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Energy Levels of Iron, Fe I through Fe XXVI

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This is a revision of the compilation of energy levels of iron for all ionization stages made in 1975 by Reader and Sugar. New material has since been provided for all but two of these ions. The present compilation includes electron configurations, energy levels, term designations, calculated leading percentages for most ions, experimental *g*-values, and ionization energies.

Key words: Atomic energy levels; atomic spectra; Fe; iron; iron energy levels.

Contents

1. Introduction

The NBS Atomic Energy Levels Data Center has undertaken to provide new compilations of atomic energy levels, the program at present being concentrated on the elements hydrogen through nickel. The data for each atom and its ions are being published as a separate paper. Already completed are the compilations for the following elements: calcium, chromium, cobalt, scandium, and vanadium by Sugar and Corliss (1979, 1977, 1981, 1980, 1978); manganese, nickel, titanium, and potassium by Corliss and Sugar (1977, 1981, 1979a, 1979b); and aluminum, magnesium, and sodium by Martin and Zalubas (1979, 1980, 1981). The present work on iron is a revision of the compilation by Reader and Sugar (1975) and completes a new set of compilations for the iron period (K through Ni) which we plan to publish as a single volume. Since the publication by Reader and Sugar appeared, new data have been added for every spectrum except Fe III and Fe V.

Generally we have used only published papers as sources of data. Unpublished data are included when they constitute a substantial improvement over material in the literature. For many of the higher ions the original papers do not give energy level values, but only classifications of observed lines. In these cases we have derived the level values. All energy levels are given in units of cm^{-1}.

Ionization energies found in the literature are usually given in eV or in cm^{-1}. The conversion factor, 8065.479 ± 0.021 cm^{-1}/eV, given by Cohen and Taylor (1973), is used here. In a few cases where adequate data were available but the ionization energy had not been derived, we carried out the calculation. For a number of the ions, no suitable series are known. In these cases we have quoted values obtained by Lotz (1967) by a method of successive differences along isoelectronic sequences. Although uncertainties are not provided with these extrapolated values, we find that they are accurate to 0.2% by comparing them with recently determined values.

Nearly all of the data result from observations of various types of laboratory light sources. However, the laboratory data are sometimes supplemented by data obtained from solar observations. This is particularly true where spin-

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forbidden lines are needed to establish the absolute energy of a system of excited levels and where parity-forbidden transitions between levels of a ground configuration are used to obtain accurate relative energies for the low levels. Whenever both solar data and equivalent laboratory data are available preference is generally given to the laboratory measurements.

When no observations are available to connect independent systems of levels, an estimate of the connecting energy is adopted. Those level values affected by the estimate are denoted by $+x$ following the value. The value of x is the systematic error of the estimate.

For Fe XXV and Fe XXVI, which are isoelectronic with He I and H I, respectively, we give (in brackets) only calculated level values since they are at present more accurate than experimental x-ray wavelengths from which level values may be obtained.

For convenient general sources of wavelengths of iron lines we refer the reader to the compilation by Kelly and Palumbo (1973) for the range 1–2000 Å, to the tables of spectral lines in the CRC Handbook of Chemistry and Physics (1980) from 40–40 000 Å and to Tables of Spectral Line Intensities by Meggers, Corliss, and Scribner (1975) from 2000–9000 Å. An accurate set of measurements of Fe I and Fe II in the range of 1900–9000 Å was given by Crosswhite (1975).

We have included under the heading "Leading Percentages" the results of calculations that express the eigenvector percentage composition of levels in terms of the basis states of a single configuration, or more than one configuration where configuration interaction has been included.

In the "Leading percentages" column we give first the percentage of the basis state corresponding to the level's name; next the second largest percentage together with the related basis state. Sometimes the leading percentage in an alternative coupling scheme is given. Generally, when the leading percentage is less than 40%, no name is given; for an unnamed level, the term symbol follows the percentage.

The user should of course bear in mind that the percentages are model dependent, so that the results of different calculations can yield notably different percentages. In the present tables, the percentages are taken mostly from published parametric calculations. When only *ab initio* calculations are found in the literature, we have used them if the calculated levels can be identified with the observed levels.

For configurations of equivalent d-electrons, several terms of the same LS type may occur. These are theoretically distinguished by their seniority number. In the present compilations they are designated in the notation of Nielson and Koster (1963). For example, in the $3d^5$ configuration there are three ^{2}D terms with seniorities of 1, 3, and 5. These terms are denoted as ^{2}D1, ^{2}D2, and ^{2}D3, respectively, by Nielson and Koster. Martin, Zalubas, and Hagan (1978) give a complete summary of the coupling notations used here, tables of the allowed terms for equivalent electrons, etc. The prefixing of terms by lower case letters (for example $a\ ^5$D, $z\ ^5$G, etc.) has been dropped except for Fe I and II, where its use in connection with tables of classified lines is established in the literature.

The text for each ion does not include a complete review of the literature but is intended to credit the major contributions. In assembling the data for each spectrum, we referred to the following bibliographies:

i. Papers cited by Moore (1952)
ii. C. E. Moore (1969)
iii. L. Hagan and W. C. Martin (1972)
iv. J. Reader and J. Sugar (1975)
v. L. Hagan (1977)
vi. R. Zalubas and A. Albright (1980)
vii. Card file of publications since June 1979 maintained by the NBS Atomic Energy Levels Data Center

This compilation includes all material available to us as of April, 1981.

Acknowledgments

Throughout this work we have made extensive use of the bibliographical files and reprint collection maintained in the Atomic Energy Levels Data Center by Romuald Zalubas and Arlene Albright. Our thanks are extended to them for generous cooperation. The compilation has also benefited greatly from the preprints that were provided by many of our colleagues.

We thank W. C. Martin for his critical reading and G. A. Martin for her careful review of the manuscript.

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References for Introduction

Cohen, E. R., and Taylor, B. N. (1973), J. Phys. Chem. Ref. Data **2**, 663.

Corliss, C., and Sugar, J. (1977), Energy Levels of Manganese, Mn I through Mn XXV, J. Phys. Chem. Ref. Data **6**, 1253.

Corliss, C., and Sugar, J. (1979a), Energy Levels of Titanium, Ti I through Ti XXII, J. Phys. Chem. Ref. Data **8**, 1.

Corliss, C., and Sugar, J. (1979b), Energy Levels of Potassium, K I through K XIX, J. Phys. Chem. Ref. Data **8**, 1109.

Corliss, C., and Sugar, J. (1981), Energy Levels of Nickel, Ni I through Ni XXVIII, J. Phys. Chem. Ref. Data **10**, 197.

CRC Handbook of Chemistry and Physics, 61st Ed. (1980), pp. E-219 to 348, Line Spectra of the Elements, Ed. by J. Reader and C. H. Corliss (CRC Press, Inc., Boca Raton, FL)

Crosswhite, H. M. (1975), J. Res. Nat. Bur. Stand. **79A**, 17.

Hagan, L. (1977), Bibliography on Atomic Energy Levels and Spectra, July 1971 through June 1975, Nat. Bur. Stand. (U.S.) Spec. Publ. 363, Suppl. 1 (U.S. Gov't Printing Office, Washington, DC).

Hagan, L., and Martin, W. C. (1972), Bibliography on Atomic Energy Levels and Spectra, July 1968 through June 1971, Nat. Bur. Stand. (U.S.) Spec. Publ. 363 (U.S. Gov't Printing Office, Washington, DC).

Kelly, R. L., and Palumbo, L. J. (1973), Atomic and Ionic Emission Lines Below 2000 Angstroms—Hydrogen through Krypton, NRL Report 7599 (U.S. Gov't Printing Office, Washington, DC).

Lotz, W. (1967), J. Opt. Soc. Am. **57**, 873.

Martin, W. C., and Zalubas, R. (1979), Energy Levels of Aluminum, Al I through Al XIII, J. Phys. Chem. Ref. Data **8**, 817.

Martin, W. C., and Zalubas, R. (1980), Energy Levels of Magnesium, Mg I through Mg XII, J. Phys. Chem. Ref. Data **9**, 1.

Martin, W. C., and Zalubas, R. (1981), Energy Levels of Sodium, Na I through Na XI, J. Phys. Chem. Ref. Data **10**, 153.

Martin, W. C., Zalubas, R., and Hagan, L. (1978), Atomic Energy Levels—The Rare-Earth Elements, Nat. Stand. Ref. Data Ser., Nat. Bur. Stand. (U.S.), 60.

Meggers, W. F., Corliss, C. H., and Scribner, B. F. (1975), Nat. Bur. Stand. Monogr. 145.

Moore, C. E. (1952), Atomic Energy Levels, Nat. Bur. Stand. (U.S.) Circ. 467, Vol. II (reissued in 1971 as Nat. Stand. Ref. Data Ser., Nat. Bur. Stand. (U.S.), 35, Vol. II).

Moore, C. E. (1969), Bibliography on the Analyses of Optical Atomic Spectra, Section 2, Nat. Bur. Stand. (U.S.), Spec. Publ. 306-2 (U.S. Gov't Printing Office, Washington, DC).

Nielson, C. W., and Koster, G. F., Spectroscopic Coefficients for the p^n, d^n, and f^n Configurations, 275 pp. (M.I.T. Press, Cambridge, MA, 1963).

Reader, J., and Sugar, J. (1975), Energy Levels of Iron, Fe I through Fe XXVI, J. Phys. Chem. Ref. Data **4**, 353.

Sugar, J., and Corliss, C. (1977), Energy Levels of Chromium, Cr I through Cr XXIV, J. Phys. Chem. Ref. Data **6**, 317.

Sugar, J., and Corliss, C. (1978), Energy Levels of Vanadium, V I through V XXIII, J. Phys. Chem. Ref. Data **7**, 1191.

Sugar, J., and Corliss, C. (1979), Energy Levels of Calcium, Ca I through Ca XX, J. Phys. Chem. Ref. Data **8**, 865.

Sugar, J., and Corliss, C. (1980), Energy Levels of Scandium, Sc I through Sc XXI, J. Phys. Chem. Ref. Data **9**, 473.

Sugar, J., and Corliss, C. (1981), Energy Levels of Cobalt, Co I through Co XXVII, J. Phys. Chem. Ref. Data, **10**.

Zalubas, R., and Albright, A. (1980), Bibliography on Atomic Energy Levels and Spectra, July 1975 through June 1979, Nat. Bur. Stand. (U.S.) Spec. Publ. 363, Suppl. 2 (U.S. Gov't Printing Office, Washington, DC).

Fe I

$Z=26$

Ground state: $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2\ {}^5D_4$

Ionization energy = 63 480±500 cm^{-1} (7.870±0.06 eV)

The principal contributors to the analysis of Fe I are Walters, Laporte, Burns, and Catalán, who together provided 404 energy levels. Following their work and utilizing new Zeeman effect data from the Massachusetts Institute of Technology, Russell, Moore, and Weeks (1944) were able to extend the analysis by the addition of 60 levels and to confirm the older analysis. A few high levels were later found by Kiess, Rubin, and Moore (1961). The five-place g-values are from Childs and Goodman (1965), who give uncertainties of about ±0.00005 with the values. The rest, from Russell et al., have an uncertainty of ±0.001 to 0.009 depending on the determination.

Redetermined values for many of the levels have been provided by Crosswhite (1975). His revisions result from a new set of observations made with a low pressure hollow cathode discharge. The values given below to three decimal places are due to Crosswhite. He ascribes an accuracy of ±0.002 cm^{-1} to these levels. A comparison of his results with the earlier data, which were derived from arc sources at atmospheric pressure, shows that the earlier values of levels belonging to the $3d^8$, $3d^7 4s$, $3d^7 4p$, $3d^7 4d$, $3d^6 4s4p$, $3d^6 4s4d$, and $3d^5 4s^2 4p/wf$ configuration should be reduced by 0.04 cm^{-1} to obtain values consistent with observations from low pressure sources. This correction has been applied by us to all levels of these configurations whose values were not already revised by Crosswhite. These are given below to two decimal places. Insufficient information is available to establish corresponding corrections for levels of the $3d^6 4s5s$, $3d^6 4s6s$, $3d^6 4s7s$, $3d^6 4s5d$, $3d^7 5s$, and $3d^6 4s5p$ configurations. The uncorrected values rounded off to two decimal places are given below.

Litzen (1976) observed the spectrum from 13 350 to 24 924 Å and identified new terms in $3d^6 4s5p$ and $3d^7 5p$. He also determined revised level values for a few high even terms. His results are included here.

A calculation of the even configurations $3d^6 4s^2$, $3d^7 4s$, and $3d^8$ in intermediate coupling by Dembczynski (1980) provided leading percentages for these levels.

The leading percentages for the levels of odd parity are from Roth (1981). He has calculated the $3d^7 4p$, $3d^6 4s4p$, and $3d^5 4s^2 4p$ groups of levels with configuration interaction. Roth distinguished repeating terms of the $3d^n$ core by the letters a, b ... rather than by seniority. His percentage composition for a given level is the sum of the percentages of states that differ only in the seniority of the core term.

The alphabetic prefixing of final terms with lower case letters, which served to distinguish final terms of the same type, has been repeated here from the literature except for levels that have been redesignated as a result of a new theoretical interpretation. Similarly, the authors' numerical designations for uninterpreted levels have been retained.

The ionization energy was derived from the $3d^7 ns$ series ($n=4,5$) by Catalán and Velasco (1952).

References

Burns, K., and Walters, Jr., F. M. (1929), Publ. Allegheny Observ. **6**, 159.
Catalán, M. A. (1930), Anales Soc. Espan. Fis. Quim. **28**, 1239.
Catalán, M. A., and Velasco, R. (1952), Anales Real Soc. Espan. Fis. Quim. (Madrid) **48A**, 247.
Childs, W. J., and Goodman, L. S. (1965), Phys. Rev. **140 A**, 447.
Crosswhite, H. M. (1975), J. Res. Nat. Bur. Stand. (U.S.) **79A**, 17.
Dembczynski, J. (1980), Physica **100 C**, 105.
Kiess, C. C., Rubin, V. C., and Moore, C. E. (1961), J. Res. Nat. Bur. Stand. (U.S.) **65A**, 1.
Laporte, O. (1924), Z. Physik **23**, 135; **26**, 1.
Litzén, U. (1976), Phys. Scr. **14**, 165.
Roth, C. (1981), At. Data Nucl. Data Tables.
Russell, H. N., Moore, C. E., and Weeks, D. W. (1944), Trans. Am. Phil. Soc. **34-II**, 111.
Walters, F. M. (1924), J. Opt. Soc. Am. **8**, 245.
Walters, F. M. (1923), J. Wash. Acad. Sci. **13**, 243.

Fe I

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages
$3d^6 4s^2$	$a\ {}^5D$	4	0.000	1.50020	100
		3	415.932	1.50034	100
		2	704.004	1.50041	100
		1	888.129	1.50022	100
		0	978.072		100

Fe I—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages		
$3d^7(^4F)4s$	$a\ ^5F$	5	6 928.266	1.40021	100		
		4	7 376.760	1.35004	100		
		3	7 728.056	1.24988	100		
		2	7 985.780	0.99953	100		
		1	8 154.710	-0.014	100		
$3d^7(^4F)4s$	$a\ ^3F$	4	11 976.234	1.254	98	1	$3d^64s^2\ ^3F2$
		3	12 560.930	1.086	98	1	
		2	12 968.549	0.670	98	1	
$3d^7(^4P)4s$	$a\ ^5P$	3	17 550.175	1.666	99		
		2	17 726.981	1.820	99		
		1	17 927.376	2.499	99		
$3d^6\,4s^2$	$a\ ^3P2$	2	18 378.181	1.506	55	32	$^3P1$
		1	19 552.473	1.500	55	32	
		0	20 037.813		55	32	
$3d^6(^5D)4s4p(^3P^\circ)$	$z\ ^7D^\circ$	5	*19 350.892*	1.597	99		
		4	*19 562.440*	1.642	98		
		3	*19 757.033*	1.746	99		
		2	*19 912.494*	2.008	99		
		1	*20 019.635*	2.999	100		
$3d^6\,4s^2$	$a\ ^3H$	6	19 390.164	1.163	100		
		5	19 621.005	1.038	100		
		4	19 788.245	0.811	100		
$3d^6\,4s^2$	$b\ ^3F2$	4	20 641.109	1.235	71	21	$^3F1$
		3	20 874.484	1.073	71	21	
		2	21 038.985	0.663	71	21	
$3d^7(^2G)4s$	$a\ ^3G$	5	21 715.730	1.197	88	10	$3d^64s^2\ ^3G$
		4	21 999.127	1.051	88	10	
		3	22 249.428	0.756	88	10	
$3d^6(^5D)4s4p(^3P^\circ)$	$z\ ^7F^\circ$	6	*22 650.421*	1.498	100		
		5	*22 845.868*	1.498	99		
		4	*22 996.676*	1.493	99		
		3	*23 110.937*	1.513	99		
		2	*23 192.497*	1.504	99		
		1	*23 244.834*	1.549	100		
		0	*23 270.374*		100		
$3d^7(^4P)4s$	$b\ ^3P$	2	22 838.318	1.498	92	4	$3d^64s^2\ ^3P1$
		1	22 946.808	1.489	79	10	$3d^7(^2P)4s\ ^3P$
		0	23 051.742		79	12	$3d^7(^2P)4s\ ^3P$
$3d^6(^5D)4s4p(^3P^\circ)$	$z\ ^7P^\circ$	4	*23 711.457*	1.747	98		
		3	*24 180.864*	1.908	99		
		2	*24 506.919*	2.333	98		
$3d^6\,4s^2$	$b\ ^3G$	5	23 783.614	1.200	88	10	$3d^7(^2G)4s\ ^3G$
		4	24 118.814	1.048	88	10	
		3	24 338.762	0.761	88	10	

Fe I—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages		
$3d^7(^2P)4s$	$c\ ^3P$	2	24 335.759	1.484	90	4	$(^2D2)\ ^3D$
		1	24 772.017	1.466	81	7	$(^4P)\ ^3P$
		0	25 091.597		79	12	$(^4P)\ ^3P$
$3d^7(^2G)4s$	$a\ ^1G$	4	24 574.650	1.001	90	3	$(^2H)\ ^3H$
$3d^6(^5D)4s4p(^3P^\circ)$	$z\ ^5D^\circ$	4	*25 899.987*	1.502	91	6	$3d^7(^4F)4p\ ^5D^\circ$
		3	*26 140.177*	1.500	91	6	
		2	*26 339.691*	1.503	92	6	
		1	*26 479.376*	1.495	92	6	
		0	*26 550.476*		93	5	
$3d^7(^2H)4s$	$b\ ^3H$	6	26 105.904	1.165	100		
		5	26 351.039	1.032	98	2	$(^2H)\ ^1H$
		4	26 627.604	0.811	98	2	$(^2G)\ ^1G$
$3d^7(^2D2)4s$	$a\ ^3D$	3	26 224.966	1.335	74	3	$(^2D1)\ ^3D$
		1	26 406.470	0.731	45	35	$(^2P)\ ^1P$
		2	26 623.730	1.178	67	18	$(^2D1)\ ^3D$
$3d^6(^5D)4s4p(^3P^\circ)$	$z\ ^5F^\circ$	5	*26 874.549*	1.399	95	4	$3d^7(^4F)4p\ ^5F^\circ$
		4	*27 166.819*	1.355	94	4	
		3	*27 394.688*	1.250	94	4	
		2	*27 559.581*	1.004	95	4	
		1	*27 666.346*	-0.012	95	4	
$3d^7(^2P)4s$	$a\ ^1P$	1	27 543.004	0.817	62	23	$(^2D2)\ ^3D$
$3d^7(^2D2)4s$	$a\ ^1D$	2	28 604.606	1.028	64	16	$(^2D1)\ ^1D$
$3d^7(^2H)4s$	$a\ ^1H$	5	28 819.946	1.000	98		
$3d^6(^5D)4s4p(^3P^\circ)$	$z\ ^5P^\circ$	3	*29 056.321*	1.657	98		
		2	*29 469.020*	1.835	97		
		1	*29 732.733*	2.487	97		
$3d^6 4s^2$	$a\ ^1I$	6	29 313.003	1.014	100		
$3d^6 4s^2$	$b\ ^3D$	1	29 320.028		88	8	$3d^7(^2D2)4s\ ^3D$
		2	29 356.740		81	7	
		3	29 371.811	1.326	94	4	
$3d^6 4s^2$	$b\ ^1G2$	4	29 798.933	0.979	62	35	$^1G1$
$3d^6(^5D)4s4p(^3P^\circ)$	$z\ ^3F^\circ$	4	*31 307.243*	1.250	94	5	$3d^7(^4F)4p\ ^3F^\circ$
		3	*31 805.067*	1.086	97		
		2	*32 133.986*	0.682	93	5	$3d^7(^4F)4p\ ^3F^\circ$
$3d^6(^5D)4s4p(^3P^\circ)$	$z\ ^3D^\circ$	3	*31 322.611*	1.321	90	8	$3d^7(^4F)4p\ ^3D^\circ$
		2	*31 686.346*	1.168	90	8	
		1	*31 937.316*	0.513	91	8	
$3d^8$	$c\ ^3F$	4	32 873.619	1.264	92	3	$3d^7(^2F)4s\ ^3F$
		3	33 412.713	1.066	92	5	
		2	33 765.304	0.677	86	6	

Fe I—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages		
$3d^7(^4F)4p$	$y\ ^5D°$	4	*33 095.937*	1.496	61	34	$3d^6(^5D)4s4p(^1P°)\ ^5D°$
		3	*33 507.120*	1.492	60	34	$3d^6(^5D)4s4p(^1P°)\ ^5D°$
		2	*33 801.567*	1.495	56	34	$3d^6(^5D)4s4p(^1P°)\ ^5D°$
		1	*34 017.098*	1.492	47	30	$3d^6(^5D)4s4p(^3P°)\ ^3P°$
		0	*34 121.58*		42	28	$3d^6(^5D)4s4p(^3P°)\ ^3P°$
$3d^7(^4F)4p$	$y\ ^5F°$	5	*33 695.394*	1.417	84	11	$3d^6(^5D)4s4p(^1P°)\ ^5F°$
		4	*34 039.513*	1.344	81	12	
		3	*34 328.749*	1.244	81	11	
		2	*34 547.206*	0.998	82	13	
		1	*34 692.144*	-0.016	84	12	
$3d^6(^5D)4s4p(^3P°)$	$z\ ^3P°$	2	*33 946.929*	1.493	91	4	$3d^7(^4F)4p\ ^5D°$
		1	*34 362.871*	1.496	50	30	
		0	*34 555.60*		69	18	
$3d^6 4s^2$	$b\ ^1D2$	2	34 636.78		67	20	$^1D1$
$3d^7(^4F)4p$	$z\ ^5G°$	5	*34 782.416*	1.218	58	35	$3d^7(^4F)4p\ ^3G°$
		6	*34 843.94*	1.332	94	4	$3d^6(^3H)4s4p(^3P°)\ ^5G°$
		4	*35 257.319*	1.103	75	16	$3d^7(^4F)4p\ ^3G°$
		3	*35 611.619*	0.887	86	6	$3d^7(^4F)4p\ ^3G°$
		2	*35 856.400*	0.335	92	5	$3d^6(^3H)4s4p(^3P°)\ ^5G°$
$3d^7(^4F)4p$	$z\ ^3G°$	5	*35 379.206*	1.248	61	33	$^5G°$
		4	*35 767.561*	1.100	78	16	
		3	*36 079.366*	0.791	89	6	
$3d^7(^4F)4p$	$y\ ^3F°$	4	*36 686.164*	1.246	86	5	$3d^6(^5D)4s4p(^3P°)\ ^3F°$
		3	*37 162.740*	1.086	84	5	
		2	*37 521.157*	0.688	87	5	
$3d^6(^5D)4s4p(^1P°)$	$y\ ^5P°$	3	*36 766.962*	1.661	60	34	$3d^5(^6S)4s^24p\ ^5P°$
		2	*37 157.557*	1.836	60	35	
		1	*37 409.542*	2.502	59	36	
$3d^7(^2F)4s$	$d\ ^3F$	2	36 940.56		92	6	$3d^8\ ^3F$
		3	36 975.60		94	5	
		4	37 045.96		96	3	
$3d^7(^4F)4p$	$y\ ^3D°$	3	*38 175.350*	1.324	84	8	$3d^6(^5D)4s4p(^3P°)\ ^3D°$
		2	*38 678.032*	1.151	85	7	
		1	*38 995.730*	0.493	86	7	
$3d^6(^5D)4s4p(^1P°)$	$x\ ^5D°$	4	*39 625.800*	1.489	55	18	$3d^7(^4F)4p\ ^5D°$
		3	*39 969.844*	1.504	54	19	
		2	*40 231.332*	1.501	53	19	
		1	*40 404.506*	1.498	53	20	
		0	*40 491.274*		53	20	
$3d^5(^6S)4s^2 4p$	$y\ ^7P°$	2	*40 052.030*	2.340	97		
		3	*40 207.086*	1.908	98		
		4	*40 421.85*	1.75?	91	7	$3d^6(^5D)4s4p(^1P°)\ ^5F°$
$3d^6(^5D)4s4p(^1P°)$	$x\ ^5F°$	5	*40 257.307*	1.390	90	5	$3d^7(^4F)4p\ ^5F°$
		4	*40 594.429*	1.328	82	5	
		3	*40 842.151*	1.254	88	5	
		2	*41 018.050*	0.998	88	5	
		1	*41 130.627*	-0.006	88	5	

Fe I—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages			
$3d^8$	^{3}P	2	40 871.410		85		6	$3d^64s^2$ ^{3}P2
		1	41 178.406		85		8	
		0	41 234.498		83		8	
$3d^6(a\ ^3P)4s4p(^3P^\circ)$	$z\ ^5S^\circ$	2	*40 894.986*	1.985	59		36	$3d^7(^4P)4p\ ^5S^\circ$
$3d^6(a\ ^3P)4s4p(^3P^\circ)$	$x\ ^5P^\circ$	3	*42 532.736*	1.650	86		5	$3d^7(^4P)4p\ ^5P^\circ$
		2	*42 859.770*	1.822	76		10	$3d^7(^4P)4p\ ^5S^\circ$
		1	*43 079.026*	2.464	85		7	$3d^7(^4P)4p\ ^5P^\circ$
$3d^6(^3H)4s4p(^3P^\circ)$	$y\ ^5G^\circ$	6	*42 784.35*	1.342	60		30	$(a\ ^3F)(^3P^\circ)\ ^5G^\circ$
		5	*42 911.908*	1.203	53		33	$(a\ ^3F)(^3P^\circ)\ ^5G^\circ$
		4	*43 022.975*	1.024	44		37	$(a\ ^3F)(^3P^\circ)\ ^5G^\circ$
		3	*43 137.479*	0.905	38		39	$(^3H)(^3P^\circ)\ ^5H^\circ$
		2	*43 210.021*	0.331	46		45	$(a\ ^3F)(^3P^\circ)\ ^5G^\circ$
$3d^6(^5D)4s\ (^6D)5s$	$e\ ^7D$	5	42 815.858	1.585				
		4	43 163.327	1.655				
		3	43 434.629	1.755				
		2	43 633.534	2.009				
		1	43 763.980	3.002				
$3d^6(^3H)4s4p(^3P^\circ)$	$z\ ^5H^\circ$	5	*42 991.62*	1.054	65		27	$^5I^\circ$
		4	*43 108.90*	0.871	67		17	$^5I^\circ$
		6	*43 321.08?*		64		30	$^5I^\circ$
		3	*43 325.958*	0.509	48		26	$^5G^\circ$
$3d^6(a\ ^3P)4s4p(^3P^\circ)$	$w\ ^5D^\circ$	4	*43 499.496*	1.492	51		28	$(a\ ^3F)(^3P^\circ)\ ^5D^\circ$
		3	*43 922.664*	1.481	35		28	
		2	*44 183.620*	1.533	44		22	
		1	*44 411.151*	1.315	48		19	
		0	*44 458.92*		45		19	
$3d^6(a\ ^3F)4s4p(^3P^\circ)$	$^5D^\circ$	4	*44 022.535*	1.444	42		23	$(a\ ^3P)(^3P^\circ)\ ^5D^\circ$
		3	*44 166.203*	1.351	39		24	
		2	*44 664.068*	1.378	41		22	
		1	*44 760.75*	1.389	40		20	
		0	*44 826.88*		60		25	
$3d^6(a\ ^3F)4s4p(^3P^\circ)$	$^5F^\circ$	5	*44 243.673*	1.382	84		4	$(^3D)(^3P^\circ)\ ^5F^\circ$
		2	*44 285.443*	1.117	59		10	$(a\ ^3F)(^3P^\circ)\ ^5D^\circ$
		1	*44 378.38?*	0.283	81		6	$(^3D)(^3P^\circ)\ ^5F^\circ$
		4	*44 415.070*	1.401	62		18	$(a\ ^3F)(^3P^\circ)\ ^5D^\circ$
		3	*44 551.330*	1.386	45		20	$(a\ ^3F)(^3P^\circ)\ ^5D^\circ$
$3d^7(^4P)4p$	$y\ ^5S^\circ$	2	*44 511.806*	1.888	38		32	$3d^6(a\ ^3P)4s4p(^3P^\circ)\ ^5S^\circ$
$3d^6(^5D)4s\ (^6D)5s$	$e\ ^5D$	4	44 677.004	1.502				
		3	45 061.327	1.508				
		2	45 333.874	1.503				
		1	45 509.150	1.518				
		0	45 595.08					
$3d^6(a\ ^3P)4s4p(^3P^\circ)$		3	*45 220.676*	1.352	29	$^3D^\circ$	29	$^5D^\circ$
$3d^6(a\ ^3P)4s4p(^3P^\circ)$		2	*45 281.831*	1.200	31	$^3D^\circ$	33	$^5D^\circ$

Fe I—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages			
$3d^6(^3H)4s4p(^3P^\circ)$	$y\ ^3G^\circ$	5	*45 294.846*	1.207	57		21	$3d^7(^2G)4p\ ^3G^\circ$
		4	*45 428.397*	1.053	55		20	
		3	*45 562.970*	0.765	54		19	
$3d^6(a\ ^3P)4s4p(^3P^\circ)$		1	*45 551.763*	0.556	30	$^3D^\circ$	32	$^5D^\circ$
$3d^6(a\ ^3F)4s4p(^3P^\circ)$	$x\ ^5G^\circ$	6	*45 608.31?*	1.336	65		30	$(^3H)(^3P^\circ)\ ^5G^\circ$
		5	*45 726.117*	1.269	60		32	
		4	*45 833.20*	1.158	55		36	
		3	*45 913.488*	0.928	53		40	
		2	*45 964.959*	0.323	52		45	
$3d^6(^3H)4s4p(^3P^\circ)$	$z\ ^3I^\circ$	7	*45 978.00?*	1.149	93		3	$3d^7(^2H)4p\ ^3I^\circ$
		6	*46 026.94*	1.040	91		3	
		5	*46 135.88*	0.833	94		4	
$3d^7(^4P)4p$	$w\ ^5P^\circ$	3	*46 137.10*	1.658	45		35	$3d^5(^6S)4s^24p\ ^5P^\circ$
		2	*46 313.57*	1.822	41		31	
		1	*46 410.40*	2.436	38		20	
$3d^6(a\ ^3P)4s4p(^3P^\circ)$	$z\ ^3S^\circ$	1	*46 600.814*	1.888	49		14	$3d^7(^2P)4p\ ^3S^\circ$
$3d^6(a\ ^3P)4s4p(^3P^\circ)$	$y\ ^3P^\circ$	0	*46 672.527*		37		24	$3d^7(^4P)4p\ ^3P^\circ$
		2	*46 727.068*	1.444	32		36	
		1	*46 901.820*	1.600	31		21	
$3d^7(^4P)4p$	$^5D^\circ$	4	*46 720.836*	1.341	50		17	$3d^6(a\ ^3F)4s4p(^3P^\circ)\ ^5D^\circ$
		3	*46 744.988*	1.397	54		14	
		2	*47 136.072*	1.216	53		19	
		0	*47 171.48?*		52		20	
		1	*47 177.225*	1.410	55		21	
$3d^7(^4P)4p$	$^3D^\circ$	2	*46 888.510*	1.260	51		15	$3d^6(a\ ^3F)4s4p(^3P^\circ)\ ^3D^\circ$
		3	*47 017.188*	1.346	54		18	
		1	*47 272.016*	0.767	47		20	
$3d^6(a\ ^3F)4s4p(^3P^\circ)$	$^3F^\circ$	4	*46 889.143*	1.344	38		17	$3d^7(^2G)4p\ ^3F^\circ$
		3	*47 092.707*	1.159	51		25	$3d^7(^2G)4p\ ^3G^\circ$
		2	*47 197.014*	0.743	41		24	$3d^6(^3G)4s4p(^3P^\circ)\ ^5G^\circ$
$3d^6(^3H)4s4p(^3P^\circ)$	$z\ ^3H^\circ$	6	*46 982.34*	1.200	36		37	$3d^7(^2G)4p\ ^3H^\circ$
		5	*47 008.366*	1.060	34		36	
		4	*47 106.477*	0.880	31		18	
$3d^7(^4F)5s$	$e\ ^5F$	5	47 005.508	1.421				
		4	47 377.962	1.331				
		3	47 755.539	1.236				
		2	48 036.666	0.991				
		1	48 221.314	0.007				
$3d^6(^3G)4s4p(^3P^\circ)$	$w\ ^5G^\circ$	6	*47 363.369*	1.306	78		11	$3d^7(^2G)4p\ ^3H^\circ$
		5	*47 420.229*	1.305	73		7	$3d^6(^3G)4s4p(^3P^\circ)\ ^5F^\circ$
		4	*47 590.047*	1.145	73		10	$3d^6(a\ ^3F)4s4p(^1P^\circ)\ ^3G^\circ$
		3	*47 693.227*	0.931	42		18	$3d^6(a\ ^3F)4s4p(^1P^\circ)\ ^3G^\circ$
		2	*47 831.150*	0.472	65		16	$3d^7(^2G)4p\ ^3F^\circ$
$3d^6(a\ ^3P)4s4p(^3P^\circ)$	$^1D^\circ$	2	*47 419.674*	1.137	36		12	$3d^7(^2P)4p\ ^1D^\circ$
$3d^7(^2G)4p$	$z\ ^1G^\circ$	4	*47 452.716*	1.025	31		23	$3d^6(^3H)4s4p(^3P^\circ)\ ^1G^\circ$

Fe I—Continued

Configuration	Term	J	Level (cm⁻¹)	g	Leading percentages		
$3d^7(^4P)4p$	$y\ ^3S°$	1	*47 555.598*	1.884	60	9	$^3D°$
$3d^6(^3G)4s4p(^3P°)$	$v\ ^5F°$	5	*47 606.094*	1.317	61	11	$(^3G)(^3P°)\ ^5H°$
		4	*47 929.999*	1.264	55	20	$(^3G)(^3P°)\ ^5H°$
		3	*48 122.928*	1.236	70	7	$(^3D)(^3P°)\ ^5F°$
		2	*48 238.844*	1.267	74	7	$(^3D)(^3P°)\ ^5F°$
		1	*48 350.601*	0.230	70	7	$(^3D)(^3P°)\ ^5F°$
$3d^6(a\ ^3F)4s4p(^3P°)$	$x\ ^3G°$	4	*47 812.118*	1.061	51	22	$(^3G)(^3P°)\ ^5H°$
		3	*47 834.218*	0.668	39	37	$(^3G)(^3P°)\ ^5G°$
		5	*47 834.542*	1.203	49	18	$(^3G)(^3P°)\ ^5H°$
$3d^7(^4F)5s$	$e\ ^3F$	4	47 960.941	1.288			
		3	48 531.864	1.107			
		2	48 928.389	0.622			
	$v\ ^5P°$	3	*47 966.59*	1.646			
		2	*48 163.438*	1.740			
		1	*48 289.865*	2.213			
$3d^6(^3G)4s4p(^3P°)$	$^5H°$	5	*48 231.270*	1.27?	67	10	$(a\ ^3F)(^3P°)\ ^3G°$
		4	*48 361.878*	0.934	44	18	
		3	*48 475.668*	0.584	54	31	
$3d^7(^4P)4p$	$x\ ^3P°$	2	*48 304.638*	1.263	36	21	$(^2P)\ ^3P°$
		0	*48 460.098*		42	23	
		1	*48 516.135*	1.547	39	18	
$3d^7(^2G)4p$	$z\ ^1H°$	5	*48 382.597*	1.018	68	10	$3d^6(^3H)4s4p(^3P°)\ ^1H°$
$3d^6(^3H)4s4p(^3P°)$	$y\ ^1G°$	4	*48 702.526*	1.063	36	20	$3d^7(^2G)4p\ ^1G°$
$3d^7(^2G)4p$	$w\ ^3F°$	4	*49 108.890*	1.181	39	26	$3d^6(a\ ^3F)4s4p(^3P°)\ ^3F°$
		3	*49 242.881*	1.165	37	25	$3d^6(a\ ^3F)4s4p(^3P°)\ ^3F°$
		2	*49 433.121*	0.677	50	21	$3d^6(a\ ^3F)4s4p(^3P°)\ ^3F°$
$3d^6(a\ ^3F)4s4p(^3P°)$	$v\ ^3D°$	3	*49 135.022*	1.211	31	19	$3d^7(^2G)4p\ ^3F°$
		2	*49 242.593*	0.954	52	12	$3d^7(^2P)4p\ ^3D°$
		1	*49 297.620*	0.562	47	13	$3d^7(^2P)4p\ ^3D°$
$3d^6(a\ ^3F)4s4p(^3P°)$	$^1F°$	3	*49 227.12*		40	39	$3d^7(^2G)4p\ ^1F°$
$3d^6(^5D)4s\ (^6D)5p$	$^7D°$	5	*49 352.335*				
		4	*49 558.724*				
		3	*49 805.249*				
		2	*50 008.515*				
		1	*50 152.609*				
$3d^7(^2G)4p$	$y\ ^3H°$	6	*49 434.156*	1.17?	43	43	$3d^6(^3H)4s4p(^3P°)\ ^3H°$
		5	*49 604.415*	1.075	38	26	
		4	*49 726.977*	0.929	42	29	
$3d^7(^2G)4p$	$v\ ^3G°$	5	*49 460.890*	1.163	38	24	$3d^6(a\ ^3F)4s4p(^3P°)\ ^3G°$
		4	*49 627.877*	0.914	41	18	$3d^6(^3H)4s4p(^3P°)\ ^3G°$
		3	*49 850.581*	0.763	43	25	$3d^6(a\ ^3F)4s4p(^3P°)\ ^3G°$
	$z\ ^1D°$	2	*49 477.10*	0.92?			

