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ELECTRON-ION COLLISIONAL IONIZATION CROSS SECTIONS AND RATES FOR THE Na ISOELECTRONIC SEQUENCE

C. Y. CHEN, J. B. QI, Y. S. WANG, and F. J. YANG

Applied Ion Beam Physics Laboratory, Institute of Modern Physics, Fudan University, Shanghai 200433, People's Republic of China

X. J. XU

Institute of Electric Light Sources, Fudan University, Shanghai 200433, People's Republic of China

and

Y. S. SUN

Institute of Applied Physics and Computational Mathematics, P.O. Box 8009, Beijing 100088, People's Republic of China

In this paper, we present the electron-impact ionization cross sections for eight highly charged Na-like ions in the range $18 \leq Z \leq 39$ calculated by means of a distorted-wave Born exchange approximation method including relativistic corrections. Direct ionization from the ground and excited states ($n = 3$–5) is calculated. For the ground state, contributions due to excitation-autoionization are also calculated, taking account of branching ratios and configuration interaction. A systematic study of the dependence of the cross sections on impact energy and nuclear charge is carried out for the direct ionization of all states and for excitation-autoionization. The results of the calculations are fitted by empirical formulas to facilitate use in practical applications; the fitted values are found to be in good agreement with the calculated results. An accurate empirical formula for calculating ionization rates is also given.

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CONTENTS

1. INTRODUCTION

The electron-ion collision is one of the fundamental processes in atomic physics. Electron-impact ionization cross sections for highly charged ions, as well as collision strengths and rates, are important data in modeling the structure and dynamics of high temperature plasmas occurring both naturally in stars and artificially in, e.g., fusion devices [1, 2]. In many situations where electron impact ionization cross sections and rates are used, it is necessary to obtain the data quickly and accurately. Suitable empirical formulas for ionization cross sections and rates are convenient and desirable for studies of x-ray lasers, fusion plasmas, and astrophysical plasmas.

Younger calculated direct-ionization cross sections for the Na-like ions Mg^{+}, Al^{2+}, P^{4+}, and Ar^{7+}, and fitted his results for individual subshells as a function of the incident electron energy with 16 Z-dependent parameters [3]. Griffin et al. [4] and Pindzola et al. [5] calculated electron-impact ionization cross sections and rates for the transition metal ions Ti^{11+}, Cr^{13+}, Fe^{15+}, and Ni^{17+} with inclusion of the contribution from excitation-autoionization (EA), using a nonrelativistic distorted-wave method [4] and a fully relativistic distorted-wave method [5]. Chen et al. and Reed et al. reported electron-impact ionization cross sections for several Na-like ions, such as Ar^{7+} [6], Fe^{15+} [7], Se^{23+} [8], Kr^{25+} [9], Xe^{43+} [10], and Au^{68+} [11], calculated with a relativistic distorted-wave method in which the contributions from excitation-autoionization and resonant-excitation double autoionization (REDA) are included. Tayal and Henry performed close-coupling calculations of the ionization cross section for Fe^{15+}, including the contributions from EA and REDA [12]. Zhang and Sampson calculated the $3s$-shell direct ionization cross sections for Se^{23+} using a relativistic distorted-wave method [13]. In all the above works, only the ionization cross sections from the ground state are calculated, and the energy range for the incident electron is not very large.

In the present work, we use a semirelativistic distorted-wave Born exchange (DWBE) approximation method to calculate a series of electron impact ionization cross sections from the ground and excited states with $n = 3$–5 for eight Na-like ions with $18 \leq Z \leq 39$. For the ground state, we also include the contribution from excitation-autoionization. The variations of the direct ionization cross sections with impact energy and nuclear charge are studied systematically, and empirical formulas with eight parameters are used to fit the calculated results for individual subshell ionization of the Na-like ions. This approach had been applied successfully in our earlier works to obtain the ionization cross sections for the H-, He-, Li-, and Ne-like isoelectronic sequences [14–16]. We also present an empirical formula able to fit the total excitation-autoionization cross sections for individual ions with high accuracy. In addition, we have developed an empirical formula for obtaining the ionization rates quickly and accurately [17].

2. OUTLINE OF THE DWBE APPROXIMATION

Our DWBE approximation, described in more detail in our previous works [18, 19], is an extension of the Coulomb–Born approximation with the following four improvements: (1) we take into account the distortion of the Coulomb potential due to the distribution of the bound electrons; (2) we include the exchange interaction between the two free electrons in the final state; (3) we include the exchange interaction between free electrons and bound electrons; and (4) we employ relativistic corrections in determining the target electron wave functions. In the outline of the calculation below, atomic units are used.

The total ionization cross section $Q_t(E_i)$ for the Na-like ground state is given by

$$Q_t(E_i) = Q_{2s}(E_i) + Q_{2p}(E_i) + Q_{3s}(E_i) + Q_{ea}(E_i), \quad (1)$$

where $Q_{2s}(E_i)$, $Q_{2p}(E_i)$, and $Q_{3s}(E_i)$ are the $2s$-, $2p$-, and $3s$-shell direct ionization cross sections, respectively, and $Q_{ea}(E_i)$ is the excitation-autoionization cross section. The latter can be expressed as

$$Q_{ea}(E_i) = \sum_j Q^j_{ea}(E_i) = \sum_j Q^j_{ex}(E_i) B^a_j, \quad (2)$$

where Q^j_{ea} is the excitation-autoionization cross section through the autoionizing level j, Q^j_{ex} is the excitation cross section of the inner-shell electrons to j, and B^a_j is the branching ratio for autoionization from the level j, written as

$$B^a_j = \frac{\sum_m A_a(j \to m)}{\sum_m A_a(j \to m) + \sum_k A_r(j \to k)} \quad (3)$$

in which $A_a(j \to m)$ is the autoionization rate to channel m and $A_r(j \to k)$ is the radiative rate to the bound level k.

2.1. Direct Ionization Cross Section

In the DWBE approximation, the direct ionization cross section (in units of πa_0^2 with a_0 being the Bohr radius) can be written as [18, 19]

$$Q(E_i) = \int_0^{E/2} \sigma(E_e, E_i)\, dE_e, \quad (4)$$

where E_i and E_e are the incident and ejected electron energies, respectively. E is the sum of the ejected and scattered electron energies in the final state and $\sigma(E_e, E_i)$ is the differential cross section as function of ejected electron energy. In Eq. (4), we use a three-point Gaussian integral when the incident energy is less than three times ionization energy, and a five-point Gaussian integral for the remaining incident

energies. By using a partial wave expansion, the scattering amplitude can be divided into an angular factor and a Slater integral. To do this, we write

$$\sigma(E_e, E_i) = \frac{16}{\pi E_i} \sum_{l_i l_e l_f L} I_{l_i l_e l_f L}(E_e, E_i), \tag{5}$$

where l_i, l_e, and l_f are the angular momenta of the incident, ejected, and scattered electrons, respectively; L is the total angular momentum of the system; and

$$I_{l_i l_e l_f L}(E_e, E_i) = |f - g|^2, \tag{6}$$

where f and g are direct and exchange partial wave scattering amplitudes, respectively, written as

$$f = \sum_{\lambda} f_\lambda(l_b l_i l_e l_f L)\left(P_b P_i \left|\frac{1}{r_{12}}\right| P_e P_f\right)_\lambda \tag{7}$$

and

$$g = \sum_{\lambda} f_\lambda(l_b l_i l_f l_e L)\left(P_b P_i \left|\frac{1}{r_{12}}\right| P_f P_e\right)_\lambda. \tag{8}$$

In the latter two expressions, f_λ is an angular factor in which l_b is the angular momentum of the bound electron, and $(P_b P_i|1/r_{12}|P_e P_f)_\lambda$ is the Slater integral in which P_b, P_i, P_e, and P_f are the wave functions of the bound, incident, ejected, and scattered electron, respectively. P_b is obtained from the atomic structure program of Cowan [20] using the Hartree–Fock approximation with relativistic corrections (HFR) method. The radial wave functions P_i, P_e, and P_f are determined from our own program. The calculation of slowly converging Slater integrals has been described in detail by Fang and Wang [21]. In the present calculation, the summation over partial waves was truncated when the increments were less than 0.2%. For higher incident electron energies, the partial waves were included up to $L = 55$. We plotted the L distribution of the cross sections on a logarithmic scale and found that it could be well fitted to a straight line for large L. We have extrapolated the contributions from higher partial waves and added it to the calculated results. The total error introduced by the numerical calculation is estimated to be less than 0.5%.

