$	[11,19]	6.42	0.586		0.092	0.069	−0.018	.077	
16718.977	5979.594	1 *	1	Al I	16718.957 †	$4p\ ^2P^o_{1/2} - 4d\ ^2D_{3/2}$	[7,13] ‡	4.09	0.833		0.004	0.003	0.000	.957	0.29 b
				Fe I	16719.077	$e\ ^5F_4 - sp3\ ^3F^o_3$	[19]	5.87	1.750	1.703?	0.213	0.160	−0.057	.074	
16723.284	5978.054	0-1	0-1	Fe I	16723.280	$e\ ^5F_3 - sp3\ ^5F^o_3$	[19]	5.92	1.250	1.243?	0.000	0.000	0.000	.280	
16750.614	5968.300	2-3 °	0-1	Al I $^\beta$	16750.587	$4p\ ^2P^o_{3/2} - 4d\ ^2D_{5/2}$	[6,7,13] #	4.09	1.100		0.019	0.014	0.002	.564	0.55 b
16753.088	5967.419	0-1	0-1	Fe I	16753.070	$f\ ^5F_4 - 4f\ (5/2)[11/2]^o_5$	[11,19]	6.38	1.029	1.019?	0.055	0.041	0.007	.073	
16760.134	5964.910	0-1	0-1	Fe I	16760.094		[2]								
				Mg II	16760.306	$5p\ ^2P^o_{1/2} - 5d\ ^2D_{3/2}$	[5,7,13]	12.08	0.833		0.004	0.003		.219	0.48 b
16763.361	5963.762	2	0	Al I	16763.366	$4p\ ^2P^o_{3/2} - 4d\ ^2D_{3/2}$	[13,15]	4.09	1.067		0.583	0.171	0.000	.360	−0.40 b
16783.038	5956.770	1	0-1	Fe I	16783.039	$f\ ^7D_4 - 4f\ (9/2)[7/2]^o_4$	[11,19]	6.30	1.575	1.537?	0.269	0.088	0.000	.042	
16794.225	5952.802	1-2	0-1	Fe I	16794.204	$sp3\ ^3F^o_4 - 58906\ cm^{-1}$	[2,19]	6.57						.210	
16799.660	5950.876	0-1	0-1	Fe I	16799.651	$e\ ^5F_4 - 5p\ ^3F^o_4$	[19]	5.87	1.300	1.290?	0.118	0.038	0.000	.651	
16811.378	5946.728	3	1	Fe I	16811.377	$f\ ^7D_4 - 4f\ (9/2)[9/2]^o_5$	[2,11,19]	6.30	0.813	0.965?	0.374	0.280	0.130	.380	
16815.474	5945.279	0	0	Ni I	16815.465	$e\ ^3D_2 - w\ ^3P^o_2$	[1,4,12]	5.31	1.333	1.293?	0.378	0.117	0.000	.470	−0.55
16818.763	5944.117	0-1	0-1	Ni I	16818.747		[4]								
16820.540	5943.489	0	0	Fe I	16820.515	$v\ ^5F^o_3 - e\ ^3G_4$	[1,12]	5.97	0.750	0.886	0.120	0.090	0.024	.220	−1.58
16828.182	5940.790	2	0-1	Si I	16828.18	$4p\ ^3D_3 - 3d\ ^3D^o_2$	[13,14]	5.98	1.500		0.044	0.033	−0.006	.159	−1.39 b
16833.135	5939.042	1-2	0-1	Fe I	16833.122		[2]								
16837.819	5937.390	3 °	0-1	Fe I	16837.897	$f\ ^5F_2 - 4f\ (3/2)[7/2]^o_3$	[2,11,19]	6.41	1.134		0.007	0.005	0.000	.880	
16843.243	5935.478	1-2	1-2	Fe I	16843.236	$e\ ^5F_4 - y\ ^1H^o_5$	[2,19]	5.87	0.300	0.428?	0.588	0.441	0.257	.230	
16867.298	5927.013	1-2 *	1	Ni I	16867.264	$e\ ^3D_1 - 3d^95p\ ^3F^o_2$	[1,4]	5.47	0.750		0.017	0.012	−0.001	.40	
				Fe I	16867.292		[2]								
16874.145	5924.608	2 °	1-2	Fe I	16874.119	$e\ ^7G_5 - 4f\ (7/2)[13/2]^o_6$	[2,11,19]	6.35	1.007	0.977?	0.074	0.055	0.011	.119	
16890.406	5918.904	2-3 °	1-2	C I	16890.36	$3p\ ^1D_2 - 3d\ ^1F^o_3$	[13,14]	9.00	1.000		0.000	0.000	0.000	.897	0.56 b
				Fe I	16890.417	$e\ ^5H_6 - 4f\ (7/2)[13/2]^o_7$	[19]	6.62	1.809	1.879?	0.212	0.159	−0.055	.417	
16898.904	5915.928	2	0-1	Fe I	16898.882	$e\ ^7P_2 - 4f\ (9/2)[5/2]^o_3$	[19]	6.31	1.011		0.700	0.525	0.347	.885	
				Cr I	16898.897	$x\ ^5D^o_4 - f\ ^5D_4$	[12]	5.32	1.500	1.479	0.000	0.000	0.000	.897	−1.12

