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A Theoretical Investigation of the Configurations $(3d+4s)^7 4p$ in Neutral Iron

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Experimental levels of the configurations $(3d+4s)^7 4p$ were compared with corresponding calculated values. On fitting 248 experimental levels by means of 20 free parameters an rms error of 213 cm^{-1} was obtained.

It was shown that the correction parameters β and T were not significant.

Key words: Arc spectrum; configurations $(3d+4s)^7 4p$; configuration interactions; energy levels; g-factors; iron.

1. Introduction

Theoretical investigations of odd configurations for trebly and doubly ionized atoms of the iron group were performed by the author [1−4].[1,2]

The configurations $(3d+4s)^n 4p$ were considered previously for the arc spectra of calcium, scandium, titanium, vanadium, chromium, manganese, and copper [5−12].

The configurations $(d+s)^7 p$ comprise 272 terms splitting into 684 levels. In AEL [13], 72 terms splitting into 223 levels are assigned to the configurations $3d^7 4p + 3d^6 4s 4p + 3d^5 4s^2 4p$, 17 terms splitting into 32 levels are given without configuration assignments and 12 unclassified odd levels have no term designations.

As for Mn I [12], the initial values for the parameters[3] B, B', C, C' and α were obtained by linear extrapolation from the results of the other neutral spectra. Then initially for Fe I

$$\begin{aligned} B &= 800 \\ B' &= 930 \\ C &= 3160 \\ C' &= 3430 \\ \alpha = \alpha' &= 83 \end{aligned} \qquad (1)$$

The numerical values of all parameters and levels are in cm^{-1} throughout the text.

The initial values for the other parameters were taken from the final values for Mn I, [12].

The initial value for the height of the configuration $d^7 p$ was obtained from $3d^7(a\,^4\mathrm{F})4pz\,^5\mathrm{G}$ since for this term only the interaction with $3d^6 4s(a\,^4\mathrm{H})4py\,^5\mathrm{G}$, i.e., $[22/15]^{1/2}\ (K-J)$, [14] needs to be taken into account. The other terms ^{5}G of $d^6 sp$ are not only distant from $z\,^5$G, but also the coefficients of K and J in the interactions between configurations are small in these cases. Then, from ref. [14] and [15]

$$z\,^5\mathrm{G}_{\mathrm{C.G.}} = A - 15B + F_2 + 12\alpha - \frac{22}{15}\frac{(K-J)^2}{(y\,^5\mathrm{G} - z\,^5\mathrm{G})} \qquad (2)$$

where the difference $y\,^5\mathrm{G} - z\,^5\mathrm{G}$ should be the distance between the centers of gravity of the unperturbed terms $z\,^5$G and $y\,^5$G. However, taking the experimental values of the centers of gravity does not cause a large difference. Hence we obtain initially

$$A = 46280. \qquad (3)$$

The height of $d^6 sp$ is obtained either from ^{7}D or ^{7}F (they only differ by $9F_2'$ [14], [15]). Then, from ref. [14] and [15]

$$^7\mathrm{D}_{\mathrm{C.G.}} = A' - 21B' - 4G'_{ds} - 7F'_2 - G'_{ps} + 6\alpha'$$

and hence

$$A' = 53600. \qquad (4)$$

The height of the configuration $d^5 s^2 p$ was obtained from the matrix of ^{7}P. Now, the configuration $d^5 s^2 p$ is considered here as 5 holes in the d-shell. The necessary changes to convert the configuration $d^5 p$ (5 electrons in the d-shell) to $d^5 s^2 p$ (5 holes in the d-shell) are described in section 4, [14]. However, the addition of $10G_1'' + 35G_3''$ to each diagonal element was not performed since this factor can be incorporated into the height A'' (of course, due compensation for

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

[2] The reader is referred to these papers for an explanation of the method used, notation and significance of the various parameters.

[3] Unprimed parameters refer to the configuration $3d^7 4p$, primed parameters to $3d^6 4s 4p$ and doubly primed parameters to $3d^5 4s^2 4p$.

this factor must be made when calculating $D''(d^5s^2p)$ [12]). Then, the matrix of ^7P is given by

$$\begin{array}{l} (^6S)^7P^* \\ {}^5D(^3P)^7P \end{array} \begin{bmatrix} A''-35B''-10G_1''-35G_3'' & \sqrt{2}J' \\ \sqrt{2}J' & A'-21B'-4G_{ds}' \\ & +7F_2'-G_{ps}'+6\alpha' \end{bmatrix} \quad (5)$$

Assuming that the parameters B, B', and B'' are in arithmetic progression and using the fact that the trace equals the sum of the eigenvalues ($z\,^7P_{C.G.}$ equals 24057 and $y\,^7P_{C.G.}$ equals 40262) we obtain

$$A''=80680. \quad (6)$$

2. Results and Discussion

As for Mn I, four iterations were performed. The parameters β and T were completely ineffective here. In the least-squares of the final iteration in the "uniform treatment"[4] 84 terms splitting into 240 levels and 8 unclassified odd levels were inserted to yield an rms error of 213. Since A'' was allowed to vary freely, the calculated values, percentage compositions and g-factors for all of the 684 predicted levels are given in table 3. The final parameters in the uniform treatment are given in table 2.

The three high terms $r\,^3G$, $t\,^3H$, and $q\,^3G$, all above 60,000, were not included in the least-squares as it is doubtful to which theoretical terms they should be assigned. Also, 5 of these 9 levels are listed in AEL as uncertain. Below 60,000 the following 10 levels are not included:

1. The three levels of $3d^7(a\,^4P)4pv\,^5P$
2. The four unclassified odd levels 2°, 5°, 7°, and 9°
3. The level $z\,^1D$
4. The level $s\,^3D_3$
5. The level $3d^64s(b\,^4D)4pt\,^5P_3$

The calculated levels of the term[5] $(^6S)^5P^*+(^4P)^5P$ are approximately 1900 cm^{-1} higher than the experimental levels of $3d^7(a\,^4P)4pv\,^5P$. Most, or all of this difference can be attributed to the interaction between $(^6S)^5P^*+(^4P)^5P$ and $^5D(4s5p\,^3P)u\,^5P$, since the difference between the unperturbed terms $v\,^5P$ and $u\,^5P$ is expected to be very small. This interaction was not considered explicitly here, and hence the levels of $v\,^5P$ were not inserted.

It is evident from table 3 that there are no conceivable theoretical levels to which any of the levels 2°, $z\,^1D$, 5°, and 7° could be assigned. It is apparent from the paper of Russell, Moore, and Weeks [16], that the above 4 levels are based on very few combinations and thus they may not be valid levels.

The level 9° was not included in the least-squares as it could be assigned to either $^3D(^3P)^5F_4$ or $^3G(^3P)^3F_4$ with a deviation of around −300 in each case.

The only theoretical level to which the experimental level $s\,^3D_3$ could be assigned is $^3D(^3P)^5F_3$. As then the resulting deviation would be around −600 and since the level $s\,^3D_3$ is quoted as uncertain in AEL, this assignment was not performed.

When the level $t\,^5P_3$ was assigned to the theoretical level $^3D(^3P)^5P_3$ the deviation was −630. This value contrasts with deviations of 102 and 57 for the other two levels $t\,^5P_{1,2}$. Since, in addition, the level $t\,^5P_3$ is given as uncertain in AEL, it was not included. Instead, the level 11°_3 was assigned to $^3D(^3P)^5P_3$ yielding a deviation of only −20. It should be noted, however, that had the level $t\,^5P_3$ not been marked as uncertain, it would have been assigned to the level $^3D(^3P)^5F_3$, as then the deviation would be only −190.

The following changes in assignment were performed:

1. AEL $d^6s(b\,^4P)pw\,^5D \longrightarrow A^3F(^3P)^5D$
2. AEL $d^6s(b\,^4F)pv\,^5D_4 \longrightarrow A^3F(^3P)^5F_4$
3. AEL $d^6s(b\,^4F)pv\,^5D_{0,1,2,3} \longrightarrow A^3P(^3P)^5D_{0,1,2,3}$
4. AEL $d^6s(b\,^4F)pw\,^5F_4 \longrightarrow A^3P(^3P)^5D_4$
5. $d^5s^2(a^6S)^5P^* \longleftrightarrow (^4P)^5P$
6. $(^4P)^3D_{2,3} \longleftrightarrow (^4P)^5D_{2,3}$
7. AEL $d^7(a\,^2G)px\,^3F_{2,3} \longrightarrow A^3F(^3P)^3F_{2,3}$
8. AEL $d^7(a\,^2G)px\,^3F_4 \longrightarrow (^4P)^5D_4$
9. AEL $d^7(a\,^4P)pu\,^5D_4 \longrightarrow A^3F(^3P)^3F_4$
10. AEL $d^6s(b\,^4F)px\,^3G_{3,4,5} \longrightarrow {}^3G(^3P)^5H_{3,4,5}$
11. AEL $d^7(a\,^2H)py\,^1G \longrightarrow {}^3H(^3P)^1G$
12. AEL $d^6s(b\,^4F)pw\,^3F \longrightarrow (^2G)^3F$
13. AEL $d^7(a\,^2D)pw\,^3P \longrightarrow (^2P)^3P$
14. AEL $d^6s(a\,^4G)pv\,^3F \longrightarrow (A^2D)^3F$
15. AEL $d^7(a\,^2H)pu\,^3G \longrightarrow {}^3G(^3P)^3G$
16. AEL $d^7(a\,^2P)py\,^1D \longrightarrow A^3F(^3P)^1D$
17. AEL $d^7(a\,^2P)pv\,^3P_1 \longrightarrow (^2P)^3S$
18. $(A^2D)^3D_1 \longleftrightarrow (^2P)^1P$
19. AEL $d^7(a\,^2P)px\,^3S \longrightarrow (A^2D)^3P_1$
20. AEL $d^7(a\,^2P)pv\,^3P_2 \longrightarrow (A^2D)^3P_2$
21. AEL $s\,^3D_2 \longrightarrow {}^3D(^3P)^5F_2$
22. AEL $d^7(a\,^2H)py\,^1H \longrightarrow {}^3G(^3P)^1H$
23. AEL $x\,^1F \longrightarrow {}^3G(^3P)^3F_3$
24. AEL $d^6s(b\,^2H)pu\,^3H \longrightarrow {}^1I(^3P)^3H$
25. AEL $d^6s(a\,^4G)pt\,^3G \longrightarrow (^2H)^3G$
26. AEL $d^7(a\,^2D)pu\,^3F \longrightarrow A^1G(^3P)\,^3F$
27. AEL $d^6s(b\,^2H)px\,^3I \longrightarrow {}^1I(^3P)^3I$

In each of the changes 1, 5, 7, 12, 14, 15, 16, 17, 19, 25, and 26 there is strong mixing between the experimentally assigned term and others. On the other hand, in 3, 11, 13, 20, 22, 24, and 27 the compositions of the theoretical levels contain only minimal contributions of the experimental designations.

After the changes 2 and 4, not only is there closer agreement between the experimental and theoretical values of the levels and g-factors of $w\,^5D_4$ and $w\,^5F_4$, but also the theoretical and experimental splittings of the two terms $w\,^5D$ and $w\,^5F$ correspond more closely.