Fe I—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages		
$3d^6(^5D)4s\ (^6D)5p$	$^7F°$	6	*49 758.133*				
		5	*50 052.184*				
		4	*50 303.216*				
		3	*50 433.015*				
		2	*50 555.750*				
		1	*50 627.429*				
		0	*50 659.672*				
$3d^7(^2P)4p$	$w\ ^3P°$	0	*49 951.341*		52	24	$3d^6(a\ ^3P)4s4p(^1P°)\ ^3P°$
		1	*50 043.205*	1.389	50	11	$3d^5(^6S)4s^24p\ ^5P°$
		2	*50 186.830*	1.469	46	10	$3d^7(^4P)4p\ ^5P°$
		2	*50 045.9*				
$3d^6(^5D)4s\ (^6D)5p$	$^7P°$	4	*50 185.730*				
		3	*50 628.360*				
		2	*50 901.157*				
$3d^6(^5D)4s\ (^6D)4d$	$e\ ^7F$	6	50 342.14	1.490			
		5	50 833.428	1.505			
		3	51 148.859	1.499			
		4	51 192.270	1.617			
		1	51 207.991	2.490			
		2	51 331.044				
$3d^6(^5D)4s\ (^6D)4d$	$f\ ^7D$	5	50 377.913	1.510			
		4	50 807.991	1.574			
		3	50 861.816				
		2	50 998.641	1.844			
		1	51 048.113				
$3d^6(^5D)4s\ (^6D)4d$	$f\ ^5D$	4	50 423.136	1.514			
		3	50 534.391	1.615			
		2	50 698.624	1.614			
		1	50 880.098	1.662			
		0	50 980.98				
$3d^6(^5D)4s\ (^6D)4d$	$e\ ^7P$	4	50 475.287	1.585			
		3	50 611.260	1.687			
		2	50 861.321				
$3d^6(^5D)4s\ (^6D)4d$	$e\ ^5G$	6	50 522.946	1.351			
		5	50 703.866	1.360			
		4	50 979.578	1.238			
		3	51 219.017	1.294			
		2	51 370.130	0.953			
$3d^7(^2G)4p$	$z\ ^1F°$	3	*50 586.874*	1.018	36	23	$(a\ ^2D)\ ^1F°$
$3d^6(a\ ^3F)4s4p(^3P°)$	$x\ ^1G°$	4	*50 613.972*	0.978	64	9	$3d^7(^2H)4p\ ^1G°$
$3d^6(^5D)4s\ (^6D)4d$	$e\ ^7G$	7	50 651.72?				
		6	50 967.826	1.415			
		5	51 228.555	1.379			
		4	51 334.909	1.338			
		3	51 460.516	1.244			
		2	51 539.712				
		1	51 566.82	-0.374			

Fe I—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages		
$3d^6(^5D)4s\ (^6D)5p$	$u\ ^5F^\circ$	5	*51 016.660*				
		4	*51 381.460*				
		3	*51 619.078*				
		2	*51 827.413*				
		1	*51 945.819*				
$3d^6(^3G)4s4p(^3P^\circ)$	$x\ ^3H^\circ$	6	*51 023.152*	1.161	80	15	$(^3H)(^3P^\circ)\ ^3H^\circ$
		5	*51 068.710*	1.038	74	13	$(^3H)(^3P^\circ)\ ^3H^\circ$
		4	*51 409.117*	0.953	67	15	$(a\ ^3F)(^3P^\circ)\ ^1G^\circ$
$3d^6(^5D)4s\ (^6D)5p$	$t\ ^5D^\circ$	4	*51 076.622*	1.486			
		3	*51 361.390*				
		2	*51 629.998*				
		1	*51 827.854*				
		0	*51 941.531*				
$3d^6(^5D)4s\ (^6D)4d$	$f\ ^5F$	5	51 103.187	1.384			
		4	51 461.672	1.355?			
		3	51 604.102				
		2	51 705.007	0.967			
		1	51 754.490				
$3d^6(^5D)4s\ (^6D)4d$	$e\ ^5S$	2	51 148.883	1.952			
$3d^7(a\ ^2D)4p$	$v\ ^3F^\circ$	2	*51 201.284*	0.803	31	23	$3d^6(^3G)4s4p(^3P^\circ)\ ^3F^\circ$
		4	*51 304.603*	1.122	34	30	$3d^7(a\ ^2D)4p\ ^3F^\circ$
		3	*51 365.308*	1.096	36	26	$3d^6(^3G)4s4p(^3P^\circ)\ ^3F^\circ$
$3d^6(^5D)4s\ (^4D)5s$	$e\ ^3D$	3	51 294.222	1.345			
		2	51 739.920	1.125			
		1	52 039.886	0.801			
$3d^6(^5D)4s\ (^4D)5s$	$g\ ^5D$	4	51 350.491	1.487			
		3	51 770.554	1.492			
		2	52 049.814	1.57?			
		1	52 214.336				
		0	52 257.33				
$3d^7(^2H)4p$	$u\ ^3G^\circ$	5	*51 373.909*	1.140	30	17	$3d^6(^3G)4s4p(^3P^\circ)\ ^3G^\circ$
		4	*51 668.189*	1.067	35	32	$3d^6(^3G)4s4p(^3P^\circ)\ ^3G^\circ$
		3	*51 825.773*	0.801	35	32	$3d^6(^3G)4s4p(^3P^\circ)\ ^3G^\circ$
$3d^6(^5D)4s\ (^6D)4d$	$e\ ^7S$	3	51 570.084	1.92?			
$3d^6(^3H)4s4p(^3P^\circ)$	$^1H^\circ$	5	*51 630.172*	1.061	39	10	$3d^7(^2G)4p\ ^1H^\circ$
$3d^6(^5D)4s\ (^6D)5p$	$u\ ^5P^\circ$	3	*51 692.007*				
		2	*51 944.784*				
		1	*52 110.607*	2.633			
$3d^7(^2P)4p$	$y\ ^1D^\circ$	2	*51 708.309*	1.025	49	18	$(a\ ^2D)\ ^1D^\circ$
$3d^6(a\ ^3F)4s4p(^3P^\circ)$	$x\ ^1D^\circ$	2	*51 762.067*	0.883	56	15	$3d^7(a\ ^2D)4p\ ^1D^\circ$
$3d^6(^5D)4s\ (^6D)4d$	$e\ ^5P$	3	51 837.24	1.664			
		1	52 019.67	2.432			
		2	52 067.460				

Fe I—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages		
$3d^7(^2P)4p$	$u\ ^3D°$	3	51 969.079	1.306	61	19	$3d^6(a\ ^3F)4s4p(^1P°)\ ^3D°$
		2	52 296.899	1.156	53	21	$3d^6(a\ ^3F)4s4p(^1P°)\ ^3D°$
		1	52 512.445	0.700	48	22	$3d^6(a\ ^3P)4s4p(^1P°)\ ^3D°$
$3d^7(^2P)4p$	$^1P°$	1	52 180.804	0.801	47	20	$(a\ ^2D)\ ^3D°$
$3d^7(a\ ^2D)4p$	$^3D°$	3	52 213.226	1.317	75	19	$3d^6(a\ ^3F)4s4p(^1P°)\ ^3D°$
		2	52 682.915	1.145	60	11	$3d^7(^2P)4p\ ^3D°$
		1	52 857.790	1.246	45	10	$3d^7(^2P)4p\ ^3D°$
$3d^7(^2H)4p$	$w\ ^3H°$	6	52 431.418	1.177	63	17	$3d^6(^3H)4s4p(^1P°)\ ^3H°$
		5	52 613.084	1.033	60	14	
		4	52 768.721	0.810	61	18	
$3d^7(^2H)4p$	$y\ ^3I°$	6	52 513.549	1.019	65	22	$3d^7(^2H)4p\ ^1I°$
		7	52 655.00?	1.147	88	8	$3d^6(^1I)4s4p(^3P°)\ ^3I°$
		5	52 898.971	0.830	85	9	$3d^6(^1I)4s4p(^3P°)\ ^3I°$
$3d^7(a\ ^2D)4p$	$^3P°$	2	52 916.292	1.495	55	19	$3d^6(a\ ^3P)4s4p(^1P°)\ ^3P°$
		1	53 229.942	1.266	41	13	$3d^7(^2P)4p\ ^1P°$
$3d^7(^4F)5p$	$^5F°$	4	52 953.625				
		5	53 084.791				
		3	53 357.508				
		2	53 749.405				
$3d^7(^4F)4d$	$g\ ^5F$	5	53 061.24				
		4	53 393.68				
		3	53 830.973				
		2	54 257.505				
		1	54 386.189				
$3d^7(^4F)5p$	$^5G°$	6	53 069.350				
		5	53 586.501				
		4	53 610.414				
		3	53 852.108				
$3d^7(^2H)4p$	$z\ ^1I°$	6	53 093.521	1.010	65	21	$^3I°$
$3d^7(^4F)4d$	$h\ ^5D$	4	53 155.09	1.435			
		3	53 545.847				
		2	53 966.68				
		1	54 132.550				
$3d^7(^4F)4d$	$f\ ^5P$	3	53 160.49				
		2	53 568.68				
		1	53 925.22				
$3d^7(^4F)4d$	$f\ ^5G$	6	53 169.17	1.323			
		5	53 281.70	1.221			
		4	53 768.969				
		3	54 161.132	1.142			
		2	54 375.68				

Fe I—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages		
$3d^7(^4F)4d$	$e\,^5H$	7	53 275.16?	1.30?			
		6	53 352.98?	1.191			
		5	53 874.26?	1.102			
		4	54 237.16	0.90?			
		3	54 491.04	0.484			
$3d^6(^3D)4s4p(^3P^\circ)$	$^5F^\circ$	2	*53 275.23*		84	11	$(^3G)(^3P^\circ)\ ^5F^\circ$
		3	*53 661.09*	1.21?	84	10	
		5	*54 013.747*	1.356	88	8	
$3d^7(^4F)5p$	$^5D^\circ$	4	*53 328.827*				
		3	*53 733.583*				
		2	*54 042.516*				
		1	*54 224.402*				
$3d^6(^3G)4s4p(^3P^\circ)$	$y\,^1H^\circ$	5	*53 722.40*	1.03?	77	15	$(^3H)(^3P^\circ)\ ^1H^\circ$
$3d^7(^4F)4d$	$e\,^3G$	5	53 739.433	1.248			
		4	54 066.53	1.096			
		3	54 379.40	0.842			
$3d^7(^4F)4d$	$f\,^3D$	3	53 747.51	1.258			
		2	54 066.758				
		1	54 449.29				
$3d^6(^3G)4s4p(^3P^\circ)$	$x\,^3F^\circ$	3	*53 763.272*	1.079	34	30	$3d^7(a\,^2D)4p\ ^3F^\circ$
$3d^6(^5D)4s\ (^6D)6s$	$g\,^7D$	5	53 800.841	1.586			
		4	54 124.724	1.65?			
		3	54 404.765				
		2	54 611.691				
		1	54 747.581				
$3d^6(^3D)4s4p(^3P^\circ)$	$^5D^\circ$	1	*53 808.353*	1.418	72	14	$(^3D)(^3P^\circ)\ ^5P^\circ$
		3	*53 891.520*	1.476	74	13	$(^3D)(^3P^\circ)\ ^5P^\circ$
		4	*54 301.334*		89	6	$(b\,^3F)(^3P^\circ)\ ^5D^\circ$
$3d^7(^4F)5p$	$^3D^\circ$	3	*53 837.847*				
		2	*54 342.762*				
$3d^7(^4F)4d$	$e\,^3H$	6	53 840.64?	1.225			
		5	54 266.72?	1.109			
		4	54 555.41?	0.871			
$3d^6(^3G)4s4p(^3P^\circ)$	$t\,^3G^\circ$	5	*53 983.284*	1.234	39	35	$3d^7(^2H)4p\ ^3G^\circ$
		4	*54 237.415*	1.183	34	36	
		3	*54 600.346*	0.922	32	31	
$3d^6(^3D)4s4p(^3P^\circ)$	$^5P^\circ$	3	*54 004.78*		68	13	$^5D^\circ$
		2	*54 112.218*	1.70?	47	31	$^5D^\circ$
		1	*54 271.057*		57	9	$3d^7(^2P)4p\ ^3S^\circ$
$3d^7(^4F)5p$	$^3G^\circ$	4	*54 017.573*				
		3	*54 357.398*				
		3	*54 289.09*				

Fe I—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages			
$3d^7(^4\mathrm{F})4d$	$f\,^3\mathrm{F}$	4	54 683.35	1.141				
		3	55 124.93	1.071				
		2	55 378.80	0.676				
$3d^6(^3\mathrm{G})4s4p(^3\mathrm{P}^\circ)$	$w\,^1\mathrm{G}^\circ$	4	*54 810.841*	1.001	44		22	$3d^7(^2\mathrm{G})4p\ ^1\mathrm{G}^\circ$
$3d^7(^4\mathrm{F})4d$	$e\,^3\mathrm{P}$	2	54 879.68	1.459				
		1	55 376.08	1.459				
		0	55 726.50?					
$3d^6(a\,^1\mathrm{G})4s4p(^3\mathrm{P}^\circ)$	$^3\mathrm{G}^\circ$	5	*55 429.815*	1.057	46		23	$3d^7(^2\mathrm{H})4p\ ^1\mathrm{H}^\circ$
		3	*55 790.673*	0.908	53		21	$3d^6(^3\mathrm{G})4s4p(^3\mathrm{P}^\circ)\ ^1\mathrm{F}^\circ$
		4	*55 905.538*		61		17	$3d^6(a\,^1\mathrm{G})4s4p(^3\mathrm{P}^\circ)\ ^3\mathrm{H}^\circ$
$3d^6(a\,^1\mathrm{G})4s4p(^3\mathrm{P}^\circ)$	$^3\mathrm{H}^\circ$	4	*55 446.000*	0.804	59		11	$3d^6(^1\mathrm{I})4s4p(^3\mathrm{P}^\circ)\ ^3\mathrm{H}^\circ$
		6	*55 489.77*	1.169	48		33	$3d^6(^1\mathrm{I})4s4p(^3\mathrm{P}^\circ)\ ^3\mathrm{H}^\circ$
		5	*55 525.54*	1.018	47		23	$3d^7(^2\mathrm{H})4p\ ^1\mathrm{H}^\circ$
$3d^7(a\,^2\mathrm{D})4p$	$w\,^1\mathrm{D}^\circ$	2	*55 754.239*	0.990	62		15	$(^2\mathrm{P})\ ^1\mathrm{D}^\circ$
$3d^7(^2\mathrm{H})4p$		5	*55 907.171*	1.145	33	$^1\mathrm{H}^\circ$	31	$3d^6(a\,^1\mathrm{G})4s4p(^3\mathrm{P}^\circ)\ ^3\mathrm{G}^\circ$
$3d^6(^3\mathrm{G})4s4p(^3\mathrm{P}^\circ)$	$^1\mathrm{F}^\circ$	3	*56 097.829*	0.857	45		25	$(a\,^1\mathrm{G})(^3\mathrm{P}^\circ)\ ^3\mathrm{G}^\circ$
$3d^6(^1\mathrm{I})4s4p(^3\mathrm{P}^\circ)$	$u\,^3\mathrm{H}^\circ$	6	*56 333.957*	1.166	44		47	$(a\,^1\mathrm{G})(^3\mathrm{P}^\circ)\ ^3\mathrm{H}^\circ$
		5	*56 382.662*	1.029	46		26	$(a\,^1\mathrm{G})(^3\mathrm{P}^\circ)\ ^3\mathrm{H}^\circ$
		4	*56 423.279*	0.859	50		18	$(^3\mathrm{H})(^1\mathrm{P}^\circ)\ ^3\mathrm{H}^\circ$
$3d^6\,4s5d$	1	5	56 428.06					
$3d^6\,4s5d$	2	4,5	56 452.04					
$3d^6(a\,^1\mathrm{G})4s4p(^3\mathrm{P}^\circ)$	$u\,^3\mathrm{F}^\circ$	4	*56 592.699*	1.148	47		17	$3d^7(a\,^2\mathrm{D})4p\ ^3\mathrm{F}^\circ$
		3	*56 783.317*	1.077	54		20	
		2	*56 858.659*	0.687	47		26	
$3d^6\,4s5d$	3	4	56 842.70					
$3d^7(^2\mathrm{H})4p$	$v\,^1\mathrm{G}^\circ$	4	*56 951.286*	1.053	39		23	$3d^6(^3\mathrm{G})4s4p(^3\mathrm{P}^\circ)\ ^1\mathrm{G}^\circ$
$3d^6(^1\mathrm{I})4s4p(^3\mathrm{P}^\circ)$	$x\,^3\mathrm{I}^\circ$	7	*57 027.52?*	1.145	86		6	$3d^7(^2\mathrm{H})4p\ ^3\mathrm{I}^\circ$
		6	*57 070.21*	1.028	85		7	
		5	*57 104.22*	0.832	84		7	
$3d^6(^3\mathrm{D})4s4p(^3\mathrm{P}^\circ)$	$t\,^3\mathrm{F}^\circ$	4	*57 550.000*	1.235	67		15	$(a\,^3\mathrm{F})(^1\mathrm{P}^\circ)\ ^3\mathrm{F}^\circ$
		3	*57 641.000*		60		17	
		2	*57 708.747*	0.698	61		16	
$3d^6(^5\mathrm{D})4s\ (^4\mathrm{D})4d$	$i\,^5\mathrm{D}$	4	57 697.55	1.384				
		3	57 813.940	1.415				
		2	57 974.129					
$3d^6(^5\mathrm{D})4s\ (^6\mathrm{D})7s$	$h\,^7\mathrm{D}$	5	57 897.17					
$3d^6(^5\mathrm{D})4s\ (^4\mathrm{D})4d$	$g\,^5\mathrm{G}$	6	58 001.84	1.40?				
		5	58 271.46?					
		4	58 520.14?					
		3	58 710.05?					
		2	58 824.77	0.343				

Fe I—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages		
$3d^6\,4s5d$	4	2	58 213.121				
$3d^6(a\ ^3F)4s4p(^1P^\circ)$	$r\ ^3G^\circ$	5	*59 926.62?*	1.190	81	8	$(^3H)(^1P^\circ)\ ^3H^\circ$
		4	*60 172.06*	1.030	65	25	$(a\ ^1D)(^3P^\circ)\ ^3F^\circ$
		3	*60 364.76?*	0.780	63	17	$(a\ ^1D)(^3P^\circ)\ ^3F^\circ$
$3d^6(^3H)4s4p(^1P^\circ)$	$t\ ^3H^\circ$	6	*60 365.70?*	1.163	59	25	$3d^7(^2H)4p\ ^3H^\circ$
		5	*60 549.18*	1.040	49	22	
		4	*60 757.68*	0.805	50	22	
		3	*60 563.61*				
$3d^6(a\ ^3F)4s4p(^1P^\circ)$	$^3F^\circ$	4	*60 754.71?*		32	33	$(a\ ^1D)(^3P^\circ)\ ^3F^\circ$
		3	*60 806.654*		29	28	
Fe II ($^6D_{9/2}$)	***Limit***		63 480				

Fe II

$Z=26$

Mn I isoelectronic sequence

Ground state: $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s\ ^6D_{9/2}$

Ionization energy = 130 563±10 cm^{-1} (16.1879±0.0012 eV)

The earlier work on this spectrum was mainly by Dobbie (1938), Green (1939), and unpublished material of Edlén. Johansson and Litzén (1974) found the complete set of $3d^6(^5D)4f$ levels as well as many new $3d^6 4d$ levels.

The spectrum has now been reobserved in the regions 900–2200 Å and 4800–11 200 Å by Johansson (1978) by using a pulsed hollow cathode discharge. With the new measurements and Dobbie's list in the region 2200–4800 Å, Johansson has contributed some 250 new levels to the presently known 576 levels. He has redetermined all the level values and discarded 23 earlier levels. The accuracy of levels given to three decimal places is about ±0.01 cm^{-1}, those with two places are about 0.1 cm^{-1}, and with one place, ±0.5 cm^{-1}.

The $3d^7$, $3d^6 4s$, and $3d^5 4s^2$ configurations have been treated theoretically by Shadmi, Oreg, and Stein (1968), whose results confirm the assignments given by Johansson. The configurations $3d^6 4p$, $3d^6 5p$, and $3d^5 4s4p$ were calculated by Sinzelle and Wyart (1978, unpublished) with configuration interaction. Since $3d^5 4s4p$ was not recoupled in the scheme which exhibits the highest percentages, we give only its admixture with the other two configurations. Experience has shown that $3d^5 4s4p$ should be coupled $3d^5(S_1,L_1)4s4p\ (S_2,L_2)S_3,L_3$. A discussion of their calculations is given by Johansson, Litzén, Sinzelle, and Wyart (1980). Johansson's designations for the $3d^5 4s4p$ levels are quoted here.

The g-values were derived by Weeks in 1949 and are taken from Moore (1952). The observations were made at M.I.T. The uncertainty in the g-value determinations varies from ±0.002 to ±0.009.

The ionization energy was determined by Johansson from the $3d^6(^5D)ns\ ^6D_{9/2}$ series.

References

Dobbie, J. C. (1938), Ann. Solar Phys. Obs. Cambridge **5**, 1.

Green, L. C. (1939), Phys. Rev. **55**, 1211.

Johansson, S. (1978), Phys. Scr. **18**, 217.

Johansson, S., and Litzén, U. (1974), Phys. Scr. **10**, 121.

Johansson, S., Litzén, U., Sinzelle, J., and Wyart, J.-F. (1980), Phys. Scr. **21**, 40.

Moore, C. E. (1952), Atomic Energy Levels, Vol. II, Nat. Bur. Stand. Circ. 467, (reissued as NSRDS-NBS35) U.S. Govt. Printing Office, Washington, DC.

Shadmi, Y., Oreg, J., and Stein, J. (1968), J. Opt. Soc. Am. **58**, 909.

Fe II

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages
$3d^6(^5D)4s$	$a\ ^6D$	9/2	0.000	1.58	
		7/2	384.790	1.58	
		5/2	667.683	1.655	
		3/2	862.613	1.862	
		1/2	977.053	3.31	
$3d^7$	$a\ ^4F$	9/2	1 872.567	1.33	
		7/2	2 430.097	1.223	
		5/2	2 837.950	1.02	
		3/2	3 117.461	0.385	
$3d^6(^5D)4s$	$a\ ^4D$	7/2	7 955.299	1.419	
		5/2	8 391.938	1.365	
		3/2	8 680.454	1.200	
		1/2	8 846.768	-0.05	
$3d^7$	$a\ ^4P$	5/2	13 474.411	1.609	
		3/2	13 673.185	1.737	
		1/2	13 904.824	2.67	
$3d^7$	$a\ ^2G$	9/2	15 844.65		
		7/2	16 369.36		
$3d^7$	$a\ ^2P$	3/2	18 360.646	1.28	
		1/2	18 886.780		

Fe II—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages
$3d^7$	$a\ ^2H$	11/2	20 340.30		
		9/2	20 805.77	0.92	
$3d^7$	$a\ ^2D2$	5/2	20 516.960	1.22	
		3/2	21 308.04		
$3d^6(^3P2)4s$	$b\ ^4P$	5/2	20 830.582	1.583	
		3/2	21 812.055	1.720	
		1/2	22 409.852	2.68	
$3d^6(^3H)4s$	$a\ ^4H$	13/2	21 251.608	1.20	
		11/2	21 430.359	1.119	
		9/2	21 581.638	0.951	
		7/2	21 711.917	0.661	
$3d^6(^3F2)4s$	$b\ ^4F$	9/2	22 637.205	1.307	
		7/2	22 810.357	1.210	
		5/2	22 939.358	1.019	
		3/2	23 031.300	0.398	
$3d^5\,4s^2$	$a\ ^6S$	5/2	23 317.633	1.996	
$3d^6(^3G)4s$	$a\ ^4G$	11/2	25 428.784	1.237	
		9/2	25 805.328	1.15	
		7/2	25 981.629	0.98	
		5/2	26 055.423	0.574	
$3d^6(^3P2)4s$	$b\ ^2P$	3/2	25 787.598	1.33	
		1/2	26 932.748	0.67	
$3d^6(^3H)4s$	$b\ ^2H$	11/2	26 170.181	1.09	
		9/2	26 352.766	0.927	
$3d^6(^3F2)4s$	$a\ ^2F$	7/2	27 314.922	1.129	
		5/2	27 620.412	0.851	
$3d^6(^3G)4s$	$b\ ^2G$	9/2	30 388.542	1.10	
		7/2	30 764.485	0.898	
$3d^6(^3D)4s$	$b\ ^4D$	3/2	31 364.440		
		1/2	31 368.450		
		5/2	31 387.948	1.327	
		7/2	31 483.176	1.41	
$3d^7$	$b\ ^2F$	5/2	31 811.822	0.86	
		7/2	31 999.048	1.124	
$3d^6(^1I)4s$	$a\ ^2I$	13/2	32 875.646	1.062	
		11/2	32 909.905	0.92	
$3d^6(^1G2)4s$	$c\ ^2G$	9/2	33 466.463	1.099	
		7/2	33 501.253	0.88	
$3d^6(^3D)4s$	$b\ ^2D$	3/2	36 126.387	0.799	
		5/2	36 252.918	1.179	
$3d^6(^1S2)4s$	$a\ ^2S$	1/2	37 227.326	2.06	

Fe II—Continued

Configuration	Term	J	Level (cm⁻¹)	g	Leading percentages		
$3d^6(^1D2)4s$	$c\ ^2D$	5/2	38 164.194	1.176			
		3/2	38 214.507	0.79			
$3d^6(^5D)4p$	$z\ ^6D^\circ$	9/2	*38 458.981*	1.542	99		
		7/2	*38 660.043*	1.584	98		
		5/2	*38 858.958*	1.653	98		
		3/2	*39 013.206*	1.86	99		
		1/2	*39 109.307*	3.35	99		
$3d^6(^5D)4p$	$z\ ^6F^\circ$	11/2	*41 968.046*		99		
		9/2	*42 114.818*	1.43	96		
		7/2	*42 237.033*	1.399	96		
		5/2	*42 334.822*	1.304	97		
		3/2	*42 401.302*	1.04	98		
		1/2	*42 439.822*	-0.647	98		
$3d^6(^5D)4p$	$z\ ^6P^\circ$	7/2	*42 658.224*	1.702	93	3	$3d^54s4p$
		5/2	*43 238.586*	1.869	95	3	
		3/2	*43 620.957*	2.398	96	3	
$3d^6(^5D)4p$	$z\ ^4F^\circ$	9/2	*44 232.512*	1.32	96	2	$(^5D)\ ^6F^\circ$
		7/2	*44 753.799*	1.29	91	5	$(^5D)\ ^4D^\circ$
		5/2	*45 079.879*	1.069	93	4	$(^5D)\ ^4D^\circ$
		3/2	*45 289.801*	0.445	96	2	$(^5D)\ ^4D^\circ$
$3d^6(^5D)4p$	$z\ ^4D^\circ$	7/2	*44 446.878*	1.40	90	5	$^4F^\circ$
		5/2	*44 784.761*	1.35	91	4	$^4F^\circ$
		3/2	*45 044.168*	1.15	93	2	$^4F^\circ$
		1/2	*45 206.450*	-0.021	95		
$3d^6(^1F)4s$	$c\ ^2F$	7/2	44 915.046				
		5/2	44 929.55				
$3d^6(^5D)4p$	$z\ ^4P^\circ$	5/2	*46 967.444*	1.592	96	2	$3d^54s4p$
		3/2	*47 389.779*	1.717	96	2	
		1/2	*47 626.076*	2.70	96	2	
$3d^7$	$d\ ^2D1$	3/2	47 674.721				
		5/2	48 039.090				
$3d^6(^3P1)4s$	$c\ ^4P$	1/2	49 100.976				
		3/2	49 506.934				
		5/2	50 212.826				
$3d^6(^3F1)4s$	$c\ ^4F$	3/2	50 075.910				
		5/2	50 142.786				
		9/2	50 157.452				
		7/2	50 187.813				
$3d^5(^6S)4s4p(^3P^\circ)$	$z\ ^8P^\circ$	5/2	*52 299.39*				
		7/2	*52 582.51*				
		9/2	*52 965.82*				
$3d^6(^3P1)4s$	$c\ ^2P$	1/2	54 063.459				
		3/2	54 902.315				
$3d^5\ 4s^2$	$b\ ^4G$	11/2	54 232.195				
		9/2	54 273.641				
		5/2	54 275.637				
		7/2	54 283.220				

Fe II—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages			
$3d^6(^3F1)4s$	$d\ ^2F$	5/2	54 870.528					
		7/2	54 904.222					
$3d^5\,4s^2$	$d\ ^4P$	5/2	57 411.065					
		3/2	57 493.321					
		1/2	57 578.484					
$3d^6(^1G1)4s$	$d\ ^2G$	9/2	58 631.531					
		7/2	58 666.258					
$3d^6(^3P2)4p$	$z\ ^4S°$	3/2	*59 663.456*	1.89	46		19	$(^3P1)\ ^4S°$
$3d^5\,4s^2$	$c\ ^4D$	7/2	60 270.339					
		1/2	60 384.370					
		3/2	60 441.033					
		5/2	60 445.275					
$3d^6(^3P2)4p$	$y\ ^4P°$	5/2	*60 402.342*	1.58	46		36	$(^3P1)\ ^4P°$
		1/2	*61 035.287*	2.613	52		42	
		3/2	*61 332.764*	1.74	28		22	
$3d^6(^3H)4p$	$z\ ^4G°$	11/2	*60 625.449*	1.24	66		24	$(^3F2)\ ^4G°$
		9/2	*60 807.230*	1.155	53		29	
		7/2	*60 956.781*	0.969	50		33	
		5/2	*61 041.748*	0.799	48		35	
$3d^6(^3H)4p$	$z\ ^4H°$	13/2	*60 837.569*		47		42	$(^3H)\ ^4I°$
		11/2	*60 887.598*		44		44	$(^3H)\ ^4I°$
		9/2	*60 989.444*		45		37	$(^3H)\ ^4I°$
		7/2	*61 156.835*	0.720	66		12	$(^3H)\ ^2G°$
$3d^6(^3P2)4p$	$z\ ^2D°$	5/2	*61 093.413*	1.01	42		27	$(^3P1)\ ^2D°$
		3/2	*62 125.600*	1.019	35		23	
$3d^6(^3H)4p$	$z\ ^4I°$	15/2	*61 347.614*		100			
		9/2	*61 512.634*		56		26	$(^3H)\ ^4H°$
		13/2	*61 527.616*		49		43	
		11/2	*61 587.214*		51		42	
$3d^6(^3P2)4p$	$y\ ^4D°$	7/2	*61 726.077*	1.411	56		33	$(^3P1)\ ^4D°$
		5/2	*62 689.880*	1.349	49		27	
		1/2	*62 829.075*		60		32	
		3/2	*62 962.205*	1.14	45		25	
$3d^5(^6S)4s4p(^3P°)$	$y\ ^6P°$	3/2	*61 974.933*					
		5/2	*62 049.025*					
		7/2	*62 171.615*	1.68				
$3d^6(^3F2)4p$		7/2	*62 065.521*	1.198	31	$^4F°$	13	$(^3H)\ ^2G°$
$3d^6(^3H)4p$	$z\ ^2G°$	9/2	*62 083.108*	1.097	61		15	$(^3G)\ ^2G°$
		7/2	*62 322.431*		38		23	$(^3F2)\ ^4F°$
$3d^6(^3F2)4p$	$y\ ^4F°$	5/2	*62 151.561*	1.025	61		19	$(^3F1)\ ^4F°$
		9/2	*62 158.110*	1.33	63		21	
		3/2	*62 244.520*	0.43	66		21	
$3d^6(^3H)4p$	$z\ ^2I°$	13/2	*62 293.164*	1.069	90		8	$(^3H)\ ^4I°$
		11/2	*62 662.244*	0.910	93		4	

Fe II—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages		
$3d^6(^3F2)4p$	$x\ ^4D^\circ$	7/2	*62 945.038*	1.385	60	14	$(^3F1)\ ^4D^\circ$
		5/2	*63 272.976*	1.351	67	15	
		3/2	*63 465.109*	1.21	71	16	
		1/2	*63 559.488*	0.013	71	15	
$3d^6(^3F2)4p$	$y\ ^4G^\circ$	11/2	*63 876.317*	1.24	50	28	$(^3H)\ ^4G^\circ$
		9/2	*63 948.790*	1.15	41	30	
		7/2	*64 040.886*	0.975	29	25	
		5/2	*64 087.418*	0.617	26	29	
$3d^6(^3F2)4p$	$z\ ^2F^\circ$	7/2	*64 286.345*	1.135	30	13	$(^3F1)\ ^2F^\circ$
		5/2	*64 425.408*	0.82	32	13	
$3d^6(^3P2)4p$	$z\ ^2P^\circ$	1/2	*64 806.487*		45	31	$(^3P1)\ ^2P^\circ$
		3/2	*64 834.073*	1.329	54	34	
$3d^6(^3F2)4p$	$y\ ^2G^\circ$	9/2	*64 831.943*	1.101	62	16	$(^3F1)\ ^2G^\circ$
		7/2	*65 109.679*	0.896	67	16	
$3d^6(^3H)4p$	$z\ ^2H^\circ$	11/2	*65 363.595*	1.066	39	37	$(^3G)\ ^4G^\circ$
		9/2	*65 556.280*	0.913	51	20	$(^3G)\ ^2H^\circ$
$3d^6(^3G)4p$	$x\ ^4G^\circ$	11/2	*65 580.041*		53	20	$(^3G)\ ^2H^\circ$
		9/2	*65 696.038*		48	27	$(^3G)\ ^4F^\circ$
		7/2	*65 931.334*	1.00	76	10	$(^3G)\ ^4F^\circ$
		5/2	*66 078.269*	0.62	83	6	$(^3F2)\ ^4G^\circ$
$3d^6(^3G)4p$	$x\ ^4F^\circ$	9/2	*66 012.750*		53	33	$(^3G)\ ^4G^\circ$
		7/2	*66 377.283*	1.21	71	11	$(^3G)\ ^4G^\circ$
		5/2	*66 522.304*	1.02	67	9	$(^3F2)\ ^2D^\circ$
		3/2	*66 612.656*		67	12	$(^3F2)\ ^2D^\circ$
$3d^6(^3P2)4p$	$z\ ^2S^\circ$	1/2	*66 248.66*		58	28	$(^3P1)\ ^2S^\circ$
$3d^6(^3G)4p$	$y\ ^4H^\circ$	13/2	*66 411.686*		89	9	$(^3H)\ ^4H^\circ$
		11/2	*66 463.528*	1.13	79	8	
		9/2	*66 589.008*	0.959	83	9	
		7/2	*66 672.334*	0.69	85	11	
$3d^6(^3F2)4p$	$y\ ^2D^\circ$	5/2	*67 000.517*	1.16	64	10	$(^3G)\ ^4F^\circ$
		3/2	*67 273.826*	0.719	59	14	
$3d^6(^3G)4p$	$y\ ^2H^\circ$	11/2	*67 516.332*	1.07	55	32	$(^3H)\ ^2H^\circ$
		9/2	*68 000.788*	0.907	59	31	
$3d^5(^6S)4s4p(^3P^\circ)$	$x\ ^4P^\circ$	5/2	*69 102.38*				
		3/2	*69 302.09*				
		1/2	*69 426.98*				
$3d^6(^3G)4p$	$y\ ^2F^\circ$	7/2	*69 606.552*	1.13	62	12	$(^3F2)\ ^2F^\circ$
		5/2	*69 650.484*	0.857	63	12	$(^3D)\ ^2F^\circ$
$3d^6(^3G)4p$	$x\ ^2G^\circ$	9/2	*70 314.604*	1.11	78	17	$(^3H)\ ^2G^\circ$
		7/2	*70 523.706*	0.87	73	14	
$3d^6(^1I)4p$	$z\ ^2K^\circ$	13/2	*70 986.677*		99		
		15/2	*71 432.680*	1.05	100		

Fe II—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages			
$3d^6(^3D)4p$	$^4P^\circ$	5/2	*71 964.710*		86		5	$^4D^\circ$
		3/2	*72 043.026*	1.66	54		23	$^4F^\circ$
		1/2	*72 429.711*		51		35	$^4D^\circ$
$3d^6(^1G2)4p$	$x\ ^2H^\circ$	9/2	*72 130.39*	0.91	51		22	$(^1G1)\ ^2H^\circ$
		11/2	*72 261.729*	1.08	42		35	$(^1I)\ ^2H^\circ$
$3d^6(^3D)4p$	$w\ ^4F^\circ$	3/2	*72 168.998*		58		16	$(^3D)\ ^4P^\circ$
		5/2	*72 238.513*		77		11	$(^3G)\ ^4F^\circ$
		7/2	*72 352.024*		67		9	$(^3G)\ ^4F^\circ$
		9/2	*72 650.658*		86		9	$(^3G)\ ^4F^\circ$
$3d^6(^3D)4p$		1/2	*72 212.978*		41	$^4P^\circ$	38	$(^3D)\ ^4D^\circ$
$3d^6(^3D)4p$	$w\ ^4D^\circ$	3/2	*72 524.566*		63		20	$^4P^\circ$
		5/2	*72 619.490*		79		5	$^4P^\circ$
		7/2	*72 651.876*		49		16	$^4F^\circ$
$3d^6(^3D)4p$		7/2	*73 016.147*		31	$^4D^\circ$	20	$(^1G2)\ ^2F^\circ$
$3d^6(^3D)4p$		5/2	*73 054.881*		32	$^2F^\circ$	30	$(^1G2)\ ^2F^\circ$
$3d^6(^1G2)4p$	$w\ ^2G^\circ$	9/2	*73 091.590*		58		26	$(^1G1)\ ^2G^\circ$
		7/2	*73 143.288*	0.91	55		25	
$3d^6(^3D)4p$	$y\ ^2P^\circ$	1/2	*73 187.280*		66		15	$(^3D)\ ^4D^\circ$
		3/2	*73 189.11*		70		10	
$3d^5\ 4s^2$	^4F	9/2	73 393.745					
		5/2	73 395.93					
		7/2	73 492.215					
		3/2	73 637.34					
$3d^6(^1I)4p$	$w\ ^2H^\circ$	11/2	*73 603.50*		44		21	$(^1G2)\ ^2H^\circ$
		9/2	*73 751.282*		68		8	
$3d^6(^1I)4p$	$y\ ^2I^\circ$	13/2	*73 966.832*		98			
		11/2	*73 969.767*		89		7	$(^1I)\ ^2H^\circ$
$3d^6(^3D)4p$	$x\ ^2D^\circ$	3/2	*74 498.057*		91		3	$(^1F)\ ^2D^\circ$
		5/2	*74 606.841*		91		2	
$3d^6(^3D)4p$	$w\ ^2F^\circ$	7/2	*75 600.931*	1.125	57		16	$(^1G2)\ ^2F^\circ$
		5/2	*75 915.215*	0.844	50		22	
$3d^6(^1S2)4p$	$x\ ^2P^\circ$	3/2	*76 129.446*	1.34	37		31	$(^1D2)\ ^2P^\circ$
		1/2	*76 577.482*		41		21	$(^3D)\ ^2P^\circ$
$3d^5\ 4s^2$	^2H	9/2	77 230.90					
$3d^6(^1D2)4p$	$v\ ^2F^\circ$	5/2	*77 742.730*		60		16	$(^1D1)\ ^2F^\circ$
		7/2	*78 137.364*	1.13	65		18	
$3d^6(^5D)5s$	$e\ ^6D$	9/2	77 861.625					
		7/2	78 237.685					
		5/2	78 525.407					
		3/2	78 725.790					
		1/2	78 843.992					

