Atomic Transition Probabilities for Iron, Cobalt, and Nickel (A Critical Data Compilation of Allowed Lines)

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Atomic transition probabilities for about 5100 spectral lines of the elements iron, cobalt, and nickel in all stages of ionization have been critically evaluated and compiled. All available literature sources have been considered. Systematic trends along isoelectronic sequences have been exploited to predict oscillator strengths (f-values) whenever no data were available in the literature. The data are presented in separate tables for each element and stage of ionization and are arranged according to multiplets and, where appropriate, also according to transition arrays and increasing quantum numbers. For each line the transition probability for spontaneous emission, the absorption oscillator strength, and the line strength are given, along with the spectroscopic designation, the wavelength, the statistical weights, and the energy levels (when available) of the upper and lower atomic states. In addition, the estimated accuracy and the literature reference are indicated. In short introductions which precede the tables for each spectrum, the main justifications for the choice of the adopted data and for the accuracy ratings are discussed. A general introduction contains additional details on the evaluation procedure.

Key words: Allowed transitions; cobalt; f-values; iron; isoelectronic sequence; line strengths; nickel; oscillator strengths; systematic trends; transition probabilities.

Contents

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1. Introductory Remarks

This work represents the most recent installment in the NBS series of critical data compilations of atomic transition probabilities [1] for iron group elements. Earlier publications in this series covered forbidden transitions for these elements [1],[2] as well as allowed transitions for scandium and titanium [2] and for vanadium, chromium, and manganese [3]. As this publication goes to press, the earlier compilations are being updated and revised, and it is planned to assemble all this material into a comprehensive compilation of transition probabilities for the iron group elements. This is to be published in book form as Volume III of Atomic Transition Probabilities, in the same (NSRDS–NBS) series as the NBS data compilations for the first twenty elements [4,5].

The literature sources were taken from the bibliographies on atomic transition probabilities which have been published by this NBS data center [6]. In addition, the more recent literature has been taken from a master reference list which is maintained and continually updated in the data center. This material includes some as yet unpublished results which have been communicated to us by researchers in the field.

Inasmuch as iron and nickel (and, to a lesser extent, cobalt) are very important elements both astrophysically and as components in magnetic fusion devices, a large number of data sources are available. The literature on the first spectrum of iron is by far the most abundant of all species covered here. Fairly reliable experimental data are also available for neutral cobalt and nickel, as well as for the singly ionized species of iron and nickel. Beyond the second spectra, few or no reliable experimental data exist, although some results based on theoretical calculations have been published. For several intermediate stages of ionization no results have been tabulated here—either because of the lack of data or because we estimate the results to be of questionable reliability. A fair number of data are available for the higher stages of ionization, and it was possible to predict the oscillator strengths of additional transitions by means of interpolation procedures.

2. Method of Evaluation

In evaluating a source of data, one first considers the general accuracy and reliability of results produced by the theoretical or experimental method used. The next step is to ascertain whether and to what extent certain factors critical to that method have been accounted for in the particular work considered.

A detailed discussion of the critical factors relevant to each technique can be found in one of the earlier NBS data compilations [5]. Some examples of critical factors are the degree of self-absorption present in emission experiments, the presence of line blending and/or cascading in experimental determinations of radiative lifetimes of atomic states, and the mixing of quantum mechanical states in theoretical calculations due to configuration interaction and/or intermediate coupling. In experimental work these critical factors can, for example, be checked and corrected for by means of special tests, modeling, or modifications to the experimental apparatus which serve to minimize sources of systematic error, or they can at least be approximately accounted for in the uncertainty estimates. Improvements to theoretical calculations may entail the inclusion of additional terms in the atomic Hamiltonian and/or the augmentation of the basis set used in calculating wave functions and transition matrix elements.

In addition to evaluating the overall merits of the method applied, as well as allowances made for the pertinent critical factors, one can make judgments regarding the relative significance of those critical factors to the types of transitions treated. For example, certain experimental techniques are better suited to the determination of oscillator strengths for strong lines as opposed to weak ones, or vice versa; others may favor resonance lines over transitions between excited states. In theoretical calculations one expects relativistic effects to be more drastic for certain transitions than for others; likewise, correlation effects are highly dependent upon the complexity of the structure being studied. Thus even in cases where some critical factors have been neglected by an author (or have not been mentioned in the published work) we have nevertheless included the data in this compilation if the method used is considered to be fairly reliable for the types of transitions treated. In the more doubtful cases, however, we are necessarily more conservative with our error estimates.

The comparison of results obtained by different investigators has served as still another helpful technique in the evaluation process. This is particularly true whenever intercomparisons can be made among several sources of data for the transition(s) in common in order to pinpoint serious discrepancies more readily. Another instance is the comparison of sums of transition probabilities out of a common upper level to the reciprocal of the lifetime of that level as measured by an independent technique; in this manner it is possible, for example, to determine whether renormalization of an absolute scale is advisable. Another valuable analytical tool which has been exploited in the critical evaluation procedure is the degree of fit of

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[1] Transition probabilities, oscillator strengths (f-values), and line strengths are equivalent quantities. The numerical relationships among these quantities are given in the conversion table (table 5) at the end of this introduction.

[2] Numbers in brackets indicate the literature references.

published results into established systematic trends along isoelectronic sequences of the lighter elements. Applied mainly to the higher ions, this technique becomes in essence an additional critical factor on which the accuracy of the data can be judged.

2.1. Review of Data Sources

Some general remarks on the selected sources of data are given below. A more detailed discussion can be found in the short introductions which accompany the tables for individual spectra.

2.1.1. Experimental Data Sources

The experimental data for iron, cobalt, and nickel are essentially limited to neutral and singly ionized species, as has been the case for other elements of the iron group. For these species the experimental material is the dominant source of information and is far superior to the existing theoretical data. Some additional experimental data are available for more highly ionized species, mainly in the form of lifetime measurements from beam-foil spectroscopy experiments. These data have contributed in an indirect way to this compilation, either by providing checks on theoretical data or by providing material for establishing systematic trends along isoelectronic sequences, which often yield interpolated f-values for highly ionized species.

Relative transition probability data have been supplied by emission experiments and, to a lesser extent, by absorption and anomalous dispersion ("hook") measurements. *Absolute* scales for these data have frequently been determined by experiments of a quite different kind, typically by determinations of atomic mean lives of a few important excited levels, such as lifetimes of the upper levels of resonance lines. It is thus convenient to discuss the experimental data sources for relative and absolute scales separately.

(a) *Relative transition probabilities.* The quantity that is directly measured in the emission, absorption, or hook techniques is proportional to the product of the transition probability and the population of the initial atomic state (i.e., the upper state in emission experiments and the lower state in absorption or hook experiments). Measurements are sometimes restricted to transitions originating from a single atomic state, as in the branching ratio technique. In such a case the population of the initial state is constant and does not enter into relative transition probability measurements. In other experiments, however, the determination of the relative populations of the various atomic states is one of the most critical problems. For the discharges or hot vapors involved, the existence of partial local thermodynamic equilibrium (PLTE), i.e., a Boltzmann distribution of excited atomic levels, may be assumed. Equilibrium criteria have indeed established that PLTE conditions for the excited atomic states hold for the typical experimental situation. But to relate the various level populations quantitatively, knowledge of the temperature is required—and these temperature measurements are often a source of considerable systematic uncertainty.

For the first spectrum of iron there are by far many more data available than for any other species compiled here. For this reason, and also because many of these data are the results of rather advanced experimental work, we feel that Fe I deserves a relatively detailed discussion.

The majority of the compiled data originate from two comprehensive emission experiments, both performed with stabilized arcs: May et al. [7] and Bridges and Kornblith [8] have measured a total of about 1500 fairly accurate f-values (with uncertainties in the 25–50% range), which represent nearly a third of the data tabulated in this compilation. The data overlap for about 170 transitions, and, with the exception of a few lines, the agreement between these two experiments is very good, as is clearly seen from figures 3, 4, and 5 of the Fe I introduction; for example, 84% of the data compared agree to within 25%. These figures also show that no systematic differences between the two sets of data are apparent when f-value ratios are plotted against wavelength (except for four ultraviolet lines, see fig. 3 of that introduction), log gf (intensity) (fig. 4), or upper energy level (fig. 5). (For a more detailed discussion, see the Fe I introduction.) While the two experiments are quite similar in conception, the technical approach used by Bridges and Kornblith is more advanced. In contrast to the photographic recording method used by May et al., the data acquisition technique of Bridges and Kornblith is based on photoelectric detection and digital data processing. Furthermore, the arc source used by the latter authors is equipped with a self-regulating system. Guided by signal monitors, the gas flows in the arc chamber are closely controlled by feedback circuits. When variations in the signals occur, valves are activated to self-stabilize the source. Furthermore, Bridges and Kornblith used a temperature measurement technique which minimized systematic uncertainties associated with the PLTE model. For their determination of the arc temperature, they utilized available lifetime data for about 40 different Fe I energy levels which span a wide range of excitation energies. May et al., in turn, normalized their relative data to the scale established by Bridges and Kornblith.

A third experiment of key importance for the Fe I spectrum is the absorption work of Blackwell et al. [9–11] with a precisely stabilized electric furnace. Their measurements represent a new level of sophistication in experimental f-value determinations of complex atoms. Precisions of about 0.5% have been obtained on a common relative scale for many of the measured lines. Their spectrometric detection system is fully computer-controlled and the data are processed online. Two spectrometers are employed to measure various line pairs, which are then linked together in loops through overlapping lines and are checked and adjusted for internal consistency. Their measurements are, however, limited to groups of lines originating either from low-lying levels or from levels of the ground term itself, so that only about 100 transitions could be treated.

Another important source of data are the "hook" measurements performed by Huber and co-workers [12–14]. In these experiments, an absorbing column of hot Fe atoms has been generated either in an electric furnace or in a shock tube. The shock heating technique could be used to study transitions from highly excited levels, while the electric furnace allowed the measurement of lines originating only from lower excited levels or from levels of the ground term. With shock heating, however, spectroscopic temperature measurements—which again involve the assumption of PLTE—sensitively affect the transition probability data. A comparison with the data of Bridges and Kornblith, illustrated in figure 1, shows an energy dependent trend (plotted here versus *lower* energy level), indicating a likely temperature error. It appears that the source of error lies with the Huber and Parkinson data, since Bridges and Kornblith have minimized their temperature measurement uncertainties by fitting their data to numerous independently determined lifetimes, as discussed earlier. On the other hand, the electric furnace work by Banfield and Huber covers a very limited range of energy levels, and the temperature measurements should be more precise. Thus one would not expect any energy dependent systematic errors, which is indeed borne out by the excellent agreement between their data and those of Bridges and Kornblith, shown in figure 2.

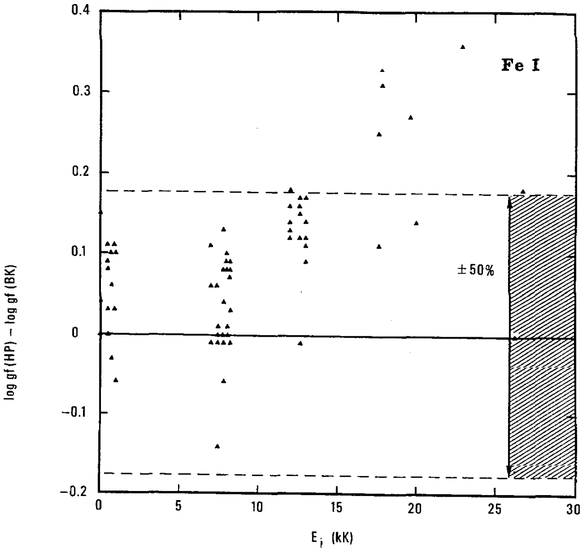

FIGURE 1. Plot of log gf (Huber and Parkinson [14])—log gf (Bridges and Ko- [8]) vs lower energy level.

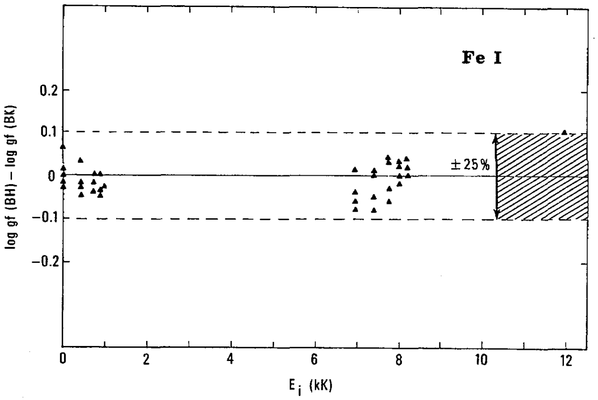

FIGURE 2. Plot of log gf (Banfield and Huber [12])—log gf (Bridges and Kornblith [8]) vs lower energy level.

Next to Fe I, the largest sets of experimental data exist for Ni I and Co I, consisting of approximately 280 and 220 lines, respectively. The selected sources of relative data for Ni I are the anomalous dispersion (hook) work (supplemented by a few weak lines measured by the absorption technique) by Huber and Sandeman [15] and branching ratio measurements by Lennard et al. [16] with a hollow cathode discharge. The two data sets are quite consistent, with three-fourths of the overlapping lines adhering to a common scale to within 25% or better. The data for Co I are from a similar group of experiments; the relative values are results of the hook measurements by Cardon and Smith [17] and the branching ratio technique of Whaling [18] with a hollow cathode discharge. As in the case of Ni I, the two sources of data are fully consistent.

Relative data for the singly ionized species are even less plentiful. Fairly reliable results exist for only about 130 lines of Fe II and are from the following sources: the emission experiments with wall-stabilized arcs by Bridges [19] and Baschek et al. [20]; the shock tube-emission work by Wolnik et al. [21]; the branching ratio measurements by Smith and Whaling [22] with a hollow cathode discharge; the hook experiment by Huber [13]; and the analysis of solar spectra by Blackwell et al. [23] and Phillips [24]. For Ni II, the principal source for the about 50 tabulated lines is the wall stabilized arc experiment by Bell et al. [25]. For Co II, however, the scatter among the few available (and very limited) sets of experimental data is very large—up to factors of 10—and cannot be definitely traced to any particular source, so that no attempt to tabulate numerical material was made.

(b) *Absolute transition probabilities.* As noted earlier, in emission as well as absorption or hook experiments the quantity that is directly measured is proportional to the product of the transition probability and the initial atomic state population. To obtain absolute data the populations have to be determined on an absolute basis, which is far more complex and involves more-stringent assumptions (e.g., complete LTE) than do relative transition probability measurements, as discussed above. Consequently, the determination of absolute data by any of these approaches is subject to considerable additional uncertainties.

If, however, a *common* relative scale for the transition probabilities of a species is established, the conversion to an absolute basis can be accomplished by an independent absolute measurement for only one transition. Precision measurements for one or a few key lines of a spectrum—primarily resonance transitions—are indeed readily accomplished via atomic lifetime techniques. Thus in recent years the combination of lifetime measurements with one of the methods discussed earlier has emerged as a very useful approach for determining large numbers of absolute transition probabilities in a reliable manner. We have therefore converted relative transition probability data to an absolute scale via the results of lifetime measurements whenever possible.

Before reviewing the sources of lifetime data, we wish to point out that the lifetime method, while representing a conceptually straightforward time-decay measurement, is not without problems of its own. For example, some lifetime techniques are based on the nonselective excitation of atomic states, which leads to cascading effects due to the simultaneous excitation of higher feeder states and the associated lengthening of observed lifetimes. Another limitation is that lifetimes are inverse *sums* of transition probabilities, comprising all possible downward transitions from a given excited atomic state. For complex spectra such as those encountered here, these sums often involve many lines, and the relative transition probability data may be quite incomplete, thus precluding the utilization of lifetime measurements. For the first and second spectra of Fe, Co, and Ni, however, many of the available lifetime data could be utilized, since either the transition probability sums are complete or the missing terms are estimated to be small. Furthermore, a number of the data were obtained with selective excitation techniques, which are very accurate.

Especially for the upper level ($z\ ^5F_5^o$) of the Fe I resonance line 3720 Å, some very accurate lifetime data have been obtained, as seen in table 1. A large variety of techniques has been employed: the Hanle effect by Hilborn and de Zafra [26]; the delayed coincidence method by Klose [27]; the optical double resonance technique by Wagner and Otten [28]; and the high frequency deflection technique by Brzozowski et al. [29]. By including the contributions of weak lines originating from the $z\ ^5F_5^o$ level, we have converted these lifetimes to oscillator strengths, which are further supplemented by the precise atomic beam result of Bell and Tubbs [30]. Several other recent lifetime experiments have yielded data for highly excited levels of Fe I, but have not been directly utilized in this compilation since relative transition probability sums were incomplete. These data were, however, used as "upper-limit" checks on the compiled material and were found to be fully consistent with it.

The situation is similar for the other spectra: For Co I, the lifetime measurements by Figger et al. [31], who applied a laser to achieve selective level excitations, provide accurate absolute data which have been utilized to place the earlier cited relative transition probability data on an absolute scale. For Ni I, both the delayed coincidence method incorporating selective laser excitation and the Hanle-effect technique were used by Becker and co-workers [32,33] to determine the absolute scale, and in the case of Fe II, phase-shift lifetime mesurements by Assousa and Smith [34] served the same purpose.

TABLE 1. Selected lifetime-oscillator strength data for the Fe I resonance level.

Reference	τ(ns) of the $z\ ^5F_5^o$ level	Oscillator strength of the 3719.93 Å line
Wagner and Otten [28]	59.5 ± 1.6	0.0425
Klose [27]	61.5 ± 0.4	0.0413
Hilborn and de Zafra [26]	63.2 ± 3.6	0.0400
Brzozowski et al. [29]	60.5 ± 1.5	0.0418
Bell and Tubbs [30]		0.041 ± 0.003

2.1.2. Theoretical Data Sources and Systematic Trends

As mentioned earlier, theoretically determined data for ions of iron are fairly abundant in the literature—at least in comparison with the corresponding ions of other iron group elements. Several sources include data for nickel ions as well, but references on cobalt are rather scarce. Thus while our earlier data compilations on scandium through manganese [2,3] relied very heavily on the interpolation or extrapolation of data from graphs of systematic trends of oscillator strengths along isoelectronic sequences, this approach did not constitute the principal means of providing tabulated data in the present work. Systematic trends were nevertheless utilized, both as an analytical tool in evaluating data and as a method of predicting *f*-values which were nonexistent in the literature. In cases where wavelengths of individual spectral lines were available but only multiplet oscillator strengths were reported in the literature or were derived by interpolation, we have derived *f*-values for the lines by decomposing the multiplet strength according to *LS* coupling—but only where we felt that this was a good approximation to the actual physical situation.

One phenomenon that manifests itself in the study of systematic trends along isoelectronic sequences is the change in the quantum character of eigenstates with increasing nuclear charge Z. This can, for example, lead to drastic variations in oscillator strengths, particularly for the member(s) of the sequence at (or nearest) which a designation interchange occurs. It may also result in increasingly greater values of the oscillator strength, as Z increases, for an intercombination line; such transitions are generally too weak to be observed in neutral and weakly ionized species of the light elements, but they may compete with transitions allowed in *LS* coupling in heavier species isoelectronic with those elements. In addition, it poses the problem of establishing a standard system of nomenclature for "mixed" eigenstates and raises the companion question of how a meaningful comparison of oscillator strength data along the sequence should be made. Because of the growing importance of this phenomenon with increasing nuclear charge, and in view of the magnitude of its effects as indicated in published theoretical work for iron group elements and beyond, this topic is discussed in more detail in section 2.2 below and thus will not be further elaborated on at this point.

We shall now turn to a brief review of the principal sources of theoretical data that have been selected for inclusion in this tabulation, or that have been major determining factors in arriving at our own predicted *f*-values.

Advanced techniques that have been used in calculating transition probabilities are the relativistic random phase approximation (RRPA), the multiconfiguration Dirac-Fock (MCDF) method, and the diverse variational approaches which allow for extensive configuration interaction and at least some relativistic effects.

Of the RRPA calculations reported for ions of iron group elements, the most advanced is that of Shorer [35] for resonance transitions in Ne-like ions, in which significant configuration interaction in the upper state was accounted for. Other sources using this same technique, but with a more limited configuration basis, include the work of Lin and co-workers [36–39] for Be-like and He-like ions, and that of Shorer et al. [40] for Mg-like species.

The (relativistic) MCDF technique has been applied by Cheng et al. [41] to the determination of *f*-values for all transitions of the type $2s^a 2p^b - 2s^{a-1} 2p^{b+1}$ in isoelectronic sequences of Li through F. It has also been used by Cheng and Johnson [42,43] for Be-like and Mg-like species; Armstrong and co-workers [44,45] for Li, Be, and Ar sequences; Cheng and Kim [46] for Ne-like ions; and Kim and Desclaux [47] for Be-like ions. In addition, Kim and co-workers [47–49] have applied the single-configuration Dirac-Fock method to calculate *f*-values for the Li and Na sequences.

Comprehensive variational calculations incorporating a large number of configurations as well as relativistic effects have been reported by Glass [50–53] for Be-like ions and B-like Fe. Also, superposition-of-configurations (SOC) calculations have been carried out in intermediate coupling by Weiss [54,55] for ions of the Be, Mg, and Ar sequences; he has also determined multiplet *f*-values via the nonrelativistic SOC approach for the Al sequence [54,55]. The nonrelativistic multiconfiguration Hartree-Fock (MCHF) method has been used by Froese Fischer [56–59] to calculate multiplet oscillator strengths for the isoelectronic sequences of Na, Mg, and Al. The (nonrelativistic) non-closed shell many-electron theory (NCMET) was used by Sinanoglu and Beck [60] to predict one multiplet oscillator strength for Si-like ions. Also, the sophisticated nonrelativistic variational calculations of Weiss [61] for low ions of the He sequence enabled us to extrapolate oscillator strengths for a few multiplets in He-like Fe through Ni.

The scaled Thomas-Fermi (STF) approximation has been exploited in several transition probability calculations on iron-group elements. Of these, the most advanced are the multiconfiguration approaches, including relativistic effects, of Bely-Dubau et al. [62] for Li-like (Fe XXIV) satellite lines of He-like resonance lines and of Nussbaumer and Storey [63] for numerous transitions in Be-like species. Additional, somewhat less-sophisticated sources of data based on the STF method are the calculations of Nussbaumer and co-workers [64–67] for Cl- and Ne-like Fe and Ni, as well as Fe XIII and XXIII; Mason and co-workers [68,69] for Fe XI, XIV, and XXI; Kastner and co-workers [70–72] in Fe XIII, XV, and XIX, as well as Co XVI; Hayes [73] for Fe XXIV; both Biemont [74] and Kurucz and Peytremann [75] for Fe III and Ni III; and Warner and Kirkpatrick [76] for Fe VII and Co VIII.

In addition to the MCDF and MCHF calculations mentioned earlier, the results of several somewhat less-sophisticated Hartree-Fock (HF) approximations have been used. These include the intermediate coupling approaches, with limited allowance for configuration interaction, of Chapman and Shadmi [77] for F-like ions, of Shamey [78] for Be-like ions, and of Dankwort and Trefftz [79] for B-like ions; the Hartree-Fock-Pauli (HFP) approximations of Weiss [80] for the Li sequence, and of Bogdanovicius et al. [81] for Fe XIX; the single-configuration HF calculations of Biemont [82] and Tull et al. [83] for Na-like ions, and of Chapman [84] for Fe XXII and XXIII.

A number of Hartree-Fock calculations have incorporated empirical adjustments to radial integrals. This technique has been used in conjunction with Cowan's HX (Hartree-Fock with statistical exchange) and Hartree-XR (HX with relativistic effects) programs, with explicit allowance for configuration interaction in some cases, to calculate gf-values for many ions of Fe as well as a few of Ni: Fe VIII [85]; Fe IX–XV [86]; Fe X,XI [87]; Fe XI, Ni XIII, XIV [88]; Fe XII, XIII [89]; Fe XV [90]; Fe XVII [91]; Fe XVIII, XIX [92]; Fe XIX [93]; Fe XX [94]; Fe XXII, XXIII [95]; Fe XXIII, XXIV [96]; Fe XXIV [97]; and Ni XXV, XXVI [98]. The calculations of Blaha [99] for Fe XIV also utilized a semi-empirical Hartree-Fock approach.

A relativistic multiconfiguration parametric-potential method has been applied by Aymar and Luc-Koenig [100] to the calculation of f-values for the Mg sequence. A single-configuration parametric-potential calculation has been performed in intermediate coupling by Crance [101] for Ne-like ions.

The nuclear-charge (Z-)expansion approach has been applied by several authors to the determination of oscillator strengths for He-like ions: the "unified relativistic" calculations of Drake [102]; the method of Brown and Cortez [103] based on variational wave functions for low-Z ions; and the less sophisticated approach of Laughlin [104]. A nonrelativistic multiconfiguration Z-expansion calculation has been reported by Fox and Dalgarno [105] for a few multiplets involving doubly excited states in Li-like species. Z-expansion perturbation theory has been applied by Vainshtein and Safronova [106] to the determination of transition probabilities for He- and Li-like satellites to resonance lines in H- and He-like species, respectively. Froese Fischer [107] has used a "simulated Z-expansion technique" to parametrize transition integrals for numerous multiplets in the Na sequence.

A number of f-values for Li-like ions are the results of studies by Smith and Wiese [108] and Martin and Wiese [109] of systematic trends of oscillator strengths along the isoelectronic sequence.

Quite a few sources of theoretically derived data have been rejected by us in the course of our critical evaluation process. One source in particular contains f-value data for numerous transitions: the scaled Thomas-Fermi (STF) approximation of Kurucz and Peytremann [75] for the neutral atoms, as well as the singly to quadruply ionized species, of Fe-group elements. Their work has already been critically reviewed in a previous compilation [3], which included several graphical comparisons of the data of ref. [75] with the more reliable experimentally determined values. In view of the outcome of those comparisons, as well as the rather crude nature of the theoretical method used by Kurucz and Peytremann to calculate oscillator strengths for lines of the complex transition arrays found in Fe-group elements, we quote their results for only two of the spectra (Fe III and Ni III) covered in the present compilation.

2.2. Spectroscopic Designations and Electron Coupling

One of the recurring problems encountered in evaluating and compiling data for these tables was the assignment of spectroscopic designations to the upper and lower states of transitions. Spectroscopists have somewhat divided opinions on the subject. One possibility is to label a state according to the largest component of its (calculated) eigenvector, although this approach does not yield unique designations if there exist two or more states with a common leading component. Alternatively, the systematic behavior of wavelengths and intensities of a "given transition" along an isoelectronic sequence suggests that a common name be applied to the upper or lower state of all ions, regardless of changes in the quantum mechanical character of that state along the sequence.

There are problems which arise in both of these approaches. Certainly calculated eigenvectors provide a quantitative, and therefore supposedly more objective, framework on which to base decisions concerning nomenclature. The accuracy and reliability of results of such calculations, however, depends quite heavily on the theoretical or semi-empirical method used to produce them. (Even quite sophisticated theoretical approaches can yield erroneous results if applied to atomic or ionic systems in which two or more eigenstates are very nearly degenerate energetically.) The alternative approach of applying the same notation to a given state of all ions in an isoelectronic sequence, based on systematic trends in wavelengths and intensities of observed spectral lines, fails to recognize the true quantum character of the state in question. Changes in the eigenvector along the sequence may lead to a reversal of the dominant component in ions of nuclear charge Z beyond some minimum value $Z_{\min}$. In some cases, moreover, a change in the coupling notation at some point in the sequence may be desirable.

In the process of evaluating and compiling transition probability data several problem areas related to the designation of energy levels and to changes in electron coupling come to light. It is particularly perplexing, for example, to find that calculated oscillator strengths, energy levels, and eigenvectors available from one source of data cannot be unequivocally matched with experimentally determined energy levels from another because of differences in nomenclature. Further difficulties arise whenever interpolation techniques are used to predict f-values for an ion which lies within an interval in the pertinent isoelectronic sequence where a change in the coupling scheme takes place. In such cases the uncertainties in calculated eigenvector components would probably be of such a magnitude as to preclude a definitive assignment. Certainly the interpolated f-values would have to be considered to be quite unreliable, and the pairing of such predicted oscillator strengths with particular spectroscopic designations could be misleading.

For the present compilation we have designated the eigenstates according to the dominant eigenvector component whenever such information was available and sufficiently unambiguous. For certain states of several species we have adopted notations such as J_1j

and/or J_1l coupling if this constituted an improvement over the Russell-Saunders (LS) designation. This was particularly true for the Ne-like ions of Fe through Ni, for example, where the LS-coupling designations given by Loulergue and Nussbaumer [65] for the two $J = 1$ levels of the $2p^5 3s$ configuration in Fe XVII and Ni XIX were indicated by them to be representative of the corresponding levels in lower-Z ions. Their calculated eigenvectors for these levels in suggest that the names should be interchanged, but that the purity in LS coupling is rather low. A transformation to the J_1j-coupling scheme clearly demonstrates a significant improvement, as seen in table 2 below. The validity of such a transformation is borne out by the calculations of Crance [101], who labeled the $2p^5ns$ ($n \geq 3$) states of these ions in J_1j-coupling notation (although he did not publish his calculated eigenvectors). Crance's calculated f-value data support this action as well, since in pure LS coupling the oscillator strength for a $^1S_0$–$^3P_1$ (i.e., intercombination) transition is zero, while Crance's results predict virtual equality of the f-values for transito the two $J = 1$ levels in Ne-like chromium.

TABLE 2. Eigenvector components and percentage compositions from ref. [65] for $J = 1$ states of the $2p^5 3s$ configuration in Fe XVII.

	LS coupling		J_1j coupling	
	$^3P^\circ_1$	$^1P^\circ_1$	$(3/2, 1/2)^\circ$	$(1/2, 1/2)^\circ$
Lower state	0.679 (46%)	0.733 (54%)	0.991 (98%)	0.131 (2%)
Upper state	0.733 (54%)	−0.678 (46%)	−0.130 (2%)	0.990 (98%)

One of the more striking examples in which the reported existence of state mixing influenced us in the preparation of this compilation was the evaluation of f-value data for resonance transitions to states of the $2p^4 3s$ and $2p^4 3d$ configurations of F-like ions. Oscillator strengths and eigenvectors were calculated by Chapman and Shadmi [77] for F-like Sc, Fe, and Cu. According to their results the purity of some states is less than 50%. In certain of those cases the same basis state constitutes the dominant component of two different eigenvectors, so that the corresponding levels cannot be labeled uniquely. In other cases a single basis state is distributed among so many eigenstates that no one level could be labeled as such. The mixing becomes more severe along the isoelectronic sequence, so that the interpolation of f-value data for F-like Co and Ni was a difficult undertaking.

An example of Chapman and Shadmi's published results is presented in table 3 below. Energy levels for $J = 1/2$ states of the $2p^4 3d$ configuration are tabulated in ascending order for each of the

TABLE 3. Calculated energy levels and percentage compositions from ref. [77] for $J = 1/2$ states of the $2p^4 3d$ configuration in F-like Sc, Fe, and Cu; also, f-values from the same source for resonance transitions to those states.

Energy level	Percentage compositions					f-values	
	$(^3P)^4D$	$(^3P)^2P$	$(^3P)^4P$	$(^1D)^2P$	$(^1D)^2S$	$3/2^a$–$1/2$	$1/2^b$–$1/2$
Sc XIII							
3900900	86					0.0019	9.0(−5)[c]
3935200			91			3.5(−6)	2.6(−4)
3947200		58		28		0.021	0.0016
4031700					92	2.4(−5)	0.088
4083200		33		61		0.031	0.43
Fe XVIII							
6775800	52	15	17			0.0089	2.7(−4)
6817300		17	64			0.0032	3.4(−4)
6856300	42	30		18		0.013	9.1(−4)
6967100					81	1.7(−4)	0.068
7040100		34		57		0.031	0.53
Cu XXI							
8768000	38	19	22			0.012	2.2(−4)
8817500		23	55	15		0.0043	4.6(−4)
8900000	57	21				0.0099	7.1(−4)
9031700			14		75	1.9(−4)	0.056
9123100		32		52		0.020	0.52

[a] $2p^5\ ^2P^\circ_{3/2}$

[b] $2p^5\ ^2P^\circ_{1/2}$

[c] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

LS coupling and *f*-values for transitions from the ground-term levels ($2p^5\ ^2P^\circ_{1/2,3/2}$). (Chapman and Shadmi tabulated only the dominant eigenvector components for each state by terminating the process when at least 75% of the eigenstate was accounted for. Thus the sum of percentage compositions for any given eigenstate (row) or basis state (column) is in general less than 100%.) The only level that seems to be unambiguously identifiable for all three ions presented is the $(^1D)^2S$, although the *f*-value for the $3/2$–$1/2$ transition undergoes a rather drastic increase in the interval between Sc and Fe. Designation of the remaining states in Sc is rather straightforward, but in the case of Fe and Cu the average purity (i.e., the percentage of the largest component averaged over all levels) reduces to 59% and 55%, respectively. Intermixing is so severe that it is virtually impossible to predict oscillator strength data for Co and Ni by interpolating along the sequence. Predicted *f*-values have been tabulated in this compilation for a few of these transitions, but they must be considered rather uncertain. Even the published data for transitions to the $(^3P)^4D_{1/2}$ and $(^3P)^2P_{1/2}$ levels in F-like iron have been excluded—in the former case because of the relatively small difference (52% vs 42%) in $(^3P)^4D$ character between two of the eigenvectors, and in the latter because of the lack of any one eigenvector containing a significant percentage of $(^3P)^2P$ character. A similar but somewhat more intricate situation is found for the levels of the $2p^43d$ configuration having $J = 3/2$ and $J = 5/2$, since each eigenvector contains eight basis states and (in some cases significant) mixing with states of the $2s2p^53p$ configuration is indicated. Transformation of Chapman and Shadmi's calculated eigenvectors to another basis set resulted in significant improvements in the purities of only a few levels, while others became more diluted, so that the overall advantage was questionable at best. Additional difficulties arose in attempting to match observed wavelengths for these transitions with the calculated ones, since the energy levels are fairly closely spaced and the relative positions determined by theory may be in error. A result of the totality of problems and uncertainties involved in the study of high ions in the fluorine isoelectronic sequence is the possibility of considerable error in our tabulated results, which is reflected in the accuracy ratings, and the essentially inevitable exclusion of possible oscillator strength data for many transitions at this time.

This rather extensive discussion of the Ne-like and F-like ions is not intended as a criticism of the work of the authors referenced herein, but rather as an exposition of some of the peripheral factors that enter into the evaluation and compilation of transition probability data—particularly for heavier species, where relativistic (such as spin-orbit) effects begin to play an important role. It is hoped that, in the future, producers of theoretical *f*-value data will accompany their published results with as much information as possible (especially eigenvector components!) so that evaluators can make better and informed judgments as to the suitability of including such *f*-value data in compilations of this type.

Probably the most outstanding presentation of eigenvector data relevant to this compilation is the work of Shorer [35] on the Ne sequence. He provides graphs of percentage compositions in *LS*, and J_1l coupling for the $J = 1$ levels of the configurations $2p^53s$ $2p^53d$. (For the sake of convenience, he also supplies matrices of transformation coefficients indicating the relationships among these three pure coupling schemes.) Thus the reader can see at a glance how the electronic coupling varies along the isoelectronic sequence, and particularly how it is affected in regions of significant level-crossing-induced configuration interaction. This mode of presentation, together with the relatively high level of sophistication of the *f*-value calculations and the detailed comparison of results according to the size of the various configuration bases used, could be considered as a model.

3. General Arrangement of the Tables

The same general format has been maintained throughout the series of NBS compilations [1–5]. For the more complex spectra, we have omitted the transition array column, and the multiplet designation scheme introduced by Moore [110–112], which labels the terms with lower case letters ($a,b,c, \ldots ,x,y,z$), has been used to identify the upper and lower states of a transition. In some special cases, we have designated the transition, where appropriate, in a coupling scheme other than Russell-Saunders (*LS*), such as the J_1j coupling encountered in Ne-like ions and J_1j or J_1l coupling for Ar-like species.

The major sources of wavelength and energy level data are the tables of Moore [110–112], Kelly and Palumbo [113], and Reader and Sugar [114]. For some spectra, particularly for the highly ionized species, few or no data were available from these sources. We thus had to search through the literature on these species to obtain the appropriate data. To this end, the bibliographies on atomic energy levels and spectra [115] were quite helpful. In addition, we made use of the facilities of the NBS Data Center on Atomic Energy Levels in locating the most recent sources of original data. All sources of wavelengths and energy levels other than refs. [110] through [114] which have been used in this compilation are given in table 4.

In the main tables, calculated or extrapolated energy levels are enclosed in square brackets, as are experimentally derived energy levels which are uncertain with respect to the ground state. The same is true of wavelengths that have been calculated from energy level differences rather than obtained from experiment.

TABLE 4. Special source material for wavelength and energy level data. Complete citations are given below.

Spectrum	Reference	Spectrum	Reference	Spectrum	Reference
Fe I	1	Fe XIII	5,11,12,13,14	Fe XXIII	37,36,37,38,39,40,41
Fe II	2	Fe XV	5,12,15	Fe XXIV	39,42,43,44,45,46
Fe VII	3	Fe XVII	16,17,18,19,20	Fe XXV	47,48
Fe VIII	4	Fe XVIII	21,22,23,26	Co VIII	49
Fe IX	5,6,7	Fe XIX	24,25,26,27,28	Co X	50
Fe X	5,8,9	Fe XX	24,27,29,30	Co XIV	12,51,52
Fe XI	5,9,10	Fe XXI	27,29,31,32,33,34	Co XVI	12,53,54
Fe XII	5,11	Fe XXII	27,29,35,36,37	Co XVII	53,55

TABLE 4. Special source material for wavelength and energy level data. Complete citations are given below.—Continued

Spectrum	Reference	Spectrum	Reference	Spectrum	Reference
Co XIX	21,56	Ni II	61	Ni XXI	24,27,57
Co XX	24,27,57	Ni XV	12,51,52	Ni XXII	27,56
Co XXI	27,56,57	Ni XVI	53	Ni XXIII	27,58
Co XXII	27,58	Ni XVII	12,53	Ni XXIV	27,59
Co XXIII	27,59	Ni XVIII	53,55	Ni XXV	27,38,39
Co XXIV	27,38	Ni XIX	17,18,19,62,63	Ni XXVI	39,47,64
Co XXV	27,47,60	Ni XX	56	Ni XXVII	47,48
Co XXVI	47,48				

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We have again classified the uncertainties in the atomic transition probability data with the same notation used in our earlier compilations, i.e.,

A .... for uncertainties within 3 percent,[3]
B .... for uncertainties within 10 percent,
C .... for uncertainties within 25 percent,
D .... for uncertainties within 50 percent,
E .... for uncertainties greater than 50 percent.

The word *uncertainty* is used here with the connotation "estimated extent of the deviation from the true value." The estimation procedure is based on our evaluation of random errors as well as our estimates of the maximum effect of possible systematic errors (see sec. 2). We have often made a further differentiation in the classification scheme by assigning plus or minus signs to some transitions to indicate that these lines are estimated to be somewhat better or worse than similar lines. These should therefore be the first or last choice among similar transitions.

A summary of the abbreviations and special symbols used in the tables is given in section 4. Also, for convenience, we have included the relations between line and multiplet values in the case of *LS* coupling. In table 5, we provide a table of conversion factors which we have used throughout this compilation to convert from transition probabilities to oscillator strengths and line strengths, and vice versa.

TABLE 5. Conversion factors

The factor in each box converts by multiplication the quantity above it into the one at its left.

	A_{ki}	f_{ik}	S
A_{ki}	1	$\frac{6.670_2 \times 10^{15}}{\lambda^2} \frac{g_i}{g_k}$	$\frac{2.026_1 \times 10^{18}}{g_k \lambda^3}$
f_{ik}	$1.4992 \times 10^{-16} \frac{\lambda^2 g_k}{g_i}$	1	$\frac{303.7_6}{g_i \lambda}$
S	$4.935_5 \times 10^{-19} g_k \lambda^3$	$3.292_1 \times 10^{-3} g_i \lambda$	1

The line strength is given in atomic units, which are $a_0^2 e^2 = 7.188_4 \times 10^{-59}\,\mathrm{m^2C^2}$ for electric dipole transitions. The transition probability is in units s^{-1}, and the *f*-value is dimensionless. The wavelength λ is given in angstrom units, and g_i and g_k are the statistical weights of the lower and upper state, respectively. For the atomic constants entering into the relations, we have used the recommendations of the CODATA Task Group on Fundamental Constants (J. Phys. Chem. Ref. Data **2**, 663 (1973)).

4. Key to Abbreviations and Symbols Used in the Tables [4]

1. Symbols for indication of accuracy:

A .... uncertainties within 3 percent,[3]
B .... uncertainties within 10 percent,
C .... uncertainties within 25 percent,
D .... uncertainties within 50 percent,
E .... uncertainties greater than 50 percent.

2. Abbreviations appearing in the source column of allowed transitions:

ls = *LS*-coupling rules applied

n = normalized to a scale different than that of the author (as explained in the introductory remarks to the pertinent spectrum)

interp. = derived by an interpolation technique, rather than taken directly from the literature

3. Special symbols used in the wavelength and energy level columns:

The number in parentheses under the multiplet designation refers to the running number of ref. [110] (Revised Multiplet Table). If letters "uv" are added, we refer to the running number of ref. [111] (Ultraviolet Multiplet Table).

Numbers in italics indicate multiplet values, i.e., weighted averages of *line* values.

Numbers in square brackets indicate approximate calculated or extrapolated values.

Useful Relations

(A) Statistical Weights:

The statistical weights are related to the inner quantum number J_L (for one-electron spectra: j_L) of a level (i.e., initial or final state of a *line*) by

$$g_L = 2J_L + 1,$$

and to the quantum numbers of a term (initial or final state of a *multiplet*) by

$$g_M = (2L + 1)(2S + 1).$$

(The "multiplet" values g_M may also be obtained by summing over all possible "line" values g_L. S is the resultant spin.)

(B) Relations between the strengths of lines and the total multiplet strength:

1. Line strength S:

$$S(i,k) = \sum_{J_i J_k} S(J_i, J_k)$$

or

$$S(\text{Multiplet}) = \sum S(\text{line})$$

(k denotes the upper and i the lower term).

---

[3] No transition probabilities of "A" accuracy are reported in this compilation.

[4] In keeping with the tradition in this field, we have tabulated the spectroscopic quantities in customary units rather than in SI units; e.g., energy levels are expressed in their equivalence in cm^{-1}.

2. Absorption oscillator strength f_{ik}:

$$f_{ik}^{\text{multiplet}} = \frac{1}{\bar{\lambda}_{ik} \sum\limits_{J_i} (2J_i + 1)} \sum_{J_i J_k} (2J_i + 1) \times \lambda(J_i, J_k) \times f(J_i, J_k).$$

The mean wavelength for the multiplet, $\bar{\lambda}_{ik}$, may be obtained the *weighted* energy levels. Often the wavelength differences for the lines within a multiplet are small, so that the wavelength factors may be neglected.

3. Transition probability A_{ki}:

$$A_{ki}^{\text{multiplet}} = \frac{1}{(\bar{\lambda}_{ik})^3 \sum\limits_{J_k} (2J_k + 1)} \sum_{J_i J_k} (2J_k + 1) \times \lambda(J_i, J_k)^3 \times A(J_i, J_k).$$

Relative strengths $S(J_i, J_k)$ of the components of a multiplet are listed for the case of LS coupling in Allen, C. W., *Astrophysical Quantities*, 3rd Ed. (The Athlone Press, London, 1973); White, H. E., and Eliason, A. Y., Phys. Rev. **44**, 753 (1933); Shore, B. W., and Menzel, D. H., *Principles of Atomic Structure*, p. 447 (John Wiley & Sons, Inc., New York, 1968); Goldberg, L., Astrophys. J. **82**, 1 (1935) and **84**, 11 (1936).

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6. Tables of Spectra

Iron

Fe I

Ground State	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2\ ^5D_4$
Ionization Potential	$7.870\ \text{eV} = 63480\ \text{cm}^{-1}$

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
1934.54	30	2510.83	14	2980.53	191	3168.85	121
1937.27	29	2512.36	15	2981.45	10	3175.45	116
1940.66	30	2518.10	14	2983.57	8	3176.36	166
2084.12	28	2522.85	14	2986.46	10	3193.23	7
2102.35	28	2524.29	14	2986.65	139	3196.93	116
2112.97	28	2527.43	14	2987.29	45	3199.53	117
2132.02	26	2529.13	14	2990.39	190	3205.40	116
2138.59	27	2535.61	14	2994.43	8	3207.07	120
2145.19	26	2540.97	14	2994.50	10	3215.94	117
2153.01	26	2545.98	14	2996.39	113	3217.38	118
2161.58	26	2549.61	14	2999.51	45	3219.58	117
2166.77	23	2584.54	49	3000.95	8	3222.07	117
2171.30	27	2606.83	49	3005.31	138	3225.79	116
2173.21	27	2618.02	49	3007.28	10	3227.80	118
2176.84	25	2623.53	49	3008.14	8	3228.25	118
2191.20	24	2632.59	13	3009.09	137	3229.99	296
2191.84	23	2656.15	140	3009.57	45	3230.21	119
2196.04	23	2669.49	140	3011.48	190	3230.96	118
2200.72	23	2679.06	48	3015.92	137	3233.05	340
2228.17	22	2719.03	12	3016.18	45	3233.97	119
2250.79	19	2720.90	12	3017.63	8	3246.96	92
2259.28	20	2723.58	12	3018.14	138	3248.20	118
2259.51	19	2733.58	47	3018.98	45	3253.60	370
2265.05	20	2735.48	47	3021.07	8	3254.36	340
2267.08	21	2737.31	12	3024.03	10	3257.59	90
2272.07	19	2742.41	12	3025.84	8	3265.62	91
2276.03	18	2744.07	12	3026.46	45	3268.23	92
2277.11	50	2750.14	12	3031.63	45	3271.00	91
2287.25	18	2756.33	12	3037.39	8	3280.26	340
2292.52	20	2788.10	46	3039.32	138	3282.89	369
2294.41	18	2835.46	11	3040.43	45	3284.59	91
2300.14	19	2869.31	11	3042.02	45	3290.99	92
2301.68	18	2874.17	11	3042.66	45	3292.02	369
2303.42	19	2894.50	113	3047.60	8	3292.59	91
2303.58	19	2899.42	113	3053.07	111	3298.13	90
2309.00	18	2912.16	9	3057.45	44	3305.97	91
2313.10	18	2920.69	66	3059.09	8	3306.36	91
2320.36	18	2923.29	341	3067.24	44	3307.23	339
2371.43	17	2925.36	192	3068.17	65	3314.74	369
2373.62	17	2929.01	9	3075.72	44	3317.12	110
2374.52	17	2936.90	9	3083.74	44	3319.25	259
2381.83	17	2941.34	9	3091.58	44	3322.47	236
2389.97	17	2947.88	9	3098.19	189	3323.74	224
2462.18	16	2953.94	9	3100.67	44	3325.46	135
2462.65	16	2954.65	112	3119.49	136	3328.87	339
2479.78	16	2957.36	9	3120.43	136	3337.66	188
2483.27	16	2965.25	9	3134.11	44	3347.93	109
2488.14	16	2966.90	9	3156.27	318	3354.06	224
2490.64	16	2969.36	10	3160.66	116	3355.23	339
2491.15	16	2973.13	9	3161.95	121	3369.55	188
2501.13	14	2973.24	9	3166.44	167	3370.78	188

List of tabulated lines—Continued

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
3372.07	86	3531.44	132	3606.68	184	3677.31	415
3380.11	188	3534.53	435	3608.86	41	3677.63	182
3382.40	89	3536.56	200	3610.16	195	3678.86	105
3383.98	86	3537.73	165	3610.70	197	3679.91	5
3392.65	87	3537.90	201	3612.07	199	3681.64	232
3394.58	87	3538.78	435	3613.15	198	3682.24	414
3396.98	43	3540.12	202	3613.45	365	3683.05	5
3399.33	87	3540.71	41	3614.77	235	3684.11	183
3402.26	338	3541.08	200	3615.19	313	3686.00	227
3406.44	368	3542.08	200	3615.66	63	3686.26	105
3407.46	87	3543.39	133	3616.15	313	3687.10	80
3410.17	398	3543.67	397	3616.32	106	3687.46	39
3411.35	187	3544.63	165	3617.79	277	3688.48	364
3413.13	87	3548.02	277	3618.77	41	3688.88	129
3417.27	43	3549.86	64	3620.24	198	3689.02	128
3417.84	87	3551.11	195	3621.46	184	3689.90	294
3418.51	87	3552.11	278	3622.00	185	3690.73	431
3424.28	88	3552.83	195	3623.19	130	3693.01	254
3425.01	295	3553.74	434	3624.06	314	3694.01	234
3427.12	86	3556.88	201	3624.31	107	3697.43	231
3428.19	88	3559.50	278	3627.05	432	3698.60	274
3428.75	447	3560.07	195	3628.09	82	3699.15	273
3440.99	6	3560.70	365	3628.82	256	3701.09	227
3443.88	6	3564.11	64	3630.35	197	3702.03	223
3445.15	88	3565.38	42	3631.46	41	3703.69	231
3447.28	85	3566.31	104	3632.04	277	3703.82	223
3450.33	85	3567.03	199	3632.55	255	3704.01	276
3462.35	84	3567.37	133	3633.84	257	3704.46	181
3463.30	64	3568.42	195	3635.19	273	3705.57	5
3476.70	6	3568.82	366	3636.99	160	3707.82	5
3477.85	85	3568.98	184	3637.25	130	3709.25	39
3483.01	42	3570.10	42	3637.86	227	3711.22	158
3485.34	83	3571.22	63	3638.30	184	3711.41	275
3493.28	64	3572.00	195	3640.39	185	3715.91	103
3493.69	186	3572.59	199	3641.45	197	3718.41	183
3495.29	164	3573.39	366	3644.58	161	3719.93	5
3496.19	134	3576.76	337	3644.80	314	3722.56	5
3497.10	83	3578.38	195	3645.82	277	3724.38	103
3497.84	6	3578.67	104	3647.84	41	3725.49	293
3500.57	164	3581.19	41	3649.51	182	3726.93	227
3504.86	105	3582.20	336	3650.03	234	3727.09	229
3505.07	278	3583.33	317	3651.47	185	3727.62	39
3506.50	108	3585.32	41	3653.76	130	3728.67	156
3508.49	258	3585.71	41	3654.66	82	3730.39	294
3509.12	200	3586.98	41	3655.46	223	3730.95	158
3509.87	83	3589.11	41	3657.14	108	3731.37	154
3510.44	110	3590.08	257	3657.89	235	3732.40	81
3511.74	164	3591.00	316	3658.55	159	3733.32	5
3512.22	200	3591.35	195	3659.52	130	3734.86	39
3513.05	64	3591.48	312	3661.36	128	3735.32	230
3513.82	42	3592.47	163	3663.25	254	3737.13	5
3514.63	133	3592.67	313	3663.95	254	3738.31	335
3516.41	258	3592.89	82	3664.54	233	3739.12	80
3516.56	200	3593.32	315	3664.69	232	3739.32	79
3518.68	201	3594.63	196	3666.94	63	3740.24	362
3518.82	83	3595.30	196	3667.25	314	3742.62	229
3520.85	164	3595.86	131	3668.21	312	3743.36	39
3521.84	83	3596.20	131	3668.89	157	3744.10	227
3522.27	200	3597.02	313	3669.15	255	3745.56	5
3522.90	203	3598.72	367	3669.52	182	3745.90	5
3523.31	200	3599.62	433	3670.09	254	3746.49	78
3524.08	165	3602.08	196	3670.81	108	3746.93	228
3524.24	108	3603.20	185	3672.69	130	3748.26	5
3527.79	200	3603.67	162	3674.77	223	3749.48	39
3529.82	200	3603.82	277	3676.31	158	3751.06	363
3530.39	200	3605.45	184	3676.88	231	3751.82	179

List of tabulated lines—Continued

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
3753.15	127	3813.63	177	3902.95	62	3983.96	172
3753.61	78	3813.88	454	3903.90	251	3985.39	358
3754.51	228	3814.52	40	3906.48	4	3989.86	411
3756.07	79	3815.84	62	3906.75	360	3990.37	290
3756.94	430	3816.34	78	3907.47	178	3994.11	289
3757.45	360	3817.64	384	3907.93	175	3995.20	331
3758.23	39	3819.50	386	3909.66	309	3995.98	173
3760.05	127	3820.43	38	3909.83	221	3996.97	489
3760.53	81	3821.18	334	3910.84	178	3997.39	174
3761.41	156	3821.83	150	3911.00	307	3998.05	172
3762.21	388	3824.44	4	3913.63	101	4000.27	301
3763.79	39	3825.88	38	3914.27	311	4000.46	250
3765.54	334	3826.84	177	3916.73	332	4001.66	77
3766.09	155	3827.82	62	3917.18	38	4003.76	393
3766.67	228	3829.13	490	3919.07	252	4005.24	60
3767.19	39	3829.77	152	3920.26	4	4006.31	330
3768.03	78	3833.31	150	3920.84	311	4007.27	172
3770.30	179	3834.22	38	3922.91	4	4009.71	77
3771.50	333	3836.33	360	3925.20	311	4010.18	475
3773.36	293	3837.13	150	3927.92	4	4011.42	148
3773.70	228	3839.26	292	3930.30	4	4011.71	115
3774.82	78	3839.61	511	3931.12	309	4014.53	428
3775.86	179	3840.44	38	3935.31	219	4017.15	290
3776.45	80	3841.05	62	3937.33	174	4018.28	305
3777.06	253	3843.26	291	3940.88	38	4019.05	149
3777.45	153	3845.17	103	3941.28	307	4020.49	476
3778.32	222	3845.69	413	3942.44	221	4021.87	174
3778.51	360	3846.00	386	3943.34	77	4024.11	172
3778.70	78	3846.41	429	3944.75	220	4024.72	305
3781.19	79	3846.80	360	3944.89	252	4030.18	77
3781.94	478	3848.29	151	3945.12	175	4031.96	357
3782.45	230	3849.96	38	3946.99	306	4032.63	61
3782.61	274	3850.82	40	3948.77	331	4036.37	173
3785.71	334	3852.57	78	3949.14	395	4040.64	357
3785.95	127	3853.46	251	3949.95	77	4044.61	218
3786.19	222	3856.37	4	3951.16	358	4045.81	60
3786.68	40	3859.21	126	3952.60	174	4049.34	148
3787.16	477	3859.91	4	3953.15	252	4051.92	383
3787.88	39	3863.74	175	3953.86	219	4054.18	302
3789.18	180	3865.52	38	3955.34	307	4054.87	382
3789.82	385	3867.22	271	3955.96	271	4055.03	148
3790.09	40	3867.93	150	3956.45	331	4057.34	173
3791.50	153	3871.75	251	3957.02	307	4058.22	303
3791.73	386	3872.50	38	3960.28	476	4058.75	101
3792.15	179	3872.92	178	3961.15	220	4059.73	410
3792.83	79	3873.76	126	3962.35	310	4062.44	218
3793.87	222	3876.04	40	3963.10	307	4063.59	60
3794.34	127	3878.02	38	3964.52	220	4065.40	382
3795.00	39	3878.57	4	3966.06	62	4066.59	249
3797.95	150	3883.28	359	3967.42	331	4067.27	147
3798.51	39	3884.36	176	3967.96	306	4067.98	304
3799.55	39	3885.15	252	3969.26	60	4069.08	302
3801.68	222	3885.51	103	3969.63	356	4070.77	303
3802.00	387	3886.28	4	3970.39	271	4071.74	60
3802.28	361	3887.05	38	3971.32	173	4073.76	303
3804.01	385	3888.51	62	3973.65	412	4074.79	288
3805.35	334	3888.82	271	3974.40	308	4076.23	270
3806.22	396	3890.39	311	3974.77	77	4076.63	303
3806.70	333	3890.84	175	3975.21	115	4078.35	147
3807.54	78	3891.93	394	3975.85	502	4079.18	383
3808.29	272	3893.39	252	3976.61	394	4079.84	218
3808.73	151	3895.66	4	3977.74	77	4080.21	303
3809.04	222	3897.45	251	3979.65	306	4080.89	302
3810.76	361	3899.03	126	3980.65	115	4082.13	382
3811.89	179	3899.71	4	3981.11	102	4082.44	474
3812.96	40	3900.52	309	3981.77	174	4084.49	382

List of tabulated lines—Continued

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
4085.00	217	4170.90	269	4258.31	3	4377.80	352
4085.30	304	4171.69	488	4258.62	211	4382.77	425
4085.98	550	4171.90	355	4258.95	246	4383.54	58
4087.09	379	4172.12	354	4260.47	114	4384.68	265
4088.57	474	4172.74	37	4264.20	377	4387.89	266
4089.22	247	4173.32	213	4264.74	509	4388.41	446
4090.09	383	4173.92	37	4266.96	170	4389.24	2
4090.98	380	4174.91	37	4267.83	269	4390.46	241
4091.55	216	4175.64	216	4268.75	354	4390.95	242
4092.46	36	4177.59	36	4271.15	114	4391.87	508
4095.27	551	4181.75	216	4271.76	59	4392.58	498
4095.97	147	4182.38	267	4275.72	146	4395.29	444
4097.10	303	4182.79	379	4276.68	501	4401.29	444
4098.18	303	4183.03	381	4277.41	145	4401.44	210
4100.74	36	4184.89	213	4278.23	376	4404.75	58
4101.27	382	4187.04	114	4279.48	509	4407.71	73
4101.68	101	4187.79	114	4279.86	211	4408.41	73
4104.97	379	4189.56	487	4280.53	328	4409.12	352
4106.27	147	4191.68	213	4282.40	76	4413.40	537
4106.44	381	4196.21	378	4284.42	244	4415.12	58
4107.49	215	4196.53	245	4285.44	327	4422.57	210
4108.13	304	4198.30	114	4285.83	471	4423.14	240
4109.07	303	4198.64	378	4286.44	242	4423.84	446
4109.80	216	4199.09	287	4288.15	170	4427.31	2
4112.35	380	4200.09	509	4288.96	145	4430.19	263
4112.96	567	4200.92	375	4290.38	243	4430.61	73
4114.45	215	4202.03	59	4290.87	211	4432.57	424
4114.96	380	4203.67	620	4292.13	75	4433.22	446
4118.54	427	4203.94	453	4292.29	75	4433.78	442
4118.90	304	4205.54	375	4294.12	58	4435.15	2
4120.21	248	4206.70	3	4298.04	285	4436.92	282
4121.80	214	4207.13	212	4300.21	500	4438.34	444
4122.51	214	4210.34	114	4300.83	501	4439.63	281
4125.88	215	4213.65	213	4302.18	285	4439.88	99
4126.18	380	4216.18	3	4304.54	242	4440.48	445
4126.88	215	4217.55	378	4305.20	406	4440.82	508
4127.61	216	4219.36	426	4305.45	266	4442.34	73
4129.22	382	4220.05	510	4307.90	59	4442.83	74
4129.46	380	4220.34	269	4309.03	452	4443.19	210
4132.06	60	4222.21	114	4309.37	242	4445.47	2
4132.90	215	4224.17	375	4310.37	510	4446.83	444
4133.86	382	4224.51	375	4315.08	76	4447.13	74
4134.68	215	4225.45	378	4317.04	408	4447.72	73
4136.51	379	4225.96	286	4325.76	59	4450.32	266
4137.00	392	4226.42	212	4326.75	241	4450.77	497
4137.42	567	4229.75	58	4327.09	407	4452.62	495
4139.93	36	4230.58	268	4327.92	327	4454.38	210
4141.86	247	4232.73	3	4337.05	58	4455.03	499
4142.63	567	4233.60	114	4338.26	75	4456.33	282
4143.87	60	4235.94	114	4343.28	352	4456.63	498
4145.21	171	4237.07	37	4343.70	283	4459.12	73
4146.06	247	4237.67	245	4346.55	328	4461.65	2
4147.67	59	4238.81	378	4347.24	2	4464.77	263
4149.37	379	4239.36	473	4347.85	444	4466.55	210
4150.25	380	4240.37	409	4348.94	242	4466.94	508
4152.17	36	4241.11	211	4351.54	240	4469.37	446
4153.90	380	4242.73	354	4352.73	76	4471.68	2
4154.80	379	4243.79	510	4358.50	240	4478.04	74
4156.80	216	4245.26	212	4360.81	470	4481.61	443
4158.79	380	4246.08	472	4365.90	241	4482.17	2
4161.08	375	4247.43	378	4367.58	242	4482.74	444
4161.48	247	4248.22	269	4367.90	58	4483.78	469
4167.86	329	4249.32	100	4369.77	284	4484.22	444
4168.63	375	4250.12	114	4372.99	264	4485.67	446
4168.94	379	4250.79	59	4374.50	353	4485.97	442
4169.78	378	4253.55	620	4375.93	2	4487.74	326

List of tabulated lines—Continued

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
4488.13	437	4638.01	440	4813.11	347	5012.07	35
4489.74	2	4643.46	438	4817.77	72	5012.68	562
4490.08	262	4647.43	238	4834.51	98	5014.94	492
4492.68	495	4649.82	323	4835.87	547	5021.89	344
4494.05	498	4657.59	206	4838.51	373	5022.24	492
4494.56	73	4658.29	324	4839.55	321	5023.23	564
4495.57	443	4661.53	616	4840.32	547	5023.50	588
4495.95	442	4661.97	238	4841.78	549	5027.76	572
4502.59	423	4663.18	404	4842.79	548	5029.62	389
4504.83	300	4669.17	439	4843.14	373	5030.77	320
4514.18	281	4673.16	438	4844.01	400	5031.90	588
4515.16	194	4673.28	440	4848.90	97	5048.43	505
4517.53	263	4674.65	57	4849.67	421	5049.82	97
4518.43	325	4678.85	439	4854.89	536	5051.63	35
4518.58	74	4679.22	374	4859.13	547	5054.64	465
4523.40	445	4680.29	56	4859.74	193	5056.00	587
4525.88	194	4682.56	226	4860.98	374	5056.86	573
4527.78	351	4683.57	206	4869.45	401	5058.00	494
4528.61	73	4685.03	207	4870.05	506	5058.50	465
4531.15	56	4687.39	207	4871.32	193	5060.08	1
4533.13	351	4690.14	438	4872.14	193	5067.15	561
4537.67	326	4691.41	238	4873.74	347	5068.77	225
4541.94	325	4700.19	486	4875.87	373	5074.75	563
4542.41	468	4701.05	438	4876.19	345	5079.74	35
4547.02	56	4704.95	439	4877.61	226	5080.95	320
4547.85	405	4705.46	402	4878.21	193	5083.34	35
4551.65	497	4707.27	299	4890.75	193	5088.16	546
4554.47	194	4712.10	261	4891.49	193	5090.78	559
4556.93	350	4714.07	615	4892.87	549	5099.09	492
4560.09	441	4714.19	324	4896.44	505	5104.04	260
4565.31	351	4726.14	226	4903.31	193	5104.21	561
4565.66	299	4729.02	532	4905.13	507	5104.44	559
4566.51	351	4729.68	374	4907.73	373	5107.45	35
4566.99	391	4733.59	55	4911.52	566	5109.65	558
4571.44	194	4734.10	580	4911.78	505	5110.41	1
4572.86	437	4735.84	535	4917.23	546	5115.78	419
4574.21	299	4736.77	299	4918.01	549	5121.64	564
4574.72	98	4737.63	322	4918.99	193	5123.72	35
4579.82	262	4740.34	238	4920.50	193	5125.11	559
4580.58	443	4741.53	206	4924.77	97	5126.19	558
4581.51	300	4745.13	72	4927.42	420	5127.36	35
4587.13	422	4749.95	615	4930.31	506	5127.68	1
4587.72	496	4765.48	57	4939.69	35	5129.63	492
4592.65	56	4766.87	374	4945.64	575	5133.69	561
4593.53	496	4771.70	72	4946.38	373	5136.09	530
4595.36	326	4776.07	349	4950.10	373	5137.38	559
4596.06	438	4779.44	390	4961.91	451	5143.73	70
4596.41	441	4780.81	347	4962.56	565	5145.09	71
4600.93	324	4785.96	534	4966.09	373	5146.30	588
4602.00	56	4786.81	261	4968.69	466	5150.84	35
4602.94	56	4787.83	226	4969.92	546	5151.91	35
4603.34	208	4788.76	321	4970.50	464	5159.06	560
4603.95	239	4789.65	403	4973.10	505	5162.27	558
4613.20	299	4790.56	547	4978.60	493	5164.55	596
4614.21	350	4790.75	346	4986.22	549	5166.28	1
4618.76	238	4791.25	348	4988.95	546	5167.49	54
4619.29	439	4793.96	279	4991.27	545	5168.90	1
4625.04	299	4794.36	98	4991.86	563	5171.60	53
4630.12	98	4798.26	535	4992.80	572	5177.23	485
4631.48	589	4798.73	55	4993.68	573	5178.80	596
4632.91	56	4799.41	467	4994.13	35	5180.07	596
4633.76	239	4800.13	226	4995.41	575	5184.26	558
4635.62	194	4800.65	535	4999.11	533	5187.91	530
4635.85	209	4807.71	374	5001.86	492	5197.93	560
4636.66	280	4808.15	347	5002.79	373	5198.71	71
4637.50	299	4809.94	421	5004.04	574	5202.34	71

List of tabulated lines—Continued

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
5204.58	1	5393.17	298	5559.64	628	5778.47	144
5207.95	463	5394.68	529	5560.23	594	5780.62	297
5208.59	298	5395.25	581	5563.60	543	5784.69	372
5223.19	463	5397.13	34	5567.40	144	5791.04	297
5224.30	70	5398.29	583	5568.81	458	5793.93	555
5225.53	1	5400.50	583	5569.62	372	5798.19	504
5228.41	560	5401.27	584	5572.84	372	5804.06	491
5232.94	225	5405.77	34	5576.09	372	5804.48	556
5236.19	531	5406.77	586	5584.77	416	5805.76	629
5241.90	588	5409.13	585	5586.76	372	5806.73	604
5242.49	450	5410.91	595	5587.58	525	5809.25	504
5243.78	558	5415.20	595	5594.66	606	5811.93	522
5247.05	1	5417.03	586	5598.30	607	5814.80	555
5249.10	596	5421.85	607	5615.64	372	5815.16	540
5250.21	1	5424.07	584	5617.22	342	5816.36	603
5253.03	96	5429.70	34	5618.65	569	5827.89	297
5253.46	298	5432.95	581	5619.60	592	5833.93	144
5254.96	1	5434.52	34	5620.53	542	5835.10	554
5262.89	343	5436.30	592	5624.06	591	5837.71	577
5263.30	298	5436.59	96	5624.54	372	5838.42	491
5263.87	418	5441.32	582	5633.97	630	5849.67	479
5266.55	225	5445.04	593	5635.85	557	5852.19	602
5269.54	34	5446.92	34	5636.71	456	5853.18	52
5270.36	54	5461.54	583	5638.27	556	5855.13	603
5279.65	319	5463.27	593	5640.46	614	5856.08	576
5280.36	463	5464.29	528	5641.46	556	5858.77	554
5281.79	225	5466.39	582	5642.75	608	5873.21	556
5283.62	298	5470.17	582	5643.94	521	5877.77	553
5284.42	449	5472.72	570	5649.66	448	5879.49	613
5284.62	530	5473.18	544	5650.01	630	5880.00	613
5285.12	596	5473.90	543	5650.71	630	5881.28	602
5288.53	484	5478.48	543	5651.47	592	5883.84	504
5293.03	595	5480.87	543	5652.32	570	5892.80	68
5293.97	529	5481.25	541	5653.89	590	5898.21	625
5294.56	461	5481.45	542	5655.18	630	5902.52	618
5295.32	584	5483.11	542	5658.82	372	5905.67	605
5298.79	461	5487.16	581	5660.79	457	5909.99	297
5300.41	619	5487.74	524	5661.36	570	5916.25	125
5302.30	298	5489.85	586	5662.94	480	5927.80	599
5307.36	53	5491.84	529	5667.67	144	5929.70	600
5315.07	585	5493.51	542	5679.02	607	5930.17	604
5319.22	526	5494.46	523	5680.26	525	5934.66	504
5320.05	462	5497.52	34	5686.53	606	5940.97	553
5321.11	595	5501.46	34	5691.51	556	5952.75	491
5322.04	95	5506.78	34	5696.10	603	5956.70	33
5324.18	298	5512.28	581	5698.05	455	6003.03	491
5328.04	34	5517.08	571	5698.37	578	6012.21	69
5329.99	527	5522.46	570	5702.43	458	6016.66	399
5332.67	529	5525.55	543	5705.48	556	6020.17	602
5339.93	298	5528.89	592	5705.99	607	6024.07	602
5341.02	54	5529.15	460	5707.07	457	6027.06	519
5349.74	593	5531.95	627	5708.11	592	6055.99	625
5353.39	543	5532.75	417	5709.38	372	6062.89	68
5361.64	581	5536.59	205	5711.87	556	6065.48	143
5364.87	584	5539.28	459	5712.15	372	6079.02	600
5367.47	584	5539.83	579	5717.85	569	6082.72	69
5369.96	584	5543.15	481	5731.77	556	6085.27	169
5371.49	34	5543.94	543	5732.29	629	6089.57	631
5373.71	596	5546.51	583	5741.86	555	6093.66	601
5376.85	579	5547.00	542	5742.95	554	6094.42	601
5379.57	483	5549.66	630	5747.95	606	6096.69	491
5383.37	584	5549.94	481	5753.12	569	6137.69	143
5385.58	482	5552.70	627	5754.41	458	6141.73	436
5386.34	544	5553.59	592	5760.35	455	6147.85	518
5387.51	529	5554.89	607	5762.43	456	6151.62	67
5389.48	583	5557.95	593	5762.99	569	6157.73	517

List of tabulated lines—Continued

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
6163.56	69	6344.15	124	6581.22	51	6843.67	597
6165.37	519	6355.04	204	6592.91	168	6857.25	515
6170.49	626	6358.69	32	6593.88	123	6858.16	597
6173.34	67	6362.89	520	6597.61	621	6862.48	610
6180.22	169	6364.38	621	6608.03	93	6885.77	597
6188.04	491	6380.75	517	6609.12	142	6916.70	539
6191.56	124	6393.60	123	6627.56	598	6988.53	122
6200.32	143	6400.00	436	6633.44	624	6999.90	538
6215.15	519	6411.65	436	6633.76	612	7000.63	514
6226.77	503	6419.98	624	6634.10	624	7008.01	552
6229.23	204	6421.35	94	6677.99	168	7016.08	93
6230.73	143	6430.85	67	6703.57	168	7016.44	538
6240.66	69	6462.73	123	6713.76	623	7022.98	538
6246.32	436	6469.21	624	6715.41	598	7024.08	513
6252.55	124	6475.63	142	6733.16	611	7024.65	609
6254.26	94	6481.88	93	6750.15	94	7038.25	538
6256.37	124	6494.98	123	6752.72	611	7038.82	552
6270.24	204	6495.78	621	6786.88	539	7068.42	512
6271.29	371	6496.46	624	6806.85	168	7090.40	538
6280.63	32	6498.95	32	6810.28	612	7095.43	568
6297.80	67	6518.38	204	6820.43	612	7107.46	514
6311.51	204	6533.97	612	6828.61	611	7112.18	237
6315.81	516	6546.24	168	6837.00	617	7130.94	538
6330.86	622	6569.23	621	6839.83	141	7132.99	512
6336.84	436	6574.24	32	6841.35	611	7912.87	31
6338.90	624	6575.02	142	6842.67	612	8075.13	31

From the large number of articles containing f-value data on Fe I, we have selected most of the recent experiments (refs. [1–20]) for this tabulation. Most of the material is taken from two very comprehensive sources, the stabilized-arc emission experiments by May et al. [5] and by Bridges and Kornblith [4].

We established the absolute scale by utilizing accurate data for the principal resonance line at 3719.93 Å. The atomic beam work by Bell and Tubbs [20] yields the f-value of this transition directly, and lifetime measurements of its upper level, $z\ ^5F^o_5$, may also be converted into f-values, since the other downward transitions contribute—at most—a few additional percent to the total lifetime and can be approximately corrected for. Very accurate lifetime measurements of this upper level have been performed by Wagner and Otten [16], who used the method of optical double resonance; Klose [17], who used the delayed coincidence technique; Hilborn and de Zafra [18], who employed the Hanle effect; and Brzozowski et al. [19], who used the high frequency deflection technique. The average f-value resulting from these four lifetime measurements and the atomic beam experiment is $f = 0.0413$, with a standard deviation of the mean of only ± 1% (these lifetime data are given in table 1 of the general introduction). This f-value (obtained by including the effects of the other weak transitions involved) is estimated to have an overall uncertainty not to exceed five percent and forms the basis of the absolute scale for this spectrum, to which all other measurements discussed below were normalized. (For most references, changes (usually small) in the absolute scale had to be made, and we have indicated this by an "n" in the reference column.)

The spectrum of Fe I is very rich in lines of moderate strength in the visible and near uv. Recently, two large-scale measurements of relative f-values were carried out by May et al. [5] and by Bridges and Kornblith [4] for this spectral range. Both experiments were performed in emission with stabilized, steady state arc sources. The most comprehensive set of data on this spectrum is the one measured by May et al. [5], who determined relative oscillator strengths for over 1000 lines with a convection stabilized arc and employed photographic detection. Bridges and Kornblith determined data for 534 lines with a more sophisticated photoelectric data acquisition technique; this included a self-regulating system for the arc discharge in which fluctuations in the spectral line signals were monitored and controlled in order to maintain stability in the arc chamber. Since the data of May et al. and of Bridges and Kornblith overlap for 168 lines, we were able to make several graphical comparisons (figs. 3–5), plotting log gf (May et al.) – log gf (Bridges and Kornblith) (in the graphs denoted by Δlog) vs wavelength, vs log gf (of ref. [4]), and vs upper energy level. These studies show that the mutual scatter is only about ± 0.1 dex and essentially random, i.e., there are no intensity or energy level dependent trends. However, there is some marked disagreement between the f-values of refs. [4] and [5] for the lines of shortest wavelength, especially λ = 3495.29, 3699.15, 3540.12, and 3521.84 Å. This may be due to scattered light problems for the radiometric standards at short wavelengths. Since Bridges and Kornblith took this problem into account by application of appropriate filters, we used their data exclusively in these cases.

The data of Bridges and Kornblith could be subjected to another important check: they overlap for 69 lines with the data of Blackwell et al. [1,3] (to be discussed later) which are of outstanding accuracy. The comparison, illustrated in figure 6, shows quite good agreement; for example, 78% of the data are within 25% of each other. Nevertheless, there are a few differences outside the mutually estimated uncertainties. The graphical comparison also indicates: (a) a systematic trend in the data with line intensity (or log gf), (b) a small

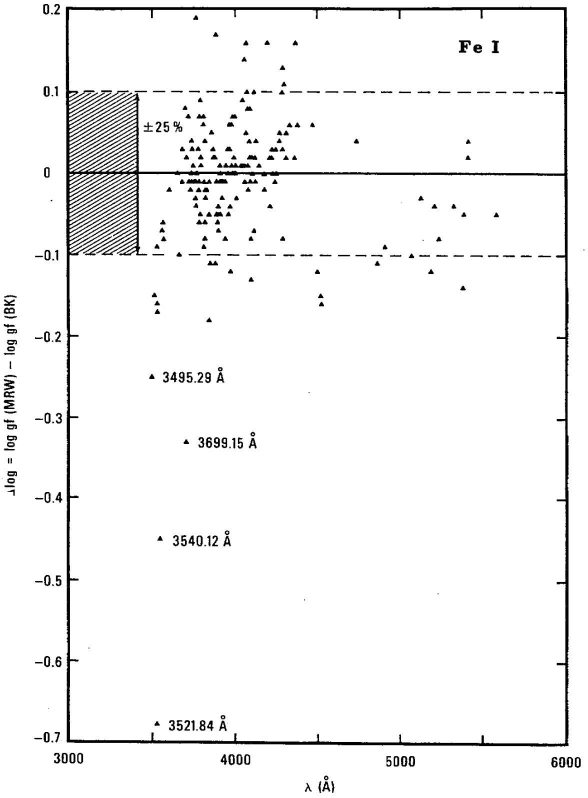

FIGURE 3. Plot of Δlog = log *gf* (May et al. [5]) − log *gf* (Bridges and Kornblith [4]) vs wavelength (Å).

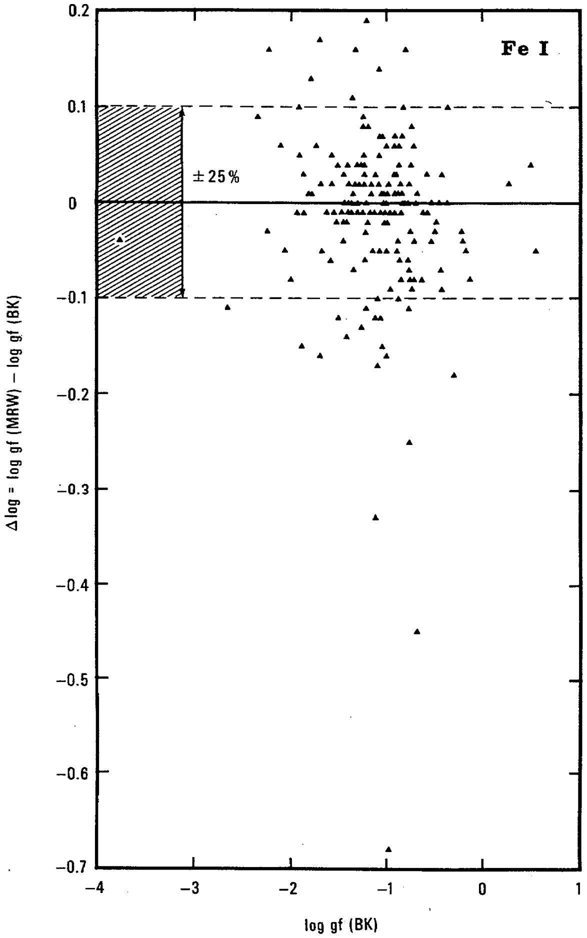

FIGURE 4. Plot of Δlog = log *gf* (May et al. [5]) − log *gf* (Bridges and Kornblith [4]) vs log *gf* (Bridges and Kornblith).

difference in absolute scales, and (c) a serious disagreement for the 4427.31 Å line. (a) The trend is probably due to two unrelated facts. First, the weak lines measured by Bridges and Kornblith, which have lower accuracy ratings, appear to be systematically too strong, a tendency which has also been observed for some other emission measurements of iron group elements. Secondly, the log *gf*-values for the strongest lines measured by Bridges and Kornblith may be slightly too small because of undetected minor amounts of self-absorption present (Bridges and Kornblith note that their self-absorption check is good to only a few percent). (b) The small difference in absolute scales is not unexpected, on account of the different normalization procedures employed. Bridges and Kornblith used an average based on various lifetime data involving numerous lines, while Blackwell et al. utilized only the very accurate data for the resonance line at 3719.9 Å. Since the high precision measurements of Blackwell et al. combined with these resonance line data determine the absolute scale very accurately, we have used that scale to renormalize the data of Bridges and Kornblith. Considering only the most accurate data of ref. [4], i.e., those designated by a 10% ("a") accuracy (see fig. 6), we found the log *gf*-values of these lines to be, on the average, about 0.03 dex or 7% greater than those measured by Blackwell et al. We have thus lowered all log *gf*-values of Bridges and Kornblith by this amount. Since May et al. normalized their scale to that of Bridges and Kornblith, we have accordingly lowered all their log *gf*-values by 0.03 as well. (c) A serious disagreement between Blackwell et al. and Bridges and Kornblith is seen in the case of the 4427.31 Å line. Here, the *f*-value of ref. [4] is greater than that of ref. [1] by a factor of 3.5. A likely reason for this discrepancy may be the blending of the 4427.31 Å line, the $a\ ^5D_3 - z\ ^7F_4^o$ transition, with another line at 4427.30 Å, the $z\ ^5P_2^o - g\ ^5D_2$ transition. The arc of Bridges and Kornblith is capable of exciting both the $z\ ^7F_4^o$ and $g\ ^5D_2$ levels, hence producing the blended feature, whereas Blackwell's furnace, operating at a much lower temperature, excites preferentially the $z\ ^7F_4^o$ level. Therefore, we have tabulated only the data of Blackwell et al. for this line.

After the few apparently unreliable *f*-values from ref [4] were eliminated, data for over five hundred lines remained. We have utilized these as the principal reference source of accurate *f*-values for Fe I and have normalized and/or compared the other, much less comprehensive data sources (to be discussed later) to it. Our error estimates for the very weak and very strong lines were adjusted to reflect the possible deficiencies detected by the comparison with the data of Blackwell et al. [1,3], as discussed above. Blackwell et al. [3] also suggest a temperature error in the data of Bridges and Kornblith. However, we have found no indication of this from our detailed graphical comparisons. We should also note that temperature errors in the experiment of Bridges and Kornblith are minimized, since their absolute scale is based on numerous lifetime data for levels spanning a large range of excitation energies.

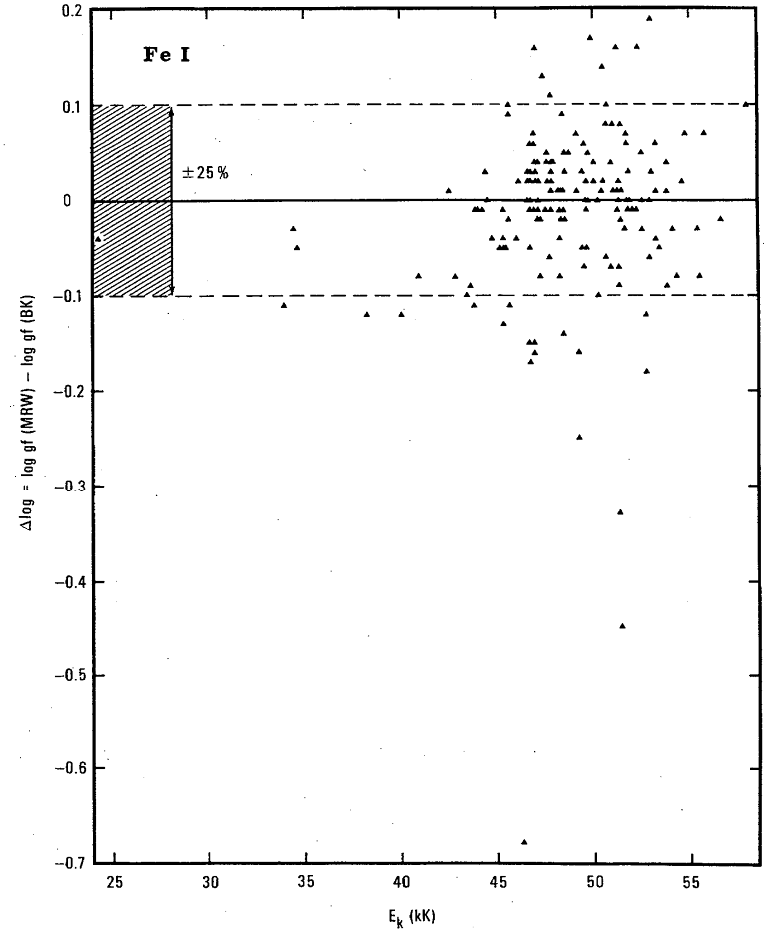

FIGURE 5. Plot of Δlog = log *gf* (May et al. [5]) − log *gf* (Bridges and Kornblith [4]) vs upper energy level.

The most accurate relative oscillator strengths for Fe I are provided by the absorption experiments of Blackwell et al. [1–3]. Their work centers on lines originating from the ground state or states of very low excitation potential. An extremely stable and well diagnosed King-type furnace was used as the absorption tube, and intensity ratios were determined photoelectrically for various line pairs, which by appropriate overlaps were built up to a network that could be cross-checked and optimized for internal consistency. The relative data thus obtained—which span a large range of *gf*-values—were estimated to be accurate to within 0.5 percent.

The fourth important data source is the experimental work by Huber and co-workers [6,7,11,12,13] which makes use of the anomalous dispersion and absorption techniques. Additional, smaller sources of data, which were utilized to supplement our material, are the branching ratio emission experiment of Martinez-Garcia et al. [8] with a hollow cathode source, the shock tube emission work of Wolnik et al. [9,14,], and the emission experiments with stabilized arcs by Garz and Kock [10] and Richter and Wulff [15].

All these data were extensively intercompared in a series of graphic plots to establish their mutual consistency and, if necessary, to find appropriate renormalization factors. Normally, Δlog was plotted versus upper energy level for emission work and versus lower energy level for the anomalous dispersion and absorption experiments. Furthermore, Δlog was also plotted versus wavelength and versus log *gf*. The material by Bridges and Kornblith or by May et al. served as reference material since their work covered so many lines. The graphs, of which figs. 3–6 plus figs. 1 and 2 of the general introduction are samples, are instructive indicators of systematic trends which are dependent on upper or lower energy level, the magnitude of log *gf*, or the wavelength. Several disagreements in absolute scales were readily detected, and in three cases an energy level dependent trend was noticed and a least squares fit was then performed for a renormalization. In other cases no renormalization was required at all. The resulting renormalization factors are shown in the following table.

References	Normalization: quantities to be added to the original log *gf*-value, as it appeared in the literature
4	−0.03
5	−0.03
6	+0.02
10	−0.35 + (0.00000789) E_k[a]
11	+0.27
12	−0.23
13	−0.06 − (0.00000727) E_i
14	−0.13
15	−0.61 + (0.0000128) E_k

[a] The units of E_k (upper energy level) or E_i (lower energy level) are cm^{-1}.

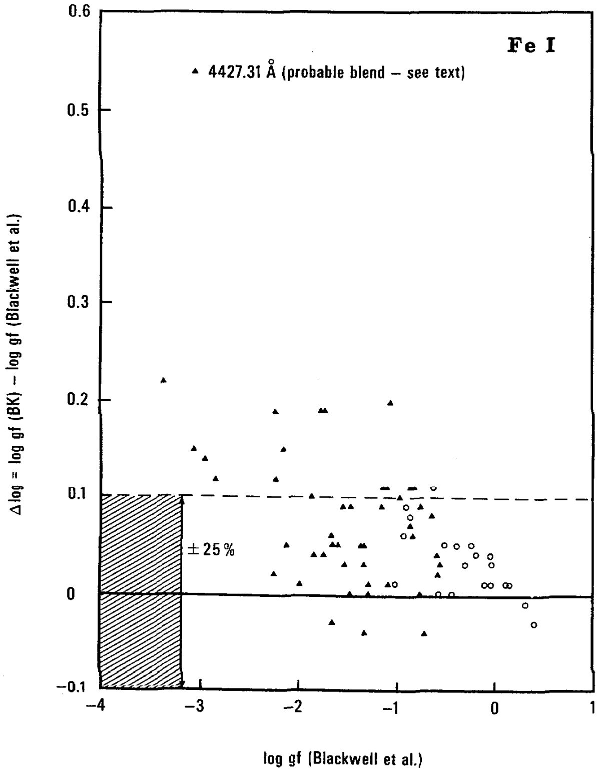

FIGURE 6. Plot of Δlog = log *gf* (Bridges and Kornblith [4]) − log *gf* (Blackwell et al. [1,3]) vs log *gf* (Blackwell et al.). Open circles are used to represent lines for which the *f*-values of Bridges and Kornblith are denoted by them to be accurate to within 10% ("a" accuracy in their notation), while solid triangles are used for lines with uncertainties greater than 10%.

The graphs are also a very good indicator of the scatter in the various sets of data. By intercomparing all overlapping data, one can readily isolate the principal sources of scatter. Our error estimates take this into account, in addition to an evaluation of the critical factors involved in each method and the error statements provided by the authors. When overlaps in the data occur we have selected the very precise data of refs. [1–3] as our first choice. Next, we have given equal weight to the data of refs. [4–8], averaging them when they overlap. Data from refs. [9–15] were tabulated with equal weight too, but only in those cases where no material from the earlier cited authors was available. In toto, we have compiled *f*-value data for 1630 lines.

In this compilation, we have generally omitted blended lines. Wavelengths have been taken from the work of Crosswhite [21]. Energy level values and term designations as listed in our multiplet column have been taken from the compilation of Reader and Sugar [22]. Particular attention was paid to the fact that the designations of some energy levels and multiplets have changed from the original classifications by Moore [23,24]. Also, some multiplet designations appear to be identical as we have listed them, for example, Nos. 20 and 26 in our tables, since the present setup does not completely identify the multiplets by their respective transition arrays. For further details on multiplet and term designations the reader is referred to ref. [22].

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Note Added in Proof

Dr. Blackwell has informed us (private communication, 1980) that errors due to possible blends may be present in his log *gf*-values for four lines. He has recommended that the following lines be withdrawn from consideration: 4427.31 Å, 3812.96 Å, 4602.94 Å, and 4733.59 Å. We comply with Dr. Blackwell's analysis and therefore request that the readers of this compilation view the *f*-values for these lines as being unreliable.

Fe I: Allowed transitions

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
1.	$a\ ^5$D - $z\ ^7$D° (1)											
		5166.28	0.0	19351	9	11	1.45(−5)^a	7.09(−6)	0.00109	−4.195	B+	1
		5247.05	704.0	19757	5	7	3.92(−6)	2.26(−6)	1.96(−4)	−4.946	B+	1
		5254.96	888.1	19912	3	5	8.32(−6)	5.74(−6)	2.98(−4)	−4.764	B+	1
		5250.21	978.1	20020	1	3	9.30(−6)	1.15(−5)	1.99(−4)	−4.938	B+	1
		5110.41	0.0	19562	9	9	4.93(−5)	1.93(−5)	0.00292	−3.760	B+	1
		5168.90	415.9	19757	7	7	3.83(−5)	1.53(−5)	0.00183	−3.969	B+	1
		5204.58	704.0	19912	5	5	2.29(−5)	9.31(−6)	7.98(−4)	−4.332	B+	1
		5225.53	888.1	20020	3	3	1.32(−5)	5.42(−6)	2.80(−4)	−4.789	B+	1
		5060.08	0.0	19757	9	7	1.3(−6)	3.9(−7)	5.8(−5)	−5.46	B+	2
		5127.68	415.9	19912	7	5	3.80(−7)	1.07(−7)	1.27(−5)	−6.125	B+	1
2.	$a\ ^5$D - $z\ ^7$F° (2)											
		4375.93	0.0	22846	9	11	2.95(−4)	1.03(−4)	0.0134	−3.031	B+	1
		4427.31	415.9	22997	7	9	3.42(−4)	1.29(−4)	0.0132	−3.044	B+	1
		4461.65	704.0	23111	5	7	2.95(−4)	1.23(−4)	0.00906	−3.210	B+	1
		4482.17	888.1	23192	3	5	2.10(−4)	1.05(−4)	0.00466	−3.501	B+	1
		4489.74	978.1	23245	1	3	1.19(−4)	1.08(−4)	0.00160	−3.966	B+	1
		4347.24	0.0	22997	9	9	1.23(−6)	3.49(−7)	4.49(−5)	−5.503	B+	1
		4445.47	704.0	23192	5	5	2.45(−6)	7.24(−7)	5.30(−5)	−5.441	B+	1
		4471.68	888.1	23245	3	3	1.12(−6)	3.37(−7)	1.49(−5)	−5.995	B+	1
		4389.24	415.9	23192	7	5	1.81(−5)	3.73(−6)	3.77(−4)	−4.583	B+	1
		4435.15	704.0	23245	5	3	4.72(−5)	8.36(−6)	6.10(−4)	−4.379	B+	1
3.	$a\ ^5$D - $z\ ^7$P° (3)											
		4216.18	0.0	23711	9	9	1.84(−4)	4.90(−5)	0.00611	−3.356	B+	1
		4206.70	415.9	24181	7	7	8.7(−5)	2.3(−5)	0.0022	−3.79	C	4*n*,5*n*
		4258.31	704.0	24181	5	7	2.54(−5)	9.66(−6)	6.77(−4)	−4.316	B+	1
		4232.73	888.1	24507	3	5	8.79(−6)	3.93(−6)	1.64(−4)	−4.928	B+	1
4.	$a\ ^5$D - $z\ ^5$D° (4)	*3882.7*	*402.9*	*26151*	25	25	0.103	0.0232	7.41	−0.237	C+	1,4*n*,13*n*
		3859.91	0.0	25900	9	9	0.0970	0.0217	2.48	−0.710	B+	1
		3886.28	415.9	26140	7	7	0.0530	0.0120	1.07	−1.076	B+	1
		3899.71	704.0	26340	5	5	0.0258	0.00589	0.378	−1.531	B+	1
		3906.48	888.1	26479	3	3	0.00833	0.00190	0.0735	−2.243	B+	1
		3824.44	0.0	26140	9	7	0.0283	0.00483	0.547	−1.362	B+	1
		3856.37	415.9	26340	7	5	0.0464	0.00739	0.657	−1.286	B+	1
		3878.57	704.0	26479	5	3	0.072	0.0098	0.63	−1.31	D−	13*n*
		3895.66	888.1	26550	3	1	0.0940	0.00713	0.274	−1.670	B+	1
		3922.91	415.9	25900	7	9	0.0108	0.00319	0.288	−1.651	B+	1
		3930.30	704.0	26140	5	7	0.019	0.0060	0.39	−1.52	C	4*n*
		3927.92	888.1	26340	3	5	0.026	0.010	0.39	−1.52	C	4*n*
		3920.26	978.1	26479	1	3	0.0260	0.0179	0.232	−1.746	B+	1
5.	$a\ ^5$D - $z\ ^5$F° (5)											
		3719.93	0.0	26875	9	11	0.163	0.0413	4.55	−0.430	B+	16,17,18, 19,20
		3737.13	415.9	27167	7	9	0.142	0.0381	3.28	−0.574	B+	1
		3745.56	704.0	27395	5	7	0.115	0.0339	2.09	−0.771	B+	1
		3748.26	888.1	27560	3	5	0.0915	0.0321	1.19	−1.016	B+	1
		3745.90	978.1	27666	1	3	0.0733	0.0462	0.570	−1.335	B+	1
		3679.91	0.0	27167	9	9	0.0138	0.00280	0.305	−1.599	B+	1
		3705.57	415.9	27395	7	7	0.0322	0.00662	0.565	−1.334	B+	1
		3722.56	704.0	27560	5	5	0.0497	0.0103	0.633	−1.287	B+	1
		3733.32	888.1	27666	3	3	0.065	0.014	0.50	−1.39	C	4*n*,6*n*
		3683.05	415.9	27560	7	5	0.0030	4.4(−4)	0.037	−2.51	C	4*n*,6*n*
		3707.82	704.0	27666	5	3	0.0072	8.9(−4)	0.055	−2.35	C	6*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
6.	$a\ {}^5\mathrm{D} - z\ {}^5\mathrm{P}^\circ$ (6)											
		3440.99	415.9	29469	7	5	0.098	0.012	0.99	−1.06	C	4*n*
		3443.88	704.0	29733	5	3	0.073	0.0078	0.44	−1.41	C	4*n*
		3497.84	888.1	29469	3	5	0.031	0.0094	0.32	−1.55	C	4*n*
		3476.70	978.1	29733	1	3	0.064	0.035	0.40	−1.46	C	4*n*
7.	$a\ {}^5\mathrm{D} - z\ {}^3\mathrm{F}^\circ$ (7)											
		3193.23	0.0	31307	9	9	0.0053	8.0(−4)	0.076	−2.14	C	6*n*
8.	$a\ {}^5\mathrm{D} - y\ {}^5\mathrm{D}^\circ$ (9)											
		3021.07	415.9	33507	7	7	0.456	0.0624	4.34	−0.360	B+	1
		3017.63	888.1	34017	3	3	0.0682	0.00931	0.277	−1.554	B+	1
		2983.57	0.0	33507	9	7	0.280	0.0290	2.57	−0.583	B+	1
		2994.43	415.9	33802	7	5	0.44	0.042	2.9	−0.53	C	6*n*
		3000.95	704.0	34017	5	3	0.642	0.0520	2.57	−0.585	B+	1
		3008.14	888.1	34122	3	1	1.07	0.0485	1.44	−0.837	B+	1
		3059.09	415.9	33096	7	9	0.18	0.032	2.3	−0.65	C+	4*n*,6*n*
		3047.60	704.0	33507	5	7	0.284	0.0553	2.78	−0.558	B+	1
		3037.39	888.1	33802	3	5	0.32	0.075	2.2	−0.65	C+	4*n*,6*n*
		3025.84	978.1	34017	1	3	0.348	0.143	1.43	−0.844	B+	1
9.	$a\ {}^5\mathrm{D} - y\ {}^5\mathrm{F}^\circ$ (uv 1)	*2965.2*	*402.9*	*34118*	25	35	0.324	0.0598	14.6	0.175	B	1,4*n*,6*n*
		2966.90	0.0	33695	9	11	0.272	0.0438	3.85	−0.404	B+	1
		2973.24	415.9	34040	7	9	0.183	0.0313	2.14	−0.660	B+	1
		2973.13	704.0	34329	5	7	0.135	0.0251	1.23	−0.901	B+	1
		2965.25	978.1	34692	1	3	0.116	0.0460	0.449	−1.337	B+	1
		2936.90	0.0	34040	9	9	0.14	0.018	1.6	−0.79	C+	4*n*,6*n*
		2947.88	415.9	34329	7	7	0.20	0.027	1.8	−0.73	C	6*n*
		2953.94	704.0	34547	5	5	0.189	0.0247	1.20	−0.908	B+	1
		2957.36	888.1	34692	3	3	0.177	0.0232	0.678	−1.157	B+	1
		2912.16	0.0	34329	9	7	0.035	0.0035	0.30	−1.50	C	4*n*,6*n*
		2929.01	415.9	34547	7	5	0.073	0.0067	0.45	−1.33	C	6*n*
		2941.34	704.0	34692	5	3	0.066	0.0051	0.25	−1.59	C	4*n*
10.	$a\ {}^5\mathrm{D} - z\ {}^3\mathrm{P}^\circ$ (11)											
		2981.45	415.9	33947	7	5	0.0654	0.00622	0.427	−1.361	B+	1
		2969.36	888.1	34556	3	1	0.0366	0.00161	0.0473	−2.315	B+	1
		3007.28	704.0	33947	5	5	0.0273	0.00371	0.184	−1.732	B+	1
		2986.46	888.1	34363	3	3	0.00219	2.92(−4)	0.00862	−3.057	B+	1
		3024.03	888.1	33947	3	5	0.0488	0.0111	0.333	−1.476	B+	1
		2994.50	978.1	34363	1	3	0.0149	0.00601	0.0593	−2.221	B+	1
11.	$a\ {}^5\mathrm{D} - z\ {}^5\mathrm{G}^\circ$ (uv 2)											
		2874.17	0.0	34782	9	11	0.013	0.0020	0.17	−1.74	C	6*n*
		2869.31	415.9	35257	7	9	0.015	0.0023	0.15	−1.79	C	6*n*
		2835.46	0.0	35257	9	9	0.0090	0.0011	0.091	−2.01	C	6*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
12.	$a\ ^5\mathrm{D} - y\ ^5\mathrm{P}^\circ$ (uv 5)											
		2719.03	0.0	36767	9	7	1.4	0.12	9.6	0.03	C	6*n*
		2720.90	415.9	37158	7	5	1.1	0.084	5.3	−0.23	C	6*n*
		2723.58	704.0	37410	5	3	0.64	0.043	1.9	−0.67	C	6*n*
		2750.14	415.9	36767	7	7	0.39	0.044	2.8	−0.51	C	6*n*
		2742.41	704.0	37158	5	5	0.63	0.071	3.2	−0.45	C	6*n*
		2737.31	888.1	37410	3	3	0.85	0.095	2.6	−0.55	C	6*n*,7
		2756.33	888.1	37158	3	5	0.20	0.038	1.0	−0.94	C	6*n*
		2744.07	978.1	37410	1	3	0.35	0.12	1.1	−0.92	C	6*n*
13.	$a\ ^5\mathrm{D} - y\ ^3\mathrm{D}^\circ$ (uv 6)											
		2632.59	704.0	38678	5	5	0.015	0.0016	0.067	−2.11	C	6*n*
14.	$a\ ^5\mathrm{D} - x\ ^5\mathrm{D}^\circ$ (uv 7)											
		2522.85	0.0	39626	9	9	2.9	0.28	21	0.40	C	6*n*
		2527.43	415.9	39970	7	7	1.9	0.18	10	0.10	C	6*n*
		2529.13	704.0	40231	5	5	0.98	0.094	3.9	−0.33	C	6*n*
		2501.13	0.0	39970	9	7	0.68	0.050	3.7	−0.35	C	6*n*
		2510.83	415.9	40231	7	5	1.3	0.088	5.1	−0.21	C	6*n*
		2518.10	704.0	40405	5	3	1.9	0.11	4.5	−0.27	C	6*n*
		2524.29	888.1	40491	3	1	3.4	0.11	2.7	−0.49	C	6*n*
		2549.61	415.9	39626	7	9	0.36	0.045	2.7	−0.50	C	6*n*
		2545.98	704.0	39970	5	7	0.67	0.091	3.8	−0.34	C	6*n*
		2540.97	888.1	40231	3	5	0.92	0.15	3.7	−0.35	C	6*n*
		2535.61	978.1	40405	1	3	0.97	0.28	2.4	−0.55	C	6*n*
15.	$a\ ^5\mathrm{D} - y\ ^7\mathrm{P}^\circ$ (uv 8)											
		2512.36	415.9	40207	7	7	0.027	0.0025	0.15	−1.75	C	6*n*
16.	$a\ ^5\mathrm{D} - x\ ^5\mathrm{F}^\circ$ (uv 9)											
		2483.27	0.0	40257	9	11	4.9	0.56	41	0.70	C	6*n*
		2488.14	415.9	40594	7	9	4.7	0.56	32	0.59	C	6*n*
		2490.64	704.0	40842	5	7	3.8	0.49	20	0.39	C	6*n*
		2491.15	888.1	41018	3	5	3.0	0.47	12	0.15	C	6*n*
		2462.65	0.0	40594	9	9	0.58	0.053	3.9	−0.32	C	6*n*
		2479.78	704.0	41018	5	5	1.8	0.17	6.9	−0.07	C	6*n*
		2462.18	415.9	41018	7	5	0.15	0.0099	0.56	−1.16	C	6*n*
17.	$a\ ^5\mathrm{D} - x\ ^5\mathrm{P}^\circ$ (uv 11)											
		2373.62	415.9	42533	7	7	0.067	0.0057	0.31	−1.40	C	6*n*
		2371.43	704.0	42860	5	5	0.052	0.0044	0.17	−1.66	C	6*n*
		2389.97	704.0	42533	5	7	0.050	0.0060	0.24	−1.52	C	6*n*
		2381.83	888.1	42860	3	5	0.054	0.0076	0.18	−1.64	C	6*n*
		2374.52	978.1	43079	1	3	0.29	0.074	0.58	−1.13	C	6*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
18.	$a\ ^5D - w\ ^5D^\circ$ (uv 14)											
		2276.03	0.0	43923	9	7	0.17	0.010	0.68	−1.04	C	6*n*
		2287.25	704.0	44411	5	3	0.34	0.016	0.60	−1.10	C	6*n*
		2294.41	888.1	44459	3	1	0.61	0.016	0.36	−1.32	C	6*n*
		2320.36	415.9	43499	7	9	0.12	0.013	0.68	−1.05	C	6*n*
		2313.10	704.0	43923	5	7	0.14	0.016	0.59	−1.11	C	6*n*
		2309.00	888.1	44184	3	5	0.15	0.020	0.46	−1.22	C	6*n*
		2301.68	978.1	44411	1	3	0.13	0.030	0.23	−1.52	C	6*n*
19.	$a\ ^5D -\ ^5F^\circ$											
		2259.51	0.0	44244	9	11	0.070	0.0065	0.44	−1.23	C	6*n*
		2272.07	415.9	44415	7	9	0.038	0.0038	0.20	−1.58	C	6*n*
		2300.14	704.0	44166	5	7	0.080	0.0089	0.34	−1.35	C	6*n*
		2303.58	888.1	44285	3	5	0.076	0.010	0.23	−1.52	C	6*n*
		2303.42	978.1	44378?	1	3	0.094	0.022	0.17	−1.65	C	6*n*
		2250.79	0.0	44415	9	9	0.019	0.0014	0.095	−1.89	C	6*n*
20.	$a\ ^5D -\ ^5D^\circ$											
		2265.05	415.9	44551	7	7	0.020	0.0015	0.080	−1.97	C	6*n*
		2259.28	415.9	44664	7	5	0.013	7.0(−4)	0.036	−2.31	C	6*n*
		2292.52	415.9	44023	7	9	0.043	0.0043	0.23	−1.52	C	6*n*
21.	$a\ ^5D - y\ ^5S^\circ$ (uv 17)											
		2267.08	415.9	44512	7	5	0.071	0.0039	0.21	−1.56	C	6*n*
22.	$a\ ^5D - x\ ^3D^\circ$ (uv 18)											
		2228.17	415.9	45282	7	5	0.021	0.0011	0.057	−2.11	C	6*n*
23.	$a\ ^5D - w\ ^5P^\circ$ (uv 21)											
		2166.77	0.0	46137	9	7	2.7	0.15	9.6	0.13	C	6*n*
		2191.84	704.0	46314	5	5	1.2	0.083	3.0	−0.38	C	6*n*
		2196.04	888.1	46410	3	3	1.2	0.086	1.9	−0.59	C	6*n*
		2200.72	888.1	46314	3	5	0.28	0.034	0.74	−0.99	C	6*n*
24.	$a\ ^5D - z\ ^3S^\circ$ (uv 22)											
		2191.20	978.1	46601	1	3	0.073	0.016	0.11	−1.80	C	6*n*
25.	$a\ ^5D - y\ ^3P^\circ$ (uv 23)											
		2176.84	978.1	46902	1	3	0.10	0.022	0.16	−1.66	C	6*n*
26.	$a\ ^5D -\ ^5D^\circ$											
		2132.02	0.0	46889	9	9	0.076	0.0052	0.33	−1.33	C	6*n*
		2145.19	415.9	47017	7	7	0.057	0.0039	0.19	−1.56	C	6*n*
		2153.01	704.0	47136	5	5	0.069	0.0048	0.17	−1.62	C	6*n*
		2161.58	888.1	47136	3	5	0.050	0.0058	0.12	−1.76	C	6*n*
27.	$a\ ^5D -\ ^3D^\circ$											
		2138.59	0.0	46745	9	7	0.028	0.0015	0.095	−1.87	C	6*n*
		2171.30	704.0	46745	5	7	0.051	0.0050	0.18	−1.60	C	6*n*
		2173.21	888.1	46889	3	5	0.083	0.0098	0.21	−1.53	C	6*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
28.	$a\ ^5D - v\ ^5P^o$ (uv 33)											
		2084.12	0.0	47967	9	7	0.37	0.019	1.2	−0.77	C	6*n*
		2102.35	415.9	47967	7	7	0.088	0.0058	0.28	−1.39	C	6*n*
		2112.97	978.1	48290	1	3	0.19	0.038	0.26	−1.42	C	6*n*
29.	$a\ ^5D - u\ ^5F^o$ (uv 35)											
		1937.27	0.0	51619?	9	7	0.22	0.0095	0.54	−1.07	C	6*n*
30.	$a\ ^5D - u\ ^5P^o$ (uv 37)											
		1934.54	0.0	51692?	9	7	0.25	0.011	0.64	−1.00	C	6*n*
		1940.66	415.9	51945?	7	5	0.26	0.010	0.46	−1.14	C	6*n*
31.	$a\ ^5F - z\ ^7D^o$ (12)											
		7912.87	6928	19562	11	9	1.68(−6)	1.29(−6)	3.70(−4)	−4.848	B+	3
		8075.13	7377	19757	9	7	1.27(−6)	9.63(−7)	2.30(−4)	−5.062	B+	3
32.	$a\ ^5F - z\ ^7F^o$ (13)											
		6358.69	6928	22650	11	13	4.32(−6)	3.09(−6)	7.13(−4)	−4.468	B+	3
		6280.63	6928	22846	11	11	6.31(−6)	3.73(−6)	8.48(−4)	−4.387	B+	3
		6498.95	7728	23111	7	7	4.51(−6)	2.86(−6)	4.28(−4)	−4.699	B+	3
		6574.24	7986	23192	5	5	3.3(−6)	2.1(−6)	2.3(−4)	−4.97	C	5*n*
33.	$a\ ^5F - z\ ^7P^o$ (14)											
		5956.70	6928	23711	11	9	5.19(−6)	2.26(−6)	4.87(−4)	−4.605	B+	3
34.	$a\ ^5F - z\ ^5D^o$ (15)											
		5269.54	6928	25900	11	9	0.0127	0.00434	0.828	−1.321	B+	3
		5328.04	7377	26140	9	7	0.0115	0.00380	0.600	−1.466	B+	3
		5371.49	7728	26340	7	5	0.0105	0.00324	0.400	−1.645	B+	3
		5405.77	7986	26479	5	3	0.0109	0.00286	0.255	−1.844	B+	3
		5434.52	8155	26550	3	1	0.0171	0.00252	0.135	−2.122	B+	3
		5397.13	7377	25900	9	9	0.00259	0.00113	0.181	−1.993	B+	3
		5429.70	7728	26140	7	7	0.00427	0.00189	0.236	−1.879	B+	3
		5446.92	7986	26340	5	5	0.0062	0.0028	0.25	−1.86	C	4*n*
		5501.46	7728	25900	7	9	3.2(−4)	1.9(−4)	0.024	−2.88	C	4*n*
		5506.78	7986	26140	5	7	5.01(−4)	3.19(−4)	0.0289	−2.797	B+	3
		5497.52	8155	26340	3	5	6.25(−4)	4.72(−4)	0.0256	−2.849	B+	3
35.	$a\ ^5F - z\ ^5F^o$ (16)											
		5012.07	6928	26875	11	11	5.50(−4)	2.07(−4)	0.0376	−2.642	B+	3
		5051.63	7377	27167	9	9	4.66(−4)	1.78(−4)	0.0267	−2.795	B+	3
		5083.34	7728	27395	7	7	4.06(−4)	1.57(−4)	0.0184	−2.958	B+	3
		5107.45	7986	27560	5	5	4.19(−4)	1.64(−4)	0.0138	−3.087	B+	3
		5123.72	8155	27666	3	3	7.24(−4)	2.85(−4)	0.0144	−3.068	B+	3
		4939.69	6928	27167	11	9	1.39(−4)	4.16(−5)	0.00743	−3.340	B+	3
		4994.13	7377	27395	9	7	3.18(−4)	9.24(−5)	0.0137	−3.080	B+	3
		5079.74	7986	27666	5	3	5.19(−4)	1.21(−4)	0.0101	−3.220	B+	3
		5127.36	7377	26875	9	11	1.14(−4)	5.48(−5)	0.00832	−3.307	B+	3
		5150.84	7986	27395	5	7	3.6(−4)	2.0(−4)	0.017	−3.00	C	4*n*
		5151.91	8155	27560	3	5	2.39(−4)	1.59(−4)	0.00808	−3.322	B+	3