2.2. Excitation-Autoionization Cross Section

From Eq. (2) we see that, in order to obtain the autoionization cross section, we have to calculate the inner-shell excitation cross section $Q_{ex}^j(E_i)$ to the excited level j, and the autoionization branching ratio B_j^a from the level j. In this paper, the inner-shell excitation cross sections are calculated by using our program, and the branching ratios are obtained from Cowan's program [20]. In our calculations, the effects of configuration interaction (CI) on the autoionization cross section are included.

In the LS coupling scheme, the inner-shell excitation cross section for the transition from i to f, $Q_{ex}^j(E_i)$ in Eq. (2), can be written as [22, 23]

$$Q_e(i \to f) = \frac{2\pi a_0^2}{g_i E_i(\mathrm{Ry})} \sum_J (2J+1) \times \sum_{ll'jj'} |R(\alpha_i L_i S_i J_i l s j J; \alpha_f L_f S_f J_f l' s' j' J)|^2, \tag{9}$$

where g_i is the statistical weight of the initial state, $E_i(\mathrm{Ry})$ is the incident energy in rydberg, and J is the total angular momentum of the system. l, l', s, s', j, and j' are, respectively, the orbital, spin, and the total angular momenta of the incident (unprimed) and scattered (primed) electron. L_i, S_i, and J_i are the orbital, spin, and total angular momenta of the target ion; α_i represents the other quantum numbers of the target ion. L_f, S_f, J_f, and α_f are the corresponding quantum numbers of the residual ion. The reactance matrix R has a direct and an exchange part:

$$\mathbf{R} = \mathbf{R}^d - \mathbf{R}^e. \tag{10}$$

The exchange scattering matrix element $\mathbf{R}^e$ represents the exchange interaction between the scattered electron and the electron in the excited state.

When CI and the spin-orbit interaction are included, the new eigenvectors corresponding to the energy level J can be represented by a superposition of the eigenvectors in the LS coupling scheme,

$$\Phi_J = \sum_{LS} c(\alpha LS, J)\phi_{\alpha LS}, \tag{11}$$

where $c(\alpha LS, J)$ are the mixing coefficients. The excitation cross section is then given by

$$Q_e(i \to f) = \frac{2\pi a_0^2}{g_i E_i(\mathrm{Ry})} \sum_J (2J+1) \sum_{ll'jj'} \times \left| \sum_{L_i S_i L_f S_f} c(i)c(f)R(\alpha_i L_i S_i J_i l s j J; \alpha_f L_f S_f J_f l' s' j' J) \right|^2, \tag{12}$$

where $c(i)$ is the abbreviation for $c(\alpha_i L_i S_i, J_i)$.

3. CALCULATED DIRECT IONIZATION CROSS SECTIONS

3.1. Scaled Cross Sections

In these calculations, we chose eight Na-like ions: Ar^{7+}, Ti^{11+}, Cr^{13+}, Fe^{15+}, Zn^{19+}, Ge^{21+}, Se^{23+}, and Y^{28+}, and we calculated the cross sections for direct ionization from both the ground and excited states of these ions. We employed a reduced incident energy defined by

$$u = E_i/I_d, \tag{13}$$

where E_i is the incident energy and I_d is the ionization potential of each state. The values of I_d, obtained from Cowan's program [20], are listed in Table I. The energy range in our calculation is quite large, from $u = 1.125$ to $u = 15.00$, as required for practical applications. The calculated direct ionization cross sections for the above ions are given in Table II. The choice of 17 incident energy points in this Table were chosen to satisfy the requirements of linear interpolation. From the tabulated cross sections, scaled direct ionization cross sections $uI_d^2 Q_d$ (in units of $\pi a_0^2 \mathrm{Ry}^2$, where Ry is the rydberg energy) were calculated. The variation of $uI_d^2 Q_d$ with $1/(Z-10)$ is very nearly linear. As an illustration, the dependence of $uI_d^2 Q_d$ on $1/(Z-10)$ for the $2s$-shell ionization from the ground state and for outer-shell ionization from the $2s^2 2p^6 5g$ excited state is given in Figs. 1 and 2, respectively. Hence it is simple to fit the values of $uI_d^2 Q_d$ to Z and reasonable to then interpolate and extrapolate to smaller Z values. From Figs. 1 and 2, it can also be seen that $uI_d^2 Q_d$ increases monotonically with u and changes more slowly at large u. Thus, fitting $uI_d^2 Q_d$ to u is relatively easy and extrapolation to larger values of u is justified.

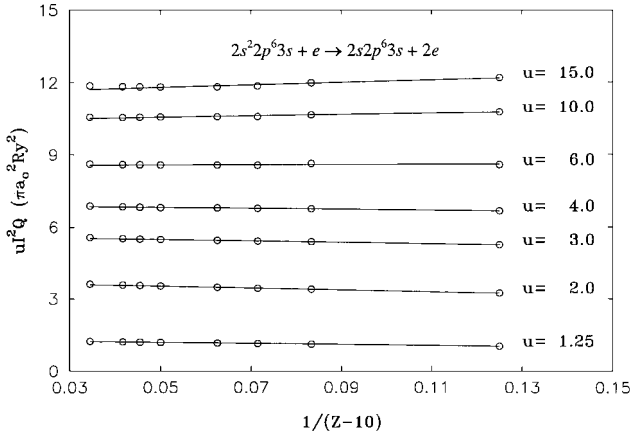

FIG. 1. Dependence of the scaled $2s$-shell direct ionization cross section $uI_{2s}^2 Q_{2s}$ on $1/(Z-10)$. The solid lines are linear fits to the calculated results ○.

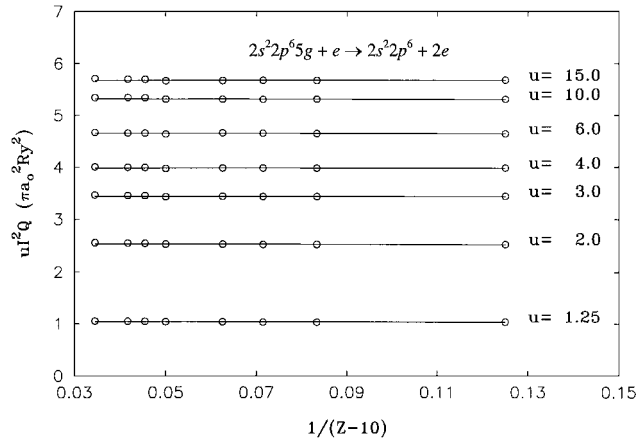

FIG. 2. Dependence of the scaled $5g$-shell direct ionization cross section $uI_{5g}^2 Q_{5g}$ on $1/(Z-10)$. The solid lines are linear fits to the calculated results ○.

3.2. Empirical Formula and Fit Parameters for Individual Ions

As in our previous papers [14–16], we fit the variation of the direct ionization cross sections with incident energy for ionization out of a given subshell to the following formula given by Younger [3]:

$$uI_d^2 Q_d = A(1-1/u) + B(1-1/u)^2 + C\ln u + D\ln u/u, \tag{14}$$

where A, B, C, and D are four adjustable parameters. The tendencies of the formula at the two limits, are

$$u \rightarrow 1 \quad Q \rightarrow 0, \tag{15}$$

and

$$u \rightarrow \infty \quad Q \propto \frac{\ln u}{u}. \tag{16}$$

Equation (16) has the same form as the well-known Bethe formula [24].

We use an "Optimal Calculation Method" [25] to determine the values of the parameters. The average deviation F (in percent) is defined as

$$F(\%) = \sqrt{\frac{1}{N}\sum_{i=1}^{N}\left(\frac{Q_{fit}(u) - Q_{cal}(u)}{Q_{cal}(u)}\right)^2} \times 100, \tag{17}$$

where Q_{cal} and Q_{fit} are the calculated and fitted values, respectively, and N is the number of calculated points used in making the fit. The fit parameters and average deviations of the fits for the individual ions are given in Table III. One can see that the values of F are all less than 0.5%.