1 $\lambda_\odot$ (Å)	2 $\sigma_\odot$ (cm⁻¹)	3 Blend‡ I)	3 Blend‡ II)	4 Ion	5 λ_{lab} (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 g_{eff}^{calc} ¶	10 g_{eff}^{emp}	11 X_π	12 X_σ	13 Y_σ	14 λ_{calc} (Å)	15 log(gf)
16929.850	5905.114	2	1	Mn I	16929.861	$e\ ^4P_{3/2} - 9p\ ^8P^o_{5/2}$	[12]	6.41	3.000	2.700?	0.952	0.714	−0.567	.861	−3.16
16945.297	5899.731	1	0-1	Ni I	16945.307	$3d^84s4p\ ^3F^o_4 - e\ ^3G_5$	[1,4,12]	5.36	1.100	1.11	0.012	0.009	0.001	.280	−1.22
16957.803	5895.380	0-1	0-1	Si I	16957.794	$5p\ ^3D_3 - 8s\ ^3P^o_2$	[7,13]	7.09	1.167		0.044	0.033	0.006	.80	−1.18 b
16969.917	5891.171	3	0	Fe I	16969.912	$e\ ^3F_4 - 5p\ ^5G^o_4$	[19]	5.95	1.200	1.219?	0.118	0.038	0.000	.915	
16994.760	5882.560 *	3	1-2	Fe I	16994.737	$v\ ^3D^o_2 - f\ ^3F_3$	[2,18]	6.11	1.000	1.188	0.011	0.008	0.001	5.404	
16996.271	5882.037	1-2	0-1	Ni I	16996.246	$e\ ^3D_2 - 3d^95p\ ^1F^o_3$	[4,15] ††	5.31	0.833	0.915?	0.044	0.033	0.006	.7	
				Fe I	16996.238	$w\ ^3F^o_3 - f\ ^3F_3$	[12,19]	6.11	1.083	1.118	0.000	0.000	0.000	.232	−3.13
17001.034	5880.389	0-1	0	Ni I	17001.026	$e\ ^1D_2 - 3d^95p\quad ^3$	[4]	5.49						.6	
17005.448	5878.862	2-3	0	Fe I	17005.449	$e\ ^3F_2 - 5p\ ^3D^o_1$	[2,19]	6.07	0.750	0.683?	0.017	0.012	−0.001	.452	
17009.021	5877.628	0-1	0-1	Fe I	17008.999	$g\ ^5F_4 - 4f\ (7/2)[5/2]^o_3$	[19]	6.62	1.322		0.001	0.001	0.000	.973	
17011.107	5876.907	1	0-1	Fe I	17011.101	$e\ ^3F_4 - 5p\ ^3D^o_3$	[9,12,19]	5.95	1.125	1.220?	0.021	0.016	0.000	.101	−0.13
17027.626	5871.206 *	3	0-1	Fe I	17027.622	$g\ ^5F_4 - 4f\ (7/2)[9/2]^o_5$	[19]	6.62	1.536		0.018	0.014	−0.001	.613	
17033.676	5869.120	3	1	Fe I	17033.665	$e\ ^7S_3 - 4f\ (5/2)[9/2]^o_4$	[19]	6.39	0.040	0.160?	1.844	1.383	1.446	.662	
17037.794	5867.702	2-3	0-1	Fe I	17037.793	$e\ ^7S_3 - 4f\ (5/2)[7/2]^o_4$	[19]	6.39	0.415	0.535?	1.206	0.904	0.765	.793	
17045.159	5865.166	2-3	0	Ca I	17045.102	$4s4f\ ^3F^o_4 - 4s10d\ ^3D_3$	[12]	5.23	1.125		0.021	0.016	0.002	.102	−1.55