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
36.	$a\,^5F - z\,^3F^\circ$ (18)											
		4100.74	6928	31307	11	9	2.92(−4)	6.02(−5)	0.00894	−3.179	B+	3
		4092.46	7377	31805	9	7	3.1(−5)	6.1(−6)	7.4(−4)	−4.26	C	5*n*
		4177.59	7377	31307	9	9	3.72(−4)	9.72(−5)	0.0120	−3.058	B+	3
		4152.17	7728	31805	7	7	3.24(−4)	8.37(−5)	0.00801	−3.232	B+	3
		4139.93	7986	32134	5	5	1.83(−4)	4.70(−5)	0.00320	−3.629	B+	3
37.	$a\,^5F - z\,^3D^\circ$ (19)											
		4174.91	7377	31323	9	7	5.87(−4)	1.19(−4)	0.0148	−2.969	B+	3
		4172.74	7728	31686	7	5	6.46(−4)	1.20(−4)	0.0116	−3.074	B+	3
		4173.92	7986	31937	5	3	6.3(−4)	9.8(−5)	0.0067	3.31	C	5*n*
		4237.07	7728	31323	7	7	2.22(−5)	5.97(−6)	5.83(−4)	−4.379	B+	3
38.	$a\,^5F - y\,^5D^\circ$ (20)											
		3820.43	6928	33096	11	9	0.668	0.120	16.5	0.119	B+	3
		3825.88	7377	33507	9	7	0.598	0.102	11.6	−0.037	B+	3
		3834.22	7728	33802	7	5	0.453	0.0713	6.30	−0.302	B+	3
		3840.44	7986	34017	5	3	0.470	0.0624	3.94	−0.506	B+	3
		3849.96	8155	34122	3	1	0.606	0.0449	1.71	−0.871	B+	3
		3887.05	7377	33096	9	9	0.0352	0.00798	0.919	−1.144	B+	3
		3878.02	7728	33507	7	7	0.0772	0.0174	1.56	−0.914	B+	3
		3872.50	7986	33802	5	5	0.105	0.0236	1.50	−0.928	B+	3
		3865.52	8155	34017	3	3	0.155	0.0347	1.33	−0.982	B+	3
		3940.88	7728	33096	7	9	0.00120	3.59(−4)	0.0326	−2.600	B+	3
		3917.18	7986	33507	5	7	0.00435	0.00140	0.0902	−2.155	B+	3
39.	$a\,^5F - y\,^5F^\circ$ (21)	*3750.2*	*7460*	*34118*	35	35	0.914	0.193	83.3	0.829	B+	3
		3734.86	6928	33695	11	11	0.902	0.189	25.5	0.317	B+	3
		3749.48	7377	34040	9	9	0.764	0.161	17.9	0.161	B+	3
		3758.23	7728	34329	7	7	0.634	0.134	11.6	−0.027	B+	3
		3763.79	7986	34547	5	5	0.544	0.116	7.16	−0.238	B+	3
		3767.19	8155	34692	3	3	0.640	0.136	5.06	−0.389	B+	3
		3687.46	6928	34040	11	9	0.0801	0.0134	1.78	−0.833	B+	3
		3709.25	7377	34329	9	7	0.156	0.0251	2.76	−0.646	B+	3
		3727.62	7728	34547	7	5	0.225	0.0334	2.87	−0.631	B+	3
		3743.36	7986	34692	5	3	0.260	0.0328	2.02	−0.785	B+	3
		3798.51	7377	33695	9	11	0.0323	0.00855	0.962	−1.114	B+	3
		3799.55	7728	34040	7	9	0.0732	0.0204	1.78	−0.846	B+	3
		3795.00	7986	34329	5	7	0.115	0.0347	2.17	−0.761	B+	3
		3787.88	8155	34547	3	5	0.129	0.0461	1.73	−0.859	B+	3
40.	$a\,^5F - z\,^3P^\circ$ (22)											
		3812.96	7728	33947	7	5	0.0792	0.0123	1.08	−1.064	B+	3
		3790.09	7986	34363	5	3	0.0268	0.00347	0.216	−1.761	B+	3
		3786.68	8155	34556	3	1	0.0277	0.00199	0.0743	−2.225	B+	3
		3850.82	7986	33947	5	5	0.0166	0.00369	0.234	−1.734	B+	3
		3814.52	8155	34363	3	3	0.00624	0.00136	0.0513	−2.389	B+	25
		3876.04	8155	33947	3	5	0.0017	6.3(−4)	0.024	−2.72	C	4*n*,5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
41.	$a\ ^5F - z\ ^5G^\circ$ (23)											
		3581.19	6928	34844	11	13	1.02	0.232	30.0	0.406	B+	3
		3647.84	7377	34782	9	11	0.292	0.0711	7.68	−0.194	B+	3
		3631.46	7728	35257	7	9	0.517	0.131	11.0	−0.036	B+	3
		3618.77	7986	35612	5	7	0.73	0.20	12	0.00	C+	4*n*,6*n*
		3608.86	8155	35856	3	5	0.814	0.265	9.44	−0.100	B+	3
		3589.11	6928	34782	11	11	0.00361	6.98(−4)	0.0907	−2.115	B+	3
		3585.71	7377	35257	9	9	0.0375	0.00722	0.767	−1.187	B+	3
		3585.32	7728	35612	7	7	0.13	0.025	2.1	−0.76	C	6*n*
		3586.98	7986	35856	5	5	0.17	0.032	1.9	−0.80	C+	4*n*,6*n*
		3540.71	7377	35612	9	7	0.0017	2.4(−4)	0.026	−2.66	C	5*n*
42.	$a\ ^5F - z\ ^3G^\circ$ (24)											
		3513.82	6928	35379	11	11	0.0341	0.00630	0.802	−1.159	B+	3
		3483.01	7377	36079	9	7	9.4(−4)	1.3(−4)	0.014	−2.92	D	12*n*
		3570.10	7377	35379	9	11	0.677	0.158	16.7	0.153	B+	3
		3565.38	7728	35768	7	9	0.39	0.094	7.8	−0.18	C+	4*n*
43.	$a\ ^5F - y\ ^5P^\circ$ (26)											
		3396.98	7728	37158	7	5	0.0024	2.9(−4)	0.023	−2.69	D	12*n*
		3417.27	8155	37410	3	3	7.2(−4)	1.3(−4)	0.0043	−3.42	D	12*n*
44.	$a\ ^5F - x\ ^5D^\circ$ (28)											
		3057.45	6928	39626	11	9	0.45	0.051	5.7	−0.25	C+	4*n*
		3067.24	7377	39970	9	7	0.35	0.039	3.5	−0.46	C+	4*n*
		3075.72	7728	40231	7	5	0.30	0.031	2.2	−0.67	C+	4*n*
		3083.74	7986	40405	5	3	0.35	0.030	1.5	−0.82	C+	4*n*
		3091.58	8155	40491	3	1	0.64	0.030	0.93	−1.04	C	4*n*
		3100.67	7728	39970	7	7	0.16	0.023	1.7	−0.79	C+	4*n*
		3134.11	7728	39626	7	9	0.014	0.0027	0.20	−1.72	C	4*n*
45.	$a\ ^5F - x\ ^5F^\circ$ (30)											
		2999.51	6928	40257	11	11	0.23	0.032	3.4	−0.46	C+	4*n*
		3009.57	7377	40594	9	9	0.18	0.024	2.2	−0.66	C+	4*n*
		3018.98	7728	40842	7	7	0.15	0.020	1.4	−0.85	C+	4*n*
		3026.46	7986	41018	5	5	0.13	0.018	0.91	−1.04	C	4*n*
		3031.63	8155	41131	3	3	0.18	0.025	0.74	−1.13	C	4*n*
		2987.29	7377	40842	9	7	0.077	0.0080	0.71	−1.14	C	4*n*
		3016.18	7986	41131	5	3	0.10	0.0081	0.40	−1.39	C	4*n*
		3040.43	7377	40257	9	11	0.035	0.0060	0.54	−1.27	C	4*n*
		3042.66	7986	40842	5	7	0.066	0.013	0.65	−1.19	C	4*n*
		3042.02	8155	41018	3	5	0.057	0.013	0.40	−1.40	C	4*n*
46.	$a\ ^5F - y\ ^5G^\circ$ (uv 44)											
		2788.10	6928	42784	11	13	0.63	0.087	8.8	−0.02	C	6*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
47.	$a\ ^5F - w\ ^5D^\circ$ (uv 46)											
		2733.58	6928	43499	11	9	0.86	0.079	7.8	−0.06	C	7
		2735.48	7377	43923	9	7	0.62	0.054	4.4	−0.31	C	7
48.	$a\ ^5F - {}^5F^\circ$											
		2679.06	6928	44244	11	11	0.19	0.021	2.0	−0.64	C	7
49.	$a\ ^5F - x\ ^5G^\circ$ (uv 52)											
		2584.54	6928	45608?	11	13	0.46	0.054	5.1	−0.23	C	6*n*, 7
		2606.83	7377	45726	9	11	0.42	0.052	4.0	−0.33	C	7
		2623.53	7728	45833	7	9	0.33	0.044	2.7	−0.51	C	7
		2618.02	7728	45913	7	7	0.40	0.041	2.5	−0.54	C	7
50.	$a\ ^5F - t\ ^5D^\circ$ (uv 71)											
		2277.11	7728	51630?	7	5	37	2.1	110	1.16	C	6*n*
51.	$a\ ^3F - z\ ^5F^\circ$ (34)											
		6581.22	11976	27167	9	9	2.8(−6)	1.8(−6)	3.5(−4)	−4.79	C	5*n*
52.	$a\ ^3F - z\ ^5P^\circ$ (35)											
		5853.18	11976	29056	9	7	1.7(−6)	6.9(−7)	1.2(−4)	−5.21	C	5*n*
53.	$a\ ^3F - z\ ^3F^\circ$ (36)											
		5171.60	11976	31307	9	9	0.0045	0.0018	0.28	−1.79	C	4*n*
		5307.36	12969	31805	5	7	1.2(−4)	7.1(−5)	0.0062	−3.45	D	15*n*
54.	$a\ ^3F - z\ ^3D^\circ$ (37)											
		5167.49	11976	31323	9	7	0.023	0.0072	1.1	−1.19	C	4*n*
		5270.36	12969	31937	5	3	0.029	0.0073	0.63	−1.44	C	4*n*
		5341.02	12969	31686	5	5	0.0047	0.0020	0.18	−2.00	D	9
55.	$a\ ^3F - y\ ^5D^\circ$ (38)											
		4733.59	11976	33096	9	9	6.4(−4)	2.2(−4)	0.030	−2.71	C	4*n*
		4798.73	12969	33802	5	5	3.8(−5)	1.3(−5)	0.0010	−4.18	C	5*n*
56.	$a\ ^3F - y\ ^5F^\circ$ (39)											
		4602.94	11976	33695	9	11	0.0032	0.0012	0.17	−1.95	C	4*n*
		4680.29	12969	34329	5	7	7.2(−5)	3.3(−5)	0.0026	−3.78	C	5*n*
		4531.15	11976	34040	9	9	0.0030	9.2(−4)	0.12	−2.08	C	4*n*
		4592.65	12561	34329	7	7	0.0017	5.4(−4)	0.057	−2.42	D−	14*n*
		4632.91	12969	34547	5	5	9.2(−4)	3.0(−4)	0.023	−2.83	C	5*n*
		4547.02	12561	34547	7	5	1.4(−4)	3.1(−5)	0.0033	−3.66	C	5*n*
		4602.00	12969	34692	5	3	6.8(−4)	1.3(−4)	0.0098	−3.19	C	5*n*
57.	$a\ ^3F - z\ ^3P^\circ$ (40)											
		4674.65	12561	33947	7	5	1.2(−5)	2.7(−6)	2.9(−4)	−4.72	C	5*n*
		4765.48	12969	33947	5	5	6.7(−5)	2.3(−5)	0.0018	−3.94	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
58.	$a\ ^3\mathrm{F} - z\ ^5\mathrm{G}^\circ$ (41)											
		4383.54	11976	34782	9	11	0.46	0.16	21	0.16	C+	4*n*
		4404.75	12561	35257	7	9	0.25	0.094	9.6	−0.18	C+	4*n*
		4415.12	12969	35612	5	7	0.13	0.053	3.8	−0.58	C+	4*n*
		4294.12	11976	35257	9	9	0.037	0.010	1.3	−1.04	C	4*n*
		4337.05	12561	35612	7	7	0.012	0.0035	0.35	−1.61	C	4*n*
		4367.90	12969	35856	5	5	0.0018	5.3(−4)	0.038	−2.58	C	5*n*
		4229.75	11976	35612	9	7	2.9(−4)	6.1(−5)	0.0077	−3.26	C	5*n*
59.	$a\ ^3\mathrm{F} - z\ ^3\mathrm{G}^\circ$ (42)	*4293.8*	*12407*	*35690*	21	27	0.41	0.14	43	0.48	D	4*n*,9,13*n*
		4271.76	11976	35379	9	11	0.25	0.082	10	−0.13	D−	13*n*
		4307.90	12561	35768	7	9	0.35	0.12	12	−0.06	C+	4*n*
		4325.76	12969	36079	5	7	0.51	0.20	14	0.00	C+	4*n*
		4202.03	11976	35768	9	9	0.11	0.030	3.7	−0.57	D	9
		4250.79	12561	36079	7	7	0.11	0.029	2.9	−0.69	D−	13*n*
		4147.67	11976	36079	9	7	0.0059	0.0012	0.15	−1.97	C	4*n*
60.	$a\ ^3\mathrm{F} - y\ ^3\mathrm{F}^\circ$ (43)	*4057.8*	*12407*	*37044*	21	21	0.98	0.24	68	0.71	C+	4*n*,13*n*
		4045.81	11976	36686	9	9	0.75	0.18	22	0.22	C+	4*n*
		4063.59	12561	37163	7	7	0.69	0.17	16	0.08	C+	4*n*
		4071.74	12969	37521	5	5	0.80	0.20	13	0.00	C+	4*n*
		3969.26	11976	37163	9	7	0.24	0.043	5.1	−0.41	C+	4*n*
		4005.24	12561	37521	7	5	0.22	0.038	3.5	−0.57	C+	4*n*
		4143.87	12561	36686	7	9	0.16	0.052	5.0	−0.44	C+	4*n*
		4132.06	12969	37163	5	7	0.13	0.047	3.2	−0.63	D−	13*n*
61.	$a\ ^3\mathrm{F} - y\ ^5\mathrm{P}^\circ$ (44)											
		4032.63	11976	36767	9	7	0.0025	4.7(−4)	0.057	−2.37	C	5*n*
62.	$a\ ^3\mathrm{F} - y\ ^3\mathrm{D}^\circ$ (45)	*3830.3*	*12407*	*38507*	21	15	1.5	0.23	62	0.69	C+	4*n*,5*n*,6*n*
		3815.84	11976	38175	9	7	1.3	0.22	25	0.30	C+	4*n*,6*n*
		3827.82	12561	38678	7	5	1.1	0.18	16	0.09	C+	4*n*
		3841.05	12969	38996	5	3	1.4	0.18	12	−0.04	C+	4*n*
		3902.95	12561	38175	7	7	0.24	0.054	4.9	−0.42	C+	4*n*
		3888.51	12969	38678	5	5	0.27	0.060	3.9	−0.52	C+	4*n*
		3966.06	12969	38175	5	7	0.017	0.0055	0.36	−1.56	C	4*n*,5*n*
63.	$a\ ^3\mathrm{F} - x\ ^5\mathrm{D}^\circ$ (46)											
		3615.66	11976	39626	9	9	7.5(−4)	1.5(−4)	0.016	−2.88	C	5*n*
		3666.94	12969	40231	5	5	6.7(−4)	1.4(−4)	0.0082	−3.17	C	5*n*
		3571.22	11976	39970	9	7	0.0022	3.3(−4)	0.035	−2.53	C	5*n*
64.	$a\ ^3\mathrm{F} - x\ ^5\mathrm{F}^\circ$ (48)											
		3493.28	11976	40594	9	9	9.2(−4)	1.7(−4)	0.017	−2.82	C	5*n*
		3564.11	12969	41018	5	5	0.0016	3.0(−4)	0.018	−2.82	C	5*n*
		3463.30	11976	40842	9	7	0.0011	1.5(−4)	0.015	−2.87	D	12*n*
		3513.05	12561	41018	7	5	0.0037	5.0(−4)	0.040	−2.46	C	5*n*
		3549.86	12969	41131	5	3	0.0060	6.8(−4)	0.040	−2.47	C	5*n*
65.	$a\ ^3\mathrm{F} - x\ ^3\mathrm{D}^\circ$ (55)											
		3068.17	12969	45552	5	3	0.12	0.0098	0.49	−1.31	C	4*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
66.	$a\ ^3F - {}^3F^\circ$											
		2920.69	12969	47197	5	5	0.061	0.0078	0.37	−1.41	C	4*n*
67.	$a\ ^5P - y\ ^5D^\circ$ (62)											
		6430.85	17550	33096	7	9	0.0017	0.0014	0.20	−2.02	D−	14*n*
		6297.80	17927	33802	3	5	5.6(−4)	5.5(−4)	0.034	−2.78	C	5*n*
		6151.62	17550	33802	7	5	1.6(−4)	6.4(−5)	0.0090	−3.35	C	5*n*
		6173.34	17927	34122	3	1	0.0018	3.4(−4)	0.021	−2.99	C	5*n*
68.	$a\ ^5P - y\ ^5F^\circ$ (63)											
		6062.89	17550	34040	7	9	1.7(−5)	1.2(−5)	0.0017	−4.07	C	5*n*
		5892.80	17727	34692	5	3	7.0(−5)	2.2(−5)	0.0021	−3.96	C	5*n*
69.	$a\ ^5P - z\ ^3P^\circ$ (64)											
		6012.21	17927	34556	3	1	1.5(−4)	2.7(−5)	0.0016	−4.09	C	5*n*
		6163.56	17727	33947	5	5	6.0(−5)	3.4(−5)	0.0034	−3.77	C	5*n*
		6082.72	17927	34363	3	3	1.5(−4)	8.4(−5)	0.0050	−3.60	C	5*n*
		6240.66	17927	33947	3	5	1.5(−4)	1.5(−4)	0.0090	−3.36	C	5*n*
70.	$a\ ^5P - y\ ^3F^\circ$ (65)											
		5224.30	17550	36686	7	9	2.7(−5)	1.4(−5)	0.0017	−4.01	C	5*n*
		5143.73	17727	37163	5	7	6.9(−5)	3.8(−5)	0.0032	−3.72	C	5*n*
71.	$a\ ^5P - y\ ^5P^\circ$ (66)											
		5202.34	17550	36767	7	7	0.0097	0.0039	0.47	−1.56	C	4*n*
		5145.09	17727	37158	5	5	3.5(−4)	1.4(−4)	0.012	−3.16	C	5*n*
		5198.71	17927	37158	3	5	0.0039	0.0026	0.14	−2.10	C	4*n*
72.	$a\ ^5P - y\ ^3D^\circ$ (67)											
		4771.70	17727	38678	5	5	1.1(−4)	3.6(−5)	0.0029	−3.74	C	5*n*
		4745.13	17927	38996	3	3	7.8(−5)	2.6(−5)	0.0012	−4.10	C	5*n*
		4817.77	17927	38678	3	5	2.0(−4)	1.2(−4)	0.0055	−3.46	C	5*n*
73.	$a\ ^5P - x\ ^5D^\circ$ (68)											
		4528.61	17550	39626	7	9	0.063	0.025	2.6	−0.76	C+	4*n*
		4494.56	17727	39970	5	7	0.035	0.015	1.1	−1.12	C	4*n*,5*n*
		4459.12	17550	39970	7	7	0.028	0.0084	0.86	−1.23	C	4*n*
		4442.34	17727	40231	5	5	0.047	0.014	1.0	−1.16	C	4*n*
		4447.72	17927	40405	3	3	0.063	0.019	0.82	−1.25	C	4*n*
		4407.71	17550	40231	7	5	0.0097	0.0020	0.20	−1.85	C	4*n*
		4408.41	17727	40405	5	3	0.026	0.0046	0.33	−1.64	C	4*n*
		4430.61	17927	40491	3	1	0.11	0.010	0.45	−1.51	D	9
74.	$a\ ^5P - y\ ^7P^\circ$ (69)											
		4447.13	17727	40207	5	7	0.0015	6.0(−4)	0.044	−2.52	C	5*n*
		4518.58	17927	40052	3	5	8.8(−5)	4.5(−5)	0.0020	−3.87	C	5*n*
		4478.04	17727	40052	5	5	1.6(−4)	4.7(−5)	0.0035	−3.63	C	5*n*
		4442.83	17550	40052	7	5	0.0019	4.0(−4)	0.041	−2.55	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
75.	$a\ ^5P - x\ ^5F^o$ (70)											
		4338.26	17550	40594	7	9	7.7(−4)	2.8(−4)	0.028	−2.71	C	5n
		4292.13	17550	40842	7	7	5.5(−4)	1.5(−4)	0.015	−2.97	C	5n
		4292.29	17727	41018	5	5	0.0014	3.9(−4)	0.028	−2.71	C	5n
76.	$a\ ^5P - z\ ^5S^o$ (71)	*4307.1*	*17684*	40895	15	5	0.26	0.024	5.2	−0.44	C+	4n,5n
		4282.40	17550	40895	7	5	0.13	0.025	2.5	−0.76	C+	4n,5n
		4315.08	17727	40895	5	5	0.090	0.025	1.8	−0.90	C+	4n
		4352.73	17927	40895	3	5	0.045	0.022	0.93	−1.19	C	4n
77.	$a\ ^5P - x\ ^5P^o$ (72)	*3988.2*	*17684*	*42751*	15	15	0.081	0.019	3.8	−0.54	C	4n,5n
		4001.66	17550	42533	7	7	0.0092	0.0022	0.20	−1.81	C	4n,5n
		3977.74	17727	42860	5	5	0.082	0.020	1.3	−1.01	C	4n
		3974.77	17927	43079	3	3	0.0042	9.8(−4)	0.039	−2.53	C	5n
		3949.95	17550	42860	7	5	0.070	0.012	1.1	−1.09	C	5n
		3943.34	17727	43079	5	3	0.0092	0.0013	0.084	−2.19	C	5n
		4030.18	17727	42533	5	7	0.0034	0.0012	0.076	−2.24	C	5n
		4009.71	17927	42860	3	5	0.062	0.025	0.98	−1.13	C	4n
78.	$a\ ^5P - w\ ^5D^o$ (73)											
		3852.57	17550	43499	7	9	0.034	0.0097	0.86	−1.17	C	4n
		3816.34	17727	43923	5	7	0.027	0.0081	0.51	−1.39	C	5n
		3807.54	17927	44184	3	5	0.097	0.035	1.3	−0.98	C+	4n,5n
		3778.70	17727	44184	5	5	0.010	0.0022	0.14	−1.96	C	5n
		3774.82	17927	44411	3	3	0.061	0.013	0.48	−1.41	C	4n,5n
		3753.61	17550	44184	7	5	0.11	0.017	1.5	−0.92	C+	4n,5n
		3746.49	17727	44411	5	3	0.013	0.0017	0.10	−2.08	C	5n
		3768.03	17927	44459	3	1	0.098	0.0070	0.26	−1.68	C	5n
79.	$a\ ^5P - {}^5F^o$											
		3781.19	17727	44166	5	7	0.0094	0.0028	0.18	−1.85	C	5n
		3792.83	17927	44285	3	5	0.0040	0.0015	0.055	−2.36	C	5n
		3756.07	17550	44166	7	7	0.0065	0.0014	0.12	−2.02	C	5n
		3739.32	17550	44285	7	5	0.0054	8.0(−4)	0.069	−2.25	C	5n
80.	$a\ ^5P - {}^5D^o$											
		3776.45	17550	44023	7	9	0.017	0.0048	0.42	−1.47	C	4n,5n
		3739.12	17927	44664	3	5	0.0071	0.0025	0.091	−2.13	C	5n
		3687.10	17550	44664	7	5	0.028	0.0040	0.34	−1.55	C	5n
81.	$a\ ^5P - y\ ^5S^o$ (76)											
		3732.40	17727	44512	5	5	0.28	0.059	3.6	−0.53	C+	4n
		3760.53	17927	44512	3	5	0.057	0.020	0.75	−1.22	C	4n,5n
82.	$a\ ^5P - x\ ^3D^o$ (77)											
		3628.09	17727	45282	5	5	0.0061	0.0012	0.072	−2.22	C	5n
		3592.89	17727	45552	5	3	0.0037	4.3(−4)	0.025	−2.67	C	5n
		3654.66	17927	45282	3	5	0.0017	5.5(−4)	0.020	−2.78	C	5n

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
83.	$a\ ^5P - w\ ^5P^{\circ}$ (78)											
		3497.10	17550	46137	7	7	0.15	0.027	2.1	−0.73	C+	4*n*
		3509.87	17927	46410	3	3	0.018	0.0033	0.12	−2.00	C	5*n*
		3485.34	17727	46410	5	3	0.16	0.017	1.0	−1.06	C	4*n*
		3518.82	17727	46137	5	7	0.0073	0.0019	0.11	−2.02	C	5*n*
		3521.84	17927	46314	3	5	0.11	0.035	1.2	−0.98	C+	4*n*
84.	$a\ ^5P - z\ ^3S^{\circ}$ (79)											
		3462.35	17727	46601	5	3	0.013	0.0014	0.083	−2.14	D	12*n*
85.	$a\ ^5P - y\ ^3P^{\circ}$ (82)											
		3477.85	17927	46673	3	1	0.039	0.0024	0.081	−2.15	D	12*n*
		3447.28	17727	46727	5	5	0.11	0.019	1.1	−1.02	C	4*n*
		3450.33	17927	46902	3	3	0.24	0.043	1.5	−0.89	C+	4*n*
86.	$a\ ^5P - ^3F^{\circ}$											
		3427.12	17550	46721	7	9	0.56	0.13	10	−0.05	C+	4*n*
		3383.98	17550	47093	7	7	0.11	0.019	1.5	−0.88	C+	4*n*
		3372.07	17550	47197	7	5	0.0093	0.0011	0.088	−2.10	D	12*n*
87.	$a\ ^5P - ^5D^{\circ}$											
		3407.46	17550	46889	7	9	0.60	0.13	10	−0.03	C+	4*n*
		3413.13	17727	47017	5	7	0.37	0.089	5.0	−0.35	C+	4*n*
		3392.65	17550	47017	7	7	0.26	0.045	3.5	−0.50	C+	4*n*
		3399.33	17727	47136	5	5	0.39	0.068	3.8	−0.47	C+	4*n*
		3417.84	17927	47177	3	3	0.52	0.092	3.1	−0.56	C+	4*n*
		3394.58	17727	47177	5	3	0.12	0.012	0.67	−1.22	C	4*n*
		3418.51	17927	47171?	3	1	1.3	0.078	2.6	−0.63	C+	4*n*
88.	$a\ ^5P - ^3D^{\circ}$											
		3424.28	17550	46745	7	7	0.21	0.037	2.9	−0.59	C+	4*n*
		3428.19	17727	46889	5	5	0.22	0.038	2.2	−0.72	C+	4*n*
		3445.15	17727	46745	5	7	0.28	0.071	4.0	−0.45	C+	4*n*
89.	$a\ ^5P - z\ ^3H^{\circ}$ (84)											
		3382.40	17550	47106	7	9	0.0085	0.0019	0.15	−1.88	D	12*n*
90.	$a\ ^5P - v\ ^5F^{\circ}$ (90)											
		3298.13	17927	48239	3	5	0.095	0.026	0.84	−1.11	C	4*n*
		3257.59	17550	48239	7	5	0.15	0.017	1.3	−0.92	D−	11*n*
91.	$a\ ^5P - v\ ^5P^{\circ}$ (91)											
		3284.59	17727	48163	5	5	0.063	0.010	0.55	−1.29	C	4*n*
		3292.59	17927	48290	3	3	0.31	0.050	1.6	−0.82	C+	4*n*
		3265.62	17550	48163	7	5	0.39	0.044	3.3	−0.51	C+	4*n*
		3271.00	17727	48290	5	3	0.67	0.065	3.5	−0.49	C+	4*n*
		3305.97	17727	47967	5	7	0.48	0.11	6.0	−0.26	C+	4*n*
		3306.36	17927	48163	3	5	0.66	0.18	5.8	−0.27	D−	11*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
92.	$a\ ^5P - x\ ^3P^\circ$ (95)											
		3246.96	17727	48516	5	3	0.11	0.010	0.54	−1.30	E	11*n*
		3268.23	17927	48516	3	3	0.055	0.0088	0.28	−1.58	D	12*n*
		3290.99	17927	48305	3	5	0.071	0.019	0.62	−1.24	C	4*n*
93.	$a\ ^3P - y\ ^5D^\circ$ (109)											
		6608.03	18378	33507	5	7	2.4(−5)	2.2(−5)	0.0024	−3.96	C	5*n*
		7016.08	19552	33802	3	5	2.0(−4)	2.4(−4)	0.017	−3.14	C	5*n*
		6481.88	18378	33802	5	5	3.2(−4)	2.0(−4)	0.022	−2.99	C	5*n*
94.	$a\ ^3P - z\ ^3P^\circ$ (111)											
		6421.35	18378	33947	5	5	0.0036	0.0022	0.24	−1.95	D−	14*n*
		6750.15	19552	34363	3	3	0.0013	9.2(−4)	0.061	−2.56	C	5*n*
		6254.26	18378	34363	5	3	0.0019	6.8(−4)	0.070	−2.47	C	5*n*
95.	$a\ ^3P - y\ ^3F^\circ$ (112)											
		5322.04	18378	37163	5	7	3.7(−4)	2.2(−4)	0.019	−2.96	C	5*n*
96.	$a\ ^3P - y\ ^5P^\circ$ (113)											
		5436.59	18378	36767	5	7	1.5(−4)	9.6(−5)	0.0086	−3.32	C	5*n*
		5253.03	18378	37410	5	3	1.1(−4)	2.7(−5)	0.0023	−3.87	C	5*n*
97.	$a\ ^3P - y\ ^3D^\circ$ (114)											
		5049.82	18378	38175	5	7	0.017	0.0089	0.74	−1.35	C	4*n*
		4924.77	18378	38678	5	5	0.0039	0.0014	0.11	−2.15	D	10*n*
		4848.90	18378	38996	5	3	4.4(−4)	9.4(−5)	0.0075	−3.33	C	5*n*
98.	$a\ ^3P - x\ ^5D^\circ$ (115)											
		4630.12	18378	39970	5	7	0.0013	5.9(−4)	0.045	−2.53	C	5*n*
		4834.51	19552	40231	3	5	2.6(−4)	1.5(−4)	0.0073	−3.34	C	5*n*
		4574.72	18378	40231	5	5	8.0(−4)	2.5(−4)	0.019	−2.90	C	5*n*
		4794.36	19552	40405	3	3	1.0(−4)	3.5(−5)	0.0017	−3.98	C	5*n*
99.	$a\ ^3P - z\ ^5S^\circ$ (116)											
		4439.88	18378	40895	5	5	9.1(−4)	2.7(−4)	0.020	−2.87	C	5*n*
100.	$a\ ^3P - x\ ^5P^\circ$ (117)											
		4249.32	19552	43079	3	3	0.0010	2.8(−4)	0.012	−3.07	C	5*n*
101.	$a\ ^3P - w\ ^5D^\circ$ (120)											
		3913.63	18378	43923	5	7	0.017	0.0055	0.35	−1.56	C	4*n*,5*n*
		4058.75	19552	44184	3	5	0.0083	0.0034	0.14	−1.99	C	4*n*
		4101.68	20038	44411	1	3	0.0040	0.0030	0.041	2.52	C	4*n*
102.	$a\ ^3P - {}^5D^\circ$											
		3981.11	19552	44664	3	5	0.0011	4.4(−4)	0.017	−2.88	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
103.	$a\ ^3P - x\ ^3D^o$ (124)											
		3724.38	18378	45221	5	7	0.13	0.037	2.3	−0.73	C+	4*n*
		3885.51	19552	45282	3	5	0.069	0.026	0.99	−1.11	C	4*n*,5*n*
		3715.91	18378	45282	5	5	0.037	0.0076	0.47	−1.42	C	4*n*,5*n*
		3845.17	19552	45552	3	3	0.085	0.019	0.71	−1.25	C	4*n*,5*n*
104.	$a\ ^3P - w\ ^5P^o$ (127)											
		3578.67	18378	46314	5	5	0.019	0.0036	0.21	−1.74	C	5*n*
		3566.31	18378	46410	5	3	0.034	0.0039	0.23	−1.71	C	5*n*
105.	$a\ ^3P - y\ ^3P^o$ (131)											
		3504.86	18378	46902	5	3	0.020	0.0022	0.13	−1.95	C	5*n*
		3686.26	19552	46673	3	1	0.14	0.0094	0.34	−1.55	C	5*n*
		3678.86	19552	46727	3	5	0.047	0.016	0.58	−1.32	C	4*n*,5*n*
106.	$a\ ^3P - ^3F^o$											
		3616.32	19552	47197	3	5	0.0085	0.0028	0.099	−2.08	C	5*n*
107.	$a\ ^3P - ^5D^o$											
		3624.31	19552	47136	3	5	0.012	0.0040	0.14	−1.92	C	5*n*
108.	$a\ ^3P - ^3D^o$											
		3524.24	18378	46745	5	7	0.051	0.013	0.77	−1.18	C	4*n*,5*n*
		3657.14	19552	46889	3	5	0.013	0.0045	0.16	−1.87	C	5*n*
		3670.81	20038	47272	1	3	0.026	0.016	0.19	−1.80	C	5*n*
		3506.50	18378	46889	5	5	0.086	0.016	0.92	−1.10	C	4*n*,5*n*
109.	$a\ ^3P - v\ ^5F^o$ (138)											
		3347.93	18378	48239	5	5	0.047	0.0080	0.44	−1.40	C	4*n*
110.	$a\ ^3P - x\ ^3P^o$ (139)											
		3317.12	18378	48516	5	3	0.033	0.0032	0.18	−1.79	D	12*n*
		3510.44	20038	48516	1	3	0.052	0.029	0.33	−1.54	C	5*n*
111.	$a\ ^3P - u\ ^3D^o$ (146)											
		3053.07	19552	52297	3	5	0.18	0.042	1.3	−0.90	C+	4*n*
112.	$a\ ^3P - ^3D^o$											
		2954.65	18378	52213	5	7	0.12	0.021	1.0	−0.97	C+	4*n*
113.	$a\ ^3P - ^3P^o$											
		2894.50	18378	52916	5	5	0.63	0.080	3.8	−0.40	C+	4*n*
		2899.42	18378	52858	5	3	0.61	0.046	2.2	−0.64	C+	4*n*
		2996.39	19552	52916	3	5	0.19	0.042	1.2	−0.90	C+	4*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
114.	$z\,^7\mathrm{D}^\circ - e\,^7\mathrm{D}$ (152)											
		4260.47	19351	42816	11	11	0.37	0.10	15	0.04	D	9
		4235.94	19562	43163	9	9	0.23	0.062	7.8	−0.25	D	9
		4222.21	19757	43435	7	7	0.063	0.017	1.6	−0.93	C+	4*n*
		4210.34	20020	43764	3	3	0.20	0.053	2.2	−0.80	C+	4*n*
		4198.30	19351	43163	11	9	0.13	0.027	4.2	−0.52	D−	13*n*
		4187.79	19562	43435	9	7	0.16	0.034	4.2	−0.52	C+	4*n*
		4187.04	19757	43634	7	5	0.23	0.043	4.2	−0.52	C+	4*n*
		4271.15	19757	43163	7	9	0.19	0.067	6.6	−0.33	D−	13*n*
		4250.12	19912	43435	5	7	0.23	0.085	6.0	−0.37	C+	4*n*
		4233.60	20020	43634	3	5	0.20	0.092	3.8	−0.56	C+	4*n*
115.	$z\,^7\mathrm{D}^\circ - e\,^5\mathrm{D}$ (153)											
		3980.65	19562	44677	9	9	2.6(−4)	6.2(−5)	0.0074	−3.25	C	5*n*
		4011.71	19757	44677	7	9	0.0011	3.4(−4)	0.032	−2.62	C	5*n*
		3975.21	19912	45061	5	7	0.0012	4.1(−4)	0.027	−2.69	C	5*n*
116.	$z\,^7\mathrm{D}^\circ - e\,^7\mathrm{F}$ (155)											
		3225.79	19351	50342	11	13	1.0	0.19	22	0.32	C+	4*n*
		3196.93	19562	50833	9	11	0.96	0.18	17	0.21	D−	11*n*
		3175.45	19351	50833	11	11	0.13	0.020	2.3	−0.66	C+	4*n*
		3160.66	19562	51192	9	9	0.19	0.029	2.7	−0.59	C+	4*n*
		3205.40	20020	51208	3	3	1.2	0.18	5.8	−0.26	C+	4*n*
117.	$z\,^7\mathrm{D}^\circ - f\,^7\mathrm{D}$ (156)											
		3222.07	19351	50378	11	11	0.35	0.055	6.4	−0.22	D−	11*n*
		3199.53	19562	50808	9	9	0.27	0.041	3.9	−0.43	C+	4*n*
		3215.94	19912	50999	5	5	0.81	0.13	6.7	−0.20	C+	4*n*
		3219.58	19757	50808	7	9	0.67	0.13	9.9	−0.03	D−	11*n*
118.	$z\,^7\mathrm{D}^\circ - f\,^5\mathrm{D}$ (157)											
		3217.38	19351	50423	11	9	0.23	0.029	3.3	−0.50	C+	4*n*
		3227.80	19562	50534	9	7	1.7	0.21	20	0.28	D−	11*n*
		3230.96	19757	50699	7	5	0.39	0.044	3.3	−0.51	C+	4*n*
		3228.25	19912	50880	5	3	0.48	0.045	2.4	−0.65	D−	11*n*
		3248.20	19757	50534	7	7	0.22	0.035	2.6	−0.61	C+	4*n*
119.	$z\,^7\mathrm{D}^\circ - e\,^7\mathrm{P}$ (158)											
		3233.97	19562	50475	9	9	0.20	0.032	3.1	−0.54	C+	4*n*
		3230.21	19912	50861	5	5	0.21	0.032	1.7	−0.79	D−	11*n*
120.	$z\,^7\mathrm{D}^\circ - e\,^5\mathrm{G}$ (159)											
		3207.07	19351	50523	11	13	0.012	0.0021	0.25	−1.63	D	12*n*
121.	$z\,^7\mathrm{D}^\circ - e\,^7\mathrm{G}$ (160)											
		3161.95	19351	50968	11	13	0.12	0.021	2.4	−0.63	C+	4*n*
		3168.85	19912	51461	5	7	0.053	0.011	0.59	−1.25	D	12*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
122.	$a\ {}^3H - y\ {}^5F^{\circ}$ (167)											
		6988.53	19390	33695	13	11	3.2(−5)	2.0(−5)	0.0059	−3.59	C	5*n*
123.	$a\ {}^3H - z\ {}^5G^{\circ}$ (168)											
		6593.88	19621	34782	11	11	4.8(−4)	3.2(−4)	0.075	−2.46	C	5*n*
		6462.73	19788	35257	9	9	5.2(−4)	3.3(−4)	0.063	−2.53	C	5*n*
		6494.98	19390	34782	13	11	0.0067	0.0036	1.0	−1.33	D−	14*n*
		6393.60	19621	35257	11	9	0.0046	0.0023	0.53	−1.60	D−	14*n*
124.	$a\ {}^3H - z\ {}^3G^{\circ}$ (169)											
		6252.55	19390	35379	13	11	0.0031	0.0015	0.41	−1.70	D−	14*n*
		6191.56	19621	35768	11	9	0.0052	0.0024	0.55	−1.57	D−	14*n*
		6344.15	19621	35379	11	11	1.8(−4)	1.1(−4)	0.025	−2.92	C	5*n*
		6256.37	19788	35768	9	9	5.3(−4)	3.1(−4)	0.058	−2.55	C	5*n*
125.	$a\ {}^3H - y\ {}^3F^{\circ}$ (170)											
		5916.25	19788	36686	9	9	2.5(−4)	1.3(−4)	0.023	−2.93	C	5*n*
126.	$a\ {}^3H - y\ {}^3G^{\circ}$ (175)											
		3859.21	19390	45295	13	11	0.087	0.016	2.7	−0.67	C+	4*n*
		3873.76	19621	45428	11	9	0.082	0.015	2.1	−0.78	C+	4*n*
		3899.03	19788	45428	9	9	0.0097	0.0022	0.26	−1.70	C	4*n*,5*n*
127.	$a\ {}^3H - z\ {}^3I^{\circ}$ (177)											
		3760.05	19390	45978?	13	15	0.057	0.014	2.3	−0.74	C+	4*n*,5*n*
		3785.95	19621	46027	11	13	0.049	0.013	1.7	−0.86	C	5*n*
		3794.34	19788	46136	9	11	0.046	0.012	1.4	−0.96	C+	4*n*,5*n*
		3753.15	19390	46027	13	13	0.0012	2.5(−4)	0.041	−2.48	C	5*n*
128.	$a\ {}^3H - {}^3F^{\circ}$											
		3689.02	19621	46721	11	9	0.0047	7.9(−4)	0.11	−2.06	C	5*n*
		3661.36	19788	47093	9	7	0.0030	4.6(−4)	0.050	−2.38	C	5*n*
129.	$a\ {}^3H - {}^5D^{\circ}$											
		3688.88	19788	46889	9	9	0.0046	9.5(−4)	0.10	−2.07	C	5*n*
130.	$a\ {}^3H - z\ {}^3H^{\circ}$ (180)											
		3623.19	19390	46982	13	13	0.076	0.015	2.3	−0.71	C+	4*n*
		3659.52	19788	47106	9	9	0.068	0.014	1.5	−0.91	C+	4*n*
		3637.25	19621	47106	11	9	0.0083	0.0013	0.18	−1.83	C	5*n*
		3653.76	19621	46982	11	13	0.0053	0.0013	0.17	−1.86	C	5*n*
		3672.69	19788	47008	9	11	0.0037	9.0(−4)	0.098	−2.09	C	5*n*
131.	$a\ {}^3H - w\ {}^5G^{\circ}$ (181)											
		3596.20	19621	47420	11	11	0.0055	0.0011	0.14	−1.93	C	5*n*
		3595.86	19788	47590	9	9	0.0023	4.5(−4)	0.048	−2.39	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
132.	$a\,{}^3\mathrm{H} - v\,{}^5\mathrm{F}^\circ$ (182)											
		3531.44	19621	47930	11	9	0.0028	4.4(−4)	0.056	−2.32	C	5*n*
133.	$a\,{}^3\mathrm{H} - {}^5\mathrm{H}^\circ$											
		3514.63	19390	47835	13	11	0.0044	6.9(−4)	0.10	−2.05	C	5*n*
		3543.39	19621	47835	11	11	0.0036	6.7(−4)	0.086	−2.13	C	5*n*
		3567.37	19788	47812	9	9	0.0041	7.9(−4)	0.083	−2.15	C	5*n*
134.	$a\,{}^3\mathrm{H} - z\,{}^1\mathrm{H}^\circ$ (186)											
		3496.19	19788	48383	9	11	2.9(−4)	6.5(−5)	0.0068	−3.23	C	8
135.	$a\,{}^3\mathrm{H} - v\,{}^3\mathrm{G}^\circ$ (191)											
		3325.46	19788	49851	9	7	0.020	0.0025	0.25	−1.64	D	12*n*
136.	$a\,{}^3\mathrm{H} - u\,{}^3\mathrm{G}^\circ$ (194)											
		3119.49	19621	51668	11	9	0.096	0.011	1.3	−0.90	C+	4*n*
		3120.43	19788	51826	9	7	0.10	0.012	1.1	−0.97	C+	4*n*
137.	$a\,{}^3\mathrm{H} - w\,{}^3\mathrm{H}^\circ$ (198)											
		3009.09	19390	52613	13	11	0.079	0.0090	1.2	−0.93	C+	4*n*
		3015.92	19621	52769	11	9	0.069	0.0077	0.85	−1.07	C	4*n*
138.	$a\,{}^3\mathrm{H} - y\,{}^3\mathrm{I}^\circ$ (199)											
		3005.31	19390	52655?	13	15	0.024	0.0038	0.48	−1.31	C	8
		3039.32	19621	52514	11	13	0.016	0.0026	0.29	−1.54	C	8
		3018.14	19390	52514	13	13	0.012	0.0016	0.21	−1.67	C	8
139.	$a\,{}^3\mathrm{H} - z\,{}^1\mathrm{I}^\circ$ (200)											
		2986.65	19621	53094	11	13	0.0085	0.0013	0.15	−1.83	C	8
140.	$a\,{}^3\mathrm{H} - x\,{}^3\mathrm{I}^\circ$ (uv 156)											
		2656.15	19390	57028?	13	15	0.28	0.034	3.9	−0.35	C	8
		2669.49	19621	57070	11	13	0.17	0.021	2.1	−0.63	C	8
141.	$b\,{}^3\mathrm{F} - z\,{}^5\mathrm{G}^\circ$ (205)											
		6839.83	20641	35257	9	9	6.6(−5)	4.6(−5)	0.0094	−3.38	C	5*n*
142.	$b\,{}^3\mathrm{F} - z\,{}^3\mathrm{G}^\circ$ (206)											
		6609.12	20641	35768	9	9	3.1(−4)	2.0(−4)	0.040	−2.74	C	5*n*
		6575.02	20874	36079	7	7	3.9(−4)	2.5(−4)	0.038	−2.75	C	5*n*
		6475.63	20641	36079	9	7	3.1(−4)	1.5(−4)	0.029	−2.87	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
143.	$b\ ^3\mathrm{F} - y\ ^3\mathrm{F}^\circ$ (207)											
		6230.73	20641	36686	9	9	0.0087	0.0051	0.94	−1.34	D−	14*n*
		6137.69	20874	37163	7	7	0.0078	0.0044	0.62	−1.51	D−	14*n*
		6065.48	21039	37521	5	5	0.010	0.0058	0.58	−1.54	D−	14*n*
		6200.32	21039	37163	5	7	9.4(−4)	7.6(−4)	0.078	−2.42	C	5*n*
144.	$b\ ^3\mathrm{F} - y\ ^3\mathrm{D}^\circ$ (209)											
		5567.40	21039	38996	5	3	0.0013	3.7(−4)	0.034	−2.73	C	5*n*
		5778.47	20874	38175	7	7	8.6(−5)	4.3(−5)	0.0057	−3.52	C	5*n*
		5667.67	21039	38678	5	5	4.6(−4)	2.2(−4)	0.020	−2.96	C	5*n*
		5833.93	21039	38175	5	7	7.2(−5)	5.1(−5)	0.0049	−3.59	C	5*n*
145.	$b\ ^3\mathrm{F} - w\ ^5\mathrm{D}^\circ$ (214)											
		4288.96	20874	44184	7	5	0.0025	5.0(−4)	0.049	−2.46	C	5*n*
		4277.41	21039	44411	5	3	0.0014	2.2(−4)	0.016	−2.95	C	5*n*
146.	$b\ ^3\mathrm{F} - ^5\mathrm{D}^\circ$											
		4275.72	20641	44023	9	9	6.9(−4)	1.9(−4)	0.024	−2.77	C	5*n*
147.	$b\ ^3\mathrm{F} - x\ ^3\mathrm{D}^\circ$ (217)											
		4067.27	20641	45221	9	7	0.025	0.0049	0.58	−1.36	C	4*n*
		4095.97	20874	45282	7	5	0.037	0.0067	0.63	−1.33	C	4*n*,5*n*
		4078.35	21039	45552	5	3	0.050	0.0074	0.50	−1.43	C	4*n*,5*n*
		4106.27	20874	45221	7	7	0.0033	8.4(−4)	0.080	−2.23	C	5*n*
148.	$b\ ^3\mathrm{F} - y\ ^3\mathrm{G}^\circ$ (218)											
		4055.03	20641	45295	9	11	0.0069	0.0021	0.25	−1.73	C	5*n*
		4049.34	20874	45563	7	7	0.0029	7.2(−4)	0.067	−2.30	C	4*n*,5*n*
		4011.42	20641	45563	9	7	0.0028	5.2(−4)	0.062	−2.33	C	5*n*
149.	$b\ ^3\mathrm{F} - x\ ^5\mathrm{G}^\circ$ (219)											
		4019.05	21039	45913	5	7	0.0012	3.9(4)	0.026	2.71	C	5*n*
150.	$b\ ^3\mathrm{F} - ^3\mathrm{F}^\circ$											
		3833.31	20641	46721	9	9	0.059	0.013	1.5	−0.93	C+	4*n*,5*n*
		3821.83	21039	47197	5	5	0.089	0.020	1.2	−1.01	C+	4*n*,5*n*
		3797.95	20874	47197	7	5	0.021	0.0032	0.28	−1.65	C	5*n*
		3867.93	20874	46721	7	9	0.0072	0.0021	0.18	−1.84	C	4*n*,5*n*
		3837.13	21039	47093	5	7	0.015	0.0047	0.30	−1.63	C	4*n*,5*n*
151.	$b\ ^3\mathrm{F} - ^5\mathrm{D}^\circ$											
		3808.73	20641	46889	9	9	0.048	0.010	1.2	−1.03	C+	4*n*,5*n*
		3848.29	21039	47017	5	7	0.0050	0.0016	0.098	−2.11	C	4*n*
152.	$b\ ^3\mathrm{F} - ^3\mathrm{D}^\circ$											
		3829.77	20641	46745	9	7	0.0078	0.0013	0.15	−1.92	C	5*n*
153.	$b\ ^3\mathrm{F} - z\ ^3\mathrm{H}^\circ$ (223)											
		3791.50	20641	47008	9	11	0.0039	0.0010	0.12	−2.03	C	5*n*
		3777.45	20641	47106	9	9	0.015	0.0033	0.37	−1.53	C	4*n*,5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
154.	$b\ ^3F - w\ ^5G^\circ$ (225)											
		3731.37	21039	47831	5	5	0.049	0.010	0.63	−1.29	C	4*n*,5*n*
155.	$b\ ^3F - {}^1D^\circ$											
		3766.09	20874	47420	7	5	0.0080	0.0012	0.11	−2.07	C	5*n*
156.	$b\ ^3F - z\ ^1G^\circ$ (227)											
		3728.67	20641	47453	9	9	0.013	0.0028	0.31	−1.60	C	5*n*
		3761.41	20874	47453	7	9	0.0077	0.0021	0.18	−1.83	C	5*n*
157.	$b\ ^3F - v\ ^5F^\circ$ (229)											
		3668.89	20874	48123	7	7	0.0028	5.7(−4)	0.048	−2.40	C	5*n*
158.	$b\ ^3F - {}^5H^\circ$											
		3676.31	20641	47835	9	11	0.061	0.015	1.6	−0.87	C+	4*n*,5*n*
		3711.22	20874	47812	7	9	0.039	0.010	0.89	−1.14	C	5*n*
		3730.95	21039	47834	5	7	0.045	0.013	0.81	−1.18	C	4*n*,5*n*
159.	$b\ ^3F - v\ ^5P^\circ$ (231)											
		3658.55	20641	47967	9	7	0.0026	4.1(−4)	0.045	−2.43	C	5*n*
160.	$b\ ^3F - w\ ^3G^\circ$ (233)											
		3636.99	20874	48362	7	9	0.017	0.0044	0.37	−1.51	C	5*n*
161.	$b\ ^3F - x\ ^3P^\circ$ (235)											
		3644.58	20874	48305	7	5	0.0042	6.0(−4)	0.050	−2.38	C	5*n*
162.	$b\ ^3F - z\ ^1H^\circ$											
		3603.67	20641	48383	9	11	0.0023	5.4(−4)	0.058	−2.31	C	8
163.	$b\ ^3F - y\ ^1G^\circ$ (237)											
		3592.47	20874	48703	7	9	0.0023	5.7(−4)	0.047	−2.40	C	5*n*
164.	$b\ ^3F - w\ ^3F^\circ$ (238)											
		3511.74	20641	49109	9	9	0.0026	4.9(−4)	0.050	−2.36	C	5*n*
		3520.85	21039	49433	5	5	0.015	0.0028	0.16	−1.85	C	5*n*
		3495.29	20641	49243	9	7	0.13	0.019	2.0	−0.77	C+	4*n*
		3500.57	20874	49433	7	5	0.034	0.0044	0.36	−1.51	C	5*n*
165.	$b\ ^3F - v\ ^3D^\circ$ (239)											
		3524.08	20874	49243	7	5	0.091	0.012	0.99	−1.07	C	4*n*,5*n*
		3537.73	21039	49298	5	3	0.13	0.014	0.82	−1.15	C	5*n*
		3544.63	21039	49243	5	5	0.017	0.0032	0.19	−1.79	C	5*n*
166.	$b\ ^3F - u\ ^3D^\circ$ (258)											
		3176.36	21039	52512	5	3	0.086	0.0078	0.41	−1.41	D	12*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
167.	$b\,{}^3\mathrm{F} - {}^3\mathrm{D}^\circ$											
		3166.44	20641	52213	9	7	0.14	0.016	1.5	−0.84	C+	4*n*
168.	$a\,{}^3\mathrm{G} - y\,{}^3\mathrm{F}^\circ$ (268)											
		6677.99	21716	36686	11	9	0.0060	0.0033	0.80	−1.44	D−	14*n*
		6592.91	21999	37163	9	7	0.0059	0.0030	0.58	−1.57	D−	14*n*
		6546.24	22249	37521	7	5	0.0075	0.0034	0.52	−1.62	D−	14*n*
		6806.85	21999	36686	9	9	0.0011	7.7(−4)	0.16	−2.16	C	5*n*
		6703.57	22249	37163	7	7	1.7(−4)	1.2(−4)	0.018	−3.09	C	5*n*
169.	$a\,{}^3\mathrm{G} - y\,{}^3\mathrm{D}^\circ$ (269)											
		6180.22	21999	38175	9	7	4.9(−4)	2.2(−4)	0.040	−2.71	C	5*n*
		6085.27	22249	38678	7	5	2.6(−4)	1.0(−4)	0.015	−3.14	C	5*n*
170.	$a\,{}^3\mathrm{G} - y\,{}^3\mathrm{G}^\circ$ (273)											
		4266.96	21999	45428	9	9	0.010	0.0027	0.34	−1.61	C	5*n*
		4288.15	22249	45563	7	7	0.0072	0.0020	0.19	−1.86	C	4*n*,5*n*
171.	$a\,{}^3\mathrm{G} - x\,{}^5\mathrm{G}^\circ$ (274)											
		4145.21	21716	45833	11	9	8.0(−4)	1.7(−4)	0.025	−2.73	C	5*n*
172.	$a\,{}^3\mathrm{G} - {}^3\mathrm{F}^\circ$											
		3998.05	21716	46721	11	9	0.075	0.015	2.1	−0.79	C+	4*n*,5*n*
		3983.96	21999	47093	9	7	0.089	0.016	1.9	−0.83	C+	4*n*,5*n*
		4007.27	22249	47197	7	5	0.049	0.0084	0.78	−1.23	C	4*n*
		4024.11	22249	47093	7	7	0.0035	8.4(−4)	0.078	−2.23	C	5*n*
173.	$a\,{}^3\mathrm{G} - {}^5\mathrm{D}^\circ$											
		3971.32	21716	46889	11	9	0.068	0.013	1.9	−0.84	C	4*n*,5*n*
		3995.98	21999	47017	9	7	0.024	0.0045	0.54	−1.39	C	4*n*,5*n*
		4036.37	22249	47017	7	7	9.9(−4)	2.4(−4)	0.023	−2.77	C	5*n*
		4057.34	22249	46889	7	9	0.0053	0.0017	0.16	−1.93	C	4*n*,5*n*
174.	$a\,{}^3\mathrm{G} - z\,{}^3\mathrm{H}^\circ$ (278)											
		3997.39	21999	47008	9	11	0.16	0.046	5.5	−0.38	C+	4*n*
		4021.87	22249	47106	7	9	0.10	0.032	3.0	−0.65	C+	4*n*
		3952.60	21716	47008	11	11	0.052	0.012	1.8	−0.87	C	4*n*,5*n*
		3981.77	21999	47106	9	9	0.046	0.011	1.3	−1.01	C+	4*n*,5*n*
		3937.33	21716	47106	11	9	0.020	0.0038	0.54	−1.38	C	4*n*,5*n*
175.	$a\,{}^3\mathrm{G} - w\,{}^5\mathrm{G}^\circ$ (280)											
		3945.12	22249	47590	7	9	0.018	0.0054	0.49	−1.42	C	5*n*
		3863.74	21716	47590	11	9	0.025	0.0047	0.65	−1.29	C	4*n*,5*n*
		3890.84	21999	47693	9	7	0.035	0.0061	0.70	−1.26	C	4*n*,5*n*
		3907.93	22249	47831	7	5	0.080	0.013	1.2	−1.04	C	4*n*,5*n*
176.	$a\,{}^3\mathrm{G} - z\,{}^1\mathrm{G}^\circ$ (282)											
		3884.36	21716	47453	11	9	0.042	0.0077	1.1	−1.07	C	4*n*,5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
177.	$a\ ^3\mathrm{G} - v\ ^5\mathrm{F}^\circ$ (283)											
		3813.63	21716	47930	11	9	0.017	0.0030	0.42	−1.48	C	4*n*,5*n*
		3826.84	21999	48123	9	7	0.018	0.0030	0.34	−1.57	C	5*n*
178.	$a\ ^3\mathrm{G} - {}^5\mathrm{H}^\circ$											
		3872.92	21999	47812	9	9	0.010	0.0023	0.27	−1.68	C	5*n*
		3907.47	22249	47834	7	7	0.0094	0.0022	0.19	−1.82	C	5*n*
		3910.84	22249	47812	7	9	0.015	0.0043	0.39	−1.52	C	5*n*
179.	$a\ ^3\mathrm{G} - w\ ^3\mathrm{G}^\circ$ (287)											
		3770.30	21716	48231	11	11	0.020	0.0044	0.59	−1.32	C	5*n*
		3792.15	21999	48362	9	9	0.023	0.0050	0.56	−1.35	C	4*n*,5*n*
		3811.89	22249	48476	7	7	0.040	0.0086	0.76	−1.22	C	4*n*,5*n*
		3751.82	21716	48362	11	9	0.0050	8.7(−4)	0.12	−2.02	C	5*n*
		3775.86	21999	48476	9	7	0.0026	4.3(−4)	0.048	−2.41	C	5*n*
180.	$a\ ^3\mathrm{G} - z\ ^1\mathrm{H}^\circ$ (289)											
		3789.18	21999	48383	9	11	0.025	0.0067	0.75	−1.22	C	4*n*,5*n*,8
181.	$a\ ^3\mathrm{G} - y\ ^1\mathrm{G}^\circ$ (290)											
		3704.46	21716	48703	11	9	0.14	0.023	3.1	−0.60	C+	4*n*
182.	$a\ ^3\mathrm{G} - w\ ^3\mathrm{F}^\circ$ (291)											
		3649.51	21716	49109	11	9	0.43	0.071	9.3	−0.11	C+	4*n*
		3669.52	21999	49243	9	7	0.30	0.047	5.2	−0.37	C+	4*n*
		3677.63	22249	49433	7	5	0.82	0.12	10	−0.08	C+	4*n*
183.	$a\ ^3\mathrm{G} - v\ ^3\mathrm{D}^\circ$ (292)											
		3684.11	21999	49135	9	7	0.34	0.054	5.9	−0.31	C+	4*n*
		3718.41	22249	49135	7	7	0.063	0.013	1.1	−1.04	C	4*n*,5*n*
184.	$a\ ^3\mathrm{G} - y\ ^3\mathrm{H}^\circ$ (294)											
		3606.68	21716	49434	11	13	0.84	0.19	25	0.33	C+	4*n*
		3621.46	21999	49604	9	11	0.52	0.12	13	0.05	C+	4*n*
		3638.30	22249	49727	7	9	0.27	0.068	5.7	−0.32	C+	4*n*
		3605.45	21999	49727	9	9	0.65	0.13	14	0.06	C+	4*n*
		3568.98	21716	49727	11	9	0.035	0.0055	0.71	−1.22	C	5*n*
185.	$a\ ^3\mathrm{G} - v\ ^3\mathrm{G}^\circ$ (295)											
		3603.20	21716	49461	11	11	0.27	0.052	6.8	−0.24	C+	4*n*
		3622.00	22249	49851	7	7	0.53	0.10	8.6	−0.14	C+	4*n*
		3640.39	21999	49461	9	11	0.39	0.095	10	−0.07	C+	4*n*
		3651.47	22249	49628	7	9	0.64	0.16	14	0.06	C+	4*n*
186.	$a\ ^3\mathrm{G} - x\ ^1\mathrm{G}^\circ$ (297)											
		3493.69	21999	50614	9	9	0.0054	9.9(−4)	0.10	−2.05	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
187.	$a\ ^3\mathrm{G} - v\ ^3\mathrm{F}^\circ$ (301)											
		3411.35	21999	51305	9	9	0.065	0.011	1.1	−0.99	C+	4*n*
188.	$a\ ^3\mathrm{G} - u\ ^3\mathrm{G}^\circ$ (304)											
		3370.78	21716	51374	11	11	0.34	0.057	7.0	−0.20	C+	4*n*
		3369.55	21999	51668	9	9	0.25	0.042	4.2	−0.42	C+	4*n*
		3380.11	22249	51826	7	7	0.24	0.041	3.2	−0.54	C+	4*n*
		3337.66	21716	51668	11	9	0.067	0.0091	1.1	−1.00	C+	4*n*
189.	$a\ ^3\mathrm{G} - t\ ^3\mathrm{G}^\circ$ (313)											
		3098.19	21716	53983	11	11	0.11	0.016	1.8	−0.76	C+	4*n*
190.	$a\ ^3\mathrm{G} - v\ ^3\mathrm{H}^\circ$ (316)											
		2990.39	21999	55430	9	11	0.40	0.065	5.8	−0.23	C+	4*n*
		3011.48	22249	55446	7	9	0.48	0.084	5.8	−0.23	C+	4*n*
191.	$a\ ^3\mathrm{G} - w\ ^1\mathrm{F}^\circ$ (317)											
		2980.53	22249	55791	7	7	0.22	0.030	2.1	−0.68	C+	4*n*
192.	$a\ ^3\mathrm{G} - u\ ^3\mathrm{H}^\circ$ (uv 167)											
		2925.36	22249	56423	7	9	0.19	0.031	2.1	−0.67	C+	4*n*
193.	$z\ ^7\mathrm{F}^\circ - e\ ^7\mathrm{D}$ (318)											
		4920.50	22846	43163	11	9	0.36	0.11	19	0.07	C+	4*n*
		4891.49	22997	43435	9	7	0.30	0.082	12	−0.13	C+	4*n*
		4871.32	23111	43634	7	5	0.22	0.057	6.4	−0.40	C+	4*n*
		4859.74	23192	43764	5	3	0.15	0.031	2.5	−0.81	C	4*n*,5*n*
		4918.99	23111	43435	7	7	0.17	0.062	7.1	−0.36	C+	4*n*
		4890.75	23192	43634	5	5	0.21	0.076	6.1	−0.42	C+	4*n*
		4872.14	23245	43764	3	3	0.24	0.086	4.1	−0.59	C+	4*n*
		4903.31	23245	43634	3	5	0.054	0.033	1.6	−1.01	C	4*n*,5*n*
		4878.21	23270	43764	1	3	0.11	0.11	1.0	−0.94	C+	4*n*
194.	$z\ ^7\mathrm{F}^\circ - e\ ^5\mathrm{D}$ (319)											
		4554.47	23111	45061	7	7	4.8(−4)	1.5(−4)	0.016	−2.98	C	5*n*
		4515.16	23192	45334	5	5	4.5(−4)	1.4(−4)	0.010	−3.16	C	5*n*
		4635.62	23111	44677	7	9	1.0(−4)	4.3(−5)	0.0046	−3.52	C	5*n*
		4571.44	23192	45061	5	7	2.9(−4)	1.3(−4)	0.0095	−3.20	C	5*n*
		4525.88	23245	45334	3	5	4.8(−4)	2.5(−4)	0.011	−3.13	C	5*n*
195.	$z\ ^7\mathrm{F}^\circ - e\ ^7\mathrm{F}$ (321)											
		3610.16	22650	50342	13	13	0.50	0.097	15	0.10	C+	4*n*
		3572.00	22846	50833	11	11	0.25	0.048	6.2	−0.28	C+	4*n*
		3552.83	23192	51331	5	5	0.17	0.032	1.9	−0.80	C	4*n*,5*n*
		3551.11	22997	51149	9	7	0.0035	5.2(−4)	0.055	−2.33	C	5*n*
		3568.42	23192	51208	5	3	0.062	0.0071	0.42	−1.45	C	5*n*
		3591.35	22997	50833	9	11	0.0084	0.0020	0.21	−1.75	C	5*n*
		3560.07	23111	51192	7	9	0.0040	9.7(−4)	0.079	−2.17	C	5*n*
		3578.38	23270	51208	1	3	0.074	0.043	0.50	−1.37	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
196.	$z\,^7F^\circ - f\,^7D$ (322)											
		3594.63	22997	50808	9	9	0.28	0.054	5.8	−0.31	C+	4*n*
		3595.30	23192	50999	5	5	0.064	0.012	0.73	−1.21	C	5*n*
		3602.08	23245	50999	3	5	0.035	0.011	0.40	−1.47	C	5*n*
197.	$z\,^7F^\circ - f\,^5D$ (323)											
		3630.35	22997	50534	9	7	0.089	0.014	1.5	−0.91	C	5*n*
		3610.70	23192	50880	5	3	0.084	0.0098	0.58	−1.31	C	5*n*
		3641.45	23245	50699	3	5	0.0061	0.0020	0.072	−2.22	C	5*n*
198.	$z\,^7F^\circ - e\,^7P$ (324)											
		3620.24	22997	50611	9	7	0.014	0.0022	0.23	−1.71	C	5*n*
		3613.15	23192	50861	5	5	0.023	0.0045	0.27	−1.65	C	5*n*
199.	$z\,^7F^\circ - e\,^5G$ (325)											
		3572.59	22997	50980	9	9	0.022	0.0041	0.44	−1.43	C	5*n*
		3612.07	22846	50523	11	13	0.077	0.018	2.3	−0.71	C+	4*n*
		3567.03	23192	51219	5	7	0.077	0.020	1.2	−0.99	C	5*n*
200.	$z\,^7F^\circ - e\,^7G$ (326)											
		3541.08	22997	51229	9	11	0.64	0.15	15	0.12	C+	4*n*
		3542.08	23111	51335	7	9	0.76	0.18	15	0.11	C+	4*n*
		3536.56	23192	51461	5	7	0.80	0.21	12	0.02	C+	4*n*
		3530.39	22650	50968	13	13	0.038	0.0070	1.1	−1.04	C	5*n*
		3522.27	22846	51229	11	11	0.038	0.0071	0.90	−1.11	C	5*n*
		3527.79	22997	51335	9	9	0.20	0.038	3.9	−0.47	C	4*n*,5*n*
		3529.82	23245	51567	3	3	0.78	0.15	5.1	−0.36	C+	4*n*
		3509.12	22846	51335	11	9	0.0054	8.1(−4)	0.10	−2.05	C	5*n*
		3512.22	22997	51461	9	7	0.024	0.0035	0.37	−1.50	C	5*n*
		3516.56	23111	51540	7	5	0.044	0.0058	0.47	−1.39	C	5*n*
		3523.31	23192	51567	5	3	0.090	0.010	0.58	−1.30	C	5*n*
201.	$z\,^7F^\circ - f\,^5F$ (327)											
		3537.90	22846	51103	11	11	0.086	0.016	2.1	−0.75	C	5*n*
		3556.88	22997	51103	9	11	0.45	0.10	11	−0.03	C+	4*n*
		3518.68	23192	51604	5	7	0.018	0.0048	0.28	−1.62	C	5*n*
202.	$z\,^7F^\circ - g\,^5D$ (329)											
		3540.12	23111	51350	7	9	0.12	0.029	2.4	−0.69	C+	4*n*
203.	$z\,^7F^\circ - e\,^7S$ (330)											
		3522.90	23192	51570	5	7	0.025	0.0065	0.38	−1.49	C	5*n*
204.	$b\,^3P - y\,^3D^\circ$ (342)											
		6518.38	22838	38175	5	7	4.7(−4)	4.2(−4)	0.045	−2.68	C	5*n*
		6355.04	22947	38678	3	5	0.0015	0.0015	0.093	−2.35	C	5*n*
		6270.24	23052	38996	1	3	0.0013	0.0023	0.047	−2.64	C	5*n*
		6311.51	22838	38678	5	5	2.3(−4)	1.4(−4)	0.014	−3.16	C	5*n*
		6229.23	22947	38996	3	3	7.2(−4)	4.2(−4)	0.026	−2.90	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
205.	$b\ ^3\mathrm{P} - z\ ^5\mathrm{S}^\circ$ (345)											
		5536.59	22838	40895	5	5	7.9(−5)	3.6(−5)	0.0033	−3.74	C	5*n*
206.	$b\ ^3\mathrm{P} - w\ ^5\mathrm{D}^\circ$ (346)											
		4741.53	22838	43923	5	7	0.0049	0.0023	0.18	−1.94	D	10*n*
		4683.57	22838	44184	5	5	0.0021	6.9(−4)	0.053	−2.46	C	5*n*
		4657.59	22947	44411	3	3	0.0015	4.9(−4)	0.023	−2.83	C	5*n*
207.	$b\ ^3\mathrm{P} - {}^5\mathrm{F}^\circ$											
		4687.39	22838	44166	5	7	7.9(−4)	3.6(−4)	0.028	−2.74	C	5*n*
		4685.03	22947	44285	3	5	3.3(−4)	1.8(−4)	0.0083	−3.27	C	5*n*
208.	$b\ ^3\mathrm{P} - {}^5\mathrm{D}^\circ$											
		4603.34	22947	44664	3	5	5.4(−4)	2.8(−4)	0.013	−3.07	C	5*n*
209.	$b\ ^3\mathrm{P} - y\ ^5\mathrm{S}^\circ$ (349)											
		4635.85	22947	44512	3	5	0.0028	0.0015	0.068	−2.35	C	5*n*
210.	$b\ ^3\mathrm{P} - x\ ^3\mathrm{D}^\circ$ (350)											
		4466.55	22838	45221	5	7	0.13	0.053	3.9	−0.58	C+	4*n*
		4443.19	23052	45552	1	3	0.13	0.11	1.6	−0.95	C+	4*n*
		4454.38	22838	45282	5	5	0.044	0.013	0.97	−1.18	C	4*n*
		4422.57	22947	45552	3	3	0.10	0.030	1.3	−1.04	C	4*n*
		4401.44	22838	45552	5	3	0.030	0.0053	0.38	−1.58	C	5*n*
211.	$b\ ^3\mathrm{P} - w\ ^5\mathrm{P}^\circ$ (351)											
		4290.87	22838	46137	5	7	0.0052	0.0020	0.14	−2.00	C	5*n*
		4279.86	23052	46410	1	3	0.0067	0.0055	0.077	−2.26	C	5*n*
		4258.62	22838	46314	5	5	0.0083	0.0022	0.16	−1.95	C	5*n*
		4241.11	22838	46410	5	3	0.0045	7.3(−4)	0.051	−2.44	C	5*n*
212.	$b\ ^3\mathrm{P} - z\ ^3\mathrm{S}^\circ$ (352)	*4217.7*	*22898*	46601	9	3	0.20	0.018	2.2	−0.80	C	4*n*,5*n*
		4207.13	22838	46601	5	3	0.051	0.0081	0.56	−1.39	C	4*n*,5*n*
		4226.42	22947	46601	3	3	0.044	0.012	0.49	−1.45	C	4*n*,5*n*
		4245.26	23052	46601	1	3	0.096	0.078	1.1	−1.11	C	4*n*,5*n*
213.	$b\ ^3\mathrm{P} - y\ ^3\mathrm{P}^\circ$ (355)											
		4184.89	22838	46727	5	5	0.12	0.032	2.2	−0.79	C+	4*n*
		4173.32	22947	46902	3	3	0.024	0.0064	0.26	−1.72	C	5*n*
		4213.65	22947	46673	3	1	0.23	0.021	0.86	−1.21	C	4*n*,5*n*
		4191.68	23052	46902	1	3	0.057	0.045	0.62	−1.35	C	5*n*
214.	$b\ ^3\mathrm{P} - {}^3\mathrm{F}^\circ$											
		4121.80	22838	47093	5	7	0.034	0.012	0.82	−1.22	C	4*n*,5*n*
		4122.51	22947	47197	3	5	0.034	0.015	0.59	−1.36	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
215.	$b\ {}^3\mathrm{P} - {}^5\mathrm{D}^\circ$											
		4134.68	22838	47017	5	7	0.18	0.066	4.5	−0.48	C+	4*n*
		4132.90	22947	47136	3	5	0.11	0.047	1.9	−0.85	C+	4*n*
		4114.45	22838	47136	5	5	0.056	0.014	0.96	−1.15	C	4*n*,5*n*
		4125.88	22947	47177	3	3	0.018	0.0045	0.18	−1.87	C	5*n*
		4107.49	22838	47177	5	3	0.25	0.038	2.6	−0.72	C+	4*n*
		4126.88	22947	47171?	3	1	0.013	0.0011	0.046	−2.47	C	5*n*
216.	$b\ {}^3\mathrm{P} - {}^3\mathrm{D}^\circ$	*4165.5*	*22898*	*46898*	9	15	0.36	0.15	19	0.14	C	4*n*,5*n*,13*n*
		4181.75	22838	46745	5	7	0.35	0.13	8.9	−0.19	D−	13*n*
		4175.64	22947	46889	3	5	0.17	0.073	3.0	−0.66	C+	4*n*
		4127.61	23052	47272	1	3	0.16	0.12	1.6	−0.92	C+	4*n*
		4156.80	22838	46889	5	5	0.19	0.049	3.4	−0.61	C+	4*n*
		4109.80	22947	47272	3	3	0.19	0.048	2.0	−0.84	C+	4*n*
		4091.55	22838	47272	5	3	0.012	0.0018	0.12	−2.05	C	4*n*,5*n*
217.	$b\ {}^3\mathrm{P} - {}^1\mathrm{D}^\circ$											
		4085.00	22947	47420	3	5	0.049	0.021	0.83	−1.21	C	5*n*
218.	$b\ {}^3\mathrm{P} - y\ {}^3\mathrm{S}^\circ$ (359)	*4054.3*	*22898*	47556	9	3	0.44	0.036	4.3	−0.49	C	4*n*,5*n*
		4044.61	22838	47556	5	3	0.13	0.020	1.3	−1.01	C	5*n*
		4062.44	22947	47556	3	3	0.23	0.057	2.3	−0.77	C+	4*n*
		4079.84	23052	47556	1	3	0.073	0.055	0.74	−1.26	C	4*n*,5*n*
219.	$b\ {}^3\mathrm{P} - v\ {}^5\mathrm{F}^\circ$ (362)											
		3953.86	22838	48123	5	7	0.0067	0.0022	0.14	−1.96	C	5*n*
		3935.31	22947	48351	3	3	0.023	0.0053	0.21	−1.80	C	5*n*
220.	$b\ {}^3\mathrm{P} - v\ {}^5\mathrm{P}^\circ$ (361)											
		3964.52	22947	48163	3	5	0.029	0.011	0.44	−1.47	C	4*n*,5*n*
		3961.15	23052	48290	1	3	0.027	0.019	0.25	−1.72	C	5*n*
		3944.75	22947	48290	3	3	0.014	0.0032	0.12	−2.02	C	5*n*
221.	$b\ {}^3\mathrm{P} - x\ {}^3\mathrm{P}^\circ$ (364)											
		3909.83	22947	48516	3	3	0.076	0.017	0.68	−1.28	C	5*n*
		3942.44	22947	48305	3	5	0.11	0.042	1.6	−0.90	C	4*n*,5*n*
222.	$b\ {}^3\mathrm{P} - v\ {}^3\mathrm{D}^\circ$ (367)											
		3801.68	22838	49135	5	7	0.077	0.023	1.5	−0.93	C	5*n*
		3809.04	23052	49298	1	3	0.018	0.012	0.15	−1.92	C	5*n*
		3786.19	22838	49243	5	5	0.14	0.030	1.8	−0.83	C	5*n*
		3793.87	22947	49298	3	3	0.087	0.019	0.70	−1.25	C	5*n*
		3778.32	22838	49298	5	3	0.028	0.0036	0.22	−1.75	C	5*n*
223.	$b\ {}^3\mathrm{P} - w\ {}^3\mathrm{P}^\circ$ (369)											
		3655.46	22838	50187	5	5	0.12	0.023	1.4	−0.93	C	4*n*,5*n*
		3674.77	22838	50043	5	3	0.079	0.0096	0.58	−1.32	C	5*n*
		3702.03	22947	49951	3	1	0.40	0.028	1.0	−1.08	C	4*n*,5*n*
		3703.82	23052	50043	1	3	0.14	0.085	1.0	−1.07	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
224.	$b\ ^3P - ^3P^\circ$											
		3323.74	22838	52916	5	5	0.31	0.051	2.8	−0.59	C+	4*n*
		3354.06	23052	52858	1	3	0.11	0.058	0.64	−1.24	C	5*n*
225.	$z\ ^7P^\circ - e\ ^7D$ (383)											
		5232.94	23711	42816	9	11	0.15	0.073	11	−0.18	C	4*n*,5*n*
		5266.55	24181	43163	7	9	0.088	0.047	5.7	−0.48	C+	4*n*
		5281.79	24507	43435	5	7	0.038	0.022	2.0	−0.95	C+	4*n*
		5068.77	23711	43435	9	7	0.026	0.0077	1.2	−1.16	C	4*n*,5*n*
226.	$z\ ^7P^\circ - e\ ^5D$ (384)											
		4787.83	24181	45061	7	7	8.3(−4)	2.9(−4)	0.031	−2.70	C	5*n*
		4800.13	24507	45334	5	5	0.0012	4.3(−4)	0.034	−2.67	C	5*n*
		4682.56	23711	45061	9	7	3.8(−4)	9.7(−5)	0.013	−3.06	C	5*n*
		4726.14	24181	45334	7	5	3.9(−4)	9.4(−5)	0.010	−3.18	C	5*n*
		4877.61	24181	44677	7	9	2.6(−4)	1.2(−4)	0.013	−3.08	C	5*n*
227.	$z\ ^7P^\circ - e\ ^7F$ (385)											
		3686.00	23711	50833	9	11	0.26	0.065	7.1	−0.23	C+	4*n*
		3701.09	24181	51192	7	9	0.49	0.13	11	−0.04	C+	4*n*
		3637.86	23711	51192	9	9	0.064	0.013	1.4	−0.94	C	5*n*
		3726.93	24507	51331	5	5	0.47	0.098	6.0	−0.31	C	5*n*
		3744.10	24507	51208	5	3	0.38	0.048	3.0	−0.62	C+	4*n*,5*n*
228.	$z\ ^7P^\circ - f\ ^7D$ (386)											
		3754.51	24181	50808	7	9	0.028	0.0077	0.66	−1.27	C	5*n*
		3746.93	24181	50862	7	7	0.23	0.048	4.2	−0.47	C	5*n*
		3773.70	24507	50999	5	5	0.039	0.0083	0.52	−1.38	C	5*n*
		3766.67	24507	51048	5	3	0.11	0.014	0.90	−1.14	C	5*n*
229.	$z\ ^7P^\circ - f\ ^5D$ (387)											
		3742.62	23711	50423	9	9	0.11	0.023	2.6	−0.68	C+	4*n*,5*n*
		3727.09	23711	50534	9	7	0.20	0.033	3.6	−0.53	C	5*n*
230.	$z\ ^7P^\circ - e\ ^7P$ (388)											
		3735.32	23711	50475	9	9	0.24	0.051	5.6	−0.34	C	5*n*
		3782.45	24181	50611	7	7	0.015	0.0031	0.27	−1.66	C	5*n*
231.	$z\ ^7P^\circ - e\ ^5G$ (389)											
		3703.69	23711	50704	9	11	0.062	0.016	1.7	−0.85	C	5*n*
		3697.43	24181	51219	7	7	0.21	0.043	3.7	−0.52	C+	4*n*
		3676.88	24181	51370	7	5	0.027	0.0038	0.33	−1.57	C	5*n*
232.	$z\ ^7P^\circ - e\ ^7G$ (390)											
		3681.64	24181	51335	7	9	0.015	0.0040	0.34	−1.55	C	5*n*
		3664.69	24181	51461	7	7	0.025	0.0051	0.43	−1.45	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
233.	$z\ {}^7\mathrm{P}^\circ - f\ {}^5\mathrm{F}$ (391)											
		3664.54	24181	51462	7	9	0.040	0.010	0.87	−1.14	C	5*n*
234.	$z\ {}^7\mathrm{P}^\circ - e\ {}^7\mathrm{S}$ (394)											
		3650.03	24181	51570	7	7	0.12	0.023	1.9	−0.79	C	5*n*
		3694.01	24507	51570	5	7	0.70	0.20	12	0.00	C+	4*n*
235.	$z\ {}^7\mathrm{P}^\circ - e\ {}^5\mathrm{P}$ (395)											
		3614.77	24181	51837	7	7	0.040	0.0079	0.65	−1.26	C	5*n*
		3657.89	24507	51837	5	7	0.039	0.011	0.66	−1.26	C	5*n*
236.	$z\ {}^7\mathrm{P}^\circ - g\ {}^7\mathrm{D}$ (396)											
		3322.47	23711	53801	9	11	0.058	0.012	1.1	−0.98	D	12*n*
237.	$b\ {}^3\mathrm{G} - y\ {}^3\mathrm{D}^\circ$ (404)											
		7112.18	24119	38175	9	7	1.8(−4)	1.1(−4)	0.022	−3.02	C	5*n*
238.	$b\ {}^3\mathrm{G} - y\ {}^3\mathrm{G}^\circ$ (409)											
		4647.43	23784	45295	11	11	0.015	0.0048	0.80	−1.28	D−	14*n*
		4691.41	24119	45428	9	9	0.013	0.0042	0.59	−1.42	D−	14*n*
		4618.76	23784	45428	11	9	0.0019	4.9(−4)	0.082	−2.27	C	5*n*
		4661.97	24119	45563	9	7	0.0018	4.5(−4)	0.063	−2.39	C	5*n*
		4740.34	24339	45428	7	9	8.1(−4)	3.5(−4)	0.038	−2.61	C	5*n*
239.	$b\ {}^3\mathrm{G} - x\ {}^5\mathrm{G}^\circ$ (410)											
		4603.95	24119	45833	9	9	5.9(−4)	1.9(−4)	0.026	−2.77	C	5*n*
		4633.76	24339	45913	7	7	4.9(−4)	1.6(−4)	0.017	−2.96	C	5*n*
240.	$b\ {}^3\mathrm{G} - {}^3\mathrm{F}^\circ$											
		4358.50	23784	46721	11	9	0.011	0.0025	0.40	−1.56	C	4*n*,5*n*
		4351.54	24119	47093	9	7	0.017	0.0037	0.47	−1.48	C	5*n*
		4423.14	24119	46721	9	9	0.0014	4.0(−4)	0.053	−2.44	C	5*n*
241.	$b\ {}^3\mathrm{G} - {}^5\mathrm{D}^\circ$											
		4326.75	23784	46889	11	9	0.0057	0.0013	0.21	−1.84	C	5*n*
		4365.90	24119	47017	9	7	0.0036	8.0(−4)	0.10	−2.14	C	4*n*,5*n*
		4390.46	24119	46889	9	9	0.0014	4.1(−4)	0.054	−2.43	C	5*n*
242.	$b\ {}^3\mathrm{G} - z\ {}^3\mathrm{H}^\circ$ (414)	*4349.6*	*24040*	*47024*	27	33	0.022	0.0075	2.9	−0.69	C	4*n*,5*n*
		4309.37	23784	46982	11	13	0.021	0.0071	1.1	−1.11	C	4*n*
		4367.58	24119	47008	9	11	0.020	0.0070	0.91	−1.20	C	5*n*
		4390.95	24339	47106	7	9	0.016	0.0058	0.59	−1.39	C	5*n*
		4304.54	23784	47008	11	11	0.0038	0.0010	0.16	−1.94	C	5*n*
		4348.94	24119	47106	9	9	0.0034	9.7(−4)	0.12	−2.06	C	5*n*
		4286.44	23784	47106	11	9	0.0017	3.9(−4)	0.060	−2.37	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
243.	$b\ ^3G - w\ ^5G^\circ$ (416)											
		4290.38	24119	47420	9	11	0.0064	0.0022	0.28	−1.71	C	4*n*,5*n*
244.	$b\ ^3G - z\ ^1G^\circ$ (417)											
		4284.42	24119	47453	9	9	0.0012	3.3(−4)	0.042	−2.53	C	5*n*
245.	$b\ ^3G - v\ ^5F^\circ$ (418)											
		4196.53	23784	47606	11	11	0.0031	8.3(−4)	0.13	−2.04	C	5*n*
		4237.67	24339	47930	7	9	0.0021	7.2(−4)	0.070	−2.30	C	5*n*
246.	$b\ ^3G - ^5H^\circ$											
		4258.95	24339	47812	7	9	0.0047	0.0016	0.16	−1.94	C	5*n*
247.	$b\ ^3G - w\ ^3G^\circ$ (422)											
		4089.22	23784	48231	11	11	0.0049	0.0012	0.18	−1.87	C	4*n*,5*n*
		4141.86	24339	48476	7	7	0.0082	0.0021	0.20	−1.83	C	5*n*
		4146.06	24119	48231	9	11	0.0060	0.0019	0.23	−1.77	C	4*n*,5*n*
		4161.48	24339	48362	7	9	0.0032	0.0011	0.10	−2.13	C	5*n*
248.	$b\ ^3G - z\ ^1H^\circ$ (423)											
		4120.21	24119	48383	9	11	0.026	0.0082	1.0	−1.13	C	4*n*,5*n*,8
249.	$b\ ^3G - y\ ^1G^\circ$ (424)											
		4066.59	24119	48703	9	9	0.013	0.0032	0.39	−1.54	C	4*n*,5*n*
250.	$b\ ^3G - w\ ^3F^\circ$ (426)											
		4000.46	24119	49109	9	9	0.013	0.0031	0.36	−1.56	C	5*n*
251.	$b\ ^3G - y\ ^3H^\circ$ (429)											
		3897.45	23784	49434	11	13	0.022	0.0060	0.85	−1.18	C	4*n*,5*n*
		3871.75	23784	49604	11	11	0.070	0.016	2.2	−0.76	C+	4*n*,5*n*
		3903.90	24119	49727	9	9	0.097	0.022	2.6	−0.70	C+	4*n*,5*n*
		3853.46	23784	49727	11	9	0.0067	0.0012	0.17	−1.87	C	4*n*,5*n*
252.	$b\ ^3G - v\ ^3G^\circ$ (430)											
		3893.39	23784	49461	11	11	0.14	0.031	4.3	−0.47	C+	4*n*,5*n*
		3919.07	24119	49628	9	9	0.045	0.010	1.2	−1.03	C+	4*n*,5*n*
		3885.15	24119	49851	9	7	0.016	0.0028	0.32	−1.60	C	4*n*,5*n*
		3944.89	24119	49461	9	11	0.016	0.0045	0.53	−1.39	C	5*n*
		3953.15	24339	49628	7	9	0.043	0.013	1.2	−1.04	C+	4*n*,5*n*
253.	$b\ ^3G - z\ ^1F^\circ$ (432)											
		3777.06	24119	50587	9	7	0.016	0.0027	0.31	−1.61	C	4*n*,5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
254.	$b\ ^3\mathrm{G} - x\ ^3\mathrm{H}^\circ$ (435)											
		3670.09	23784	51023	11	13	0.078	0.019	2.5	−0.69	C+	4*n*
		3693.01	24339	51409	7	9	0.022	0.0058	0.50	−1.39	C	5*n*
		3663.95	23784	51069	11	11	0.0057	0.0011	0.15	−1.90	C	5*n*
		3663.25	24119	51409	9	9	0.012	0.0024	0.26	−1.66	C	5*n*
255.	$b\ ^3\mathrm{G} - v\ ^3\mathrm{F}^\circ$ (437)											
		3632.55	23784	51305	11	9	0.062	0.010	1.3	−0.96	C	5*n*
		3669.15	24119	51365	9	7	0.087	0.014	1.5	−0.91	C	5*n*
256.	$b\ ^3\mathrm{G} - u\ ^3\mathrm{G}^\circ$ (438)											
		3628.82	24119	51668	9	9	0.0035	6.9(−4)	0.074	−2.21	C	5*n*
257.	$b\ ^3\mathrm{G} - {}^1\mathrm{H}^\circ$											
		3590.08	23784	51630	11	11	0.012	0.0023	0.30	−1.60	C	5*n*
		3633.84	24119	51630	9	11	0.021	0.0050	0.53	−1.35	C	5*n*
258.	$b\ ^3\mathrm{G} - w\ ^3\mathrm{H}^\circ$ (442)											
		3508.49	24119	52613	9	11	0.066	0.015	1.6	−0.87	C	5*n*
		3516.41	24339	52769	7	9	0.040	0.0094	0.76	−1.18	C	5*n*
259.	$b\ ^3\mathrm{G} - t\ ^3\mathrm{G}^\circ$ (449)											
		3319.25	24119	54237	9	9	0.031	0.0052	0.51	−1.33	D	12*n*
260.	$c\ ^3\mathrm{P} - w\ ^5\mathrm{D}^\circ$ (465)											
		5104.04	24336	43923	5	7	5.8(−4)	3.2(−4)	0.027	−2.80	C	5*n*
261.	$c\ ^3\mathrm{P} - x\ ^3\mathrm{D}^\circ$ (467)											
		4786.81	24336	45221	5	7	0.013	0.0060	0.48	−1.52	D−	14*n*
		4712.10	24336	45552	5	3	8.7(−4)	1.7(−4)	0.014	−3.06	C	5*n*
262.	$c\ ^3\mathrm{P} - z\ ^3\mathrm{S}^\circ$ (469)											
		4490.08	24336	46601	5	3	0.034	0.0062	0.46	−1.51	C	5*n*
		4579.82	24772	46601	3	3	0.0018	5.8(−4)	0.026	−2.76	C	5*n*
263.	$c\ ^3\mathrm{P} - y\ ^3\mathrm{P}^\circ$ (472)											
		4464.77	24336	46727	5	5	0.013	0.0039	0.29	−1.71	C	4*n*,5*n*
		4517.53	24772	46902	3	3	0.019	0.0057	0.25	−1.77	C	4*n*,5*n*
		4430.19	24336	46902	5	3	0.014	0.0025	0.18	−1.90	C	5*n*
264.	$c\ ^3\mathrm{P} - {}^3\mathrm{F}^\circ$											
		4372.99	24336	47197	5	5	0.0019	5.5(−4)	0.040	−2.56	C	5*n*
265.	$c\ ^3\mathrm{P} - {}^5\mathrm{D}^\circ$											
		4384.68	24336	47136	5	5	0.0056	0.0016	0.12	−2.09	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
266.	$c\ ^3P - y\ ^3S^{\circ}$ (476)	4348.3	24565	47556	9	3	0.13	0.012	1.6	−0.95	C	4*n*,5*n*
		4305.45	24336	47556	5	3	0.072	0.012	0.85	−1.22	C	4*n*,5*n*
		4387.89	24772	47556	3	3	0.046	0.013	0.58	−1.40	C	5*n*
		4450.32	25092	47556	1	3	0.012	0.010	0.15	−1.98	C	5*n*
267.	$c\ ^3P - v\ ^5F^{\circ}$ (476a)											
		4182.38	24336	48239	5	5	0.058	0.015	1.0	−1.12	C	5*n*
268.	$c\ ^3P - v\ ^5P^{\circ}$ (478)											
		4230.58	24336	47967	5	7	0.0016	5.9(−4)	0.041	−2.53	C	5*n*
269.	$c\ ^3P - x\ ^3P^{\circ}$ (482)											
		4170.90	24336	48305	5	5	0.072	0.019	1.3	−1.03	C+	4*n*,5*n*
		4220.34	24772	48460	3	1	0.23	0.021	0.86	−1.21	C	4*n*,5*n*
		4248.22	24772	48305	3	5	0.042	0.019	0.79	−1.25	C	5*n*
		4267.83	25092	48516	1	3	0.11	0.089	1.3	−1.05	C	4*n*,5*n*
270.	$c\ ^3P - v\ ^3D^{\circ}$ (486)											
		4076.23	24772	49298	3	3	0.015	0.0037	0.15	−1.96	C	5*n*
271.	$c\ ^3P - w\ ^3P^{\circ}$ (488)											
		3867.22	24336	50187	5	5	0.35	0.078	5.0	−0.41	C+	4*n*
		3955.96	24772	50043	3	3	0.066	0.016	0.61	−1.33	C	5*n*
		3888.82	24336	50043	5	3	0.27	0.037	2.4	−0.73	C	5*n*
		3970.39	24772	49951	3	1	0.41	0.033	1.3	−1.01	C	5*n*
272.	$c\ ^3P - z\ ^1F^{\circ}$ (489)											
		3808.29	24336	50587	5	7	0.014	0.0042	0.26	−1.68	C	5*n*
273.	$c\ ^3P - t\ ^5D^{\circ}$ (490)											
		3699.15	24336	51361	5	7	0.053	0.015	0.92	−1.12	C	4*n*
		3635.19	24336	51837?	5	3	0.16	0.019	1.1	−1.02	C	5*n*
274.	$c\ ^3P - v\ ^3F^{\circ}$ (491)											
		3698.60	24336	51365	5	7	0.042	0.012	0.73	−1.22	C	4*n*,5*n*
		3782.61	24772	51201	3	5	0.015	0.0054	0.20	−1.79	C	5*n*
275.	$c\ ^3P - y\ ^1D^{\circ}$ (494)											
		3711.41	24772	51708	3	5	0.086	0.030	1.1	−1.05	C	5*n*
276.	$c\ ^3P - x\ ^1D^{\circ}$ (495)											
		3704.01	24772	51762	3	5	0.018	0.0062	0.23	−1.73	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
277.	$c\ {}^{3}\mathrm{P} - u\ {}^{3}\mathrm{D}^{\circ}$ (496)											
		3617.79	24336	51969	5	7	0.66	0.18	11	−0.04	C+	4*n*
		3632.04	24772	52297	3	5	0.50	0.16	5.9	−0.31	C+	4*n*
		3645.82	25092	52512	1	3	0.58	0.35	4.2	−0.46	C+	4*n*,5*n*
		3603.82	24772	52512	3	3	0.20	0.038	1.4	−0.94	C	5*n*
		3548.02	24336	52512	5	3	0.091	0.010	0.60	−1.29	D	12*n*
278.	$c\ {}^{3}\mathrm{P} - {}^{3}\mathrm{P}^{\circ}$											
		3559.50	24772	52858	3	3	0.22	0.042	1.5	−0.90	C+	4*n*,5*n*
		3505.07	24336	52858	5	3	0.12	0.013	0.75	−1.19	C	5*n*
		3552.11	24772	52916	3	5	0.053	0.017	0.59	−1.30	C	5*n*
279.	$a\ {}^{1}\mathrm{G} - y\ {}^{3}\mathrm{G}^{\circ}$ (512)											
		4793.96	24575	45428	9	9	1.1(−4)	3.9(−5)	0.0055	−3.46	C	5*n*
280.	$a\ {}^{1}\mathrm{G} - z\ {}^{3}\mathrm{I}^{\circ}$ (513)											
		4636.66	24575	46136	9	11	5.8(−5)	2.3(−5)	0.0031	−3.69	D	15*n*
281.	$a\ {}^{1}\mathrm{G} - {}^{3}\mathrm{F}^{\circ}$											
		4514.18	24575	46721	9	9	0.0040	0.0012	0.16	−1.96	C	4*n*,5*n*
		4439.63	24575	47093	9	7	8.2(−4)	1.9(−4)	0.025	−2.77	C	5*n*
282.	$a\ {}^{1}\mathrm{G} - z\ {}^{3}\mathrm{H}^{\circ}$ (516)											
		4456.33	24575	47008	9	11	0.0024	8.8(−4)	0.12	−2.10	C	5*n*
		4436.92	24575	47106	9	9	0.0034	0.0010	0.13	−2.04	C	5*n*
283.	$a\ {}^{1}\mathrm{G} - w\ {}^{5}\mathrm{G}^{\circ}$ (517)											
		4343.70	24575	47590	9	9	0.0061	0.0017	0.22	−1.81	C	5*n*
284.	$a\ {}^{1}\mathrm{G} - z\ {}^{1}\mathrm{G}^{\circ}$ (518)	4369.77	24575	47453	9	9	0.074	0.021	2.7	−0.72	C+	4*n*
285.	$a\ {}^{1}\mathrm{G} - {}^{5}\mathrm{H}^{\circ}$											
		4298.04	24575	47835	9	11	0.016	0.0056	0.71	−1.30	C	4*n*,5*n*
		4302.18	24575	47812	9	9	0.0084	0.0023	0.30	−1.68	C	4*n*,5*n*
286.	$a\ {}^{1}\mathrm{G} - w\ {}^{3}\mathrm{G}^{\circ}$ (521)											
		4225.96	24575	48231	9	11	0.016	0.0053	0.67	−1.32	C	4*n*
287.	$a\ {}^{1}\mathrm{G} - z\ {}^{1}\mathrm{H}^{\circ}$ (522)	4199.09	24575	48383	9	11	0.61	0.20	25	0.25	C	8
288.	$a\ {}^{1}\mathrm{G} - w\ {}^{3}\mathrm{F}^{\circ}$ (524)											
		4074.79	24575	49109	9	9	0.056	0.014	1.7	−0.90	C+	4*n*,5*n*
289.	$a\ {}^{1}\mathrm{G} - y\ {}^{3}\mathrm{H}^{\circ}$ (526)											
		3994.11	24575	49604	9	11	0.015	0.0044	0.52	−1.40	C	4*n*,5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
290.	$a\,{}^1G - v\,{}^3G^\circ$ (527)											
		4017.15	24575	49461	9	11	0.053	0.016	1.9	−0.85	C+	4*n*
		3990.37	24575	49628	9	9	0.019	0.0046	0.55	−1.38	C	4*n*,5*n*
291.	$a\,{}^1G - z\,{}^1F^\circ$ (528)	3843.26	24575	50587	9	7	0.48	0.082	9.4	−0.13	C+	4*n*
292.	$a\,{}^1G - x\,{}^1G^\circ$ (529)	3839.26	24575	50614	9	9	0.29	0.064	7.3	−0.24	C+	4*n*
293.	$a\,{}^1G - x\,{}^3H^\circ$ (531)											
		3773.36	24575	51069	9	11	0.0034	8.8(−4)	0.099	−2.10	C	5*n*
		3725.49	24575	51409	9	9	0.018	0.0038	0.42	−1.47	C	4*n*,5*n*
294.	$a\,{}^1G - u\,{}^3G^\circ$ (533)											
		3730.39	24575	51374	9	11	0.13	0.033	3.6	−0.53	C+	4*n*,5*n*
		3689.90	24575	51668	9	9	0.020	0.0041	0.45	−1.43	C	5*n*
295.	$a\,{}^1G \quad x\,{}^3F^\circ$											
		3425.01	24575	53763	9	7	0.29	0.039	4.0	−0.45	C+	4*n*
296.	$a\,{}^1G - x\,{}^1H^\circ$ (546)	3229.99	24575	55526	9	11	0.48	0.092	8.8	−0.08	D−	11*n*
297.	$z\,{}^5D^\circ - e\,{}^7D$ (552)											
		5909.99	25900	42816	9	11	3.4(−4)	2.2(−4)	0.038	−2.71	C	5*n*
		5827.89	26479	43634	3	5	1.8(−4)	1.5(−4)	0.0088	−3.34	C	5*n*
		5791.04	25900	43163	9	9	9.0(−4)	4.5(−4)	0.078	−2.39	C	5*n*
		5780.62	26141	43435	7	7	7.7(−4)	3.8(−4)	0.051	−2.57	C	5*n*
298.	$z\,{}^5D^\circ - e\,{}^5D$ (553)											
		5324.18	25900	44677	9	9	0.15	0.065	10	−0.23	C+	4*n*,5*n*
		5283.62	26141	45061	7	7	0.092	0.038	4.7	−0.57	D	9
		5263.30	26340	45334	5	5	0.061	0.025	2.2	−0.90	C+	4*n*
		5253.46	26479	45509	3	3	0.020	0.0084	0.43	−1.60	C	4*n*
		5208.59	26141	45334	7	5	0.060	0.018	2.1	−0.91	C+	4*n*,5*n*
		5393.17	26141	44677	7	9	0.037	0.021	2.6	−0.84	C+	4*n*
		5339.93	26340	45061	5	7	0.071	0.043	3.8	−0.67	C+	4*n*
		5302.30	26479	45334	3	5	0.073	0.052	2.7	−0.81	C+	4*n*
299.	$z\,{}^5D^\circ - e\,{}^5F$ (554)											
		4736.77	25900	47006	9	11	0.050	0.021	2.9	−0.73	C+	4*n*,5*n*
		4707.27	26141	47378	7	9	0.030	0.013	1.4	−1.05	D−	14*n*
		4637.50	26479	48037	3	5	0.030	0.016	0.73	−1.32	C	5*n*
		4613.20	26550	48221	1	3	0.026	0.025	0.38	−1.60	C	5*n*
		4625.04	26141	47756	7	7	0.022	0.0070	0.75	−1.31	D−	14*n*
		4574.21	25900	47756	9	7	0.0017	4.1(−4)	0.056	−2.43	C	5*n*
		4565.66	26141	48037	7	5	0.0042	9.4(−4)	0.099	−2.18	C	5*n*
300.	$z\,{}^5D^\circ - e\,{}^3F$ (555)											
		4581.51	26141	47961	7	9	0.0061	0.0025	0.26	−1.76	C	5*n*
		4504.83	26340	48532	5	7	0.0030	0.0013	0.094	−2.20	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
301.	$z\ ^5D^\circ - e\ ^7F$ (556)											
		4000.27	26340	51331	5	5	0.023	0.0056	0.37	−1.55	C	5*n*
302.	$z\ ^5D^\circ - f\ ^7D$ (557)											
		4080.89	26550	51048	1	3	0.025	0.019	0.25	−1.73	C	5*n*
		4054.18	26340	50999	5	5	0.0083	0.0020	0.14	−1.99	C	5*n*
		4069.08	26479	51048	3	3	0.020	0.0050	0.20	−1.82	C	5*n*
303.	$z\ ^5D^\circ - f\ ^5D$ (558)											
		4076.63	25900	50423	9	9	0.20	0.050	6.0	−0.35	C+	4*n*
		4098.18	26141	50534	7	7	0.082	0.021	2.0	−0.84	C+	4*n*,5*n*
		4097.10	26479	50880	3	3	0.032	0.0080	0.32	−1.62	C	5*n*
		4058.22	25900	50534	9	7	0.058	0.011	1.3	−1.00	C	4*n*,5*n*
		4070.77	26141	50699	7	5	0.14	0.024	2.3	−0.77	C	4*n*,5*n*
		4073.76	26340	50880	5	3	0.19	0.030	1.9	−0.84	C+	4*n*,5*n*
		4080.21	26479	50981	3	1	0.28	0.024	0.95	−1.15	C	4*n*,5*n*
		4109.07	26550	50880	1	3	0.054	0.041	0.55	−1.39	C	4*n*,5*n*
304.	$z\ ^5D^\circ - e\ ^7P$ (559)											
		4067.98	25900	50475	9	9	0.17	0.042	5.1	−0.42	C+	4*n*
		4085.30	26141	50611	7	7	0.12	0.029	2.7	−0.69	C+	4*n*,5*n*
		4108.13	26141	50475	7	9	0.0037	0.0012	0.12	−2.07	C	5*n*
		4118.90	26340	50611	5	7	0.020	0.0073	0.49	−1.44	C	5*n*
305.	$z\ ^5D^\circ - e\ ^5G$ (560)											
		4024.72	26141	50980	7	9	0.091	0.029	2.6	−0.70	C	5*n*
		4018.28	26340	51219	5	7	0.030	0.010	0.68	−1.29	C	5*n*
306.	$z\ ^5D^\circ - e\ ^7G$ (561)											
		3946.99	25900	51229	9	11	0.051	0.015	1.7	−0.88	C	5*n*
		3967.96	26141	51335	7	9	0.075	0.023	2.1	−0.80	C	5*n*
		3979.65	26340	51461	5	7	0.0076	0.0025	0.16	−1.90	C	5*n*
307.	$z\ ^5D^\circ - f\ ^5F$ (562)											
		3957.02	26340	51604	5	7	0.16	0.053	3.4	−0.58	C	5*n*
		3963.10	26479	51705	3	5	0.17	0.068	2.7	−0.69	C+	4*n*,5*n*
		3911.00	25900	51462	9	9	0.012	0.0027	0.32	−1.61	C	5*n*
		3941.28	26340	51705	5	5	0.099	0.023	1.5	−0.94	C	5*n*
		3955.34	26479	51754	3	3	0.16	0.038	1.5	−0.94	C	5*n*
308.	$z\ ^5D^\circ - e\ ^3D$ (564)											
		3974.40	26141	51294	7	7	0.0089	0.0021	0.19	−1.83	C	5*n*
309.	$z\ ^5D^\circ - g\ ^5D$ (565)											
		3900.52	26141	51771	7	7	0.086	0.020	1.8	−0.86	C+	4*n*,5*n*
		3931.12	26340	51771	5	7	0.052	0.017	1.1	−1.07	C	5*n*
		3909.66	26479	52050	3	5	0.062	0.024	0.91	−1.15	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
310.	$z\ ^5\mathrm{D}^\circ - e\ ^7\mathrm{S}$ (566)											
		3962.35	26340	51570	5	7	0.013	0.0044	0.29	−1.66	C	5*n*
311.	$z\ ^5\mathrm{D}^\circ - e\ ^5\mathrm{P}$ (567)											
		3890.39	26141	51837	7	7	0.017	0.0039	0.35	−1.56	C	5*n*
		3914.27	26479	52020	3	3	0.063	0.015	0.56	−1.36	C	5*n*
		3920.84	26340	51837	5	7	0.021	0.0069	0.45	−1.46	C	5*n*
		3925.20	26550	52020	1	3	0.067	0.047	0.60	−1.33	C	5*n*
312.	$z\ ^5\mathrm{D}^\circ - g\ ^5\mathrm{F}$ (568)											
		3668.21	26141	53394	7	9	0.036	0.0092	0.78	−1.19	C	5*n*
		3591.48	26550	54386	1	3	0.070	0.041	0.48	−1.39	C	5*n*
313.	$z\ ^5\mathrm{D}^\circ - h\ ^5\mathrm{D}$ (569)											
		3615.19	26479	54133	3	3	0.068	0.013	0.47	−1.40	C	5*n*
		3616.15	25900	53546	9	7	0.036	0.0054	0.58	−1.31	C	5*n*
		3592.67	26141	53967	7	5	0.047	0.0065	0.54	−1.34	C	5*n*
		3597.02	26340	54133	5	3	0.20	0.023	1.4	−0.93	C	5*n*
314.	$z\ ^5\mathrm{D}^\circ - f\ ^5\mathrm{P}$ (570)											
		3667.25	25900	53160	9	7	0.14	0.022	2.4	−0.70	C	5*n*
		3644.80	26141	53569	7	5	0.092	0.013	1.1	−1.04	C	5*n*
		3624.06	26340	53925	5	3	0.063	0.0074	0.44	−1.43	C	5*n*
315.	$z\ ^5\mathrm{D}^\circ - f\ ^5\mathrm{G}$ (571)											
		3593.32	26340	54161	5	7	0.034	0.0091	0.54	−1.34	C	5*n*
316.	$z\ ^5\mathrm{D}^\circ - e\ ^3\mathrm{G}$ (573)											
		3591.00	25900	53739	9	11	0.0088	0.0021	0.22	−1.73	C	5*n*
317.	$z\ ^5\mathrm{D}^\circ - f\ ^3\mathrm{D}$ (574)											
		3583.33	26550	54449	1	3	0.27	0.15	1.8	−0.81	C	5*n*
318.	$z\ ^5\mathrm{D}^\circ - i\ ^5\mathrm{D}$ (578)											
		3156.27	26141	57814	7	7	0.50	0.075	5.5	−0.28	D	12*n*
319.	$b\ ^3\mathrm{H} - y\ ^3\mathrm{G}^\circ$ (584)											
		5279.65	26628	45563	9	7	1.5(−4)	4.7(−5)	0.0074	−3.37	C	5*n*
320.	$b\ ^3\mathrm{H} - z\ ^3\mathrm{I}^\circ$ (585)											
		5030.77	26106	45978?	13	15	2.3(−4)	1.0(−4)	0.022	−2.88	C	5*n*
		5080.95	26351	46027	11	13	1.9(−4)	8.7(−5)	0.016	−3.02	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
321.	$b\ ^3\mathrm{H} - z\ ^3\mathrm{H}^\circ$ (588)											
		4788.76	26106	46982	13	13	0.0041	0.0014	0.29	−1.74	C	5*n*
		4839.55	26351	47008	11	11	0.0046	0.0016	0.28	−1.75	C	5*n*
322.	$b\ ^3\mathrm{H} - z\ ^1\mathrm{G}^\circ$ (590)											
		4737.63	26351	47453	11	9	0.0011	3.1(−4)	0.053	−2.47	C	5*n*
323.	$b\ ^3\mathrm{H} - v\ ^5\mathrm{F}^\circ$ (592)											
		4649.82	26106	47606	13	11	6.7(−4)	1.8(−4)	0.037	−2.62	C	5*n*
324.	$b\ ^3\mathrm{H} - {}^5\mathrm{H}^\circ$											
		4600.93	26106	47835	13	11	9.1(−4)	2.4(−4)	0.048	−2.50	C	5*n*
		4658.29	26351	47812	11	9	3.7(−4)	9.7(−5)	0.016	−2.97	C	5*n*
		4714.19	26628	47834	9	7	0.0011	2.8(−4)	0.039	−2.60	C	5*n*
325.	$b\ ^3\mathrm{H} - w\ ^3\mathrm{G}^\circ$ (593)											
		4518.43	26106	48231	13	11	2.2(−4)	5.7(−5)	0.011	−3.13	C	5*n*
		4541.94	26351	48362	11	9	3.1(−4)	7.9(−5)	0.013	−3.06	C	5*n*
326.	$b\ ^3\mathrm{H} - z\ ^1\mathrm{H}^\circ$ (594)											
		4487.74	26106	48383	13	11	4.7(−4)	1.2(−4)	0.023	−2.81	C	5*n*,8
		4537.67	26351	48383	11	11	4.3(−4)	1.3(−4)	0.022	−2.84	C	5*n*,8
		4595.36	26628	48383	9	11	0.0060	0.0023	0.32	−1.68	C	5*n*,8
327.	$b\ ^3\mathrm{H} - y\ ^3\mathrm{H}^\circ$ (597)											
		4285.44	26106	49434	13	13	0.021	0.0058	1.1	−1.12	C	4*n*,5*n*
		4327.92	26628	49727	9	9	0.0093	0.0026	0.33	−1.63	C	5*n*
328.	$b\ ^3\mathrm{H} - v\ ^3\mathrm{G}^\circ$ (598)											
		4280.53	26106	49461	13	11	0.0033	7.7(−4)	0.14	−2.00	C	5*n*
		4346.55	26628	49628	9	9	0.013	0.0038	0.48	−1.47	C	5*n*
329.	$b\ ^3\mathrm{H} - x\ ^1\mathrm{G}^\circ$ (599)											
		4167.86	26628	50614	9	9	0.0062	0.0016	0.20	−1.84	C	5*n*
330.	$b\ ^3\mathrm{H} - v\ ^3\mathrm{F}^\circ$ (603)											
		4006.31	26351	51305	11	9	0.056	0.011	1.6	−0.92	C	5*n*
331.	$b\ ^3\mathrm{H} - u\ ^3\mathrm{G}^\circ$ (604)											
		3956.45	26106	51374	13	11	0.22	0.043	7.3	−0.25	C	5*n*
		3948.77	26351	51668	11	9	0.22	0.043	6.1	−0.33	C	5*n*
		3967.42	26628	51826	9	7	0.24	0.044	5.2	−0.40	C+	4*n*,5*n*
		3995.20	26351	51374	11	11	0.0098	0.0023	0.34	−1.59	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
332.	$b\,^3\mathrm{H} - {}^1\mathrm{H}^\circ$											
		3916.73	26106	51630	13	11	0.12	0.023	3.9	−0.52	C+	4*n*,5*n*
333.	$b\,^3\mathrm{H} - w\,^3\mathrm{H}^\circ$ (607)											
		3806.70	26351	52613	11	11	0.55	0.12	17	0.12	C+	4*n*
		3771.50	26106	52613	13	11	0.0071	0.0013	0.21	−1.78	C	5*n*
334.	$b\,^3\mathrm{H} - y\,^3\mathrm{I}^\circ$ (688)											
		3765.54	26106	52655?	13	15	0.99	0.24	39	0.50	C+	4*n*,8
		3821.18	26351	52514	11	13	0.70	0.18	25	0.30	C+	4*n*,8
		3805.35	26628	52899	9	11	1.0	0.27	30	0.38	C+	4*n*
		3785.71	26106	52514	13	13	0.014	0.0030	0.48	−1.41	C	8
335.	$b\,^3\mathrm{H} - z\,^1\mathrm{I}^\circ$ (609)											
		3738.31	26351	53094	11	13	0.38	0.093	13	0.01	C+	4*n*,8
336.	$b\,^3\mathrm{H} - {}^5\mathrm{F}^\circ$											
		3582.20	26106	54014	13	11	0.25	0.041	6.3	−0.27	C+	4*n*
337.	$b\,^3\mathrm{H} - {}^5\mathrm{D}^\circ$											
		3576.76	26351	54301	11	9	0.098	0.015	2.0	−0.77	C	5*n*
338.	$b\,^3\mathrm{H} - v\,^3\mathrm{H}^\circ$ (614)											
		3402.26	26106	55490	13	13	0.29	0.050	7.2	−0.19	C+	4*n*
339.	$b\,^3\mathrm{H} - u\,^3\mathrm{H}^\circ$ (617)											
		3307.23	26106	56334	13	13	0.20	0.034	4.8	−0.36	C+	4*n*
		3328.87	26351	56383	11	11	0.27	0.046	5.5	−0.30	C+	4*n*
		3355.23	26628	56423	9	9	0.33	0.056	5.5	−0.30	C+	4*n*
340.	$b\,^3\mathrm{H} - x\,^3\mathrm{I}^\circ$ (620)											
		3233.05	26106	57028?	13	15	0.55	0.099	14	0.11	C+	4*n*,8
		3254.36	26351	57070	11	13	0.51	0.095	11	0.02	C+	4*n*,8
		3280.26	26628	57104	9	11	0.55	0.11	11	−0.01	C+	4*n*
341.	$b\,^3\mathrm{H} - t\,^3\mathrm{H}^\circ$ (uv 182)											
		2923.29	26351	60549	11	11	1.7	0.21	23	0.37	C+	4*n*
342.	$a\,^3\mathrm{D} - {}^5\mathrm{D}^\circ$											
		5617.22	26225	44023	7	9	3.6(−4)	2.2(−4)	0.029	−2.81	C	5*n*
343.	$a\,^3\mathrm{D} - x\,^3\mathrm{D}^\circ$ (628)											
		5262.89	26225	45221	7	7	8.8(−4)	3.7(−4)	0.045	−2.59	C	5*n*
344.	$a\,^3\mathrm{D} - w\,^5\mathrm{P}^\circ$ (629)											
		5021.89	26406	46314	3	5	0.0046	0.0029	0.14	−2.06	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
345.	$a\ {}^3D - y\ {}^3P^\circ$ (631)											
		4876.19	26225	46727	7	5	2.7(−4)	7.0(−5)	0.0079	−3.31	C	5*n*
346.	$a\ {}^3D - {}^3F^\circ$											
		4790.75	26225	47093	7	7	2.8(−4)	9.7(−5)	0.011	−3.17	C	5*n*
347.	$a\ {}^3D - {}^5D^\circ$											
		4808.15	26225	47017	7	7	7.9(−4)	2.7(−4)	0.030	−2.72	C	5*n*
		4873.74	26624	47136	5	5	5.7(−4)	2.0(−4)	0.016	−2.99	C	5*n*
		4813.11	26406	47177	3	3	0.0015	5.0(−4)	0.024	−2.82	C	5*n*
		4780.81	26225	47136	7	5	3.0(−4)	7.3(−5)	0.0081	−3.29	D	15*n*
348.	$a\ {}^3D - {}^3D^\circ$											
		4791.25	26406	47272	3	3	0.0035	0.0012	0.057	−2.44	C	5*n*
349.	$a\ {}^3D - y\ {}^3S^\circ$ (635)											
		4776.07	26624	47556	5	3	0.0023	4.7(−4)	0.037	−2.63	C	5*n*
350.	$a\ {}^3D - v\ {}^5P^\circ$ (638)											
		4556.93	26225	48163	7	5	0.0015	3.3(−4)	0.034	−2.64	C	5*n*
		4614.21	26624	48290	5	3	0.0029	5.6(−4)	0.043	−2.55	C	5*n*
351.	$a\ {}^3D - x\ {}^3P^\circ$ (641)											
		4527.78	26225	48305	7	5	0.0014	3.1(−4)	0.032	−2.67	C	5*n*
		4566.51	26624	48516	5	3	0.0070	0.0013	0.099	−2.18	C	5*n*
		4533.13	26406	48460	3	1	0.044	0.0045	0.20	−1.87	C	5*n*
		4565.31	26406	48305	3	5	0.0023	0.0012	0.055	−2.44	C	5*n*
352.	$a\ {}^3D - v\ {}^3D^\circ$ (645)											
		4343.28	26225	49243	7	5	0.017	0.0033	0.34	−1.63	C	5*n*
		4409.12	26624	49298	5	3	0.0079	0.0014	0.10	−2.16	C	5*n*
		4377.80	26406	49243	3	5	0.0040	0.0019	0.083	−2.24	C	5*n*
353.	$a\ {}^3D - z\ {}^1D^\circ$ (648)											
		4374.50	26624	49477	5	5	0.0059	0.0017	0.12	−2.07	C	4*n*,5*n*
354.	$a\ {}^3D - w\ {}^3P^\circ$ (649)											
		4172.12	26225	50187	7	5	0.12	0.022	2.1	−0.82	C+	4*n*,5*n*
		4268.75	26624	50043	5	3	0.050	0.0081	0.57	−1.39	C	4*n*,5*n*
		4242.73	26624	50187	5	5	0.021	0.0056	0.39	−1.55	C	5*n*
355.	$a\ {}^3D - z\ {}^1F^\circ$ (650)											
		4171.90	26624	50587	5	7	0.015	0.0054	0.37	−1.57	C	5*n*
356.	$a\ {}^3D - x\ {}^3H^\circ$											
		3969.63	26225	51409	7	9	0.031	0.0094	0.86	−1.18	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
357.	$a\ ^3$D - $v\ ^3$F° (655)											
		4040.64	26624	51365	5	7	0.054	0.019	1.2	−1.03	C	4*n*,5*n*
		4031.96	26406	51201	3	5	0.086	0.035	1.4	−0.98	C+	4*n*,5*n*
358.	$a\ ^3$D - $y\ ^1$D° (661)											
		3985.39	26624	51708	5	5	0.082	0.020	1.3	−1.01	C	4*n*,5*n*
		3951.16	26406	51708	3	5	0.36	0.14	5.4	−0.38	C+	4*n*,5*n*
359.	$a\ ^3$D - $u\ ^3$D° (663)											
		3883.28	26225	51969	7	7	0.17	0.038	3.4	−0.58	C+	4*n*,5*n*
360.	$a\ ^3$D - ^{3}D°											
		3846.80	26225	52213	7	7	0.67	0.15	13	0.02	C+	4*n*
		3836.33	26624	52683	5	5	0.39	0.085	5.4	−0.37	C	4*n*,5*n*
		3778.51	26225	52683	7	5	0.14	0.022	1.9	−0.81	C	5*n*
		3757.45	26624	53230	5	3	0.14	0.017	1.1	−1.06	C	5*n*
		3906.75	26624	52213	5	7	0.079	0.025	1.6	−0.90	C	5*n*
361.	$a\ ^3$D - ^{3}P°											
		3810.76	26624	52858	5	3	0.24	0.031	1.9	−0.81	C+	4*n*,5*n*
		3802.28	26624	52916	5	5	0.058	0.013	0.79	−1.20	C	5*n*
362.	$a\ ^3$D - $s\ ^3$D°											
		3740.24	26225	52954?	7	7	0.19	0.039	3.4	−0.56	C+	4*n*,5*n*
363.	$a\ ^3$D - ^{5}F°											
		3751.06	26624	53275	5	5	0.014	0.0030	0.18	−1.83	C	5*n*
364.	$a\ ^3$D - 9° (669)											
		3688.48	26225	53329	7	9	0.081	0.021	1.8	−0.83	C	5*n*
365.	$a\ ^3$D - ^{5}D°											
		3613.45	26225	53892	7	7	0.078	0.015	1.3	−0.97	C	5*n*
		3560.70	26225	54301	7	9	0.077	0.019	1.5	−0.88	C+	4*n*,5*n*
366.	$a\ ^3$D - $t\ ^3$G° (673)											
		3568.82	26225	54237	7	9	0.065	0.016	1.3	−0.95	C	5*n*
		3573.39	26624	54600	5	7	0.088	0.023	1.4	−0.93	C	5*n*
367.	$a\ ^3$D - ^{5}P°											
		3598.72	26225	54005	7	7	0.034	0.0067	0.55	−1.33	C	5*n*
368.	$a\ ^3$D - $w\ ^1$D° (676)											
		3406.44	26406	55754	3	5	0.30	0.088	2.9	−0.58	C+	4*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
369.	$a\ {}^3\mathrm{D} - u\ {}^3\mathrm{F}^\circ$ (680)											
		3292.02	26225	56593	7	9	0.62	0.13	9.9	−0.04	C+	4*n*
		3314.74	26624	56783	5	7	0.70	0.16	8.9	−0.09	C+	4*n*
		3282.89	26406	56859	3	5	0.31	0.084	2.7	−0.60	C+	4*n*
370.	$a\ {}^3\mathrm{D} - v\ {}^1\mathrm{G}^\circ$ (681)											
		3253.60	26225	56951	7	9	0.18	0.038	2.8	−0.58	C+	4*n*
371.	$z\ {}^5\mathrm{F}^\circ - e\ {}^7\mathrm{D}$ (685)											
		6271.29	26875	42816	11	11	2.0(−4)	1.2(−4)	0.027	−2.88	C	5*n*
372.	$z\ {}^5\mathrm{F}^\circ - e\ {}^5\mathrm{D}$ (686)											
		5615.64	26875	44677	11	9	0.17	0.067	14	−0.13	C+	4*n*
		5586.76	27167	45061	9	7	0.19	0.070	12	−0.20	C+	4*n*,5*n*
		5572.84	27395	45334	7	5	0.22	0.072	9.2	−0.30	C+	4*n*
		5569.62	27560	45509	5	3	0.21	0.059	5.4	−0.53	C+	4*n*
		5576.09	27666	45595	3	1	0.25	0.039	2.2	−0.93	C	5*n*
		5709.38	27167	44677	9	9	0.015	0.0075	1.3	−1.17	C	4*n*
		5658.82	27395	45061	7	7	0.042	0.020	2.6	−0.85	C+	4*n*
		5624.54	27560	45334	5	5	0.062	0.030	2.7	−0.83	C+	4*n*
		5784.69	27395	44677	7	9	5.6(−4)	3.6(−4)	0.048	−2.60	C	5*n*
		5712.15	27560	45061	5	7	0.0030	0.0020	0.19	−1.99	C	5*n*
373.	$z\ {}^5\mathrm{F}^\circ - e\ {}^5\mathrm{F}$ (687)											
		4966.09	26875	47006	11	11	0.037	0.014	2.5	−0.82	C+	4*n*
		4946.38	27167	47378	9	9	0.022	0.0080	1.2	−1.14	D−	14*n*
		4875.87	26875	47378	11	9	0.0035	0.0010	0.18	−1.95	C	5*n*
		4843.14	27395	48037	7	5	0.0097	0.0024	0.27	−1.77	C	5*n*
		4838.51	27560	48221	5	3	0.013	0.0026	0.21	−1.88	C	5*n*
		5002.79	27395	47378	7	9	0.0092	0.0044	0.51	−1.51	C	5*n*
		4950.10	27560	47756	5	7	0.0083	0.0043	0.35	−1.67	D	10*n*
		4907.73	27666	48037	3	5	0.0084	0.0050	0.24	−1.82	D	10*n*
374.	$z\ {}^5\mathrm{F}^\circ - e\ {}^3\mathrm{F}$ (688)											
		4679.22	27167	48532	9	7	0.0037	9.5(−4)	0.13	−2.07	C	5*n*
		4807.71	27167	47961	9	9	0.0024	8.2(−4)	0.12	−2.13	C	5*n*
		4729.68	27395	48532	7	7	0.0017	5.7(−4)	0.062	−2.40	C	5*n*
		4860.98	27395	47961	7	9	0.0014	6.2(−4)	0.070	−2.36	C	5*n*
		4766.87	27560	48532	5	7	0.0024	0.0012	0.090	−2.24	C	5*n*
375.	$z\ {}^5\mathrm{F}^\circ - e\ {}^7\mathrm{F}$ (689)											
		4224.17	27167	50833	9	11	0.14	0.044	5.5	−0.40	C+	4*n*
		4200.92	27395	51192	7	9	0.049	0.017	1.6	−0.93	C	5*n*
		4224.51	27666	51331	3	5	0.084	0.037	1.6	−0.95	C	5*n*
		4161.08	27167	51192	9	9	0.010	0.0027	0.33	−1.62	C	5*n*
		4205.54	27560	51331	5	5	0.042	0.011	0.78	−1.25	C	5*n*
		4168.63	27167	51149	9	7	0.0074	0.0015	0.19	−1.87	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
376.	$z\,^5F^\circ - f\,^5D$ (691)											
		4278.23	27167	50534	9	7	0.011	0.0024	0.30	−1.67	C	5*n*
377.	$z\,^5F^\circ - e\,^7P$ (692)											
		4264.20	27167	50611	9	7	0.020	0.0043	0.55	−1.41	C	5*n*
378.	$z\,^5F^\circ - e\,^5G$ (693)											
		4247.43	27167	50704	9	11	0.20	0.067	8.4	−0.22	C+	4*n*
		4238.81	27395	50980	7	9	0.22	0.077	7.5	−0.27	C+	4*n*
		4225.45	27560	51219	5	7	0.17	0.065	4.5	−0.49	C+	4*n*
		4217.55	27666	51370	3	5	0.24	0.11	4.4	−0.50	C+	4*n*
		4196.21	27395	51219	7	7	0.11	0.028	2.7	−0.71	C	4*n*,5*n*
		4198.64	27560	51370	5	5	0.13	0.036	2.5	−0.75	C	5*n*
		4169.78	27395	51370	7	5	0.011	0.0021	0.20	−1.84	C	5*n*
379.	$z\,^5F^\circ - e\,^7G$ (694)											
		4149.37	26875	50968	11	13	0.043	0.013	2.0	−0.84	C+	4*n*,5*n*
		4154.80	27167	51229	9	11	0.15	0.049	6.0	−0.36	C+	4*n*
		4182.79	27560	51461	5	7	0.014	0.0051	0.35	−1.59	C	5*n*
		4104.97	26875	51229	11	11	0.0028	7.1(−4)	0.10	−2.11	C	5*n*
		4136.51	27167	51335	9	9	0.015	0.0039	0.47	−1.46	C	5*n*
		4168.94	27560	51540	5	5	0.020	0.0053	0.36	−1.58	C	5*n*
		4087.09	26875	51335	11	9	0.021	0.0044	0.64	−1.32	C	4*n*,5*n*
380.	$z\,^5F^\circ - f\,^5F$ (695)											
		4126.18	26875	51103	11	11	0.046	0.012	1.7	−0.89	C	5*n*
		4114.96	27167	51462	9	9	0.012	0.0030	0.36	−1.57	C	5*n*
		4129.46	27395	51604	7	7	0.0070	0.0018	0.17	−1.90	C	5*n*
		4150.25	27666	51754	3	3	0.083	0.022	0.88	−1.19	C	5*n*
		4090.98	27167	51604	9	7	0.012	0.0023	0.27	−1.69	C	5*n*
		4112.35	27395	51705	7	5	0.016	0.0030	0.28	−1.68	C	5*n*
		4153.90	27395	51462	7	9	0.24	0.079	7.5	−0.26	C+	4*n*
		4158.79	27666	51705	3	5	0.17	0.073	3.0	−0.66	C	5*n*
381.	$z\,^5F^\circ - e\,^3D$ (697)											
		4106.44	27395	51740	7	5	0.029	0.0052	0.49	−1.44	C	5*n*
		4183.03	27395	51294	7	7	0.0043	0.0011	0.11	−2.10	C	5*n*
382.	$z\,^5F^\circ - g\,^5D$ (698)											
		4084.49	26875	51350	11	9	0.12	0.024	3.5	−0.58	C+	4*n*
		4054.87	27560	52214	5	3	0.18	0.027	1.8	−0.87	C	5*n*
		4065.40	27666	52257	3	1	0.24	0.020	0.79	−1.23	C	4*n*,5*n*
		4133.86	27167	51350	9	9	0.026	0.0065	0.80	−1.23	C	4*n*
		4101.27	27395	51771	7	7	0.028	0.0070	0.66	−1.31	C	4*n*,5*n*
		4082.13	27560	52050	5	5	0.027	0.0068	0.46	−1.47	C	5*n*
		4129.22	27560	51771	5	7	0.0061	0.0022	0.15	−1.96	C	5*n*
383.	$z\,^5F^\circ - e\,^5P$ (700)											
		4051.92	27395	52067	7	5	0.035	0.0062	0.58	−1.36	C	5*n*
		4090.09	27395	51837	7	7	0.011	0.0028	0.26	−1.71	C	5*n*
		4079.18	27560	52067	5	5	0.059	0.015	1.0	−1.13	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
384.	$z\ {}^5\mathrm{F}^\circ - g\ {}^5\mathrm{F}$ (701)											
		3817.64	26875	53061	11	11	0.085	0.019	2.6	−0.69	C	5*n*
385.	$z\ {}^5\mathrm{F}^\circ - h\ {}^5\mathrm{D}$ (702)											
		3804.01	26875	53155	11	9	0.052	0.0093	1.3	−0.99	C+	4*n*,5*n*
		3789.82	27167	53546	9	7	0.046	0.0077	0.86	−1.16	C	5*n*
386.	$z\ {}^5\mathrm{F}^\circ - f\ {}^5\mathrm{P}$ (703)											
		3846.00	27167	53160	9	7	0.050	0.0086	0.98	−1.11	C	5*n*
		3819.50	27395	53569	7	5	0.054	0.0084	0.74	−1.23	C	5*n*
		3791.73	27560	53925	5	3	0.074	0.0096	0.60	−1.32	C	5*n*
387.	$z\ {}^5\mathrm{F}^\circ - f\ {}^5\mathrm{G}$ (704)											
		3802.00	26875	53169	11	13	0.041	0.010	1.4	−0.94	C	5*n*
388.	$z\ {}^5\mathrm{F}^\circ - e\ {}^3\mathrm{G}$ (705)											
		3762.21	27167	53739	9	11	0.033	0.0086	0.96	−1.11	C	4*n*,5*n*
389.	$a\ {}^1\mathrm{P} - {}^1\mathrm{D}^\circ$	5029.62	27543	47420	3	5	0.0055	0.0035	0.17	−1.98	C	5*n*
390.	$a\ {}^1\mathrm{P} - x\ {}^3\mathrm{P}^\circ$ (720)											
		4779.44	27543	48460	3	1	0.017	0.0019	0.091	−2.24	C	5*n*
391.	$a\ {}^1\mathrm{P} - w\ {}^3\mathrm{F}^\circ$ (723)											
		4566.99	27543	49433	3	5	0.0063	0.0033	0.15	−2.01	C	5*n*
392.	$a\ {}^1\mathrm{P} - y\ {}^1\mathrm{D}^\circ$ (726)	4137.00	27543	51708	3	5	0.23	0.098	4.0	−0.53	C+	4*n*
393.	$a\ {}^1\mathrm{P} - u\ {}^3\mathrm{D}^\circ$ (728)											
		4003.76	27543	52512	3	3	0.082	0.020	0.78	−1.23	C	4*n*,5*n*
394.	$a\ {}^1\mathrm{P} - {}^3\mathrm{D}^\circ$											
		3976.61	27543	52683	3	5	0.18	0.073	2.9	−0.66	C	5*n*
		3891.93	27543	53230	3	3	0.40	0.090	3.4	−0.57	C+	4*n*,5*n*
395.	$a\ {}^1\mathrm{P} - {}^3\mathrm{P}^\circ$											
		3949.14	27543	52858	3	3	0.046	0.011	0.42	−1.49	C	5*n*
396.	$a\ {}^1\mathrm{P} - {}^3\mathrm{S}^\circ$											
		3806.22	27543	53808	3	3	0.25	0.055	2.1	−0.78	C	4*n*,5*n*
397.	$a\ {}^1\mathrm{P} - w\ {}^1\mathrm{D}^\circ$ (734)	3543.67	27543	55754	3	5	0.18	0.058	2.0	−0.76	C	5*n*
398.	$a\ {}^1\mathrm{P} - u\ {}^3\mathrm{F}^\circ$ (735)											
		3410.17	27543	56859	3	5	0.48	0.14	4.7	−0.38	C+	4*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
399.	$a\ ^1D - x\ ^3D^\circ$ (738)											
		6016.66	28605	45221	5	7	0.0047	0.0036	0.35	−1.75	C	5*n*
400.	$a\ ^1D - w\ ^3F^\circ$ (750)											
		4844.01	28605	49243	5	7	0.0045	0.0022	0.17	−1.96	C	5*n*
401.	$a\ ^1D - v\ ^3D^\circ$ (751)											
		4869.45	28605	49135	5	7	0.0014	7.1(−4)	0.057	−2.45	C	5*n*
402.	$a\ ^1D - v\ ^3G^\circ$ (752)											
		4705.46	28605	49851	5	7	0.0025	0.0012	0.089	−2.24	C	5*n*
403.	$a\ ^1D - z\ ^1D^\circ$ (753)	4789.65	28605	49477	5	5	0.084	0.029	2.3	−0.84	C+	4*n*
404.	$a\ ^1D - w\ ^3P^\circ$ (754)											
		4663.18	28605	50043	5	3	0.0046	8.9(−4)	0.069	−2.35	C	5*n*
405.	$a\ ^1D - z\ ^1F^\circ$ (755)	4547.85	28605	50587	5	7	0.078	0.034	2.5	−0.77	C+	4*n*
406.	$a\ ^1D - u\ ^3C^\circ$ (760)											
		4305.20	28605	51826	5	7	0.0051	0.0020	0.14	−2.00	C	5*n*
407.	$a\ ^1D - y\ ^1D^\circ$ (761)	4327.09	28605	51708	5	5	0.094	0.026	1.9	−0.88	C+	4*n*,5*n*
408.	$a\ ^1D - x\ ^1D^\circ$ (762)	4317.04	28605	51762	5	5	0.0057	0.0016	0.11	−2.10	C	5*n*
409.	$a\ ^1D - ^1P^\circ$	4240.37	28605	52181	5	3?	0.070	0.011	0.79	−1.25	C+	4*n*,5*n*
410.	$a\ ^1D - ^3D^\circ$											
		4059.73	28605	53230	5	3	0.096	0.014	0.95	−1.15	C+	4*n*,5*n*
411.	$a\ ^1D - y\ ^1F^\circ$ (768)	3989.86	28605	53661	5	7	0.058	0.020	1.3	−1.01	C	5*n*
412.	$a\ ^1D - x\ ^3F^\circ$											
		3973.65	28605	53763	5	7	0.080	0.026	1.7	−0.88	C+	4*n*,5*n*
413.	$a\ ^1D - t\ ^3G^\circ$ (771)											
		3845.69	28605	54600	5	7	0.057	0.018	1.1	−1.05	C	5*n*
414.	$a\ ^1D - w\ ^1D^\circ$ (772)	3682.24	28605	55754	5	5	1.7	0.36	22	0.25	C+	4*n*
415.	$a\ ^1D - w\ ^1F^\circ$ (773)	3677.31	28605	55791	5	7	0.31	0.089	5.4	−0.35	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
416.	$a\ ^1\mathrm{H} - {}^3\mathrm{F}^\circ$											
		5584.77	28820	46721	11	9	0.0013	5.1(−4)	0.10	−2.25	C	5*n*
417.	$a\ ^1\mathrm{H} - {}^5\mathrm{D}^\circ$											
		5532.75	28820	46889	11	9	0.0020	7.6(−4)	0.15	−2.08	C	5*n*
418.	$a\ ^1\mathrm{H} - {}^5\mathrm{H}^\circ$											
		5263.87	28820	47812	11	9	0.0023	7.9(−4)	0.15	−2.06	C	5*n*
419.	$a\ ^1\mathrm{H} - w\ ^3\mathrm{G}^\circ$ (789)											
		5115.78	28820	48362	11	9	6.1(−4)	1.9(−4)	0.036	−2.67	C	5*n*
420.	$a\ ^1\mathrm{H} - w\ ^3\mathrm{F}^\circ$ (792)											
		4927.42	28820	49109	11	9	0.0037	0.0011	0.20	−1.92	C	5*n*
421.	$a\ ^1\mathrm{H} - y\ ^3\mathrm{H}^\circ$ (793)											
		4849.67	28820	49434	11	13	5.4(−4)	2.2(−4)	0.039	−2.61	C	5*n*
		4809.94	28820	49604	11	11	5.9(−4)	2.0(−4)	0.035	−2.65	C	5*n*
422.	$a\ ^1\mathrm{H} - x\ ^1\mathrm{G}^\circ$ (795)	4587.13	28820	50614	11	9	0.0069	0.0018	0.29	−1.71	C	5*n*
423.	$a\ ^1\mathrm{H} - x\ ^3\mathrm{H}^\circ$ (796)											
		4502.59	28820	51023	11	13	0.0013	4.8(−4)	0.078	−2.28	C	5*n*
424.	$a\ ^1\mathrm{H} - u\ ^3\mathrm{G}^\circ$ (797)											
		4432.57	28820	51374	11	11	0.0091	0.0027	0.43	−1.53	C	5*n*
425.	$a\ ^1\mathrm{H} - {}^1\mathrm{H}^\circ$	4382.77	28820	51630	11	11	0.013	0.0039	0.62	−1.37	C	5*n*
426.	$a\ ^1\mathrm{H} - y\ ^3\mathrm{I}^\circ$ (800)											
		4219.36	28820	52514	11	13	0.38	0.12	18	0.12	C+	4*n*,8
427.	$a\ ^1\mathrm{H} - z\ ^1\mathrm{I}^\circ$ (801)	4118.54	28820	53094	11	13	0.58	0.17	26	0.28	C	8
428.	$a\ ^1\mathrm{H} - y\ ^1\mathrm{H}^\circ$ (802)	4014.53	28820	53722	11	11	0.24	0.059	8.5	−0.19	C+	4*n*
429.	$a\ ^1\mathrm{H} - w\ ^1\mathrm{G}^\circ$ (804)	3846.41	28820	54811	11	9	0.19	0.035	4.8	−0.42	C	5*n*
430.	$a\ ^1\mathrm{H} - v\ ^3\mathrm{H}^\circ$ (805)											
		3756.94	28820	55430	11	11	0.25	0.052	7.1	−0.24	C+	4*n*,5*n*
431.	$a\ ^1\mathrm{H} - s\ ^3\mathrm{G}^\circ$ (807)											
		3690.73	28820	55907	11	11	0.28	0.057	7.7	−0.20	C+	4*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
432.	$a\ ^1H - u\ ^3H^\circ$ (808)											
		3627.05	28820	56383	11	11	0.027	0.0052	0.69	−1.24	C	5*n*
433.	$a\ ^1H - u\ ^3F^\circ$ (809)											
		3599.62	28820	56593	11	9	0.19	0.030	3.9	−0.48	C+	4*n*,5*n*
434.	$a\ ^1H - v\ ^1G^\circ$ (810)	3553.74	28820	56951	11	9	0.83	0.13	17	0.15	C+	4*n*
435.	$a\ ^1H - x\ ^3I^\circ$ (811)											
		3538.78	28820	57070	11	13	0.0076	0.0017	0.22	−1.73	C	8
		3534.53	28820	57104	11	11	0.022	0.0042	0.53	−1.34	C	5*n*
436.	$z\ ^5P^\circ - e\ ^5D$ (816)											
		6400.00	29056	44677	7	9	0.059	0.046	6.8	−0.49	D−	14*n*
		6411.65	29469	45061	5	7	0.038	0.032	3.4	−0.79	D−	14*n*
		6246.32	29056	45061	7	7	0.029	0.017	2.4	−0.93	D−	14*n*
		6336.84	29733	45509	3	3	0.053	0.032	2.0	−1.02	D−	14*n*
		6141.73	29056	45334	7	5	0.010	0.0041	0.58	−1.54	C	5*n*
437.	$z\ ^5P^\circ - e\ ^7F$ (819)											
		4572.86	29469	51331	5	5	0.0012	3.6(−4)	0.027	−2.74	C	5*n*
		4488.13	29056	51331	7	5	0.015	0.0032	0.33	−1.65	C	5*n*
438.	$z\ ^5P^\circ - f\ ^7D$ (820)											
		4596.06	29056	50808	7	9	0.0094	0.0038	0.41	−1.57	C	5*n*
		4673.16	29469	50862	5	7	0.049	0.022	1.7	−0.95	D−	14*n*
		4701.05	29733	50999	3	5	0.0078	0.0043	0.20	−1.89	C	5*n*
		4643.46	29469	50999	5	5	0.037	0.012	0.92	−1.22	C	5*n*
		4690.14	29733	51048	3	3	0.025	0.0082	0.38	−1.61	C	5*n*
439.	$z\ ^5P^\circ - f\ ^5D$ (821)											
		4678.85	29056	50423	7	9	0.085	0.036	3.9	−0.60	D	9
		4619.29	29056	50699	7	5	0.056	0.013	1.4	−1.05	C	5*n*
		4669.17	29469	50880	5	3	0.047	0.0091	0.70	−1.34	C	5*n*
		4704.95	29733	50981	3	1	0.095	0.011	0.49	−1.50	C	5*n*
440.	$z\ ^5P^\circ - e\ ^7P$ (822)											
		4638.01	29056	50611	7	7	0.039	0.013	1.4	−1.05	C	5*n*
		4673.28	29469	50861	5	5	0.040	0.013	1.0	−1.18	C	5*n*
441.	$z\ ^5P^\circ - e\ ^5G$ (823)											
		4560.09	29056	50980	7	9	0.0050	0.0020	0.21	−1.85	C	5*n*
		4596.41	29469	51219	5	7	0.0025	0.0011	0.085	−2.25	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
442.	$z\ ^5\mathrm{P}^\circ - f\ ^5\mathrm{F}$ (825)											
		4433.78	29056	51604	7	7	0.031	0.0090	0.92	−1.20	C	5*n*
		4495.95	29469	51705	5	5	0.015	0.0045	0.33	−1.65	C	5*n*
		4485.97	29469	51754	5	3	0.0058	0.0010	0.078	−2.28	C	5*n*
443.	$z\ ^5\mathrm{P}^\circ - e\ ^3\mathrm{D}$ (827)											
		4495.57	29056	51294	7	7	0.0042	0.0013	0.13	−2.05	C	5*n*
		4481.61	29733	52040	3	3	0.049	0.015	0.66	−1.35	C	5*n*
		4580.58	29469	51294	5	7	0.0043	0.0019	0.14	−2.02	C	5*n*
444.	$z\ ^5\mathrm{P}^\circ - g\ ^5\mathrm{D}$ (828)											
		4484.22	29056	51350	7	9	0.081	0.031	3.2	−0.66	D	9
		4482.74	29469	51771	5	7	0.025	0.010	0.77	−1.28	C	5*n*
		4401.29	29056	51771	7	7	0.069	0.020	2.0	−0.85	C+	4*n*
		4446.83	29733	52214	3	3	0.062	0.018	0.80	−1.26	C	5*n*
		4347.85	29056	52050	7	5	0.018	0.0037	0.37	−1.59	C	5*n*
		4395.29	29469	52214	5	3	0.020	0.0035	0.25	−1.76	C	5*n*
		4438.34	29733	52257	3	1	0.093	0.0092	0.40	−1.56	C	5*n*
445.	$z\ ^5\mathrm{P}^\circ - e\ ^7\mathrm{S}$ (829)											
		4440.48	29056	51570	7	7	0.0048	0.0014	0.15	−2.00	C	5*n*
		4523.40	29469	51570	5	7	0.0056	0.0024	0.18	−1.92	C	5*n*
446.	$z\ ^5\mathrm{P}^\circ - e\ ^5\mathrm{P}$ (830)											
		4388.41	29056	51837	7	7	0.13	0.038	3.8	−0.58	C+	4*n*
		4423.84	29469	52067	5	5	0.020	0.0058	0.42	−1.54	C	5*n*
		4485.67	29733	52020	3	3	0.12	0.037	1.7	−0.95	C	5*n*
		4433.22	29469	52020	5	3	0.23	0.041	3.0	−0.69	C	5*n*
		4469.37	29469	51837	5	7	0.27	0.11	8.3	−0.25	C+	4*n*
447.	$z\ ^5\mathrm{P}^\circ - 4$ (836)											
		3428.75	29056	58213	7	5	0.25	0.031	2.5	−0.66	D	12*n*
448.	$a\ ^1\mathrm{I} - z\ ^3\mathrm{H}^\circ$ (838)											
		5649.66	29313	47008	13	11	3.8(−4)	1.5(−4)	0.037	−2.70	C	5*n*
449.	$a\ ^1\mathrm{I} - w\ ^3\mathrm{G}^\circ$ (842)											
		5284.42	29313	48231	13	11	6.7(−4)	2.4(−4)	0.054	−2.51	C	5*n*
450.	$a\ ^1\mathrm{I} - z\ ^1\mathrm{H}^\circ$ (843)	5242.49	29313	48383	13	11	0.032	0.011	2.5	−0.84	C+	4*n*,8
451.	$a\ ^1\mathrm{I} - v\ ^3\mathrm{G}^\circ$ (845)											
		4961.91	29313	49461	13	11	0.0015	4.6(−4)	0.098	−2.22	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
452.	$a\ {}^1\mathrm{I} - y\ {}^3\mathrm{I}^\circ$ (849)											
		4309.03	29313	52514	13	13	0.024	0.0067	1.2	−1.06	C+	4*n*,5*n*,8
453.	$a\ {}^1\mathrm{I} - z\ {}^1\mathrm{I}^\circ$ (850)	4203.94	29313	53094	13	13	0.13	0.034	6.2	−0.35	C	8
454.	$a\ {}^1\mathrm{I} - x\ {}^1\mathrm{H}^\circ$ (854)	3813.88	29313	55526	13	11	0.091	0.017	2.7	−0.66	C+	4*n*,5*n*
455.	$b\ {}^3\mathrm{D} - y\ {}^3\mathrm{P}^\circ$ (867)											
		5760.35	29372	46727	7	5	0.0015	5.4(−4)	0.072	−2.42	C	5*n*
		5698.05	29357	46902	5	3	0.0017	4.9(−4)	0.046	−2.61	C	5*n*
456.	$b\ {}^3\mathrm{D} - {}^3\mathrm{F}^\circ$											
		5762.43	29372	46721	7	9	0.0014	8.8(−4)	0.12	−2.21	C	5*n*
		5636.71	29357	47093	5	7	8.6(−4)	5.8(−4)	0.054	−2.54	C	5*n*
457.	$b\ {}^3\mathrm{D} - {}^5\mathrm{D}^\circ$											
		5707.07	29372	46889	7	9	0.0011	6.7(−4)	0.088	−2.33	C	5*n*
		5660.79	29357	47017	5	7	4.6(−4)	3.1(−4)	0.029	−2.81	C	5*n*
458.	$b\ {}^3\mathrm{D} - {}^3\mathrm{D}^\circ$											
		5754.41	29372	46745	7	7	6.7(−4)	3.3(−4)	0.044	−2.63	C	5*n*
		5702.43	29357	46889	5	5	6.5(−4)	3.2(−4)	0.030	−2.80	C	5*n*
		5568.81	29320	47272	3	3	9.5(−4)	4.4(−4)	0.024	−2.88	C	5*n*
459.	$b\ {}^3\mathrm{D} - {}^1\mathrm{D}^\circ$											
		5539.28	29372	47420	7	5	0.0011	3.7(−4)	0.047	−2.59	C	5*n*
460.	$b\ {}^3\mathrm{D} - z\ {}^1\mathrm{G}^\circ$ (872)											
		5529.15	29372	47453	7	9	5.3(−4)	3.1(−4)	0.040	−2.66	C	5*n*
461.	$b\ {}^3\mathrm{D} - v\ {}^5\mathrm{F}^\circ$ (875)											
		5294.56	29357	48239	5	5	7.7(−4)	3.2(−4)	0.028	−2.79	C	5*n*
		5298.79	29372	48239	7	5	0.0039	0.0012	0.14	−2.09	C	5*n*
462.	$b\ {}^3\mathrm{D} - v\ {}^5\mathrm{P}^\circ$ (877)											
		5320.05	29372	48163	7	5	0.0016	4.8(−4)	0.059	−2.47	C	5*n*
463.	$b\ {}^3\mathrm{D} - x\ {}^3\mathrm{P}^\circ$ (880)											
		5280.36	29372	48305	7	5	0.0052	0.0016	0.19	−1.96	C	5*n*
		5223.19	29320	48460	3	1	0.012	0.0016	0.082	−2.32	C	5*n*
		5207.95	29320	48516	3	3	0.0034	0.0014	0.071	−2.38	C	5*n*
464.	$b\ {}^3\mathrm{D} - w\ {}^3\mathrm{F}^\circ$ (883)											
		4970.50	29320	49433	3	5	0.013	0.0078	0.38	−1.63	C	5*n*