3.3. Fit Parameters for the Isoelectronic Sequence

Because the variation of $uI_d^2Q_d$ with $1/(Z-10)$ for each state of the Na-like ions is very nearly linear, we can fit the scaled cross sections to the following formula:

$$uI_d^2Q_d = a(u) + b(u)/(Z-10), \tag{18}$$

where a and b are parameters which depend only on the scaled incident energy u. A formula such as Eq. (14) can in turn be used to fit the variation of a and b with u, so that

$$a(u) = A_1(1-1/u) + B_1(1-1/u)^2 + C_1 \ln u + D_1 \ln u/u, \tag{19}$$

and

$$b(u) = A_2(1-1/u) + B_2(1-1/u)^2 + C_2 \ln u + D_2 \ln u/u, \tag{20}$$

where A_1, B_1, C_1, D_1, A_2, B_2, C_2, and D_2 are adjustable parameters. These fit parameters are given in Table IV. One can use these fit parameters, together with Eq. (18) and the ionization potentials given in Table I, to obtain the direct ionization cross section for each state ($2 \le n \le 5$) of the other Na-like ions ($18 < Z < 39$) which have not been tabulated. For ions with $15 \le Z < 18$, extrapolation is feasible: the discrepancy between the cross sections for P^{4+} calculated with the present extrapolation and Younger's results [3] is less than 8%. For ions with $Z < 15$, the extrapolation is not good because the linear scaling law (see Eq. (18)) is inappropriate. For ions with $Z > 39$, extrapolation may also be inappropriate because of larger relativistic effects.

As a test, we compared the cross sections for electron-impact ionization of 14 states obtained from Eq. (18) using the fit parameters in Table IV with the calculated values for all 14 states of the eight Na-like ions in Table II. We found that the deviations between the fitted results and the calculated ones are smaller than 1% in most cases and between 1% and 2% for the remaining ones.

4. CALCULATED EXCITATION-AUTOIONIZATION CROSS SECTIONS

4.1. Excitation Cross Section and Autoionization Branching Ratio

In the calculation of excitation-autoionization cross sections for Na-like ions, only excitation from the ground state $1s^22s^22p^63s$ to the excited states $2s2p^63s3l$ ($l = 0, 1, 2$), $2s^22p^53s3l$ ($l = 0, 1, 2$), and $2s^22p^53s4l$ ($l = 1, 2$) are considered. The contributions from other transitions are neglected. Among the above eight excitations, the $2p^63s \rightarrow 2p^53s3d$ transition accounts for the largest indirect contribution to the total ionization cross section.

To obtain the mixing coefficients, excitation energies, and autoionization branching ratios, the effects due to CI and the spin-orbit interaction are included. For all transitions, we treat the initial ground state $1s^22s^22p^63s$ as a pure state. For the final states, we consider that all the states with the same parity and total angular momentum quantum number interact with each other. For example, the interaction between $2p^53s^2$, $2p^53s3d$, $2p^53p^2$, and $2p^53d^2$ configurations are included for the $2p \rightarrow 3s$ and $2p \rightarrow 3d$ transitions. In excitation cross section calculations, the contribution from the ground state to all pure doubly excited states can be neglected [4]. However, it should be pointed out that the $2p^53p^2$ configuration mixes strongly with the $2p^53s3d$ configuration. Thus, the wave functions for the levels of the $2p^53p^2$ configuration include large contributions from the $2p^53s3d$ configuration; the levels of the $2p^53p^2$ configuration whose mixing coefficients with the $2p^53s3d$ configuration are larger than 0.1 are therefore included in the present cross section calculation (see Table V). The other excitations via configuration interaction from the ground state to doubly excited states are not included in our cross section calculation.

As in the calculation of direct ionization, we again chose 17 incident energies to calculate the excitation cross sections. The incident energies for each level range up to 10 times its excitation threshold energy. We fit the variation of the excitation cross section with incident energy for each level with the equation

$$uI_{ex}^2Q_{ex} = A + B/u + C/u^2 + D \ln u, \tag{21}$$

in which I_{ex} is excitation threshold energy, u is the reduced incident energy as defined in Eq. (13) but with I_d replaced by I_{ex}, and A, B, C, and D are four adjustable fit parameters which are obtained by the same method as given in Section 3.2. These fit parameters are listed in Table V. It should be pointed out that the values of the average deviations F (which are not listed in Table V) are less than 1% for most transitions and between 1% and 3% for the remaining ones. The excitation threshold energy, I_{ex}, the autoionization branching ratio, B_j^a, and the excitation-autoionization cross section at threshold energy, Q_{ea}^j, for each level j are also listed in Table V. One can obtain the excitation cross section for each level, Q_{ex}^j, and the total autoionization cross sections, Q_{ea}, by using Eqs. (21) and (2), respectively.

4.2. Empirical Formula and Fit Parameters for the Excitation-Autoionization Cross Sections

The calculated total excitation-autoionization cross section for individual ions can be fitted to the following empirical formula:

$$Z^4 Q_{ea}(u) = A(Z)\left(1 - \frac{1}{u^{10}}\right)\left(\frac{1}{u^{1/2}} + \frac{B(Z)}{u}\right), \qquad (22)$$

where A and B are two adjustable parameters which depend on Z, and u is the reduced incident energy given by

$$u = E_i / I'_{ex}. \qquad (23)$$

I'_{ex} is the lowest transition energy, i.e., the energy of the $2p^6 3s\ ^2S_{1/2} \rightarrow 2p^5 3s^2\ ^2P_{3/2}$ transition. The I'_{ex} values of the present ions are obtained from Cowan's program [20] (see Table VI for the values of I'_{ex}).

In Eq. (22), the first factor $A(Z)$ determines the average value of the excitation-autoionization cross section, the second factor $(1 - 1/u^{10})$ describes the rapid rise of the excitation-autoionization cross section near threshold, and the third factor $[1/u^{1/2} + B(Z)/u]$ accounts for the decrease of the excitation-autoionization cross section at higher incident electron energy. The rapidity with which the excitation-autoionization cross section decreases varies with atomic number Z, mainly as a result of the variation of the autoionization branching ratio. The fit parameters A and B are listed in Table VII. It can be seen that A and B change abruptly between Ti^{11+} $(Z = 22)$ and Cr^{13+} $(Z = 24)$. As pointed out by Griffin et al. [4], this is due to the rather large decrease in the autoionization branching ratio that occurs between these two ions. However, the variations of A and B with Z are still smooth; hence it should be reasonable to make interpolations to estimate the total excitation-autoionization cross sections of those ions with $18 < Z < 39$ which have not been tabulated.

As an example of a fit, the total excitation-autoionization cross section of Fe^{15+} is given in Fig. 3 as a function of u. In the figure, the solid curve is the total excitation-autoionization cross section obtained from Table V and the dotted curve is the fit. It can be seen that the fitting is quite successful. The results of our calculation indicate that the deviation between the fitted results and the calculated results for all the eight Na-like ions we selected is less than 2%, except for the points near threshold. Due to the large contribution from autoionization near threshold, this may introduce about a 5% deviation for the rate coefficients at lower temperature if one uses the total autoionization cross section obtained from Eq. (22) with the parameters given in Table VII to calculate ionization rate coefficients.

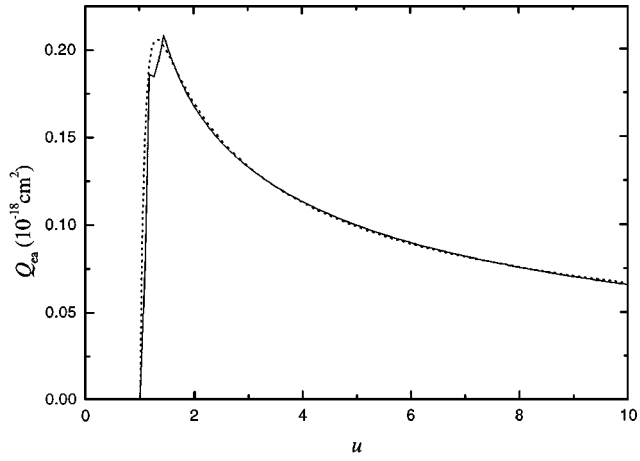

FIG. 3. Total excitation-autoionization cross section for Fe^{15+}. The solid curve represents our calculated values, and the dotted curve represents the fitted ones.