17052.197	5862.746 *	3	0	Fe I	17052.184	$e\ ^7S_3 - 4f\ (5/2)[5/2]^o_3$	[2,11,19]	6.39	1.684	1.64?	2.796	0.899	0.000	.184	
17067.672	5857.430	2-3 °	0	Fe I	17067.677	$t\ ^5D^o_3 - 6s\ ^3F_3$	[2,17]	6.37	1.292		1.215	0.391	0.000		
17075.149	5854.865	3	0-1	Fe I	17075.152	$e\ ^5F_3 - 5p\ ^5D^o_4$	[19]	5.92	1.875	1.896?	0.188	0.141	−0.047	.126	
				Fe I	17075.181	$e\ ^5F_2 - 4s4p\ ^5D^o_3$	[12]	5.96	2.000	1.961	0.400	0.300	−0.150	.182	−0.25
				Co I	17075.135	$t\ ^4D^o_{1/2} - h\ ^4F_{3/2}$	[12]	6.02	0.500	0.415	0.040	0.030	−0.006	.135	−2.00
17088.864	5850.166	1-2 °	0-1	Ni II $^\alpha$	17088.853	$5s\ ^2P_{3/2} - 4s4p\ ^4F^o_{5/2}$	[12]	13.55	0.800		0.098	0.073	0.019	.853	−3.47
17094.469	5848.248	2-3	1	Fe I	17094.451	$g\ ^5D_3 - 4f\ (3/2)[3/2]^o_2$	[19]	6.42	1.850	1.834?	0.196	0.147	−0.051	.471	
				Fe I	17094.451	$g\ ^5F_3 - 4f\ (5/2)[5/2]^o_3$	[19]	6.67	1.309		0.097	0.031	0.000	.436	
17097.153	5847.330	2	0-1	Fe I	17097.144		[2]								
17108.657	5843.398	1	0-1	Mg I	17108.632	$4s\ ^1S_0 - 4p\ ^1P^o_1$	[7,8,13]	5.39	1.000		0.000	0.000	0.000	.663	0.14 b
17120.547	5839.340	2-3	1	Ni I	17120.506	$w\ ^3P^o_2 - f\ ^3S_1$	[1,4,12]	6.04	1.250		0.150	0.112	0.038	.571	0.09
17131.002	5835.776	1	0-1	Fe I	17130.961	$e\ ^7G_5 - 6p\ ^5F^o_4$	[17,19]	6.35	1.400	1.437?	0.001	0.001	0.000	.955	
17137.127	5833.691	2-3	1	Fe I	17137.116	$n\ ^7P_3 - 5d\ ^7P^o_3$	[2,17]	6.28	1.917		0.000	0.000	0.000		
17144.141	5831.304	2	0-1	Fe I	17144.084		[2]								
17161.115	5825.536	1-2	\0-1	Fe I	17161.109	$e\ ^3F_3 - 5p\ ^3G^o_3$	[9,12,19]	6.02	0.917 °	0.929?	0.778	0.250	0.000	.106	−0.15
17166.201	5823.810	2	0	Fe I	17166.198	$e\ ^3F_4 - 5p\ ^5D^o_3$	[2,19]	5.95	0.875	0.970?	0.188	0.141	0.047	.204	
17192.836	5814.788	3	1	Fe I	17192.832	$e\ ^7G_4 - 4f\ (7/2)[7/2]^o_3$	[2,11,19]	6.37	1.105	1.325?	0.051	0.038	0.007	.829	
17200.338	5812.252 *	3 °	0-1	Fe I	17200.313	$e\ ^7G_4 - 4f\ (7/2)[9/2]^o_4$	[2,11,19]	6.37	1.366	1.410?	0.206	0.067	0.000	.316	
17204.304	5810.912	1-2 °	1	Fe I	17204.303	$e\ ^3F_3 - 5p\ ^3D^o_2$	[9,12,19]	6.02	1.000	1.047?	0.011	0.008	0.001	.300	−0.02