Fe I: Allowed transitions—Continue

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
465.	$b\ ^3\mathrm{D} - v\ ^3\mathrm{D}^\circ$ (884)											
		5058.50	29372	49135	7	7	6.2(−4)	2.4(−4)	0.028	−2.78	D	15*n*
		5054.64	29357	49135	5	7	0.0032	0.0017	0.14	−2.07	C	5*n*
466.	$b\ ^3\mathrm{D} - z\ ^1\mathrm{D}^\circ$ (887)											
		4968.69	29357	49477	5	5	0.011	0.0039	0.32	−1.71	C	5*n*
467.	$b\ ^3\mathrm{D} - w\ ^3\mathrm{P}^\circ$ (888)											
		4799.41	29357	50187	5	5	0.0040	0.0014	0.11	−2.16	C	5*n*
468.	$b\ ^3\mathrm{D} - v\ ^3\mathrm{F}^\circ$ (894)											
		4542.41	29357	51365	5	7	0.0048	0.0021	0.16	−1.98	C	5*n*
469.	$b\ ^3\mathrm{D} - u\ ^3\mathrm{G}^\circ$ (898)											
		4483.78	29372	51668	7	9	0.0015	5.7(−4)	0.059	−2.40	C	5*n*
470.	$b\ ^3\mathrm{D} - u\ ^3\mathrm{D}^\circ$ (903)											
		4360.81	29372	52297	7	5	0.011	0.0023	0.23	−1.80	C	5*n*
471.	$b\ ^3\mathrm{D} - {}^3\mathrm{D}^\circ$											
		4285.83	29357	52683	5	5	0.014	0.0039	0.28	−1.71	C	5*n*
472.	$b\ ^3\mathrm{D} - {}^3\mathrm{P}^\circ$											
		4246.08	29372	52916	7	5	0.069	0.013	1.3	−1.03	C+	4*n*,5*n*
473.	$b\ ^3\mathrm{D} - s\ ^3\mathrm{D}^\circ$ (907)											
		4239.36	29372	52954?	7	7	0.019	0.0051	0.50	−1.45	C	5*n*
474.	$b\ ^3\mathrm{D} - {}^3\mathrm{S}^\circ$											
		4088.57	29357	53808	5	3	0.046	0.0069	0.47	−1.46	C	5*n*
		4082.44	29320	53808	3	3	0.044	0.011	0.45	−1.48	C	5*n*
475.	$b\ ^3\mathrm{D} - {}^5\mathrm{D}^\circ$											
		4010.18	29372	54301	7	9	0.0088	0.0027	0.25	−1.72	C	5*n*
476.	$b\ ^3\mathrm{D} - t\ ^3\mathrm{G}^\circ$ (913)											
		4020.49	29372	54237	7	9	0.0091	0.0029	0.26	−1.70	C	5*n*
		3960.28	29357	54600	5	7	0.049	0.016	1.1	−1.09	C	5*n*
477.	$b\ ^3\mathrm{D} - w\ ^1\mathrm{D}^\circ$ (916)											
		3787.16	29357	55754	5	5	0.12	0.026	1.6	−0.88	C+	4*n*,5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
478.	$b\ ^3\mathrm{D} - w\ ^1\mathrm{F}^{\circ}$ (917)											
		3781.94	29357	55791	5	7	0.043	0.013	0.80	−1.19	C	5*n*
479.	$b\ ^1\mathrm{G} - ^5\mathrm{D}^{\circ}$											
		5849.67	29799	46889	9	9	2.6(−4)	1.3(−4)	0.023	−2.92	C	5*n*
480.	$b\ ^1\mathrm{G} - z\ ^1\mathrm{G}^{\circ}$ (924)	5662.94	29799	47453	9	9	0.0012	5.8(−4)	0.098	−2.28	C	5*n*
481.	$b\ ^1\mathrm{G} - ^5\mathrm{H}^{\circ}$											
		5549.94	29799	47812	9	9	3.5(−4)	1.6(−4)	0.026	−2.84	C	5*n*
		5543.15	29799	47834	9	7	0.0098	0.0035	0.58	−1.50	C	5*n*
482.	$b\ ^1\mathrm{G} - w\ ^3\mathrm{G}^{\circ}$ (927)											
		5385.58	29799	48362	9	9	3.2(−4)	1.4(−4)	0.022	−2.90	C	5*n*
483.	$b\ ^1\mathrm{G} - z\ ^1\mathrm{H}^{\circ}$ (928)	5379.57	29799	48383	9	11	0.0078	0.0041	0.66	−1.43	C	4*n*,5*n*,8
484.	$b\ ^1\mathrm{G} - y\ ^1\mathrm{G}^{\circ}$ (929)	5288.53	29799	48703	9	9	0.0071	0.0030	0.47	−1.57	D	15*n*
485.	$b\ ^1\mathrm{G} - w\ ^3\mathrm{F}^{\circ}$ (930)											
		5177.23	29799	49109	9	9	0.0012	5.0(−4)	0.076	−2.35	C	5*n*
486.	$b\ ^1\mathrm{G} - x\ ^3\mathrm{H}^{\circ}$ (935)											
		4700.19	29799	51409	9	11	0.0067	0.0027	0.38	−1.61	C	5*n*
487.	$b\ ^1\mathrm{G} - y\ ^1\mathrm{F}^{\circ}$ (940)	4189.56	29799	53661	9	7	0.030	0.0061	0.76	−1.26	C	5*n*
488.	$b\ ^1\mathrm{G} - x\ ^3\mathrm{F}^{\circ}$											
		4171.69	29799	53763	9	7	0.034	0.0069	0.85	−1.21	C	5*n*
489.	$b\ ^1\mathrm{G} - w\ ^1\mathrm{G}^{\circ}$ (945)	3996.97	29799	54811	9	9	0.074	0.018	2.1	−0.80	C+	4*n*,5*n*
490.	$b\ ^1\mathrm{G} - s\ ^3\mathrm{G}^{\circ}$ (948)											
		3829.13	29799	55907	9	11	0.031	0.0084	0.96	−1.12	C	5*n*
491.	$z\ ^3\mathrm{F}^{\circ} - e\ ^3\mathrm{F}$ (959)											
		6003.03	31307	47961	9	9	0.017	0.0090	1.6	−1.09	D−	14*n*
		5952.75	32134	48928	5	5	0.016	0.0085	0.84	−1.37	C	5*n*
		5804.06	31307	48532	9	7	0.0017	6.7(−4)	0.12	−2.22	C	5*n*
		5838.42	31805	48928	7	5	0.0021	7.7(−4)	0.10	−2.27	C	5*n*
		6188.04	31805	47961	7	9	0.0043	0.0032	0.46	−1.65	C	5*n*
		6096.69	32134	48532	5	7	0.0035	0.0028	0.28	−1.86	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
492.	$z\ ^3F^\circ - e\ ^3D$ (965)											
		5001.86	31307	51294	9	7	0.40	0.12	17	0.02	C+	4*n*
		5014.94	31805	51740	7	5	0.31	0.082	9.5	−0.24	C+	4*n*
		5022.24	32134	52040	5	3	0.27	0.060	5.0	−0.52	C+	4*n*
		5129.63	31805	51294	7	7	0.0060	0.0024	0.28	−1.78	C	5*n*
		5099.09	32134	51740	5	5	0.018	0.0069	0.58	−1.46	C	5*n*
493.	$z\ ^3F^\circ - g\ ^5D$ (966)											
		4978.60	32134	52214	5	3	0.11	0.025	2.1	−0.90	D−	14*n*
494.	$z\ ^3F^\circ - e\ ^7S$ (967)											
		5058.00	31805	51570	7	7	0.0013	5.0(−4)	0.058	−2.46	C	5*n*
495.	$z\ ^3F^\circ - g\ ^5F$ (969)											
		4452.62	31805	54258	7	5	0.0093	0.0020	0.20	−1.86	C	5*n*
		4492.68	32134	54386	5	3	0.029	0.0053	0.39	−1.58	C	5*n*
496.	$z\ ^3F^\circ - f\ ^5P$ (971)											
		4593.53	31805	53569	7	5	0.0065	0.0015	0.15	−1.99	C	5*n*
		4587.72	32134	53925	5	3	0.0088	0.0017	0.13	−2.08	C	5*n*
497.	$z\ ^3F^\circ - f\ ^5G$ (972)											
		4551.65	31805	53769	7	9	0.0037	0.0015	0.15	−1.99	C	5*n*
		4450.77	31307	53769	9	9	0.0025	7.5(−4)	0.099	−2.17	C	5*n*
498.	$z\ ^3F^\circ - e\ ^3G$ (973)											
		4456.63	31307	53739	9	11	0.0075	0.0027	0.36	−1.61	C	5*n*
		4494.05	32134	54379	5	7	0.0086	0.0036	0.27	−1.74	C	5*n*
		4392.58	31307	54067	9	9	0.0045	0.0013	0.17	−1.93	C	5*n*
499.	$z\ ^3F^\circ - f\ ^3D$ (974)											
		4455.03	31307	53748	9	7	0.046	0.011	1.4	−1.02	C	5*n*
500.	$z\ ^3F^\circ - e\ ^3H$ (975)											
		4300.21	31307	54555?	9	9	0.0073	0.0020	0.26	−1.74	C	5*n*
501.	$z\ ^3F^\circ - f\ ^3F$ (976)											
		4276.68	31307	54683	9	9	0.029	0.0080	1.0	−1.14	C	5*n*
		4300.83	32134	55379	5	5	0.055	0.015	1.1	−1.12	C	5*n*
502.	$z\ ^3F^\circ - 2$ (977)											
		3975.85	31307	56452	9	9	0.030	0.0070	0.83	−1.20	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
503.	$z\ ^3D^\circ - e\ ^5F$ (981)											
		6226.77	31323	47378	7	9	0.0014	0.0010	0.15	−2.15	C	5*n*
504.	$z\ ^3D^\circ - e\ ^3F$ (982)											
		5934.66	31686	48532	5	7	0.021	0.016	1.6	−1.10	C	5*n*
		5883.84	31937	48928	3	5	0.020	0.017	0.99	−1.29	C	5*n*
		5809.25	31323	48532	7	7	0.0048	0.0024	0.32	−1.77	C	5*n*
		5798.19	31686	48928	5	5	0.0060	0.0030	0.29	−1.82	C	5*n*
505.	$z\ ^3D^\circ - e\ ^3D$ (984)											
		4973.10	31937	52040	3	3	0.12	0.044	2.2	−0.88	C+	4*n*
		4896.44	31323	51740	7	5	0.0058	0.0015	0.17	−1.98	C	5*n*
		4911.78	31686	52040	5	3	0.018	0.0038	0.31	−1.72	C	5*n*
		5048.43	31937	51740	3	5	0.034	0.022	1.1	−1.19	C	4*n*
506.	$z\ ^3D^\circ - g\ ^5D$ (985)											
		4930.31	31937	52214	3	3	0.048	0.017	0.85	−1.28	C	5*n*
		4870.05	31686	52214	5	3	0.0050	0.0011	0.086	−2.27	C	5*n*
507.	$z\ ^3D^\circ - e\ ^5P$ (986)											
		4905.13	31686	52067	5	5	0.0058	0.0021	0.17	−1.98	C	5*n*
508.	$z\ ^3D^\circ - f\ ^3D$ (992)											
		4466.94	31686	54067	5	5	0.035	0.010	0.77	−1.28	C	5*n*
		4440.82	31937	54449	3	3	0.033	0.0098	0.43	−1.53	C	5*n*
		4391.87	31686	54449	5	3	0.012	0.0021	0.15	−1.97	C	5*n*
509.	$z\ ^3D^\circ - f\ ^3F$ (993)											
		4279.48	31323	54683	7	9	0.016	0.0058	0.57	−1.39	C	5*n*
		4264.74	31937	55379	3	5	0.031	0.014	0.59	−1.38	C	5*n*
		4200.09	31323	55125	7	7	0.047	0.012	1.2	−1.06	C	5*n*
510.	$z\ ^3D^\circ - e\ ^3P$ (994)											
		4243.79	31323	54880	7	5	0.028	0.0053	0.52	−1.43	C	5*n*
		4220.05	31686	55376	5	3	0.032	0.0051	0.36	−1.59	C	5*n*
		4310.37	31686	54880	5	5	0.027	0.0074	0.53	−1.43	C	5*n*
511.	$z\ ^3D^\circ - i\ ^5D$ (995)											
		3839.61	31937	57974	3	5	0.40	0.15	5.6	−0.35	C	5*n*
512.	$c\ ^3F - ^5D^\circ$											
		7132.99	32874	46889	9	9	0.0030	0.0023	0.49	−1.68	C	5*n*
		7068.42	32874	47017	9	7	0.0093	0.0054	1.1	−1.31	C	5*n*
513.	$c\ ^3F - z\ ^3H^\circ$ (1003)											
		7024.08	32874	47106	9	9	0.0014	0.0011	0.22	−2.02	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log *gf*	Accuracy	Source
514.	$c\ ^3\mathrm{F} - w\ ^5\mathrm{G}^\circ$ (1005)											
		7000.63	33413	47693	7	7	0.0014	0.0010	0.17	−2.14	C	5*n*
		7107.46	33765	47831	5	5	0.0028	0.0021	0.25	−1.97	C	5*n*
515.	$c\ ^3\mathrm{F} - z\ ^1\mathrm{G}^\circ$ (1006)											
		6857.25	32874	47453	9	9	0.0013	9.2(−4)	0.19	−2.08	C	5*n*
516.	$c\ ^3\mathrm{F} - y\ ^1\mathrm{G}^\circ$ (1014)											
		6315.81	32874	48703	9	9	0.0043	0.0025	0.48	−1.64	C	5*n*
517.	$c\ ^3\mathrm{F} - w\ ^3\mathrm{F}^\circ$ (1015)											
		6157.73	32874	49109	9	9	0.013	0.0072	1.3	−1.19	C	5*n*
		6380.75	33765	49433	5	5	0.015	0.0094	0.98	−1.33	C	5*n*
518.	$c\ ^3\mathrm{F} - v\ ^3\mathrm{D}^\circ$ (1016)											
		6147.85	32874	49135	9	7	0.0059	0.0026	0.47	−1.63	C	5*n*
519.	$c\ ^3\mathrm{F} - v\ ^3\mathrm{G}^\circ$ (1018)											
		6027.06	32874	49461	9	11	0.012	0.0080	1.4	−1.14	C	5*n*
		6165.37	33413	49628	7	9	0.0065	0.0047	0.67	−1.48	C	5*n*
		6215.15	33765	49851	5	7	0.011	0.0085	0.87	−1.37	C	5*n*
520.	$c\ ^3\mathrm{F} - z\ ^1\mathrm{D}^\circ$ (1019)											
		6362.89	33765	49477	5	5	0.0041	0.0025	0.26	−1.90	C	5*n*
521.	$c\ ^3\mathrm{F} - z\ ^1\mathrm{F}^\circ$ (1021)											
		5643.94	32874	50587	9	7	0.0031	0.0012	0.19	−1.98	C	5*n*
522.	$c\ ^3\mathrm{F} - x\ ^1\mathrm{G}^\circ$ (1022)											
		5811.93	33413	50614	7	9	9.6(−4)	6.2(−4)	0.084	−2.36	C	5*n*
523.	$c\ ^3\mathrm{F} - x\ ^3\mathrm{H}^\circ$ (1024)											
		5494.46	32874	51069	9	11	0.0019	0.0011	0.17	−2.02	C	5*n*
524.	$c\ ^3\mathrm{F} - t\ ^5\mathrm{D}^\circ$ (1025)											
		5487.74	33413	51630?	7	5	0.093	0.030	3.8	−0.68	D−	14*n*
525.	$c\ ^3\mathrm{F} - v\ ^3\mathrm{F}^\circ$ (1026)											
		5587.58	33413	51305	7	9	0.0039	0.0024	0.31	−1.78	C	5*n*
		5680.26	33765	51365	5	7	9.1(−4)	6.2(−4)	0.058	−2.51	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
526.	$c\ {}^3F - u\ {}^3G^\circ$ (1029)											
		5319.22	32874	51668	9	9	0.0013	5.6(−4)	0.088	−2.30	C	5*n*
527.	$c\ {}^3F - {}^1H^\circ$											
		5329.99	32874	51630	9	11	0.013	0.0065	1.0	−1.23	C	5*n*
528.	$c\ {}^3F - y\ {}^1D^\circ$ (1030)											
		5464.29	33413	51708	7	5	0.010	0.0032	0.40	−1.65	C	5*n*
529.	$c\ {}^3F - u\ {}^3D^\circ$ (1031)											
		5293.97	33413	52297	7	5	0.0075	0.0023	0.28	−1.80	C	5*n*
		5332.67	33765	52512	5	3	0.0075	0.0019	0.17	−2.02	C	5*n*
		5387.51	33413	51969	7	7	0.0028	0.0012	0.15	−2.07	C	5*n*
		5394.68	33765	52297	5	5	0.013	0.0056	0.50	−1.55	C	5*n*
		5491.84	33765	51969	5	7	0.0015	9.4(−4)	0.085	−2.33	C	5*n*
530.	$c\ {}^3F - {}^3D^\circ$											
		5187.91	33413	52683	7	5	0.032	0.0092	1.1	−1.19	C	4*n*,5*n*
		5136.09	33765	53230	5	3	0.0075	0.0018	0.15	−2.05	C	5*n*
		5284.62	33765	52683	5	5	0.0044	0.0018	0.16	−2.04	C	5*n*
531.	$c\ {}^3F - {}^3P^\circ$											
		5236.19	33765	52858	5	3	0.018	0.0045	0.39	−1.65	C	5*n*
532.	$c\ {}^3F - {}^5F^\circ$											
		4729.02	32874	54014	9	11	0.0070	0.0029	0.40	−1.59	C	5*n*
533.	$c\ {}^3F - x\ {}^3F^\circ$											
		4999.11	33765	53763	5	7	0.0082	0.0043	0.35	−1.67	C	5*n*
534.	$c\ {}^3F - {}^5D^\circ$											
		4785.96	33413	54301	7	9	0.0045	0.0020	0.22	−1.86	C	5*n*
535.	$c\ {}^3F - t\ {}^3G^\circ$ (1042)											
		4735.84	32874	53983	9	11	0.019	0.0079	1.1	−1.15	C	5*n*
		4800.65	33413	54237	7	9	0.021	0.0092	1.0	−1.19	C	5*n*
		4798.26	33765	54600	5	7	0.014	0.0066	0.52	−1.48	C	5*n*
536.	$c\ {}^3F - {}^5P^\circ$											
		4854.89	33413	54005	7	7	0.0043	0.0015	0.17	−1.97	C	5*n*
537.	$c\ {}^3F - x\ {}^1H^\circ$ (1046)											
		4413.40	32874	55526	9	11	0.011	0.0039	0.50	−1.46	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
538.	$y\ ^5\mathrm{D}^\circ - e\ ^5\mathrm{F}$ (1051)											
		7130.94	34017	48037	3	5	0.044	0.055	3.9	−0.78	C	5*n*
		7090.40	34122	48221	1	3	0.032	0.072	1.7	−1.14	C	5*n*
		6999.90	33096	47378	9	9	0.0049	0.0036	0.75	−1.49	C	5*n*
		7016.44	33507	47756	7	7	0.012	0.0092	1.5	−1.19	C	5*n*
		7022.98	33802	48037	5	5	0.018	0.013	1.5	−1.18	C	5*n*
		7038.25	34017	48221	3	3	0.026	0.020	1.4	−1.23	C	5*n*
539.	$y\ ^5\mathrm{D}^\circ - e\ ^3\mathrm{F}$ (1052)											
		6916.70	33507	47961	7	9	0.0065	0.0060	0.95	−1.38	C	5*n*
		6786.88	33802	48532	5	7	0.0021	0.0020	0.22	−2.00	C	5*n*
540.	$y\ ^5\mathrm{D}^\circ - f\ ^5\mathrm{D}$ (1055)											
		5815.16	33507	50699	7	5	0.0011	4.0(−4)	0.054	−2.55	C	5*n*
541.	$y\ ^5\mathrm{D}^\circ - e\ ^7\mathrm{G}$ (1058)											
		5481.25	33096	51335	9	9	0.012	0.0052	0.84	−1.33	C	5*n*
542.	$y\ ^5\mathrm{D}^\circ - e\ ^3\mathrm{D}$ (1061)											
		5493.51	33096	51294	9	7	0.0054	0.0019	0.31	−1.77	C	5*n*
		5483.11	33507	51740	7	5	0.014	0.0044	0.56	−1.51	C	5*n*
		5381.45	33802	52040	5	3	0.031	0.0083	0.75	−1.38	C	5*n*
		5620.53	33507	51294	7	7	0.0057	0.0027	0.35	−1.72	C	5*n*
		5547.00	34017	52040	3	3	0.010	0.0048	0.26	−1.84	C	5*n*
543.	$y\ ^5\mathrm{D}^\circ - g\ ^5\mathrm{D}$ (1062)											
		5473.90	33507	51771	7	7	0.057	0.025	3.2	−0.75	C+	4*n*
		5478.48	33802	52050	5	5	0.0074	0.0033	0.30	−1.78	C	5*n*
		5353.39	33096	51771	9	7	0.051	0.017	2.7	−0.81	D−	14*n*
		5480.87	34017	52257	3	1	0.14	0.022	1.2	−1.19	C	5*n*
		5563.60	33802	51771	5	7	0.037	0.024	2.2	−0.92	C	5n
		5543.94	34017	52050	3	5	0.037	0.028	1.6	−1.07	C	5*n*
		5525.55	34122	52214	1	3	0.040	0.055	1.0	−1.26	C	5*n*
544.	$y\ ^5\mathrm{D}^\circ\ \ c\ ^5\mathrm{P}$ (1064)											
		5386.34	33507	52067	7	5	0.0092	0.0029	0.35	−1.70	C	5n
		5473.18	33802	52067	5	5	0.0038	0.0017	0.15	−2.07	C	5n
545.	$y\ ^5\mathrm{D}^\circ - g\ ^5\mathrm{F}$ (1065)											
		4991.27	33802	53831	5	7	0.088	0.046	3.8	−0.64	D−	14*n*
546.	$y\ ^5\mathrm{D}^\circ - h\ ^5\mathrm{D}$ (1066)											
		4988.95	33507	53546	7	7	0.058	0.022	2.5	−0.82	C+	4*n*
		4969.92	34017	54133	3	3	0.16	0.061	3.0	−0.74	D+	10*n*
		4917.23	33802	54133	5	3	0.071	0.016	1.3	−1.11	C	5*n*
		5088.16	33507	53155	7	9	0.0056	0.0028	0.33	−1.71	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
547.	$y\ ^5D^o - f\ ^5G$ (1068)											
		4835.87	33096	53769	9	9	0.012	0.0041	0.59	−1.43	C	5*n*
		4840.32	33507	54161	7	7	0.019	0.0068	0.76	−1.32	C	5*n*
		4859.13	33802	54376	5	5	0.012	0.0044	0.35	−1.66	C	5*n*
		4790.56	33507	54376	7	5	0.0016	3.8(−4)	0.042	−2.57	C	5*n*
548.	$y\ ^5D^o - e\ ^3G$ (1069)											
		4842.79	33096	53739	9	11	0.0084	0.0036	0.52	−1.49	C	5*n*
549.	$y\ ^5D^o - f\ ^3D$ (1070)											
		4841.78	33802	54449	5	3	0.015	0.0031	0.25	−1.81	C	5*n*
		4892.87	34017	54449	3	3	0.057	0.021	0.99	−1.21	D	15*n*
		4986.22	34017	54067	3	5	0.026	0.016	0.79	−1.32	C	5*n*
		4918.01	34122	54449	1	3	0.047	0.051	0.83	−1.29	C	5*n*
550.	$y\ ^5D^o - i\ ^5D$ (1073)											
		4085.98	33507	57974	7	5	0.059	0.011	1.0	−1.13	C	5*n*
551.	$y\ ^5D^o - 4$ (1075)											
		4095.27	33802	58213	5	5	0.037	0.0094	0.63	−1.33	C	5*n*
552.	$y\ ^5F^o - e\ ^3F$ (1078)											
		7008.01	33695	47961	11	9	0.0015	9.3(−4)	0.24	−1.99	C	5*n*
		7038.82	34329	48532	7	7	0.0023	0.0017	0.28	−1.92	C	5*n*
553.	$y\ ^5F^o - e\ ^5G$ (1083)											
		5940.97	33695	50523	11	13	0.0012	7.6(−4)	0.16	−2.08	C	5*n*
		5877.77	33695	50704	11	11	0.0012	6.3(−4)	0.13	−2.16	C	5*n*
554.	$y\ ^5F^o - f\ ^5F$ (1084)											
		5742.95	33695	51103	11	11	6.7(−4)	3.3(−4)	0.069	−2.44	C	5*n*
		5858.77	34040	51103	9	11	0.0011	7.2(−4)	0.12	−2.19	C	5*n*
		5835.10	34329	51462	7	9	0.0011	7.2(−4)	0.096	−2.30	C	5*n*
555.	$y\ ^5F^o - e\ ^3D$ (1086)											
		5793.93	34040	51294	9	7	0.0067	0.0026	0.45	−1.63	C	5*n*
		5741.86	34329	51740	7	5	0.0089	0.0031	0.41	−1.66	C	5*n*
		5814.80	34547	51740	5	5	0.0050	0.0025	0.24	−1.90	C	5*n*
556.	$y\ ^5F^o - g\ ^5D$ (1087)											
		5638.27	34040	51771	9	7	0.048	0.018	2.9	−0.80	C	5*n*
		5641.46	34329	52050	7	5	0.033	0.011	1.4	−1.11	C	5*n*
		5691.51	34692	52257	3	1	0.073	0.012	0.66	−1.45	C	5*n*
		5731.77	34329	51771	7	7	0.017	0.0084	1.1	−1.23	C	5*n*
		5711.87	34547	52050	5	5	0.017	0.0081	0.77	−1.39	C	5*n*
		5705.48	34692	52214	3	3	0.020	0.0098	0.55	−1.53	C	5*n*
		5873.21	34329	51350	7	9	0.0018	0.0012	0.16	−2.07	C	5*n*
		5804.48	34547	51771	5	7	0.0030	0.0021	0.20	−1.97	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
557.	$y\ ^5F^\circ - e\ ^5P$ (1088)											
		5635.85	34329	52067	7	5	0.0064	0.0022	0.28	−1.82	C	5*n*
558.	$y\ ^5F^\circ - g\ ^5F$ (1089)											
		5162.27	33695	53061	11	11	0.27	0.11	20	0.08	D	9
		5126.19	34329	53831	7	7	0.035	0.014	1.6	−1.01	C	5n
		5243.78	34329	53394	7	9	0.022	0.012	1.4	−1.08	C	5*n*
		5184.26	34547	53831	5	7	0.042	0.023	2.0	−0.93	C	5*n*
		5109.65	34692	54258	3	5	0.063	0.041	2.1	−0.91	C−	15*n*
559.	$y\ ^5F^\circ - h\ ^5D$ (1090)											
		5137.38	33695	53155	11	9	0.11	0.037	6.9	−0.39	C+	4*n*
		5125.11	34040	53546	9	7	0.30	0.092	14	−0.08	D	9
		5090.78	34329	53967	7	5	0.21	0.058	6.8	−0.39	C+	4*n*
		5104.44	34547	54133	5	3	0.020	0.0048	0.40	−1.62	C	5*n*
560.	$y\ ^5F^\circ - f\ ^5P$ (1091)											
		5228.41	34040	53160	9	7	0.021	0.0067	1.0	−1.22	C	5*n*
		5159.06	34547	53925	5	3	0.14	0.034	2.9	−0.77	D−	14*n*,15*n*
		5197.93	34692	53925	3	3	0.022	0.0090	0.46	−1.57	C	5*n*
561.	$y\ ^5F^\circ - f\ ^5G$ (1092)											
		5133.69	33695	53169	11	13	0.31	0.14	27	0.20	D	9
		5104.21	33695	53282	11	11	0.0029	0.0011	0.21	−1.90	C	5*n*
		5067.15	34040	53769	9	9	0.037	0.014	2.1	−0.89	C−	15*n*
562.	$y\ ^5F^\circ - e\ ^5H$ (1093)											
		5012.68	34547	54491	5	7	0.0072	0.0038	0.31	−1.72	C	5*n*
563.	$y\ ^5F^\circ - e\ ^3G$ (1094)											
		4991.86	34040	54067	9	9	0.0043	0.0016	0.24	−1.84	C	5*n*
		5074.75	34040	53739	9	11	0.15	0.072	11	−0.19	C+	4*n*
564.	$y\ ^5F^\circ - f\ ^3D$ (1095)											
		5023.23	34547	54449	5	3	0.026	0.0059	0.49	−1.53	C	5*n*
		5121.64	34547	54067	5	5	0.086	0.034	2.9	−0.77	C+	4*n*,5*n*
565.	$y\ ^5F^\circ - e\ ^3H$ (1097)											
		4962.56	33695	53841?	11	13	0.013	0.0055	0.98	−1.22	C	5*n*
566.	$y\ ^5F^\circ - f\ ^3F$ (1098)											
		4911.52	34329	54683	7	9	0.0021	9.7(−4)	0.11	−2.17	C	5*n*
567.	$y\ ^5F^\circ - g\ ^5G$ (1103)											
		4112.96	33695	58002	11	13	0.15	0.044	6.5	−0.32	C	4*n*,5*n*
		4137.42	34547	58710?	5	7	0.072	0.026	1.8	−0.89	C	5*n*
		4142.63	34692	58825	3	5	0.087	0.037	1.5	−0.95	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log *gf*	Accuracy	Source
568.	$z\,^3\mathrm{P}^\circ - e\,^5\mathrm{F}$ (1105)											
		7095.43	33947	48037	5	5	0.0030	0.0022	0.26	−1.95	C	5*n*
569.	$z\,^3\mathrm{P}^\circ - e\,^3\mathrm{D}$ (1107)											
		5762.99	33947	51294	5	7	0.10	0.073	6.9	−0.44	C+	4*n*
		5753.12	34363	51740	3	5	0.072	0.059	3.4	−0.75	C+	4*n*
		5717.85	34556	52040	1	3	0.059	0.087	1.6	−1.06	C	5*n*
		5618.65	33947	51740	5	5	0.021	0.0098	0.91	−1.31	C	5*n*
570.	$z\,^3\mathrm{P}^\circ - g\,^3\mathrm{D}$ (1108)											
		5652.32	34363	52050	3	5	0.0055	0.0044	0.25	−1.88	C	5*n*
		5661.36	34556	52214	1	3	0.0078	0.011	0.21	−1.95	C	5*n*
		5522.46	33947	52050	5	5	0.014	0.0066	0.60	−1.48	C	5*n*
		5472.72	33947	52214	5	3	0.017	0.0045	0.40	−1.65	C	5*n*
571.	$z\,^3\mathrm{P}^\circ - e\,^5\mathrm{P}$ (1109)											
		5517.08	33947	52067	5	5	0.0022	0.0010	0.091	−2.30	C	5*n*
572.	$z\,^3\mathrm{P}^\circ - g\,^5\mathrm{F}$ (1110)											
		5027.76	33947	53831	5	7	0.025	0.013	1.1	−1.18	C	5*n*
		4992.80	34363	54386	3	3	0.0048	0.0018	0.088	−2.27	D	15*n*
573.	$z\,^3\mathrm{P}^\circ - h\,^5\mathrm{D}$ (1111)											
		4993.68	33947	53967	5	5	0.021	0.0080	0.65	−1.40	C	5*n*
		5056.86	34363	54133	3	3	0.011	0.0043	0.21	−1.89	C	5*n*
574.	$z\,^3\mathrm{P}^\circ - f\,^5\mathrm{P}$ (1112)											
		5004.04	33947	53925	5	3	0.042	0.0094	0.77	−1.33	C	5*n*
575.	$z\,^3\mathrm{P}^\circ - f\,^5\mathrm{G}$ (1113)											
		4945.64	33947	54161	5	7	0.014	0.0073	0.59	−1.44	C	5*n*
		4995.41	34363	54376	3	5	0.0081	0.0050	0.25	−1.82	C	5*n*
576.	$b\,^1\mathrm{D} - y\,^1\mathrm{D}^\circ$ (1128)	5856.08	34637	51708	5	5	0.010	0.0054	0.52	−1.57	C	5*n*
577.	$b\,^1\mathrm{D} - x\,^1\mathrm{D}^\circ$ (1129)	5837.71	34637	51762	5	5	0.0021	0.0011	0.10	−2.27	C	5*n*
578.	$b\,^1\mathrm{D} - {}^1\mathrm{P}^\circ$	5698.37	34637	52181	5	3?	0.0057	0.0017	0.16	−2.08	C	5*n*
579.	$b\,^1\mathrm{D} - {}^3\mathrm{D}^\circ$											
		5539.83	34637	52683	5	5	0.0015	6.9(−4)	0.063	−2.46	C	5*n*
		5376.85	34637	53230	5	3	0.0044	0.0012	0.10	−2.24	C	5*n*
580.	$b\,^1\mathrm{D} - w\,^1\mathrm{D}^\circ$ (1133)	4734.10	34637	55754	5	5	0.018	0.0062	0.48	−1.51	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
581.	$z\ ^5G^\circ - g\ ^5F$ (1143)											
		5361.64	35612	54258	7	5	0.020	0.0062	0.77	−1.36	C	5*n*
		5395.25	35856	54386	5	3	0.0061	0.0016	0.14	−2.10	C	5*n*
		5512.28	35257	53394	9	9	0.011	0.0050	0.81	−1.35	C	5*n*
		5487.16	35612	53831	7	7	0.011	0.0050	0.63	−1.46	C	5*n*
		5432.95	35856	54258	5	5	0.048	0.021	1.9	−0.97	C	5*n*
582.	$z\ ^5C^\circ - h\ ^5D$ (1144)											
		5441.32	34782	53155	11	9	0.0055	0.0020	0.39	−1.66	C	5*n*
		5466.39	35257	53546	9	7	0.080	0.028	4.5	−0.60	D−	14*n*
		5470.17	35856	54133	5	3	0.014	0.0036	0.33	−1.74	C	5*n*
583.	$z\ ^5G^\circ - f\ ^5G$ (1145)											
		5400.50	35257	53769	9	9	0.20	0.088	14	−0.10	D	9
		5389.48	35612	54161	7	7	0.14	0.060	7.4	−0.38	D−	14*n*
		5398.29	35856	54376	5	5	0.10	0.044	3.9	−0.66	C	5*n*
		5546.51	35257	53282	9	11	0.011	0.0064	1.1	−1.24	C	5*n*
		5461.54	35856	54161	5	7	0.0047	0.0030	0.27	−1.83	C	5*n*
584.	$z\ ^5G^\circ - e\ ^5H$ (1146)											
		5424.07	34844	53275?	13	15	0.57	0.29	68	0.58	D	9
		5383.37	34782	53353?	11	13	0.59	0.30	59	0.52	C+	4*n*,5*n*
		5369.96	35257	53874?	9	11	0.48	0.25	40	0.36	C+	4*n*
		5367.47	35612	54237	7	9	0.59	0.33	40	0.36	C+	4*n*
		5364.87	35856	54491	5	7	0.63	0.38	34	0.28	D	9
		5401.27	34844	53353?	13	13	0.0025	0.0011	0.25	−1.85	C	5*n*
		5295.32	35612	54491	7	7	0.0082	0.0034	0.42	−1.62	C	5*n*
585.	$z\ ^5G^\circ - e\ ^3G$ (1147)											
		5315.07	35257	54067	9	9	0.0087	0.0037	0.58	−1.48	C	5*n*
		5409.13	35257	53739	9	11	0.012	0.0065	1.0	−1.23	C	5*n*
586.	$z\ ^5G^\circ - f\ ^3D$ (1148)											
		5406.77	35257	53748	9	7	0.0073	0.0025	0.40	−1.65	C	5*n*
		5417.03	35612	54067	7	5	0.011	0.0035	0.44	−1.61	C	5*n*
		5489.85	35856	54067	5	5	0.0030	0.0014	0.12	−2.17	C	5*n*
587.	$z\ ^5G^\circ - e\ ^3H$ (1149)											
		5056.00	34782	54555?	11	9	0.0033	0.0010	0.19	−1.94	C	5*n*
588.	$z\ ^5G^\circ - f\ ^3F$ (1150)											
		5023.50	34782	54683	11	9	0.0067	0.0021	0.38	−1.64	C	5*n*
		5031.90	35257	55125	9	7	0.0095	0.0028	0.42	−1.60	C	5*n*
		5146.30	35257	54683	9	9	0.0031	0.0012	0.19	−1.96	C	5*n*
		5241.90	35612	54683	7	9	0.0068	0.0036	0.43	−1.60	C	5*n*
589.	$z\ ^5G^\circ - 3$ (1152)											
		4631.48	35257	56843	9	9	0.0040	0.0013	0.18	−1.94	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
590.	$z\ ^3G^o - g\ ^5F$ (1159)											
		5653.89	35379	53061	11	11	0.0051	0.0024	0.50	−1.57	C	5*n*
591.	$z\ ^3G^o - h\ ^5D$ (1160)											
		5624.06	35379	53155	11	9	0.0091	0.0035	0.72	−1.41	C	5*n*
592.	$z\ ^3G^o - f\ ^5G$ (1161)											
		5619.60	35379	53169	11	13	0.0038	0.0021	0.43	−1.63	C	5*n*
		5708.11	35768	53282	9	11	0.0059	0.0035	0.59	−1.50	C	5*n*
		5651.47	36079	53769	7	9	0.0027	0.0017	0.22	−1.93	C	5*n*
		5553.59	35768	53769	9	9	0.011	0.0051	0.84	−1.34	C	5*n*
		5528.89	36079	54161	7	7	0.0035	0.0016	0.20	−1.95	C	5*n*
		5436.30	35379	53769	11	9	0.0085	0.0031	0.61	−1.47	C	5*n*
593.	$z\ ^3G^o - e\ ^3G$ (1163)											
		5445.04	35379	53739	11	11	0.22	0.10	20	0.04	D	9
		5463.27	35768	54067	9	9	0.33	0.15	24	0.12	C+	4*n*
		5349.74	35379	54067	11	9	0.015	0.0054	1.0	−1.23	C	5*n*
		5557.95	36079	54067	7	9	0.015	0.0088	1.1	−1.21	C	5*n*
594.	$z\ ^3G^o - f\ ^3D$ (1164)											
		5560.23	35768	53748	9	7	0.023	0.0084	1.4	−1.12	C	5*n*
595.	$z\ ^3G^o - e\ ^3H$ (1165)											
		5415.20	35379	53841?	11	13	0.68	0.35	69	0.59	C+	4*n*,5*n*
		5410.91	36079	54555?	7	9	0.49	0.28	35	0.29	C+	4*n*,5*n*
		5293.03	35379	54267?	11	11	0.0011	4.8(−4)	0.091	−2.28	C	5*n*
		5321.11	35768	54555?	9	9	0.011	0.0047	0.75	−1.37	C	5*n*
596.	$z\ ^3G^o - f\ ^3F$ (1166)	*5178.3*	*35690*	*54996*	27	21	0.044	0.014	6.3	−0.43	C	5*n*
		5178.80	35379	54683	11	9	0.0047	0.0015	0.29	−1.77	C	5*n*
		5164.55	35768	55125	9	7	0.018	0.0057	0.87	−1.29	C	5*n*
		5180.07	36079	55379	7	5	0.032	0.0092	1.1	−1.19	C	5*n*
		5285.12	35768	54683	9	9	0.0071	0.0030	0.47	−1.57	C	5*n*
		5249.10	36079	55125	7	7	0.013	0.0056	0.67	−1.41	C	5*n*
		5373.71	36079	54683	7	9	0.042	0.023	2.9	−0.79	C	5*n*
597.	$y\ ^3F^o - e\ ^3D$ (1173)											
		6843.67	36686	51294	9	7	0.028	0.015	3.1	−0.86	C	5*n*
		6858.16	37163	51740	7	5	0.029	0.015	2.3	−0.99	C	5*n*
		6885.77	37521	52040	5	3	0.023	0.0098	1.1	−1.31	C	5*n*
598.	$y\ ^3F^o - g\ ^5D$ (1174)											
		6627.56	36686	51771	9	7	0.0053	0.0027	0.54	−1.61	C	5*n*
		6715.41	37163	52050	7	5	0.0080	0.0038	0.60	−1.57	C	5*n*
599.	$y\ ^3F^o - g\ ^5F$ (1175)											
		5927.80	37521	54386	5	3	0.060	0.019	1.9	−1.02	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
600.	$y\ {}^3\mathrm{F}^\circ - h\ {}^5\mathrm{D}$ (1176)											
		6079.02	37521	53967	5	5	0.032	0.018	1.8	−1.05	C	5*n*
		5929.70	36686	53546	9	7	0.012	0.0051	0.89	−1.34	C	5*n*
601.	$y\ {}^3\mathrm{F}^\circ - f\ {}^5\mathrm{P}$ (1177)											
		6093.66	37163	53569	7	5	0.013	0.0053	0.75	−1.43	C	5*n*
		6094.42	37521	53925	5	3	0.0081	0.0027	0.27	−1.87	C	5*n*
602.	$y\ {}^3\mathrm{F}^\circ - f\ {}^5\mathrm{G}$ (1178)											
		6024.07	36686	53282	9	11	0.14	0.090	16	−0.09	D−	14*n*
		6020.17	37163	53769	7	9	0.12	0.082	11	−0.24	D−	14*n*
		5852.19	36686	53769	9	9	0.012	0.0061	1.1	−1.26	C	5*n*
		5881.28	37163	54161	7	7	0.0047	0.0024	0.33	−1.77	C	5*n*
603.	$y\ {}^3\mathrm{F}^\circ - e\ {}^5\mathrm{H}$ (1179)											
		5816.36	36686	53874?	9	11	0.040	0.025	4.3	−0.65	D−	14*n*
		5855.13	37163	54237	7	9	0.0044	0.0029	0.39	−1.69	C	5*n*
		5696.10	36686	54237	9	9	0.0027	0.0013	0.23	−1.92	C	5*n*
604.	$y\ {}^3\mathrm{F}^\circ - e\ {}^3\mathrm{G}$ (1180)											
		5930.17	37521	54379	5	7	0.17	0.13	12	−0.20	D−	14*n*
		5806.73	37163	54379	7	7	0.030	0.015	2.0	−0.98	C	5*n*
605.	$y\ {}^3\mathrm{F}^\circ - f\ {}^3\mathrm{D}$ (1181)											
		5905.67	37521	54449	5	3	0.12	0.038	3.7	−0.72	C	5*n*
606.	$y\ {}^3\mathrm{F}^\circ - e\ {}^3\mathrm{H}$ (1182)											
		5686.53	36686	54267?	9	11	0.045	0.027	4.5	−0.62	C	5*n*
		5747.95	37163	54555?	7	9	0.0098	0.0062	0.83	−1.36	C	5*n*
		5594.66	36686	54555?	9	9	0.035	0.016	2.7	−0.83	C	5*n*
607.	$y\ {}^3\mathrm{F}^\circ - f\ {}^3\mathrm{F}$ (1183)											
		5554.89	36686	54683	9	9	0.093	0.043	7.1	−0.41	D−	14*n*
		5598.30	37521	55379	5	5	0.19	0.091	8.4	−0.34	D−	14*n*
		5421.85	36686	55125	9	7	0.0063	0.0022	0.35	−1.71	C	5*n*
		5705.99	37163	54683	7	9	0.069	0.043	5.7	−0.52	C	5*n*
		5679.02	37521	55125	5	7	0.042	0.028	2.6	−0.85	C	5*n*
608.	$y\ {}^3\mathrm{F}^\circ - e\ {}^3\mathrm{P}$ (1184)											
		5642.75	37163	54880	7	5	0.0037	0.0013	0.17	−2.05	C	5*n*
609.	$y\ {}^5\mathrm{P}^\circ - f\ {}^7\mathrm{D}$ (1187)											
		7024.65	36767	50999	7	5	0.014	0.0072	1.2	−1.30	C	5*n*
610.	$y\ {}^5\mathrm{P}^\circ - e\ {}^7\mathrm{G}$ (1191)											
		6862.48	36767	51335	7	9	0.0050	0.0045	0.71	−1.50	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
611.	$y\ ^5\mathrm{P}^\circ - g\ ^5\mathrm{D}$ (1195)											
		6841.35	37158	51771	5	7	0.037	0.036	4.1	−0.74	C	5*n*
		6828.61	37410	52050	3	5	0.040	0.047	3.2	−0.85	C	5*n*
		6752.72	37410	52214	3	3	0.025	0.017	1.1	−1.29	C	5*n*
		6733.16	37410	52257	3	1	0.045	0.010	0.69	−1.51	C	5*n*
612.	$y\ ^5\mathrm{P}^\circ - e\ ^5\mathrm{P}$ (1197)											
		6633.76	36767	51837	7	7	0.037	0.024	3.7	−0.77	C	5*n*
		6842.67	37410	52020	3	3	0.027	0.019	1.3	−1.25	C	5*n*
		6533.97	36767	52067	7	5	0.013	0.0058	0.88	−1.39	C	5*n*
		6810.28	37158	51837	5	7	0.018	0.018	2.0	−1.05	C	5*n*
		6820.43	37410	52067	3	5	0.016	0.019	1.3	−1.25	C	5*n*
613.	$y\ ^5\mathrm{P}^\circ - f\ ^5\mathrm{G}$ (1201)											
		5880.00	36767	53769	7	9	0.0029	0.0019	0.26	−1.87	C	5*n*
		5879.49	37158	54161	5	7	0.0023	0.0017	0.16	−2.07	C	5*n*
614.	$y\ ^5\mathrm{P}^\circ - e\ ^5\mathrm{H}$ (1202)											
		5640.46	36767	54491	7	7	0.0066	0.0031	0.41	−1.66	C	5*n*
615.	$y\ ^5\mathrm{P}^\circ - i\ ^5\mathrm{D}$ (1206)											
		4749.95	36767	57814	7	7	0.023	0.0077	0.84	−1.27	C	5*n*
		4714.07	36767	57974	7	5	0.020	0.0048	0.53	−1.47	C	5*n*
616.	$y\ ^5\mathrm{P}^\circ - 4$ (1207)											
		4661.53	36767	58213	7	5	0.039	0.0090	0.97	−1.20	C	5*n*
617.	$d\ ^3\mathrm{F} - u\ ^3\mathrm{G}^\circ$ (1225)											
		6837.00	37046	51668	9	9	0.0029	0.0020	0.41	−1.74	C	5*n*
618.	$d\ ^3\mathrm{F} - t\ ^3\mathrm{G}^\circ$ (1234)											
		5902.52	37046	53983	9	11	0.0032	0.0020	0.35	−1.74	C	5*n*
619.	$d\ ^3\mathrm{F} - s\ ^3\mathrm{G}^\circ$ (1240)											
		5300.41	37046	55907	9	11	0.0045	0.0023	0.36	−1.68	C	5*n*
620.	$d\ ^3\mathrm{F} - t\ ^3\mathrm{H}^\circ$ (1245)											
		4253.55	37046	60549	9	11	0.025	0.0084	1.1	−1.12	C	5*n*
		4203.67	36976	60758	7	9	0.088	0.030	2.9	−0.68	C	5*n*
621.	$y\ ^3\mathrm{D}^\circ - g\ ^5\mathrm{F}$ (1253)											
		6569.23	38175	53394	7	9	0.067	0.056	8.4	−0.41	C	5*n*
		6597.61	38678	53831	5	7	0.022	0.020	2.2	−1.00	C	5*n*
		6495.78	38996	54386	3	3	0.071	0.045	2.9	−0.87	C	5*n*
		6364.38	38678	54386	5	3	0.024	0.0087	0.91	−1.36	C	5*n*

Fe I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
622.	$y\ ^3D^\circ - h\ ^5D$ (1254)											
		6330.86	38175	53967	7	5	0.0071	0.0031	0.45	−1.67	C	5*n*
623.	$y\ ^3D^\circ - f\ ^5P$ (1255)											
		6713.76	38678	53569	5	5	0.0087	0.0059	0.65	−1.53	C	5*n*
624.	$y\ ^3D^\circ - f\ ^3D$ (1258)											
		6419.98	38175	53748	7	7	0.14	0.084	12	−0.23	C	5*n*
		6496.46	38678	54067	5	5	0.087	0.055	5.9	−0.56	C	5*n*
		6469.21	38996	54449	3	3	0.092	0.058	3.7	−0.76	C	5*n*
		6338.90	38678	54449	5	3	0.057	0.020	2.1	−0.99	C	5*n*
		6634.10	38678	53748	5	7	0.0095	0.0087	0.95	−1.36	C	5*n*
		6633.44	38996	54067	3	5	0.012	0.013	0.83	−1.42	C	5*n*
625.	$y\ ^3D^\circ - f\ ^3F$ (1259)											
		6055.99	38175	54683	7	9	0.075	0.053	7.4	−0.43	D−	14*n*
		5898.21	38175	55125	7	7	0.0048	0.0025	0.34	−1.76	C	5*n*
626.	$y\ ^3D^\circ - e\ ^3P$ (1260)											
		6170.49	38678	54880	5	5	0.14	0.078	7.9	−0.41	D−	14*n*
627.	$x\ ^5D^\circ - i\ ^5D$ (1281)											
		5531.95	39626	57698	9	9	0.0070	0.0032	0.53	−1.54	C	5*n*
		5552.70	39970	57974	7	5	0.0052	0.0017	0.22	−1.92	C	5*n*
628.	$x\ ^5D^\circ - 4$ (1282)											
		5559.64	40231	58213	5	5	0.0075	0.0035	0.32	−1.76	C	5*n*
629.	$x\ ^5F^\circ - i\ ^5D$ (1313)											
		5732.29	40257	57698	11	9	0.0073	0.0029	0.61	−1.49	C	5*n*
		5805.76	40594	57814	9	7	0.0085	0.0034	0.58	−1.52	C	5*n*
630.	$x\ ^5F^\circ - g\ ^5G$ (1314)											
		5633.97	40257	58002	11	13	0.089	0.050	10	−0.26	C	5*n*
		5655.18	40842	58520?	7	9	0.054	0.033	4.4	−0.63	C	5*n*
		5650.71	41018	58710?	5	7	0.038	0.026	2.4	−0.89	C	5*n*
		5650.01	41131	58825	3	5	0.059	0.047	2.6	−0.85	C	5*n*
		5549.66	40257	58271?	11	11	0.0047	0.0022	0.44	−1.62	C	5*n*
631.	$a\ ^1F - v\ ^1G^\circ$ (1327)	6089.57	40534?	56951	7	9	0.023	0.017	2.4	−0.93	C	5*n*

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[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe II

Ground State $1s^22s^22p^63s^23p^63d^64s$ $^6D_{9/2}$

Ionization Potential 16.183 eV = 130524 cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
2029.84	6	2666.63	35	4416.82	10	5234.62	28
2041.35	6	2684.94	29	4472.92	17	5264.81	27
2051.69	6	2712.39	29	4489.19	17	5276.00	28
2296.66	14	2753.29	32	4491.40	17	5284.10	21
2303.35	14	2879.24	36	4515.34	17	5316.62	28
2369.23	19	2902.46	36	4520.23	17	5325.56	28
2379.00	19	2910.76	36	4522.63	18	5337.73	27
2388.39	7	2934.49	36	4534.17	17	5362.87	27
2414.08	13	2997.75	40	4541.52	18	5414.05	27
2433.50	13	3002.33	41	4549.47	18	5425.25	28
2554.95	30	3044.84	41	4555.89	17	5534.83	31
2559.77	30	3131.72	43	4576.33	18	5627.49	34
2561.58	30	3162.80	45	4582.84	17	5991.37	26
2562.54	3	3186.74	5	4583.83	18	6084.10	26
2573.21	30	3187.29	45	4595.68	18	6113.33	26
2585.88	1	3213.31	5	4601.34	23	6147.77	39
2591.54	3	3277.35	2	4620.51	18	6149.25	39
2592.78	44	3360.10	42	4629.34	17	6239.91	39
2598.03	33	3938.29	4	4656.97	23	6247.55	39
2598.37	1	4087.27	11	4663.70	24	6369.46	20
2599.40	1	4122.64	11	4666.75	17	6383.72	46
2607.09	1	4124.79	8	4670.17	9	6416.92	39
2611.87	1	4128.74	10	4923.93	22	6432.68	20
2613.82	1	4173.45	10	4953.98	47	6446.40	48
2617.62	1	4178.86	11	4993.35	16	6456.39	39
2621.67	1	4227.14	25	5000.74	9	6516.08	20
2623.13	44	4233.17	10	5018.45	22	7224.47	38
2625.49	44	4258.16	11	5019.45	47	7301.56	37
2625.66	1	4303.17	10	5132.66	15	7479.69	37
2628.29	1	4369.40	11	5136.80	15	7515.79	38
2631.32	1	4385.38	10	5169.00	22	7711.71	38
2664.67	35	4413.60	12	5197.56	28		

For this spectrum, unlike that of Fe I, there is an extreme dearth of reliable *f*-value data. Recent advanced techniques have provided data for relatively few lines. Furthermore, due to the lack of appropriate comparison data, the absolute scale of Fe II is not nearly as well established as that of Fe I .

We chose the following experimental data sources for this compilation: work by Bridges [1] and Baschek et al. [3], who measured relative oscillator strengths in emission with wall-stabilized arc sources; Huber [2], who employed the anomalous dispersion (hook) method; Wolnik et al. [4], who used the shock tube-emission technique; Smith and Whaling [5], who determined absolute *f*-values by combining beam-foil lifetimes with branching ratios, obtained from a hollow cathode discharge; and *f*-value data derived from solar spectra, compiled by Blackwell et al. [6] and Phillips [7].

The most accurate set of relative oscillator strengths is probably that of Bridges. In his experiment, he measured all lines photoelectrically and accounted for effects of self-absorption. A calibrated tungsten strip lamp was used as a radiometric standard, and a predisperser served to reduce scattered light. He normalized his relative data to an absolute scale by using the phase-shift lifetime of the *z* $^6D^o_{9/2}$ level, as measured by Assousa and Smith [8]. As part of this normalization, Bridges measured all of the principal downward decays from this level. The absolute data of ref. [1] should generally be accurate to ± 25 percent except for the weakest lines.

The lifetime data of Assousa and Smith appear to be quite reliable, and agree within ± 10 percent with the data of Brzozowski et al. [9], who used the high frequency deflection technique. A further indication of the reliability of the Assousa and Smith data is obtained from the case of Fe I, where these lifetimes agree—within ± 6.1 percent—with the precise laser-excitation lifetime measurements of Figger et al. [10,11].

The data of refs. [2], [3], [4], and [7] overlap with those of Bridges [1]. We have compared these four sources directly to ref. [1] for subsequent normalization. A consistent absolute scale is obtained by multiplying the oscillator strengths of Baschek et al. by a factor of 1.41, those of Huber by 0.52, those of Phillips by 1.56, and those of Blackwell et al. by 1.60. Ref. [6] did not share lines in common with ref. [1]. In this case, we adjusted the log *gf*-values of Blackwell et al. to agree with the renormalized data of Baschek et al. and Wolnik et al. (The data of Wolnik et al. required no renormalization.) As a consistency check, we have compared the (incomplete) inverse sums of our tabulated transition probabilities, for the downward transitions to the experimental lifetime of refs. [8] and [9]. As the following table shows, the agreement is satisfactory.

Lifetimes (in ns) of excited levels of Fe II

Upper atomic level	τ_k (experiment)	$(\Sigma_i A_{ki})^{-1}$ (this compilation)
$z\ ^6D^\circ_{5/2}$	3.9^{a}	$< 5.8^{c}$
$z\ ^6D^\circ_{7/2}$	4.0^{b}	$< 4.9^{c}$

[a] Ref. [8].

[b] Ref. [9].

[c] All measured downward transitions have been included. The indicated sums may be quite incomplete, since for several of the significant transitions, no reliable data exist. This is especially true for the $z\ ^6D^\circ_{5/2}$ upper level, where we have omitted the contribution of a blended resonance line.

The data of Smith and Whaling contain no lines in common with Bridges, as they all originate from high-lying levels. Nevertheless, we have included this reference because the beam-foil lifetime-branching ratio technique has been shown to be quite accurate for other members of the iron group, i.e., Ti I, Fe I, and Ni I.

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Fe II: Allowed transitions

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
1.	$a\ ^6D - z\ ^6D^\circ$ (uv 1)											
		2599.40	0.0	38459	10	10	2.22	0.225	19.3	0.352	C	1
		2611.87	384.8	38660	8	8	0.98	0.10	6.9	−0.10	D	2*n*
		2617.62	667.7	38859	6	6	0.43	0.044	2.3	−0.58	D	2*n*
		2621.67	977.1	39109	2	2	0.66	0.068	1.2	−0.87	D	2*n*
		2585.88	0.0	38660	10	8	0.71	0.057	4.9	−0.24	D	2*n*
		2598.37	384.8	38859	8	6	1.3	0.10	6.8	−0.10	C	1
		2607.09	667.7	39013	6	4	1.5	0.10	5.1	−0.22	D	2*n*
		2613.82	862.6	39109	4	2	1.9	0.099	3.4	−0.40	D	2*n*
		2625.66	384.8	38459	8	10	0.34	0.044	3.0	−0.45	C	1
		2631.32	667.7	38660	6	8	0.38	0.052	2.7	−0.51	D	2*n*
		2628.29	977.1	39013	2	4	0.77	0.16	2.8	−0.49	D	2*n*
2.	$a\ ^4D - z\ ^6D^\circ$ (1)											
		3277.35	7955	38459	8	10	0.0023	$4.6(-4)^{a}$	0.040	−2.43	D	1
3.	$a\ ^4D - z\ ^4P^\circ$ (uv 64)											
		2562.54	7955	46967	8	6	1.5	0.11	7.4	−0.06	D	2*n*
		2591.54	8392	46967	6	6	0.52	0.052	2.7	−0.51	C	1
4.	$a\ ^4P - z\ ^6D^\circ$ (3)											
		3938.29	13474	38859	6	6	0.0028	6.5(−4)	0.051	−2.41	D	7*n*
5.	$a\ ^4P - z\ ^4D^\circ$ (6)											
		3213.31	13673	44785	4	6	0.065	0.015	0.63	−1.22	C	1
		3186.74	13673	45044	4	4	0.039	0.0060	0.25	−1.62	C	1

Fe II: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
6.	$a\ ^2C - y\ ^2G^\circ$ (uv 93)											
		2041.35	15845	64832	10	10	0.46	0.029	1.9	−0.54	D	5
		2051.69	16369	65110	8	8	0.42	0.026	1.4	−0.67	D	5
		2029.84	15845	65110	10	8	0.076	0.0038	0.25	−1.43	D−	5
7.	$a\ ^2H - z\ ^2I^\circ$ (uv 117)											
		2388.39	20806	62662	10	12	0.14	0.014	1.1	−0.84	D	5
8.	$a\ ^2D - z\ ^4F^\circ$ (22)											
		4124.79	20517	44754	6	8	5.0(−5)	1.7(−5)	0.0014	−3.99	D−	6*n*
9.	$b\ ^4P - z\ ^6F^\circ$ (25)											
		4670.17	20831	42237	6	8	3.0(−5)	1.3(−5)	0.0012	−4.11	E	3*n*
		5000.74	22410	42401	2	4	2.0(−5)	1.5(−5)	4.9(−4)	−4.52	E	6*n*
10.	$b\ ^4P - z\ ^4D^\circ$ (27)											
		4233.17	20831	44447	6	8	0.0064	0.0023	0.19	−1.86	D	7*n*
		4416.82	22410	45044	2	4	0.0039	0.0023	0.067	−2.34	D	4
		4173.45	20831	44785	6	6	0.0022	5.7(−4)	0.047	−2.47	D	7*n*
		4303.17	21812	45044	4	4	0.0061	0.0017	0.096	−2.17	D	7*n*
		4385.38	22410	45206	2	2	0.0059	0.0017	0.049	−2.47	D	7*n*
		4128.74	20831	45044	6	4	4.2(−4)	7.2(−5)	0.0059	−3.36	D−	7*n*
11.	$b\ ^4P - z\ ^4F^\circ$ (28)											
		4178.86	20831	44754	6	8	0.0012	4.3(−4)	0.035	−2.59	D	6*n*,7*n*
		4369.40	22410	45290	2	4	3.5(−4)	2.0(−4)	0.0058	−3.40	D−	7*n*
		4122.64	20831	45080	6	6	5.1(−4)	1.3(−4)	0.011	−3.11	D−	7*n*
		4258.16	21812	45290	4	4	9.2(−4)	2.5(−4)	0.014	−3.00	D−	7*n*
		4087.27	20831	45290	6	4	5.6(−5)	9.4(−6)	7.6(−4)	−4.25	E	7*n*
12.	$a\ ^4H - z\ ^4F^\circ$ (32)											
		4413.60	21582	44233	10	10	7.5(−5)	2.2(−5)	0.0032	−3.66	D−	6*n*
13.	$a\ ^4H - z\ ^2I^\circ$ (uv 164)											
		2414.08	21252	62662	14	12	0.0094	7.0(−4)	0.078	−2.01	E	5
		2433.50	21582	62662	10	12	0.091	0.0097	0.78	−1.01	D	5
14.	$a\ ^4H - y\ ^2G^\circ$ (uv 167)											
		2303.35	21430	64832	12	10	0.054	0.0036	0.33	−1.37	D−	5
		2296.66	21582	65110	10	8	0.037	0.0023	0.18	−1.63	D−	5
15.	$b\ ^4F - z\ ^6F^\circ$ (35)											
		5132.66	22637	42115	10	10	2.8(−5)	1.1(−5)	0.0019	−3.96	D−	6*n*
		5136.80	22939	42401	6	4	3.3(−5)	8.6(−6)	8.7(−4)	−4.29	E	6*n*

Fe II: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
6.	*b* ^{4}F – *z* ^{6}P° (36)											
		4993.35	22637	42658	10	8	7.0(−5)	2.1(−5)	0.0035	−3.68	E	3*n*
17.	*b* ^{4}F – *z* ^{4}F° (37)	*4563.5*	*22807*	*44714*	28	28	0.0024	7.4(−4)	0.31	−1.69	D	1,3*n*,6*n*,7*n*
		4629.34	22637	44233	10	10	0.0013	4.3(−4)	0.066	−2.37	D	1
		4555.89	22810	44754	8	8	0.0019	5.9(−4)	0.071	−2.33	D	6*n*,7*n*
		4515.34	22939	45080	6	6	0.0018	5.5(−4)	0.049	−2.48	D	1
		4491.40	23031	45290	4	4	0.0023	6.9(−4)	0.041	−2.56	D	6*n*,7*n*
		4520.23	22637	44754	10	8	0.0010	2.5(−4)	0.037	−2.60	D	1
		4489.19	22810	45080	8	6	6.6(−4)	1.5(−4)	0.018	−2.92	D	7*n*
		4472.92	22939	45290	6	4	3.4(−4)	6.7(−5)	0.0059	−3.40	D−	7*n*
		4666.75	22810	44233	8	10	1.4(−4)	5.6(−5)	0.0069	−3.35	D−	7*n*
		4582.84	22939	44754	6	8	3.3(−4)	1.4(−4)	0.013	−3.08	D	3*n*
		4534.17	23031	45080	4	6	2.4(−4)	1.1(−4)	0.0066	−3.36	D	3*n*
18.	*b* ^{4}F – *z* ^{4}D° (38)											
		4583.83	22637	44447	10	8	0.0063	0.00159	0.240	−1.80	C	1
		4549.47	22810	44785	8	6	0.0018	4.2(−4)	0.050	−2.47	D	7*n*
		4522.63	22939	45044	6	4	0.0064	0.0013	0.12	−2.11	D	4
		4620.51	22810	44447	8	8	1.8(−4)	5.9(−5)	0.0072	−3.33	E	3*n*
		4576.33	22939	44785	6	6	5.7(−4)	1.8(−4)	0.016	−2.97	D	3*n*
		4541.52	23031	45044	4	4	0.0022	6.8(−4)	0.041	−2.57	D	4
		4595.68	23031	44785	4	6	2.5(−5)	1.2(−5)	7.3(−4)	−4.32	E	7*n*
19.	*b* ^{4}F *y* ^{2}C° (uv 182)											
		2369.23	22637	64832	10	10	0.026	0.0022	0.17	−1.66	D	5
		2379.00	22810	64832	8	10	0.064	0.0068	0.43	−1.27	D	5
20.	*a* ^{6}S – *z* ^{6}D° (40)											
		6516.08	23318	38660	6	8	1.5(−4)	1.3(−4)	0.017	−3.11	D−	6*n*,7*n*
		6432.68	23318	38859	6	6	8.9(−5)	5.5(−5)	0.0070	−3.48	D−	6*n*,7*n*
		6369.46	23318	39013	6	4	3.9(−5)	1.6(−5)	0.0020	−4.02	E	6*n*,7*n*
21.	*a* ^{6}S – *z* ^{6}F° (41)											
		5284.10	23318	42237	6	8	3.9(−4)	2.2(−4)	0.023	−2.88	D	6*n*,7*n*
22.	*a* ^{6}S – *z* ^{6}P° (42)	*5062.4*	23318	*43066*	6	18	0.020	0.023	2.3	−0.86	C−	1,7*n*
		5169.00	23318	42658	6	8	0.011	0.0057	0.58	−1.47	D	7*n*
		5018.45	23318	43239	6	6	0.026	0.010	0.99	−1.22	C	1
		4923.93	23318	43621	6	4	0.030	0.0073	0.71	−1.36	C	1
23.	*a* ^{6}S – *z* ^{4}D° (43)											
		4656.97	23318	44785	6	6	1.2(−4)	3.8(−5)	0.0035	−3.64	E	3*n*
		4601.34	23318	45044	6	4	3.4(−5)	7.2(−6)	6.5(−4)	−4.36	E	7*n*
24.	*a* ^{6}S – *z* ^{4}F° (44)											
		4663.70	23318	44754	6	8	5.8(−5)	2.5(−5)	0.0023	−3.82	D−	7*n*

Fe II: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
25.	$a\ {}^6S - z\ {}^4P^\circ$ (45)											
		4227.14	23318	46967	6	6	3.1(−4)	8.4(−5)	0.0070	−3.30	D−	7*n*
26.	$a\ {}^4G - z\ {}^6F^\circ$ (46)											
		5991.37	25429	42115	12	10	5.4(−5)	2.4(−5)	0.0057	−3.54	D−	6*n*
		6084.10	25805	42237	10	8	3.8(−5)	1.7(−5)	0.0034	−3.77	D−	6*n*
		6113.33	25982	42335	8	6	2.3(−5)	9.8(−6)	0.0016	−4.11	E	6*n*
27.	$a\ {}^4G - z\ {}^4D^\circ$ (48)											
		5362.87	25805	44447	10	8	0.0014	4.7(−4)	0.083	−2.33	D	7*n*
		5264.81	26055	45044	6	4	6.5(−4)	1.8(−4)	0.019	−2.97	D	6*n*,7*n*
		5414.05	25982	44447	8	8	1.5(−4)	6.6(−5)	0.0094	−3.28	D−	6*n*,7*n*
		5337.73	26055	44785	6	6	1.9(−4)	8.2(−5)	0.0086	−3.31	D−	7*n*
28.	$a\ {}^4G - z\ {}^4F^\circ$ (49)											
		5316.62	25429	44233	12	10	0.0045	0.0016	0.34	−1.72	D	4
		5276.00	25805	44754	10	8	0.0033	0.0011	0.19	−1.96	D	4
		5234.62	25982	45080	8	6	0.0032	0.0010	0.14	−2.10	D	7*n*
		5197.56	26055	45290	6	4	0.0041	0.0011	0.11	−2.18	D	7*n*
		5425.25	25805	44233	10	10	2.2(−4)	9.5(−5)	0.017	−3.02	D−	6*n*,7*n*
		5325.56	25982	44754	8	8	2.8(−4)	1.2(−4)	0.017	−3.02	D−	6*n*,7*n*
29.	$a\ {}^4G - z\ {}^2I^\circ$ (uv 201)											
		2712.39	25805	62662	10	12	0.11	0.015	1.3	−0.84	D+	5
		2684.94	25429	62662	12	12	0.0043	4.6(−4)	0.049	−2.25	D	5
30.	$a\ {}^4G - y\ {}^2G^\circ$ (uv 205)											
		2561.58	25805	64832	10	10	0.0081	8.0(−4)	0.067	−2.10	D−	5
		2554.95	25982	65110	8	8	0.019	0.0019	0.13	−1.83	D	5
		2573.21	25982	64832	8	10	0.11	0.014	0.93	−0.96	D	5
		2559.77	26055	65110	6	8	0.22	0.029	1.5	−0.76	D+	5
31.	$b\ {}^2H - z\ {}^4F^\circ$ (55)											
		5534.83	26170	44233	12	10	5.2(−4)	2.0(−4)	0.044	−2.62	D	6*n*,7*n*
32.	$b\ {}^2H - z\ {}^2I^\circ$ (uv 235)											
		2753.29	26353	62662	10	12	1.71	0.233	21.1	0.368	C	5
33.	$b\ {}^2H - y\ {}^2G^\circ$ (uv 239)											
		2598.03	26353	64832	10	10	0.020	0.0020	0.17	−1.69	D	5
34.	$a\ {}^2F - z\ {}^4F^\circ$ (57)											
		5627.49	27315	45080	8	6	2.4(−5)	8.7(−6)	0.0013	−4.16	E	6*n*

Fe II: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
35.	$a\ ^2F - y\ ^2G^\circ$ (uv 263)											
		2664.67	27315	64832	8	10	1.50	0.200	14.0	0.203	C	5
		2666.63	27620	65110	6	8	1.62	0.230	12.1	0.140	C	5
36.	$b\ ^2G - y\ ^2G^\circ$ (uv 278)	*2906.1*	*30556*	*64956*	18	18	0.043	0.0055	0.94	−1.01	D	5
		2902.46	30389	64832	10	10	0.038	0.0048	0.46	−1.32	D	5
		2910.76	30764	65110	8	8	0.0055	7.0(−4)	0.054	−2.25	D	5
		2879.24	30389	65110	10	8	0.029	0.0029	0.27	−1.54	D+	5
		2934.49	30764	64832	8	10	0.013	0.0021	0.16	−1.78	E	5
37.	$b\ ^4D - z\ ^4F^\circ$ (72)											
		7479.69	31388	44754	6	8	3.1(−5)	3.5(−5)	0.0052	−3.68	D−	6*n*
		7301.56	31388	45080	6	6	4.4(−5)	3.5(−5)	0.0050	−3.68	D−	6*n*
38.	$b\ ^4D - z\ ^4D^\circ$ (73)											
		7711.71	31483	44447	8	8	4.0(−4)	3.6(−4)	0.073	−2.54	D	6*n*
		7224.47	31368	45206	2	2	4.1(−4)	3.2(−4)	0.015	−3.19	D−	6*n*
		7515.79	31483	44785	8	6	6.6(−5)	4.2(−5)	0.0083	−3.47	D−	6*n*
39.	$b\ ^4D - z\ ^4P^\circ$ (74)											
		6456.39	31483	46967	8	6	0.0021	0.0010	0.17	−2.10	D	6*n*,7*n*
		6247.55	31388	47390	6	4	0.0023	9.1(−4)	0.11	−2.26	D	6*n*,7*n*
		6147.77	31364	47626	4	2	0.0022	6.2(−4)	0.050	−2.61	D	7*n*
		6416.92	31388	46967	6	6	9.2(−4)	5.7(−4)	0.072	−2.47	D	6*n*,7*n*
		6149.25	31368	47626	2	2	0.0021	0.0012	0.049	−2.62	D	6*n*,7*n*
		6239.91	31368	47390	2	4	1.9(−4)	2.2(−4)	0.0090	−3.36	D−	7*n*
40.	$b\ ^4D - y\ ^2G^\circ$ (uv 292)											
		2997.75	31483	64832	8	10	0.0048	8.1(−4)	0.064	−2.19	E	5
41.	$b\ ^2F - y\ ^2G^\circ$ (98)											
		3044.84	31999	64832	8	10	0.011	0.0019	0.15	−1.82	D	5
		3002.33	31812	65110	6	8	0.018	0.0032	0.19	−1.71	D+	5
42.	$a\ ^2I - z\ ^2I^\circ$ (105)											
		3360.10	32910	62662	12	12	0.0084	0.0014	0.19	−1.77	D	5
43.	$a\ ^2I - y\ ^2G^\circ$ (107)											
		3131.72	32910	64832	12	10	0.012	0.0015	0.18	−1.75	D	5
44.	$a\ ^2I - z\ ^2K^\circ$ (uv 318)	*2607.9*	*32892*	*71225*	26	30	2.2	0.26	58	0.83	C	5
		2592.78	32876	71433	14	16	2.25	0.259	31.0	0.56	C	5
		2625.49	32910	70987	12	14	2.04	0.246	25.5	0.470	C	5
		2623.13	32876	70987	14	14	0.092	0.0095	1.1	−0.88	D+	5

Fe II: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
45.	$c\ ^2G - y\ ^2G^o$ (120)											
		3187.29	33466	64832	10	10	0.028	0.0043	0.45	−1.37	D+	5
		3162.80	33501	65110	8	8	0.042	0.0063	0.52	−1.30	D+	5
46.	$z\ ^4D^o - c\ ^4D$											
		6383.72	44785	60445	6	6	0.0023	0.0014	0.18	−2.08	D	6n
47.	$c\ ^2F - y\ ^2G^o$ (168)											
		5019.45	44915	64832	8	10	0.0015	7.1(−4)	0.094	−2.25	D−	5
		4953.98	44930	65110	6	8	0.0016	7.8(−4)	0.077	−2.33	D−	5
48.	$c\ ^4F - x\ ^4G^o$ (199)											
		6446.40	50188	65696	8	10	0.0018	0.0014	0.24	−1.95	D	6n

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe III

Ground State $1s^22s^22p^63s^23p^63d^6\ ^5D_4$

Ionization Potential 30.651 eV = 247221 cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
1843.4	15	1930.39	2	1961.23	3	2058.2	9
1844.3	15	1931.51	3	1962.72	3	2058.56	12
1845.0	15	1937.35	2	1964.26	3	2059.68	9
1846.9	15	1943.48	2	1966.20	3	2061.75	9
1849.41	11	1945.34	3	1987.50	1	2084.97	8
1854.38	11	1950.33	13	1991.61	1	2087.13	8
1865.20	17	1951.01	6	1994.07	1	2087.91	8
1893.98	10	1951.3	6	1995.27	1	2088.63	5
1896.80	10	1952.3	6	1995.56	1	2089.09	8
1898.9	7	1952.65	6	1996.42	1	2090.1	8
1903.3	7	1953.32	6	2002.5	18	2090.14	5
1904.3	19	1953.5	6	2039.51	14	2091.31	8
1907.58	10	1954.22	3	2053.5	9	2097.48	5
1915.08	2	1954.98	13	2057.06	9	2103.80	4
1922.79	2	1959.32	3	2057.9	16	2107.32	4

For this spectrum we have chosen the calculations of Biemont [1] and of Kurucz and Peytremann [2]. Biemont obtained radial wavefunctions by means of the scaled Thomas-Fermi method and calculated individual line strengths in intermediate coupling. Similarly, Kurucz and Peytremann used a semiempirical scaled Thomas-Fermi-Dirac approach with very limited configuration interaction. Generally, the log gf-values of refs. [1] and [2] are in quite good agreement, particularly for strong lines; e.g., 68% of the data for common lines agree within ± 50%. In this compilation, we have included only those lines showing 50% or better agreement between refs. [1] and [2].

We were able to assess the reliability of Kurucz and Peytremann's (or Biemont's) absolute scale by comparing the calculated inverse transition probability sums with beam-foil lifetimes for four excited levels measured by Andersen et al. [3]. We considered only ref. [2] for this study because its branching ratio data were more complete than those of Biemont. The comparison shows that the beam-foil lifetimes are, on the average, only 14% longer than the correspondıg inverse sums of Kurucz and Peytremann.

References

[1] Biemont, E., J. Quant. Spectrosc. Radiat. Transfer **16**, 137 (1976).

[2] Kurucz, R. L., and Peytremann, E., Smithsonian Astrophysical Observatory Special Report 362 (1975).

[3] Andersen, T., Petersen, P., and Biemont, E., J. Quant. Spectrosc. Radiat. Transfer **17**, 389 (1977).