5. IONIZATION RATE

In many situations, ionization rate coefficients, rather than cross sections, are needed. The rate coefficient is defined as

$$\alpha = \int_0^\infty v f(v) Q_t(v)\, dv, \qquad (24)$$

where $f(v)$ is the velocity distribution of the electrons and $Q_t(v)$ is the total electron-impact ionization cross section as a function of electron velocity (see Eq. (1)). If we assume a Maxwellian distribution of velocities, then the rate coefficient as a function of electron temperature is given by

$$\begin{aligned}\alpha(kT) &= \frac{4}{\sqrt{2\pi m}} \times \frac{1}{(kT)^{3/2}} \int_0^\infty e^{-E/kT} Q_t(E) E\, dE \\ &= \frac{1.090 \times 10^{-6}(\mathrm{cm}^3/\mathrm{s})}{(kT)^{3/2}} \Bigg(\sum_d \int_1^\infty e^{-uI_d/kT} \\ &\quad \times u I_d^2 Q_d\, du + \sum_j B_j^a \int_1^\infty e^{-uI_{ex}/kT} u I_{ex}^2 Q_{ex}^j\, du \Bigg),\end{aligned} \qquad (25)$$

where kT is in eV, and the scaled cross sections uI^2Q are in units of $\pi a_0^2 \mathrm{Ry}^2$. For the direct ionization cross section, we

can insert Eq. (14) into Eq. (25) to obtain

$$\int_1^\infty e^{-uI_d/kT} uI_d^2 Q_d du = \frac{e^{-x}}{x}\{A[1 - xf_1(x)] + B[1 + x - x(x+2)f_1(x)] + Cf_1(x) + Dxf_2(x)\}, \quad (26)$$

where the reduced ionization energy x is defined as

$$x = I_d/kT \quad (27)$$

and

$$f_1(x) = e^x \int_1^\infty \frac{e^{-ux}}{u}\, du, \quad (28)$$

$$f_2(x) = e^x \int_1^\infty \frac{\ln u}{u} e^{-ux}\, du. \quad (29)$$

For the excitation-autoionization cross section, we can insert Eq. (21) into Eq. (25) to obtain

$$\int_1^\infty e^{-uI_{ex}/kT} uI_{ex}^2 Q_{ex} du = \frac{e^{-x}}{x}\{A + Bxf_1(x) + Cx[1 - xf_1(x)] + Df_1(x)\}, \quad (30)$$

where the reduced excitation energy x is also defined as in Eq. (27) with I_d replaced by I_{ex}. It is seen that the integral in Eq. (30) depends only on $f_1(x)$.

Given the four fit parameters of the scaled cross sections uI^2Q, the calculation of the rate coefficients is then reduced to the calculation of the functions $f_1(x)$ and $f_2(x)$. The values of the exponential integral $f_1(x)$ can be obtained from Abramowitz and Stegun [26]. Due to the rapid decrease of $f_2(x)$, we have to fit $f_2(x)$ in three different ranges to ensure the accuracy of the fitting [16]. These ranges are $0 < x < 0.2$, $0.2 \le x < 1$, and $1 \le x < \infty$. In the empirical formula

$$f_2(x) = \frac{1}{x^2} \cdot \frac{x^3 + a_1x^2 + a_2x + a_3}{x^3 + a_4x^2 + a_5x + a_6}, \quad (31)$$

the fit parameters a_i are different in the different ranges; their values are given in Table A in Ref. [16]. The relative deviation of this fit from the actual value for $f_2(x)$ is mostly in the range from 10^{-3} to 10^{-5}, and the maximum deviation is below 1%.

Based on the high precision of the empirical formulas for $f_1(x)$ and $f_2(x)$, the relative error between the rates calculated from the fitted values and the rates obtained with accurate values of the two functions is in the range 10^{-3}–10^{-5} for most cases and the maximum error is below 2%. We calculated the rates for the ground states of the eight selected ions, using the Eqs. (24)–(31) in conjunction with the fit parameters from Table III and Table V. The ionization rate coefficients versus kT for these ground states are given in Table VIII. For other ions not tabulated, one can obtain the direct ionization cross sections by using Eq. (18), estimate the total excitation-autoionization cross sections by using Eq. (22) in conjunction with parameters interpolated from those in Table VII, and calculate the rates from these cross sections.

TABLE A
Comparison of Electron-Impact Direct Ionization Cross Sections (in 10^{-20} cm^2) for the 3s-shell ionization of Se^{23+}

u	Present[a]	[8][b]	[13][c]	[29][d]
1.351	0.9316	0.97	0.972	0.980
1.448	1.043	1.1	1.09	1.09
1.552	1.130	1.2	1.18	1.18
1.737	1.230	1.3	1.29	1.27

Note. u is the reduced incident energy as defined in Eq. (13).

[a] Present results obtained with Eq. (14) with the parameters from Table III.

[b] Relativistic values estimated from Fig. 7 in Ref. [8].

[c] Relativistic values obtained from Table I in Ref. [13].

[d] MCDF values obtained from Table I in Ref. [13], calculated by Moores and Pindzola [29].

Griffin et al. [4] and Gregory et al. [27] have fitted the natural logarithms of the ionization rate coefficients of the $1s^22s^22p^63s$ ground state to a Chebyshev polynomial expansion. In the present work, we fit the natural logarithms of the total ionization rate coefficients to a polynomial expansion,

$$\alpha(kT) = \exp\left[\sum_{i=0}^{8} a_i x^i\right] (\text{cm}^3/\text{s}), \quad (32)$$

in which $x = \ln(kT)$ with kT in eV, and the a_i are fit parameters. The fitted range ($kT_1 \to kT_2$) for the electron temperature and the fit parameters are listed in Table IX. The deviations between the fitted values and the calculated values in Table VIII are found to be lower than 1% for most cases, but may be up to 3% at low electron temperatures.

6. COMPARISON WITH OTHER WORKS

Biémont et al. recently derived ionization potentials for many light ions ($3 \le Z \le 50$) along the Li through Ar isoelectronic sequences by a systematic comparison of the

differences between calculated ab initio values of these potentials and the NIST evaluated database [28]. In their paper, only the outer-shell ionization potentials are given. A comparison of our 3*s*-shell ionization potentials listed in Table I with Biémont's results for the Na isoelectronic sequence shows that the discrepancy is less than 0.12% in all cases.

The present direct ionization cross sections from the 3*s*, 2*p*, and 2*s* subshell for Ar^{7+} are within 2.5% of Younger's results [3]. The direct ionization cross sections for Ni^{17+} given in Ref. [4] at twice threshold for the 3*s*, 2*p*, and 2*s* subshell are 3.5×10^{-20}, 4.9×10^{-20}, and 1.0×10^{-20} cm^2, respectively. Our corresponding results obtained from Eq. (18) with the parameters in Table IV are 3.71×10^{-20}, 4.87×10^{-20}, and 1.06×10^{-20} cm^2. In Table A, we compare the present calculated direct ionization cross sections for the 3*s* subshell of Se^{23+} with other calculations using a fully relativistic distorted wave method [8, 13, 29]. Our results are about 5% lower than the relativistic ones.

There are some absolute ionization cross section measurements for highly charged Na-like ions by Gregory et al. for Fe^{15+} [27], Ti^{11+} and Cr^{13+} [30], Rachafi et al. [31], and Zhang et al. [32] for Ar^{7+}, and Linkemann et al. for Fe^{15+} [33]. To compare our calculations with these experiments, we give the ratios of total ionization cross sections to the direct-ionization cross sections for several Na-like ions in Table B. In Fig. 4, we plot the present cross sections for Fe^{15+} together with the measurements [27, 33]. From

TABLE B

Ratios Q_t/Q_d of the Total Ionization Cross Section (Q_t) to the Direct Ionization Cross Section (Q_d) of Na-like Ions

Ion	E (eV)	Present[a]	Present[b]	Other theory	Experiment
Ar^{7+}	364	4.3	3.5	5.4[c] 3.8[e]	5.3 ± 0.4[d] 2.8 ± 0.3[f]
Ti^{11+}	688	6.2	4.2	5.4[c]	4.6 ± 0.2[d]
Cr^{13+}	885	6.6	4.5	4.9[c]	5.4 ± 0.5[d]
Fe^{15+}	988	7.6	4.7	5.0[c] 4.6[g] 4.0[h]	5.8 ± 0.9[d]
Se^{23+}	1800	9.2	5.0	5.1[i]	

Note. The theoretical ratios are listed at energies, obtained from Table IV in Ref. [32], where the distorted-wave calculations predict the maximum contribution of the indirect ionization.