Table 3. continued

1 $\lambda_\odot$ (Å)	2 $\sigma_\odot$ (cm^{-1})	3 Blend‡ I)	II)	4 Ion	5 λ_{lab} (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 $g_{\text{eff}}^{\text{calc}}$ ¶	10 $g_{\text{eff}}^{\text{emp}}$	11 X_π	12 X_σ	13 Y_σ	14 λ_{calc} (Å)	15 log(gf)
				Cr I	17204.379		[2]								
17205.719	5810.434	1-2	1	Si I	17205.76	$4p\ ^3P_1 - 5s\ ^1P_1^o$	[13,14]	6.08	1.250		0.250	0.063	0.000	.731	−1.59 b
17221.432	5805.133	3	1	Fe I	17221.400	$e\ ^5P_3 - 4f(3/2)[7/2]_3^o$	[2,11,19]	6.43	1.367	1.366?	2.520	0.810	0.000	.400	
17232.221	5801.498	2-3	1	Fe I	17232.232	$e\ ^5F_5 - 5p\ ^3G_5^o$	[2,19]	5.83	1.300	1.310?	0.712	0.234	0.000	.232	
17234.455	5800.746	3	1-2	C I	17234.47	$3d\ ^3F_3 - 4f\ ^1[9/2]_4$	[13,14]	9.70						.473	0.17 b
17257.593	5792.969 *	3 °	0-1	Fe I	17257.571	$f\ ^7D_2 - 4f(9/2)[3/2]_1^o$	[11,19]	6.32	1.869	1.635?	0.041	0.031	0.005	.571	
17278.723	5785.885 *	3	1-2	Fe I	17278.727	$f\ ^5G_3 - 4f(3/2)[7/2]_4^o$	[19]	6.72	1.832	1.494?	0.403	0.302	−0.147	.727	
17282.318	5784.681	1 *	0	Fe I	17282.299	$e\ ^5P_3 - 4f(3/2)[9/2]_4^o$	[11,19]	6.43	0.545	0.549?	0.604	0.453	0.271	.296	
17306.565	5776.576	2-3	0-1	Ni I	17306.518	$e\ ^1D_2 - 5p\ ^3F_2^o$	[1,4,12]	5.49	0.833	0.88?	0.378	0.117	0.000	.611	−0.56
17327.374	5769.639	1-2	1-2	Si I	17327.29	$3p3d\ ^1F_3 - 3p4f\ (9/2)_4$	[13,15]	6.62						.276	0.73 b
17360.705	5758.562	2	1-2	Ni I	17360.673		[4]								
17374.673	5753.933 *	3	1-2	Fe I	17374.677	$w\ ^5P_2^o - e\ ^5P_2$	[2,18,19]	5.74	2.333		0.000	0.000	0.000	.677	
17399.410	5745.752	1-2	0-1	Ni I	17399.385		[4]								
17400.591	5745.362	2	1	Fe I	17400.585	$u\ ^5F_4^o - 5d\ ^7G_5$	[2,17,19]	6.37	1.400		0.001	0.001	0.000	.582	
17433.666	5734.462	1	0-1	Fe I	17433.644	$f\ ^5F_2 - 4f(5/2)[7/2]_3^o$	[11,19]	6.41	1.302	1.335?	0.036	0.027	−0.004	.638	