Fe III: Allowed transitions

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
1.	$^5G - ^5G^{\circ}$ (uv 50)											
		1987.50	63425	113740	13	13	4.9	0.29	25	0.58	D	1,2
		1991.61	63466	113677	11	11	4.2	0.25	18	0.44	D	1,2
		1994.07	63487	113635	9	9	3.5	0.21	12	0.28	D	1,2
		1995.56	63494	113605	7	7	3.7	0.22	10	0.19	D	1,2
		1996.42	63495	113584	5	5	4.2	0.25	8.2	0.10	D	1,2
		1995.27	63487	113605	9	7	1.0	0.048	2.8	−0.36	D	1,2
		1996.42	63494	113584	7	5	0.96	0.041	1.9	−0.54	D	1,2
2.	$^5G - ^5H^{\circ}$ (uv 51)											
		1915.08	63425	115642	13	15	6.0	0.38	31	0.69	D	1,2
		1922.79	63466	115474	11	13	5.5	0.36	25	0.60	D	1,2
		1930.39	63487	115290	9	11	5.1	0.35	20	0.50	D	1,2
		1937.35	63494	115111	7	9	5.1	0.37	17	0.41	D	1,2
		1943.48	63495	114949	5	7	5.0	0.40	13	0.30	D	1,2
3.	$^5D - ^5F^{\circ}$ (uv 61)											
		1931.51	69696	121469	9	11	5.3	0.36	21	0.51	D	1,2
		1945.34	69837	121242	7	9	3.7	0.27	12	0.28	D	1,2
		1954.22	69838	121009	5	7	3.5	0.28	9.0	0.15	D	1,2
		1959.32	69788	120826	3	5	2.8	0.27	5.2	−0.09	D	1,2
		1962.72	69747	120697	1	3	2.3	0.39	2.5	−0.41	D	1,2
		1954.22	69837	121009	7	7	1.3	0.074	3.3	−0.29	D	1,2
		1961.23	69838	120826	5	5	1.7	0.10	3.2	0.30	D	1,2
		1964.26	69788	120697	3	3	2.2	0.13	2.5	−0.42	D	1,2
		1966.20	69838	120697	5	3	0.28	0.0099	0.32	−1.31	D	1,2
4.	$^3G - ^3F^{\circ}$ (uv 66)											
		2103.80	70729	118247	9	7	2.9	0.15	9.3	0.13	D	1,2
		2107.32	70725	118164	7	5	3.8	0.18	8.7	0.10	D	1,2
5.	$^3G - ^3H^{\circ}$ (uv 67)											
		2097.48	70694	118355	11	13	4.5	0.35	27	0.59	D	1,2
		2090.14	70729	118557	9	11	4.4	0.35	22	0.50	D	1,2
		2088.63	70694	118557	11	11	0.17	0.011	0.83	−0.92	D	1,2
6.	$^3G - ^3G^{\circ}$ (uv 68)											
		1951.01	70694	121950	11	11	5.3	0.30	21	0.52	D	1,2
		1952.65	70729	121941	9	9	4.9	0.28	16	0.40	D	1,2
		1953.32	70725	121920	7	7	5.1	0.29	13	0.31	D	1,2
		[1951.3]	70694	121941	11	9	0.34	0.016	1.1	−0.75	D	1,2
		[1953.5]	70729	121920	9	7	0.40	0.018	1.0	−0.79	D	1,2
		[1952.3]	70729	121950	9	11	0.20	0.014	0.81	−0.90	D	1,2

Fe III: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
7.	^{3}P - ^{3}S°											
		[1898.9]	73728	126391	5	3	3.7	0.12	3.8	−0.22	D	1,2
		[1903.3]	73849	126391	3	3	1.8	0.099	1.9	−0.53	D	1,2
8.	^{3}D - ^{3}D° (uv 77)											
		2087.13	76957	124854	7	7	3.1	0.20	9.6	0.15	D	1,2
		2091.31	77102	124904	5	5	2.6	0.17	5.9	−0.07	D	1,2
		2087.91	77075	124955	3	3	2.9	0.19	3.9	−0.24	D	1,2
		2084.97	76957	124904	7	5	0.75	0.035	1.7	−0.61	D	1,2
		2089.09	77102	124955	5	3	1.1	0.043	1.5	−0.67	D	1,2
		[2090.1]	77075	124904	3	5	0.64	0.070	1.4	−0.68	D	1,2
9.	^{3}D - ^{3}F° (uv 78)											
		2061.75	76957	125444	7	9	4.4	0.36	17	0.40	D	1,2
		2059.68	77102	125638	5	7	3.9	0.35	12	0.24	D	1,2
		2057.06	77075	125673	3	5	3.7	0.39	7.9	0.07	D	1,2
		[2053.5]	76957	125638	7	7	0.44	0.028	1.3	−0.71	D	1,2
		[2058.2]	77102	125673	5	5	0.76	0.048	1.6	−0.62	D	1,2
10.	^{3}I - ^{3}H° (uv 83)											
		1907.58	79840	132263	15	13	5.3	0.25	24	0.57	D	1,2
		1896.80	79845	132565	13	11	5.0	0.23	19	0.48	D	1,2
		1893.98	79860	132659	11	9	5.5	0.24	16	0.42	D	1,2
11.	^{5}F - ^{5}D° (uv 97)											
		1849.41	83138	137210	11	9	4.3	0.18	12	0.30	D	1,2
		1854.38	83647	137573	3	1	5.7	0.098	1.8	−0.53	D	1,2
12.	^{1}I - ^{1}K° (uv 100)	2058.56	83430	131992	13	15	4.5	0.33	29	0.63	D	1,2
13.	^{3}H - ^{3}I° (uv 116)											
		1950.33	88923	140196	13	15	5.5	0.36	30	0.67	D	1,2
		1954.98	88695	139846	11	13	4.3	0.29	21	0.50	D	1,2
14.	^{1}H - ^{1}I° (uv 134)	2039.51	92524	141540	11	13	4.3	0.32	24	0.55	D	1,2
15.	^{3}F - ^{3}D°											
		[1843.4]	93389	147636	9	7	4.8	0.19	10	0.23	D	1,2
		[1844.3]	93392	147615	7	5	4.9	0.18	7.7	0.10	D	1,2
		[1846.9]	93413	147556	5	3	5.5	0.17	5.2	−0.07	D	1,2
		[1845.0]	93413	147615	5	5	0.78	0.040	1.2	−0.70	D	1,2
16.	^{1}F - ^{1}D°	[2057.9]	97041	145618	7	5	3.7	0.17	8.1	0.08	D	1,2
17.	^{1}F - ^{1}F° (uv 154)	1865.20	97041	150655	7	7	6.1	0.32	14	0.35	D	1,2
18.	^{1}D - ^{1}F°	[2002.5]	109571	159493	5	7	4.3	0.36	12	0.26	D	1,2
19.	^{1}D - ^{1}D°	[1904.3]	109571	162085	5	5	5.7	0.31	9.7	0.19	D	1,2

Fe VII

Ground State	$1s^22s^22p^63s^23p^63d^2\ {}^3F_2$
Ionization Potential	[126] eV = [1016000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
150.19	18	153.74	24	155.55	19	236.78	6
150.28	17	154.04	23	155.99	32	236.87	12
150.40	18	154.21	23	158.16	31	238.04	5
150.52	18	154.27	29	158.48	30	238.39	5
150.81	16	154.30	29	165.08	34	239.73	11
150.85	16	154.33	22	166.63	33	239.85	11
151.02	16	154.36	29	231.04	3	240.05	11
151.04	16	154.45	29	231.64	3	240.08	11
151.14	16	154.56	29	231.73	3	240.22	11
151.49	15	154.65	29	232.26	3	240.57	11
151.51	15	154.70	21	232.44	3	243.37	13
151.67	15	154.85	28	232.95	3	244.09	10
151.75	15	154.89	20	233.02	3	244.52	10
151.78	15	154.92	28	233.76	2	244.54	10
151.97	15	154.95	28	234.34	2	245.15	4
152.07	14	155.12	28	234.75	7	245.49	9
152.91	25	155.24	27	235.66	1	246.01	9
153.66	24	155.41	26	236.39	12	247.46	8

For this ion we have selected the data of Warner and Kirkpatrick [1], who used the single configuration scaled Thomas-Fermi approximation and calculated individual line strengths in intermediate coupling. These authors provided data for a large number of transitions within the $3d^2$–$3d4p$, $3d^2$–$3d4f$, and $3d4s$–$3d4p$ arrays. Of we have tabulated only those lines that have actually been observed, either by Edlén [2], as listed in the compilation of Kelly and Palumbo [3], or by Cady [4].

It is expected that for this relatively simple, essentially two-electron spectrum Warner and Kirkpatrick's data should be fairly reliable (except when configuration interaction effects become appreciable). This conjecture seems to be supported by the good agreement between their calculated data and beam-foil lifetimes available for Ti III (see, for example, ref. [5]), an ion which is isoelectronic with Fe VII.

References

[1] Warner, B., and Kirkpatrick, R., Publications of the Department of Astronomy, University of Texas at Austin, Vol. 3, No. 2 (1969) and Mon. Not. R. Astron. Soc. **144**, 397 (1969).

[2] Edlén, B., private communication.

[3] Kelly, R. L., and Palumbo, L. J., *Atomic and Ionic Emission Lines Below 2000 Angstroms—Hydrogen through Krypton*, Naval Research Laboratory Report 7599 (June 1973).

[4] Cady, W. M., Phys. Rev. **43**, 322 (1933).

[5] Wiese, W. L., and Fuhr, J. R., J. Phys. Chem. Ref. Data **4**, 263 (1975).

Fe VII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$3d^2$–$3d4p$	^3F - $^1D^o$											
			235.66	1047	425388	7	5	0.37	2.2(−4)^a	0.0012	−2.81	E	1
2.		^3F - $^3D^o$											
			234.34	1047	427780	7	5	110	0.067	0.36	−0.33	D	1
			233.76	0	427780	5	5	34	0.028	0.11	−0.86	D	1

Fe VII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
3.		${}^3\mathrm{F} - {}^3\mathrm{F}^\circ$	*232.07*	*1346*	*432245*	21	21	73	0.059	0.95	0.09	D	1
			231.73	2327	433870	9	9	60	0.049	0.33	−0.36	D	1
			232.26	1047	431606	7	7	21	0.017	0.092	−0.92	D	1
			232.44	0	430215	5	5	21	0.017	0.065	−1.07	D	1
			232.95	2327	431606	9	7	67	0.042	0.29	−0.42	D	1
			233.02	1047	430215	7	5	46	0.027	0.14	−0.73	D	1
			231.04	1047	433870	7	9	4.1	0.0042	0.022	−1.53	E	1
			231.64	0	431606	5	7	2.8	0.0032	0.012	−1.80	E	1
4.		${}^1\mathrm{D} - {}^1\mathrm{D}^\circ$	245.15	17475	425388	5	5	70	0.063	0.26	−0.50	D	1
5.		${}^1\mathrm{D} - {}^3\mathrm{P}^\circ$											
			238.04	17475	437567	5	5	0.98	8.3(−4)	0.0033	−2.38	E	1
			238.39	17475	436963	5	3	18	0.0094	0.037	−1.33	D	1
6.		${}^1\mathrm{D} - {}^1\mathrm{F}^\circ$	236.78	17475	439812	5	7	6.8	0.0080	0.031	−1.40	D	1
7.		${}^1\mathrm{D} - {}^1\mathrm{P}^\circ$	234.75	17475	443455	5	3	86	0.043	0.17	−0.67	D	1
8.		${}^3\mathrm{P} - {}^1\mathrm{D}^\circ$											
			247.46	21275	425388	5	5	0.51	4.7(−4)	0.0019	−2.63	E	1
9.		${}^3\mathrm{P} - {}^3\mathrm{D}^\circ$											
			245.49	20428	427780	3	5	23	0.035	0.085	−0.98	D	1
			246.01	21275	427780	5	5	1.9	0.0017	0.0069	−2.07	E	1
10.		${}^3\mathrm{P} - {}^3\mathrm{F}^\circ$											
			244.09	21275	431606	5	7	5.5	0.0069	0.028	−1.46	D	1
			244.52	20428	430215	3	5	1.9	0.0028	0.0069	−2.07	E	1
			244.54	21275	430215	5	5	0.024	2.2(−5)	8.8(−5)	−3.96	E	1
11.		${}^3\mathrm{P} - {}^3\mathrm{P}^\circ$	*240.13*	*20855*	*437304*	9	9	120	0.11	0.75	−0.02	D	1
			240.22	21275	437567	5	5	100	0.087	0.35	−0.36	D	1
			240.08	20428	436963	3	3	35	0.030	0.072	−1.04	D	1
			240.57	21275	436963	5	3	40	0.021	0.083	−0.98	D	1
			240.05	20428	437010	3	1	130	0.037	0.089	−0.95	D	1
			239.73	20428	437567	3	5	25	0.037	0.087	−0.96	D	1
			239.85	20037	436963	1	3	34	0.089	0.070	−1.05	D	1
12.		${}^3\mathrm{P} - {}^1\mathrm{P}^\circ$											
			236.87	21275	443455	5	3	18	0.0091	0.036	−1.34	D	1
			236.39	20428	443455	3	3	1.2	0.0010	0.0024	−2.52	E	1
13.		${}^1\mathrm{G} - {}^1\mathrm{F}^\circ$	243.37	28915	439812	9	7	210	0.15	1.1	0.12	D	1
14.	$3d^2$–$3d4f$	${}^3\mathrm{F} - {}^1\mathrm{G}^\circ$											
			152.07	2327	659923	9	9	49	0.017	0.076	−0.82	D	1
15.		${}^3\mathrm{F} - {}^3\mathrm{F}^\circ$											
			151.78	2327	661176	9	9	170	0.058	0.26	−0.28	D	1
			151.67	1047	660360	7	7	390	0.13	0.47	−0.03	D	1
			151.51	0	660022	5	5	530	0.18	0.45	−0.04	D	1
			151.97	2327	660360	9	7	29	0.0077	0.035	−1.16	D	1
			151.75	1047	660022	7	5	50	0.012	0.044	−1.06	D	1
			151.49	1047	661176	7	9	200	0.088	0.31	−0.21	D	1

Fe VII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
16.		^{3}F - ^{3}G°											
			151.02	2327	664483	9	11	1600	0.67	3.0	0.78	D	1
			150.85	1047	663953	7	9	1300	0.58	2.0	0.61	D	1
			150.81	0	663104	5	7	1300	0.62	1.5	0.49	D	1
			151.14	2327	663953	9	9	210	0.072	0.32	−0.19	D	1
			151.04	1047	663104	7	7	220	0.077	0.27	−0.27	D	1
17.		^{3}F - ^{1}F°											
			150.28	0	665425	5	7	220	0.10	0.25	−0.79	D	1
18.		^{3}F - ^{3}D°											
			150.52	2327	666663	9	7	68	0.018	0.080	−0.79	D	1
			150.40	1047	665925	7	5	73	0.018	0.061	−0.91	D	1
			150.19	0	665843	5	3	75	0.015	0.038	−1.12	D	1
19.		^{1}D - ^{3}F°											
			155.55	17475	660360	5	7	13	0.0066	0.017	−1.48	D	1
20.		^{1}D - ^{3}G°											
			154.89	17475	663104	5	7	83	0.042	0.11	−0.68	D	1
21.		^{1}D - ^{1}D°	154.70	17475	663882	5	5	700	0.25	0.64	0.10	D	1
22.		^{1}D - ^{1}F°	154.33	17475	665425	5	7	1200	0.58	1.5	0.46	D	1
23.		^{1}D - ^{3}D°											
			154.04	17475	666663	5	7	44	0.022	0.056	−0.96	D	1
			154.21	17475	665925	5	5	24	0.0087	0.022	−1.36	D	1
24.		^{1}D - ^{3}P°											
			153.74	17475	667903	5	5	15	0.0053	0.013	−1.58	E	1
			153.66	17475	668265	5	3	39	0.0083	0.021	−1.38	D	1
25.		^{1}D - ^{1}P°	152.91	17475	671470	5	3	110	0.022	0.056	−0.95	D	1
26.		^{3}P - ^{1}D°											
			155.41	20428	663882	3	5	30	0.018	0.028	−1.26	D	1
27.		^{3}P - ^{1}F°											
			155.24	21275	665425	5	7	17	0.0085	0.022	−1.37	D	1
28.		^{3}P - ^{3}D°											
			154.95	21275	666663	5	7	1000	0.53	1.3	0.42	D	1
			154.92	20428	665925	3	5	970	0.58	0.89	0.24	D	1
			154.85	20037	665843	1	3	770	0.83	0.42	−0.08	D	1
			155.12	21275	665925	5	5	8.2	0.0030	0.0076	−1.83	E	1
29.		^{3}P - ^{3}P°	*154.50*	*20855*	*668090*	9	9	850	0.31	1.4	0.44	D	1
			154.65	21275	667903	5	5	880	0.32	0.81	0.20	D	1
			154.36	20428	668265	3	3	420	0.15	0.23	−0.35	D	1
			154.56	21275	668265	5	3	350	0.076	0.19	−0.42	D	1
			154.30	20428	668497	3	1	890	0.11	0.16	−0.50	D	1
			154.45	20428	667903	3	5	1.5	8.8(−4)	0.0013	−2.58	E	1
			154.27	20037	668265	1	3	81	0.087	0.044	−1.06	D	1

Fe VII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^{8}s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
30.		^{1}G - ^{1}G°	158.48	28915	659923	9	9	230	0.086	0.40	−0.11	D	1
31.		^{1}G - ^{3}F°											
			158.16	28915	661176	9	9	8.9	0.0034	0.016	−1.52	E	1
32.		^{1}G - ^{1}H°	155.99	28915	669978	9	11	1800	0.80	3.7	0.86	D	1
33.		^{1}S - ^{3}D°											
			166.63	65707	665843	1	3	14	0.017	0.0095	−1.76	E	1
34.		^{1}S - ^{1}P°	165.08	65707	671470	1	3	690	0.85	0.46	−0.07	D	1

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe VIII

Ground State $1s^22s^22p^63s^23p^63d\ ^2D_{3/2}$

Ionization Potential 151.06 eV = 1218400 cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
98.39	8	112.49	5	114.29	4	117.65	2
98.58	8	112.57	7	114.56	4	118.28	2
112.26	5	112.70	5	116.18	3	118.63	1
112.27	7	112.81	7	116.43	3	118.89	1
112.29	6	112.83	4	117.18	3	119.37	1
112.47	5	112.93	6				

For this potassium-like ion, we have compiled oscillator strengths taken from Cowan [1], who performed Hartree-Fock-Slater calculations in intermediate coupling. Biemont [2] has applied a single configuration Hartree-Fock approximation to the calculation of multiplet oscillator strengths for transitions of the type $ns-n'p$ and $np-n'd$, where n,n' = 4, 5, 6, 7, and 8. We have not tabulated material, however, because of the strong possibility of configuration interaction of these single-valence-electron states with configurations of the type $3p^53d^2$, $3p^53dns$, $3p^53dnp$, etc.; e.g., the $3p^5(^2P^\circ)3d^2(^3P)\ ^2P^\circ$ state can mix strongly with the $3p^64p\ ^2P^\circ$ state.

A third reference providing f-value data on this spectrum is that by Czyzak and Krueger [3]. These authors calculated radial wavefunctions by the Hartree-Fock self-consistent field method and used *LS* coupling to provide individual line strengths. Because of intermediate coupling effects found by Cowan, however, we did not tabulate the data of ref. [3].

References

[1] Cowan, R. D., Astrophys. J. **147**, 377 (1967).
[2] Biemont, E., Physica C **81**, 158 (1976).
[3] Czyzak, S. J., and Krueger, T. K., Astrophys J. **144**, 381 (1966).

Fe VIII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$3p^63d$– $3p^53d(^3\mathrm{P}^\circ)4s$	$^2\mathrm{D} - {}^2\mathrm{P}^\circ$	*119.03*	*1103*	*841200*	10	6	380	0.048	0.19	−0.31	D	1
			118.89	1838	842930	6	4	330	0.047	0.11	−0.55	D	1
			119.37	0	837750	4	2	380	0.041	0.064	−0.79	D	1
			118.63	0	842930	4	4	52	0.011	0.017	−1.36	D	1
2.	$3p^63d$– $3p^53d(^3\mathrm{F}^\circ)4s$	$^2\mathrm{D} - {}^4\mathrm{F}^\circ$											
			118.28	1838	847250	6	8	22	0.0062	0.014	−1.43	D	1
			117.65	0	849990	4	6	32	0.010	0.015	−1.40	D	1
3.		$^2\mathrm{D} - {}^2\mathrm{F}^\circ$	*116.76*	*1103*	*857560*	10	14	350	0.10	0.39	0.01	D	1
			117.18	1838	855190	6	8	320	0.088	0.20	−0.28	D	1
			116.18	0	860710	4	6	400	0.12	0.18	−0.32	D	1
			116.43	1838	860710	6	6	22	0.0045	0.010	−1.57	D	1
4.	$3p^63d$– $3p^53d(^3\mathrm{D}^\circ)4s$	$^2\mathrm{D} - {}^4\mathrm{D}^\circ$											
			114.56	1838	874770	6	8	27	0.0072	0.016	−1.36	D	1
			114.29	1838	876810	6	6	50	0.0098	0.022	−1.23	D	1
			[112.83]	0	[886300]	4	4	30	0.0058	0.0086	−1.63	D	1
5.		$^2\mathrm{D} - {}^2\mathrm{D}^\circ$	*112.48*	*1103*	*890130*	10	10	430	0.081	0.30	−0.09	D	1
			112.49	1838	890810	6	6	380	0.073	0.16	−0.36	D	1
			112.47	0	889110	4	4	320	0.061	0.090	−0.61	D	1
			112.70	1838	889110	6	4	87	0.011	0.024	−1.18	D	1
			112.26	0	890810	4	6	67	0.019	0.028	−1.12	D	1
6.	$3p^63d$– $3p^53d(^1\mathrm{F}^\circ)4s$	$^2\mathrm{D} - {}^2\mathrm{F}^\circ$											
			112.93	1838	887320	6	8	220	0.055	0.12	−0.48	D	1
			[112.29]	1838	[892400]	6	6	150	0.028	0.062	−0.77	D	1
7.	$3p^63d$– $3p^53d(^1\mathrm{D}^\circ)4s$	$^2\mathrm{D}\ \ {}^2\mathrm{D}^\circ$											
			[112.81]	1838	[888300]	6	6	19	0.0037	0.0082	−1.65	D	1
			[112.27]	0	[890700]	4	4	190	0.035	0.052	−0.85	D	1
			[112.57]	0	[888300]	4	6	84	0.024	0.036	−1.02	D	1
8.	$3p^63d$– $3p^53d(^1\mathrm{P}^\circ)4s$	$^2\mathrm{D} - {}^2\mathrm{P}^\circ$	*98.53*	*1103*	[1016000]	10	6	240	0.021	0.068	−0.68	D	1
			[98.58]	1838	[1016000]	6	4	210	0.020	0.039	−0.92	D	1
			[98.39]	0	[1016000]	4	2	250	0.018	0.023	−1.14	D	1
			[98.39]	0	[1016000]	4	4	33	0.0048	0.0062	−1.72	D	1

Fe IX

Ground State $1s^22s^22p^63s^23p^6\ ^1S_0$

Ionization Potential 235.04 eV = 1895800 cm^{-1}

Allowed Transitions

Line strengths for the first three multiplets of this argon-like ion are from the superposition-of-configurations (SOC) calculations of Weiss [1], which are expected to be fairly accurate. Lin et al. [2] have computed transitions to $4s$ and $4d$ states by using the Dirac-Hartree-Fock method, but they have omitted correlation in excited states. Oscillator strengths for $3d-4f$ transitions have been calculated by Fawcett et al. [3] using Cowan's HX (Hartree-Fock with statistical exchange) method.

References

[1] Weiss, A. W., private communication.
[2] Lin, D. L., Fielder, W., Jr., and Armstrong, L., Jr., Phys. Rev. A **16**, 589 (1977).
[3] Fawcett, B. C., Cowan, R. D., Kononov, E. Y., and Hayes, R. W., J. Phys. B **5**, 1255 (1972).

Fe IX: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$3p^6-3p^53d$	$^1S - {}^3P^\circ$											
			244.912	0	408307	1	3	0.087	2.4(−4)[a]	1.9(−4)	−3.63	E	1
2.		$^1S - {}^3D^\circ$											
			217.108	0	460609	1	3	2.0	0.0043	0.0031	−2.36	E	1
3.		$^1S - {}^1P^\circ$	171.075	0	584547	1	3	2010	2.65	1.49	0.423	C+	1
4.	$3p^6-3p^5(^2P^\circ_{3/2})4s$	$^1S - (3/2,1/2)^\circ$											
			105.208	0	950500	1	3	320	0.16	0.055	−0.80	D	2
5.	$3p^6-3p^5(^2P^\circ_{1/2})4s$	$^1S - (1/2,1/2)^\circ$											
			103.566	0	965570	1	3	520	0.25	0.085	−0.60	D	2
6.	$3p^6-3p^5(^2P^\circ_{3/2})4d$	$^1S - {}^2[3/2]^\circ$											
			83.457	0	1198220	1	3	990	0.31	0.085	−0.51	D	2
7.	$3p^6-3p^5(^2P^\circ_{1/2})4d$	$^1S - {}^2[3/2]^\circ$											
			82.430	0	1213150	1	3	560	0.17	0.046	−0.77	D	2
8.	$3p^53d-3p^5(^2P^\circ_{3/2})4f$	$^3P^\circ - {}^2[3/2]$											
			111.791	408307	1302830	3	5	1200	0.39	0.43	0.07	E	3
			111.713	405765	1300920	1	3	1000	0.56	0.21	−0.25	E	3
9.		$^3P^\circ - {}^2[5/2]$											
			112.096	413667	1305760	5	7	1600	0.41	0.76	0.31	E	3
10.		$^3F^\circ - {}^2[9/2]$											
			113.793	425800	1304590	9	11	2000	0.48	1.6	0.64	E	3
			114.024	429311	1306320	7	9	1600	0.40	1.1	0.45	E	3

Fe IX: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^{8}s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
11.	$3p^53d-3p^5(^2P^\circ_{1/2})4f$	$^3F^\circ-{}^2[7/2]$	114.111	433807	1310150	5	7	1400	0.37	0.69	0.27	E	3
12.		$^3D^\circ-{}^2[7/2]$	116.803	455612	1311750	7	9	1600	0.41	1.1	0.46	E	3
13.		$^3D^\circ-{}^2[7/2]$	115.996	462616	1324710	5	7	1600	0.46	0.88	0.36	E	3
14.		$^1D^\circ-{}^2[5/2]$	115.353	456744	1323650	5	7	1400	0.39	0.74	0.29	E	3

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe X

Ground State $1s^22s^22p^63s^23p^5\ ^2P^\circ_{3/2}$

Ionization Potential 262.1 eV = 2114000 cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
75.685	17	96.122	10	104.248	23	180.407	6
76.006	16	96.788	10	104.638	23	182.310	6
76.495	17	97.122	9	137.027	20	184.542	2
76.822	16	97.591	10	139.868	18	190.044	2
77.627	14	100.026	24	140.296	21	192	8
77.728	13	101.733	25	140.678	18	195.399	8
77.812	12	101.846	25	144.328	19	201.556	8
77.865	12	102.095	25	170.58	7	220.882	5
78.151	15	102.192	22	174.534	7	229.99	4
78.769	12	102.829	27	175.266	7	234.356	3
94.012	11	103.319	27	175.474	6	345.75	1
95.338	10	103.724	26	177.243	6	365.57	1
95.374	11						

Significant correlation effects in this chlorine-like ion make theoretical oscillator strengths for low-lying transitions somewhat uncertain. Nussbaumer [1] has calculated energy levels and oscillator strengths for many transitions by using a scaled Thomas-Fermi method with configuration interaction and relativistic effects; we quote here his values for the $3s^23p^5$–$3s3p^6$ resonance lines. Bromage et al. [2] have studied the $3p$–$3d$ transitions by using Cowan's semi-empirical HX method. Since they also tabulated percentage compositions of all levels of the $3p^43d$ configuration, we have their results over those of Nussbaumer, because this information allowed us to match the f-value data with the appropriate term designations. We have also employed earlier f-values due to Fawcett et al. [3] for transitions to $n = 4$ levels.

The accuracy ratings for transitions for which the upper or lower level is indicated to be of low purity in LS coupling have been lowered to "E." Transitions involving any level for which the dominant component is significantly less than 50% have been excluded from this compilation.

References

[1] Nussbaumer, H., Astron. Astrophys. **48**, 93 (1976).
[2] Bromage, G. E., Cowan, R. D., and Fawcett, B. C., Phys. Scr. **15**, 177 (1977).
[3] Fawcett, B. C., Cowan, R. D., Kononov, E. Y., and Hayes, R. W., J. Phys. B **5**, 1255 (1972).

Fe X: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$3s^23p^5 - 3s3p^6$	$^2P^o - ^2S$	*352.11*	*5228*	289230	6	2	56	0.035	0.24	−0.68	E	1
			345.75	0	289230	4	2	39	0.035	0.16	−0.85	E	1
			365.57	15683	289230	2	2	17	0.035	0.084	−1.15	E	1
2.	$3p^5$–$3p^4(^1D)3d$	$^2P^o - ^2S$	*186.34*	*5228*	541882	6	2	1900	0.33	1.2	0.29	D	2
			184.542	0	541882	4	2	1500	0.38	0.92	0.18	D	2
			190.044	15683	541882	2	2	420	0.23	0.29	−0.34	D	2
3.		$^2P^o - ^4F$											
			234.356	0	426701	4	6		5.3(−4)[a]		−2.67	E	2
4.		$^2P^o - ^4P$											
			229.99	0	434800	4	2	3.0	0.0012	0.0036	−2.32	D	2
5.		$^2P^o - ^2F$											
			220.882?	0	452730?	4	6	0.30	3.3(−4)	9.6(−4)	−2.88	E	2
6.	$3p^5$–$3p^4(^3P)3d$	$^2P^o - ^2P$	*178.30*	*5228*	*566093*	6	6	1900	0.91	3.2	0.74	E	2
			177.243	0	564197	4	4	1900	0.90	2.1	0.56	E	2
			180.407	15683	569885	2	2	1400	0.70	0.83	0.15	E	2
			175.474	0	569885	4	2	480	0.11	0.25	−0.36	E	2
			182.310	15683	564197	2	4	40	0.04	0.05	−1.1	E	2
7.		$^2P^o - ^2D$	*174.51*	*5228*	*578270*	6	10	2200	1.7	5.7	1.00	D	2
			174.534	0	572954	4	6	2200	1.5	3.4	0.78	D	2
			175.266	15683	586244	2	4	2100	1.9	2.2	0.58	D	2
			170.58	0	586244	4	4	66	0.029	0.065	−0.94	D	2
8.	$3p^5$–$3p^4(^1S)3d$	$^2P^o - ^2D$	*195*	*5228*	*[517000]*	6	10	7.9	0.0075	0.029	−1.35	D−	2
			[192]	0	[521000]	4	6	0.06	5(−5)	1(−4)	−3.7	E	2
			201.556	15683	511773	2	4	11	0.014	0.019	−1.55	D	2
			195.399	0	511773	4	4	6.6	0.0038	0.0098	−1.82	D	2
9.	$3p^5$–$3p^4(^3P)4s$	$^2P^o - ^4P$											
			97.122	0	1029600	4	4	350	0.050	0.064	−0.70	D	3
10.		$^2P^o - ^2P$	*96.342*	*5228*	*1043200*	6	6	1100	0.15	0.28	−0.05	D−	3
			96.122	0	1040300	4	4	870	0.12	0.15	−0.32	D	3
			96.788	15683	1048900	2	2	780	0.11	0.070	−0.66	D	3
			95.338	0	1048900	4	2	590	0.040	0.050	−0.80	D	3
			97.591	15683	1040300	2	4	70	0.02	0.01	−1.4	E	3
11.	$3p^5$–$3p^4(^1D)4s$	$^2P^o - ^2D$											
			94.012	0	1063700	4	6	470	0.093	0.12	−0.43	D	3
			95.374	15683	1064200	2	4	550	0.15	0.094	−0.52	D	3
12.	$3p^5$–$3p^4(^3P)4d$	$^2P^o - ^2D$	*78.163*	*5228*	*1284600*	6	10	1400	0.22	0.34	0.12	D	3
			77.865	0	1284300	4	6	1600	0.22	0.23	−0.06	D	3
			78.769	15683	1285100	2	4	400	0.075	0.039	−0.82	E	3
			77.812	0	1285100	4	4	800	0.073	0.075	−0.53	E	3
13.		$^2P^o - ^4F$											
			77.728	0	1286500	4	6	280	0.038	0.039	−0.82	D	3

Fe X: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
14.		$^2P^o - ^2F$											
			77.627	0	1288200	4	6	480	0.065	0.066	−0.59	D	3
15.		$^2P^o - ^2P$											
			78.151	15683	1295300	2	4	440	0.080	0.041	−0.80	D	3
16.	$3p^5$–$3p^4(^1D)4d$	$^2P^o - ^2P$											
			76.006	0	1315700	4	4	1300	0.11	0.11	−0.36	D	3
			76.822	15683	1317400	2	2	1800	0.16	0.081	−0.49	D	3
17.		$^2P^o - ^2D$											
			75.685	0	1321300	4	6	780	0.10	0.10	−0.40	D	3
			76.495	15683	1323000	2	4	1400	0.24	0.12	−0.32	D	3
18.	$3p^4(^1D)3d$– $3p^4(^1D)4p$	$^2G - ^2F^o$											
			139.868	450753	1165713	10	8	220	0.052	0.24	−0.28	D	3
			140.678	451081	1161924	8	6	170	0.038	0.14	−0.52	E	3
9.		$^2F - ^2D^o$											
			144.328?	485978	1178844?	8	6	140	0.033	0.13	−0.58	D	3
20.	$3p^4(^3P)3d$– $3p^4(^3P)4p$	$^4D - ^4P^o$											
			137.027?	388708	1118491?	8	6	150	0.031	0.11	−0.61	D	3
21.		$^4F - ^4D^o$											
			140.296	417653	1130432	10	8	220	0.052	0.24	−0.28	D	3
22.	$3p^4(^1D)3d$– $3p^4(^1D)4f$	$^2G - ^2H^o$											
			102.192	450753	1429303	10	12	2900	0.55	1.9	0.74	D	3
23.		$^2F - ^2G^o$											
			104.638	485978	1441654	8	10	2100	0.43	1.2	0.54	D	3
			104.248	[482000]	[1441000]	6	8	1400	0.31	0.64	0.27	D	3
24.	$3p^4(^3P)3d$– $3p^4(^3P)4f$	$^4D - ^4F^o$											
			100.026	388708	1388448	8	10	2600	0.49	1.3	0.59	D	3
25.		$^4F - ^4G^o$											
			102.095	417653	1397133	10	12	2900	0.55	1.8	0.74	D	3
			101.733	426701	1409666	6	8	1800	0.38	0.76	0.36	D	3
			101.846	428297	1410172	4	6	1700	0.39	0.52	0.19	E	3
26.		$^2F - ^2G^o$											
			103.724	452730?	1416827?	6	8	1700	0.36	0.74	0.33	E	3
27.	$3p^4(^1S)3d$– $3p^4(^1S)4f$	$^2D - ^2F^o$											
			103.319	[521000]	[1489000]	6	8	2600	0.55	1.1	0.52	D	3
			102.829	511773	1484261	4	6	2100	0.49	0.66	0.29	D	3

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[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe XI

Ground State	$1s^22s^22p^63s^23p^4\ ^3P_2$
Ionization Potential	290.4 eV = 2342000 cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
72.166	22	90.205	15	123.822	24	201.737	12
72.310	21	90.345	15	124.725	25	208	7
72.635	20	91.394	28	176.620	11	276.41	2
73.2	20	91.472	28	179.762	14	308.61	4
86.513	18	91.63	27	184.41	8	341.115	1
86.772	16	91.733	27	184.800	13	348.97	1
87.025	16	92.81	31	187.446	10	352.680	1
87.995	16	92.87	29,31	188.219	9	355.92	5
88.029	16	93.433	30	189.017	9	356.55	1
88.167	16	121.419	23	192.020	10	358.64	1
89.104	17	121.747	23	192.641	10	369.23	1
89.185	15	123.49	24	192.819	9	406.84	3
89.865	19	123.572	26	201.575	6		

For the resonance transitions of this highly ionized member of the sulfur isoelectronic sequence, we have chosen the data of Mason [1], computed by using a multiconfiguration scaled Thomas-Fermi method. Substantial correlation is present in these values, reducing them by as much as an order of magnitude below single configuration results.

The remainder of the oscillator strengths were computed by Bromage et al. [2] and Fawcett et al. [3,4] using Cowan's semi-empirical Hartree-Fock-Slater programs. The $3p$–$3d$ calculations include the effects of configuration interaction [2]. Accuracy ratings for some transitions for which the upper or lower level is indicated to be of low purity in *LS* coupling have been lowered to "E," while those for which the dominant component is significantly less than 50% have been excluded from this compilation.

References

[1] Mason, H. E., Mon. Not. R. Astron. Soc. **170**, 651 (1975).

[2] Bromage, G. E., Cowan, R. D., and Fawcett, B. C., Phys. Scr. **15**, 177 (1977).

[3] Fawcett, B. C., Cowan, R. D., Kononov, E. Y., and Hayes, R. W., J. Phys. B **5**, 1255 (1972).

[4] Fawcett, B. C., Peacock, N. J., and Cowan, R. D., J. Phys. B **1**, 295 (1968).

Fe XI: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$3s^23p^4$–$3s3p^5$	^3P – $^3P^o$	*353.76*	*5812*	*288490*	9	9	23	0.043	0.45	−0.41	C	1
			352.680	0	283543	5	5	17	0.032	0.19	−0.80	C	1
			356.55	12667.9	293156	3	3	5.2	0.010	0.035	−1.52	C	1
			341.115	0	293156	5	3	11	0.012	0.067	−1.22	C	1
			348.97	12667.9	299230	3	1	23	0.014	0.048	−1.38	C	1
			369.23	12667.9	283543	3	5	5.3	0.018	0.066	−1.27	C	1
			358.64	14300	293156	1	3	7.1	0.041	0.048	−1.39	C	1
2.		^3P – $^1P^o$											
			[276.41]	0	361780	5	3	2.0	0.0014	0.064	−2.15	E	1

Fe XI: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^{8}s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
3.		$^1D - ^3P^\circ$											
			[406.84]	37743.6	283543	5	5	0.40	0.0010	0.0067	−2.30	E	1
4.		$^1D - ^1P^\circ$	308.61	37743.6	361780	5	3	75	0.064	0.33	−0.49	C	1
5.		$^1S - ^1P^\circ$	[355.92]	80815	361780	1	3	1.6	0.0094	0.011	−2.03	D	1
6.	$3p^4$–$3p^3(^2P^\circ)3d$	$^3P - ^3P^\circ$											
			201.575	0	496093	5	5	36	0.022	0.073	−0.96	D	2
7.		$^1D - ^3D^\circ$											
			[208]	37743.6	[481000]	5	3	160	0.062	0.21	−0.51	E	2
8.		$^1S - ^1P^\circ$	184.41	80815	623080	1	3	1400	2.2	1.3	0.34	D	2
9.	$3p^4$–$3p^3(^2D^\circ)3d$	$^3P - ^3P^\circ$											
			188.219	0	531296	5	5	1100	0.59	1.8	0.47	D	2
			189.017	12667.9	541721	3	1	1400	0.25	0.47	−0.12	D	2
			192.819	12667.9	531296	3	5	220	0.20	0.38	−0.22	D	2
10.		$^3P - ^3S^\circ$	*189.51*	*5812*	533487	9	3	550	0.098	0.55	−0.05	E	2
			187.446	0	533487	5	3	100	0.032	0.099	−0.80	E	2
			192.020	12667.9	533487	3	3	290	0.16	0.30	−0.32	E	2
			192.641	14300	533487	1	3	140	0.23	0.15	−0.64	E	2
11.		$^3P - ^1D^\circ$											
			176.620	12667.9	578855	3	5	86	0.067	0.12	−0.70	D	2
12.		$^1D - ^3S^\circ$											
			201.737	37743.6	533487	5	3	630	0.23	0.76	0.06	E	2
13.		$^1D - ^1D^\circ$	184.800	37743.6	578855	5	5	1200	0.63	1.9	0.50	D	2
14.		$^1D - ^1F^\circ$	179.762	37743.6	594035	5	7	1600	1.1	3.3	0.74	D	2
15.	$3p^4$–$3p^3(^4S^\circ)4s$	$^3P - ^3S^\circ$	*89.647*	*5812*	1121300	9	3	2100	0.083	0.22	−0.13	D−	3
			89.185	0	1121300	5	3	1300	0.092	0.14	−0.34	D	3
			90.205	12667.9	1121300	3	3	550	0.067	0.060	−0.70	D	3
			90.345	14300	1121300	1	3	200	0.08	0.02	−1.1	E	3
16.	$3p^4$–$3p^3(^2D^\circ)4s$	$^3P - ^3D^\circ$											
			86.772	0	1152400	5	7	540	0.086	0.12	−0.37	D	3
			87.995	12667.9	1149100	3	5	220	0.043	0.037	−0.89	D	3
			88.167	14300	1148500	1	3	200	0.06	0.02	−1.2	E	3
			87.025	0	1149100	5	5	350	0.040	0.057	−0.70	D	3
			88.029	12667.9	1148500	3	3	400	0.047	0.041	−0.85	D	3
17.		$^1D - ^1D^\circ$	89.104	37743.6	1160000	5	5	1300	0.16	0.23	−0.10	D	3

Fe XI: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
18.	$3p^4$–$3p^3(^2P^\circ)4s$	$^1D - {}^1P^\circ$	86.513	37743.6	1193600	5	3	830	0.056	0.080	−0.55	D	3
19.		$^1S - {}^1P^\circ$	[89.865]	80815	1193600	1	3	690	0.25	0.074	−0.60	D	3
20.	$3p^4$–$3p^3(^4S^\circ)4d$	$^3P - {}^3D^\circ$											
			72.635	0	1376700	5	7	1600	0.18	0.22	−0.05	D	3
			[73.2]	12667.9	[1380000]	3	5	820	0.11	0.080	−0.48	D	4
21.	$3p^4$–$3p^3(^2D^\circ)4d$	$^1D - {}^1D^\circ$	72.310	37743.6	1420700	5	5	1500	0.12	0.14	−0.22	D	3
22.		$^1D - {}^1F^\circ$	72.166	37743.6	1423400	5	7	2900	0.32	0.38	0.20	D	3
23.	$3p^3(^4S^\circ)3d$– $3p^3(^4S^\circ)4p$	$^5D^\circ - {}^5P$											
			121.419			9	7	290	0.050	0.18	−0.35	D	3
			121.747			7	5	210	0.033	0.093	−0.64	D	3
24.	$3p^3(^2D^\circ)3d$– $3p^3(^2D^\circ)4p$	$^3G^\circ - {}^3F$											
			123.49			11	9	270	0.050	0.22	−0.26	D	3
			123.49			9	7	170	0.030	0.11	−0.57	E	3
			123.822			7	5	220	0.036	0.10	−0.60	E	3
25.		$^1G^\circ - {}^1F$	124.725			9	7	220	0.040	0.15	−0.44	D	3
26.	$3p^3(^2P^\circ)3d$– $3p^3(^2P^\circ)4p$	$^3F^\circ - {}^3D$											
			123.572			7	5	360	0.059	0.17	−0.38	E	3
27.	$3p^3(^4S^\circ)3d$– $3p^3(^4S^\circ)4f$	$^5D^\circ - {}^5F$											
			91.733			9	11	4100	0.63	1.7	0.75	D	3
			91.63			7	9	3400	0.55	1.2	0.59	D	3
			91.63			5	7	2800	0.49	0.74	0.39	D	3
			91.63			3	5	2300	0.48	0.43	0.16	D	3
28.	$3p^3(^2D^\circ)3d$– $3p^3(^2D^\circ)4f$	$^3F^\circ - {}^3G$											
			91.472			7	9	2500	0.41	0.86	0.46	D	3
			91.394			5	7	2600	0.45	0.68	0.35	D	3
29.		$^3G^\circ - {}^3H$											
			92.87			11	13	3900	0.60	2.0	0.82	D	3
			92.87			7	9	3400	0.57	1.2	0.60	D	3
30.		$^1G^\circ - {}^1H$	93.433			9	11	3200	0.51	1.4	0.66	D	3
31.	$3p^3(^2P^\circ)3d$– $3p^3(^2P^\circ)4f$	$^3F^\circ - {}^3G$											
			92.81			9	11	3700	0.59	1.6	0.73	D	3
			92.87			7	9	2800	0.47	1.0	0.52	D	3

Fe XII

Ground State	$1s^22s^22p^63s^23p^3\ ^4S^o_{3/2}$
Ionization Potential	[328] eV = [2646000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
65.805	23	82.226	15	185.85	10	200.356	13
65.905	18	82.744	17	186.856	6	201.121	12
66.526	22	82.837	17	186.880	6	202.090	12
66.960	20	84.48	27	188.216	7	204.743	12
67.164	24	84.491	27	188.45	6	208.410	11
67.821	19	84.52	27	189.561	9	209.11	5
68.382	21	84.85	28	190.459	7	210.932	11
79.488	14	85.14	29	192.394	4	335.06	2
80.022	14	85.477	29	193.509	4	338.263	2
80.160	16	108.440	25	194.920	8	346.852	1
80.542	16	108.605	25	195.119	4,8	352.107	1
80.55	14	108.862	25	196.640	8	364.468	1
81.651	15	110.591	26	196.923	8	382.83	3
81.943	15	110.732	26	198.555	12		

Significant correlation effects in this P-like ion make the accurate calculation of oscillator strengths difficult.

Bromage et al. [1] have calculated *gf*-values of resonance transitions to levels of the $3s3p^4$ and $3s^23p^23d$ configurations by using Cowan's multiconfiguration Hartree-XR approach including exchange (X) and relativistic effects (R) and semiempirically scaled Slater parameters. Fawcett et al. [2] have used Cowan's Hartree-Fock-Slater (HX) method to determine *gf*-values of transitions to $n = 4$ states.

The accuracy ratings for transitions for which the upper or lower level is indicated to be of low purity in *LS* coupling have been lowered to "E." Transitions involving any level for which the dominant component is significantly less than 50% have been excluded from this compilation.

References

[1] Bromage, G. E., Cowan, R. D., and Fawcett, B. C., Mon. Not. R. Astron. Soc. **183**, 19 (1978).

[2] Fawcett, B. C., Cowan, R. D., Kononov, E. Y., and Hayes, R. W., J. Phys. B **5**, 1255 (1972).

Fe XII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$3s^23p^3$–$3s3p^4$	$^4S^o$ – ^4P	*357.26*	0	*279906*	4	12	17	0.096	0.45	−0.42	D	1
			364.468	0	274373	4	6	16	0.048	0.23	−0.72	D	1
			352.107	0	284005	4	4	18	0.033	0.15	−0.88	D	1
			346.852	0	288307	4	2	18	0.016	0.073	−1.19	D	1
2.		$^2D^o$ – ^2D											
			338.263	46110	341738	6	6	27	0.047	0.31	−0.55	D	1
			335.06	41560	340010	4	4	34	0.058	0.26	−0.63	D	1

Fe XII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
3.		$^2P^o - ^2D$											
			382.83	80514	341730	4	6	5.5	0.018	0.091	−1.14	D	1
4.	$3p^3$–$3p^2(^3P)3d$	$^4S^o - ^4P$	*194.12*	0	*515139*	4	12	950	1.6	4.1	0.81	D	1
			195.119	0	512508	4	6	930	0.80	2.1	0.51	D	1
			193.509	0	516772	4	4	940	0.53	1.4	0.33	D	1
			192.394	0	519767	4	2	900	0.25	0.63	0.00	D	1
5.		$^2D^o - ^4P$											
			[209.11]	41560	519767	4	2	64	0.021	0.058	−1.08	D	1
6.		$^2D^o - ^2F$	*186.92*	*44290*	*579292*	10	14	1200	0.85	5.2	*0.93*	E	*1*
			186.880	46110	581213	6	8	1100	0.80	3.0	0.68	D	1
			186.856	41560	576731	4	6	1100	0.85	2.1	0.53	E	1
			188.45	46110	576731	6	6	69	0.037	0.14	−0.65	E	1
7.		$^2P^o - ^2D$											
			188.216	74103	605407	2	4	800	0.85	1.1	0.23	E	1
			190.459	80514	605407	4	4	240	0.13	0.33	−0.28	E	1
8.	$3p^3$–$3p^2(^1D)3d$	$^2D^o - ^2D$	*196.05*	*44290*	*554362*	10	10	620	0.36	2.3	0.55	D	1
			196.640	46110	554654	6	6	480	0.28	1.1	0.23	D	1
			195.119	41560	553923	4	4	670	0.38	0.98	0.18	D	1
			196.923	46110	553923	6	4	110	0.043	0.17	−0.59	D	1
			194.920	41560	554654	4	6	23	0.020	0.051	−1.10	D	1
9.		$^2D^o - ^2P$											
			189.561	41560	569095	4	2	45	0.012	0.030	−1.32	E	1
10.		$^2D^o - ^2S$											
			[185.85]	41560	579626	4	2	50	0.013	0.032	−1.28	D	1
11.		$^2P^o - ^2D$											
			210.932	80514	554654	4	6	58	0.058	0.16	−0.63	D	1
			208.410	74103	553923	2	4	58	0.075	0.10	−0.82	D	1
12.		$^2P^o - ^2P$	*201.42*	*78377*	*574850*	6	6	830	0.50	2.0	0.48	E	1
			201.121	80514	577727	4	4	640	0.39	1.0	0.19	D	1
			202.090	74103	569095	2	2	730	0.45	0.60	−0.05	E	1
			204.743	80514	569095	4	2	57	0.018	0.049	−1.14	E	1
			198.555	74103	577727	2	4	210	0.25	0.33	−0.30	D	1
13.		$^2P^o - ^2S$											
			200.356	80514	579626	4	2	660	0.20	0.53	−0.10	D	1
14.	$3p^3$–$3p^2(^3P)4s$	$^4S^o - ^4P$	*79.87*	0	*1252000*	4	12	660	0.19	0.20	−0.12	D	2
			79.488	0	1258100	4	6	670	0.095	0.099	−0.42	D	2
			80.022	0	1249700	4	4	680	0.065	0.068	−0.59	D	2
			80.55	0	1241000	4	2	720	0.035	0.037	−0.85	D	2
15.		$^2D^o - ^2P$	*82.014*	*44290*	*1263600*	10	6	1700	0.10	0.27	0.00	D	2
			81.943	46110	1266500	6	4	1400	0.097	0.16	−0.24	D	2
			82.226	41560	1257700	4	2	1900	0.095	0.10	−0.42	D	2
			81.651	41560	1266500	4	4	100	0.01	0.01	−1.4	E	2

Fe XII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
16.	$3p^3$–$3p^2(^1D)4s$	$^2D^o - {}^2D$											
			[80.542]	46110	1287700	6	6	870	0.085	0.14	−0.29	D	2
			80.160	41560	1289100	4	4	600	0.058	0.061	−0.63	D	2
17.		$^2P^o - {}^2D$											
			82.837	80514	1287700	4	6	190	0.030	0.033	−0.92	D	2
			82.744	80514	1289100	4	4	760	0.078	0.085	−0.51	D	2
18.	$3p^3$–$3p^2(^3P)4d$	$^4S^o - {}^4P$											
			65.905	0	1517300	4	4	2000	0.13	0.11	−0.28	D	2
19.		$^2D^o - {}^2F$											
			67.821	41560	1516000	4	6	1400	0.14	0.13	−0.25	D	2
20.		$^2D^o - {}^2D$											
			66.960	41560	1535000	4	6	1600	0.16	0.14	−0.19	D	2
21.		$^2P^o - {}^2D$											
			68.382	74103	1536840	2	4	1700	0.24	0.11	−0.32	D	2
22.	$3p^3$–$3p^2(^1D)4d$	$^2D^o - {}^2F$											
			66.526	46110	1549280	6	8	1700	0.15	0.20	−0.05	D	2
23.		$^2D^o - {}^2P$											
			65.805	46110	1565750	6	4	510	0.022	0.029	−0.88	D	2
24.		$^2P^o - {}^2S$											
			67.164	80514	1569400	4	2	1100	0.038	0.034	−0.82	D	2
25.	$3p^2(^3P)3d$–$3p^2(^3P)4p$	$^4F - {}^4D^o$											
			108.440			10	8	330	0.047	0.17	−0.33	D	2
			108.605			8	6	330	0.044	0.13	−0.45	D	2
			108.862			6	4	320	0.038	0.082	−0.64	D	2
26.	$3p^2(^1D)3d$–$3p^2(^1D)4p$	$^2G - {}^2F^o$											
			110.591			10	8	310	0.046	0.17	−0.34	D	2
			110.732			8	6	130	0.018	0.052	−0.84	D	2
27.	$3p^2(^3P)3d$–$3p^2(^3P)4f$	$^4F - {}^4G^o$											
			84.491			10	12	5200	0.67	1.9	0.83	D	2
			84.48			8	10	4900	0.66	1.5	0.72	D	2
			84.52			6	8	4000	0.57	0.95	0.53	D	2
			84.48			4	6	4500	0.72	0.80	0.46	D	2
28.		$^4D - {}^4F^o$											
			84.85			6	8	2300	0.33	0.55	0.30	D	2
29.	$3p^2(^1D)3d$–$3p^2(^1D)4f$	$^2G - {}^2H^o$											
			85.477			10	12	4600	0.60	1.7	0.78	D	2
			85.14			8	10	3400	0.46	1.0	0.57	D	2

Fe XIII

Ground State $1s^22s^22p^63s^23p^2\ ^3P_0$

Ionization Potential [360.0] eV = [2903700] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
62.10	33	178.05	20	233.234	6	313	3
62.353	31	181.03	20	237	16	318.21	9
62.46	32	185.75	19	238	16	320.800	3
62.699	31	191.24	25	238.38	6	321.45	3
63.188	34	196.525	24	240.713	5	348.184	2
64.139	35	197.434	18	241.10	27	354.34	8
74.327	29	200.021	18	242	16	355.14	8
74.845	29	201.121	18	246.208	5	359.63	2
75.892	29	202.044	17	248.01	26	359.837	2
76.117	30	202.424	17	251.953	5	368.12	2
78.452	38	203.793	18	256	21	372.03	2
78.760	38	203.826	18	256.42	11	372.24	2
81.154	40	204.942	18	261	21	412.98	7
82.010	41	205.91	17	272.19	10	417.90	7
84.270	42	208.679	28	283.26	4	418.17	7
85.461	43	209.916	17	288.75	15	420.33	13
98.128	36	216.83	23	290.89	4	511.60	12
98.523	36	216.87	23	303.35	3	493	1
98.826	36	218.13	23	308.91	14	517	1
107.384	37	223.78	22	311.552	3		
175.15	20	228.28	6	312.164	3		

Significant correlation effects in this Si-like ion make the accurate calculation of oscillator strengths difficult. Flower and Nussbaumer [1] have studied resonance transitions to the $3s3p^3$ and $3s^23p3d$ configurations by using a variation of the Thomas-Fermi method with allowance for configuration interaction. They remark that their results are quite sensitive to the particular configurations included, causing substantial discrepancies with earlier, more restricted calculations. More recently, Bromage et al. [2] have used Cowan's multiconfiguration Hartree-XR approach including exchange (X) and relativistic effects (R) and semiempirically scaled Slater parameters to calculate *gf*-values for the strongest lines of these same transition arrays.

With the exception of a few lines of the $3p^2$–$3p3d$ array, the results of these two sources are in excellent agreement for the transitions in common. We have adopted the results of ref. [2] for the transitions treated there, while ref. [1] has been quoted for the remaining ones. Flower and Nussbaumer's *A*-values have been modified to account for the deviation of their calculated wavelengths from observed ones (or from wavelengths computed from experimentally derived energy levels). In a few cases, the calculated energy levels from ref. [2] have been used to determine wavelengths. The accuracy ratings for the two lines mentioned above have been lowered to "E," as have those for transitions whose upper or lower level is indicated to be of low purity in *LS* coupling. Transitions involving any level whose dominant component is significantly less than 50% have been excluded from this compilation.

The *f*-value of 0.055 calculated by Sinanoglu and Beck [3] according to their non-closed shell many-electron theory (NCMET) for the $3s^23p^2\ ^3P$–$3s3p^3\ ^3D^\circ$ multiplet is in good agreement with our tabulated value derived from the results for individual lines.

Transitions to $n = 4$ states have been treated by Fawcett et al. [4] in Cowan's statistical Hartree-Fock approximation, as well as by Kastner et al. [5] in a multiconfiguration scheme. The results have been averaged for transitions in common. The remarks made above concerning accuracy ratings for lines connecting levels of low purity apply to these transitions as well. We should note further that the classifications of some observed spectral lines of these arrays are indicated by the respective authors to be questionable.

References

[1] Flower, D. R., and Nussbaumer, H., Astron. Astrophys. **31**, 353 (1974).

[2] Bromage, G. E., Cowan, R. D., and Fawcett, B. C., Mon. Not. R. Astron. Soc. **183**, 19 (1978).

[3] Sinanoglu, O., and Beck, D. R., Chem. Phys. Lett. **24**, 20 (1974).

[4] Fawcett, B. C., Cowan, R. D., Kononov, E. Y., and Hayes, R. W., J. Phys. B **5**, 1255 (1972).

[5] Kastner, S. O., Swartz, M., Bhatia, A. K., and Lapides, J., J. Opt. Soc. Am. **68**, 1558 (1978).

Fe XIII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accu-racy	Source
1.	$3s^23p^2-3s3p^3$	^{3}P - ^{5}S°											
			[517]	18561.0	[212000]	5	5	0.091	3.6(−4)[a]	0.0031	−2.74	E	1
			[493]	9302.5	[212000]	3	5	0.054	3.3(−4)	0.0016	−3.01	E	1
2.		^{3}P - ^{3}D°	*363.31*	*13412.5*	*288660*	9	15	14	0.047	0.51	−0.37	D−	1,2
			368.12	18561.0	290210	5	7	13	0.036	0.22	−0.74	D	2
			359.63	9302.5	287360	3	5	15	0.050	0.18	−0.82	D	2
			348.184	0.0	287205	1	3	10	0.07	0.08	−1.2	E	2
			[372.03]	18561.0	287360	5	5	0.48	0.0010	0.0061	−2.30	D	1
			359.837	9302.5	287205	3	3	3.5	0.0068	0.024	−1.69	D	1
			[372.24]	18561.0	287205	5	3	0.11	1.4(−4)	8.4(−4)	−3.16	E	1
3.		^{3}P - ^{3}P°	*316*	*13412.5*	*[330000]*	9	9	41	0.061	0.57	−0.26	D	1,2
			320.800	18561.0	330279	5	5	34	0.052	0.27	−0.59	D	2
			312.164	9302.5	329647	3	3	20	0.029	0.089	−1.06	D	2
			[321.45]	18561.0	329647	5	3	10	0.0096	0.051	−1.32	D	1
			[313]	9302.5	[329000]	3	1	41	0.020	0.062	−1.22	D	2
			311.552	9302.5	330279	3	5	4.8	0.012	0.036	−1.45	D	1
			[303.35]	0.0	329647	1	3	14	0.057	0.057	−1.24	D	1
4.		^{3}P - ^{1}D°											
			[290.89]	18561.0	362330	5	5	1.3	0.0016	0.0076	−2.10	E	1
			[283.26]	9302.5	362330	3	5	0.70	0.0014	0.0039	−2.38	E	1
5.		^{3}P - ^{3}S°	*248.73*	*13412.5*	415462	9	3	610	0.19	1.4	0.23	D	2
			251.953	18561.0	415462	5	3	350	0.20	0.83	0.00	D	2
			246.208	9302.5	415462	3	3	180	0.16	0.39	−0.32	D	2
			240.713	0.0	415462	1	3	69	0.18	0.14	−0.74	D	2
6.		^{3}P - ^{1}P°											
			[238.38]	18561.0	438056	5	3	9.5	0.0048	0.019	−1.62	D	1
			233.234	9302.5	438056	3	3	53	0.043	0.099	−0.89	D	2
			[228.28]	0.0	438056	1	3	7.4	0.017	0.013	−1.76	D	1
7.		^{1}D - ^{3}D°											
			[412.98]	48068	290210	5	7	0.90	0.0032	0.022	−1.79	D	1
			[417.90]	48068	287360	5	5	0.11	2.8(−4)	0.0019	−2.86	E	1
			[418.17]	48068	287205	5	3	0.32	5.1(−4)	0.0035	−2.59	E	1
8.		^{1}D - ^{3}P°											
			[354.34]	48068	330279	5	5	0.054	1.0(−4)	5.9(−4)	−3.30	E	1
			[355.14]	48068	329647	5	3	0.53	6.0(−4)	0.0035	−2.52	E	1
9.		^{1}D - ^{1}D°	318.21	48068	362330	5	5	53	0.080	0.42	−0.40	E	2
10.		^{1}D - ^{3}S°											
			[272.19]	48068	415462	5	3	6.0	0.0040	0.018	−1.70	D	1
11.		^{1}D - ^{1}P°	256.42	48068	438056	5	3	300	0.18	0.76	−0.05	D	2
12.		^{1}S - ^{3}D°											
			[511.60]	91740	287205	1	3	0.028	3.3(−4)	5.6(−4)	−3.48	E	1

Fe XIII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
13.		^{1}S - ^{3}P°											
			[420.33]	91740	329647	1	3	0.24	0.0019	0.0026	−2.73	D	1
14.		^{1}S - ^{3}S°											
			[308.91]	91740	415462	1	3	3.9	0.017	0.017	−1.78	D	1
15.		^{1}S - ^{1}P°	[288.75]	91740	438056	1	3	40	0.15	0.14	−0.82	D	2
16.	$3p^2$–$3p3d$	^{3}P - ^{3}F°											
			[238]	18561.0	[438000]	5	7	3.2	0.0038	0.015	−1.72	E	1
			[237]	9302.5	[431000]	3	5	1.1	0.0016	0.0037	−2.32	E	1
			[242]	18561.0	[431000]	5	5	1.3	0.0011	0.0045	−2.25	E	1
17.		^{3}P - ^{3}P°											
			[205.91]	9302.5	494942	3	3	0.16	1.0(−4)	2.1(−4)	−3.51	E	1
			209.916	18561.0	494942	5	3	61	0.024	0.083	−0.92	E	2
			202.424	9302.5	503315	3	1	490	0.10	0.20	−0.52	D	2
			202.044	0.0	494942	1	3	530	0.97	0.65	−0.01	E	2
18.		^{3}P - ^{3}D°	*201.92*	*13412.5*	*508666*	9	15	640	0.65	3.9	0.77	D	2
			203.826	18561.0	509176	5	7	680	0.59	2.0	0.47	D	2
			200.021	9302.5	509250	3	5	190	0.19	0.38	−0.24	D	2
			197.434	0.0	506502	1	3	50	0.08	0.05	−1.1	E	2
			203.793	18561.0	509250	5	5	370	0.23	0.77	0.06	D	2
			201.121	9302.5	506502	3	3	410	0.25	0.50	−0.12	E	2
			204.942	18561.0	506502	5	3	160	0.060	0.20	−0.52	E	2
19.		^{3}P - ^{1}F°											
			[185.75]	18561.0	556910	5	7	32	0.023	0.071	−0.94	D	1
20.		^{3}P - ^{1}P°											
			[181.03]	18561.0	570944	5	3	0.11	3.4(−5)	1.0(−4)	−3.78	E	1
			[178.05]	9302.5	570944	3	3	1.8	8.5(−4)	0.0015	−2.59	E	1
			[175.15]	0.0	570944	1	3	4.3	0.0059	0.0034	−2.23	D	1
21.		^{1}D - ^{3}F°											
			[256]	48068	[438000]	5	7	0.28	3.8(−4)	0.0016	−2.72	E	1
			[261]	48068	[431000]	5	5	3.2	0.0033	0.014	−1.79	D	1
22.		^{1}D - ^{3}P°											
			[223.78]	48068	494942	5	3	7.2	0.0033	0.012	−1.79	E	1
23.		^{1}D - ^{3}D°											
			[216.87]	48068	509176	5	7	24	0.024	0.086	−0.92	D	2
			[216.83]	48068	509250	5	5	96	0.068	0.24	−0.47	D	2
			[218.13]	48068	506502	5	3	12	0.0050	0.018	−1.60	E	1
24.		^{1}D - ^{1}F°	196.525	48068	556910	5	7	720	0.58	1.9	0.46	D	2
25.		^{1}D - ^{1}P°	191.24	48068	570944	5	3	0.0083	2.7(−6)	8.6(−6)	−4.86	E	1
26.		^{1}S - ^{3}P°											
			[248.01]	91740	494942	1	3	0.89	0.0024	0.0020	−2.61	E	1

Fe XIII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
27.		${}^1S - {}^3D^o$											
			[241.10]	91740	506502	1	3	0.17	4.4(−4)	3.5(−4)	−3.36	E	1
28.		${}^1S - {}^1P^o$	208.679	91740	570944	1	3	610	1.2	0.82	0.08	D	2
29.	$3p^2-3p4s$	${}^3P - {}^3P^o$											
			74.845	18561.0	1354700	5	5	1000	0.088	0.11	−0.36	D	4
			75.892	18561.0	1336200	5	3	770	0.040	0.050	−0.70	D	4
			74.327	9302.5	1354700	3	5	410	0.057	0.042	−0.77	D	4
30.		${}^1D - {}^1P^o$	76.117	48068	1361800	5	3	2100	0.11	0.14	−0.26	D	4
31.	$3p^2-3p4d$	${}^3P - {}^3D^o$											
			62.699	9302.5	1604200	3	5	2300	0.23	0.14	−0.17	D	4,5
			62.353	0.0	1603800	1	3	2000	0.35	0.072	−0.46	D	5
32.		${}^3P - {}^3F^o$											
			62.46	18561.0	1620000	5	7	1200	0.098	0.10	−0.31	D	5
33.		${}^3P - {}^3P^o$											
						5	5	1400				D	5
			62.10?	9302.5	1620000?	3	1	1600	0.031	0.019	−1.03	D	5
34.		${}^1D - {}^1F^o$	63.188	48068	1630600	5	7	3900	0.33	0.34	0.21	D	4.5
35.		${}^1S - {}^1P^o$	64.139	91740	1650900	1	3	2100	0.39	0.082	−0.41	D	5
36.	$3p3d-3p4p$	${}^3F^o - {}^3D$											
			98.128	[448000]	[1467000]	9	7	410	0.046	0.13	−0.38	D	4
			98.523	[438000]	[1453000]	7	5	380	0.040	0.091	−0.55	D	4
			98.826	[431000]	[1443000]	5	3	390	0.034	0.055	−0.77	E	4
37.		${}^1F^o - {}^1D$	107.384	556910	1488150	7	5	1800	0.22	0.54	0.19	D	4
38.	$3p3d-3p4f$	${}^3F^o - {}^3G$											
			78.452	[448000]	[1723000]	9	11	6500	0.73	1.7	0.82	D	4,5
			78.760	[438000]	[1708000]	7	9	4100	0.50	0.90	0.54	E	4,5
39.		${}^3P^o - {}^3F$											
						3	5	1900				E	5
40.		${}^3P^o - {}^3D$											
			81.154?	503315	1735500?	1	3	2300	0.68	0.18	−0.17	D	5
41.		${}^3D^o - {}^3F$											
			82.010?	509176	1728500?	7	9	3700	0.48	0.91	0.53	E	4,5
						3	5	1900				E	5
42.		${}^1F^o - {}^1G$	84.270	556910	1743600	7	9	5600	0.77	1.5	0.73	D	4,5
43.		${}^1P^o - {}^1D$	85.461?	570944	1741100?	3	5	3400	0.62	0.52	0.27	D	5

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[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe XIV

Ground State $1s^22s^22p^63s^23p\ ^2P^\circ_{1/2}$

Ionization Potential $[391.0]$ eV $= [3153700]$ cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
58.963	47	76.022	49	219.13	21	356.60	1
59.579	47	76.137	49	220.09	21	719.58	51
59.626	47	76.152	49	252.190	3	747.38	51
69.176	46	78.449	20	257.385	3	786.41	52
69.386	46	78.584	20	264.799	3	811.03	52
69.66	46	78.769	20	270.512	3	819.74	52
69.685	45	90.845	48	274.22	2	1079	53
70.251	46	91.009	48	280.69	11	1095	53
70.613	45	91.273	48	288.45	11	1098	53
72.796	50	211.32	21	289.17	2		
72.95	50	216.95	24	334.15	1		
73.08	50	218.21	24	353.84	1		

Strong configuration interaction in the Al sequence makes the accurate calculation of oscillator strengths for Fe XIV difficult. In many cases the results are quite sensitive to the particular configurations included.

Blaha [1] has computed *gf*-values for a large number of transitions by combining Hartree-Fock wave functions with mixing coefficients which were derived from a diagonalization of a semi-empirical Slater parameter matrix. The accuracy of these data is difficult to assess because of the combination of *ab initio* and semi-empirical methods. Mason [2] has provided *f*-values for the $3p$-$3d$ transitions by using a scaled Thomas-Fermi method. The Hartree-Fock-Slater calculations of Fawcett et al. [3] might be expected to be reasonably accurate, although they have not explicitly included configuration interaction. It should be noted that all of the above calculations have included the effects of intermediate coupling.

The most sophisticated material available for high ions of the Al sequence consists of Weiss' superposition-of-configurations (SOC) calculations [4] and Froese Fischer's nonrelativistic multiconfiguration Hartree-Fock (MCHF) approach [5,6]. However, only multiplet *f*-values have been determined by these two investigators, and accurate values of relative strengths within multiplets are not available. Moreover, the accuracies of their multiplet strengths were difficult to assess, on account of the level crossings occurring along the isoelectronic sequence at or near the iron ion.

Multiplet *f*-values derived from Blaha's data for individual lines are in good agreement with Weiss' results for two of the four multiplets in common, while in the remaining two cases they deviate by 36 and 58 percent, respectively. Blaha's relative values nevertheless indicate that *LS* coupling is a good approximation in these cases. Weiss' multiplet *f*-values have thus been quoted here and his multiplet strengths have been distributed according to *LS*-coupling rules. Froese Fischer has made a detailed study of the $3s^23p\ ^2P^\circ$–$3s3p^2\ ^2D$ and $3p\ ^2P^\circ$–$3d\ ^2D$ transitions in the Al sequence, and her multiplet values are in good agreement with those presented here. She has used the same method to calculate the oscillator strength of the $4s\ ^2S$ – $4p\ ^2P^\circ$ multiplet. The value of 0.48 obtained by using her own calculated energy difference is significantly lower than the value of 0.58 obtained by incorporating the experimentally derived energy difference, and both of these are lower than the multiplet value derived from the results of ref. [1] for individual lines. It is not known whether these discrepanicies arise from the methods used in performing the transition integral calculations or from the classifications of the observed spectral lines from which the energies of the $4s$ and $4p$ levels were derived.

References

[1] Blaha, M., Sol. Phys. **17**, 99 (1971).

[2] Mason, H. E., Mon. Not. R. Astron. Soc., **170**, 651 (1975).

[3] Fawcett, B. C., Cowan, R. D., Kononov, E. Y., and Hayes, R. W., J. Phys. B **5**, 1255 (1972).

[4] Weiss, A. W., *Beam-Foil Spectroscopy*, Vol. I, 51-68 (Eds. Sellin, I. A., and Pegg, D. J., Plenum Press, New York, 1976) and private communication.

[5] Froese Fischer, C., Can. J. Phys. **54**, 740 (1976).

[6] Froese Fischer, C., Can. J. Phys. **56**, 983 (1978).

Fe XIV: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$3s^23p$–$3s3p^2$	$^2P^\circ - {}^2D$	*347.20*	*12568.3*	*300590*	6	10	21	0.063	0.43	−0.42	D	1
			353.84	18852.5	301460	4	6	19	0.054	0.25	−0.67	D	1
			334.15	0.0	299280	2	4	24	0.079	0.17	−0.80	D	1
			356.60	18852.5	299280	4	4	0.63	0.0012	0.0056	−2.32	D	1
2.		$^2P^\circ - {}^2S$	*284.01*	*12568.3*	364670	6	2	200	0.082	0.46	−0.31	D	1
			289.17	18852.5	364670	4	2	11	0.0069	0.026	−1.56	E	1
			274.22	0.0	364670	2	2	210	0.24	0.43	−0.32	C	1
3.		$^2P^\circ - {}^2P$	*262.28*	*12568.3*	*393840*	6	6	520	0.54	2.8	0.51	D	1
			264.799	18852.5	396510	4	4	430	0.45	1.6	0.26	D	1
			257.385	0.0	388490	2	2	180	0.18	0.31	−0.44	D	1
			270.512	18852.5	388490	4	2	260	0.14	0.50	−0.25	D	1
			252.190	0.0	396510	2	4	110	0.21	0.35	−0.38	D	1
4.	$3s^23p$–$3s3d^2$	$^2P^\circ - {}^2S$				6	2		3.0(−4)[a]		−2.74	C	4
5.	$3s^23d$– $3s3p(^3P^\circ)3d$	$^2D - {}^2F^\circ$											
						6	8		0.032		−0.72	E	1
						4	6		0.029		−0.94	E	1
						6	6		0.0050		−1.52	E	1
6.		$^2D - {}^2D^\circ$											
						6	6		0.26		0.19	D	1
						4	4		0.27		0.03	D	1
						6	4		6.1(−4)		−2.44	E	1
						4	6		0.0055		−1.66	E	1
7.		$^2D - {}^2P^\circ$											
						6	4		0.12		−0.14	D	1
						4	2		0.10		−0.40	D	1
						4	4		0.0019		−2.12	E	1
8.	$3s^23d$– $3s3p(^1P^\circ)3d$	$^2D - {}^2F^\circ$											
						6	8		0.52		0.49	D	1
						4	6		0.56		0.35	D	1
						6	6		0.016		−1.02	E	1
9.		$^2D - {}^2D^\circ$											
						6	6		0.0048		−1.54	E	1
						4	4		0.0062		−1.61	E	1
						4	6		0.0040		−1.80	E	1
10.		$^2D - {}^2P^\circ$											
						6	4		0.029		−0.76	E	1
						4	2		0.0082		−1.48	E	1
						4	4		6.1(−4)		−2.61	E	1

Fe XIV: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
11.	$3s3p^2$–$3p^3$	^{4}P – ^{4}S$^\circ$											
			288.45			6	4	170	0.14	0.80	−0.08	D	1
			280.69			4	4	130	0.15	0.55	−0.22	D	1
						2	4		0.15		−0.52	D	1
12.		^{2}D – ^{2}D$^\circ$											
						6	6		0.050		−0.52	E	1
						4	4		0.037		−0.83	E	1
						6	4		0.0064		−1.42	E	1
						4	6		0.0070		−1.55	E	1
13.		^{2}D – ^{2}P$^\circ$											
						6	4		0.015		−1.05	E	1
						4	2		0.019		−1.12	E	1
						4	4		0.0075		−1.52	E	1
14.		^{2}S – ^{2}D$^\circ$											
						2	4		0.019		−1.42	E	1
15.		^{2}S – ^{2}P$^\circ$											
						2	4		0.043		−1.07	E	1
						2	2		0.0015		−2.52	E	1
16.		^{2}P – ^{2}D$^\circ$											
						4	6		0.031		−0.91	E	1
						2	4		0.028		−1.25	E	1
						4	4		0.017		−1.17	E	1
17.		^{2}P – ^{2}P$^\circ$											
						4	4		0.11		−0.36	D	1
						2	2		0.059		−0.93	E	1
						4	2		0.0077		−1.51	E	1
18.	$3s3p(^3P^\circ)3d$– $3p^2(^1D)3d$	^{2}P$^\circ$ – ^{2}S				6	2		0.0012		−2.14	D	4
19.	$3s3p(^1P^\circ)3d$– $3p^2(^1D)3d$	^{2}P$^\circ$ – ^{2}S				6	2		0.032		−0.72	D	4
20.	$3s3p^2$–$3s^24p$	^{2}D – ^{2}P$^\circ$	*78.636*	*300590*	*1572270*	10	6	320	0.018	0.047	−0.74	C	4
			[78.584]	301460	1573990	6	4	290	0.018	0.028	−0.97	C	*ls*
			[78.769]	299280	1568820	4	2	330	0.015	0.016	−1.21	C	*ls*
			[78.449]	299280	1573990	4	4	33	0.0030	0.0031	−1.92	D	*ls*
21.	$3p$–$3d$	^{2}P$^\circ$ – ^{2}D	*216.53*	*12568.3*	*474400*	6	10	440	0.51	2.2	0.49	C	2
			219.13	18852.5	475200	4	6	420	0.45	1.3	0.26	C	2
			211.32	0.0	473210	2	4	370	0.50	0.70	0.00	C	2
			220.09	18852.5	473210	4	4	83	0.060	0.17	−0.62	C	2
22.	$3s^23p$–$3p^2(^1D)3d$	^{2}P$^\circ$ – ^{2}S				6	2		1.1(−4)		−3.18	D	4

Fe XIV: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accu-racy	Sourc
23.	$3s3p^2$- $3s3p(^3P^o)3d$	$^4P - ^4F^o$											
						6	8		0.0027		−1.79	E	1
						4	6		0.0017		−2.17	E	1
						2	4		0.072		−0.84	E	1
						6	6		6.2(−4)		−2.43	E	1
						4	4		0.022		−1.06	E	1
						6	4		0.0057		−1.47	E	1
24.		$^4P - ^4D^o$											
			218.21			6	8	430	0.41	1.8	0.39	D	1
			216.95			4	6	130	0.14	0.40	−0.25	D	1
						2	4		0.40		−0.10	D	1
						6	6		0.19		0.06	D	1
						4	4		0.034		−0.87	E	1
						2	2		0.29		−0.24	D	1
						6	4		0.0068		−1.39	E	1
						4	2		7.9(−4)		−2.50	E	1
25.		$^4P - ^4P^o$											
						6	6		0.025		−0.82	E	1
						4	4		0.16		−0.19	D	1
						2	2		0.0055		−1.96	E	1
						6	4		0.055		−0.48	E	1
						4	2		0.10		−0.40	D	1
						4	6		0.27		0.03	D	1
						2	4		0.0079		−1.80	E	1
26.		$^2D - ^2F^o$											
						6	8		0.22		0.12	D	1
						4	6		0.20		−0.10	D	1
						6	6		0.029		−0.76	E	1
27.		$^2D - ^2D^o$											
						6	6		8.6(−4)		−2.29	E	1
						4	4		0.0049		−1.71	E	1
						6	4		9.6(−4)		−2.24	E	1
28.		$^2D - ^2P^o$											
						6	4		0.18		0.03	D	1
						4	2		0.068		−0.57	E	1
						4	4		0.020		−1.10	E	1
29.		$^2S - ^2D^o$											
						2	4		0.093		−0.73	E	1
30.		$^2S - ^2P^o$											
						2	4		0.0021		−2.38	E	1
						2	2		0.070		−0.85	E	1

Fe XIV: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
31.		^{2}P - ^{2}F°											
						4	6		3.4(−4)		−2.87	E	1
32.		^{2}P - ^{2}D°											
						4	6		0.79		0.50	D	1
						2	4		0.46		−0.04	D	1
						4	4		0.093		−0.43	E	1
33.		^{2}P - ^{2}P°											
						4	4		0.010		−1.40	E	1
						2	2		0.12		−0.62	D	1
						4	2		0.061		−0.61	D	1
						2	4		0.37		−0.13	D	1
34.	$3s3p^2$– $3s3p(^1P°)3d$	^{2}D - ^{2}F°											
						6	8		0.16		−0.02	D	1
						4	6		0.18		−0.14	D	1
						6	6		0.0067		−1.40	E	1
35.		^{2}D - ^{2}D°											
						6	6		0.30		0.26	D	1
						4	4		0.31		0.09	D	1
						6	4		0.025		−0.82	E	1
						4	6		0.063		−0.60	E	1
36.		^{2}D - ^{2}P°											
						6	4		0.34		0.31	D	1
						4	2		0.38		0.18	D	1
						4	4		0.082		−0.48	E	1
37.		^{2}S - ^{2}D°											
						2	4		0.012		−1.62	E	1
38.		^{2}S - ^{2}P°											
						2	4		0.69		0.14	D	1
						2	2		0.15		−0.52	D	1
39.		^{2}P - ^{2}F°											
						4	6		0.0069		−1.56	E	1
40.		^{2}P - ^{2}D°											
						4	6		0.026		−0.98	E	1
						2	4		0.032		−1.19	E	1
						4	4		0.0060		−1.62	E	1
41.		^{2}P - ^{2}P°											
						4	4		0.0071		−1.55	E	1
						2	2		0.21		−0.38	D	1
						4	2		0.0061		−1.61	E	1
						2	4		0.0014		−2.55	E	1
42.	$3s3p(^3P°)3d$– $3s3d^2$	^{2}P° - ^{2}S				6	2		0.11		−0.18	C	4

Fe XIV: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
43.	$3s3p(^1P^o)3d$–$3s3d^2$	^{2}P° – ^{2}S				6	2		0.11		−0.18	C	4
44.	$3p^3$–$3p^2(^1D)3d$	^{2}P° – ^{2}S				6	2		0.090		−0.27	C	4
45.	$3p$–$4s$	^{2}P° – ^{2}S	*70.301*	*12568.3*	1435020	6	2	2500	0.062	0.086	−0.43	C	4
			70.613	18852.5	1435020	4	2	1600	0.061	0.057	−0.61	C	*ls*
			[69.685]	0.0	1435020	2	2	870	0.063	0.029	−0.90	C	*ls*
46.	$3s3p^2$–$3s3p(^3P^o)4s$	^{4}P – ^{4}P°											
			69.66			6	6	1300	0.092	0.13	−0.26	D	3
			70.251			6	4	810	0.040	0.056	−0.62	D	3
			69.176			4	6	560	0.060	0.055	−0.62	D	3
			69.386			2	4	760	0.11	0.050	−0.66	D	3
47.	$3p$–$4d$	^{2}P° – ^{2}D	*59.375*	*12568.3*	*1696770*	6	10	3200	0.28	0.33	0.23	C	4
			59.579	18852.5	1697290	4	6	3200	0.25	0.20	0.00	C	*ls*
			58.963	0.0	1695980	2	4	2700	0.28	0.11	−0.25	C	*ls*
			[59.626]	18852.5	1695980	4	4	530	0.028	0.022	−0.95	C	*ls*
48.	$3d$–$4p$	^{2}D – ^{2}P°	*91.085*	*474400*	*1572270*	10	6	380	0.028	0.084	−0.55	C	4
			91.009	475200	1573990	6	4	340	0.028	0.050	−0.78	C	*ls*
			91.273	473210	1568820	4	2	370	0.023	0.028	−1.03	C	*ls*
			[90.845]	473210	1573990	4	4	38	0.0047	0.0056	−1.73	D	*ls*
49.	$3d$–$4f$	^{2}D – ^{2}F°	*76.099*	*474400*	*1788470*	10	14	6900	0.84	2.1	0.92	C	1,3
			76.152	475200	1788360	6	8	7000	0.81	1.2	0.69	C	3
			76.022	473210	1788620	4	6	6600	0.86	0.86	0.54	C	3
			[76.137]	475200	1788620	6	6	390	0.034	0.051	−0.69	E	1
50.	$3s3p(^3P^o)3d$–$3s3p(^3P^o)4f$	^{4}F° – ^{4}G											
			72.796			10	12	7900	0.75	1.8	0.88	D	3
			73.08			8	10	5000	0.50	0.96	0.60	D	3
			72.95			6	8	5100	0.54	0.78	0.51	D	3
51.	$4s$–$4p$	^{2}S ^{2}P°	*728.60*	1435020	*1572270*	2	6	29	0.69	3.3	0.14	D	1
			[719.58]	1435020	1573990	2	4	30	0.46	2.2	−0.04	D	1
			[747.38]	1435020	1568820	2	2	26	0.22	1.1	−0.36	D	1
52.	$4p$–$4d$	^{2}P° – ^{2}D	*803.21*	*1572270*	*1696770*	6	10	39	0.63	10	0.58	D	1
			[811.03]	1573990	1697290	4	6	39	0.57	6.1	0.36	D	1
			[786.41]	1568820	1695980	2	4	35	0.65	3.4	0.11	D	1
			[819.74]	1573990	1695980	4	4	6.3	0.063	0.68	−0.60	D	1
53.	$4d$–$4f$	^{2}D – ^{2}F°	*1091*	*1696770*	*1788470*	10	14	7.2	0.18	6.5	0.26	D	1
			[1098]	1697290	1788360	6	8	7.1	0.17	3.7	0.01	D	1
			[1079]	1695980	1788620	4	6	6.9	0.18	2.6	−0.14	D	1
			[1095]	1697290	1788620	6	6	0.47	0.0084	0.18	−1.30	D	1

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[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe XV

Ground State	$1s^22s^22p^63s^2\ ^1S_0$
Ionization Potential	[456] eV = [3678000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
38.95	11	70.054	20	227.21	12	312.55	4
52.911	10	70.224	28	227.70	12	317.62	3
59.404	19	70.519	28	233.87	12	321.82	3
63.957	22	70.53	27	234.76	12	323.57	7
65.370	17	70.59	27	235.27	12	327.03	4
65.612	17	70.601	27	243.80	15	417.24	1
66.238	17	71.062	26	284.15	2	435.20	5
68.860	23	73.199	25	292.36	3	470.26	5
68.884	24	73.471	29	302.45	3	481.52	6
69.049	23	73.473	21	303.40	14	493.63	5
69.66	18	191.40	13	305.00	3		
69.945	20	196.73	13	305.88	14		
69.987	20	224.76	12	307.78	3		

Results of several accurate theoretical calculations are available for in-shell ($n = 3$) transitions in this highly ionized member of the Mg isoelectronic sequence. Cheng and Johnson [1] have used a relativistic multi-configuration Hartree-Fock (MCHF) approach to determine line strengths for several transitions of the $3s^2$–$3s3p$ and $3s3p$–$3p^2$ arrays. Weiss [2] has performed superposition-of-configurations (SOC) calculations in intermediate coupling to determine line strengths for numerous transitions within the $n = 3$ shell, and his results are tabulated here for several transitions not treated in ref. [1].

We note that, with the exception of the $3s^2\ ^1S$–$3s3p\ ^3P_1^\circ$ intercombination line, the results of Aymar and Luc-Koenig [3] obtained by introducing relativistic effects via a parametric potential method are in very good agreement with the data tabulated here. Multiplet strengths which include the effects of configuration interaction have been calculated by Froese [4] and by Crossley and Dalgarno [5] in the Hartree-Fock and Z-expansion approximations, respectively, for many additional $\Delta n = 0$ transitions, but they are not tabulated here since the wavelengths are unknown at this time.

The f-values of the $3s^2\ ^1S$ – $3snp\ ^1P^\circ$ ($n = 4,5$) transitions calculated by Shorer et al. [6] in the relativistic random phase approximation (RRPA) are quoted here, and their results for the $3s^2$–$3s3p$ transitions are in good agreement with those of ref. [1].

The multiconfiguration results of Kastner et al. [7] in intermediate coupling have been tabulated for a number of $3p3d$–$3p4f$ transitions. Data for additional lines involving electrons which occupy orbitals of principal quantum number $n = 4$ are from the Hartree-Fock-Slater (HX) results of Cowan and Widing [8] and Fawcett et al. [9]. (The f-value for the $3s3p\ ^3P_2^\circ$–$3s3d\ ^3D_3$ transition has also been taken from ref. [8].) Froese Fischer [10] has calculated oscillator strengths in a nonrelativistic MCHF scheme for a few D–F° multiplets. Her f-value of 0.90 for the multiplet could not be directly compared to the results of Cowan and Widing, since they have published gf-values for only the strongest lines of the multiplet.

A single configuration approximation has been applied by Burkhalter et al. [11] to the calculation of A-values for several inner-shell transitions. Because of the neglect of correlation effects, we have not tabulated these data.

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Fe XV: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$3s^2$–$3s3p$	^1S – $^3P^o$											
			417.24	0	239670	1	3	0.41	0.0032	0.0044	−2.49	D	1
2.		^1S – $^1P^o$	284.15	0	351930	1	3	220	0.80	0.75	−0.10	C	1
3.	$3s3p$–$3p^2$	$^3P^o$ – ^3P	*306.67*	*246900*	*572980*	9	9	179	0.252	2.29	0.356	C+	1
			305.00	253820	581710	5	5	127	0.177	0.891	−0.052	C+	1
			307.78	239670	564580	3	3	49.1	0.0697	0.212	−0.679	C+	1
			321.82	253820	564580	5	3	71.1	0.0663	0.351	−0.480	C+	1
			317.62	239670	554510	3	1	177	0.0893	0.280	−0.572	C+	1
			292.36	239670	581710	3	5	44.6	0.0952	0.275	−0.544	C+	1
			302.45	233950	564580	1	3	69.3	0.285	0.284	−0.545	C+	1
4.		$^3P^o$ – ^1D											
			327.03	253820	559610	5	5	20	0.032	0.17	−0.80	C	1
			312.55	239670	559610	3	5	11	0.027	0.083	−1.09	D	1
5.		$^1P^o$ – ^3P											
			[435.20]	351930	581710	3	5	4.7	0.022	0.096	−1.17	D	1
			[470.26]	351930	564580	3	3	0.084	2.8(−4)[a]	0.0013	−3.08	D	1
			[493.63]	351930	554510	3	1	0.64	7.8(−4)	0.0038	−2.63	D	1
6.		$^1P^o$ – ^1D	481.52	351930	559610	3	5	15.5	0.0896	0.426	−0.571	C+	1
7.		$^1P^o$ – ^1S	323.57	351930	660980?	3	1	202	0.105	0.337	−0.50	C	2
8.	$3s3d$–$3p3d$	^3D – $^3F^o$	383.98	680360	940790	15	21	48.8	0.151	2.86	0.355	C	10
9.		^1D – $^1F^o$				5	7		0.378		0.276	C	10
10.	$3s^2$–$3s4p$	^1S – $^1P^o$	52.911	0	1889970	1	3	2940	0.370	0.064	−0.432	C	6
11.	$3s^2$–$3s5p$	^1S – $^1P^o$	38.95	0	2567000	1	3	1690	0.115	0.0147	−0.94	C	6
12.	$3s3p$–$3s3d$	$^3P^o$ – ^3D	*230.70*	*246900*	*680360*	9	15	238	0.316	2.16	0.454	C	2,8
			233.87	253820	681410	5	7	239	0.274	1.05	0.137	C	8
			227.21	239670	679790	3	5	180	0.233	0.522	−0.156	C+	2
			224.76	233950	678860	1	3	138	0.314	0.232	−0.504	C+	2
			234.76	253820	679790	5	5	54.5	0.0450	0.174	−0.648	C+	2
			227.70	239670	678860	3	3	99.0	0.0769	0.173	−0.637	C+	2
			[235.27]	253820	678860	5	3	6.2	0.0031	0.012	−1.81	D	2
13.		$^3P^o$ – ^1D											
			[196.73]	253820	762130	5	5	0.11	6.5(−5)	2.1(−4)	−3.49	D−	2
			[191.40]	239670	762130	3	5	3.0	0.0028	0.0052	−2.08	D	2
14.		$^1P^o$ – ^3D											
			303.40	351930	679790	3	5	0.14	3.2(−4)	9.6(−4)	−3.02	D	2
			[305.88]	351930	678860	3	3	0.24	3.3(−4)	0.0010	−3.00	D	2
15.		$^1P^o$ – ^1D	243.80	351930	762130	3	5	419	0.623	1.50	0.272	C+	2
16.	$3p^2$–$3p3d$	^1D – $^1F^o$				5	7		0.232		0.064	C	10

Fe XV: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
17.	$3s3p-3s4s$	$^3P^o - {}^3S$	*65.930*	*246900*	1763670	9	3	2800	0.061	0.12	−0.26	D	8
			66.238	253820	1763670	5	3	1600	0.062	0.068	−0.51	D	8
			65.612	239670	1763670	3	3	980	0.063	0.041	−0.72	D	8
			65.370	233950	1763670	1	3	320	0.062	0.013	−1.21	D	8
18.		$^1P^o - {}^1S$	69.66?	351930	1787000?	3	1	1900	0.047	0.032	−0.85	D	8
19.	$3s3p-3s4d$	$^1P^o - {}^1D$	59.404	351930	2035320	3	5	3400	0.30	0.18	−0.05	C	8
20.	$3s3d-3s4f$	$^3D - {}^3F^o$											
			70.054	681410	2108880	7	9	8800	0.83	1.3	0.76	C	8
			69.987	679790	2108630	5	7	7900	0.81	0.93	0.61	C	8
			69.945	678860	2108550	3	5	7400	0.91	0.63	0.44	C	8
21.		$^1D - {}^1F^o$	73.473?	762130	2123170	5	7	6100	0.69	0.83	0.54	C	10
22.	$3p^2-3s4f$	$^1D - {}^1F^o$	[63.957]	559610	2123170	5	7	2300	0.20	0.21	0.00	D	10
23.	$3p3d-3p4f$	$^3F^o - {}^3G$											
			68.860	949660	2402110	9	11	9200	0.80	1.6	0.86	C	7
			69.049	938190	2386710	7	9	6500	0.60	0.95	0.62	D	7
24.		$^3F^o - {}^3F$											
			68.884?	938190	2389900?	7	9	2200	0.20	0.32	0.15	D	7
25.		$^1F^o - {}^1G$	73.199			7	9	8800	0.91	1.5	0.80	C	7
26.		$^3D^o - {}^3F$											
			71.062			7	9	5200	0.51	0.83	0.55	D	7
			71.062			3	5	6400	0.81	0.57	0.38	C	7
27.		$^3D^o - {}^3D$											
			70.59			7	7	1700	0.13	0.21	−0.04	C	9
			70.53			5	5	3100	0.23	0.27	0.06	D	9
			70.53			7	5	260	0.014	0.023	−1.01	D	9
			70.601			5	7	4500	0.47	0.55	0.37	D	7
28.		$^3P^o - {}^3D$											
			70.519			3	5	4400	0.55	0.38	0.21	C	7
			70.224			1	3	4100	0.91	0.21	−0.04	C	7
			70.224			3	3	4200	0.31	0.22	−0.03	C	7
29.		$^1P^o - {}^1D$	73.471?			3	5	7000	0.94	0.69	0.45	C	7

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[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe XVI

Ground State $1s^22s^22p^63s\ ^2S_{1/2}$

Ionization Potential 489.5 eV = 3947840 cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
36.749	3	48.979	11	117.70	16	335.407	1
36.803	3	50.350	2	123.46	19	360.798	1
39.827	8	50.555	2	124.61	19	684.74	17
40.153	8	54.142	6	124.70	19	718.08	17
40.163	8	54.728	6	143.99	22	724.74	17
40.199	14	54.769	6	144.18	22	843.38	15
40.245	14	62.879	5	144.25	22	904.90	15
40.247	14	63.719	5	146.2	18	1411	25
41.095	13	66.263	10	148.0	18	1483	25
41.137	13	66.368	10	167.48	21	1496	25
41.17	13	66.393	10	167.84	21	1652	20
41.91	7	76.299	9	168.61	21	1672	20
42.30	7	76.502	9	251.058	4	1688	20
46.661	12	76.796	9	262.967	4	1690	24
46.718	12	96.245	23	265.007	4	1813	24
46.725	12	96.354	23	266.62	26		
48.883	11	96.364	23	266.96	26		
48.97	11	117.15	16	267.04	26		

Oscillator strengths have been computed for a great many transitions of this highly ionized member of the sodium isoelectronic sequence.

Kim and Cheng [1] have applied the relativistic single-configuration Hartree-Fock method to the calculation of *f*-values of individual lines for all cases in which the valence electron undergoes a transition of the type $nl\ ^2L - n'l'\ ^2L'$ $(n, n' = 3,4)$.

Froese Fischer [2] has calculated *f*-values for a few multiplets of this type by using the nonrelativistic multiconfiguration Hartree-Fock approach, and her results are in very good agreement with the multiplet oscillator strengths derived from the results of ref. [1].

Biemont [3] has computed a large number of Hartree-Fock *f*-values; because of the small correlation expected in the Na sequence, these results are expected to be quite accurate.

Tull et al. [4] have computed a large number of oscillator strengths for Fe XVI by using the frozen-core HF approximation, of which we have included some strong transitions arising from $3d$ and $4d$ states. Relativistic corrections to the theoretical wavelengths have been used in their calculation.

Froese Fischer [5] has parametrized additional Hartree-Fock data of Biemont, obtaining fits with errors of 1–2% over the isoelectronic sequence.

Burkhalter et al. [6] have published gA-values for numerous transitions involving excitation of a core $(2p)$ electron. We have not tabulated these data, however, since the authors apparently have not taken configuration interaction into account.

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Fe XVI: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$3s$–$3p$	^{2}S – ^{2}P°	*343.47*	0	*291150*	2	6	74.8	0.397	0.898	−0.100	B	1
			335.407	0	298140	2	4	80.6	0.272	0.601	−0.264	B	1
			360.798	0	277160	2	2	64.1	0.125	0.297	−0.602	B	1
2.	$3s$–$4p$	^{2}S – ^{2}P°	*50.418*	0	*1983410*	2	6	1890	0.217	0.0719	−0.363	B	1
			50.350	0	1986100	2	4	1850	0.141	0.0467	−0.550	B	1
			50.555	0	1978040	2	2	1970	0.0756	0.0252	−0.820	B	1
3.	$3s$–$5p$	^{2}S – ^{2}P°	*36.767*	0	*2719830.*	2	6	1150	0.0697	0.0169	−0.856	C+	3
			36.749	0	2721160	2	4	1150	0.0467	0.0113	−1.030	C	*ls*
			36.803	0	2717170	2	2	1100	0.023	0.0056	−1.34	D	*ls*
4.	$3p$–$3d$	^{2}P° – ^{2}D	*259.01*	*291150*	*677240*	6	10	170	0.285	1.46	0.234	B	1
			262.967	298140	678420	4	6	163	0.254	0.880	0.007	B	1
			251.058	277160	675470	2	4	156	0.294	0.486	−0.231	B	1
			265.007	298140	675470	4	4	26.5	0.0279	0.0974	−0.952	B	1
5.	$3p$–$4s$	^{2}P° – ^{2}S	*63.436*	*291150*	1867530	6	2	3230	0.0649	0.0813	−0.410	B	1
			63.719	298140	1867530	4	2	2170	0.0661	0.0555	−0.578	B	1
			62.879	277160	1867530	2	2	1050	0.0622	0.0258	−0.905	B	1
6.	$3p$–$4d$	^{2}P° – ^{2}D	*54.535*	*291150*	*2124850*	6	10	4150	0.308	0.332	0.267	B	1
			54.728	298140	2125360	4	6	4160	0.280	0.202	0.049	B	1
			54.142	277160	2124080	2	4	3410	0.300	0.107	−0.222	B	1
			54.769	298140	2124080	4	4	698	0.0314	0.0226	−0.901	B	1
7.	$3p$–$5s$	^{2}P° – ^{2}S	*42.18*	*291150*	2662000	6	2	1380	0.0123	0.0102	−1.132	C+	3
			42.30	298140	2662000	4	2	910	0.012	0.0068	−1.311	C	*ls*
			41.91	277160	2662000	2	2	468	0.0123	0.00340	−1.61	C	*ls*
8.	$3p$–$5d$	^{2}P° – ^{2}D	*40.045*	*291150*	*2788370*	6	10	2490	0.0996	0.0788	−0.224	C+	3
			40.153	298140	2788610	4	6	2470	0.089	0.0473	−0.446	C	*ls*
			39.827	277160	2788020	2	4	2110	0.100	0.0263	−0.70	C	*ls*
			[40.163]	298140	2788020	4	4	410	0.010	0.0053	−1.40	D	*ls*
9.	$3d$–$4p$	^{2}D – ^{2}P°	*76.560*	*677240*	*1983410*	10	6	750	0.0397	0.100	−0.401	C	1
			76.502	678420	1986100	6	4	668	0.0391	0.0591	−0.630	B	1
			76.796	675470	1978040	4	2	769	0.0340	0.0344	−0.866	B	1
			[76.299]	675470	1986100	4	4	74	0.0065	0.0065	−1.59	D	1
10.	$3d$–$4f$	^{2}D – ^{2}F°	*66.327*	*677240*	*2184930*	10	14	1.00(+4)[a]	0.925	2.02	0.966	B	1
			66.368	678420	2185170	6	8	1.00(+4)	0.882	1.16	0.724	B	1
			66.263	675470	2184610	4	6	9360	0.924	0.806	0.568	B	1
			[66.393]	678420	2184610	6	6	667	0.0441	0.0578	−0.577	B	1
11.	$3d$–$5p$	^{2}D – ^{2}P°	*48.957*	*677240*	*2719830*	10	6	290	0.0062	0.010	−1.21	D	3
			48.97	678420	2721160	6	4	260	0.0062	0.0060	−1.43	D	*ls*
			[48.979]	675470	2717170	4	2	280	0.0051	0.0033	−1.69	D	*ls*
			[48.883]	675470	2721160	4	4	29	0.0010	6.7(−4)	−2.38	E	*ls*
12.	$3d$–$5f$	^{2}D – ^{2}F°	*46.695*	*677240*	*2818780*	10	14	3740	0.171	0.263	0.233	C+	4
			46.718	678420	2818920	6	8	3730	0.163	0.150	−0.011	C	*ls*
			46.661	675470	2818590	4	6	3490	0.171	0.105	−0.165	C	*ls*
			[46.725]	678420	2818590	6	6	250	0.0081	0.0075	−1.31	D	*ls*

Fe XVI: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
13.	3*d*–6*p*	^{2}D – ^{2}P$^\circ$	*41.139*	*677240*	*3108030*	10	6	140	0.0022	0.0030	−1.66	D	4
			41.17	678420	3108870	6	4	130	0.0022	0.0018	−1.88	D	*ls*
			[41.137]	675470	3106360	4	2	150	0.0018	0.0010	−2.13	D	*ls*
			[41.095]	675470	3108870	4	4	15	3.7(−4)	2.0(−4)	−2.83	E	*ls*
14.	3*d*–6*f*	^{2}D – ^{2}F$^\circ$	*40.227*	*677240*	*3163150*	10	14	1860	0.0633	0.0838	−0.199	C+	3
			40.245	678420	3163200	6	8	1860	0.060	0.0479	−0.442	C	*ls*
			40.199	675470	3163090	4	6	1740	0.063	0.0335	−0.60	C	*ls*
			[40.247]	678420	3163090	6	6	120	0.0030	0.0024	−1.74	D	*ls*
15.	4*s*–4*p*	^{2}S – ^{2}P$^\circ$	*862.96*	1867530	*1983410*	2	6	17.1	0.574	3.26	0.060	B	1
			[843.38]	1867530	1986100	2	4	18.4	0.393	2.18	−0.105	B	1
			[904.90]	1867530	1978040	2	2	14.8	0.182	1.08	−0.439	B	1
16.	4*s*–5*p*	^{2}S – ^{2}P$^\circ$	*117.33*	1867530	*2719830*	2	6	392	0.243	0.188	−0.313	C+	3
			[117.15]	1867530	2721160	2	4	394	0.162	0.125	−0.489	C	*ls*
			[117.70]	1867530	2717170	2	2	390	0.081	0.063	−0.79	D	*ls*
17.	4*p*–4*d*	^{2}P$^\circ$ – ^{2}D	*707.01*	*1983410*	*2124850*	6	10	36.2	0.453	6.32	0.434	B	1
			[718.08]	1986100	2125360	4	6	34.7	0.402	3.80	0.206	B	1
			[684.74]	1978040	2124080	2	4	33.1	0.466	2.10	−0.031	B	1
			[724.74]	1986100	2124080	4	4	5.60	0.0441	0.421	−0.754	B	1
18.	4*p*–5*s*	^{2}P$^\circ$ – ^{2}S	*147.4*	*1983410*	2662000	6	2	976	0.106	0.309	−0.197	C+	3
			[148.0]	1986100	2662000	4	2	640	0.106	0.206	−0.374	C	*ls*
			[146.2]	1978040	2662000	2	2	334	0.107	0.103	−0.67	C	*ls*
19.	4*p*–5*d*	^{2}P$^\circ$ – ^{2}D	*124.23*	*1983410*	*2788370*	6	10	711	0.274	0.672	0.216	C+	3
			[124.61]	1986100	2788610	4	6	700	0.246	0.403	−0.008	C	*ls*
			[123.46]	1978040	2788020	2	4	600	0.276	0.224	−0.259	C	*ls*
			[124.70]	1986100	2788020	4	4	120	0.027	0.045	−0.96	D	*ls*
20.	4*d*–4*f*	^{2}D – ^{2}F$^\circ$	*1664*	*2124850*	*2184930*	10	14	1.9	0.11	6.0	0.04	C	1
			[1672]	2125360	2185170	6	8	1.86	0.104	3.43	−0.205	B	1
			[1652]	2124080	2184610	4	6	1.81	0.111	2.41	−0.353	B	1
			[1688]	2125360	2184610	6	6	0.12	0.0052	0.17	−1.51	D	1
21.	4*d*–5*p*	^{2}D – ^{2}P$^\circ$	*168.07*	*2124850*	*2719830*	10	6	357	0.0907	0.502	−0.042	C+	3
			[167.84]	2125360	2721160	6	4	322	0.091	0.301	−0.264	C	*ls*
			[168.61]	2124080	2717170	4	2	353	0.075	0.167	−0.52	C	*ls*
			[167.48]	2124080	2721160	4	4	36	0.015	0.033	−1.22	D	*ls*
22.	4*d*–5*f*	^{2}D – ^{2}F$^\circ$	*144.11*	*2124850*	*2818780*	10	14	1670	0.726	3.44	0.861	C+	4
			[144.18]	2125360	2818920	6	8	1660	0.69	1.97	0.62	C	*ls*
			[143.99]	2124080	2818590	4	6	1560	0.73	1.38	0.464	C	*ls*
			[144.25]	2125360	2818590	6	6	110	0.034	0.098	−0.69	D	*ls*
23.	4*d*–6*f*	^{2}D – ^{2}F$^\circ$	*96.311*	*2124850*	*3163150*	10	14	919	0.179	0.568	0.253	C+	4
			[96.354]	2125360	3163200	6	8	920	0.171	0.325	0.011	C	*ls*
			[96.245]	2124080	3163090	4	6	860	0.179	0.227	−0.145	C	*ls*
			[96.364]	2125360	3163090	6	6	60	0.0084	0.016	−1.30	D	*ls*

Fe XVI: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accu-racy	Source
24.	$5s$–$5p$	$^{2}\mathrm{S} - {}^{2}\mathrm{P}^{\circ}$	*1729*	2662000	*2719830*	2	6	5.23	0.703	8.00	0.148	C+	3
			[1690]	2662000	2721160	2	4	5.6	0.48	5.3	−0.02	C	*ls*
			[1813]	2662000	2717170	2	2	4.6	0.23	2.7	−0.34	D	*ls*
25.	$5p$–$5d$	$^{2}\mathrm{P}^{\circ} - {}^{2}\mathrm{D}$	*1459*	*2719830*	*2788370*	6	10	11.0	0.586	16.9	0.546	C+	3
			[1483]	2721160	2788610	4	6	10.5	0.52	10.1	0.316	C	*ls*
			[1411]	2717170	2788020	2	4	10	0.60	5.6	0.08	C	*ls*
			[1496]	2721160	2788020	4	4	1.7	0.056	1.1	−0.65	D	*ls*
26.	$5d$–$6f$	$^{2}\mathrm{D} - {}^{2}\mathrm{F}^{\circ}$	*266.82*	*2788370*	*3163150*	10	14	432	0.646	5.67	0.810	C+	3
			[266.96]	2788610	3163200	6	8	431	0.61	3.24	0.57	C	*ls*
			[266.62]	2788020	3163090	4	6	404	0.65	2.27	0.413	C	*ls*
			[267.04]	2788610	3163090	6	6	28	0.030	0.16	−0.74	D	*ls*

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe XVII

Ground State $1s^{2}2s^{2}2p^{6}\ {}^{1}\mathrm{S}_{0}$

Ionization Potential 1266 eV = 10210000 cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
10.660	52	49.6	98	57.9	95	102.1	7
10.771	51	49.7	98	58.1	89	102.4	16
11.03	33,34	50.1	104,112	58.8	119	103.0	16
11.130	48	50.2	101,103,	61.3	91	103.3	16
11.251	47		106	62.1	92	104.8	4
11.419	46	50.26	102	66.1	97	107.7	19
11.440	45	50.3	104	66.4	120	108.3	21
12.121	44	50.4	101	66.7	120	110.0	9
12.263	43	50.6	110	68.1	122	110.4	9
12.4	42	50.7	105	68.7	121	111.1	3
12.509	41	50.8	102,115,	94.8	5	111.2	10
12.681	40		116	95.3	2	111.7	26
13.824	32	50.9	110,115	95.8	13	111.8	26
13.889	31	51.1	107	96.5	5,15	112.1	25
15.013	39	51.2	107,109	96.9	5	112.3	14
15.259	38	51.3	107	98.6	12	112.6	18
15.449	37	51.5	110	98.8	6,17	113.0	18
16.769	36	52.8	111	99	6	113.2	18
17.041	35	52.9	87,93	99.0	1	113.3	20
41.37	123	53.6	114,118	99.6	8	113.7	6,10,20
46.6	64	53.8	101	99.7	12	116.2	23
47.1	100	55.8	93	99.8	24	122.4	22
47.5	66	55.9	87	99.9	14	122.7	22
47.6	65	56.2	89	100.0	12,24	132.4	11
47.8	65	56.4	117	100.2	29	205.3	57
48.3	108	56.7	90,94	100.6	30	217.5	75
48.7	68	56.8	96	100.7	27,28	232.1	78
49.0	67	57.3	88	100.8	14	247.0	70
49.3	99	57.5	88	101.2	7,26	255.0	62
49.5	98,113	57.6	91,94	101.6	28	255.9	84

List of tabulated lines—Continued

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
260.8	69	286.4	83	316.3	76	379.0	58
264.4	56	287.8	77	320.5	85	386.6	55
267.0	73	288.2	83	322.4	85	396.9	54
269.4	73	288.3	82	326.2	76	403.0	60
272.0	69	289.5	74	332.9	76	404.2	63
274.6	79	292.5	72	345.9	55	410.9	63
277.2	72	292.6	81	364.6	58	420.6	60
278.3	69	295.8	72	373.9	61	448.8	59
281.0	86	298.9	80	375.2	63	450.9	53
283.1	71	302.3	83	376.9	54	484.4	71
284.0	77	314.7	55				

Transition probabilities for the majority of the lines of this neon-like ion were taken from the results of the scaled Thomas-Fermi approach of Loulergue and Nussbaumer [1], which allows for extensive configuration interaction as well as spin-orbit coupling.

For the resonance transitions to $J = 1$ levels of the $2p^53s$ and $2p^53d$ configurations, we have selected the results of the relativistic random phase approximation (RRPA) calculations of Shorer [2], who has included mixing between $2p^53s$ and $2p^53d$ as well as correlation effects due to configurations having a vacancy in the $1s$ or $2s$ subshell. His calculations for this sequence provide an illustrative example of the rather drastic changes due to configuration interaction that can result in the values of oscillator strengths of heavy ions. The single-configuration relativistic Hartree-Fock results of Fielder et al. [3] for the same resonance transitions differ significantly (by 35–75 percent) in three of the five cases from the values obtained by Shorer. The multiconfiguration Dirac-Fock method of Cheng and Kim [4] which includes the effects of mixing between the $2p^53s$ and $2p^53d$ configurations yields oscillator strengths for the two resonance transitions to $J = 1$ levels of $2p^53s$ which are in much better agreement with Shorer's results than are those of ref. [3]. Shorer himself illustrates by numerical comparison the effects of including various configurations in his calculations.

Results of the model potential calculations of Crance [5] have been tabulated for other resonance transitions to $2p^5ns$ and $2p^5nd$ ($n = 5,6$).

Fawcett et al. [6] have used Cowan's Hartree-XR (i. e., allowing for statistical exchange and relativistic effects) and Slater-Condon programs to calculate f-values for the strongest lines of the $3l$–$4l'$ transition arrays and for one strong $3d$–$5f$ transition. Since they have labeled the levels in J_1l-coupling notation, while those of Loulergue and Nussbaumer are labeled in LS-coupling notation, an unambiguous comparison of their results could be made for only two of the lines in common, and the agreement is excellent. A few transitions treated by Fawcett et al. but excluded from the tabulation of Loulergue and Nussbaumer are presented here.

References

[1] Loulergue, M., and Nussbaumer, H., Astron. Astrophys. **45**, 125 (1975).
[2] Shorer, P., Phys. Rev. A **20**, 642 (1979).
[3] Fielder, W., Jr., Lin, D. L., and Ton-That, D., Phys. Rev. A **19**, 741 (1979).
[4] Cheng, K. T., and Kim, Y.-K., Argonne National Laboratory Report ANL-78-65, 168 (1978).
[5] Crance, M., At. Data **5**, 185 (1973).
[6] Fawcett, B. C., Bromage, G. E., and Hayes, R. W., Mon. Not. R. Astron. Soc. **186**, 113 (1979).