[a] Present results assuming unit autoionization branching ratio to derive Q_t.

[b] Present results obtained with calculated autoionization branching ratios from Table V.

[c] Theoretical values obtained from Table IV in Ref. [32].

[d] Experimental values obtained from Table IV in Ref. [32].

[e] Theoretical value estimated from Fig. 7 in Ref. [6].

[f] Experimental value estimated from Table 1 in Ref. [31].

[g] Theoretical value estimated from Fig. 1 in Ref. [7].

[h] Theoretical value at 952 eV obtained from Table V in Ref. [12].

[i] Theoretical value estimated from Fig. 7 in Ref. [8].

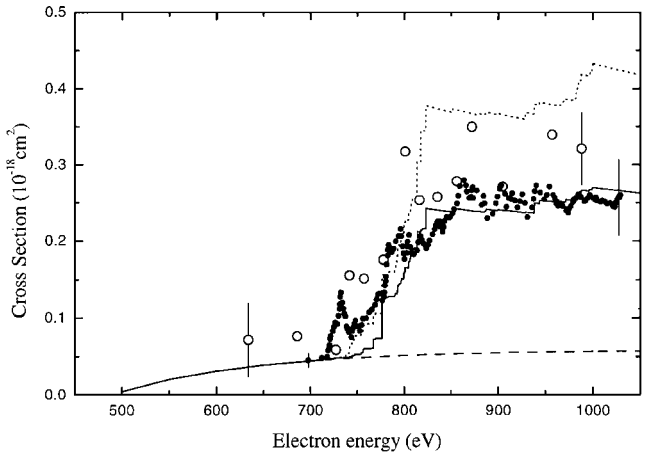

FIG. 4. Ionization cross section for Fe^{15+}. The dashed line shows the present values for 3*s*-shell direct ionization, the dotted line is the sum of the present direct ionization and excitation cross sections, and the solid line is the sum of present direct ionization and excitation-autoionization cross sections. ○ [27] and ● [33] are experimental values.

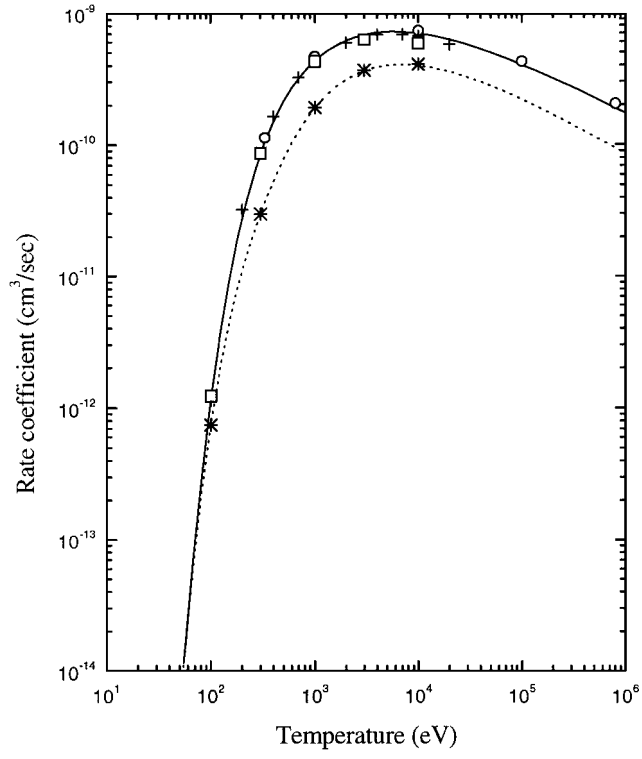

FIG. 5. Ionization rate coefficients for Fe^{15+}. The dotted line shows the present values including only direction ionization; the solid curve includes also the contribution from excitation-autoionization (EA). + is obtained from the experimental ionization cross section [27]; ○ are theoretical values obtained from the parameters in Table V of Ref. [4]; □ are theoretical values including EA; and ✱ are theoretical values including only direct ionization, both derived using the parameters listed in Table I of Ref. [34].

Table B and Fig. 4, it can be seen that our calculated values agree reasonably well with the experiments and other theoretical calculations. It should be pointed out that the discrepancy at low incident energy between the calculated values and the experimental data seen in Fig. 4 is mainly due the contribution from REDA, which is not included in the present calculation. For the ions with higher nuclear charge Z, we also compared the present total ionization cross section for Se^{23+} to the fully relativistic results including direct ionization and excitation-autoionization calculated by Chen et al. [8], and found that the overall discrepancy is less than 10% in the incident energy range of 1.4–2.0 keV.

We also give the ionization rate coefficients for Fe^{15+} in Fig. 5, where the solid curve represents the present results including the contribution from excitation-autoionization while the dotted curve includes only direct ionization. The comparison here shows that the present rates for Fe^{15+} are about 5% lower than those given by Griffin et al. [4]; it can also be seen that the present rates agree well with those reported by Arnaud and Raymond [34] and Gregory et al. [27].

Acknowledgments

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EXPLANATION OF TABLES

TABLE I. Ionization Potential for $2 \leq n \leq 5$ States of Na-like Ions (in Ry)

Z	Nuclear charge number
Ion	Element symbol and degree of ionization
$I(2s)$	Ionization potential in Ry of the $2s$ electron in the $2s^2 2p^6 3s$ ground state (1 Ry = 13.60 eV)
$I(2p)$	Ionization potential in Ry of the $2p$ electron in the $2s^2 2p^6 3s$ ground state
$I(nl)$	Ionization potential in Ry of the nl electron in the $2s^2 2p^6 nl$ ($n = 3$–5, $l = s$-g) state

TABLE II. Direct Ionization Cross Sections for $2 \leq n \leq 5$ States of Na-like Ions (in cm^2)

Z	Nuclear charge number
Ion	Element symbol and degree of ionization
u	Reduced incident energy; see Eq. (13)
$Q(2s)$	2s-shell ionization cross section in cm^2, corresponding to ejection of a 2s electron from the $2s^2 2p^6 3s$ ground state
$Q(2p)$	2p-shell ionization cross section in cm^2, corresponding to ejection of a 2p electron from the $2s^2 2p^6 3s$ ground state
$Q(nl)$	nl-shell ionization cross section in cm^2, corresponding to ejection of the nl electron from the $2s^2 2p^6 nl$ ($n = 3$–5, $l = s$-g) state

TABLE III. Fit Parameters for Direct Ionization Cross Sections for Individual Ions

Z	Nuclear charge number
Transition	Initial $\rightarrow$ final state of the ionization process
A, B, C, D	Fit parameters of Eq. (14) in units of $\pi a_0^2 \mathrm{Ry}^2 = 1.628 \times 10^{-14}\ \mathrm{eV}^2\mathrm{cm}^2$
F	Average deviation; see Eq. (17)

TABLE IV. Fit Parameters for Direct Ionization Cross Sections for the Na Isoelectronic Sequence

Transition	Initial $\rightarrow$ final state of the ionization processes
A_1, B_1, C_1, D_1	Fit parameters of Eq. (19) in units of $\pi a_0^2 \mathrm{Ry}^2 = 1.628 \times 10^{-14}\ \mathrm{eV}^2\mathrm{cm}^2$
A_2, B_2, C_2, D_2	Fit parameters of Eq. (20) in units of $\pi a_0^2 \mathrm{Ry}^2 = 1.628 \times 10^{-14}\ \mathrm{eV}^2\mathrm{cm}^2$

TABLE V. Autoionization Branching Ratio and Fit Parameters for Excitation Cross Sections for Individual Levels

Z	Nuclear charge number
Transition	The transition from initial shell to final shell
J	The total angular momentum of the excited autoionizing level j
I_{ex}	The excitation threshold energy in eV
B_j^a	The autoionization branching ratio of the level j (Eq. (3))
A, B, C, D	The fit parameters of Eq. (21) in units of $\pi a_0^2 \mathrm{Ry}^2 = 1.628 \times 10^{-14}\ \mathrm{eV}^2\ \mathrm{cm}^2$
Q_{ea}	The excitation-autoionization cross section Q_{ea}^j for level j at excitation threshold energy, in cm^2

The levels of the doubly excited $2p^5 3p^2$ configuration whose mixing coefficients with the $2p^5 3s 3d$ configuration are larger than 0.1 are also included in the present calculation.