17448.585	5729.559	1 *	0-1	C I	17448.58	$3p\ ^1D_2 - 4s\ ^1P_1^o$	[7,13] ‡	9.00	1.000		0.000	0.000	0.000	.582	0.04 b
				Fe I	17448.558		[2]								
17453.864	5727.826	2	1	Fe I	17453.842	$f\ ^5F_2 - 4f(5/2)[5/2]_3^o$	[11,19]	6.41	1.736	1.769?	0.217	0.163	−0.060	.842	
				Fe I	17453.833	$v\ ^5F_2^o - h\ ^5D_2$	[12]	5.98	1.250	1.384?	0.850	0.262	0.000	.834	−2.46
17456.027	5727.116	2	0-1	C I	17455.99	$3d\ ^3F_2^o - 4f\ [7/2]_3$	[13,14]	9.70						.986	0.43 b
17478.034	5719.905	2	1-2	Fe I	17478.022	$h\ ^5D_3 - 4f(7/2)[7/2]_4^o$	[19]	6.64	0.965		0.137	0.103	0.029	.016	
17480.671	5719.042	1-2	1	Fe I	17480.653		[2]								
17488.561	5716.462	2	0	Fe I	17488.567	$f\ ^5F_2 - 4f(5/2)[1/2]_1^o$	[19]	6.41	0.958	0.908?	0.004	0.003	0.000	.585	
				Fe I	17488.567	$h\ ^5D_3 - 4f(9/2)[9/2]_4^o$	[19]	6.64	1.330		0.014	0.010	0.001	.549	
17500.014	5712.721	2-3	1-2	Fe I	17499.983	$e\ ^5F_2 - sp3\ ^3F_2^o$	[19]	5.96	0.833	0.829?	0.378	0.117	0.000	.986	
17505.661	5710.878	1-2	0	C I	17505.62	$3d\ ^3F_3^o - 4f\ ^1[7/2]_4$	[13,14]							.717	0.63 b
17518.103	5706.822	2	1-2	Fe I	17518.121	$z\ ^5F_4^o - c\ ^3F_4$	[19]	3.37	1.300	1.310	0.118	0.038	0.000	.133	
17522.765	5705.304 *	3 °	1	Sc I	17522.776	$5s\ ^4D_{3/2} - 5p\ ^4D_{5/2}^o$	[12]	4.27	1.500	1.506?	0.031	0.023	−0.003	.777	0.22
17524.312	5704.800	1-2	0-1	Fe I	17524.294	$w\ ^3G_4^o - e\ ^3G_4$	[2,18]	6.00	1.050		0.000	0.000	0.000		
17531.201	5702.558	2-3	1-2	Fe I	17531.174	$f\ ^5P_2 - 4f(7/2)[5/2]_3^o$	[19]	6.64	0.905		0.345	0.259	0.120	.174	
17534.798	5701.389	2	1	Fe I	17534.744	$f\ ^5P_2 - 4f(7/2)[5/2]_2^o$	[19]	6.64	1.745		0.107	0.033	0.000	.741	
17536.934	5700.694	2	0-1	Fe I	17536.900	$w\ ^5G_3^o - g\ ^5F_4$	[2,18]	5.91	2.000	1.979?	0.563	0.423	−0.244	7.676	
17538.645	5700.138	1-2	0-1	Fe I	17538.635	$w\ ^5P_3^o - e\ ^5P_3$	[10,12,19]	5.72	1.667	1.661	0.000	0.000	0.000	.644	−1.66
17543.433	5698.582	2-3	0	Fe I	17543.436		[2]								