Fe XVII: Allowed transiti

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Sour
1.	$2s^22p^5(^2P^o_{3/2})3s$–$2s2p^63s$	$(3/2,1/2)^o$ – ^3S											
			[99.0]			5	3	750	0.066	0.11	−0.48	C	1
2.		$(3/2,1/2)^o$ – ^1S											
			[95.3]			3	1	510	0.023	0.022	−1.16	C	1
3.	$2s^22p^5(^2P^o_{1/2})3s$–$2s2p^63s$	$(1/2,1/2)^o$ – ^3S											
			[111.1]			3	3	180	0.033	0.037	−1.00	C	1
4.		$(1/2,1/2)^o$ – ^1S											
			[104.8]			3	1	310	0.017	0.018	−1.29	C	1

Fe XVII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at.u.)	log *gf*	Accuracy	Source
5.	$2s^22p^53p$–$2s2p^63p$	^{3}S – ^{3}P°	95.6			3	9	100	0.042	0.040	−0.90	C	1
			[94.8]			3	5	26	0.0058	0.0055	−1.76	C	1
			[96.5]			3	3	120	0.017	0.016	−1.30	C	1
			[96.9]			3	1	390	0.018	0.018	−1.26	C	1
6.		^{3}D – ^{3}P°											
			[98.8]			7	5	630	0.066	0.15	−0.34	C	1
			[99]			5	3	660	0.058	0.095	−0.54	C	1
			[113.7]			3	1	21	0.0014	0.0015	−2.39	D	1
7.		^{3}P – ^{3}P°											
			[101.2]			5	5	170	0.026	0.043	−0.88	C	1
			[102.1]			3	1	400	0.021	0.021	−1.20	C	1
8.		^{3}P – ^{1}P°											
			[99.6]			5	3	310	0.028	0.045	−0.86	C	1
9.		^{1}P – ^{3}P°											
			[110.0]			3	3	190	0.034	0.037	−0.99	C	1
			[110.4]			3	1	290	0.018	0.019	−1.28	C	1
10.		^{1}D – ^{3}P°											
			[111.2]			5	5	150	0.028	0.051	−0.86	C	1
			[113.7]			5	3	8.9	0.0010	0.0019	−2.29	D	1
11.		^{1}S – ^{3}P°											
			[132.4]			1	3	31	0.024	0.011	−1.61	C	1
12.	$2s^22p^53d$–$2s2p^63d$	^{3}P° – ^{3}D											
			[99.7]			5	7	27	0.0056	0.0092	−1.55	D	1
			[100.0]			5	5	90	0.013	0.022	−1.17	C	1
			[98.6]			3	3	96	0.014	0.014	−1.38	C	1
13.		^{3}P° – ^{1}D											
			[95.8]			5	5	32	0.0044	0.0069	−1.66	D	1
14.		^{3}F° – ^{3}D											
			[99.9]			9	7	540	0.063	0.19	−0.25	C	1
			[100.8]			7	5	430	0.047	0.11	−0.48	C	1
			[112.3]			5	3	190	0.022	0.040	−0.97	C	1
15.		^{3}F° – ^{1}D											
			[96.5]			7	5	150	0.015	0.033	−0.98	C	1
16.		^{3}D° – ^{3}D											
			[103.0]			7	7	130	0.021	0.049	−0.84	C	1
			[103.3]			7	5	56	0.0064	0.015	−1.35	D	1
			[102.4]			5	3	320	0.030	0.051	−0.82	C	1
17.		^{3}D° – ^{1}D											
			[98.8]			7	5	230	0.024	0.055	−0.77	C	1

Fe XVII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
18.		$^{1}D^{\circ}-{}^{3}D$											
			[112.6]			5	7	51	0.014	0.025	−1.17	C	1
			[113.0]			5	5	48	0.0092	0.017	−1.34	C	1
			[113.2]			5	3	6.5	7.5(−4)[a]	0.0014	−2.43	D	1
19.		$^{1}D^{\circ}-{}^{1}D$	[107.7]			5	5	66	0.011	0.020	−1.24	C	1
20.		$^{1}F^{\circ}-{}^{3}D$											
			[113.3]			7	7	120	0.023	0.060	−0.79	C	1
			[113.7]			7	5	49	0.0068	0.018	−1.32	C	1
21.		$^{1}F^{\circ}-{}^{1}D$	[108.3]			7	5	190	0.024	0.060	−0.78	C	1
22.		$^{1}P^{\circ}-{}^{3}D$											
			[122.4]			3	5	9.5	0.0036	0.0043	−1.97	D	1
			[122.7]			3	3	15	0.0034	0.0041	−1.99	D	1
23.		$^{1}P^{\circ}-{}^{1}D$	[116.2]			3	5	36	0.012	0.014	−1.44	C	1
24.	$2s^22p^54p-$ $2s2p^64p$	$^{3}S-{}^{3}P^{\circ}$											
			[99.8]			3	3	110	0.016	0.016	−1.31	C	1
			[100.0]			3	1	460	0.023	0.023	−1.16	C	1
25.		$^{3}D-{}^{3}P^{\circ}$											
			[112.1]			5	5	140	0.026	0.049	−0.88	C	1
26.		$^{3}P-{}^{3}P^{\circ}$											
			[101.2]			5	5	170	0.026	0.043	−0.88	C	1
			[111.7]			3	3	170	0.032	0.035	−1.02	C	1
			[111.8]			3	1	290	0.018	0.020	−1.26	C	1
27.		$^{3}P-{}^{1}P^{\circ}$											
			[100.7]			5	3	280	0.026	0.042	−0.89	C	1
28.		$^{1}P-{}^{3}P^{\circ}$											
			[100.7]			3	5	24	0.0061	0.0060	−1.74	C	1
			[101.6]			3	1	230	0.012	0.012	−1.45	C	1
29.		$^{1}P-{}^{1}P^{\circ}$	[100.2]			3	3	250	0.038	0.037	−0.95	C	1
30.		$^{1}D-{}^{3}P^{\circ}$											
			[100.6]			5	3	590	0.054	0.089	−0.57	C	1
31.	$2s^22p^6-$ $2s2p^63p$	$^{1}S-{}^{3}P^{\circ}$											
			13.889	0	7199900	1	3	3400	0.029	0.0013	−1.53	C	1
32.		$^{1}S-{}^{1}P^{\circ}$	13.824	0	7233800	1	3	3.3(+4)	0.28	0.013	−0.55	C	1
33.	$2s^22p^6-$ $2s2p^64p$	$^{1}S-{}^{3}P^{\circ}$											
			11.03	0	9066000	1	3	2900	0.016	5.8(−4)	−1.80	C	1

Fe XVII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
34.		${}^1S - {}^1P^o$	11.03	0	9066000	1	3	2.1(+4)	0.11	0.0042	−0.94	C	1
35.	$2p^6-$ $2p^5({}^2P^o_{3/2})3s$	${}^1S - (\frac{3}{2},\frac{1}{2})^o$	17.041	0	5868200	1	3	9340	0.122	0.00684	−0.914	B	2
36.	$2p^6-$ $2p^5({}^2P^o_{1/2})3s$	${}^1S - (\frac{1}{2},\frac{1}{2})^o$	16.769	0	5963400	1	3	8300	0.105	0.00580	−0.979	B	2
37.	$2p^6-2p^53d$	${}^1S - {}^3P^o$	15.449	0	6472900	1	3	900	0.00966	4.91(−4)	−2.015	B	2
38.		${}^1S - {}^3D^o$	15.259	0	6553500	1	3	6.01(+4)	0.629	0.0316	−0.213	B	2
39.		${}^1S - {}^1P^o$	15.013	0	6660900	1	3	2.28(+5)	2.31	0.114	0.364	B	2
40.	$2p^6-$ $2p^5({}^2P^o_{3/2})4s$	${}^1S - (\frac{3}{2},\frac{1}{2})^o$	12.681	0	7885800	1	3	3000	0.022	9.1(−4)	−1.66	C	1
41.	$2p^6-$ $2p^5({}^2P^o_{1/2})4s$	${}^1S - (\frac{1}{2},\frac{1}{2})^o$	12.509	0	7994200	1	3	3500	0.025	0.0010	−1.61	C	1
42.	$2p^6-2p^54d$	${}^1S - {}^3P^o$	[12.4]			1	3	530	0.0037	1.5(−4)	−2.44	D	1
43.		${}^1S - {}^3D^o$	12.263	0	8154600	1	3	5.9(+4)	0.40	0.016	−0.40	C	1
44.		${}^1S - {}^1P^o$	12.121	0	8250100	1	3	8.0(+4)	0.53	0.021	−0.28	C	1
45.	$2p^6-$ $2p^5({}^2P^o_{3/2})5s$	${}^1S - (\frac{3}{2},\frac{1}{2})^o$	11.440	0	8741300	1	3	1100	0.0065	2.4(−4)	−2.19	D	5
46.	$2p^6-$ $2p^5({}^2P^o_{1/2})5s$	${}^1S - (\frac{1}{2},\frac{1}{2})^o$	11.419	0	8757300	1	3	600	0.0035	1.3(−4)	−2.46	D	5
47.	$2p^6-2p^55d$	${}^1S - {}^3D^o$	11.251	0	8888100	1	3	2.3(+4)	0.13	0.0048	−0.89	D	5
48.		${}^1S - {}^1P^o$	11.130	0	8984700	1	3	3.2(+4)	0.18	0.0066	−0.74	D	5
49.	$2p^6-$ $2p^5({}^2P^o_{3/2})6s$	${}^1S - (\frac{3}{2},\frac{1}{2})^o$				1	3		0.0033		−2.48	D	5
50.	$2p^6-$ $2p^5({}^2P^o_{1/2})6s$	${}^1S - (\frac{1}{2},\frac{1}{2})^o$				1	3		0.0017		−2.77	D	5

Fe XVII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
51.	$2p^6$–$2p^56d$	^{1}S – ^{3}D°											
			10.771	0	9284200	1	3	1.1(+4)	0.060	0.0021	−1.22	D	5
52.		^{1}S – ^{1}P°	10.660	0	9380900	1	3	1.9(+4)	0.096	0.0034	−1.02	D	5
53.	$2p^5(^2$P$^\circ_{3/2})3s$–$2p^53p$	(3/2,1/2)° – ^{3}S											
			[450.9]			5	3	25	0.046	0.34	−0.64	C	1
54.		(3/2,1/2)° – ^{3}D											
			[376.9]			5	7	51	0.15	0.94	−0.12	C	1
			[396.9]			5	5	21	0.050	0.32	−0.61	C	1
55.		(3/2,1/2)° – ^{3}P											
			[345.9]			5	5	37	0.066	0.38	−0.48	C	1
			[386.6]			3	3	45	0.10	0.38	−0.52	C	1
			[314.7]			3	1	65	0.032	0.10	−1.02	C	1
56.		(3/2,1/2)° – ^{1}D											
			[264.4]			5	5	1.0	0.0010	0.0046	−2.28	D	1
57.		(3/2,1/2)° – ^{1}S											
			[205.3]			3	1	120	0.025	0.051	−1.12	C	1
58.	$2p^5(^2$P$^\circ_{1/2})3s$–$2p^53p$	(1/2,1/2)° – ^{3}D											
			[364.6]			1	3	33	0.20	0.24	−0.70	C	1
			[379.0]			3	3	19	0.041	0.15	−0.91	C	1
59.		(1/2,1/2)° – ^{3}P											
			[448.8]			3	1	9.3	0.0094	0.041	−1.55	C	1
60.		(1/2,1/2)° – ^{1}P											
			[420.6]			3	3	22	0.058	0.24	−0.76	C	1
			[403.0]			1	3	17	0.12	0.16	−0.91	C	1
61.		(1/2,1/2)° – ^{1}D											
			[373.9]			3	5	53	0.19	0.68	−0.26	C	1
62.		(1/2,1/2)° – ^{1}S											
			[255.0]			3	1	130	0.042	0.11	−0.90	C	1
63.	$2s2p^63s$–$2s2p^63p$	^{3}S – ^{3}P°	*388.2*			3	9	51	0.344	1.32	0.014	C	1
			[375.2]			3	5	59	0.21	0.77	−0.21	C	1
			[404.2]			3	3	41	0.10	0.40	−0.52	C	1
			[410.9]			3	1	44	0.037	0.15	−0.95	C	1
64.	$2p^5(^2$P$^\circ_{3/2})3s$–$2p^54p$	(3/2,1/2)° – ^{3}D											
			[46.6]			5	7	2600	0.12	0.092	−0.22	C	6

Fe XVII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
65.	$2s2p^63s-2s2p^64p$	^{3}S - ^{3}P°	*47.6*			3	9	2570	0.262	0.123	−0.105	C	1
			[47.6]			3	5	2600	0.15	0.069	−0.35	C	1
			[47.8]			3	3	2400	0.082	0.039	−0.61	C	1
			[47.8]			3	1	2700	0.031	0.015	−1.03	C	1
66.		^{3}S - ^{1}P°											
			[47.5]			3	3	360	0.012	0.0057	−1.44	D	1
67.		^{1}S - ^{3}P°											
			[49.0]			1	3	400	0.043	0.0070	−1.36	D	1
68.		^{1}S - ^{1}P°	[48.7]			1	3	2400	0.26	0.041	−0.59	C	1
69.	$2p^53p-2p^53d$	^{3}S - ^{3}P°	*266.3*			3	9	70	0.22	0.59	−0.17	C	1
			[260.8]			3	5	51	0.087	0.22	−0.58	C	1
			[272.0]			3	3	88	0.098	0.26	−0.53	C	1
			[278.3]			3	1	100	0.039	0.11	−0.94	C	1
70.		^{3}S - ^{3}D°											
			[247.0]			3	5	2.6	0.0040	0.0097	−1.92	D	1
71.		^{3}D - ^{3}P°											
			[484.4]			3	1	1.2	0.0014	0.0067	−2.37	D	1
			[283.1]			5	5	9.1	0.011	0.051	−1.26	D	1
72.		^{3}D - ^{3}F°											
			[292.5]			7	9	100	0.16	1.1	0.06	C	1
			[277.2]			5	7	100	0.16	0.74	−0.09	C	1
			[295.8]			3	5	2.3	0.0050	0.015	−1.82	C	1
73.		^{3}D - ^{3}D°											
			[269.4]			7	7	25	0.027	0.17	−0.72	C	1
			[267.0]			5	5	45	0.048	0.21	−0.62	C	1
74.		^{3}D - ^{1}D°											
			[289.5]			3	5	91	0.19	0.54	−0.24	C	1
75.		^{3}D - ^{1}F°											
			[217.5]			7	7	1.6	0.0011	0.0057	−2.10	D	1
76.		^{3}P - ^{3}P°											
			[316.3]			5	5	33	0.049	0.26	−0.61	C	1
			[332.9]			5	3	9.5	0.0095	0.052	−1.32	C	1
			[326.2]			3	1	2.5	0.0013	0.0043	−2.40	D	1
77.		^{3}P - ^{3}D°											
			[287.8]			5	7	91	0.16	0.75	−0.10	C	1
			[284.0]			3	5	74	0.15	0.42	−0.35	C	1
78.		^{3}P - ^{1}D°											
			[232.1]			5	5	6.6	0.0053	0.020	−1.57	C	1

Fe XVII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
79.		^{1}P - ^{3}F°											
			[274.6]			3	5	110	0.21	0.56	−0.21	C	1
80.		^{1}D - ^{3}F°											
			[298.9]			5	5	13	0.017	0.086	−1.06	C	1
81.		^{1}D - ^{1}D°	[292.6]			5	5	11	0.014	0.068	−1.15	C	1
82.		^{1}D - ^{1}F°	[288.3]			5	7	110	0.19	0.91	−0.02	C	1
83.	$2s2p^63p-$ $2s2p^63d$	^{3}P° - ^{3}D											
			[302.3]			5	7	100	0.19	0.95	−0.02	C	1
			[288.2]			3	5	81	0.17	0.48	−0.30	C	1
			[286.4]			1	3	66	0.24	0.23	−0.61	C	1
84.		^{3}P° - ^{1}D											
			[255.9]			3	5	14	0.023	0.058	−1.16	C	1
85.		^{1}P° - ^{3}D											
			[320.5]			3	5	4.7	0.012	0.038	−1.44	C	1
			[322.4]			3	3	3.8	0.0059	0.019	−1.75	C	1
86.		^{1}P° - ^{1}D	[281.0]			3	5	120	0.24	0.66	−0.15	C	1
87.	$2p^53p-$ $2p^5(^2P^\circ_{3/2})4s$	^{3}S - (3/2,1/2)°											
			[55.9]			3	5	670	0.052	0.029	−0.80	C	1
			[52.9]			3	3	56	0.0023	0.0012	−2.15	D	1
88.		^{3}D - (3/2,1/2)°											
			[57.3]			7	5	1700	0.060	0.079	−0.38	C	1
			[57.5]			3	3	420	0.021	0.012	−1.20	C	1
89.		^{3}P - (3/2,1/2)°											
			[58.1]			5	5	740	0.037	0.036	−0.73	C	1
			[56.2]			1	3	120	0.017	0.0032	−1.77	D	1
90.		^{1}P - (3/2,1/2)°											
			[56.7]			3	3	560	0.027	0.015	−1.09	C	1
91.		^{1}D - (3/2,1/2)°											
			[61.3]			5	5	11	6.2(−4)	6.3(−4)	−2.51	D	1
			[57.6]			5	3	2100	0.063	0.059	−0.50	C	1
92.		^{1}S - (3/2,1/2)°											
			[62.1]			1	3	370	0.064	0.013	−1.19	C	1
93.	$2p^53p-$ $2p^5(^2P^\circ_{1/2})4s$	^{3}S - (1/2,1/2)°											
			[55.8]			3	3	55	0.0026	0.0014	−2.11	D	1
			[52.9]			3	1	74	0.0010	5.4(−4)	−2.51	D	1

Fe XVII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accu-racy	Source
94.		^{3}D - (½,½)°											
			[56.7]			5	3	910	0.026	0.025	−0.88	C	1
			[57.6]			3	1	2300	0.038	0.022	−0.94	C	1
95.		^{3}P - (½,½)°											
			[57.9]			5	3	1000	0.030	0.029	−0.82	C	1
96.		^{1}P - (½,½)°											
			[56.8]			3	1	1300	0.021	0.012	−1.20	C	1
97.		^{1}S - (½,½)°											
			[66.1]			1	3	290	0.057	0.012	−1.24	C	1
98.	$2p^53p-2p^54d$	^{3}S - ^{3}P°	*49.5*			3	9	2470	0.272	0.133	−0.088	C	1
			[49.5]			3	5	2000	0.12	0.060	−0.43	C	1
			[49.6]			3	3	3900	0.14	0.070	−0.36	C	1
			[49.7]			3	1	510	0.0063	0.0031	−1.72	D	1
99.		^{3}S - ^{3}D°											
			[49.3]			3	5	48	0.0029	0.0014	−2.06	D	1
100.		^{3}S - ^{1}D°											
			[47.1]			3	5	140	0.0078	0.0036	−1.63	C	1
101.		^{3}D - ^{3}P°											
			[50.4]			5	3	570	0.013	0.011	−1.19	C	1
			[53.8]			3	1	270	0.0039	0.0021	−1.93	D	1
			[50.2]			5	5	480	0.018	0.015	−1.04	C	1
102.		^{3}D - ^{3}F°											
			50.26			7	9	5800	0.28	0.33	0.30	C	1
			[50.8]			3	5	81	0.0052	0.0026	−1.80	D	1
103.		^{3}D - ^{1}F°											
			[50.2]			5	7	4500	0.24	0.20	0.08	C	1
104.		^{3}D - ^{3}D°											
			[50.3]			7	7	1000	0.038	0.044	−0.58	C	1
			[50.1]			5	5	1600	0.060	0.050	−0.52	C	1
105.		^{3}D - ^{1}D°											
			[50.7]			3	5	4800	0.31	0.15	−0.03	C	1
106.		^{3}D - ^{1}P°											
			[50.2]			3	3	830	0.031	0.016	−1.03	C	1
107.		^{3}P - ^{3}P°											
			[51.2]			5	5	2500	0.098	0.083	−0.31	C	1
			[51.3]			5	3	860	0.020	0.017	−0.99	C	1
			[51.1]			3	1	260	0.0034	0.0017	−1.99	D	1

Fe XVII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
108.		^{3}P – ^{3}F°											
			[48.3]			3	5	46	0.0027	0.0013	−2.09	D	1
109.		^{3}P – ^{1}F°											
			[51.2]			5	7	54	0.0030	0.0025	−1.83	D	1
110.		^{3}P – ^{3}D°											
			[50.9]			5	7	4700	0.26	0.21	0.11	C	1
			[50.6]			3	5	3600	0.23	0.12	−0.16	C	1
			[51.5]			1	3	2400	0.29	0.049	−0.54	C	1
111.		^{1}P – ^{3}P°											
			[52.8]			3	5	30	0.0021	0.0011	−2.20	D	1
112.		^{1}P – ^{3}F°											
			[50.1]			3	5	4500	0.28	0.14	−0.07	C	1
113.		^{1}P – ^{1}P°	[49.5]			3	3	1200	0.044	0.022	−0.88	C	1
114.		^{1}D – ^{3}P°											
			[53.6]			5	5	40	0.0017	0.0015	−2.06	D	1
115.		^{1}D – ^{3}F°											
			[50.8]			5	7	5800	0.31	0.26	0.20	C	1
			[50.9]			5	5	830	0.032	0.027	−0.79	C	1
116.		^{1}D – ^{1}D°	[50.8]			5	5	610	0.024	0.020	−0.93	C	1
117.		^{1}S – ^{3}D°											
			[56.4]			1	3	770	0.11	0.020	−0.96	C	1
118.		^{1}S – ^{1}P°	[53.6]			1	3	2500	0.32	0.057	−0.49	C	1
119.	$2p^53d$–$2p^54f$	^{3}F° – ^{3}G											
			58.8			9	11	1.2(+4)	0.78	1.4	0.85	C	6
120.	$2s2p^63d$– $2s2p^64p$	^{3}D – ^{3}P°											
			[66.4]			7	5	690	0.033	0.050	−0.64	C	1
			[66.7]			5	3	600	0.024	0.026	−0.92	C	1
			[66.7]			3	1	860	0.019	0.013	−1.24	C	1
121.		^{1}D – ^{3}P°											
			[68.7]			5	3	110	0.0047	0.0053	−1.63	D	1
122.		^{1}D – ^{1}P°	[68.1]			5	3	870	0.036	0.041	−0.74	C	1
123.	$2p^53d$–$2p^55f$	^{3}F° – ^{3}G											
			41.37			9	11	4800	0.15	0.18	0.13	C	6

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[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe XVIII

Ground State $1s^22s^22p^5\ ^2P^o_{3/2}$

Ionization Potential [1353] eV = [10913000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
11.25	27	13.70	6	14.48	16	15.614	10
11.33	24	13.75	5	14.485	15	15.623	10
11.34	25	13.92	4	14.50	18	15.764	9
11.45	24,26	13.954	21	14.53	2	15.826	8
11.50	22	14.07	3	14.551	14	15.847	8
11.55	23	14.11	3	14.57	15	15.869	10
11.64	22	14.12	4	14.581	14	16.003	9
12.00	12	14.150	20	14.70	16	16.024	9
12.15	12	14.20	18	14.772	14	16.087	8
13.43	7	14.255	19	14.78	13	16.109	8
13.49	6	14.28	3,18	14.79	15	16.270	9
13.51	6	14.31	2	14.80	13	93.931	1
13.52	5	14.32	3,17	14.803	14	103.954	1
13.56	5	14.361	20	15.01	13		
13.61	7	14.42	18	15.258	11		
13.68	6	14.467	19	15.491	11		

Oscillator strengths for lines of the multiplet $2s^22p^5\ ^2P^o-2s2p^6\ ^2S$ are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1], which include a perturbative treatment of the Breit interaction and the Lamb shift.

Data for transitions from the levels of the $2s2p^5\ ^2P^o$ term to of configurations involving one electron in the $n = 3$ shell are from the comprehensive calculations of Chapman and Shadmi [2], who employed Hartree-Fock wavefunctions including the principal configuration mixing and calculated individual oscillator strengths in intermediate coupling.

The experimentally determined wavelengths and energy levels for the $2p-3s$ and $2p-3d$ transitions presented here are taken from work of Feldman et al. [3]. In some cases, however, we have permuted the "names" of the levels to coincide with those suggested by the percentage compositions given by Feldman et al. and/or by Chapman and Shadmi [2]. Specifically, within the $2p^4(^3P)3s$ configuration the $^2P_{3/2}$ and $^4P_{3/2}$ designations given by Feldman et al. have been interchanged; and within the $2p^4(^3P)3d$ configuration $^4P_{5/2}$ was changed to $^4F_{5/2}$.

Accuracy ratings for the weaker transitions, as well as for those involving levels of relatively low purity in *LS* coupling, were lowered to "E." Transitions to levels of extremely low purity, or to those for which the two largest components are very nearly equal, were omitted from the present compilation.

Oscillator strengths for a few transitions of the array $2p^5-2p^44d$ have been calculated by Bromage et al. [4] with the Hartree-Fock method including statistical exchange (HX) and configuration interaction. The above remarks concerning purity of levels in *LS* coupling apply here as well. Additional data are available for resonance transitions to levels of configurations $2p^4nl$ ($n \geq 4$) [5,6], but they are not tabulated since the eigenvectors are not reported and such states are expected to be strongly mixed.

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Fe XVIII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$2s^22p^5$–$2s2p^6$	$^2P^\circ - {}^2S$	*97.051*	*34220*	1064610	6	2	1240	0.0584	0.112	−0.455	C+	1
			93.931	0	1064610	4	2	913	0.0604	0.0747	−0.617	C+	1
			103.954	102650	1064610	2	2	331	0.0537	0.0368	−0.969	C+	1
2.	$2s^22p^5$–$2s2p^5(^3P^\circ)3p$	$^2P^\circ - {}^4S$											
			[14.31]			4	4	590	0.0018	3.4(−4)[a]	−2.14	E	2
			[14.53]			2	4	1700	0.011	0.0011	−1.66	E	2
3.		$^2P^\circ - {}^2P$	*14.16*			6	6	3.7(+4)	0.11	0.031	−0.18	E	2
			[14.11]			4	4	3.0(+4)	0.089	0.017	−0.45	D	2
			[14.28]			2	2	1.0(+4)	0.032	0.0030	−1.19	E	2
			[14.07]			4	2	4.1(+4)	0.061	0.011	−0.61	E	2
			[14.32]			2	4	23	1.4(−4)	1.3(−5)	−3.55	E	2
4.		$^2P^\circ - {}^2S$	*13.99*			6	2	6.7(+4)	0.065	0.018	−0.41	D	2
			[13.92]			4	2	2.0(+4)	0.029	0.0053	−0.94	D	2
			[14.12]			2	2	4.7(+4)	0.14	0.013	−0.55	D	2
5.	$2s^22p^5$–$2s2p^5(^1P^\circ)3p$	$^2P^\circ - {}^2D$	*13.60*			6	10	3.0(+4)	0.14	0.037	−0.08	D	2
			[13.52]			4	6	1.8(+4)	0.075	0.013	−0.52	D	2
			[13.75]			2	4	3.7(+4)	0.21	0.019	−0.38	D	2
			[13.56]			4	4	9800	0.027	0.0048	−0.97	D	2
6.		$^2P^\circ - {}^2P$	*13.56*			6	6	3.9(+4)	0.11	0.029	−0.19	E	2
			[13.49]			4	4	6600	0.018	0.0032	−1.14	E	2
			[13.70]			2	2	4.3(+4)	0.12	0.011	−0.62	D	2
			[13.51]			4	2	8800	0.012	0.0021	−1.32	D	2
			[13.68]			2	4	2.5(+4)	0.14	0.013	−0.55	D	2
7.		$^2P^\circ - {}^2S$	*13.49*			6	2	6200	0.0056	0.0015	−1.47	E	2
			[13.43]			4	2	1000	0.0014	2.5(−4)	−2.25	E	2
			[13.61]			2	2	4700	0.013	0.0012	−1.59	D	2
8.	$2p^5$–$2p^4(^3P)3s$	$^2P^\circ - {}^4P$											
			16.087	102650	6318700	2	4	490	0.0038	4.0(−4)	−2.12	E	2
			15.826	0	6318700	4	4	150	5.5(−4)	1.1(−4)	−2.66	E	2
			16.109	102650	6310500	2	2	23	9.0(−5)	9.5(−6)	−3.74	E	2
			[15.847]	0	6310500	4	2	130	2.5(−4)	5.2(−5)	−3.00	E	2
9.		$^2P^\circ - {}^2P$	*16.010*	*34220*	*6280400*	6	6	9100	0.035	0.011	−0.68	E	2
			16.003	0	6248800	4	4	630	0.0024	5.1(−4)	−2.02	E	2
			16.024	102650	6343600	2	2	1.0(+4)	0.039	0.0041	−1.11	D	2
			15.764	0	6343600	4	2	1.6(+4)	0.029	0.0060	−0.94	D	2
			16.270	102650	6248800	2	4	250	0.0020	2.1(−4)	−2.40	E	2

Fe XVIII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
10.	$2p^5$–$2p^4(^1D)3s$	$^2P^o - ^2D$	*15.704*	*34220*	*6402200*	6	10	4700	0.029	0.0089	−0.76	E	2
			15.623	0	6400800	4	6	8.4	4.6(−5)	9.5(−6)	−3.74	E	2
			15.869	102650	6404400	2	4	1.0(+4)	0.078	0.0081	−0.81	D	2
			[15.614]	0	6404400	4	4	1000	0.0038	7.8(−4)	−1.82	E	2
11.	$2p^5$–$2p^4(^1S)3s$	$^2P^o - ^2S$	*15.328*	*34220*	6558200	6	2	2.2(+4)	0.026	0.0079	−0.81	D	2
			15.258	0	6558200	4	2	1.4(+4)	0.024	0.0048	−1.02	D	2
			15.491	102650	6558200	2	2	8300	0.030	0.0031	−1.22	D	2
12.	$2s^22p^5$–$2p^63s$	$^2P^o - ^2S$	*12.05*			6	2	35	2.5(−5)	6.0(−6)	−3.82	E	2
			[12.00]			4	2	11	1.2(−5)	1.9(−6)	−4.32	E	2
			[12.15]			2	2	23	5.1(−5)	4.1(−6)	−3.99	E	2
13.	$2p^5$–$2p^4(^3P)3d$	$^2P^o - ^4D$											
			[14.80]			4	6	3000	0.015	0.0029	−1.22	D	2
			[15.01]			2	4	340	0.0023	2.3(−4)	−2.34	E	2
			[14.78]			4	4	5800	0.019	0.0037	−1.12	D	2
14.		$^2P^o - ^4P$											
			14.772	102650	6872500	2	4	3400	0.022	0.0021	−1.36	E	2
			14.551	0	6872500	4	4	19	6.1(−5)	1.2(−5)	−3.61	E	2
			[14.803]	102650	6858200	2	2	100	3.4(−4)	3.3(−5)	−3.17	E	2
			14.581	0	6858200	4	2	2000	0.0032	6.1(−4)	−1.89	E	2
15.		$^2P^o - ^4F$											
			14.485	0	6903700	4	6	81	3.8(−4)	7.2(−5)	−2.82	E	2
			[14.79]			2	4	1200	0.0081	7.9(−4)	−1.79	E	2
			[14.57]			4	4	1700	0.0054	0.0010	−1.67	E	2
16.		$^2P^o - ^2P$											
			[14.48]			4	4	280	8.9(−4)	1.7(−4)	−2.45	E	2
			[14.70]			2	4	4900	0.032	0.0031	−1.19	E	2
17.	$2p^5$–$2p^4(^1D)3d$	$^2P^o - ^2F$											
			[14.32]			4	6	2.2(+4)	0.10	0.019	−0.40	E	2
18.		$^2P^o - ^2P$	*14.32*			6	6	7.7(+4)	0.24	0.067	0.15	E	2
			[14.28]			4	4	3200	0.0098	0.0018	−1.41	E	2
			[14.42]			2	2	1.7(+5)	0.53	0.050	0.03	E	2
			[14.20]			4	2	2.1(+4)	0.031	0.0058	−0.91	E	2
			[14.50]			2	4	1.6(+4)	0.10	0.0095	−0.70	E	2
19.		$^2P^o - ^2S$	*14.325*	*34220*	7015100	6	2	2.2(+4)	0.023	0.0065	−0.86	D−	2
			14.255	0	7015100	4	2	110	1.7(−4)	3.2(−5)	−3.17	E	2
			14.467	102650	7015100	2	2	2.2(+4)	0.068	0.0065	−0.87	D	2
20.		$^2P^o - ^2D$											
			14.361	102650	7067100	2	4	8.1(+4)	0.50	0.047	0.00	E	2
			14.150	0	7067100	4	4	1.4(+4)	0.041	0.0076	−0.79	E	2
21.	$2p^5$–$2p^4(^1S)3d$	$^2P^o - ^2D$											
			13.954	0	7166400	4	6	1.4(+4)	0.061	0.011	−0.61	E	2

Fe XVIII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
22.	$2s^22p^5$–$2p^63d$	^{2}P° – ^{2}D	*11.54*			6	10	1300	0.0044	0.0010	−1.58	E	2
			[11.50]			4	6	57	1.7(−4)	2.6(−5)	−3.17	E	2
			[11.64]			2	4	1500	0.0059	4.5(−4)	−1.93	E	2
			[11.50]			4	4	1900	0.0037	5.6(−4)	−1.83	E	2
23.	$2p^5$–$2p^4(^3$P$)4d$	^{2}P° – ^{2}P											
			[11.55]			2	4	2.4(+4)	0.095	0.0072	−0.72	E	4
24.	$2p^5$–$2p^4(^1$D$)4d$	^{2}P° – ^{2}P											
			[11.33]			4	4	4.1(+4)	0.078	0.012	−0.51	D	4
			[11.45]			2	2	7.1(+4)	0.14	0.011	−0.55	D	4
25.		^{2}P° – ^{2}S											
			[11.34]			4	2	4.7(+4)	0.045	0.0067	−0.74	D	4
26.		^{2}P° – ^{2}D											
			[11.45]			2	4	4.3(+4)	0.17	0.013	−0.47	D	4
27.	$2p^5$–$2p^4(^1$S$)4d$	^{2}P° – ^{2}D											
			[11.25]			2	4	3.2(+4)	0.12	0.0089	−0.62	D	4

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe XIX

Ground State $1s^22s^22p^4\ ^3$P$_2$

Ionization Potential [1451] eV = [11703000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
10.58	22	13.45	13	77.6	2	109.97	1
10.62	23	13.49	12	82.5	2	111.70	1
10.63	19	13.54	11	83.4	2	115.42	8
10.65	18	13.74	15,16	84.8	7	120.00	1
10.73	24	13.76	14	91.02	4	132	3
10.80	21,25	13.82	10	101.56	1	149	5
10.81	17,20	14.04	10	106.12	6		
10.89	17	15.2	9	106.33	1		
10.92	17	15.4	9	108.37	1		

Oscillator strengths for $2s$–$2p$ transitions are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1]. These relativistic calculations include a perturbative treatment of the Breit interaction and the Lamb shift. The results should be quite accurate, except in the case of intercombination transitions, for which the f-values should be considered rather [illegible]

$2s^2 2p^4\ ^1D_2 - 2s2p^5\ ^3P^o_1$ transition has been omitted from this tabulation, because its f-value as reported in ref. [1] is extremely and therefore even more uncertain.

The results of the scaled Thomas-Fermi calculations of Kastner et al. [2] including configuration interaction and intermediate coupling are quoted for the two $2p^4$–$2p^3 3s$ intercombination lines treatby them.

Oscillator strengths tabulated for a few transitions of the $2p^4$–$2p^3 3d$ array are averages of the semi-empirical results of Bromage and Fawcett [3] and the Hartree-Fock-Pauli (HFP) data of Bogdanovicius et al. [4]. The f-values intercompared very well for the transitions presented here, except in the case of $2p^4\ ^1D_2$–$2p^3(^2D^o)3d\ ^1F^o_3$ and $2p^4\ ^1D_2$–$2p^3(^2P^o)3d\ ^3F^o_3$, for which the authors' published results differ from the values tabulated here by 30% and 50%, respectively. Transitions involving levels of purity less than 50% in *LS* coupling, as indicated in refs. [3] and [4], have omitted, and the accuracy ratings for transitions to levels of purity less than 60% have been lowered to "E," as have those for the two rather uncertain f-values discussed above.

The oscillator strengths tabulated for transitions of the $2p^4$–$2p^3 4d$ are from the Hartree-Fock calculations with statistical exchange (HX) of Bromage et al. [5] with allowance for configuration interaction. The above remarks concerning purity in *LS* coupling apply here as well.

The assignment of term designations to observed spectral lines of the rather complex transition arrays $2p^4$–$2p^3nd$ ($n = 3,4$) is rathdifficult, since these lines are closely spaced. For this reason, we have quoted the theoretical wavelengths of refs. [3] and [5], respectively, in order to provide an indication of the locations of these lines.

Data for additional transitions are available [6,7], but these results are not quoted here since no indication of the percentage compositions is given.

References

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[7] Burkhalter, P. G., Dozier, C. M., Stallings, C., and Cowan, R. D., J. Appl. Phys. **49**, 1092 (1978).

Fe XIX: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$2s^2 2p^4$–$2s2p^5$	^3P - $^3P^o$	*109.04*	*38170*	*955290*	9	9	540	0.096	0.31	−0.06	C	1
			108.37	0	922770	5	5	390	0.068	0.12	−0.47	C	1
			111.70	89410	984650	3	3	126	0.0235	0.0259	−1.152	C	1
			101.56	0	984650	5	3	320	0.0294	0.0491	−0.83	C	1
			106.33	89410	1029830	3	1	610	0.0342	0.0359	−0.99	C	1
			120.00	89410	922770	3	5	104	0.0374	0.0443	−0.95	C	1
			109.97	75290	984650	1	3	160	0.087	0.031	−1.06	C	1
2.		^3P - $^1P^o$											
			[77.6]	0	[1268440]	5	3	130	0.0071	0.0091	−1.45	E	1
			[83.4]	89410	[1268440]	3	3	9.6	0.0010	8.2(−4)[a]	−2.52	E	1
			[82.5]	75290	[1268440]	1	3	16	0.0050	0.0014	−2.30	E	1
3.		^1D - $^3P^o$											
			[132]	[169800]	922770	5	5	23	0.0059	0.013	−1.53	E	1
4.		^1D - $^1P^o$	91.02	[169800]	[1268440]	5	3	1490	0.111	0.166	−0.256	C	1
5.		^1S - $^3P^o$											
			[149]	[326160]	984650	1	3	8.2	0.0082	0.0040	−2.09	E	1
6.		^1S - $^1P^o$	106.12	[326160]	[1268440]	1	3	110	0.054	0.019	−1.27	C	1
7.	$2s2p^5$–$2p^6$	$^3P^o$ - ^1S											
			[84.8]	984650	[2134800]	3	1	130	0.0045	0.0038	−1.87	E	1
8.		$^1P^o$ - ^1S	115.42	[1268440]	[2134800]	3	1	1610	0.107	0.122	−0.493	C	1

Fe XIX: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
9.	$2p^4$–$2p^3(^4S^\circ)3s$	$^3P - {}^5S^\circ$											
			[15.2]			5	5	450	0.0016	3.9(−4)	−2.11	E	2
			[15.4]			3	5	17	1.0(−4)	1.5(−5)	−3.52	E	2
10.	$2p^4$–$2p^3(^4S^\circ)3d$	$^3P - {}^3D^\circ$											
			[13.82]			5	7	5.7(+4)	0.23	0.052	0.06	D	3,4
			[14.04]			3	5	1.4(+4)	0.070	0.0097	−0.68	E	3,4
11.	$2p^4$–$2p^3(^2D^\circ)3d$	$^3P - {}^3D^\circ$											
			[13.54]			5	7	1.9(+5)	0.73	0.16	0.56	D	3,4
12.		$^3P - {}^3S^\circ$											
			[13.49]			5	3	1.5(+5)	0.25	0.056	0.10	D	3,4
13.		$^3P - {}^1F^\circ$											
			[13.45]			5	7	5.5(+4)	0.21	0.046	0.02	E	3,4
14.		$^1D - {}^1F^\circ$	[13.76]			5	7	7.5(+4)	0.30	0.068	0.18	E	3,4
15.	$2p^4$–$2p^3(^2P^\circ)3d$	$^1D - {}^3F^\circ$											
			[13.74]			5	7	2.4(+4)	0.094	0.021	−0.33	E	3,4
16.		$^1S - {}^1P^\circ$	[13.74]			1	3	2.6(+5)	2.2	0.10	0.34	D	3,4
17.	$2p^4$–$2p^3(^4S^\circ)4d$	$^3P - {}^3D^\circ$											
			[10.81]			5	7	4.9(+4)	0.12	0.021	−0.22	D	5
			[10.92]			3	5	1.3(+4)	0.040	0.0043	−0.92	D	5
			[10.89]			1	3	2.8(+4)	0.15	0.0054	−0.82	D	5
18.	$2p^4$–$2p^3(^2D^\circ)4d$	$^3P - {}^3D^\circ$											
			[10.65]			5	7	3.2(+4)	0.076	0.013	−0.42	D	5
19.		$^3P - {}^3S^\circ$											
			[10.63]			5	3	4.3(+4)	0.044	0.0077	−0.66	D	5
20.		$^1D - {}^1D^\circ$	[10.81]			5	5	4.7(+4)	0.082	0.015	−0.39	D	5
21.		$^1D - {}^1F^\circ$	[10.80]			5	7	5.3(+4)	0.13	0.023	−0.19	D	5
22.	$2p^4$–$2p^3(^2P^\circ)4d$	$^3P - {}^3P^\circ$											
			[10.58]			3	3	3.2(+4)	0.053	0.0055	−0.80	E	5
23.		$^3P - {}^3D^\circ$											
			[10.62]			1	3	4.7(+4)	0.24	0.0084	−0.62	E	5
24.		$^1D - {}^3F^\circ$											
			[10.73]			5	7	1.6(+4)	0.038	0.0067	−0.72	E	5
25.		$^1S - {}^1P^\circ$	[10.80]			1	3	8.4(+4)	0.44	0.016	−0.36	E	5

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe XX

Ground State $1s^22s^22p^3\ {}^4S^o_{3/2}$

Ionization Potential [1575] eV = [12704000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
12.76	23	81.4	13	108.7	6	136.06	10
12.82	17	83.0	3	108.82	12	138.49	16
12.83	20	83.23	8	109.65	14	139	10
12.84	17,20	86.2	13	110.65	6	140.42	16
12.88	23	87.8	13	111.60	14	143	5
12.89	20	90.60	8	113.34	6	148	5
12.94	18	92.59	12	115	11,15	156	5
13.00	18	93.76	8	115.39	6	163	16
13.06	22	94.62	7	118.70	1	164	5
13.14	21	95.1	2	121.85	1	172	9
13.15	19	98.08	14	122.00	16	175	5
78.9	13	98.37	12	128	10	202	9
79.5	4	101.84	12	131.76	15	234	9
80.3	13	106.96	11	132.85	1		

Oscillator strengths for transitions of the arrays $2s^22p^3$–$2s2p^4$ and $2s2p^4$–$2p^5$ are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1]. These relativistic calculations include a perturbative treatment of the Breit interaction and the Lamb shift. The results should be quite accurate, except in the case of intercombination lines, for which the f-values should be considered rather uncertain. (A few very weak intercombination lines have been omitted from this tabulation.) The f-value listed for the $2s^22p^3\ {}^2D^o_{3/2}$–$2s2p^4\ {}^2S_{1/2}$ transition is quoted with an uncertainty of 50%, since its magnitude is considerably larger than those of the other intercombination lines.

For transitions of the type $2p^3$–$2p^23d$, we quote the semiempirical results of Bromage and Fawcett [2], which include approximate correlation, relativistic, and intermediate coupling effects. Transitions to levels that are of very low purity in LS coupling have been excluded. The f-values for the remaining lines which involve nominally pure levels (i.e., less than 60% pure) have been assigned accuracy ratings of "E."

Oscillator strength data are available for additional transitions [3], but these results are not quoted here since no indication of the percentage compositions is given.

References

[1] Cheng, K. T., Kim, Y.-K., and Desclaux, J. P., At. Data Nucl. Data Tables **24**, 111 (1979).

[2] Bromage, G. E., and Fawcett, B. C., Mon. Not. R. Astron. Soc. **179**, 683 (1977).

[3] Bromage, G. E., Cowan, R. D., Fawcett, B. C., Gordon, H., Hobby, M. G., Peacock, N. J., and Ridgeley, A., United Kingdom Atomic Energy Authority Report CLM-R170 (August 1977).

Fe XX: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} ($10^8 s^{-1}$)	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$2s^22p^3$–$2s2p^4$	${}^4S^o$ – ${}^4P$	*126.53*	0	*790340*	4	12	160	0.115	0.192	−0.336	C	1
			132.85	0	752730	4	6	130	0.052	0.091	−0.68	C	1
			121.85	0	820680	4	4	186	0.0413	0.066	−0.78	C	1
			118.70	0	842460	4	2	209	0.0221	0.0345	−1.054	C	1

Fe XX: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
2.		^{4}S° - ^{2}D											
			[95.1]	0	[1028100]	4	4	19	0.0026	0.0033	−1.98	E	1
3.		^{4}S° - ^{2}S											
			[83.0]	0	[1181000]	4	2	19	0.0010	0.0011	−2.40	E	1
4.		^{4}S° - ^{2}P											
			[79.5]	0	[1229000]	4	4	47	0.0045	0.0047	−1.74	E	1
5.		^{2}D° - ^{4}P											
			[175]	[162000]	752730	6	6	2.6	0.0012	0.0041	−2.14	E	1
			[148]	[124300]	820680	4	4	1.3	4.2(−4)[a]	8.2(−4)	−2.77	E	1
			[156]	[162000]	820680	6	4	0.45	1.1(−4)	3.4(−4)	−3.18	E	1
			[143]	[124300]	842460	4	2	3.3	5.1(−4)	9.6(−4)	−2.69	E	1
			[164]	[124300]	752730	4	6	6.3	0.0038	0.0082	−1.82	E	1
6.		^{2}D° - ^{2}D	*112.2*	*[146900]*	*[1037800]*	10	10	360	0.068	0.25	−0.17	C−	1
			113.34	[162000]	[1044300]	6	6	330	0.063	0.14	−0.42	C	1
			110.65	[124300]	[1028100]	4	4	420	0.078	0.11	−0.51	C	1
			115.39	[162000]	[1028100]	6	4	0.43	5.7(−5)	1.3(−4)	−3.47	E	1
			[108.7]	[124300]	[1044300]	4	6	0.27	7.1(−5)	1.0(−4)	−3.55	E	1
7.		^{2}D° - ^{2}S											
			94.62	[124300]	[1181000]	4	2	450	0.030	0.037	−0.92	D	1
8.		^{2}D° - ^{2}P	*89.76*	*[146900]*	*[1261000]*	10	6	930	0.068	0.20	−0.17	C	1
			93.76	[162000]	[1229000]	6	4	1000	0.089	0.16	−0.27	C	1
			83.23	[124300]	[1326000]	4	2	291	0.0151	0.0165	−1.219	C	1
			90.60	[124300]	[1229000]	4	4	147	0.0181	0.0216	−1.140	C	1
9.		^{2}P° - ^{4}P											
			[234]	[309000]	752730	4	6	0.27	3.3(−4)	0.0010	−2.88	E	1
			[202]	[309000]	820680	4	4	1.8	0.0011	0.0029	−2.36	E	1
			[172]	[246000]	842460	2	2	2.5	0.0011	0.0012	−2.66	E	1
10.		^{2}P° - ^{2}D	*133*	*[288000]*	*[1037800]*	6	10	53	0.023	0.061	−0.86	C−	1
			136.06	[309000]	[1044300]	4	6	60	0.0250	0.0448	−1.000	C	1
			[128]	[246000]	[1028100]	2	4	29.7	0.0146	0.0123	−1.53	C	1
			[139]	[309000]	[1028100]	4	4	6.9	0.0020	0.0037	−2.10	D	1
11.		^{2}P° - ^{2}S	*112*	*[288000]*	[1181000]	6	2	360	0.023	0.050	−0.87	C−	1
			[115]	[309000]	[1181000]	4	2	30	0.0030	0.0045	−1.92	D	1
			106.96	[246000]	[1181000]	2	2	370	0.064	0.045	−0.89	C	1
12.		^{2}P° - ^{2}P	*103*	*[288000]*	*[1261000]*	6	6	423	0.067	0.137	−0.394	C−	1
			108.82	[309000]	[1229000]	4	4	94	0.0167	0.0239	−1.175	C	1
			[92.59]	[246000]	[1326000]	2	2	44	0.0057	0.0035	−1.94	D	1
			98.37	[309000]	[1326000]	4	2	970	0.070	0.091	−0.55	C	1
			101.84	[246000]	[1229000]	2	4	91	0.0284	0.0190	−1.246	C	1

Fe XX: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
13.	$2s2p^4$–$2p^5$	^{4}P – ^{2}P°											
			[81.4]	752730	[1940400]	6	4	32	0.0021	0.0034	−1.90	E	1
			[78.9]	820680	[2048000]	4	2	2.8	1.3(−4)	1.4(−4)	−3.28	E	1
			[86.2]	820680	[1940400]	4	4	17	0.0019	0.0022	−2.12	E	1
			[80.3]	842460	[2048000]	2	2	10	9.7(−4)	5.1(−4)	−2.71	E	1
			[87.8]	842460	[1940400]	2	4	5.6	0.0013	7.5(−4)	−2.59	E	1
14.		^{2}D – ^{2}P°	*107*	*[1037800]*	*[1976000]*	10	6	580	0.060	0.21	−0.22	C	1
			111.60	[1044300]	[1940400]	6	4	430	0.054	0.12	−0.49	C	1
			98.08	[1028100]	[2048000]	4	2	462	0.0333	0.0430	−0.88	C	1
			109.65	[1028100]	[1940400]	4	4	176	0.0317	0.0458	−0.90	C	1
15.		^{2}S – ^{2}P°	*126*	[1181000]	*[1976000]*	2	6	75	0.053	0.0442	−0.97	C−	1
			131.76	[1181000]	[1940400]	2	4	90	0.0469	0.0407	−1.028	C	1
			[115]	[1181000]	[2048000]	2	2	23	0.0046	0.0035	−2.04	D	1
16.		^{2}P –^{2}P°	*140*	*[1261000]*	*[1976000]*	6	6	420	0.12	0.34	−0.13	C	1
			140.42	[1229000]	[1940400]	4	4	310	0.092	0.17	−0.43	C	1
			138.49	[1326000]	[2048000]	2	2	320	0.093	0.085	−0.73	C	1
			122.00	[1229000]	[2048000]	4	2	370	0.0413	0.066	−0.78	C	1
			[163]	[1326000]	[1940400]	2	4	17.8	0.0142	0.0152	−1.55	C	1
17.	$2p^3$–$2p^2(^3P)3d$	^{4}S° – ^{4}P											
			[12.84]			4	6	1.5(+5)	0.56	0.095	0.35	E	2
			[12.82]			4	4	2.1(+5)	0.52	0.088	0.32	D	2
18.		^{2}D° – ^{2}D											
			[13.00]			6	6	5.9(+4)	0.15	0.039	−0.05	E	2
			[12.94]			4	6	1.5(+5)	0.56	0.095	0.35	D	2
19.		^{2}P° – ^{2}D											
			[13.15]			2	4	9.6(+4)	0.50	0.043	0.00	D	2
20.	$2p^3$–$2p^2(^1D)3d$	^{2}D° – ^{2}D											
			[12.89]			6	6	9.6(+4)	0.24	0.061	0.16	E	2
			[12.84]			4	4	1.2(+5)	0.30	0.051	0.08	D	2
			[12.83]			4	6	1.1(+5)	0.42	0.071	0.23	E	2
21.		^{2}P° – ^{2}D											
			[13.14]			4	6	1.7(+4)	0.065	0.011	−0.59	E	2
22.		^{2}P° – ^{2}P											
			[13.06]			4	4	1.5(+5)	0.39	0.067	0.19	D	2
23.	$2p^3$–$2p^2(^1S)3d$	^{2}P° – ^{2}D											
			[12.88]			4	6	1.4(+5)	0.53	0.090	0.33	D	2
			[12.76]			2	4	1.5(+5)	0.73	0.061	0.16	D	2

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[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe XXI

Ground State $1s^22s^22p^2\ {}^3P_0$

Ionization Potential [1685] eV = [13591000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
8.47	69	9.68	53	13.25	31	124	19
8.53	67,68	9.69	44,60	13.41	33	124.26	3
8.56	66,68	9.70	53	78.3	16	125.30	28
8.57	67	9.73	44	83.4	6	128.73	2
8.61	66	9.74	46	84.4	16	136	14
8.62	62	9.75	45	86.6	6	137	19
8.63	62	9.79	59	87.7	21	140	19
8.64	65,66	9.85	47	91.29	4	142.14	2
8.65	65,73,74	12.02	37	94.480	5	142.25	2
8.66	71,72	12.10	36	95.656	18	144.46	8
8.68	62	12.13	37	97.89	4	144.82	25
8.71	62	12.192	38	98.140	18	145.66	2
8.72	63	12.21	36	98.525	5	148.79	8
8.74	70,76	12.25	35	99.05	11	151.51	2
8.81	64	12.28	36	102.23	4	151.63	2
8.83	75	12.36	35	103	17	155	22
9.34	52	12.38	35,42	104	23	156	22
9.41	52	12.393	41	108.45	3	164	24
9.42	51	12.43	35	111.02	20	178	27
9.44	50	12.47	40	112.47	15	179	13
9.45	49	12.525	34	113.34	10	180.55	7
9.46	51	12.53	34	113.56	20	182	22
9.47	49,50	12.587	39	114	17	189.61	7
9.52	49	12.623	43	115.16	3	189.81	7
9.54	48	12.91	30	117	17	193	24
9.56	48,49,57,	12.95	29	117.89	3	209	26
	58	12.99	30	118.3	9	244	12
9.58	48,54,56	13.00	29	118.70	3	251	1
9.59	44,55	13.03	29	120	19	260	26
9.62	44	13.13	29	121	19	282	1
9.63	44	13.14	29	121.22	3		
9.67	61	13.20	29,32	122	19		

Oscillator strengths for transitions of the arrays $2s^22p^2$–$2s2p^3$ and $2s2p^3$–$2p^4$ are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1]. These relativistic calculations include a perturbative treatment of the Breit interaction and the Lamb shift. The results should be quite accurate, except in the case of intercombination lines, for which the f-values should be considered rather uncertain. (A few very weak intercombination lines have been omitted from this tabulation.) The f-value listed for the $2s^22p^2\ {}^3P_2$–$2s2p^3\ {}^1D_2^\circ$ transition is quoted with an uncertainty of 50%, since its magnitude is considerably larger than those of the other intercombination lines.

Transition probabilities for the arrays $2p^2$–$2p3s$ and $2p^2$–$2p3d$ are the results of the scaled Thomas-Fermi calculations of Mason et al. [2] in intermediate coupling with limited configuration interaction. Their A-values and f-values were corrected for deviations of the calculated wavelengths from the observed ones wherever possible. Of the intercombination lines, only the stronger ones have been included here, since these values were considered to be more uncertain than those for transitions between terms of the same total spin. Transitions to $J = 2$ levels of the configuration $2p3d$, with the exception of ${}^3F_2^\circ$, have been omitted since the eigenvectors calculated by Mason et al. for these levels indicate severe mixing of Russell-Saunders states.

Mason et al. [2] have also calculated gf-values for transitions of the arrays $2p^2$–$2pns$ and $2p^2$–$2pnd$ ($n = 4,5$). Again, only the stronger intercombination lines treated by them are tabulated here. Transitions involving the levels $2pnd\ {}^3P_2^\circ$ and $2pnd\ {}^3D_2^\circ$ ($n = 4,5$)

have been excluded, since the results of ref. [2] indicate that these levels are of very low purity in *LS* coupling.

The remaining *f*-values were derived by interpolation from graphs of systematic trends along the isoelectronic sequence.

Oscillator strength data are available for additional transitions [3], but they have not been tabulated here since no indication of the eigenvectors is provided.

References

[1] Cheng, K. T., Kim, Y.-K., and Desclaux, J. P., At. Data Nucl. Data Tables **24**, 111 (1979).

[2] Mason, H. E., Doschek, G. A., Feldman, U., and Bhatia, A. K., Astron. Astrophys. **73**, 74 (1979).

[3] Bromage, G. E., Cowan, R. D., Fawcett, B. C., Gordon, H., Hobby, M. G., Peacock, N. J., and Ridgeley, A., United Kingdom Atomic Energy Authority Report CLM–R170 (August 1977).

Fe XXI: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$2s^22p^2$–$2s2p^3$	^{3}P – ^{5}S°											
			[282]			5	5	0.32	3.8(−4)[a]	0.0018	−2.72	E	1
			[251]			3	5	0.34	5.3(−4)	0.0013	−2.80	E	1
2.		^{3}P – ^{3}D°	*142.89*	*89790*	*789620*	9	15	88	0.045	0.19	−0.39	D	1
			145.66	117310	803840	5	7	66	0.0295	0.071	−0.83	C	1
			142.14	73850	777380	3	5	100	0.051	0.072	−0.82	C	1
			128.73	0	776820	1	3	120	0.093	0.039	−1.03	C	1
			151.51	117310	777380	5	5	0.13	4.4(−5)	1.1(−4)	−3.66	E	1
			[142.25]	73850	776820	3	3	7.9	0.0024	0.0034	−2.14	D	1
			[151.63]	117310	776820	5	3	0.73	1.5(−4)	3.7(−4)	−3.12	E	1
3.		^{3}P – ^{3}P°	*118.65*	*89790*	*932620*	9	9	237	0.050	0.176	−0.346	C−	1
			121.22	117310	942210	5	5	217	0.0479	0.096	−0.62	C	1
			117.89	73850	922080	3	3	170	0.0354	0.0412	−0.97	C	1
			[124.26]	117310	922080	5	3	32	0.0044	0.0090	−1.66	D	1
			118.70	73850	916310	3	1	241	0.0170	0.0199	−1.292	C	1
			115.16	73850	942210	3	5	3.6	0.0012	0.0014	−2.44	D	1
			108.45	0	922080	1	3	42.5	0.0225	0.0080	−1.65	C	1
4.		^{3}P – ^{3}S°	*99.43*	*89790*	1095500	9	3	1000	0.051	0.15	−0.34	C	1
			102.23	117310	1095500	5	3	640	0.060	0.10	−0.52	C	1
			97.89	73850	1095500	3	3	264	0.0379	0.0366	−0.94	C	1
			91.29	0	1095500	1	3	99	0.0370	0.0111	−1.432	C	1
5.		^{3}P – ^{1}D°											
			[98.525]	117310	1132280	5	5	89	0.013	0.021	−1.19	D	1
			[94.480]	73850	1132280	3	5	4.3	9.5(−4)	8.9(−4)	−2.55	E	1
6.		^{3}P – ^{1}P°											
			[86.6]			5	3	2.4	1.6(−4)	2.3(−4)	−3.10	E	1
			[83.4]			3	3	54	0.0056	0.0046	−1.77	E	1
7.		^{1}D – ^{3}D°											
			[180.55]	249980	803840	5	7	10	0.0070	0.021	−1.46	E	1
			[189.61]	249980	777380	5	5	0.37	2.0(−4)	6.2(−4)	−3.00	E	1
			[189.81]	249980	776820	5	3	2.0	6.4(−4)	0.0020	−2.49	E	1
8.		^{1}D – ^{3}P°											
			[144.46]	249980	942210	5	5	2.4	7.5(−4)	0.0018	−2.43	E	1
			[148.79]	249980	922080	5	3	3.0	5.9(−4)	0.0014	−2.53	E	1
9.		^{1}D – ^{3}S°											
			[118.3]	249980	1095500	5	3	2.9	3.7(−4)	7.2(−4)	−2.73	E	1
10.		^{1}D – ^{1}D°	113.34	249980	1132280	5	5	480	0.092	0.17	−0.34	C	1

Fe XXI: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
11.		^{1}D - ^{1}P°	99.05?			5	3	700	0.062	0.10	−0.51	C	1
12.		^{1}S - ^{3}D°											
			[244]			1	3	0.56	0.0015	0.0012	−2.82	E	1
13.		^{1}S - ^{3}P°											
			[179]			1	3	1.7	0.0024	0.0014	−2.62	E	1
14.		^{1}S - ^{3}S°											
			[136]			1	3	7.1	0.0059	0.0026	−2.23	E	1
15.		^{1}S - ^{1}P°	112.47			1	3	183	0.104	0.0385	−0.98	C	1
16.	$2s2p^3$–$2p^4$	^{5}S° - ^{3}P											
			[84.4]			5	5	15	0.0016	0.0022	−2.10	E	1
			[78.3]			5	3	2.9	1.6(−4)	2.1(−4)	−3.10	E	1
17.		^{3}D° - ^{3}P	*110*			15	9	472	0.051	0.279	−0.113	C	1
			[117]			7	5	319	0.0467	0.126	−0.486	C	1
			[103]			5	3	231	0.0220	0.0373	−0.96	C	1
			[103]			3	1	383	0.0203	0.0207	−1.215	C	1
			[114]			5	5	150	0.0292	0.055	−0.84	C	1
			[103]			3	3	158	0.0252	0.0256	−1.121	C	1
			[114]			3	5	38.5	0.0125	0.0141	−1.426	C	1
18.		^{3}D° - ^{1}D											
			[98.140]	803840	1822790	7	5	60	0.0062	0.014	−1.36	E	1
			[95.656]	777380	1822790	5	5	7.3	0.0010	0.0016	−2.30	E	1
19.		^{3}P° - ^{3}P	*131*			9	9	130	0.033	0.13	−0.52	D	1
			[140]			5	5	37.8	0.0111	0.0256	−1.256	C	1
			[121]			3	3	1.5	3.4(−4)	4.1(−4)	−2.99	E	1
			[124]			5	3	181	0.0250	0.051	−0.90	C	1
			[122]			3	1	208	0.0155	0.0187	−1.333	C	1
			[137]			3	5	39.2	0.0184	0.0249	−1.258	C	1
			[120]			1	3	53	0.0341	0.0135	−1.467	C	1
20.		^{3}P° - ^{1}D											
			[113.56]	942210	1822790	5	5	25	0.0049	0.0092	−1.61	E	1
			[111.02]	922080	1822790	3	5	13	0.0041	0.0045	−1.91	E	1
21.		^{3}P° - ^{1}S											
			[87.7]			3	1	47	0.0018	0.0016	−2.27	E	1
22.		^{3}S° - ^{3}P	*169*			3	9	100	0.13	0.22	−0.40	C	1
			[182]			3	5	68	0.056	0.10	−0.77	C	1
			[155]			3	3	140	0.052	0.080	−0.81	C	1
			[156]			3	1	193	0.0235	0.0362	−1.152	C	1
23.		^{3}S° - ^{1}S											
			[104]			3	1	59	0.0032	0.0033	−2.02	E	1

Fe XXI: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Sourc
24.		$^1D^o$ - ^3P											
			[193]			5	5	8.4	0.0047	0.015	−1.63	E	1
			[164]			5	3	3.5	8.5(−4)	0.0023	−2.37	E	1
25.		$^1D^o$ - ^1D	144.82	1132280	1822790	5	5	356	0.112	0.267	−0.252	C	1
26.		$^1P^o$ - ^3P											
			[260]			3	5	1.1	0.0019	0.0049	−2.24	E	1
			[209]			3	3	7.3	0.0048	0.0099	−1.84	E	1
27.		$^1P^o$ - ^1D	[178]			3	5	51	0.0400	0.070	−0.92	C	1
28.		$^1P^o$ - ^1S	125.30			3	1	870	0.068	0.084	−0.69	C	1
29.	$2p^2$–$2p3s$	^3P - $^3P^o$	*13.06*			9	9	2.0(+4)	0.052	0.020	−0.33	D	2
			[13.03]			5	5	1.3(+4)	0.033	0.0071	−0.78	D	2
			[13.13]			3	3	3900	0.010	0.0013	−1.52	D	2
			[13.20]			5	3	1.2(+4)	0.019	0.0041	−1.03	D	2
			[13.14]			3	1	2.0(+4)	0.017	0.0022	−1.29	D	2
			[12.95]			3	5	6100	0.026	0.0033	−1.12	D	2
			[13.00]			1	3	7300	0.055	0.0024	−1.26	D	2
30.		^3P - $^1P^o$											
			[12.99]			5	3	1100	0.0017	3.6(−4)	−2.08	E	2
			[12.91]			3	3	1200	0.0030	3.8(−4)	−2.05	E	2
31.		^1D - $^3P^o$											
			[13.25]			5	5	3400	0.0089	0.0020	−1.35	E	2
32.		^1D - $^1P^o$	[13.20]			5	3	2.3(+4)	0.036	0.0078	−0.74	D	2
33.		^1S - $^1P^o$	[13.41]			1	3	7300	0.059	0.0026	−1.23	E	2
34.	$2p^2$–$2p3d$	^3P - $^3F^o$											
			12.525	117310	8101300	5	7	5.9(+4)	0.19	0.040	−0.01	D	2
			[12.53]			5	5	1.5(+4)	0.035	0.0073	−0.75	D	2
35.		^3P - $^3D^o$											
			12.38	117310	8195000	5	7	2.1(+5)	0.69	0.14	0.54	D	2
			[12.25]			1	3	2.1(+5)	1.4	0.057	0.15	D	2
			[12.36]			3	3	3.6(+4)	0.082	0.010	−0.61	D	2
			[12.43]			5	3	2100	0.0029	6.0(−4)	−1.84	E	2
36.		^3P - $^3P^o$											
			[12.21]			3	3	1.2(+5)	0.27	0.032	−0.09	D	2
			[12.28]			5	3	5.2(+4)	0.071	0.014	−0.45	D	2
			[12.21]			3	1	1.5(+5)	0.11	0.013	−0.47	D	2
			[12.10]			1	3	230	0.0015	6.0(−5)	−2.82	E	2
37.		^3P - $^1P^o$											
			[12.13]			3	3	1.8(+4)	0.040	0.0048	−0.92	E	2
			[12.02]			1	3	1.3(+4)	0.084	0.0033	−1.07	E	2
38.		^3P - $^1F^o$											
			[12.192]	117310	8319100	5	7	2.2(+4)	0.070	0.014	−0.46	E	2

Fe XXI: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
39.		^{1}D – ^{3}D°											
			[12.587]	249980	8195000	5	7	1.2(+4)	0.039	0.0081	0.71	E	2
40.		^{1}D – ^{3}P°											
			[12.47]			5	3	1.3(+4)	0.018	0.0037	−1.04	E	2
41.		^{1}D – ^{1}F°	12.393	249980	8319100	5	7	3.2(+5)	1.0	0.21	0.71	D	2
42.		^{1}D – ^{1}P°	[12.38]			5	3	6900	0.0095	0.0019	−1.32	E	2
43.		^{1}S – ^{1}P°	12.623			1	3	7.1(+4)	0.51	0.021	−0.30	E	2
44.	$2p^2$–$2p4s$	^{3}P – ^{3}P°	9.65			9	9	4500	0.0063	0.0018	−1.25	E	2
			[9.63]			5	5	3000	0.0042	6.7(−4)	−1.68	E	2
			[9.69]			3	3	610	8.6(−4)	8.2(−5)	−2.59	E	2
			[9.73]			5	3	2300	0.0020	3.2(−4)	−2.00	E	2
			[9.69]			3	1	3600	0.0017	1.6(−4)	−2.29	E	2
			[9.59]			3	5	1700	0.0040	3.8(−4)	−1.92	E	2
			[9.62]			1	3	1200	0.0049	1.6(−4)	−2.31	E	2
45.		^{1}D – ^{3}P°											
			[9.75]			5	5	770	0.0011	1.8(−4)	−2.26	E	2
46.		^{1}D – ^{1}P°	[9.74]			5	3	5300	0.0045	7.2(−4)	−1.65	E	2
47.		^{1}S – ^{1}P°	[9.85]			1	3	2200	0.0095	3.1(−4)	−2.02	E	2
48.	$2p^2$–$2p4d$	^{3}P – ^{3}F°											
			[9.56]			5	7	3.2(+4)	0.061	0.0096	−0.52	D	2
			[9.54]			3	5	750	0.0017	1.6(−4)	−2.29	E	2
			[9.58]			5	5	5200	0.0071	0.0011	−1.45	E	2
49.		^{3}P – ^{3}D°											
			[9.47]			5	7	4.9(+4)	0.093	0.014	−0.33	D	2
			[9.45]			1	3	5.2(+4)	0.21	0.0065	−0.68	D	2
			[9.52]			3	3	8100	0.011	0.0010	−1.48	D	2
			[9.56]			5	3	850	7.0(−4)	1.1(−4)	−2.46	E	2
50.		^{3}P – ^{1}D°											
			[9.47]			5	5	6100	0.0082	0.0013	−1.39	E	2
			[9.44]			3	5	1.7(+4)	0.037	0.0034	−0.95	D	2
51.		^{3}P – ^{3}P°											
			[9.42]			3	3	3.3(+4)	0.044	0.0041	−0.88	D	2
			[9.46]			5	3	1.5(+4)	0.012	0.0019	−1.22	D	2
			[9.42]			3	1	4.3(+4)	0.019	0.0018	−1.24	D	2
52.		^{3}P – ^{1}P°											
			[9.41]			3	3	1300	0.0017	1.6(−4)	−2.29	E	2
			[9.34]			1	3	2200	0.0086	2.6(−4)	−2.07	E	2
53.		^{1}D – ^{3}F°											
			[9.68]			5	7	4000	0.0079	0.0013	−1.40	E	2
			[9.70]			5	5	1900	0.0027	4.3(−4)	−1.87	E	2

Fe XXI: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
54.		$^1\mathrm{D} - {}^3\mathrm{D}^\circ$											
			[9.58]			5	7	1700	0.0033	5.2(−4)	−1.78	E	2
55.		$^1\mathrm{D} - {}^1\mathrm{D}^\circ$	[9.59]			5	5	1.0(+4)	0.014	0.0022	−1.15	D	2
56.		$^1\mathrm{D} - {}^3\mathrm{P}^\circ$											
			[9.58]			5	3	3900	0.0032	5.0(−4)	−1.80	E	2
57.		$^1\mathrm{D} - {}^1\mathrm{F}^\circ$	[9.56]			5	7	8.9(+4)	0.17	0.027	−0.07	D	2
58.		$^1\mathrm{D} - {}^1\mathrm{P}^\circ$	[9.56]			5	3	2300	0.0019	3.0(−4)	−2.02	E	2
59.		$^1\mathrm{S} - {}^3\mathrm{D}^\circ$											
			[9.79]			1	3	2200	0.0094	3.0(−4)	−2.03	E	2
60.		$^1\mathrm{S} - {}^3\mathrm{P}^\circ$											
			[9.69]			1	3	500	0.0021	6.7(−5)	−2.68	E	2
61.		$^1\mathrm{S} - {}^1\mathrm{P}^\circ$	[9.67]			1	3	5.7(+4)	0.24	0.0076	−0.62	D	2
62.	$2p^2$–$2p5s$	$^3\mathrm{P} - {}^3\mathrm{P}^\circ$											
			[8.63]			5	5	510	5.7(−4)	8.1(−5)	−2.55	E	2
			[8.68]			3	3	160	1.8(−4)	1.5(−5)	−3.27	E	2
			[8.71]			5	3	730	5.0(−4)	7.2(−5)	−2.60	E	2
			[8.68]			3	1	1000	3.9(−4)	3.3(−5)	−2.93	E	2
			[8.62]			1	3	280	9.5(−4)	2.7(−5)	−3.02	E	2
63.		$^1\mathrm{D} - {}^1\mathrm{P}^\circ$	[8.72]			5	3	2000	0.0014	2.0(−4)	−2.15	E	2
64.		$^1\mathrm{S} - {}^1\mathrm{P}^\circ$	[8.81]			1	3	890	0.0031	9.0(−5)	−2.51	E	2
65.	$2p^2$–$2p5d$	$^3\mathrm{P} - {}^3\mathrm{F}^\circ$											
			[8.64]			5	7	1.5(+4)	0.024	0.0034	−0.92	D	2
			[8.65]			5	5	2500	0.0028	4.0(−4)	−1.85	E	2
66.		$^3\mathrm{P} - {}^3\mathrm{D}^\circ$											
			[8.56]			5	7	2.0(+4)	0.030	0.0042	−0.82	D	2
			[8.56]			1	3	2.1(+4)	0.070	0.0020	−1.15	D	2
			[8.61]			3	3	3200	0.0036	3.1(−4)	−1.97	E	2
			[8.64]			5	3	400	2.7(−4)	3.8(−5)	−2.87	E	2
67.		$^3\mathrm{P} - {}^1\mathrm{D}^\circ$											
			[8.57]			5	5	2800	0.0031	4.4(−4)	−1.81	E	2
			[8.53]			3	5	6100	0.011	9.3(−4)	−1.48	D	2
68.		$^3\mathrm{P} - {}^3\mathrm{P}^\circ$											
			[8.53]			3	3	1.5(+4)	0.016	0.0013	−1.32	D	2
			[8.56]			5	3	6500	0.0043	6.1(−4)	−1.67	E	2
			[8.53]			3	1	1.8(+4)	0.0066	5.6(−4)	−1.70	E	2
69.		$^3\mathrm{P} - {}^1\mathrm{P}^\circ$											
			[8.47]			1	3	1400	0.0046	1.3(−4)	−2.34	E	2
70.		$^1\mathrm{D} - {}^3\mathrm{F}^\circ$											
			[8.74]			5	7	2700	0.0044	6.3(−4)	−1.66	E	2

Fe XXI: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accu-racy	Source
71.		$^1\mathrm{D} - {}^1\mathrm{D}^\circ$	[8.66]			5	5	4400	0.0049	7.0(−4)	−1.61	E	2
72.		$^1\mathrm{D} - {}^3\mathrm{P}^\circ$											
			[8.66]			5	3	1600	0.0011	1.6(−4)	−2.26	E	2
73.		$^1\mathrm{D} - {}^1\mathrm{F}^\circ$	[8.65]			5	7	3.9(+4)	0.061	0.0087	−0.52	D	2
74.		$^1\mathrm{D} - {}^1\mathrm{P}^\circ$	[8.65]			5	3	1000	6.9(−4)	9.8(−5)	−2.46	E	2
75.		$^1\mathrm{S} - {}^3\mathrm{D}^\circ$											
			[8.83]			1	3	1600	0.0055	1.6(−4)	−2.26	E	2
76.		$^1\mathrm{S} - {}^1\mathrm{P}^\circ$	[8.74]			1	3	2.5(+4)	0.085	0.0024	−1.07	D	2
77.	$2p3s-2p3p$	$^3\mathrm{P}^\circ - {}^3\mathrm{D}$				9	15		0.088		−0.10	D	*interp.*
78.		$^3\mathrm{P}^\circ - {}^3\mathrm{S}$				9	3		0.021		−0.72	D	*interp.*
79.		$^3\mathrm{P}^\circ - {}^3\mathrm{P}$				9	9		0.073		−0.18	D	*interp.*
80.		$^1\mathrm{P}^\circ - {}^1\mathrm{P}$				3	3		0.050		−0.82	D	*interp.*
81.		$^1\mathrm{P}^\circ - {}^1\mathrm{D}$				3	5		0.14		−0.38	D	*interp.*
82.	$2p3p-2p3d$	$^1\mathrm{P} - {}^1\mathrm{P}^\circ$				3	3		0.030		−1.05	D	*interp.*
83.		$^3\mathrm{D} - {}^3\mathrm{F}^\circ$				15	21		0.032		−0.32	D−	*interp.*
84.		$^1\mathrm{D} - {}^1\mathrm{P}^\circ$				5	3		5.8(−4)		−2.54	E	*interp.*
85.		$^1\mathrm{D} - {}^1\mathrm{F}^\circ$				5	7		0.11		−0.26	D	*interp.*
86.		$^1\mathrm{S} - {}^1\mathrm{P}^\circ$				1	3		0.067		−1.17	D	*interp.*

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe XXII

Ground State $1s^22s^22p\ ^2\mathrm{P}^\circ_{1/2}$

Ionization Potential [1794] eV = [14470000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
8.960	33,38	9.215	37	11.837	21	12.095	23
8.977	36	9.241	36	11.886	20	12.193	22,24
8.992	35	10.25	40	11.898	27	12.22	17
9.006	35	10.30	40	11.921	18	12.325	25
9.057	33	10.31	40	11.933	18	12.38	17
9.065	33,34	11.748	20,21,26	11.976	19	14.05	31
9.08	32	11.767	18	12.027	30	14.14	31
9.16	32	11.789	21,26	12.045	23,28	14.16	31
9.163	39	11.797	21	12.053	23	84.4	7
9.183	38	11.823	20	12.077	27,29	84.6	7

List of tabulated lines—Continued

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
88.4	7	116.29	4	149.90	9	230.05	12
99.3	6	117.17	3	151.30	9	238.53	15
100.78	3	117.52	5	153.95	16	246.82	12
102	6	120.17	10	155.87	2	251	1
102.23	4	125.71	5	156.84	9	255	11
105	6	129.15	13	157.36	13	258	1
108	6	134.65	5	161.75	2	299	1
111	6	135.78	2	169.35	16	358	1
112.20	10	136.02	3	173.49	13	372	14
114.42	3	139.82	13	183.84	12	398	11
115.22	10	144.82	9	195	8		

The tabulated oscillator strengths for transitions of the arrays $2s^22p$–$2s2p^2$ and $2s2p^2$–$2p^3$ are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1]. These relativistic calculations include a perturbative treatment of the Breit interaction and the Lamb shift. The results should be quite accurate, except in the case of intercombination lines, for which the f-values should be considered rather uncertain. (A few very weak intercombination lines have been omitted from this tabulation.)

Other sources of reliable data for $2s$–$2p$ transitions are the multiconfiguration Breit-Pauli method of Glass [2,3] (including relativistic effects) and the similar but somewhat less sophisticated approach of Dankwort and Trefftz [4]. With the exception of some weaker lines, they agree very well with the results of Cheng et al. [1], but the latter are quoted exclusively since ref. [1] provides data derived from comprehensive calculations for all outer-shell $2s$–$2p$ transi-in ions of the isoelectronic sequences of Li through F.

According to the sources of data mentioned above, the lower of the two levels $2s2p^2$ $^2P_{1/2}$ and $^2S_{1/2}$ is mostly of ^2P character, "crossed" the $^2S_{1/2}$ level at about V XIX or Cr XX. We have thus labeled these two levels accordingly, in contrast to their labeling by Cheng et al. [1], which is consistent with their ordering at the neutral end of the B sequence.

The results of the Hartree-XR (Hartree-Fock with exchange and relativistic effects) calculations of Bromage et al. [5] are quoted for several $2p$–$3d$ and $2p$–$4d$ transitions. The Hartree-Fock (HF) sults of Shamey [6] are tabulated for a few transitions of the type $2p$–ns,nd ($n = 3,4$). The very weak lines have been omitted, Shamey's calculations accounted for very limited configuration interaction. A few multiplet f-values are the results of Chapman's single-configuration HF calculations [7].

The f-value for the $3p$–$3d$ multiplet was derived by graphical interpolation along the isoelectronic sequence.

References

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Fe XXII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$2s^22p$–$2s2p^2$	$^2P^\circ$ – ^4P											
			[258]			4	6	0.67	0.0010	0.0034	−2.40	E	1
			[299]			4	4	0.082	1.1(−4)[a]	4.3(−4)	−3.36	E	1
			[251]			2	2	0.84	7.9(−4)	0.0013	−2.80	E	1
			[358]			4	2	0.14	1.3(−4)	6.1(−4)	−3.28	E	1
2.		$^2P^\circ$ – ^2D	*148.89*	*78850*	*750490*	6	10	77	0.0425	0.125	−0.59	C−	1
			155.87	118270	759830	4	6	62	0.0340	0.070	−0.87	C	1
			135.78	0	736490	2	4	110	0.062	0.055	−0.91	C	1
			[161.75]	118270	736490	4	4	0.38	1.5(−4)	3.2(−4)	−3.22	E	1

Fe XXII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
3.		$^2P^o - {}^2P$	*115.32*	*78850*	*945990*	6	6	440	0.088	0.20	−0.28	C−	1
			114.42	118270	992260	4	4	450	0.088	0.13	−0.45	C	1
			117.17	0	853460	2	2	390	0.080	0.062	−0.80	C	1
			[136.02]	118270	853460	4	2	0.12	1.6(−5)	2.9(−5)	−4.19	E	1
			100.78	0	992260	2	4	62	0.0189	0.0125	−1.423	C	1
4.		$^2P^o - {}^2S$	*111.19*	*78850*	978190	6	2	430	0.026	0.058	−0.80	C−	1
			116.29	118270	978190	4	2	353	0.0358	0.055	−0.84	C	1
			102.23	0	978190	2	2	27	0.0042	0.0028	−2.08	D	1
5.	$2s2p^2–2p^3$	$^4P - {}^4S^o$	*128.48*			12	4	449	0.0370	0.188	−0.352	C	1
			134.65			6	4	196	0.0356	0.095	−0.67	C	1
			125.71			4	4	152	0.0360	0.060	−0.84	C	1
			117.52			2	4	103	0.0428	0.0331	−1.068	C	1
6.		$^4P - {}^2D^o$											
			[108]			6	6	20	0.0035	0.0075	−1.68	E	1
			[105]			4	4	24	0.0039	0.0054	−1.81	E	1
			[111]			6	4	2.3	2.8(−4)	6.1(−4)	−2.77	E	1
			[102]			4	6	0.51	1.2(−4)	1.6(−4)	−3.32	E	1
			[99.3]			2	4	0.34	1.0(−4)	6.5(−5)	−3.70	E	1
7.		$^4P - {}^2P^o$											
			[88.4]			6	4	1.5	1.2(−4)	2.1(−4)	−3.14	E	1
			[84.4]			4	4	3.0	3.2(−4)	3.6(−4)	−2.89	E	1
			[84.6]			2	2	2.3	2.5(−4)	1.4(−4)	−3.30	E	1
8.		$^2D - {}^4S^o$											
			[195]			4	4	1.3	7.4(−4)	0.0019	−2.53	E	1
9.		$^2D - {}^2D^o$	*150.46*	*750490*	*1415130*	10	10	149	0.050	0.250	−0.297	C	1
			149.90	759830	1426940	6	6	128	0.0432	0.128	−0.59	C	1
			[151.30]	736490	1397420	4	4	76	0.0260	0.052	−0.98	C	1
			156.84	759830	1397420	6	4	50	0.0124	0.0384	−1.128	C	1
			144.82	736490	1426940	4	6	35.4	0.0167	0.0318	−1.175	C	1
10.		$^2D - {}^2P^o$	*116.61*	*750490*	*1608060*	10	6	230	0.029	0.11	−0.54	D	1
			[115.22]	759830	1627750	6	4	142	0.0189	0.0430	−0.95	C	1
			[120.17]	736490	1568670	4	2	296	0.0320	0.051	−0.89	C	1
			[112.20]	736490	1627750	4	4	51	0.0097	0.014	−1.41	D	1
11.		$^2P - {}^4S^o$											
			[398]			4	4	0.28	6.7(−4)	0.0035	−2.57	E	1
			[255]			2	4	1.1	0.0022	0.0037	−2.36	E	1
12.		$^2P - {}^2D^o$	*213.16*	*945990*	*1415130*	6	10	42	0.048	0.20	−0.55	D	1
			[230.05]	992260	1426940	4	6	33.8	0.0402	0.122	−0.79	C	1
			[183.84]	853460	1397420	2	4	66	0.067	0.081	−0.87	C	1
			[246.82]	992260	1397420	4	4	0.44	4.0(−4)	0.0013	−2.80	E	1

Fe XXII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at.u.)	log gf	Accu-racy	Sourc
13.		^{2}P – ^{2}P°	*151.04*	*945990*	*1608060*	6	6	190	0.064	0.19	−0.42	C−	1
			157.36	992260	1627750	4	4	200	0.075	0.16	−0.52	C	1
			139.82	853460	1568670	2	2	26	0.0075	0.0069	−1.82	D	1
			[173.49]	992260	1568670	4	2	22	0.0050	0.011	−1.70	D	1
			[129.15]	853460	1627750	2	4	37.4	0.0187	0.0159	−1.427	C	1
14.		^{2}S – ^{4}S°											
			[372]			2	4	0.12	4.8(−4)	0.0012	−3.02	E	1
15.		^{2}S – ^{2}D°											
			[238.53]	978190	1397420	2	4	8.6	0.0146	0.0229	−1.53	C	1
16.		^{2}S – ^{2}P°	*158.76*	978190	*1608060*	2	6	58	0.066	0.069	−0.88	C	1
			[153.95]	978190	1627750	2	4	17.4	0.0124	0.0126	−1.61	C	1
			[169.35]	978190	1568670	2	2	120	0.050	0.056	−1.00	C	1
17.	$2p$–$3s$	^{2}P° – ^{2}S	*12.33*			6	2	2.4(+4)	0.018	0.0045	−0.96	D	6
			[12.38]			4	2	1.6(+4)	0.018	0.0030	−1.13	D	6
			[12.22]			2	2	8500	0.019	0.0015	−1.42	D	6
18.	$2p$–$3d$	^{2}P° – ^{2}D	*11.870*	*78850*	*8503500*	6	10	1.8(+5)	0.64	0.15	0.58	D	5,6
			11.921	118270	8506900	4	6	1.8(+5)	0.59	0.093	0.37	D	5
			[11.767]	0	8498300	2	4	1.6(+5)	0.66	0.051	0.12	D	5
			[11.933]	118270	8498300	4	4	3.0(+4)	0.064	0.010	−0.59	D−	6
19.	$2s2p^2$– $2s2p(^3$P°$)3d$	^{4}P – ^{4}F°											
			11.976			6	8	5.9(+4)	0.17	0.040	0.01	D	5
20.		^{4}P – ^{4}P°											
			11.748			4	4	1.2(+5)	0.25	0.039	0.00	D	5
			11.823			6	4	7.9(+4)	0.11	0.026	−0.18	D	5
			11.748			4	2	1.8(+5)	0.19	0.029	−0.12	D	5
			11.886			4	6	1.3(+5)	0.42	0.066	0.23	D	5
21.		^{4}P – ^{4}D°											
			11.837			6	8	2.3(+5)	0.65	0.15	0.59	D	5
			11.748			4	6	4.8(+4)	0.15	0.023	−0.22	D	5
			11.797			2	4	1.7(+5)	0.70	0.054	0.15	D	5
			11.837			6	6	1.7(+5)	0.35	0.082	0.32	D	5
			11.789			2	2	2.6(+5)	0.55	0.043	0.04	D	5
22.		^{2}D – ^{2}D°											
			12.193	736490	8937900	4	6	9.9(+4)	0.33	0.053	0.12	D	5
23.		^{2}D – ^{2}F°	*12.049*	*750490*	*9049700*	10	14	2.0(+5)	0.61	0.24	0.78	D	5
			12.045	759830	9062000	6	8	2.4(+5)	0.71	0.17	0.63	D	5
			12.053	736490	9033200	4	6	6.1(+4)	0.20	0.032	−0.10	D	5
			12.095	759830	9033200	6	6	7.8(+4)	0.17	0.041	0.01	D	5
24.		^{2}P – ^{2}P°											
			12.193	853460	9054900	2	4	7.2(+4)	0.32	0.026	−0.19	D	5

Fe XXII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
25.		^{2}S – ^{2}P°											
			12.325	978190	9091800	2	2	1.5(+5)	0.35	0.028	−0.15	D	5
26.	$2s2p^2$– $2s2p(^1$P°$)3d$	^{2}D – ^{2}F°											
			11.789	759830	9242300	6	8	1.2(+5)	0.32	0.075	0.28	D	5
			11.748	736490	9248600	4	6	1.6(+5)	0.49	0.076	0.29	D	5
27.		^{2}P – ^{2}D°											
			12.077	992260	9272500	4	6	2.4(+5)	0.78	0.12	0.49	D	5
			11.898	853460	9258200	2	4	8.2(+4)	0.35	0.027	−0.15	D	5
28.		^{2}P – ^{2}P°											
			12.045	992260	9294500	4	4	9.7(+4)	0.21	0.033	−0.08	D	5
29.		^{2}S – ^{2}D°											
			12.077	978190	9258200	2	4	1.0(+5)	0.44	0.035	−0.06	D	5
30.		^{2}S – ^{2}P°											
			12.027	978190	9294500	2	4	6.9(+4)	0.30	0.024	−0.22	D	5
31.	$2p^3$–$2s^23d$	^{2}P° – ^{2}D	*14.11*			6	10	3200	0.016	0.0044	−1.02	D	6
			[14.14]			4	6	3000	0.013	0.0025	−1.27	D	6
			[14.05]			2	4	2900	0.017	0.0016	−1.46	D	6
			[14.16]			4	4	590	0.0018	3.3(−4)	−2.15	E	6
32.	$2p$–$4s$	^{2}P° – ^{2}S	*9.13*			6	2	9700	0.0040	7.3(−4)	−1.61	E	6
			[9.16]			4	2	6400	0.0040	4.9(−4)	−1.79	E	6
			[9.08]			2	2	3300	0.0041	2.4(−4)	−2.09	E	6
33.	$2p$–$4d$	^{2}P° – ^{2}D	*9.032*	*78850*	*11150000*	6	10	6.0(+4)	0.12	0.022	−0.13	D	5,6
			9.065	118270	11150000	4	6	6.0(+4)	0.11	0.013	−0.36	D	5
			8.960	0	11160000	2	4	5.0(+4)	0.12	0.0071	−0.62	D	5
			[9.057]	118270	11160000	4	4	9900	0.012	0.0015	−1.31	D−	6
34.	$2s2p^2$– $2s2p(^3$P°$)4d$	^{4}P – ^{4}F°											
			9.065			4	6	3.5(+4)	0.065	0.0078	−0.59	D	5
35.		^{4}P – ^{4}D°											
			9.006			6	8	5.7(+4)	0.093	0.017	−0.25	D	5
			8.992			2	4	4.9(+4)	0.12	0.0071	−0.62	D	5
			9.006			6	6	5.3(+4)	0.065	0.012	−0.41	D	5
36.		^{2}D – ^{2}F°											
			8.977	759830	11900000	6	8	2.5(+4)	0.040	0.0071	−0.62	D	5
			9.241	736490	11560000	4	6	5.1(+4)	0.098	0.012	−0.41	D	5
37.		^{2}D – ^{2}D°											
			9.215	759830	11610000	6	6	2.7(+4)	0.035	0.0061	−0.68	D	[illegible]

Fe XXII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
38.	$2s2p^2$– $2s2p(^1P^\circ)4d$	$^2D - ^2F^\circ$											
			9.183	759830	11650000	6	8	8.3(+4)	0.14	0.025	−0.08	D	5
			8.960	736490	11900000	4	6	3.8(+4)	0.068	0.0080	−0.57	D	5
39.		$^2P - ^2D^\circ$											
			9.163	992260	11910000	4	6	6.9(+4)	0.13	0.016	−0.28	D	5
40.	$2p^3$–$2s^24d$	$^2P^\circ - ^2D$	*10.28*			6	10	1000	0.0028	5.6(−4)	−1.78	E	6
			[10.30]			4	6	1000	0.0024	3.2(−4)	−2.02	E	6
			[10.25]			2	4	960	0.0030	2.0(−4)	−2.22	E	6
			[10.31]			4	4	170	2.7(−4)	3.7(−5)	−2.97	E	6
41.	$3s$–$3p$	$^2S - ^2P^\circ$				2	6		0.17		−0.47	D−	7
42.	$3s$–$4p$	$^2S - ^2P^\circ$	*34.40*			2	6	7000	0.37	0.084	−0.13	D−	7
43.	$3p$–$3d$	$^2P^\circ - ^2D$				6	10		0.048		−0.54	E	*interp.*
44.	$3p$–$4s$	$^2P^\circ - ^2S$	*37.66*			6	2	6300	0.045	0.033	−0.57	D−	7
45.	$3p$–$4d$	$^2P^\circ - ^2D$	*35.88*			6	10	1.7(+4)	0.54	0.38	0.51	D−	7
46.	$3d$–$4p$	$^2D - ^2P^\circ$	*38.85*			10	6	1200	0.016	0.020	−0.80	D−	7
47.	$3d$–$4f$	$^2D - ^2F^\circ$	*37.48*			10	14	3.4(+4)	0.99	1.2	1.00	D−	7

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe XXIII

Ground State	$1s^22s^2\ ^1S_0$
Ionization Potential	[1950] eV = [15730000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
7.45	21	8.63	37	11.44	24	144	3
7.48	20	8.669	36	11.440	24	147	3
7.66	39	8.67	36	11.49	27,28	149	7
7.68	39	8.752	38	11.517	27	154	3
7.73	39	8.764	35	11.594	29	166	3
7.78	42	8.812	34	11.690	26	173	3
7.83	42	8.94	32	11.737	25	179	3
7.85	43	10.903	11	11.84	30	223	6
7.86	41	10.927	10	32.6	47	263.76	1
7.89	40	10.934	10	33.4	53	321	5
8.271	19	10.979	9	35.2	51	377	5
8.303	18	11.07	23	35.4	57	513	5
8.316	17	11.14	12	36.1	55	607.5	49
8.528	33	11.298	24	120	4		
8.547	33	11.33	24	132.83	2		
8.614	33	11.333	24	135	4		

The tabulated oscillator strengths for transitions of the arrays $2s^2$–$2s2p$ and $2s2p$–$2p^2$ are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1]. These relativistic calculations include a perturbative treatment of the Breit interaction and the Lamb shift. The results should be quite accurate, except in the case of intercombination lines, for which the f-values should be considered more uncertain. (The $2s2p$ $^3P^o_1$–$2p^2$ $^1S_0$ trantion has been omitted from this tabulation, since its f-value is considerably smaller than those of the other lines of the array.)

Several other sources of reliable data are available for the $2s$–$2p$ transitions treated by Cheng et al. Those which provide results for most or all of the lines of these arrays are: the superposition-of-configurations calculations of Weiss [2] in intermediate coupling; the multiconfiguration Breit-Pauli method of Glass [3,4] (including relativistic effects); and the scaled Thomas-Fermi approach of Nussbaumer and Storey [5] with extensive allowance for configuration interaction and including a perturbational treatment of relativistic effects. Those which treat only the resonance lines include: the multiconfiguration Dirac-Fock (MCDF) approaches of Armstrong et al. [6] and Cheng and Johnson [7]; and the relativistic random phase approximation (RRPA) of Lin and Johnson [8]. With the exception of some weaker lines, these sources agree very well with the results of Cheng et al. [1], but the latter are quoted exclusively since ref. [1] provides data derived from comprehensive calculations for all outer-shell $2s$–$2p$ transitions in ions of the isoelectronic sequences Li through F.

A preliminary result derived from the beam-foil lifetime experiment by Dietrich et al. [9] for the $2s^2$ $^1S_0$–$2s2p$ $^3P^o_1$ transition deviates considerably from the calculated value of Cheng et al. [1] quoted here, although the experimental result with its stated error limits lies within our estimated uncertainty of the theoretical value. Nussbaumer and Storey [5] have calculated A-values for all downward transitions from levels of the configurations $2l'nl$ ($l' = s,p$; $n = 3,4$; $l = s,p,d$), as well as $2s4f$ and $2p4f$, in order to struct simulated decay curves of the levels $2s2p$ $^3P^o_1$ and $2s2p$ $^1P^o_1$. They conclude that the suspected blending of $2s^2$ $^1S_0$–$2s2p$ $^3P^o_1$ the second-order line of $2s^2$ $^1S_0$–$2s2p$ $^1P^o_1$ in the experiment of Dietrich et al. should not have been a significant factor in the determination of the lifetime, and that there must have been additional problems in their experiment.

Nussbaumer and Storey [5] reported the results of their calculations for only a few of the transitions mentioned above. These results are tabulated here, as are the A-values for two transitions calculated by Nussbaumer [10] in the scaled Thomas-Fermi approximation with limited configuration interaction.

Lin and Johnson [8] have calculated f-values for the transitions $2s^2$ $^1S_0$–$2snp$ $^1P^o_1$ ($n = 3,4$), which are quoted here. In addition, they determined f-values for the intercombination lines $2s^2$ $^1S_0$–$2snp$ $^3P^o_1$ ($n = 3,4$), but only for selected ions of the Be sequence (not including Fe XXIII). The Hartree-XR (Hartree-Fock with statistical exchange and relativistic effects) calculations of Bromage et al. [11] yielded a result for $2s^2$ $^1S_0$–$2s3p$ $^3P^o_1$ which lies outside the interval bracketed by the calculated f-values of Lin and Johnson for V XX and Ni XXV. This transition has thus been omitted from our tabulation, since it is difficult to derive an f-value by interpolation along an isoelectronic sequence for a transition that is increasing rather rapidly in strength, as is the case here. The result of Doschek et al. [12] for the $2s^2$ $^1S_0$–$2s4p$ $^3P^o_1$ transition calcu- in the same approximation as that used by Bromage et al. [11] lies slightly beyond the interval of f-values given by Lin and Johnson for the corresponding ions of V and Ni; it is thus quoted here, but with an accuracy rating of "E."

Oscillator strengths for several transitions involving electron jumps from the $n = 2$ shell to an upper state characterized by principal quantum number n' ($n' = 3,4,5$) are from the Hartree-XR calculations of Bromage et al. [11] mentioned above. It is indicated there that the $2p3d$ $^3D^o_2$ and $^1D^o_2$ levels are severely mixed. Thus transitions to these states are omitted here, and the f-value for the single transition to the $2p3d$ $^3P^o_2$ level is given an accuracy of "E," since its purity in LS coupling is slightly greater than 50%. All transitions to the levels $2p4d$ $^3D^o_2$, $^1D^o_2$, and $^3P^o_2$ are omitted, they are even more strongly mixed than those of $2p3d$.

A few multiplet f-values are from the single-configuration Hartree-Fock (HF) calculations of Chapman [13]. The remaining multiplet f-values were derived by interpolation along the Be isoelectronic sequence. Line strengths for the $^3P^o_2$–$^3D_2$ and $^3P^o_1$–$^3D_1$ transitions of the array $2s2p$–$2s3d$ were estimated to be in the proportion to the strongest line of the multiplet ($^3P^o_2$–$^3D_3$) as they would be in a pure LS-coupled multiplet. The calculated f-values of Fawcett et al. [14] for lines of the same multiplet in Ni XXV are an indication that this is a reasonable assumption to make, since the ratios of line strengths derived from their f-values deviate by only few percent from the LS-coupling ratios.

Transition probabilities are available in graphical form for several transitions involving vacancies in the K shell [15], but they are not tabulated here since relativistic effects were not taken into account.

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Fe XXIII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$2s^2$–$2s2p$	^{1}S – ^{3}P°											
			263.76	0	379130	1	3	0.48	0.0015	0.0013	−2.82	D	1
2.		^{1}S – ^{1}P°	132.83	0	752840	1	3	195	0.155	0.0678	−0.810	B	1
3.	$2s2p$–$2p^2$	^{3}P° – ^{3}P	*162*			9	9	132	0.0521	0.250	−0.329	B	1
			[166]			5	5	76.5	0.0316	0.0863	−0.801	B	1
			[154]			3	3	41.9	0.0149	0.0227	−1.350	B	1
			[179]			5	3	45.1	0.0130	0.0383	−1.187	B	1
			[173]			3	1	124	0.0185	0.0316	−1.256	B	1
			[144]			3	5	54.6	0.0283	0.0402	−1.071	B	1
			[147]			1	3	66.2	0.0643	0.0311	−1.192	B	1
4.		^{3}P° – ^{1}D											
			[135]			5	5	49.4	0.0135	0.0300	−1.171	C	1
			[120]			3	5	4.4	0.0016	0.0019	−2.32	D	1
5.		^{1}P° – ^{3}P											
			[321]			3	5	3.5	0.0090	0.029	−1.57	D	1
			[377]			3	3	0.070	1.5(−4)[a]	5.6(−4)	−3.35	E	1
			[513]			3	1	0.21	2.8(−4)	0.0014	−3.08	E	1
6.		^{1}P° – ^{1}D	[223]			3	5	45.4	0.0564	0.124	−0.772	B	1
7.		^{1}P° – ^{1}S	[149]			3	1	328	0.0364	0.0536	−0.962	B	1
8.	$2s3d$–$2p3d$	^{3}D – ^{3}F°											
						7	9	24				C+	5
9.	$2s^2$–$2s3p$	^{1}S – ^{1}P°	10.979	0	9108300	1	3	1.14(+5)	0.620	0.0224	−0.208	B	8
10.	$2s2p$–$2p3p$	^{3}P° – ^{3}D											
			10.927	462000	9614000	5	7	5.2(+4)	0.13	0.023	−0.19	D	11
			10.934	379130	9524900	3	5	5.0(+4)	0.15	0.016	−0.35	D	11
11.		^{3}P° – ^{3}P											
			10.903	462000	9634000	5	5	4.9(+4)	0.088	0.016	−0.36	D	11
12.		^{1}P° – ^{1}D	[11.14]			3	5	6.8(+4)	0.21	0.023	−0.20	D	11
13.	$2p^2$–$2s3p$	^{3}P – ^{3}P°											
						5	5	400				C	5
						3	1	380				C	5
						3	5	300				C	5
14.		^{1}D – ^{3}P°											
						5	5	79				D	5
15.		^{1}D – ^{1}P°				5	3	1700				D	10
16.		^{1}S – ^{1}P°				1	3	1400				D	10
17.	$2s^2$–$2s4p$	^{1}S – ^{3}P°											
			8.316	0	12030000	1	3	1.2(+4)	0.036	9.9(−4)	−1.44	E	12

Fe XXIII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
18.		$^{1}\mathrm{S}-{}^{1}\mathrm{P}^{\circ}$	8.303	0	12040000	1	3	4.97(+4)	0.154	0.00421	−0.812	B	8
19.	$2s2p-2p4p$	$^{3}\mathrm{P}^{\circ}-{}^{3}\mathrm{D}$											
			8.271	462000	12550000	5	7	2.6(+4)	0.038	0.0052	−0.72	D	11
20.	$2s^2-2s5p$	$^{1}\mathrm{S}-{}^{1}\mathrm{P}^{\circ}$	[7.48]			1	3	2.5(+4)	0.063	0.0016	−1.20	D	11
21.	$2s2p-2p5p$	$^{3}\mathrm{P}^{\circ}-{}^{3}\mathrm{D}$											
			[7.45]			5	7	1.5(+4)	0.018	0.0022	−1.05	D	11
22.	$2s2p-2s3s$	$^{3}\mathrm{P}^{\circ}-{}^{3}\mathrm{S}$				9	3		0.028		−0.60	D	*interp.*
23.		$^{1}\mathrm{P}^{\circ}-{}^{1}\mathrm{S}$	[11.07]			3	1	9800	0.0060	6.6(−4)	−1.74	E	*interp.*
24.	$2s2p-2s3d$	$^{3}\mathrm{P}^{\circ}-{}^{3}\mathrm{D}$											
			11.440	462000	9203000	5	7	2.2(+5)	0.60	0.11	0.48	C+	5
			11.333	379130	9202900	3	5	1.7(+5)	0.56	0.063	0.23	D	11
			11.298	354000	9205000	1	3	1.3(+5)	0.77	0.029	−0.11	D	11
			11.44	462000	9202900	5	5	5.4(+4)	0.11	0.020	−0.27	D−	*ls*
			11.33	379130	9205000	3	3	9.3(+4)	0.18	0.020	−0.27	D−	*ls*
25.		$^{1}\mathrm{P}^{\circ}-{}^{1}\mathrm{D}$	11.737	752840	9272900	3	5	1.7(+5)	0.59	0.068	0.25	D	11
26.	$2p^2-2p3d$	$^{3}\mathrm{P}-{}^{3}\mathrm{F}^{\circ}$											
			11.690			5	7	7.7(+4)	0.22	0.042	0.04	D	11
27.		$^{3}\mathrm{P}-{}^{3}\mathrm{D}^{\circ}$											
			11.517			5	7	2.3(+5)	0.64	0.12	0.51	D	11
			11.49			1	3	2.4(+5)	1.4	0.053	0.15	D	11
28.		$^{3}\mathrm{P}-{}^{3}\mathrm{P}^{\circ}$											
			11.49			5	5	1.2(+5)	0.23	0.044	0.06	E	11
29.		$^{1}\mathrm{D}-{}^{1}\mathrm{F}^{\circ}$	11.594			5	7	3.5(+5)	0.99	0.19	0.69	D	11
30.		$^{1}\mathrm{S}-{}^{1}\mathrm{P}^{\circ}$	[11.84]			1	3	2.1(+5)	1.3	0.051	0.11	D	11
31.	$2s2p-2s4s$	$^{3}\mathrm{P}^{\circ}-{}^{3}\mathrm{S}$	8.70			9	3	1.1(+4)	0.0042	0.0011	−1.42	D	13
32.		$^{1}\mathrm{P}^{\circ}-{}^{1}\mathrm{S}$	[8.94]			3	1	1.6(+4)	0.0064	5.7(−4)	−1.72	D	13
33.	$2s2p-2s4d$	$^{3}\mathrm{P}^{\circ}-{}^{3}\mathrm{D}$											
			8.614	462000	12070000	5	7	7.1(+4)	0.11	0.016	−0.26	D	11
			8.547	379130	12080000	3	5	5.3(+4)	0.097	0.0082	−0.54	D	11
			8.528	354000	12080000	1	3	4.0(+4)	0.13	0.0036	−0.89	D	11
34.		$^{1}\mathrm{P}^{\circ}-{}^{1}\mathrm{D}$	8.812	752840	12100000	3	5	6.2(+4)	0.12	0.010	−0.44	D	11
35.	$2p^2-2p4d$	$^{3}\mathrm{P}-{}^{3}\mathrm{F}^{\circ}$											
			8.764			5	7	4.6(+4)	0.074	0.011	−0.43	D	11
36.		$^{3}\mathrm{P}-{}^{3}\mathrm{D}^{\circ}$											
			8.669			5	[illegible]	6.1(+4)	0.096	[illegible]	[illegible]		
			[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			

Fe XXIII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
37.		$^3\mathrm{P} - {}^3\mathrm{P}^\circ$											
			[8.63]			3	3	4.5(+4)	0.050	0.0043	−0.82	D	11
38.		$^1\mathrm{D} - {}^1\mathrm{F}^\circ$	8.752			5	7	1.2(+5)	0.19	0.027	−0.02	D	11
39.	$2s2p-2s5d$	$^3\mathrm{P}^\circ - {}^3\mathrm{D}$											
			[7.73]			5	7	3.0(+4)	0.038	0.0048	−0.72	D	11
			[7.68]			3	5	2.5(+4)	0.037	0.0028	−0.95	D	11
			[7.66]			1	3	1.8(+4)	0.047	0.0012	−1.33	D	11
40.		$^1\mathrm{P}^\circ - {}^1\mathrm{D}$	[7.89]			3	5	2.8(+4)	0.043	0.0034	−0.89	D	11
41.	$2p^2-2p5d$	$^3\mathrm{P} - {}^3\mathrm{F}^\circ$											
			[7.86]			5	7	2.3(+4)	0.030	0.0039	−0.82	D	11
42.		$^3\mathrm{P} - {}^3\mathrm{D}^\circ$											
			[7.78]			5	7	2.5(+4)	0.032	0.0041	−0.80	D	11
			[7.83]			3	5	2.6(+4)	0.040	0.0031	−0.92	D	11
43.		$^1\mathrm{D} - {}^1\mathrm{F}^\circ$	[7.85]			5	7	4.9(+4)	0.064	0.0083	−0.49	D	11
44.	$2s3s-2s3p$	$^3\mathrm{S} - {}^3\mathrm{P}^\circ$				3	9		0.12		−0.44	D	*interp.*
45.		$^1\mathrm{S} - {}^1\mathrm{P}^\circ$				1	3		0.050		−1.30	E	*interp.*
46.	$2s3s-2s4p$	$^3\mathrm{S} - {}^3\mathrm{P}^\circ$	*32.6*			3	9	8200	0.390	0.126	0.068	C	13
47.		$^1\mathrm{S} - {}^1\mathrm{P}^\circ$	[32.6]			1	3	6200	0.294	0.0316	−0.53	C	13
48.	$2s3p-2s3d$	$^3\mathrm{P}^\circ - {}^3\mathrm{D}$				9	15		0.027		−0.61	E	*interp.*
49.		$^1\mathrm{P}^\circ - {}^1\mathrm{D}$	[607.5]	9108300	9272900	3	5	5.1	0.047	0.28	−0.85	E	*interp.*
50.	$2s3p-2s4s$	$^3\mathrm{P}^\circ - {}^3\mathrm{S}$	*35.1*			9	3	7000	0.0428	0.0445	−0.414	C	13
51.		$^1\mathrm{P}^\circ - {}^1\mathrm{S}$	[35.2]			3	1	6200	0.0383	0.0133	−0.94	C	13
52.	$2s3p-2s4d$	$^3\mathrm{P}^\circ - {}^3\mathrm{D}$	*33.9*			9	15	2.0(+4)	0.57	0.57	0.71	C	13
53.		$^1\mathrm{P}^\circ - {}^1\mathrm{D}$	[33.4]	9108300	12100000	3	5	2.0(+4)	0.56	0.18	0.23	C	13
54.	$2s3d-2s4p$	$^3\mathrm{D} - {}^3\mathrm{P}^\circ$	*35.4*			15	9	1200	0.0135	0.0236	−0.69	C	13
55.		$^1\mathrm{D} - {}^1\mathrm{P}^\circ$	[36.1]	9272900	12040000	5	3	1300	0.015	0.0089	−1.12	D	13
56.	$2s3d-2s4f$	$^3\mathrm{D} - {}^3\mathrm{F}^\circ$	*34.6*			15	21	3.9(+4)	0.99	1.7	1.17	C	13
57.		$^1\mathrm{D} - {}^1\mathrm{F}^\circ$	[35.4]			5	7	3.84(+4)	1.01	0.59	0.70	C	13

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[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe XXIV

Ground State $1s^22s\ ^2S_{1/2}$

Ionization Potential [2045] eV = [16494000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
1.8523	8	1.8739	5	8.280	17	21.8	27
1.8552	2	1.874	1	8.316	18	22.0	27
1.8563	8	1.8767	5	8.369	17	30.7	22
1.8572	2	1.891	4	10.619	10	30.9	22
1.858	7	1.897	4	10.663	10	31.5	26
1.8604	3	6.749	21	11.030	16	31.9	26
1.8614	7	6.787	13	11.171	16	37.0	36
1.8626	6	6.808	21	11.187	16	37.3	36
1.8627	7	6.972	20	11.262	15	44.2	32
1.8637	3	7.033	20	11.422	15	44.8	35
1.8655	6	7.169	12	17.1	29	45.2	35
1.8672	7	7.370	19	17.3	29	67.6	31
1.8678	6	7.438	19	18.3	24	68.5	34
1.8700	5	7.983	11	18.7	28	69.4	34
1.8721	5	7.993	11	18.8	28	192.04	9
1.8730	1	8.231	18	21.4	23	255.10	9

Transition probabilities for the inner-shell transitions to doubly excited $n = 2$ states are the results of the multiconfiguration scaled Thomas-Fermi calculations of Bely-Dubau et al. [1] in intermediate coupling. The multiplet oscillator strengths for the $^2P^o$–^2P and $^2P^o$–^2D transitions of the $1s^22p$–$1s2p^2$ array which were calculated by Fox and Dalgarno [2] in a Z-expansion approximation that allowed for extensive configuration interaction are in good agreement with the results of ref. [1].

Oscillator strengths for lines of the principal ($2s$–$2p$) resonance multiplet are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [3], which include a perturbative treatment of the Breit interaction and the Lamb shift. Other sources of reliable theoretical data for these $2s$–$2p$ transitions are the Hartree-Fock line strength calculations of Weiss [4] with relativistic corrections and the MCDF approach of Armstrong et al. [5].

Lifetimes of the $2p$ levels have been determined by Dietrich et al. [6] using the beam-foil technique. The associated oscillator strengths for the $2s$–$2p$ transitions are in excellent agreement with the results mentioned above.

The results of the relativistic Hartree-Fock calculations of Kim and Desclaux [7] were averaged with the results of Armstrong et al. [5] for the $2s$–$3p$ transitions. The data of ref. [5] are quoted for the lines of the $2p$–$3d$ multiplet too.

The results of the scaled Thomas-Fermi calculations of Hayes [8] are tabulated for the $2p$–$3s$ transitions. He used the Breit-Pauli approximation to account for relativistic effects. The Hartree-Fock results of Doschek et al. [9] that included configuration interaction and relativistic corrections are quoted for transitions of the type $2l$–$4l'$. The $2p$–$5d$ f-values are the results of the Hartree-Fock calculations with statistical exchange (HX) of Burkhalter et al. [10].

The f-value for the $3d$-$4f$ transition was taken from a study of systematic trends along isoelectronic sequences by Smith and Wiese [11]. The tabulated data for the remaining transitions were taken from the theoretical analysis of Martin and Wiese [12], which was based on a generalized study of systematic trends for several spectral series of the lithium isoelectronic sequence. For these transitions, no relativistic calculations were available. However, the relativistic calculations of Younger and Weiss [13] for the hydrogen isoelectronic sequence provide a means of assessing the magnitude of relativistic corrections since the Li sequence is very similar in structure to the H sequence. For those transitions for which relativistic effects were estimated to be significant (specifically, whenever the ratio of the weighted relativistic hydrogenic f-values g_if_{ik} of any two lines within a multiplet was found to deviate from the corresponding LS-coupling line-strength ratio by more than 5% for the appropriate value of the nuclear charge Z), the f-values were excluded from the compilation. A more detailed discussion of this comparison is given in ref. [12].

Transition probability data are available for numerous transitions between doubly excited states in which one of the electrons occupies the $n = 3$ shell [1] or the $n = 4$ shell [14]. There are A-value data for many transitions involving a vacant K shell as well [15,16]. None of these data have been tabulated, however, since such transition arrays are rather complex and all of the lines are concentrated in a very narrow wavelength range.