Similarly changes 6, 8, and 9 improve the agreement between the experimental and theoretical levels of $w\,^3D$, $x\,^3F$ and $u\,^5D$ and cause the splittings of these three terms to correspond more closely to the experimental splittings.

[4] The parameters A, A', A'', G_{ds}' and G_{ps}' are allowed to change freely. The parameters B, C, F_2, and G_1 are in arithmetic progression. The parameters G_3, α, ζ_d, and ζ_p are kept equal, and for the parameters of the interactions between configurations H' was kept equal to H, J' to J, G to G_{ds}' and $K'=K+828$ (fixed difference).

[5] See section 3 of this paper for the theoretical term designations.

In the vicinity of 48,000 there is only one theoretical term ^{3}G predicted. The levels of $w\,^3$G fit much better than $x\,^3$G to the theoretical term A^{3}F(^{3}P)^{3}G. The levels of $x\,^3$G are then assigned to the theoretical levels ^{3}G(^{3}P)^{5}H$_{3,4,5}$ yielding a mean deviation of only 18 cm^{-1}. The g-factors of $w\,^3$G also correspond closely to the calculated g-factors of ^{3}G(^{3}P)^{5}H$_{3,4,5}$.

The calculated values of the levels (^{2}P)^{1}P and (A^{2}D)^{3}D$_1$ are 52012 and 53274 respectively. As the experimental values for these two levels are 53230 and 52181 respectively, it is necessary to exchange the assignments of these levels as indicated by 18. After the change the deviations are 169 and -44.

The levels of $s\,^3$D cannot be assigned to a theoretical term ^{3}D (see table 3). The only vacant theoretical level to which $s\,^3$D$_2$ can be assigned is ^{3}D(^{3}P)^{5}F$_2$, as indicated by change 21. The deviation here is -264.

Similarly the experimental level $x\,^1$F could not be assigned to a theoretical term ^{1}F. However, when $x\,^1$F is assigned to the vacant level ^{3}G(^{3}P)^{3}F the deviation is only -129. The experimental g-factor of 1.079 corresponds to the calculated value of 1.060.

Table 1 below indicates how the 8 unclassified odd levels were assigned. It should be noted that the level $3d^7(a\,^2\text{P})4px\,^3$S at 52858 is given as 8° in the original paper of Russell, Moore and Weeks, [16].

TABLE 1. *Miscellaneous odd levels of* Fe I

Level	Assignment	Deviation	Obs. g-factor	Calc. g-factor
1_2°	A^{3}P(^{3}P)^{1}D	-254	1.137	1.140
3_3°	A^{3}F(^{3}P)^{1}F + (^{2}G)^{1}F	-116	.....	1.020
4_4°	^{3}G(^{3}P$x\,^3$H$_4$	-77	0.953	0.924
6_5°	^{3}H(^{3}P)^{1}H	82	1.061	1.101
10_3°	^{3}D(^{3}P)^{5}D$_3$	-135	1.476	1.505
11_3°	^{3}D(^{3}P)^{5}P$_3$	-20	.....	1.633
12_5°	^{3}D(^{3}P)^{5}F$_5$	234	1.356	1.398
13_4°	^{3}D(^{3}P)^{5}D$_4$	145	.....	1.489

Below 58,000 (the limit of the experimental data inserted) there are 31 theoretical levels with no corresponding experimental values. The lowest of these are the levels of ^{3}H(^{3}P)^{5}I at around 42900.

The highest deviations occur for the levels of $s\,^3$G (mean deviation 650). An examination of the paper of Russell, Moore and Weeks [16], indicates, however, that the levels of $s\,^3$G are based upon combinations with 41 even levels and thus they are definitely valid levels. The high deviations cannot be explained as being due to perturbations with higher lying levels of ^{3}G belonging to $(3d+4s)^7 5p$ since the deviations are positive. It may be argued, however, that conceivably the levels $s\,^3$G are high enough in order to belong to either $3d^7(a\,^4\text{F})5p\,^5$F, $3d^7(a\,^4\text{F})5p\,^5$G or $3d^7(a\,^4\text{F})5p\,^3$G (although the difference between $3d^6 4s(a\,^6\text{D})5px\,^7$P and $3d^6 4s(a\,^6\text{D})4pz\,^7$P is almost 26,000, we would expect the difference between $3d^7(a\,^4\text{F})5p\,^3$G and $3d^7(a\,^4\text{F})4pz\,^3$G to be considerably smaller since $z\,^3$G is higher than $z\,^7$P by 12,000 and the parameters of $(3d+4s)^7 5p$ are expected to be considerably smaller than the corresponding parameters of $(3d+4s)^7 4p$). However, unlike the terms $w\,^5$P in Cr I, [11] and $w\,^4$P in Mn I, [12] which are superfluous to $(3d+4s)^n 4p$ at their respective heights, here the theoretical term A^{1}G(^{3}P)^{3}G is in the neighborhood of $s\,^3$G. In addition, the terms $w\,^5$P and $w\,^4$P coincide in height with the lowest predicted terms ^{5}P and ^{4}P for $(3d+4s)^5 5p$ and $(3d+4s)^6 5p$, respectively, whereas here it is impossible to calculate even the approximate value of the lowest term ^{3}G of $(3d+4s)^7 5p$ since the height of $3d^7 5p$ is not known. Furthermore, although the mean deviation of the levels $s\,^3$G is more than three times the rms error obtained, there are other levels which also suffer high deviations. As an example, the low level $x\,^5$D$_4$ at 39065 has a deviation of 561. Thus, the variation which we consider as final is the one including the levels $s\,^3$G. In another variation, based on the same diagonalization, and not including the levels $s\,^3$G, an rms error of 192 was obtained. All the parameters were nearly identical in the two cases.

For 13 of the 17 terms given in AEL without configuration assignments, the theoretical assignments are given in table 3 (the terms $z\,^1$D, $r\,^3$G, $t\,^3$H and $q\,^3$G are not inserted).

Two misprints in AEL should be noted. The configuration assignments for the odd levels 10° and 12° should be $3d^6 4s(b\,^4\text{D})4p$: and not $3d^6 4s(b\,^4\text{D})4d$: as given for each case in AEL.

3. Table of the Observed and Calculated Levels and g-Factors

In the column "NAME" the calculated designation of the term is given. Whenever the terms of the parent d^n have different seniorities these are denoted by the letters A and B (for $d^5\,^2$D by A, B, and C), the lower calculated term being designated by A. The terms of d^6sp are denoted by $d^6 v_1 S_1 L_1 (sp\,^{1,3}\text{P})SL$. The terms of d^7p are differentiated from those of d^5s^2p by using a star for the latter terms.

The entries in the columns "J", "OBS. LEVEL cm^{-1}", "CALC. LEVEL cm^{-1}", "OBS. g-FACTOR" and "CALC. g-FACTOR", are self-evident. In the column "PERCENTAGE", for each calculated level either the three highest contributions or all those contributions exceeding six percent are given.

Whenever the experimental and calculated term designations differ, the experimental designation is entered in the column "AEL" using the notation of C. E. Moore, [13]. In many instances the exchanges involve complete terms rather than isolated levels. Unless specified otherwise, the entries in the column "AEL" pertain to exchanges in terms.

The column "O–C" gives the difference between the observed and calculated values of the levels.

The entries are in increasing energy of the calculated terms.

TABLE 2. *Parameters for* Fe I $(3d+4s)^7 4p$

Parameter	Initial value	Final value
A	46,280	$45{,}626 \pm 572$
A'	53,600	$54{,}552 \pm 512$
A''	80,680	$83{,}934 \pm 629$
B	800	738 ± 9
B'	930	943 ± 7
B''	1,060	1,148 (Arith. Progress.)
C	3,160	$3{,}310 \pm 29$
C'	3,430	$3{,}509 \pm 14$
C''	3,700	3,708 (Arith. Progress.)
$G'_{ds}=G$	1,530	$1{,}536 \pm 24$
F_2	190	173 ± 10
F'_2	310	305 ± 5
F''_2	430	437 (Arith. Progress.)
G_1	230	202 ± 8
G'_1	245	245 ± 7
G''_1	260	288 (Arith. Progress.)
$G_3=G'_3=G''_3$	18	20 ± 2
G'_{ps}	6,650	$7{,}116 \pm 58$
$\alpha=\alpha'=\alpha''$	83	74 ± 2
$H=H'$	70	85 ± 6
$J=J'$	1,300	$1{,}183 \pm 41$
K	2,600	$2{,}459 \pm 45$
K'	3,428	3,287 (Fixed Diff.)
$\zeta_d=\zeta'_d=\zeta''_d$	320	410 ± 23
$\zeta_p=\zeta'_p=\zeta''_p$	210	200 ± 68
rms error		213.4

TABLE 3. *Observed and calculated levels of* Fe I $(3d+4s)^7 4p$

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$^5D(^3P)^7D$	1	100	$3d^6 4s(a\,^6D)4p$	$z\,^7D$	20,020	20,158	−138	2.999	2.998
	2	99			19,913	20,045	−132	2.008	1.999
	3	99			19,757	19,880	−123	1.746	1.749
	4	99			19,562	19,671	−109	1.642	1.649
	5	100			19,351	19,437	−86	1.597	1.599
$^5D(^3P)^7F$	0	100	$3d^6 4s(a\,^6D)4p$	$z\,^7F$	23,270	22,905	365		
	1	100			23,245	22,875	370	1.549	1.501
	2	100			23,193	22,813	380	1.504	1.501
	3	99			23,111	22,717	394	1.513	1.500
	4	99			22,997	22,585	412	1.493	1.500
	5	99			22,846	22,413	433	1.498	1.500
	6	100			22,650	22,194	456	1.498	1.500
$^5D(^3P)^7P$	2	99	$3d^6 4s(a\,^6D)4p$	$z\,^7P$	24,507	24,331	176	2.333	2.332
	3	98			24,181	23,998	183	1.908	1.916
	4	98			23,711	23,527	184	1.747	1.749