1 $\lambda_\odot$ (Å)	2 $\sigma_\odot$ (cm^{-1})	3 Blend‡ I)	II)	4 Ion	5 λ_{lab} (Å)	6 Transition	7 Ref.	8 χ_e (eV)	9 $g_{\text{eff}}^{\text{calc}}$ ¶	10 $g_{\text{eff}}^{\text{emp}}$	11 X_π	12 X_σ	13 Y_σ	14 λ_{calc} (Å)	15 log(gf)
17575.323	5688.242	1-2	1-2	Fe I	17575.327	$u\ ^5F_3^o - 5d\ ^7F_4$	[19]	6.40	1.875		0.188	0.141	−0.047	.324	
17577.857	5687.422	3 °	1-2	Fe I	17577.799	$f\ ^5F_4 - 4f(7/2)[7/2]_4^o$	[2,11,19]	6.38	1.318	1.321?	0.048	0.016	0.000	.799	
17617.026	5674.777	2	0	Si I	17617.08	$3d\ ^1F_3^o - 4f\ ^1[7/2]_4$	[13,14]	6.62						6.946	0.13 b
				Fe I	17616.986	$y\ ^3G_4^o - f\ ^5F_5$	[12]	5.63	2.100	2.046	0.588	0.441	−0.257	.986	−4.06
17630.877	5670.319	2-3 °	0	Fe I	17630.886		[2]								
17644.269	5666.015	2	1	Fe I	17644.265		[2]								
17672.167	5657.071	3	0	Fe I	17672.122	$w\ ^5P_1^o - e\ ^5P_2$	[2,12,19]	5.75	1.500	1.532?	0.267	0.200	0.089	.116	−2.17
				Fe I	17672.188	$e\ ^3D_3 - v\ ^1G_4^o$	[12]	6.36	0.500	0.615	0.333	0.250	0.111	.188	−2.56
17683.918	5653.311	2-3	1-2	Fe I	17683.910	$f\ ^5F_5 - 4f(9/2)[13/2]_6^o$	[2,11,19]	6.34	1.068	1.107?	0.063	0.047	0.009	.923	
17689.542	5651.514	2-3	1-2	Fe I	17689.483	$f\ ^5F_5 - 4f(9/2)[9/2]_6^o$	[2,11,19]	6.34	1.386	1.378?	0.015	0.005	0.000	.480	
17695.935	5649.472	2-3	1	Fe I	17695.942	$e\ ^3F_4 - 5p\ ^5D_4^o$	[19]	5.95	1.375	1.394?	0.738	0.241	0.000	.942	
17699.073	5648.471 *	3	1	Al I	17699.095 †	$5s\ ^2S_{1/2} - 6p\ ^2P_{3/2}^o$	[7,16]	4.67	1.167		0.111	0.083	0.028	.095	−1.16 ç
				Cr I	17699.044	$c\ ^5D_0 - y\ ^5D_1^o$	[12]	4.42	1.500	1.503?	0.000	0.000	0.000	.044	−3.92
17700.857	5647.902 *	2	1	Fe I	17700.843	$f\ ^5F_5 - 4f(9/2)[11/2]_5^o$	[2,11,19]	6.34	1.417	1.409?	0.021	0.007	0.000	.843	
17706.666	5646.049	3	1	Fe I	17706.630	$v\ ^5F_3^o - f\ ^5G_4$	[12,19]	5.97	1.000	1.021?	0.030	0.023	0.003	.665	−2.25
				Fe I	17706.630	$g\ ^5F_5 - 4f(9/2)[9/2]_5^o$	[19]	6.58	1.385		0.015	0.005	0.000	.617	
17708.736	5645.389 *	3	1-2	Cr I	17708.730		[3]								
17710.854	5644.713	1-2	1	Fe I	17710.847		[2]								
17712.720	5644.119	1	0-1	Fe I	17712.731		[2]								
17714.368	5643.594 *	3 °	1	Fe I	17714.364	$g\ ^5F_5 - 4f(9/2)[9/2]_4^o$	[19]	6.58	1.356		0.002	0.002	0.000	.364	
17717.159	5642.705	3	0-1	Fe I	17717.139	$e\ ^5S_2 - 4f(9/2)[3/2]_1^o$	[2,11,19]	6.34	1.869	1.798?	0.041	0.031	0.005	.139	
17747.352	5633.105	3 °	0-1	Fe I	17747.377	$e\ ^5F_3 - 5p\ ^5F_4^o$	[2,19]	5.92	1.500	1.521?	0.030	0.023	−0.003	.374	
17765.311	5627.410	3	1-2	?											
17768.967	5626.253	1-2	1-2	C I	17768.94	$3d\ ^3D_1^o - 4f\ [5/2]_2$	[13,14]	9.71						.913	0.16 b
17771.128	5625.568	3 °	1-2	Fe I	17771.126	$e\ ^3F_4 - 5p\ ^5G_5^o$	[2,12,19]	5.95	1.300	1.224?	0.001	0.001	0.000	.126	0.11
17788.038	5620.221 *	3	1-2	Fe I	17788.067		[2]								
17789.689	5619.699	3	1-2	C I	17789.655 †	$2p^3\ ^3D_2 - 3p\ ^3D_2$	[13]	7.95	1.167		0.000	0.000	0.000	.655	−1.53 b
17793.249	5618.575 *	3	0-1	C I	17793.264 †	$3d\ ^3D_2^o - 4f\ [7/2]_3$	[13]	9.71						.264	−1.38 b
17813.960	5612.042	3	0-1	C I	17814.03	$3d\ ^3D_3^o - 4f\ [5/2]_3$	[13,14]	9.71						.031	−0.05 b
17822.474	5609.361	2-3	1-2	Fe I	17822.503	$e\ ^7G_7 - 6p\ ^7F_6^o$	[19]	6.28	1.214		0.049	0.037	0.006	.513	
17826.319	5608.151	2-3	1-2	C I	17826.32	$3d\ ^3D_3^o - 4f\ [7/2]_4$	[13,14]	9.71						.419	−0.51 b
17830.694	5606.776 *	3	1-2	Fe I	17830.696		[2]								
17861.713	5597.039	3	1	Fe I	17861.727	$f\ ^5P_3 - 5p\ ^5F_3^o$	[2,17,19]	6.59	1.458		1.215	0.391	0.000	.724	
17876.032	5592.555	3	1	Fe I	17876.023	$g\ ^5D_2 - 4f(3/2)[7/2]_3^o$	[2,19]	6.45	0.634	0.564?	0.300	0.225	0.097	.023	