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Fe XXIV: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$1s^22s-$ $1s2p(^3P^{\circ})2s$	$^2S - {}^4P^{\circ}$											
			1.8730	0	53390000	2	4	1.5(+5)[a]	0.016	1.9(−4)	−1.50	D+	1
			[1.874]			2	2	4.9(+4)	0.0026	3.2(−5)	−2.29	D+	1
2.		$^2S - {}^2P^{\circ}$	*1.8559*	0	*53883000*	2	6	6.9(+5)	0.11	0.0013	−0.67	D	1
			1.8552	0	53903000	2	4	4.4(+4)	0.0045	5.5(−5)	−2.04	E	1
			1.8572	0	53844000	2	2	1.96(+6)	0.101	0.00124	−0.69	C	1
3.	$1s^22s-$ $1s2p(^1P^{\circ})2s$	$^2S - {}^2P^{\circ}$	*1.8615*	0	*53720000*	2	6	4.1(+6)	0.64	0.0079	0.11	C	1
			1.8604	0	53752000	2	4	4.74(+6)	0.492	0.0060	−0.007	C	1
			1.8637	0	53657000	2	2	2.93(+6)	0.153	0.00187	−0.52	C	1
4.	$1s^22p-1s2s^2$	$^2P^{\circ} - {}^2S$	*1.895*			6	2	1.9(+5)	0.0035	1.3(−4)	−1.68	D+	1
			[1.897]			4	2	9.4(+4)	0.0025	6.3(−5)	−1.99	D+	1
			[1.891]			2	2	9.5(+4)	0.0051	6.3(−5)	−1.99	D+	1
5.	$1s^22p-1s2p^2$	$^2P^{\circ} - {}^4P$											
			1.8721	520720	53937000	4	6	3.3(+5)	0.026	6.4(−4)	−0.98	D	1
			1.8700	392000	53877000	2	4	1300	1.4(−4)	1.7(−6)	−3.56	E	1
			1.8739	520720	53877000	4	4	8.1(+4)	0.0043	1.1(−4)	−1.77	D	1
			1.8721	392000	53807000	2	2	1.9(+5)	0.010	1.2(−4)	−1.70	D	1
			1.8767	520720	53807000	4	2	2000	5.3(−5)	1.3(−6)	−3.68	E	1
6.		$^2P^{\circ} - {}^2D$	*1.8648*	*477810*	*54104000*	6	10	2.6(+6)	0.23	0.0084	0.14	C	1
			1.8655	520720	54126000	4	6	2.10(+6)	0.164	0.00404	−0.182	C	1
			1.8626	392000	54070000	2	4	3.13(+6)	0.326	0.00399	−0.186	C	1
			1.8678	520720	54070000	4	4	3.0(+5)	0.016	3.9(−4)	−1.20	D	1
7.		$^2P^{\circ} - {}^2P$	*1.8618*	*477810*	*54188000*	6	6	6.5(+6)	0.340	0.0125	0.310	C	1
			1.8614	520720	54244000	4	4	6.2(+6)	0.32	0.0079	0.11	C	1
			[1.8627]	392000	54077000	2	2	5.4(+6)	0.28	0.0034	−0.25	C	1
			1.8672	520720	54077000	4	2	1.57(+6)	0.0410	0.00101	−0.78	C	1
			1.858	392000	54244000	2	4	1.3(+5)	0.013	1.6(−4)	−1.57	D	1

Fe XXIV: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
8.		^{2}P$^\circ$ – ^{2}S	*1.8550*	*477810*	54385000	6	2	2.54(+6)	0.0437	0.00160	−0.58	C	1
			1.8563	520720	54385000	4	2	2.44(+6)	0.063	0.00154	−0.60	C	1
			1.8523	392000	54385000	2	2	8.8(+4)	0.0045	5.5(−5)	−2.04	D	1
9.	$2s-2p$	^{2}S – ^{2}P$^\circ$	*209.29*	0	*477810*	2	6	33.2	0.0654	0.0901	−0.883	B+	3
			192.04	0	520720	2	4	43.2	0.0478	0.0604	−1.020	B+	3
			255.10	0	392000	2	2	18.1	0.0177	0.0297	−1.451	B+	3
10.	$2s-3p$	^{2}S – ^{2}P$^\circ$	*10.634*	0	*9404100*	2	6	7.36(+4)	0.374	0.0262	−0.126	B+	5,7
			10.619	0	9417100	2	4	7.28(+4)	0.246	0.0172	−0.308	B+	5,7
			10.663	0	9378200	2	2	7.51(+4)	0.128	0.00899	−0.592	B+	5,7
11.	$2s-4p$	^{2}S – ^{2}P$^\circ$	*7.987*	0	*12520000*	2	6	3.4(+4)	0.097	0.0051	−0.71	C+	9
			7.983	0	12530000	2	4	3.43(+4)	0.0655	0.00344	0.883	C+	9
			7.993	0	12510000	2	2	3.4(+4)	0.033	0.0017	−1.18	C+	9
12.	$2s-5p$	^{2}S – ^{2}P$^\circ$	7.169	0	13950000	2	6	1.7(+4)	0.040	0.0019	−1.10	C+	12
13.	$2s-6p$	^{2}S – ^{2}P$^\circ$	6.787	0	14730000	2	6	1.02(+4)	0.0212	9.47(−4)	−1.373	C+	12
14.	$2s-7p$	^{2}S – ^{2}P$^\circ$				2	6		0.0125		−1.602	C+	12
15.	$2p-3s$	^{2}P$^\circ$ – ^{2}S	*11.370*	*477810*	9272500	6	2	2.6(+4)	0.017	0.0038	−0.99	D	8
			11.422	520720	9272500	4	2	1.80(+4)	0.0176	0.00265	−1.152	C	8
			11.262	392000	9272500	2	2	7900	0.015	0.0011	−1.52	D	8
16.	$2p-3d$	^{2}P$^\circ$ – ^{2}D	*11.124*	*477810*	*9467100*	6	10	2.19(+5)	0.678	0.149	0.609	B	5
			11.171	520720	9472500	4	6	2.18(+5)	0.611	0.0899	0.388	B	5
			11.030	392000	9459000	2	4	1.84(+5)	0.670	0.0487	0.127	B	5
			11.187	520720	9459000	4	4	3.6(+4)	0.068	0.010	−0.57	B	5
17.	$2p-4s$	^{2}P$^\circ$ – ^{2}S	*8.339*	*477810*	12470000	6	2	1.0(+4)	0.0036	6.0(−4)	−1.66	D	9
			[8.369]	520720	12470000	4	2	6900	0.0036	4.0(−4)	−1.84	D	9
			[8.280]	392000	12470000	2	2	3600	0.0037	2.0(−4)	−2.13	D	9
18.	$2p-4d$	^{2}P$^\circ$ – ^{2}D	*8.284*	*477810*	12550000	6	10	7.16(+4)	0.123	0.0201	−0.133	C+	9
			8.316	520720	12550000	4	6	7.07(+4)	0.110	0.0120	−0.357	C+	9
			8.231	392000	12550000	2	4	6.10(+4)	0.124	0.00672	−0.606	C+	9
			8.316	520720	12550000	4	4	1.18(+4)	0.0122	0.00134	−1.312	C	9
19.	$2p-5d$	^{2}P$^\circ$ – ^{2}D	*7.412*	*477810*	13970000	6	10	3.3(+4)	0.045	0.0066	−0.57	C−	10
			7.438	520720	13970000	4	6	3.26(+4)	0.0405	0.00397	−0.79	C	10
			7.370	392000	13970000	2	4	2.8(+4)	0.046	0.0022	−1.04	C	10
			7.438	520720	13970000	4	4	5400	0.0045	4.4(−4)	−1.74	D	10
20.	$2p-6d$	^{2}P$^\circ$ – ^{2}D	*7.012*	*477810*	14740000	6	10	1.79(+4)	0.0220	0.00305	−0.879	C+	12
			7.033	520720	14740000	4	6	1.78(+4)	0.0198	0.00183	−1.102	C+	*ls*
			6.972	392000	14740000	2	4	1.52(+4)	0.0222	0.00102	−1.352	C+	*ls*
			7.033	520720	14740000	4	4	2900	0.0022	2.0(−4)	−2.06	D	*ls*
21.	$2p-7d$	^{2}P$^\circ$ – ^{2}D	*6.788*	*477810*	15210000	6	10	1.09(+4)	0.0126	0.00169	−1.121	C+	12
			6.808	520720	15210000	4	6	1.08(+4)	0.0113	0.00101	−1.346	C+	*ls*
			[6.749]	392000	15210000	2	4	9280	0.0127	5.63(−4)	−1.596	C+	*ls*
			6.808	520720	15210000	4	4	1800	0.0012	1.1(−4)	−2.31	D	*ls*

Fe XXIV: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
22.	$3s-4p$	$^2S - ^2P^\circ$	*30.8*	9272500	*12520000*	2	6	1.1(+4)	0.45	0.091	−0.05	C	12
			[30.7]	9272500	12530000	2	4	1.1(+4)	0.30	0.061	−0.22	C	*ls*
			[30.9]	9272500	12510000	2	2	1.0(+4)	0.15	0.030	−0.53	C	*ls*
23.	$3s-5p$	$^2S - ^2P^\circ$	[21.4]	9272500	13950000	2	6	5200	0.108	0.0152	−0.67	C	12
24.	$3s-6p$	$^2S - ^2P^\circ$	[18.3]	9272500	14730000	2	6	3200	0.048	0.0058	−1.02	C	12
25.	$3s-7p$	$^2S - ^2P^\circ$				2	6		0.0250		−1.301	C	12
26.	$3p-4d$	$^2P^\circ - ^2D$	*31.8*	*9404100*	12550000	6	10	2.4(+4)	0.60	0.38	0.56	B	12
			[31.9]	9417100	12550000	4	6	2.4(+4)	0.55	0.23	0.34	B	*ls*
			[31.5]	9378200	12550000	2	4	2.1(+4)	0.63	0.13	0.10	B	*ls*
			[31.9]	9417100	12550000	4	4	3900	0.060	0.025	−0.62	C+	*ls*
27.	$3p-5d$	$^2P^\circ - ^2D$	*21.9*	*9404100*	13970000	6	10	1.15(+4)	0.138	0.0597	−0.082	C+	12
			[22.0]	9417100	13970000	4	6	1.14(+4)	0.124	0.0358	−0.306	C+	*ls*
			[21.8]	9378200	13970000	2	4	9730	0.139	0.0199	−0.557	C+	*ls*
			[22.0]	9417100	13970000	4	4	1900	0.014	0.0040	−1.26	D	*ls*
28.	$3p-6d$	$^2P^\circ - ^2D$	*18.7*	*9404100*	14740000	6	10	6390	0.0558	0.0206	−0.475	C+	12
			[18.8]	9417100	14740000	4	6	6300	0.0501	0.0124	−0.698	C+	*ls*
			[18.7]	9378200	14740000	2	4	5320	0.0558	0.00687	−0.952	C+	*ls*
			[18.8]	9417100	14740000	4	4	1100	0.0057	0.0014	−1.65	D	*ls*
29.	$3p-7d$	$^2P^\circ - ^2D$	*17.2*	*9404100*	15210000	6	10	3910	0.0289	0.00982	−0.761	C+	12
			[17.3]	9417100	15210000	4	6	3840	0.0259	0.00589	−0.985	C+	*ls*
			[17.1]	9378200	15210000	2	4	3310	0.0290	0.00327	−1.236	C+	*ls*
			[17.3]	9417100	15210000	4	4	640	0.0029	6.5(−4)	−1.94	D	*ls*
30.	$3d-4f$	$^2D - ^2F^\circ$				10	14		1.00		1.000	B	11
31.	$4s-5p$	$^2S - ^2P^\circ$	[67.6]	12470000	13950000	2	6	2330	0.478	0.213	−0.020	C	12
32.	$4s-6p$	$^2S - ^2P^\circ$	[44.2]	12470000	14730000	2	6	1460	0.128	0.0373	−0.59	C	12
33.	$4s-7p$	$^2S - ^2P^\circ$				2	6		0.056		−0.95	C	12
34.	$4p-5d$	$^2P^\circ - ^2D$	*69.0*	*12520000*	13970000	6	10	4920	0.585	0.797	0.545	C+	12
			[69.4]	12530000	13970000	4	6	4830	0.523	0.478	0.321	C+	*ls*
			[68.5]	12510000	13970000	2	4	4190	0.590	0.266	0.072	C+	*ls*
			[69.4]	12530000	13970000	4	4	800	0.058	0.053	−0.63	D	*ls*
35.	$4p-6d$	$^2P^\circ - ^2D$	*45.0*	*12520000*	14740000	6	10	2810	0.142	0.126	−0.070	C+	12
			[45.2]	12530000	14740000	4	6	2760	0.127	0.0756	−0.294	C+	*ls*
			[44.8]	12510000	14740000	2	4	2370	0.142	0.0420	−0.545	C+	*ls*
			[45.2]	12530000	14740000	4	4	460	0.014	0.0084	−1.25	D	*ls*
36.	$4p-7d$	$^2P^\circ - ^2D$	*37.2*	*12520000*	15210000	6	10	1780	0.0617	0.0453	−0.432	C+	12
			[37.3]	12530000	15210000	4	6	1770	0.0554	0.0272	−0.655	C+	*ls*
			[37.0]	12510000	15210000	2	4	1510	0.0620	0.0151	−0.907	C+	*ls*
			[37.3]	12530000	15210000	4	4	290	0.0061	0.0030	−1.61	D	*ls*

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[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe XXV

Ground State	$1s^2\ ^1S_0$
Ionization Potential	[8828.8] eV = [71208500] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
1.4607	19	1.792	9	6.9468	38	28.950	41
1.4611	18	1.793	3	7.4924	25	29.253	42
1.4945	17	1.794	9	7.6191	26	29.795	46
1.4952	16	1.797	11	7.6527	33	30.224	47
1.5730	15	1.798	11	7.7930	34	62.846	57
1.5749	14	1.800	5	10.038	23	63.295	58
1.778	4	1.802	7	10.221	24	64.608	60
1.782	13	1.810	8	10.371	29	65.342	61
1.787	6,10	1.8502	2	10.586	30	194.9	21
1.788	3,9	1.8593	1	19.934	43	272.6	20
1.789	9	6.7073	27	20.139	44	384.3	22
1.790	9	6.8157	28	20.272	50	398.9	20
1.791	3,12	6.8288	37	20.527	51	426.6	20

Oscillator strengths for transitions of the $1s^2$–$1s2p$ array are taken from the results of Drake [1], who incorporated accurate nonrelativistic matrix elements and exact Dirac hydrogenic matrix elements into a Z-expansion technique in order to provide f-values which would accurately reflect correlation effects for low-Z ions and relativistic effects for high-Z ions of the He isoelectronic sequence. Results for the stronger transitions to doubly excited $n = 2$ states are from the charge-expansion perturbation theory calculations of Vainshtein and Safronova [2]. The f-values for the ($n = 3$–5) transitions were interpolated from results of the relativistic random phase approximation (RRPA) calculations of Johnson and Lin [3]. Data for numerous other s–p and p–s transitions are from the RRPA results of Lin et al. [4,5].

The Z–expansion results of Laughlin [6] have been tabulated for various p–d and d–p transitions, as well as transitions between $4d$ and $4f$ levels. For those multiplets which involve no change of quantum number ($3p$–$3d$, $4p$–$4d$, $4d$–$4f$) the results should be considered to be rather uncertain, since the f-values are very sensitive to energy differences. It should be noted that, according to Laughlin's calculations, the $nd\ ^1D$ levels ($n = 3,4$) lie below the corresponding $np\ ^1P^o$ levels, and that the $4f\ ^1F^o$ level lies below $4d\ ^1D$. The opposite is true for the triplet states. Oscillator strengths for a few p–d transitions were extrapolated from the variational calculations of Weiss [7].

Brown and Cortez [8] have provided f-values for numerous d–f and f–d transitions for the entire isoelectronic sequence by deriving Z-expansion formulae based on variational calculations for the low-Z ions. Their results for transitions between the lower-lying D and F^o terms are tabulated here.

References

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Fe XXV: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$1s^2$–$1s2p$	^1S - $^3P^o$											
			[1.8593]	0	[53785000]	1	3	4.42(+5)'	0.0687	4.21(−4)	−1.163	B	1
2.		^1S - $^1P^o$	[1.8502]	0	[54047400]	1	3	4.57(+6)	0.703	0.00428	−0.153	B	1

Fe XXV: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
3.	$1s2s-2s2p$	$^3S - {}^3P^\circ$	*1.790*	[53534300]	*[109400000]*	3	9	2.8(+6)	0.41	0.0072	0.09	C	2
			[1.788]	[53534300]	[109450000]	3	5	2.9(+6)	0.23	0.0041	−0.16	C	2
			[1.791]	[53534300]	[109350000]	3	3	2.7(+6)	0.13	0.0023	−0.41	C	2
			[1.793]	[53534300]	[109300000]	3	1	2.8(+6)	0.045	8.0(−4)	−0.87	C	2
4.		$^3S - {}^1P^\circ$											
			[1.778]	[53534300]	[109760000]	3	3	1.1(+5)	0.0052	9.2(−5)	−1.81	D	2
5.		$^1S - {}^3P^\circ$											
			[1.800]	[53787200]	[109350000]	1	3	1.1(+5)	0.016	9.5(−5)	−1.80	D	2
6.		$^1S - {}^1P^\circ$	[1.787]	[53787200]	[109760000]	1	3	2.8(+6)	0.40	0.0024	−0.40	C	2
7.	$1s2p-2s^2$	$^3P^\circ - {}^1S$											
			[1.802]	[53785000]	[109290000]	3	1	4.9(+5)	0.0080	1.4(−4)	−1.62	D	2
8.		$^1P^\circ - {}^1S$	[1.810]	[54047400]	[109290000]	3	1	5.9(+5)	0.0097	1.7(−4)	−1.54	D	2
9.	$1s2p-2p^2$	$^3P^\circ - {}^3P$	*1.791*	*[53847700]*	*[109670000]*	9	9	5.1(+6)	0.243	0.0129	0.340	C	2
			[1.792]	[53901100]	[109700000]	5	5	2.9(+6)	0.14	0.0041	−0.16	C	2
			[1.790]	[53785000]	[109650000]	3	3	1.3(+6)	0.062	0.0011	−0.73	C	2
			[1.794]	[53901100]	[109650000]	5	3	2.4(+6)	0.069	0.0021	−0.46	C	2
			[1.792]	[53785000]	[109590000]	3	1	5.2(+6)	0.083	0.0015	−0.60	C	2
			[1.788]	[53785000]	[109700000]	3	5	1.8(+6)	0.14	0.0025	−0.37	C	2
			[1.789]	[53768700]	[109650000]	1	3	1.9(+6)	0.27	0.0016	−0.56	C	2
10.		$^3P^\circ - {}^1D$											
			[1.787]	[53901100]	[109870000]	5	5	1.4(+6)	0.067	0.0020	−0.47	C	2
11.		$^1P^\circ - {}^3P$											
			[1.797]	[54047400]	[109700000]	3	5	1.0(+6)	0.081	0.0014	−0.62	C	2
			[1.798]	[54047400]	[109650000]	3	3	1.2(+5)	0.0058	1.0(−4)	−1.76	D	2
12.		$^1P^\circ - {}^1D$	[1.791]	[54047400]	[109870000]	3	5	4.3(+6)	0.34	0.0061	0.01	C	2
13.		$^1P^\circ - {}^1S$	[1.782]	[54047400]	[110160000]	3	1	5.0(+6)	0.079	0.0014	−0.62	C	2
14.	$1s^2-1s3p$	$^1S - {}^3P^\circ$											
			[1.5749]	0	[63496000]	1	3	1.5(+5)	0.017	8.8(−5)	−1.77	E	*interp.*
15.		$^1S - {}^1P^\circ$	[1.5730]	0	[63570800]	1	3	1.24(+6)	0.138	7.15(−4)	−0.860	B	4
16.	$1s^2-1s4p$	$^1S - {}^3P^\circ$											
			[1.4952]	0	[66881100]	1	3	6.0(+4)	0.0060	3.0(−5)	−2.22	E	*interp.*
17.		$^1S - {}^1P^\circ$	[1.4945]	0	[66912100]	1	3	5.05(+5)	0.0507	2.49(−4)	−1.295	B	4
18.	$1s^2-1s5p$	$^1S - {}^3P^\circ$											
			[1.4611]	0	[68443500]	1	3	3.1(+4)	0.0030	1.4(−5)	−2.52	E	*interp.*
19.		$^1S - {}^1P^\circ$	[1.4607]	0	[68459300]	1	3	2.54(+5)	0.0244	1.17(−4)	−1.613	B	4

Fe XXV: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
20.	$1s2s-1s2p$	$^3S - ^3P^o$	*319.1*	[53534300]	*[53847700]*	3	9	8.94	0.0409	0.129	−0.911	B	5
			[272.6]	[53534300]	[53901100]	3	5	14.7	0.0273	0.0735	−1.087	B	5
			[398.9]	[53534300]	[53785000]	3	3	4.31	0.0103	0.0405	−1.511	B	5
			[426.6]	[53534300]	[53768700]	3	1	3.82	0.00347	0.0146	−1.982	B	5
21.		$^3S - ^1P^o$											
			[194.9]	[53534300]	[54047400]	3	3	3.46	0.00197	0.00379	−2.228	B	5
22.		$^1S - ^1P^o$	[384.3]	[53787200]	[54047400]	1	3	4.96	0.0329	0.0417	−1.482	B	5
23.	$1s2s-1s3p$	$^3S - ^3P^o$											
			[10.038]	[53534300]	[63496000]	3	3	8.08(+4)	0.122	0.0121	−0.437	B	4
24.		$^1S - ^1P^o$	[10.221]	[53787200]	[63570800]	1	3	7.75(+4)	0.364	0.0122	−0.439	B	4
25.	$1s2s-1s4p$	$^3S - ^3P^o$											
			[7.4924]	[53534300]	[66881100]	3	3	3.6(+4)	0.030	0.0022	−1.05	B	4
26.		$^1S - ^1P^o$	[7.6191]	[53787200]	[66912100]	1	3	3.4(+4)	0.088	0.0022	−1.06	B	4
27.	$1s2s-1s5p$	$^3S - ^3P^o$											
			[6.7073]	[53534300]	[68443500]	3	3	1.8(+4)	0.012	7.9(−4)	−1.44	B	4
28.		$^1S - ^1P^o$	[6.8157]	[53787200]	[68459300]	1	3	1.7(+4)	0.036	8.1(−4)	−1.44	B	4
29.	$1s2p-1s3s$	$^3P^o - ^3S$											
			[10.371]	[53785000]	[63426900]	3	3	8700	0.014	0.0014	−1.38	B	4
30.		$^1P^o - ^1S$	[10.586]	[54047400]	[63493700]	3	1	2.5(+4)	0.014	0.0015	−1.38	B	4
31.	$1s2p-1s3d$	$^3P^o - ^3D$				9	15		0.69		0.79	C+	*interp.*
32.		$^1P^o - ^1D$				3	5		0.70		0.32	C+	*interp.*
33.	$1s2p-1s4s$	$^3P^o - ^3S$											
			[7.6527]	[53785000]	[66852300]	3	3	3500	0.0031	2.3(−4)	−2.03	C	4
34.		$^1P^o - ^1S$	[7.7930]	[54047400]	[66879400]	3	1	1.0(+4)	0.0031	2.4(−4)	−2.03	C	4
35.	$1s2p-1s4d$	$^3P^o - ^3D$				9	15		0.12		0.03	C	6
36.		$^1P^o - ^1D$				3	5		0.12		−0.44	C	6
37.	$1s2p-1s5s$	$^3P^o - ^3S$											
			[6.8288]	[53785000]	[68428900]	3	3	1700	0.0012	8.1(−5)	−2.44	C	4
38.		$^1P^o - ^1S$	[6.9468]	[54047400]	[68442500]	3	1	5000	0.0012	8.2(−5)	−2.44	C	4
39.	$1s3s-1s3p$	$^3S - ^3P^o$											
						3	3		0.016		−1.32	C	4
40.		$^1S - ^1P^o$				1	3		0.056		−1.25	C	4
41.	$1s3s-1s4p$	$^3S - ^3P^o$											
			[28.950]	[63426900]	[66881100]	3	3	1.07(+4)	0.135	0.0386	−0.393	B	4

Fe XXV: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
42.		^{1}S – ^{1}P°	[29.253]	[63493700]	[66912100]	1	3	1.04(+4)	0.400	0.0385	−0.398	B	4
43.	1s3s–1s5p	^{3}S – ^{3}P°											
			[19.934]	[63426900]	[68443500]	3	3	5700	0.034	0.0067	−0.99	B	4
44.		^{1}S – ^{1}P°	[20.139]	[63493700]	[68459300]	1	3	5650	0.103	0.00683	−0.987	B	4
45.	1s3p–1s3d	^{3}P° – ^{3}D				9	15		0.012		−0.97	D	*interp.*
46.	1s3p–1s4s	^{3}P° – ^{3}S											
			[29.795]	[63496000]	[66852300]	3	3	2500	0.033	0.0097	−1.00	B	4
47.		^{1}P° – ^{1}S	[30.224]	[63570800]	[66879400]	3	1	7400	0.034	0.010	−0.99	B	4
48.	1s3p–1s4d	^{3}P° – ^{3}D				9	15		0.60		0.73	C	6
49.		^{1}P° – ^{1}D				3	5		0.62		0.27	C	6
50.	1s3p–1s5s	^{3}P° – ^{3}S											
			[20.272]	[63496000]	[68428900]	3	3	1200	0.0073	0.0015	−1.66	C	4
51.		^{1}P° – ^{1}S	[20.527]	[63570800]	[68442500]	3	1	3700	0.0077	0.0016	−1.64	C	4
52.	1s3d–1s3p	^{1}D – ^{1}P°				5	3		0.0020		−2.00	E	6
53.	1s3d–1s4p	^{3}D – ^{3}P°				15	9		0.012		−0.74	C	6
54.		^{1}D – ^{1}P°				5	3		0.011		−1.26	C	6
55.	1s4s–1s4p	^{3}S – ^{3}P°											
						3	3		0.023		−1.16	E	4
56.		^{1}S – ^{1}P°				1	3		0.078		−1.11	D	4
57.	1s4s–1s5p	^{3}S – ^{3}P°											
			[62.846]	[66852300]	[68443500]	3	3	2530	0.150	0.0931	−0.347	B	4
58.		^{1}S – ^{1}P°	[63.295]	[66879400]	[68459300]	1	3	2480	0.446	0.0929	−0.351	B	4
59.	1s4p–1s4d	^{3}P° – ^{3}D				9	15		0.019		−0.77	D	6
60.	1s4p–1s5s	^{3}P° – ^{3}S											
			[64.608]	[66881100]	[68428900]	3	3	850	0.053	0.034	−0.80	B	4
61.		^{1}P° – ^{1}S	[65.342]	[66912100]	[68442500]	3	1	2600	0.055	0.035	−0.78	B	4
62.	1s4d–1s4p	^{1}D – ^{1}P°				5	3		0.0031		−1.81	E	6
63.	1s4d–1s4f	^{3}D – ^{3}F°				15	21		7.8(−4)		−1.93	E	6
64.	1s4d–1s5f	^{3}D – ^{3}F°				15	21		0.89		1.13	B	8
65.		^{1}D – ^{1}F°				5	7		0.89		0.65	B	8
66.	1s4f–1s4d	^{1}F° – ^{1}D				7	5		4.2(−4)		−2.53	E	6
67.	1s4f–1s5d	^{3}F° – ^{3}D				21	15		0.0089		−0.73	C	8
68.		^{1}F° – ^{1}D				7	5		0.0089		−1.21	C	8

Fe XXV: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
69.	1s5s–1s5p	^{3}S - ^{3}P°											
						3	3		0.029		−1.06	E	4
70.		^{1}S - ^{1}P°				1	3		0.099		−1.00	E	4

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Fe XXVI

Ground State	1s ^{2}S$_{1/2}$
Ionization Potential	[9277.2] eV = [74827600] cm^{-1}

Allowed Transitions

The transition probability data for this hydrogen-like ion may be obtained by scaling the data available for the hydrogen spectrum (see NSRDS–NBS 4 [1]) according to

$$\begin{aligned} f_{\text{Fe XXVI}} &= f_{\text{Hydrogen}}, \\ A_{\text{Fe XXVI}} &= (26)^4 A_{\text{Hydrogen}}, \\ S_{\text{Fe XXVI}} &= (26)^{-2} S_{\text{Hydrogen}}. \end{aligned}$$

An uncertainty of a few percent arises from the neglect of relativistic effects. Recent theoretical studies [2,3] indicate that relativistic effects on line strengths for this ion are generally in this range, with the relativistic value usually slightly below the non-relativistic one, although in certain transitions where n increases and l decreases the line strength increases. Younger and Weiss [3] have calculated exact Dirac relativistic hydrogenic line strengths for a number of transitions of interest along the hydrogen isoelectronic sequence.

References

[1] Wiese, W. L., Smith, M. W., and Glennon, B. M., Atomic Transition Probabilities—Hydrogen through Neon (A Critical Data Compilation), Vol. I, 157 pp., Nat. Stand. Ref. Data Ser., Nat. Bur. Stand. (U.S.), 4 (May 1966).

[2] Garstang, R. H., *Topics in Modern Physics* (*A Tribute to Edward U. Condon*), 153–167, Ed. Brittin, W. E., and Odabasi, H., Colorado Associated Univ. Press, Boulder, Colorado (1971).

[3] Younger, S. M., and Weiss, A. W., J. Res. Nat. Bur. Stand., Sect. A **79**, 629 (1975).

Cobalt

Co I

Ground State	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^7 4s^2\ {}^4F_{9/2}$
Ionization Potential	7.86 eV = 63430 cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
2236.80	24	2886.44	12	3433.05	32	3842.05	49
2274.50	23	2916.03	13	3442.92	4	3845.47	50
2287.80	44	2928.81	11	3443.64	31	3861.16	49
2295.22	22	2987.17	9	3449.17	31	3873.12	27
2304.18	21	2989.59	11	3449.44	31	3873.95	27
2305.17	23	3000.55	11	3453.51	31	3881.87	27
2309.03	21	3013.59	8	3455.24	4	3884.60	48
2323.13	21	3017.55	9	3456.92	3	3885.28	47
2325.53	23	3034.43	10	3462.80	32	3894.07	50
2335.98	21	3042.48	8	3465.79	3	3894.98	27
2337.95	23	3044.00	9	3483.41	32	3909.93	1
2338.66	21	3048.89	9	3483.80	3	3922.76	48
2339.05	22	3054.72	11	3489.40	52	3935.96	48
2346.16	22	3061.82	9	3490.74	29	3940.89	27
2352.86	43	3062.20	10	3491.32	4	3941.73	26
2353.36	21	3064.37	11	3495.68	31	3957.93	27
2355.48	21	3071.96	10	3496.68	28	3965.01	47
2358.18	21	3072.34	9	3502.28	30	3979.52	1
2365.06	17	3082.61	8	3502.63	4	3995.31	47
2370.51	19	3086.78	9	3506.31	30	3997.90	48
2371.85	22	3089.60	8	3509.84	31	4020.90	25
2384.86	16	3098.19	8	3510.43	4	4045.39	47
2392.03	17	3110.82	9	3512.64	30	4092.39	46
2401.60	20	3118.25	9	3513.48	3	4118.77	45
2402.06	16	3121.42	7	3518.34	52	4121.32	45
2406.27	41	3121.57	9	3520.08	2	4781.43	57
2407.25	17	3127.25	35	3521.57	29	4920.27	57
2411.62	17	3129.01	36	3523.42	30	5082.12	54
2412.76	20	3136.73	6	3526.85	2	5094.96	62
2414.46	17	3137.33	8	3529.03	3	5176.09	62
2415.29	17	3139.95	7	3529.82	31	5426.73	56
2424.93	16	3147.06	8	3533.36	3	5647.23	63
2425.59	42	3149.31	7	3550.59	2	5659.12	59
2429.23	18	3158.77	8	3552.72	4	5881.08	58
2432.21	16	3186.35	6	3558.77	29	5890.49	59
2435.82	15	3189.75	7	3560.89	30	5915.55	59
2436.66	16	3219.15	6	3564.95	28	5990.42	61
2439.04	16	3223.15	36	3569.37	51	6005.03	53
2460.80	16	3237.03	5	3574.97	30	6093.14	53
2511.02	39	3261.62	34	3575.36	2	6158.51	58
2521.36	14	3333.39	34	3584.80	4	6168.86	59
2528.97	14	3334.15	32	3585.15	30	6189.01	53
2530.13	39	3337.17	34	3587.19	51	6230.97	53
2535.96	14	3354.37	32	3594.87	2	6282.64	53
2536.49	40	3367.11	31	3602.08	2	6771.04	55
2544.25	14	3385.22	31	3605.37	29	6814.95	55
2562.12	14	3395.37	34	3618.01	52	7016.60	55
2567.34	14	3405.12	32	3627.81	28	7052.87	55
2574.35	14	3409.18	32	3631.39	2	7054.04	64
2685.34	38	3412.34	34	3647.66	2	7154.69	60
2695.85	38	3412.63	4	3652.54	2	7417.38	60
2764.19	37	3414.72	33	3704.06	51	7590.57	60
2815.56	37	3417.15	32	3745.49	50		
2850.95	13	3417.80	28	3811.07	47		
2862.60	12	3431.58	4	3841.46	48		

For this spectrum, we have utilized two very recent experiments. These are the measurements by Cardon and Smith [1], who obtained relative oscillator strengths by the anomalous dispersion (hook) method, and by Whaling [2], who determined the absolute oscillator strengths of lines originating from common upper levels by combining hollow cathode discharge (branching ratio) measurements with known lifetime data for these atomic levels.

For most levels, Whaling used the lifetimes measured directly by Figger et al. [3], who observed the exponential decay curves resulting from selective laser excitation. Whaling also provided absolute *f*-values for lines originating from some upper levels not measured by Figger et al. The lifetimes of these levels were obtained by using the technique provided by Roberts, Andersen, and Sorensen [4] (see eq (5)). We estimate these additional lifetimes to be somewhat less accurate than those of ref. [3].

Cardon and Smith used several of Whaling's absolute *f*-values to normalize their relative scale. The overall agreement between refs. [1] and [2] then turned out to be excellent: 72% of the 50 overlapping absolute log *gf*-values agreed within 25%, and 90% of the data agreed within 50%. For all overlapping lines we selected Cardon and Smith's *f*-values, since they are based on one common scale throughout, while Whaling's data are based on a different scale for each upper level involved.

Another source providing relative oscillator strengths are the hook measurements of Ostrovskii and Penkin [5]. We found these log *gf*-values, when lowered by 4.65, to agree quite well (generally within 50%) with those of refs. [1] and [2]. However, we did not use the data of ref. [5] in this compilation, because the same lines are already covered by Cardon and Smith or by Whaling. In a few cases, where the *f*-values of Cardon and Smith and those of Whaling showed serious disagreement, i.e., for the 3462.80 Å, 3997.90 Å, and 3745.49 Å lines, Ostrovskii and Penkin's data were of key importance in our selections.

References

[1] Cardon, B. L., and Smith, P. L., private communication (1978).
[2] Whaling, W., private communication (1978).
[3] Figger, H., Heldt, J., Siomos, K., and Walther, H., Astron. Astrophys. **43**, 389 (1975).
[4] Roberts, J. R., Andersen, T., and Sorensen, G., Astrophys. J. **181**, 567 (1973).
[5] Ostrovskii, Yu. I., and Penkin, N. P., Opt. Spektrosk. **5**, 345 (1958).

NOTE: The data of refs. [1,2] are to be published jointly after significant revision and will supersede the present values.

Co I: Allowed transitions

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
1.	$a\,^4F - z\,^6G^o$ (3)											
		3909.93	0.0	25569	10	12	0.0019	5.1(−4)[a]	0.066	−2.29	C	1
		3979.52	816.0	25938	8	10	0.0024	7.2(−4)	0.075	−2.24	D	1
2.	$a\,^4F - z\,^4F^o$ (4)											
		3526.85	0.0	28346	10	10	0.12	0.023	2.7	−0.64	C	1
		3575.36	816.0	28777	8	8	0.094	0.018	1.7	−0.84	C	1
		3594.87	1406.8	29216	6	6	0.086	0.017	1.2	−1.00	C	1
		3602.08	1809.3	29563	4	4	0.10	0.019	0.92	−1.11	C	1
		3520.08	816.0	29216	8	6	0.034	0.0048	0.44	−1.42	C	1
		3550.59	1406.8	29563	6	4	0.042	0.0053	0.37	−1.50	C	1
		3631.39	816.0	28346	8	10	0.0065	0.0016	0.15	−1.89	C	1
		3652.54	1406.8	28777	6	8	0.0095	0.0025	0.18	−1.82	C	1
		3647.66	1809.3	29216	4	6	0.012	0.0035	0.17	−1.86	C	1
3.	$a\,^4F - z\,^4G^o$ (5)											
		3465.79	0.0	28845	10	12	0.097	0.021	2.4	−0.68	C	1
		3513.48	816.0	29270	8	10	0.084	0.019	1.8	−0.81	C	1
		3529.03	1406.8	29735	6	8	0.090	0.022	1.6	−0.87	C	1
		3533.36	1809.3	30103	4	6	0.091	0.026	1.2	−0.99	C	1
		3456.92	816.0	29735	8	8	0.0041	7.4(−4)	0.067	−2.23	C	1
		3483.80	1406.8	30103	6	6	0.0050	9.2(−4)	0.063	−2.26	E	1
4.	$a\,^4F - z\,^4D^o$ (6)	*3438.6*	*793.1*	*29866*	28	20	0.17	0.021	6.7	−0.23	C	1
		3412.63	0.0	29295	10	8	0.12	0.016	1.8	−0.79	C	1
		3431.58	816.0	29949	8	6	0.11	0.015	1.3	−0.93	C	1
		3442.92	1406.8	30444	6	4	0.12	0.015	0.99	−1.06	C	1
		3455.24	1809.3	30743	4	2	0.18	0.016	0.73	−1.19	C	1
		3510.43	816.0	29295	8	8	0.041	0.0075	0.70	−1.22	C	1
		3502.63	1406.8	29949	6	6	0.050	0.0092	0.63	−1.26	C	1
		3491.32	1809.3	30444	4	4	0.053	0.0097	0.45	−1.41	C	1
		3584.80	1406.8	29295	6	8	0.0036	9.2(−4)	0.065	−2.26	C	1
		3552.72	1809.3	29949	4	6	0.0046	0.0013	0.061	−2.28	D	1

Co I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
5.	$a\ ^4F - z\ ^2G^\circ$ (7)											
		3237.03	816.0	31700	8	10	0.0082	0.0016	0.14	−1.89	C	1
6.	$a\ ^4F - z\ ^2F^\circ$ (8)											
		3136.73	0.0	31871	10	8	0.0023	2.7(−4)	0.028	−2.57	C	1
		3219.15	816.0	31871	8	8	0.0058	9.1(−4)	0.077	−2.14	C	1
		3186.35	1406.8	32782	6	6	0.0022	3.3(−4)	0.021	−2.70	D	1
7.	$a\ ^4F - y\ ^4D^\circ$ (9)											
		3121.42	0.0	32028	10	8	0.021	0.0025	0.26	−1.60	C	1
		3139.95	816.0	32655	8	6	0.028	0.0031	0.25	−1.61	C	1
		3149.31	1406.8	33151	6	4	0.031	0.0031	0.19	−1.73	C	1
		3189.75	1809.3	33151	4	4	0.0052	7.9(−4)	0.033	−2.50	D	1
8.	$a\ ^4F - y\ ^4G^\circ$ (10)											
		3082.61	0.0	32431	10	12	0.026	0.0045	0.45	−1.35	C	1
		3158.77	816.0	32465	8	10	0.023	0.0043	0.36	−1.46	C	1
		3147.06	1406.8	33173	6	8	0.045	0.0090	0.56	−1.27	C	1
		3137.33	1809.3	33674	4	6	0.047	0.010	0.43	−1.38	C	1
		3089.60	816.0	33173	8	8	0.024	0.0034	0.28	−1.56	C	1
		3098.19	1406.8	33674	6	6	0.027	0.0039	0.24	−1.63	C	1
		3013.59	0.0	33173	10	8	0.016	0.0017	0.17	−1.76	C	1
		3042.48	816.0	33674	8	6	0.020	0.0021	0.17	−1.78	C	1
9.	$a\ ^4F - y\ ^4F^\circ$ (11)	*3061.2*	*793.1*	*33451*	28	28	0.22	0.030	8.6	−0.07	C	1
		3044.00	0.0	32842	10	10	0.19	0.027	2.7	−0.57	C	1
		3061.82	816.0	33467	8	8	0.15	0.021	1.7	−0.77	C	1
		3072.34	1406.8	33946	6	6	0.15	0.021	1.3	−0.90	C	1
		3086.78	1809.3	34196	4	4	0.19	0.027	1.1	−0.97	C	1
		2987.17	0.0	33467	10	8	0.050	0.0054	0.53	−1.27	C	1
		3017.55	816.0	33946	8	6	0.072	0.0074	0.58	−1.23	C	1
		3048.89	1406.8	34196	6	4	0.078	0.0073	0.44	−1.36	C	1
		3121.57	816.0	32842	8	10	0.012	0.0023	0.19	−1.74	C	1
		3118.25	1406.8	33467	6	8	0.0031	6.1(−4)	0.037	−2.44	C	1
		3110.82	1809.3	33946	4	6	0.0026	5.7(−4)	0.023	−2.64	C	1
10.	$a\ ^4F - z\ ^2D^\circ$ (12)											
		3062.20	816.0	33463	8	6	0.0088	9.3(−4)	0.075	−2.13	C	1
		3034.43	1406.8	34352	6	4	0.018	0.0016	0.098	−2.01	C	1
		3071.96	1809.3	34352	4	4	0.016	0.0023	0.092	−2.04	C	1
11.	$a\ ^4F - y\ ^2G^\circ$ (13)											
		2989.59	0.0	33440	10	10	0.037	0.0050	0.49	−1.30	C	1
		3000.55	816.0	34134	8	8	0.0090	0.0012	0.097	−2.01	C	1
		2928.81	0.0	34134	10	8	0.0024	2.5(−4)	0.024	−2.61	C	2
		3064.37	816.0	33440	8	10	0.0068	0.0012	0.096	−2.02	C	1
		3054.72	1406.8	34134	6	8	0.0038	7.1(−4)	0.043	−2.37	C	1
12.	$a\ ^4F - y\ ^2F^\circ$ (uv 1)											
		2886.44	816.0	35451	8	8	0.017	0.0021	0.16	−1.78	C	1
		2862.60	1406.8	36330	6	6	0.012	0.0015	0.086	−2.04	D	1

Co I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
13.	$a\ {}^4\mathrm{F} - y\ {}^2\mathrm{D}^\circ$ (uv 2)											
		2850.95	1809.3	36875	4	4	0.0084	0.0010	0.038	−2.39	D	1
		2916.03	1809.3	36092	4	6	4.0(−4)	7.7(−5)	0.0030	−3.51	D	2
14.	$a\ {}^4\mathrm{F} - x\ {}^4\mathrm{D}^\circ$ (uv 3)											
		2521.36	0.0	39649	10	8	2.4	0.18	15	0.26	C	1
		2528.97	816.0	40346	8	6	2.1	0.15	10	0.08	C	1
		2535.96	1406.8	40828	6	4	2.0	0.13	6.5	−0.11	C	1
		2544.25	1809.3	41102	4	2	2.5	0.12	4.0	−0.32	C	1
		2574.35	816.0	39649	8	8	0.18	0.018	1.2	−0.84	C	1
		2567.34	1406.8	40346	6	6	0.31	0.031	1.6	−0.73	C	1
		2562.12	1809.3	40828	4	4	0.41	0.041	1.4	−0.79	C	1
15.	$a\ {}^4\mathrm{F} - 1^\circ$											
		2435.82	*0.0*	*41041*	*10*	*8*	*0.015*	*0.0011*	*0.088*	*−1.96*	*C*	*1*
16.	$a\ {}^4\mathrm{F} - x\ {}^4\mathrm{F}^\circ$ (uv 5)											
		2424.93	0.0	41226	10	10	2.9	0.26	21	0.41	C	1
		2432.21	816.0	41918	8	8	2.7	0.24	15	0.28	C	1
		2436.66	1406.8	42434	6	6	2.5	0.22	11	0.13	C	1
		2439.04	1809.3	42797	4	4	2.8	0.25	8.0	−0.00	C	1
		2384.86	0.0	41918	10	8	0.26	0.018	1.4	−0.75	C	1
		2402.06	816.0	42434	8	6	0.50	0.032	2.0	−0.59	C	1
		2460.80	1809.3	42434	4	6	0.14	0.019	0.60	−1.13	D	1
17.	$a\ {}^4\mathrm{F} - x\ {}^4\mathrm{G}^\circ$ (uv 6)											
		2407.25	0.0	41529	10	12	3.8	0.40	32	0.60	C	1
		2411.62	816.0	42269	8	10	3.9	0.42	27	0.53	C	1
		2414.46	1406.8	42811	6	8	3.4	0.40	19	0.38	C	1
		2415.29	1809.3	43200	4	6	3.8	0.50	16	0.30	C	1
		2365.06	0.0	42269	10	10	0.15	0.012	0.96	−0.91	C	1
		2392.03	1406.8	43200	6	6	0.50	0.043	2.0	−0.59	C	1
18.	$a\ {}^4\mathrm{F} - z\ {}^4\mathrm{P}^\circ$ (uv 7)											
		2429.23	816.0	41969	8	6	0.053	0.0035	0.23	−1.55	D	1
19.	$a\ {}^4\mathrm{F} - 3^\circ$ (uv 8)											
		2370.51	816.0	42988	8	8	0.089	0.0075	0.47	−1.22	C	1
20.	$a\ {}^4\mathrm{F} - w\ {}^4\mathrm{D}^\circ$ (uv 10)											
		2401.60	1809.3	43436	4	2	0.39	0.017	0.53	−1.17	D	1
		2412.76	1809.3	43243	4	6	0.66	0.087	2.8	−0.46	C	1
21.	$a\ {}^4\mathrm{F} - w\ {}^4\mathrm{F}^\circ$ (uv 11)											
		2309.03	0.0	43295	10	10	0.56	0.045	3.4	−0.35	C	1
		2323.13	816.0	43848	8	8	0.54	0.043	2.7	−0.46	C	1
		2335.98	1406.8	44202	6	6	0.64	0.053	2.4	−0.50	C	1
		2338.66	1809.3	44556	4	4	1.1	0.087	2.7	−0.46	D	1
		2304.18	816.0	44202	8	6	0.26	0.015	0.93	−0.91	D	1
		2353.36	816.0	43295	8	10	0.18	0.019	1.2	−0.82	D	1
		2355.48	1406.8	43848	6	8	0.24	0.026	1.2	−0.80	C	1
		2358.18	1809.3	44202	4	6	0.21	0.026	0.81	−0.98	C	1

Co I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
22.	*a* ^{4}F - *x* ^{2}F° (uv 12)											
		2295.22	0.0	43555	10	8	0.23	0.014	1.1	−0.84	C	1
		2346.16	816.0	43426	8	6	0.17	0.011	0.66	−1.07	C	1
		2339.05	816.0	43555	8	8	0.094	0.0077	0.47	−1.21	D	1
		2371.85	1406.8	43555	6	8	0.12	0.013	0.62	−1.10	C	1
23.	*a* ^{4}F - *w* ^{4}G° (uv 14)											
		2274.50	0.0	43952	10	12	0.046	0.0043	0.32	−1.37	C	1
		2305.17	816.0	44183	8	10	0.081	0.0081	0.49	−1.19	C	1
		2325.53	1406.8	44394	6	8	0.31	0.033	1.5	−0.70	D	1
		2337.95	1809.3	44568	4	6	0.19	0.023	0.70	−1.04	C	1
24.	*a* ^{4}F - *v* ^{4}D° (uv 19)											
		2236.80	1809.3	46502	4	2	1.0	0.039	1.1	−0.81	D	1
25.	*b* ^{4}F - *z* ^{4}F° (16)											
		4020.90	3482.8	28346	10	10	0.0092	0.0022	0.30	−1.65	D	1
26.	*b* ^{4}F - *z* ^{4}G° (17)											
		3941.73	3482.8	28845	10	12	0.0099	0.0028	0.36	−1.56	C	1
27.	*b* ^{4}F - *z* ^{4}D° (18)											
		3873.12	3482.8	29295	10	8	0.12	0.021	2.7	−0.68	C	1
		3873.95	4142.7	29949	8	6	0.12	0.021	2.1	−0.78	C	1
		3881.87	4690.2	30444	6	4	0.11	0.016	1.2	−1.01	C	1
		3894.98	5075.8	30743	4	2	0.11	0.013	0.64	−1.30	C	1
		3957.93	4690.2	29949	6	6	0.010	0.0024	0.18	−1.85	D	2
		3940.89	5075.8	30444	4	4	0.012	0.0027	0.14	−1.97	D	2
28.	*b* ^{4}F - *z* ^{2}G° (19)											
		3496.68	4142.7	32733	8	8	0.036	0.0066	0.60	−1.28	C	1
		3417.80	3482.8	32733	10	8	0.020	0.0028	0.32	−1.55	E	1
		3627.81	4142.7	31700	8	10	0.052	0.013	1.2	−0.99	C	1
		3564.95	4690.2	32733	6	8	0.086	0.022	1.5	−0.88	C	1
29.	*b* ^{4}F - *z* ^{2}F° (20)											
		3521.57	3482.8	31871	10	8	0.12	0.018	2.1	−0.75	C	1
		3490.74	4142.7	32782	8	6	0.038	0.0052	0.48	−1.38	E	1
		3605.37	4142.7	31871	8	8	0.039	0.0075	0.72	−1.22	C	1
		3558.77	4690.2	32782	6	6	0.023	0.0043	0.30	−1.59	D	1
30.	*b* ^{4}F - *y* ^{4}D° (21)											
		3502.28	3482.8	32028	10	8	0.90	0.13	15	0.12	C	1
		3506.31	4142.7	32655	8	6	0.86	0.12	11	−0.02	C	1
		3512.64	4690.2	33151	6	4	0.87	0.11	7.5	−0.19	C	1
		3523.42	5075.8	33449	4	2	1.2	0.11	5.3	−0.34	C	1
		3585.15	4142.7	32028	8	8	0.076	0.015	1.4	−0.93	C	1
		3574.97	4690.2	32655	6	6	0.18	0.034	2.4	−0.69	C	1
		3560.89	5075.8	33151	4	4	0.24	0.045	2.1	−0.74	C	1

Co I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
31.	$b\ ^4F - y\ ^4G^\circ$ (22)	*3488.7*	*4157.6*	*32813*	28	36	0.98	0.23	74	0.81	C	1
		3453.51	3482.8	32431	10	12	1.1	0.25	28	0.39	C	1
		3529.82	4142.7	32465	8	10	0.48	0.11	10	−0.05	C	1
		3509.84	4690.2	33173	6	8	0.35	0.085	5.9	−0.29	C	1
		3495.68	5075.8	33674	4	6	0.45	0.12	5.6	−0.31	C	1
		3449.44	3482.8	32465	10	10	0.16	0.029	3.3	−0.54	C	1
		3443.64	4142.7	33173	8	8	0.63	0.11	10	−0.05	C	1
		3449.17	4690.2	33674	6	6	0.73	0.13	8.8	−0.11	C	1
		3367.11	3482.8	33173	10	8	0.069	0.0093	1.0	−1.03	C	1
		3385.22	4142.7	33674	8	6	0.12	0.016	1.4	−0.90	C	1
32.	$b\ ^4F - y\ ^4F^\circ$ (23)											
		3405.12	3482.8	32842	10	10	0.98	0.17	19	0.23	C	1
		3409.18	4142.7	33467	8	8	0.42	0.074	6.6	−0.23	C	1
		3417.15	4690.2	33946	6	6	0.32	0.055	3.7	−0.48	C	1
		3433.05	5075.8	34196	4	4	1.1	0.19	8.6	−0.12	C	1
		3334.15	3482.8	33467	10	8	0.080	0.011	1.2	−0.97	C	1
		3354.37	4142.7	33946	8	6	0.12	0.016	1.4	−0.90	C	1
		3483.41	4142.7	32842	8	10	0.062	0.014	1.3	−0.95	C	1
		3462.80	5075.8	33946	4	6	0.87	0.23	11	−0.03	C	1
33.	$b\ ^4F - z\ ^2D^\circ$ (24)											
		3414.72	5075.8	34352	4	4	0.11	0.019	0.83	−1.13	C	1
34.	$b\ ^4F - y\ ^2G^\circ$ (25)											
		3337.17	3482.8	33440	10	10	0.0033	5.5(−4)	0.060	−2.26	C	2
		3333.39	4142.7	34134	8	8	0.015	0.0026	0.22	−1.69	E	1
		3412.34	4142.7	33440	8	10	0.64	0.14	13	0.05	C	1
		3395.37	4690.2	34134	6	8	0.26	0.061	4.1	−0.44	C	1
		3261.62	3482.8	34134	10	8	2.0(−5)	2.6(−6)	2.8(−4)	−4.59	E	2
35.	$b\ ^4F - y\ ^2F^\circ$ (26)											
		3127.25	3482.8	35451	10	8	0.0059	6.9(−4)	0.071	−2.16	D	1
36.	$b\ ^4F - y\ ^2D^\circ$											
		3129.01	4142.7	36092	8	6	0.0013	1.5(−4)	0.012	−2.93	D	2
		3223.15	5075.8	36092	4	6	3.0(−4)	7.0(−5)	0.0030	−3.55	D	2
37.	$b\ ^4F - x\ ^4D^\circ$ (uv 52)											
		2764.19	3482.8	39649	10	8	0.060	0.0055	0.50	−1.26	C	1
		2815.56	4142.7	39649	8	8	0.048	0.0057	0.42	−1.34	C	1
38.	$b\ ^4F - x\ ^4F^\circ$ (uv 53)											
		2695.85	4142.7	41226	8	10	0.068	0.0093	0.66	−1.13	C	1
		2685.34	4690.2	41918	6	8	0.11	0.016	0.83	−1.03	D	1
39.	$b\ ^4F - w\ ^4F^\circ$ (uv 56)											
		2511.02	3482.8	43295	10	10	0.88	0.083	6.9	−0.08	C	1
		2530.13	4690.2	44202	6	6	0.43	0.041	2.0	−0.61	C	1

Co I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
40.	$b\ ^4F - x\ ^2F^\circ$											
		2536.49	4142.7	43555	8	8	0.30	0.029	2.0	−0.63	C	1
41.	$b\ ^4F - w\ ^2D^\circ$ (uv 58)											
		2406.27	4142.7	45688	8	6	0.48	0.031	2.0	−0.60	D	1
42.	$b\ ^4F - x\ ^4P^\circ$ (uv 59)											
		2425.59	4690.2	45905	6	4	0.45	0.026	1.3	−0.80	D	1
43.	$b\ ^4F - v\ ^4D^\circ$ (uv 60)											
		2352.86	3482.8	45971	10	8	0.37	0.025	1.9	−0.61	D	1
44.	$b\ ^4F - 6^\circ$ (uv 64)											
		2287.80	4142.7	47839	8	8	1.2	0.093	5.6	−0.13	C	1
45.	$a\ ^2F - z\ ^2G^\circ$ (28)											
		4121.32	7442.4	31700	8	10	0.24	0.077	8.4	−0.21	C	1
		4118.77	8460.8	32733	6	8	0.34	0.12	9.4	−0.16	C	1
46.	$a\ ^2F - z\ ^2F^\circ$ (29)											
		4092.39	7442.4	31871	8	8	0.14	0.036	3.9	−0.54	D	1
47.	$a\ ^2F - y\ ^4G^\circ$ (31)											
		3995.31	7442.4	32465	8	10	0.36	0.11	11	−0.06	C	1
		4045.39	8460.8	33173	6	8	0.038	0.012	0.99	−1.13	C	2
		3885.28	7442.4	33173	8	8	0.0046	0.0010	0.11	−2.08	C	2
		3965.01	8460.8	33674	6	6	2.0(−4)	4.7(−5)	0.0037	−3.55	C	2
		3811.07	7442.4	33674	8	6	0.0020	3.3(−4)	0.033	−2.58	C	2
48.	$a\ ^2F - y\ ^4F^\circ$ (32)											
		3935.96	7442.4	32842	8	10	0.15	0.044	4.6	−0.45	C	1
		3997.90	8460.8	33467	6	8	0.079	0.025	2.0	−0.82	C	2
		3841.46	7442.4	33467	8	8	0.010	0.0023	0.23	−1.74	C	2
		3922.76	8460.8	33946	6	6	0.0089	0.0021	0.16	−1.91	C	2
		3884.60	8460.8	34196	6	4	0.020	0.0030	0.23	−1.74	C	2
49.	$a\ ^2F - z\ ^2D^\circ$ (33)											
		3842.05	7442.4	33463	8	6	0.31	0.051	5.2	−0.39	C	1
		3861.16	8460.8	34352	6	4	0.59	0.087	6.7	−0.28	D	1
50.	$a\ ^2F - y\ ^2G^\circ$ (34)	*3864.5*	*7878.9*	*33748*	14	18	0.68	0.20	35	0.44	C	1,2
		3845.47	7442.4	33440	8	10	0.49	0.14	14	0.04	C	1
		3894.07	8460.8	34134	6	8	0.81	0.25	19	0.17	C	1
		3745.49	7442.4	34134	8	8	0.077	0.016	1.6	−0.89	C	2

Co I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
51.	$a\ ^2F - y\ ^2F^\circ$ (35)											
		3569.37	7442.4	35451	8	8	1.6	0.31	29	0.39	C	1
		3587.19	8460.8	36330	6	6	1.9	0.36	26	0.34	C	1
		3704.06	8460.8	35451	6	8	0.18	0.048	3.5	−0.54	C	1
52.	$a\ ^2F - y\ ^2D^\circ$ (36)	*3504.6*	*7878.9*	*36405*	14	10	1.6	0.21	34	0.47	C	1,2
		3489.40	7442.4	36092	8	6	1.6	0.22	20	0.24	C	1
		3518.34	8460.8	36875	6	4	1.7	0.21	14	0.09	C	1
		3618.01	8460.8	36092	6	6	0.0021	4.1(−4)	0.029	−2.61	D	2
53.	$a\ ^4P - z\ ^4D^\circ$ (37)											
		6282.64	14036	29949	4	6	0.0030	0.0027	0.22	−1.97	D	2
		6230.97	14399	30444	2	4	0.0016	0.0019	0.076	−2.43	D	2
		6189.01	13796	29949	6	6	0.0018	0.0011	0.13	−2.20	D	2
		6093.14	14036	30444	4	4	0.0024	0.0013	0.11	−2.27	D	2
		6005.03	13796	30444	6	4	3.4(−4)	1.2(−4)	0.014	−3.14	D	2
54.	$a\ ^4P - y\ ^4F^\circ$											
		5082.12	13796	33467	6	8	9.1(−5)	4.7(−5)	0.0047	−3.55	C	2
55.	$b\ ^4P - z\ ^4D^\circ$ (54)											
		7052.87	15774	29949	4	6	0.0081	0.0091	0.84	−1.44	D	2
		7016.60	16196	30444	2	4	0.0076	0.011	0.52	−1.65	D	2
		6771.04	15184	29949	6	6	0.0045	0.0031	0.42	−1.73	D	2
		6814.95	15774	30444	4	4	0.0072	0.0050	0.45	−1.70	D	2
56.	$b\ ^4P - y\ ^4F^\circ$											
		5426.73	15774	34196	4	4	3.5(−4)	1.5(−4)	0.011	−3.21	C	2
57.	$b\ ^4P - y\ ^2D^\circ$ (57)											
		4781.43	15184	36092	6	6	0.0035	0.0012	0.11	−2.14	D	2
		4920.27	15774	36092	4	6	0.0016	8.7(−4)	0.056	−2.46	D	2
58.	$a\ ^2G - y\ ^4F^\circ$											
		5881.08	16468	33467	10	8	2.8(−4)	1.1(−4)	0.022	−2.94	C	2
		6158.51	17234	33467	8	8	8.4(−5)	4.8(−5)	0.0077	−3.42	C	2
59.	$a\ ^2G - y\ ^2G^\circ$ (82)	*5901.6*	*16808*	*33748*	18	18	0.0022	0.0012	0.41	−1.68	C	2
		5890.49	16468	33440	10	10	0.0017	8.9(−4)	0.17	−2.05	C	2
		5915.55	17234	34134	8	8	0.0022	0.0011	0.18	−2.04	C	2
		5659.12	16468	34134	10	8	8.0(−4)	3.1(−4)	0.058	−2.51	C	2
		6168.86	17234	33440	8	10	5.9(−5)	4.2(−5)	0.0069	−3.47	C	2
60.	$a\ ^2D - z\ ^4D^\circ$ (89)											
		7417.38	16471	29949	4	6	0.0020	0.0025	0.24	−2.00	D	2
		7590.57	16778	29949	6	6	5.0(−4)	4.3(−4)	0.064	−2.59	D	2
		7154.69	16471	30444	4	4	0.0019	0.0015	0.14	−2.23	D	2
61.	$a\ ^2D - y\ ^4F^\circ$											
		5990.42	16778	33467	6	8	6.7(−5)	4.8(−5)	0.0057	−3.54	C	2

Co I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
62.	$a\ ^2D - y\ ^2D^o$ (92)											
		5176.09	16778	36092	6	6	0.0066	0.0026	0.27	−1.80	D	2
		5094.96	16471	36092	4	6	0.0042	0.0024	0.16	−2.01	D	2
63.	$a\ ^2P - y\ ^2D^o$ (112)											
		5647.23	18390	36092	4	6	0.012	0.0083	0.62	−1.48	D	2
64.	$b\ ^2D - y\ ^2D^o$ (140)											
		7054.04	21920	36092	6	6	0.0076	0.0056	0.79	−1.47	D	2

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Co VIII

Ground State $1s^22s^22p^63s^23p^63d^2\ ^3F_2$

Ionization Potential [159] eV = [1282000] cm^{-1}

Allowed Transitions

For this ion the only data available are those of Warner and Kirkpatrick [1], who used the single configuration scaled Thomas-Fermi approximation and calculated individual line strengths in intermediate coupling. These authors provided data for many transitions within the $3d^2 - 3d4f$ array. Of these data, we have tabulated only those lines that have been experimentally observed (Alexander et al. [2]).

It is expected that for this relatively simple, essentially two-electron spectrum Warner and Kirkpatrick's data should be fairly reliable (except when configuration interaction effects become appreciable). This conjecture seems to be supported by the good agreement between their calculated data and beam-foil lifetimes available for Ti III (see, for example, ref. [3]), an ion which is isoelectronic with Co VIII.

References

[1] Warner, B., and Kirkpatrick, R., Publications of the Department of Astronomy, University of Texas at Austin, Vol. 3, No. 2 (1969) and Mon. Not. R. Astron. Soc. **144**, 397 (1969).

[2] Alexander, E., Feldman, U., Fraenkel, B. S., and Hoory, S., J. Opt. Soc. Am. **56**, 651 (1966).

[3] Wiese, W. L., and Fuhr, J. R., J. Phys. Chem. Ref. Data **4**, 263 (1975).

Co VIII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$3d^2$–$3d4f$	$^3F - ^3F^o$	*123.20*	*1820*	*813540*	21	21	880	0.20	1.7	0.62	D	1
			123.31	3140	814120	9	9	640	0.15	0.54	0.12	D	1
			123.17	1430	813290	7	7	720	0.16	0.47	0.06	D	1
			123.02	0	812860	5	5	900	0.20	0.41	0.01	D	1
			123.44	3140	813290	9	7	51	0.0090	0.033	−1.09	D	1
			123.24	1430	812860	7	5	88	0.014	0.041	−1.00	D	1
			123.05	1430	814120	7	9	83	0.024	0.069	−0.77	D	1
			122.96	0	813290	5	7	240	0.076	0.15	−0.42	D	1
2.		$^3F - ^3G^o$											
			122.47	3140	819640	9	11	2800	0.77	2.8	0.84	D	1
			122.32	1430	818950	7	9	2400	0.70	2.0	0.69	D	1
			122.27	0	817840	5	7	2200	0.68	1.4	0.53	D	1
			122.58	3140	818950	9	9	300	0.069	0.25	−0.21	D	1
			122.49	1430	817840	7	7	270	0.061	0.17	−0.37	D	1

Co VIII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^{8}s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
3.		$^1D - {}^1D^o$	125.16	[19670]	[818650]	5	5	1100	0.27	0.56	0.13	D	1
4.		$^1D - {}^1F^o$	124.88	[19670]	[820450]	5	7	1800	0.59	1.2	0.47	D	1
5.		$^1D - {}^3D^o$											
			124.65	[19670]	[821900]	5	7	43	0.014	0.029	−1.15	D	1
6.		$^3P - {}^1F^o$											
			125.57	[24090]	[820450]	5	7	13	0.0042	0.0086	−1.68	E	1
7.		$^3P - {}^3D^o$											
			125.34	[24090]	[821900]	5	7	1800	0.59	1.2	0.47	D	1
			125.35	[22880]	[820620]	3	5	1600	0.64	0.79	0.28	D	1
			125.27	[22310]?	[820570]?	1	3	1300	0.93	0.38	−0.03	D	1

Co X

Ground State	$1s^22s^22p^63s^23p^6\ {}^1S_0$
Ionization Potential	276.7 eV = 2232000 cm^{-1}

Allowed Transitions

The line strength for the $3p^6$–$3p^53d$ resonance transition of this argon-like ion was interpolated from the superposition-of-configurations (SOC) calculations of Weiss [1] for neighboring ions, which are expected to be fairly accurate. The remainder of the oscillator strengths were interpolated from the Dirac-Hartree-Fock data of Lin et al. [2], who included correlation only in the lower state.

References

[1] Weiss, A. W., private communication.

[2] Lin, D. L., Fielder, W., Jr., and Armstrong, L., Jr., Phys. Rev. A **16**, 589 (1977).

Co X: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^{8}s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
1.	$3p^6$–$3p^53d$	$^1S - {}^1P^o$	158.87	0	629450	1	3	2200	2.5	1.3	0.40	C	*interp.*
2.	$3p^6$– $3p^5(^2P^o_{3/2})4s$	$^1S - (3/2,1/2)^o$											
			90.47	0	1105000	1	3	430	0.16	0.048	−0.80	D	*interp.*
3.	$3p^6$– $3p^5(^2P^o_{1/2})4s$	$^1S - (1/2,1/2)^o$											
			88.99	0	1124000	1	3	650	0.23	0.067	−0.64	D	*interp.*
4.	$3p^6$– $3p^5(^2P^o_{3/2})4d$	$^1S - {}^2[3/2]^o$											
			72.45	0	1380000	1	3	1700	0.39	0.093	−0.41	D	*interp.*
5.	$3p^6$– $3p^5(^2P^o_{1/2})4d$	$^1S - {}^2[3/2]^o$											
			71.48	0	1399000	1	3	870	0.20	0.047	−0.70	D	*interp.*

Co XI

Ground State $1s^22s^22p^63s^23p^5\ ^2P^\circ_{3/2}$

Ionization Potential $305\ \text{eV} = 2462000\ \text{cm}^{-1}$

Allowed Transitions

Significant correlation effects and deviations from *LS* coupling in this chlorine-like ion make theoretical oscillator strengths for low-lying transitions somewhat uncertain (see, for example, the comments on Fe X). Nussbaumer [1] has calculated energy levels and oscillator strengths for many transitions in Fe X and Ni XII by using a scaled Thomas-Fermi method with configuration interaction and relativistic effects. We have interpolated these data for a few transitions in Co XI.

Reference

[1] Nussbaumer, H., Astron. Astrophys. **48**, 93 (1976).

Co XI: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
1.	$3s^23p^5$–$3s3p^6$	$^2P^\circ$ – ^2S	*325.57*	*6480*	313630	6	2	68	0.036	0.23	−0.67	E	*interp.*
			318.85	0	313630	4	2	46	0.035	0.15	−0.85	E	*interp.*
			[339.90]	19430	313630	2	2	20	0.034	0.076	−1.17	E	*interp.*
2.	$3p^5$–$3p^4(^1D)3d$	$^2P^\circ$ – ^2S	*173.59*	*6480*	582550	6	2	1800	0.27	0.91	0.20	D	*interp.*
			171.66	0	582550	4	2	1300	0.29	0.66	0.06	D	*interp.*
			177.58	19430	582550	2	2	440	0.21	0.25	−0.38	D	*interp.*
3.	$3p^5$–$3p^4(^3P)3d$	$^2P^\circ$ – ^2P	*166.03*	*6480*	*608770*	6	6	1800	0.73	2.4	0.64	E	*interp.*
			164.91	0	606390	4	4	1800	0.72	1.6	0.46	E	*interp.*
			168.327	19430	613530	2	2	1200	0.53	0.59	0.03	E	*interp.*
			162.99	0	613530	4	2	470	0.094	0.20	−0.42	E	*interp.*
			170.33	19430	606390	2	4	21	0.018	0.020	−1.44	E	*interp.*
4.		$^2P^\circ$ – ^2D	*162.51*	*6480*	*621830*	6	10	2000	1.3	4.3	0.91	D	*interp.*
			162.56	0	615160	4	6	2000	1.2	2.6	0.68	D	*interp.*
			163.32	19430	631830	2	4	2000	1.6	1.7	0.51	D	*interp.*
			158.27	0	631830	4	4	51	0.019	0.040	−1.12	D	*interp.*

Co XII

Ground State $1s^22s^22p^63s^23p^4\ ^3P_2$

Ionization Potential $[335]\ \text{eV} = [2702000]\ \text{cm}^{-1}$

Allowed Transitions

The oscillator strength for one $3p$–$3d$ transition of this highly ionized member of the sulfur sequence was interpolated from the statistical Hartree-Fock data calculated by Fawcett et al. [1] for neighboring ions. We felt that to extrapolate *f*-values for additional transitions would be rather risky, in view of correlation effects and deviations from *LS* coupling (see, for example, the comments on Fe XI).

Reference

[1] Fawcett, B. C., Peacock, N. J., and Cowan, R. D., J. Phys. B **1**, 295 (1968).

Co XII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
1.	$3p^4$–$3p^3(^2D^\circ)3d$	^1D – $^1F^\circ$	169.91			5	7	1800	1.1	3.1	0.74	D	*interp.*

Co XIII

Ground State $1s^22s^22p^63s^23p^3\ ^4S^o_{3/2}$

Ionization Potential [375] eV = [3025000] cm^{-1}

Allowed Transitions

The single oscillator strength available for this highly ionized member of the P sequence has been interpolated from the results of Hartree-Fock-Slater (HX) calculations [1] for Fe XII and Ni XIV.

(For additional comments on this sequence, see Fe XII.)

Reference

[1] Fawcett, B. C., Peacock, N. J., and Cowan, R. D., J. Phys. B **1**, 295 (1968).

Co XIII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
1.	$3p^3$–$3p^2(^3P)3d$	$^2D^o$ – ^2F											
			174.82			6	8	1400	0.87	3.0	0.72	D	*interp.*

Co XIV

Ground State $1s^22s^22p^63s^23p^2\ ^3P_0$

Ionization Potential [409] eV = [3299000] cm^{-1}

Allowed Transitions

The f-values for the transitions presented here were interpolated from results of the multiconfiguration calculations of Kastner et al. [1] for some Si-like ions.

Reference

[1] Kastner, S. O., Swartz, M., Bhatia, A. K., and Lapides, J., J. Opt. Soc. Am. **68**, 1558 (1978).

Co XIV: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
1.	$3p^2$–$3p4d$	^1D – $^1F^o$	56.115	[54960]	[1837000]	5	7	4800	0.32	0.30	0.20	E	*interp.*
2.	$3p3d$–$3p4f$	$^3F^o$ – ^3G											
			68.807			9	11	8000	0.69	1.4	0.79	D	*interp.*
3.		$^3P^o$ – ^3D											
			70.698?			1	3	3100	0.69	0.16	−0.16	D	*interp.*
4.		$^1F^o$ – ^1G	73.402	[597230]	[1959600]	7	9	7600	0.79	1.3	0.74	D	*interp.*
5.		$^1P^o$ – ^1D	74.379	[612090]	[1956600]	3	5	4600	0.63	0.46	0.28	D	*interp.*

Co XV

Ground State $1s^22s^22p^63s^23p\ ^2P^o_{1/2}$

Ionization Potential [442.0] eV = [3565100] cm^{-1}

Allowed Transitions

Oscillator strengths for multiplets 1, 4, and 11 were interpolated from the multiconfiguration Hartree-Fock calculations of Froese Fischer [1,2]. The remainder of the data were interpolated from the superposition-of-configurations calculations of Weiss [3]. Significant correlation effects and level crossings introduce uncertainties into the interpolation procedure; the accuracy ratings assigned to the pertinent transitions have been lowered accordingly.

References

[1] Froese Fischer, C., Can. J. Phys. **54**, 740 (1976).

[2] Froese Fischer, C., Can. J. Phys. **56**, 983 (1978).

[3] Weiss, A. W., *Beam-Foil Spectroscopy*, Vol. 1, 51–68 (Eds. Sellin, I. A., and Pegg, D. J., Plenum Press, New York, 1976) and private communication.

Co XV: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
1.	$3s^23p-3s3p^2$	$^2P^o-{}^2D$	*323.74*	*15330*	*324220*	6	10	24	0.062	0.40	−0.43	E	*interp.*
			330.25	23000	325800	4	6	23	0.055	0.24	−0.66	E	*ls*
			310.69	0	321860	2	4	22	0.064	0.13	−0.90	E	*ls*
			[334.60]	23000	321860	4	4	3.7	0.0061	0.027	−1.61	E	*ls*
2.	$3s3p(^1P^o)3d-3p^2(^1D)3d$	$^2P^o-{}^2S$				6	2		0.032		−0.72	E	*interp.*
3.	$3s3p^2-3s^24p$	$^2D-{}^2P^o$				10	6		0.017		−0.77	C	*interp.*
4.	$3p-3d$	$^2P^o-{}^2D$	*203.07*	*15330*	*507770*	6	10	430	0.44	1.8	0.42	C	*interp.*
			205.85	23000	508790	4	6	430	0.41	1.1	0.21	C	*ls*
			197.54	0	506230	2	4	390	0.46	0.60	−0.03	C	*ls*
			206.94	23000	506230	4	4	69	0.044	0.12	−0.75	D	*ls*
5.	$3s3p(^3P^o)3d-3s3d^2$	$^2P^o-{}^2S$				6	2		0.10		−0.22	D	*interp.*
6.	$3s3p(^1P^o)3d-3s3d^2$	$^2P^o-{}^2S$				6	2		0.11		−0.18	D	*interp.*
7.	$3p^3-3p^2(^1D)3d$	$^2P^o-{}^2S$				6	2		0.083		−0.30	C	*interp.*
8.	$3p-4s$	$^2P^o-{}^2S$				6	2		0.060		−0.44	D	*interp.*
9.	$3p-4d$	$^2P^o-{}^2D$	*52.978*	*15330*	*1902900*	6	10	4300	0.30	0.31	0.26	C	*interp.*
			53.173	23000	1903700	4	6	4300	0.27	0.19	0.04	C	*ls*
			52.583	0	1901800	2	4	3500	0.29	0.10	−0.24	C	*ls*
			[53.225]	23000	1901800	4	4	710	0.030	0.021	−0.92	D	*ls*
10.	$3d-4p$	$^2D-{}^2P^o$				10	6		0.026		−0.59	C	*interp.*
11.	$4s-4p$	$^2S-{}^2P^o$				2	6		0.46		−0.04	D	*interp.*

Co XVI

Ground State $1s^22s^22p^63s^2\ ^1S_0$

Ionization Potential [512] eV = [4130000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
47.489	10	64.537	21	221.62	12	298.46	3
56.83	18	64.773	17	229.074	14	302.65	3
61.025	19,20	64.780	25	265.74	2	308	4
61.200	19	210.249	12	271.00	3	389	1
62.131	24	212.800	12	281.88	3	449	6
62.334	24	213.396	12	284.42	3		
62.412	23	219.947	12	287.53	3		
62.805	22	220.980	12	293	4		

Transition probabilities for a few lines were taken from the multiconfiguration results of Kastner and Bhatia [1] in intermediate coupling. The wavelengths for these lines are interpolated values taken from the same source and thus may be rather uncertain.

Data for the remaining transitions in this high ion of the Mg sequence have been interpolated from the results of several theoretical calculations: the relativistic multiconfiguration Hartree-Fock (MCHF) approach of Cheng and Johnson [2]; the superposition-of-configurations (SOC) method of Weiss [3] in intermediate coupling, including relativistic corrections to the energy levels; the nonrelativistic MCHF calculations of Froese Fischer [4]; the relativistic random phase approximation (RRPA) approach of Shorer et al. [5]; and the multiconfiguration results of Kastner et al. [6] in intermediate coupling.

Weiss did not calculate line strengths for the transition in Mg-like ions. Thus we have converted f-values interpolated from his results for the remaining lines of the multiplet to line strengths, and then estimated the strength of this missing line to be in proportion to its strength in a pure LS-coupled multiplet. The resulting multiplet strength is in very good agreement with the Z-expansion results of Crossley and Dalgarno [7], whose result for the corresponding multiplet in Fe XV agrees with our tabulated value (derived from the results of rather accurate calculations) for the Fe ion multiplet to within 5%. We have nevertheless been conservative in our accuracy rating for this particular transition.

References

[1] Kastner, S. O., and Bhatia, A. K., J. Opt. Soc. Am. **69**, 1391 (1979).
[2] Cheng, K. T., and Johnson, W. R., Phys. Rev. A **16**, 263 (1977).
[3] Weiss, A. W., private communication.
[4] Froese Fischer, C., J. Opt. Soc. Am. **69**, 118 (1979).
[5] Shorer, P., Lin, C. D., and Johnson, W. R., Phys. Rev. A **16**, 1109 (1977).
[6] Kastner, S. O., Swartz, M., Bhatia, A. K., and Lapides, J. J. Opt. Soc. Am. **68**, 1558 (1978).
[7] Crossley, R. J. S., and Dalgarno, A., Proc. R. Soc. London, Ser. A **286**, 510 (1965).

Co XVI: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$3s^2$–$3s3p$	^1S – $^3P^o$											
			[389]?			1	3	0.54	0.0037	0.0047	−2.43	D	1
2.		^1S – $^1P^o$	265.74	0	376310	1	3	250	0.80	0.70	−0.10	C	*interp.*

Co XVI: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
3.	$3s3p-3p^2$	$^3P^o - {}^3P$	*286.32*			9	9	199	0.244	2.07	0.342	C	*interp.*
			284.42			5	5	140	0.170	0.80	−0.071	C	*interp.*
			287.53			3	3	55	0.068	0.19	−0.69	C	*interp.*
			302.65			5	3	78	0.064	0.32	−0.49	C	*interp.*
			298.46			3	1	200	0.087	0.26	−0.58	C	*interp.*
			271.00			3	5	50	0.091	0.24	−0.56	C	*interp.*
			281.88			1	3	78	0.279	0.259	−0.55	C	*interp.*
4.		$^3P^o - {}^1D$											
			[308]?			5	5	25	0.036	0.18	−0.75	D	1
			[293]?			3	5	14	0.030	0.087	−1.05	D	1
5.		$^1P^o - {}^3P$											
						3	5		0.024		−1.14	D−	*interp.*
6.		$^1P^o - {}^1D$	[449]?			3	5	16.3	0.082	0.364	−0.61	C	1
7.		$^1P^o - {}^1S$				3	1		0.101		−0.52	C	*interp.*
8.	$3s3d-3p3d$	$^3D - {}^3F^o$				15	21		0.145		0.337	C	*interp.*
9.		$^1D - {}^1F^o$				5	7		0.362		0.258	C	*interp.*
10.	$3s^2-3s4p$	$^1S - {}^1P^o$	47.489	0	2105800	1	3	3760	0.381	0.060	−0.419	C	*interp.*
11.	$3s^2-3s5p$	$^1S - {}^1P^o$				1	3		0.117		−0.93	C	*interp.*
12.	$3s3p-3s3d$	$^3P^o - {}^3D$	*216.56*			9	15	250	0.30	1.9	0.43	D	*interp.*, *ls*
			219.947			5	7	240	0.24	0.88	0.08	D	*ls*
			212.800			3	5	197	0.223	0.469	−0.175	C	*interp.*
			210.249			1	3	152	0.302	0.209	−0.52	C	*interp.*
			220.980			5	5	59	0.0435	0.158	−0.66	C	*interp.*
			213.396			3	3	110	0.074	0.16	−0.65	C	*interp.*
			[221.62]			5	3	6.6	0.0029	0.011	−1.84	C	*interp.*
13.		$^1P^o - {}^3D$											
						3	5		$3.3(-4)^a$		−3.00	D	*interp.*
14.		$^1P^o - {}^1D$	229.074	376310	812850	3	5	440	0.58	1.3	0.24	D	*interp.*
15.	$3p^2-3p3d$	$^1D - {}^1F^o$				5	7		0.217		0.035	C	*interp.*
16.	$3s3d-3s4f$	$^3D - {}^3F^o$				15	21		0.91		1.14	C	*interp.*
17.		$^1D - {}^1F^o$	64.773	812850	2356700	5	7	7800	0.69	0.74	0.54	C	*interp.*
18.	$3p^2-3s4f$	$^1D - {}^1F^o$	56.83			5	7	3100	0.21	0.20	0.02	D	*interp.*
19.	$3p3d-3p4f$	$^3F^o - {}^3G$											
			61.025			9	11	1.2(+4)	0.80	1.4	0.86	C	*interp.*
			61.200			7	9	8400	0.61	0.86	0.63	D	*interp.*
20.		$^3F^o - {}^3F$											
			61.025?			7	9	2500	0.18	0.25	0.10	D	*interp.*
21.		$^1F^o - {}^1G$	64.537			7	9	1.1(+4)	0.90	1.3	0.80	C	*interp.*

Co XVI: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
22.		^{3}D° - ^{3}F											
			62.805			7	9	7000	0.53	0.77	0.57	D	*interp.*
			62.805			3	5	8400	0.83	0.51	0.40	C	*interp.*
23.		^{3}D° - ^{3}D											
			62.412			5	7	6100	0.50	0.51	0.40	D	*interp.*
24.		^{3}P° - ^{3}D											
			62.334			3	5	5800	0.56	0.34	0.23	C	*interp.*
			62.131			1	3	5300	0.92	0.19	−0.04	C	*interp.*
			62.131			3	3	5400	0.31	0.19	−0.03	C	*interp.*
25.		^{1}P° - ^{1}D	64.780?			3	5	9000	0.94	0.60	0.45	C	*interp.*

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Co XVII

Ground State $1s\ 2s^2 2p^6 3s\ ^2S_{1/2}$

Ionization Potential 546.8 eV = 4410480 cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
32.995	3	37.78	7	49.171	6	249.84	4
33.046	3	41.404	12	56.021	5	312.58	1
35.617	8	41.462	12	56.833	5	339.53	1
35.660	14	41.467	12	58.842	10	636.1	16
35.707	14	43.278	11	58.948	10	672.9	16
35.932	8	43.347	11	58.971	10	679.8	16
35.942	8	43.366	11	67.274	9	786.8	15
36.42	13	45.319	2	67.443	9	854.7	15
36.454	13	45.527	2	67.734	9	1520	17
36.47	13	48.564	6	234.95	4	1540	17
37.42	7	49.133	6	247.56	4	1550	17

Oscillator strengths for individual lines of multiplets of the type $nl\ ^2L - n'l'\ ^2L'$ $(n, n' = 3,4)$ were interpolated from the relativ-single-configuration Hartree-Fock results of Kim and Cheng [1] for selected ions of the Na isoelectronic sequence. Numerous multiplet f-values have been calculated by Tull et al. [2] in the frozen-core Hartree-Fock approximation, including relativistic corrections to the energy levels; of these, we quote the results for the lower-lying transitions out of the $n = 3$ shell.

Froese Fischer [3] has parametrized the non-relativistic Hartree-Fock f-value data of Biemont for many transitions of the Na sequence.

References

[1] Kim, Y.-K., and Cheng, K.-t., J. Opt. Soc. Am. **68**, 836 (1978).
[2] Tull, C. E., McEachran, R. P., and Cohen, M., At. Data **3**, 169 (1971).
[3] Froese Fischer, C., Phys. Scr. **14**, 269 (1976).

Co XVII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	3s–3p	^{2}S – ^{2}P°	*321.08*	0	*311450*	2	6	83	0.38	0.81	−0.12	C	*interp.*
			312.58	0	319920	2	4	89	0.260	0.54	−0.284	C	*interp.*
			339.53	0	294520	2	2	69	0.120	0.268	−0.62	C	*interp.*
2.	3s–4p	^{2}S – ^{2}P°	*45.389*	0	*2203200*	2	6	2400	0.224	0.067	−0.35	C	*interp.*
			45.319	0	2206600	2	4	2350	0.145	0.0433	−0.54	C	*interp.*
			45.527	0	2196500	2	2	2500	0.079	0.024	−0.80	C	*interp.*
3.	3s–5p	^{2}S – ^{2}P°	*33.012*	0	*3029200*	2	6	1460	0.0718	0.0156	−0.843	C+	2
			32.995	0	3030800	2	4	1470	0.0479	0.0104	−1.019	C	*ls*
			33.046	0	3026100	2	2	1500	0.024	0.0053	−1.31	D	*ls*
4.	3p–3d	^{2}P° – ^{2}D	*243.36*	*311450*	*722370*	6	10	183	0.270	1.30	0.210	C	*interp.*
			247.56	319920	723860	4	6	171	0.235	0.77	−0.027	C	*interp.*
			234.95	294520	720140	2	4	172	0.284	0.439	−0.246	C	*interp.*
			249.84	319920	720140	4	4	27.9	0.0261	0.086	−0.98	C	*interp.*
5.	3p–4s	^{2}P° – ^{2}S	*56.559*	*311450*	2079500	6	2	4000	0.064	0.071	−0.42	D	*interp.*
			56.833	319920	2079500	4	2	2700	0.065	0.049	−0.59	D	*interp.*
			56.021	294520	2079500	2	2	1300	0.060	0.022	−0.92	C	*interp.*
6.	3p–4d	^{2}P° – ^{2}D	*48.944*	*311450*	*2354600*	6	10	5400	0.32	0.31	0.28	C−	*interp.*
			49.133	319920	2355200	4	6	5500	0.298	0.193	0.076	C	*interp.*
			48.564	294520	2353700	2	4	4500	0.32	0.10	−0.18	D	*interp.*
			49.171	319920	2353700	4	4	920	0.0332	0.0215	−0.88	C	*interp.*
7.	3p–5s	^{2}P° – ^{2}S	*37.66*	*311450*	[2967000]	6	2	1710	0.0121	0.00900	−1.139	C+	2
			[37.78]	319920	[2967000]	4	2	1100	0.012	0.0060	−1.32	C	*ls*
			[37.42]	294520	[2967000]	2	2	580	0.0122	0.00300	−1.61	C	*ls*
8.	3p–5d	^{2}P° – ^{2}D	*35.826*	*311450*	*3102700*	6	10	3150	0.101	0.0715	−0.218	C+	2
			35.932	319920	3103000	4	6	3120	0.091	0.0429	−0.440	C	*ls*
			35.617	294520	3102200	2	4	2670	0.101	0.0238	−0.69	C	*ls*
			[35.942]	319920	3102200	4	4	520	0.010	0.0048	−1.39	D	*ls*
9.	3d–4p	^{2}D – ^{2}P°	*67.530*	*722370*	*2203200*	10	6	910	0.037	0.083	−0.43	D	*interp.*
			[67.443]	723860	2206600	6	4	810	0.0367	0.0489	−0.66	C	*interp.*
			[67.734]	720140	2196500	4	2	960	0.033	0.029	−0.88	D	*interp.*
			[67.274]	720140	2206600	4	4	87	0.0060	0.0054	−1.62	D	*interp.*
10.	3d–4f	^{2}D – ^{2}F°	*58.906*	*722370*	*2420000*	10	14	1.3(+4)[a]	0.93	1.8	0.97	C−	*interp.*
			58.948	723860	2420300	6	8	1.3(+4)	0.89	1.0	0.73	C	*interp.*
			58.842	720140	2419600	4	6	1.2(+4)	0.93	0.72	0.57	C−	*interp.*
			[58.971]	723860	2419600	6	6	850	0.0445	0.052	−0.57	C	*interp.*
11.	3d–5p	^{2}D – ^{2}P°	*43.350*	*722370*	*3029200*	10	6	350	0.0060	0.0086	−1.22	D	2
			[43.347]	723860	3030800	6	4	320	0.0061	0.0052	−1.44	D	*ls*
			[43.366]	720140	3026100	4	2	360	0.0051	0.0029	−1.69	D	*ls*
			[43.278]	720140	3030800	4	4	36	0.0010	5.7(−4)	−2.40	E	*ls*
12.	3d–5f	^{2}D – ^{2}F°	*41.438*	*722370*	*3135600*	10	14	4740	0.171	0.233	0.233	C+	2
			41.462	723860	3135700	6	8	4730	0.162	0.133	−0.011	C	*ls*
			41.404	720140	3135400	4	6	4400	0.17	0.093	−0.17	C	*ls*
			[41.467]	723860	3135400	6	6	320	0.0082	0.0067	−1.31	D	*ls*

Co XVII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
13.	$3d-6p$	$^2\mathrm{D} - {}^2\mathrm{P}^\circ$	*36.46*	*722370*	*3465000*	10	6	180	0.0021	0.0025	−1.68	D	2
			[36.47]	723860	3466000	6	4	160	0.0021	0.0015	−1.90	D	*ls*
			[36.454]	720140	3463300	4	2	170	0.0017	8.3(−4)	−2.16	D	*ls*
			[36.42]	720140	3466000	4	4	18	3.5(−4)	1.7(−4)	−2.85	E	*ls*
14.	$3d-6f$	$^2\mathrm{D} - {}^2\mathrm{F}^\circ$	*35.688*	*722370*	3524400	10	14	2350	0.0629	0.0739	−0.201	C+	2
			35.707	723860	3524400	6	8	2350	0.060	0.0422	−0.445	C	*ls*
			35.660	720140	3524400	4	6	2200	0.063	0.0296	−0.60	C	*ls*
			[35.707]	723860	3524400	6	6	160	0.0030	0.0021	−1.75	D	*ls*
15.	$4s-4p$	$^2\mathrm{S} - {}^2\mathrm{P}^\circ$	*808.4*	2079500	*2203200*	2	6	19	0.56	3.0	0.05	D	*interp.*
			[786.8]	2079500	2206600	2	4	20	0.38	2.0	−0.12	D	*interp.*
			[854.7]	2079500	2196500	2	2	15.9	0.174	0.98	−0.458	C	*interp.*
16.	$4p-4d$	$^2\mathrm{P}^\circ - {}^2\mathrm{D}$	*660.5*	*2203200*	*2354600*	6	10	39	0.43	5.6	0.41	C	*interp.*
			[672.9]	2206600	2355200	4	6	36.9	0.376	3.33	0.177	C	*interp.*
			[636.1]	2196500	2353700	2	4	36.8	0.446	1.87	−0.050	C	*interp.*
			[679.8]	2206600	2353700	4	4	6.0	0.0415	0.372	−0.78	C	*interp.*
17.	$4d-4f$	$^2\mathrm{D} - {}^2\mathrm{F}^\circ$	*1530*	*2354600*	*2420000*	10	14	2.1	0.10	5.2	0.01	C	*interp.*
			[1540]	2355200	2420300	6	8	2.1	0.098	3.0	−0.23	C	*interp.*
			[1520]	2353700	2419600	4	6	2.00	0.104	2.08	−0.381	C	*interp.*
			[1550]	2355200	2419600	6	6	0.14	0.0050	0.15	−1.52	D−	*interp.*

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Co XVIII

Ground State $1s^22s^22p^6\ {}^1\mathrm{S}_0$

Ionization Potential 1403.0 eV = 11316400 cm^{-1}

Allowed Transitions

Oscillator strengths for the resonance transitions to $J = 1$ levels of the configurations $2p^53s$ and $2p^53d$ were interpolated from the results of the multiconfiguration relativistic random phase approximation (RRPA) calculations of Shorer [1] for Ne-like ions. Results of the model potential calculations of Crance [2] have been tabulated for resonance transitions to $2p^5ns$ and $2p^5nd$ (n = 5,6). The maining oscillator strengths presented here were interpolated from the results of the scaled Thomas-Fermi approach of Loulergue and Nussbaumer [3], which allows for extensive configuration interaction as well as spin-orbit coupling, for Fe XVII and Ni XIX.

References

[1] Shorer, P., Phys. Rev. A **20**, 642 (1979).
[2] Crance, M., At. Data **5**, 185 (1973).
[3] Loulergue, M., and Nussbaumer, H., Astron. Astrophys. **45**, 125 (1975).

Co XVIII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$2s^22p^6-2s2p^63p$	$^1\mathrm{S} - {}^3\mathrm{P}^\circ$											
			12.656	0	7901400	1	3	4700	0.034	0.0014	−1.47	C	*interp.*
2.		$^1\mathrm{S} - {}^1\mathrm{P}^\circ$	12.593	0	7940900	1	3	4.1(+4)[a]	0.29	0.012	−0.54	C	*interp.*
3.	$2s^22p^6-2s2p^64p$	$^1\mathrm{S} - {}^3\mathrm{P}^\circ$											
						1	3		0.018		−1.74	C	*interp.*

Co XVIII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
4.		^{1}S - ^{1}P°				1	3		0.12		−0.92	C	*interp.*
5.	$2p^6$-$2p^5(^2P^o_{3/2})3s$	^{1}S - (3/2,1/2)°	15.432	0	6480000	1	3	1.15(+4)	0.123	0.00625	−0.910	C+	*interp.*
6.	$2p^6$-$2p^5(^2P^o_{1/2})3s$	^{1}S - (1/2,1/2)°	15.169	0	6592400	1	3	9760	0.101	0.00504	−0.996	C+	*interp.*
7.	$2p^6$-$2p^5 3d$	^{1}S - ^{3}P°				1	3		0.0094		−2.03	C	*interp.*
8.		^{1}S - ^{3}D°				1	3		0.71		−0.15	C	*interp.*
9.		^{1}S - ^{1}P°	13.862	0	7214000	1	3	2.7(+5)	2.3	0.10	0.36	C	*interp.*
10.	$2p^6$-$2p^5(^2P^o_{3/2})4s$	^{1}S - (3/2,1/2)°	11.458	0	8727500	1	3	3900	0.023	8.7(−4)	−1.64	C	*interp.*
11.	$2p^6$-$2p^5(^2P^o_{1/2})4s$	^{1}S - (1/2,1/2)°	11.324	0	8830800	1	3	4200	0.024	8.9(−4)	−1.62	C	*interp.*
12.	$2p^6$-$2p^5 4d$	^{1}S - ^{3}P°				1	3		0.0035		−2.46	D	*interp.*
13.		^{1}S - ^{3}D°	11.103	0	9006600	1	3	7.6(+4)	0.42	0.015	−0.38	C	*interp.*
14.		^{1}S - ^{1}P°	10.97	0	9116000	1	3	9.4(+4)	0.51	0.018	−0.29	C	*interp.*
15.	$2p^6$-$2p^5(^2P^o_{3/2})5s$	^{1}S - (3/2,1/2)°				1	3		0.0064		−2.19	D	2
16.	$2p^6$-$2p^5(^2P^o_{1/2})5s$	^{1}S - (1/2,1/2)°				1	3		0.0035		−2.46	D	2
17.	$2p^6$-$2p^5 5d$	^{1}S - ^{3}D°	10.178	0	9825100	1	3	2.8(+4)	0.13	0.0044	−0.89	D	2
18.		^{1}S - ^{1}P°	10.060	0	9940400	1	3	4.0(+4)	0.18	0.0060	−0.74	D	2
19.	$2p^6$-$2p^5(^2P^o_{3/2})6s$	^{1}S - (3/2,1/2)°				1	3		0.0033		−2.48	D	2

Co XVIII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
20.	$2p^6$–$2p^5(^2P^o_{1/2})6s$	^1S - $(\frac{1}{2},\frac{1}{2})^o$											
						1	3		0.0017		−2.77	D	2
21.	$2p^6$–$2p^56d$	^1S - $^3D^o$											
			9.743	0	10260000	1	3	1.4(+4)	0.059	0.0019	−1.23	D	2
22.		^1S - $^1P^o$	9.611	0	10400000	1	3	2.3(+4)	0.097	0.0031	−1.01	D	2

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Co XIX

Ground State $1s^22s^22p^5\ ^2P^o_{3/2}$

Ionization Potential [1493] eV = [12042000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
12.700	20	13.279	13	14.300	9	14.791	9
12.939	17	13.497	13	14.349	8	88.35	1
12.981	18	13.847	11	14.418	10	99.02	1
13.090	19	14.074	11	14.530	9		
13.146	17	14.170	10	14.553	9		
13.188	18	14.178	10	14.604	8		

Oscillator strengths for lines of the multiplet $2s^22p^5\ ^2P^o$–$2s2p^6\ ^2S$ are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1], which include a perturbative treatment of the Breit interaction and the Lamb shift.

All other data are interpolated from the comprehensive calculations of Chapman and Shadmi [2], who employed Hartree-Fock wave functions including the principal configuration mixing and calculated individual oscillator strengths in intermediate coupling.

Experimentally determined wavelengths and energy levels for some of the $2p$–$3s$ and $2p$–$3d$ transitions presented here have been reported by Feldman et al. [3]. In some cases, however, we have permuted the "names" of the levels to coincide with the percentage compositions interpolated from the results of Chapman and Shadmi [2] for Fe XVIII and Cu XXI. Specifically, within the $2p^4(^3P)3s$ configuration, the $^2P_{3/2}$ and $^4P_{3/2}$ designations given by Feldman et al. have been interchanged. There are indications that certain of the $J = \frac{5}{2}$ levels within the $2p^4(^3P)3d$ configuration should also be relabeled, but the calculated energy levels and percentage compositions given by Chapman and Shadmi predict level crossings among those states at some point along the isoelectronic sequence beyond iron, since their relative locations for copper are somewhat different than for iron. For transitions to these states, therefore, we have left the wavelength and energy level columns blank.

References

[1] Cheng, K. T., Kim, Y.-K., and Desclaux, J. P., At. Data Nucl. Data Tables **24**, 111 (1979).

[2] Chapman, R. D., and Shadmi, Y., J. Opt. Soc. Am. **63**, 1440 (1973).

[3] Feldman, U., Doschek, G. A., Cowan, R. D., and Cohen, L., J. Opt. Soc. Am. **63**, 1445 (1973).

Co XIX: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$2s^22p^5$–$2s2p^6$	^{2}P° – ^{2}S	*91.62*	*40500*	1132000	6	2	1340	0.0564	0.102	−0.471	C+	1
			88.35	0	1132000	4	2	1000	0.0586	0.0682	−0.630	C+	1
			99.02	121600	1132000	2	2	350	0.0514	0.0335	−0.988	C+	1
2.	$2s^22p^5$–$2s2p^5$(^{3}P°)$3p$	^{2}P° – ^{4}S											
						4	4		0.0018		−2.14	E	*interp.*
3.		^{2}P° – ^{2}P											
						4	4		0.083		−0.48	E	*interp.*
4.		^{2}P° – ^{2}S											
						4	2		0.026		−0.98	E	*interp.*
						2	2		0.13		−0.59	E	*interp.*
5.	$2s^22p^5$–$2s2p^5$(^{1}P°)$3p$	^{2}P° – ^{2}D											
						4	6		0.072		−0.54	D	*interp.*
						2	4		0.23		−0.34	E	*interp.*
						4	4		0.029		−0.94	E	*interp.*
6.		^{2}P° – ^{2}P											
						4	4		0.016		−1.19	E	*interp.*
						2	2		0.13		−0.59	E	*interp.*
						4	2		0.011		−1.36	D	*interp.*
						2	4		0.16		−0.49	E	*interp.*
7.		^{2}P° – ^{2}S											
						4	2		0.0013		−2.28	E	*interp.*
						2	2		0.013		−1.59	E	*interp.*
8.	$2p^5$–$2p^4$(^{3}P)$3s$	^{2}P° – ^{4}P											
			[14.604]	121600	6969100	2	4	530	0.0034	3.3(−4)[a]	−2.17	E	*interp.*
			14.349	0	6969100	4	4	170	5.2(−4)	9.8(−5)	−2.68	E	*interp.*
						2	2		8.4(−5)		−3.77	E	*interp.*
9.		^{2}P° – ^{2}P	*14.538*	*40500*	*6919200*	6	6	1.1(+4)	0.034	0.0099	−0.68	E	*interp.*
			14.530	0	6882300	4	4	820	0.0026	5.0(−4)	−1.98	E	*interp.*
			14.553	121600	6993000	2	2	1.2(+4)	0.038	0.0036	−1.12	D	*interp.*
			14.300	0	6993000	4	2	2.0(+4)	0.030	0.0056	−0.92	D	*interp.*
			14.791	121600	6882300	2	4	260	0.0017	1.7(−4)	−2.47	E	*interp.*
10.	$2p^5$–$2p^4$(^{1}D)$3s$	^{2}P° – ^{2}D	*14.256*	*40500*	*7054900*	6	10	5600	0.028	0.0080	−0.77	E	*interp.*
			14.178	0	7053200	4	6	10	4.6(−5)	8.6(−6)	−3.74	E	*interp.*
			14.418	121600	7057400	2	4	1.2(+4)	0.077	0.0073	−0.81	D	*interp.*
			[14.170]	0	7057400	4	4	1200	0.0037	6.9(−4)	−1.83	E	*interp.*
11.	$2p^5$–$2p^4$(^{1}S)$3s$	^{2}P° – ^{2}S	*13.915*	*40500*	7226900	6	2	2.8(+4)	0.027	0.0075	−0.79	D	*interp.*
			13.847	0	7226900	4	2	1.7(+4)	0.025	0.0046	−1.00	D	*interp.*
			14.074	121600	7226900	2	2	1.0(+4)	0.031	0.0029	−1.21	D	*interp.*
12.	$2p^5$–$2p^4$(^{3}P)$3d$	^{2}P° – ^{4}D											
						4	6		0.017		−1.17	E	*interp.*
						2	4		0.0024		−2.32	E	*interp.*
						4	4		0.021		−1.08	E	*interp.*

Co XIX: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
13.		^{2}P° – ^{4}P											
			[13.497]	121600	7530700	2	2	140	3.8(−4)	3.4(−5)	−3.12	E	*interp.*
			13.279	0	7530700	4	2	2600	0.0035	6.1(−4)	−1.85	E	*interp.*
14.		^{2}P° – ^{4}F											
						2	4		0.0077		−1.81	E	*interp.*
						4	4		0.0066		−1.58	E	*interp.*
15.		^{2}P° – ^{2}P											
						4	4		9.8(−4)		−2.41	E	*interp.*
						2	4		0.034		−1.17	E	*interp.*
16.	$2p^5$–$2p^4(^1D)3d$	^{2}P° – ^{2}F											
						4	6		0.11		−0.36	E	*interp.*
17.		^{2}P° – ^{2}P											
			[12.939]	0	7728500	4	4	5200	0.013	0.0022	−1.28	E	*interp.*
						2	2		0.53		0.03	E	*interp.*
						4	2		0.027		−0.97	E	*interp.*
			13.146	121600	7728500	2	4	1.9(+4)	0.10	0.0087	−0.70	E	*interp.*
18.		^{2}P° – ^{2}S	*13.050*	*40500*	7703600	6	2	2.6(+4)	0.022	0.0056	−0.88	E	*interp.*
			12.981	0	7703600	4	2	130	1.7(−4)	2.9(−5)	−3.17	E	*interp.*
			13.188	121600	7703600	2	2	2.5(+4)	0.064	0.0056	−0.89	E	*interp.*
19.		^{2}P° – ^{2}D											
			[13.090]	121600	7761000	2	4	1.0(+5)	0.52	0.045	0.02	E	*interp.*
20.	$2p^5$–$2p^4(^1S)3d$	^{2}P° – ^{2}D											
			12.700	0	7874000	4	6	1.4(+4)	0.051	0.0085	−0.69	E	*interp.*
21.	$2s^22p^5$–$2p^63d$	^{2}P° – ^{2}D											
						4	6		1.7(−4)		−3.17	E	*interp.*
						2	4		0.0061		−1.91	E	*interp.*
						4	4		0.0037		−1.83	E	*interp.*

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Co XX

Ground State	$1s^22s^22p^4\ ^3P_2$
Ionization Potential	[1596] eV = [12873000] cm^{-1}

Allowed Transitions

Oscillator strengths for $2s$–$2p$ transitions are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1]. These relativistic calculations include a perturbative treatment of the Breit interaction and the Lamb shift. The results should be quite accurate, except in the case of intercombination transitions, for which the f-values should be considered rather uncertain. The $2s^22p^4\ ^1D_2$–$2s2p^5\ ^3P_1^o$ transition has been omitted from this tabulation, because its f-value as reported in ref. [1] is extremely and therefore even more uncertain.

Reference

[1] Cheng, K. T., Kim, Y.-K., and Desclaux, J. P., At. Data Nucl. Data Tables **24**, 111 (1979).

Co XX: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$2s^22p^4$–$2s2p^5$	^{3}P – ^{3}P°	*103*	*45200*	*1020000*	9	9	580	0.092	0.28	−0.08	C	1
			101.88	0	981550	5	5	420	0.065	0.11	−0.49	C	1
			105.72	107500	1053400	3	3	134	0.0225	0.0235	−1.171	C	1
			94.94	0	1053400	5	3	364	0.0295	0.0461	−0.83	C	1
			99.89	107500	1109000	3	1	670	0.0333	0.0329	−1.000	C	1
			114.41	107500	981550	3	5	109	0.0358	0.0405	−0.97	C	1
			103.16	84000	1053400	1	3	170	0.083	0.028	−1.08	C	1
2.		^{3}P – ^{1}P°											
			[73.0]			5	3	150	0.0074	0.0089	−1.43	E	1
			[79.2]			3	3	14	0.0013	0.0010	−2.41	E	1
			[77.0]			1	3	20	0.0054	0.0014	−2.27	E	1
3.		^{1}D – ^{3}P°											
			[125]			5	5	28	0.0065	0.013	−1.49	E	1
4.		^{1}D – ^{1}P°	86.19			5	3	1590	0.106	0.150	−0.276	C	1
5.		^{1}S – ^{3}P°											
			[143]			1	3	9.7	0.0089	0.0042	−2.05	E	1
6.		^{1}S – ^{1}P°	101.39			1	3	110	0.052	0.017	−1.28	C	1
7.	$2s2p^5$–$2p^6$	^{3}P° – ^{1}S											
			[80.5]			3	1	170	0.0056	0.0045	−1.77	E	1
8.		^{1}P° – ^{1}S	109.14			3	1	1730	0.103	0.111	−0.51	C	1

Co XXI

Ground State	$1s^22s^22p^3\ ^4S^o_{3/2}$
Ionization Potential	[1725] eV = [13913000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
74.4	13	88.77	8	106	15	129	10,16
75.0	4	89.6	2	106.23	14	132	10,16
75.7	13	90.6	14	106.76	6	133	5
77.1	13	93.00	12	109	11	138	5
77.69	8	94.9	12	110.64	1	146	5
78.3	3	100	11	113	16	155	5,16
82.2	13	101	6	113.70	1	161	9
83.8	13	102	14	119	10	166	5
85.40	8	103	12	122	15	193	9
85.6	12	104.14	6	125.15	1	229	9
88.7	7						

Oscillator strengths for transitions of the arrays $2s^22p^3$–$2s2p^4$ and $2s2p^4$–$2p^5$ are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1]. These relativistic calculations include a perturbative treatment of the Breit interaction and the Lamb shift. The results should be quite accurate, except in the case of intercombination lines, for which the *f*-values should be considered rather uncertain. (A few very weak intercombination lines have been omitted from this tabulation.) The *f*-value listed for the $2s^22p^3\ ^2D^o_{3/2}$–$2s2p^4\ ^2S_{1/2}$ transition is quoted with an uncertainty of 50%, since its magnitude is considerably larger than those of the other intercombination lines. The $2s^22p^3\ ^2D^o_{5/2}$–$2s2p^4\ ^2D_{3/2}$ transition is omitted, since its *f*-value according to ref. [1] is of the order of 10^{-8}.

Reference

[1] Cheng, K. T., Kim, Y.-K., and Desclaux, J. P., At. Data Nucl. Data Tables **24**, 111 (1979).

Co XXI: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$2s^22p^3$–$2s2p^4$	$^4S^o - ^4P$	*118.58*	0	*843330*	4	12	175	0.111	0.173	−0.353	C	1
			125.15	0	799040	4	6	139	0.0491	0.081	−0.71	C	1
			113.70	0	879510	4	4	208	0.0404	0.060	−0.79	C	1
			110.64	0	903830	4	2	236	0.0217	0.0316	−1.061	C	1
2.		$^4S^o - ^2D$											
			[89.6]			4	4	31	0.0037	0.0044	−1.83	E	1
3.		$^4S^o - ^2S$											
			[78.3]			4	2	28	0.0013	0.0013	−2.28	E	1
4.		$^4S^o - ^2P$											
			[75.0]			4	4	62	0.0052	0.0051	−1.68	E	1
5.		$^2D^o - ^4P$											
			[166]			6	6	3.4	0.0014	0.0046	−2.08	E	1
			[138]			4	4	2.0	5.6(−4)[a]	0.0010	−2.65	E	1
			[146]			6	4	0.70	1.5(−4)	4.3(−4)	−3.05	E	1
			[133]			4	2	5.1	6.7(−4)	0.0012	−2.57	E	1
			[155]			4	6	9.3	0.0050	0.010	−1.70	E	1
6.		$^2D^o - ^2D$											
			106.76			6	6	360	0.061	0.13	−0.44	C	1
			104.14			4	4	470	0.076	0.10	−0.52	C	1
			[101]			4	6	0.65	1.5(−4)	2.0(−4)	−3.22	E	1
7.		$^2D^o - ^2S$											
			[88.7]			4	2	510	0.030	0.035	−0.92	D	1
8.		$^2D^o - ^2P$	*84.53*			10	6	1000	0.065	0.18	−0.19	C	1
			88.77			6	4	1100	0.086	0.15	−0.29	C	1
			77.69			4	2	285	0.0129	0.0132	−1.287	C	1
			85.40			4	4	137	0.0150	0.0169	−1.222	C	1
9.		$^2P^o - ^4P$											
			[229]			4	6	0.28	3.3(−4)	0.0010	−2.88	E	1
			[193]			4	4	2.3	0.0013	0.0033	−2.28	E	1
			[161]			2	2	3.6	0.0014	0.0015	−2.55	E	1
10.		$^2P^o - ^2D$	*125*			6	10	56	0.022	0.054	−0.88	C−	1
			[129]			4	6	64	0.0241	0.0409	−1.016	C	1
			[119]			2	4	31.3	0.0133	0.0104	−1.58	C	1
			[132]			4	4	6.9	0.0018	0.0031	−2.14	D	1
11.		$^2P^o - ^2S$	*106*			6	2	370	*0.021*	*0.044*	*−0.90*	C−	*1*
			[109]			4	2	22	0.0020	0.0029	−2.10	D	1
			[100]			2	2	410	0.062	0.041	−0.91	C	1

Co XXI: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
12.		$^2P^o - ^2P$	*95.8*			6	6	488	0.067	0.127	−0.395	C−	1
			[103]			4	4	100	0.0159	0.0216	−1.197	C	1
			[85.6]			2	2	43	0.0047	0.0026	−2.03	D	1
			93.00			4	2	1100	0.069	0.085	−0.56	C	1
			[94.9]			2	4	107	0.0290	0.0181	−1.237	C	1
13.	$2s2p^4-2p^5$	$^4P - ^2P^o$											
			[77.1]			6	4	42	0.0025	0.0038	−1.82	E	1
			[74.4]			4	2	4.1	1.7(−4)	1.7(−4)	−3.17	E	1
			[82.2]			4	4	25	0.0025	0.0027	−2.00	E	1
			[75.7]			2	2	13	0.0011	5.5(−4)	−2.66	E	1
			[83.8]			2	4	8.1	0.0017	9.4(−4)	−2.47	E	1
14.		$^2D - ^2P^o$	*99.2*			10	6	660	0.058	0.19	−0.24	C	1
			106.23			6	4	460	0.052	0.11	−0.51	C	1
			[90.6]			4	2	489	0.0301	0.0359	−0.92	C	1
			[102]			4	4	216	0.0337	0.0453	−0.87	C	1
15.		$^2S - ^2P^o$	*116*			2	6	90	0.054	0.0416	−0.96	C−	1
			[122]			2	4	105	0.0467	0.0375	−1.030	C	1
			[106]			2	2	35	0.0059	0.0041	−1.93	D	1
16.		$^2P - ^2P^o$	*131*			6	6	450	0.12	0.30	−0.16	C	1
			[132]			4	4	330	0.086	0.15	−0.46	C	1
			[129]			2	2	360	0.089	0.076	−0.75	C	1
			[113]			4	2	443	0.0424	0.063	−0.77	C	1
			[155]			2	4	17.1	0.0123	0.0126	−1.61	C	1

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Co XXII

Ground State $1s^22s^22p^2\ ^3P_0$

Ionization Potential [1841] eV = [14849000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
73.8	16	96.90	4	116	3,19	154	24
78.3	6	97.1	17,23	117	19	169	27
80.5	16	100	3	119	28	170	7,13
81.4	6	104	20	120	2	172	22
82.6	21	105	15	130	14	181	7
84.7	4	106	20	131	19	186	24
88.2	5	107	3	134	2	197	26
88.9	18	107.48	10	135	19	233	1
91.6	18	108	17	136	8,25	236	12
92.1	5	110	3	137	2	253	26
92.2	11	111	9	140	8	262	1
92.63	4	112	3,17	143	2		
96.1	17	113	3,19	144	2,22		
96.3	17	114	19	146	22		

Oscillator strengths for transitions of the arrays $2s^22p^2-2s2p^3$ and $2s2p^3-2p^4$ are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1]. These relativistic calculations include a perturbative treatment of the Breit interaction and the Lamb shift. The results should be quite accurate, except in the case of intercombination lines, for which the f-values should be considered rather uncertain. (A few very weak intercombination lines have been omitted from this tabulation.) The f-value listed for the $2s^22p^2\ ^3P_2-2s2p^3\ ^1D^o_2$ transition is quoted with an uncertainty 50%, since its magnitude is considerably larger than those of the other intercombination lines.

The remaining f-values were derived by interpolation from graphs of systematic trends along the isoelectronic sequence.

Reference

[1] Cheng, K. T., Kim, Y.-K., and Desclaux, J. P., At. Data Nucl. Data Tables **24**, 111 (1979).