TABLE 3. *Observed and calculated levels of* Fe I $(3d+4s)^7 4p$ – Continued

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$^5D(^3P)^5D$	0	93	$3d^64s(a\,^6D)4p$	$z\,^5D$	26,551	26,534	17		
	1	92			26,479	26,461	18	1.495	1.497
	2	91			26,340	26,316	24	1.503	1.498
	3	91			26,140	26,108	32	1.500	1.498
	4	91			25,900	25,853	47	1.502	1.499
$^5D(^3P)^5F$	1	95	$3d^64s(a\,^6D)4p$	$z\,^5F$	27,666	27,706	−40	−0.012	0.005
	2	95			27,560	27,595	−35	1.004	1.003
	3	94			27,395	27,424	−29	1.250	1.252
	4	94			27,167	27,189	−22	1.355	1.351
	5	94			26,875	26,889	−14	1.399	1.400
$^5D(^3P)^5P$	1	97	$3d^64s(a\,^6D)4p$	$z\,^5P$	29,733	29,929	−196	2.487	2.498
	2	97			29,469	29,668	−199	1.835	1.832
	3	97			29,056	29,266	−210	1.657	1.666
$^5D(^3P)^3D$	1	91	$3d^64s(a\,^4D)4p$	$z\,^3D$	31,937	31,655	282	0.513	0.503
	2	90			31,686	31,397	289	1.168	1.164
	3	89			31,323	31,017	306	1.321	1.330
$^5D(^3P)^3F$	2	93	$3d^64s(a\,^4D)4p$	$z\,^3F$	32,134	32,298	−164	0.682	0.672
	3	93			31,805	31,963	−158	1.086	1.087
	4	94			31,307	31,474	−167	1.250	1.250
$(^4F)^5D$	0	$58+40\,^5D(^1P)^5D$			34,122	34,231	−109		
	1	$58+39\,^5D(^1P)^5D$			34,017	34,108	−91	1.492	1.492
	2	$57+38\,^5D(^1P)^5D$			33,802	33,861	−59	1.495	1.494
	3	$59+38\,^5D(^1P)^5D$			33,507	33,499	8	1.492	1.495
	4	$60+37\,^5D(^1P)^5D$			33,096	33,020	76	1.496	1.498
$(^4F)^5F$	1	$83+13\,^5D(^1P)^5F$			34,692	34,786	−94	−0.016	0.009
	2	$81+13\,^5D(^1P)^5F$			34,547	34,611	−64	0.998	0.997
	3	$80+13\,^5D(^1P)^5F$			34,329	34,349	−20	1.244	1.245
	4	$79+13\,^5D(^1P)^5F$			34,040	34,005	35	1.344	1.344
	5	$82+13\,^5D(^1P)^5F$			33,695	33,601	94	1.417	1.396
$^5D(^3P)^3P$	0	97	$3d^64s(a\,^4D)4p$	$z\,^3P$	34,556	34,744	−188		
	1	96			34,363	34,542	−179	1.496	1.498
	2	96			33,947	34,112	−165	1.493	1.498
$(^4F)^5G$	2	92			35,856	35,715	141	0.335	0.342
	3	$84+7\,(^4F)^3G$			35,612	35,495	117	0.887	0.912
	4	$71+20\,(^4F)^3G$			35,257	35,179	78	1.103	1.134
	5	$50+43\,(^4F)^3G$			34,782	34,751	31	1.218	1.239
	6	94			34,844	34,578	266	1.332	1.333
$(^4F)^3G$	3	$86+7\,(^4F)^5G$			36,079	36,400	−321	0.791	0.769
	4	$72+20\,(^4F)^5G$			35,768	35,946	−178	1.100	1.078
	5	$53+41\,(^4F)^5G$			35,379	35,389	−10	1.248	1.231
$^5D(^1P)^5P$	1	$58+34\,(^6S)^5P^*$	$3d^64s(a\,^4D)4p$	$y\,^5P$	37,410	37,338	72	2.502	2.498
	2	$59+33\,(^6S)^5P^*$			37,158	37,122	36	1.836	1.832
	3	$60+32\,(^6S)^5P^*$			36,767	36,786	−19	1.661	1.659

TABLE 3. *Observed and calculated levels of* Fe I $(3d+4s)^7 4p$ – Continued

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$(^4F)^3F$	2	87			37,521	37,645	−124	0.688	0.679
	3	82			37,163	37,228	−65	1.086	1.096
	4	85			36,686	36,692	−6	1.246	1.245
$(^4F)^3D$	1	$87+7{}^5D(^3P)^3D$			38,996	39,021	−25	0.493	0.501
	2	$85+7{}^5D(^3P)^3D$			38,678	38,669	9	1.151	1.157
	3	$82+8{}^5D(^3P)^3D$			38,175	38,110	65	1.324	1.322
$^5D(^1P)^5D$	0	$47+22(^4F)^5D+13A^3P(^3P)^5D$	$3d^64s(a\,^4D)4p$	$x\,^5D$	40,491	40,038	453		
	1	$47+21(^4F)^5D+13A^3P(^3P)^5D$			40,405	39,939	466	1.498	1.499
	2	$47+22(^4F)^5D+13A^3P(^3P)^5D$			40,231	39,743	488	1.501	1.502
	3	$48+20(^4F)^5D+12A^3P(^3P)^5D$			39,970	39,452	518	1.504	1.500
	4	$50+24(^4F)^5D+13A^3P(^3P)^5D$			39,626	39,065	561	1.489	1.500
$(^6S)^7P^*$	2	98			40,052	40,188	−136	2.340	2.330
	3	98			40,207	40,283	−76	1.908	1.915
	4	99			40,422	40,417	5	1.751	1.749
$A^3P(^3P)^5S$	2	$56+36(^4P)^5S$	$3d^64s(b\,^4P)4p$	$z\,^5S$	40,895	41,089	−194	1.985	1.987
$^5D(^1P)^5F$	1	$85+7(^4F)^5F$	$3d^64s(a\,^4D)4p$	$x\,^5F$	41,131	41,443	−312	−0.006	0.003
	2	$85+7(^4F)^5F$			41,018	41,325	−307	0.998	1.001
	3	$85+7(^4F)^5F$			40,842	41,142	−300	1.254	1.250
	4	$85+7(^4F)^5F$			40,594	40,889	−295	1.328	1.350
	5	$86+6(^4F)^5F$			40,257	40,555	−298	1.390	1.400
$^3H(^3P)^5I$	4	$73+15{}^3H(^3P)^5H$				42,992			0.702
	5	$65+18{}^3H(^3P)^5H$				42,905			0.988
	6	$66+18{}^3H(^3P)^5H$				42,851			1.133
	7	$81+16{}^3H(^3P)^5H$				42,843			1.199
	8	100				42,899			1.250
$A^3P(^3P)^5P$	1	$85+6(^4P)^5P$	$3d^64s(b\,^4P)4p$	$x\,^5P$	43,079	43,225	−146	2.464	2.466
	2	$78+12(^4P)^5S$			42,860	43,036	−176	1.822	1.838
	3	88			42,533	42,722	−189	1.650	1.658
$^3H(^3P)^5G$	2	$46+45A^3F(^3P)^5G$	$3d^64s(a\,^4H)4p$	$y\,^5G$	43,210	43,371	−161	0.331	0.336
	3	$31+32A^3F(^3P)^5G+24{}^3H(^3P)^5H$			43,138	43,277	−139	0.905	0.800
	4	$36+32A^3F(^3P)^5G+17{}^3H(^3P)^5I$			43,023	43,217	−194	1.024	1.042
	5	$42+31A^3F(^3P)^5G+18{}^3H(^3P)^5I$			42,912	43,129	−217	1.203	1.201
	6	$49+30A^3F(^3P)^5G+13{}^3H(^3P)^5I$			42,784	43,014	−230	1.342	1.297
$^3H(^3P)^5H$	3	$63+17{}^3H(^3P)^5G+11A^3F(^3P)^5G$	$3d^64s(a\,^4H)4p$	$z\,^5H$	43,326	43,475	−149	0.509	0.628
	4	$67+11{}^3H(^3P)^5G+9{}^3H(^3P)^5I$			43,109	43,490	−381	0.871	0.917
	5	$69+16{}^3H(^3P)^5I+6{}^3H(^3P)^5G$			42,992	43,477	−485	1.054	1.083
	6	$71+20{}^3H(^3P)^5I$			43,321:	43,437	−116		1.189
	7	$75+19{}^3H(^3P)^5I$				43,362			1.265
$(^4P)^5S$	2	$45+38A^3P(^3P)^5S$			44,512	44,355	157	1.888	1.911
$A^3F(^3P)^5D$	0	$60+24(^4P)^5D+11A^3P(^3P)^5D$	$3d^64s(b\,^4P)4p$	$w\,^5D$	44,459	44,457	2		
	1	$58+24(^4P)^5D+12A^3P(^3P)^5D$			44,411	44,410	1	1.315	1.480
	2	$54+23(^4P)^5D+12A^3P(^3P)^5D$			44,184	44,301	−117	1.533	1.487
	3	$50+21(^4P)^5D+14A^3P(^3P)^5D$			43,923	44,167	−244	1.481	1.486
	4	$37+22A^3P(^3P)^5D+15(^4P)^5D$			43,500	43,963	−463	1.492	1.497

TABLE 3. *Observed and calculated levels of* Fe I $(3d+4s)^7 4p$ – Continued

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$A^3F(^3P)^5F$	1	$82+6^3D(^3P)^5F$	$3d^64s(b\,^4F)4p$	w^5F	44,378:	44,637	−259	0.283	0.035
	2	$70+5^3D(^3P)^5F$			44,285	44,580	−295	1.117	1.083
	3	$46+20A^3P(^3P)^5D$			44,166	44,445	−279	1.351	1.334
	4	$71+8A^3F(^3P)^5D$	$3d^64s(b\,^4F)4p$	v^5D	44,415	44,555	−140	1.401	1.364
	5	$85+4^3D(^3P)^5F$	$3d^64s(b\,^4F)4p$	w^5F	44,244	44,437	−193	1.382	1.393
$A^3P(^3P)^5D$	0	$78+8^5D(^1P)^5D$	$3d^64s(b\,^4F)4p$	v^5D	44,827	45,360	−533		
	1	$52+8(^4P)^3D$			44,761	45,235	−474	1.389	1.233
	2	$33+20A^3P(^3P)^3D+10(^4P)^3D$			44,664	44,975	−311	1.378	1.345
	3	$26+28A^3F(^3P)^5F+11A^3F(^3P)^5D$			44,551	44,711	−160	1.386	1.377
	4	$46+27A^3F(^3P)^5F+12A^3F(^3P)^5D$	$3d^64s(b\,^4F)4p$	w^5F	44,023	44,189	−166	1.444	1.475
$A^3P(^3P)^3D$	1	$30+34(^4P)^3D+15A^3P(^3P)^5D$	$3d^64s(b\,^4P)4p$	x^3D	45,552	45,610	−58	0.556	0.784
	2	$29+35A^3P(^3P)^5D+26(^4P)^3D$			45,282	45,399	−117	1.200	1.310
	3	$33+32(^4P)^3D+15A^3P(^3P)^5D$			45,221	45,305	−84	1.352	1.377
$^3H(^3P)^3G$	3	$52+21(^2G)^3G$	$3d^64s(a\,^4H)4p$	y^3G	45,563	45,649	−86	0.765	0.758
	4	$51+22(^2G)^3G$			45,428	45,516	−88	1.053	1.054
	5	$52+24(^2G)^3G$			45,295	45,405	−110	1.207	1.202
$A^3F(^3P)^5G$	2	$52+45^3H(^3P)^5G$	$3d^64s(b\,^4F)4p$	x^5G	45,965	45,855	110	0.323	0.342
	3	$51+41^3H(^3P)^5G$			45,914	45,811	103	0.928	0.914
	4	$52+38^3H(^3P)^5G$			45,833	45,730	103	1.158	1.146
	5	$55+36^3H(^3P)^5G$			45,726	45,619	107	1.269	1.261
	6	$61+34^3H(^3P)^5G$			45,608:	45,493	115	1.336	1.327
$^3H(^3P)^3I$	5	95	$3d^64s(a\,^4H)4p$	z^3I	46,136	46,191	−55	0.833	0.839
	6	93			46,027	46,088	−61	1.040	1.030
	7	93			45,978:	46,018	−40	1.149	1.148
$(^4P)^5P$	1	$41+28(^6S)^5P^*+10A^3P(^3P)^5P$	$3d^54s^2(a\,^6S)4p$	w^5P	46,410	46,156	254	2.436	2.413
	2	$46+32(^6S)^5P^*+8^5D(^1P)^5P$			46,314	46,151	163	1.822	1.813
	3	$49+35(^6S)^5P^*+8^5D(^1P)^5P$			46,137	45,998	139	1.658	1.660
$(^4P)^3P$	0	$36+35A^3P(^3P)^3P+10(^2P)^1S$			46,673	46,709	−36		
	1	$30+28(^4P)^3S+15A^3P(^3P)^3P$			46,902	46,819	83	1.600	1.812
	2	$52+25A^3P(^3P)^3P$			46,727	46,602	125	1.444	1.482
$A^3P(^3P)^3S$	1	$41+20A^3P(^3P)^3P+13(^4P)^3P$	$3d^64s(b\,^4P)4p$	z^3S	46,601	46,791	−190	1.888	1.815
$(^4P)^3D$	1	$22+27(^4P)^3S+20A^3F(^3P)^3D$			47,272	47,252	20	0.767	1.120
	2	$45+18A^3F(^3P)^3D$	$3d^7(a\,^4P)4p$	u^3D	46,889	46,913	−24	1.260	1.183
	3	$50+17A^3F(^3P)^3D$			46,745	46,702	43	1.397	1.334
$A^3F(^3P)^3F$	2	$44+26^3G(^3P)^5F+22(^2G)^3F$	$3d^7(a\,^2G)4p$	x^3F	47,197	47,278	−81	0.743	0.583
	3	$45+32(^2G)^3F+10^3G(^3P)^5G$			47,093	47,169	−76	1.159	1.066
	4	$38+32(^2G)^3F+14^3G(^3P)^5G$	$3d^7(a\,^4P)4p$	u^3D	46,721	46,873	−152	1.341	1.224
$^3H(^3P)^3H$	4	$23+18(^2G)^3H+10(^2G)^1G$	$3d^64s(a\,^4H)4p$	z^3H	47,107	47,261	−154	0.880	0.996
	5	$33+34(^2G)^3H+10^3G(^3P)^5G$			47,008	47,146	−138	1.060	1.072
	6	$29+33^3G(^3P)^5H+27(^2G)^3H$			46,982	47,086	−104	1.200	1.226

