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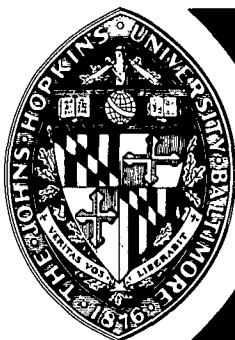
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Technical Report No. AF-105

WAVE FUNCTIONS, ENERGIES, AND REDUCED MATRIX
ELEMENTS OF THE $5f^3$ CONFIGURATION
IN INTERMEDIATE COUPLING

by

Hannah M. Crosswhite



THE JOHNS HOPKINS UNIVERSITY
CARLYLE BARTON LABORATORY
BALTIMORE, MD.

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ERRATA - AF 104 - A Forming Study of Point-Contact Tunnel
Diodes - H. J. Lory - May 1963

Page 11 line 9 reads aresnic - should be arsenic

Page 20 line 12 reads normal of N- should be - normal or N-

Page 35 equation (8) should be $\sqrt{2}$ $2h\epsilon$ e in the denominator

Page 88 line 14 reads H on D_o , should read H or D_o .

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ABSTRACT

Since the crystal field can be considered as a perturbation of the free ion spectra of actinide ions in certain crystals, we have calculated energy levels and wave functions of the $5f^3$ configuration, which is the ground configuration of U^{3+} , in intermediate coupling for values of $\chi = \zeta / F_2$ of 7 to 11. Energy levels are given in units of F_2 , and wave functions are expressed as linear combinations of Russell-Saunders functions. Hydrogenic and non-hydrogenic approximations are compared.

Reduced matrix elements in intermediate coupling are given so that crystal field splittings may be calculated. The splittings of the two lowest levels of U^{3+} in a weak field with and without J-mixing are compared.

I. INTRODUCTION

In the triply ionized actinides the optically active electrons belong to the $5f^n$ configuration^{1, 2}, so comparison of their spectra with those of the triply ionized rare earths, whose optically active electrons belong to the $4f^n$ configurations, is of considerable interest. The effect of the crystal field on rare earth ions is small enough to be treated as a perturbation of the free ion spectra; this is also true for the actinide ions, at least in some crystals³⁻⁹. In a free ion, electric dipole transitions within a configuration are forbidden, but the odd parity part of the crystal potential will mix configurations of opposite parity so that "forced" electric dipole transitions can take place as well as the allowed magnetic dipole transitions. The strength of the forced electric dipole transition depends inversely upon the energy differences between mixing configurations^{10, 11}. In crystals containing triply ionized actinides total absorption begins at about 4000A, and it is assumed that this is due to the allowed $5f-6d$ transitions. (Knowledge of the free ion spectra would be useful here). Since the analogous $4f-5d$ transitions in rare earth crystals take place at about 2000 A¹², more intense spectra can be expected from this effect in actinide crystals than in rare earth crystals.

The ground configuration of U^{3+} is $5f^3$. Since nothing is known experimentally about the free ion spectrum of U^{3+} , we have made calculations on the $5f^3$ configuration to aid in the interpretation of crystal spectra.

II. FREE ION

The Hamiltonian for the free ion is

$$H_f = H_o + H_e + H_s \quad ,$$

where H_o is the interaction of the 5f electrons with the core (constant for the configuration)

H_e is the electrostatic interaction between the three 5f electrons

H_s is the spin orbit interaction.

Higher order effects, including spin-spin and spin-other-orbit interactions will be neglected.

The electrostatic interaction is

$$H_e = \sum_{i>j} \frac{e^2}{r_{ij}} \quad i, j = 1, 2, 3 \quad ,$$

where electrons in closed shells are assumed to affect the energies of the 5f electrons only by a contribution to the central potential.

We can expand $\frac{1}{r_{ij}}$ in terms of the Legendre polynomials¹³

$$\frac{1}{r_{ij}} = \sum_{k=0}^{\infty} \frac{r_a^n}{r_b^n} P_n(\cos \omega) \quad ,$$

where r_a is the smaller and r_b the larger of the distances of r_i and r_j from the nucleus, and ω is the angle between r_i and r_j . Then we can separate the radial and angular components and write

$$H_e = \sum_n f^n F_n \quad n = 2, 4, 6 \quad \text{for } f \text{ electrons}$$

Matrix elements of f^n are essentially integrals of spherical harmonics over the angular wave function, and have been evaluated by Carlson¹⁴ for f^3 using Racah's method. The F_n are integrals of $\frac{r^n}{r^{n+1}}$ over the 5f radial wave functions (Slater integrals). If 5f hydrogenic wave functions are assumed, that is, in a Coulomb field, Judd¹⁵ has calculated

$$F_4/F_2 = 0.1422 \quad \text{and} \quad F_6/F_2 = 0.0161$$

The spin orbit interaction is

$$H_s = \sum_{i=1}^3 \xi(r_i) \vec{l}_i \cdot \vec{s}_i$$

ξ , the integral of $\xi(r_i)$ over the radial wave function, is determined experimentally due to lack of knowledge of the wave function. The matrix elements of the angular part of H_s have been calculated for f^3 by Judd and Loudon¹⁶. In U^{3+} the spin orbit interaction is rather large, therefore we had to perform intermediate coupling calculations. Since J is a good quantum number, this involved diagonalizing matrices for each J value, $1/2$ to $17/2$. The electrostatic matrices, assuming 5f hydrogenic wave functions, and spin orbit matrices have been diagonalized simultaneously, by using a program developed

by Wybourne^{*}, for various values of $\chi = \zeta/F_2$ expressing energies in terms of F_2 and wave functions as linear combinations of Russell-Saunders states. Figure 1 shows the variation in energy levels of f^3 with χ , for $\chi = 7$ to 11. The levels are named by the Russell-Saunders states into which they go at $\zeta = 0$. For $F_2 = 200$, $\chi = 8$, (the order of magnitude appropriate for U^{3+})¹⁷, it is noted that the configuration extends $35,000 \text{ cm}^{-1}$. In comparison, the $Nd^{3+} 4f^3$ configuration extends $67,000 \text{ cm}^{-1}$. The 41 levels are each $(2J + 1)$ -fold degenerate.

The use of the 5f hydrogenic wave functions for U^{3+} is questionable. Lammermann and Conway⁸ feel that the Coulomb approximation is satisfactory for the interpretation of the $Pu^{3+}(5f^5)$ spectrum. Cohen has done a relativistic self-consistent calculation for the normal uranium ion, and Winocur has calculated the following set of Slater integrals from Cohen's eigenfunctions¹⁸

$$F_4/F_2 = 0.159 \qquad F_6/F_2 = 0.0204.$$

The discrepancy between a similar calculation for $PrIV$ and the experimental values indicates that these should be treated with reserve¹⁷.

McLaughlin⁹ determined F_2 , F_4 , and F_6 experimentally by a least squares fit to the spectrum of $UCl_4(5f^2)$ and found the ratios to be

* Private communication.

$$F_4/F_2 = 0.1468 \quad F_6/F_2 = 0.0219 \quad .$$

We have calculated energy levels and wave functions of f^3 using these last ratios with $\chi = 8.0$, and the energy levels are compared with hydrogenic ones in Figure 2. F_2 has been chosen to put the $^4I_{11/2}$ level at 4500 cm^{-1} from the ground state where it has been observed^{19, 20}. It is apparent that the position of the $^4F_{3/2}$ level relative to the $^4I_{13/2}$ is depressed in the non-hydrogenic case, and above $10,000 \text{ cm}^{-1}$, where the energy levels become more dense, the grouping is much different in the two cases.

III. CRYSTAL FIELD

We are interested in crystals in which the splitting of the J manifold is small compared to the spin-orbit splitting, so in a first approximation the crystal field interaction can be treated as a perturbation of the free ion energy levels. However, since the 5f wave functions are more extensive than the 4f wave functions²², somewhat larger crystal field effects can be expected in the actinides than in the rare earths. Each J level of an ion with an odd number of electrons will split in a crystal field into $(2J + 1)/2$ components at the most due to Kramers degeneracy.

The Hamiltonian for the crystal field interaction, assuming a purely electrostatic field is²³

$$H_c = \sum_{kq} A_k^q \langle r^k \rangle V_k^q(\theta, \phi) \quad |q| \leq k, k = 2, 4, 6 \text{ for } f \text{ electrons.}$$

The number of terms in the expansion depends on the symmetry of the ion site in the crystal. The coefficients A_k^q depend on the lattice, and, although it is theoretically possible to calculate them if the positions and charge distributions of the ions in the crystal are known, results have not been satisfactory. Therefore, $A_k^q \langle r^k \rangle$ are customarily treated as experimentally determined parameters. The V_k^q are normalized associate spherical harmonics which transform in the same manner as the unit tensor operators U_k^q and are related to them by constant factors. We may use either set for calculations. Matrix elements of the crystal potential, for LS coupling then, can be obtained by using the relation¹⁵

$$\langle a LSJM | U_q^k | a' L'S'J'M' \rangle = \delta(SS') (-1)^{J-M} \begin{pmatrix} J & k & J' \\ -M & q & M' \end{pmatrix} \langle a LSJ || U^k || a' L'S'J' \rangle,$$

where the reduced matrix element is

$$\langle a LSJ || U^k || a' L'S'J' \rangle = (-1)^{S+k+L'+J} \left[(2J+1)(2J'+1) \right]^{1/2} \begin{Bmatrix} L & J & S \\ J' & L' & k \end{Bmatrix} \langle a LS || U^k || a' L'S \rangle.$$

3-j symbols $\begin{pmatrix} J & k & J' \\ -M & q & M' \end{pmatrix}$ and 6-j symbols $\begin{Bmatrix} L & J & S \\ J' & L' & k \end{Bmatrix}$ are vector coupling coefficients and are available in tabular form²⁴. Judd has tabulated²⁵ the double reduced matrix elements $\langle a LS || U^k || a' L'S \rangle$ for f^3 . If J mixing is neglected, the matrix elements may be more simply calculated from

$$\langle a LSJM | V_k^q | a' L'SJM' \rangle = \langle a LSJ || V_k || a' L'SJ \rangle f_k S_k^q(M),$$

where $S_k^q(M)$ are the Stevens coefficients²⁶ and the f_k , which depend only on J, are proportionality constants chosen to make the S_k^0 integers.

U^{3+} states can be represented by linear combinations of Russell-Saunders states with coefficients depending on χ ; therefore the crystal field matrix elements will also depend on χ , and we have obtained them for $\Delta J = 0$ by the same transformation which diagonalized the $5f^3$ energy matrix.

Table I presents the results of calculations we have made on the $5f^3$ configuration using hydrogenic wave functions. For each J value for $\chi = 7.0$ to 11.0 , energies in units of F_2 are given in the first row. In the columns below each energy level are the coefficients

of the LS wave functions for that level. Reduced matrix elements in intermediate coupling are given in terms of $\langle aLSJ || V_k || aL'SJ \rangle f_k \times 10^3$ in order that they may be used with the Stevens coefficients given in Table II^{26, 27}. The last row of each column gives the Landé g-value of the level in intermediate coupling.