Fe II—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages		
$3d^5\,4s^2$	^{2}G	7/2	78 185.03				
		9/2	78 577.28				
$3d^6(^1D2)4p$	$w\,^2D°$	3/2	*78 487.153*		68	15	(^{1}D1) ^{2}D°
		5/2	*78 690.846*		64	15	
$3d^6(^1D2)4p$	$w\,^2P°$	1/2	*78 841.96*		48	20	(^{1}S2) ^{2}P°
		3/2	*79 243.60*		36	25	
$3d^5(^6S)4s4p(^1P°)$	$x\,^6P°$	3/2	*79 246.17*				
		5/2	*79 285.11*				
		7/2	*79 331.50*				
$3d^6(^5D)5s$	$e\,^4D$	7/2	79 439.467				
		5/2	79 885.493				
		3/2	80 177.975				
		1/2	80 346.016				
$3d^5\,4s^2$	^{2}F2	5/2	81 639.26				
		7/2	81 734.75				
$3d^6(^5D)4d$	$e\,^6F$	11/2	82 853.658				
		9/2	82 978.677				
		7/2	83 136.487				
		5/2	83 308.194				
		3/2	83 459.67				
		1/2	83 558.54				
$3d^6(^1F)4p$	$v\,^2G°$	7/2	*83 305.251*		92		
		9/2	*83 871.184*		94		
$3d^6(^5D)4d$	^{6}D	7/2	83 713.536				
		9/2	83 726.364				
		5/2	83 812.316				
		3/2	83 990.063				
		1/2	84 131.563				
$3d^6(^1F)4p$	$v\,^2D°$	5/2	*83 868.45*		80	6	(^{1}D2) ^{2}D°
		3/2	*84 359.80*		85	4	
$3d^6(^5D)4d$	$e\,^6G$	13/2	84 035.14				
		11/2	84 296.83	1.33			
		9/2	84 527.778				
		7/2	84 710.685				
		5/2	84 844.834				
		3/2	84 938.18				
$3d^6(^5D)4d$	^{6}P	7/2	84 266.556				
		5/2	84 326.912				
		3/2	84 424.37				
$3d^6(^5D)4d$	$f\,^4D$	7/2	84 685.198				
		5/2	84 870.863				
		3/2	85 048.602				
		1/2	85 172.809				
$3d^6(^5D)4d$	$e\,^4G$	11/2	84 863.351	1.27			
		9/2	85 184.734				
		7/2	85 462.862				
		5/2	85 679.698				

Fe II—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages			
$3d^6(^5D)4d$	^6S	5/2	85 495.304					
$3d^6(^5D)4d$	^4S	3/2	85 728.806					
$3d^6(^5D)4d$	$e\ ^4F$	9/2	86 124.301	1.29				
		7/2	86 416.333					
		5/2	86 599.738					
		3/2	86 710.837					
$3d^6(^3P1)4p$	$v\ ^4D^\circ$	1/2	86 388.82		35		36	$(^3F1)\ ^4D^\circ$
		3/2	86 543.974		33		38	
		5/2	86 767.577		30		40	
		7/2	86 929.649		25		45	
$3d^6(^1F)4p$	$u\ ^2F^\circ$	7/2	86 482.75		88		2	$(^1G2)\ ^2F^\circ$
		5/2	86 547.49		90		2	
$3d^5(^4G)4s4p(^3P^\circ)$	$y\ ^6F^\circ$	11/2	87 340.983					
		9/2	87 471.765					
		7/2	87 537.652					
		5/2	87 572.431					
		3/2	87 602.25					
		1/2	87 898.12					
$3d^5(^4P)4s4p(^3P^\circ)$	$^6D^\circ$	1/2	87 635.92					
		3/2	87 964.65					
		5/2	88 059.38					
		7/2	88 209.45					
		9/2	88 614.52					
$3d^6(^5D)4d$	^4P	5/2	87 985.628					
		3/2	88 157.116					
		1/2	88 189.030					
$3d^6(^5D)5p$	$^6D^\circ$	9/2	88 723.400		90		8	$3d^54s4p$
		7/2	88 853.533		53		19	$(^5D)\ ^6P^\circ$
		5/2	89 119.457		71		12	$(^5D)\ ^6P^\circ$
		3/2	89 331.195		84		6	$(^5D)\ ^6P^\circ$
		1/2	89 471.365		97		2	$3d^54s4p$
$3d^6(^3P1)4p$	$^2S^\circ$	1/2	89 003.46		61		32	$(^3P2)\ ^2S^\circ$
$3d^6(^5D)5p$		7/2	89 128.561		40	$^6D^\circ$	22	$^6P^\circ$
$3d^5(^4P)4s4p(^3P^\circ)$	$^6P^\circ$	5/2	89 444.458					
		3/2	89 625.940					
$3d^6(^3F1)4p$	$^4G^\circ$	5/2	89 727.342		77		17	$(^3F2)\ ^4G^\circ$
		7/2	89 890.373		76		17	
		9/2	90 042.779		70		16	
		11/2	90 211.70		75		18	
$3d^6(^5D)5p$	$^6F^\circ$	11/2	89 924.175		87		12	$3d^54s4p$
		9/2	90 067.347		39		45	$(^5D)\ ^4F^\circ$
		7/2	90 300.625		59		26	$(^5D)\ ^4F^\circ$
		5/2	90 487.810		77		9	$(^5D)\ ^4F^\circ$
		3/2	90 593.497		82		13	$3d^54s4p$
		1/2	90 648.217		83		15	$3d^54s4p$

Fe II—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages			
$3d^6(^5D)5p$	$^4F^\circ$	9/2	90 386.528		48		44	$(^5D)\ ^6F^\circ$
		7/2	90 780.621		60		18	$(^5D)\ ^4D^\circ$
		5/2	91 070.547		67		13	$(^5D)\ ^4D^\circ$
		3/2	91 208.887		64		28	$(^5D)\ ^4D^\circ$
$3d^6(^5D)5p$	$^4D^\circ$	7/2	90 397.868		77		12	$^6F^\circ$
		5/2	90 638.822		69		19	$^4F^\circ$
		3/2	91 048.256		65		30	$^4F^\circ$
		1/2	91 199.746		97		1	$^4P^\circ$
$3d^6(^3P1)4p$	$^4S^\circ$	3/2	90 629.902		61		27	$(^3P2)\ ^4S^\circ$
$3d^6(^3P1)4p$	$^4P^\circ$	1/2	90 839.486		52		37	$(^3P2)\ ^4P^\circ$
		3/2	90 898.873		28		20	
		5/2	92 274.12		45		31	
$3d^6(^5D)5p$	$^4P^\circ$	5/2	90 901.124		79		16	$^4D^\circ$
		3/2	92 225.538		91		5	
		1/2	92 314.758		95		1	
$3d^6(^5D)5p$	$w\ ^6P^\circ$	7/2	91 167.937		53		39	$3d^54s4p$
		5/2	91 575.139		55		38	
$3d^6(^3P1)4p$		3/2	91 843.470		28	$^4P^\circ$	24	$3d^6(^5D)5p\ ^6P^\circ$
$3d^5(^4D)4s4p(^3P^\circ)$	$^6F^\circ$	1/2	91 850.722					
		3/2	91 915.95					
		5/2	92 018.729					
		7/2	92 154.165					
		9/2	92 300.277					
		11/2	92 432.136					
$3d^5(^4G)4s4p(^3P^\circ)$	$x\ ^4H^\circ$	7/2	92 089.26					
		9/2	92 116.78					
		11/2	92 166.60					
		13/2	92 250.21					
$3d^6(^3F1)4p$	$u\ ^2G^\circ$	9/2	92 171.716		50		13	$(^3F2)\ ^2G^\circ$
		7/2	92 602.703		62		15	
$3d^6(^3F1)4p$	$u\ ^2D^\circ$	3/2	92 216.32		46		20	$(^3P1)\ ^2D^\circ$
		5/2	92 695.374		50		17	
$3d^5(^4G)4s4p(^3P^\circ)$	$v\ ^4F^\circ$	7/2	92 282.46					
		5/2	92 329.89					
		3/2	92 358.61					
		9/2	92 426.98					
$3d^6(^3F1)4p$	$^4D^\circ$	1/2	92 453.46		42		25	$(^3P1)\ ^4D^\circ$
		3/2	92 647.51		36		25	
		5/2	92 899.20		26		23	
		7/2	93 129.90		18		22	
$3d^6(^3F1)4p$	$u\ ^4F^\circ$	3/2	93 328.48		46		17	$(^3F2)\ ^4F^\circ$
		5/2	93 395.36		45		17	
		9/2	93 484.58		54		21	
		7/2	93 487.65		35		13	

Fe II—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages		
$3d^5(^4D)4s4p(^3P^\circ)$	$^6D^\circ$	5/2	*93 830.979*				
		3/2	*93 840.34*				
		7/2	*93 987.457*				
		1/2	*94 031.378*				
		9/2	*94 057.773*				
$3d^5(^4G)4s4p(^3P^\circ)$	$w\ ^4G^\circ$	5/2	*93 988.17*				
		7/2	*94 073.24*				
		9/2	*94 148.51*				
		11/2	*94 189.88*				
$3d^5(^4P)4s4p(^3P^\circ)$	$^4P^\circ$	5/2	*94 211.739*				
		3/2	*94 739.17*				
		1/2	*94 880.74*		37		
$3d^5(^4D)4s4p(^3P^\circ)$	$^6P^\circ$	5/2	*94 685.09*		43		
		7/2	*94 763.219*				
					56		
$3d^6(^3P1)4p$	$^2D^\circ$	5/2	*94 700.66*		54	27	$(^3P2)\ ^2D^\circ$
$3d^6(^3P1)4p$	$^2P^\circ$	3/2	*95 039.2*			26	$(^3P2)\ ^2P^\circ$
$3d^6(^3F1)4p$	$^2F^\circ$	5/2	*95 046.10*			20	$3d^54s4p$
		7/2	*95 079.64*			20	
$3d^5(^4P)4s4p(^3P^\circ)$	$^4D^\circ$	1/2	*95 767.70*				
		3/2	*95 858.05*				
		5/2	*95 995.69*				
		7/2	*96 217.42*				
$3d^5(^4G)4s4p(^3P^\circ)$	$v\ ^2H^\circ$	11/2	*96 062.06*				
		9/2	*96 239.20*				
$3d^5(^4G)4s4p(^3P^\circ)$	$t\ ^2F^\circ$	5/2	*96 279.49*		62		
		7/2	*96 356.96*		63		
$3d^5(^4P)4s4p(^3P^\circ)$	$^2P^\circ$	3/2	*97 326.27*				
$3d^6(^1G1)4p$	$^2H^\circ$	9/2	*97 851.35*			33	$(^1G2)\ ^2H^\circ$
		11/2	*98 278.77*			34	
$3d^6(^3H)5s$	$e\ ^4H$	13/2	98 130.131				
		11/2	98 294.401				
		9/2	98 445.400				
		7/2	98 568.912				
$3d^5(^4D)4s4p(^3P^\circ)$	$^4F^\circ$	3/2	*98 196.00*				
		5/2	*98 354.66*				
		7/2	*98 535.85*				
		9/2	*98 596.65*				
$3d^5(^4P)4s4p(^3P^\circ)$	$^4S^\circ$	3/2	*98 338.28*				
$3d^5(^4D)4s4p(^3P^\circ)$	$^4D^\circ$	7/2	*98 391.33*		43		
		5/2	*98 505.10*				
		3/2	*98 770.14*				
		1/2	*99 007.70*				
$3d^6(^1G1)4p$	$^2F^\circ$	7/2	*98 898.71*			22	$(^1G2)\ ^2F^\circ$

Fe II—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages
$3d^6(^3H)5s$	$e\ ^2H$	11/2	99 093.452		
		9/2	99 332.102		
$3d^6(^3F2)5s$	$f\ ^4F$	9/2	99 573.225		
		7/2	99 688.337		
		5/2	99 824.045		
		3/2	99 918.569		
$3d^5(^4G)4s4p(^3P^\circ)$	$^2G^\circ$	7/2	*99 635.52*		
		9/2	*99 653.22*		
$3d^6(^1G1)4p$	$^2G^\circ$	9/2	*99 757.12*		42 31 $3d^54s4p$
		7/2	*99 808.40*		44 20 $3d^6(^1G2)4p\ ^2G^\circ$
$3d^5(^4P)4s4p(^3P^\circ)$	$^2D^\circ$	5/2	*100 400.36*		
$3d^6(^3F2)5s$	$e\ ^2F$	7/2	100 492.02		
		5/2	100 749.81		
$3d^5(^4D)4s4p(^3P^\circ)$	$^4P^\circ$	1/2	*101 402.38*		
		3/2	*101 573.90*		
$3d^6(^5D)6s$	^6D	9/2	101 698.489		
		7/2	102 030.912		
		5/2	102 334.112		
		3/2	102 543.648		
		1/2	102 666.694		
$3d^5(^2I)4s4p(^3P^\circ)$	$^4K^\circ$	11/2	*102 340.3*		
		13/2	*102 489.9*		
		15/2	*102 851.2?*		
$3d^6(^5D)6s$	^4D	7/2	102 394.718		
		5/2	102 802.312		
		3/2	103 118.400		
		1/2	103 265.694		
$3d^5(^4D)4s4p(^3P^\circ)$	$^2D^\circ$	5/2	*102 449.10*		
		3/2	*102 503.81*		
$3d^6(^3G)5s$	$f\ ^4G$	11/2	102 584.963		
		9/2	102 842.119		
$3d^6(^5D_4)4f$	$^2[5]^\circ$	11/2	*102 831.32*		
		9/2	*102 851.36*		
$3d^6(^5D_4)4f$	$^2[6]^\circ$	13/2	*102 840.25*		
		11/2	*102 893.38*		
$3d^6(^5D_4)4f$	$^2[4]^\circ$	9/2	*102 882.37*		
		7/2	*102 887.12*		
$3d^6(^5D_4)4f$	$^2[3]^\circ$	7/2	*102 942.20*		
		5/2	*102 952.12*		
$3d^5(^2I)4s4p(^3P^\circ)$	$^4I^\circ$	9/2	*102 951.5*		
		11/2	*102 980.3*		
		13/2	*103 120.9*		
		15/2	*103 232.1*		

Fe II—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages
$3d^6(^5D_4)4f$	$^2[7]°$	13/2 15/2	*103 019.67* *103 040.32*		
$3d^6(^5D_4)4f$	$^2[2]°$	5/2 3/2	*103 024.29* *103 034.76*		
$3d^5(^6S)4s\,(^7S)5s$	^8S	7/2	103 094.73		
$3d^6(^5D_4)4f$	$^2[1]°$	3/2 1/2	*103 110.79* *103 125.65*		
$3d^5(^4D)4s4p(^3P°)$	$^2F°$	7/2 5/2	*103 183.7* *103 334.1*		
$3d^6(^5D_3)4f$	$^2[5]°$	11/2 9/2	*103 325.95* *103 352.68*		
$3d^6(^5D_3)4f$	$^2[4]°$	9/2 7/2	*103 326.41* *103 340.64*		
$3d^6(^5D_3)4f$	$^2[3]°$	5/2 7/2	*103 364.84* *103 385.73*		
$3d^6(^5D_3)4f$	$^2[2]°$	3/2 5/2	*103 391.29* *103 406.25*		
$3d^6(^5D_3)4f$	$^2[1]°$	3/2 1/2	*103 417.91* *103 437.28*		
$3d^6(^5D_3)4f$	$^2[0]°$	1/2	*103 418.08*		
$3d^6(^5D_3)4f$	$^2[6]°$	11/2 13/2	*103 420.16* *103 421.18*		
$3d^6(^3H)4d$	^4H	13/2 11/2	103 600.44 103 751.66		
$3d^6(^3G)5s$	^2G	9/2 7/2	103 608.909 103 983.51		
$3d^6(^5D_2)4f$	$^2[2]°$	3/2 5/2	*103 645.22* *103 660.98*		
$3d^6(^5D_2)4f$	$^2[1]°$	3/2 1/2	*103 668.69* *103 676.22*		
$3d^6(^5D_2)4f$	$^2[3]°$	7/2 5/2	*103 676.78* *103 698.44*		
$3d^6(^5D_2)4f$	$^2[4]°$	9/2 7/2	*103 680.64* *103 711.57*		
$3d^6(^5D_2)4f$	$^2[5]°$	11/2 9/2	*103 691.05* *103 701.72*		
$3d^6(^5D_1)4f$	$^2[2]°$	5/2 3/2	*103 857.74* *103 869.02*		

Fe II—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages
$3d^6(^5D_1)4f$	$^2[4]^\circ$	9/2	*103 873.99*		
		7/2	*103 882.68*		
$3d^6(^3H)4d$	^4I	15/2	103 878.34		
		13/2	104 064.67		
		11/2	104 174.27		
$3d^6(^5D)5d$	^6F	11/2	103 936.60		
		9/2	103 950.59		
		7/2	104 380.94		
		5/2	104 426.46		
$3d^5(^4P)4s4p(^3P^\circ)$	$^2S^\circ$	1/2	*103 967.49*		
$3d^6(^5D_1)4f$	$^2[3]^\circ$	7/2	*103 969.76*		
		5/2	*103 987.93*		
$3d^6(^5D)5d$	^6P	7/2	104 000.81		
		5/2	104 120.27		
		3/2	104 630.43		
$3d^6(^5D_0)4f$	$^2[3]^\circ$	7/2	*104 022.89*		
		5/2	*104 046.35*		
$3d^6(^3H)4d$	^2K	15/2	104 119.71		
		13/2	104 315.37		
$3d^6(^3H)4d$	^4F	3/2	104 189.38		
$3d^6(^5D)5d$	^6G	13/2	104 366.82		
		11/2	104 593.27		
		9/2	104 868.50		
		7/2	105 065.63		
		5/2	105 205.79		
		3/2	105 288.53		
$3d^6(^5D)5d$	^6D	9/2	104 411.69		
		3/2	104 588.71		
		7/2	104 705.42		
		1/2	104 757.11		
		5/2	104 828.16		
		5/2	104 569.23		
$3d^5(^2I)4s4p(^3P^\circ)$	$^4H^\circ$	13/2	*104 659.26*		
		11/2	*104 816.80*		
		9/2	*104 937.8*		
		7/2	*105 028.6*		
		5/2	104 761.10		
		3/2	104 840.02		
$3d^6(^5D)5d$	^4G	11/2	104 863.43		
		9/2	105 211.14		
		7/2	105 449.54		
		5/2	105 630.75		

Fe II—Continued

Configuration	Term	J	Level (cm^{-1})	g	Leading percentages
$3d^6(^5D)5d$	^4D	7/2	104 873.23		
		5/2	105 127.77		
		1/2	105 230.29		
$3d^6(^3F2)4d$	^4G	11/2	105 063.55		
		9/2	105 155.09		
		7/2	105 291.01		
		5/2	105 414.18		
		5/2	105 234.06		
		5/2	105 238.77		
$3d^6(^3F2)4d$	^4H	13/2	105 288.847		
		11/2	105 398.852		
		9/2	105 524.461		
		7/2	105 589.42		
$3d^6(^5D)5d$	^6S	5/2	105 711.73		
$3d^6(^3F2)4d$	^2H	11/2	105 763.270		
		9/2	106 018.643		
$3d^5(^2I)4s4p(^3P^\circ)$	$^2K^\circ$	13/2	*106 183.1*		
		15/2	*106 524.4*		
$3d^5(^2I)4s4p(^3P^\circ)$	$^2H^\circ$	11/2	*106 690.17*		
		9/2	*107 006.35*		
$3d^5(^6S)4p^2(^3P)$	^8P	7/2	106 836.0		
		9/2	107 219.5		
$3d^5(^4G)4s4p(^1P^\circ)$	$^4G^\circ$	11/2	*108 483.87*		
		9/2	*108 570.56*		
		5/2	*108 629.25*		
		7/2	*108 631.09*		
$3d^6(^1I)5s$	$e\ ^2I$	11/2	108 630.429		
		13/2	108 648.695		
$3d^5(^4G)4s4p(^1P^\circ)$	$^4H^\circ$	13/2	*108 729.16*		
		11/2	*108 809.31*		
		9/2	*108 868.98*		
		7/2	*108 906.64*		
$3d^6(^3D)5s$	^4D	7/2	108 804.667		
$3d^5(^2I)4s4p(^3P^\circ)$	$^2I^\circ$	13/2	*109 149.68*		
		11/2	*109 271.71*		
$3d^5(^6S)4s\ (^7S)4d$	^8D	3/2	109 449.53		
		5/2	109 455.25		
		7/2	109 463.22		
		9/2	109 473.65		
		11/2	109 486.15		
Fe III ($^5D_4$)	*Limit*		130 563		

Fe III

$Z=26$

Cr I isoelectronic sequence

Ground state: $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6\ ^5D_4$

Ionization energy = 247 220±100 cm^{-1} (30.652±0.01 eV)

The present list of energy levels for Fe III is a combination of the results of Edlén and Swings (1942), who observed the spectrum from 500 to 6500 Å, and those of Glad (1956), who reobserved the long wavelength portion from 2600 to 8600 Å. A correction of 0.8 cm^{-1} has been added to the published level values to place the ground state at zero. No discussion of the level accuracy was given.

The percentage compositions for levels of the $3d^6$ configuration were taken from the theoretical work of Pasternak and Goldschmidt (1972). For the $3d^5 4s$ configuration, we have used the percentages given by Shadmi, Caspi, and Oreg (1969), who listed compositions only for highly mixed states. Although no statement was made concerning the percentage compositions of the remaining levels, it appears that their purity is at least 90%. For the $3d^5 4p$ configuration we have used the results of Roth (1968). Roth distinguished repeating terms of $3d^n$ by the letters a, b ... rather than by seniority. Each of his percentages is the sum of LS term contributions differing only in the seniority of the core term.

Transitions among levels of the $3d^6$ configuration observed in nebular spectra have been given by Bowen (1960).

The ionization energy was determined by Glad from the $3d^5(^6S)ns\ ^7S$ levels (n=5,6,7).

References

Bowen, I. S., (1960), Astrophys. J. **132**, 1.
Edlén, B., and Swings, P. (1942), Astrophys. J. **95**, 532.
Glad, S. (1956), Arkiv Fysik **10**, 21.
Pasternak, A., and Goldschmidt, Z. B. (1972), Phys. Rev. **A6**, 55.
Roth, C. (1968), J. Res. Nat. Bur. Stand (U.S.) **72A**, 505.
Shadmi, Y., Caspi, E., and Oreg, J. (1969), J. Res. Nat. Bur. Stand. (U.S.) **73A**, 173.

Fe III

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3d^6$	^5D	4	0.0	100		
		3	436.2	100		
		2	738.9	100		
		1	932.4	100		
		0	1 027.3	100		
$3d^6$	$^3P2$	2	19 404.8	61	38	$^3P1$
		1	20 688.4	62	38	
		0	21 208.5	62	37	
$3d^6$	^3H	6	20 051.1	100		
		5	20 300.8	99		
		4	20 481.9	97		
$3d^6$	$^3F2$	4	21 462.2	74	21	$^3F1$
		3	21 699.9	77	21	
		2	21 857.2	79	20	
$3d^6$	^3G	5	24 558.8	99		
		4	24 940.9	97		
		3	25 142.4	98		
$3d^5(^6S)4s$	^7S	3	30 088.84			
$3d^6$	^1I	6	30 356.2	100		
$3d^6$	^3D	2	30 716.2	99		
		1	30 725.8	100		
		3	30 857.8	100		

Fe III–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3d^6$	^{1}G2	4	30 886.4	65	34	^{1}G1
$3d^6$	^{1}S2	0	34 812.4	76	23	^{1}S1
$3d^6$	^{1}D2	2	35 803.7	77	22	^{1}D1
$3d^5(^6S)4s$	^{5}S	2	40 999.87			
$3d^6$	^{1}F	3	42 896.9	99		
$3d^6$	^{3}P1	0	49 148	62	38	^{3}P2
		1	49 576.9	62	38	
		2	50 412.3	61	39	
$3d^6$	^{3}F1	2	50 184.9	80	20	^{3}F2
		4	50 276.1	78	22	
		3	50 295.2	78	21	
$3d^6$	^{1}G1	4	57 221.7	65	35	^{1}G2
$3d^5(^4G)4s$	^{5}G	6	63 425.17			
		5	63 466.39			
		4	63 486.78			
		3	63 494.00			
		2	63 494.56			
$3d^5(^4P)4s$	^{5}P	3	66 464.64			
		2	66 522.95			
		1	66 591.68			
$3d^5(^4D)4s$	^{5}D	4	69 695.73			
		0	69 747.40			
		1	69 788.19			
		3	69 836.83			
		2	69 837.76			
$3d^5(^4G)4s$	^{3}G	5	70 694.03			
		3	70 725.01			
		4	70 728.75			
$3d^5(^4P)4s$	^{3}P	2	73 727.64			
		1	73 849.10			
		0	73 935.96			
$3d^5(^4D)4s$	^{3}D	3	76 956.79			
		1	77 075.30			
		2	77 102.43			
$3d^5(^2I)4s$	^{3}I	7	79 840.12			
		6	79 844.74			
		5	79 860.42			
$3d^5(^6S)4p$	^{7}P°	2	*82 001.73*	100		
		3	*82 333.92*	99		
		4	*82 846.59*	100		
$3d^5(^2D3)4s$	^{3}D	3	82 382.87	76	16	(^{2}F2) ^{3}F
		2	82 410.94	69	17	(^{4}F) ^{5}F
		1	82 494.88	66	34	(^{4}F) ^{5}F

Fe III–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3d^5(^4F)4s$	^5F	5	83 138.23			
		4	83 161.48			
		3	83 237.86			
		2	83 358.88	77	15	$(^2F2)\ ^3F$
		1	83 646.98	66	34	$(^2D3)\ ^3D$
$3d^5(^2I)4s$	^1I	6	83 429.61			
$3d^5(^2F2)4s$	^3F	4	84 159.55			
		2	84 369.92	60	17	$(^2D3)\ ^3D$
		3	84 671.87	77	18	$(^2D3)\ ^3D$
$3d^5(^2D3)4s$	^1D	2	86 847.11			
$3d^5(^2F2)4s$	^1F	3	87 901.87			
$3d^5(^2H)4s$	^3H	4	88 663.87			
		5	88 694.67			
		6	88 923.07			
$3d^5(^6S)4p$	$^5P^\circ$	3	*89 084.79*	98		
		2	*89 334.51*	98		
		1	*89 491.39*	98		
$3d^5(^2G2)4s$	^3G	3	89 697.52			
		4	89 783.59			
		5	89 907.85			
$3d^5(^4F)4s$	^3F	2	90 423.68			
		4	90 472.53			
		3	90 483.94			
$3d^5(^2H)4s$	^1H	5	92 523.91			
$3d^5(^2F1)4s$	^3F	4	93 388.75	58	41	$(^2G2)\ ^1G$
		3	93 392.45			
		2	93 412.93			
$3d^5(^2G2)4s$	^1G	4	93 512.64	55	40	$(^2F1)\ ^3F$
$3d^5(^2F1)4s$	^1F	3	97 041.38			
$3d^5(^2S)4s$	^3S	1	98 662.68			
$3d^5(^2D2)4s$	^3D	1	105 895.35			
		2	105 906.23			
		3	105 929.16			
$3d^5(^2D2)4s$	^1D	2	109 570.84			
$3d^5(^4G)4p$	$^5G^\circ$	2	*113 584.20*	96		
		3	*113 605.37*	91	5	$(^4G)\ ^5H^\circ$
		4	*113 635.34*	89	8	
		5	*113 677.01*	88	9	
		6	*113 739.62*	90	7	
$3d^5(^2G1)4s$	^3G	5	114 325.35			
		4	114 339.95			
		3	114 351.92			

Fe III—Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages			
$3d^5(^4G)4p$	$^5H°$	3	114 948.55	94		5	$(^4G)\ ^5G°$
		4	115 110.92	90		8	
		5	115 289.91	90		9	
		6	115 474.25	92		7	
		7	115 642.23	100			
$3d^5(^4G)4p$	$^5F°$	5	116 316.63	90		5	$(^4D)\ ^5F°$
		4	116 467.41	81		7	$(^4D)\ ^5F°$
		3	116 475.44	55		22	$(^4P)\ ^5D°$
		1	116 937.57	76		12	$(^4P)\ ^5D°$
		2	116 975.05	57		28	$(^4P)\ ^5D°$
$3d^5(^4P)4p$	$^5D°$	0	116 364.76	80		16	$(^4D)\ ^5D°$
		1	116 380.07	67		16	$(^4D)\ ^5D°$
		2	116 419.39	46		29	$(^4G)\ ^5F°$
		3	117 068.56	49		32	$(^4G)\ ^5F°$
		4	117 521.91	75		14	$(^4D)\ ^5D°$
$3d^5(^4P)4p$	$^5S°$	2	116 898.22	92			
$3d^5(^2G1)4s$	^1G	4	117 950.32				
$3d^5(^4G)4p$	$^3F°$	2	118 163.56	90			
		3	118 246.52	75		10	$(^4P)\ ^5P°$
		4	118 350.24	89			
$3d^5(^4G)4p$	$^3H°$	6	118 355.01	96			
		5	118 557.25	97			
		4	118 686.25	95			
$3d^5(^4P)4p$	$^5P°$	3	118 442.92	53		22	$(^4D)\ ^5P°$
		2	118 721.60	69		19	
		1	118 867.87	78		14	
$3d^5(^4P)4p$	$^3P°$	2	119 697.64	66		18	$(^4D)\ ^3P°$
		1	119 982.26	71		18	
		0	120 179.95	76		17	
$3d^5(^4D)4p$	$^5F°$	1	120 697.10	85		11	$(^4G)\ ^5F°$
		2	120 826.17	84		10	
		3	121 008.78	84		8	
		4	121 241.67	87		7	
		5	121 468.82	92		6	
$3d^5(^4G)4p$	$^3G°$	3	121 919.74	94			
		4	121 941.29	95			
		5	121 949.62	95			
$3d^5(^4P)4p$	$^3D°$	3	122 346.61	53		29	$(^4D)\ ^5D°$
		2	122 628.34	46		36	
		1	122 843.03	46		35	
$3d^5(^4D)4p$		3	122 829.55	36	$^5D°$	31	$(^4P)\ ^3D°$
$3d^5(^4P)4p$		2	122 898.84	40	$^3D°$	25	$(^4D)\ ^5D°$
$3d^5(^4P)4p$		1	122 921.37	41	$^3D°$	22	$(^4D)\ ^5P°$

Fe III–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages			
$3d^5(^4D)4p$	$^5D^{\circ}$	4	*122 944.15*	78		16	$(^4P)\ ^5D^{\circ}$
		0	*123 455.92*	75		19	$(^4P)\ ^5D^{\circ}$
$3d^5(^4D)4p$	$^5P^{\circ}$	1	*123 552.95*	56		20	$(^4D)\ ^5D^{\circ}$
		2	*123 697.18*	55		18	$(^4P)\ ^5P^{\circ}$
		3	*123 750.39*	45		23	$(^4P)\ ^5P^{\circ}$
$3d^5(^4D)4p$	$^3D^{\circ}$	3	*124 854.04*	71		12	$(^4D)\ ^5P^{\circ}$
		2	*124 903.92*	84		7	$(^4F)\ ^3D^{\circ}$
		1	*124 954.88*	84		8	$(^4F)\ ^3D^{\circ}$
$3d^5(^4D)4p$	$^3F^{\circ}$	4	*125 443.58*	90		6	$(a\ ^2G)\ ^3F^{\circ}$
		3	*125 637.98*	86		6	
		2	*125 672.83*	88		6	
$3d^5(^4P)4p$	$^3S^{\circ}$	1	*126 390.57*	95			
$3d^5(^4D)4p$	$^3P^{\circ}$	0	*128 371.53*	77		18	$(^4P)\ ^3P^{\circ}$
		1	*128 605.65*	74		19	
		2	*128 917.51*	72		21	
$3d^5(^2I)4p$	$^3K^{\circ}$	6	*129 854.80*	83		15	$(^2I)\ ^3I^{\circ}$
		7	*130 040.56*	76		17	
		8	*130 852.25*	100			
$3d^5(^2I)4p$	$^3I^{\circ}$	5	*130 256.27*	82		9	$(^2I)\ ^1H^{\circ}$
		6	*130 756.84*	78		16	$(^2I)\ ^3K^{\circ}$
		7	*131 035.07*	71		21	$(^2I)\ ^3K^{\circ}$
$3d^5(a\ ^2D)4p$		2	*131 445.03*	32	$^1D^{\circ}$	26	$(a\ ^2F)\ ^3F^{\circ}$
$3d^5(^2I)4p$	$^1H^{\circ}$	5	*131 710.79*	69		13	$(^2I)\ ^3I^{\circ}$
$3d^5(^2I)4p$	$^1K^{\circ}$	7	*131 991.58*	89		9	$(^2I)\ ^3I^{\circ}$
$3d^5(a\ ^2D)4p$	$^3F^{\circ}$	3	*132 079.91*	58		25	$(a\ ^2F)\ ^3F^{\circ}$
		2	*132 104.94*	42		26	$(a\ ^2D)\ ^1D^{\circ}$
		4	*132 785.36*	58		22	$(a\ ^2F)\ ^3F^{\circ}$
$3d^5(^2I)4p$	$^3H^{\circ}$	6	*132 262.66*	90			
		5	*132 564.71*	86		6	$(^2I)\ ^1H^{\circ}$
		4	*132 659.17*	84			
$3d^5(a\ ^2D)4p$	$^3P^{\circ}$	2	*134 265.42*	67		25	$(a\ ^2F)\ ^3D^{\circ}$
		1	*134 549.38*	59		20	$(a\ ^2D)\ ^3D^{\circ}$
		0	*135 088.60*	90		6	$(^4F)\ ^5D^{\circ}$
$3d^5(a\ ^2F)4p$	$^1G^{\circ}$	4	*134 360.40*	57		17	$(a\ ^2F)\ ^3G^{\circ}$
$3d^5(a\ ^2F)4p$	$^3G^{\circ}$	3	*134 549.00*	53		25	$(a\ ^2D)\ ^1F^{\circ}$
		5	*135 316.42*	55		35	$(^4F)\ ^5G^{\circ}$
		4	*135 554.41*	54		36	$(a\ ^2F)\ ^3F^{\circ}$
$3d^5(^4F)4p$	$^5G^{\circ}$	2	*134 937.84*	75		10	$(a\ ^2F)\ ^3F^{\circ}$
		3	*135 096.84*	54		27	$(a\ ^2D)\ ^3D^{\circ}$
		4	*135 239.74*	81		8	$(a\ ^2F)\ ^1G^{\circ}$
		6	*135 582.08*	50		44	$(^2I)\ ^1I^{\circ}$
		5	*135 735.31*	58		39	$(a\ ^2F)\ ^3G^{\circ}$

Fe III–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages			
$3d^5(a\,^2D)4p$	$^3D^\circ$	3	*134 976.22*	32		25	$(a\,^2F)\,^3D^\circ$
		1	*135 217.17*	60		22	$(a\,^2D)\,^3P^\circ$
		2	*135 279.04*	62		12	$(^4F)\,^5G^\circ$
$3d^5(a\,^2F)4p$	$^3D^\circ$	3	*135 705.57*	65		11	$(a\,^2D)\,^3D^\circ$
		1	*136 464.9*	66		19	$(a\,^2D)\,^1P^\circ$
		2	*136 793.82*	36		37	$(^4F)\,^5F^\circ$
$3d^5(^2I)4p$	$^1I^\circ$	6	*135 739.47*	50		46	$(^4F)\,^5G^\circ$
$3d^5(^4F)4p$	$^5F^\circ$	4	*135 990.62*	74		17	$(^4F)\,^5D^\circ$
		3	*136 008.74*	65		13	$(^4F)\,^5D^\circ$
		2	*136 117.94*	38		36	$(a\,^2F)\,^3D^\circ$
		5	*136 185.17*	88			
		1	*136 235.84*	76		10	$(a\,^2D)\,^3D^\circ$
$3d^5(a\,^2D)4p$		3	*136 200.13*	31	$^1F^\circ$	24	$(a\,^2F)\,^3G^\circ$
$3d^5(a\,^2F)4p$	$^3F^\circ$	2	*136 532.45*	46		19	$(a\,^2D)\,^3F^\circ$
		4	*136 612.78*	42		28	
		3	*136 797.05*	41		14	
$3d^5(^4F)4p$	$^5D^\circ$	4	*137 209.73*	75		16	$(^4F)\,^5F^\circ$
		3	*137 423.00*	74		14	$(^4F)\,^5F^\circ$
		2	*137 544.60*	77		9	$(^4F)\,^5F^\circ$
		1	*137 561.1*	85		6	$(a\,^2D)\,^3P^\circ$
		0	*137 573.2*	91		6	$(a\,^2D)\,^3P^\circ$
$3d^5(^2H)4p$	$^3H^\circ$	4	*137 527.92*	46		44	$(a\,^2G)\,^3H^\circ$
		5	*137 763.70*	43		42	
		6	*138 264.47*	46		41	
$3d^5(^2H)4p$	$^3G^\circ$	5	*138 054.59*	47		29	$(^4F)\,^3G^\circ$
		4	*138 103.12*	43		30	
		3	*138 187.93*	41		28	
$3d^5(a\,^2D)4p$	$^1P^\circ$	1	*138 691.81*	71		17	$(a\,^2F)\,^3D^\circ$
$3d^5(^4F)4p$	$^3G^\circ$	5	*139 463.36*	43		25	$(a\,^2G)\,^3G^\circ$
		4	*139 625.17*	42		36	
		3	*139 680.47*	42		41	
$3d^5(^2H)4p$	$^3I^\circ$	5	*139 509.44*	79		8	$(^2H)\,^3H^\circ$
		6	*139 846.18*	87		5	
		7	*140 196.33*	96			
$3d^5(a\,^2F)4p$	$^1D^\circ$	2	*139 764.48*	56		38	$(a\,^2D)\,^1D^\circ$
$3d^5(a\,^2G)4p$	$^1G^\circ$	4	*139 827.17*	40		19	$(a\,^2F)\,^1G^\circ$
$3d^5(a\,^2F)4p$	$^1F^\circ$	3	*140 453.10*	72		8	$(a\,^2D)\,^1F^\circ$
$3d^5(a\,^2G)4p$	$^3F^\circ$	3	*140 693.36*	42		26	$(^4F)\,^3F^\circ$
		2	*140 750.98*	42		31	
		4	*141 002.99*	45		26	
$3d^5(^4F)4p$	$^3D^\circ$	2	*141 399.04*	68		8	$(a\,^2G)\,^3F^\circ$
		3	*141 466.53*	64		7	$(a\,^2G)\,^3F^\circ$
		1	*141 469.45*	84		6	$(^4D)\,^3D^\circ$