TABLE 3. *Observed and calculated levels of* Fe I $(3d+4s)^7 4p$ – Continued

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$(^4P)^5D$	0	$51+26A^3F(^3P)^5D+10^5D(^1P)^5D$			47,172:	47,428	−256		
	1	$50+25A^3F(^3P)^5D+10^5D(^1P)^5D$			47,177	47,409	−232	1.410	1.484
	2	$39+20A^3F(^3P)^5D+9A^3P(^3P)^1D$	$3d^7(a\,^4P)4p$	$w\,^3D$	47,136	47,331	−135	1.216	1.393
	3	$50+22A^3F(^3P)^5D+8^5D(^1P)^5D$			47,017	47,163	−146	1.346	1.481
	4	$46+21A^3F(^3P)^5D+10^5D(^1P)^5D$	$3d^7(a\,^2G)4p$	$x\,^3F$	46,889	47,036	−147	1.344	1.399
$(^4P)^3S$	1	$26+19(^4P)^3D+14A^3P(^3P)^3S$			47,556	47,226	330	1.884	1.303
$(^2G)^1G$	4	$23+22^3H(^3P)^1G+14^3G(^3P)^5G$			47,453	47,534	−81	1.025	0.994
$A^3P(^3P)^1D$	2	$44+10A^3F(^3P)^1D+10(^4P)^5D$		1°	47,420	47,674	−254	1.137	1.140
$^3G(^3P)^5G$	2	$65+16(^2G)^3F+11A^3F(^3P)^3F$	$3d^64s(a\,^4G)4p$	$w\,^5G$	47,831	47,822	9	0.472	0.448
	3	$71+8(^2G)^3F+6^3G(^3P)^5H$			47,693	47,646	47	0.931	0.910
	4	$68+7(^2G)^3F$			47,590	47,575	15	1.145	1.097
	5	$76+8(^2G)^3H$			47,420	47,438	−18	1.305	1.233
	6	$59+22(^2G)^3H+10^3H(^3P)^3H$			47,363	47,361	2	1.306	1.270
$^3G(^3P)^5H$	3	$41+30A^3F(^3P)^3G+10^3G(^3P)^5G$	$3d^64s(b\,^4F)4p$	$x\,^3G$	47,834	47,826	8	0.668	0.656
	4	$38+32A^3F(^3P)^3G+12^3G(^3P)^5G$			47,812	47,831	−19	1.061	0.983
	5	$32+20A^3F(^3P)^3G+11^3G(^3P)^5F$			47,835	47,861	−26	1.203	1.165
	6	$87+9^3H(^3P)^5H$				47,830			1.213
	7	$88+8^3H(^3P)^5H$				47,706			1.280
$^3H(^3P)^1I$	6	$87+6(^2H)^1I$				48,073			1.009
$^3G(^3P)^5F$	1	$64+6^3D(^3P)^5F$	$3d^64s(a\,^4G)4p$	$v\,^5F$	48,351	48,549	−198	0.230	0.253
	2	$72+7^3D(^3P)^5F$			48,239	48,457	−218	1.267	1.024
	3	$59+10^3G(^3P)^5H$			48,123	48,318	−195	1.236	1.121
	4	$62+12^3G(^3P)^5H$			47,930	48,099	−169	1.264	1.273
	5	$41+38^3G(^3P)^5H$			47,606	47,745	−139	1.317	1.246
$A^3F(^3P)^3G$	3	$30+31^3G(^3P)^5H+15^3G(^3P)^5F$		$w\,^3G$	48,476	48,414	62	0.584	0.770
	4	$36+33^3G(^3P)^5H+12^3G(^3P)^5F$			48,362	48,286	76	0.934	1.035
	5	$34+29^3G(^3P)^5F+13^3G(^3P)^5H$			48,231	48,116	115	1.27:	1.246
$(^2G)^1H$	5	$65+8^3H(^3P)^1H$			48,383	48,448	−65	1.028	1.061
$A^3P(^3P)^3P$	0	$30+42(^4P)^3P+22A^3P(^3P)^1S$	$3d^64s(b\,^4P)4p$	$x\,^3P$	48,460	48,412	48		
	1	$36+25(^4P)^3P+11^3G(^3P)^5F$			48,516	48,511	5	1.547	1.290
	2	$40+18(^4P)^3P+8(^2P)^3P$			48,305	48,400	−95	1.263	1.446
$A^3P(^3P)^1S$	0	$23+22(^2P)^1S+22A^3P(^3P)^3P$				48,669			
$(^2G)^3F$	2	$44+27A^3F(^3P)^3F+16^3G(^3P)^3F$	$3d^64s(b\,^4F)4p$	$w\,^3F$	49,433	49,333	100	0.677	0.667
	3	$29+28A^3F(^3P)^3F+13^3G(^3P)^3F$			49,243	49,079	164	1.165	1.107
	4	$22+18A^3F(^3P)^3F+15^3G(^3P)^3F$			49,109	48,862	247	1.181	1.178
$^3H(^3P)^1G$	4	$37+11(^2G)^1G+9(^2G)^3F$	$3d^7(a\,^2H)4p$	$y\,^1G$	48,703	49,170	−161	1.063	1.061
$(^6S)^5P^*$	1	$20+21(^4P)^5P+18^5D(^1P)^5P$	$3d^7(a\,^4P)4p$	$v\,^5P$	(48,290)	50,273		(2.213)	2.242
	2	$18+28(^2P)^3P+13(^4P)^5P$			(48,163)	49,953		(1.740)	1.683
	3	$27+25(^4P)^5P+23^5D(^1P)^5P$			(47,967)	49,928		(1.646)	1.648

TABLE 3. *Observed and calculated levels of* Fe I $(3d+4s)^7 4p$—Continued

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$A^3F(^3P)^3D$	1	$34+20A^3P(^3P)^3D+15(^2P)^3D$	$3d^64s(b\,^4F)4p$	$v\,^3D$	49,298	49,274	24	0.562	0.589
	2	$39+23A^3P(^3P)^3D+14(^2P)^3D$			49,243	49,237	6	0.954	1.170
	3	$33+17A^3P(^3P)^3D+12(^2P)^3D$			49,135	49,193	−58	1.211	1.273
$A^3F(^3P)^1F$	3	$39+40(^2G)^1F$		3°	49,227	49,343	−116		1.020
$(^2G)^3H$	4	$46+30^3H(^3P)^3H$			49,727	49,480	247	0.929	0.833
	5	$41+23^3H(^3P)^3H$			49,604	49,375	229	1.075	1.063
	6	$41+37^3H(^3P)^3H$			49,434	49,267	167	1.17:	1.161
$(^2G)^3G$	3	$44+22A^3F(^3P)^3G+15^3H(^3P)^3G$			49,851	49,860	−9	0.763	0.765
	4	$35+15A^3F(^3P)^3G+15^3H(^3P)^3G$			49,628	49,717	−89	0.914	1.019
	5	$32+18A^3F(^3P)^3G+13^3H(^3P)^3G$			49,461	49,546	−85	1.163	1.164
$(^2P)^3P$	0	$64+7(^4P)^3P$	$3d^7(a\,^2D)4p$	$w\,^3P$	49,951	49,873	78		
	1	$48+12A^3P(^3P)^3P+6(^6S)^5P$			50,043	49,959	84	1.389	1.594
	2	$35+13(^4P)^5P+9(^6S)^5P$			50,187	50,270	−83	1.469	1.595
$(^2G)^1F$	3	$21+21(A^2D)^1F+16^3G(^3P)^1F$			50,587	50,612	−25	1.018	1.010
$A^3F(^3P)^1G$	4	$59+9(^2H)^1G$		$x\,^1G$	50,614	50,618	−4	0.978	0.981
$A^3P(^3P)^1P$	1	$72+10(A^2D)^1P$				50,827			1.063
$^3G(^3P)^3H$	4	$40+14(^2H)^3G+13^3G(^3P)^3G$		4°	51,409	51,486	−77	0.953	0.924
	5	$56+11^3H(^3P)^1H$	$3d^64s(a\,^4G)4p$	$x\,^3H$	51,069	51,146	−77	1.038	1.056
	5	$77+17^3H(^3P)^3H$			51,023	51,077	−54	1.161	1.165
$(A^2D)^3F$	2	$25+19^3G(^3P)^3F+11A^3P(^3P)^1D$	$3d^64s(a\,^4G)4p$	$v\,^3F$	51,201	51,131	70	0.803	0.788
	3	$30+23^3G(^3P)^3F+12A^3F(^3P)^3F$			51,365	51,281	84	1.096	1.087
	4	$31+24^3G(^3P)^3F+17A^3F(^3P)^3F$			51,305	51,257	48	1.122	1.227
$^3G(^3P)^3G$	3	$41+36(^2H)^3G$	$3d^7(a\,^2H)4p$	$u\,^3G$	51,826	51,805	21	0.801	0.775
	4	$24+23(^2H)^3G+18^3G(^3P)^3H$			51,668	51,589	79	1.067	0.971
	5	$19+19^3H(^3P)^1H+11(^2H)^3G$			51,374	51,266	108	1.140	1.077
$^3H(^3P)^1H$	5	$30+24(^2H)^3G+18^3G(^3P)^3G$		6°	51,630	51,548	82	1.061	1.101
$(^2P)^1D$	2	$32+19A^3P(^3P)^1D+17A^3F(^3P)^1D$		$x\,^1D$	51,762	51,738	24	0.883	0.937
$A^3F(^3P)^1D$	2	$36+29(A^2D)^1D+16(^2P)^1D$	$3d^7(a\,^2P)4p$	$y\,^1D$	51,708	51,814	−106	1.025	1.018
$(^2P)^1P$	1	$41+15(A^2D)^3D+11(A^2D)^3P$	$3d^7(a\,^2D)4p$	$t\,^3D$	52,181	52,012	169	0.801	0.961
$(^2P)^3D$	1	$47+25A^3F(^1P)^3D+9(^2P)^1P$			52,512	52,328	184	0.700	0.623
	2	$46+39A^3F(^1P)^3D+8(A^2D)^3D$			52,297	52,185	112	1.156	1.160
	3	$63+15A^3F(^1P)^3D$			51,969	51,934	35	1.306	1.304
$(^2H)^3H$	4	$59+17^3H(^1P)^3H+15^1I(^3P)^3H$			52,769	52,724	45	0.810	0.814
	5	$60+18^3H(^1P)^3H+14^1I(^3P)^3H$			52,613	52,557	56	1.033	1.036
	6	$62+21^3H(^1P)^3H+15^1I(^3P)^3H$			52,431	52,366	65	1.177	1.166
$(^2H)^3I$	5	$85+9^1I(^3P)^3I$			52,899	52,971	−72	0.830	0.839
	6	$61+27(^2H)^1I+5^1I(^3P)^3I$			52,514	52,595	−81	1.019	1.016
	7	$88+8^1I(^3P)^3I$			52,655:	52,691	−36	1.147	1.143