As an example of the use of the tables, the splitting of a $^4F_{5/2}$ level in D_{3h} symmetry for $\chi = 8$ is $(-0.00937) S_2^0(M) + (-0.02391) S_4^0(M)$ or

$$\begin{aligned} (-0.00937) \times 5 \times A_2^0 + (-0.02391) \times 1 \times A_4^0 &= -0.04685 A_2^0 - 0.02391 A_4^0, m=5/2 \\ -(-0.00937) \times (-1) \times A_2^0 - (-0.02391) \times (-3) \times A_4^0 &= 0.00937 A_2^0 + 0.07173 A_4^0, m=3/2 \\ -(-0.00937) \times (-4) \times A_2^0 - (-0.02391) \times 2 \times A_4^0 &= 0.03748 A_2^0 - 0.04782 A_4^0, m=1/2 \end{aligned}$$

In a crystal field J is only approximately a good quantum number, so that J levels will also be mixed. A complete J mixing calculation would involve diagonalizing three 60- and 61-dimensional matrices, and does not seem to be worthwhile until more is known about the wave functions. However, in order to get an idea of the magnitude involved, J mixing of the $^4I_{9/2}$ and $^4I_{11/2}$ states can be calculated by second order perturbation theory. (For higher levels which become more nearly degenerate this cannot be done).

We have calculated the splittings of the $^4I_{9/2}$ and $^4I_{11/2}$ states using 5f hydrogenic wave functions for $\chi = 8.0$ and the fictitious crystal field parameters

$$\begin{aligned} A_2^o \langle r^2 \rangle &= 170 & A_6^o \langle r^6 \rangle &= -100 \\ A_4^o \langle r^4 \rangle &= -80 & A_6^6 \langle r^6 \rangle &= 1100 \end{aligned} ,$$

which are close to those found by Gruber⁴ for Am^{3+} in LaCl_3 .

The effect of the $^4I_{11/2}$ state on the $^4I_{9/2}$ state 4500 cm^{-1} below it is to depress the ground Stark level by 27 cm^{-1} and to increase slightly the overall splitting. The calculated splittings of the $^4I_{11/2}$ and $^4I_{9/2}$ levels using the above parameters, with and without J mixing, are shown in Figure 3.

CONCLUSION

Experimentally, a complication occurs in uranium doped crystals in that uranium readily ionizes to U^{4+} and less easily to U^{3+} so that crystals nominally containing U^{3+} sometimes contain both ions, as was the case for $CaF_2:U^{3+}$.^{28, 29} The ground configuration of U^{4+} is $5f^2$. In Figure 4 we compare McLaughlin's energy level diagram for U^{4+} with our calculated one for $5f^3$ for reasonable values of F_2 and χ , and find that the energy levels are often very close, especially when we take into account Stark splitting, which could spread each level by several hundred cm^{-1} . However, a 1.88μ absorption line, described as characteristic of U^{3+} ^{28, 29} does not fit into the $5f^3$ energy level scheme. Either hydrogenic wave functions are decidedly in error or this 1.88μ line belongs to U^{4+} , where it could fit into the $^3H_5$ state.

It is difficult to see how these levels can be definitely assigned until the free ion spectra have been analyzed. Also it is quite desirable to know the position of the $6d$ configuration in order to estimate line strengths. Therefore, a program has been initiated to analyze the free ion spectra of ionized uranium. We hope to start with UIV (U^{3+}) and to go on to UIII and UV. This work will be done in cooperation with the Physics Department of The Johns Hopkins University.

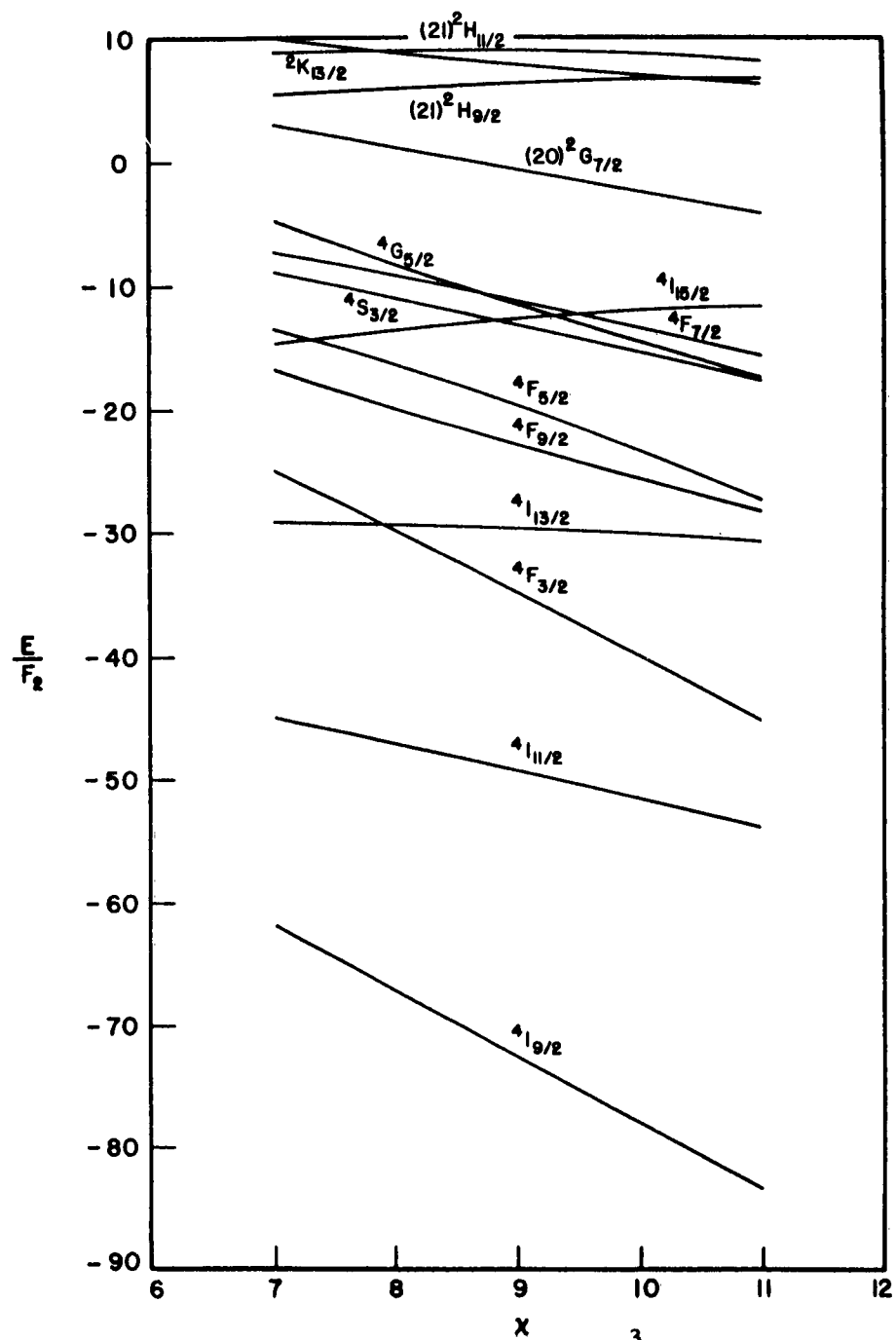


FIGURE 1a ENERGY LEVELS OF THE $5f^3$ CONFIGURATION.

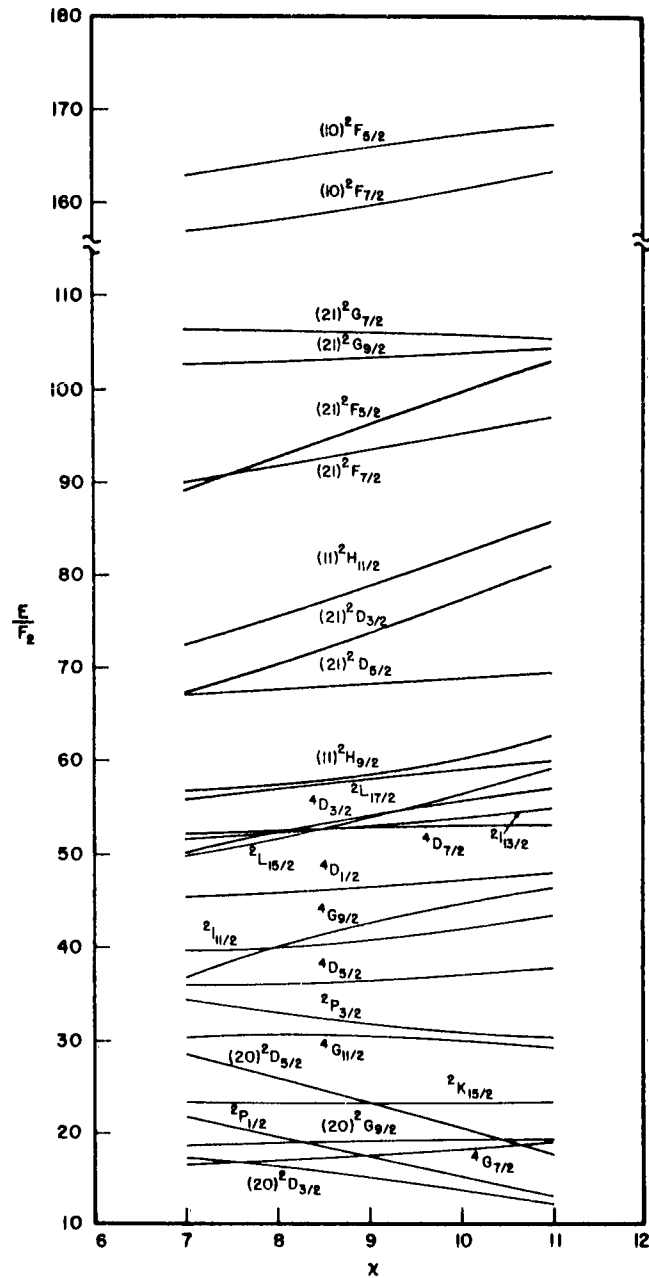


FIGURE 1b ENERGY LEVELS OF THE $5f^3$ CONFIGURATION.

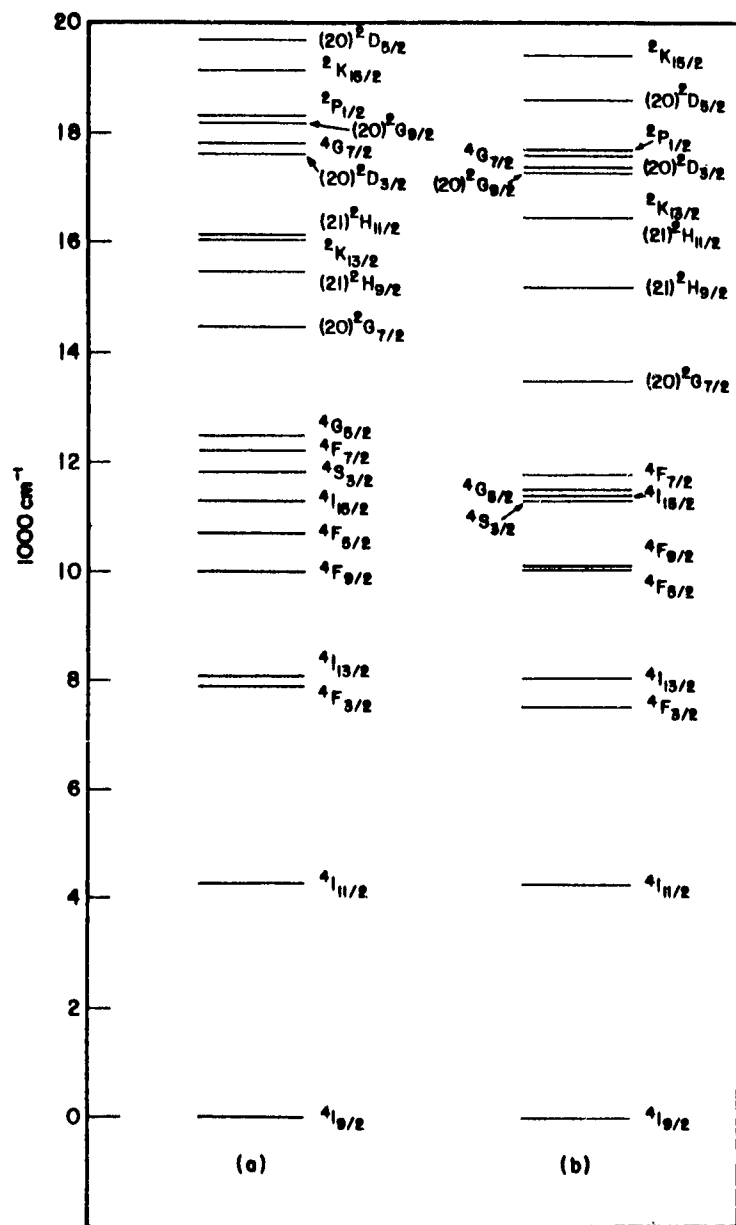


FIGURE 2 LOW-LYING ENERGY LEVELS OF THE $5f^3$ CONFIGURATION
FOR $\chi = 8$.