TABLE VI. Excitation Energy of the $2p^6 3s\ ^2S_{1/2} \rightarrow 2p^5 3s^2\ ^2P_{3/2}$ Transition (in eV)

Z	Nuclear charge number
I'_{ex}	Excitation energy of the $2p^6 3s\ ^2S_{1/2} \rightarrow 2p^5 3s^2\ ^2P_{3/2}$ transition in eV

EXPLANATION OF TABLES continued

TABLE VII. Fit Parameters for the Total Excitation-Autoionization Cross Section

Z	Nuclear charge number
A, B	The fit parameters of Eq. (22), where A is in units of cm^2 and B is dimensionless

TABLE VIII. Ionization Rate Coefficients for the $2s^2 2p^6 3s$ Ground State (in cm^3/s)

kT	Electron temperature in eV
α_d	Ionization rate coefficients due to direct ionization only
α_t	Total ionization rate coefficients including autoionization

TABLE IX. Fit Parameters for Total Ionization Rate Coefficients for Individual Ions

kT_1	Minimum electron temperature of fit range in eV
kT_2	Maximum electron temperature of fit range in eV
$a_i (i = 0–8)$	Fit parameters (dimensionless) in Eq. (32)

TABLE I. Ionization Potential for $2 \leq n \leq 5$ States of Na-like Ions (in Ry)

See page 76 for Explanation of Tables

Z	Ion	$I(2s)$	$I(2p)$	$I(3s)$	$I(3p)$	$I(3d)$	$I(4s)$	$I(4p)$
18	Ar^{7+}	3.478E+01	2.908E+01	1.056E+01	9.265E+00	7.526E+00	5.297E+00	4.812E+00
19	K^{8+}	4.105E+01	3.488E+01	1.294E+01	1.148E+01	9.518E+00	6.556E+00	6.003E+00
20	Ca^{9+}	4.783E+01	4.118E+01	1.555E+01	1.392E+01	1.174E+01	7.943E+00	7.321E+00
21	Sc^{10+}	5.513E+01	4.799E+01	1.839E+01	1.659E+01	1.418E+01	9.457E+00	8.766E+00
22	Ti^{11+}	6.295E+01	5.531E+01	2.145E+01	1.949E+01	1.686E+01	1.110E+01	1.034E+01
23	V^{12+}	7.129E+01	6.313E+01	2.475E+01	2.261E+01	1.976E+01	1.287E+01	1.204E+01
24	Cr^{13+}	8.015E+01	7.146E+01	2.827E+01	2.596E+01	2.288E+01	1.477E+01	1.386E+01
25	Mn^{14+}	8.953E+01	8.030E+01	3.202E+01	2.953E+01	2.623E+01	1.680E+01	1.581E+01
26	Fe^{15+}	9.944E+01	8.965E+01	3.601E+01	3.333E+01	2.980E+01	1.896E+01	1.789E+01
27	Co^{16+}	1.099E+02	9.951E+01	4.022E+01	3.735E+01	3.360E+01	2.124E+01	2.010E+01
28	Ni^{17+}	1.209E+02	1.099E+02	4.467E+01	4.161E+01	3.762E+01	2.366E+01	2.243E+01
29	Cu^{18+}	1.324E+02	1.208E+02	4.935E+01	4.609E+01	4.187E+01	2.620E+01	2.490E+01
30	Zn^{19+}	1.444E+02	1.322E+02	5.427E+01	5.080E+01	4.634E+01	2.888E+01	2.748E+01
31	Ga^{20+}	1.570E+02	1.441E+02	5.941E+01	5.573E+01	5.104E+01	3.168E+01	3.020E+01
32	Ge^{21+}	1.701E+02	1.565E+02	6.480E+01	6.089E+01	5.596E+01	3.462E+01	3.304E+01
33	As^{22+}	1.838E+02	1.694E+02	7.042E+01	6.629E+01	6.110E+01	3.769E+01	3.602E+01
34	Se^{23+}	1.980E+02	1.829E+02	7.628E+01	7.191E+01	6.647E+01	4.089E+01	3.912E+01
35	Br^{24+}	2.128E+02	1.968E+02	8.238E+01	7.776E+01	7.206E+01	4.422E+01	4.235E+01
36	Kr^{25+}	2.281E+02	2.113E+02	8.872E+01	8.384E+01	7.788E+01	4.768E+01	4.571E+01
37	Rb^{26+}	2.440E+02	2.264E+02	9.530E+01	9.016E+01	8.393E+01	5.128E+01	4.919E+01
38	Sr^{27+}	2.605E+02	2.419E+02	1.021E+02	9.670E+01	9.019E+01	5.502E+01	5.281E+01
39	Y^{28+}	2.775E+02	2.579E+02	1.092E+02	1.035E+02	9.669E+01	5.888E+01	5.656E+01

Z	Ion	$I(4d)$	$I(4f)$	$I(5s)$	$I(5p)$	$I(5d)$	$I(5f)$	$I(5g)$
18	Ar^{7+}	4.187E+00	4.021E+00	3.187E+00	2.956E+00	2.658E+00	2.571E+00	2.563E+00
19	K^{8+}	5.295E+00	5.089E+00	3.965E+00	3.699E+00	3.362E+00	3.254E+00	3.243E+00
20	Ca^{9+}	6.530E+00	6.281E+00	4.824E+00	4.524E+00	4.146E+00	4.017E+00	4.004E+00
21	Sc^{10+}	7.892E+00	7.599E+00	5.765E+00	5.430E+00	5.011E+00	4.860E+00	4.845E+00
22	Ti^{11+}	9.381E+00	9.043E+00	6.788E+00	6.417E+00	5.958E+00	5.783E+00	5.766E+00
23	V^{12+}	1.100E+01	1.061E+01	7.893E+00	7.485E+00	6.984E+00	6.787E+00	6.767E+00
24	Cr^{13+}	1.274E+01	1.231E+01	9.079E+00	8.633E+00	8.092E+00	7.871E+00	7.848E+00
25	Mn^{14+}	1.460E+01	1.412E+01	1.035E+01	9.863E+00	9.280E+00	9.035E+00	9.009E+00
26	Fe^{15+}	1.660E+01	1.607E+01	1.170E+01	1.117E+01	1.055E+01	1.028E+01	1.025E+01
27	Co^{16+}	1.872E+01	1.814E+01	1.313E+01	1.257E+01	1.190E+01	1.160E+01	1.157E+01
28	Ni^{17+}	2.096E+01	2.033E+01	1.464E+01	1.404E+01	1.333E+01	1.301E+01	1.297E+01
29	Cu^{18+}	2.333E+01	2.265E+01	1.624E+01	1.559E+01	1.484E+01	1.449E+01	1.445E+01
30	Zn^{19+}	2.583E+01	2.510E+01	1.792E+01	1.723E+01	1.643E+01	1.606E+01	1.602E+01
31	Ga^{20+}	2.845E+01	2.767E+01	1.968E+01	1.895E+01	1.810E+01	1.771E+01	1.766E+01
32	Ge^{21+}	3.120E+01	3.037E+01	2.153E+01	2.075E+01	1.985E+01	1.943E+01	1.938E+01
33	As^{22+}	3.408E+01	3.319E+01	2.346E+01	2.263E+01	2.168E+01	2.124E+01	2.118E+01
34	Se^{23+}	3.708E+01	3.614E+01	2.547E+01	2.459E+01	2.360E+01	2.312E+01	2.306E+01
35	Br^{24+}	4.021E+01	3.921E+01	2.757E+01	2.664E+01	2.559E+01	2.509E+01	2.503E+01
36	Kr^{25+}	4.346E+01	4.241E+01	2.975E+01	2.876E+01	2.767E+01	2.714E+01	2.707E+01
37	Rb^{26+}	4.685E+01	4.574E+01	3.202E+01	3.097E+01	2.982E+01	2.927E+01	2.919E+01
38	Sr^{27+}	5.035E+01	4.919E+01	3.437E+01	3.326E+01	3.206E+01	3.148E+01	3.140E+01
39	Y^{28+}	5.399E+01	5.276E+01	3.680E+01	3.564E+01	3.438E+01	3.377E+01	3.368E+01