TABLE 3. *Observed and calculated levels of* Fe I $(3d+4s)^7 4p$ — Continued

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$(A^2D)^3D$	1	$33+10(^2P)^3S+10(^2P)^3D$	$3d^7(a\,^2P)4p$	$z\,^1P$	53,230	53,274	−44	1.266	0.937
	2	$59+14(^2P)^3D$			52,683	52,981	−298	1.145	1.152
	3	$72+15A^3F(^1P)^3D$			52,213	52,403	−190	1.317	1.332
$(A^2D)^3P$	0	$53+23A^3P(^1P)^3P+10(^2P)^3P$				53,418			
	1	$21+13A^3P(^1P)^3P+12(^2P)^3S$	$3d^7(a\,^2P)4p$	$x\,^3S$	52,858	52,907	−49	1.246	1.374
	2	$55+25A^3P(^1P)^3P$	$3d^7(a\,^2P)4p$	$v\,^3P$:	52,916	52,723	193	1.495	1.488
$(^2H)^1I$	6	$61+25(^2H)^3I$			53,094	53,307	−213	1.010	1.012
$^3G(^3P)^1H$	5	$77+17^3H(^3P)^1H$	$3d^7(a\,^2H)4p$	$y\,^1H$	53,722	53,416	306	1.03:	1.006
$^3D(^3P)^5F$	1	$77+10^3G(^3P)^5F$				53,517			0.129
	2	$84+11^3G(^3P)^5F$		$s\,^3D$	53,275	53,539	−264		1.003
	3	$83+10^3G(^3P)^5F$				53,581			1.244
	4	$81+9^3G(^3P)^5F$				53,659			1.343
	5	$87+9^3G(^3P)^5F$		12°	54,014	53,780	234	1.356	1.398
$(A^2D)^1F$	3	$39+17(^2G)^1F+14A^3F(^3P)^1F$		$y\,^1F$	53,661	53,672	−11	1.21:	0.992
$^3D(^3P)^5D$	0	$88+7A^3F(^3P)^5D$				53,418			
	1	$86+7A^3F(^3P)^5D$				53,964			1.521
	2	$87+7A^3F(^3P)^5D$				53,983			1.487
	3	$74+12^3D(^3P)^5P+6A^3F(^3P)^5D$		10°	53,892	54,027	−135	1.476	1.505
	4	$88+7A^3F(^3P)^5D$		13°	54,301	54,156	145		1.489
$(^2P)^3S$	1	$17+18(A^2D)^3P+11(^2P)^1P$	$3d^7(a\,^2P)4p$	$v\,^3P$	53,808	53,755	53	1.418	1.535
$^3G(^3P)^3F$	2	$38+33(A^2D)^3F+12A^1G(^3P)^3F$				54,171			0.722
	3	$30+27(A^2D)^3F+12A^1G(^3P)^3F$		$x\,^1F$	53,763	53,892	−129	1.079	1.060
	4	$36+29(A^2D)^3F+12A^1G(^3P)^3F$				53,601			1.244
$^3D(^3P)^5P$	1	$69+10(^4P)^5P$	$3d^64s(b\,^4D)4p$	$t\,^5P$	54,271	54,169	102		2.393
	2	$78+10(^4P)^5P$			54,112	54,055	57	1.70:	1.806
	3	$69+12^3D(^3P)^5D+9(^4P)^5P$		11°	54,005	54,025	−20		1.633
$^1I(^3P)^3K$	6	99				54,164			0.859
	7	99				54,253			1.019
	8	100				54,361			1.125
$(^2H)^3G$	3	$33+25^3G(^3P)^3G+8^3H(^1P)^3G$	$3d^64s(a\,^4G)4p$	$t\,^3G$	54,600	54,614	−14	0.922	0.826
	4	$36+31^3G(^3P)^3G+12^3H(^1P)^3G$			54,237	54,272	−35	1.183	1.068
	5	$37+37^3G(^3P)^3G+13^3H(^1P)^3G$			53,983	54,000	−17	1.234	1.194
$^3G(^3P)^1G$	4	$42+25(^2H)^1G+19(^2G)^1G$		$w\,^1G$	54,811	54,736	75	1.001	0.998
$A^1G(^3P)^3H$	4	$85+5^1I(^3P)^3H$		$v\,^3H$	55,446	54,996	450	0.804	0.806
	5	$82+5^1I(^3P)^3H$			55,430	55,071	359	1.057	1.039
	6	$82+8^1I(^3P)^3H$			55,490	55,111	379	1.169	1.164
$(^2P)^1S$	0	$52+43A^3P(^3P)^1S$				55,042			
$(A^2D)^1P$	1	$39+22^3D(^3P)^1P+13(^2P)^1P$				55,161			1.045

TABLE 3. *Observed and calculated levels of* Fe I $(3d+4s)^7 4p$ – Continued

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$A^1G(^3P)^3G$	3	$73+6^3G(^1P)^3G$		$s\,^3G$	56,098	55,481	617	0.857	0.770
	4	$76+6^3G(^1P)^3G$			55,906	55,246	660		1.045
	5	$66+15(^2H)^1H+6^3G(^1P)^3G$			55,907	55,235	672	1.145	1.154
$(^2H)^1H$	5	$59+13A^1G(^3P)^3G+9^3H(^3P)^1H$		$x\,^1H$	55,526	55,574	−48	1.018	1.036
$(A^2D)^1D$	2	$56+15(^2P)^1D+14A^3F(^3P)^1D$			55,754	55,668	86	0.990	0.969
$^3G(^3P)^1F$	3	$61+13A^3F(^3P)^1F+12(A^2D)^1F$		$w\,^1F$	55,791	55,911	−120	0.908	0.985
$^1I(^3P)^3H$	4	$35+21A^1G(^3P)^3F+8^3H(^1P)^3H$	$3d^64s(b\,^2H)4p$	$u\,^3H$	56,423	56,326	97	0.859	0.981
	5	$62+12^3H(^1P)^3H$			56,383	56,325	58	1.029	1.036
	6	$63+13^3H(^1P)^3H+13A^1G(^3P)^3H$			56,334	56,208	126	1.166	1.166
$A^1G(^3P)^3F$	2	$30+23^3D(^3P)^3P+14(A^2D)^3F$	$3d^7(a\,^2D)4p$	$u\,^3F$	56,859	56,721	138	0.687	0.974
	3	$55+19(A^2D)^3F$			56,783	56,587	196	1.077	1.084
	4	$34+26^1I(^3P)^3H+9(A^2D)^3F$			56,593	56,441	152	1.148	1.063
$^3D(^3P)^3P$	0	$55+35A^1S(^3P)^3P$				56,866			
	1	$60+34A^1S(^3P)^3P$				56,863			1.490
	2	$43+15A^1G(^3P)^3F+12A^1S(^3P)^3P$				56,755			1.221
$(^2H)^1G$	4	$41+27^3G(^3P)^1G+14^3H(^3P)^1G$		$v\,^1G$	56,951	56,986	−35	1.053	1.013
$^1I(^3P)^3I$	5	$85+7(^2H)^3I$	$3d^64s(b\,^2H)4p$	$x\,^3I$	57,104	57,138	−34	0.832	0.836
	6	$86+6(^2H)^3I$			57,070	57,114	−44	1.028	1.025
	7	$86+5(^2H)^3I$			57,028:	57,082	−54	1.145	1.143
$^3D(^3P)^3D$	1	89				57,199			0.512
	2	$83+5A^1S(^3P)^3P$				57,234			1.192
	3	$85+6A^3F(^1P)^3D$				57,302			1.323
$^3D(^3P)^3F$	2	$59+9(^2F)^3F$		$t\,^3F$	57,709	57,407	302	0.698	0.669
	3	$61+8^3G(^1P)^3F$			57,641	57,398	243		1.092
	4	$65+8^3G(^1P)^3F$			57,550	57,386	164	1.235	1.248
$A^1S(^3P)^3P$	0	$32+18A^1D(^3P)^3P+16^3D(^3P)^3P$				58,100			
	1	$34+19A^1D(^3P)^3P+13^3D(^3P)^3P$				57,851			1.498
	2	$45+21A^3P(^1P)^3P+17A^1D(^3P)^3P$				57,522			1.474
$^3H(^1P)^3G$	3	$50+25(^2F)^3G$				58,980			0.781
	4	$55+24(^2F)^3G$				58,923			1.054
	5	$58+22(^2F)^3G$				58,838			1.199
$^3H(^1P)^3I$	5	90				59,291			0.839
	6	91				59,170			1.026
	7	90				58,993			1.142
$^3D(^3P)^1F$	3	$80+5^3G(^3P)^1F$				59,765			1.006
$^3D(^3P)^1D$	2	$58+25A^3P(^1P)^3D$				59,803			1.056
$A^3P(^1P)^3D$	1	$51+15^3D(^3P)^1P$				59,955			0.683
	2	$47+29^3D(^3P)^1D$				59,601			1.124
	3	$76+5(^2F)^3D$				59,019			1.310