(a) $F_2 = 211$ $F_4 = 30.004$ $F_6 = 3.3971$ (hydrogenic)
 (b) $F_2 = 213$ $F_4 = 31.098$ $F_6 = 4.6647$ (McLaughlin's ratios⁹
 from U^{4+}).

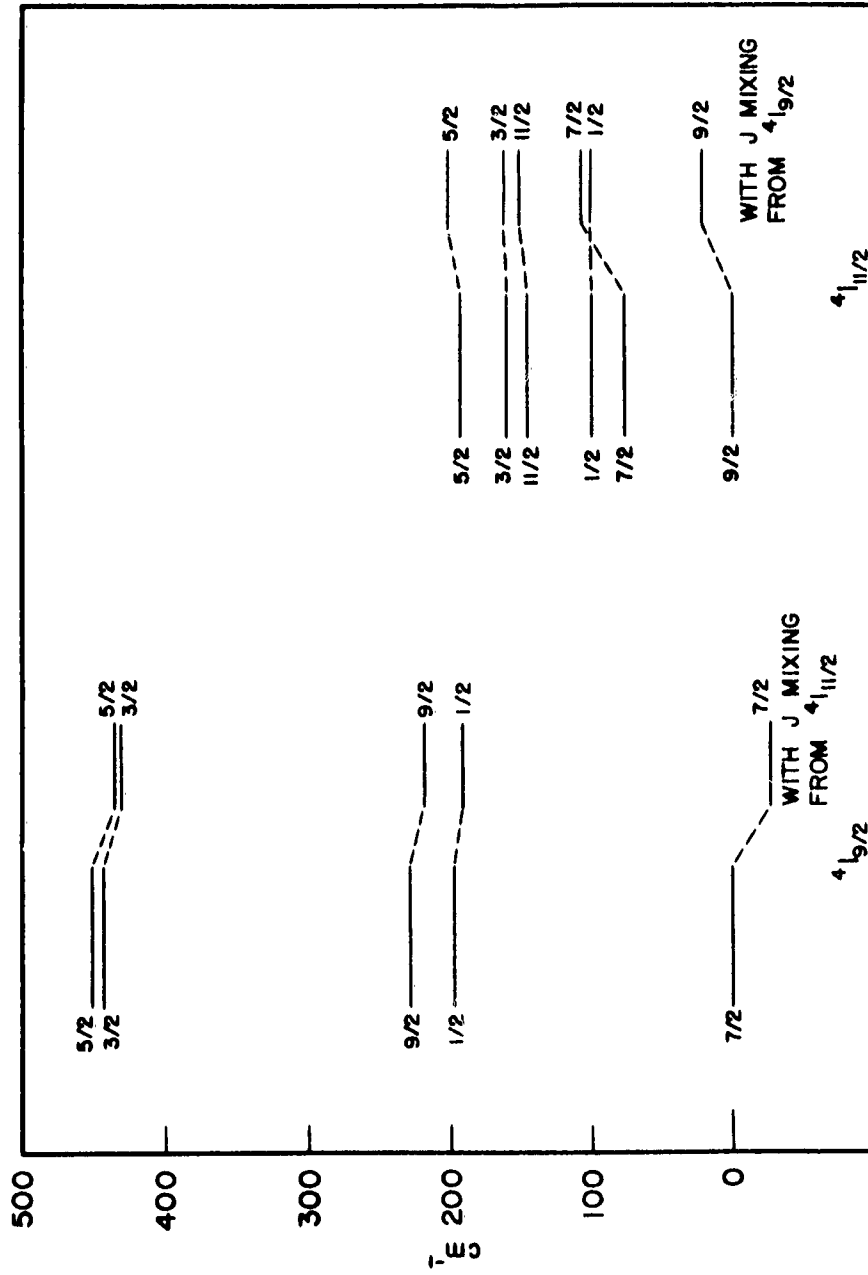


FIGURE 3 CRYSTAL FIELD SPLITTING IN A D_{3h} SYMMETRY SITE

$$\begin{aligned} A_2^0 \langle r^2 \rangle &= 170 & A_6^0 \langle r^6 \rangle &= -100 \\ A_4^0 \langle r^4 \rangle &= -80 & A_6^0 \langle r^6 \rangle &= 1100 \end{aligned}$$

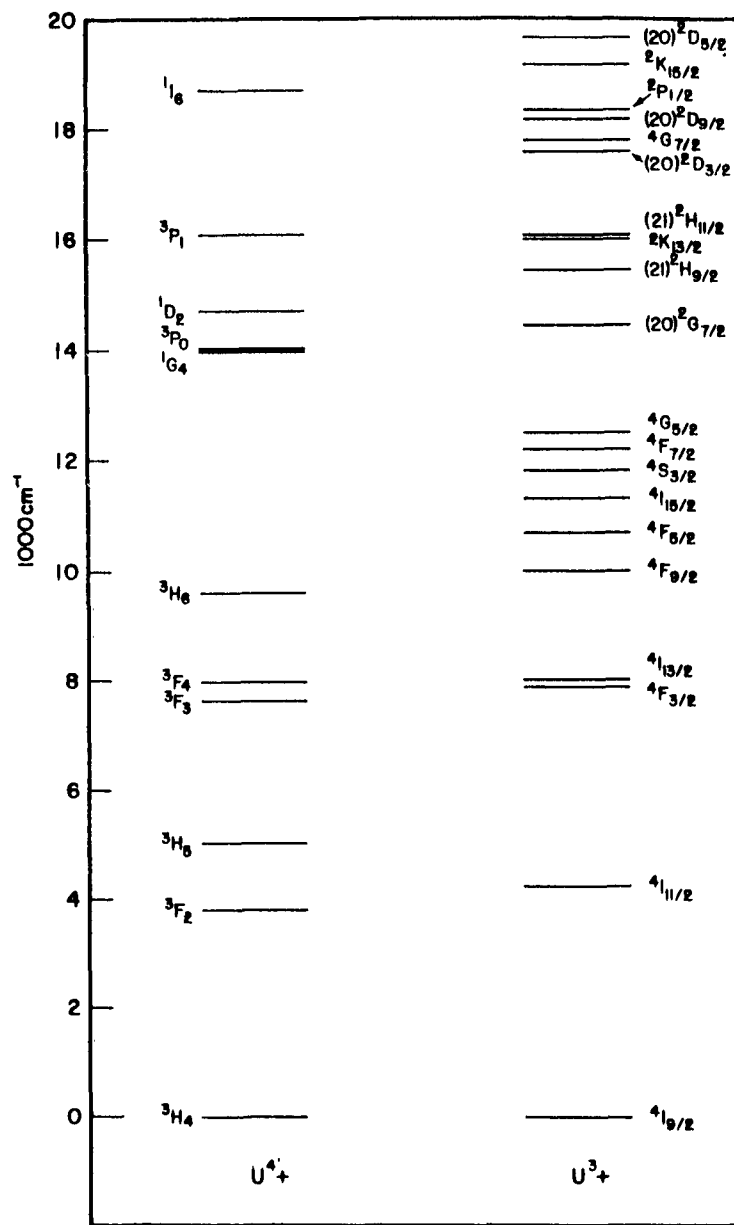


FIGURE 4 LOWER ENERGY LEVELS FOR U^{3+} AND U^{4+} .

X= 7.0, J= 1/2		X= 9.0, J= 1/2	
EIGENVALUES	21.714 45.335	EIGENVALUES	17.555 46.454
EIGENVECTORS		EIGENVECTORS	
2P 0.82131 -C.57C45		2P 0.76853 -C.63581	
4C 0.57C5C C.82131		4C C.63882 C.76853	
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING		REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING	
F2V2 C.CCCC C.CCCC		F2V2 C.CCCC C.CCCC	
F4V4 C.CCCC C.CCCC		F4V4 C.CCCC C.CCCC	
F6V6 C.CCCC C.CCCC		F6V6 C.CCCC C.CCCC	
G 0.4457C C.21657		G C.39376 C.27251	
X= 7.5, J= 1/2		X= 9.5, J= 1/2	
EIGENVALUES	2C.713 45.586	EIGENVALUES	16.461 46.838
EIGENVECTORS		EIGENVECTORS	
2P 0.8C665 -C.591C3		2P C.75764 -C.65268	
4C C.591C4 C.8C665		4C 0.65269 C.75764	
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING		REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING	
F2V2 C.CCCC C.CCCC		F2V2 C.CCCC C.CCCC	
F4V4 C.CCCC C.CCCC		F4V4 C.CCCC C.CCCC	
F6V6 C.CCCC C.CCCC		F6V6 C.CCCC C.CCCC	
G 0.43375 C.23288		G C.38267 C.2840C	
X= 8.0, J= 1/2		X= 10.0, J= 1/2	
EIGENVALUES	15.623 45.866	EIGENVALUES	15.353 47.156
EIGENVECTORS		EIGENVECTORS	
2P 0.78259 -C.60923		2P 0.74755 -C.66421	
4C 0.6C924 C.78259		4C 0.66422 C.74755	
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING		REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING	
F2V2 C.CCCC C.CCCC		F2V2 C.CCCC C.CCCC	
F4V4 C.CCCC C.CCCC		F4V4 C.CCCC C.CCCC	
F6V6 C.CCCC C.CCCC		F6V6 C.CCCC C.CCCC	
G 0.41522 C.24745		G C.37255 C.29412	
X= 8.5, J= 1/2		X= 11.0, J= 1/2	
EIGENVALUES	18.625 46.17C	EIGENVALUES	13.C96 47.953
EIGENVECTORS		EIGENVECTORS	
2P 0.78C3C -C.62541		2P 0.72554 -C.68354	
4C C.62542 C.78C3C		4C 0.68355 C.72554	
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING		REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING	
F2V2 C.CCCC C.CCCC		F2V2 C.CCCC C.CCCC	
F4V4 C.CCCC C.CCCC		F4V4 C.CCCC C.CCCC	
F6V6 C.CCCC C.CCCC		F6V6 C.CCCC C.CCCC	
G 0.4C591 C.26676		G C.35481 C.31186	

TABLE I. WAVE FUNCTIONS, ENERGIES, AND REDUCED MATRIX ELEMENTS OF $5f^3$.