TABLE II. Direct Ionization Cross Sections for $2 \leq n \leq 5$ States of Na-like Ions (in cm^2)

See page 76 for Explanation of Tables

Z	Ion	u	Q(2s)	Q(2p)	Q(3s)	Q(3p)	Q(3d)	Q(4s)	Q(4p)
18	Ar^{7+}	1.125	3.466E-20	2.127E-19	2.119E-19	3.076E-19	6.951E-19	9.253E-19	1.235E-18
		1.250	6.006E-20	3.549E-19	3.493E-19	5.277E-19	1.131E-18	1.513E-18	1.999E-18
		1.500	9.074E-20	5.244E-19	5.032E-19	7.655E-19	1.602E-18	2.157E-18	2.823E-18
		1.750	1.079E-19	6.129E-19	5.740E-19	8.789E-19	1.806E-18	2.437E-18	3.179E-18
		2.000	1.178E-19	6.593E-19	6.054E-19	9.325E-19	1.888E-18	2.549E-18	3.328E-18
		2.250	1.233E-19	6.832E-19	6.168E-19	9.532E-19	1.906E-18	2.575E-18	3.371E-18
		2.500	1.262E-19	6.928E-19	6.171E-19	9.553E-19	1.891E-18	2.557E-18	3.358E-18
		2.750	1.274E-19	6.941E-19	6.110E-19	9.462E-19	1.859E-18	2.513E-18	3.315E-18
		3.000	1.273E-19	6.902E-19	6.014E-19	9.312E-19	1.817E-18	2.458E-18	3.253E-18
		3.500	1.248E-19	6.744E-19	5.772E-19	8.916E-19	1.724E-18	2.332E-18	3.106E-18
		4.000	1.211E-19	6.520E-19	5.506E-19	8.491E-19	1.629E-18	2.204E-18	2.952E-18
		5.000	1.129E-19	6.013E-19	5.005E-19	7.681E-19	1.454E-18	1.971E-18	2.655E-18
		6.000	1.038E-19	5.543E-19	4.571E-19	6.982E-19	1.307E-18	1.775E-18	2.399E-18
		8.000	8.915E-20	4.761E-19	3.876E-19	5.882E-19	1.079E-18	1.476E-18	1.997E-18
		10.00	7.818E-20	4.156E-19	3.356E-19	5.066E-19	9.146E-19	1.265E-18	1.708E-18
		12.00	6.914E-20	3.677E-19	2.955E-19	4.440E-19	7.911E-19	1.106E-18	1.494E-18
		15.00	5.903E-20	3.113E-19	2.565E-19	3.867E-19	6.541E-19	9.299E-19	1.253E-18

Z	Ion	u	Q(4d)	Q(4f)	Q(5s)	Q(5p)	Q(5d)	Q(5f)	Q(5g)
18	Ar^{7+}	1.125	2.195E-18	2.753E-18	2.722E-18	3.583E-18	5.205E-18	6.909E-18	7.315E-18
		1.250	3.560E-18	4.429E-18	4.397E-18	5.797E-18	8.456E-18	1.104E-17	1.170E-17
		1.500	4.975E-18	6.121E-18	6.187E-18	8.053E-18	1.187E-17	1.506E-17	1.603E-17
		1.750	5.542E-18	6.780E-18	6.957E-18	8.927E-18	1.329E-17	1.648E-17	1.762E-17
		2.000	5.736E-18	6.986E-18	7.263E-18	9.194E-18	1.379E-17	1.681E-17	1.803E-17
		2.250	5.749E-18	6.976E-18	7.335E-18	9.187E-18	1.383E-17	1.664E-17	1.791E-17
		2.500	5.671E-18	6.859E-18	7.274E-18	9.050E-18	1.364E-17	1.625E-17	1.752E-17
		2.750	5.543E-18	6.689E-18	7.146E-18	8.855E-18	1.335E-17	1.576E-17	1.701E-17
		3.000	5.395E-18	6.493E-18	6.978E-18	8.624E-18	1.298E-17	1.525E-17	1.644E-17
		3.500	5.079E-18	6.083E-18	6.604E-18	8.144E-18	1.220E-17	1.421E-17	1.530E-17
		4.000	4.770E-18	5.684E-18	6.218E-18	7.675E-18	1.143E-17	1.325E-17	1.423E-17
		5.000	4.227E-18	4.987E-18	5.520E-18	6.844E-18	1.007E-17	1.161E-17	1.240E-17
		6.000	3.783E-18	4.422E-18	4.939E-18	6.156E-18	8.971E-18	1.030E-17	1.094E-17
		8.000	3.117E-18	3.590E-18	4.079E-18	5.119E-18	7.358E-18	8.388E-18	8.825E-18
		10.00	2.651E-18	3.012E-18	3.477E-18	4.377E-18	6.248E-18	7.071E-18	7.374E-18
		12.00	2.305E-18	2.588E-18	3.028E-18	3.819E-18	5.427E-18	6.102E-18	6.315E-18
		15.00	1.923E-18	2.124E-18	2.532E-18	3.200E-18	4.524E-18	5.040E-18	5.167E-18

Z	Ion	u	Q(2s)	Q(2p)	Q(3s)	Q(3p)	Q(3d)	Q(4s)	Q(4p)
22	Ti^{11+}	1.125	1.175E-20	6.319E-20	5.546E-20	7.848E-20	1.430E-19	2.263E-19	2.775E-19
		1.250	1.977E-20	1.049E-19	9.093E-20	1.295E-19	2.328E-19	3.692E-19	4.522E-19
		1.500	2.957E-20	1.531E-19	1.297E-19	1.866E-19	3.283E-19	5.229E-19	6.392E-19
		1.750	3.482E-20	1.769E-19	1.473E-19	2.128E-19	3.685E-19	5.883E-19	7.212E-19
		2.000	3.770E-20	1.889E-19	1.548E-19	2.242E-19	3.837E-19	6.127E-19	7.555E-19
		2.250	3.919E-20	1.942E-19	1.574E-19	2.279E-19	3.865E-19	6.168E-19	7.654E-19
		2.500	3.987E-20	1.956E-19	1.572E-19	2.274E-19	3.827E-19	6.108E-19	7.622E-19
		2.750	3.999E-20	1.950E-19	1.555E-19	2.245E-19	3.755E-19	5.994E-19	7.516E-19
		3.000	3.977E-20	1.931E-19	1.530E-19	2.202E-19	3.664E-19	5.854E-19	7.371E-19
		3.500	3.887E-20	1.867E-19	1.467E-19	2.101E-19	3.465E-19	5.539E-19	7.020E-19
		4.000	3.743E-20	1.792E-19	1.400E-19	1.994E-19	3.266E-19	5.227E-19	6.653E-19
		5.000	3.453E-20	1.639E-19	1.273E-19	1.797E-19	2.904E-19	4.677E-19	5.973E-19
		6.000	3.186E-20	1.499E-19	1.161E-19	1.627E-19	2.599E-19	4.221E-19	5.399E-19
		8.000	2.709E-20	1.277E-19	9.809E-20	1.360E-19	2.138E-19	3.530E-19	4.511E-19
		10.00	2.360E-20	1.105E-19	8.606E-20	1.194E-19	1.813E-19	3.032E-19	3.867E-19
		12.00	2.087E-20	9.714E-20	7.653E-20	1.047E-19	1.584E-19	2.655E-19	3.379E-19
		15.00	1.771E-20	8.179E-20	6.529E-20	8.854E-20	1.321E-19	2.267E-19	2.848E-19

TABLE II. Direct Ionization Cross Sections for $2 \leq n \leq 5$ States of Na-like Ions (in cm^2)