Co XXII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$2s^22p^2-2s2p^3$	$^3P-^5S^o$											
			[262]			5	5	0.45	4.6(−4)[a]	0.0020	−2.64	E	1
			[233]			3	5	0.52	7.1(−4)	0.0016	−2.67	E	1
2.		$^3P-^3D^o$	*134*			9	15	95	0.043	0.17	−0.41	D	1
			[137]			5	7	70	0.0275	0.062	−0.86	C	1
			[134]			3	5	111	0.0496	0.066	−0.83	C	1
			[120]			1	3	150	0.096	0.038	−1.02	C	1
			[143]			5	5	0.49	1.5(−4)	3.5(−4)	−3.12	E	1
			[134]			3	3	6.3	0.0017	0.0022	−2.29	D	1
			[144]			5	3	1.2	2.2(−4)	5.2(−4)	−2.96	E	1
3.		$^3P-^3P^o$	*111*			9	9	260	0.049	0.16	−0.36	D	1
			[113]			5	5	251	0.0480	0.089	−0.62	C	1
			[110]			3	3	203	0.0369	0.0401	−0.96	C	1
			[116]			5	3	31	0.0037	0.0071	−1.73	D	1
			[112]			3	1	263	0.0165	0.0183	−1.305	C	1
			[107]			3	5	2.3	6.7(−4)	7.1(−4)	−2.70	E	1
			[100]			1	3	44.0	0.0198	0.0065	−1.70	C	1
4.		$^3P-^3S^o$	*94.0*			9	3	1110	0.0488	0.136	−0.357	C	1
			96.90			5	3	700	0.059	0.094	−0.53	C	1
			92.63			3	3	272	0.0350	0.0320	−0.98	C	1
			[84.7]			1	3	105	0.0339	0.0095	−1.470	C	1
5.		$^3P-^1D^o$											
			[92.1]			5	5	110	0.014	0.021	−1.15	D	1
			[88.2]			3	5	5.7	0.0011	9.6(−4)	−2.48	E	1
6.		$^3P-^1P^o$											
			[81.4]			5	3	3.7	2.2(−4)	2.9(−4)	−2.96	E	1
			[78.3]			3	3	63	0.0058	0.0045	−1.76	E	1
7.		$^1D-^3D^o$											
			[170]			5	7	13	0.0079	0.022	−1.40	E	1
			[181]			5	5	0.39	1.9(−4)	5.7(−4)	−3.02	E	1
			[181]			5	3	2.4	7.2(−4)	0.0021	−2.44	E	1
8.		$^1D-^3P^o$											
			[136]			5	5	2.3	6.4(−4)	0.0014	−2.49	E	1
			[140]			5	3	2.8	5.0(−4)	0.0012	−2.60	E	1
9.		$^1D-^3S^o$											
			[111]			5	3	4.9	5.4(−4)	9.9(−4)	−2.57	E	1

Co XXII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
10.		^{1}D – ^{1}D°	107.48			5	5	500	0.087	0.15	−0.36	C	1
11.		^{1}D – ^{1}P°	[92.2]			5	3	780	0.060	0.091	−0.52	C	1
12.		^{1}S – ^{3}D°											
			[236]			1	3	0.60	0.0015	0.0012	−2.82	E	1
13.		^{1}S – ^{3}P°											
			[170]			1	3	2.0	0.0026	0.0015	−2.59	E	1
14.		^{1}S – ^{3}S°											
			[130]			1	3	8.8	0.0067	0.0029	−2.17	E	1
15.		^{1}S – ^{1}P°	[105]			1	3	202	0.100	0.0346	−1.000	C	1
16.	$2s2p^3$–$2p^4$	^{5}S° – ^{3}P											
			[80.5]			5	5	22	0.0021	0.0028	−1.98	E	1
			[73.8]			5	3	3.5	1.7(−4)	2.1(−4)	−3.07	E	1
17.		^{3}D° – ^{3}P	*104*			15	9	510	0.0495	0.254	−0.130	C	1
			[112]			7	5	328	0.0441	0.114	−0.51	C	1
			[96.3]			5	3	242	0.0202	0.0320	−1.000	C	1
			[97.1]			3	1	412	0.0194	0.0186	−1.235	C	1
			[108]			5	5	166	0.0290	0.052	−0.84	C	1
			[96.1]			3	3	170	0.0235	0.0223	−1.152	C	1
			[108]			3	5	48.4	0.0141	0.0150	−1.374	C	1
18.		^{3}D° – ^{1}D											
			[91.6]			7	5	76	0.0068	0.014	−1.32	E	1
			[88.9]			5	5	8.4	0.0010	0.0015	−2.30	E	1
19.		^{3}P° – ^{3}P	*125*			9	9	150	0.035	0.13	−0.50	D	1
			[135]			5	5	38.8	0.0106	0.0236	−1.276	C	1
			[114]			3	3	4.2	8.1(−4)	9.1(−4)	−2.61	E	1
			[117]			5	3	202	0.0249	0.0480	−0.90	C	1
			[116]			3	1	220	0.0148	0.0170	−1.353	C	1
			[131]			3	5	42.2	0.0181	0.0234	−1.265	C	1
			[113]			1	3	58	0.0334	0.0124	−1.476	C	1
20.		^{3}P° – ^{1}D											
			[106]			5	5	40	0.0067	0.012	−1.47	E	1
			[104]			3	5	18	0.0049	0.0050	−1.83	E	1
21.		^{3}P° – ^{1}S											
			[82.6]			3	1	62	0.0021	0.0017	−2.20	E	1
22.		^{3}S° – ^{3}P	*159*			3	9	109	0.124	0.194	−0.431	C	1
			[172]			3	5	69	0.051	0.087	−0.82	C	1
			[144]			3	3	160	0.051	0.073	−0.82	C	1
			[146]			3	1	222	0.0237	0.0342	−1.148	C	1
23.		^{3}S° – ^{1}S											
			[97.1]			3	1	66	0.0031	0.0030	−2.03	E	1

Co XXII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
24.		$^1D^o - {}^3P$											
			[186]			5	5	9.3	0.0048	0.015	−1.62	E	1
			[154]			5	3	5.6	0.0012	0.0030	−2.22	E	1
25.		$^1D^o - {}^1D$	[136]			5	5	382	0.106	0.237	−0.276	C	1
26.		$^1P^o - {}^3P$											
			[253]			3	5	1.2	0.0019	0.0047	−2.24	E	1
			[197]			3	3	8.9	0.0052	0.010	−1.81	E	1
27.		$^1P^o - {}^1D$	[169]			3	5	55	0.0389	0.065	−0.93	C	1
28.		$^1P^o - {}^1S$	[119]			3	1	920	0.065	0.076	−0.71	C	1
29.	$2p^2$–$2p3s$	$^3P - {}^3P^o$				9	9		0.048		−0.36	D	*interp.*
30.		$^1D - {}^1P^o$				5	3		0.040		−0.70	D	*interp.*
31.	$2p^2$–$2p3d$	$^1D - {}^1F^o$				5	7		0.95		0.68	D	*interp.*
32.	$2p3s$–$2p3p$	$^3P^o - {}^3D$				9	15		0.085		−0.12	D	*interp.*
33.		$^3P^o - {}^3S$				9	3		0.019		−0.77	D	*interp.*
34.		$^3P^o - {}^3P$				9	9		0.068		−0.21	D	*interp.*
35.		$^1P^o - {}^1P$				3	3		0.048		−0.84	D	*interp.*
36.		$^1P^o - {}^1D$				3	5		0.14		−0.38	D	*interp.*
37.	$2p3p$–$2p3d$	$^1P - {}^1P^o$				3	3		0.028		−1.08	D	*interp.*
38.		$^3D - {}^3F^o$				15	21		0.030		−0.35	D−	*interp.*
39.		$^1D - {}^1P^o$				5	3		5.4(−4)		−2.57	E	*interp.*
40.		$^1D - {}^1F^o$				5	7		0.10		−0.30	D	*interp.*
41.		$^1S - {}^1P^o$				1	3		0.065		−1.19	D	*interp.*

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Co XXIII

Ground State $1s^22s^22p$ $^2P^o_{1/2}$

Ionization Potential [1955] eV = [15768000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
79.1	7	107	10	141	9	229	15
79.4	7	108.02	3	143	9,16	236	1,11
83.2	7	109	4	146	2	239	12
93.0	3	110	3,5	147	13	242	1
93.4	6	113	10	149	9	285	1
94.5	4	118	5	153	2	352	1
96.1	6	119	13	160	16	359	14
99.7	6	126	2	165	13	383	11
102	6	128	5	172	12		
104	10	130	3,13	184	8		
106	6	135	9	219	12		

Oscillator strengths for transitions of the arrays $2s^22p-2s2p^2$ $2s2p^2-2p^3$ are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1]. These relativistic calculations include a perturbative treatment of the Breit interaction and the Lamb shift. The results should be quite accurate, except in the case of intercombination lines, for which the f-values should be considered rather uncertain. (A few very weak intercombination lines have been omitted from this tabulation.)

According to several sources (see, e.g., introduction to Fe XXII), the lower of the two levels $2s2p^2$ $^2P_{1/2}$ and $^2S_{1/2}$ is mostly of ^2P character, having "crossed" the $^2S_{1/2}$ level at about V XIX or Cr XX. We have thus labeled these two levels accordingly, in contrast to their labeling by Cheng et al. [1], which is consistent with their ordering at the neutral end of the B sequence.

A few multiplet f-values were derived by graphical interpolation along the isoelectronic sequence.

Reference

[1] Cheng, K. T., Kim, Y.-K., and Desclaux, J. P., At. Data Nucl. Data Tables **24**, 111 (1979) and private communication.

Co XXIII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
1.	$2s^22p-2s2p^2$	$^2P^\circ - {}^4P$											
			[242]			4	6	0.99	0.0013	0.0041	−2.28	E	1
			[285]			4	4	0.099	1.2(−4)^a	4.5(−4)	−3.32	E	1
			[236]			2	2	1.2	9.8(−4)	0.0015	−2.71	E	1
			[352]			4	2	0.16	1.5(−4)	7.0(−4)	−3.22	E	1
2.		$^2P^\circ - {}^2D$	*139*			6	10	86	0.0415	0.114	−0.60	C−	1
			[146]			4	6	68	0.0327	0.063	−0.88	C	1
			[126]			2	4	130	0.062	0.051	−0.91	C	1
			[153]			4	4	0.12	4.3(−5)	8.7(−5)	−3.76	E	1
3.		$^2P^\circ - {}^2P$	*109*			6	6	500	0.088	0.19	−0.28	C−	1
			108.02			4	4	490	0.086	0.12	−0.46	C	1
			[110]			2	2	440	0.079	0.057	−0.80	C	1
			[130]			4	2	0.78	9.9(−5)	1.7(−4)	−3.40	E	1
			[93.0]			2	4	66	0.0171	0.0105	−1.466	C	1
4.		$^2P^\circ - {}^2S$	*104*			6	2	470	0.025	0.052	−0.82	C−	1
			[109]			4	2	389	0.0346	0.0497	−0.86	C	1
			[94.5]			2	2	24	0.0032	0.0020	−2.19	D	1
5.	$2s2p^2-2p^3$	$^4P - {}^4S^\circ$	*122*			12	4	474	0.0353	0.170	−0.373	C	1
			[128]			6	4	208	0.0340	0.086	−0.69	C	1
			[118]			4	4	162	0.0338	0.053	−0.87	C	1
			[110]			2	4	116	0.0422	0.0306	−1.074	C	1
6.		$^4P - {}^2D^\circ$											
			[102]			6	6	28	0.0044	0.0089	−1.58	E	1
			[99.7]			4	4	35	0.0052	0.0068	−1.68	E	1
			[106]			6	4	4.1	4.6(−4)	9.6(−4)	−2.56	E	1
			[96.1]			4	6	0.67	1.4(−4)	1.8(−4)	−3.25	E	1
			[93.4]			2	4	0.80	2.1(−4)	1.3(−4)	−3.38	E	1
7.		$^4P - {}^2P^\circ$											
			[83.2]			6	4	1.7	1.2(−4)	2.0(−4)	−3.14	E	1
			[79.1]			4	4	3.6	3.4(−4)	3.5(−4)	−2.87	E	1
			[79.4]			2	2	2.9	2.7(−4)	1.4(−4)	−3.27	E	1
8.		$^2D - {}^4S^\circ$											
			[184]			4	4	2.2	0.0011	0.0027	−2.36	E	1
9.		$^2D - {}^2D^\circ$	*142*			10	10	161	0.0488	0.228	−0.312	C	1
			[141]			6	6	138	0.0412	0.115	−0.61	C	1
			[143]			4	4	78	0.0240	0.0452	−1.018	C	1
			[149]			6	4	56	0.0124	0.0365	−1.128	C	1
			[135]			4	6	43.4	0.0178	0.0316	−1.148	C	1

Co XXIII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^{8}s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
10.		^{2}D - ^{2}P^o	*109*			10	6	250	0.027	0.096	−0.57	D	1
			[107]			6	4	155	0.0177	0.0374	−0.97	C	1
			[113]			4	2	330	0.0316	0.0470	−0.90	C	1
			[104]			4	4	56	0.0091	0.012	−1.44	D	1
11.		^{2}P - ^{4}S^o											
			[383]			4	4	0.34	7.4(−4)	0.0037	−2.53	E	1
			[236]			2	4	1.9	0.0032	0.0050	−2.19	E	1
12.		^{2}P - ^{2}D^o	*202*			6	10	46.2	0.0471	0.188	−0.55	C−	1
			[219]			4	6	35.3	0.0381	0.110	−0.82	C	1
			[172]			2	4	77	0.068	0.077	−0.87	C	1
			[239]			4	4	0.44	3.8(−4)	0.0012	−2.82	E	1
13.		^{2}P - ^{2}P^o	*141*			6	6	200	0.061	0.17	−0.44	D	1
			[147]			4	4	230	0.074	0.14	−0.53	C	1
			[130]			2	2	34	0.0087	0.0074	−1.76	D	1
			[165]			4	2	22	0.0044	0.0096	−1.75	D	1
			[119]			2	4	36.7	0.0156	0.0122	−1.51	C	1
14.		^{2}S - ^{4}S^o											
			[359]			2	4	0.14	5.5(−4)	0.0013	−2.96	E	1
15.		^{2}S - ^{2}D^o											
			[229]			2	4	7.4	0.0116	0.0175	−1.63	C	1
16.		^{2}S - ^{2}P^o	*148*			2	6	66	0.065	0.063	−0.89	C	1
			[143]			2	4	22.8	0.0140	0.0132	−1.55	C	1
			[160]			2	2	124	0.0475	0.050	−1.022	C	1
17.	$2p$–$3s$	^{2}P^o - ^{2}S				6	2		0.019		−0.94	D	*interp.*
18.	$2p$–$3d$	^{2}P^o - ^{2}D				6	10		0.66		0.60	D	*interp.*
19.	$3s$–$3p$	^{2}S - ^{2}P^o				2	6		0.16		−0.49	E	*interp.*
20.	$3p$–$3d$	^{2}P^o - ^{2}D				6	10		0.044		−0.58	E	*interp.*

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Co XXIV

Ground State $1s^22s^2\ ^1S_0$

Ionization Potential [2106] eV = [16986000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
10.07	9	10.57	14	127	4	172	3
10.08	10	10.59	17	135	3	206	6
10.16	8	10.61	17	137	3	250	1
10.19	13	10.67	18	140	7	301	5
10.42	14	10.80	15	144	3	356	5
10.45	14	112	4	158	3	512	5
10.56	14	123	2	165	3		

Oscillator strengths for transitions of the arrays $2s^2$–$2s2p$ and $2s2p$–$2p^2$ are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1]. These relativistic calculations include a perturbative treatment of the Breit interaction and the Lamb shift. The results should be quite accurate, except in the case of intercombination lines. for which the f-values should be considered more uncertain. (The $2s2p\ ^3P_1^o$–$2p^2\ ^1S_0$ transition has been omitted from this tabulation, since its f-value is considerably smaller than those of the other lines of the array.)

The f-values for the resonance transitions $2s^2\ ^1S_0$–$2snp\ ^1P_1^o$ ($n = 3,4$) were interpolated from the relativistic random phase approximation (RRPA) results of Lin and Johnson [2] for Fe XXIII and Ni XXV.

The results of the Hartree-XR (Hartree-Fock with statistical exchange and relativistic effects) calculations of Bromage et al. [3] for Fe XXIII, and of Fawcett et al. [4] for Ni XXV, were used to interpolate f-values for several transitions involving electron jumps from the $n = 2$ shell to the $n = 3$ shell.

A few multiplet f-values were derived by interpolation along the Be isoelectronic sequence.

Transition probabilities are available in graphical form for several transitions involving vacancies in the K shell [5], but they are not tabulated here since relativistic effects were not taken into account.

References

[1] Cheng, K. T., Kim, Y.-K., and Desclaux, J. P., At. Data Nucl. Data Tables **24**, 111 (1979).

[2] Lin, C. D., and Johnson, W. R., Phys. Rev. A **15**, 1046 (1977).

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Co XXIV: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^{8}s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
1.	$2s^2$–$2s2p$	^1S – $^3P^o$											
			[250]			1	3	0.64	0.0018	0.0015	−2.74	D	1
2.		^1S – $^1P^o$	[123]			1	3	223	0.152	0.0615	−0.818	B	1
3.	$2s2p$–$2p^2$	$^3P^o$ – ^3P	*153*			9	9	142	0.0499	0.226	−0.348	B	1
			[158]			5	5	77.5	0.0290	0.0754	−0.839	B	1
			[144]			3	3	46.6	0.0145	0.0206	−1.362	B	1
			[172]			5	3	46.6	0.0124	0.0351	−1.208	B	1
			[165]			3	1	132	0.0179	0.0292	−1.270	D	1
			[135]			3	5	61.7	0.0281	0.0375	−1.074	B	1
			[137]			1	3	75.0	0.0633	0.0285	−1.199	B	1
4.		$^3P^o$ – ^1D											
			[127]			5	5	62	0.0151	0.0316	−1.122	C	1
			[112]			3	5	5.7	0.0018	0.0020	−2.27	D	1
5.		$^1P^o$ – ^3P											
			[301]			3	5	4.42	0.0100	0.0297	−1.52	C	1
			[356]			3	3	0.095	1.8(−4)*	6.3(−4)	−3.27	E	1
			[512]			3	1	0.23	3.0(−4)	0.0015	−3.05	E	1
6.		$^1P^o$ – ^1D	[206]			3	5	51.1	0.0542	0.110	−0.789	B	1
7.		$^1P^o$ – ^1S	[140]			3	1	359	0.0352	0.0487	−0.976	D	1
8.	$2s^2$–$2s3p$	^1S – $^1P^o$	[10.16]	0	[9842500]	1	3	1.32(+5)	0.612	0.0205	−0.213	B	*interp.*
9.	$2s2p$–$2p3p$	$^3P^o$ – ^3D											
			[10.07]			5	7	6.1(+4)	0.13	0.022	−0.19	D	*interp.*
			[10.07]			3	5	5.9(+4)	0.15	0.015	−0.35	D	*interp.*
10.		$^3P^o$ – ^3P											
			[10.08]			5	5	5.5(+4)	0.084	0.014	−0.38	D−	*interp.*
11.	$2s^2$–$2s4p$	^1S – $^1P^o$				1	3		0.152		−0.818	B	*interp.*

Co XXIV: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^{8}s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
12.	$2s2p-2s3s$	^{3}P° - ^{3}S				9	3		0.027		−0.61	D	*interp.*
13.		^{1}P° - ^{1}S	[10.19]			3	1	1.1(+4)	0.0059	5.9(−4)	−1.75	E	*interp.*
14.	$2s2p-2s3d$	^{3}P° - ^{3}D											
			[10.56]			5	7	2.6(+5)	0.60	0.10	0.48	D	*interp.*
			[10.45]			3	5	2.0(+5)	0.55	0.057	0.22	D	*interp.*
			[10.42]			1	3	1.6(+5)	0.76	0.026	−0.12	D	*interp.*
			[10.57]			5	5	6.6(+4)	0.11	0.019	−0.26	D	*interp.*
			[10.45]			3	3	1.1(+5)	0.18	0.019	−0.27	D	*interp.*
15.		^{1}P° - ^{1}D	[10.80]			3	5	2.0(+5)	0.59	0.063	0.25	D	*interp.*
16.	$2p^2-2p3d$	^{3}P - ^{3}F°											
						5	7		0.25		0.10	E	*interp.*
17.		^{3}P - ^{3}D°											
			[10.61]			5	7	2.6(+5)	0.61	0.11	0.48	D	*interp.*
			[10.59]			1	3	2.6(+5)	1.3	0.045	0.11	D	*interp.*
18.		^{1}D - ^{1}F°	[10.67]			5	7	4.1(+5)	0.97	0.17	0.69	D	*interp.*
19.	$2s3s-2s3p$	^{3}S - ^{3}P°				3	9		0.12		−0.44	D	*interp.*
20.		^{1}S - ^{1}P°				1	3		0.050		−1.30	E	*interp.*
21.	$2s3p-2s3d$	^{3}P° - ^{3}D				9	15		0.026		−0.63	E	*interp.*
22.		^{1}P° - ^{1}D				3	5		0.045		−0.87	E	*interp.*

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Co XXV

Ground State	$1s^22s$ ^{2}S$_{1/2}$
Ionization Potential	[2218] eV = [17882000] cm^{-1}

Allowed Transitions

Transition probabilities for the strongest inner-shell transitions to doubly excited $n = 2$ states are taken from results of the Z-expansion perturbation calculations of Vainshtein and Safronova [1]. Their results are in good agreement with the multiplet oscillator strengths for the ^{2}P° - ^{2}P and ^{2}P° - ^{2}D transitions of the $1s^22p-1s2p^2$ array which were calculated by Fox and Dalgarno [2] in a Z-expansion approximation that included large-scale configuration interaction.

Oscillator strengths for lines of the principal ($2s-2p$) resonance multiplet are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al, [3], which include a perturbative treatment of the Breit interaction and the Lamb shift.

The results of the scaled Thomas-Fermi calculations of Hayes [4], which included relativistic effects, and the Hartree-XR (Hartree-Fock with statistical exchange and relativistic effects) calculations of Fawcett et al. [5] for the $2p-3s$ transitions in Fe XXIV and Ni XXVI, respectively, were used to derive interpolated f-values for these transitions in Co XXV. Similarly, the results of the MCDF calculations of Armstrong et al. [6] for Fe XXIV and those of Fawcett et al. [5] for Ni XXVI were used to interpolate f-values for the $2p-3d$ transitions in Co XXV.

The f-value for the $3d-4f$ transition was taken from a study of systematic trends along isoelectronic sequences by Smith and Wiese [7]. The tabulated data for the remaining transitions were taken from the theoretical analysis of Martin and Wiese [8], which was based on a generalized study of systematic trends for several spectral series of the lithium isoelectronic sequence.

Results of the relativistic Hartree-Fock calculations of Kim and Desclaux [9] for several ions of the Li sequence were incorporated into the data of ref. [8] for the $2s-3p$ transitions. For all other transitions for which the results of ref. [8] are quoted here, no relativistic calculations were available. However, the relativistic calculations of Younger and Weiss [10] for the hydrogen isoelectronic sequence provide a means of assessing the magnitude of relativistic corrections since the Li sequence is very similar in structure to the H sequence. For those transitions for which relativistic effects were estimated to be significant (specifically, whenever the ratio of the weighted relativistic hydrogenic f-values g_if_{ik} of any two lines within a multiplet was found to deviate from the corresponding LS-coupling line-strength ratio by more than 5% for the appropriate value of the nuclear charge Z), the f-values were excluded from the compilation. A more detailed discussion of this comparison is given in ref. [8].

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Co XXV: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
1.	$1s^22s-1s2p(^1P^o)2s$	$^2S-^2P^o$	*1.722*			2	6	5.0(+6)[a]	0.66	0.0075	0.12	D	1
			[1.721]			2	4	5.7(+6)	0.51	0.0057	0.01	D	1
			[1.724]			2	2	3.6(+6)	0.16	0.0018	−0.49	D	1
2.	$1s^22s-1s2p(^3P^o)2s$	$^2S-^2P^o$											
			[1.718]			2	2	2.2(+6)	0.097	0.0011	−0.71	D	1
3.	$1s^22p-1s2p^2$	$^2P^o-^2D$											
			[1.725]			4	6	2.4(+6)	0.16	0.0036	−0.19	D	1
			[1.723]			2	4	3.8(+6)	0.34	0.0038	−0.17	D	1
4.		$^2P^o-^2P$											
			[1.722]			4	4	7.2(+6)	0.32	0.0073	0.11	D	1
			[1.723]			2	2	6.3(+6)	0.28	0.0032	−0.25	D	1
			[1.727]			4	2	1.9(+6)	0.042	9.7(−4)	−0.77	D	1
5.		$^2P^o-^2S$											
			[1.717]			4	2	2.9(+6)	0.064	0.0014	−0.59	D	1
6.	$2s-2p$	$^2S-^2P^o$	*195*			2	6	37.7	0.0645	0.0828	−0.889	B+	3
			[178]			2	4	49.9	0.0474	0.0556	−1.023	B+	3
			[243]			2	2	19.2	0.0170	0.0272	−1.469	B+	3
7.	$2s-3p$	$^2S-^2P^o$	*9.81*			2	6	8.69(+4)	0.376	0.0243	−0.124	B+	8
			[9.80]			2	4	8.58(+4)	0.247	0.0159	−0.306	B+	8
			[9.84]			2	2	8.89(+4)	0.129	0.00836	0.588	B+	8
8.	$2s-4p$	$^2S-^2P^o$				2	6		0.100		−0.699	C+	8
9.	$2s-5p$	$^2S-^2P^o$				2	6		0.040		−1.10	C+	8
10.	$2s-6p$	$^2S-^2P^o$				2	6		0.0213		−1.371	C+	8
11.	$2s-7p$	$^2S-^2P^o$				2	6		0.0125		−1.602	C+	8
12.	$2p-3s$	$^2P^o-^2S$	*10.49*			6	2	3.2(+4)	0.018	0.0037	−0.97	D	*interp.*
			[10.54]			4	2	2.2(+4)	0.018	0.0025	−1.14	C	*interp.*
			[10.38]			2	2	1.1(+4)	0.017	0.0012	−1.47	D	*interp.*

Co XXV: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
13.	$2p$–$3d$	^{2}P^o – ^{2}D	*10.26*			6	10	2.57(+5)	0.68	0.137	0.61	C	*interp.*
			[10.31]			4	6	2.54(+5)	0.608	0.0825	0.386	C+	*interp.*
			[10.17]			2	4	2.19(+5)	0.678	0.0454	0.132	C+	*interp.*
			[10.32]			4	4	4.3(+4)	0.068	0.0092	−0.57	C	*interp.*
14.	$2p$–$4d$	^{2}P^o – ^{2}D				6	10		0.12		−0.14	C+	8
15.	$2p$–$5d$	^{2}P^o – ^{2}D				6	10		0.0450		−0.569	C+	8
16.	$2p$–$6d$	^{2}P^o – ^{2}D				6	10		0.0220		−0.879	C+	8
17.	$2p$–$7d$	^{2}P^o – ^{2}D				6	10		0.0126		−1.121	C+	8
18.	$3s$–$4p$	^{2}S – ^{2}P^o				2	6		0.45		−0.05	C	8
19.	$3s$–$5p$	^{2}S – ^{2}P^o				2	6		0.108		−0.67	C	8
20.	$3s$–$6p$	^{2}S – ^{2}P^o				2	6		0.048		−1.02	C	8
21.	$3s$–$7p$	^{2}S – ^{2}P^o				2	6		0.0250		−1.301	C	8
22.	$3p$–$4d$	^{2}P^o – ^{2}D				6	10		0.60		0.56	B	8
23.	$3p$–$5d$	^{2}P^o – ^{2}D				6	10		0.138		−0.082	C+	8
24.	$3p$–$6d$	^{2}P^o – ^{2}D				6	10		0.0558		−0.475	C+	8
25.	$3p$–$7d$	^{2}P^o – ^{2}D				6	10		0.0289		−0.761	C+	8
26.	$3d$–$4f$	^{2}D – ^{2}F^o				10	14		1.00		1.000	B	7
27.	$4s$–$5p$	^{2}S – ^{2}P^o				2	6		0.481		−0.017	C	8
28.	$4s$–$6p$	^{2}S – ^{2}P^o				2	6		0.129		−0.59	C	8
29.	$4s$–$7p$	^{2}S – ^{2}P^o				2	6		0.056		−0.95	C	8
30.	$4p$–$5d$	^{2}P^o – ^{2}D				6	10		0.585		0.545	C+	8
31.	$4p$–$6d$	^{2}P^o – ^{2}D				6	10		0.142		−0.070	C+	8
32.	$4p$–$7d$	^{2}P^o – ^{2}D				6	10		0.0617		−0.432	C+	8

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Co XXVI

Ground State	$1s^2\ ^1S_0$
Ionization Potential	[9544.8] eV — [76983600] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
1.3512	19	1.4552	15	1.655	6,10	1.659	12
1.3515	18	1.4569	14	1.656	3,9	1.660	3,9
1.3824	17	1.648	4	1.657	9	1.661	3,9
1.3831	16	1.651	13	1.658	9	1.662	9

List of tabulated lines—Continued

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
1.664	11	6.3098	37	9.7862	30	58.106	57
1.666	11	6.4208	38	18.427	43	58.473	58
1.667	5	6.9269	25	18.607	44	59.684	60
1.669	7,11	7.0393	26	18.730	50	60.408	61
1.677	8	7.0708	33	18.973	51	181.2	21
1.7118	2	7.2032	34	26.767	41	249.3	20
1.7203	1	9.2825	23	27.024	42	348.3	22
6.2007	27	9.4422	24	27.524	46	379.5	20
6.2972	28	9.5814	29	27.941	47	406.8	20

Oscillator strengths for transitions of the $1s^2$–$1s2p$ array are taken from the results of Drake [1], who incorporated accurate nonrelativistic matrix elements and exact Dirac hydrogenic matrix elements into a Z-expansion technique in order to provide f-values which would accurately reflect correlation effects for low-Z ions and relativistic effects for high-Z ions of the He isoelectronic sequence. Results for the stronger transitions to doubly excited $n = 2$ states are from the charge-expansion perturbation theory calculations of Vainshtein and Safronova [2]. The f-values for the $1s^2\ {}^1\mathrm{S} - 1snp\ {}^3\mathrm{P}^{\circ}$ ($n = 3$–5) transitions were interpolated from results of the relativistic random phase approximation (RRPA) calculations of Johnson and Lin [3]. Data for numerous other s–p and p–s trantions were interpolated from the RRPA results of Lin et al. [4], with the exception of the $2s$–$2p$ transitions, which are the actual published A-values of these same authors [5] obtained by the RRPA method.

The Z-expansion results of Laughlin [6] have been tabulated for various p–d and d–p transitions, as well as transitions between $4d$ and $4f$ levels. For those multiplets which involve no change of quantum number ($3p$–$3d$, $4p$–$4d$, $4d$–$4f$) the results should be considered to be rather uncertain, since the f-values are very sensitive to energy differences. It should be noted that, according to Laughlin's calculations, the $nd\ {}^1\mathrm{D}$ levels ($n = 3,4$) lie below the corresponding $np\ {}^1\mathrm{P}^{\circ}$ levels, and that the $4f\ {}^1\mathrm{F}^{\circ}$ level lies below $4d\ {}^1\mathrm{D}$. The opposite is true for the triplet states. Oscillator strengths for a few p–d transitions were extrapolated from the variational calculations of Weiss [7].

Brown and Cortez [8] have provided f-values for numerous d–f and f–d transitions for the entire isoelectronic sequence by deriving Z-expansion formulae based on variational calculations for the low-Z ions. Their results for transitions between the lower-lying D and F$^{\circ}$ terms are tabulated here.

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Co XXVI: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$1s^2$–$1s2p$	${}^1\mathrm{S} - {}^3\mathrm{P}^{\circ}$											
			[1.7203]	0	[58128200]	1	3	5.89(+5)^a	0.0784	4.44(−4)	−1.106	B	1
2.		${}^1\mathrm{S} - {}^1\mathrm{P}^{\circ}$	[1.7118]	0	[58416500]	1	3	5.26(+6)	0.693	0.00391	−0.159	B	1
3.	$1s2s$–$2s2p$	${}^3\mathrm{S} - {}^3\mathrm{P}^{\circ}$	*1.658*	[57864700]	*[118180000]*	3	9	3.3(+6)	0.41	0.0067	0.09	C	2
			[1.656]	[57864700]	[118240000]	3	5	3.3(+6)	0.23	0.0037	−0.17	C	2
			[1.660]	[57864700]	[118110000]	3	3	3.2(+6)	0.13	0.0022	−0.40	C	2
			[1.661]	[57864700]	[118060000]	3	1	3.3(+6)	0.045	7.5(−4)	−0.86	C	2
4.		${}^3\mathrm{S} - {}^1\mathrm{P}^{\circ}$											
			[1.648]	[57864700]	[118540000]	3	3	1.5(+5)	0.0061	9.9(−5)	−1.74	D	2
5.		${}^1\mathrm{S} - {}^3\mathrm{P}^{\circ}$											
			[1.667]	[58129400]	[118110000]	1	3	1.5(+5)	0.019	1.0(−4)	−1.73	D	2
6.		${}^1\mathrm{S} - {}^1\mathrm{P}^{\circ}$	[1.655]	[58129400]	[118540000]	1	3	3.2(+6)	0.39	0.0021	−0.40	C	2

Co XXVI: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
7.	$1s2p-2s^2$	$^3P^o - {}^1S$	[1.669]	[58128200]	[118050000]	3	1	6.4(+5)	0.0089	1.5(−4)	−1.57	D	2
8.		$^1P^o - {}^1S$	[1.677]	[58416500]	[118050000	3	1	6.2(+5)	0.0087	1.4(−4)	−1.58	D	2
9.	$1s2p-2p^2$	$^3P^o - {}^3P$	*1.659*	*[58202700]*	*[118470000]*	9	9	5.8(+6)	0.240	0.0118	0.335	C	2
			[1.660]	[58265900]	[118510000	5	5	3.2(+6)	0.13	0.0036	−0.18	C	2
			[1.658]	[58128200]	[118440000	3	3	1.5(+6)	0.062	0.0010	−0.73	C	2
			[1.662]	[58265900]	[118440000]	5	3	2.8(+6)	0.070	0.0019	−0.46	C	2
			[1.661]	[58128200]	[118330000]	3	1	6.0(+6)	0.083	0.0014	−0.61	C	2
			[1.656]	[58128200]	[118510000]	3	5	2.1(+6)	0.14	0.0024	−0.36	C	2
			[1.657]	[58110500]	[118440000]	1	3	2.2(+6)	0.27	0.0015	−0.57	C	2
10.		$^3P^o - {}^1D$	[1.655]	[58265900]	[118670000]	5	5	1.8(+6)	0.074	0.0020	−0.43	C	2
11.		$^1P^o - {}^3P$	[1.664]	[58416500]	[118510000]	3	5	1.3(+6)	0.090	0.0015	−0.57	C	2
			[1.666]	[58416500]	[118440000]	3	3	1.6(+5)	0.0067	1.1(−4)	−1.70	D	2
			[1.669]	[58416500]	[118330000]	3	1	1.0(+5)	0.0014	2.3(−5)	−2.38	D	2
12.		$^1P^o - {}^1D$	[1.659]	[58416500]	[118670000]	3	5	4.9(+6)	0.34	0.0055	0.00	C	2
13.		$^1P^o - {}^1S$	[1.651]	[58416500]	[118980000]	3	1	5.9(+6)	0.080	0.0013	−0.62	C	2
14.	$1s^2-1s3p$	$^1S - {}^3P^o$	[1.4569]	0	[68637700]	1	3	1.9(+5)	0.018	8.6(−5)	−1.74	E	*interp.*
15.		$^1S - {}^1P^o$	[1.4552]	0	[68720200]	1	3	1.42(+6)	0.135	6.47(−4)	−0.870	B	*interp.*
16.	$1s^2-1s4p$	$^1S - {}^3P^o$	[1.3831]	0	[72301100]	1	3	7.7(+4)	0.0066	3.0(−5)	−2.18	E	*interp.*
17.		$^1S - {}^1P^o$	[1.3824]	0	[72335400]	1	3	5.68(+5)	0.0488	2.22(−4)	−1.312	B	*interp.*
18.	$1s^2-1s5p$	$^1S - {}^3P^o$	[1.3515]	0	[73991900]	1	3	4.0(+4)	0.0033	1.5(−5)	−2.48	E	*interp.*
19.		$^1S - {}^1P^o$	[1.3512]	0	[74009400]	1	3	2.92(+5)	0.0240	1.07(−4)	−1.620	B	*interp.*
20.	$1s2s-1s2p$	$^3S - {}^3P^o$	*295.9*	[57864700]	*[58202700]*	3	9	10.3	0.0407	0.119	−0.913	B	5
			[249.3]	[57864700]	[58265900]	3	5	17.8	0.0276	0.0681	−1.081	B	5
			[379.5]	[57864700]	[58128200]	3	3	4.56	0.00985	0.0369	−1.530	B	5
			[406.8]	[57864700]	[58110500]	3	1	4.08	0.00337	0.0136	−1.995	B	5
21.		$^3S - {}^1P^o$	[181.2]	[57864700]	[58416500]	3	3	4.56	0.00224	0.00402	−2.172	B	5
22.		$^1S - {}^1P^o$	[348.3]	[58129400]	[58416500]	1	3	6.10	0.0333	0.0382	−1.478	B	5
23.	$1s2s-1s3p$	$^3S - {}^3P^o$	[9.2825]	[57864700]	[68637700]	3	3	9.37(+4)	0.121	0.0111	−0.440	B	*interp.*
24.		$^1S - {}^1P^o$	[9.4422]	[58129400]	[68720200]	1	3	8.93(+4)	0.358	0.0111	−0.446	B	*interp.*

Co XXVI: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
25.	1*s*2*s*–1*s*4*p*	$^3S - {}^3P^o$											
			[6.9269]	[57864700]	[72301100]	3	3	4.3(+4)	0.031	0.0021	−1.03	B	*interp.*
26.		$^1S - {}^1P^o$	[7.0393]	[58129400]	[72335400]	1	3	3.9(+4)	0.086	0.0020	−1.07	B	*interp.*
27.	1*s*2*s*–1*s*5*p*	$^3S - {}^3P^o$											
			[6.2007]	[57864700]	[73991900]	3	3	2.1(+4)	0.012	7.3(−4)	−1.44	B	*interp.*
28.		$^1S - {}^1P^o$	[6.2972]	[58129400]	[74009400]	1	3	2.0(+4)	0.035	7.3(−4)	−1.46	B	*interp.*
29.	1*s*2*p*–1*s*3*s*	$^3P^o - {}^3S$											
			[9.5814]	[58128200]	[68565100]	3	3	1.0(+4)	0.014	0.0013	−1.38	B	*interp.*
30.		$^1P^o - {}^1S$	[9.7862]	[58416500]	[68635000]	3	1	2.9(+4)	0.014	0.0014	−1.38	B	*interp.*
31.	1*s*2*p*–1*s*3*d*	$^3P^o - {}^3D$				9	15		0.69		0.79	C+	*interp.*
32.		$^1P^o - {}^1D$				3	5		0.70		0.32	C+	*interp.*
33.	1*s*2*p*–1*s*4*s*	$^3P^o - {}^3S$											
			[7.0708]	[58128200]	[72270900]	3	3	4000	0.0030	2.1(−4)	−2.05	C	*interp.*
34.		$^1P^o - {}^1S$	[7.2032]	[58416500]	[72299200]	3	1	1.2(+4)	0.0031	2.2(−4)	−2.03	C	*interp.*
35.	1*s*2*p*–1*s*4*d*	$^3P^o - {}^3D$				9	15		0.12		0.03	C	6
36.		$^1P^o - {}^1D$				3	5		0.12		−0.44	C	6
37.	1*s*2*p*–1*s*5*s*	$^3P^o - {}^3S$											
			[6.3098]	[58128200]	[73976600]	3	3	2000	0.0012	7.5(−5)	−2.44	C	*interp.*
38.		$^1P^o - {}^1S$	[6.4208]	[58416500]	[73990800]	3	1	5800	0.0012	7.6(−5)	−2.44	C	*interp.*
39.	1*s*3*s*–1*s*3*p*	$^3S - {}^3P^o$											
						3	3		0.016		−1.32	C	*interp.*
40.		$^1S - {}^1P^o$				1	3		0.057		−1.24	C	*interp.*
41.	1*s*3*s*–1*s*4*p*	$^3S - {}^3P^o$											
			[26.767]	[68565100]	[72301100]	3	3	1.24(+4)	0.133	0.0352	−0.399	B	*interp.*
42.		$^1S - {}^1P^o$	[27.024]	[68635000]	[72335400]	1	3	1.20(+4)	0.393	0.0350	−0.406	B	*interp.*
43.	1*s*3*s*–1*s*5*p*	$^3S - {}^3P^o$											
			[18.427]	[68565100]	[73991900]	3	3	6700	0.034	0.0062	−0.99	B	*interp.*
44.		$^1S - {}^1P^o$	[18.607]	[68635000]	[74009400]	1	3	6490	0.101	0.00619	−0.996	B	*interp.*
45.	1*s*3*p*–1*s*3*d*	$^3P^o - {}^3D$				9	15		0.011		−1.00	D	*interp.*
46.	1*s*3*p*–1*s*4*s*	$^3P^o - {}^3S$											
			[27.524]	[68637700]	[72270900]	3	3	2800	0.032	0.0087	−1.02	B	*interp.*

Co XXVI: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
47.		$^1P^o - {}^1S$	[27.941]	[68720200]	[72299200]	3	1	8500	0.033	0.0091	−1.00	B	*interp.*
48.	1*s*3*p*–1*s*4*d*	$^3P^o - {}^3D$				9	15		0.61		0.74	C	6
49.		$^1P^o - {}^1D$				3	5		0.62		0.27	C	6
50.	1*s*3*p*–1*s*5*s*	$^3P^o - {}^3S$											
			[18.730]	[68637700]	[73976600]	3	3	1300	0.0071	0.0013	−1.67	C	*interp.*
51.		$^1P^o - {}^1S$	[18.973]	[68720200]	[73990800]	3	1	4200	0.0075	0.0014	−1.65	C	*interp.*
52.	1*s*3*d*–1*s*3*p*	$^1D - {}^1P^o$				5	3		0.0020		−2.00	E	6
53.	1*s*3*d*–1*s*4*p*	$^3D - {}^3P^o$				15	9		0.012		−0.74	C	6
54.		$^1D - {}^1P^o$				5	3		0.011		−1.26	C	6
55.	1*s*4*s*–1*s*4*p*	$^3S - {}^3P^o$											
						3	3		0.025		−1.12	E	*interp.*
56.		$^1S - {}^1P^o$				1	3		0.069		−1.16	D	*interp.*
57.	1*s*4*s*–1*s*5*p*	$^3S - {}^3P^o$											
			[58.106]	[72270900]	[73991900]	3	3	2960	0.150	0.0861	−0.347	B	*interp.*
58.		$^1S - {}^1P^o$	[58.473]	[72299200]	[74009400]	1	3	2850	0.438	0.0843	−0.359	B	*interp.*
59.	1*s*4*p*–1*s*4*d*	$^3P^o - {}^3D$				9	15		0.019		−0.77	D	6
60.	1*s*4*p*–1*s*5*s*	$^3P^o - {}^3S$											
			[59.684]	[72301100]	[73976600]	3	3	970	0.052	0.031	−0.81	B	*interp.*
61.		$^1P^o - {}^1S$	[60.408]	[72335400]	[73990800]	3	1	3000	0.054	0.032	−0.79	B	*interp.*
62.	1*s*4*d*–1*s*4*p*	$^1D - {}^1P^o$				5	3		0.0030		−1.82	E	6
63.	1*s*4*d*–1*s*4*f*	$^3D - {}^3F^o$				15	21		7.6(−4)		−1.94	E	6
64.	1*s*4*d*–1*s*5*f*	$^3D - {}^3F^o$				15	21		0.89		1.13	B	8
65.		$^1D - {}^1F^o$				5	7		0.89		0.65	B	8
66.	1*s*4*f*–1*s*4*d*	$^1F^o - {}^1D$				7	5		4.0(−4)		−2.55	E	6
67.	1*s*4*f*–1*s*5*d*	$^3F^o - {}^3D$				21	15		0.0089		−0.73	C	8
68.		$^1F^o - {}^1D$				7	5		0.0089		−1.21	C	8
69.	1*s*5*s*–1*s*5*p*	$^3S - {}^3P^o$											
						3	3		0.027		−1.09	E	*interp.*
70.		$^1S - {}^1P^o$				1	3		0.10		−1.00	E	*interp.*

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[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Co XXVII

Ground State $1s\ ^2S_{1/2}$

Ionization Potential $[10011]$ eV $= [80746000]$ cm^{-1}

Allowed Transitions

The transition probability data for this hydrogen-like ion may be obtained by scaling the data available for the hydrogen spectrum (see NSRDS–NBS 4 [1]) according to

$$f_{\mathrm{Co\ XXVII}} = f_{\mathrm{Hydrogen}},$$
$$A_{\mathrm{Co\ XXVII}} = (27)^4\ A_{\mathrm{Hydrogen}},$$
$$S_{\mathrm{Co\ XXVII}} = (27)^{-2}\ S_{\mathrm{Hydrogen}}.$$

An uncertainty of a few percent arises from the neglect of relativistic effects. Recent theoretical studies [2,3] indicate that relativistic effects on line strengths for this ion are generally in this range, with the relativistic value usually slightly below the non-relativistic one, although in certain transitions where n increases and l decreases the line strength increases. Younger and Weiss [3] have calculated exact Dirac relativistic hydrogenic line strengths for a number of transitions of interest along the hydrogen isoelectronic sequence.

References

[1] Wiese, W. L., Smith, M. W., and Glennon, B. M., Atomic Transition Probabilities—Hydrogen through Neon (A Critical Data Compilation), Vol. I, 157 pp., Nat. Stand. Ref. Data Ser., Nat. Bur. Stand. (U.S.), 4 (May 1966).

[2] Garstang, R. H., *Topics in Modern Physics (A Tribute to Edward U. Condon)*, 153–167, Ed. Brittin, W. E., and Odabasi, H., Colorado Associated Univ. Press, Boulder, Colorado (1971).

[3] Younger, S. M., and Weiss, A. W., J. Res. Nat. Bur. Stand., Sect. A **79**, 629 (1975).

Nickel

Ni I

Ground State $1s^22s^22p^63s^23p^63d^84s^2\ ^3F_4$

Ionization Potential 7.635 eV = 61579 cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
1963.85	65	2201.59	80	3019.14	11	3452.89	36
1968.90	33	2212.15	27	3031.87	11	3458.47	38
1976.87	65	2220.71	55	3037.94	44	3461.65	36
1981.61	65	2221.94	27	3045.01	12	3467.50	3
1990.25	65	2230.96	54	3050.82	44	3469.49	8
1994.29	31	2244.46	52	3054.32	44	3472.55	39
2000.49	61	2251.48	51	3057.64	45	3483.77	6
2001.83	62	2253.57	52	3064.62	45	3485.89	36
2007.01	64	2254.81	26	3080.75	45	3492.96	37
2007.69	33	2258.15	50	3097.12	11	3498.19	2
2014.25	65	2259.56	50	3099.12	13	3500.85	6
2025.40	32	2261.42	25	3101.55	44	3502.60	3
2026.62	30	2266.35	51	3101.88	75	3507.69	3
2029.29	62	2267.55	23	3105.47	12	3510.34	37
2033.56	57	2271.95	53	3114.12	43	3513.93	36
2041.16	64	2274.66	22	3129.31	12	3515.05	38
2047.35	60	2287.32	52	3134.11	44	3519.77	5
2050.84	63	2288.40	52	3145.72	11	3523.44	35
2052.04	29	2289.98	18	3184.37	11	3524.54	37
2052.45	29	2293.11	50	3195.57	12	3527.98	6
2053.91	29	2300.77	49	3197.11	43	3551.53	5
2055.50	30	2302.97	50	3200.42	42	3561.75	2
2059.92	58	2307.35	53	3221.65	8	3566.37	71
2060.20	58	2312.34	23	3225.02	74	3571.87	5
2062.37	32	2313.98	23	3226.98	7	3587.93	35
2063.42	61	2317.16	21	3232.96	7	3597.71	37
2064.39	58	2320.03	22	3234.65	40	3602.28	3
2069.52	61	2321.38	22	3243.06	41	3609.31	35
2082.87	30	2324.65	26	3248.46	40	3610.46	37
2085.37	59	2325.79	22	3249.44	10	3612.74	6
2085.57	85	2329.96	21	3250.74	74	3619.39	70
2088.98	58	2345.54	19	3271.12	42	3624.73	2
2089.09	30	2346.63	24	3282.70	7	3664.10	4
2095.13	85	2347.51	18	3286.95	38	3669.24	2
2105.85	61	2348.73	50	3315.66	41	3670.43	4
2109.79	29	2419.31	20	3320.26	9	3674.06	34
2111.73	29	2476.88	16	3322.31	74	3674.15	68
2114.43	84	2540.02	78	3361.56	38	3688.42	5
2121.40	56	2553.37	17	3362.81	42	3722.48	37
2124.80	83	2561.42	16	3365.77	73	3736.81	66
2125.62	28	2696.48	77	3366.17	8	3739.23	2
2128.41	30	2746.74	48	3367.89	39	3749.05	1
2129.96	55	2798.65	48	3369.57	6	3775.57	69
2147.80	55	2805.08	14	3371.99	7	3783.53	66
2151.93	29	2821.29	47	3374.22	36	3793.61	4
2152.23	56	2834.55	15	3380.57	72	3807.14	69
2157.83	54	2865.50	48	3380.89	7	3831.69	67
2158.31	54	2907.46	15	3391.05	5	3832.87	1
2161.04	55	2914.01	14	3392.99	39	3858.30	68
2166.15	55	2943.91	45	3409.58	5	3885.87	1
2173.54	79	2981.65	45	3413.48	5	3946.18	1
2174.48	54	2984.13	12	3414.77	38	3973.56	67
2182.38	28	2992.60	44	3420.74	9	4009.98	107
2183.91	82	2994.46	46	3423.71	39	4035.96	107
2190.22	54	3002.48	45	3433.56	38	4093.62	1
2191.21	81	3003.62	45	3437.28	3	4295.89	110
2197.35	54	3012.00	76	3446.26	39	4382.87	113

List of tabulated lines—Continued

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
4401.55	97	4976.71	118	5514.80	111	6384.70	117
4450.13	110	4980.16	101	5578.73	90	6421.51	119
4633.03	99	5017.59	100	5642.66	112	6482.81	95
4698.41	116	5039.36	105	5664.02	122	6643.64	86
4714.42	98	5080.52	106	5709.56	89	6767.78	91
4729.29	116	5085.48	103	5847.01	87	7001.57	94
4740.17	99	5129.38	108	6108.12	88	7062.97	94
4786.54	98	5157.99	100	6176.81	115	7197.07	92
4817.85	118	5187.86	108	6230.12	114	7261.94	92
4838.65	120	5262.83	102	6256.37	86	7291.48	93
4843.53	116	5265.75	104	6314.67	96	7414.51	92
4855.41	103	5371.33	121	6327.60	87	7714.27	92
4900.97	98	5499.39	109	6364.60	96	7788.95	92

For this spectrum, we have primarily chosen the data of Huber and Sandeman [1] (hereafter referred to as HS), who measured relative oscillator strengths by using the anomalous dispersion (hook) method. With the absorption technique, these authors were able to provide data for a few additional, weak resonance lines. HS normalized their relative f-values to an absolute scale by using the lifetime measurements of Becker et al. [3], who employed the zero-field level-crossing (Hanle) technique. As a second data source we used Lennard et al. [2], who measured relative oscillator strengths by determining branching ratios with a hollow cathode discharge and established an absolute scale by normalizing to their own beam-foil lifetime measurements. We have used ref. [2] principally as a supplementary data source, i.e., for lines not measured by HS.

The beam-foil lifetimes of Lennard et al. are, on the average, about 20 percent longer than those of Becker et al. Because of likely cascade problems with the beam-foil measurements, we have renormalized the transition probabilities (or branching ratios) of Lennard et al. to the lifetimes of ref. [3] whenever possible. For four higher levels, the data of Becker et al. overlap with lifetimes measured by Heldt et al. [4], who used selective laser excitation. In two cases, the agreement is within 5 percent; in the other two cases the differences are 22 percent and 36 percent. Additional support for the data of HS is provided by a comparison of the inverse sums of their transition probabilities $(\Sigma_i A_{ki})^{-1}$, to the lifetimes of Heldt et al. With the exception of the long-lived $z\ {}^1G^o_4$ level, this comparison indicates agreement within 15 percent for seven levels and within 5 percent for four of these levels. Although these inverse sums are incomplete, the missing A-values generally correspond to weak infrared or intercombination lines. (In performing this analysis, we have included the effects of these additional lines by using the calculated transition probabilities of Kurucz and Peytremann [5].)

It should be noted that the log gf-values of Lennard et al., renormalized to the lifetime of ref. [3], agreed quite well with HS. There was no indication of energy level or intensity dependent trends between the two sets of data, and 76 percent of the f-values for common lines agreed within 25 percent. The only serious disagreements occurred for three lines—the 3674.15 Å line, which is blended with a line at 3674.06 Å; and the 3973.56 Å and 3200.42 Å lines, which are both quite weak. Only one other source—the experiment by Bell et al. [6], who measured relative f-values in emission with a wall-stabilized arc—agreed consistently with HS. The data of Bell et al. exhibited very little scatter (±0.07 dex), no trends, and only a slight difference in scale from that of HS. However, we did not use ref. [6] in this compilation, because all lines tabulated by these authors were also measured by HS.

In evaluating the data for this spectrum, we compared four other sources—Heise [7], Goly et al. [8], Moity [9], and Parchevskii and Penkin [10]—to HS. Heise's data showed a very serious intensity dependent trend, indicating his log gf-values to be too high for weak lines. This result is analogous to a similar problem observed in the case of Ti I, where the log gf-values of Klemt [11], who used the same apparatus as Heise, were also shown to be systematically too great for weak lines. Oscillator strengths for lines tabulated in the other three data sources, refs. [8–10], were essentially covered by HS. Also, the scatter between these sources and HS was greater than that exhibited by Lennard et al. or by Bell et al., and we have therefore omitted refs. [8–10] from this compilation.

Our accuracy ratings for the data of HS directly reflect their own uncertainty estimates. Factors considered include the uncertainty in the absolute scale as given by Becker et al., plus uncertainties in the relative scale, which depend primarily upon (a) distances between line and hook and (b) the number of measurements taken. We feel that the data of Lennard et al., when normalized to the lifetimes of ref. [3], are generally accurate to within 25 percent, except for very weak lines, i.e., those lines having log gf-values less than -1.5. We have, however, not tabulated the more accurate data of ref. [2], because the same strong lines were already covered by HS. Lennard et al. have also provided transition probabilities for lines arising from high-lying upper levels not measured by Becker et al. Thus we had to rely on the somewhat less accurate beam-foil lifetimes of ref. [2] for the absolute scale in these cases, and we have lowered the accuracy ratings accordingly.

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Note Added in Proof

New lifetime data by U. Becker, H. Kerkhoff, M. Schmidt, and P. Zimmermann [J. Quant. Spectrosc. Radiat. Transfer **25**, 339 (1981)], obtained with the delayed coincidence technique using selective dye laser excitation, closely confirm our adopted scale. The lifetimes for all eleven levels measured by them can be compared to branching ratio data taken from the Huber and Sandeman [1] results. This comparison yields agreement within 10 percent for ten levels and within 5 percent for nine levels.

Earlier in this introduction, we noted some disagreement (a 26 percent difference) between the branching ratios of Huber and Sandeman and lifetimes of Heldt et al. for the $z\ ^1G_4^\circ$ level. For this level, the new results of Becker et al. support the data of HS—the agreement is within 7 percent.

Ni I: Allowed transitions

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
1.	$a\ ^3F - z\ ^5D^\circ$ (1)											
		3946.18	1332.2	26666	7	7	2.1(−6)^a	4.8(−7)	4.4(−5)	−5.47	C−	1
		3749.05	0.0	26666	9	7	2.7(−4)	4.4(−5)	0.0049	−3.40	C−	1
		3832.87	1332.2	27415	7	5	2.0(−4)	3.1(−5)	0.0028	−3.66	C−	1
		3885.87	2216.5	27944	5	3	4.1(−5)	5.5(−6)	3.5(−4)	−4.56	C	1
		4093.62	1332.2	25754	7	9	9.0(−7)	2.9(−7)	2.8(−5)	−5.69	C	1
2.	$a\ ^3F - z\ ^5G^\circ$ (2)											
		3624.73	0.0	27580	9	11	0.0015	3.7(−4)	0.040	−2.48	C−	1
		3739.23	1332.2	28068	7	9	0.0024	6.4(−4)	0.055	−2.35	E	1
		3561.75	0.0	28068	9	9	0.0012	2.3(−4)	0.024	−2.69	C−	1
		3669.24	1332.2	28578	7	7	0.0037	7.5(−4)	0.063	−2.28	E	1
		3498.19	0.0	28578	9	7	1.1(−5)	1.6(−6)	1.7(−4)	−4.84	C−	1
3.	$a\ ^3F - z\ ^5F^\circ$ (3)											
		3502.60	0.0	28542	9	11	8.6(−4)	1.9(−4)	0.020	−2.76	D	1
		3602.28	1332.2	29084	7	9	0.0040	0.0010	0.084	−2.15	D	1
		3437.28	0.0	29084	9	9	0.041	0.0072	0.73	−1.19	C	1
		3507.69	1332.2	29833	7	7	0.0027	5.0(−4)	0.040	−2.46	D	1
		3467.50	1332.2	30163	7	5	0.011	0.0014	0.11	−2.00	C	1
4.	$a\ ^3F - z\ ^3P^\circ$ (4)											
		3670.43	1332.2	28569	7	5	0.0058	8.4(−4)	0.071	−2.23	E	1
		3664.10	2216.5	29501	5	3	0.019	0.0022	0.14	−1.95	D−	1
		3793.61	2216.5	28569	5	5	0.0015	3.2(−4)	0.020	−2.80	E	2n
5.	$a\ ^3F - z\ ^3F^\circ$ (5)	*3480.0*	*971.8*	*29699*	21	21	0.062	0.011	2.7	−0.63	C	1,2n
		3391.05	0.0	29481	9	9	0.055	0.0095	0.95	−1.07	C	1
		3571.87	1332.2	29321	7	7	0.052	0.0099	0.81	−1.16	C+	1
		3519.77	2216.5	30619	5	5	0.041	0.0076	0.44	−1.42	C	1
		3409.58	0.0	29321	9	7	0.0032	4.3(−4)	0.044	−2.41	C	1
		3413.48	1332.2	30619	7	5	0.038	0.0047	0.37	−1.48	C	1
		3551.53	1332.2	29481	7	9	0.0016	3.9(−4)	0.032	−2.56	E	2n
		3688.42	2216.5	29321	5	7	0.0054	0.0016	0.094	−2.11	E	1
6.	$a\ ^3F - z\ ^3D^\circ$ (6)											
		3369.57	0.0	29669	9	7	0.17	0.023	2.3	−0.69	C	1
		3500.85	1332.2	29889	7	5	0.056	0.0073	0.59	−1.29	C	1
		3483.77	2216.5	30913	5	3	0.14	0.016	0.89	−1.11	C	1
		3527.98	1332.2	29669	7	7	0.0043	8.0(−4)	0.065	−2.25	D−	1
		3612.74	2216.5	29889	5	5	0.042	0.0081	0.48	−1.39	C	1

Ni I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
7.	$a\ ^3\mathrm{F} - z\ ^3\mathrm{G}^\circ$ (7)											
		3232.96	0.0	30923	9	11	0.053	0.010	0.97	−1.04	C	1
		3371.99	1332.2	30980	7	9	0.026	0.0057	0.44	−1.40	C	1
		3380.89	2216.5	31786	5	7	0.038	0.0091	0.51	−1.34	C	1
		3226.98	0.0	30980	9	9	0.0023	3.5(−4)	0.034	−2.50	D	1
		3282.70	1332.2	31786	7	7	0.0044	7.2(−4)	0.054	−2.30	D	1
8.	$a\ ^3\mathrm{F} - z\ ^1\mathrm{F}^\circ$ (8)											
		3221.65	0.0	31031	9	7	0.012	0.0014	0.13	−1.90	C	1
		3366.17	1332.2	31031	7	7	0.033	0.0057	0.44	−1.40	D	1
		3469.49	2216.5	31031	5	7	0.013	0.0032	0.18	−1.80	C	1
9.	$a\ ^3\mathrm{F} - z\ ^1\mathrm{D}^\circ$ (9)											
		3320.26	1332.2	31442	7	5	0.048	0.0057	0.44	−1.40	C	1
		3420.74	2216.5	31442	5	5	0.0011	2.0(−4)	0.011	−3.00	E	2*n*
10.	$a\ ^3\mathrm{F} - z\ ^1\mathrm{P}^\circ$ (10)											
		3249.44	2216.5	32982	5	3	0.0084	8.0(−4)	0.043	−2.40	D−	1
11.	$a\ ^3\mathrm{F} - y\ ^3\mathrm{F}^\circ$ (11)											
		3031.87	0.0	32973	9	9	0.012	0.0016	0.15	−1.83	C	1
		3145.72	1332.2	33112	7	7	0.0071	0.0011	0.077	−2.13	D	1
		3184.37	2216.5	33611	5	5	0.013	0.0020	0.11	−1.99	D−	1
		3019.14	0.0	33112	9	7	0.048	0.0051	0.45	−1.34	C	1
		3097.12	1332.2	33611	7	5	0.047	0.0048	0.35	−1.47	C	1
12.	$a\ ^3\mathrm{F} - y\ ^3\mathrm{D}^\circ$ (12)											
		2984.13	0.0	33501	9	7	0.036	0.0038	0.33	−1.47	D−	1
		3045.01	1332.2	34163	7	5	0.024	0.0024	0.17	−1.77	D−	1
		3105.47	2216.5	34409	5	3	0.068	0.0059	0.30	−1.53	D−	1
		3129.31	2216.5	34163	5	5	0.0053	7.8(−4)	0.040	−2.41	E	1
		3195.57	2216.5	33501	5	7	0.0041	8.7(−4)	0.046	−2.36	E	1
13.	$a\ ^3\mathrm{F} - z\ ^1\mathrm{G}^\circ$ (13)											
		3099.12	1332.2	33590	7	9	0.020	0.0038	0.27	−1.58	E	1
14.	$a\ ^3\mathrm{F} - y\ ^1\mathrm{F}^\circ$ (uv 1)											
		2805.08	0.0	35639	9	7	0.0059	5.4(−4)	0.045	−2.31	D−	1
		2914.01	1332.2	35639	7	7	0.0040	5.1(−4)	0.034	−2.45	E	1
15.	$a\ ^3\mathrm{F} - y\ ^1\mathrm{D}^\circ$ (uv 2)											
		2834.55	1332.2	36601	7	5	0.0079	6.8(−4)	0.045	−2.32	E	1
		2907.46	2216.5	36601	5	5	0.018	0.0022	0.11	−1.95	D	1
16.	$a\ ^3\mathrm{F} - 1^\circ$ (uv 3)											
		2476.88	0.0	40361	9	7	0.026	0.0018	0.14	−1.78	C	1
		2561.42	1332.2	40361	7	7	0.0037	3.7(−4)	0.022	−2.59	D−	1

Ni I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
17.	$a\ ^3\mathrm{F} - 2^\circ$ (uv 4)											
		2553.37	1332.2	40484	7	5	0.0060	4.2(−4)	0.025	−2.53	D−	1
18.	$a\ ^3\mathrm{F} - x\ ^3\mathrm{F}^\circ$ (uv 5)											
		2347.51	0.0	42585	9	9	0.22	0.018	1.3	−0.78	D−	1
		2289.98	0.0	43655?	9	7	2.1	0.13	8.7	0.06	C	1
19.	$a\ ^3\mathrm{F} - x\ ^3\mathrm{D}^\circ$ (uv 6)											
		2345.54	0.0	42621	9	7	2.2	0.14	9.9	0.11	C	1
20.	$a\ ^3\mathrm{F} - y\ ^3\mathrm{P}^\circ$ (uv 7)											
		2419.31	1332.2	42654	7	5	0.20	0.012	0.69	−1.06	E	1
21.	$a\ ^3\mathrm{F} - w\ ^3\mathrm{D}^\circ$ (uv 8)											
		2317.16	1332.2	44475	7	5	3.8	0.22	12	0.18	C	1
		2329.96	2216.5	45122	5	3	5.3	0.26	9.9	0.11	C	1
22.	$a\ ^3\mathrm{F} - y\ ^3\mathrm{G}^\circ$ (uv 9)											
		2320.03	0.0	43090	9	11	6.9	0.69	47	0.79	C	1
		2325.79	1332.2	44315	7	9	3.5	0.37	20	0.41	C	1
		2321.38	2216.5	45281	5	7	5.6	0.63	24	0.50	E	1
		2274.66	1332.2	45281	7	7	0.052	0.0040	0.21	−1.55	D−	1
23.	$a\ ^3\mathrm{F} - w\ ^3\mathrm{F}^\circ$ (uv 10)											
		2312.34	1332.2	44565	7	7	5.5	0.44	24	0.49	C	1
		2313.98	2216.5	45419	5	5	5.0	0.40	15	0.30	E	1
		2267.55	1332.2	45419	7	5	0.080	0.0044	0.23	−1.51	D−	1
24.	$a\ ^3\mathrm{F} - x\ ^1\mathrm{D}^\circ$ (uv 12)											
		2346.63	1332.2	43933	7	5	0.55	0.033	1.8	−0.64	D−	1
25.	$a\ ^3\mathrm{F} - x\ ^1\mathrm{F}^\circ$ (uv 13)											
		2261.42	0.0	44206	9	7	0.091	0.0054	0.36	−1.31	C	1
26.	$a\ ^3\mathrm{F} - 3^\circ$ (uv 14)											
		2254.81	0.0	44336	9	9	0.096	0.0073	0.49	−1.18	C	1
		2324.65	1332.2	44336	7	9	0.18	0.019	1.0	−0.88	D−	1
27.	$a\ ^3\mathrm{F} - x\ ^3\mathrm{P}^\circ$ (uv 15)											
		2212.15	1332.2	46523	7	5	0.059	0.0031	0.16	−1.67	D−	1
		2221.94	2216.5	47208	5	3	0.22	0.0096	0.35	−1.32	D	1

Ni I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
28.	$a\,^3\mathrm{F} - v\,^3\mathrm{D}^\circ$ (uv 16)											
		2125.62	0.0	47030	9	7	0.051	0.0027	0.17	−1.62	C	1
		2182.38	1332.2	47139	7	5	0.13	0.0068	0.34	−1.32	C	1
29.	$a\,^3\mathrm{F} - v\,^3\mathrm{F}^\circ$ (uv 17)											
		2052.04	0.0	48715	9	9	0.097	0.0061	0.37	−1.26	C	1
		2111.73	1332.2	48672	7	7	0.065	0.0043	0.21	−1.52	C	1
		2053.91	0.0	48672	9	7	0.0075	3.7(−4)	0.022	−2.48	D	1
		2052.45	1332.2	50039	7	5	0.032	0.0014	0.068	−2.00	C	1
		2109.79	1332.2	48715	7	9	0.015	0.0013	0.063	−2.04	C	1
		2151.93	2216.5	48672	5	7	0.032	0.0031	0.11	−1.81	C	1
30.	$a\,^3\mathrm{F} - u\,^3\mathrm{D}^\circ$ (uv 19)											
		2026.62	0.0	49328	9	7	0.24	0.012	0.70	−0.98	C	1
		2089.09	1332.2	49185	7	5	0.097	0.0045	0.22	−1.50	D	1
		2055.50	2216.5	50851	5	3	0.33	0.013	0.43	−1.20	C	1
		2082.87	1332.2	49328	7	7	0.085	0.0056	0.27	−1.41	C	1
		2128.41	2216.5	49185	5	5	0.056	0.0038	0.13	−1.72	C	1
31.	$a\,^3\mathrm{F} - w\,^1\mathrm{F}^\circ$ (uv 20)											
		1994.29	0.0	50143	9	7	0.057	0.0027	0.16	−1.62	C	1
32.	$a\,^3\mathrm{F} - w\,^1\mathrm{D}^\circ$ (uv 22)											
		2025.40	1332.2	50689	7	5	0.23	0.010	0.47	−1.15	D−	1
		2062.37	2216.5	50689	5	5	0.046	0.0030	0.10	−1.83	E	1
33.	$a\,^3\mathrm{F} - u\,^3\mathrm{F}^\circ$ (uv 23)											
		1968.90	0.0	50790	9	9	0.045	0.0026	0.15	−1.63	C	1
		2007.69	1332.2	51125	7	7	0.090	0.0054	0.25	−1.42	C	1
34.	$a\,^3\mathrm{D} - z\,^5\mathrm{D}^\circ$ (15)											
		3674.06	204.8	27415	7	5	0.0027	3.8(−4)	0.033	−2.57	D−	1
35.	$a\,^3\mathrm{D} - z\,^5\mathrm{G}^\circ$ (16)											
		3587.93	204.8	28068	7	9	0.0024	6.0(−4)	0.049	−2.38	C	1
		3609.31	879.8	28578	5	7	0.0054	0.0015	0.088	−2.13	C	1
		3523.44	204.8	28578	7	7	0.0033	6.1(−4)	0.049	−2.37	E	1
36.	$a\,^3\mathrm{D} - z\,^5\mathrm{F}^\circ$ (17)											
		3461.65	204.8	29084	7	9	0.27	0.062	5.0	−0.36	C+	1
		3452.89	879.8	29833	5	7	0.098	0.025	1.4	−0.91	C+	1
		3513.93	1713.1	30163	3	5	0.011	0.0033	0.11	−2.01	C−	1
		3374.22	204.8	29833	7	7	0.015	0.0025	0.19	−1.76	C	1
		3485.89	1713.1	30392	3	3	0.012	0.0021	0.072	−2.20	C	1

Ni I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
37.	$a\,^3\mathrm{D} - z\,^3\mathrm{P}^\circ$ (18)	*3529.0*	*731.5*	*29060*	15	9	1.1	0.13	22	0.28	C	1
		3524.54	204.8	28569	7	5	1.0	0.13	11	−0.03	C	1
		3492.96	879.8	29501	5	3	0.98	0.11	6.2	−0.27	C+	1
		3510.34	1713.1	30192	3	1	1.2	0.071	2.5	−0.67	C+	1
		3610.46	879.8	28569	5	5	0.072	0.014	0.84	−1.15	C+	1
		3597.71	1713.1	29501	3	3	0.14	0.028	0.99	−1.08	C	1
		3722.48	1713.1	28569	3	5	0.0059	0.0021	0.076	−2.21	E	1
38.	$a\,^3\mathrm{D} - z\,^3\mathrm{F}^\circ$ (19)	*3451.2*	*731.5*	*29699*	15	21	0.61	0.15	26	0.36	C	1
		3414.77	204.8	29481	7	9	0.55	0.12	9.8	−0.06	C	1
		3515.05	879.8	29321	5	7	0.44	0.12	6.7	−0.24	C	1
		3458.47	1713.1	30619	3	5	0.61	0.18	6.3	−0.26	C+	1
		3433.56	204.8	29321	7	7	0.17	0.031	2.4	−0.67	C+	1
		3361.56	879.8	30619	5	5	0.045	0.0076	0.42	−1.42	C	1
		3286.95	204.8	30619	7	5	0.0039	4.5(−4)	0.034	−2.50	C	1
39.	$a\,^3\mathrm{D} - z\,^3\mathrm{D}^\circ$ (20)											
		3392.99	204.8	29669	7	7	0.24	0.041	3.2	−0.54	C+	1
		3446.26	879.8	29889	5	5	0.44	0.078	4.4	−0.41	C+	1
		3423.71	1713.1	30913	3	3	0.35	0.062	2.1	−0.73	C	1
		3367.89	204.8	29889	7	5	0.0026	3.2(−4)	0.025	−2.65	E	1
		3472.55	879.8	29669	5	7	0.12	0.031	1.8	−0.81	C+	1
40.	$a\,^3\mathrm{D} - z\,^3\mathrm{G}^\circ$ (21)											
		3248.46	204.8	30980	7	9	0.0047	9.7(−4)	0.072	−2.17	C	1
		3234.65	879.8	31786	5	7	0.020	0.0044	0.23	−1.66	C	1
41.	$a\,^3\mathrm{D} - z\,^1\mathrm{F}^\circ$ (22)											
		3243.06	204.8	31031	7	7	0.049	0.0077	0.57	−1.27	C	1
		3315.66	879.8	31031	5	7	0.053	0.012	0.67	−1.21	C+	1
42.	$a\,^3\mathrm{D} - z\,^1\mathrm{D}^\circ$ (23)											
		3200.42	204.8	31442	7	5	0.0032	3.5(−4)	0.026	−2.61	E	1
		3271.12	879.8	31442	5	5	0.0072	0.0012	0.062	−2.24	C	1
		3362.81	1713.1	31442	3	5	0.0011	3.1(−4)	0.010	−3.03	E	2*n*
43.	$a\,^3\mathrm{D} - z\,^1\mathrm{P}^\circ$ (24)											
		3114.12	879.8	32982	5	3	0.069	0.0060	0.31	−1.52	C	1
		3197.11	1713.1	32982	3	3	0.040	0.0061	0.19	−1.74	C	1
44.	$a\,^3\mathrm{D} - y\,^3\mathrm{F}^\circ$ (25)	*3081.8*	*731.5*	*33171*	15	21	0.86	0.17	26	0.41	D	1
		3050.82	204.8	32973	7	9	0.59	0.11	7.4	−0.13	D−	1
		3101.55	879.8	33112	5	7	0.72	0.14	7.4	−0.14	C	1
		3134.11	1713.1	33611	3	5	0.71	0.17	5.4	−0.28	C	1
		3037.94	204.8	33112	7	7	0.32	0.044	3.1	−0.51	C	1
		3054.32	879.8	33611	5	5	0.34	0.048	2.4	−0.62	D−	1
		2992.60	204.8	33611	7	5	0.10	0.0099	0.68	−1.16	D−	1

Ni I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
45.	$a\ ^3D - y\ ^3D^o$ (uv 24)	*3013.8*	*731.5*	*33903*	15	15	1.0	0.14	21	0.33	D	1
		3002.48	204.8	33501	7	7	0.92	0.12	8.6	−0.06	D−	1
		3003.62	879.8	34163	5	5	0.69	0.094	4.6	−0.33	D−	1
		3057.64	1713.1	34409	3	3	1.0	0.14	4.3	−0.37	D−	1
		2943.91	204.8	34163	7	5	0.11	0.0099	0.67	−1.16	C	1
		2981.65	879.8	34409	5	3	0.29	0.023	1.2	−0.93	D−	1
		3064.62	879.8	33501	5	7	0.075	0.015	0.75	−1.13	C	1
		3080.75	1713.1	34163	3	5	0.093	0.022	0.67	−1.18	C	1
46.	$a\ ^3D - z\ ^1G^o$ (27)											
		2994.46	204.8	33590	7	9	0.097	0.017	1.2	−0.93	D−	1
47.	$a\ ^3D - y\ ^1F^o$ (uv 25)											
		2821.29	204.8	35639	7	7	0.048	0.0057	0.37	−1.40	C	1
48.	$a\ ^3D - y\ ^1D^o$ (uv 26)											
		2746.74	204.8	36601	7	5	0.016	0.0013	0.082	−2.04	C	1
		2798.65	879.8	36601	5	5	0.055	0.0065	0.30	−1.49	C	1
		2865.50	1713.1	36601	3	5	0.018	0.0037	0.10	−1.96	D−	1
49.	$a\ ^3D - x\ ^3F^o$ (uv 29)											
		2300.77	204.8	43655?	7	7	0.75	0.060	3.2	−0.38	C	1
50.	$a\ ^3D - w\ ^3D^o$ (uv 32)											
		2348.73	204.8	42768	7	7	0.22	0.018	0.97	−0.90	E	1
		2293.11	879.8	44475	5	5	0.38	0.030	1.1	−0.82	C	1
		2302.97	1713.1	45122	3	3	0.45	0.036	0.81	−0.97	C	1
		2258.15	204.8	44475	7	5	0.17	0.0094	0.49	−1.18	C	1
		2259.56	879.8	45122	5	3	0.20	0.0091	0.34	−1.34	C	1
51.	$a\ ^3D - y\ ^3G^o$ (uv 33)											
		2266.35	204.8	44315	7	9	0.023	0.0023	0.12	−1.80	D−	1
		2251.48	879.8	45281	5	7	0.040	0.0043	0.16	−1.67	D	1
52.	$a\ ^3D - w\ ^3F^o$ (uv 34)											
		2288.40	879.8	44565	5	7	0.081	0.0089	0.34	−1.35	D−	1
		2287.32	1713.1	45419	3	5	0.18	0.024	0.55	−1.14	D−	1
		2253.57	204.8	44565	7	7	0.19	0.015	0.76	−0.99	C	1
		2244.46	879.8	45419	5	5	0.38	0.029	1.1	−0.84	C	1
53.	$a\ ^3D - x\ ^1F^o$ (uv 35)											
		2271.95	204.8	44206	7	7	0.050	0.0038	0.20	−1.57	C	1
		2307.35	879.8	44206	5	7	0.16	0.017	0.66	−1.06	C	1

Ni I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
54.	$a\ ^3D - x\ ^3P^\circ$ (uv 36)	*2166.2*	*731.5*	*46881*	15	9	1.1	0.046	4.9	−0.16	C	1
		2158.31	204.8	46523	7	5	0.69	0.034	1.7	−0.62	C	1
		2157.83	879.8	47208	5	3	0.41	0.017	0.60	−1.07	C	1
		2174.48	1713.1	47687?	3	1	0.89	0.021	0.45	−1.20	E	1
		2190.22	879.8	46523	5	5	0.30	0.021	0.77	−0.97	C	1
		2197.35	1713.1	47208	3	3	0.78	0.057	1.2	−0.77	C	1
		2230.96	1713.1	46523	3	5	0.052	0.0065	0.14	−1.71	E	1
55.	$a\ ^3D - v\ ^3D^\circ$ (uv 37)											
		2161.04	879.8	47139	5	5	0.13	0.0089	0.32	−1.35	C	1
		2129.96	204.8	47139	7	5	0.042	0.0020	0.099	−1.85	C	1
		2147.80	879.8	47425	5	3	0.47	0.020	0.69	−1.01	C	1
		2166.15	879.8	47030	5	7	0.066	0.0065	0.23	−1.49	C	1
		2220.71	1713.1	47139	3	5	0.082	0.010	0.22	−1.52	C	1
56.	$a\ ^3D - 4^\circ$ (uv 38)											
		2121.40	204.8	47329	7	5	0.28	0.014	0.67	−1.02	C	1
		2152.23	879.8	47329	5	5	0.032	0.0022	0.078	−1.96	C	1
57.	$a\ ^3D - v\ ^3F^\circ$ (uv 39)											
		2033.56	879.8	50039	5	5	0.030	0.0019	0.062	−2.03	D−	1
58.	$a\ ^3D - w\ ^3P^\circ$ (uv 40)											
		2059.92	204.8	48735	7	5	0.21	0.0097	0.46	−1.17	D−	1
		2060.20	879.8	49403	5	3	0.23	0.0087	0.30	−1.36	E	1
		2064.39	1713.1	50139	3	1	0.40	0.0086	0.17	−1.59	D−	1
		2088.98	879.8	48735	5	5	0.042	0.0028	0.095	−1.86	D−	1
59.	$a\ ^3D - 5^\circ$ (uv 41)											
		2085.37	879.8	48818	5	3	0.077	0.0030	0.10	−1.82	C	1
60.	$a\ ^3D - 6^\circ$ (uv 42)											
		2047.35	204.8	49033	7	7	0.13	0.0082	0.39	−1.24	C	1
61.	$a\ ^3D - u\ ^3D^\circ$ (uv 43)											
		2069.52	879.8	49185	5	5	0.11	0.0071	0.24	−1.45	D−	1
		2000.49	879.8	50851	5	3	0.054	0.0020	0.064	−2.01	C	1
		2063.42	879.8	49328	5	7	0.050	0.0045	0.15	−1.65	D−	1
		2105.85	1713.1	49185	3	5	0.030	0.0033	0.069	−2.00	C	1
62.	$a\ ^3D - w\ ^1F^\circ$ (uv 44)											
		2001.83	204.8	50143	7	7	0.073	0.0044	0.20	−1.51	C	1
		2029.29	879.8	50143	5	7	0.023	0.0020	0.065	−2.01	C	1
63.	$a\ ^3D - x\ ^1P^\circ$ (uv 45)											
		2050.84	1713.1	50458	3	3	0.076	0.0048	0.098	−1.84	E	1

Ni I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
64.	$a\ ^3D - w\ ^1D^\circ$ (uv 46)											
		2007.01	879.8	50689	5	5	0.17	0.010	0.35	−1.28	C	1
		2041.16	1713.1	50689	3	5	0.032	0.0033	0.067	−2.00	D−	1
65.	$a\ ^3D - u\ ^3F^\circ$ (uv 47)											
		1976.87	204.8	50790	7	9	1.1	0.080	3.7	−0.25	C	1
		1990.25	879.8	51125	5	7	0.83	0.069	2.3	−0.46	C	1
		2014.25	1713.1	51344	3	5	0.93	0.094	1.9	−0.55	C	1
		1963.85	204.8	51125	7	7	0.11	0.0064	0.29	−1.35	C	1
		1981.61	879.8	51344	5	5	0.13	0.0078	0.25	−1.41	C	1
66.	$a\ ^1D - z\ ^5F^\circ$ (30)											
		3783.53	3409.9	29833	5	7	0.033	0.0098	0.61	−1.31	C	1
		3736.81	3409.9	30163	5	5	0.014	0.0029	0.18	−1.84	E	1
67.	$a\ ^1D - z\ ^3P^\circ$ (31)											
		3973.56	3409.9	28569	5	5	0.0074	0.0017	0.11	−2.06	E	1
		3831.69	3409.9	29501	5	3	0.015	0.0020	0.13	−2.00	C	1
68.	$a\ ^1D - z\ ^3F^\circ$ (32)											
		3858.30	3409.9	29321	5	7	0.069	0.021	1.4	−0.97	C	1
		3674.15	3409.9	30619	5	5	0.0084	0.0017	0.10	−2.07	E	1
69.	$a\ ^1D - z\ ^3D^\circ$ (33)											
		3807.14	3409.9	29669	5	7	0.043	0.013	0.83	−1.18	C	1
		3775.57	3409.9	29889	5	5	0.042	0.0089	0.56	−1.35	C	1
70.	$a\ ^1D - z\ ^1F^\circ$ (35)	3619.39	3409.9	31031	5	7	0.73	0.20	12	0.00	C	1
71.	$a\ ^1D - z\ ^1D^\circ$ (36)	3566.37	3409.9	31442	5	5	0.56	0.11	6.3	−0.27	C	1
72.	$a\ ^1D - z\ ^1P^\circ$ (37)	3380.57	3409.9	32982	5	3	1.2	0.12	6.7	−0.22	C	1
73.	$a\ ^1D - y\ ^3F^\circ$ (38)											
		3365.77	3409.9	33112	5	7	0.048	0.012	0.64	−1.24	C	1
74.	$a\ ^1D - y\ ^3D^\circ$ (39)											
		3322.31	3409.9	33501	5	7	0.043	0.010	0.55	−1.30	D	1
		3250.74	3409.9	34163	5	5	0.025	0.0040	0.21	−1.70	D	1
		3225.02	3409.9	34409	5	3	0.11	0.010	0.53	−1.30	C	1
75.	$a\ ^1D - y\ ^1F^\circ$ (40)	3101.88	3409.9	35639	5	7	0.49	0.098	5.0	−0.31	C	1
76.	$a\ ^1D - y\ ^1D^\circ$ (41)	3012.00	3409.9	36601	5	5	1.5	0.20	9.9	0.00	C	1

Ni I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
77.	$a\ ^1D - 2^\circ$ (uv 49)											
		2696.48	3409.9	40484	5	5	0.014	0.0015	0.067	−2.12	D−	1
78.	$a\ ^1D - w\ ^3D^\circ$ (uv 53)											
		2540.02	3409.9	42768	5	7	0.026	0.0035	0.15	−1.76	D−	1
79.	$a\ ^1D - w\ ^3P^\circ$ (uv 59)											
		2173.54	3409.9	49403	5	3	0.15	0.0065	0.23	−1.49	E	1
80.	$a\ ^1D - 5^\circ$ (uv 60)											
		2201.59	3409.9	48818	5	3	0.73	0.032	1.1	−0.80	C	1
81.	$a\ ^1D - 6^\circ$ (uv 61)											
		2191.21	3409.9	49033	5	7	0.033	0.0033	0.12	−1.78	E	1
82.	$a\ ^1D - u\ ^3D^\circ$ (uv 62)											
		2183.91	3409.9	49185	5	5	0.12	0.0089	0.32	−1.35	D	1
83.	$a\ ^1D - x\ ^1P^\circ$ (uv 63)	2124.80	3409.9	50458	5	3	0.38	0.016	0.54	−1.11	C	1
84.	$a\ ^1D - w\ ^1D^\circ$ (uv 64)	2114.43	3409.9	50689	5	5	0.097	0.0065	0.23	−1.49	C	1
85.	$a\ ^1D - u\ ^3F^\circ$ (uv 65)											
		2095.13	3409.9	51125	5	7	0.11	0.010	0.35	−1.30	E	1
		2085.57	3409.9	51344	5	5	2.6	0.17	5.8	−0.07	D−	1
86.	$b\ ^1D - z\ ^3P^\circ$ (43)											
		6643.64	13521	28569	5	5	0.0015	9.9(−4)	0.11	−2.30	D	2*n*
		6256.37	13521	29501	5	3	0.0019	6.7(−4)	0.069	−2.48	D	2*n*
87.	$b\ ^1D - z\ ^3F^\circ$ (44)											
		6327.60	13521	29321	5	7	1.7(−4)	1.4(−4)	0.015	−3.15	E	2*n*
		5847.01	13521	30619	5	5	1.3(−4)	6.7(−5)	0.0064	−3.48	E	2*n*
88.	$b\ ^1D - z\ ^3D^\circ$ (45)											
		6108.12	13521	29889	5	5	6.8(−4)	3.8(−4)	0.038	2.72	E	2*n*
89.	$b\ ^1D - z\ ^1F^\circ$ (46)	5709.56	13521	31031	5	7	0.0012	8.2(−4)	0.077	2.39	D	2*n*
90.	$b\ ^1D - z\ ^1D^\circ$ (47)	5578.73	13521	31442	5	5	5.7(−4)	2.7(−4)	0.024	−2.88	E	2*n*

Ni I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
91.	$a\ {}^1\mathrm{S} - z\ {}^3\mathrm{P}^\circ$ (57)											
		6767.78	14729	29501	1	3	0.0033	0.0068	0.15	−2.17	D	2*n*
92.	$a\ {}^3\mathrm{P} - z\ {}^3\mathrm{P}^\circ$ (62)											
		7714.27	15610	28569	5	5	0.0014	0.0012	0.16	−2.20	D	2*n*
		7261.94	15734	29501	3	3	8.4(−4)	6.6(−4)	0.048	−2.70	E	2*n*
		7197.07	15610	29501	5	3	9.0(−4)	4.2(−4)	0.050	−2.68	E	2*n*
		7788.95	15734	28569	3	5	8.4(−4)	0.0013	0.098	−2.42	D	2*n*
		7414.51	16017	29501	1	3	0.0011	0.0027	0.066	−2.57	E	2*n*
93.	$a\ {}^3\mathrm{P} - z\ {}^3\mathrm{F}^\circ$ (63)											
		7291.48	15610	29321	5	7	3.0(−4)	3.3(−4)	0.040	−2.78	E	2*n*
94.	$a\ {}^3\mathrm{P} - z\ {}^3\mathrm{D}^\circ$ (64)											
		7062.97	15734	29889	3	5	8.4(−5)	1.0(−4)	0.0073	−3.50	E	2*n*
		7001.57	15610	29889	5	5	5.9(−5)	4.3(−5)	0.0050	−3.66	E	2*n*
95.	$a\ {}^3\mathrm{P} - z\ {}^1\mathrm{F}^\circ$ (66)											
		6482.81	15610	31031	5	7	5.3(−4)	4.7(−4)	0.050	−2.63	E	2*n*
96.	$a\ {}^3\mathrm{P} - z\ {}^1\mathrm{D}^\circ$ (67)											
		6314.67	15610	31442	5	5	0.0057	0.0034	0.35	−1.77	D	2*n*
		6364.60	15734	31442	3	5	3.5(−5)	3.5(−5)	0.0022	−3.97	E	2*n*
97.	$z\ {}^5\mathrm{D}^\circ - e\ {}^5\mathrm{F}$ (86)											
		4401.55	25754	48467	9	11	0.38	0.13	18	0.08	D	2
98.	$z\ {}^5\mathrm{G}^\circ - e\ {}^5\mathrm{F}$ (98)											
		4714.42	27261	48467	13	11	0.46	0.13	26	0.23	D	2
		4786.54	27580	48467	11	11	0.18	0.062	11	−0.17	D	2
		4900.97	28068	48467	9	11	0.0050	0.0022	0.32	−1.70	E	2
99.	$z\ {}^5\mathrm{G}^\circ - e\ {}^3\mathrm{G}$ (99)											
		4740.17	28068	49159	9	11	0.0034	0.0014	0.20	−1.90	E	2
		4633.03	27580	49159	11	11	7.7(−4)	2.5(−4)	0.042	−2.56	E	2
100.	$z\ {}^5\mathrm{F}^\circ - e\ {}^5\mathrm{F}$ (111)											
		5017.59	28542	48467	11	11	0.20	0.075	14	−0.08	D	2
		5157.99	29084	48467	9	11	0.0059	0.0029	0.44	−1.59	E	2
101.	$z\ {}^5\mathrm{F}^\circ - e\ {}^3\mathrm{G}$ (112)											
		4980.16	29084	49159	9	11	0.19	0.086	13	−0.11	D	2
102.	$z\ {}^5\mathrm{F}^\circ - e\ {}^3\mathrm{P}$											
		5262.83	30163	49159	5	5	5.7(−4)	2.4(−4)	0.021	−2.93	E	2

Ni I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
103.	$z\ {}^3P^\circ - e\ {}^3P$ (130)											
		4855.41	28569	49159	5	5	0.57	0.20	16	0.00	D	2
		5085.48	29501	49159	3	5	0.017	0.011	0.55	−1.48	E	2
104.	$z\ {}^3F^\circ - e\ {}^5F$ (141)											
		5265.75	29481	48467	9	11	0.0037	0.0019	0.29	−1.77	E	2
105.	$z\ {}^3F^\circ - e\ {}^3P$ (142)											
		5039.36	29321	49159	7	5	0.037	0.010	1.2	−1.15	E	2
106.	$z\ {}^3F^\circ - e\ {}^3G$ (143)											
		5080.52	29481	49159	9	11	0.32	0.15	23	0.13	D	2
107.	$z\ {}^3F^\circ - g\ {}^3F$ (150)											
		4009.98	29321	54251	7	7	0.0085	0.0020	0.19	−1.84	E	2
		4035.96	29481	54251	9	7	0.0048	9.1(−4)	0.11	−2.09	E	2
108.	$z\ {}^3D^\circ - e\ {}^3P$ (159)											
		5129.38	29669	49159	7	5	0.12	0.034	4.0	−0.63	D	2
		5187.86	29889	49159	5	5	0.0061	0.0025	0.21	−1.91	E	2
109.	$z\ {}^3G^\circ - e\ {}^3G$ (176)											
		5499.39	30980	49159	9	11	6.2(−4)	3.4(−4)	0.056	−2.51	E	2
110.	$z\ {}^3G^\circ - g\ {}^3F$ (178)											
		4295.89	30980	54251	9	7	0.17	0.037	4.7	−0.48	D	2
		4450.13	31786	54251	7	7	0.0081	0.0024	0.25	−1.77	E	2
111.	$z\ {}^1F^\circ - e\ {}^3P$ (189)											
		5514.80	31031	49159	7	5	0.0045	0.0015	0.19	−1.99	E	2
112.	$z\ {}^1D^\circ - e\ {}^3P$ (203)											
		5642.66	31442	49159	5	5	0.0040	0.0019	0.18	−2.02	E	2
113.	$z\ {}^1D^\circ - g\ {}^3F$											
		4382.87	31442	54251	5	7	0.015	0.0060	0.44	−1.52	E	2
114.	$y\ {}^3F^\circ - e\ {}^3P$ (227)											
		6230.12	33112	49159	7	5	0.019	0.0079	1.1	−1.26	E	2
115.	$y\ {}^3F^\circ - e\ {}^3G$ (228)											
		6176.81	32973	49159	9	11	0.047	0.033	6.0	−0.53	D	2

Ni I: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
116.	$y\ ^3F^o - g\ ^3F$ (235)											
		4729.29	33112	54251	7	7	0.027	0.0091	0.99	−1.20	E	2
		4698.41	32973	54251	9	7	0.062	0.016	2.2	−0.84	D	2
		4843.53	33611	54251	5	7	0.044	0.022	1.7	−0.97	D	2
117.	$y\ ^3D^o - e\ ^3P$ (246)											
		6384.70	33501	49159	7	5	0.024	0.010	1.5	−1.13	E	2
118.	$y\ ^3D^o - g\ ^3F$ (254)											
		4976.71	34163	54251	5	7	0.016	0.0083	0.68	−1.38	E	2
		4817.85	33501	54251	7	7	0.070	0.024	2.7	−0.77	D	2
119.	$z\ ^1G^o - e\ ^3G$ (258)											
		6421.51	33590	49159	9	11	0.0073	0.0055	1.0	−1.30	E	2
120.	$z\ ^1G^o - g\ ^3F$ (260)											
		4838.65	33590	54251	9	7	0.22	0.060	8.6	−0.27	D	2
121.	$y\ ^1F^o - g\ ^3F$											
		5371.33	35639	54251	7	7	0.16	0.069	8.6	−0.31	D	2
122.	$y\ ^1D^o - g\ ^3F$ (272)											
		5664.02	36601	54251	5	7	0.11	0.074	6.9	−0.43	D	2

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Ni II

Ground State $1s^22s^22p^63s^23p^63d^9\ ^2D_{5/2}$

Ionization Potential 18.168 eV = 146542 cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
2034.05	5	2175.15	3	2270.21	2	2387.76	9
2053.30	5	2184.61	3	2278.77	12	2394.52	10
2080.85	6	2188.05	2	2287.09	12	2410.74	8
2090.10	5	2201.41	3	2296.55	11	2412.27	1
2093.56	5	2206.72	3	2297.14	1	2413.04	9
2125.12	4	2210.38	3	2297.49	1	2416.13	10
2125.91	3	2216.48	2	2298.27	11	2433.56	9
2128.58	5	2220.40	13	2303.00	1	2437.89	9
2138.58	3	2222.96	2	2316.04	1	2510.87	8
2158.74	3	2224.36	11	2326.45	1	2545.90	8
2161.22	4	2224.86	2	2334.58	10	2630.27	7
2165.55	3	2226.33	2	2356.40	12		
2169.10	3	2253.85	2	2367.39	1		
2174.67	4	2264.46	2	2375.42	11		

For this spectrum we have chosen the experiment by Bell et al. [1], who determined relative oscillator strengths in emission with a wall-stabilized arc operated in argon and small admixtures of nickel carbonyl. All observations were performed photoelectrically, and digital data processing techniques were employed. Since the measured lines are located in the near ultraviolet, the intensity calibrations presented a special problem, which was solved by utilizing the continuous emission of a hydrogen arc operated at well-diagnosed plasma conditions.

Most of the plasma analysis by Bell et al. involves only the assumption of partial local thermodynamic equilibrium, which, according to general equilibrium criteria, is readily fulfilled. But in order to obtain the absolute scale for Ni II, they used a full thermodynamic equilibrium relation connecting the number densities of neutral and singly ionized nickel, i.e., the Saha equation. Since the equilibrium criteria and other tests indicated that complete equilibrium is only marginally achieved, this appears to be a questionable procedure. However, their experimental scale has found independent support from the recent calculations of Kurucz and Peytremann [2]. As shown earlier [3,4], the majority of these calculated data are in good agreement—i. e., normally within 50%—with reliable absolute scales for spectra of other iron group elements, although individual f-values from the Kurucz and Peytremann work have been found to be in error by factors of two or more. For the case of Ni II, the agreement between the experiment and calculation was particularly good: 58% of the data agreed within 25%, and 83% agreed within 50%, so that we decided to adopt this scale.

We did not utilize other recent experiments because of calibration problems and the larger inherent uncertainties in the photographic detection techniques applied. In the case of Heise's experiment [5], we noticed strong intensity dependent trends in the data in associated measurements on Ni I.

References

[1] Bell, G. D., Paquette, D. R., and Wiese, W. L., Astrophys. J. **143**, 559 (1966).

[2] Kurucz, R. L., and Peytremann, E., Smithsonian Astrophysical Observatory Special Report 362 (1975).

[3] Smith, P. L., Mon. Not. R. Astron. Soc. **177**, 275 (1976).

[4] Younger, S. M., Fuhr, J. R., Martin, G. A., and Wiese, W. L., J. Phys. Chem. Ref. Data **7**, 495 (1978).

[5] Heise, H., Astron. Astrophys. **34**, 275 (1974).

Ni II: Allowed transitions

No.	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at. u.)	log gf	Accuracy	Source
1.	$a\ ^4F - z\ ^4D^o$ (uv 11)											
		2316.04	8394	51558	10	8	4.9	0.32	24	0.50	D	1
		2303.00	9330	52738	8	6	4.7	0.28	17	0.35	D	1
		2297.14	10116	53635	6	4	4.6	0.24	11	0.16	D	1
		2297.49	10664	54176	4	2	5.3	0.21	6.3	−0.08	D	1
		2367.39	9330	51558	8	8	0.13	0.011	0.66	−1.07	D−	1
		2326.45	10664	53635	4	4	1.0	0.081	2.5	−0.49	D	1
		2412.27	10116	51558	6	8	0.0039	4.5(−4)^a	0.021	−2.57	E	1
2.	$a\ ^4F - z\ ^4G^o$ (uv 12)											
		2216.48	8394	53496	10	12	5.5	0.49	36	0.69	D	1
		2270.21	9330	53365	8	10	2.5	0.24	15	0.29	D	1
		2264.46	10116	54263	6	8	2.4	0.24	11	0.16	D	1
		2253.85	10664	55019	4	6	3.2	0.36	11	0.16	D	1
		2222.96	8394	53365	10	10	1.6	0.12	8.6	0.07	D	1
		2224.86	9330	54263	8	8	2.5	0.19	11	0.18	D	1
		2226.33	10116	55019	6	6	2.0	0.15	6.7	−0.04	D	1
		2188.05	9330	55019	8	6	0.090	0.0049	0.28	−1.41	D−	1
3.	$a\ ^4F - z\ ^4F^o$ (uv 13)	*2171.3*	*9355*	*55395*	28	28	4.9	0.35	70	0.99	D	1
		2165.55	8394	54557	10	10	3.8	0.27	19	0.43	D	1
		2169.10	9330	55418	8	8	2.3	0.16	9.4	0.12	D	1
		2175.15	10116	56075	6	6	2.8	0.20	8.6	0.08	D	1
		2184.61	10664	56424	4	4	4.7	0.34	9.7	0.13	D	1
		2125.91	8394	55418	10	8	0.073	0.0040	0.28	−1.40	D−	1
		2138.58	9330	56075	8	6	0.28	0.014	0.81	−0.94	D	1
		2158.74	10116	56424	6	4	0.57	0.026	1.1	−0.80	D	1
		2210.38	9330	54557	8	10	0.64	0.058	3.4	−0.33	D	1
		2206.72	10116	55418	6	8	2.5	0.24	11	0.16	D	1
		2201.41	10664	56075	4	6	2.1	0.23	6.6	−0.04	D	1

Ni II: Allowed transitions—Continued

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
4.	$a\,^4$F - $z\,^2$G° (uv 14)											
		2125.12	9330	56371	8	8	0.10	0.0070	0.39	−1.25	D−	1
		2174.67	9330	55300	8	10	2.4	0.21	12	0.23	D	1
		2161.22	10116	56371	6	8	0.32	0.030	1.3	−0.75	D	1
5.	$a\,^4$F - $z\,^2$F° (uv 15)											
		2053.30	8394	57081	10	8	0.041	0.0021	0.14	−1.68	D−	1
		2034.05	9330	58493	8	6	0.038	0.0018	0.095	−1.85	D−	1
		2093.56	9330	57081	8	8	0.11	0.0072	0.40	−1.24	D−	1
		2128.58	10116	57081	6	8	0.40	0.036	1.5	−0.66	D	1
		2090.10	10664	58493	4	6	0.11	0.011	0.31	−1.35	D−	1
6.	$a\,^4$F - $z\,^2$D° (uv 16)											
		2080.85	10664	58706	4	4	0.13	0.0085	0.23	−1.47	D−	1
7.	$a\,^2$F - $z\,^4$D° (uv 17)											
		2630.27	13550	51558	8	8	0.012	0.0012	0.083	−2.02	E	1
8.	$a\,^2$F - $z\,^4$G° (uv 18)											
		2510.87	13550	53365	8	10	0.94	0.11	7.4	−0.05	D	1
		2545.90	14996	54263	6	8	0.26	0.034	1.7	−0.69	D	1
		2410.74	13550	55019	8	6	0.018	0.0012	0.076	−2.02	E	1
9.	$a\,^2$F - $z\,^4$F° (uv 19)											
		2437.89	13550	54557	8	10	0.87	0.097	6.2	−0.11	D	1
		2387.76	13550	55418	8	8	0.23	0.020	1.2	−0.80	D	1
		2433.56	14996	56075	6	6	0.12	0.010	0.49	−1.21	D−	1
		2413.04	14996	56424	6	4	0.13	0.0076	0.36	−1.34	D−	1
10.	$a\,^2$F - $z\,^2$G° (uv 20)	*2402.8*	*14170*	*55776*	14	18	3.7	0.41	45	0.76	D	1
		2394.52	13550	55300	8	10	2.9	0.31	19	0.39	D	1
		2416.13	14996	56371	6	8	3.3	0.39	19	0.37	D	1
		2334.58	13550	56371	8	8	1.3	0.11	6.5	−0.07	D	1
11.	$a\,^2$F - $z\,^2$F° (uv 21)	*2297.3*	*14170*	*57686*	14	14	4.7	0.37	39	0.71	D	1
		2296.55	13550	57081	8	8	3.2	0.26	15	0.31	D	1
		2298.27	14996	58493	6	6	4.5	0.36	16	0.33	D	1
		2224.36	13550	58493	8	6	0.51	0.029	1.7	−0.64	D	1
		2375.42	14996	57081	6	8	1.1	0.12	5.8	−0.13	D	1
12.	$a\,^2$F - $z\,^2$D° (uv 22)	*2284.3*	*14170*	*57934*	14	10	4.9	0.28	29	0.59	D	1
		2278.77	13550	57420	8	6	4.5	0.26	16	0.32	D	1
		2287.09	14996	58706	6	4	4.5	0.24	11	0.15	D	1
		2356.40	14996	57420	6	6	0.45	0.037	1.7	−0.65	D	1
13.	$b\,^2$D - $y\,^2$F° (uv 28)											
		2220.40	23108	68131	6	8	3.7	0.36	16	0.34	D	1

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[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Ni III

Ground State	$1s^22s^22p^63s^23p^63d^8\ ^3F_4$
Ionization Potential	35.17 eV = 283700 cm^{-1}

Allowed Transitions

For this spectrum, we have chosen the calculations of Biemont [1] and of Kurucz and Peytremann [2]. Biemont obtained radial wavefunctions by means of the scaled Thomas-Fermi method and calculated individual line strengths in intermediate coupling. Similarly, Kurucz and Peytremann used a semiempirical scaled Thomas-Fermi-Dirac approach with very limited configuration interaction. Generally the agreement between refs. [1] and [2] was good, particularly for strong lines: 63% of the log gf-values for common lines agreed within ± 50 percent. In this compilation, we have included only those lines showing 50 percent or better agreement between refs. [1] and [2].

As in the case of Fe III, we were able to assess the reliability of Kurucz and Peytremann's (or Biemont's) absolute scale by comparing their theoretical branching ratios to beam-foil lifetime data of Andersen et al. [3]. This comparison supports the adopted scale: for the $z\ ^3G^o$ state (the only level measured by Andersen et al. for the inverse sum of the transition probabilities, $(\sum_i A_{ki})^{-1}$, taken from ref. [2] is only 17 percent higher than the corresponding beam-foil lifetime.

References

[1] Biemont, E., J. Quant. Spectrosc. Radiat. Transfer **16**, 137 (1976).

[2] Kurucz, R. L., and Peytremann, E., Smithsonian Astrophysical Observatory Special Report 362 (1975).

[3] Andersen, T., Petersen, P., and Biemont, E., J. Quant. Spectrosc. Radiat. Transfer **17**, 389 (1977).

Ni III: Allowed transitions

No.	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8 s^{-1})	f_{ik}	S(at. u.)	log gf	Accuracy	Source
1.	$a\ ^5F - z\ ^5F^o$ (uv 14)											
		1769.64	53704	110212	11	11	6.2	0.29	19	0.50	D	1,2
		1794.90	54658	110371	9	9	2.7	0.13	6.9	0.07	D	1,2
		1791.64	55406	111221	7	7	2.5	0.12	5.0	−0.08	D	1,2
		1786.93	55952	111914	5	5	2.5	0.12	3.5	−0.22	D	1,2
		1782.75	56308	112402	3	3	3.8	0.18	3.2	−0.27	D	1,2
2.	$a\ ^5F - z\ ^5D^o$ (uv 15)											
		1724.52	56308	114295	3	1	6.7	0.10	1.7	−0.52	D	1,2
3.	$a\ ^5F - z\ ^5G^o$ (uv 16)											
		1692.51	53704	112787	11	13	7.9	0.40	25	0.64	D	1,2
		1709.90	54658	113141	9	11	6.3	0.34	17	0.49	D	1,2
		1719.46	55952	114110	5	7	6.0	0.37	10	0.27	D	1,2
		1722.28	56308	114371	3	5	5.9	0.44	7.5	0.12	D	1,2
		[1666.6]	53704	113705	11	9	0.038	0.0013	0.078	−1.84	D	1,2
4.	$b\ ^3F - z\ ^3G^o$ (uv 19)											
		1854.15	61339	115273	9	11	5.4	0.34	19	0.49	D	1,2
		1849.54	62606	116675	7	9	5.3	0.35	15	0.39	D	1,2
5.	$b\ ^3F - z\ ^3F^o$ (uv 20)											
		1823.06	61339	116192	9	9	5.6	0.28	15	0.40	D	1,2
		1830.01	62606	117251	7	7	4.6	0.23	9.7	0.21	D	1,2
		1830.08	63473	118115	5	5	5.0	0.25	7.5	0.10	D	1,2
6.	$b\ ^3F - z\ ^3D^o$ (uv 21)											
		1741.96	61339	118746	9	7	5.7	0.20	10	0.26	D	1,2
		1752.43	62606	119670	7	5	5.5	0.18	7.3	0.10	D	1,2
		1760.56	63473	120273	5	3	6.5	0.18	5.2	0.05	D	1,2

Ni XI

Ground State $1s^22s^22p^63s^23p^6\ {}^1S_0$

Ionization Potential 321.2 eV = 2591000 cm^{-1}

Allowed Transitions

The line strength for the $3p^6$–$3p^53d$ resonance transition of this argon-like ion was taken from the superposition-of-configurations (SOC) calculations of Weiss [1], which are expected to be fairly accurate. The remainder of the oscillator strengths were interpolated from the Dirac-Hartree-Fock data of Lin et al. [2], who included correlation only in the lower state.

References

[1] Weiss, A. W., private communication.

[2] Lin, D. L., Fielder, W., Jr., and Armstrong, L., Jr., Phys. Rev. A **16**, 589 (1977).

Ni XI: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^{8}s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
1.	$3p^6$–$3p^53d$	^1S – $^1P^\circ$	148.402	0	673845	1	3	2340	2.31	1.13	0.364	C+	1
2.	$3p^6$– $3p^5(^2P^\circ_{3/2})4s$	^1S – $(3/2,1/2)^\circ$	78.744	0	1269900	1	3	610	0.17	0.044	−0.77	D	*interp.*
3.	$3p^6$– $3p^5(^2P^\circ_{1/2})4s$	^1S – $(1/2,1/2)^\circ$	77.393	0	1292100	1	3	850	0.23	0.059	−0.64	D	*interp.*
4.	$3p^6$– $3p^5(^2P^\circ_{3/2})4d$	^1S – $^2[3/2]^\circ$	63.641	0	1571300	1	3	2500	0.45	0.094	−0.35	D	*interp.*
5.	$3p^6$– $3p^5(^2P^\circ_{1/2})4d$	^1S – $^2[3/2]^\circ$	62.730	0	1594100	1	3	1200	0.22	0.045	−0.66	D	*interp.*

Ni XII

Ground State $1s^22s^22p^63s^23p^5\ {}^2P^\circ_{3/2}$

Ionization Potential [352.0] eV = [2839200] cm^{-1}

Allowed Transitions

Significant correlation effects and deviations from LS coupling in this chlorine-like ion make theoretical oscillator strengths for low-lying transitions somewhat uncertain (see, for example, the comments on Fe X). Nussbaumer [1] has calculated energy levels and oscillator strengths for many transitions by using a scaled Thomas-Fermi method with configuration interaction and relativistic effects. Corresponding data for Fe X are in good agreement with the semi-empirical calculations of Bromage et al. [2].

References

[1] Nussbaumer, H., Astron. Astrophys. **48**, 93 (1976).

[2] Bromage, G. E., Cowan, R. D., and Fawcett, B. C., Phys. Scr. **15**, 177 (1977).

Ni XII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$3s^23p^5-3s3p^6$	^{2}P° - ^{2}S											
						4	2		0.035		−0.85	E	1
						2	2		0.034		−1.17	E	1
2.	$3p^5-3p^4(^1D)3d$	^{2}P° - ^{2}S	*162.60*	*7840*	622843	6	2	1900	0.25	0.80	0.17	D	1
			160.554	0	622843	4	2	1400	0.28	0.59	0.05	D	1
			166.88	23519	622843	2	2	460	0.19	0.21	−0.42	D	1
3.	$3p^5-3p^4(^3P)3d$	^{2}P° - ^{2}P	*155.36*	*7840*	*651488*	6	6	1900	0.68	2.1	0.61	E	1
			154.175	0	648614	4	4	1900	0.67	1.4	0.43	E	1
			157.798	23519	657237	2	2	1300	0.50	0.52	0.00	E	1
			152.152	0	657237	4	2	480	0.084	0.17	−0.47	E	1
			159.975	23519	648614	2	4	14	0.011	0.012	−1.66	E	1
4.		^{2}P° - ^{2}D	*152.20*	*7840*	*664890*	6	10	2200	1.3	3.9	0.89	D	1
			152.153	0	657233	4	6	2300	1.2	2.4	0.68	D	1
			153.174	23519	676375	2	4	2100	1.5	1.5	0.48	D	1
			147.847	0	676375	4	4	43	0.014	0.027	−1.25	D	1

Ni XIII

Ground State $1s^22s^22p^63s^23p^4\ ^3P_2$

Ionization Potential [384.0] eV = [3097300] cm^{-1}

Allowed Transitions

The oscillator strength for one $3p-3d$ transition of this highly ionized member of the sulfur sequence is from the statistical Hartree-Fock calculations of Fawcett et al. [1]. We felt that to extrapolate f-values for additional transitions would be rather risky, in view of correlation effects and deviations from *LS* coupling (see, for example, the comments on Fe XI).

Reference

[1] Fawcett, B. C., Peacock, N. J., and Cowan, R. D., J. Phys. B 1, 295 (1968).

Ni XIII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$3p^4-3p^3(^2D^\circ)3d$	^{1}D - ^{1}F°	157.55	46984	681700	5	7	2100	1.1	2.9	0.74	D	1

Ni XIV

Ground State $1s^22s^22p^63s^23p^3\ ^4S^\circ_{3/2}$

Ionization Potential [426] eV = [3436000] cm^{-1}

Allowed Transitions

The single oscillator strength available for this highly ionized member of the P sequence is from a Hartree-Fock-Slater calculation [1]. (For additional comments on this sequence, see Fe XII.)

Reference

[1] Fawcett, B. C. Peacock, N. J., and Cowan, R. D., J. Phys. B 1, 295 (1968).

Ni XIV: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^{8}s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
1.	$3p^3$-$3p^2(^3P)3d$	$^2D^o$ - ^2F											
			164.146			6	8	1500	0.83	2.7	0.70	D	1

Ni XV

Ground State $1s^22s^22p^63s^23p^2\ ^3P_0$

Ionization Potential [461] eV = [3718000] cm^{-1}

Allowed Transitions

The f-values for the transitions presented here were interpolated from results of the multiconfiguration calculations of Kastner et al. [1] for some Si-like ions.

Reference

[1] Kastner, S. O., Swartz, M., Bhatia, A. K., and Lapides, J., J. Opt. Soc. Am. **68**, 1558 (1978).

Ni XV: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^{8}s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
1.	$3p^2$-$3p4d$	^1D - $^1F^o$	50.249	[62871]	[2053000]	5	7	6400	0.34	0.28	0.23	E	*interp.*
2.	$3p3d$-$3p4f$	$^3F^o$ - ^3G											
			60.890			9	11	1.0(+4)[a]	0.70	1.3	0.80	D	*interp.*
3.		$^3P^o$ - ^3D											
			62.369?			1	3	3900	0.69	0.14	−0.16	D	*interp.*
4.		$^1F^o$ - ^1G	64.635	[638480]	[2185600]	7	9	9800	0.79	1.2	0.74	D	*interp.*
5.		$^1P^o$ - ^1D	65.415			3	5	5900	0.63	0.41	0.28	D	*interp.*

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Ni XVI

Ground State $1s^22s^22p^63s^23p\ ^2P^o_{1/2}$

Ionization Potential [496.0] eV = [4000600] cm^{-1}

Allowed Transitions

Oscillator strengths for multiplets 1, 4, and 11 were interpolated from the multiconfiguration Hartree-Fock calculations of Froese Fischer [1,2]. The remainder of the data were interpolated from the superposition-of-configurations calculations of Weiss [3]. Significant correlation effects and level crossings introduce uncertainties into the interpolation procedure; the accuracy ratings assigned to the pertinent transitions have been lowered accordingly.

References

[1] Froese Fischer, C., Can. J. Phys. **54**, 740 (1976).
[2] Froese Fischer, C., Can. J. Phys. **56**, 983 (1978).
[3] Weiss, A. W., *Beam-Foil Spectroscopy*, Vol. 1, 51–68 (Eds. Sellin, I. A., and Pegg, D. J., Plenum Press, New York, 1976) and private communication.