X= 8.5, J= 3/2
EIGENVALUES
-14.891 -6.876 17.332 34.471 50.233 67.271
EIGENVECTORS
4S -C.15247 C.53843 0.45368 0.13778 -C.20225 -0.08990
2P -C.22134 C.43417 -0.45858 -0.27697 C.59253 0.33591
(2012C 0.42828 C.68175 0.51321 0.32595 C.53332 0.35691
(2112D -0.14578 C.60665 -0.23750 0.79803 0.23382 0.29162
4C -C.68536 C.57025 -0.34335 0.79803 0.23382 0.29162
4F -C.68536 C.57025 -0.34335 0.79803 0.23382 0.29162
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 112.2228 78.7181 34.7212 -57.5063-104.5398 176.2628
F4V4 C.CCCC C.CCCC 0.0000 0.0000 0.0000 0.0000
F6V6 C.CCCC C.CCCC 0.0000 0.0000 0.0000 0.0000
G 0.56854 1.70728 1.15173 1.08088 1.05403 0.97038

X= 7.5, J= 3/2
EIGENVALUES
-27.293 -5.952 16.871 33.655 51.314 68.693
EIGENVECTORS
4S -C.15854 C.82349 0.46667 0.16365 -C.20407 -0.10254
2P -C.23555 C.44612 -0.42854 -0.29986 C.57002 0.38344
(2012C 0.44213 -C.68664 0.48746 0.34869 0.51780 0.41318
(2112D -0.15528 -C.60624 -0.28168 0.49222 -0.46597 0.56327
4C -C.67551 C.57611 -0.37311 0.71603 0.32753 -0.47887
4F -C.67551 C.57611 -0.37311 0.71603 0.32753 -0.47887
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 107.771C 85.9424 25.2438 -52.5228-142.8223 215.5876
F4V4 C.CCCC C.CCCC 0.0000 0.0000 0.0000 0.0000
F6V6 C.CCCC C.CCCC 0.0000 0.0000 0.0000 0.0000
G 0.59440 1.67800 1.15800 1.08250 1.04869 0.98175

X= 8.0, J= 3/2
EIGENVALUES
-11.047 16.383 32.917 52.319 70.213
EIGENVECTORS
4S -C.16370 C.30540 0.47576 0.19116 -0.20497 -0.11482
2P -C.24950 C.45630 -0.35772 -0.32109 0.54724 0.41144
(2012C 0.55441 -C.67823 0.46035 0.37166 C.49559 0.43779
(2112D -0.16433 -C.60128 -0.36688 0.48521 -0.48459 0.63537
4C -C.68247 C.58162 -0.46328 0.69074 C.35815 0.46746
4F -C.68247 C.58162 -0.46328 0.69074 -C.35815 -0.46746
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 103.5677 92.7436 14.8283 -46.0971-175.3461 250.8035
F4V4 C.CCCC C.CCCC 0.0000 0.0000 0.0000 0.0000
F6V6 C.CCCC C.CCCC 0.0000 0.0000 0.0000 0.0000
G 0.59836 1.65034 1.16233 1.08580 1.04346 0.99205

TABLE I CONTINUED.

TABLE I

X= 10.0, J= 3/2									
EIGENVALUES									
4S	-0.17739	C-76159	0.47802	0.30654	C-20332	-0.15720	77.076		
2P	-0.28945	C-68435	-0.27218	-0.38598	C-44244	0.19468			
(20)2C	C-09111	C-66775	0.34298	0.43157	C-41348	0.50964			
(21)2C	C-10634	C-60634	-0.40516	0.43274	C-56752	0.53664			
4F	-0.10728	C-10362	-0.51605	-0.57826	C-45165	-0.41660			
4F	-0.77031	C-41309	-0.38640	-0.17232	C-21820	-0.09681			
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING									
F2V2	85.1934	115.8674	-31.4121	-11.4765	-270.5437	348.3713			
F4V4	C-00000	C-00000	C-00000	C-00000	C-00000	C-00000			
F6V6	C-00000	C-00000	C-00000	C-00000	C-00000	C-00000			
G	0.64976	1.55692	1.16051	1.11409	1.02621	1.02584			
X= 7.0, J= 5/2									
EIGENVALUES									
4S	-0.17739	C-76159	0.47802	0.30654	C-20332	-0.15720	77.076		
2P	-0.28945	C-68435	-0.27218	-0.38598	C-44244	0.19468			
(20)2C	C-09111	C-66775	0.34298	0.43157	C-41348	0.50964			
(21)2C	C-10634	C-60634	-0.40516	0.43274	C-56752	0.53664			
4F	-0.10728	C-10362	-0.51605	-0.57826	C-45165	-0.41660			
4F	-0.77031	C-41309	-0.38640	-0.17232	C-21820	-0.09681			
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING									
F2V2	85.1934	115.8674	-31.4121	-11.4765	-270.5437	348.3713			
F4V4	C-00000	C-00000	C-00000	C-00000	C-00000	C-00000			
F6V6	C-00000	C-00000	C-00000	C-00000	C-00000	C-00000			
G	0.64976	1.55692	1.16051	1.11409	1.02621	1.02584			
X= 11.0, J= 3/2									
EIGENVALUES									
4S	-0.17739	C-76159	0.47802	0.30654	C-20332	-0.15720	77.076		
2P	-0.28945	C-68435	-0.27218	-0.38598	C-44244	0.19468			
(20)2C	C-09111	C-66775	0.34298	0.43157	C-41348	0.50964			
(21)2C	C-10634	C-60634	-0.40516	0.43274	C-56752	0.53664			
4F	-0.10728	C-10362	-0.51605	-0.57826	C-45165	-0.41660			
4F	-0.77031	C-41309	-0.38640	-0.17232	C-21820	-0.09681			
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING									
F2V2	85.1934	115.8674	-31.4121	-11.4765	-270.5437	348.3713			
F4V4	C-00000	C-00000	C-00000	C-00000	C-00000	C-00000			
F6V6	C-00000	C-00000	C-00000	C-00000	C-00000	C-00000			
G	0.64976	1.55692	1.16051	1.11409	1.02621	1.02584			
X= 7.5, J= 5/2									
EIGENVALUES									
4S	-0.17739	C-76159	0.47802	0.30654	C-20332	-0.15720	77.076		
2P	-0.28945	C-68435	-0.27218	-0.38598	C-44244	0.19468			
(20)2C	C-09111	C-66775	0.34298	0.43157	C-41348	0.50964			
(21)2C	C-10634	C-60634	-0.40516	0.43274	C-56752	0.53664			
4F	-0.10728	C-10362	-0.51605	-0.57826	C-45165	-0.41660			
4F	-0.77031	C-41309	-0.38640	-0.17232	C-21820	-0.09681			
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING									
F2V2	85.1934	115.8674	-31.4121	-11.4765	-270.5437	348.3713			
F4V4	C-00000	C-00000	C-00000	C-00000	C-00000	C-00000			
F6V6	C-00000	C-00000	C-00000	C-00000	C-00000	C-00000			
G	0.64976	1.55692	1.16051	1.11409	1.02621	1.02584			
X= 8.0, J= 5/2									
EIGENVALUES									
4S	-0.17739	C-76159	0.47802	0.30654	C-20332	-0.15720	77.076		
2P	-0.28945	C-68435	-0.27218	-0.38598	C-44244	0.19468			
(20)2C	C-09111	C-66775	0.34298	0.43157	C-41348	0.50964			
(21)2C	C-10634	C-60634	-0.40516	0.43274	C-56752	0.53664			
4F	-0.10728	C-10362	-0.51605	-0.57826	C-45165	-0.41660			
4F	-0.77031	C-41309	-0.38640	-0.17232	C-21820	-0.09681			
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING									
F2V2	85.1934	115.8674	-31.4121	-11.4765	-270.5437	348.3713			
F4V4	C-00000	C-00000	C-00000	C-00000	C-00000	C-00000			
F6V6	C-00000	C-00000	C-00000	C-00000	C-00000	C-00000			
G	0.64976	1.55692	1.16051	1.11409	1.02621	1.02584			

TABLE I CONTINUED.

X= 8.5, J= 5/2									
EIGENVALUES									
-17.932 -9.895 24.688 36.088 67.999 94.308 174.906									
EIGENVECTORS									
(20)12C	C.30932	C.11489	0.43345	0.81447	0.17037	-0.10890	0.03420		
(21)12C	C.04466	C.09013	0.55496	-0.12717	-0.34202	0.73957	-0.04239		
4C	C.02728	C.06575	-0.60800	-0.48141	0.55375	-0.28937	0.05603		
(10)12F	-0.16259	C.1716C	-0.18039	0.06803	0.42952	0.41877	0.73981		
(21)12F	C.15841	C.15987	-0.16774	0.08932	0.56062	0.39125	-0.66778		
4F	C.54784	C.40251	-0.15562	0.26873	C.03192	0.10544	-0.00554		
4G	-0.36921	C.87023	0.19837	-0.0824C	-C.21811	-0.13377	-0.02494		
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING									
F2V2	-15.394	38.7182	35.3409	58.1577	0.04225	-14.4166	-188.0543		
F4V4	-3.260C	38.722C	124.508C	-18.000C	0.000C	-19.021C	224.000C		
F6V6	C.000C	C.000C	C.000C	C.000C	0.000C	0.000C	0.000C		
G	C.07359	C.47814	1.21192	1.22058	1.05148	1.08859	0.85960		
X= 9.0, J= 5/2									
EIGENVALUES									
-15.594 -11.56C 23.331 36.321 68.296 96.055 175.563									
EIGENVECTORS									
(20)12C	C.20576	C.13965	0.38912	0.83143	C.17297	-0.11434	0.03635		
(21)12C	C.05645	-C.09277	0.56378	-0.09752	-0.32204	0.74495	-0.04696		
4C	C.03514	-C.0651C	C.6234C	-0.45221	0.55518	-0.29349	0.05960		
(10)12F	-0.13215	C.16677	-0.18446	0.06025	0.43300	0.41351	0.73561		
(21)12F	-0.17982	C.15444	-0.17149	0.08259	0.56362	0.37447	-0.67165		
4F	C.21371	C.460C3	-0.17949	-0.2845C	0.03481	0.10388	-0.00647		
4G	-0.41937	C.83855	C.21557	-0.05764	-0.22759	-0.13441	-0.02556		
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING									
F2V2	-2C.8369	65.060C	-40.8819	63.0876	0.99311	-115.2838	-188.2085		
F4V4	-21.5915	35C.118C	-135.895C	-2.2443	-77.1691	-135.5414	217.8319		
F6V6	C.000C	C.000C	0.000C	0.000C	C.000C	0.000C	0.000C		
G	C.05418	C.70442	1.21014	1.21551	1.04688	1.09458	0.86000		
X= 9.5, J= 5/2									
EIGENVALUES									
-21.365 -13.168 21.935 36.607 68.600 97.816 176.233									
EIGENVECTORS									
(20)12C	C.30299	C.16497	0.35342	0.84238	-C.17538	-0.11936	0.03854		
(21)12C	C.06876	-C.094C1	0.56966	-0.07345	-C.30414	0.74923	-0.03176		
4C	C.04358	-C.07154	0.63338	-0.42952	C.55623	-0.30649	0.06323		
(10)12F	-C.00169	C.16C21	-0.18698	0.05404	0.43577	0.41351	0.73136		
(21)12F	-0.19853	C.14711	-0.17354	0.07733	C.5658C	0.35872	-0.67545		
4F	C.77551	C.51493	-0.17515	-0.29787	0.03754	0.11215	-0.00746		
4G	-0.47144	C.6039C	C.21166	-0.05379	-C.23646	-0.13502	-0.02569		
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING									
F2V2	-25.4424	7C.5C33	-45.0447	66.5858	1.5784C	-116.0287	-188.3359		
F4V4	-4E.8856	382.6663	-143.7998	8.7494	-75.0485	-134.7696	214.2479		
F6V6	C.000C	C.000C	0.000C	0.000C	0.000C	0.000C	0.000C		
G	C.53681	C.73251	1.20747	1.21155	1.04279	1.09975	0.86045		

TABLE I CONTINUED.