Fe III–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages			
$3d^5(^2H)4p$	$^1I°$	6	*141 539.55*	88		5	$(^2H)\ ^3H°$
$3d^5(^4F)4p$	$^3F°$	4	*142 047.0*	50		25	$(a\ ^2G)\ ^3F°$
		3	*142 312.90*	50		24	
		2	*142 535.07*	48		24	
$3d^5(a\ ^2G)4p$	$^3H°$	4	*142 855.59*	45		47	$(^2H)\ ^3H°$
		5	*142 908.48*	46		38	
		6	*143 320.85*	50		40	
$3d^5(a\ ^2G)4p$	$^3G°$	5	*143 883.74*	40		20	$(a\ ^2F)\ ^3G°$
		4	*144 085.97*	42		23	
		3	*144 116.64*	43		24	
$3d^5(b\ ^2F)4p$		4	*144 332.21*	35	$^1G°$	30	$(a\ ^2F)\ ^3F°$
$3d^5(b\ ^2F)4p$	$^3F°$	2	*144 501.74*	66		19	$(a\ ^2G)\ ^3F°$
		3	*144 570.53*	73		11	$(a\ ^2G)\ ^3F°$
		4	*144 968.50*	48		20	$(b\ ^2F)\ ^1G°$
$3d^5(a\ ^2G)4p$	$^1H°$	5	*144 586.83*	66		18	$(^2H)\ ^1H°$
$3d^5(^2H)4p$	$^1H°$	5	*144 843.24*	70		23	$(a\ ^2G)\ ^1H°$
$3d^5(a\ ^2G)4p$	$^1F°$	3	*145 038.61*	76		5	$(b\ ^2F)\ ^1F°$
$3d^5(b\ ^2F)4p$	$^1D°$	2	*145 618.39*	82		7	$(b\ ^2F)\ ^3F°$
$3d^5(b\ ^2F)4p$	$^3G°$	3	*146 891.04*	55		36	$(^2H)\ ^3G°$
		4	*147 161.36*	59		32	
		5	*147 406.14*	66		28	
$3d^5(^6S)4d$	^7D	1	147 281.69				
		2	147 291.21				
		3	147 305.97				
		4	147 326.85				
		5	147 354.70				
$3d^5(b\ ^2F)4p$	$^3D°$	1	*147 556.45*	90			
		2	*147 614.65*	89			
		3	*147 635.95*	86		7	$(^4F)\ ^3D°$
$3d^5(^2S)4p$	$^3P°$	0	*148 655*	85		12	$(b\ ^2D)\ ^3P°$
		1	*148 915.3*	82		13	
		2	*149 525.63*	82		14	
$3d^5(b\ ^2F)4p$	$^1G°$	4	*149 013.36*	44		34	$(^2H)\ ^1G°$
$3d^5(^6S)5s$	^7S	3	149 285.00				
$3d^5(b\ ^2F)4p$	$^1F°$	3	*150 654.9*	93			
$3d^5(^6S)4d$	^5D	3	151 534.13				
		2	151 534.90				
		1	151 536.68				
		4	151 537.80				
		0	151 537.91				

Fe III–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3d^5(^2S)4p$	$^1P°$	1	*151 637.3?*	78	19	$(b\ ^2D)\ ^1P°$
$3d^5(^6S)5s$	^5S	2	151 757.67			
$3d^5(b\ ^2D)4p$	$^3F°$	2	*157 684.3*	75	18	$(b\ ^2D)\ ^3D°$
		3	*157 982.0*	61	27	
		4	*158 562.7*	94		
$3d^5(b\ ^2D)4p$	$^3D°$	1	*158 257.37*	95		
		2	*158 417.31*	76	18	$(b\ ^2D)\ ^3F°$
		3	*158 729.89*	67	29	
$3d^5(b\ ^2D)4p$	$^1F°$	3	*159 493.0*	82	12	$(b\ ^2G)\ ^1F°$
$3d^5(b\ ^2D)4p$	$^3P°$	2	*160 037.9*	81	14	$(^2S)\ ^3P°$
$3d^5(b\ ^2D)4p$	$^1D°$	2	*162 084.8?*	92	6	$(b\ ^2F)\ ^1D°$
$3d^5(b\ ^2G)4p$	$^3H°$	4	*165 719.20*	93	5	$(b\ ^2G)\ ^3G°$
		5	*165 939.47*	90	6	
		6	*166 187.50*	98		
$3d^5(^6S)5p$	$^7P°$	2	*166 144.63*			
		3	*166 252.74*			
		4	*166 421.33*			
$3d^5(b\ ^2G)4p$	$^3F°$	4	*166 222.2*	81	11	$(b\ ^2G)\ ^3G°$
		3	*166 498*	50	46	$(b\ ^2G)\ ^3G°$
		2	*167 002*	93	5	$(c\ ^2D)\ ^3F°$
$3d^5(b\ ^2G)4p$	$^3G°$	3	*167 085.12*	53	44	$(b\ ^2G)\ ^3F°$
		4	*167 207.30*	85	11	$(b\ ^2G)\ ^3F°$
		5	*167 299.60*	91	7	$(b\ ^2G)\ ^3H°$
$3d^5(^6S)5p$	$^5P°$	3	*168 329.67*			
		2	*168 420.99*			
		1	*168 477.36*			
$3d^5(b\ ^2G)4p$	$^1H°$	5	*168 780.1*	95		
$3d^5(b\ ^2G)4p$	$^1G°$	4	*169 277.6?*	96		
$3d^5(b\ ^2G)4p$	$^1F°$	3	*170 310.6?*	87	12	$(c\ ^2D)\ ^1F°$
$3d^5(^4G)4d$	^5H	3	179 178.62			
		4	179 194.22			
		5	179 207.57			
		6	179 216.47			
		7	179 221.45			
$3d^5(^4G)4d$	^5F	5	179 579.83			
		4	179 630.77			
		3	179 661.48			
		2	179 676.89			
		1	179 682.94			

Fe III–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages
$3d^5(^4G)4d$	^5G	6	179 725.31	
		5	179 748.17	
		4	179 757.98	
		2	179 759.49	
		3	179 760.72	
$3d^5(^4G)4d$	^5I	4	179 876.71	
		8	179 889.03	
		5	179 893.56	
		7	179 904.56	
		6	179 904.56	
$3d^5(^4G)5s$	^5G	6	181 772.59	
		5	181 808.70	
		4	181 825.67	
		2	181 828.66	
		3	181 830.02	
$3d^5(^4P)4d$	^5F	5	182 379.86	
		4	182 412.65	
		3	182 444.70	
		2	182 480.72	
		1	182 486.40	
$3d^5(^4G)4d$	^3F	2	182 392.55	
		3	182 408.91	
		4	182 418.70	
$3d^5(^4G)4d$	^3I	5	182 810.66	
		6	182 830.76	
		7	182 852.05	
$3d^5(^4G)5s$	^3G	5	183 431.28	
		3	183 456.69	
		4	183 457.15	
$3d^5(^6S)4f$	$^7F^\circ$	1	*184 181.39*	
		2	*184 247.16*	
		3	*184 316.58*	
		4	*184 374.59*	
		5	*184 417.27*	
		6	*184 447.38*	
$3d^5(^6S)4f$	$^5F^\circ$	1	*184 777.3*	
		2	*184 777.6*	
		3	*184 778.5*	
		4	*184 779.5*	
		5	*184 780.8*	
$3d^5(^4P)5s$	^5P	3	184 951.62	
		2	185 003.35	
		1	185 061.35	
$3d^5(^4D)4d$	^5G	2	186 268.69	
		3	186 303.44	
		4	186 378.94	
		5	186 454.09	
		6	186 597.30	

Fe III–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages
$3d^5(^4D)4d$	^5D	1	186 712.02	
		2	186 791.78	
		3	186 882.98	
		4	186 998.60	
$3d^5(^4D)5s$	^5D	4	188 013.40	
		0	188 109.32	
		3	188 109.58	
		1	188 131.70	
		2	188 142.64	
$3d^5(^4D)4d$	^3G	3	188 955.56	
		4	189 011.84	
		5	189 024.53	
$3d^5(^4D)5s$	^3D	3	189 679.07	
		2	189 784.52	
		1	189 796.03	
$3d^5(^6S)5d$	^7D	1	190 393.27	
		2	190 397.71	
		3	190 404.31	
		4	190 413.57	
		5	190 425.72	
$3d^5(^6S)6s$	^7S	3	190 918.17	
$3d^5(^6S)6s$	^5S	2	192 006.94	
$3d^5(^6S)5d$	^5D	0	193 595.30	
		1	193 599.54	
		2	193 605.99	
		3	193 610.92	
		4	193 611.37	
$3d^5(^2I)5s$	^3I	7	196 881.47	
		6	196 886.01	
		5	196 901.27	
$3d^5(^4G)5p$	$^5G^\circ$	2	*198 333.56*	
		6	*198 333.76*	
		5	*198 336.58*	
		3	*198 337.06*	
		4	*198 338.62*	
$3d^5(^6S)6p$	$^7P^\circ$	2	*198 606.37*	
		3	*198 655.66*	
		4	*198 737.05*	
$3d^5(^4G)5p$	$^5H^\circ$	3	*198 658.80*	
		4	*198 717.60*	
		5	*198 773.95*	
		6	*198 821.39*	
		7	*198 848.38*	
$3d^5(^4G)5p$	$^5F^\circ$	5	*199 139.76*	
		4	*199 212.72*	
		3	*199 262.44*	
		2	*199 300.15*	
		1	*199 327.95*	

Fe III–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages
$3d^5(^4G)5p$	$^3F°$	2	*199 577.71*	
		3	*199 595.30*	
		4	*199 603.61*	
$3d^5(^4G)5p$	$^3H°$	6	*199 634.92*	
		5	*199 660.84*	
		4	*199 700.83*	
$3d^5(^4F)4d$	^5H	3	199 701.82	
		4	199 804.81	
		5	199 884.39	
		6	199 906.03	
		7	200 003.70	
$3d^5(^4F)4d$	^5G	4	200 325.56	
		3	200 384.28	
		5	200 395.33	
		2	200 437.94	
		6	200 656.02	
$3d^5(^4G)5p$	$^3G°$	3	*200 504.99*	
		4	*200 514.46*	
		5	*200 524.12*	
$3d^5(^4P)5p$	$^5D°$	2	*201 164.21*	
		3	*201 166.35*	
		0	*201 170.10*	
		1	*201 178.01*	
		4	*201 207.29*	
$3d^5(^4P)5p$	$^5S°$	2	*201 293.75*	
$3d^5(^4F)5s$	^5F	5	201 892.44	
		4	201 919.53	
		3	202 030.38	
		2	202 156.13	
		1	202 429.04	
$3d^5(^4P)5p$	$^5P°$	3	*202 200.51*	
		2	*202 282.65*	
		1	*202 334.39*	
$3d^5(^4D)5p$	$^5F°$	1	*204 907.13*	
		2	*204 943.26*	
		3	*205 002.47*	
		4	*205 092.53*	
		5	*205 195.15*	
$3d^5(^4D)5p$	$^5D°$	4	*205 672.01*	
		1	*205 694.09*	
		3	*205 732.37*	
		2	*205 737.51*	
$3d^5(^4D)5p$	$^3D°$	3	*206 180.41*	
		2	*206 233.31*	
		1	*206 295.81*	

Fe III–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages
$3d^5(^4D)5p$	$^3F°$	4	*206 261.33*	
		2	*206 324.89*	
		3	*206 328.22*	
$3d^5(^6S)5f$	$^7F°$	6	*207 118.1*	
		5	*207 118.6*	
		4	*207 119.1*	
		3	*207 119.6*	
		2	*207 120.1*	
$3d^5(^6S)5f$	$^5F°$	1	*207 252.5*	
		2	*207 257.8*	
		3	*207 263.0*	
		4	*207 268.2*	
		5	*207 273.23*	
$3d^5(^6S)5g$	^7G	7	207 640.8	
		6	207 640.8	
		5	207 640.9	
		4	207 640.9	
		3	207 641.1	
		2	207 641.3	
$3d^5(^6S)5g$	^5G	6	207 642.9	
		5	207 643.1	
		4	207 643.3	
		3	207 643.3	
		2	207 643.5	
$3d^5(^6S)6d$	^7D	1	210 393.67	
		2	210 396.00	
		3	210 399.57	
		4	210 404.61	
		5	210 411.32	
$3d^5(^6S)7s$	^7S	3	210 615.21	
$3d^5(^2I)5p$	$^3I°$	7	*213 457.82*	
		6	*213 505.73*	
		5	*213 563.08*	
$3d^5(^2I)5p$	$^3H°$	6	*213 974.42*	
		5	*214 010.32*	
		4	*214 047.38*	
$3d^5(^4F)5p$	$^5G°$	2	*218 860.43*	
		3	*218 923.08*	
		4	*219 004.53*	
		5	*219 092.86*	
		6	*219 162.42*	
$3d^5(^4F)5p$	$^5F°$	5	*219 415.61*	
		4	*219 471.97*	
		3	*219 566.08*	
		2	*219 655.55*	
		1	*219 743.04*	
$3d^5(^6S)6g$	^7G	1–7	219 740	

Fe III–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages
$3d^5(^6S)6g$	^5G	6	219 741.9	
		5	219 741.9	
		4	219 742.0	
		3	219 742.1	
		2	219 742.1	
$3d^5(^6S)6h$	$^7H°$	2–8	*219 780.2*	
$3d^5(^6S)6h$	$^5H°$	3–7	*219 780.6*	
$3d^5(^4G)5d$	^5H	7	222 590.86	
		6	222 602.50	
		3	222 605.24	
		4	222 605.82	
		5	222 611.16	
$3d^5(^4G)5d$	^5F	5	222 699.09	
		4	222 734.33	
		3	222 750.23	
		2	222 774.22	
		1	222 776.89	
$3d^5(^4G)5d$	^5G	6	222 714.30	
		5	222 744.69	
		2	222 758.28	
		4	222 765.97	
		3	222 766.04	
$3d^5(^4G)5d$	^5I	8	222 797.97	
		4	222 823.33	
		7	222 824.71	
		5	222 832.48	
		6	222 834.77	
$3d^5(^4G)6s$	^5G	6	223 272.06	
		5	223 309.37	
		4	223 326.76	
		2	223 327.87	
		3	223 330.71	
$3d^5(^4G)6s$	^3G	5	224 038.73	
		3	224 051.63	
		4	224 058.70	
$3d^5(^4P)6s$	^5P	3	226 381.91	
		2	226 447.88	
		1	226 506.54	
$3d^5(^4D)6s$	^5D	4	229 421.73	
		3	229 509.56	
		1	229 530.67	
		2	229 570.36	
$3d^5(^4D)6s$	^3D	3	230 192.86	
		1	230 248.26	
		2	230 257.15	
Fe IV ($^6S_{5/2}$)	***Limit***		**247 220**	

Fe IV

$Z=26$

V I isoelectronic sequence

Ground state: $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5\ ^6S_{5/2}$

Ionization energy = 442 000±1000 cm^{-1} (54.8±0.1 eV)

The early work of Kruger and Gilroy (1935) and Edlén (1969) has now been superseded by that of Ekberg and Edlén (1978), who have made a nearly complete analysis of the three lowest configurations. They have classified 706 lines from the transition array $3d^5$–$3d^4 4p$ in the region 446–789 Å and 560 lines of the $3d^4 4s$–$3d^4 4p$ array in the region 1247–2028 Å. Only four of the 280 possible levels are undiscovered. The uncertainty of the $3d^5$ level values is ±0.4 cm^{-1} and of the $3d^4 4s$ and $3d^4 4p$ levels is ±0.2 cm^{-1}.

The leading percentages for $3d^5$ were provided to Ekberg and Edlén by R. Poppe, A. J. J. Raassen, and Th. A. M. van Kleef. The rest were calculated by the authors.

Transitions among levels of the $3d^5$ configuration observed in nebular spectra have been identified by Bowen (1960).

The ionization energy is taken from an isoelectronic extrapolation by Lotz (1967).

References

Bowen, I. S. (1960), Astrophys. J. **132**, 1.
Edlén, B. (1969), Mon. Not. R. Astron. Soc. **144**, 391.
Ekberg, J. O., and Edlén, B. (1978), Phys. Scr. **18**, 107.
Kruger, P. G., and Gilroy, H. T. (1935), Phys. Rev. **48**, 720.
Lotz, W. (1967), J. Opt. Soc. Am. **57**, 873.

Fe IV

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3d^5$	^{6}S	5/2	0.0	100		
$3d^5$	^{4}G	11/2	32 245.5	100		
		9/2	32 292.8	100		
		5/2	32 301.2	100		
		7/2	32 305.7	100		
$3d^5$	^{4}P	5/2	35 253.8	95		
		3/2	35 333.3	97		
		1/2	35 406.6	99		
$3d^5$	^{4}D	7/2	38 779.4	100		
		1/2	38 896.7	99		
		5/2	38 935.1	96		
		3/2	38 938.2	97		
$3d^5$	^{2}I	11/2	47 078.6	99		
		13/2	47 090.5	100		
$3d^5$	^{2}D3	5/2	49 541.5	57	24	^{2}F2
		3/2	50 051.4	73	23	^{2}D1
$3d^5$	^{2}F2	7/2	51 394.2	97		
		5/2	52 166.7	70	15	^{2}D3
$3d^5$	^{4}F	9/2	52 620.7	98		
		7/2	52 695.4	98		
		3/2	52 837.1	96		
		5/2	52 838.0	89	5	^{2}F2
$3d^5$	^{2}H	9/2	56 058.3	86	14	^{2}G2
		11/2	56 368.8	99		
$3d^5$	^{2}G2	7/2	57 408.0	99		
		9/2	57 721.2	84	14	^{2}H

Fe IV–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3d^5$	^{2}F1	5/2	61 156.5	99		
		7/2	61 254.4	98		
$3d^5$	^{2}S	1/2	66 720.1	100		
$3d^5$	^{2}D2	3/2	74 096.6	100		
		5/2	74 133.1	100		
$3d^5$	^{2}G1	9/2	82 894.9	100		
		7/2	82 897.3	100		
$3d^5$	^{2}P	3/2	100 118.0	100		
		1/2	100 126.0	100		
$3d^5$	^{2}D1	5/2	108 242.1	76	24	^{2}D3
		3/2	108 258.3	76	24	
$3d^4$(^{5}D)4s	^{6}D	1/2	127 766.15	100		
		3/2	127 929.12	100		
		5/2	128 191.54	100		
		7/2	128 541.85	100		
		9/2	128 967.67	100		
$3d^4$(^{5}D)4s	^{4}D	1/2	137 700.81	100		
		3/2	137 949.29	100		
		5/2	138 338.83	100		
		7/2	138 844.03	100		
$3d^4$(^{3}P2)4s	^{4}P	1/2	153 651.74	60	39	(^{3}P1) ^{4}P
		3/2	154 474.85	60	39	
		5/2	155 744.87	61	39	
$3d^4$(^{3}H)4s	^{4}H	7/2	154 185.85	98		
		9/2	154 325.96	98		
		11/2	154 512.67	99		
		13/2	154 731.29	100		
$3d^4$(^{3}F2)4s	^{4}F	3/2	156 012.29	78	21	(^{3}F1) ^{4}F
		5/2	156 049.32	77	21	
		7/2	156 123.77	76	20	
		9/2	156 224.88	76	19	
$3d^4$(^{3}G)4s	^{4}G	5/2	158 738.69	96		
		7/2	159 010.39	95		
		9/2	159 227.90	93		
		11/2	159 342.88	92	7	(^{3}H) ^{2}H
$3d^4$(^{3}P2)4s	^{2}P	1/2	160 015.88	59	39	(^{3}P1) ^{2}P
		3/2	161 571.59	60	38	
$3d^4$(^{3}H)4s	^{2}H	9/2	160 311.64	96		
		11/2	160 778.60	93	7	(^{3}G) ^{4}G
$3d^4$(^{3}F2)4s	^{2}F	5/2	162 074.42	77	21	(^{3}F1) ^{2}F
		7/2	162 087.81	74	19	
$3d^4$(^{3}G)4s	^{2}G	7/2	164 950.50	94		
		9/2	165 392.58	98		

Fe IV–Continued

Configuration	Term	J	Level (cm⁻¹)	Leading percentages		
$3d^4(^3D)4s$	^4D	7/2	165 493.10	100		
		5/2	165 600.96	99		
		3/2	165 720.94	99		
		1/2	165 804.47	99		
$3d^4(^1G2)4s$	^2G	9/2	167 712.50	65	32	$(^1G1)\ ^2G$
		7/2	167 795.92	64	32	
$3d^4(^1I)4s$	^2I	13/2	168 526.37	100		
		11/2	168 566.43	99		
$3d^4(^1S2)4s$	^2S	1/2	170 729.49	78	20	$(^1S1)\ ^2S$
$3d^4(^3D)4s$	^2D	5/2	171 345.33	99		
		3/2	171 476.39	99		
$3d^4(^1D2)4s$	^2D	5/2	177 005.97	78	21	$(^1D1)\ ^2D$
		3/2	177 066.72	78	21	
$3d^4(^1F)4s$	^2F	5/2	183 159.61	99		
		7/2	183 164.49	99		
$3d^4(^5D)4p$	$^6F°$	1/2	*187 878.81*	99		
		3/2	*188 086.05*	99		
		5/2	*188 428.78*	99		
		7/2	*188 904.55*	99		
		9/2	*189 515.88*	99		
		11/2	*190 276.85*	100		
$3d^4(^5D)4p$	$^6P°$	3/2	*189 885.11*	96		
		5/2	*190 008.28*	97		
		7/2	*190 226.87*	99		
$3d^4(^3P1)4s$	^4P	5/2	189 975.01	61	39	$(^3P2)\ ^4P$
		3/2	190 811.79	60	39	
		1/2	191 337.82	60	39	
$3d^4(^3F1)4s$	^4F	9/2	190 318.34	80	20	$(^3F2)\ ^4F$
		3/2	190 406.45	78	22	
		7/2	190 424.14	79	20	
		5/2	190 435.47	78	21	
$3d^4(^5D)4p$	$^4P°$	1/2	*191 021.18*	70	28	$(^5D)\ ^6D°$
		3/2	*191 694.11*	61	33	
		5/2	*193 549.25*	54	44	
$3d^4(^5D)4p$	$^6D°$	5/2	*192 595.28*	55	41	$(^5D)\ ^4P°$
		1/2	*193 120.34*	72	27	$(^5D)\ ^4P°$
		3/2	*193 271.27*	66	33	$(^5D)\ ^4P°$
		7/2	*193 386.17*	97		
		9/2	*193 789.19*	94	5	$(^5D)\ ^4F°$
$3d^4(^3P1)4s$	^2P	3/2	195 864.15	61	39	$(^3P2)\ ^2P$
		1/2	196 875.62	60	39	
$3d^4(^3F1)4s$	^2F	7/2	196 131.19	80	20	$(^3F2)\ ^2F$
		5/2	196 220.71	79	21	

Fe IV–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages			
$3d^4(^5D)4p$	$^4F^\circ$	3/2	*196 186.88*	96			
		5/2	*196 334.63*	95			
		7/2	*196 549.59*	94			
		9/2	*196 846.82*	91		6	$(^5D)\ ^6D^\circ$
$3d^4(^1G1)4s$	^2G	9/2	201 178.05	66		33	$(^1G2)\ ^2G$
		7/2	201 212.22	66		33	
$3d^4(^5D)4p$	$^4D^\circ$	1/2	*201 919.38*	98			
		3/2	*202 085.22*	98			
		5/2	*202 328.53*	97			
		7/2	*202 608.33*	97			
$3d^4(^3H)4p$	$^4H^\circ$	7/2	*212 135.79*	77		20	$(^3G)\ ^4H^\circ$
		9/2	*212 374.04*	75		19	
		11/2	*212 714.37*	76		17	
		13/2	*213 162.59*	80		15	
$3d^4(^3P2)4p$	$^4D^\circ$	1/2	*212 812.66*	48		33	$(^3P1)\ ^4D^\circ$
		3/2	*213 445.05*	47		32	$(^3P1)\ ^4D^\circ$
		5/9	*214 317.21*	44		30	$(^3P1)\ ^4D^\circ$
		7/2	*215 220.67*	26		19	$(^3F2)\ ^4D^\circ$
$3d^4(^3F2)4p$	$^4G^\circ$	5/2	*214 821.74*	47		21	$(^3F1)\ ^4G^\circ$
		7/2	*215 033.81*	27		13	$(^3G)\ ^4G^\circ$
		9/2	*215 385.23*	24		14	$(^3G)\ ^4G^\circ$
		11/2	*216 002.72*	26		31	$(^3H)\ ^4G^\circ$
$3d^4(^3H)4p$	$^4I^\circ$	9/2	*215 155.69*	87			
		11/2	*215 808.91*	92		6	$(^3H)\ ^4H^\circ$
		13/2	*216 367.80*	94		5	$(^3H)\ ^4H^\circ$
		15/2	*216 877.83*	100			
$3d^4(^3P2)4p$	$^4P^\circ$	1/2	*215 860.50*	32		19	$(^3P1)\ ^4P^\circ$
		3/2	*217 031.89*	56		33	$(^3P1)\ ^4P^\circ$
		5/2	*218 023.81*	26		15	$(^3P1)\ ^4P^\circ$
$3d^4(^3H)4p$	$^2G^\circ$	7/2	*216 111.69*	46		22	$(^3F2)\ ^2G^\circ$
		9/2	*216 428.44*	36		22	
$3d^4(^3F2)4p$	$^4F^\circ$	3/2	*217 466.19*	42		23	$(^3F2)\ ^2D^\circ$
		7/2	*218 478.36*	71		13	$(^3F1)\ ^4F^\circ$
		9/2	*218 601.03*	70		12	$(^3F1)\ ^4F^\circ$
$3d^4(^3P2)4p$		1/2	*217 607.71*	26	$^4P^\circ$	21	$(^3P1)\ ^2S^\circ$
$3d^4(^3H)4p$	$^4G^\circ$	5/2	*217 845.29*	31		20	$(^3F2)\ ^4G^\circ$
		7/2	*218 159.77*	51		28	
		9/2	*218 238.51*	50		33	
		11/2	*218 375.12*	31		26	
$3d^4(^3F2)4p$		5/2	*218 195.66*	30	$^4F^\circ$	28	$(^3P2)\ ^4P^\circ$
$3d^4(^3P2)4p$		3/2	*218 613.88*	25	$^2P^\circ$	15	$(^3P2)\ ^4S^\circ$
$3d^4(^3F2)4p$	$^2D^\circ$	5/2	*218 871.21*	37		13	$(^3D)\ ^2D^\circ$
$3d^4(^3F2)4p$		3/2	*219 091.67*	21	$^2D^\circ$	19	$(^3F2)\ ^4F^\circ$

Fe IV–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages			
$3d^4(^3P2)4p$	$^2P^\circ$	1/2	*219 333.90*	33		15	$(^3P1)\ ^2P^\circ$
		3/2	*220 360.44*	27		11	$(^3P1)\ ^2P^\circ$
$3d^4(^3H)4p$	$^2I^\circ$	11/2	*219 564.46*	89			
		13/2	*219 640.76*	89		6	$(^3G)\ ^4H^\circ$
$3d^4(^3F2)4p$	$^4D^\circ$	5/2	*219 590.84*	30		10	$(^3P2)\ ^4D^\circ$
		7/2	*219 700.53*	23		18	$(^3P2)\ ^4D^\circ$
		3/2	*219 826.61*	39		13	$(^3F1)\ ^4D^\circ$
		1/2	*220 059.33*	43		14	$(^3F1)\ ^4D^\circ$
$3d^4(^3G)4p$	$^2F^\circ$	5/2	*220 197.25*	26		14	$(^3F2)\ ^2F^\circ$
		7/2	*220 649.22*	21		20	$(^3F2)\ ^2F^\circ$
$3d^4(^3H)4p$	$^2H^\circ$	9/2	*220 461.33*	51		16	$(^3G)\ ^4H^\circ$
		11/2	*221 161.02*	40		33	
$3d^4(^3G)4p$	$^4H^\circ$	7/2	*220 658.04*	77		19	$(^3H)\ ^4H^\circ$
		9/2	*221 104.17*	56		16	$(^3H)\ ^2H^\circ$
		11/2	*221 647.49*	46		35	$(^3H)\ ^2H^\circ$
		13/2	*222 154.99*	79		15	$(^3H)\ ^4H^\circ$
$3d^4(^3G)4p$	$^4F^\circ$	3/2	*221 219.29*	44		13	$(^3D)\ ^4F^\circ$
		9/2	*221 239.21*	60		12	
		5/2	*221 320.54*	58		16	
		7/2	*221 346.06*	56		14	
$3d^4(^3P2)4p$	$^2D^\circ$	3/2	*222 020.09*	34		23	$(^3P1)\ ^2D^\circ$
		5/2	*222 880.23*	47		32	
$3d^4(^1D1)4s$	^2D	5/2	222 840.58	79		21	$(^1D2)\ ^2D$
		3/2	222 851.68	79		21	
$3d^4(^3F2)4p$	$^2G^\circ$	7/2	*223 398.62*	32		19	$(^3H)\ ^2G^\circ$
$3d^4(^3F2)4p$	$^2F^\circ$	5/2	*223 478.96*	48		35	$(^3G)\ ^2F^\circ$
		7/2	*224 046.02*	44		42	
$3d^4(^3G)4p$	$^2H^\circ$	11/2	*223 550.14*	50		19	$(^3G)\ ^4G^\circ$
		9/2	*223 745.82*	41		15	$(^3H)\ ^2G^\circ$
$3d^4(^3G)4p$		9/2	*223 629.59*	18	$^4G^\circ$	15	$(^3F2)\ ^2G^\circ$
$3d^4(^3G)4p$	$^4G^\circ$	5/2	*224 045.96*	55		29	$(^3H)\ ^4G^\circ$
		7/2	*224 230.60*	55		25	$(^3H)\ ^4G^\circ$
		9/2	*224 576.43*	42		17	$(^3H)\ ^4G^\circ$
		11/2	*224 870.85*	47		24	$(^3G)\ ^2H^\circ$
$3d^4(^3D)4p$	$^4D^\circ$	1/2	*226 851.93*	86			
		3/2	*226 892.10*	81		7	$(^3D)\ ^4P^\circ$
		5/2	*226 983.58*	60		29	$(^3D)\ ^4P^\circ$
		7/2	*227 258.80*	81			
$3d^4(^3G)4p$	$^2G^\circ$	7/2	*227 604.73*	64		14	$(^3H)\ ^2G^\circ$
		9/2	*227 660.25*	60		20	
$3d^4(^3D)4p$	$^4P^\circ$	5/2	*227 919.05*	63		25	$(^3D)\ ^4D^\circ$
		3/2	*228 589.67*	82		5	$(^3D)\ ^4D^\circ$
		1/2	*229 037.02*	90		5	$(^3P2)\ ^4P^\circ$

Fe IV–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3d^4(^1G2)4p$	$^2F°$	7/2	228 193.67	53	24	(^{1}G1) ^{2}F°
		5/2	229 138.90	53	25	
$3d^4(^1I)4p$	$^2I°$	13/2	228 204.33	69	27	(^{1}I) ^{2}K°
		11/2	228 315.03	89		
$3d^4(^1G2)4p$	$^2H°$	9/2	228 793.86	51	25	(^{1}G1) ^{2}H°
		11/2	229 306.61	52	22	
$3d^4(^3D)4p$	$^4F°$	3/2	228 862.61	69	20	(^{3}G) ^{4}F°
		5/2	229 062.58	68	18	
		7/2	229 288.02	71	19	
		9/2	229 494.74	80	19	
$3d^4(^1S2)4p$	$^2P°$	1/2	228 946.59	39	37	(^{3}D) ^{2}P°
		3/2	233 786.72	33	27	
$3d^4(^3D)4p$	$^2P°$	3/2	229 428.91	52	32	(^{1}S2) ^{2}P°
		1/2	233 927.12	48	29	
$3d^4(^1I)4p$	$^2K°$	13/2	229 472.83	72	27	(^{1}I) ^{2}I°
		15/2	230 195.02	100		
$3d^4(^1G2)4p$	$^2G°$	7/2	231 473.32	47	30	(^{1}G1) ^{2}G°
		9/2	231 804.00	44	31	
$3d^4(^1I)4p$	$^2H°$	11/2	233 272.84	80	9	(^{3}G) ^{2}H°
		9/2	233 802.12	86	9	
$3d^4(^3D)4p$	$^2F°$	7/2	233 780.86	70	11	(^{3}G) ^{2}F°
		5/2	234 106.72	70	12	
$3d^4(^3D)4p$	$^2D°$	5/2	234 472.00	60	19	(^{1}D2) ^{2}D°
		3/2	234 984.35	68	9	(^{3}F2) ^{2}D°
$3d^4(^1D2)4p$	$^2D°$	3/2	236 918.79	54	18	(^{1}D1) ^{2}D°
		5/2	237 283.09	44	18	(^{3}D) ^{2}D°
$3d^4(^1D2)4p$	$^2F°$	5/2	238 512.84	59	14	(^{1}D1) ^{2}F°
		7/2	239 071.40	59	20	(^{1}F) ^{2}F°
$3d^4(^1D2)4p$	$^2P°$	3/2	242 259.25	68	14	(^{1}D1) ^{2}P°
$3d^4(^1F)4p$	$^2F°$	5/2	242 614.60	74	10	(^{1}D2) ^{2}F°
		7/2	242 965.62	66	16	
$3d^4(^1F)4p$	$^2G°$	7/2	244 759.25	91		
		9/2	245 742.29	94		
$3d^4(^1F)4p$	$^2D°$	5/2	246 990.80	61	15	(^{3}P1) ^{2}D°
		3/2	248 077.97	64	13	
$3d^4(^3F1)4p$	$^4F°$	5/2	250 195.07	73	11	(^{3}F2) ^{4}F°
		3/2	250 249.39	78	13	
		7/2	250 279.06	74	11	
		9/2	250 502.29	84	12	

Fe IV–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages			
$3d^4(^3P1)4p$	$^4P°$	3/2	*250 891.05*	38		19	$(^3P2)\ ^4P°$
		1/2	*251 156.94*	43		23	
		5/2	*251 958.94*	39		20	
$3d^4(^3P1)4p$		5/2	*251 014.02*	22	$^4D°$	22	$(^3P1)\ ^4P°$
$3d^4(^3P1)4p$	$^4D°$	7/2	*251 658.34*	37		21	$(^3P2)\ ^4D°$
		1/2	*251 984.20*	30		18	
$3d^4(^3P1)4p$		3/2	*251 944.03*	25	$^4D°$	21	$(^3P1)\ ^4P°$
$3d^4(^3F1)4p$	$^4G°$	5/2	*252 884.48*	54		18	$(^3F2)\ ^4G°$
		7/2	*253 254.37*	52		20	$(^3F1)\ ^2F°$
		9/2	*253 827.43*	73		22	$(^3F2)\ ^4G°$
		11/2	*254 164.84*	76		22	$(^3F2)\ ^4G°$
$3d^4(^3P1)4p$	$^2D°$	5/2	*253 575.65*	23		25	$(^1F)\ ^2D°$
		3/2	*253 868.43*	25		26	
$3d^4(^3F1)4p$	$^2F°$	7/2	*253 923.59*	52		21	$(^3F1)\ ^4G°$
		5/2	*254 169.13*	55		16	
$3d^4(^3P1)4p$	$^4S°$	3/2	*257 503.26*	50		45	$(^3P2)\ ^4S°$
$3d^4(^3F1)4p$	$^2G°$	9/2	*258 566.02*	75		21	$(^3F2)\ ^2G°$
		7/2	*259 039.72*	75		22	
$3d^4(^3F1)4p$	$^4D°$	7/2	*258 591.92*	50		17	$(^3F2)\ ^4D°$
		5/2	*258 986.64*	50		18	
		3/2	*259 183.82*	49		18	
		1/2	*259 254.34*	52		20	
$3d^4(^3P1)4p$	$^2P°$	3/2	*259 011.48*	61		29	$(^3P2)\ ^2P°$
		1/2	*259 581.64*	61		29	
$3d^4(^3P2)4p$	$^2S°$	1/2	*262 348.36*	55		43	$(^3P1)\ ^2S°$
$3d^4(^1G1)4p$	$^2H°$	9/2	*262 557.77*	42		21	$(^1G2)\ ^2H°$
		11/2	*264 011.54*	65		32	
$3d^4(^1G1)4p$	$^2G°$	7/2	*262 995.01*	57		35	$(^1G2)\ ^2G°$
		9/2	*263 876.91*	39		23	
$3d^4(^1G1)4p$	$^2F°$	7/2	*265 084.77*	58		21	$(^1G2)\ ^2F°$
		5/2	*265 369.48*	49		18	
$3d^4(^3F1)4p$	$^2D°$	5/2	*266 181.09*	41		15	$(^3F2)\ ^2D°$
		3/2	*266 335.24*	47		18	
$3d^4(^1D1)4p$	$^2P°$	3/2	*280 758.37*	76		16	$(^1D2)\ ^2P°$
		1/2	*281 446.30*	76		17	
$3d^4(^1D1)4p$	$^2F°$	5/2	*285 052.77*	72		19	$(^1D2)\ ^2F°$
		7/2	*286 084.72*	74		19	
$3d^4(^1D1)4p$	$^2D°$	3/2	*289 400.72*	73		26	$(^1D2)\ ^2D°$
		5/2	*289 818.77*	73		25	
Fe V ($^5D_0$)	***Limit***		**442 000**				

Fe V

$Z=26$

Ti I isoelectronic sequence

Ground state: $1s^2 2s^2 2p^6 3s^2 3p^6 3d^4\ ^5D_0$

Ionization energy = 605 000±1200 cm^{-1} (75.0±0.2 eV)

Bowen's contribution in 1937 established terms of $3d^4$, $3d^3 4s$, and $3d^3 4p$, greatly expanding the start made by White (1929). Additions to all three configurations have been made by Fawcett and Henrichs (1974). The analysis of these configurations has been greatly extended by Ekberg (1975), who reobserved the spectrum from 302–1715 Å. He improved the level uncertainty to ±0.4 cm^{-1}. The leading percentages given below are also due to Ekberg.

Bowen (1960) has observed lines in nebular spectra due transitions among levels of the $3d^4$ configuration.

The ionization energy is from the isoelectro extrapolation of Lotz (1967).

References

Bowen, I. S. (1937), Phys. Rev. **52**, 1153.
Bowen, I. S. (1960), Astrophys. J. **132**, 1.
Ekberg, J. O. (1975), Phys. Scr. **12**, 42.
Fawcett, B. C., and Henrichs, H. F. (1974), Astron. Astrophys. **18**, 157.
Lotz, W. (1967), J. Opt. Soc. Am. **57**, 873.
White, H. E. (1929), Phys. Rev. **33**, 914.