Table 3. continued

1 λ$_\odot$ (Å)	2 σ$_\odot$ (cm^{-1})	3 Blend‡ I)	II)	4 Ion	5 λ$_{lab}$ (Å)	6 Transition	7 Ref.	8 χ$_e$ (eV)	9 g$_{eff}^{calc}$ ¶	10 g$_{eff}^{emp}$	11 X$_\pi$	12 X$_\sigma$	13 Y$_\sigma$	14 λ$_{calc}$ (Å)	15 log(gf)
17885.074	5589.728	3	1	Fe I	17885.119		[2]								
17889.372	5588.385	0–1	0	Fe I	17889.342		[2]								
17893.870	5586.980	3	1	Ni I	17893.824		[4]								
17895.605	5586.438	3	1	Fe I	17895.579		[2]								
17926.364	5576.853	2	0–1	Fe I	17926.351	$f\ ^5G_2 - 4f(3/2)[5/2]_3^\circ$	[19]	6.74	2.191		1.380	1.035	−0.961	.357	
17932.658	5574.896	3	1–2	Fe I	17932.605	$e\ ^5P_2 - 4f(3/2)[7/2]_3^\circ$	[2,11,19]	6.46	0.301		0.939	0.704	0.539	.602	
17943.145	5571.638 *	3	0–1	Fe I	17943.114	$f\ ^5G_2 - 4f(3/2)[7/2]_3^\circ$	[19]	6.74	1.801		0.861	0.646	−0.474	.117	
17951.869	5568.930	2	0	Ni I	17951.841		[4,14]								
17968.096	5563.900	3	1–2	Fe I	17968.110	$h\ ^5D_4 - 4f(9/2)[5/2]_3^\circ$	[19]	6.59	1.242	1.080?	0.089	0.067	0.015	.113	
17971.995	5562.694 *	3 °	1	Fe I	17971.983	$f\ ^5P_3 - 4f(9/2)[5/2]_2^\circ$	[19]	6.59	1.611		0.005	0.004	0.000	.989	
17979.411	5560.399	2–3	0–1	Fe I	17979.383		[2]								
17982.325	5559.498	1	0	Fe I	17982.299	$x\ ^3G_3^\circ - g\ ^5F_4$	[2]	5.93	2.250	2.373?	1.080	0.810	−0.648	.441	
				Fe I	17982.302	$h\ ^5D_4 - 4f(9/2)[7/2]_3^\circ$	[19]	6.59	1.519	1.357?	0.001	0.000	0.000	.312	

Table 4. Possible blends rejected as too weak

λ$_\odot$ (Å)	Ion	λ$_{lab}$ (Å)	χ$_e$ (eV)	log(gf)
15207.545	Cr I	15207.607	5.47	−2.14
15219.637	Cr I	15219.669	6.03	−3.55
15224.741	Ni II	15224.768	14.09	−2.97
15246.503	Cr II	15246.478	12.23	−2.71
	Ni II	15246.478	15.16	−3.24
15671.023	Sc I	15670.977	4.95	−1.13
15774.084	V I	15774.061	2.13	−2.12
15906.060	Co I	15906.072	5.79	−2.04
16094.818	Cr II	16094.826	13.56	−0.24
16126.088	Ca I	16126.034	5.83	−4.70
16231.673	Mn I	16231.704	7.02	−2.99
16396.327	Fe II	16396.277	13.32	−3.54
16444.840	Ni I	16444.800	13.24	−2.96
16584.475	P I	16584.500 †	8.25	−0.42
16837.819	Mn II	16837.846	13.44	−3.14
	V II	16837.846	6.10	−4.06
17037.794	V I	17037.741	2.68	−1.70
	Mn II	17037.799	12.87	−1.85
17131.002	Ni II	17130.962	16.26	−3.18
17144.141	Cr II	17144.093	12.56	−4.03
17161.115	V II	17161.103	8.03	−4.32
17204.304	Cr II	17204.280	13.64	−0.87
17234.455	V I	17234.383	5.45	−1.67
17433.666	Fe II	17433.642	12.79	−1.83
17478.034	Ni II	17478.019	15.15	−0.82
17534.798	Ni II	17534.793	16.12	−1.68
	Ni II	17534.701	16.12	−2.25
17700.857	Ni II	17700.862	16.23	−3.18
17747.352	V I	17747.336	4.26	−3.27
17813.960	Ca I	17813.961	5.27	−6.00
17822.474	V I	17822.447	1.87	−2.44
17876.032	Co I	17876.049	5.79	−2.58
17932.658	Ni II	17932.644	16.23	−0.94
17951.869	Fe II	17951.836	12.95	−3.14