X= 8.5, J= 7/2 EIGENVALUES EIGENVECTORS 4C 0.01288 -0.02446 -0.02632 0.97400 0.19143 -0.03254 0.11037 0.11037 0.11037 (10)2F -0.05946 C.08813 0.07008 -0.18597 0.45994 -0.11516 0.85514 0.85514 0.85514 (21)2F -0.07198 C.10413 0.01613 -0.09743 0.83260 0.25718 0.01348 0.01348 0.01348 (20)2G -0.05364 C.05716 0.05716 -0.05716 0.05716 0.05716 0.05716 0.05716 0.05716 (21)2G -0.07140 C.05716 0.05716 -0.05716 0.05716 0.05716 0.05716 0.05716 0.05716 (21)2G 0.40822 C.18025 -0.04797 0.01325 -0.01325 -0.01325 -0.01325 -0.01325 -0.01325 4G 0.26285 C.83154 0.05513 0.07495 -0.14089 -0.06545 -0.05027 REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING F2V2 55.8392 -32.4543 55.1846 -92.9544 -31.4737 -105.2538 -107.9240 F4V4 34.0734 -24.0925 36.2257 28.2456 -40.0400 53.0074 45.4817 F6V6 -35.7365 53.0391 14.6892 13.0843 -44.8761 -153.6377 100.5789 G 1.06032 1.04141 0.95593 1.40718 1.14071 0.91889 1.12934									
X= 9.0, J= 7/2 EIGENVALUES EIGENVECTORS 4C 0.01582 -0.03811 -0.03405 0.96317 0.21434 -0.05861 0.14170 0.14170 0.14170 (10)2F -0.05813 C.11175 0.07198 -0.21996 0.47174 -0.15431 0.85514 0.85514 0.85514 (21)2F -0.08438 C.14122 0.07492 -0.05965 0.83365 0.21032 -0.40801 -0.40801 -0.40801 4F 0.76847 C.47864 0.36786 0.05354 0.95960 0.58904 0.02007 0.02007 0.02007 (20)2G -0.46887 C.11159 0.05356 0.05356 0.05356 0.05356 0.05356 0.05356 0.05356 (21)2G 0.27836 C.83154 0.05513 0.07495 -0.14089 -0.06545 -0.05027 REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING F2V2 56.4761 -32.2687 55.4620 -93.0011 -32.0275 -107.5418 -105.2064 F4V4 35.1460 -24.2370 36.0601 27.7452 -41.3088 55.1433 44.3821 F6V6 -36.7525 51.7745 10.3888 13.4776 -42.7447 -156.2695 101.2682 G 1.07334 1.04473 1.00077 1.40527 1.13958 0.92218 1.12801									
X= 9.5, J= 7/2 EIGENVALUES EIGENVECTORS 4C 0.01639 -0.04146 -0.03595 0.96040 0.21834 -0.06655 0.14922 0.14922 0.14922 (10)2F -0.05827 C.12462 0.07229 -0.22771 0.40727 -0.16368 0.85514 0.85514 0.85514 (21)2F -0.08535 C.15025 0.07424 -0.09521 0.83410 0.32242 -0.39481 -0.39481 -0.39481 4F 0.69055 C.48463 0.35235 0.05354 0.95960 0.58904 0.02007 0.02007 0.02007 (20)2G -0.49598 C.69935 0.56070 0.08847 0.08847 0.08847 0.08847 0.08847 0.08847 (21)2G 0.42442 C.14812 -0.46598 0.01801 0.01801 0.01801 0.01801 0.01801 0.01801 4G 0.29240 C.83276 0.42816 0.05356 0.05356 0.05356 0.05356 0.05356 0.05356 REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING F2V2 56.9697 -32.7403 55.6363 -93.0516 -32.6117 -109.7285 -107.5393 F4V4 36.0646 -24.2274 36.0646 27.7452 -41.3088 55.1433 44.3821 F6V6 -37.1397 50.5372 6.4166 13.7645 -40.8117 -158.5973 101.4220 G 1.06660 1.04756 1.00536 1.40531 1.13921 0.92552 1.12670									
X= 7.0, J= 7/2 EIGENVALUES EIGENVECTORS 4C 0.01288 -0.02446 -0.02632 0.97400 0.19143 -0.03254 0.11037 0.11037 0.11037 (10)2F -0.05946 C.08813 0.07008 -0.18597 0.45994 -0.11516 0.85514 0.85514 0.85514 (21)2F -0.07198 C.10413 0.01613 -0.09743 0.83260 0.25718 0.01348 0.01348 0.01348 (20)2G -0.05364 C.05716 0.05716 -0.05716 0.05716 0.05716 0.05716 0.05716 0.05716 (21)2G -0.07140 C.05716 0.05716 -0.05716 0.05716 0.05716 0.05716 0.05716 0.05716 (21)2G 0.40822 C.18025 -0.04797 0.01325 -0.01325 -0.01325 -0.01325 -0.01325 -0.01325 4G 0.26285 C.83154 0.05513 0.07495 -0.14089 -0.06545 -0.05027 REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING F2V2 55.8392 -32.4543 55.1846 -92.9544 -31.4737 -105.2538 -107.9240 F4V4 34.0734 -24.0925 36.2257 28.2456 -40.0400 53.0074 45.4817 F6V6 -35.7365 53.0391 14.6892 13.0843 -44.8761 -153.6377 100.5789 G 1.06032 1.04141 0.95593 1.40718 1.14071 0.91889 1.12934									
X= 7.5, J= 7/2 EIGENVALUES EIGENVECTORS 4C 0.01373 -0.02787 -0.02929 0.97132 0.19926 -0.03924 0.11836 0.11836 0.11836 (10)2F -0.05646 C.09610 0.07073 -0.19493 0.44945 -0.12503 0.85262 0.85262 0.85262 (21)2F -0.06803 C.11411 0.07614 -0.09837 0.83283 0.26837 -0.44662 -0.44662 -0.44662 4F 0.76027 -0.43700 0.43700 0.02960 0.02960 0.02960 0.02960 0.02960 0.02960 (20)2G -0.45866 C.19407 0.57153 0.06111 -0.18151 0.60685 0.14274 0.14274 0.14274 (21)2G 0.38860 C.21866 -0.46944 0.00924 -0.08182 0.73567 0.19275 0.19275 0.19275 4G 0.22351 C.83263 0.48809 0.05827 0.05827 0.05827 0.05827 0.05827 0.05827 REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING F2V2 56.1017 -32.1244 55.2006 -92.9544 -31.4737 -105.2538 -107.9240 F4V4 35.1017 -24.0925 36.2257 28.2456 -40.0400 53.0074 45.4817 F6V6 -36.7525 51.7745 10.3888 13.4776 -42.7447 -156.2695 101.2682 G 1.06324 1.03291 0.98569 1.41087 1.14260 0.91258 1.13198									
X= 8.0, J= 7/2 EIGENVALUES EIGENVECTORS 4C 0.01449 -0.03125 -0.03023 0.96863 0.20433 -0.04448 0.12626 0.12626 0.12626 (10)2F -0.05721 C.10373 0.07123 -0.20360 0.43892 -0.13487 0.85358 0.85358 0.85358 (21)2F -0.08175 C.12372 0.07591 -0.09856 0.83366 0.28322 -0.43397 -0.43397 -0.43397 4F 0.74110 -0.46625 0.46625 0.03173 0.03173 0.03173 0.03173 0.03173 0.03173 (20)2G -0.47046 C.16715 0.56953 0.06774 -0.19127 0.60200 0.15090 0.15090 0.15090 (21)2G 0.39327 C.19861 -0.46893 0.01115 -0.08774 0.72960 0.20475 0.20475 0.20475 4G 0.24630 C.82554 0.47077 0.06985 -0.13671 -0.06215 -0.04643 REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING F2V2 55.0544 -31.4591 54.7779 -92.9125 -30.9428 -102.8838 -110.6815 F4V4 35.0544 -23.7622 36.3959 28.7784 -38.7160 50.7308 46.8594 F6V6 -37.1397 50.5372 6.4166 13.7645 -40.8117 -158.5973 101.4220 G 1.06910 1.03750 0.99089 1.40905 1.14139 0.91368 1.13067									

TABLE I CONTINUED.

X= 7.0, J= 9/2
EIGENVALUES
-62.032 -16.837 5.534 18.700 36.914 56.812 102.709
EIGENVECTORS
4F C-C20C3 -C-337C5 0.80657 -0.06924 C.47317 0.06776 0.04659
(20)2C -C-0556C C.4248C -C.21011 0.01095 C.59463 0.04950 0.64417
(21)2C 0.06636 -C.3656B -C.10772 0.09734 -C.44886 -0.31629 0.72867
4G C-C3494 -C-2357E -0.11952 0.92832 C.14453 0.21626 -C.04528
(11)2H 0.1101C -C.2351E -0.11648 -0.24545 -C.15745 0.88885 0.20954
(21)2H -C.33039 C.60365 0.49220 0.24065 -C.42029 0.24216 0.07731
4I C-53229 C.31135 0.15959 0.07544 -C.06752 -0.00452 0.00151
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -3C.3266 39.5259 25.3452 -4.2083 31.8316 -40.5707 -68.4859
F4V4 -19.7803 3.1603 -18.4418 10.0028 12.1995 0.6014 4.1292
F6V6 -151.7799 100.0563 -32.2719 41.5147 -23.5746 50.8922 -76.1403
G C.75316 1.01773 1.15961 1.13805 1.12269 0.94355 1.10184

X= 7.5, J= 9/2
EIGENVALUES
-64.621 -18.315 5.786 18.813 38.528 57.019 102.841
EIGENVECTORS
4F C-C2214 -C-23649 0.80150 -0.03287 C.48042 0.08709 0.05074
(20)2C -C-07074 C.42814 -0.21670 0.02303 C.58637 0.07151 0.44442
(21)2C C-C5529 -C.36515 0.09590 C.10336 0.09590 -C.44006 -0.34915 0.72360
4G C-C3813 -C.24122 -0.13432 0.92397 C.11847 0.22885 -C.04692
(11)2H 0.11328 -C.23023 -0.10671 -0.26011 -C.19935 0.87489 0.22320
(21)2H -C.34377 C.59195 0.49476 0.24409 -C.41591 0.21804 0.08039
4I C-52609 C.32476 C.15917 0.03082 -C.07042 -C.00806 0.00153
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -25.7618 38.3334 23.2031 -2.8572 26.8915 -36.9554 -67.3434
F4V4 -15.3396 3.0453 -18.5876 10.4027 12.7068 -0.2940 3.9669
F6V6 -147.2095 102.6625 -34.7346 45.9943 -16.4263 42.0054 -77.0626
G C.75562 1.01785 1.15348 1.13526 1.11837 0.95171 1.10043

X= 8.0, J= 9/2
EIGENVALUES
-62.237 -19.780 6.022 18.916 40.048 57.334 102.998
EIGENVECTORS
4F C-C2422 -C-33645 0.78650 -0.03532 C.48514 0.11029 0.05507
(20)2C -C-07565 C.43054 -0.22333 0.03382 C.57643 0.09728 0.44444
(21)2C 0.07004 -C.37318 0.10340 0.09577 C.41700 -0.33380 0.71895
4G C-C4128 -C.24613 0.15829 0.91856 0.09020 0.24679 -0.04832
(11)2H 0.11733 -C.22557 -0.09583 0.27486 -C.22655 0.85664 0.23663
(21)2H -C.35623 C.58020 0.49952 0.24839 -C.42929 0.19017 0.08417
4I C-52001 C.33734 0.16409 0.03644 -C.07242 -0.01233 0.00151
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -25.0088 38.1157 20.9232 -1.3841 26.9027 -31.8291 -66.2044
F4V4 -18.9060 2.9154 -18.7739 10.7896 13.2087 -1.0957 3.7624
F6V6 -142.3004 96.2042 -37.1212 50.5030 -7.7020 41.6117 -77.9577
G C.75804 1.01783 1.15147 1.13193 1.11238 0.96189 1.09918

TABLE I CONTINUED.