Fe V

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3d^4$	^5D	0	0.0	100		
		1	142.1	100		
		2	417.3	100		
		3	803.1	100		
		4	1 282.8	100		
$3d^4$	$^3P2$	0	24 055.4	59	40	$^3P1$
		1	24 972.9	60	40	
		2	26 468.3	60	39	
$3d^4$	^3H	4	24 932.5	97		
		5	25 225.9	99		
		6	25 528.5	100		
$3d^4$	$^3F2$	2	26 760.7	78	22	$^3F1$
		3	26 842.3	75	20	
		4	26 974.0	75	19	
$3d^4$	^3G	3	29 817.1	96		
		4	30 147.0	94		
		5	30 430.1	99		
$3d^4$	$^1G2$	4	36 586.3	65	33	$^1G1$
$3d^4$	^3D	3	36 630.1	100		
		2	36 758.5	99		
		1	36 925.4	100		
$3d^4$	^1I	6	37 511.7	100		
$3d^4$	$^1S2$	0	39 633.4	78	21	$^1S1$
$3d^4$	$^1D2$	2	46 291.2	78	21	$^1D1$
$3d^4$	^1F	3	52 732.7	99		

Fe v–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3d^4$	^{3}P1	2	61 854.4	61	39	^{3}P2
		1	62 914.2	60	40	
		0	63 420.0	60	40	
$3d^4$	^{3}F1	4	62 238.1	80	20	^{3}F2
		2	62 321.1	78	22	
		3	62 364.4	78	21	
$3d^4$	^{1}G1	4	71 280.3	66	34	^{1}G2
$3d^4$	^{1}D1	2	93 832.3	78	22	^{1}D2
$3d^4$	^{1}S1	0	121 130.2	79	21	^{1}S2
$3d^3(^4F)4s$	^{5}F	1	186 433.6	100		
		2	186 725.5	100		
		3	187 157.5	100		
		4	187 719.0	100		
		5	188 395.3	100		
$3d^3(^4F)4s$	^{3}F	2	195 196.3	100		
		3	195 933.0	100		
		4	196 838.6	100		
$3d^3(^4P)4s$	^{5}P	1	204 729.9	99		
		2	204 975.4	99		
		3	205 536.4	100		
$3d^3(^2G)4s$	^{3}G	3	208 838.2	100		
		4	209 110.1	99		
		5	209 523.9	98		
$3d^3(^4P)4s$	^{3}P	0	212 542.1	85	15	(^{2}P) ^{3}P
		1	212 818.1	88	6	
		2	213 649.2	91	8	
$3d^3(^2G)4s$	^{1}G	4	213 534.1	94	5	(^{2}H) ^{3}H
$3d^3(^2P)4s$	^{3}P	2	214 525.8	61	23	(^{2}D2) ^{3}D
		1	214 611.4	72	14	
$3d^3(^2D2)4s$	^{3}D	1	215 782.6	56	20	(^{2}P) ^{3}P
		3	216 538.1	80	20	(^{2}D1) ^{3}D
		2	216 592.7	55	28	(^{2}P) ^{3}P
$3d^3(^2H)4s$	^{3}H	4	216 779.1	94	5	(^{2}G) ^{1}G
		5	216 860.4	99		
		6	217 122.5	100		
$3d^3(^2P)4s$	^{1}P	1	219 486.9	90	5	(^{2}D2) ^{3}D
$3d^3(^2D2)4s$	^{1}D	2	220 621.0	77	20	(^{2}D1) ^{1}D
$3d^3(^2H)4s$	^{1}H	5	221 305.2	99		
$3d^3(^2F)4s$	^{3}F	4	233 633.6	100		
		3	233 848.9	100		
		2	234 027.4	100		

Fe v–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3d^3(^2F)4s$	^1F	3	237 729.6	100		
$3d^3(^4F)4p$	$^5G^\circ$	2	*254 803.3*	99		
		3	*255 399.2*	99		
		4	*256 177.9*	99		
		5	*257 138.0*	99		
		6	*258 297.4*	100		
$3d^3(^4F)4p$	$^5F^\circ$	1	*257 742.3*	38	36	$(^4F)\ ^3D^\circ$
		2	*259 376.1*	51	42	$(^4F)\ ^5D^\circ$
		3	*259 954.7*	78	19	$(^4F)\ ^5D^\circ$
		4	*260 521.0*	90	6	$(^4F)\ ^5D^\circ$
		5	*261 051.9*	94		
$3d^3(^4F)4p$	$^5D^\circ$	2	*258 128.5*	48	25	$(^4F)\ ^5F^\circ$
		0	*258 619.5*	96		
		3	*258 680.0*	71	15	$(^4F)\ ^5F^\circ$
		1	*258 891.5*	72	20	$(^4F)\ ^5F^\circ$
		4	*259 344.8*	89	7	$(^4F)\ ^5F^\circ$
$3d^3(^2D1)4s$	^3D	3	258 434.1	80	20	$(^2D2)\ ^3D$
		2	258 628.5	79	21	
		1	258 769.5	78	22	
$3d^3(^4F)4p$	$^3D^\circ$	1	*259 995.2*	49	42	$(^4F)\ ^5F^\circ$
		2	*260 411.4*	62	23	$(^4F)\ ^5F^\circ$
		3	*261 179.6*	76	8	$(^4P)\ ^3D^\circ$
$3d^3(^2D1)4s$	^1D	2	262 509.3	79	21	$(^2D2)\ ^1D$
$3d^3(^4F)4p$	$^3G^\circ$	3	*263 898.6*	92	5	$(^2G)\ ^3G^\circ$
		4	*264 434.2*	91		
		5	*265 112.6*	88	6	$(^4F)\ ^5F^\circ$
$3d^3(^4F)4p$	$^3F^\circ$	2	*266 612.8*	94		
		3	*267 240.1*	94		
		4	*267 928.6*	94		
$3d^3(^4P)4p$	$^5P^\circ$	1	*273 643.1*	98		
		2	*274 136.1*	96		
		3	*274 930.3*	98		
$3d^3(^4P)4p$	$^5D^\circ$	0	*274 753.3*	54	36	$(^4P)\ ^3P^\circ$
		1	*275 146.6*	59	34	
		2	*276 759.2*	58	32	
		3	*277 068.5*	94		
		4	*278 075.8*	96		
$3d^3(^4P)4p$	$^3P^\circ$	2	*275 374.3*	52	36	$(^4P)\ ^5D^\circ$
		0	*276 434.9*	43	40	
		1	*276 765.9*	54	35	
$3d^3(^2G)4p$	$^3H^\circ$	4	*276 429.7*	79	16	$(^2H)\ ^3H^\circ$
		5	*277 292.7*	73	18	
		6	*278 650.7*	78	21	
$3d^3(^2G)4p$	$^3G^\circ$	3	*278 794.2*	77	7	$(^2G)\ ^1F^\circ$
		4	*279 502.6*	78	9	$(^2G)\ ^3F^\circ$
		5	*280 039.6*	79	7	$(^2G)\ ^3H^\circ$

Fe v–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages			
$3d^3(^2G)4p$	$^3F°$	4	280 367.2	46		35	$(^2G)\ ^1G°$
		2	280 539.7	60		17	$(^2D2)\ ^3F°$
		3	280 832.2	64		11	$(^2G)\ ^3G°$
$3d^3(^2P)4p$	$^3P°$	1	281 944.9	52		22	$(^2D2)\ ^3P°$
		0	282 234.5	50		17	$(^2D2)\ ^3P°$
$3d^3(^2G)4p$	$^1G°$	4	282 038.1	50		30	$(^2G)\ ^3F°$
$3d^3(^4P)4p$		2	282 423.5	27	$^5S°$	12	$(^2P)\ ^1D°$
$3d^3(^2G)4p$	$^1F°$	3	282 571.6	67		13	$(^2D2)\ ^1F°$
$3d^3(^4P)4p$	$^5S°$	2	282 604.8	49		21	$(^2P)\ ^1D°$
$3d^3(^2G)4p$	$^1H°$	5	282 871.9	72		18	$(^2H)\ ^1H°$
$3d^3(^2P)4p$		2	283 686.3	27	$^3P°$	22	$(^4P)\ ^5S°$
$3d^3(^2P)4p$	$^3D°$	1	283 754.0	81		8	$(^4P)\ ^3D°$
		2	284 911.2	66		9	$(^2P)\ ^1D°$
		3	285 474.0	54		15	$(^2D2)\ ^3F°$
$3d^3(^2H)4p$	$^3H°$	4	284 690.3	69		15	$(^2G)\ ^3H°$
		5	284 790.8	78		19	
		6	285 196.1	77		21	
$3d^3(^2D2)4p$	$^1P°$	1	285 961.7	40		21	$(^2P)\ ^1P°$
$3d^3(^2D2)4p$	$^3F°$	2	286 154.9	45		15	$(^2G)\ ^3F°$
		4	287 620.2	70		16	$(^2D1)\ ^3F°$
$3d^3(^2P)4p$	$^3S°$	1	286 187.7	83		6	$(^2P)\ ^3P°$
$3d^3(^4P)4p$	$^3D°$	3	286 431.3	41		24	$(^2D2)\ ^3F°$
		1	286 855.3	48		15	$(^2D2)\ ^3D°$
		2	286 862.7	52		20	$(^2P)\ ^3D°$
$3d^3(^2P)4p$		3	287 109.6	33	$^3D°$	23	$(^2D2)\ ^3F°$
$3d^3(^2H)4p$	$^3I°$	5	287 440.5	93		5	$(^2G)\ ^1H°$
		6	288 167.2	98			
		7	289 171.9	100			
$3d^3(^2D2)4p$	$^3D°$	1	288 669.8	58		20	$(^4P)\ ^3D°$
		2	289 389.7	65		15	
		3	289 913.0	57		10	
$3d^3(^2H)4p$	$^1G°$	4	289 545.9	75		17	$(^2F)\ ^1G°$
$3d^3(^2H)4p$	$^1H°$	5	290 099.1	75		17	$(^2G)\ ^1H°$
$3d^3(^2D2)4p$	$^3P°$	2	290 407.7	38		42	$(^2P)\ ^3P°$
		1	290 583.7	43		33	
		0	290 903.4	45		35	
$3d^3(^2D2)4p$	$^1F°$	3	291 231.4	53		16	$(^2D1)\ ^1F°$

Fe v–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3d^3(^2H)4p$	$^3G°$	5	*292 287.6*	83	6	$(^2F)\ ^3G°$
		4	*292 430.7*	82	7	
		3	*292 513.2*	82	7	
$3d^3(^2H)4p$	$^1I°$	6	*292 365.9*	98		
$3d^3(^4P)4p$	$^3S°$	1	*294 644.0*	83	8	$(^2P)\ ^1P°$
$3d^3(^2D2)4p$	$^1D°$	2	*295 716.4*	46	41	$(^2P)\ ^1D°$
$3d^3(^2P)4p$	$^1P°$	1	*295 973.2*	62	18	$(^2D2)\ ^1P°$
$3d^3(^2F)4p$	$^3F°$	2	*302 292.7*	92		
		3	*302 377.1*	90		
		4	*302 602.5*	90		
$3d^3(^2F)4p$	$^3G°$	3	*306 193.9*	86	8	$(^2H)\ ^3G°$
		4	*306 622.8*	86	8	
		5	*307 064.4*	93	7	
$3d^3(^2F)4p$	$^3D°$	3	*307 288.7*	85	8	$(^2D1)\ ^3D°$
		2	*308 165.0*	75	12	$(^2F)\ ^1D°$
		1	*308 671.5*	90	8	$(^2D1)\ ^3D°$
$3d^3(^2F)4p$	$^1D°$	2	*307 644.4*	62	18	$(^2D1)\ ^1D°$
$3d^3(^2F)4p$	$^1G°$	4	*311 180.9*	80	18	$(^2H)\ ^1G°$
$3d^3(^2F)4p$	$^1F°$	3	*311 538.7*	92		
$3d^3(^2D1)4p$	$^3D°$	1	*327 533.8*	76	18	$(^2D2)\ ^3D°$
		2	*327 605.4*	75	16	
		3	*327 924.4*	76	15	
$3d^3(^2D1)4p$	$^1D°$	2	*329 848.6*	47	18	$(^2D2)\ ^1D°$
$3d^3(^2D1)4p$	$^3F°$	2	*331 333.8*	57	18	$(^2D2)\ ^3F°$
		3	*331 367.0*	70	21	
		4	*332 017.3*	76	22	
$3d^3(^2D1)4p$	$^3P°$	2	*334 509.1*	75	22	$(^2D2)\ ^3P°$
		1	*335 267.8*	75	24	
		0	*335 642.7*	75	24	
$3d^3(^2D1)4p$	$^1F°$	3	*335 947.4*	75	19	$(^2D2)\ ^1F°$
$3d^3(^2D1)4p$	$^1P°$	1	*342 462.2*	76	23	$(^2D2)\ ^1P°$
Fe VI $(^4F_{3/2})$	***Limit***		**605 000**			

Fe VI

Z=26

Sc I isoelectronic sequence

Ground state: $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3\ ^4F_{3/2}$

Ionization energy = 799 000±2000 cm^{-1} (99.1±0.2 eV)

The original analysis was by Bowen (1935), whose observations yielded levels of the $3d^3$ and $3d^2 4p$ configurations. Several levels due to Bowen were published later in a paper by Pasternak (1940). Fawcett and Cowan (1973) observed the $3p^6 3d^3$–$3p^5 3d^4$ transition array between 162 and 180 Å. Fawcett and Henrichs (1974) have classified a number of lines of the $3d^2 4s$–$3d^2 4p$ array. Ekberg (1975) has observed the spectrum from 250 to 1580 Å. He has found all the terms of $3d^3$, $3d^2 4s$ and $3d^2 4p$ except $3d^2(^1S)4s\ ^2S$.

The present list of levels and leading percentages is compiled from Ekberg, except the configuration $3p^5 3d^4$, the levels of which are from Fawcett and Cowan. Ekberg's levels are stated to be uncertain by ±0.4 cm^{-1} and those of Fawcett and Cowan by ±100 cm^{-1}.

Bowen (1960) has observed lines in nebular spectra due to transitions within the $3d^3$ configuration.

The ionization energy is from an isoelectronic extrapolation by Lotz (1967).

References

Bowen, I. S. (1960), Astrophys. J. **132**, 1.
Bowen, I. S. (1935), Phys. Rev. **47**, 924.
Ekberg, J. O. (1975), Phys. Scr. **11**, 23.
Fawcett, B. C., and Cowan, R. D. (1973), Solar Physics **31**, 339.
Fawcett, B. C., and Henrichs, H. F. (1974), Astron. Astrophys. **18**, 157.
Lotz, W. (1967), J. Opt. Soc. Am. **57**, 873.
Pasternak, S. (1940), Astrophys. J. **92**, 140.

Fe VI

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3d^3$	^4F	3/2	0.0	100		
		5/2	511.3	100		
		7/2	1 188.3	100		
		9/2	2 000.6	100		
$3d^3$	^4P	1/2	18 738.3	99		
		3/2	18 942.0	98		
		5/2	19 610.8	100		
$3d^3$	^2G	7/2	20 616.4	100		
		9/2	21 315.0	98		
$3d^3$	^2P	3/2	26 214.9	58	31	$^2D2$
		1/2	26 495.5	99		
$3d^3$	$^2D2$	5/2	28 484.3	80	20	$^2D1$
		3/2	28 627.9	46	40	^2P
$3d^3$	^2H	9/2	28 724.3	98		
		11/2	29 202.9	100		
$3d^3$	^2F	7/2	46 217.3	100		
		5/2	46 603.7	100		
$3d^3$	$^2D1$	5/2	71 707.6	80	20	$^2D2$
		3/2	72 048.9	78	22	
$3d^2(^3F)4s$	^4F	3/2	261 841.4	100		
		5/2	262 368.4	99		
		7/2	263 135.9	99		
		9/2	264 118.3	100		

Fe VI–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3d^2(^3F)4s$	^2F	5/2	269 140.2	99		
		7/2	270 672.6	99		
$3d^2(^1D)4s$	^2D	5/2	280 901.5	61	38	$(^3P)\ ^4P$
		3/2	281 217.8	51	49	
$3d^2(^3P)4s$	^4P	1/2	281 477.0	100		
		3/2	282 035.0	51	47	$(^1D)\ ^2D$
		5/2	282 951.9	62	38	$(^1D)\ ^2D$
$3d^2(^3P)4s$	^2P	1/2	287 919.2	100		
		3/2	288 638.3	98		
$3d^2(^1G)4s$	^2G	9/2	292 313.0	100		
		7/2	292 330.1	100		
$3d^2(^3F)4p$	$^4G°$	5/2	*338 256.4*	91	6	$(^3F)\ ^2F°$
		7/2	*339 477.0*	92	5	$(^3F)\ ^4F°$
		9/2	*340 935.0*	93	7	$(^3F)\ ^4F°$
		11/2	*342 730.6*	100		
$3d^2(^3F)4p$	$^4F°$	3/2	*339 539.8*	94		
		5/2	*340 344.0*	94		
		7/2	*341 365.3*	94	5	$(^3F)\ ^4G°$
		9/2	*342 434.4*	91	7	$(^3F)\ ^4G°$
$3d^2(^3F)4p$	$^2F°$	5/2	*342 571.5*	58	16	$(^3F)\ ^4D°$
		7/2	*343 608.2*	54	40	
$3d^2(^3F)4p$	$^4D°$	3/2	*343 210.9*	55	30	$(^3F)\ ^2D°$
		1/2	*343 619.3*	92	7	$(^3P)\ ^4D°$
		5/2	*344 273.3*	63	23	$(^3F)\ ^2F°$
		7/2	*345 422.6*	53	37	$(^3F)\ ^2F°$
$3d^2(^3F)4p$	$^2D°$	3/2	*344 652.6*	47	36	$(^3F)\ ^4D°$
		5/2	*345 907.1*	62	15	$(^3P)\ ^2D°$
$3d^2(^3F)4p$	$^2G°$	7/2	*348 962.1*	94	4	$(^1G)\ ^2G°$
		9/2	*350 017.8*	94	4	
$3d^2(^3P)4p$	$^2S°$	1/2	*351 805.8*	98		
$3d^2(^3P)4p$	$^4S°$	3/2	*355 657.1*	90	9	$(^1D)\ ^2P°$
$3d^2(^1D)4p$	$^2P°$	3/2	*357 755.2*	80	9	$(^3P)\ ^4S°$
		1/2	*359 099.3*	51	40	$(^3P)\ ^4D°$
$3d^2(^1D)4p$	$^2F°$	5/2	*358 334.6*	83	6	$(^3F)\ ^2F°$
		7/2	*359 884.0*	77	12	$(^3P)\ ^4D°$
$3d^2(^3P)4p$	$^4D°$	1/2	*359 395.9*	52	44	$(^1D)\ ^2P°$
		3/2	*359 781.3*	90	7	$(^3F)\ ^4D°$
		5/2	*360 707.1*	85	6	$(^3F)\ ^4D°$
		7/2	*362 270.0*	82	12	$(^1D)\ ^2F°$
$3d^2(^1D)4p$	$^2D°$	3/2	*361 858.2*	80	6	$(^3F)\ ^2D°$
		5/2	*362 602.9*	76	11	$(^3P)\ ^4P°$

Fe VI–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3d^2(^3P)4p$	$^4P^\circ$	$1/2$	*363 945.7*	98		
		$3/2$	*364 392.9*	97		
		$5/2$	*365 494.0*	87	13	$(^1D)\ ^2D^\circ$
$3d^2(^1G)4p$	$^2G^\circ$	$7/2$	*365 077.0*	93	5	$(^3F)\ ^2G^\circ$
		$9/2$	*365 266.6*	94	4	
$3d^2(^3P)4p$	$^2D^\circ$	$3/2$	*370 538.1*	78	12	$(^3F)\ ^2D^\circ$
		$5/2$	*370 579.6*	80	15	
$3d^2(^1G)4p$	$^2H^\circ$	$9/2$	*372 095.6*	98		
		$11/2$	*373 706.1*	100		
$3d^2(^3P)4p$	$^2P^\circ$	$1/2$	*374 088.3*	98		
		$3/2$	*374 425.6*	95		
$3d^2(^1G)4p$	$^2F^\circ$	$7/2$	*377 951.8*	95	4	$(^1D)\ ^2F^\circ$
		$5/2$	*379 077.6*	97		
$3d^2(^1S)4p$	$^2P^\circ$	$1/2$	*408 207.4*	97		
		$3/2$	*410 389.5*	98		
$3p^5(^2P^\circ)3d^4(^1G)$	$^2G^\circ$	$7/2$	*575 930*			
		$9/2$	*576 990*			
$3p^5(^2P^\circ)3d^4(^5D)$	$^4D^\circ$	$1/2$	*603 210*			
		$3/2$	*604 230*			
		$5/2$	*605 420*			
		$7/2$	*606 230*			
$3p^5(^2P^\circ)3d^4(^3H)$	$^2H^\circ$	$9/2$	*603 340*			
		$11/2$	*605 740*			
$3p^5(^2P^\circ)3d^4(^3F)$	$^2D^\circ$	$5/2$	*617 520*			
		$3/2$	*618 290*			
$3p^5(^2P^\circ)3d^4(^3H)$	$^2G^\circ$	$9/2$	*630 240*			
		$7/2$	*631 240*			
$3p^5(^2P^\circ)3d^4(^3G)$	$^2F^\circ$	$7/2$	*634 170*			
		$5/2$	*635 430*			
Fe VII $(^3F_2)$	*Limit*		799 000			

Fe VII

$Z=26$

Ca I isoelectronic sequence

Ground state: $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2\ {}^3F_2$

Ionization energy = 1 008 000±100 cm^{-1} (124.98±0.01 eV)

The initial work by Cady (1933) on this spectrum was gradually extended by numerous contributions. Ekberg (1981) has completely reobserved the spectrum and greatly extended the analysis. His paper gives more than 400 lines in the region 104–270 Å classified as transitions to the lowest configuration, $3p^6 3d^2$, and 20 lines between 1010 and 1362 Å in the $3d4s$–$3d4p$ transition array. He states that the uncertainty of the levels of $3d^2$ is ±1 cm^{-1}, while for the excited configurations the uncertainty increases from ±4 to ±20 cm^{-1} as the level value rises. He has made parametric calculations for $3d^2$, $3d4s$, $3dnf$, n=4–6, and $3p^5 3d^2 4s$. In the calculations for $3d4f$ configuration interaction with $3p^5 3d^3$ was included. The repeating ^{2}D terms of $3d^3$ were distinguished by the letters A and B by Ekberg. No indication of seniority contributions was given.

The $3d4p$ configuration has been calculated by Warner and Kirkpatrick (1969). Their percentage compositions as communicated privately to us are given here.

A number of forbidden transitions among levels of the $3d^2$ configuration have been listed by Bowen (1960). Their wavelengths are improved by Ekberg.

The ionization energy was determined by Ekberg from five different $3dnf$ series.

References

Bowen, I. S. (1960), Astrophys. J. **132**, 1.
Cady, W. M. (1933), Phys. Rev. **43**, 324.
Ekberg, J. O. (1981), Physica Scripta **23**, 7.
Warner, B., and Kirkpatrick, R. C. (1969), Mon. Not. R. Astron. Soc. **144**, 397.

Fe VII

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3p^6 3d^2$	^{3}F	2	0.0	100		
		3	1 051.5	100		
		4	2 331.5	100		
$3p^6 3d^2$	^{1}D	2	17 475.5	93	6	^{3}P
$3p^6 3d^2$	^{3}P	0	20 040.3	100		
		1	20 430.1	100		
		2	21 278.6	94	6	^{1}D
$3p^6 3d^2$	^{1}G	4	28 927.3	100		
$2p^6 3d^2$	^{1}S	0	67 078.3	100		
$3p^6 3d 4s$	^{3}D	1	344 463.3	100		
		2	345 028.7	97		
		3	346 262.2	100		
$3p^6 3d 4s$	^{1}D	2	350 332.6	97		
$3p^6 3d 4p$	^{3}D°	1	*425 128.6*	97	2	^{1}P°
		2	*427 784.7*	83	7	^{1}D°
		3	*430 948.6*	75	23	^{3}F°
$3p^6 3d 4p$	^{1}D°	2	*425 386.1*	76	21	^{3}F°
$3p^6 3d 4p$	^{3}F°	2	*430 213.4*	72	15	^{1}D°
		3	*431 609.5*	77	23	^{3}D°
		4	*433 871.2*	100		
$3p^6 3d 4p$	^{3}P°	1	*436 952.2*	92	6	^{1}P°
		0	*437 001.3*	100		
		2	*437 558.0*	96		

Fe VII–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3p^6 3d 4p$	$^1F°$	3	*439 811.6*	98		
$3p^6 3d 4p$	$^1P°$	1	*443 447.0*	92	6	$^3P°$
$3p^5(^2P°)3d^3(^2G)$	$^1H°$	5	*464 034*			
$3p^5(^2P°)3d^3(^2F)$	$^3G°$	5	*472 559*			
		4	*472 903*			
		3	*481 435*			
$3p^5(^2P°)3d^3(^2F)$	$^1G°$	4	*496 454*			
$3p^5(^2P°)3d^3(^2H)$	$^3G°$	3	*510 086*			
		4	*510 158*			
		5	*514 133*			
$3p^5(^2P°)3d^3(a^2D)$	$^1D°$	2	*538 290*			
$3p^5(^2P°)3d^3(^2F)$	$^3D°$	2	*548 274*			
		3	*551 568*			
$3p^5(^2P°)3d^3(^2F)$	$^1D°$	2	*553 220*			
$3p^5(^2P°)3d^3(^2G)$	$^1F°$	3	*556 422*			
$3p^5(^2P°)3d^3(^4P)$	$^3P°$	1	*561 303*			
		2	*565 275*			
$3p^5(^2P°)3d^3(^4F)$	$^3F°$	2	*564 425*			
		3	*566 256*			
		4	*568 118*			
$3p^5(^2P°)3d^3(^2P)$	$^1P°$	1	*598 638*			
$3p^5(^2P°)3d^3(^4F)$	$^3D°$	3	*603 419*			
		2	*603 757*			
		1	*604 270*			
$3p^5(^2P°)3d^3(^2H)$	$^1G°$	4	*605 489*			
$3p^5(^2P°)3d^3(^4P)$	$^3S°$	1	*623 699*			
$3p^5(^2P°)3d^3(b^2D)$	$^1P°$	1	*630 283*			
$3p^6 3d4f$	$^1G°$	4	*659 917*	56	25	$^3F°$
$3p^6 3d4f$	$^3F°$	2	*660 015*	94		
		3	*660 358*	94		
		4	*661 169*	70	26	$^1G°$
$3p^6 3d4f$	$^3G°$	3	*663 097*	87	9	$^1F°$
		4	*663 950*	94		
		5	*664 482*	97		
$3p^6 3d4f$	$^1D°$	2	*663 871*	90		
$3p^6 3d4f$	$^1F°$	3	*665 417*	58	30	$^3D°$

Fe VII–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3p^6 3d4f$	$^3D^\circ$	1	*665 832*	92	5	$^3P^\circ$
		2	*665 923*	85	10	$^3P^\circ$
		3	*666 651*	66	31	$^1F^\circ$
$3p^6 3d4f$	$^3P^\circ$	2	*667 899*	85	11	$^3D^\circ$
		1	*668 253*	92	6	$^3D^\circ$
		0	*668 489*	99		
$3p^6 3d4f$	$^1H^\circ$	5	*669 978*	98		
$3p^6 3d4f$	$^1P^\circ$	1	*672 820*	90	8	$3p^5(^2P^\circ)3d^3(b^2D)$ $^1P^\circ$
$3p^5(^2P^\circ)3d^2(^3F)4s$ (^2F)	$^3D^\circ$	1	*745 556*	78	20	$(^2P^\circ)(^2P)$ $^3D^\circ$
		2	*746 965*	73	24	
		3	*749 166*	67	29	
$3p^5(^2P^\circ)3d^2(^3F)4s$ (^2F)	$^3G^\circ$	5	*766 991*	94	5	$(^2P^\circ)(^4F)$ $^5F^\circ$
		4	*768 813*	83	7	
		3	*769 991*	50	16	
$3p^5(^2P^\circ)3d^2(^3P)4s$ (^2P)	$^3P^\circ$	2	*768 425*	95		
		1	*771 612*	95		
		0	*773 488*	97		
$3p^5(^2P^\circ)3d^2(^1G)4s$ (^2G)	$^3F^\circ$	3	*778 420*	45	36	$(^2P^\circ)(^4F)$ $^3F^\circ$
		4	*779 575*	36	32	
$3p^5(^2P^\circ)3d^2(^1D)4s$ (^2D)	$^1D^\circ$	2	*779 009*	45	21	$(^2P^\circ)(^2F)$ $^3F^\circ$
$3p^5(^2P^\circ)3d^2(^3F)4s$ (^2F)	$^3F^\circ$	4	*782 690*	72	9	$(^2P^\circ)(^2G)$ $^3F^\circ$
		3	*783 119*	52	13	$(^2P^\circ)(^2F)$ $^3G^\circ$
$3p^6 3d5f$	$^1G^\circ$	4	*784 174*	48	46	$^3H^\circ$
$3p^6 3d5f$	$^3H^\circ$	4	*784 477*	50	29	$^1G^\circ$
$3p^6 3d5f$	$^3F^\circ$	2	*784 733*	86	12	$^1D^\circ$
		3	*785 012*	90		
		4	*785 809*	76	21	$^1G^\circ$
$3p^6 3d5f$	$^3G^\circ$	3	*786 732*	78	16	$^1F^\circ$
		4	*787 737*	91	5	$^3F^\circ$
		5	*788 146*	97		
$3p^6 3d5f$	$^1D^\circ$	2	*786 830*	74	12	$^3P^\circ$
$3p^6 3d5f$	$^3D^\circ$	1	*787 945*	75	18	$^3P^\circ$
		2	*788 030*	51	32	$^3P^\circ$
		3	*788 303*	60	20	$^1F^\circ$
$3p^6 3d5f$	$^3P^\circ$	2	*788 995*	56	41	$^3D^\circ$
		1	*789 172*	78	21	$^3D^\circ$
		0	*789 365*	100		
$3p^6 3d5f$	$^1F^\circ$	3	*789 215*	64	31	$^3D^\circ$
$3p^6 3d5f$	$^1P^\circ$	1	*790 708*	93		
$3p^6 3d5f$	$^1H^\circ$	5	*791 168*	98		

Fe VII–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages			
$3p^5(^2P°)\,3d^2(^3F)4s\,(^4F)$	$^3G°$	3	*794 149*	45		30	$(^2P°)(^2D)\ ^3F°$
		4	*797 712*	65		9	$(^2P°)(^2F)\ ^1G°$
		5	*800 633*	69		12	$(^2P°)(^2G)\ ^1H°$
$3p^5(^2P°)\,3d^2(^3F)4s\,(^4F)$		3	*797 257*	38	$^3G°$	33	$(^2P°)(^2D)\ ^3F°$
$3p^5(^2P°)\,3d^2(^3F)4s\,(^2F)$	$^1G°$	4	*802 462*	67		13	$(^2P°)(^4F)\ ^3G°$
$3p^5(^2P°)\,3d^2(^1G)4s\,(^2G)$	$^1H°$	5	*806 033*	61		21	$(^2P°)(^2G)\ ^3H°$
$3p^5(^2P°)\,3d^2(^1D)4s\,(^2D)$	$^1F°$	3	*807 627*	64		30	$(^2P°)(^2D)\ ^3F°$
$3p^5(^2P°)\,3d^2(^3P)4s\,(^2P)$	$^3D°$	3	*812 086*	63		30	$(^2P°)(^2F)\ ^3D°$
		2	*813 877*	65		23	
		1	*817 195*	71		19	
$3p^5(^2P°)\,3d^2(^3P)4s\,(^4P)$	$^3D°$	1	*822 689*	79		8	$(^2P°)(^2P)\ ^3D°$
		2	*824 184*	75		7	$(^2P°)(^2P)\ ^1D°$
		3	*827 533*	81		7	$(^2P°)(^4F)\ ^3D°$
$3p^5(^2P°)\,3d^2(^3P)4s\,(^4P)$	$^3S°$	1	*826 106*	97			
$3p^5(^2P°)\,3d^2(^3P)4s\,(^2P)$	$^1D°$	2	*829 626*	72		8	$(^2P°)(^4P)\ ^3D°$
$3p^5(^2P°)\,3d^2(^1G)4s\,(^2G)$	$^3G°$	5	*832 889*	88		8	$(^2P°)(^4F)\ ^3G°$
		4	*832 893*	91		6	
		3	*833 128*	93		5	
$3p^5(^2P°)\,3d^2(^3P)4s\,(^2P)$	$^3S°$	1	*837 472*	97			
$3p^6\,3d6f$	$^3H°$	4	*852 601*	61		34	$^1G°$
$3p^6\,3d6f$		4	*853 307*	33	$^3H°$	30	$^1G°$
$3p^6\,3d6f$	$^3F°$	2	*853 433*	77		19	$^1D°$
		3	*853 697*	79		11	$^3G°$
		4	*854 767*	63		31	$^1G°$
$3p^6\,3d6f$	$^3G°$	3	*854 760*	65		24	$^1F°$
		4	*855 969*	82		11	$^3F°$
		5	*856 260*	93		6	$^3H°$
$3p^6\,3d6f$	$^1D°$	2	*854 838*	40		34	$^3P°$
$3p^6\,3d6f$	$^3D°$	1	*855 346*	64		22	$^3P°$
		3	*856 109*	49		19	$^3F°$
$3p^6\,3d6f$		2	*855 903*	38	$^1D°$	29	$^3D°$
$3p^6\,3d6f$	$^1F°$	3	*856 797*	61		32	$^3D°$
$3p^6\,3d6f$	$^3P°$	2	*856 811*	48		48	$^3D°$
		1	*856 975*	71		28	$^3D°$
		0	*857 082*	100			
$3p^6\,3d6f$	$^1H°$	5	*857 881*	94			
$3p^6\,3d7f$	$^3F°$	2	*894 718*				
		3	*894 944*				
		4	*896 382*				

Fe VII–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3p^6 3d7f$	$^3G°$	3	*895 744*			
		4	*897 077*			
		5	*897 254*			
$3p^6 3d7f$	$^1H°$	5	*898 243*			
$3p^6 3d8f$	$^3F°$	3	*921 694*			
		4	*923 282*			
$3p^6 3d8f$	$^3G°$	4	*923 716*			
		5	*923 838*			
$3p^6 3d8f$	$^1H°$	5	*924 479*			
$3p^5(^2P°)\,3d^2(^3P)4s\,(^4P)$	$^3P°$	2	*928 684*	75	16	$(^2P°)(^2D)\,^3P°$
$3p^6 3d9f$	$^3G°$	4	*941 918*			
		5	*942 022*			
$3p^6 3d9f$	$^1H°$	5	*942 477*			
$3p^6 3d\,10f$	$^3G°$	4	*954 904*			
		5	*954 966*			
$3p^6 3d\,10f$	$^1H°$	5	*955 307*			
Fe VIII ($^2D_{3/2}$)	*Limit*		1 008 000			

Fe VIII

$Z=26$

K I isoelectronic sequence

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

Ionization energy = 1 218 380±100 cm^{-1} (151.061±0.012 eV)

The ground-term splitting was determined by Cowan and Peacock (1965) by means of four pairs of lines arising from the $3p^53d^2$ configuration. This upper configuration was interpreted by the same authors. Earlier, Kruger and Weissberg (1937) reported the one-electron terms $3p^6(^1S)\ 5s$, $6s$, $4p$, $4f$, $5f$, $6f$, and $7f$. With light sources allowing differentiation among highly ionized species Alexander, Feldman, and Fraenkel (1965) determined that the lines used by Kruger et al. to establish $5s$, $6s$, and $4p$ were erroneously assigned to Fe VIII. This finding has been confirmed privately by Ekberg.

The levels of $3p^53d4s$ were deduced by Cowan (1967) from lines reported by Feldman and Fraenkel (1966).

The spectrum has now been remeasured between 93 233 Å with an uncertainty of ±0.003 Å by Ramonas Ryabtsev (1980). They have redetermined all the kı level values and extended the analysis. Their results given below. The leading percentages were supplied priv by Cowan.

We have determined the ionization energy from the measurements of the nf series. The $7f$ term is predicted 590 cm^{-1} below the observed value.

References

Alexander, E., Feldman, U., and Fraenkel, B. S. (1965), J. Opt. Soc. Am. **55**, 650.
Cowan, R. D., and Peacock, N. J. (1965), Astrophys. J. **142**, 390.
Cowan, R. W. (1967), Astrophys. J. **147**, 377.
Feldman, U., and Fraenkel, B. S. (1966), Astrophys. J. **145**, 959.
Kruger, P. G., and Weissberg, S. G. (1937), Phys. Rev. **52**, 314.
Ramonas, A. A., and Ryabtsev, A. N. (1980), Opt. Spectrosc. **48**, 631.

Fe VIII

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3p^6(^1S)3d$	^2D	3/2	0			
		5/2	1 836			
$3p^5(^2P^\circ)3d^2(^1G)$	$^2F^\circ$	5/2	*431 250*	44	37	$(^2P^\circ)(^3F)\ ^2F^\circ$
		7/2	*434 555*	45	41	
$3p^5(^2P^\circ)3d^2(^1D)$	$^2F^\circ$	7/2	*447 656*	72	23	$(^2P^\circ)(^3F)\ ^2G^\circ$
		5/2	*459 367*	91	4	$(^2P^\circ)(^3P)\ ^4D^\circ$
$3p^5(^2P^\circ)3d^2(^1S)$	$^2P^\circ$	3/2	*508 518*	61	23	$3p^64p\ ^2P^\circ$
		1/2	*520 822?*	77	14	$3p^5(^2P^\circ)3d^2(^1D)\ ^2P^\circ$
$3p^6(^1S)4p$	$^2P^\circ$	1/2	*510 277*	94	4	$3p^5(^2P^\circ)3d^2(^1S)\ ^2P^\circ$
		3/2	*515 550*	74	18	
$3p^5(^2P^\circ)3d^2(^3F)$	$^2F^\circ$	5/2	*535 909*	53	45	$(^2P^\circ)(^1G)\ ^2F^\circ$
		7/2	*541 755*	50	48	
$3p^5(^2P^\circ)3d^2(^3P)$	$^2P^\circ$	1/2	*591 964*	72	14	$(^2P^\circ)(^1D)\ ^2P^\circ$
		3/2	*595 152*	73	16	
$3p^5(^2P^\circ)3d^2(^3F)$	$^2D^\circ$	5/2	*596 463*	71	17	$(^2P^\circ)(^1D)\ ^2D^\circ$
		3/2	*597 065*	71	17	
$3p^6(^1S)4f$	$^2F^\circ$	5/2	*763 703*	98		
		7/2	*763 799*	98		
$3p^5\,3d(^3P^\circ)4s$	$^2P^\circ$	1/2	*837 661*	98		
		3/2	*842 829*	95		

Fe VIII–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3p^5 3d(^3F°)4s$	$^4F°$	7/2	*847 145*	95		
		5/2	*849 899*	92		
		3/2	*852 849?*	96		
$3p^5 3d(^3F°)4s$	$^2F°$	7/2	*855 100*	94		
		5/2	*860 615*	89	4	$(^1D°)\ ^2D°$
$3p^5 3d(^3D°)4s$	$^4D°$	7/2	*874 711*	81	18	$(^1F°)\ ^2F°$
		5/2	*876 765*	74	10	$(^1D°)\ ^2D°$
		3/2	*877 476*	76	19	$(^1D°)\ ^2D°$
		1/2	*878 264?*	98		
$3p^5 3d(^1D°)4s$	$^2D°$	5/2	*879 021*	48	25	$(^3D°)\ ^2D°$
		3/2	*881 345*	77	20	$(^3D°)\ ^4D°$
$3p^5 3d(^1F°)4s$	$^2F°$	5/2	*884 331*	46	27	$(^1D°)\ ^2D°$
		7/2	*887 325*	78	16	$(^3D°)\ ^4D°$
$3p^5 3d(^3D°)4s$	$^2D°$	3/2	*889 113*	98		
		5/2	*890 845*	68	20	$(^1F°)\ ^2F°$
$3p^6(^1S)5f$	$^2F°$	5/2	*927 059*			
		7/2	*927 102*			
$3p^6(^1S)6f$	$^2F°$	5/2	*1 016 560*			
		7/2	*1 016 570*			
$3p^6(^1S)7f$	$^2F°$	5/2	*1 069 873*			
		7/2	*1 070 029*			
Fe IX ($^1S_0$)	*Limit*		1 218 380			

Fe IX

$Z=26$

Ar I isoelectronic sequence

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

Ionization energy = 1 884 000±3000 cm^{-1} (233.6±0.4 eV)

This spectrum was first investigated by Kruger, Weissberg, and Phillips (1937), who identified the resonance lines arising from the two $J=1$ levels of the $3p^54s$ configuration. The present values of these levels are taken from the paper of Fawcett, Cowan, Kononov, and Hayes (1972).

All levels of the $3s^23p^53d$ configuration were determined from combinations with $3s3p^63d$ by Svensson, Ekberg and Edlén (1974). Using these levels to predict forbidden transitions within $3s^23p^53d$, Edlén and Smitt (1978) identified a number of well-measured solar lines obtained with Skylab and redetermined most of the level values. Their results are quoted here. The $3s3p^63d$ levels are from Smitt and Svensson (1978). The uncertainty of the connection of these two configurations to the ground state is ±5 cm^{-1}.