References:

[1] = Biémont (1976)
[2] = Biémont et al. (1985a)
[3] = Biémont et al. (1985b)
[4] = Biémont et al. (1986)
[5] = Biémont & Brault (1987a)
[6] = Biémont & Brault (1987b)
[7] = Biémont & Grevesse (1973)
[8] = Hall (1974)
[9] = Litzén (1976)
[10] =Litzén & Vergès (1976)
[11] =Johansson & Learner (1990). In accordance with this reference JK notation is used for the levels of the $3d^6\,4s\,(^6D)\,4f$ configuration.
[12] =Kurucz (1991c)
[13] =Kurucz & Peytremann (1975)
[14] =Livingston & Wallace (1991)
[15] =Wallace & Livingston (1991)
[16] =Martin & Zalubas (1979)
[17] =Nave & Johansson (1993)
[18] =Mohler (1955)
[19] =Nave et al. (1994)

Notes to tables III and IV:

* (in column: $\sigma_\odot$): The wavenumber of this line was taken from the purely solar component of the Livingston & Wallace (1991) spectral atlas due to the too strong telluric blending of the line in the Delbouille et al. (1981) spectral atlas.

‡ (in colum Blend): Subcolumn marked I) lists the blending index derived from the Delbouille et al. (1981) spectral atlas and II) the blending index determined from the Livingston & Wallace (1991) atlas. The latter blending index was obtained from the purely solar component of the observed spectrum.

° (in subcolumn: I): In the Delbouille et al. (1981) atlas these lines look less blended than the values given here, but according to the Livingston & Wallace (1991) atlas the lines are blended with a telluric line having almost the same wavelength, so that the blends show no readily visible effects.

• Line is blended according to Biémont et al. (1985a).

α (in column: Ion): According to the available $log(gf)$ this identification is extremely unlikely.

β According to Biémont & Brault (1987a,b) this line is a blend of different hyperfine components.

† (in column: λ_{lab}): For this line no laboratory wavelength is available in the above references therefore the calculated wavelength has been written instead.

♮ (in column: Ref.): The order of the multiple line identifications represents their probable contribution to the line (e.g. due to the huge equivalent width of the primary identification, the secondary (blend) probably provides only a very small contribution to the line).

** The sign of the Landé factor of Fe I 15611.151 Å is opposite to that expected from the observed Stokes V profile, so that the identification is probably wrong.

* This transition involves a change in total spin $\Delta S > 1$, making the identification uncertain. Such identifications are listed only where no other possible identification is known.

†† Ni I 16673.715 Å and Ni I 16996.271 Å: The laboratory wavelengths of both lines can be matched much better by the calculated wavelengths of the transitions identified by Biémont & Brault (1987b) if the $3d^9 5p\ ^1F_3^o$ level common to both lies at 48672.085 ± 0.015 cm^{-1} (instead of 48671.9 cm^{-1} listed in Corliss & Sugar, 1981).

‡ Due to the large equivalent width of the primary identification, the secondary identification (blend) probably contributes only a very minute amount to the line.

\# Al I 16750.614 Å is blended with a telluric line of about the same wavelength and is also distorted by the large hyperfine splitting of the given transition (see Biémont & Brault 1987b).

¶ (in column: $g_{\text{eff}}^{\text{calc}}$): For most transitions the LS coupling Landé factors of the upper and lower levels are used to determine g_{eff}. For the levels of the $3d^6 4s\ (^6D)\ 4f$ configuration g values have been taken from Johansson & Learner (1990).

° According to Stokes profile calculations by Muglach & Solanki (1992) the g_{eff} values listed here are incompatible with the observed splittings of these lines.

? (in column: $g_{\text{eff}}^{\text{emp}}$): If only g_l or g_u is available from laboratory measurements, the missing atomic level Landé factor is assumed to be represented by its LS coupling value.

ɟ (in column: $log(gf)$): This $log(gf)$ value has been taken from Nave et al. (1994).

♭ This $log(gf)$ value was obtained from the compilation by Kurucz & Peytremann (1975).

ς This $log(gf)$ value was derived from Biémont & Grevesse (1973). All other $log(gf)$ values are from Kurucz (1991c).