X= 10.0, J= 7/2
EIGENVALUES
-13.530 -2.347 18.463 53.062 95.189 105.931 171.229
EIGENVECTORS
4C C-C165C -C-04481 -C.03786 0.95755 0.07510 0.15658
(10)2F -C-0585C C.13045 0.07259 -0.23523 C.39666 -0.17334 0.85525
(21)2F -C-08695 C.1584C 0.07346 -0.09288 C.83475 0.33330 -0.38153
4F C-07696 -C-48898 0.53743 -0.0387C C.10558 0.04122 0.02419
(20)2G -C-0626C -C-08047 0.55727 0.09561 -C.22536 0.58209 0.17950
(21)2G C-43102 -C.13412 -0.46373 0.02065 -C.10849 0.71215 0.24866
4G C-03053 C-83234 C.41651 0.03945 -C.13168 -0.07447 -0.06202
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -38.0782 33.1228 -33.2378 -11.7922 -99.9320
F4V4 -21.8784 -3.0758 32.4418 38.7441 42.1177
F6V6 -21.9304 49.1631 37.5838 -160.881 101.453
G 1.60053 1.04937 1.00975 1.40129 1.13842 0.92890 1.12542

X= 11.0, J= 7/2
EIGENVALUES
-15.766 -4.220 19.208 53.175 96.877 105.584 173.139
EIGENVECTORS
4C C-C178C -C-0511E -C-04174 0.95184 C.22643 -0.09422 C.17079
(10)2F -C-05853 C.14272 0.07323 -0.24965 C.37515 -0.19213 0.85491
(21)2F -C-08761 C.17355 0.0717C -C-0866C C.83707 0.35059 -0.35492
4F C-05057 -C-49346 0.56214 -0.04111 C.11110 0.04507 0.02817
(20)2G -C-05118 -C-04798 0.55016 0.11021 -C.23823 0.57280 0.19124
(21)2G C-44193 C.15962 -0.46013 0.02646 -C.11534 0.70346 0.26785
4G C-22855 C-83013 C.35622 0.09819 -C.13782 -0.07949 -0.06992
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 57.9695 -34.4321 55.7273 -93.2533 -34.6912 -115.4410 -94.9264
F4V4 36.2657 -23.5726 34.9956 26.1388 -45.6420 62.0023 40.7461
F6V6 -14.4453 47.1352 -3.8262 13.9661 -32.4194 -164.1062 100.8421
G 1.65011 1.05315 1.01780 1.39708 1.13693 0.93558 1.12298

X= 8.5, J= 9/2
EIGENVALUES
-65.878 -21.232 6.241 19.010 41.451 57.779 103.181
EIGENVECTORS
4F C.02624 -0.33630 0.79145 -0.01652 0.48698 0.13730 0.05960
120126 C.08043 C.43330 -0.23009 0.04239 0.56425 0.12675 0.45454
121126 C.07466 -0.37475 0.09886 0.09672 0.38907 -0.11964 0.71231
4G C.04430 -0.25057 -0.16741 0.91208 0.05940 0.26337 -0.49448
111124 C.12046 -0.22115 -0.08380 -0.28960 0.29835 0.83320 0.24986
121124 C.16783 C.57018 0.47751 0.25357 -0.44170 0.15844 0.08714
41 C.51406 C.34914 0.16933 0.09232 -0.07385 -0.01732 0.00145
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -26.2704 37.3665 18.4934 0.2187 13.8102 -25.5362 -65.0668
F4V4 -18.4805 2.7750 -18.9634 11.1594 13.6331 -1.7356 3.5128
F6V6 -135.4421 95.7412 -39.4186 54.9460 2.4681 19.8055 -18.8337
G C.76642 1.01770 1.18971 1.12938 1.10453 0.97407 1.09790

X= 9.5, J= 9/2
EIGENVALUES
-72.543 -22.671 6.440 19.097 42.717 58.374 103.387
EIGENVECTORS
4F C.02822 -0.33622 0.78621 0.00356 0.48562 0.16755 0.06434
120126 C.08497 C.43535 -0.23704 0.04994 0.54935 0.15868 0.46427
121126 C.07911 -0.37762 0.09476 0.09859 -0.35610 -0.45560 0.70605
4G C.04726 -0.25461 -0.13545 0.90450 0.02578 0.27778 -0.50509
111124 C.12334 -0.21766 -0.07057 -0.30421 -0.35317 0.80394 0.26287
121124 C.17865 C.56004 0.47772 0.25966 -0.45234 0.12318 0.08977
41 C.50825 C.36021 0.17190 0.09848 -0.07464 -0.02294 0.00133
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -27.5489 37.5977 15.9035 1.9570 5.7190 -19.1847 -63.9283
F4V4 -18.0655 2.6276 -19.1481 11.5072 13.8981 -2.1335 3.2148
F6V6 -135.7360 92.3100 -41.6093 59.3157 13.7014 6.9479 -19.5991
G C.76275 1.01748 1.18817 1.12466 1.09488 0.98819 1.09666

X= 9.5, J= 9/2
EIGENVALUES
-24.059 6.617 19.178 43.829 59.137 103.618
EIGENVECTORS
4F C.03013 -0.33617 0.78064 0.02490 0.48097 0.19984 0.06932
120126 C.08591 C.43657 -0.24420 0.05617 0.53157 0.19159 0.46733
121126 C.08318 -0.37501 0.05010 0.10122 -0.31867 -0.49029 0.69936
4G C.05013 -0.25829 -0.26497 0.89576 -0.31017 0.28925 -0.05103
111124 C.12597 -0.21317 -0.05610 -0.31856 -0.40952 0.76888 0.27567
121124 C.16874 C.55034 0.45714 0.26666 -0.46040 0.08540 0.09207
41 C.50259 C.37081 0.17480 0.10494 -0.07473 -0.02900 0.00116
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -24.8460 37.3152 13.1466 3.8343 -3.0459 -10.1036 -62.7853
F4V4 -17.6608 2.4756 -19.3191 11.8260 13.9300 -2.2164 2.8649
F6V6 -132.1015 88.9322 -43.6423 63.5842 25.3236 -6.2967 -80.5628
G C.76503 1.01718 1.18678 1.12079 1.08383 1.09527

TABLE I CONTINUED.

X= 10.5, J= 9/2
EIGENVALUES
-71.935 -25.516 6.768 19.257 44.779 60.074 103.874
EIGENVECTORS
4F C.03198 -0.33616 0.77460 0.04740 0.47340 0.23249 0.07456
120126 C.09345 C.43835 -0.23160 0.06114 0.51126 0.22349 0.44863
121126 C.08749 -0.38076 0.08406 0.10445 -0.27813 -0.52226 0.69220
4G C.05951 -0.26165 -0.22529 0.88583 -0.04749 0.29732 -0.05141
111124 C.12837 -0.20550 -0.04038 -0.33250 -0.46142 0.72900 0.28829
121124 C.16816 C.54112 0.49576 -0.27456 -0.46527 0.04655 0.09401
41 C.59716 C.38036 0.17701 0.11170 -0.07417 -0.03521 0.00092
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -26.1627 37.0236 10.2200 5.8512 -11.9665 -1.8165 -61.6338
F4V4 -17.2671 85.6242 -45.8666 12.1673 13.6844 1.8442 2.4597
F6V6 -125.5271 85.6242 -45.8666 12.1673 13.6844 1.8442 2.4597
G C.76725 1.01652 1.18531 1.11682 1.07219 1.02020 1.09393

X= 11.5, J= 9/2
EIGENVALUES
-82.358 -28.321 6.980 19.415 46.222 62.445 104.458
EIGENVECTORS
4F C.03549 -0.33630 0.76060 0.09597 0.45297 0.29229 0.08594
120126 C.10115 C.44059 -0.26710 0.06740 0.46663 0.27715 0.45209
121126 C.09522 -0.38365 0.07269 0.11224 -0.19559 -0.57459 0.67635
4G C.05818 -0.26746 -0.26832 0.86220 -0.12148 0.30370 -0.05134
111124 C.13259 -0.20274 -0.06526 -0.35855 -0.54984 0.64222 0.31298
121124 C.14522 C.52367 0.45056 0.29296 -0.46539 -0.02695 0.09680
41 C.68661 C.39815 0.17942 0.12604 -0.07164 -0.04695 0.00023
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -24.8579 36.4272 3.8794 10.2791 -28.0794 13.1508 -59.2839
F4V4 -16.5145 2.0132 -19.6496 12.5802 12.4803 -0.4163 1.4665
F6V6 -121.8566 79.2532 -48.4198 75.3120 54.9451 -40.1685 -53.2367
G C.77149 1.01598 1.18305 1.10880 1.05080 1.05137 1.05123

X= 12.5, J= 9/2
EIGENVALUES
-83.358 -28.321 6.980 19.415 46.222 62.445 104.458
EIGENVECTORS
4F C.03549 -0.33630 0.76060 0.09597 0.45297 0.29229 0.08594
120126 C.10115 C.44059 -0.26710 0.06740 0.46663 0.27715 0.45209
121126 C.09522 -0.38365 0.07269 0.11224 -0.19559 -0.57459 0.67635
4G C.05818 -0.26746 -0.26832 0.86220 -0.12148 0.30370 -0.05134
111124 C.13259 -0.20274 -0.06526 -0.35855 -0.54984 0.64222 0.31298
121124 C.14522 C.52367 0.45056 0.29296 -0.46539 -0.02695 0.09680
41 C.68661 C.39815 0.17942 0.12604 -0.07164 -0.04695 0.00023
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -24.8579 36.4272 3.8794 10.2791 -28.0794 13.1508 -59.2839
F4V4 -16.5145 2.0132 -19.6496 12.5802 12.4803 -0.4163 1.4665
F6V6 -121.8566 79.2532 -48.4198 75.3120 54.9451 -40.1685 -53.2367
G C.77149 1.01598 1.18305 1.10880 1.05080 1.05137 1.05123