The $3p^54d$ and $3p^55s$ levels were found by Alexander, Feldman, and Fraenkel (1965). The present values for the two $3p^54d$ levels are obtained from the measurements of Fawcett et al. The uncertainty is less than 100 cm^{-1}.

The $3p^54f$ level values given here were derived by combining the $3p^53d$–$3p^54f$ line identifications of Wagner and House (1971) and of Fawcett et al. with the level values of $3p^53d$ of Edlén and Smitt. The $3p^54f$ levels clearly follow a J_1l coupling scheme, the designations having been assigned by comparison with isoelectronic spectra.

The $3s3p^64p$ term is from Kastner, Crooker, Behring, and Cohen (1977).

We have derived the ionization energy from the $3p^54s$ and $3p^55s$ configurations under the assumption of a change in effective quantum number $\Delta n^*=n^*(5s)-n^*(4s)=1.024$, as observed in similar spectra. The stated uncertainty in the ionization energy is based on an estimated uncertainty of ±0.005 in the value of Δn^*.

References

Alexander, E., Feldman, U., and Fraenkel, B. S. (1965), J. Opt. Soc. Am. **55**, 650.

Edlén, B., and Smitt, R. (1978), Sol. Phys. **57**, 329.

Fawcett, B. C., Cowan, R. D., Kononov, E. Y., and Hayes, R. W. (1972), J. Phys. **B5**, 1255.

Kastner, S. O., Crooker, A. M., Behring, W. E., and Cohen, L. (1977), Phys. Rev. **A16**, 577.

Kruger, P. G., Weissberg, S. G., and Phillips, L. W. (1937), Phys. Rev. **51**, 1090.

Smitt, R., and Svensson, L. A. (1978), Atomic Spectroscopy, Univ. of Lund, Annual Report.

Svensson, L. Å., Ekberg, J. O., and Edlén, B., (1974), Sol. Phys. **34**, 173.

Wagner, W. J., and House, L. L. (1971), Astrophys. J. **166**, 683.

Fe IX

Configuration	Term	J	Level (cm^{-1})
$3p^6$	^1S	0	0
$3p^5\,3d$	$^3P°$	0	*405 772*
		1	*408 315.1*
		2	*413 669.2*
$3p^5\,3d$	$^3F°$	4	*425 809.8*
		3	*429 310.9*
		2	*433 818.8*
$3p^5\,3d$	$^3D°$	3	*455 612.2*
		1	*460 616*
		2	*462 616.6*
$3p^5\,3d$	$^1D°$	2	*456 752.7*
$3p^5\,3d$	$^1F°$	3	*465 828.4*
$3p^5\,3d$	$^1P°$	1	*584 546*

Fe IX–Continued

Configuration	Term	J	Level (cm^{-1})
$3s3p^6\,3d$	^3D	1	726 734
		2	727 560
		3	728 935
$3s3p^6\,3d$	^1D	2	749 871
$3p^5(^2P^\circ_{3/2})4s$	$(3/2,1/2)^\circ$	1	*950 500*
$3p^5(^2P^\circ_{1/2})4s$	$(1/2,1/2)^\circ$	1	*965 570*
$3p^5\,4d$	$^3P^\circ$	1	*1 198 220*
$3p^5\,4d$	$^1P^\circ$	1	*1 213 150*
$3p^5(^2P^\circ_{3/2})4f$	$^2[3/2]$	1	1 300 920
		2	1 302 840
$3p^5(^2P^\circ_{3/2})4f$	$^2[9/2]$	5	1 304 600
		4	1 306 320
$3p^5(^2P^\circ_{3/2})4f$	$^2[5/2]$	3	1 305 760
$3p^5(^2P^\circ_{3/2})4f$	$^2[7/2]$	3	1 310 160
		4	1 311 750
$3p^5(^2P^\circ_{1/2})4f$	$^2[5/2]$	3	1 323 660
$3p^5(^2P^\circ_{1/2})4f$	$^2[7/2]$	3	1 324 720
		4	1 324 800
$3p^5(^2P^\circ_{3/2})5s$	$(3/2,1/2)^\circ$	1	*1 358 140*
$3s3p^6\,4p$	$^1P^\circ$	1	*1 371 910*
$3p^5(^2P^\circ_{1/2})5s$	$(1/2,1/2)^\circ$	1	*1 372 670*
Fe X ($^2P^\circ_{3/2}$)	***Limit***		**1 884 000**

Fe X

$Z=26$

Cl I isoelectronic sequence

Ground state: $1s^2 2s^2 2p^6 3s^2 3p^5\ ^2P^\circ_{3/2}$

Ionization energy = 2 114 000±1000 cm^{-1} (262.1±0.1 eV)

The $3s^2 3p^4 4s$ levels and the $3s^2 3p^5\ ^2P^\circ$ term interval were established with an uncertainty of ±50 cm^{-1} by the identification of a group of eight lines at 94–98 Å by Edlén in 1937. The value of the $3s^2 3p^5\ ^2P^\circ$ interval was later more precisely determined by Grotrian (1939) to ±0.1 cm^{-1} through his identification of the solar coronal line at 6374.51 Å as the $3s^2 3p^5$ magnetic dipole transition $^2P^\circ_{3/2}$–$^2P^\circ_{1/2}$ in Fe X, which was confirmed by Edlén (1942). The $3s3p^5 3d\ ^4F^\circ$ term is from Smitt (1977). The $3s3p^6\ ^2S$ term was first located by Fawcett (1971). We use the improved measurements of Smitt, Svensson, and Outred (1976), which provide a level uncertainty of ±5 cm^{-1}.

Edlén and Smitt (1978) derived levels of the $3s^2 3p^4 3d$ configuration relative to its lowest level ($^4D_{7/2}$) using forbidden transitions within this configuration observed in the solar corona. The $^4D_{7/2}$ and $^4D_{5/2}$ levels are unresolved. Bromage, Cowan, and Fawcett (1977) give the connection of $^4D_{5/2}$ to the $3s^2 3p^5\ ^2P_{3/2}$ ground state with an uncertainty of ±10 cm^{-1} and report additional levels of $3s^2 3p^4 3d$. They have also provided the leading percentages for the levels. The $3s^2 3p^4 4p$, $4d$, and $4f$ level values are derived from the identifications of Fawcett, Cowan, Kononov, and Hayes (1972), who also give the percentage composition of the levels. Their levels are uncertain by less than 100 cm^{-1}.

Edlén (1937) derived the ionization energy by isoelectronic extrapolation.

References

Bromage, G. E., Cowan, R. D., and Fawcett, B. C. (1977), Phys. Scr. **15**, 177.
Edlén, B. (1937), Z. Phys. **104**, 407.
Edlén, B. (1942), Z. Astrophys. **22**, 30.
Edlén, B., and Smitt, R. (1978), Sol. Phys. **57**, 329.
Fawcett, B. C. (1971), J. Phys. **B4**, 1577.
Fawcett, B. C., Cowan, R. D., Kononov, E. Y., and Hayes, R. W. (1972), J. Phys. **B5**, 1255.
Grotrian, W. (1939), Naturwiss. **27**, 214.
Smitt, R. (1977), Sol. Phys. **51**, 113.
Smitt R., Svensson, L. A., and Outred, M. (1976), Phys. Scr. **13**, 293.

Fe X

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3s^2 3p^5$	$^2P^\circ$	3/2	*0.0*			
		1/2	*15 683.1*			
$3s3p^6$	^2S	1/2	289 249			
$3s^2 3p^4(^3P)3d$	^4D	7/2	388 709	97		
		5/2	388 709	95		
		3/2	390 050	94		
		1/2	391 555	96		
$3s^2 3p^4(^3P)3d$	^4F	9/2	417 653	94		
		7/2	422 795	89		
		5/2	426 763	94		
		3/2	428 298	90		
$3s^2 3p^4(^1D)3d$	^2P	3/2	431 928	45	33	$(^3P)\ ^2P$
$3s^2 3p^4(^1D)3d$	^2D	3/2	434 614	43	27	$(^3P)\ ^2D$
$3s^2 3p^4(^3P)3d$	^4P	1/2	434 800	96		
		5/2	441 853	45	23	$(^1D)\ ^2D$
$3s^2 3p^4(^3P)3d$	^2F	7/2	440 840	55	28	$(^1D)\ ^2G$
		5/2	452 730?	78	15	$(^1D)\ ^2F$
$3s^2 3p^4(^1D)3d$	^2G	9/2	450 751	94		
		7/2	451 084	67	25	$(^3P)\ ^2F$

Fe x–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3s^2 3p^4(^1D)3d$	^2F	7/2	485 983	84		
$3s^2 3p^4(^1S)3d$	^2D	3/2	511 800	69	26	$(^1D)\ ^2D$
$3s^2 3p^4(^1D)3d$	^2S	1/2	541 879	73	23	$3s3p^6\ ^2S$
$3s^2 3p^4(^3P)3d$	^2P	3/2	564 198	52	40	$(^1D)\ ^2P$
		1/2	569 985	54	45	
$3s^2 3p^4(^3P)3d$	^2D	5/2	572 954	66	21	$(^1D)\ ^2D$
		3/2	586 244	61	17	
$3s3p^5(^3P^\circ)3d$	$^4F^\circ$	9/2	*696 661*			
		7/2	*699 492*			
		5/2	*702 585*			
		3/2	*705 430*			
$3s^2 3p^4(^3P)4s$	^4P	5/2	1 022 100			
		3/2	1 029 630			
$3s^2 3p^4(^3P)4s$	^2P	3/2	1 040 350			
		1/2	1 048 890			
$3s^2 3p^4(^1D)4s$	^2D	5/2	1 063 690			
		3/2	1 064 190			
$3s^2 3p^4(^3P)4p$	$^4P^\circ$	5/2	*1 118 490?*	84	14	$(^3P)\ 4d$
$3s^2 3p^4(^3P)4p$	$^4D^\circ$	7/2	*1 130 430*			
$3s^2 3p^4(^1D)4p$	$^2F^\circ$	5/2	*1 161 930*			
		7/2	*1 165 710*			
$3s^2 3p^4(^1D)4p$	$^2D^\circ$	5/2	*1 178 850?*			
$3s^2 3p^4(^3P)4d$	^2D	5/2	1 284 270	65	14	^2F
		3/2	1 285 180	58	20	^4P
$3s^2 3p^4(^3P)4d$	^4F	5/2	1 286 540	77	14	$(^3P)\ ^2D$
$3s^2 3p^4(^3P)4d$	^2F	5/2	1 288 210			
$3s^2 3p^4(^3P)4d$	^2P	3/2	1 295 260	82	10	$(^3P)\ ^2D$
$3s^2 3p^4(^1D)4d$	^2P	3/2	1 315 690			
		1/2	1 317 390	79	18	$(^3P)\ ^2P$
$3s^2 3p^4(^1D)4d$	^2D	5/2	1 321 270			
		3/2	1 322 960			
$3s^2 3p^4(^3P)4f$	$^4F^\circ$	9/2	*1 388 450*			
$3s^2 3p^4(^3P)4f$	$^4G^\circ$	11/2	*1 397 130*			
		9/2	*1 399 850*	47	40	$(^3P)\ ^2G^\circ$
		7/2	*1 409 730*	61	14	$(^3P)\ ^2F^\circ$
$3s^2 3p^4(^3P)4f$	$^2G^\circ$	9/2	*1 408 650*	49	42	$(^3P)\ ^4G^\circ$

Fe x–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages
$3s^2 3p^4(^1D)4f$	$^2H^\circ$	$^{11}/_2$	*1 429 300*	
$3s^2 3p^4(^1D)4f$	$^2G^\circ$	$^9/_2$	*1 441 660*	
$3s^2 3p^4(^1S)4f$	$^2F^\circ$	$^5/_2$	*1 484 290*	
Fe XI ($^3P_2$)	***Limit***		**2 114 000**	

Fe XI

$Z=26$

S I isoelectronic sequence

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

Ionization energy = 2 341 000±5000 cm^{-1} (290.3±0.6 eV)

This spectrum was first investigated by Edlén (1937), who observed and identified the group of $3s^23p^4$–$3s^23p^34s$ transitions occurring at about 90 Å. He established most of the levels of these two configurations. Grotrian (1939) identified a solar coronal line at 7891 Å as the transition between the $3s^23p^4\ ^3P_2$ and $^3P_1$ levels. This was subsequently confirmed by Edlén (1942), who also identified a coronal line at 3986.9 Å as the $3s^23p^4$ transition $^3P_1$–$^1D_2$.

The separations of these levels quoted here are derived from wavelengths from the coronal observations of Jefferies (1969). He assigns an estimated accuracy of ±0.4 Å, which corresponds to about ±1 cm^{-1} in the levels. The $3s^23p^4\ ^1S_0$ level is derived from the solar line at 1467.08 Å observed by Doschek et al. (1976), which was identified by both Svensson (1971) and Jordan (1971) as the $3s^23p^4$ transition $^3P_1$–$^1S_0$.

The $3s^23p^4$–$3s3p^5$ array was analyzed by Fawcett (1971). The more accurate measurements of Smitt, Svensson, and Outred (1976) are used here to obtain the levels of $3s3p^5$ and the $^3P_0$ level of $3s^23p^4$ with an uncertainty of ±5 cm^{-1}.

The $3s^23p^34s$ levels are derived from the 1937 observations of Edlén, with the dropping of the identification of the original singlet-triplet intercombination lines at 86.149 and 89.771 Å, as noted by Edlén in 1942. The level uncertainty for this configuration is ±50 cm^{-1}. The line at 89.771 Å has been given by Fawcett, Cowan, Kononov, and Hayes (1972) as the $3s^23p^4\ ^1S_0$–$3s^23p^34s\ ^1P^\circ_1$ transition in Fe XI. However, this identification is inconsistent with Edlén's identification of the line at 86.513 Å as the $3s^23p^4\ ^1D_2$–$3s^23p^34s\ ^1P^\circ_1$ transition, which fixes the position of the $3s^23p^34s\ ^1P^\circ_1$ level. The $3s^23p^34s\ ^5S^\circ$ and $^3P^\circ$ terms have not yet been located.

The classifications for the $3p^4$–$3p^33d$ array are from Bromage, Cowan, and Fawcett (1977) and Fawcett (1971). The leading percentages for the $3p^33d$ were calculated including configuration interaction with $3s3p^5$, $3p^53d$ and $3s3p^33d^2$ by Bromage et al., but only the results for $3p^33d$ were published. Levels are derived with an uncertainty of ±20 cm^{-1} from the more accurate solar wavelengths (±0.008 Å) of Behring, Cohen, and Feldman (1972).

The $3s^23p^34d$ levels are taken from the work of Fawcett, Cowan, Kononov, and Hayes and are reliable to ±100 cm^{-1}. These authors have also observed a number of lines identified as $3s^23p^33d$–$3s^23p^34f$ and $3s^23p^33d$–$3s^23p^34p$ transitions of Fe XI. However, it is not possible to derive level values from these identifications inasmuch as none of the levels involved is part of the system of levels given here. The leading percentages for the $3s^23p^34d\ ^1D^\circ_2$ level are from Fawcett et al.

The ionization energy is from an isoelectronic extrapolation by Lotz (1967).

References

Behring, W. E., Cohen, L., and Feldman, U. (1972), Astrophys. J. **175**, 493.

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

Doschek, G. A., Feldman, U., Van Hoosier, M. E., and Bartoe, J.-D. F. (1976), Astrophys. J. Suppl. Ser. **31**, 417.

Edlén, B. (1937), Z. Phys. **104**, 188.

Edlén, B. (1942), Z. Astrophys. **22**, 30.

Fawcett, B. C. (1971), J. Phys. **B4**, 1577.

Fawcett, B. C., Cowan, R. D., Kononov, E. Y., and Hayes, R. W. (1972), J. Phys. **B5**, 1255.

Grotrian, W. (1939), Naturwiss. **27**, 214.

Jefferies, J. T. (1969), Mem. Soc. Roy. Sci. Liege, Collect. **8**, 17, 213.

Jordan, C. (1971), Solar Phys. **21**, 381.

Lotz, W. (1967), J. Opt. Soc. Am. **57**, 873.

Smitt, R., Svensson, L. A., and Outred, M. (1976), Phys. Scr. **13**, 293.

Svensson, L. Å. (1971), Solar Phys. **18**, 232.

Fe XI

Configuration	Term	J	Level (cm^{-1})	Leading percentages
$3s^2\,3p^4$	^3P	2	0.0	
		1	12 667.9	
		0	14 312	
$3s^2\,3p^4$	^1D	2	37 743.6	
$3s^2\,3p^4$	^1S	0	80 814.7	
$3s3p^5$	$^3P^\circ$	2	*283 558*	
		1	*293 158*	
		0	*299 163*	

Fe XI–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages			
$3s3p^5$	$^1P^\circ$	1	*361 842*				
$3s^2 3p^3(^2P^\circ)3d$	$^3P^\circ$	2	*496 090*	80			
$3s^2 3p^3(^2D^\circ)3d$		1	*526 480*	38	$^3S^\circ$	23	$^3P^\circ$
$3s^2 3p^3(^2D^\circ)3d$	$^3P^\circ$	2	*531 290*	74		15	$3s3p^5\ ^3P^\circ$
		1	*541 390*	42		16	$3s^2 3p^3(^2P^\circ)3d\ ^3P^\circ$
		0	*541 720*	62		19	$3s^2 3p^3(^2P^\circ)3d\ ^3P^\circ$
$3s^2 3p^3(^2D^\circ)3d$	$^3S^\circ$	1	*533 450*	53		28	$(^2D^\circ)\ ^1P^\circ$
$3s^2 3p^3(^4S^\circ)3d$	$^3D^\circ$	3	*554 300*	46		31	$(^2P^\circ)\ ^3D^\circ$
		2	*561 610*	41		31	
		1	*566 380*	42		36	
$3s^2 3p^3(^2D^\circ)3d$	$^1D^\circ$	2	*578 860*	70		20	$(^2P^\circ)\ ^1D^\circ$
$3s^2 3p^3(^2D^\circ)3d$	$^1F^\circ$	3	*594 030*	62		33	$(^2P^\circ)\ ^1S^\circ$
$3s^2 3p^3(^2P^\circ)3d$	$^1P^\circ$	1	*623 080*	90			
$3s^2 3p^3(^4S^\circ)4s$	$^3S^\circ$	1	*1 121 230*				
$3s^2 3p^3(^2D^\circ)4s$	$^3D^\circ$	1	*1 148 590*				
		2	*1 149 100*				
		3	*1 152 450*				
$3s^2 3p^3(^2D^\circ)4s$	$^1D^\circ$	2	*1 160 030*				
$3s^2 3p^3(^2P^\circ)4s$	$^1P^\circ$	1	*1 193 640*				
$3s^2 3p^3(^4S^\circ)4d$	$^3D^\circ$	3	*1 376 750*				
$3s^2 3p^3(^2D^\circ)4d$	$^1D^\circ$	2	*1 420 680*	72		10	$(^2D^\circ)\ ^3D^\circ$
$3s^2 3p^3(^2D^\circ)4d$	$^1F^\circ$	3	*1 423 440*				
Fe XII ($^4S^\circ_{3/2}$)	***Limit***		**2 341 000**				

Fe XII

$Z=26$

P I isoelectronic sequence

Ground state: $1s^2 2s^2 2p^6 3s^2 3p^3\ ^4S^{\circ}_{3/2}$

Ionization energy = 2 668 000±5000 cm^{-1} (330.8±0.6 eV)

The level values of the $3s^2 3p^3$ ground configuration are determined from four solar coronal lines. The lines at 1242 and 1349 Å were identified by Burton, Ridgeley, and Wilson (1967) as $3p^3\ ^4S^{\circ}_{3/2}$–$3p^3\ ^2P^{\circ}_{3/2,1/2}$. New measurements for these lines by Doschek et al. (1976) with an uncertainty of ±0.05 Å are used here. The line at 2169.7 Å measured by Gabriel et al. (1971) was identified as $3p^3\ ^4S^{\circ}_{3/2}$–$3p^3\ ^2D^{\circ}_{5/2}$. The transition $3p^3\ ^2D_{3/2}$ — $3P^3\ 2p_{1/2}$ was assigned by Svensson (1971) to the coronal line reported at 3072.0 Å by Jefferies (1969). The level uncertainty in the ground configuration is ± 5 cm^{-1}.

The classifications of the $3s^2 3p^3$–$3s3p^4$ and $3s^2 3p^3$–$3s^2 3p^2 3d$ transition arrays are due to Fawcett (1971), who points out that they are strong in the solar spectrum between 180 and 390 Å, and to Bromage, Cowan, and Fawcett (1978), who also provided the leading percentages for $3s3p^4$ and $3s^2 3p^2 3d$. Configuration interaction between them was included in the calculation. Improved measurements of these wavelengths by Behring, Cohen, Feldman, and Doschek (1976) with an uncertainty of ±0.004 Å made from solar observations are used to obtain the levels with an uncertainty of ±10 cm^{-1}.

Lines classified as transitions between the $3s^2 3p^3$ configuration and the $3s^2 3p^2 4s$ and $4d$ configurations in the range of 66 Å–81 Å are given by Fawcett, Cowan, Kononov, and Hayes (1972) with an uncertainty of 0.01 Å. The upper levels are derived with these data with an uncertainty of ±200 cm^{-1}. Classified lines from $3s^2 3p^2 4p$ and $4f$ are also given but are not connected with known lower levels. The percentage compositions for $3p^2 4s$ and $3p^2 4d$ are given in the same paper.

The ionization energy is an extrapolated value by Lotz (1967).

References

Behring, W.E., Cohen, L. Feldman, U., and Doschek, G.A. (1976), Astrophys. J. **203**, 521.

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

Burton, W. M., Ridgeley, A., and Wilson, R. (1967), Mon. Not. R. Astron. Soc. **135**, 207.

Doschek, G. A., Feldman, U., Van Hoosier, M. E., and Bartoe, J.-D. F. (1976), Astrophys. J. Suppl. Ser. **31**, 417.

Fawcett, B. C. (1971), J. Phys. **B4**, 1577.

Fawcett, B. C., Cowan, R. D., Kononov, E. Y., and Hayes, R. W. (1972), J. Phys. **B5**, 1255.

Gabriel, A. H., Garton, W. R. S., Goldberg, L., Jones, T. J. L., Jordan, C., Morgan, F. J., Nicholls, R. W., Parkinson, W. J., Paxton, H. J. B., Reeves, E. M., Shenton, C. B., Speer, R. J., and Wilson, R. (1971), Astrophys. J. **169**, 595.

Jefferies, J. T. (1969), Mem. Soc. Roy. Sci. Liege **17**, 213.

Lotz, W., (1967), J. Opt. Soc. Am. **57**, 873.

Svensson, L. Å. (1971), Solar Phys. **18**, 232.

Fe XII

Configuration	Term	J	Level (cm^{-1})	Leading percentages			
$3s^2 3p^3$	$^4S^{\circ}$	3/2	*0*				
$3s^2 3p^3$	$^2D^{\circ}$	3/2	*41 566*				
		5/2	*46 075*				
$3s^2 3p^3$	$^2P^{\circ}$	1/2	*74 109*				
		3/2	*80 515*				
$3s3p^4$	^4P	5/2	274 373	89		9	$3p^2(^3P)3d\ ^4P$
		3/2	284 005	89		9	
		1/2	288 307	88		9	
$3s3p^4$	^2D	3/2	340 020	78		16	$3p^2(^1D)3d\ ^2D$
		5/2	341 703	79		16	
$3s3p^4$	^2P	3/2	389 706	48		44	$3p^2(^3P)3d\ ^2P$
$3s3p^4$	^2S	1/2	394 120	41		27	^2P
$3s3p^4$		3/2	501 800	41	^2P	26	$3p^2(^1D)3d\ ^2P$

Fe XII–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages			
$3s^2 3p^2(^3P)3d$	^4P	5/2	512 510	86		8	$3s3p^4\ ^4P$
		3/2	516 740	82		8	
		1/2	519 770	80		8	
$3s3p^4$		1/2	513 850	35	^2P	32	$3s^2 3p^2(^1D)3d\ ^2P$
$3s^2 3p^2(^1S)3d$	^2D	3/2	526 120	46		40	$(^3P)\ ^2D$
		5/2	538 040	41		43	
$3s^2 3p^2(^1D)3d$	^2D	3/2	554 030	78		14	$3s3p^4\ ^2D$
		5/2	554 610	71		17	$3p^2(^1S)3d\ ^2D$
$3s^2 3p^2(^1D)3d$	^2P	1/2	568 940	58		24	$(^3P)\ ^2P$
		3/2	577 740	61		26	
$3s^2 3p^2(^3P)3d$	^2F	5/2	576 740	49		35	$(^1D)\ ^2F$
		7/2	581 180	61		37	
$3s^2 3p^2(^1D)3d$	^2S	1/2	579 630	72		14	$3s3p^4\ ^2S$
$3s^2 3p^2(^3P)3d$	^2D	5/2	603 930	47		31	$(^1S)\ ^2D$
		3/2	605 480	55		41	
$3s^2 3p^2(^3P)4s$	^4P	1/2	1 242 000				
		3/2	1 249 660				
		5/2	1 258 050				
$3s^2 3p^2(^3P)4s$	^2P	1/2	1 257 730				
		3/2	1 266 360	81		17	$(^1D)\ ^2D$
$3s^2 3p^2(^1D)4s$	^2D	5/2	1 287 700				
		3/2	1 289 060	82		16	$(^3P)\ ^2P$
$3s^2 3p^2(^3P)4d$	^4P	5/2	1 508 360	35		35	$(^3P)\ ^4F$
		3/2	1 517 340	65		19	$(^3P)\ ^2P$
$3s^2 3p^2(^3P)4d$	^4F	5/2	1 514 070	49		48	$(^3P)\ ^4P$
$3s^2 3p^2(^3P)4d$	^2F	5/2	1 516 030	77		9	$(^3P)\ ^4F$
		7/2	1 523 140	39		12	$(^1D)\ ^2F$
$3s^2 3p^2(^3P)4d$	^4D	7/2	1 532 160	48		48	$(^3P)\ ^2F$
$3s^2 3p^2(^3P)4d$	^2D	5/2	1 534 990	67		26	$(^1D)\ ^2F$
		3/2	1 536 480				
$3s^2 3p^2(^1D)4d$	^2F	7/2	1 549 250	81		14	$(^3P)\ ^4D$
		5/2	1 551 400?	40		39	$(^1D)\ ^2D$
$3s^2 3p^2(^1D)4d$	^2D	5/2	1 551 640	40		24	$(^3P)\ ^2D$
$3s^2 3p^2(^1D)4d$	^2P	3/2	1 565 720				
$3s^2 3p^2(^1D)4d$	^2S	1/2	1 569 410				
Fe XIII $(^3P_0)$	*Limit*		**2 668 000**				

Fe XIII

$Z=26$

Si I isoelectronic sequence

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

Ionization energy = 2 912 000±6000 cm^{-1} (361.0±0.7 eV)

The ^{3}P and ^{1}D terms of the $3s^23p^2$ configuration are from solar coronal line identifications by Edlén (1942). We used the improved wavelength measurements given by Jefferies (1969). The level uncertainty is ±0.4 cm^{-1}. The ^{1}S term is due to Doschek et al. (1976). From laboratory observations, Fawcett (1971), interpreted the $3s^23p^2$–$3s3p^3$ array except for the $^3P_0$–$^3D_1^\circ$ transition, which was established through a solar identification by Widing, Sandlin, and Cowan (1971). Fawcett also identified the $3s^23p3d$ configuration.

Behring, Cohen, Feldman, and Doschek (1976) observed the $3s^23p^2$–$3s3p^3$ and $3s^23p3d$ transition arrays with improved accuracy (±0.004 cm^{-1}) in the spectrum of the quiet sun in the region from 200 to 360 Å by using a rocket-borne spectrograph. The level values are mostly from their observations and have an uncertainty of ±10 cm^{-1}. They also identified the $3s3p^3\ ^3P_1^\circ$ level. The leading percentages for $3s3p^3$ and $3s^23p3d$ are taken from the calculations of Bromage, Cowan, and Fawcett (1978), who also identified the $3p3d\ ^3P_0^\circ$ level. Configuration interaction between them was included.

The level values for $3p4d$ and the level values and leading percentages for $3p4f$ are from Kastner, Swartz, Bhatia, and Lapides (1978). The uncertainty of the level values is ±100 cm^{-1}.

The configurations $3s^23p4s$, $4p$, $4d$, and $4f$ were found also by Fawcett, Cowan, Kononov, and Hayes (1972) from observations in the region 60–100 Å. Some of the lines they identified involve transitions to the unknown $^3F^\circ$ term of $3s^23p3d$ from $3s^23p4f$ levels, and therefore cannot be used to establish connected levels of the latter configuration. In the same paper percentage compositions are given for levels whose first component is not "high," generally less than 90%. The uncertainty of the level values is ±200 cm^{-1}.

The ionization energy was taken from Lotz (1967).

References

Behring, W. E., Cohen, L., Feldman, U., and Doschek, G. A. (1976), Astrophys. J. **203**, 521.

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

Doschek, G. A., Feldman, U., Van Hoosier, M. E., and Bartoe, J.-D. F. (1976), Astrophys. J. Suppl. Ser. **31**, 417.

Edlén, B. (1942), Z. Astrophys. **22**, 30.

Fawcett, B. C. (1971), J. Phys. **B4**, 1577.

Fawcett, B. C., Cowan, R. D., Kononov, E. Y., and Hayes, R. W. (1972), J. Phys. **B5**, 1255.

Jefferies, J.T. (1969), Mem. Soc. Roy. Sci. Liege, Collect. **17**, 213.

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

Lotz, W. (1967), J. Opt. Soc. Am. **57**, 873.

Widing, K. G., Sandlin, G. D., and Cowan, R. D. (1971), Astrophys. J. **169**, 405.

Fe XIII

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3s^2\,3p^2$	^{3}P	0	0.0			
		1	9 302.5			
		2	18 561.0			
$3s^2\,3p^2$	^{1}D	2	48 068			
$3s^2\,3p^2$	^{1}S	0	91 508			
$3s3p^3$	^{3}D°	1	*287 205*	85	10	$3p3d\ ^3$D°
		2	*287 360*	83	10	
		3	*290 210*	89	10	
$3s3p^3$	^{3}P°	1	*329 647*	86	9	$3p3d\ ^3$P°
		2	*330 279*	78	9	
$3s3p^3$	^{1}D°	2	*362 330*	54	39	$3p3d\ ^1$D°
$3s3p^3$	^{3}S°	1	*415 462*	78	17	^{1}P°
$3s3p^3$	^{1}P°	1	*438 050*	69	19	^{3}S°

Fe XIII–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$3s^2 3p3d$	$^3P^\circ$	2	*486 358*	43	23	$3p3d$ $^1D^\circ$
		1	*494 942*	49	38	$3p3d$ $^3D^\circ$
		0	*503 340*	89	9	$3s3p^3$ $^3P^\circ$
$3s^2 3p3d$	$^1D^\circ$	2	*498 870*	32	21	$3s3p^3$ $^1D^\circ$
$3s^2 3p3d$	$^3D^\circ$	1	*506 502*	48	39	$3p3d$ $^3P^\circ$
		3	*509 176*	86	10	$3s3p^3$ $^3D^\circ$
		2	*509 250*	61	24	$3p3d$ $^3P^\circ$
$3s^2 3p3d$	$^1F^\circ$	3	*556 870*	97		
$3s^2 3p3d$	$^1P^\circ$	1	*570 690*	86	10	$3s3p^3$ $^1P^\circ$
$3s^2 3p4s$	$^3P^\circ$	1	*1 336 220*	84	16	$^1P^\circ$
		2	*1 354 680*			
$3s^2 3p4s$	$^1P^\circ$	1	*1 361 830*	84	16	$^3P^\circ$
$3s^2 3p4p$	^1D	2	1 488 110	86	13	^3P
$3s^2 3p4p$	^1P	1	1 515 260?	39	35	^3D
$3s^2 3p4p$	^3D	1	1 603 770	59	39	^1P
$3s^2 3p4d$	$^3D^\circ$	2	*1 604 220*	61	17	$^3F^\circ$
		3	*1 606 800*	45	41	$^3F^\circ$
$3s^2 3p4d$	$^3F^\circ$	3	*1 619 600*			
$3s^2 3p4d$	$^1F^\circ$	3	*1 630 650*	84	12	$^3F^\circ$
$3s^2 3p4d$	$^1P^\circ$	1	*1 650 620*			
$3s^2 3p4f$	^1D	2	*1 740 800*			
$3s^2 3p4f$	^3F	4	1 741 290	56	44	^3G
$3s^2 3p4f$	^1G	4	1 743 460			
Fe XIV ($^2P^\circ_{1/2}$)	*Limit*		2 912 000			

Fe XIV

$Z=26$

Al I isoelectronic sequence

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

Ionization energy = 3 163 000±6000 cm^{-1} (392.2±0.8 eV)

The early laboratory work on this one-electron spectrum consisted of Edlén's (1936) identification of the $3p$–$4d$ resonance lines at about 59 Å. Later Edlén (1942) identified the strong solar coronal line at 5302.86 Å as the transition between the $3s^23p\ ^2P^\circ_{1/2}$ and $^2P^\circ_{3/2}$ levels. This identification serves as the basis for the ground term splitting in this ion. The uncertainty is ±2 cm^{-1}.

The first excited configuration in Fe XIV, $3s3p^2$, was identified from the laboratory observations of Fawcett and Peacock (1967) and by Fawcett (1970). The $3s^23d$ levels were found by Peacock, Cowan, and Sawyer (1967). The level values for these two configurations are derived from the more accurate solar observations of Behring, Cohen, Feldman, and Doschek (1976) in the region 210–290 Å, which give an uncertainty of ±20 cm^{-1}. The $3s^24s$, $3s^24p$, and $3s^24f$ levels are derived from the work of Fawcett, Cowan, Kononov, and Hayes (1972) with a level uncertainty of ±200 cm^{-1}.

The $3s^24d$ levels are obtained from Edlén (1936).

Fawcett (1970) has classified the $3s3p^2\ ^4P$–$3p^3\ ^4S^\circ$ group and Fawcett et al. (1972) reported the observation of $3s3p^2\ ^4P$–$3s3p4s\ ^4P^\circ$. The quartet levels depend on these data and the calculated position of $3s3p^2\ ^4P_{1/2}$ by Fischer (1978).

The ionization energy is the value given by Lotz (1967) from his isoelectronic extrapolation.

References

Behring, W. E., Cohen, L., Feldman, U., and Doschek, G. A. (1976), Astrophys. J. **203**, 521.

Edlén, B. (1936), Z. Phys. **103**, 536.

Edlén B. (1942), Z. Astrophys. **22**, 30.

Fawcett, B. C., and Peacock, N. J. (1967), Proc. Phys. Soc. (London) **91**, 973.

Fawcett, B. C. (1970), J. Phys. **B3**, 1732.

Fawcett, B. C., Cowan, R. D., Kononov, E. Y., and Hayes, R. W. (1972), J. Phys. **B5**, 1255.

Fischer, C. F. (1978), Penn. State Univ. Dept. Computer Sci., CS-78-24.

Lotz, W. (1967), J. Opt. Soc. Am. **57**, 873.

Peacock, N. J., Cowan, R. D., and Sawyer, G. A., Proc. 7th Int. Conf. on Ionization Phenomena in Gases, Belgrade, 1967 (Belgrade: Gradevinska Knjiga).

Fe XIV

Configuration	Term	J	Level (cm^{-1})
$3s^23p$	$^2P^\circ$	1/2	*0.0*
		3/2	*18 852.5*
$3s3p^2$	^4P	1/2	*221 700+x*
		3/2	*222 986+x*
		5/2	*239 450+x*
$3s3p^2$	^2D	3/2	299 248
		5/2	301 472
$3s3p^2$	^2S	1/2	364 693
$3s3p^2$	^2P	1/2	388 510
		3/2	396 515
$3s^23d$	^2D	3/2	473 227
		5/2	475 217
$3p^3$	$^4S^\circ$	3/2	*586 130+x*
$3s^24s$	^2S	1/2	1 435 020
$3s^24p$	$^2P^\circ$	1/2	*1 568 840*
		3/2	*1 574 010*

Fe XIV–Continued

Configuration	Term	J	Level (cm^{-1})
$2s3p(^3P°)4s$	$^4P°$	3/2	*1 662 920+x*
		5/2	*1 675 450+x*
$3s^2 4d$	^2D	3/2	1 695 980
		5/2	1 697 290
$3s^2 4f$	$^2F°$	7/2	*1 788 380*
		5/2	*1 788 640*
Fe XV ($^1S_0$)	*Limit*		3 163 000

Fe XV

$Z=26$

Mg I isoelectronic sequence

Ground state: $1s^2 2s^2 2p^6 3s^2\ ^1S_0$

Ionization energy = 3 686 000±20 000 cm^{-1} (457.0±2.5 eV)

Edlén's (1936) work on this spectrum consisted of the observation of the multiplets $3s\,^1S - 3s4p\,^1P^\circ$, $3s3p\,^3P^\circ - 3s4d\,^3D$, $3s3d\,^3D - 3s4f\,^3F^\circ$ and $3s3d\,^3D - 3s5f\,^3F^\circ$. These groups were unconnected and the relative positions of the terms were estimated by isoelectronic extrapolation.

The absolute energy of the system of excited triplet levels is based on the measurement of $3s^2\ ^1S_0$–$3s3p\ ^3P_1^\circ$ at 417.258 Å in the solar spectrum by Behring, Cohen, Feldman, and Doschek (1976). The error in this wavelength is stated to be <0.01 Å, giving an error in the intersystem connection of 5 cm^{-1}. The error in the levels due to Edlén is about 100 cm^{-1}.

Peacock, Cowan, and Sawyer (1967) gave the classification of the $3s3p$–$3s3d$ array and the $3s^2\ ^1S_0$–$3s3p\ ^1P_1^\circ$ resonance line measured in the range of 224–284 Å with an accuracy of ±0.05 Å. Several of these lines are found in the list of solar lines of Behring et al. (1976) with improved accuracy and are used here. The resulting level values have an uncertainty of 20 cm^{-1}. They are $3s^2\ ^1S_0$–$3s3p\ ^1P_1^\circ$ and $3s3p$–$3s3d\ ^1P_1^\circ$–$^1D_2$, $^3P_1^\circ$–$^3D_2$, and $^3P_2^\circ$–$^3D_3$ at 284.160 Å, 243.790 Å, 227.208 Å, and 233.857 Å, respectively.

The values of the levels of the $3p^2$ configuration are derived with an uncertainty of 20 cm^{-1} from the classifications of Fawcett (1971) and Fawcett, Cowan, and Hayes (1972). The $3p^2\ ^1S_0$ level has been tentatively located by Cowan and Widing (1973). The observations by Fawcett (1970) provide values for the three levels of the $3p3d\ ^3F^\circ$ term.

The measurements of Edlén were used to obtain the values of the $3s4f\ ^3F^\circ$, $3s4d\ ^3D$, and $3s5f\ ^3F^\circ$ levels.

The levels of $3s4s\ ^3S$ and $3s5d\ ^3D$ given here are derived from the work of Feldman, Katz, Behring, and Cohen (1971). The $3s4d\ ^1D$ and $3s4f\ ^1F^\circ$ levels are taken from the paper of Fawcett, Cowan, Kononov, and Hayes (1972). The $3s5s\ ^3S$, $3s5p\ ^1P^\circ$, $3s5f\ ^1F^\circ$ and $3s6f\ ^{1,3}F^\circ$ levels are from Fawcett, Gabriel, Irons, Peacock, and Saunders (1966). Ekberg (1971) has noted that the $3s5f\ ^1F^\circ$ and $3s6f\ ^1F^\circ$ levels are questionable. We have not included them here.