TABLE 3. *Observed and calculated levels of* Fe I $(3d+4s)^7 4p$ — Continued

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$^3D(^3P)^1P$	1	$40+25A^3P(^1P)^3S+10(A^2D)^1P$				60,060			1.323
$A^3P(^1P)^3S$	1	$39+15^3D(^3P)^1P+13(^2P)^3S$				60,194			1.476
$A^3F(^1P)^3F$	2	$28+17A^1D(^3P)^3F+11^3G(^1P)^3F$				60,199			0.685
	3	$27+12A^1D(^3P)^3F+11^3G(^1P)^3F$				60,226			1.084
	4	$23+15^3D(^3P)^3F+12(^2F)^3F$				60,257			1.236
$A^3F(^1P)^3G$	3	83				60,876			0.765
	4	$69+5(^2F)^3F$				60,768			1.063
	5	80				60,588			1.188
$A^1D(^3P)^3F$	2	$53+25(^2F)^3F$				60,851			0.679
	3	$57+19(^2F)^3F$				60,868			1.077
	4	$62+15(^2F)^3F$				60,855			1.229
$A^3F(^1P)^3D$	1	$60+19(^2F)^3D$				61,289			0.504
	2	$53+22(^2F)^3D$				61,236			1.147
	3	$50+21(^2F)^3D$				61,125			1.299
$^3H(^1P)^3H$	4	$42+18(^2H)^3H+10^3G(^3P)^3G$				61,338			0.887
	5	$44+19(^2H)^3H+15^3G(^3P)^3G$				61,176			1.077
	6	$61+25(^2H)^3H$				61,073			1.166
$A^1D(^3P)^3P$	0	$64+20A^1S(^3P)^3P$				61,698			
	1	$63+19A^1S(^3P)^3P$				61,813			1.495
	2	$65+16A^1S(^3P)^3P$				62,002			1.491
$A^3P(^1P)^3P$	0	$46+18(A^2D)^3P+13A^1D(^3P)^3P$				62,162			
	1	$40+14(A^2D)^3P+11A^1D(^3P)^3P$				61,985			1.442
	2	$40+16(A^2D)^3P+6A^1D(^3P)^3P$				61,344			1.468
$^3G(^1P)^3G$	3	$19+22A^1D(^3P)^3D+9(^2F)^3G$				62,095			1.053
	4	$28+16A^3F(^1P)^3F+11(^2F)^3G$				62,453			1.123
	5	$44+16(^2F)^3G$				62,046			1.160
$A^1D(^3P)^3D$	1	$69+8A^3P(^1P)^3D$				62,449			0.579
	2	$67+8A^3P(^1P)^3D$				62,373			1.147
	3	$44+18^3G(^1P)^3G$				62,262			1.123
$^3G(^1P)^3F$	2	$24+26A^3F(^1P)^3F+11A^1D(^3P)^3F$				62,622			0.726
	3	$20+19A^3F(^1P)^3F+13^3G(^1P)^3G$				62,644			1.005
	4	$21+17A^3F(^1P)^3F+11^3H(^1P)^3H$				61,929			1.106
$(^2F)^1D$	2	$75+6^3D(^3P)^1D$				63,079			0.983
$(^2F)^1G$	4	89				63,731			1.000
$^3G(^1P)^3H$	4	86				63,850			0.806
	5	86				63,660			1.036
	6	89				63,314			1.165
$(^2F)^3D$	1	$49+17A^3F(^1P)^3D+11^3D(^1P)^3D$				64,369			0.502
	2	$50+20A^3F(^1P)^3D+11^3D(^1P)^3D$				64,378			1.159
	3	$48+12A^3F(^1P)^3D+11^3D(^1P)^3D$				64,398			1.301

TABLE 3. *Observed and calculated levels of* Fe I $(3d+4s)^{7}4p$ – Continued

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$(^2F)\,^1F$	3	$76+10A\,^1G(^1P)\,^1F$				64,728			1.024
$(^2F)\,^3F$	2	$28+38\,^3G(^1P)\,^3F+7A\,^1D(^3P)\,^3F$				65,483			0.674
	3	$27+30\,^3G(^1P)\,^3F+7A\,^1D(^3P)\,^3F$				65,472			1.042
	4	$32+28\,^3G(^1P)\,^3F+8A\,^1D(^3P)\,^3F$				65,478			1.227
$(^2F)\,^3G$	3	$38+24\,^3G(^1P)\,^3G$				65,681			0.799
	4	$42+24\,^3G(^1P)\,^3G$				65,688			1.072
	5	$53+26\,^3G(^1P)\,^3G$				65,694			1.199
$^1F(^3P)\,^3G$	3	$83+9\,^3G(^1P)\,^3G$				66,475			0.752
	4	$86+6\,^3G(^1P)\,^3G$				66,591			1.051
	5	91				66,748			1.200
$^1F(^3P)\,^3D$	1	$82+7\,^3D(^1P)\,^3D$				67,401			0.509
	2	$82+7A\,^1D(^3P)\,^3D$				67,302			1.172
	3	$83+7A\,^1D(^3P)\,^3D$				67,168			1.336
$^3D(^1P)\,^3F$	2	$72+13(^4G)\,^3F^*$				67,856			0.668
	3	$72+13(^4G)\,^3F^*$				67,896			1.084
	4	$73+13(^4G)\,^3F^*$				67,993			1.250
$^1I(^1P)\,^1K$	7	98				68,142			1.000
$A\,^1G(^1P)\,^1H$	5	91				68,554			1.001
$^3D(^1P)\,^3D$	1	$58+7(^2F)\,^3D$				68,773			0.624
	2	$57+6(^4D)\,^3D$				68,764			1.220
	3	$68+8(^4D)\,^3D$				68,841			1.334
$^3D(^1P)\,^3P$	0	$77+5(^4P)\,^3P$				68,914			
	1	$76+4(^4P)\,^3P$				68,909			1.405
	2	$74+10\,^3D(^1P)\,^3D$				68,988			1.455
$B\,^3P(^3P)\,^5D$	0	$48+41B\,^3F(^3P)\,^5D$				69,095			
	1	$49+43B\,^3F(^3P)\,^5D$				69,171			1.463
	2	$48+45B\,^3F(^3P)\,^5D$				69,290			1.480
	3	$44+48B\,^3F(^3P)\,^5D$				69,416			1.480
	4	$35+48B\,^3F(^3P)\,^5D$				69,497			1.454
$A\,^1G(^1P)\,^1G$	4	$79+5(^2G)\,^1G$				69,309			1.017
$^1F(^3P)\,^3F$	2	$74+11(^2F)\,^3F$				69,784			0.671
	3	$72+11(^2F)\,^3F$				69,770			1.097
	4	$62+10(^2F)\,^3F$				69,784			1.280
$^1I(^1P)\,^1I$	6	$89+6(^2I)\,^1I$				69,857			1.000
$^1I(^1P)\,^1H$	5	$78+9(^2H)\,^1H$				70,146			1.001
$A\,^1G(^1P)\,^1F$	3	$72+10(A\,^2D)\,^1F$				70,198			1.003

TABLE 3. *Observed and calculated levels of* Fe I $(3d+4s)^74p$ – Continued

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$(^4G)^5G^*$	2	$73+25B^3F(^3P)^5G$				71,050			0.336
	3	$73+25B^3F(^3P)^5G$				71,085			0.916
	4	$73+24B^3F(^3P)^5G$				71,124			1.148
	5	$73+24B^3F(^3P)^5G$				71,160			1.265
	6	$73+25B^3F(^3P)^5G$				71,189			1.332
$(^4G)^5H^*$	3	99				71,835			0.504
	4	98				71,894			0.904
	5	98				71,958			1.103
	6	98				72,023			1.216
	7	100				72,083			1.286
$A^1S(^1P)^1P$	1	$83+7(A^2D)^1P$				72,282			1.000
$B^3F(^3P)^5G$	2	$73+24(^4G)^5G^*$				72,302			0.336
	3	$73+24(^4G)^5G^*$				72,353			0.916
	4	$73+24(^4G)^5G^*$				72,408			1.149
	5	$73+24(^4G)^5G^*$				72,458			1.265
	6	$72+25(^4G)^5G^*$				72,487			1.332
$B^3P(^3P)^5S$	2	$79+11(^4P)^5S$				72,554			1.982
$B^3P(^3P)^5P$	1	$80+6(^4P)^5P^*$				73,237			2.431
	2	$66+10(^4P)^5P^*$				73,716			1.772
	3	$42+27(^4G)^5F^*$				74,067			1.514
$(^4P)^5D^*$	0	$65+13B^3F(^3P)^5D+12B^3P(^3P)^5D$				73,513			
	1	$63+11B^3F(^3P)^5D+11B^3P(^3P)^5D$				73,545			1.466
	2	$51+11B^3F(^3P)^5D+10B^3P(^3P)^5D$				73,598			1.503
	3	$49+21(^4G)^5F^*+10B^3P(^3P)^5D$				73,724			1.438
	4	$51+22(^4G)^5F^*+10B^3P(^3P)^5D$				74,102			1.461
$(^4G)^5F^*$	1	$87+5B^3F(^3P)^5F$				74,079			0.045
	2	$79+7B^3F(^3P)^5F$				74,068			1.061
	3	$41+36B^3P(^3P)^5P$				74,008			1.453
	4	$68+17(^4P)^5D^*$				73,881			1.385
	5	$90+5B^3F(^3P)^5F$				73,877			1.400
$B^3P(^3P)^3S$	1	89				74,162			2.036
$B^3F(^3P)^3D$	1	$51+26B^3P(^3P)^3D$				74,513			0.509
	2	$56+24B^3P(^3P)^3D+13(B^2D)^1D$				74,590			1.173
	3	$57+21B^3P(^3P)^3D+12(B^2D)^3D$				74,744			1.337
$(^4P)^5S^*$	2	$82+13B^3P(^3P)^5S$				74,750			1.985
$A^1D(^1P)^1D$	2	$77+9(B^2D)^1D$				74,796			1.001
$A^1D(^1P)^1F$	3	82				74,828			1.002
$(^4G)^3H^*$	4	91				74,847			0.803
	5	91				74,831			1.038
	6	92				74,779			1.167
$A^1D(^1P)^1P$	1	84				74,870			1.007