X= 7.0, J= 11/2
EIGENVALUES
-44.734 8.555 30.326 39.821 72.404
EIGENVECTORS
4G 0.02769 -C.44293 0.69939 -0.48852 C.27431
(11)2H 0.07398 -C.25566 -0.61274 -0.24711 C.70189
(21)2H -0.18254 C.82143 0.22916 -0.16940 C.45891
21 -0.03066 -C.17713 0.27720 0.81905 C.46902
41 0.57949 C.17582 0.07783 0.02598 C.03935
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -3.8745 C.6147 -2.0331 -7.1347 -3.9488
F4V4 -10.6834 3.8471 14.5828 28.2027 10.5498
F6V6 -20.4488 -26.5054 -13.3387 -11.6099 62.7741
G 0.57013 1.11724 1.16618 1.02162 1.06748

X= 8.5, J= 11/2
EIGENVALUES
-46.101 9.150 30.532 40.344 77.101
EIGENVECTORS
4G 0.03441 -C.48440 0.47395 0.66067 C.32119
(11)2H 0.08271 -C.18675 -0.71720 0.05019 C.66437
(21)2H -0.20317 C.79813 0.22724 0.19949 C.47969
21 -0.03363 -C.23864 0.44500 -0.72186 C.47203
41 0.57446 C.19113 0.10688 -0.01090 C.04863
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -3.8168 C.1795 -4.4371 -4.5475 -3.3146
F4V4 -10.4305 7.0517 11.8203 25.2643 12.7931
F6V6 -19.9618 -30.3862 -1.2879 -17.9907 60.4975
G 0.57141 1.11942 1.09706 1.08280 1.07157

X= 9.0, J= 11/2
EIGENVALUES
-45.238 9.114 30.347 40.809 78.743
EIGENVECTORS
4G 0.03654 -C.49532 0.40003 0.69336 C.33551
(11)2H 0.08575 -C.16055 -0.73556 -0.01057 C.65252
(21)2H -0.20912 C.78554 0.22205 0.20374 C.48656
21 -0.03470 -C.26120 0.48116 -0.69050 C.47146
41 0.57286 C.19305 0.11651 -0.00551 C.05161
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -3.7684 -C.0119 -5.0176 -3.8436 -3.7653
F4V4 -10.3501 8.2627 11.1525 23.923 13.5018
F6V6 -18.8085 -31.5360 1.5033 -18.9089 59.6235
G 0.57182 1.11937 1.07944 1.09829 1.07374

X= 9.5, J= 11/2
EIGENVALUES
-45.380 9.022 30.098 41.366 80.419
EIGENVECTORS
4G 0.03861 -C.50470 0.33211 0.71525 C.34916
(11)2H 0.08773 -C.13255 -0.74809 -0.06411 C.64099
(21)2H -0.21474 C.78034 0.24054 0.20988 C.45301
21 -0.03571 -C.28456 0.50625 -0.66352 C.47033
41 0.57130 C.19414 0.12616 -0.00063 C.05453
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -3.7806 -C.2254 -5.4267 -3.2857 -3.7144
F4V4 -10.2718 9.5355 10.4588 22.5906 14.1854
F6V6 -18.6600 -32.5858 3.6309 -19.2270 58.7132
G 0.57221 1.11895 1.06595 1.11003 1.07557

TABLE I CONTINUED

X= 7.5, J= 11/2
EIGENVALUES
-45.849 9.068 30.553 39.823 73.929
EIGENVECTORS
4G 0.02998 -C.45817 0.62845 -0.55659 C.29058
(11)2H 0.07707 -C.23432 -0.65612 -0.18406 C.68904
(21)2H -0.15011 C.81355 0.22705 -0.18062 C.46603
21 -0.03132 -C.19652 0.33964 0.78945 C.47098
41 0.57178 C.18448 0.03747 0.02174 C.04249
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -3.8550 C.4905 -2.8633 -6.3023 -3.9067
F4V4 -10.5973 4.8420 13.4450 27.4958 11.3133
F6V6 -20.2821 -27.8522 -8.9124 -14.1700 62.0880
G 0.57057 1.11831 1.14239 1.04258 1.06880

X= 8.0, J= 11/2
EIGENVALUES
-46.971 9.133 30.613 40.005 75.496
EIGENVECTORS
4G 0.03222 -C.47200 0.55144 -0.61508 C.30821
(11)2H 0.07997 -C.21135 -0.65114 -0.11644 C.67654
(21)2H -0.19884 C.80622 0.22589 -0.19098 C.47304
21 -0.03250 -C.21704 0.39720 0.75589 C.47192
41 0.57610 C.18626 0.09721 0.01650 C.04559
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -3.8357 0.3463 -3.6986 -5.3870 -3.8618
F4V4 -10.5129 5.9103 12.5487 26.4903 12.0825
F6V6 -20.1196 -29.1512 -4.7940 -16.3877 61.3240
G 0.57099 1.11965 1.08377 1.07032

X= 7.0, J= 13/2									
EIGENVALUES									
	-25.022	10.009	51.564						
EIGENVECTORS									
21	-0.07516	-0.19383	0.97816						
41	0.97615	-0.21466	0.03247						
2K	0.02035	0.95726	0.20335						
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING									
F2V2	-20.3037	-56.2375	-37.3045						
F4V4	-3.3937	-5.0065	4.3037						
F6V6	-3.5841	1.6942	1.1076						
G	1.10028	0.94676	1.07090						
X= 7.5, J= 13/2									
EIGENVALUES									
	-25.102	9.456	51.946						
EIGENVECTORS									
21	-0.08229	-0.20043	0.97625						
41	0.97152	-0.23455	0.03374						
2K	0.02223	0.95122	0.21403						
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING									
F2V2	-20.6558	-55.8811	-37.3092						
F4V4	-3.3925	-4.9215	4.2186						
F6V6	-3.5210	1.6958	1.0428						
G	1.09827	0.94865	1.07038						
X= 8.0, J= 13/2									
EIGENVALUES									
	-25.216	8.531	52.336						
EIGENVECTORS									
21	-0.08962	-0.20630	0.97438						
41	0.96635	-0.25487	0.03493						
2K	0.02415	0.94471	0.22021						
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING									
F2V2	-21.0470	-55.4826	-37.3155						
F4V4	-3.3931	-4.8407	4.1370						
F6V6	-3.4506	1.6863	0.9819						
G	1.09731	0.95077	1.06987						
X= 8.5, J= 13/2									
EIGENVALUES									
	-25.365	8.434	52.732						
EIGENVECTORS									
21	-0.09714	-0.21147	0.97255						
41	0.96062	-0.27555	0.03604						
2K	0.02637	0.93774	0.22991						
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING									
F2V2	-21.4778	-55.0421	-37.3261						
F4V4	-3.3924	-4.7632	4.0588						
F6V6	-3.3730	1.6661	0.9245						
G	1.09558	0.95359	1.06937						
X= 11.0, J= 11/2									
EIGENVALUES									
	-51.529	8.871	29.819	41.986	82.128				
EIGENVECTORS									
4G	0.04063	-0.51246	-0.27047	-0.72898	0.36213				
(111)2h	0.05004	-0.10414	0.75647	0.11042	0.62978				
(211)2h	0.22004	0.77046	-0.25237	-0.21226	0.49924				
21	-0.03667	-0.30849	-0.52195	0.64135	0.46875				
41	0.96979	0.19425	-0.13590	-0.00362	0.05738				
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING									
F2V2	-3.7633	-0.4734	-5.6798	-2.8578	-3.6625				
F4V4	-10.1956	10.8554	9.6943	21.2980	14.8427				
F6V6	-19.5161	-33.5020	5.2038	-19.0861	57.7777				
G	0.97260	1.11794	1.05616	1.11849	1.07746				
X= 11.0, J= 11/2									
EIGENVALUES									
	-52.841	8.375	29.268	43.337	85.636				
EIGENVECTORS									
4G	0.04449	-0.52305	-0.16381	-0.74061	0.38612				
(111)2h	0.05430	-0.07439	0.76839	0.18463	0.60932				
(211)2h	0.22590	0.74847	-0.21359	-0.21359	0.51095				
21	-0.03847	-0.35693	-0.53241	0.60976	0.46460				
41	0.96687	0.19204	-0.15565	-0.01036	0.06285				
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING									
F2V2	-2.7302	1.0355	-5.3216	-2.2928	-3.5567				
F4V4	-10.0493	13.3891	7.9357	18.9502	16.0731				
F6V6	-15.2419	-34.9007	7.0807	-17.9343	55.8676				
G	0.97335	1.11463	1.04516	1.12822	1.08129				

TABLE I CONTINUED

x= 10.0, J= 11/2					
EIGENVALUES					
	-51.525	8.871	29.819	41.986	82.128
EIGENVECTORS					
4G	0.04063	-0.51248	-0.27047	-0.72898	0.36213
(11)2H	0.09004	-0.10414	0.75647	0.11042	0.62978
(21)2H	-0.02200	0.77046	-0.25237	-0.21226	0.49924
21	-0.03667	-0.30845	-0.52195	0.64135	0.46875
41	0.56979	0.19425	-0.13590	-0.00362	0.05738
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING					
F2V2	-5.7633	-0.4734	-5.6798	-2.8572	-3.6625
F4V4	-10.1956	10.8554	9.6943	21.2980	14.8427
F6V6	-10.5161	-33.5080	5.2038	-19.0861	57.7777
G	0.57260	1.11794	1.05616	1.11849	1.07746
x= 11.0, J= 11/2					
EIGENVALUES					
	-53.841	5.375	29.268	43.337	85.636
EIGENVECTORS					
4G	0.04449	-0.52305	-0.16381	-0.74061	0.38612
(11)2H	0.09430	-0.04385	0.76489	0.18463	0.60932
(21)2H	-0.02280	0.74847	-0.28359	-0.21329	0.51095
21	-0.03847	-0.35693	-0.53241	0.60976	0.46460
41	0.56887	0.19204	-0.13565	-0.01036	0.06285
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING					
F2V2	-5.7302	-1.0355	-5.3216	-2.2928	-3.5567
F4V4	-10.0493	13.5891	7.9357	18.9502	16.0731
F6V6	-10.2419	-34.9007	7.0807	-17.9343	55.8676
G	0.57335	1.11463	1.04516	1.12822	1.08129

X= 7.0, J= 15/2
EIGENVALUES
-14.710 23.312 49.948 56.053
EIGENVECTORS
41 0.33721 -0.32385 -0.12943 0.00000
2K 0.23553 0.76235 0.55091 0.00000
15 2L -0.07973 -0.56025 0.82448 0.00000
17 2L 0.00000 0.00000 0.00000 1.00000
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -5.4857 -25.9628 -31.2421 -19.6078
F4V4 -2.6786 -1.1275 -3.4541 -3.5651
F6V6 -25.4831 -7.1865 15.1189 1.6876
G 1.18298 1.04126 0.98360 1.05900

X= 7.5, J= 15/2
EIGENVALUES
-14.057 23.308 50.805 56.553
EIGENVECTORS
41 0.52610 -0.34717 -0.14767 0.00000
2K 0.36539 0.72785 0.58030 0.00000
15 2L -0.09398 -0.59136 0.80091 0.00000
17 2L 0.00000 0.00000 0.00000 1.00000
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -5.8297 -26.2427 -30.5582 -19.6072
F4V4 -2.6670 -0.9924 -3.6011 -3.5651
F6V6 -24.9761 -7.4241 14.8490 1.6876
G 1.17991 1.03885 0.98908 1.05900