The transitions $3p3d$–$3p4f$ are classified by Kastner, Swartz, Bhatia, and Lapides (1978), who gave percentages for $3p4f$.

With observations of L-series satellite spectra, Burkhalter, Cohen, Cowan, and Feldman (1979) have made some tentative assignments to $2p^6 3s3p$–$2p^5 3s^2 3p$ transitions. They are not quoted here.

The ionization energy has been derived here from the $3snf\ ^3F_4^\circ$ ($n=4$–6) levels. Comparison with lower members of the isoelectronic sequence indicates that the ionization energy has an uncertainty of about ±20 000 cm^{-1} (2.5 eV).

References

Behring, W. E., Cohen, L., Feldman, U., and Doschek, G. A. (1976), Astrophys. J. **203**, 521.

Burkhalter, P. G., Cohen, L., Cowan, R. D., and Feldman, U. (1979), J. Opt. Soc. Am. **69**, 1133.

Cowan, R. D., and Widing, K. C. (1973), Astrophys. J. **180**, 285.

Edlén, , B. (1936), Z. Phys. **103**, 536.

Ekberg, J. O. (1971), Phys. Scr. **4**, 101.

Fawcett, B. C. (1970), J. Phys. **B3**, 1732.

Fawcett, B. C. (1971), J. Phys. **B4**, 1577.

Fawcett, B. C., Cowan, R. D., and Hayes (1972), J. Phys. **B5**, 2143.

Fawcett, B. C., Cowan, R. D., Kononov, E. Y., and Hayes, R. W. (1972), J. Phys. **B5**, 1255.

Fawcett, B. C., Gabriel, A. H., Irons, F. E., Peacock, N. J., and Saunders, P. A. H. (1966), Proc. Phys. Soc. (London) **88**, 1051.

Feldman, U., Katz, L., Behring, W., and Cohen L. (1971), J. Opt. Soc. Am. **61**, 91.

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

Peacock, N. J., Cowan, R. D., and Sawyer, G. A., Proc. 7th Int. Conf. on Ionization Phenomena in Gases, Belgrade, 1967 (Belgrade: Gradevinska Knjiga).

Fe XV

Configuration	Term	J	Level (cm^{-1})	Leading percentages
$3s^2$	^1S	0	0	
$3s3p$	$^3P^\circ$	0	*233 910*	
		1	*239 660*	
		2	*253 820*	
$3s3p$	$^1P^\circ$	1	*351 914*	

Fe xv–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages
$3p^2$	^{3}P	0	554 500	
		1	564 570	
		2	581 690	
$3p^2$	^{1}D	2	559 590	
$3p^2$	^{1}S	0	660 970?	
$3s3d$	^{3}D	1	678 830	
		2	679 785	
		3	681 410	
$3s3d$	^{1}D	2	762 103	
$3p3d$	^{3}F°	2	*928 420*	
		3	*938 180*	
		4	*949 660*	
$3s4s$	^{3}S	1	1 763 700	
$3s4p$	^{1}P°	1	*1 889 970*	
$3s4d$	^{3}D	1	2 031 310	
		2	2 032 020	
		3	2 033 180	
$3s4d$	^{1}D	2	2 035 280	
$3s4f$	^{3}F°	2	*2 108 520*	
		3	*2 108 620*	
		4	*2 108 880*	
$3s4f$	^{1}F°	3	*2 123 150*	
$3p4f$	^{3}G	3	2 380 160	46 51 ^{1}F
		4	2 386 700	57 39 ^{3}F
		5	2 402 100	
$3s5s$	^{3}S	1	2 544 800	
$3s5p$	^{1}P°	1	*2 567 000*	
$3s5d$	^{3}D	2	2 639 900	
		1	2 640 100	
		3	2 640 300	
$3s5f$	^{3}F°	2	*2 676 400*	
		3	*2 676 400*	
		4	*2 676 600*	
$3s5f$	^{1}F°	3	*2 782 700?*	
$3s6f$	^{3}F°	4	*2 986 100*	
$3s6f$	^{1}F°	3	*3 091 500?*	
Fe XVI (^{2}S$_{1/2}$)	*Limit*		3 686 000	

Fe XVI

$Z=26$

Na I isoelectronic sequence

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

Ionization energy = 3 946 280±200 cm^{-1} (489.264±0.025 eV)

The original work on this spectrum by Edlén (1936) in the region 40–66 Å gave the position of only the $4p\ ^2P°$ term relative to the ground state, but included transitions from $4s$, $4d$, and $5d$ to the $3p\ ^2P°$ term, and transitions from $4f$ and $5f$ to $3d\ ^2D$. Peacock, Cowan, and Sawyer (1967) brought these unconnected systems together by identifying the $3s$–$3p$ and $3p$–$3d$ transitions in the region 250–360 Å. We have used improved wavelengths of Edlén (1978) for the $3s$–$3p$ and $3p$–$3d$ transitions together with his earlier measurements for the level values. The uncertainty of the $n=3$ levels is probably 5 cm^{-1} and the higher ones ±200 cm^{-1}.

Higher series members of ns, np, nd, and nf were identified by Fawcett, Gabriel, Irons, Peacock, and Saunders (1966) between 27 and 64 A°. The values of the $5p$, $6p$, $6d$, $7d$, and $8d$ terms given below were derived by using the wavelengths of Feldman et al. (1971). Their uncertainty is 800 cm^{-1}. The $5g$ term is from Kononov, Kovalev, Ryabtsev, and Churilov (1977).

The $2p^5 3s\ nl$ configurations are from classifications of L-series satellite spectra by Burkhalter, Cohen, Cowan, and Feldman (1979). The leading percentages, in two alternate coupling schemes, are taken from this paper. Other inner shell transitions have been tentatively identified by Connerade, Peacock, and Speer (1970).

The ionization energy was determined from a polarization formula applied to the nf series by Edlén (1978). The uncertainty is ±200 cm^{-1} (0.025 eV).

References

Burkhalter, P. G., Cohen, L., Cowan, R. D., and Feldman, U. (1979), J. Opt. Soc. Am. **69**, 1133.

Connerade, J. P., Peacock, N. J., and Speer, R. J. (1970), Solar Phys. **14**, 159.

Edlén, B. (1936), Z. Phys. **100**, 621.

Edlén, B. (1978), Phys. Scr. **17**, 565.

Fawcett, B. C., Gabriel, A. H., Irons, F. E., Peacock, N. J., and Saunders, P. A. H. (1966), Proc. Phys. Soc. **88**, 1051.

Feldman, U., Katz, L., Behring, W., and Cohen, L. (1971), J. Opt. Soc. Am. **61**, 91.

Kononov, E. Y., Kovalev, V. I., Ryabtsev, A. N., and Churilov, S. S. (1977), Sov. J. Quan. Elec. **7**, 111.

Peacock, N. J., Cowan, R. D., and Sawyer, G. A., Proc. 7th Int. Conf. on Ionization Phenomena in Gases, Belgrade, 1967 (Belgrade: Gradevinska Knjiga).

Fe XVI

Configuration	Term	J	Level (cm^{-1})	Leading percentages
$2p^6(^1S)3s$	^2S	1/2	0	
$2p^6(^1S)3p$	$^2P°$	1/2	*277 206*	
		3/2	*298 155*	
$2p^6(^1S)3d$	^2D	3/2	675 503	
		5/2	678 412	
$2p^6(^1S)4s$	^2S	1/2	1 867 550	
$2p^6(^1S)4p$	$^2P°$	1/2	*1 978 040*	
		3/2	*1 986 100*	
$2p^6(^1S)4d$	^2D	3/2	2 124 200	
		5/2	2 125 370	
$2p^6(^1S)4f$	$^2F°$	5/2	*2 184 640*	
		7/2	*2 185 160*	
$2p^6(^1S)5s$	^2S	1/2	2 662 000	
$2p^6(^1S)5p$	$^2P°$	1/2	*2 717 170*	
		3/2	*2 721 160*	
$2p^6(^1S)5d$	^2D	3/2	2 788 060	
		5/2	2 788 630	

Fe XVI–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages			
$2p^6(^1S)5f$	$^2F°$	5/2	*2 818 620*				
		7/2	*2 818 910*				
$2p^6(^1S)5g$	^2G	7/2,9/2	2 822 100				
$2p^6(^1S)6s$	^2S	1/2	3 076 000				
$2p^6(^1S)6p$	$^2P°$	1/2	*3 106 400*				
		3/2	*3 108 900*				
$2p^6(^1S)6d$	^2D	3/2	3 146 070				
		5/2	3 146 670				
$2p^6(^1S)6f$	$^2F°$	5/2	*3 163 130*				
		7/2	*3 163 190*				
$2p^6(^1S)7s$	^2S	1/2	3 323 000				
$2p^6(^1S)7p$	$^2P°$	3/2	*3 341 000*				
$2p^6(^1S)7d$	^2D	3/2	3 360 500				
		5/2	3 360 800				
$2p^6(^1S)7f$	$^2F°$	7/2	*3 371 070*				
		5/2	*3 371 210*				
$2p^6(^1S)8p$	$^2P°$	3/2	*3 488 000*				
$2p^6(^1S)8d$	^2D	3/2	3 498 800				
		5/2	3 499 000				
$2p^6(^1S)8f$	$^2F°$	5/2	*3 505 700*				
		7/2	*3 505 800*				
$2p^6(^1S)9p$	$^2P°$	3/2	*3 587 000*				
$2p^6(^1S)9d$	^2D	5/2	3 595 000				
		3/2	3 599 000				
$2p^6(^1S)9f$	$^2F°$	5/2,7/2	*3 600 000*				
Fe XVII ($^1S_0$)	***Limit***		**3 946 280**				
$2p^5(^2P°)3s^2$	$^2P°$	3/2	*5 773 000*				
		1/2	*5 873 000*				
$2p^5(^2P°_{3/2})3s3p(^3P_1)$	(3/2,1)	5/2	5 982 000	98	or	83	$2p^53s(^3P°)3p\ ^4D$
		1/2	6 001 000	92	or	35	$2p^53s(^1P°)3p\ ^2P$
$2p^5(^2P°_{3/2})3s3p(^3P_2)$	(3/2,2)	3/2	6 013 000	69	or	30	$2p^53s(^1P°)3p\ ^2D$
		5/2	6 013 000	99	or	65	$2p^53s(^3P°)3p\ ^4P$
		1/2	6 042 000	71	or	40	$2p^53s(^1P°)3p\ ^2S$
$2p^5(^2P°_{1/2})3s3p(^3P_0)$	(1/2,0)	1/2	6 075 000	68	or	65	$2p^53s(^3P°)3p\ ^4D$
$2p^5(^2P°_{1/2})3s3p(^3P_1)$	(1/2,1)	3/2	6 089 000	88	or	50	$2p^53s(^3P°)3p\ ^4D$

Fe XVI–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages			
$2p^5(^2P^\circ_{3/2})3s3p(^1P_1)$	$(3/2,1)$	1/2	6 089 000	44	or	39	$2p^53s(^3P^\circ)3p\ ^4P$
		5/2	6 110 000	57	or	69	$2p^53s(^1P^\circ)3p\ ^2D$
		3/2	6 129 000	94	or	40	$2p^53s(^3P^\circ)3p\ ^2P$
$2p^5(^2P^\circ_{1/2})3s3p(^3P_2)$	$(1/2,2)$	3/2	6 096 000	86	or	45	$2p^53s(^3P^\circ)3p\ ^4P$
$2p^5(^2P^\circ_{1/2})3s3p(^1P_1)$	$(1/2,1)$	1/2	6 197 000	47	or	55	$2p^53s(^3P^\circ)3p\ ^2P$
$2p^5(^2P^\circ_{1/2})3s3p(^1P_1)$	$(1/2,1)$	3/2	6 217 000	98	or	59	$2p^53s(^3P^\circ)3p\ ^2D$
		1/2	6 267 000	50	or	80	$2p^53s(^3P^\circ)3p\ ^2S$
$2p^5(^2P^\circ_{3/2})3s3d(^3D_3)$	$(3/2,3)^\circ$	5/2	*6 393 000*	50	or	67	$2p^53s(^3P^\circ)3d\ ^4P^\circ$
		7/2	*6 422 000*	100	or	66	$2p^53s(^3P^\circ)3d\ ^4D^\circ$
		3/2	*6 436 000*	45	or	57	$2p^53s(^1P^\circ)3d\ ^2P^\circ$
$2p^5(^2P^\circ_{3/2})3s3d(^3D_1)$	$(3/2,1)^\circ$	5/2	*6 406 000*	83	or	54	$2p^53s(^3P^\circ)3d\ ^4F^\circ$
		3/2	*6 419 000*	60	or	40	$2p^53s(^3P^\circ)3d\ ^4F^\circ$
$2p^5(^2P^\circ_{3/2})3s3d(^3D_2)$	$(3/2,2)^\circ$	1/2	*6 423 000*	45	or	61	$2p^53s(^1P^\circ)3d\ ^2P^\circ$
		5/2	*6 425 000*	64	or	39	$2p^53s(^1P^\circ)3d\ ^2F^\circ$
$2p^5(^2P^\circ_{3/2})3s3d(^1D_2)$	$(3/2,2)^\circ$	7/2	*6 445 000*	100	or	72	$2p^53s(^3P^\circ)3d\ ^2F^\circ$
		5/2	*6 464 000*	95	or	50	$2p^53s(^3P^\circ)3d\ ^2D^\circ$
		3/2	*6 473 000*	44	or	35	$2p^53s(^3P^\circ)3d\ ^4D^\circ$
$2p^5(^2P^\circ_{1/2})3s3d(^3D_3)$	$(1/2,3)^\circ$	5/2	*6 502 000*	54	or	41	$2p^53s(^3P^\circ)3d\ ^4D^\circ$
		7/2	*6 517 000*	98	or	41	$2p^53s(^1P^\circ)3d\ ^2F^\circ$
$2p^5(^2P^\circ_{1/2})3s3d(^3D_1)$	$(1/2,1)^\circ$	3/2	*6 502 000*	88	or	54	$2p^53s(^3P^\circ)3d\ ^4F^\circ$
		1/2	*6 574 000*	74	or	52	$2p^53s(^3P^\circ)3d\ ^2P^\circ$
$2p^5(^2P^\circ_{1/2})3s3d(^3D_2)$	$(1/2,2)^\circ$	5/2	*6 516 000*	51	or	45	$2p^53s(^1P^\circ)3d\ ^2D^\circ$
		3/2	*6 530 000*	46	or	38	$2p^53s(^1P^\circ)3d\ ^2P^\circ$
$2p^5(^2P^\circ_{1/2})3s3d(^1D_2)$	$(1/2,2)^\circ$	5/2	*6 556 000*	97	or	51	$2p^53s(^3P^\circ)3d\ ^2F^\circ$
		3/2	*6 595 000*	61	or	68	$2p^53s(^3P^\circ)3d\ ^2P^\circ$

Fe XVII

$Z=26$

Ne I isoelectronic sequence

Ground state: $1s^2 2s^2 2p^6\ ^1S_0$

Ionization energy = 10 180 000±8000 cm^{-1} (1262.2±1.0 eV)

Tyrén (1938) identified resonance lines in the region of 12–17 Å arising from the $2p^5 3s$, $2p^5 3d$, $2p^5 4d$, and $2s2p^6 3p$ configurations. The magnetic quadrupole transition from the $2p^5 3s\ ^3P^\circ_2$ level to the ground state was first observed by Parkinson (1973). New laboratory observations in the region 10–17 Å were reported by Gordon, Hobby, and Peacock (1980), who identified resonance transitions from $2p^5 4s$, $2p^5 4d$, $2p^5 5d$, $2p^5 6d$, and $2s2p^6 4p$. Their results, with a reported wavelength accuracy of ±0.005 Å are used to obtain the present levels (all $J=1$) with an uncertainty of ±3000 cm^{-1}. From solar coronal observations Hutcheon, Pye, and Evans (1976) identified resonance lines from $2p^5 5s$, $6s$, $7s$, $5p$, and $8d$ and obtained the value for the ionization energy quoted here. Their measurement uncertainty is given as ±0.003 Å, giving a level uncertainty of ±2000 cm^{-1}. We use their wavelength for the magnetic quadrupole transition from $2p^5 3s$.

Parametric calculations made by us for Sc XII and Ni XIX show that the $2p^5 3s$ configuration is best described in $J_1 j$-coupling and the $2p^5 3d$ in LS-coupling.

Classifications in the $2p^5 3d$–$2p^5 4f$ array at 59 Å by Fawcett, Bromage, and Hayes (1979) could not be used to derive additional levels because they are not connected with the known system.

References

Fawcett, B. C., Bromage, G. E., and Hayes, R. W. (1979), Mon. Not. R. Astron. Soc. **186**, 113.

Gordon, H. Hobby, M. G., and Peacock, N. J. (1980), J. Phys. **B13**, 1985.

Hutcheon, R. J., Pye, J. P., and Evans, K. D. (1976), Astron. Astrophys. **51**, 451.

Parkinson, J. H. (1973), Astron. Astrophys. **24**, 213.

Tyrén, F. (1938), Z. Phys. **111**, 314.

Fe XVII

Configuration	Term	J	Level (cm^{-1})
$2s^2 2p^6$	^1S	0	0
$2s^2 2p^5(^2P^\circ_{3/2})3s$	$(3/2,1/2)^\circ$	2	*5 849 000*
		1	*5 863 700*
$2s^2 2p^5(^2P^\circ_{1/2})3s$	$(1/2,1/2)^\circ$	1	*5 960 500*
$2s^2 2p^5(^2P^\circ)3d$	$^3P^\circ$	1	*6 472 500*
$2s^2 2p^5(^2P^\circ)3d$	$^3D^\circ$	1	*6 552 200*
$2s^2 2p^5(^2P^\circ)3d$	$^1P^\circ$	1	*6 660 000*
$2s2p^6 3p$	$^3P^\circ$	1	*7 198 900*
$2s2p^6 3p$	$^1P^\circ$	1	*7 234 300*
$2s^2 2p^5(^2P^\circ_{3/2})4s$	$(3/2,1/2)^\circ$	1	*7 885 800*
$2s^2 2p^5(^2P^\circ_{1/2})4s$	$(1/2,1/2)^\circ$	1	*7 983 000*
$2s^2 2p^5(^2P^\circ_{3/2})4d$	$^2[1/2]^\circ$	1	*8 116 000*
$2s^2 2p^5(^2P^\circ_{3/2})4d$	$^2[3/2]^\circ$	1	*8 154 000*
$2s^2 2p^5(^2P^\circ_{1/2})4d$	$^2[3/2]^\circ$	1	*8 249 000*
$2s^2 2p^5(^2P^\circ_{3/2})5s$	$(3/2,1/2)^\circ$	1	*8 757 000*

Fe XVII–Continued

Configuration	Term	J	Level (cm^{-1})
$2s^2 2p^5(^2P^\circ_{1/2})5s$	$(\frac{1}{2},\frac{1}{2})^\circ$	1	*8 860 000*
$2s^2 2p^5(^2P^\circ_{3/2})5d$	$^2[\frac{1}{2}]^\circ$	1	*8 860 000*
$2s^2 2p^5(^2P^\circ_{3/2})5d$	$^2[\frac{3}{2}]^\circ$	1	*8 887 000*
$2s^2 2p^5(^2P^\circ_{1/2})5d$	$^2[\frac{3}{2}]^\circ$	1	*8 982 000*
$2s2p^6 4p$	$^3P^\circ$	1	*9 056 000*
$2s2p^6 4p$	$^1P^\circ$	1	*9 072 000*
$2s^2 2p^5(^2P^\circ_{3/2})6s$	$(\frac{3}{2},\frac{1}{2})^\circ$	1	*9 216 000*
$2s^2 2p^5(^2P^\circ_{3/2})6d$	$^2[\frac{3}{2}]^\circ$	1	*9 285 000*
$2s^2 2p^5(^2P^\circ_{1/2})6d$	$^2[\frac{3}{2}]^\circ$	1	*9 383 000*
$2s^2 2p^5(^2P^\circ_{3/2})7s$	$(\frac{3}{2},\frac{1}{2})^\circ$	1	*9 479 000*
$2s^2 2p^5(^2P^\circ_{3/2})7d$	$^2[\frac{3}{2}]^\circ$	1	*9 524 000*
$2s^2 2p^5(^2P^\circ_{1/2})7d$	$^2[\frac{3}{2}]^\circ$	1	*9 628 000*
$2s^2 2p^5(^2P^\circ_{3/2})8d$	$^2[\frac{3}{2}]^\circ$	1	*9 690 000*
$2s^2 2p^5(^2P^\circ_{1/2})8d$	$^2[\frac{3}{2}]^\circ$	1	*9 784 000*
$2s2p^6 5p$	$^3P^\circ$	1	*9 878 000*
$2s2p^6 5p$	$^1P^\circ$	1	*9 878 000*
Fe XVIII ($^2P^\circ_{3/2}$)	***Limit***		10 180 000

Fe XVIII

$Z=26$

F I isoelectronic sequence

Ground state: $1s^2 2s^2 2p^5\ ^2P^\circ_{3/2}$

Ionization energy = 10 985 000±30 000 cm^{-1} (1362±4 eV)

The $2s^2 2p^5\ ^2P^\circ$–$2s2p^6\ ^2S$ doublet at 93.931 and 103.954 Å was measured in a laser-produced plasma by Feldman, Doschek, Nagel, Behring, and Cohen (1973) with a precision of ±0.003 Å (±30 cm^{-1}) and an estimated absolute (systematic) error of ±0.01 Å (±100 cm^{-1}).

The $2p^4 3s$ and $2p^4 3d$ levels were derived by Feldman, Doschek, Cowan, and Cohen (1973) from measurements at 14–16 Å. The range of observation was extended to 10 Å by Gordon, Hobby, and Peacock (1980), who also obtained the $2p^4 4s$, $2p^4 4d$, and $2s2p^5 3p$ levels. Their measurements, with a reported accuracy of ±0.005 Å, are used to determine these configurations. The uncertainty in the level values is about ±3000 cm^{-1}.

All of the leading percentages are taken from Gordon et al.

The $2p^4 5d$ and $6d$ levels are from observations of exploding wires at 10 Å by Burkhalter, Dozier, Stallings, and Cowan (1978) with a wavenumber uncertainty of ±5000 cm^{-1}. These levels are designated by the authors in *LS* coupling, although *Jj* coupling is probably more appropriate. We include designations from both coupling schemes.

The $1s2s^2 2p^6\ ^2S$ level was obtained from the x-ray observations of Fraenkel and Schwob (1972). An uncertainty of ±30 000 cm^{-1} is estimated for this level.

We derived the value for the ionization energy from the $2p^4(^1D)nd\ ^2D_{3/2}$ series for $n=3$-5.

References

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

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

Feldman, U., Doschek, G. A., Nagel, D. J., Behring, W. E., and Cohen, L. (1973), Astrophys. J. **183**, L43.

Fraenkel, B. S., and Schwob, J. L. (1972), Phys. Lett. **40A**, 83.

Gordon, H., Hobby, M. G., and Peacock, N. J. (1980), J. Phys. **B13**, 1985.

Fe XVIII

Configuration	Term	J	Level (cm^{-1})	Leading percentages			
$2s^2 2p^5$	$^2P^\circ$	3/2	*0*				
		1/2	*102 650*				
$2s2p^6$	^2S	1/2	1 064 600				
$2s^2 2p^4(^3P)3s$	^4P	5/2	6 222 000	90		9	$(^1D)\ ^2D$
		1/2	6 301 200	84		15	$(^1S)\ ^2S$
		3/2	6 317 900	68		30	$(^3P)\ ^2P$
$2s^2 2p^4(^3P)3s$	^2P	3/2	6 248 100	57		31	$(^3P)\ ^4P$
		1/2	6 342 600	90		5	$(^1S)\ ^2S$
$2s^2 2p^4(^1D)3s$	^2D	5/2	6 400 000	90		9	$(^3P)\ ^4P$
		3/2	6 403 800	85		13	$(^3P)\ ^2P$
$2s^2 2p^4(^1S)3s$	^2S	1/2	6 575 100	80		11	$(^3P)\ ^4P$
$2s^2 2p^4(^3P)3d$	^4P	1/2	6 858 200	61		22	$(^3P)\ ^2P$
		3/2	6 872 400	48		27	$(^3P)\ ^2D$
		5/2	6 903 700	42		36	$(^3P)\ ^2F$
$2s^2 2p^4(^3P)3d$		5/2	6 880 400	26	^2F	23	$(^3P)\ ^4P$
$2s^2 2p^4(^3P)3d$	^4D	1/2	6 903 200	53		26	$(^3P)\ ^2P$
$2s^2 2p^4(^3P)3d$		3/2	6 919 000	29	^4D	19	$(^3P)\ ^2P$
$2s^2 2p^4(^3P)3d$	^2P	3/2	6 947 300	49		21	$(^1D)\ ^2P$

Fe XVIII–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages			
$2s^2 2p^4(^3P)3d$	^2D	5/2	6 963 800	42		29	$(^3P)\ ^2F$
$2s^2 2p^4(^1D)3d$	^2S	1/2	7 014 300	83		10	$(^3P)\ ^4P$
$2s^2 2p^4(^1D)3d$	^2P	3/2	7 038 400	66		20	$(^3P)\ ^2P$
		1/2	7 074 200	61		34	
$2s^2 2p^4(^1D)3d$	^2D	5/2	7 040 800	44		26	$(^3P)\ ^2D$
		3/2	7 066 100	65		28	
$2s^2 2p^4(^1S)3d$	^2D	5/2	7 166 400	72		13	$(^3P)\ ^2D$
		3/2	7 184 300	72		13	
$2s2p^5(^3P^\circ)3p$		3/2	7 464 400	38	^4D	29	$(^3P^\circ)\ ^2P$
$2s2p^5(^3P^\circ)3p$	^2D	5/2	7 477 200	50		49	$(^3P^\circ)\ ^4D$
		3/2	7 567 000	45		22	
$2s2p^5(^3P^\circ)3p$	^2P	3/2	7 487 800	59		37	$(^3P^\circ)\ ^4D$
		1/2	7 508 100	58		16	
$2s2p^5(^3P^\circ)3p$	^4P	5/2	7 508 100				
		3/2	7 529 900	44		41	$(^3P^\circ)\ ^2D$
$2s2p^5(^3P^\circ)3p$	^2S	1/2	7 599 400	62		21	$(^3P^\circ)\ ^2P$
$2s2p^5(^1P^\circ)3p$	^2D	3/2	7 763 400	88		7	$(^1P^\circ)\ ^2P$
		5/2	7 783 900	96		2	$(^3P^\circ)\ ^4D$
$2s2p^5(^1P^\circ)3p$	^2P	1/2	7 786 000	93		2	$(^3P^\circ)\ ^2S$
		3/2	7 794 400	89		7	$(^1P^\circ)\ ^2D$
$2s^2 2p^4(^3P_2)4s$	(2,1/2)	3/2	8 428 200	88	or	70	$(^3P)\ ^2P$
$2s^2 2p^4(^3P_1)4s$	(1,1/2)	3/2	8 517 200	99	or	80	$(^3P)\ ^4P$
$2s^2 2p^4(^1D_2)4s$	(2,1/2)	5/2	8 591 100	90	or	90	$(^1D)\ ^2D$
		3/2	8 593 000	88	or	88	
$2s^2 2p^4(^3P_2)4d$	(2,5/2)	5/2	8 676 000	73	or	40	$(^3P)\ ^2D$
		3/2	8 676 000	86	or	32	
$2s^2 2p^4(^3P_0)4d$	(0,3/2)	3/2	8 727 500	73	or	55	$(^3P)\ ^4F$
$2s^2 2p^4(^3P_0)4d$	(0,5/2)	5/2	8 727 500	66	or	44	$(^3P)\ ^4F$
$2s^2 2p^4(^3P_1)4d$	(1,5/2)	5/2	8 756 600	94	or	44	$(^3P)\ ^4P$
		3/2	8 759 900	68	or	51	$(^3P)\ ^2P$
$2s^2 2p^4(^1D_2)4d$	(2,3/2)	5/2	8 829 200	82	or	50	$(^1D)\ ^2F$
		1/2	8 829 200	68	or	78	$(^1D)\ ^2S$
		3/2	8 843 900	49	or	81	$(^1D)\ ^2D$
$2s^2 2p^4(^1D_2)4d$	(2,5/2)	5/2	8 829 200	86	or	54	$(^1D)\ ^2D$
		3/2	8 829 200	52	or	87	$(^1D)\ ^2P$
		1/2	8 843 900	61	or	71	$(^1D)\ ^2P$
$2s^2 2p^4(^1S_0)4d$	(0,3/2)	3/2	8 989 200	79	or	79	$(^1S)\ ^2D$

Fe XVIII – Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages
$2s^2 2p^4(^3P)5d$	^2D	5/2	9 510 000	
$2s^2 2p^4(^3P)5d$	^2F	5/2	9 610 000	
$2s^2 2p^4(^3P)5d$	^2P	3/2	9 640 000	
$2s^2 2p^4(^1D)5d$	^2P	1/2,3/2	9 680 000	
$2s^2 2p^4(^1D)5d$	^2D	3/2	9 680 000	
$2s^2 2p^4(^1D)5d$	^2F	5/2	9 680 000	
$2s^2 2p^4(^3P)6d$	^2D	5/2	9 970 000	
$2s^2 2p^4(^1D)6d$	^2P	1/2	10 120 000	
$2s^2 2p^4(^1D)6d$	^2D	3/2	10 120 000	
Fe XIX ($^3P_2$)	***Limit***		**10 985 000**	
$1s2s^2 2p^6$	^2S	1/2	51 902 000	

Fe XIX

$Z=26$

O I isoelectronic sequence

Ground state: $1s^2 2s^2 2p^4\ {}^3P_2$

Ionization energy = 11 850 000±30 000 cm^{-1} (1469±4 eV)

All levels of the ground configuration except $^3P_0$ are determined from forbidden lines observed in solar flares. These transitions within the $2p^4$ configuration permit the determination of the levels with an uncertainty of 10 cm^{-1}. The transition $^3P_2$–$^3P_1$ at 1118.1±0.1 Å was reported by Doschek et al. (1975). The lines at 592.16 Å and 424.26 Å are classified as $^3P_2$–$^1D_2$ and $^3P_1$–$^1S_0$, respectively, by Widing (1978).

The value for the level $^3P_0$ of the ground configuration and those of the first excited configuration $2s2p^5$ were derived from the spectral observations of iron plasmas produced by high power laser pulses by Feldman, Doschek, Nagel, Behring, and Cohen (1973). They report a wavelength uncertainty of 0.003 Å. Fawcett, Galanti, and Peacock (1974) identified the transition from $2p^6\ {}^1S_0$ to $2s2p^5\ {}^1P_1^\circ$ at 115.42 Å.

Wavelengths in the range of 10–14 Å observed in a laser-produced plasma by Gordon, Hobby, and Peacock (1980a) were classified in the transition arrays $2p^4$–$2p^3 3s$, $2p^3 3d$, and $2p^3 4d$. A wavelength accuracy of 0.005 Å is reported, permitting an energy level accuracy of ±3000 cm^{-1}. Their calculated leading percentages in Jj and LS coupling appear in a Culham Laboratory Report (1980b).

The $2p^3 5d$ and $6d$ levels are from observations of exploding wires between 9 and 10 Å by Burkhalter et al. (1978). The uncertainty in their level values is ±30 000 cm^{-1}. Designations for these configurations are available only in LS coupling.

A position for the $1s2s^2 2p^5$ configuration of 52 138 000 cm^{-1} was obtained from the observation of Fe XIX by Lie and Elton (1971).

We derived the value for the ionization energy from the $2p^3(^4S)nd\ {}^3D_3$ series for $n=3$ to 5.

References

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

Doschek, G. A., Feldman, U. Dere, K. P., Sandlin, G. D., Van Hoosier, M. E. Brueckner, G. E., Purcell, J. D., and Tousey, R. (1975), Astrophys. J. **196**, L83.

Fawcett, B. C., Galanti, M., and Peacock, N. J. (1974), J. Phys. **B7**, 1149.

Feldman, U., Doschek, G. A., Nagel, D. J., Behring, W. E., and Cohen, L. (1973), Astrophys. J. **183**, L43.

Gordon, H., Hobby, M. G., and Peacock, N. J. (1980a), J. Phys. **B13**, 1985.

Gordon, H., Hobby, M. G., and Peacock, N. J. (1980b), Culham Laboratory Report No. CLM-P592, Abingdon, England.

Lie, T. N., and Elton, R. C. (1971), Phys. Rev. **A3**, 865.

Widing, K. G. (1978), Astrophys. J. **222**, 735.

Fe XIX

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$2s^2 2p^4$	^3P	2	0			
		0	75 296			
		1	89 413			
$2s^2 2p^4$	^1D	2	168 873			
$2s^2 2p^4$	^1S	0	325 118			
$2s2p^5$	$^3P^\circ$	2	*922 766*			
		1	*984 651*			
		0	*1 029 837*			
$2s2p^5$	$^1P^\circ$	1	*1 267 450*			
$2p^6$	^1S	0	2 133 900			
$2s^2 2p^3(^4S^\circ)3s$	$^3S^\circ$	1	*6 680 000*	81	8	$(^2P^\circ)\ {}^1P^\circ$
$2s^2 2p^3(^2D^\circ)3s$	$^3D^\circ$	2	*6 787 000*	64	17	$(^2P^\circ)\ {}^3P^\circ$
		1	*6 788 000*	76	13	$(^4S^\circ)\ {}^3S^\circ$
		3	*6 818 000*	99		
$2s^2 2p^3(^2D^\circ)3s$	$^1D^\circ$	2	*6 834 000*	75	22	$(^2D^\circ)\ {}^3D^\circ$

Fe XIX–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages			
$2s^2 2p^3(^2P^\circ)3s$	$^3P^\circ$	0	6 907 000	99			
		1	6 923 000	76		22	$(^2P^\circ)\ ^1P^\circ$
		2	6 970 000	72		12	$(^2D^\circ)\ ^3D^\circ$
$2s^2 2p^3(^2P^\circ)3s$	$^1P^\circ$	1	6 985 000	63		17	$(^2D^\circ)\ ^3D^\circ$
$2s^2 2p^3(^4S^\circ_{3/2})3d$	$(3/2,5/2)^\circ$	3	7 249 000	52	or	69	$(^4S^\circ)\ ^3D^\circ$
$2s^2 2p^3(^2D^\circ_{3/2})3d$	$(3/2,5/2)^\circ$	2	7 370 000	55	or	27	$(^2D^\circ)\ ^3P^\circ$
$2s^2 2p^3(^2D^\circ_{5/2})3d$	$(5/2,5/2)^\circ$	3	7 396 000	44	or	74	$(^2D^\circ)\ ^3D^\circ$
$2s^2 2p^3(^2D^\circ_{5/2})3d$	$(5/2,3/2)^\circ$	2	7 405 000	73	or	43	$(^2D^\circ)\ ^3D^\circ$
$2s^2 2p^3(^2D^\circ_{5/2})3d$	$(5/2,5/2)^\circ$	3	7 449 000	37	or	59	$(^2D^\circ)\ ^1F^\circ$
$2s^2 2p^3(^2P^\circ_{1/2})3d$	$(1/2,5/2)^\circ$	3	7 450 000	69	or	68	$(^2P^\circ)\ ^3F^\circ$
		2	7 468 000	62	or	31	$(^2P^\circ)\ ^3P^\circ$
$2s^2 2p^3(^2P^\circ_{3/2})3d$	$(3/2,3/2)^\circ$	2	7 554 000	57	or	32	$(^2P^\circ)\ ^3D^\circ$
		3	7 565 000	51	or	44	$(^2P^\circ)\ ^1F^\circ$
		1	7 567 000	48	or	33	$(^2P^\circ)\ ^3P^\circ$
$2s^2 2p^3(^2P^\circ_{3/2})3d$	$(3/2,5/2)^\circ$	1	7 606 000	55	or	68	$(^2P^\circ)\ ^1P^\circ$
$2s^2 2p^3(^4S^\circ_{3/2})4d$	$(3/2,5/2)^\circ$	2	9 242 000	68	or	76	$(^4S^\circ)\ ^3D^\circ$
		1	9 244 000	81	or	87	
		3	9 248 000	53	or	82	
$2s^2 2p^3(^2D^\circ_{3/2})4d$	$(3/2,3/2)^\circ$	3	9 359 000	37	or	36	$(^2D^\circ)\ ^3F^\circ$
$2s^2 2p^3(^2D^\circ_{3/2})4d$	$(3/2,5/2)^\circ$	2	9 374 000	70	or	41	$(^2D^\circ)\ ^3D^\circ$
$2s^2 2p^3(^2D^\circ_{5/2})4d$	$(5/2,3/2)^\circ$	3	9 383 000	62	or	71	$(^2D^\circ)\ ^3D^\circ$
		2	9 395 000	93	or	44	$(^2D^\circ)\ ^3D^\circ$
		1	9 403 000	57	or	62	$(^2D^\circ)\ ^3S^\circ$
$2s^2 2p^3(^2D^\circ_{5/2})4d$	$(5/2,5/2)^\circ$	3	9 417 000	64	or	77	$(^2D^\circ)\ ^1F^\circ$
		2	9 417 000	93	or	65	$(^2D^\circ)\ ^1D^\circ$
$2s^2 2p^3(^2P^\circ_{1/2})4d$	$(1/2,5/2)^\circ$	3	9 483 000	97	or	55	$(^2P^\circ)\ ^3F^\circ$
		2	9 492 000	99	or	45	$(^2P^\circ)\ ^3P^\circ$
$2s^2 2p^3(^2P^\circ_{1/2})4d$	$(1/2,3/2)^\circ$	1	9 494 000	97	or	56	$(^2P^\circ)\ ^3D^\circ$
$2s^2 2p^3(^2P^\circ_{3/2})4d$	$(3/2,3/2)^\circ$	3	9 552 000	72	or	39	$(^2P^\circ)\ ^1F^\circ$
		1	9 556 000	56	or	57	$(^2P^\circ)\ ^3P^\circ$
$2s^2 2p^3(^2P^\circ_{3/2})4d$	$(3/2,5/2)^\circ$	1	9 573 000	57	or	59	$(^2P^\circ)\ ^1P^\circ$
$2s^2 2p^3(^4S^\circ)5d$	$^3D^\circ$	3	10 190 000				
$2s^2 2p^3(^2D^\circ)5d$	$^3D^\circ$	2	10 330 000				
		3	10 330 000				
$2s^2 2p^3(^2D^\circ)5d$	$^1D^\circ$	2	10 360 000				
$2s^2 2p^3(^2D^\circ)5d$	$^1F^\circ$	3	10 390 000				

Fe XIX–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages
$2s^2 2p^3(^2D°)5d$	$^3F°$	3	*10 420 000*	
$2s^2 2p^3(^2P°)5d$	$^3D°$	1	*10 450 000*	
		3	*10 500 000*	
$2s^2 2p^3(^2P°)5d$	$^3F°$	3	*10 500 000*	
$2s^2 2p^3(^2P°)5d$	$^3P°$	1	*10 500 000*	
$2s^2 2p^3(^2P°)5d$	$^1F°$	3	*10 500 000*	
$2s^2 2p^3(^2P°)5d$	$^1P°$	1	*10 510 000*	
$2s^2 2p^3(^4S°)6d$	$^5D°$	2	*10 680 000*	
$2s^2 2p^3(^4S°)6d$	$^3D°$	3	*10 710 000*	
$2s^2 2p^3(^2P°)6d$	$^3D°$	1	*10 760 000*	
$2s^2 2p^3(^2D°)6d$	$^1F°$	3	*11 030 000*	
Fe XX ($^4S°_{3/2}$)	***Limit***		**11 850 000**	

Fe XX

$Z=26$

N I isoelectronic sequence

Ground state: $1s^2 2s^2 2p^3\ {}^4S^\circ_{3/2}$

Ionization energy = 12 708 000±4000 cm^{-1} (1582.0±0.5 eV)

The array $2s^2 2p^3$–$2s2p^4$ was identified in the range of 90–132 Å from spectra of a laser-produced plasma by Doschek, Feldman, Cowan, and Cohen (1974) and by Feldman, Doschek, Cowan, and Cohen (1975). Further classifications in the same wavelength region by Doschek, Feldman, Davis, and Cowan (1975) provided the $2p^5\ {}^2P^\circ$ term. These arrays were reobserved by Lawson and Peacock (1980) with improved accuracy of ±0.01 Å. They also identified intersystem transitions connecting the quartet and doublet levels. Their results are used here to obtain level values with an uncertainty of ±100 cm^{-1} for the $2s^2 2p^3$, $2s2p^4$ and $2p^5$ configurations.