TABLE 3. *Observed and calculated levels of* Fe I (3d + 4s) 4p – Continued

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$B^3F(^3P)^5D$	0	$40+33A^3P(^3P)^5D+18(^4P)^5D^*$				74,790			
	1	$38+33A^3P(^3P)^5D+17(^4P)^5D^*$				74,856			1.475
	2	$36+34A^3P(^3P)^5D+15(^4P)^5D^*$				74,989			1.504
	3	$31+34A^3P(^3P)^5D+9(^4P)^5D^*$				75,191			1.526
	4	$34+43A^3P(^3P)^5D+16(^4P)^5D^*$				75,393			1.498
$B^3F(^3P)^5F$	1	90				74,849			0.030
	2	91				74,891			1.004
	3	90				74,939			1.252
	4	90				74,974			1.348
	5	91				74,969			1.394
$B^3P(^3P)^1S$	0	$85+6B^3P(^3P)^3P$				75,549			
$(^4P)^5P^*$	1	$72+14(^4D)^5P^*$				75,951			2.433
	2	$67+15(^4D)^5P^*$				75,767			1.802
	3	$57+18(^4D)^5P^*+8(^4P)^5D^*$				75,524			1.634
$B^3F(^3P)^3G$	3	91				76,097			0.752
	4	90				76,059			1.051
	5	93				76,075			1.201
$B^3P(^3P)^3P$	0	$29+28(^4P)^3P^*+27(B^2D)^3P$				76,401			
	1	$30+30(^4P)^3P^*+26(B^2D)^3P$				76,357			1.550
	2	$30+23(^4P)^3P^*+18(B^2D)^3P$				76,332			1.463
$(^4G)^3F^*$	2	$40+18(B^2D)^3F+7(^4P)^3P^*$				76,453			0.834
	3	$53+13(B^2D)^3F$				76,504			1.084
	4	$56+13(B^2D)^3F$				76,567			1.249
$B^3F(^3P)^1D$	2	$45+27(B^2D)^1D+18B^3P(^3P)^1D$				76,696			0.988
$(^4P)^3P^*$	0	$41+32B^3P(^3P)^3P$				77,475			
	1	$35+34B^3P(^3P)^3P$				77,368			1.444
	2	$34+15B^3P(^3P)^3P+15(B^2D)^3P$				77,360			1.374
$(B^2D)^3F$	2	$38+31B^3F(^3P)^3F+15(^4G)^3F^*$				77,676			0.682
	3	$39+32B^3F(^3P)^3F+12(^4G)^3F^*$				77,779			1.091
	4	$21+37B^3F(^3P)^1G+17B^3F(^3P)^3F$				77,810			1.126
$B^3P(^3P)^3D$	1	$58+18B^3F(^3P)^3D$				77,682			0.567
	2	$47+16B^3F(^3P)^3D$				77,895			1.186
	3	$43+35(^4P)^3D^*$				78,067			1.322
$B^3F(^3P)^1G$	4	$38+20(B^2D)^3F+9^1F(^1P)^1G$				77,936			1.125
$(^4P)^3D^*$	1	$59+19(^4D)^5F^*$				78,229			0.399
	2	$61+8(^4D)^5F^*$				78,130			1.133
	3	$36+31B^3P(^3P)^3D$				78,169			1.324
$(^4G)^3G^*$	3	$75+9B^3F(^3P)^3G$				78,425			0.756
	4	$76+8B^3F(^3P)^3G$				78,446			1.052
	5	$77+8B^3F(^3P)^3G$				78,451			1.204
$^1F(^1P)^1D$	2	$31+40(^4D)^5F+10(B^2D)^1D$				78,776			1.008

TABLE 3. *Observed and calculated levels of* Fe I $(3d+4s)^7 4p$ – Continued

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$(^4D)^5F^*$	1	$70+17(^4P)^3D^*$				78,855			0.126
	2	$40+23\,^1F(^1P)^1D+13(^4P)^3D^*$				78,881			1.032
	3	$86+4(^4G)^5F^*$				78,885			1.255
	4	$89+4(^4G)^5F^*$				78,941			1.350
	5	90				79,004			1.395
$(B^2D)^1P$	1	$44+44B^3P(^3P)^1P$				79,295			0.986
$(B^2D)^1F$	3	$65+19B^3F(^3P)^1F$				79,310			1.003
$(B^2D)^3P$	0	$52+40B^3P(^3P)^3P$				79,504			
	1	$47+38B^3P(^3P)^3P$				79,498			1.519
	2	$48+33B^3P(^3P)^3P$				79,611			1.478
$B^3F(^3P)^3F$	2	$59+25(B^2D)^3F$				79,602			0.670
	3	$56+26(B^2D)^3F$				79,612			1.083
	4	$51+26(B^2D)^3F$				79,647			1.249
$(^4P)^3S^*$	1	$71+20B^3P(^3P)^3S$				79,715			1.968
$(B^2D)^3D$	1	$48+32B^3F(^3P)^3D$				80,166			0.508
	2	$47+30B^3F(^3P)^3D$				80,251			1.169
	3	$34+34(^4D)^5D^*+19B^3F(^3P)^3D$				80,382			1.402
$(^4D)^5D^*$	0	$80+15(^4P)^5D^*$				80,785			
	1	$76+14(^4P)^5D^*$				80,715			1.543
	2	$75+13(^4P)^5D^*$				80,606			1.511
	3	$44+20(B^2D)^3D+19B^3F(^1P)^3D$				80,451			1.431
	4	$82+12(^4P)^5D^*$				80,282			1.497
$^1F(^1P)^1G$	4	$72+19B^3F(^3P)^1G$				80,630			0.997
$B^3P(^3P)^1D$	2	$55+32B^3F(^3P)^1D$				80,675			1.018
$B^3F(^3P)^1F$	3	$44+43\,^1F(^1P)^1F$				81,005			0.999
$(^4D)^5P^*$	1	$77+12(^4P)^5P^*$				81,125			2.441
	2	$74+15(^4P)^5P^*$				81,311			1.814
	3	$72+19(^4P)^5P^*$				81,523			1.657
$B^1G(^3P)^3H$	4	95				81,288			0.805
	5	97				81,365			1.034
	6	97				81,474			1.167
$B^3P(^3P)^1P$	1	$49+44(B^2D)^1P$				81,779			0.999
$(^4D)^3F^*$	2	$74+10B^3F(^1P)^3F$				82,431			0.693
	3	$64+7(^4D)^3D^*$				82,424			1.108
	4	$73+6B^1G(^3P)^3F$				82,455			1.241
$B^1G(^3P)^3G$	3	$74+10B^1G(^3P)^3F$				82,700			0.826
	4	$81+6(^4D)^3F^*$				82,747			1.082
	5	96				82,830			1.200

TABLE 3. *Observed and calculated levels of* Fe I $(3d+4s)^7 4p$ – Continued

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$(^4D)^3D^*$	1	$68+10^3D(^1P)^3D$				82,813			0.516
	2	$52+16B^1G(^3P)^3F$				82,818			1.069
	3	$49+10B^1G(^3P)^3F+8^3D(^1P)^3D$				82,863			1.250
$^1F(^1P)^1F$	3	$27+15B^3F(^3P)^1F+12(^4D)^3F^*$				82,922			1.040
$B^1G(^3P)^3F$	2	$58+11(^4D)^3D^*$				82,990			0.762
	3	$40+17B^1G(^3P)^3G$				83,106			1.036
	4	$64+11B^1G(^3P)^3G$				83,087			1.229
$(B^2D)^1D$	2	$42+22^1F(^1P)^1D$				83,636			1.004
$(^4D)^3P^*$	0	$63+21B^3P(^1P)^3P+9(^4P)^3P^*$				83,442			
	1	$60+20B^3P(^1P)^3P+11(^4P)^3P^*$				83,647			1.492
	2	$57+19B^3P(^1P)^3P+13(^4P)^3P^*$				83,908			1.481
$(^2I)^3K^*$	6	97				85,859			0.862
	7	99				86,012			1.018
	8	100				86,159			1.125
$(^2I)^3I^*$	5	93				86,815			0.838
	6	93				86,942			1.020
	7	$88+8(^2I)^1K^*$				86,861			1.132
$(^2I)^1K^*$	7	$90+8(^2I)^3I^*$				87,284			1.011
$B^3P(^1P)^3D$	1	$78+8(^4F)^3D^*$				86,930			0.507
	2	$76+9(^4F)^3D^*$				87,281			1.162
	3	$59+10(^4F)^3D^*$				87,797			1.327
$B^3F(^1P)^3G$	3	85				87,684			0.752
	4	82				87,747			1.050
	5	$73+10(^2I)^1H^*$				87,676			1.170
$B^3F(^1P)^3D$	1	$71+14(^4F)^3D^*$				87,911			0.504
	2	$68+13(^4F)^3D^*$				87,969			1.088
	3	$60+20(^4F)^3D^*$				87,995			1.330
$(A^2D)^1D^*$	2	$35+18(A^2F)^3F+17(A^2D)^3F^*$				88,159			0.919
$(^2I)^1H^*$	5	$69+11B^3F(^1P)^3G+10B^1G(^1P)^1H$				88,248			1.026
$(A^2D)^3F^*$	2	$41+22(A^2D)^1D^*+16(A^2F)^1D^*$				88,636			0.804
	3	$62+30(A^2F)^3F^*$				88,632			1.079
	4	$69+24(A^2F)^3F^*$				88,904			1.229
$B^3F(^1P)^3F$	2	$68+14(^4F)^3F^*$				88,903			0.708
	3	$72+17(^4F)^3F^*$				88,859			1.083
	4	$73+17(^4F)^3F^*$				88,844			1.234
$(^2I)^3H^*$	4	87				89,341			0.819
	5	91				89,325			1.034
	6	92				89,251			1.166
$(A^2D)^1F^*$	3	$50+32(A^2F)^3G^*+14(A^2F)^1F^*$				90,257			0.930

TABLE 3. *Observed and calculated levels of* Fe I $(3d+4s)^7 4p$ – Continued

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$B^3P(^1P)^3S$	1	$79+14(^4P)^3S^*$				90,466			1.954
$(A^2D)^3P^*$	0	$51+33B^3P(^1P)^3P$				90,926			
	1	$72+22B^3P(^1P)^3P$				90,918			1.480
	2	$74+18B^3P(^1P)^3P$				90,819			1.467
$(A^2F)^1G^*$	4	$61+27(A^2F)^3G^*+7(^2H)^1G^*$				90,922			1.013
$(^2I)^1I^*$	6	$90+5^1I(^1P)^1I$				91,139			1.002
$(A^2D)^3D^*$	1	85				91,706			0.513
	2	$80+7(A^2D)^3F^*$				91,640			1.106
	3	$69+18(A^2F)^3G^*$				91,316			1.202
$(A^2F)^3G^*$	3	$57+25(A^2D)^1F^*+16(A^2D)^3D^*$				91,813			0.932
	4	$62+21(A^2F)^3F^*+15(A^2F)^1G^*$				91,428			1.090
	5	93				91,376			1.199
$B^3P(^1P)^3P$	0	$41+42(A^2D)^3P^*$				92,053			
	1	$40+19(A^2D)^3P^*+11(^4D)^3P^*$				92,194			1.449
	2	$57+13(A^2D)^3P^*+13(^4D)^3P^*$				92,291			1.464
$(A^2F)^3F^*$	2	$43+33(^4F)^5G^*+14(A^2D)^3F^*$				92,699			0.610
	3	$41+31(^4F)^5G^*+15(A^2D)^3F^*$				92,785			1.060
	4	$47+22(A^2D)^3F^*+13(^4F)^5G^*$				92,712			1.205
$(^4F)^5G^*$	2	$63+20(A^2F)^3F^*+12(A^2D)^3F^*$				93,291			0.464
	3	$55+23(A^2F)^3F^*+10(A^2D)^3F^*$				93,245			1.007
	4	$82+8(A^2F)^3F^*$				93,054			1.158
	5	95				92,971			1.263
	6	95				93,008			1.328
$(A^2F)^3D^*$	1	$56+27(A^2D)^1P^*$				93,249			0.712
	2	$70+12(A^2D)^3P^*$				93,668			1.212
	3	$72+9(^4F)^5G^*$				93,165			1.291
$B^1G(^1P)^1H$	5	$68+27(^2H)^1H^*$				93,663			1.006
$B^1G(^1P)^1G$	4	$53+27(^2H)^1G^*$				93,814			1.044
$(^4F)^5F^*$	1	90				94,225			0.049
	2	$88+5(^4F)^5D^*$				94,169			1.026
	3	$87+7(^4F)^5D^*$				94,109			1.264
	4	$75+9B^1G(^1P)^1G$				94,041			1.300
	5	89				94,088			1.383
$(^2H)^3H^*$	4	$56+35(A^2G)^3H^*$				94,313			0.821
	5	$54+36(A^2G)^3H^*$				94,457			1.040
	6	$54+37(A^2G)^3H^*$				94,658			1.161
$(A^2D)^1P^*$	1	$62+26(A^2F)^3D^*$				94,900			0.916
$(^2H)^3G^*$	3	$32+49(^4F)^3G^*+11(B^2F)^3G^*$				94,917			0.762
	4	$34+48(^4F)^3G^*+10(B^2F)^3G^*$				94,966			1.051
	5	$37+46(^4F)^3G^*+10(B^2F)^3G^*$				95,018			1.198