Ni XVI: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$3s^23p-3s3p^2$	$^2P^o - ^2D$				6	10		0.061		−0.44	E	*interp.*
2.	$3s3p(^1P^o)3d-$ $3p^2(^1D)3d$	$^2P^o - ^2S$				6	2		0.031		−0.73	E	*interp.*
3.	$3s3p^2-3s^24p$	$^2D - ^2P^o$				10	6		0.016		−0.80	C	*interp.*
4.	$3p-3d$	$^2P^o - ^2D$	*191.1*	*18500*	*541900*	6	10	460	0.42	1.6	0.40	C	*interp.*
			194.04	27800	543200	4	6	440	0.38	0.96	0.18	C	*ls*
			185.23	0	539870	2	4	420	0.43	0.53	−0.06	C	*ls*
			[195.3]	27800	539870	4	4	75	0.043	0.11	−0.77	D	*ls*
5.	$3s3p(^3P^o)3d-$ $3s3d^2$	$^2P^o - ^2S$				6	2		0.098		−0.23	D	*interp.*
6.	$3s3p(^1P^o)3d-$ $3s3d^2$	$^2P^o - ^2S$				6	2		0.10		−0.22	D	*interp.*
7.	$3p^3-3p^2(^1D)3d$	$^2P^o - ^2S$				6	2		0.079		−0.32	C	*interp.*
8.	$3p-4s$	$^2P^o - ^2S$				6	2		0.060		−0.44	D	*interp.*
9.	$3p-4d$	$^2P^o - ^2D$	*47.576*	*18500*	*2120400*	6	10	5700	0.32	0.30	0.28	C	*interp.*
			47.772	27800	2121100	4	6	5600	0.29	0.18	0.06	C	*ls*
			47.184	0	2119400	2	4	4800	0.32	0.10	−0.19	C	*ls*
			[47.810]	27800	2119400	4	4	930	0.032	0.020	−0.90	D	*ls*
10.	$3d-4p$	$^2D - ^2P^o$				10	6		0.025		−0.60	C	*interp.*
11.	$4s-4p$	$^2S - ^2P^o$				2	6		0.44		−0.06	D	*interp.*

Ni XVII

Ground State	$1s^22s^22p^63s^2\ ^1S_0$
Ionization Potential	[570] eV = [4597000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
30.919	11	55.511	24	197.39	12	249.180	2
42.840	10	55.606	23	199.87	12	251.97	3
50.958	18	55.887	22	200.53	12	263.6	3
54.384	20	55.933	22	207.50	12	266.15	3
54.451	19	57.348	21	208.66	12	269.44	3
54.628	19	57.573	25	209.38	12	281.50	3
55.361	24	57.579	17	215.89	14	285.66	3

Oscillator strengths for the $3s^2$ ^{1}S–$3snp$ ^{1}P° ($n = 3$–5) transitions are the results of the relativistic random phase approximation (RRPA) calculations of Shorer et al. [1].

Data for the remaining transitions in this high ion of the Mg sequence have been interpolated from the results of several theoretical calculations: the relativistic multiconfiguration Hartree-Fock (MCHF) approach of Cheng and Johnson [2]; the superposition-of-configurations (SOC) method of Weiss [3] in intermediate coupling, including relativistic corrections to the energy levels; the nonrelativistic MCHF calculations of Froese Fischer [4]; and the multiconfiguration results of Kastner et al. [5] in intermediate coupling.

Weiss did not calculate line strengths for the transition in Mg-like ions. Thus we have converted f-values interpolated from his results for the remaining lines of the multiplet to line strengths, and then estimated the strength of this missing line to be in proportion to its strength in a pure LS-coupled multiplet. The resulting multiplet strength is in very good agreement with the Z-expansion results of Crossley and Dalgarno [6], whose result for the corresponding multiplet in Fe XV agrees with our tabulated value (derived from the results of rather accurate calculations) for the Fe ion multiplet to within 5%. We have nevertheless been conservative in our accuracy rating for this particular transition.

References

[1] Shorer, P., Lin, C. D., and Johnson, W. R., Phys. Rev. A **16**, 1109 (1977).

[2] Cheng, K. T., and Johnson, W. R., Phys. Rev. A **16**, 263 (1977).

[3] Weiss, A. W., private communication.

[4] Froese Fischer, C., J. Opt. Soc. Am. **69**, 118 (1979).

[5] Kastner, S. O., Swartz, M., Bhatia, A. K., and Lapides, J., J. Opt. Soc. Am. **68**, 1558 (1978).

[6] Crossley, R. J. S., and Dalgarno, A., Proc. R. Soc. London, Ser. A **286**, 510 (1965).

Ni XVII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
1.	$3s^2$–$3s3p$	^{1}S – ^{3}P°											
						1	3		0.0055		−2.26	D−	*interp.*
2.		^{1}S – ^{1}P°	249.180	0	401316	1	3	280	0.77	0.63	−0.11	C	1
3.	$3s3p$–$3p^2$	^{3}P° – ^{3}P	*268.2*			9	9	215	0.232	1.84	0.319	C	*interp.*
			266.15			5	5	153	0.162	0.71	−0.092	C	*interp.*
			269.44			3	3	60	0.065	0.17	−0.71	C	*interp.*
			285.66			5	3	84	0.062	0.29	−0.51	C	*interp.*
			281.50			3	1	210	0.083	0.23	−0.60	C	*interp.*
			251.97			3	5	54	0.085	0.21	−0.59	C	*interp.*
			263.6			1	3	86	0.270	0.234	−0.57	C	*interp.*
4.		^{3}P° – ^{1}D											
						5	5		0.034		−0.77	D	*interp.*
						3	5		0.032		−1.02	D	*interp.*
5.		^{1}P° – ^{3}P											
						3	5		0.025		−1.12	D−	*interp.*
6.		^{1}P° – ^{1}D				3	5	18	0.078	0.32	−0.63	C	*interp.*
7.		^{1}P° – ^{1}S				3	1		0.097		−0.54	C	*interp.*
8.	$3s3d$–$3p3d$	^{3}D – ^{3}F°				15	21		0.140		0.322	C	*interp.*
9.		^{1}D – ^{1}F°				5	7		0.347		0.239	C	*interp.*
10.	$3s^2$–$3s4p$	^{1}S – ^{1}P°	42.840	0	2334300	1	3	4750	0.392	0.055	−0.407	C	1
11.	$3s^2$–$3s5p$	^{1}S – ^{1}P°	30.919	0	3234300	1	3	2770	0.119	0.0121	−0.92	C	1
12.	$3s3p$–$3s3d$	^{3}P° – ^{3}D	*203.91*			9	15	270	0.28	1.7	0.40	D	*interp.*, *ls*
			207.50			5	7	260	0.23	0.79	0.06	D	*ls*
			199.87			3	5	213	0.213	0.420	−0.194	C	*interp.*
			197.39			1	3	165	0.290	0.188	−0.54	C	*interp.*
			208.66			5	5	64	0.0418	0.144	−0.68	C	*interp.*
			200.53			3	3	120	0.070	0.14	−0.68	C	*interp.*
			[209.38]			5	3	6.8	0.0027	0.0093	−1.87	D	*interp.*

Ni XVII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
13.		$^1P^o - {}^3D$											
						3	5		3.3(−4)[a]		−3.00	D	*interp.*
14.		$^1P^o - {}^1D$	215.89	401316	864520	3	5	460	0.53	1.1	0.20	D	*interp.*
15.	$3p^2$–$3p3d$	$^1D - {}^1F^o$				5	7		0.204		0.009	C	*interp.*
16.	$3s3d$–$3s4f$	$^3D - {}^3F^o$				15	21		0.91		1.14	C	*interp.*
17.		$^1D - {}^1F^o$	57.579	864520	2601200	5	7	9900	0.69	0.65	0.54	C	*interp.*
18.	$3p^2$–$3s4f$	$^1D - {}^1F^o$	50.958			5	7	4000	0.22	0.18	0.04	D	*interp.*
19.	$3p3d$–$3p4f$	$^3F^o - {}^3G$											
			54.451			9	11	1.5(+4)	0.81	1.3	0.86	C	*interp.*
			54.628			7	9	1.1(+4)	0.63	0.79	0.64	D	*interp.*
20.		$^3F^o - {}^3F$											
			54.384			7	9	3000	0.17	0.21	0.08	D	*interp.*
21.		$^1F^o - {}^1G$	57.348			7	9	1.4(+4)	0.89	1.2	0.79	C	*interp.*
22.		$^3D^o - {}^3F$											
			55.887			7	9	9000	0.54	0.70	0.58	D	*interp.*
			55.933			3	5	1.1(+4)	0.85	0.47	0.41	C	*interp.*
23.		$^3D^o - {}^3D$											
			55.606			5	7	8200	0.53	0.49	0.42	D	*interp.*
24.		$^3P^o - {}^3D$											
			55.511			3	5	7400	0.57	0.31	0.23	C	*interp.*
			55.361			1	3	6700	0.92	0.17	−0.04	C	*interp.*
			55.361			3	3	6700	0.31	0.17	−0.03	C	*interp.*
25.		$^1P^o - {}^1D$	57.573?			3	5	1.1(+4)	0.94	0.53	0.45	C	*interp.*

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Ni XVIII

Ground State $1s^22s^22p^63s\ ^2S_{1/2}$

Ionization Potential 607.2 eV = 4897400 cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
29.779	3	31.891	14	32.493	13	33.95	7
29.829	3	32.034	8	32.534	13	36.990	12
31.845	14	32.340	8	32.541	13	37.049	12
31.890	14	32.351	8	33.60	7	37.052	12

List of tabulated lines—Continued

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
38.574	11	59.793	9	116	18	594.5	17
38.641	11	59.950	9	118	18	613.3	17
38.659	11	60.212	9	130.9	21	640.2	17
41.015	2	76.243	23	131.3	21	732.6	15
41.218	2	76.365	23	131.9	21	803.2	15
43.814	6	76.371	23	211.7	26	1230	25
44.365	6	94.652	16	212.1	26	1310	25
44.405	6	95.166	16	212.2	26	1320	25
50.253	5	99.256	19	220.41	4	1390	20
51.042	5	100.4	19	233.79	4	1420	20
52.615	10	100.5	19	236.36	4	1430	20,24
52.720	10	114.3	22	292.00	1	1550	24
52.743	10	114.6	22	320.56	1		

Oscillator strengths for individual lines of multiplets of the type $nl\ ^2L - n'l'\ ^2L'$ $(n, n' = 3,4)$ were interpolated from the relativistic single-configuration Hartree Fock results of Kim and Cheng [1] for selected ions of the Na isoelectronic sequence. Numerous multiplet f-values have been calculated by Tull et al. [2] in the frozen-core Hartree-Fock approximation, including relativistic corrections to the energy levels; of these, we quote the results for the lower-lying transitions out of the $n = 3$, 4, and 5 shells.

Froese Fischer [3] has parametrized the non-relativistic Hartree-Fock data of Biemont for many transitions of the Na sequence. Oscillator strengths for the $3s_{1/2}$–$3p_{1/2,3/2}$ and $3p_{3/2}$–$3d_{5/2}$ transitions derived by Pegg et al. [4] from beam-foil lifetimes are in very good agreement with the values tabulated here.

References

[1] Kim, Y.-K., and Cheng, K. -t., J. Opt. Soc. Am. **68**, 836 (1978).

[2] Tull, C. E., McEachran, R. P., and Cohen, M., At. Data **3**, 169 (1971).

[3] Froese Fischer, C., Phys. Scr. **14**, 269 (1976).

[4] Pegg, D. J., Griffin, P. M., Johnson, B. M., Jones, K. W., and Kruse, T. H., Astrophys. J. **224**, 1056 (1978).

Ni XVIII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$3s$–$3p$	^{2}S – ^{2}P°	*300.93*	0	*332300*	2	6	90	0.37	0.73	−0.13	C	*interp.*
			292.00	0	342470	2	4	99	0.252	0.484	−0.298	C	*interp.*
			320.56	0	311950	2	2	74	0.114	0.241	−0.64	C	*interp.*
2.	$3s$–$4p$	^{2}S – ^{2}P°	*41.083*	0	*2434100*	2	6	3000	0.23	0.062	−0.34	C	*interp.*
			41.015	0	2438100	2	4	2930	0.148	0.0400	−0.53	C	*interp.*
			41.218	0	2426100	2	2	3200	0.082	0.022	−0.79	C	*interp.*
3.	$3s$–$5p$	^{2}S – ^{2}P°	*29.796*	0	*3356200*	2	6	1850	0.0739	0.0145	−0.830	C+	2
			29.779	0	3358100	2	4	1900	0.049	0.0097	−1.00	C	*ls*
			29.829	0	3352400	2	2	1900	0.025	0.0050	−1.29	D	*ls*
4.	$3p$–$3d$	^{2}P° – ^{2}D	*229.32*	*332300*	*768380*	6	10	195	0.256	1.16	0.187	C	*interp.*
			233.79	342470	770200	4	6	182	0.224	0.69	−0.048	C	*interp.*
			220.41	311950	765650	2	4	187	0.273	0.396	−0.263	C	*interp.*
			236.36	342470	765650	4	4	30.0	0.0251	0.078	−1.00	C	*interp.*
5.	$3p$–$4s$	^{2}P° – ^{2}S	*50.779*	*332300*	2301600	6	2	4900	0.063	0.063	−0.42	D	*interp.*
			51.042	342470	2301600	4	2	3300	0.064	0.043	−0.59	D	*interp.*
			50.253	311950	2301600	2	2	1600	0.059	0.020	−0.93	C	*interp.*
6.	$3p$–$4d$	^{2}P° – ^{2}D	*44.183*	*332300*	*2595600*	6	10	7000	0.339	0.296	0.309	C−	*interp.*
			44.365	342470	2596500	4	6	7000	0.310	0.181	0.093	C	*interp.*
			43.814	311950	2594300	2	4	5700	0.33	0.095	−0.18	D	*interp.*
			44.405	342470	2594300	4	4	1160	0.0344	0.0201	−0.86	C	*interp.*

Ni XVIII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
7.	$3p$–$5s$	$^2\mathrm{P}^\circ - {}^2\mathrm{S}$	*33.83*	*332300*	[3288000]	6	2	2080	0.0119	0.00795	−1.146	C+	2
			[33.95]	342470	[3288000]	4	2	1400	0.012	0.0053	−1.32	C	*ls*
			[33.60]	311950	[3288000]	2	2	710	0.0120	0.00265	−1.62	C	*ls*
8.	$3p$–$5d$	$^2\mathrm{P}^\circ - {}^2\mathrm{D}$	*32.238*	*332300*	*3434200*	6	10	4000	0.104	0.0662	−0.205	C+	2
			32.340	342470	3434600	4	6	3960	0.093	0.0397	−0.428	C	*ls*
			32.034	311950	3433600	2	4	3410	0.105	0.0221	−0.68	C	*ls*
			[32.351]	342470	3433600	4	4	660	0.010	0.0044	−1.38	D	*ls*
9.	$3d$–$4p$	$^2\mathrm{D} - {}^2\mathrm{P}^\circ$	*60.034*	*768380*	*2434100*	10	6	1100	0.036	0.071	−0.44	D	*interp.*
			59.950	770200	2438100	6	4	970	0.0349	0.0413	−0.68	C	*interp.*
			60.212	765650	2426100	4	2	1200	0.032	0.025	−0.89	D	*interp.*
			[59.793]	765650	2438100	4	4	110	0.0057	0.0045	−1.64	D	*interp.*
10.	$3d$–$4f$	$^2\mathrm{D} - {}^2\mathrm{F}^\circ$	*52.678*	*768380*	*2666700*	10	14	1.60(+4)[a]	0.93	1.62	0.97	C−	*interp.*
			52.720	770200	2667000	6	8	1.6(+4)	0.89	0.93	0.73	C	*interp.*
			52.615	765650	2666200	4	6	1.5(+4)	0.93	0.64	0.57	C−	*interp.*
			[52.743]	770200	2666200	6	6	1070	0.0448	0.0467	−0.57	C	*interp.*
11.	$3d$–$5p$	$^2\mathrm{D} - {}^2\mathrm{P}^\circ$	*38.643*	*768380*	*3356200*	10	6	420	0.0057	0.0073	−1.24	D	2
			[38.641]	770200	3358100	6	4	390	0.0058	0.0044	−1.46	D	*ls*
			[38.659]	765650	3352400	4	2	420	0.0047	0.0024	−1.72	D	*ls*
			[38.574]	765650	3358100	4	4	43	9.6(−4)	4.9(−4)	−2.41	E	*ls*
12.	$3d$–$5f$	$^2\mathrm{D} - {}^2\mathrm{F}^\circ$	*37.026*	*768380*	*3469200*	10	14	5910	0.170	0.207	0.230	C+	2
			37.049	770200	3469300	6	8	5900	0.161	0.118	−0.014	C	*ls*
			36.990	765650	3469100	4	6	5500	0.170	0.083	−0.017	C	*ls*
			[37.052]	770200	3469100	6	6	390	0.0081	0.0059	−1.32	D	*ls*
13.	$3d$–$6p$	$^2\mathrm{D} - {}^2\mathrm{P}^\circ$	*32.536*	*768380*	*3841900*	10	6	220	0.0021	0.0022	−1.68	D	2
			[32.541]	770200	3843200	6	4	190	0.0020	0.0013	−1.92	D	*ls*
			[32.534]	765650	3839400	4	2	210	0.0017	7.3(−4)	−2.17	D	*ls*
			[32.493]	765650	3843200	4	4	22	3.5(−4)	1.5(−4)	−2.85	E	*ls*
14.	$3d$–$6f$	$^2\mathrm{D} - {}^2\mathrm{F}^\circ$	*31.871*	*768380*	*3906000*	10	14	2940	0.0626	0.0657	−0.203	C+	2
			31.890	770200	3906000	6	8	2930	0.060	0.0375	−0.447	C	*ls*
			31.845	765650	3905900	4	6	2750	0.063	0.0263	−0.60	C	*ls*
			[31.891]	770200	3905900	6	6	200	0.0030	0.0019	−1.74	D	*ls*
15.	$4s$–$4p$	$^2\mathrm{S} - {}^2\mathrm{P}^\circ$	*754.7*	2301600	*2434100*	2	6	21	0.54	2.7	0.04	D	*interp.*
			[732.6]	2301600	2438100	2	4	23	0.37	1.8	−0.13	D	*interp.*
			[803.2]	2301600	2426100	2	2	17.3	0.167	0.88	−0.476	C	*interp.*
16.	$4s$–$5p$	$^2\mathrm{S} - {}^2\mathrm{P}^\circ$	*94.823*	2301600	*3356200*	2	6	655	0.265	0.165	−0.276	C+	2
			[94.652]	2301600	3358100	2	4	660	0.177	0.110	−0.452	C	*ls*
			[95.166]	2301600	3352400	2	2	650	0.088	0.055	−0.76	D	*ls*
17.	$4p$–$4d$	$^2\mathrm{P}^\circ - {}^2\mathrm{D}$	*619.2*	*2434100*	*2595600*	6	10	42.3	0.406	4.96	0.386	C	*interp.*
			[613.3]	2438100	2596500	4	6	39.7	0.356	2.96	0.154	C	*interp.*
			[594.5]	2426100	2594300	2	4	40.1	0.425	1.66	−0.071	C	*interp.*
			[640.2]	2438100	2594300	4	4	6.5	0.0397	0.335	−0.80	C	*interp.*

Ni XVIII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8 s^{-1})	f_{ik}	S (at.u.)	log gf	Accu-racy	Source
18.	4p–5s	^{2}P° – ^{2}S	*117*	*2434100*	[3288000]	6	2	1480	0.101	0.233	−0.218	C+	2
			[118]	2438100	[3288000]	4	2	960	0.100	0.155	−0.399	C	*ls*
			[116]	2426100	[3288000]	2	2	510	0.10	0.078	−0.69	C	*ls*
19.	4p–5d	^{2}P° – ^{2}D	*99.990*	*2434100*	*3434200*	6	10	1200	0.301	0.594	0.257	C+	2
			[100.4]	2438100	3434600	4	6	1190	0.269	0.356	0.032	C	*ls*
			[99.256]	2426100	3433600	2	4	1030	0.303	0.198	−0.218	C	*ls*
			[100.5]	2438100	3433600	4	4	200	0.030	0.040	−0.92	D	*ls*
20.	4d–4f	^{2}D – ^{2}F°	*1410*	*2595600*	*2666700*	10	14	2.4	0.099	4.6	−0.00	C	*interp.*
			[1420]	2596500	2667000	6	8	2.3	0.094	2.6	−0.25	C	*interp.*
			[1390]	2594300	2666200	4	6	2.32	0.101	1.85	−0.394	C	*interp.*
			[1430]	2596500	2666200	6	6	0.16	0.0048	0.14	−1.54	D	*interp.*
21.	4d–5p	^{2}D – ^{2}P°	*131.5*	*2595600*	*3356200*	10	6	513	0.0798	0.345	−0.098	C+	2
			[131.3]	2596500	3358100	6	4	463	0.080	0.207	−0.320	C	*ls*
			[131.9]	2594300	3352400	4	2	510	0.066	0.115	−0.58	C	*ls*
			[130.9]	2594300	3358100	4	4	52	0.013	0.023	−1.27	D	*ls*
22.	4d–5f	^{2}D – ^{2}F°	*114.5*	*2595600*	*3469200*	10	14	2680	0.737	2.78	0.867	C+	2
			[114.6]	2596500	3469300	6	8	2680	0.70	1.59	0.62	C	*ls*
			[114.3]	2594300	3469100	4	6	2510	0.74	1.11	0.470	C	*ls*
			[114.6]	2596500	3469100	6	6	180	0.035	0.079	−0.68	D	*ls*
23.	4d–6f	^{2}D – ^{2}F°	*76.313*	*2595600*	*3906000*	10	14	1470	0.180	0.452	0.255	C+	2
			[76.365]	2596500	3906000	6	8	1470	0.171	0.258	0.011	C	*ls*
			[76.243]	2594300	3905900	4	6	1380	0.180	0.181	−0.142	C	*ls*
			[76.371]	2596500	3905900	6	6	99	0.0086	0.013	−1.29	D	*ls*
24.	5s–5p	^{2}S – ^{2}P°	*1470*	[3288000]	*3356200*	2	6	6.61	0.642	6.21	0.109	C+	2
			[1430]	[3288000]	3358100	2	4	7.2	0.440	4.14	−0.056	C	*ls*
			[1550]	[3288000]	3352400	2	2	5.7	0.21	2.1	−0.39	D	*ls*
25.	5p–5d	^{2}P° – ^{2}D	*1280*	*3356200*	*3434200*	6	10	12.8	0.526	13.3	0.499	C+	2
			[1310]	3358100	3434600	4	6	12	0.46	8.0	0.27	C	*ls*
			[1230]	3352400	3433600	2	4	12.1	0.55	4.43	0.039	C	*ls*
			[1320]	3358100	3433600	4	4	2.0	0.051	0.89	−0.69	D	*ls*
26.	5d–6f	^{2}D – ^{2}F°	*212.0*	*3434200*	*3906000*	10	14	699	0.659	4.60	0.819	C+	2
			[212.1]	3434600	3906000	6	8	700	0.63	2.63	0.58	C	*ls*
			[211.7]	3433600	3905900	4	6	650	0.66	1.84	0.422	C	*ls*
			[212.2]	3434600	3905900	6	6	46	0.031	0.13	−0.73	D	*ls*

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Ni XIX

Ground State $1s^22s^22p^6\ ^1S_0$

Ionization Potential $1546.9\ \text{eV} = 12477000\ \text{cm}^{-1}$

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.
8.725	52
8.838	51
9.130	48
9.236	47
9.3	33,34
9.97	44
10.102	43
10.2	42
10.306	41
10.417	40
11.522	32
11.582	31
12.436	39
12.659	38
12.805	37
13.776	36
14.037	35
38.3	99
39.0	65
39.1	64
39.3	64,107
40.0	67
40.2	66
40.4	98
40.5	97,112
40.7	97
40.9	103
41.0	100,102,111
41.1	105
41.13	101
41.2	100,103
41.5	104,109
41.6	101,114,115
41.7	109,114
41.8	106
41.9	106,108
42.0	106
42.3	109
42.6	86,92
43.4	110,117
44.2	113
44.4	100
45.2	88,92
45.3	86
45.8	89,93
45.9	95
46.0	116
46.4	87
46.6	87,93
46.7	90
46.9	94
47.0	88
49.5	91
50.0	90
52.9	118
53.1	96,118
54.1	120
54.6	119
85.5	5
86.4	2
86.7	13
87.2	15
87.6	5
88.0	5
89.3	12
89.4	17
89.5	6
89.6	1
90.0	6
90.2	8
90.3	12
90.4	14
90.5	24
90.6	24
90.7	12,29
91.1	28,30
91.2	14,27
91.6	7,26
92.3	28
92.8	16
92.9	7
93.2	16
93.6	16
97.6	4
100.0	19
100.7	21
102.4	9
102.9	9
103.6	3
103.7	10
104.2	26
104.4	26
104.6	25
104.7	14
104.9	18
105.4	18
105.7	18,20
106.2	20
106.8	6
106.9	10
107.9	23
114.2	22
114.6	22
123.0	11
179.7	57
185.9	74
198.2	77
221.4	56,69
226.6	83
232.9	68
236.2	62
237.2	72
242.8	72
244.0	68
244.5	78
246.6	71
250.4	68,70
252.5	85
254.6	82
255.6	76
256.1	82
259.5	76
260.2	81
261.4	73
264.2	71
265.0	80
267.8	71
271.6	79
272.7	82
274.1	55
285.2	75
289.7	84
293.0	84
295.1	75
301.9	75
308.1	55
326.1	58
332.4	61
333.8	63
335.4	54
338.3	58
346.6	55
362.4	54
368.6	63
369.0	60
375.5	63
384.7	60
406.6	53
431.5	59
503.4	70

Transition probabilities for the majority of the lines of this neon-like ion were taken from the results of the scaled Thomas-Fermi approach of Loulergue and Nussbaumer [1], which allows for extensive configuration interaction as well as spin-orbit coupling. Oscillator strengths for the resonance transitions to $J = 1$ levels of the configuration $2p^53s$ and $2p^53d$ were interpolated from the results the multiconfiguration relativistic random phase approximation (RRPA) calculations of Shorer [2] for several ions of the Ne isoelectronic sequence. Results of the model potential calculations of Crance [3] have been tabulated for resonance transitions to $2p^5ns$ and $2p^5nd$ ($n = 5,6$).

References

[1] Loulergue, M., and Nussbaumer, H., Astron. Astrophys. **45**, 125 (1975).
[2] Shorer, P., Phys. Rev. A **20**, 642 (1979).
[3] Crance, M., At. Data **5**, 185 (1973).

Ni XIX: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$2s^22p^5(^2P^o_{3/2})3s-2s2p^63s$	$(3/2,1/2)^o-{}^3S$											
			[89.6]			5	3	850	0.061	0.091	−0.51	C	1
2.		$(3/2,1/2)^o-{}^1S$											
			[86.4]			3	1	600	0.022	0.019	−1.17	C	1
3.	$2s^22p^5(^2P^o_{1/2})3s-2s2p^63s$	$(1/2,1/2)^o-{}^3S$											
			[103.6]			3	3	200	0.032	0.033	−1.02	C	1
4.		$(1/2,1/2)^o-{}^1S$											
			[97.6]			3	1	300	0.014	0.014	−1.37	C	1
5.	$2s^22p^53p-2s2p^63p$	$^3S-{}^3P^o$	*86.5*			3	9	110	0.039	0.033	−0.94	C	1
			[85.5]			3	5	21	0.0038	0.0032	−1.94	C	1
			[87.6]			3	3	130	0.015	0.013	−1.35	C	1
			[88.0]			3	1	510	0.020	0.017	−1.23	C	1
6.		$^3D-{}^3P^o$											
			[89.5]			7	5	710	0.061	0.13	−0.37	C	1
			[90.0]			5	3	760	0.055	0.082	−0.56	C	1
			[106.8]			3	1	15	8.6(−4)[a]	9.0(−4)	−2.59	D	1
7.		$^3P-{}^3P^o$											
			[91.6]			5	5	190	0.024	0.036	−0.92	C	1
			[92.9]			3	1	370	0.016	0.015	−1.32	C	1
8.		$^3P-{}^1P^o$											
			[90.2]			5	3	350	0.026	0.038	−0.89	C	1
9.		$^1P-{}^3P^o$											
			[102.4]			3	3	200	0.031	0.032	−1.03	C	1
			[102.9]			3	1	320	0.017	0.017	−1.29	C	1
10.		$^1D-{}^3P^o$											
			[103.7]			5	5	160	0.026	0.044	−0.89	C	1
			[106.9]			5	3	7.2	7.4(−4)	0.0013	−2.43	D	1
11.		$^1S-{}^3P^o$											
			[123.0]			1	3	42	0.029	*0.012*	*−1.54*	C	*1*
12.	$2s^22p^53d-2s2p^63d$	$^3P^o-{}^3D$											
			[90.3]			5	7	30	*0.0051*	*0.0076*	*−1.59*	*D*	*1*
			[90.7]			5	5	120	0.015	0.022	−1.13	C	1
			[89.3]			3	3	130	0.016	0.014	−1.33	C	1
13.		$^3P^o-{}^1D$											
			[86.7]			5	5	40	0.0045	0.0064	−1.65	D	1

Ni XIX: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
14.		$^{3}F^{o}-{}^{3}D$											
			[90.4]			9	7	610	0.058	0.16	−0.28	C	1
			[91.2]			7	5	480	0.043	0.090	−0.52	C	1
			[104.7]			5	3	210	0.021	0.036	−0.98	C	1
15.		$^{3}F^{o}-{}^{1}D$											
			[87.2]			7	5	180	0.015	0.029	−0.99	C	1
16.		$^{3}D^{o}-{}^{3}D$											
			[93.2]			7	7	160	0.021	0.045	−0.84	C	1
			[93.6]			7	5	60	0.0056	0.012	−1.40	D	1
			[92.8]			5	3	340	0.026	0.040	−0.88	C	1
17.		$^{3}D^{o}-{}^{1}D$											
			[89.4]			7	5	250	0.021	0.044	−0.82	C	1
18.		$^{1}D^{o}-{}^{3}D$											
			[104.9]			5	7	59	0.014	0.024	−1.17	C	1
			[105.4]			5	5	48	0.0080	0.014	−1.40	C	1
			[105.7]			5	3	4.1	4.1(−4)	7.2(−4)	−2.69	D	1
19.		$^{1}D^{o}-{}^{1}D$	[100.0]			5	5	66	0.0099	0.016	−1.31	C	1
20.		$^{1}F^{o}-{}^{3}D$											
			[105.7]			7	7	120	0.020	0.049	−0.85	C	1
			[106.2]			7	5	53	0.0064	0.016	−1.35	C	1
21.		$^{1}F^{o}-{}^{1}D$	[100.7]			7	5	200	0.022	0.050	−0.82	C	1
22.		$^{1}P^{o}-{}^{3}D$											
			[114.2]			3	5	13	0.0042	0.0048	−1.90	D	1
			[114.6]			3	3	20	0.0039	0.0045	−1.93	D	1
23.		$^{1}P^{o}-{}^{1}D$	[107.9]			3	5	38	0.011	0.012	−1.48	C	1
24.	$2s^22p^54p-$ $2s2p^64p$	$^{3}S-{}^{3}P^{o}$											
			[90.5]			3	3	120	0.015	0.013	−1.35	C	1
			[90.6]			3	1	580	0.024	0.021	−1.15	C	1
25.		$^{3}D-{}^{3}P^{o}$											
			[104.6]			5	5	140	0.023	0.040	−0.94	C	1
26.		$^{3}P-{}^{3}P^{o}$											
			[91.6]			5	5	200	0.025	0.038	−0.90	C	1
			[104.2]			3	3	180	0.029	0.030	−1.06	C	1
			[104.4]			3	1	310	0.017	0.017	−1.30	C	1
27.		$^{3}P-{}^{1}P^{o}$											
			[91.2]			5	3	330	0.025	0.037	−0.91	C	1
28.		$^{1}P-{}^{3}P^{o}$											
			[91.1]			3	5	29	0.0060	0.0054	−1.74	C	1
			[92.3]			3	1	210	0.0089	0.0081	−1.57	C	1

Ni XIX: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
29.		^{1}P - ^{1}P°	[90.7]			3	3	290	0.036	0.032	−0.97	C	1
30.		^{1}D - ^{3}P°											
			[91.1]			5	3	680	0.051	0.076	−0.60	C	1
31.	$2s^22p^6$–$2s2p^63p$	^{1}S - ^{3}P°											
			11.582	0	8634100	1	3	6300	0.038	0.0014	−1.42	C	1
32.		^{1}S - ^{1}P°	11.522	0	8679000	1	3	4.8(+4)	0.29	0.011	−0.54	C	1
33.	$2s^22p^6$–$2s2p^64p$	^{1}S - ^{3}P°											
			[9.3]			1	3	5200	0.020	6.2(−4)	−1.69	C	1
34.		^{1}S - ^{1}P°	[9.3]			1	3	3.1(+4)	0.12	0.0037	−0.92	C	1
35.	$2p^62p^5(^2P^o_{3/2})3s$	^{1}S - $(\frac{3}{2},\frac{1}{2})^\circ$											
			14.037	0	7124000	1	3	1.41(+4)	0.125	0.00578	−0.903	C+	*interp.*
36.	$2p^6$–$2p^5(^2P^o_{1/2})3s$	^{1}S - $(\frac{1}{2},\frac{1}{2})^\circ$											
			13.776	0	7259000	1	3	1.1(+4)	0.098	0.0044	−1.01	C+	*interp.*
37.	$2p^6$–$2p^53d$	^{1}S - ^{3}P°											
			12.805	0	7809400	1	3	1200	0.0091	3.8(−4)	−2.04	C	*interp.*
38.		^{1}S - ^{3}D°											
			12.659	0	7899500	1	3	1.1(+5)	0.80	0.033	−0.10	C	*interp.*
39.		^{1}S - ^{1}P°	12.436	0	8041200	1	3	3.2(+5)	2.2	0.090	0.34	C	*interp.*
40.	$2p^6$–$2p^5(^2P^o_{3/2})4s$	^{1}S - $(\frac{3}{2},\frac{1}{2})^\circ$											
			10.417	0	9599700	1	3	4700	0.023	7.9(−4)	−1.64	C	1
41.	$2p^6$–$2p^5(^2P^o_{1/2})4s$	^{1}S - $(\frac{1}{2},\frac{1}{2})^\circ$											
			10.306	0	9703100	1	3	5100	0.024	8.3(−4)	−1.61	C	1
42.	$2p^6$–$2p^54d$	^{1}S - ^{3}P°											
			[10.2]			1	3	700	0.0033	1.1(−4)	−2.48	D	1
43.		^{1}S - ^{3}D°											
			10.102	0	9899000	1	3	9.4(+4)	0.43	0.014	−0.37	C	1
44.		^{1}S - ^{1}P°	9.97	0	10000000	1	3	1.1(+5)	0.49	0.016	−0.31	C	1
45.	$2p^6$–$2p^5(^2P^o_{3/2})5s$	^{1}S - $(\frac{3}{2},\frac{1}{2})^\circ$											
						1	3		0.0064		−2.19	D	3
46.	$2p^6$–$2p^5(^2P^o_{1/2})5s$	^{1}S - $(\frac{1}{2},\frac{1}{2})^\circ$											
						1	3		0.0034		−2.47	D	3
47.	$2p^6$–$2p^55d$	^{1}S - ^{3}D°											
			9.236	0	10830000	1	3	3.1(+4)	0.12	0.0036	−0.92	D	3

Ni XIX: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
48.		^{1}S – ^{1}P°	9.130	0	10950000	1	3	4.8(+4)	0.18	0.0054	−0.74	D	3
49.	$2p^6-2p^5(^2\mathrm{P}^\circ_{3/2})6s$	^{1}S – (3/2,1/2)°											
						1	3		0.0032		−2.49	D	3
50.	$2p^6-2p^5(^2\mathrm{P}^\circ_{1/2})6s$	^{1}S – (1/2,1/2)°											
						1	3		0.0017		−2.77	D	3
51.	$2p^6-2p^56d$	^{1}S – ^{3}D°											
			8.838	0	11310000	1	3	1.7(+4)	0.058	0.0017	−1.24	D	3
52.		^{1}S – ^{1}P°	8.725	0	11460000	1	3	2.8(+4)	0.097	0.0028	−1.01	D	3
53.	$2p^5(^2\mathrm{P}^\circ_{3/2})3s-2p^53p$	(3/2,1/2)° – ^{3}S											
			[406.6]			5	3	30	0.045	0.30	−0.65	C	1
54.		(3/2,1/2)° – ^{3}D											
			[335.4]			5	7	60	0.14	0.78	−0.15	C	1
			[362.4]			5	5	22	0.043	0.26	−0.66	C	1
55.		(3/2,1/2)° – ^{3}P											
			[308.1]			5	5	43	0.061	0.31	−0.51	C	1
			[346.6]			3	3	52	0.094	0.32	−0.55	C	1
			[274.1]			3	1	85	0.032	0.086	−1.02	C	1
56.		(3/2,1/2)° – ^{1}D											
			[221.4]			5	5	0.97	7.1(−4)	0.0026	−2.45	D	1
57.		(3/2,1/2)° – ^{1}S											
			[179.7]			3	1	140	0.023	0.040	−1.17	C	1
58.	$2p^5(^2\mathrm{P}^\circ_{1/2})3s-2p^53p$	(1/2,1/2)° – ^{3}D											
			[326.1]			1	3	40	0.19	0.21	−0.72	C	1
			[338.3]			3	3	20	0.034	0.11	−0.99	C	1
59.		(1/2,1/2)° – ^{3}P											
			[431.5]			3	1	7.8	0.0073	0.031	−1.66	C	1
60.		(1/2,1/2)° – ^{1}P											
			[384.7]			3	3	24	0.053	0.20	−0.80	C	1
			[369.0]			1	3	17	0.10	0.13	−0.98	C	1
61.		(1/2,1/2)° – ^{1}D											
			[332.4]			3	5	62	0.17	0.56	−0.29	C	1
62.		(1/2,1/2)° – ^{1}S											
			[236.2]			3	1	140	0.039	0.091	−0.93	C	1

Ni XIX: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
63.	$2s2p^63s-$ $2s2p^63p$	$^3S - ^3P^\circ$	*349.2*			3	9	57	0.310	1.07	−0.031	C	1
			[333.8]			3	5	69	0.19	0.63	−0.24	C	1
			[368.6]			3	3	43	0.088	0.32	−0.58	C	1
			[375.5]			3	1	47	0.033	0.12	−1.00	C	1
64.	$2s2p^63s-$ $2s2p^64p$	$^3S - ^3P^\circ$	*39.2*			3	9	3850	0.266	0.103	−0.098	C	1
			[39.1]			3	5	3900	0.15	0.058	−0.35	C	1
			[39.3]			3	3	3600	0.083	0.032	−0.60	C	1
			[39.3]			3	1	4300	0.033	0.013	−1.00	C	1
65.		$^3S - ^1P^\circ$											
			[39.0]			3	3	690	0.016	0.0061	−1.33	D	1
66.		$^1S - ^3P^\circ$											
			[40.2]			1	3	7500	0.55	0.072	−0.26	D	1
67.		$^1S - ^1P^\circ$	[40.0]			1	3	3600	0.26	0.034	−0.59	C	1
68.	$2p^53p-2p^53d$	$^3S - ^3P^\circ$	*238.4*			3	9	80	0.20	0.48	−0.21	C	1
			[232.9]			3	5	55	0.075	0.17	−0.65	C	1
			[244.0]			3	3	100	0.089	0.22	−0.57	C	1
			[250.4]			3	1	120	0.038	0.093	−0.95	C	1
69.		$^3S - ^3D^\circ$											
			[221.4]			3	5	4.6	0.0056	0.012	−1.77	D	1
70.		$^3D - ^3P^\circ$											
			[503.4]			3	1	0.67	8.5(−4)	0.0042	−2.59	D	1
			[250.4]			5	5	13	0.012	0.050	−1.21	D	1
71.		$^3D - ^3F^\circ$											
			[264.2]			7	9	110	0.15	0.90	0.02	C	1
			[246.6]			5	7	120	0.15	0.62	−0.12	C	1
			[267.8]			3	5	2.4	0.0043	0.011	−1.89	C	1
72.		$^3D - ^3D^\circ$											
			[242.8]			7	7	28	0.025	0.14	−0.76	C	1
			[237.2]			5	5	50	0.042	0.16	−0.68	C	1
73.		$^3D - ^1D^\circ$											
			[261.4]			3	5	100	0.17	0.44	−0.29	C	1
74.		$^3D - ^1F^\circ$											
			[185.9]			7	7	1.4	7.3(−4)	0.0031	−2.29	D	1
75.		$^3P - ^3P^\circ$											
			[285.2]			5	5	37	0.045	0.21	−0.65	C	1
			[301.9]			5	3	10	0.0082	0.041	−1.39	C	1
			[295.1]			3	1	1.1	4.8(−4)	0.0014	−2.84	D	1

Ni XIX: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
76.		^{3}P - ^{3}D°											
			[259.5]			5	7	100	0.14	0.60	−0.15	C	1
			[255.6]			3	5	82	0.13	0.34	−0.40	C	1
77.		^{3}P - ^{1}D°											
			[198.2]			5	5	6.1	0.0036	0.012	−1.75	C	1
78.		^{1}P - ^{3}F°											
			[244.5]			3	5	120	0.18	0.43	−0.27	C	1
79.		^{1}D - ^{3}F°											
			[271.6]			5	5	14	0.015	0.069	−1.11	C	1
80.		^{1}D - ^{1}D°	[265.0]			5	5	12	0.013	0.055	−1.20	C	1
81.		^{1}D - ^{1}F°	[260.2]			5	7	120	0.17	0.73	−0.07	C	1
82.	$2s2p^63p-$ $2s2p^63d$	^{3}P° - ^{3}D											
			[272.7]			5	7	110	0.17	0.77	−0.07	C	1
			[256.1]			3	5	92	0.15	0.38	−0.34	C	1
			[254.6]			1	3	76	0.22	0.19	−0.65	C	1
83.		^{3}P° - ^{1}D											
			[226.6]			3	5	20	0.026	0.057	−1.11	C	1
84.		^{1}P° - ^{3}D											
			[289.7]			3	5	6.1	0.013	0.037	−1.42	C	1
			[293.0]			3	3	5.2	0.0067	0.019	−1.70	C	1
85.		^{1}P° - ^{1}D	[252.5]			3	5	130	0.21	0.52	−0.21	C	1
86.	$2p^53p-$ $2p^5(^2P^o_{3/2})4s$	^{3}S - (3/2,1/2)°											
			[45.3]			3	5	1000	0.051	0.023	−0.81	C	1
			[42.6]			3	3	72	0.0020	8.2(−4)	−2.23	D	1
87.		^{3}D - (3/2,1/2)°											
			[46.4]			7	5	2600	0.060	0.064	−0.38	C	1
			[46.6]			3	3	580	0.019	0.0087	−1.25	C	1
88.		^{3}P - (3/2,1/2)°											
			[47.0]			5	5	1100	0.036	0.028	−0.74	C	1
			[45.2]			1	3	140	0.013	0.0019	−1.89	D	1
89.		^{1}P - (3/2,1/2)°											
			[45.8]			3	3	840	0.026	0.012	−1.10	C	1
90.		^{1}D - (3/2,1/2)°											
			[50.0]			5	5	10	3.7(−4)	3.1(−4)	−2.73	D	1
			[46.7]			5	3	3100	0.061	0.047	−0.52	C	1

Ni XIX: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accu-racy	Source
91.		$^{1}S - (\tfrac{3}{2},\tfrac{1}{2})^{\circ}$											
			[49.5]			1	3	570	0.063	0.010	−1.20	C	1
92.	$2p^5 3p - 2p^5(^2P^{\circ}_{1/2})4s$	$^{3}S - (\tfrac{1}{2},\tfrac{1}{2})^{\circ}$											
			[45.2]			3	3	45	0.0014	6.2(−4)	−2.38	D	1
			[42.6]			3	1	93	8.4(−4)	3.5(−4)	−2.60	D	1
93.		$^{3}D - (\tfrac{1}{2},\tfrac{1}{2})^{\circ}$											
			[45.8]			5	3	1300	0.025	0.018	−0.91	C	1
			[46.6]			3	1	3500	0.038	0.017	−0.94	C	1
94.		$^{3}P - (\tfrac{1}{2},\tfrac{1}{2})^{\circ}$											
			[46.9]			5	3	1500	0.030	0.023	−0.83	C	1
95.		$^{1}P - (\tfrac{1}{2},\tfrac{1}{2})^{\circ}$											
			[45.9]			3	1	1700	0.018	0.0081	−1.27	C	1
96.		$^{1}S - (\tfrac{1}{2},\tfrac{1}{2})^{\circ}$											
			[53.1]			1	3	390	0.049	0.0086	−1.31	C	1
97.	$2p^5 3p - 2p^5 4d$	$^{3}S - ^{3}P^{\circ}$	*40.6*			3	9	4740	0.352	0.141	0.023	C	1
			[40.5]			3	5	3000	0.12	0.049	−0.43	C	1
			[40.7]			3	3	6400	0.16	0.064	−0.32	C	1
			[40.7]			3	1	8400	0.070	0.028	−0.68	C	1
98.		$^{3}S - ^{3}D^{\circ}$											
			[40.4]			3	5	110	0.0045	0.0018	−1.87	D	1
99.		$^{3}S - ^{1}D^{\circ}$											
			[38.3]			3	5	170	0.0062	0.0024	−1.73	C	1
100.		$^{3}D - ^{3}P^{\circ}$											
			[41.2]			5	3	930	0.014	0.0096	−1.15	C	1
			[44.4]			3	1	310	0.0031	0.0013	−2.04	D	1
			[41.0]			5	5	950	0.024	0.016	−0.92	C	1
101.		$^{3}D - ^{3}F^{\circ}$											
			41.13			7	9	9300	0.30	0.29	0.33	C	1
			[41.6]			3	5	150	0.0065	0.0027	−1.71	D	1
102.		$^{3}D - ^{1}F^{\circ}$											
			[41.0]			5	7	7100	0.25	0.17	0.10	C	1
103.		$^{3}D - ^{3}D^{\circ}$											
			[41.2]			7	7	1600	0.041	0.039	−0.55	C	1
			[40.9]			5	5	2400	0.060	0.041	−0.52	C	1
104.		$^{3}D - ^{1}D^{\circ}$											
			[41.5]			3	5	7800	0.34	0.14	0.00	C	1

Ni XIX: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
105.		$^{3}\mathrm{D} - {}^{1}\mathrm{P}^{\circ}$											
			[41.1]			3	3	1300	0.033	0.013	−1.01	C	1
106.		$^{3}\mathrm{P} - {}^{3}\mathrm{P}^{\circ}$											
			[41.9]			5	5	3900	0.10	0.071	−0.29	C	1
			[42.0]			5	3	1400	0.022	0.015	−0.95	C	1
			[41.8]			3	1	190	0.0017	6.8(−4)	−2.30	D	1
107.		$^{3}\mathrm{P} - {}^{3}\mathrm{F}^{\circ}$											
			[39.3]			3	5	50	0.0019	7.5(−4)	−2.24	D	1
108.		$^{3}\mathrm{P} - {}^{1}\mathrm{F}^{\circ}$											
			[41.9]			5	7	100	0.0037	0.0025	−1.73	D	1
109.		$^{3}\mathrm{P} - {}^{3}\mathrm{D}^{\circ}$											
			[41.7]			5	7	7500	0.27	0.19	0.14	C	1
			[41.5]			3	5	5800	0.25	0.10	−0.13	C	1
			[42.3]			1	3	3800	0.31	0.043	−0.51	C	1
110.		$^{1}\mathrm{P} - {}^{3}\mathrm{P}^{\circ}$											
			[43.4]			3	5	33	0.0016	6.7(−4)	−2.33	D	1
111.		$^{1}\mathrm{P} - {}^{3}\mathrm{F}^{\circ}$											
			[41.0]			3	5	7000	0.29	0.12	−0.05	C	1
112.		$^{1}\mathrm{P} - {}^{1}\mathrm{P}^{\circ}$	[40.5]			3	3	2100	0.052	0.021	−0.81	C	1
113.		$^{1}\mathrm{D} - {}^{3}\mathrm{P}^{\circ}$											
			[44.2]			5	5	43	0.0013	9.2(−4)	−2.20	D	1
114.		$^{1}\mathrm{D} - {}^{3}\mathrm{F}^{\circ}$											
			[41.6]			5	7	9200	0.33	0.23	0.22	C	1
			[41.7]			5	5	1400	0.036	0.025	−0.74	C	1
115.		$^{1}\mathrm{D} - {}^{1}\mathrm{D}^{\circ}$	[41.6]			5	5	950	0.025	0.017	−0.91	C	1
116.		$^{1}\mathrm{S} - {}^{3}\mathrm{D}^{\circ}$											
			[46.0]			1	3	1100	0.10	0.016	−0.98	C	1
117.		$^{1}\mathrm{S} - {}^{1}\mathrm{P}^{\circ}$	[43.4]			1	3	4000	0.34	0.048	−0.47	C	1
118.	$2s2p^63d-$ $2s2p^64p$	$^{3}\mathrm{D} - {}^{3}\mathrm{P}^{\circ}$											
			[52.9]			7	5	970	0.029	0.035	−0.69	C	1
			[53.1]			5	3	840	0.021	0.019	−0.97	C	1
			[53.1]			3	1	1200	0.017	0.0089	−1.29	C	1
119.		$^{1}\mathrm{D} - {}^{3}\mathrm{P}^{\circ}$											
			[54.6]			5	3	180	0.0048	0.0043	−1.62	D	1
120.		$^{1}\mathrm{D} - {}^{1}\mathrm{P}^{\circ}$	[54.1]			5	3	1200	0.032	0.028	−0.80	C	1

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* The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Ni XX

Ground State $1s^22s^22p^5\ {}^2P^o_{3/2}$

Ionization Potential [1639] eV = [13220000] cm^{-1}

Allowed Transitions

Oscillator strengths for lines of the multiplet $2s^22p^5\ {}^2P^o$–$2s2p^6\ {}^2S$ are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1], which include a perturbative treatment of the Breit interaction and the Lamb shift.

All other data are interpolated from the comprehensive calculations of Chapman and Shadmi [2], who employed Hartree-Fock wave functions including the principal configuration mixing and calculated individual oscillator strengths in intermediate coupling. Wavelengths and energy levels for transitions to states of the $2p^43s$ and $2p^43d$ configurations are available in the literature, but they have not been tabulated here because of possible errors in their classifications and LS-coupling designations (see, e.g., Fe XVIII).

References

[1] Cheng, K. T., Kim, Y.-K., and Desclaux, J. P., At. Data Nucl. Data Tables **24**, 111 (1979).

[2] Chapman, R. D., and Shadmi, Y., J. Opt. Soc. Am. **63**, 1440 (1973).

Ni XX: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$2s^22p^5$–$2s2p^6$	$^2P^o - {}^2S$	*86.66*	*48000*	1202000	6	2	1450	0.0544	0.0932	−0.486	C+	1
			83.17	0	1202000	4	2	1100	0.0571	0.0625	−0.641	C+	1
			94.49	144000	1202000	2	2	368	0.0493	0.0307	−1.006	C+	1
2.	$2s^22p^5$–$2s2p^5(^3P^o)3p$	$^2P^o - {}^4S$											
						4	4		0.0018		−2.14	E	*interp.*
3.		$^2P^o - {}^2P$											
						4	4		0.076		−0.52	E	*interp.*
4.		$^2P^o - {}^2S$											
						4	2		0.024		−1.02	E	*interp.*
						2	2		0.13		−0.59	E	*interp.*
5.	$2s^22p^5$–$2s2p^5(^1P^o)3p$	$^2P^o - {}^2D$											
						4	6		0.070		−0.55	D	*interp.*
						2	4		0.24		−0.32	E	*interp.*
						4	4		0.030		−0.92	E	*interp.*
6.		$^2P^o - {}^2P$											
						4	2		0.014		−1.25	E	*interp.*
						2	2		0.14		−0.55	E	*interp.*
						4	2		0.010		−1.40	D	*interp.*
						2	4		0.18		−0.44	E	*interp.*
7.		$^2P^o - {}^2S$											
						4	2		0.0013		−2.28	E	*interp.*
						2	2		0.014		−1.55	E	*interp.*
8.	$2p^5$–$2p^4(^3P)3s$	$^2P^o - {}^4P$											
						2	4		0.0030		−2.22	E	*interp.*
						4	4		4.8(−4)[a]		−2.72	E	*interp.*
						2	2		7.8(−5)		−3.81	E	*interp.*

Ni XX: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
9.		^{2}P° – ^{2}P											
						4	4		0.0029		−1.94	E	*interp.*
						2	2		0.036		−1.14	D	*interp.*
						4	2		0.030		−0.92	D	*interp.*
						2	4		0.0015		−2.52	E	*interp.*
10.	$2p^5$–$2p^4(^1D)3s$	^{2}P° – ^{2}D											
						4	6		4.7(−5)		−3.73	E	*interp.*
						2	4		0.077		−0.81	D	*interp.*
						4	4		0.0037		−1.83	E	*interp.*
11.	$2p^5$–$2p^4(^1S)3s$	^{2}P° – ^{2}S											
						4	2		0.026		−0.98	D	*interp.*
						2	2		0.032		−1.19	D	*interp.*
12.	$2p^5$–$2p^4(^3P)3d$	^{2}P° – ^{4}D											
						4	6		0.020		−1.10	E	*interp.*
						2	4		0.0025		−2.30	E	*interp.*
						4	4		0.023		−1.04	E	*interp.*
13.		^{2}P° – ^{4}P											
						2	2		4.2(−4)		−3.08	E	*interp.*
						4	2		0.0039		−1.81	E	*interp.*
14.		^{2}P° – ^{4}F											
						2	4		0.0072		−1.84	E	*interp.*
						4	4		0.0077		−1.51	E	*interp.*
15.		^{2}P° – ^{2}P											
						4	4		0.0011		−2.36	E	*interp.*
						2	4		0.036		−1.14	E	*interp.*
16.	$2p^5$–$2p^4(^1D)3d$	^{2}P° – ^{2}F											
						4	6		0.12		−0.32	E	*interp.*
17.		^{2}P° – ^{2}P											
						4	4		0.015		−1.22	E	*interp.*
						2	2		0.52		0.02	E	*interp.*
						4	2		0.024		−1.02	E	*interp.*
						2	4		0.11		−0.66	E	*interp.*
18.		^{2}P° – ^{2}S											
						4	2		1.8(−4)		−3.14	E	*interp.*
						2	2		0.060		−0.92	E	*interp.*
19.		^{2}P° – ^{2}D											
						2	4		0.55		0.04	E	*interp.*
20.	$2p^5$–$2p^4(^1S)3d$	^{2}P° – ^{2}D											
						4	6		0.041		−0.79	E	*interp.*
21.	$2s^22p^5$–$2p^63d$	^{2}P° – ^{2}D											
						4	6		1.7(−4)		−3.17	E	*interp.*
						2	4		0.0062		−1.91	E	*interp.*
						4	4		0.0038		−1.82	E	*interp.*

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Ni XXI

Ground State $1s^22s^22p^4\ ^3P_2$

Ionization Potential [1747] eV = [14091000] cm^{-1}

Allowed Transitions

Oscillator strengths for $2s-2p$ transitions are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1] . These relativistic calculations include a perturbative treatment of the Breit interaction and the Lamb shift. The results should be quite accurate, except in the case of intercombination transitions, for which the f-values should be considered rather uncertain.

Reference

[1] Cheng, K. T., Kim, Y.-K., and Desclaux, J. P., At. Data Nucl. Data Tables **24**, 111 (1979).

Ni XXI: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$2s^22p^4-2s2p^5$	^{3}P – ^{3}P°	*96.71*	*53000*	*1087000*	9	9	640	0.089	0.256	−0.095	C	1
			95.85	0	1043000	5	5	460	0.063	0.099	−0.50	C	1
			100.23	128000	1126000	3	3	143	0.0215	0.0213	−1.190	C	1
			88.81	0	1126000	5	3	419	0.0297	0.0434	−0.83	C	1
			93.91	128000	1193000	3	1	740	0.0325	0.0301	−1.011	C	1
			109.30	128000	1043000	3	5	115	0.0344	0.0371	−0.99	C	1
			96.79	93000	1126000	1	3	190	0.079	0.025	−1.10	C	1
2.		^{3}P – ^{1}P°											
			[68.7]			5	3	180	0.0076	0.0086	−1.42	E	1
			[75.2]			3	3	19	0.0016	0.0012	−2.32	E	1
			[73.4]			1	3	24	0.0057	0.0014	−2.24	E	1
3.		^{1}D – ^{3}P°											
			[119]			5	5	33	0.0070	0.014	−1.46	E	1
			[109]			5	3	1.0	1.1(−4)[a]	2.0(−4)	−3.26	E	1
4.		^{1}D – ^{1}P°	81.69			5	3	1700	0.102	0.137	−0.292	C	1
5.		^{1}S – ^{3}P°											
			[137]			1	3	11	0.0093	0.0042	−2.03	E	1
6.		^{1}S – ^{1}P°	97.13			1	3	120	0.050	0.016	−1.30	C	1
7.	$2s2p^5-2p^6$	^{3}P° – ^{1}S											
			[76.5]			3	1	240	0.0070	0.0053	−1.68	E	1
8.		^{1}P° – ^{1}S	103.33			3	1	1800	0.098	0.10	−0.53	C	1

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Ni XXII

Ground State	$1s^22s^22p^3\ ^4S^o_{3/2}$
Ionization Potential	[1882] eV = [15180000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
70.2	13	84.06	8	100.60	6	127	10
70.7	4	84.4	2	103	6	128	5
71.5	13	84.8	14	104	1	137	5
72.0	8	88.00	12	105	11,16	146	5
73.1	13	89.9	12	106.04	1	150	16
73.9	3	95.1	6,11	113	10	151	9
78.5	13	97.2	14	116	15	158	5
80.1	13	98.15	6	117.91	1	185	9
80.2	12	98.6	12	123	10,16	225	9
80.55	8	99.0	15	124	5		
83.8	7	99.8	14	125	16		

Oscillator strengths for transitions of the arrays $2s^22p^3$–$2s2p^4$ and $2s2p^4$–$2p^5$ are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1]. These relativistic calculations include a perturbative treatment of the Breit interaction and the Lamb shift. The results should be quite accurate, except in the case of intercombination lines, for which the f-values should be considered rather uncertain. (A few very weak intercombination lines have been omitted from this tabulation.) The f-value listed for the $2s^22p^3\ ^2D^o_{3/2}$ – $2s2p^4\ ^2S_{1/2}$ transition is quoted with an uncertainty of 50%, since its magnitude is considerably larger than those of the other intercombination lines.

Reference

[1] Cheng, K. T., Kim, Y.-K., and Desclaux, J. P., At. Data Nucl. Data Tables **24**, 111 (1979).

Ni XXII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$2s^22p^3$–$2s2p^4$	$^4S^o$ – ^4P	*111*			4	12	193	0.107	0.156	−0.370	C	1
			117.91	0	848100	4	6	146	0.0458	0.071	−0.74	C	1
			106.04	0	943040	4	4	236	0.0398	0.056	−0.80	C	1
			[104]			4	2	263	0.0213	0.0292	−1.070	C	1
2.		$^4S^o$ – ^2D											
			[84.4]			4	4	48	0.0051	0.0057	−1.69	E	1
3.		$^4S^o$ – ^2S											
			[73.9]			4	2	39	0.0016	0.0016	−2.19	E	1
4.		$^4S^o$ – ^2P											
			[70.7]			4	4	77	0.0058	0.0054	−1.63	E	1
5.		$^2D^o$ – ^4P											
			[158]			6	6	4.3	0.0016	0.0050	−2.02	E	1
			[128]			4	4	2.8	$7.0(-4)^a$	0.0012	−2.55	E	1
			[137]			6	4	1.1	2.1(−4)	5.7(−4)	−2.90	E	1
			[124]			4	2	7.3	8.4(−4)	0.0014	−2.47	E	1
			[146]			4	6	13	0.0063	0.012	−1.60	E	1

Ni XXII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
6.		$^2D^o - {}^2D$	*99.61*			10	10	450	0.067	0.22	−0.17	C−	1
			100.60			6	6	390	0.059	0.12	−0.45	C	1
			98.15			4	4	520	0.075	0.097	−0.52	C	1
			[103]			6	4	0.48	5.1(−5)	1.0(−4)	−3.51	E	1
			[95.1]			4	6	1.2	2.4(−4)	3.0(−4)	−3.02	E	1
7.		$^2D^o - {}^2S$											
			[83.8]			4	2	570	0.030	0.033	−0.92	D	1
8.		$^2D^o - {}^2P$	*78.6*			10	6	1100	0.062	0.16	−0.21	C	1
			84.06			6	4	1200	0.084	0.14	−0.30	C	1
			[72.0]			4	2	288	0.0112	0.0106	−1.349	C	1
			80.55			4	4	124	0.0121	0.0128	−1.315	C	1
9.		$^2P^o - {}^4P$											
			[225]			4	6	0.29	3.3(−4)	9.8(−4)	−2.88	E	1
			[185]			4	4	2.7	0.0014	0.0034	−2.25	E	1
			[151]			2	2	5.3	0.0018	0.0018	−2.44	E	1
10.		$^2P^o - {}^2D$	*119.*			6	10	59	0.0210	0.0493	−0.90	C−	1
			[123]			4	6	68	0.0233	0.0377	−1.031	C	1
			[113]			2	4	31.1	0.0119	0.0089	−1.62	C	1
			[127]			4	4	6.6	0.0016	0.0027	−2.19	D	1
11.		$^2P^o - {}^2S$	*101*			6	2	390	0.020	0.040	−0.92	C−	1
			[105]			4	2	15	0.0012	0.0017	−2.32	D	1
			[95.1]			2	2	450	0.061	0.038	−0.91	C	1
12.		$^2P^o - {}^2P$	*91.2*			6	6	530	0.066	0.119	−0.402	C−	1
			[98.6]			4	4	105	0.0153	0.0199	−1.213	C	1
			[80.2]			2	2	40	0.0039	0.0021	−2.11	D	1
			88.00			4	2	1200	0.068	0.079	−0.57	C	1
			[89.9]			2	4	123	0.0297	0.0176	−1.226	C	1
13.	$2s2p^4$-$2p^5$	$^4P - {}^2P^o$											
			[73.1]			6	4	54	0.0029	0.0042	−1.76	E	1
			[70.2]			4	2	6.2	2.3(−4)	2.1(−4)	−3.04	E	1
			[78.5]			4	4	36	0.0033	0.0034	−1.88	E	1
			[71.5]			2	2	16	0.0012	5.6(−4)	−2.62	E	1
			[80.1]			2	4	12	0.0023	0.0012	−2.34	E	1
14.		$^2D - {}^2P^o$	*94.0*			10	6	710	0.056	0.174	−0.250	C	1
			[99.8]			6	4	497	0.0495	0.098	−0.53	C	1
			[84.8]			4	2	500	0.0271	0.0303	−0.96	C	1
			[97.2]			4	4	252	0.0357	0.0457	−0.85	C	1
15.		$^2S - {}^2P^o$	*109*			2	6	105	0.056	0.0402	−0.95	C−	1
			[116]			2	4	115	0.0463	0.0354	−1.033	C	1
			[99.0]			2	2	50	0.0074	0.0048	−1.83	D	1
16.		$^2P - {}^2P^o$	*124*			6	6	480	0.11	0.27	−0.18	C	1
			[125]			4	4	340	0.080	0.13	−0.49	C	1
			[123]			2	2	370	0.085	0.069	−0.77	C	1
			[105]			4	2	530	0.0435	0.060	−0.76	C	1
			[150]			2	4	15.7	0.0106	0.0105	−1.67	C	1

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[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Ni XXIII

Ground State	$1s^22s^22p^2\ ^3P_0$
Ionization Potential	[2003] eV = [16156000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
69.6	16	90.5	24	109	3	144	25
73.4	6	91.5	17	110	19	160	28
76.4	6	91.83	4	111	19	162	13
76.8	16	92.7	3	112	2,29	163	7,22
77.7	21	98.2	20	120	23	174	7
79.3	4	98.9	15	125	14	176	7
82.9	5	100	3	126	19	179	25
83.6	18	101	10,20	127	2	186	27
86.6	18	102	17	128	2,8,26	216	1
86.7	5	103	3,17	130	19	230	12
86.9	4	105	3	133	8	244	1
87.3	11	106	3,19	134	22	248	27
89.8	17	107	9,17	136	2		
90.2	17	108	19	137	2,22		

Oscillator strengths for transitions of the arrays $2s^22p^2$–$2s2p^3$ and $2s2p^3$–$2p^4$ are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1]. These relativistic calculations include a perturbative treatment of the Breit interaction and the Lamb shift. The results should be quite accurate, except in the case of intercombination lines, for which the f-values should be considered rather uncertain. (A few very weak intercombination lines have been omitted from this tabulation.) The f-value listed for the $2s^22p^2\ ^3P_2$–$2s2p^3\ ^1D^o_2$ transition is quoted with an uncertainty 50%, since its magnitude is considerably larger than those of the other intercombination lines.

The remaining f-values were derived by interpolation from graphs of systematic trends along the isoelectronic sequence.

Reference

[1] Cheng, K. T., Kim, Y.-K., and Desclaux, J. P., At. Data Nucl. Data Tables 2
111 (1979).

Ni XXIII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$2s^22p^2$–$2s2p^3$	^3P – $^5S^o$											
			[244]			5	5	0.62	5.5(−4)^a	0.0022	−2.56	E	1
			[216]			3	5	0.81	9.4(−4)	0.0020	−2.55	E	1
2.		^3P – $^3D^o$	*126*			9	15	100	0.040	0.15	−0.44	D	1
			[128]			5	7	75	0.0257	0.054	−0.89	C	1
			[127]			3	5	120	0.0482	0.060	−0.84	C	1
			[112]			1	3	170	0.098	0.036	−1.01	C	1
			[136]			5	5	1.0	2.8(−4)	6.3(−4)	−2.85	E	1
			[127]			3	3	5.0	0.0012	0.0015	−2.44	D	1
			[137]			5	3	2.0	3.3(−4)	7.4(−4)	−2.78	E	1

Ni XXIII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
3.		^{3}P - ^{3}P°	*104*			9	9	302	0.0490	0.151	−0.356	C−	1
			[106]			5	5	287	0.0484	0.084	−0.62	C	1
			[103]			3	3	241	0.0384	0.0391	−0.94	C	1
			[109]			5	3	29	0.0031	0.0056	−1.81	D	1
			[105]			3	1	292	0.0161	0.0167	−1.316	C	1
			[100]			3	5	1.2	2.9(−4)	2.9(−4)	−3.06	E	1
			[92.7]			1	3	45.3	0.0175	0.0053	−1.76	C	1
4.		^{3}P - ^{3}S°	*88.6*			9	3	1180	0.0465	0.122	−0.379	C	1
			91.83			5	3	750	0.057	0.086	−0.55	C	1
			[86.9]			3	3	284	0.0322	0.0276	−1.015	C	1
			[79.3]			1	3	109	0.0308	0.0080	−1.51	C	1
5.		^{3}P - ^{1}D°											
			[86.7]			5	5	120	0.014	0.020	−1.15	D	1
			[82.9]			3	5	7.0	0.0012	9.8(−4)	−2.44	E	1
6.		^{3}P - ^{1}P°											
			[76.4]			5	3	5.1	2.7(−4)	3.4(−4)	−2.87	E	1
			[73.4]			3	3	73	0.0059	0.0043	−1.75	E	1
7.		^{1}D - ^{3}D°											
			[163]			5	7	15	0.0086	0.023	−1.37	E	1
			[174]			5	5	0.40	1.8(−4)	5.2(−4)	−3.05	E	1
			[176]			5	3	2.8	7.8(−4)	0.0023	−2.41	E	1
8.		^{1}D - ^{3}P°											
			[128]			5	5	1.9	4.7(−4)	9.9(−4)	−2.63	E	1
			[133]			5	3	2.5	3.9(−4)	8.5(−4)	−2.71	E	1
9.		^{1}D - ^{3}S°											
			[107]			5	3	7.1	7.3(−4)	0.0013	−2.44	E	1
10.		^{1}D - ^{1}D°	[101]			5	5	540	0.083	0.14	−0.38	C	1
11.		^{1}D - ^{1}P°	[87.3]			5	3	850	0.058	0.083	−0.54	C	1
12.		^{1}S - ^{3}D°											
			[230]			1	3	0.67	0.0016	0.0012	−2.80	E	1
13.		^{1}S - ^{3}P°											
			[162]			1	3	2.4	0.0028	0.0015	−2.55	E	1
14.		^{1}S - ^{3}S°											
			[125]			1	3	11	0.0075	0.0031	−2.12	E	1
15.		^{1}S - ^{1}P°	[98.9]			1	3	220	0.096	0.031	−1.02	C	1
16.	$2s2p^3$–$2p^4$	^{5}S° - ^{3}P											
			[76.8]			5	5	31	0.0027	0.0034	−1.87	E	1
			[69.6]			5	3	3.9	1.7(−4)	1.9(−4)	−3.07	E	1

Ni XXIII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
17.		$^3D^o - {}^3P$	*98.6*			15	9	540	0.0474	0.231	−0.148	C	1
			[107]			7	5	340	0.0417	0.103	−0.53	C	1
			[90.2]			5	3	254	0.0186	0.0276	−1.032	C	1
			[91.5]			3	1	447	0.0187	0.0169	−1.251	C	1
			[103]			5	5	*180*	*0.0286*	*0.0485*	−0.84	C	1
			[89.8]			3	3	179	0.0217	0.0192	−1.186	C	1
			[102]			3	5	61	0.0158	0.0159	−1.324	C	1
18.		$^3D^o - {}^1D$											
			[86.6]			7	5	92	*0.0074*	0.015	−1.29	E	1
			[83.6]			5	5	9.5	0.0010	0.0014	−2.30	E	1
19.		$^3P^o - {}^3P$	*119*			9	9	156	0.0332	0.117	−0.52	C−	1
			[130]			5	5	40.7	0.0103	0.0220	−1.288	C	1
			[108]			3	3	8.6	0.0015	0.0016	−2.35	D	1
			[111]			5	3	222	0.0246	0.0449	−0.91	C	1
			[110]			3	1	232	0.0140	0.0152	−1.377	C	1
			[126]			3	5	44.9	0.0178	0.0222	−1.272	C	1
			[106]			1	3	65	0.0329	0.0115	−1.483	C	1
20.		$^3P^o - {}^1D$											
			[101]			5	5	58	0.0089	0.015	−1.35	E	1
			[98.2]			3	5	*24*	*0.0058*	*0.0056*	*−1.76*	E	1
21.		$^3P^o - {}^1S$											
			[77.7]			3	1	76	0.0023	0.0018	−2.16	E	1
22.		$^3S^o - {}^3P$	*149*			3	9	118	0.118	0.174	−0.450	C	1
			[163]			3	5	71	0.0474	0.076	−0.85	C	1
			[134]			3	3	185	0.0497	*0.066*	−0.83	C	1
			[137]			3	1	255	0.0239	0.0323	−1.144	C	1
23.		$^3S^o - {}^1D$											
			[120]			3	5	0.39	1.4(−4)	1.7(−4)	−3.38	E	1
24.		$^3S^o - {}^1S$											
			[90.5]			3	1	71	0.0029	0.0026	−2.06	E	1
25.		$^1D^o - {}^3P$											
			[179]			5	5	9.8	0.0047	0.014	−1.63	E	1
			[144]			5	3	8.0	0.0015	0.0036	−2.12	E	1
26.		$^1D^o - {}^1D$	[128]			5	5	407	*0.100*	0.211	−0.301	C	1
27.		$^1P^o - {}^3P$											
			[248]			3	5	1.2	0.0018	0.0044	−2.27	E	1
			[186]			3	3	11	0.0055	0.010	−1.78	E	1
28.		$^1P^o - {}^1D$	[160]			3	5	59	0.0378	0.060	−0.95	C	1
29.		$^1P^o - {}^1S$	[112]			3	1	1000	0.063	0.070	−0.72	C	1
30.	$2p^2$–$2p3s$	$^3P - {}^3P^o$				9	9		0.048		−0.36	D	*interp.*
31.		$^1D - {}^1P^o$				5	3		0.040		−0.70	D	*interp.*

Ni XXIII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
32.	$2p^2$–$2p3d$	$^1D - {}^1F^o$				5	7		0.95		0.68	D	*interp.*
33.	$2p3s$–$2p3p$	$^3P^o - {}^3D$				9	15		0.081		−0.14	D	*interp.*
34.		$^3P^o - {}^3S$				9	3		0.018		−0.79	D	*interp.*
35.		$^3P^o - {}^3P$				9	9		0.065		−0.23	D	*interp.*
36.		$^1P^o - {}^1P$				3	3		0.047		−0.85	D	*interp.*
37.		$^1P^o - {}^1D$				3	5		0.13		−0.41	D	*interp.*
38.	$2p3p$–$2p3d$	$^1P - {}^1P^o$				3	3		0.026		−1.11	D	*interp.*
39.		$^3D - {}^3F^o$				15	21		0.028		−0.38	D−	*interp.*
40.		$^1D - {}^1P^o$				5	3		5.0(−4)		−2.60	E	*interp.*
41.		$^1D - {}^1F^o$				5	7		0.10		−0.30	D	*interp.*
42.		$^1S - {}^1P^o$				1	3		0.063		−1.20	D	*interp.*

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Ni XXIV

Ground State	$1s^22s^22p\ ^2P^o_{1/2}$
Ionization Potential	[2123] eV = [17124000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
74.1	7	102.05	3	134	9,16	218	11
74.6	7	103	4,5	135	9	220	15
78.2	7	104	3	137	13	222	1
86.7	3	106	10	138	2	228	1
87.8	6	109	13	143	9	229	12
88.0	4	112	5	153	16	272	1
90.7	6	118	2	157	13	349	1,14
94.6	6	121	13	160	12	371	11
96.8	10	122	5	174	8		
96.9	6	125	3	187	8		
101	6,10	127	9	208	12		

Oscillator strengths for transitions of the arrays $2s^22p$–$2s2p^2$ $2s2p^2$–$2p^3$ are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1]. These relativistic calculations include a perturbative treatment of the Breit interaction and the Lamb shift. The results should be quite accurate, except in the case of intercombination lines, for which the f-values should be considered rather uncertain. (A few very weak intercombination lines have been omitted from this tabulation.) According to ref. [1], the f-value for the $2s^22p\ ^2P^o_{3/2} - 2s2p^2\ ^2D_{3/2}$ transition is smaller a factor of about 30 than the corresponding transition in Co XXIII, and is of the order of 10^{-6}. This extremely weak "allowed" line has thus been omitted from the tabulation.

According to several sources (see, e.g., introduction to Fe XXII), the lower of the two levels $2s2p^2\ ^2P_{1/2}$ and $^2S_{1/2}$ is mostly of ^2P character, having "crossed" the $^2S_{1/2}$ level at about V XIX or Cr XX. We have thus labeled these two levels accordingly, in contrast to their labeling by Cheng et al. [1], which is consistent with their ordering at the neutral end of the B sequence.

A few multiplet f-values were derived by graphical interpolation along the isoelectronic sequence.

Reference

[1] Cheng, K. T., Kim, Y.-K., and Desclaux, J. P., At. Data Nucl. Data Tables **24**, 111 (1979) and private communication.

Ni XXIV: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$2s^22p-2s2p^2$	$^2\mathrm{P}^\circ-{}^4\mathrm{P}$											
			[228]			4	6	1.4	0.0016	0.0048	−2.19	E	1
			[272]			4	4	0.13	1.4(−4)^a	5.0(−4)	−3.25	E	1
			[222]			2	2	1.6	0.0012	0.0018	−2.62	E	1
			[349]			4	2	0.18	1.6(−4)	7.4(−4)	−3.19	E	1
2.		$^2\mathrm{P}^\circ-{}^2\mathrm{D}$											
			[138]			4	6	73	0.0314	0.057	−0.90	C	1
			[118]			2	4	150	0.063	0.049	−0.90	C	1
3.		$^2\mathrm{P}^\circ-{}^2\mathrm{P}$	*103*			6	6	530	0.084	0.17	−0.30	C−	1
			102.05			4	4	540	0.084	0.11	−0.47	C	1
			[104]			2	2	470	0.077	0.053	−0.81	C	1
			[125]			4	2	1.9	2.2(−4)	3.6(−4)	−3.06	E	1
			[86.7]			2	4	68	0.0153	0.0087	−1.51	C	1
4.		$^2\mathrm{P}^\circ-{}^2\mathrm{S}$	*97.5*			6	2	510	0.0243	0.0468	−0.84	C−	1
			[103]			4	2	421	0.0335	0.0454	−0.87	C	1
			[88.0]			2	2	21	0.0024	0.0014	−2.32	D	1
5.	$2s2p^2-2p^3$	$^4\mathrm{P}-{}^4\mathrm{S}^\circ$	*115*			12	4	510	0.0339	0.154	−0.391	C	1
			[122]			6	4	219	0.0326	0.079	−0.71	C	1
			[112]			4	4	168	0.0316	0.0466	−0.90	C	1
			[103]			2	4	131	0.0418	0.0283	−1.078	C	1
6.		$^4\mathrm{P}-{}^2\mathrm{D}^\circ$											
			[96.9]			6	6	38	0.0053	0.010	−1.50	E	1
			[94.6]			4	4	51	0.0068	0.0085	−1.57	E	1
			[101]			6	4	6.9	7.0(−4)	0.0014	−2.38	E	1
			[90.7]			4	6	0.86	1.6(−4)	1.9(−4)	−3.19	E	1
			[87.8]			2	4	1.6	3.6(−4)	2.1(−4)	−3.14	E	1
7.		$^4\mathrm{P}-{}^2\mathrm{P}^\circ$											
			[78.2]			6	4	1.8	1.1(−4)	1.7(−4)	−3.18	E	1
			[74.1]			4	4	4.3	3.5(−4)	3.4(−4)	−2.85	E	1
			[74.6]			2	2	3.5	2.9(−4)	1.4(−4)	−3.24	E	1
8.		$^2\mathrm{D}-{}^4\mathrm{S}^\circ$											
			[187]			6	4	0.37	1.3(−4)	4.8(−4)	−3.11	E	1
			[174]			4	4	3.3	0.0015	0.0034	−2.22	E	1
9.		$^2\mathrm{D}-{}^2\mathrm{D}^\circ$	*134*			10	10	177	0.0476	0.210	−0.322	C	1
			[134]			6	6	146	0.0393	0.104	−0.63	C	1
			[135]			4	4	81	0.0221	0.0393	−1.054	C	1
			[143]			6	4	61	0.0124	0.0350	−1.128	C	1
			[127]			4	6	52	0.0190	0.0318	−1.119	C	1
10.		$^2\mathrm{D}-{}^2\mathrm{P}^\circ$	*102*			10	6	280	0.026	0.088	−0.58	C	1
			[101]			6	4	164	0.0167	0.0333	−1.00	C	1
			[106]			4	2	372	0.0313	0.0437	−0.90	C	1
			[96.8]			4	4	60	0.0084	0.011	−1.47	C	1
11.		$^2\mathrm{P}-{}^4\mathrm{S}^\circ$											
			[371]			4	4	0.38	7.0(−4)	0.0039	−2.50	E	1
			[218]			2	4	3.2	0.0045	0.0065	−2.05	E	1

Ni XXIV: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
12.		^{2}P – ^{2}D°	*190*			6	10	50	0.045	0.17	−0.57	D	1
			[208]			4	6	37.0	0.0360	0.099	−0.84	C	1
			[160]			2	4	89	0.068	0.072	−0.87	C	1
			[229]			4	4	0.48	3.8(−4)	0.0011	−2.82	E	1
13.		^{2}P – ^{2}P°	*131*			6	6	240	0.062	0.16	−0.43	D	1
			[137]			4	4	260	0.073	0.13	−0.53	C	1
			[121]			2	2	44	0.0097	0.0077	−1.71	D	1
			[157]			4	2	21	0.0038	0.0079	−1.82	D	1
			[109]			2	4	36.8	0.0131	0.0094	−1.58	C	1
14.		^{2}S – ^{4}S°											
			[349]			2	4	0.17	6.2(−4)	0.0014	−2.91	E	1
15.		^{2}S – ^{2}D°											
			[220]			2	4	6.4	0.0093	0.013	−1.73	D	1
16.		^{2}S – ^{2}P°	*140*			2	6	73	0.064	0.059	−0.89	C	1
			[134]			2	4	28.6	0.0154	0.0136	−1.51	C	1
			[153]			2	2	127	0.0447	0.0450	−1.049	C	1
17.	2*p*–3*s*	^{2}P° – ^{2}S				6	2		0.019		−0.94	D	*interp.*
18.	2*p*–3*d*	^{2}P° – ^{2}D				6	10		0.67		0.60	D	*interp.*
19.	3*s*–3*p*	^{2}S – ^{2}P°				2	6		0.15		−0.52	E	*interp.*
20.	3*p*–3*d*	^{2}P° – ^{2}D				6	10		0.042		−0.60	E	*interp.*

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Ni XXV

Ground State $1s^22s^2\ ^1S_0$

Ionization Potential [2279] eV = [18382000] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
9.297	11,12	9.691	22	103	4	165	3
9.306	10	9.707	21	116	2	190	6
9.316	10	9.744	17	119	4	238	1
9.340	9	9.75	17	126	3	283	5
9.39	8	9.759	20,21	129	3	336	5
9.41	16	9.776	20	131	7	517	5
9.601	17	9.860	23	136	3		
9.63	17	9.938	19	151	3		
9.633	17	9.97	18	158	3		

Oscillator strengths for transitions of the arrays $2s^2$–$2s2p$ and $2s2p$–$2p^2$ are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [1]. These relativistic calculations include a perturbative treatment of the Breit interaction and the Lamb shift. The results should be quite accurate, except in the case of intercombination lines, for which the f-values should be considered more uncertain. (The $2s2p\ {}^3\mathrm{P}_1^\circ$–$2p^2\ {}^1\mathrm{S}_0$ transition has been omitted from this tabulation, since its f-value is considerably smaller than those of the other lines of the array.)

The results of the relativistic random-phase approximation (RRPA) of Lin and Johnson [2] are quoted for the resonance transitions $2s^2\ {}^1\mathrm{S}_0$–$2snp\ {}^{1,3}\mathrm{P}_1^\circ (n = 3,4)$. Their result for the $2s^2\ {}^1\mathrm{S}_0$–$2s2p\ {}^1\mathrm{P}_1^\circ$ transition is in excellent agreement with the f-value of Cheng et al. [1].

Oscillator strengths for several transitions involving electron jumps from the $n = 2$ shell to the $n = 3$ shell are from the Hartree-XR (Hartree-Fock with statistical exchange and relativistic effects) calculations of Fawcett et al. [3]. Transitions involving the levels ${}^3\mathrm{D}_2^\circ$, ${}^1\mathrm{D}_2^\circ$, and ${}^3\mathrm{P}_2^\circ$ of the configuration $2p3d$ are excluded from our tabulation, since they are indicated to be severely mixed in Ni XXV (see also the introduction to Fe XXIII).

A few multiplet f-values were derived by interpolation along the Be isoelectronic sequence.

Transition probabilities are available in graphical form for several transitions involving vacancies in the K shell [4], but they are not tabulated here since relativistic effects were not taken into account.

References

[1] Cheng, K. T., Kim, Y.-K., and Desclaux, J. P., At. Data Nucl. Data Tables **24**, 111 (1979).

[2] Lin, C. D., and Johnson, W. R., Phys. Rev. A **15**, 1046 (1977).

[3] Fawcett, B. C., Ridgeley, A., and Hughes, T. P., Mon. Not. R. Astron. Soc. **188**, 365 (1979).

[4] Boiko, V. A., Chugunov, A. Yu., Ivanova, T. G., Faenov, A. Ya., Holin, I. V., Pikuz, S. A., Urnov, A. M., Vainshtein, L. A., and Safronova, U. I., Mon. Not. R. Astron. Soc. **185**, 305 (1978).

Ni XXV: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i(cm^{-1})	E_k(cm^{-1})	g_i	g_k	A_{ki}(10^8s^{-1})	f_{ik}	S(at.u.)	log gf	Accuracy	Source
1.	$2s^2$–$2s2p$	${}^1\mathrm{S} - {}^3\mathrm{P}^\circ$											
			[238]			1	3	0.82	0.0021	0.0016	−2.68	D	1
2.		${}^1\mathrm{S} - {}^1\mathrm{P}^\circ$	[116]			1	3	246	0.149	0.0569	−0.827	B	1
3.	$2s2p$–$2p^2$	${}^3\mathrm{P}^\circ - {}^3\mathrm{P}$	*145*			9	9	152	0.0479	0.206	−0.365	B	1
			[151]			5	5	77.5	0.0265	0.0659	−0.878	B	1
			[136]			3	3	51.2	0.0142	0.0191	−1.371	B	1
			[165]			5	3	49.0	0.0120	0.0326	−1.222	B	1
			[158]			3	1	139	0.0174	0.0272	−1.282	B	1
			[126]			3	5	70.8	0.0281	0.0350	−1.074	B	1
			[129]			1	3	83.5	0.0625	0.0265	−1.204	B	1
4.		${}^3\mathrm{P}^\circ - {}^1\mathrm{D}$											
			[119]			5	5	79	0.0167	0.0327	−1.078	C	1
			[103]			3	5	7.5	0.0020	0.0020	−2.22	D	1
5.		${}^1\mathrm{P}^\circ - {}^3\mathrm{P}$											
			[283]			3	5	5.4	0.0109	0.0305	−1.485	C	1
			[336]			3	3	0.12	2.1(−4)[a]	7.0(−4)	−3.20	E	1
			[517]			3	1	0.22	3.0(−4)	0.0015	−3.05	E	1
6.		${}^1\mathrm{P}^\circ - {}^1\mathrm{D}$	[190]			3	5	58.0	0.0523	0.0981	−0.804	B	1
7.		${}^1\mathrm{P}^\circ - {}^1\mathrm{S}$	[131]			3	1	399	0.0342	0.0442	−0.989	B	1
8.	$2s^2$–$2s3p$	${}^1\mathrm{S} - {}^3\mathrm{P}^\circ$											
			9.39	0	10600000	1	3	2.85(+4)	0.113	0.00349	−0.95	C	2
9.		${}^1\mathrm{S} - {}^1\mathrm{P}^\circ$	9.340	0	10710000	1	3	1.54(+5)	0.604	0.0186	−0.219	B	2
10.	$2s2p$–$2p3p$	${}^3\mathrm{P}^\circ - {}^3\mathrm{D}$											
			9.306			5	7	7.2(+4)	0.13	0.020	−0.19	D	3
			9.316			3	5	6.9(+4)	0.15	0.014	−0.35	D	3

Ni XXV: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
11.		$^3P^o - {}^3P$											
			9.297			5	5	6.2(+4)	0.080	0.012	−0.40	D	3
12.		$^3P^o - {}^3S$											
			9.297			5	3	6.7(+4)	0.052	0.0080	−0.59	D	3
13.	$2s^2$–$2s4p$	$^1S - {}^3P^o$											
						1	3		0.032		−1.49	C	2
14.		$^1S - {}^1P^o$				1	3		0.150		−0.824	B	2
15.	$2s2p$–$2s3s$	$^3P^o - {}^3S$				9	3		0.027		−0.61	D	*interp.*
16.		$^1P^o - {}^1S$	[9.41]			3	1	1.3(+4)	0.0058	5.4(−4)	−1.76	E	*interp.*
17.	$2s2p$–$2s3d$	$^3P^o - {}^3D$											
			9.744			5	7	3.0(+5)	0.60	0.096	0.48	D	3
			9.633			3	5	2.4(+5)	0.55	0.052	0.22	D	3
			9.601			1	3	1.8(+5)	0.76	0.024	−0.12	D	3
			9.75			5	5	7.7(+4)	0.11	0.018	−0.26	D	3
			9.63			3	3	1.3(+5)	0.18	0.017	−0.27	D	3
18.		$^1P^o - {}^1D$	9.97			3	5	2.4(+5)	0.59	0.058	0.25	D	3
19.	$2p^2$–$2p3d$	$^3P - {}^3F^o$											
			9.938			5	7	1.3(+5)	0.27	0.044	0.13	D	3
20.		$^3P - {}^3D^o$											
			9.776			5	7	2.9(+5)	0.58	0.093	0.46	D	3
			9.759			1	3	3.0(+5)	1.3	0.042	0.11	D	3
21.		$^3P - {}^3P^o$											
			9.707			3	3	1.8(+5)	0.26	0.025	−0.11	D	3
			9.759			5	3	7.2(+4)	0.062	0.010	−0.51	D	3
			9.707			3	1	2.5(+5)	0.12	0.012	−0.44	D	3
22.		$^3P - {}^1F^o$											
			9.691			5	7	5.1(+4)	0.10	0.016	−0.30	D	3
23.		$^1D - {}^1F^o$	9.860			5	7	4.7(+5)	0.96	0.16	0.68	D	3
24.	$2s3s$–$2s3p$	$^3S - {}^3P^o$				3	9		0.11		−0.48	D	*interp.*
25.		$^1S - {}^1P^o$				1	3		0.050		−1.30	E	*interp.*
26.	$2s3p$–$2s3d$	$^3P^o - {}^3D$				9	15		0.025		−0.65	E	*interp.*
27.		$^1P^o - {}^1D$				3	5		0.043		−0.89	E	*interp.*

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Ni XXVI

Ground State $1s^22s\ ^2S_{1/2}$

Ionization Potential [2398] eV = [19342000] cm^{-1}

Allowed Transitions

Transition probabilities for the strongest inner-shell transitions to doubly excited $n = 2$ states are taken from results of the Z-expansion perturbation calculations of Vainshtein and Safronova [1]. Their results are in good agreement with the multiplet oscillator strengths for the $^2P^o–^2P$ and $^2P^o–^2D$ transitions of the array which were calculated by Fox and Dalgarno [2] in a Z-expansion approximation that included large-scale configuration interaction.

Oscillator strengths for lines of the principal ($2s–2p$) resonance multiplet are the results of the multiconfiguration Dirac-Fock (MCDF) calculations of Cheng et al. [3], which include a perturbative treatment of the Breit interaction and the Lamb shift.

The results of the Hartree-XR (Hartree-Fock with statistical exchange and relativistic effects) calculations of Fawcett et al. [4] are tabulated for the $2p–3s$ and $2p–3d$ transitions.

The f-value for the $3d–4f$ transition was taken from a study of systematic trends along isoelectronic sequences by Smith and Wiese [5]. The tabulated data for the remaining transitions were taken from the theoretical analysis of Martin and Wiese [6], which was based on a generalized study of systematic trends for several spectral series of the lithium isoelectronic sequence.

Results of the relativistic Hartree-Fock calculations of Kim and Desclaux [7] for several ions of the Li sequence were incorporated into the data of ref. [6] for the $2s–3p$ transitions. For all other transitions for which the data of ref. [6] are quoted here, no relativistic calculations were available. However, the relativistic calculations of Younger and Weiss [8] for the hydrogen isoelectronic sequence provide a means of assessing the magnitude of relativistic corrections since the Li sequence is very similar in structure to the H sequence. For those transitions for which relativistic effects were estimated to be significant (specifically, whenever the ratio of the weighted relativistic hydrogenic f-values g_if_{ik} of any two lines within a multiplet was found to deviate from the corresponding LS-coupling line-strength ratio by more than 5% for the appropriate value of the nuclear charge Z), the f-values were excluded from the compilation. A more detailed discussion of this comparison is given in ref. [6].

Transition probability data are available for numerous transitions involving a vacant K shell [9,10]. None of these data have been tabulated, however, since such transition arrays are rather complex and all of the lines are concentrated in a very narrow wavelength range.

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Ni XXVI: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$1s^22s–$ $1s2p(^1P^o)2s$	$^2S – ^2P^o$	*1.598*			2	6	5.6(+6)^a	0.65	0.0068	0.11	D	1
			[1.597]			2	4	6.5(+6)	0.50	0.0052	−0.00	D	1
			[1.599]			2	2	4.0(+6)	0.15	0.0016	−0.51	D	1
2.	$1s^22s–$ $1s2p(^3P^o)2s$	$^2S – ^2P^o$											
			[1.593]			2	2	2.8(+6)	0.11	0.0011	−0.67	D	1

Ni XXVI: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
3.	$1s^22p-1s2p^2$	$^2P^o - {}^2P$											
			[1.597]			4	4	8.3(+6)	0.32	0.0067	0.10	D	1
			[1.598]			2	2	7.3(+6)	0.28	0.0029	−0.25	D	1
			[1.603]			4	2	2.1(+6)	0.040	8.5(−4)	−0.79	D	1
4.		$^2P^o - {}^2D$											
			[1.601]			4	6	2.7(+6)	0.16	0.0033	−0.21	D	1
			[1.598]			2	4	4.5(+6)	0.34	0.0036	−0.16	D	1
5.		$^2P^o - {}^2S$											
			[1.593]			4	2	3.5(+6)	0.067	0.0014	−0.57	D	1
6.	$2s-2p$	$^2S - {}^2P^o$	*183.37*	0	*545340*	2	6	42.0	0.0635	0.0767	−0.896	B+	3
			165.42?	0	604520	2	4	57.5	0.0472	0.0514	−1.025	B+	3
			234.20	0	426990	2	2	19.9	0.0164	0.0253	−1.484	B+	3
7.	$2s-3p$	$^2S - {}^2P^o$	*9.074*	0	*11020000*	2	6	1.01(+5)	0.375	0.0224	−0.125	B+	6
			9.061	0	11040000	2	4	9.99(+4)	0.246	0.0147	−0.308	B+	6
			9.105	0	10980000	2	2	1.04(+5)	0.129	0.00773	−0.588	B+	6
8.	$2s-4p$	$^2S - {}^2P^o$				2	6		0.101		−0.695	C+	6
9.	$2s-5p$	$^2S - {}^2P^o$				2	6		0.040		−1.10	C+	6
10.	$2s-6p$	$^2S - {}^2P^o$				2	6		0.0213		−1.371	C+	6
11.	$2s-7p$	$^2S - {}^2P^o$				2	6		0.0125		−1.602	C+	6
12.	$2p-3s$	$^2P^o - {}^2S$	*9.676*	*545340*	10880000	6	2	3.8(+4)	0.018	0.0034	−0.97	C	4
			9.732	604520	10880000	4	2	2.5(+4)	0.018	0.0023	−1.14	C	4
			[9.567]	426990	10880000	2	2	1.3(+4)	0.018	0.0011	−1.44	C	4
13.	$2p-3d$	$^2P^o - {}^2D$	*9.483*	*545340*	*11090000*	6	10	3.02(+5)	0.68	0.127	0.61	C	4
			9.535	604520	11090000	4	6	2.96(+5)	0.605	0.0760	0.384	C+	4
			9.390	426990	11080000	2	4	2.59(+5)	0.685	0.0424	0.137	C+	4
			9.55	604520	11080000	4	4	5.0(+4)	0.068	0.0086	−0.57	C	4
14.	$2p-4d$	$^2P^o - {}^2D$				6	10		0.12		−0.14	C+	6
15.	$2p-5d$	$^2P^o - {}^2D$				6	10		0.0450		−0.569	C+	6
16.	$2p-6d$	$^2P^o - {}^2D$				6	10		0.0220		−0.879	C+	6
17.	$2p-7d$	$^2P^o - {}^2D$				6	10		0.0125		−1.125	C+	6
18.	$3s-4p$	$^2S - {}^2P^o$				2	6		0.45		−0.05	C	6
19.	$3s-5p$	$^2S - {}^2P^o$				2	6		0.108		−0.67	C	6
20.	$3s-6p$	$^2S - {}^2P^o$				2	6		0.048		−1.02	C	6
21.	$3s-7p$	$^2S - {}^2P^o$				2	6		0.0250		−1.301	C	6
22.	$3p-4d$	$^2P^o - {}^2D$				6	10		0.60		0.56	B	6
23.	$3p-5d$	$^2P^o - {}^2D$				6	10		0.138		−0.082	C+	6
24.	$3p-6d$	$^2P^o - {}^2D$				6	10		0.0558		−0.475	C+	6

Ni XXVI: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
25.	$3p$–$7d$	^{2}P° – ^{2}D				6	10		0.0289		−0.761	C+	6
26.	$3d$–$4f$	^{2}D – ^{2}F°				10	14		1.00		1.000	B	5
27.	$4s$–$5p$	^{2}S – ^{2}P°				2	6		0.483		−0.015	C	6
28.	$4s$–$6p$	^{2}S – ^{2}P°				2	6		0.129		−0.59	C	6
29.	$4s$–$7p$	^{2}S – ^{2}P°				2	6		0.056		−0.95	C	6
30.	$4p$–$5d$	^{2}P° – ^{2}D				6	10		0.586		0.546	C+	6
31.	$4p$–$6d$	^{2}P° – ^{2}D				6	10		0.143		−0.067	C+	6
32.	$4p$–$7d$	^{2}P° – ^{2}D				6	10		0.0618		−0.431	C+	6

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Ni XXVII

Ground State $1s^2$ $^1S_0$

Ionization Potential [10290] eV = [82990100] cm^{-1}

Allowed Transitions

List of tabulated lines

Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.	Wavelength (Å)	No.
1.2534	19	1.543	3,9	6.4225	25	25.500	46
1.2537	18	1.544	9	6.5224	26	25.907	47
1.2824	17	1.546	11	6.5520	33	53.879	57
1.2831	16	1.547	11	6.6779	34	54.177	58
1.3500	15	1.549	5	8.6080	23	55.298	60
1.3516	14	1.550	11	8.7475	24	56.016	61
1.531	4	1.551	7	8.8772	29	168.5	21
1.534	13	1.558	8	9.0740	30	228.0	20
1.537	6,10	1.5883	2	17.084	43	315.5	22
1.538	3	1.5963	1	17.241	44	361.9	20
1.539	9	5.7489	27	17.356	50	388.7	20
1.540	9	5.8352	28	17.590	51		
1.541	12	5.8471	37	24.819	41		
1.542	3,9	5.9524	38	25.036	42		

Oscillator strengths for transitions of the $1s^2$–$1s2p$ array are taken from the results of Drake [1], who incorporated accurate nonrelativistic matrix elements and exact Dirac hydrogenic matrix elements into a Z-expansion technique in order to provide f-values which would accurately reflect correlation effects for low-Z ions and relativistic effects for high-Z ions of the He isoelectronic sequence. Results for the stronger transitions to doubly exicted $n = 2$ states are from the charge-expansion perturbation theory calculations of Vainshtein and Safronova [2]. The f-values for the $1s^2$ ^{1}S – $1snp$ ^{3}P° (n = 3–5) transitions were interpolated from results of the relativistic random phase approximation (RRPA) calculations of Johnson and Lin [3]. Data for numerous other s–p and p–s transitions are from the RRPA results of Lin et al. [4,5].

The Z-expansion results of Laughlin [6] have been tabulated for various p–d and d–p transitions, as well as transitions between $4d$ and $4f$ levels. For those multiplets which involve no change of quantum number ($3p$–$3d$, $4p$–$4d$, $4d$–$4f$) the results should be considered to be rather uncertain, since the f-values are very sensitive to energy differences. It should be noted that, according to Laughlin's calculations, the nd ^{1}D levels (n = 3,4) lie below the corresponding $np\ ^1P^{\circ}$ levels, and that the $4f\ ^1F^{\circ}$ level lies below $4d\ ^1D$. The opposite is true for the triplet states. Oscillator strengths for a few $p-d$ transitions were extrapolated from the variational calculations of Weiss [7].

Brown and Cortez [8] have provided f-values for numerous $d-f$ and $f-d$ transitions for the entire isoelectronic sequence by deriving Z-expansion formulae based on variational calculations for the low-Z ions. Their results for transitions between the lower-lying D and F° terms are tabulated here.

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Ni XXVII: Allowed transitions

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
1.	$1s^2$–$1s2p$	$^1S - {}^3P^{\circ}$											
			[1.5963]	0	[62644200]	1	3	7.70(+5)[a]	0.0883	4.64(−4)	−1.054	B	1
2.		$^1S - {}^1P^{\circ}$	[1.5883]	0	[62961500]	1	3	6.02(+6)	0.683	0.00357	−0.166	B	1
3.	$1s2s$–$2s2p$	$^3S - {}^3P^{\circ}$	*1.540*	[62367900]	*[127300000]*	3	9	3.8(+6)	0.41	0.0062	0.09	C	2
			[1.538]	[62367900]	[127380000]	3	5	3.9(+6)	0.23	0.0035	−0.16	C	2
			[1.542]	[62367900]	[127210000]	3	3	3.6(+6)	0.13	0.0020	−0.41	C	2
			[1.543]	[62367900]	[127170000]	3	1	3.8(+6)	0.045	6.9(−4)	−0.87	C	2
4.		$^3S - {}^1P^{\circ}$											
			[1.531]	[62367900]	[127690000]	3	3	2.0(+5)	0.0070	1.1(−4)	−1.68	D	2
5.		$^1S - {}^3P^{\circ}$											
			[1.549]	[62644500]	[127210000]	1	3	2.0(+5)	0.022	1.1(−4)	−1.67	D	2
6.		$^1S - {}^1P^{\circ}$	[1.537]	[62644500]	[127690000]	1	3	3.7(+6)	0.39	0.0020	−0.41	C	2
7.	$1s2p$–$2s^2$	$^3P^{\circ} - {}^1S$											
			[1.551]	[62644200]	[127130000]	3	1	8.2(+5)	0.0099	1.5(−4)	−1.53	D	2
8.		$^1P^{\circ} - {}^1S$	[1.558]	[62961500]	[127130000]	3	1	6.5(+5)	0.0079	1.2(−4)	−1.63	D	2
9.	$1s2p$–$2p^2$	$^3P^{\circ} - {}^3P$	*1.542*	*[62732300]*	*[127600000]*	9	9	6.6(+6)	0.236	0.0108	0.328	C	2
			[1.542]	[62806500]	[127640000]	5	5	3.5(+6)	0.12	0.0032	−0.20	C	2
			[1.540]	[62644200]	[127590000]	3	3	1.7(+6)	0.060	9.2(−4)	−0.74	C	2
			[1.544]	[62806500]	[127590000]	5	3	3.2(+6)	0.069	0.0017	−0.46	C	2
			[1.543]	[62644200]	[127460000]	3	1	6.9(+6)	0.082	0.0013	−0.61	C	2
			[1.539]	[62644200]	[127640000]	3	5	2.6(+6)	0.15	0.0023	−0.34	C	2
			[1.539]	[62625200]	[127590000]	1	3	2.6(+6)	0.28	0.0014	−0.56	C	2
10.		$^3P^{\circ} - {}^1D$											
			[1.537]	[62806500]	[127860000]	5	5	2.3(+6)	0.081	0.0021	−0.39	C	2
11.		$^1P^{\circ} - {}^3P$											
			[1.546]	[62961500]	[127640000]	3	5	1.6(+6)	0.096	0.0015	−0.54	C	2
			[1.547]	[62961500]	[127590000]	3	3	2.1(+5)	0.0075	1.2(−4)	−1.65	D	2
			[1.550]	[62961500]	[127460000]	3	1	1.2(+5)	0.0014	2.2(−5)	−2.36	D	2
12.		$^1P^{\circ} - {}^1D$	[1.541]	[62961500]	[127860000]	3	5	5.5(+6)	0.33	0.0050	−0.01	C	2
13.		$^1P^{\circ} - {}^1S$	[1.534]	[62961500]	[128140000]	3	1	6.9(+6)	0.081	0.0012	−0.61	C	2

Ni XXVII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
14.	$1s^2$–$1s3p$	$^1S-{}^3P^o$											
			[1.3516]	0	[73985000]	1	3	2.4(+5)	0.020	8.9(−5)	−1.70	E	*interp.*
15.		$^1S-{}^1P^o$	[1.3500]	0	[74076300]	1	3	1.63(+6)	0.134	5.96(−4)	−0.873	B	4
16.	$1s^2$–$1s4p$	$^1S-{}^3P^o$											
			[1.2831]	0	[77938200]	1	3	1.0(+5)	0.0074	3.1(−5)	−2.13	E	*interp.*
17.		$^1S-{}^1P^o$	[1.2824]	0	[77976200]	1	3	6.38(+5)	0.0472	1.99(−4)	−1.326	B	4
18.	$1s^2$–$1s5p$	$^1S-{}^3P^o$											
			[1.2537]	0	[79762600]	1	3	5.2(+4)	0.0037	1.5(−5)	−2.43	E	*interp.*
19.		$^1S-{}^1P^o$	[1.2534]	0	[79782000]	1	3	3.35(+5)	0.0237	9.78(−5)	−1.625	B	4
20.	$1s2s$–$1s2p$	$^3S-{}^3P^o$	*274.4*	[62367900]	*[62732300]*	3	9	12.0	0.0406	0.110	−0.914	B	5
			[228.0]	[62367900]	[62806500]	3	5	21.7	0.0282	0.0635	−1.073	B	5
			[361.9]	[62367900]	[62644200]	3	3	4.82	0.00946	0.0338	−1.547	B	5
			[388.7]	[62367900]	[62625200]	3	1	4.35	0.00328	0.0126	−2.006	B	5
21.		$^3S-{}^1P^o$											
			[168.5]	[62367900]	[62961500]	3	3	5.95	0.00253	0.00421	−2.119	B	5
22.		$^1S-{}^1P^o$	[315.5]	[62644500]	[62961500]	1	3	7.53	0.0337	0.0350	−1.472	B	5
23.	$1s2s$–$1s3p$	$^3S-{}^3P^o$											
			[8.6080]	[62367900]	[73985000]	3	3	1.07(+5)	0.119	0.0101	−0.447	B	4
24.		$^1S-{}^1P^o$	[8.7475]	[62644500]	[74076300]	1	3	1.03(+5)	0.353	0.0102	−0.452	B	4
25.	$1s2s$–$1s4p$	$^3S-{}^3P^o$											
			[6.4225]	[62367900]	[77938200]	3	3	5.2(+4)	0.032	0.0020	−1.02	B	4
26.		$^1S-{}^1P^o$	[6.5224]	[62644500]	[77976200]	1	3	4.4(+4)	0.085	0.0018	−1.07	B	4
27.	$1s2s$–$1s5p$	$^3S-{}^3P^o$											
			[5.7489]	[62367900]	[79762600]	3	3	2.4(+4)	0.012	6.8(−4)	−1.44	B	4
28.		$^1S-{}^1P^o$	[5.8352]	[62644500]	[79782000]	1	3	2.3(+4)	0.035	6.7(−4)	−1.46	B	4
29.	$1s2p$–$1s3s$	$^3P^o-{}^3S$											
			[8.8772]	[62644200]	[73909000]	3	3	1.1(+4)	0.013	0.0011	−1.41	B	4
30.		$^1P^o-{}^1S$	[9.0740]	[62961500]	[73982000]	3	1	3.4(+4)	0.014	0.0013	−1.38	B	4
31.	$1s2p$–$1s3d$	$^3P^o-{}^3D$				9	15		0.69		0.79	C+	*interp.*
32.		$^1P^o-{}^1D$				3	5		0.70		0.32	C+	*interp.*
33.	$1s2p$–$1s4s$	$^3P^o-{}^3S$											
			[6.5520]	[62644200]	[77906600]	3	3	4700	0.0030	1.9(−4)	−2.05	C	4
34.		$^1P^o-{}^1S$	[6.6779]	[62961500]	[77936200]	3	1	1.3(+4)	0.0030	2.0(−4)	−2.05	C	4
35.	$1s2p$–$1s4d$	$^3P^o-{}^3D$				9	15		0.12		0.03	C	6

Ni XXVII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^8s^{-1})	f_{ik}	S (at.u.)	log gf	Accu-racy	Source
36.		$^1P^o - ^1D$				3	5		0.12		−0.44	C	6
37.	$1s2p-1s5s$	$^3P^o - ^3S$											
			[5.8471]	[62644200]	[79746600]	3	3	2300	0.0012	6.9(−5)	−2.44	C	4
38.		$^1P^o - ^1S$	[5.9524]	[62961500]	[79761400]	3	1	6800	0.0012	7.1(−5)	−2.44	C	4
39.	$1s3s-1s3p$	$^3S - ^3P^o$											
						3	3		0.015		−1.35	C	4
40.		$^1S - ^1P^o$				1	3		0.057		−1.24	C	4
41.	$1s3s-1s4p$	$^3S - ^3P^o$											
			[24.819]	[73909000]	[77938200]	3	3	1.42(+4)	0.131	0.0321	−0.406	B	4
42.		$^1S - ^1P^o$	[25.036]	[73982000]	[77976200]	1	3	1.37(+4)	0.387	0.0319	−0.412	B	4
43.	$1s3s-1s5p$	$^3S - ^3P^o$											
			[17.084]	[73909000]	[79762600]	3	3	7500	0.033	0.0056	−1.00	B	4
44.		$^1S - ^1P^o$	[17.241]	[73982000]	[79782000]	1	3	7400	0.099	0.0056	−1.00	B	4
45.	$1s3p-1s3d$	$^3P^o - ^3D$				9	15		0.010		−1.05	D	*interp.*
46.	$1s3p-1s4s$	$^3P^o - ^3S$											
			[25.500]	[73985000]	[77906600]	3	3	3200	0.031	0.0078	−1.03	B	4
47.		$^1P^o - ^1S$	[25.907]	[74076300]	[77936200]	3	1	9800	0.033	0.0084	−1.00	B	4
48.	$1s3p-1s4d$	$^3P^o - ^3D$				9	15		0.60		0.73	C	6
49.		$^1P^o - ^1D$				3	5		0.62		0.27	C	6
50.	$1s3p-1s5s$	$^3P^o - ^3S$											
			[17.356]	[73985000]	[79746600]	3	3	1600	0.0070	0.0012	−1.68	C	4
51.		$^1P^o - ^1S$	[17.590]	[74076300]	[79761400]	3	1	4700	0.0073	0.0013	−1.66	C	4
52.	$1s3d-1s3p$	$^1D - ^1P^o$				5	3		0.0019		−2.02	E	6
53.	$1s3d-1s4p$	$^3D - ^3P^o$				15	9		0.012		−0.74	C	6
54.		$^1D - ^1P^o$				5	3		0.011		−1.26	C	6
55.	$1s4s-1s4p$	$^3S - ^3P^o$											
						3	3		0.026		−1.11	E	4
56.		$^1S - ^1P^o$				1	3		0.062		−1.21	D	4
57.	$1s4s-1s5p$	$^3S - ^3P^o$											
			[53.879]	[77906600]	[79762600]	3	3	3380	0.147	0.0782	−0.356	B	4
58.		$^1S - ^1P^o$	[54.177]	[77936200]	[79782000]	1	3	3260	0.431	0.0769	−0.366	B	4
59.	$1s4p-1s4d$	$^3P^o - ^3D$				9	15		0.018		−0.79	D	6

Ni XXVII: Allowed transitions—Continued

No.	Transition array	Multiplet	λ(Å)	E_i (cm^{-1})	E_k (cm^{-1})	g_i	g_k	A_{ki} (10^{8}s^{-1})	f_{ik}	S (at.u.)	log gf	Accuracy	Source
60.	1s4p–1s5s	^{3}P° – ^{3}S											
			[55.298]	[77938200]	[79746600]	3	3	1100	0.051	0.028	−0.82	B	4
61.		^{1}P° – ^{1}S	[56.016]	[77976200]	[79761400]	3	1	3400	0.053	0.029	−0.80	B	4
62.	1s4d–1s4p	^{1}D – ^{1}P°				5	3		0.0029		−1.84	E	6
63.	1s4d–1s4f	^{3}D – ^{3}F°				15	21		7.3(−4)		−1.96	E	6
64.	1s4d–1s5f	^{3}D – ^{3}F°				15	21		0.89		1.13	B	8
65.		^{1}D – ^{1}F°				5	7		0.89		0.65	B	8
66.	1s4f–1s4d	^{1}F° – ^{1}D				7	5		3.9(−4)		−2.56	E	6
67.	1s4f–1s5d	^{3}F° – ^{3}D				21	15		0.0089		−0.73	C	8
68.		^{1}F° – ^{1}D				7	5		0.0089		−1.21	C	8
69.	1s5s–1s5p	^{3}S – ^{3}P°											
						3	3		0.026		−1.11	E	4
70.		^{1}S – ^{1}P°				1	3		0.10		−1.00	E	4

[a] The number in parentheses following the tabulated value indicates the power of ten by which this value has to be multiplied.

Ni XXVIII

Ground State	1s ^{2}S$_{1/2}$
Ionization Potential	[10775] eV = [86908000] cm^{-1}

Allowed Transitions

The transition probability data for this hydrogen-like ion may be obtained by scaling the data available for the hydrogen spectrum (see NSRDS-NBS 4 [1]) according to

$$f_{\mathrm{Ni\,XXVIII}} = f_{\mathrm{Hydrogen}},$$

$$A_{\mathrm{Ni\,XXVIII}} = (28)^4\, A_{\mathrm{Hydrogen}},$$

$$S_{\mathrm{Ni\,XXVIII}} = (28)^{-2}\, S_{\mathrm{Hydrogen}}.$$

An uncertainty of a few percent arises from the neglect of relativistic effects. Recent theoretical studies [2,3] indicate that relativistic effects on line strengths for this ion are generally in this range, with the relativistic value usually slightly below the non-relativistic one, although in certain transitions where *n* increases and *l* decreases the line strength increases. Younger and Weiss [3] have calculated exact Dirac relativistic hydrogenic line strengths for a number of transitions of interest along the hydrogen isoelectronic sequence.

References

[1] Wiese, W. L., Smith, M. W., and Glennon, B. M., Atomic Transition Probabilities—Hydrogen through Neon (A Critical Data Compilation), Vol. I, 157 pp., Nat. Stand. Ref. Data Ser., Nat. Bur. Stand. (U.S.), 4 (May 1966).
[2] Garstang, R. H., *Topics in Modern Physics* (*A Tribute to Edward U. Condon*), 153–167, Ed. Brittin, W. E., and Odabasi, H., Colorado Associated Univ. Press, Boulder, Colorado (1971).
[3] Younger, S. M., and Weiss, A. W., J. Res. Nat. Bur. Stand., Sect. A **79**, 629 (1975).