A measurement of the $2s^2 2p^3\ {}^2D^\circ_{3/2}$–${}^2D^\circ_{5/2}$ transition at 2665 Å was obtained by Suckewer and Hinnov (1979) from a tokamak discharge.

Transition arrays between the ground configuration and $2p^2 3d$, $4d$, and $5d$ are analyzed in the report of Bromage et al. (1977) who used laser-produced plasma spectra observed in the range of 8–18 Å. The estimated wavelength accuracy is about 0.005 Å. The levels derived from their measurements have an uncertainty of ±3000 cm^{-1}. Bromage and Fawcett (1977) have given the leading percentages for the $2p^2 3d$ levels. Bogdanovich et al. calculated the leading percentages of the levels of the ground configuration, $2s^2 2p^3$, by the Hartree-Fock method.

The identification of the inner shell transitions giving the position of the $1s2s^2 2p^4$ configuration at 52 470 000 cm^{-1} was made by Lie and Elton (1971).

We derived the value for the ionization energy from the $2p^2(^1D)nd\ {}^2F$ series.

References

Bogdanovich, P. O., Bogdanovichene, M. I., Grudzinskas, I. I., Rudzikas, Z. B., Tutlis, V. I., and Shadsjuvene, S. D. On the theory of energy spectra of multielectron atoms and ions, Chapter 2 in Spectroscopy of Multiply Charged Ions, Moscow, Academy of Sciences USSR, 1980, (in Russian).

Bromage, G. E., Cowan, R. D., Fawcett, B. C., Gordon, H., Hobby, M. G., Peacock, N. J., and Ridgley, A. (1977), UKAEA Report CLMR 170, Culham Lab.

Bromage, G. E., and Fawcett, B.C. (1977), Mon. Not. R. Astr. Soc. **179**, 683.

Doschek, G. A., Feldman, U., Cowan, R. D., and Cohen, L. (1974), Astrophys. J. **188**, 417.

Doschek, G. A., Feldman, U., Davis, J., and Cowan, R.D. (1975), Phys. Rev. **A12**, 980.

Feldman, U., Doschek, G. A., Cowan, R. D., and Cohen, L. (1975), Astrophys. J. **196**, 613.

Lawson, K. D., and Peacock, N. J. (1980), J. Phys. **B13**, 3313.

Lie, T. N., and Elton, R. C. (1971) Phys. Rev. **A3**, 865.

Suckewer, S., and Hinnov, E. (1979), Phys. Rev. **A20**, 578.

Fe XX

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$2s^2 2p^3$	$^4S^\circ$	3/2	*0*	90	8	$^2P^\circ$
$2s^2 2p^3$	$^2D^\circ$	3/2	*138 270*	79	15	$^2P^\circ$
		5/2	*175 810*	100		
$2s^2 2p^3$	$^2P^\circ$	1/2	*260 090*	100		
		3/2	*323 180*	79	19	$^2D^\circ$
$2s\,2p^4$	^4P	5/2	752 730			
		3/2	820 820			
		1/2	842 740			
$2s\,2p^4$	^2D	3/2	1 042 210			
		5/2	1 058 130			
$2s\,2p^4$	^2S	1/2	1 194 850			
$2s\,2p^4$	^2P	3/2	1 242 080			
		1/2	1 339 680			
$2p^5$	$^2P^\circ$	3/2	*1 954 150*			
		1/2	*2 061 730*			

Fe xx–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages	
$2s^2 2p^2(^3P)3d$	^4P	$5/2$	7 802 000	54	29 ^4D
		$3/2$	7 802 000	77	
$2s^2 2p^2(^3P)3d$	^2F	$7/2$	7 820 000	40	28 ^4D
$2s^2 2p^2(^3P)3d$	^2D	$5/2$	7 843 000	65	14 $(^1D)\ ^2D$
		$3/2$	7 859 000	72	
$2s^2 2p^2(^1D)3d$	^2D	$5/2$	7 913 000	54	22 ^2F
		$3/2$	7 919 000	80	
$2s^2 2p^2(^1D)3d$	^2F	$7/2$	7 935 000	41	41 $(^3P)\ ^2F$
		$5/2$	7 983 000	31	30 $(^3P)\ ^2D$
$2s^2 2p^2(^1D)3d$	^2P	$3/2$	7 967 000	73	11 $(^3P)\ ^2P$
$2s^2 2p^2(^1S)3d$	^2D	$5/2$	8 047 000	86	
$2s^2 2p^2(^3P)4d$	^4P	$5/2$	9 880 000		
		$3/2$	10 009 000		
		$1/2$	10 009 000		
$2s^2 2p^2(^3P)4d$	^4F	$5/2$	9 942 000		
$2s^2 2p^2(^3P)4d$	^2F	$5/2$	9 964 000		
		$7/2$	10 019 000		
$2s^2 2p^2(^3P)4d$	^4D	$5/2$	9 992 000		
$2s^2 2p^2(^3P)4d$	^2D	$5/2$	10 019 000		
		$3/2$	10 043 000		
$2s^2 2p^2(^1D)4d$	^2D	$3/2$	10 130 000		
		$5/2$	10 142 000		
$2s^2 2p^2(^1D)4d$	^2G	$7/2$	10 142 000		
$2s^2 2p^2(^1D)4d$	^2F	$5/2$	10 149 000		
$2s^2 2p^2(^1D)4d$	^2P	$3/2$	10 149 000		
$2s^2 2p^2(^1S)4d$	^2D	$3/2$	10 269 000		
		$5/2$	10 289 000		
$2s^2 2p^2(^3P)5d$	^4P	$5/2$	10 930 000		
		$3/2$	11 048 000		
		$1/2$	11 048 000		
$2s^2 2p^2(^3P)5d$	^4F	$5/2$	10 994 000		
$2s^2 2p^2(^3P)5d$	^2F	$5/2$	10 998 000		
		$7/2$	11 047 000		
$2s^2 2p^2(^3P)5d$	^2D	$5/2$	11 036 000		
$2s^2 2p^2(^3P)5d$	^4D	$5/2$	11 048 000		
$2s^2 2p^2(^1D)5d$	^2G	$7/2$	11 153 000		

Fe XX–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages
$2s^2 2p^2(^1D)5d$	^2D	$5/2$	11 153 000	
		$3/2$	11 160 000	
$2s^2 2p^2(^1D)5d$	^2F	$5/2$	11 169 000	
$2s^2 2p^2(^1D)5d$	^2P	$3/2$	11 169 000	
Fe XXI ($^3P_0$)	*Limit*		**12 708 000**	

Fe XXI

$Z=26$

C I isoelectronic sequence

Ground state: $1s^2 2s^2 2p^2\ ^3P_0$

Ionization energy = 13 620 000±30 000 cm^{-1} (1689±4 eV)

Identifications of transitions in the $2s^2 2p^2$–$2s2p^3$ array were reported by Feldman et al. (1975) in the region 91–121 Å. Kononov et al. (1976) extended the analysis and found transitions from $2p^4$, but reported no intersystem lines. Lawson and Peacock (1980) remeasured this spectrum and found the connection among all the terms. Their results, accurate to about ±50 cm^{-1}, are used here. The wavelengths of these groups fall in the range of 84 Å–182 Å.

The $2s^2 2p^2\ ^3P$ splittings are obtained from forbidden transitions within the ^3P term. The $^3P_0$–$^3P_1$ interval is derived from a solar line at 1354.1±0.1 Å observed by Doschek et al. (1975) from Skylab. Hinnov and Suckewer reported privately the observations of the $^3P_1$–$^3P_2$ transition at 2298.0±0.3 Å (in air) using the PLT tokamak. Thus the level values of the ground term have an uncertainty of ±6 cm^{-1}.

Boiko, Faenov, and Pikuz (1978), using their measurements and the predictions of Fawcett and Hayes (1975), give the levels $^3D^\circ_3$ and $^1F^\circ_3$ of the $2p3d$ configuration. Bromage and Fawcett (1977) add the rest of the levels given here. The $^3F_4$ level of $2s2p^2 3d$ is from Boiko et al.

The transitions $2p^2 - 2p4d$, $2p5d$ in the range of 8.5 Å–9.5 Å were observed by Bromage et al. (1977). Their classifications provide the levels of $2p4d$ and $2p5d$ included here with an uncertainty of ± 6000 cm^{-1}.

The resonance line reported by Lie and Elton (1971) at 1.896 Å arising from the $1s2s^2 2p^3$ configuration was resolved into three components by Feldman, Doschek, and Kreplin (1980), each classified as a blend of three lines. A center of gravity value for the configuration is about 52 910 000 cm^{-1}.

The ionization energy is from Lotz (1967).

References

Boiko, V. A., Faenov, A. Y., and Pikuz, S. A., (1978), J. Quant. Spect. Radiat. Transfer **19**, 11.

Bromage, G. E., Cowan, R. D., Fawcett, B. C., Gordon, H., Hobby, M. G., Peacock, N. J., and Ridgeley, A. (1977), UKAEA Report CLMR170, Culham Lab.

Bromage, G. E., and Fawcett, B. C. (1977), Mon. Not. R. Astron. Soc. **178**, 605.

Doschek, G. A., Feldman, U., Dere, K. P., Sandlin, G. D., Van Hoosier, M. E., Brueckner, G. E., Purcell, J. D., and Tousey, R. (1975), Astrophys. J. **196**, L83.

Fawcett, B. C., and Hayes, R. W. (1975), Mon. Not. R. Astron. Soc. **175**, 185.

Feldman, U., Doschek, G. A., Cowan, R. D., and Cohen, L. (1975), Astrophys. J. **196**, 613.

Feldman, U., Doschek, G. A., and Kreplin, R. W. (1980), Astrophys. J. **238**, 365.

Kononov, E. Y., Koshelev, K. N., Podobedova, L. I., Chekalin, S. V., and Churilov, S. S. (1976), J. Phys. **B9**, 565.

Lawson, K. D., and Peacock, N. J. (1980), J. Phys. **B13**, 3313.

Lie, F. N., and Elton, R. C. (1971), Phys. Rev. **3**, 865.

Lotz, W. (1967), J. Opt. Soc. Am. **57**, 873.

Fe XXI

Configuration	Term	J	Level (cm^{-1})
$2s^2 2p^2$	^3P	0	0
		1	73 850
		2	117 350
$2s^2 2p^2$	^1D	2	244 030
$2s^2 2p^2$	^1S	0	371 520
$2s2p^3$	$^5S^\circ$	2	*487 000*
$2s2p^3$	$^3D^\circ$	1	*776 780*
		2	*777 280*
		3	*803 930*
$2s2p^3$	$^3P^\circ$	0	*916 380*
		1	*924 900*
		2	*942 320*
$2s2p^3$	$^3S^\circ$	1	*1 095 520*

Fe XXI–Continued

Configuration	Term	J	Level (cm^{-1})
$2s2p^3$	$^1D°$	2	*1 126 640*
$2s2p^3$	$^1P°$	1	*1 260 650*
$2p^4$	^3P	2	1 646 290
		0	1 735 690
		1	1 740 420
$2p^4$	^1D	2	1 817 240
$2p^4$	^1S	0	2 047 800
$2s^2 2p3d$	$^1D°$	2	*8 098 000*
$2s^2 2p3d$	$^3D°$	2	*8 187 400*
		3	*8 211 800*
$2s^2 2p3d$	$^3P°$	2	*8 230 800*
$2s^2 2p3d$	$^1P°$	1	*8 293 600*
$2s^2 2p3d$	$^1F°$	3	*8 300 700*
$2s2p^2(^4P)3d$	^3F	4	8 669 100
$2s^2 2p4d$	$^3F°$	3	*10 554 000*
$2s^2 2p4d$	$^3P°$	2	*10 580 000*
		1	*10 688 000*
$2s^2 2p4d$	$^3D°$	1	*10 581 000*
		2	*10 655 000*
		3	*10 688 000*
$2s^2 2p4d$	$^1D°$	2	*10 675 000*
$2s^2 2p4d$	$^1F°$	3	*10 681 000*
$2s^2 2p5d$	$^3D°$	3	*11 802 000*
$2s^2 2p5d$	$^3P°$	1	*11 810 000*
$2s^2 2p5d$	$^1D°$	2	*11 810 000*
$2s^2 2p5d$	$^1F°$	3	*11 814 000*
Fe XXII ($^2P°_{1/2}$)	*Limit*		**13 620 000**

Fe XXII

$Z=26$

B I isoelectronic sequence

Ground state: $1s^22s^22p\ ^2P^\circ_{1/2}$

Ionization energy = 14 510 000±30 000 cm^{-1} (1799±4 eV)

Spectra in the range of 100–160 Å arising from transitions among configurations $2s^22p$, $2s2p^2$ and $2p^3$ were analyzed by Kononov et al. (1976). New measurements and some corrections to $2p^3$ were made by Lawson and Peacock (1980), whose wavelengths appear to be uncertain by ±0.01 Å, corresponding to a level uncertainty of ±50 cm^{-1}. The results of Lawson and Peacock are used below. They have identified the intersystem line $2s2p^2\ ^4P_{5/2}$–$2p^3\ ^2D^\circ_{5/2}$ at 109.53 Å. Sandlin, Brueckner, Scherrer, and Tousey (1976) identified the intersystem multiplet $2s^22p\ ^2P^\circ$–$2s2p^2\ ^4P$ from solar flare data which predicts the value 109.45±0.03 Å for the line of Lawson and Peacock. We adopt the Lawson and Peacock value.

Bromage, Cowan, Fawcett, and Ridgeley (1978) using the wavelength measurements of Boiko, Faenov, and Pikuz (1978) in the region of 9–12 Å and Hartree-Fock calculations, classified spectra arising from the transition arrays $2s^22p$–$2s^23d$, $2s^22p$–$2s2p3p$, $2s2p^2$–$2s2p3d$, and $2s2p^2-2s2p4d$. The uncertainty in the level values derived from these data is ± 2000 cm^{-1}.

Exploding wire spectra were analyzed by Burkhalter et al. (1978), who reported the observation of the $2s^22p\ ^2P^\circ$–$2s^24d\ ^2D$ and $2s^22p\ ^2P^\circ$–$2s^24s\ ^2S$ lines at 9 Å measured with an uncertainty of ±0.03 Å.

The transition array $1s^22s^22p - 1s2s^22p^2$ was measured in solar flare spectra at ~1.8 Å by Feldman, Doschek, and Kreplin (1980) and an uncertainty of ±0.0005 Å was given. The level accuracy is ±14 000 cm^{-1}.

The ionization energy is from the isoelectronic extrapolation by Lotz (1967).

References

Boiko, V. A., Faenov, A. Y., and Pikuz, S. A. (1978), J. Quant. Spectrosc. Radiat. Transfer **19**, 11.

Bromage, G. E., Cowan, R. D., Fawcett, B. C., and Ridgeley, A. (1978), J. Opt. Soc. Am. **68**, 48.

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

Feldman, U., Doschek, G. A., and Kreplin, R. W. (1980), Astrophys. J. **238**, 365.

Kononov, E. Y., Koshelev, K. N., Podobedova, L. I., Chekalin, S. V., and Churilov, S. S. (1976), J. Phys. **B9**, 565.

Lawson, K. D., and Peacock, N. J. (1980), J. Phys. **B13**, 3313.

Lotz, W. (1967), J. Opt. Soc. Am. **57**, 873.

Sandlin, G. D., Brueckner, G. E., Scherrer, V. E., and Tousey, R. (1976), Astrophys. J. **205**, L 47.

Fe XXII

Configuration	Term	J	Level (cm^{-1})
$1s^2\,2s^2\,2p$	$^2P^\circ$	1/2	*0*
		3/2	*118 260*
$1s^2\,2s2p^2$	^4P	1/2	405 590
		3/2	461 030
		5/2	513 840
$1s^2\,2s2p^2$	^2D	3/2	736 490
		5/2	759 560
$1s^2\,2s2p^2$	^2S	1/2	853 460
$1s^2\,2s2p^2$	^2P	1/2	978 200
		3/2	992 260
$1s^2\,2p^3$	$^4S^\circ$	3/2	*1 256 510*
$1s^2\,2p^3$	$^2D^\circ$	3/2	*1 396 380*
		5/2	*1 426 830*
$1s^2\,2p^3$	$^2P^\circ$	1/2	*1 569 610*
		3/2	*1 627 680*
$1s^2\,2s^2\,3d$	^2D	3/2	8 498 000
		5/2	8 507 000

Fe XXII–Continued

Configuration	Term	J	Level (cm^{-1})
$1s^2 2s2p3p$	^{2}P	1/2	8 584 000
		3/2	8 688 000
$1s^2 2s2p3p$	^{2}D	3/2	8 740 000
		5/2	8 845 000
$1s^2 2s2p(^3P^\circ)3d$	^{4}F°	7/2	*8 864 000*
$1s^2 2s2p(^3P^\circ)3d$	^{4}P°	5/2	*8 874 000*
		3/2	*8 972 000*
		1/2	*8 973 000*
$1s^2 2s2p(^3P^\circ)3d$	^{4}D°	3/2	*8 882 000*
		1/2	*8 888 000*
		7/2	*8 962 000*
		5/2	*8 973 000*
$1s^2 2s2p(^3P^\circ)3d$	^{2}D°	5/2	*8 938 000*
$1s^2 2s2p(^3P^\circ)3d$	^{2}P°	1/2	*8 967 000*
		3/2	*9 180 000*
$1s^2 2s2p(^3P^\circ)3d$	^{2}F°	5/2	*9 030 000*
		7/2	*9 062 000*
$1s^2 2s2p(^1P^\circ)3d$	^{2}D°	3/2	*9 134 000*
		5/2	*9 272 000*
$1s^2 2s2p(^1P^\circ)3d$	^{2}P°	3/2	*9 168 000*
$1s^2 2s2p(^1P^\circ)3d$	^{2}F°	7/2	*9 242 000*
		5/2	9 249 000
$1s^2 2s^2 4s$	^{2}S	1/2	11 050 000
$1s^2 2s^2 4d$	^{2}D	5/2	11 149 000
		3/2	11 161 000
$1s^2 2s2p(^3P^\circ)4d$	^{4}F°	5/2	*11 492 000*
$1s^2 2s2p(^3P^\circ)4d$	^{4}D°	3/2	*11 526 000*
		5/2	*11 618 000*
		7/2	*11 618 000*
$1s^2 2s2p(^3P^\circ)4d$	^{2}F°	5/2	*11 558 000*
		7/2	*11 900 000*
$1s^2 2s2p(^3P^\circ)4d$	^{2}D°	5/2	*11 611 000*
$1s^2 2s2p(^1P^\circ)4d$	^{2}F°	7/2	*11 649 000*
		5/2	*11 897 000*
$1s^2 2s2p(^1P^\circ)4d$	^{2}D°	5/2	*11 906 000*

Fe XXII–Continued

Configuration	Term	J	Level (cm^{-1})
Fe XXIII ($^1S_0$)	***Limit***		**14 510 000**
$1s2s^2 2p^2$	^2P	$1/2$	53 122 000
		$3/2$	53 242 000
$1s2s^2 2p^2$	^2D	$3/2$	53 124 000
		$5/2$	53 166 000
$1s2s^2 2p^2$	^2S	$1/2$	53 327 000

Fe XXIII

$Z=26$

Be I isoelectronic sequence

Ground state: $1s^2 2s^2\ ^1S_0$

Ionization energy = 15 797 000±30 000 cm^{-1} (1958.6±3.7 eV)

The $2s^2$–$2s2p$ and $2s2p$–$2p^2$ arrays in the range of 132–180 Å classified by Lawson and Peacock (1980) establish all the levels of these configurations with an uncertainty of 50 cm^{-1}. The percentage compositions of the $2s^2$, $2s2p$, and $2p^2$ configurations with mixing of $2s^2$ and $2p^2$ were calculated by Scott and Burke (1980). We give the two leading percentages.

Laser produced spectra of iron in the range of 6–17 Å arising from *L*-shell excitations were reported by Boiko, Faenov, and Pikuz (1978) with an accuracy of 0.001–0.003 Å. Their classification of a group of these lines with levels of Fe XXIII was revised and extended by Bromage, Cowan, Fawcett, and Ridgeley (1978), who obtained the spectra with improved ionization discrimination. They made new calculations of the energy level structure and used the wavelengths of Boiko, Pikuz, and Faenov (distributed in 1976 in report form). The classifications by Bromage et al. are used to determine the levels of the $2snp$, $2snd$, $2pnp$, and $2pnd$ configurations ($n=3$–5) with an uncertainty of ±5000 cm^{-1}. They also gave percentage compositions for only the highly mixed levels of this group. The $2s3s$ and $2p3s$ levels were given only by Boiko et al.

Spectral lines at ~1.8 Å were identified in the $1s^2 2s2p$–$1s2s2p^2$ array by Kononov, Koshelev, and Sidelnikov (1977). The complete designations are given by Safronova and Lisina (1979). The line at 1.8704 Å was assigned to $1s^2 2s^2\ ^1S_0$–$1s2s^2 2p\ ^1P^\circ_1$ by Feldman, Doschek, and Kreplin (1980). The uncertainty of these level values is about ±10 000 cm^{-1}.

We obtained an average value of 15 797 000±30 000 cm^{-1} for the ionization energy from the $2snp\ ^1P^\circ_1$ and the $2snd\ ^1D_2$ series.

References

Boiko, V. A., Faenov, A. Y., and Pikuz, S. A. (1978), J. Quant. Spectrosc. Radiat. Transfer **19**, 11.

Bromage, G. E., Cowan, R. D., Fawcett, B. C., and Ridgeley, A. (1978), J. Opt. Soc. Am. **68**, 48.

Feldman, U., Doschek, G. A., and Kreplin, R. W. (1980), Astrophys. J. **238**, 365.

Kononov, E. Y., Koshelev, K. N., and Sidelnikov, Y. V. (1977), Sov. J. Plasma Phys. **3**, 375.

Lawson, K. D., and Peacock, N. J. (1980), J. Phys. **B13**, 3313.

Safronova, U. I., and Lisina, T. G. (1979), At. Data Nucl. Data Tables **24**, 49.

Scott, N. S., and Burke, P. G. (1980), J. Phys. **B13**, 4299.

Fe XXIII

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$1s^2 2s^2$	^1S	0	0	96	4	$2p^2\ ^1S$
$1s^2 2s2p$	$^3P^\circ$	0	*348 230*	100		
		1	*379 180*	96	2	$^1P^\circ$
		2	*472 150*	100		
$1s^2 2s2p$	$^1P^\circ$	1	*752 780*	96	2	$^3P^\circ$
$1s^2 2p^2$	^3P	0	956 180	94	6	^1S
		1	1 027 390	100		
		2	1 071 890	76	24	^1D
$1s^2 2p^2$	^1D	2	1 204 590	76	24	^3P
$1s^2 2p^2$	^1S	0	1 422 900	90	6	^3P
$1s^2 2s3s$	^3S	1	8 894 000			
$1s^2 2s3p$	$^3P^\circ$	1	*9 076 000*	70	29	$^1P^\circ$
$1s^2 2s3p$	$^1P^\circ$	1	*9 107 000*	64	30	$^3P^\circ$

Fe XXIII–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages
$1s^2 2s3d$	^{3}D	1	9 199 000	
		2	9 209 000	
		3	9 212 000	
$1s^2 2p3s$	^{3}P°	0	*9 295 000*	
$1s^2 2s3d$	^{1}D	2	9 273 000	
$1s^2 2p3p$	^{3}D	1	9 455 000	
		2	9 524 000	
		3	9 624 000	
$1s^2 2p3s$	^{1}P°	1	*9 470 000*	
$1s^2 2p3d$	^{3}F°	3	*9 625 000*	
$1s^2 2p3d$	^{3}D°	1	*9 637 000*	
		3	*9 749 000*	
$1s^2 2p3d$		2	*9 728 000*	35 ^{3}P° 29 ^{3}D°
$1s^2 2p3d$	^{1}D°	2	*9 638 000*	46 29 ^{3}D°
$1s^2 2p3p$	^{3}P	2	9 644 000	
$1s^2 2p3p$	^{1}D	2	9 709 000	
$1s^2 2p3d$	^{3}P°	2	*9 753 000*	54 40 ^{3}D°
$1s^2 2s3s$	^{1}S	0	9 783 000	
$1s^2 2p3d$	^{1}P°	1	*9 828 000*	
$1s^2 2p3d$	^{1}F°	3	*9 830 000*	
$1s^2 2s4p$	^{1}P°	1	*12 044 000*	
$1s^2 2s4d$	^{3}D	1	12 073 000	
		2	12 075 000	
		3	12 081 000	
$1s^2 2s4d$	^{1}D	2	12 098 000	
$1s^2 2p4d$		2	*12 481 000*	44 ^{3}P° 35 ^{3}D°
$1s^2 2p4d$	^{3}D°	1	*12 488 000*	
		3	*12 603 000*	
$1s^2 2p4d$	^{3}F°	3	*12 484 000*	
$1s^2 2p4p$	^{3}D	3	12 560 000	
$1s^2 2p4d$	^{1}D°	2	*12 597 000*	56 21 ^{3}D°
$1s^2 2p4d$	^{3}P°	2	*12 614 000*	50 42 ^{3}D°
		1	*12 615 000*	
$1s^2 2p4d$	^{1}F°	3	*12 631 000*	

Fe XXIII–Continued

Configuration	Term	*J*	Level (cm^{-1})	Leading percentages
$1s^2 2s5d$	^{3}D	1	13 369 000	
		2	13 400 000	
		3	13 404 000	
$1s^2 2s5p$	^{1}P°	1	*13 383 000*	
$1s^2 2s5d$	^{1}D	2	13 438 000	
$1s^2 2p5d$	^{3}F°	3	*13 804 000*	
$1s^2 2p5d$	^{3}D°	2	*13 805 000*	
		3	*13 929 000*	
$1s^2 2p5p$	^{3}D	3	13 904 000	
$1s^2 2p5d$	^{1}D°	2	*13 922 000*	
$1s^2 2p5d$	^{1}F°	3	*13 945 000*	
Fe XXIV ($^2S_{1/2}$)	***Limit***		**15 797 000**	
$1s2s^2 2p$	^{1}P°	1	*53 464 000*	
$1s(^2S)2s2p^2(^4P)$	^{3}P	0	53 707 000	
$1s(^2S)2s2p^2(^2D)$	^{3}D	1	53 800 000	
$1s(^2S)2s2p^2(^2S)$	^{3}S	1	53 925 000	
$1s(^2S)2s2p^2(^2D)$	^{1}D	2	54 045 000	
$1s(^2S)2s2p^2(^2P)$	^{1}P	1	54 182 000	
$1s(^2S)2s2p^2(^2S)$	^{1}S	0	54 252 000	

Fe XXIV

$Z=26$

Li I isoelectronic sequence

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

Ionization energy = 16 500 000±4000 cm^{-1} (2045.8±0.5 eV)

The $2s$–$2p$ transitions have been observed with an uncertainty of ±0.02 Å at 192.04 and 255.10 Å in solar flares from Skylab as reported by Widing and Purcell (1976).

The transitions to $n=2$ from $n=3$ and 4 were observed by Fawcett, Ridgeley, and Hughes (1979) between 8 and 11 Å by means of a laser-produced plasma. We used their results but substituted for their blended lines the more accurate predicted wavelengths of Edlén (1979) for $2p$–$3s$ and $2p$–$4s$ transitions. Fawcett et al. report a wavelength accuracy of better than 0.001 Å.

The $1s^2np$ and $1s^2nd$ levels with $n>4$ are from the observations of Boiko, Faenov, and Pikuz (1978) at ~7 Å with a laser-produced plasma. They report a measurement uncertainty of ±0.003 Å.

The levels above the ionization energy are from the analysis by Kononov, Koshelev, and Sidelnikov (1977). They obtained the spectrum at ~1.8 Å from the x-ray emitting hot spot in a low inductance spark discharge with a measurement uncertainty of ±0.0003 Å. The designations are obtained from Vainstein and Safronova (1978). Klapisch et al. (1977) reported two resonance lines from the $1s2s3p$ configuration.

The ionization energy was calculated by Edlén (1979).

References

Boiko, V. A., Faenov, A. Y., and Pikuz, S. A. (1978), J. Quant. Spectrosc. Radiat. Transfer **19**, 11.

Edlén, B. (1979), Phys. Scr. **19**, 255.

Fawcett, B. C., Ridgeley, A., and Hughes, T. P. (1979), Mon. Not. R. Astron. Soc. **188**, 365.

Klapisch, M., Schwob, J. L., Fraenkel, B. S., and Oreg. J. (1977), J. Opt. Soc. Am. **67**, 148.

Kononov, E. Y., Koshelev, K. N., and Sidelnikov, Y. V. (1977), Sov. J. Plasma Phys. **3**, 375.

Vainstein, L. A., and Safronva, U. I. (1978), At. Data Nucl. Data Tables **21**, 49.

Widing, K. G., and Purcell, J. D. (1976), Astrophys. J. **204**, L151.

Fe XXIV

Configuration	Term	J	Level (cm^{-1})
$1s^2 2s$	^2S	1/2	0
$1s^2 2p$	$^2P°$	1/2	*392 000*
		3/2	*520 720*
$1s^2 3s$	^2S	1/2	9 271 700
$1s^2 3p$	$^2P°$	1/2	*9 379 000*
		3/2	*9 416 000*
$1s^2 3d$	^2D	3/2	9 460 000
		5/2	9 470 000
$1s^2 4s$	^2S	1/2	12 464 000
$1s^2 4p$	$^2P°$	1/2	*12 513 000*
		3/2	*12 525 000*
$1s^2 4d$	^2D	3/2	12 541 000
		5/2	12 546 000
$1s^2 5p$	$^2P°$	1/2,3/2	*13 949 000*
$1s^2 5d$	^2D	3/2	13 961 000
		5/2	13 965 000
$1s^2 6p$	$^2P°$	1/2,3/2	*14 734 000*

Fe XXIV–Continued

Configuration	Term	J	Level (cm^{-1})
$1s^2 6d$	^2D	3/2 5/2	*14 735 000* 14 739 000
$1s^2 7p$	$^2P°$	1/2,3/2	*15 188 000*
$1s^2 7d$	^2D	3/2,5/2	15 209 000
Fe XXV ($^1S_0$)	***Limit***		**16 500 000**
$1s(^2S)2s2p(^3P°)$	$^4P°$	3/2	*53 390 000*
$1s(^2S)2s2p(^1P°)$	$^2P°$	1/2 3/2	*53 657 000* *53 752 000*
$1s2p^2$	^4P	1/2 3/2 5/2	53 806 000 53 877 000 53 937 000
$1s(^2S)2s2p(^3P°)$	$^2P°$	1/2 3/2	*53 844 000* *53 903 000*
$1s2p^2$	^2D	3/2 5/2	54 070 000 54 126 000
$1s2p^2$	^2P	1/2 3/2	54 077 000 54 244 000
$1s2p^2$	^2S	1/2	54 385 000
$1s2s(3s_1)3p$	(1,1/2)°	1/2	*62 790 000*
$1s2s(1s_0)3p$	(0,1/2)°	1/2	*62 970 000*
$1s2p3s$	$^2P°$	3/2	*63 209 000*
$1s2p(^3P°)3d$	$^4D°$	3/2	*63 281 000*
$1s2p3p$	^2D	5/2	63 543 000
$1s2p3p$	^2S	1/2	63 572 000
$1s2p3d$	$^2F°$	7/2	*63 618 000*

Fe XXV

$Z=26$

He I isoelectronic sequence

Ground state: $1s^2\ ^1S_0$

Ionization energy = 71 203 200±2000 cm^{-1} (8828.14±0.25 eV)

Safronova (1981) has calculated the term values for the levels of this ion for $n=1$ and 2, taking into account the leading relativistic and radiative corrections. We have used her results, with an exception noted below, since they are at present probably more accurate than the measurements of the resonance lines occuring at ~1 Å. No estimate of uncertainty is made by Safronova. Her level uncertainty is probably about ±2000 cm^{-1}. Kononov, Koshelev, and Sidelnikov (1977) have measured the wavelengths of the $1s^2$–$1s2p\ ^1P_1^\circ$ and $^3P_1^\circ$ transitions with an estimated uncertainty of $\pm3\times10^{-4}$ Å. Their values are 1.8510 Å and 1.8592 Å respectively, compared with calculated values of 1.85048 Å and 1.85945 Å. A beam foil observation of the $1s2s\ ^3S_1$–$1s2p\ ^3P_2^\circ$ line by Buchet et al. (1981) gave a wavelength of 271.02±0.09 Å. The calculated value by Safronova is 270.929 Å. A *new calculation of* $1s2s\ ^3S_1$–$1s2p\ ^3P_{0,2}^\circ$ by DeSerio (1981) gives the values 428.594 Å and 271.350 Å for these transitions. We use the experimental value for the $^3S_1$–$^3P_2^\circ$ transition by Buchet et al. to set the value of $1s2p\ ^3P_2^\circ$ relative to $1s2s\ ^3S_1$.

For $n=3$ to 5 we give the calculated levels by Ermolaev and Jones (1974). These are obtained by subtracting their binding energies for the excited states from the binding energy of the ground state obtained by Safronova. The radiative corrections are reduced considerably with increasing n, which should bring the two calculations into closer agreement for $n>2$. Resonance transitions from $1s3p\ ^{1,3}P_1^\circ$ were observed by Klapisch et al. (1977) at 1.5738 Å and 1.5755 Å. Values from the present calculated levels are 1.5732 Å and 1.5750 Å.

The mixing coefficients for the $1snp\ ^{1,3}P$ levels were obtained from Ermolaev and Jones.

References

Buchet, J. P., Buchet-Poulizac, M. C., Denis, A., Desesquelles, J., and Druetta, M. (1981), Phys. Rev. **A23**, 3354.

DeSerio, R. (1981), Ph.D. Dissertation "The 2s–2p transitions in helium-like silicon, sulphur, and chlorine," Dept. of Physics, University of Chicago, Chicago, IL.

Ermolaev, A. M., and Jones, M. (1974), J. Phys. **B7**, 199.

Kononov, E. Y., Koshelev, K. N., and Sidelnikov, Y. V. (1977), Sov. J. Plasma Phys. **3**, 375.

Klapisch, M., Schwob, J. L., Fraenkel, B. S., and Oreg, J. (1977), J. Opt. Soc. Am. **67**, 148.

Safronova, U. I. (1981), Phys. Scr. **23**, 241.

Fe XXV

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
$1s^2$	^1S	0	0			
1s2s	^3S	1	[53 527 100]			
1s2p	$^3P^\circ$	0	*[53 760 300]*			
		1	*[53 779 200]*	91	9	$^1P^\circ$
		2	*[53 896 100]*			
1s2s	^1S	0	[53 781 300]			
1s2p	$^1P^\circ$	1	*[54 040 000]*	91	9	$^3P^\circ$
1s3s	^3S	1	[63 421 600]			
1s3p	$^3P^\circ$	0	*[63 486 300]*			
		1	*[63 490 700]*	89	11	$^1P^\circ$
		2	*[63 525 700]*			
1s3s	^1S	0	[63 488 400]			
1s3p	$^1P^\circ$	1	*[63 565 500]*	89	11	$^3P^\circ$
1s4s	^3S	1	[66 847 000]			

Fe XXV–Continued

Configuration	Term	J	Level (cm^{-1})	Leading percentages		
1s4p	$^3P^\circ$	0	[*66 874 000*]			
		1	[*66 875 800*]	89	11	$^1P^\circ$
		2	[*66 890 600*]			
1s4s	^1S	0	[66 874 100]			
1s4p	$^1P^\circ$	1	[*66 906 800*]	89	11	$^3P^\circ$
1s5s	^3S	1	[68 423 700]			
1s5s	^1S	0	[68 437 200]			
1s5p	$^3P^\circ$	0	[*68 437 300*]			
		1	[*68 438 200*]	89	11	$^1P^\circ$
		2	[*68 445 800*]			
1s5p	$^1P^\circ$	1	[*68 454 000*]	89	11	$^3P^\circ$
Fe XXVI ($^2S_{1/2}$)	***Limit***		**71 203 200**			

Fe XXVI

$Z=26$

H I isoelectronic sequence

Ground state: $1s\ ^2S_{1/2}$

Ionization energy = 74 828 700±300 cm^{-1}(9277.65±0.04 eV)

The theoretical values calculated by Erikson for terms of this hydrogen-like ion are given below through $n=5$. The binding energy of the 1*s* electron is reported with an uncertainty of ±300 cm^{-1}; the levels measured from the ground state taken as zero will also have this uncertainty, although relative values should be better.

Lie and Elton (1971) observed the $1s-2p$ transition at 56 210 000 ± 160 000 cm^{-1} by using a spark discharge.

References

Erikson, G. W. (1977), J. Phys. Chem. Ref. Data **6**, 831.
Lie, T. N., and Elton, R. C. (1971), Phys. Rev. **A3**, 865.

Fe XXVI

Configuration	Term	*J*	Level (cm^{-1})
1*s*	^2S	1/2	0
2*p*	$^2P°$	1/2	[*56 070 500*]
		3/2	[*56 241 580*]
2*s*	^2S	1/2	[56 075 220]
3*p*	$^2P°$	1/2	[*66 510 790*]
		3/2	[*66 561 520*]
3*s*	^2S	1/2	[66 512 210]
3*d*	^2D	3/2	[66 561 420]
		5/2	[66 578 050]
4*p*	$^2P°$	1/2	[*70 157 890*]
		3/2	[*70 179 270*]
4*s*	^2S	1/2	[70 158 490]
4*d*	^2D	3/2	[70 179 240]
		5/2	[70 186 250]
4*f*	$^2F°$	5/2	[*70 186 240*]
		7/2	[*70 189 740*]
5*p*	$^2P°$	1/2	[*71 843 000*]
		3/2	[*71 853 940*]
5*s*	^2S	1/2	[71 843 310]
5*d*	^2D	3/2	[71 853 920]
		5/2	[71 857 510]
5*f*	$^2F°$	5/2	[*71 857 500*]
		7/2	[*71 859 300*]
5*g*	^2G	7/2	[71 859 290]
		9/2	[71 860 360]
	Limit		**74 828 700**