TABLE 3. *Observed and calculated levels of* Fe I $(3d+4s)^7 4p$ – Continued

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$(^4F)^5D^*$	0	94				95,038			
	1	85				95,064			1.422
	2	$88+5(^4F)^5F^*$				95,045			1.470
	3	$87+6(^4F)^5F^*$				95,019			1.475
	4	$88+5(^4F)^5F^*$				94,967			1.487
$B^1G(^1P)^1F$	3	$56+22(A^2F)^1F^*$				95,292			1.000
$(^2H)^3I^*$	5	92				95,329			0.843
	6	92				95,463			1.030
	7	96				95,616			1.142
$(^4F)^3G^*$	3	$26+42(A^2G)^3G^*+18(^2H)^3G^*$				96,477			0.762
	4	$29+39(A^2G)^3G^*+18(^2H)^3G^*$				96,399			1.050
	5	$33+36(A^2G)^3G^*+16(^2H)^3G^*$				96,293			1.199
$(A^2F)^1D^*$	2	$58+30(A^2D)^1D^*$				96,581			0.998
$(A^2G)^1G^*$	4	$52+20(A^2F)^1G^*+15(^2H)^1G^*$				96,730			1.009
$(A^2F)^1F^*$	3	$50+30B^1G(^1P)^1F+10(A^2D)^1F^*$				96,731			0.996
$(^2H)^1I^*$	6	93				96,857			1.004
$(A^2G)^3F^*$	2	$59+27(4F)^3F^*$				98,018			0.677
	3	$57+27(^4F)^3F^*$				98,021			1.088
	4	$56+26(^4F)^3F^*$				98,198			1.237
$B^1D(^3P)^3D$	1	95				98,571			0.500
	2	95				98,595			1.163
	3	95				98,635			1.331
$(A^2G)^3H^*$	4	$59+37(^2H)^3H^*$				99,217			0.807
	5	$59+35(^2H)^3H^*$				99,245			1.039
	6	$61+35(^2H)^3H^*$				99,382			1.165
$(^4F)^3D^*$	1	$57+21(B^2F)^3D^*$				100,156			0.503
	2	$54+22(B^2F)^3D^*$				100,063			1.158
	3	$50+21(B^2F)^3D^*$				99,965			1.317
$(A^2G)^1H^*$	5	$60+24(A^2G)^3G^*+11(B^2F)^3G^*$				100,323			1.072
$(A^2G)^3G^*$	3	$45+17(B^2F)^3G^*+15(^4F)^3G^*$				100,790			0.791
	4	$46+22(B^2F)^3G^*+13(^4F)^3G^*$				100,747			1.065
	5	$33+30(A^2G)^1H^*+14(B^2F)^3G^*$				100,437			1.113
$(^4F)^3F^*$	2	$29+24(B^2F)^3F^*+20B^1D(^3P)^3F$				100,948			0.671
	3	$41+21(B^2G)^3F^*+14(B^2F)^3F^*$				100,829			1.082
	4	$38+22(B^2F)^3F^*+22(B^2G)^3F^*$				100,602			1.238
$B^1D(^3P)^3F$	2	$69+15(^4F)^3F^*$				100,778			0.668
	3	$76+14(B^2F)^3F^*$				100,841			1.056
	4	$84+11(B^2F)^3F^*$				100,955			1.241
$(A^2G)^1F^*$	3	$76+8(B^2F)^1F^*$				101,827			1.003

TABLE 3. *Observed and calculated levels of* Fe I $(3d+4s)^7 4p$ – Continued

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$(B^2F)^1G^*$	4	$64+19(A^2G)^1G^*+6(^2H)^1G^*$				101,671			1.006
$(^2H)^1H^*$	5	$53+22B^1G(^1P)^1H+9(^2I)^1H^*$				102,138			1.010
$B^1D(^3P)^3P$	0	95				102,242			
	1	95				102,211			1.500
	2	95				102,147			1.499
$(B^2F)^3F^*$	2	$70+13(A^2G)^3F^*$				102,750			0.675
	3	$73+12(A^2G)^3F^*$				102,809			1.083
	4	$69+10(A^2G)^3F^*+9(^4F)^3F^*$				102,915			1.247
$(B^2F)^1D^*$	2	$83+8(B^2D)^1D^*$				103,163			0.997
$(B^2F)^3G^*$	3	$70+25(^2H)^3G^*$				103,655			0.753
	4	$70+25(^2H)^3G^*$				103,764			1.051
	5	$69+25(^2H)^3G^*$				103,882			1.199
$(B^2F)^3D^*$	1	$77+9(^4F)^3D^*$				104,973			0.507
	2	$74+11(^4F)^3D^*$				105,129			1.168
	3	$72+13(^4F)^3D^*$				105,341			1.332
$(^2H)^1G^*$	4	$32+31(B^2F)^1G^*+23(A^2G)^1G^*$				106,455			1.001
$(^2S)^3P^*$	0	$83+13(B^2D)^3P^*$				107,066			
	1	$83+13(B^2D)^3P^*$				107,164			1.495
	2	$83+12(B^2D)^3P^*$				107,371			1.497
$(B^2F)^1F^*$	3	$83+8(A^2G)^1F^*$				107,873			1.001
$(^2S)^1P^*$	1	$79+10(B^2D)^1P^*+9B^1D(^1P)^1P$				108,476			0.999
$B^1D(^1P)^1D$	2	$76+21(B^2D)^1D^*$				110,880			1.000
$B^1D(^1P)^1F$	3	$78+16(B^2G)^1F^*$				113,463			1.000
$B^1D(^1P)^1P$	1	$75+19(B^2D)^1P^*$				115,224			0.991
$(B^2D)^3D^*$	1	96				115,523			0.511
	2	95				115,589			1.165
	3	$91+6(B^2D)^3F^*$				115,698			1.320
$(B^2D)^3F^*$	2	92				115,524			0.669
	3	90				115,612			1.095
	4	94				115,746			1.250
$(B^2D)^1F^*$	3	89				116,688			1.000
$(B^2D)^3P^*$	0	$81+12(^2S)^3P^*$				117,777			
	1	$81+12(^2S)^3P^*$				117,800			1.496
	2	$82+12(^2S)^3P^*$				117,850			1.499
$(B^2D)^1P^*$	1	$70+16(^2S)^1P^*+10B^1D(^1P)^1P$				118,501			1.002
$(B^2D)^1D^*$	2	$75+19B^1D(^1P)^1D$				120,088			1.000

TABLE 3. *Observed and calculated levels of* Fe I $(3d+4s)^7 4p$ – Continued

Name	J	Percentage	AEL		Obs. Level (cm^{-1})	Calc. Level (cm^{-1})	O–C	Obs. g-Factor	Calc. g-Factor
			Config.	Desig.					
$B^1S(^3P)^3P$	0	92				122,270			
	1	92				122,356			1.500
	2	92				122,532			1.500
$(B^2G)^3H^*$	4	98				123,645			0.801
	5	98				123,693			1.034
	6	98				123,777			1.167
$(B^2G)^3G^*$	3	$88+11(B^2G)^3F^*$				124,705			0.788
	4	96				124,837			1.055
	5	98				124,926			1.199
$(B^2G)^3F^*$	2	93				125,023			0.667
	3	$84+11(B^2G)^3G^*$				124,929			1.046
	4	91				124,729			1.244
$(B^2G)^1H^*$	5	98				125,484			1.001
$(B^2G)^1G^*$	4	96				126,557			1.001
$(B^2G)^1F^*$	3	$80+10B^1D(^1P)^1F$				129,093			1.000
$B^1S(^1P)^1P$	1	$85+10(C^2D)^1P^*$				134,135			1.000
$(^2P)^3P^*$	0	$75+24(C^2D)^3P^*$				138,527			
	1	$75+23(C^2D)^3P^*$				138,631			1.500
	2	$75+23(C^2D)^3P^*$				138,877			1.499
$(^2P)^1S^*$	0	99				141,049			
$(^2P)^1D^*$	2	$42+43(^2P)^3D^*+10(C^2D)^1D^*$				141,744			1.078
$(^2P)^3D^*$	1	$93+5(C^2D)^3D^*$				142,012			0.501
	2	$49+38(^2P)^1D^*+10(C^2D)^1D^*$				142,162			1.089
	3	$91+7(C^2D)^3D^*$				142,092			1.333
$(^2P)^3S^*$	1	99				143,800			1.998
$(^2P)^1P^*$	1	$75+12(C^2D)^1P^*+10B^1S(^1P)^1P$				145,679			0.999
$(C^2D)^3F^*$	2	95				149,953			0.673
	3	95				149,997			1.086
	4	96				150,099			1.250
$(C^2D)^3D^*$	1	$93+6(^2P)^3D^*$				150,910			0.503
	2	$91+6(^2P)^3D^*$				151,048			1.162
	3	$91+7(^2P)^3D^*$				151,252			1.330
$(C^2D)^1D^*$	2	$77+18(^2P)^1D^*$				152,034			1.009
$(C^2D)^1F^*$	3	96				152,174			1.001
$(C^2D)^3P^*$	0	$75+24(^2P)^3P^*$				153,610			
	1	$75+24(^2P)^3P^*$				153,440			1.498
	2	$74+23(^2P)^3P^*$				153,150			1.491
$(C^2D)^1P^*$	1	$78+16(^2P)^1P^*$				157,198			1.001

TABLE 4. *Orders of the submatrices of* $(d+s)^7p$

J	Order
0	39
1	107
2	144
3	145
4	117
5	76
6	39
7	14
8	3

The approximate time for the diagonalization routine on the IBM 7040 computer was $4\frac{1}{2}$ hr.

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