X= 8.0, J= 15/2
EIGENVALUES
-13.490 23.282 51.755 57.053
EIGENVECTORS
41 0.51395 -0.37026 -0.16618 0.00000
2K 0.36080 0.69241 0.60652 0.00000
15 2L -0.10590 -0.61926 0.77752 0.00000
17 2L 0.00000 0.00000 0.00000 1.00000
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -10.2101 -26.5250 -29.8915 -19.6078
F4V4 -2.6508 -0.8905 -3.7292 -3.5651
F6V6 -24.4355 -7.6127 14.4970 1.6876
G 1.17653 1.03682 0.95449 1.05900

X= 9.0, J= 13/2
EIGENVALUES
-35.550 7.967 53.134
EIGENVECTORS
21 -0.10481 -0.21596 0.97076
41 0.55432 -0.59550 0.03708
2K 0.27883 0.53530 0.23718
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -21.9481 -54.5604 -37.3375
F4V4 -3.3614 -4.6893 3.9839
F6V6 -3.2880 1.6352 0.8704
G 1.09370 0.95536 1.06889

X= 9.5, J= 13/2
EIGENVALUES
-35.773 7.532 53.542
EIGENVECTORS
21 -0.11262 -0.21582 0.96902
41 0.54745 -0.31764 0.03806
2K 0.29944 0.52238 0.24405
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -22.4570 -54.0386 -37.3505
F4V4 -3.3899 -4.6185 3.9120
F6V6 -3.1958 1.5941 0.8194
G 1.09167 0.95786 1.06842

X= 10.0, J= 13/2
EIGENVALUES
-30.034 7.129 53.955
EIGENVECTORS
21 -0.12052 -0.22307 0.96733
41 0.54003 -0.33887 0.03898
2K 0.31911 0.51401 0.25054
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -23.0029 -53.4786 -37.3646
F4V4 -3.3875 -4.5521 3.8432
F6V6 -3.0967 1.5432 0.7712
G 1.08945 0.96050 1.06796

X= 11.0, J= 13/2
EIGENVALUES
-30.672 6.427 54.795
EIGENVECTORS
21 -0.13651 -0.22786 0.96408
41 0.52359 -0.38123 0.04067
2K 0.35827 0.49566 0.26252
REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
F2V2 -24.1558 -52.2548 -37.3955
F4V4 -3.3821 -4.4286 3.7139
F6V6 -2.8792 1.4144 0.6824
G 1.08474 0.96613 1.06708

TABLE I CONTINUED

X= 8.5, J= 15/2
 EIGENVALUES
 -12.582 23.246 52.791 57.553
 EIGENVECTORS
 41 0.50075 -0.39307 -0.18478 0.00000
 2K 0.41560 C.65635 0.62969 0.00000
 15 2L -0.12622 -0.64358 0.75456 0.00000
 17 2L 0.00000 C.00000 0.00000 1.00000
 REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
 F2V2 -10.6269 -26.7555 -29.2478 -19.6078
 F4V4 -23.6254 -0.7520 -3.8392 -3.5651
 F6V6 -23.8641 -7.7638 14.0767 1.6876
 G 1.17285 1.03522 0.95977 1.05900

X= 9.0, J= 15/2
 EIGENVALUES
 -12.564 23.213 53.908 58.053
 EIGENVECTORS
 41 0.88656 -0.41554 -0.20330 0.00000
 2K 0.43962 C.61890 0.64999 0.00000
 15 2L -0.14406 -0.66562 0.73225 0.00000
 17 2L 0.00000 C.00000 0.00000 1.00000
 REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
 F2V2 -11.0797 -26.9202 -28.6307 -19.6078
 F4V4 -23.6025 -0.7255 -3.9321 -3.5651
 F6V6 -23.2654 -7.8872 13.6013 1.6876
 G 1.16886 1.03405 1.00489 1.05900

X= 9.5, J= 15/2
 EIGENVALUES
 -12.227 23.185 55.098 58.553
 EIGENVECTORS
 41 0.67143 0.43761 -0.22162 0.00000
 2K 0.46270 -0.58324 0.66764 0.00000
 15 2L -0.16250 C.68434 0.71074 0.00000
 17 2L 0.00000 C.00000 0.00000 1.00000
 REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
 F2V2 -11.5670 -27.0216 -28.0421 -19.6078
 F4V4 -23.5658 -0.6810 -4.0097 -3.5651
 F6V6 -22.6432 -7.9510 13.0831 1.6876
 G 1.16455 1.03343 1.00983 1.05900

X= 10.0, J= 15/2
 EIGENVALUES
 -11.970 23.169 56.358 59.053
 EIGENVECTORS
 41 0.85543 C.45916 -0.23962 0.00000
 2K 0.48468 -0.54657 0.68289 0.00000
 15 2L -0.18258 C.70031 0.69011 0.00000
 17 2L 0.00000 C.00000 0.00000 1.00000
 REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
 F2V2 -12.0864 -27.0616 -27.4826 -19.6078
 F4V4 -22.5312 -0.6558 -4.0736 -3.5651
 F6V6 -22.0022 -8.0816 12.5327 1.6876
 G 1.16005 1.03323 1.01456 1.05900

X= 11.0, J= 15/2
 EIGENVALUES
 -11.699 23.156 59.060 60.053
 EIGENVECTORS
 41 0.82125 C.50028 -0.27438 0.00000
 2K 0.52498 -0.47377 0.70715 0.00000
 15 2L -0.22376 C.72476 0.65166 0.00000
 17 2L 0.00000 C.00000 0.00000 1.00000
 REDUCED MATRIX ELEMENTS IN INTERMEDIATE COUPLING
 F2V2 -13.2079 -26.9734 -26.4493 -19.6078
 F4V4 -24.4367 -0.6571 -4.1668 -3.5651
 F6V6 -20.6836 -8.2325 11.3708 1.6876
 G 1.15021 1.03412 1.02341 1.05900

TABLE I CONTINUED

			M											
J	k	d ²	1000 f	1/2	3/2	5/2	7/2	9/2	11/2	13/2	15/2	17/2	19/2	21/2
3/2	2	4.5	223.606 798	-1	1									
5/2	2	4.3.5.7	48.795 005	-4	-1	5								
	4	36.7	62.994 079	2	-3	1								
7/2	2	4.2.3.5.7	34.503 279	-5	-3	1	7							
	4	36.2.7.11	13.430 383	9	-3	-13	7							
	6	4.2.3.11.13	17.069 718	-5	9	-5	1							
9/2	2	4.3.5.11	38.924 947	-4	-3	-1	2	6						
	4	36.5.11.13	6.232 980	18	3	-17	-22	18						
	6	4.3.5.11.13	10.795 838	-8	6	10	-11	3						
11/2	2	4.3.5.7.11.13	4.080 444	-35	-29	-17	1	25	55					
	4	36.2.7.11.13	3.724 918	28	12	-13	-33	-27	33					
	6	4.2.3.11.13.17	4.140 015	-20	4	25	11	-31	11					
13/2	2	4.2.5.7.13	16.574 839	-8	-7	-5	-2	2	7	13				
	4	36.2.7.11.13.17	0.903 425	108	63	-13	-92	-132	-77	143				
	6	4.5.7.11.13.17.19	0.393 248	-200	-25	185	227	-11	-319	143				
15/2	2	16.3.5.7.17	5.917 263	-21	-19	-15	-9	-1	9	21	35			
	4	36.2.7.13.17.19	0.486 068	189	129	23	-101	-201	-221	-91	273			
	6	16.3.5.13.17.19	0.996 142	-75	-25	45	87	59	-39	-117	65			
17/2	2	36.2.5.17.19	2.932 564	-40	-37	-31	-22	-10	5	23	44	68		
	4	36.2.11.17.19	1.977 134	44	33	13	-12	-36	-51	-47	-12	68		
	6	36.11.13.17.19.23	0.161 702	-440	-209	145	439	481	169	-377	-650	442		
19/2	2	4.3.5.7.11.19	3.375 221	-33	-31	-27	-21	-13	-3	9	23	39	57	
	4	36.2.5.7.11.17.19.23	0.069 848	1188	948	503	-77	-687	-1187	-1402	-1122	-102	1938	
	6	100.2.3.11.13.17.19.23	0.039 609	-1716	-988	195	1353	1931	1497	6	-1870	-2346	1938	
21/2	2	4.5.7.11.23	5.313 439	-20	-19	-17	-14	-10	-5	1	8	16	25	35
	4	36.5.7.11.13.19.23	0.112 695	702	585	365	70	-258	-563	-775	-810	-570	57	1197
	6	4.3.5.11.13.17.19.23	0.125 254	-338	-30	303	537	558	306	-170	-646	-646	646	646

(a) S_K^0

J	7/2, -5/2	9/2, -3/2	11/2, -1/2	13/2, 1/2	15/2, 3/2	17/2, 5/2	19/2, 7/2	21/2, 9/2
7/2	0.755 929							
9/2	1.000 000	0.654 654						
11/2	2.309 401	1.825 742	1.023 533					
13/2	22.135 944	18.956 090	13.403 980	6.904 105				
15/2	8.090 398	7.236 272	5.693 469	3.765 875	1.837 559			
17/2	46.669 049	42.878 566	35.874 782	26.739 484	16.911 535	7.946 248		
19/2	179.885 678	168.267 644	146.458 185	117.166 548	84.095 184	51.497 573	23.531 134	
21/2	54.048 920	51.202 214	45.796 652	38.384 024	29.732 138	20.752 510	12.401 997	5.546 342

(b) S_6^6

TABLE II. STEVENS COEFFICIENTS

ADDITIONAL TABLES OF S_K^q MAY BE FOUND IN REFERENCE 2.

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Attn: Science-Technology Library
Baltimore 3, Maryland | | |
| 1 | MITRE Corporation
Attn: Library
Bedford, Mass. | | |
| 1 | MOTOROLA INC.
Systems Research Laboratory
8330 Indiana Avenue
Riverside, Calif. | | |
| 2 | North American Aviation, Inc.
Attn: Technical Library
International Airport
Los Angeles 9, Calif. | | |
| 1 | Northrop Corporation
Nonair Division
Attn: Technical Information, 3924-31
1001 E. Broadway
Hawthorne, Calif. | | |
| 2 | Radio Corporation of America
Defense Electronic Products, DSD
Attn: L. R. Hund, Librarian
8500 Balboa Blvd.
Van Nuys, Calif. | | |
| 1 | Raytheon Company
Attn: Librarian
P. O. Box 636
Santa Barbara, California | | |
| 1 | Revere Copper and Brass Incorporated
Foil Division
Attn: Mr. Arthur Ferretti
196 Diamond Street
Brooklyn 22, N. Y. | | |
| 1 | Stanford University, Stanford Electronics Labs
Attn: Security Officer
Stanford, Calif. | | |
| 1 | Sylvania Electric Products Inc.
Technical Information Section
P. O. Box 188
Mountain View, Calif. | | |
| 1 | Sylvania Electric Products, Inc.
Sylvania Electronic Systems
Attn: Applied Research Lab. Library
40 Sylvan Road
Waltham 54, Mass. | | |
| 1 | The Ohio State University Research Foundation
Attn: Dr. Curt A. Lewis
1314 Kinnear Road
Columbus 12, Ohio | | |
| 1 | The RAND Corporation
Attn: Library
1700 Main Street
Santa Monica, Calif. | | |
| 1 | The University of Michigan
University Research Security Office
Attn: Dr. B. F. Barton, Director CRL
P. O. Box 622
Ann Arbor, Michigan | | |

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