See page 76 for Explanation of Tables

Z	Ion	u	Q(4d)	Q(4f)	Q(5s)	Q(5p)	Q(5d)	Q(5f)	Q(5g)
22	Ti^{11+}	1.125	4.457E-19	5.537E-19	6.243E-19	7.707E-19	1.043E-18	1.362E-18	1.458E-18
		1.250	7.222E-19	8.911E-19	1.014E-18	1.243E-18	1.692E-18	2.166E-18	2.334E-18
		1.500	1.007E-18	1.231E-18	1.432E-18	1.729E-18	2.378E-18	2.976E-18	3.197E-18
		1.750	1.120E-18	1.362E-18	1.611E-18	1.918E-18	2.657E-18	3.255E-18	3.509E-18
		2.000	1.157E-18	1.400E-18	1.679E-18	1.978E-18	2.750E-18	3.316E-18	3.589E-18
		2.250	1.158E-18	1.397E-18	1.692E-18	1.982E-18	2.755E-18	3.282E-18	3.560E-18
		2.500	1.140E-18	1.371E-18	1.675E-18	1.957E-18	2.716E-18	3.204E-18	3.480E-18
		2.750	1.112E-18	1.335E-18	1.643E-18	1.917E-18	2.654E-18	3.108E-18	3.376E-18
		3.000	1.080E-18	1.294E-18	1.602E-18	1.871E-18	2.580E-18	3.007E-18	3.263E-18
		3.500	1.015E-18	1.209E-18	1.512E-18	1.773E-18	2.425E-18	2.803E-18	3.035E-18
		4.000	9.523E-19	1.130E-18	1.423E-18	1.676E-18	2.273E-18	2.615E-18	2.822E-18
		5.000	8.449E-19	9.900E-19	1.263E-18	1.499E-18	2.006E-18	2.294E-18	2.457E-18
		6.000	7.575E-19	8.780E-19	1.132E-18	1.352E-18	1.789E-18	2.036E-18	2.167E-18
		8.000	6.262E-19	7.129E-19	9.362E-19	1.125E-18	1.467E-18	1.659E-18	1.746E-18
		10.00	5.324E-19	5.980E-19	7.976E-19	9.610E-19	1.244E-18	1.397E-18	1.458E-18
		12.00	4.619E-19	5.133E-19	6.951E-19	8.371E-19	1.079E-18	1.205E-18	1.248E-18
		15.00	3.842E-19	4.208E-19	5.809E-19	6.999E-19	8.980E-19	9.944E-19	1.021E-18

Z	Ion	u	Q(2s)	Q(2p)	Q(3s)	Q(3p)	Q(3d)	Q(4s)	Q(4p)
24	Cr^{13+}	1.125	7.418E-21	3.852E-20	3.252E-20	4.540E-20	7.840E-20	1.303E-19	1.567E-19
		1.250	1.247E-20	6.387E-20	5.327E-20	7.481E-20	1.275E-19	2.124E-19	2.550E-19
		1.500	1.858E-20	9.290E-20	7.581E-20	1.074E-19	1.793E-19	2.999E-19	3.604E-19
		1.750	2.182E-20	1.070E-19	8.595E-20	1.222E-19	2.011E-19	3.368E-19	4.069E-19
		2.000	2.355E-20	1.138E-19	9.032E-20	1.285E-19	2.090E-19	3.504E-19	4.261E-19
		2.250	2.442E-20	1.168E-19	9.179E-20	1.304E-19	2.102E-19	3.523E-19	4.315E-19
		2.500	2.479E-20	1.176E-19	9.170E-20	1.299E-19	2.080E-19	3.487E-19	4.296E-19
		2.750	2.485E-20	1.171E-19	9.072E-20	1.282E-19	2.039E-19	3.422E-19	4.232E-19
		3.000	2.469E-20	1.156E-19	8.925E-20	1.256E-19	1.989E-19	3.340E-19	4.147E-19
		3.500	2.403E-20	1.117E-19	8.565E-20	1.198E-19	1.880E-19	3.163E-19	3.953E-19
		4.000	2.316E-20	1.069E-19	8.181E-20	1.136E-19	1.770E-19	2.988E-19	3.746E-19
		5.000	2.126E-20	9.733E-20	7.431E-20	1.020E-19	1.571E-19	2.678E-19	3.363E-19
		6.000	1.951E-20	8.894E-20	6.765E-20	9.207E-20	1.405E-19	2.417E-19	3.039E-19
		8.000	1.669E-20	7.554E-20	5.712E-20	7.703E-20	1.158E-19	2.024E-19	2.538E-19
		10.00	1.447E-20	6.507E-20	4.954E-20	6.657E-20	9.858E-20	1.733E-19	2.164E-19
		12.00	1.276E-20	5.709E-20	4.353E-20	5.828E-20	8.531E-20	1.514E-19	1.885E-19
		15.00	1.081E-20	4.805E-20	3.669E-20	4.889E-20	7.052E-20	1.270E-19	1.576E-19

Z	Ion	u	Q(4d)	Q(4f)	Q(5s)	Q(5p)	Q(5d)	Q(5f)	Q(5g)
24	Cr^{13+}	1.125	2.434E-19	3.006E-19	3.540E-19	4.282E-19	5.673E-19	7.335E-19	7.893E-19
		1.250	3.941E-19	4.832E-19	5.753E-19	6.904E-19	9.207E-19	1.168E-18	1.263E-18
		1.500	5.492E-19	6.673E-19	8.126E-19	9.590E-19	1.291E-18	1.604E-18	1.726E-18
		1.750	6.107E-19	7.376E-19	9.138E-19	1.064E-18	1.443E-18	1.756E-18	1.897E-18
		2.000	6.299E-19	7.578E-19	9.513E-19	1.100E-18	1.495E-18	1.790E-18	1.939E-18
		2.250	6.291E-19	7.548E-19	9.584E-19	1.103E-18	1.499E-18	1.773E-18	1.924E-18
		2.500	6.188E-19	7.407E-19	9.489E-19	1.091E-18	1.477E-18	1.731E-18	1.880E-18
		2.750	6.040E-19	7.214E-19	9.303E-19	1.069E-18	1.443E-18	1.679E-18	1.824E-18
		3.000	5.871E-19	6.991E-19	9.074E-19	1.044E-18	1.403E-18	1.624E-18	1.762E-18
		3.500	5.514E-19	6.533E-19	8.558E-19	9.891E-19	1.316E-18	1.514E-18	1.639E-18
		4.000	5.172E-19	6.099E-19	8.052E-19	9.363E-19	1.234E-18	1.412E-18	1.524E-18
		5.000	4.588E-19	5.349E-19	7.152E-19	8.385E-19	1.090E-18	1.240E-18	1.328E-18
		6.000	4.113E-19	4.746E-19	6.412E-19	7.556E-19	9.719E-19	1.101E-18	1.172E-18
		8.000	3.398E-19	3.854E-19	5.305E-19	6.281E-19	7.976E-19	8.967E-19	9.444E-19
		10.00	2.871E-19	3.226E-19	4.503E-19	5.342E-19	6.738E-19	7.537E-19	7.881E-19
		12.00	2.489E-19	2.769E-19	3.923E-19	4.653E-19	5.845E-19	6.503E-19	6.746E-19
		15.00	2.069E-19	2.271E-19	3.280E-19	3.893E-19	4.867E-19	5.371E-19	5.517E-19

TABLE II. Direct Ionization Cross Sections for $2 \leq n \leq 5$ States of Na-like Ions (in cm^2)

See page 76 for Explanation of Tables

Z	Ion	u	Q(2s)	Q(2p)	Q(3s)	Q(3p)	Q(3d)	Q(4s)	Q(4p)
26	Fe^{15+}	1.125	4.917E-21	2.485E-20	2.036E-20	2.814E-20	4.662E-20	8.053E-20	9.533E-20
		1.250	8.253E-21	4.113E-20	3.334E-20	4.627E-20	7.571E-20	1.311E-19	1.551E-19
		1.500	1.226E-20	5.965E-20	4.737E-20	6.631E-20	1.064E-19	1.847E-19	2.193E-19
		1.750	1.436E-20	6.862E-20	5.363E-20	7.524E-20	1.191E-19	2.070E-19	2.473E-19
		2.000	1.547E-20	7.286E-20	5.634E-20	7.903E-20	1.237E-19	2.150E-19	2.591E-19
		2.250	1.602E-20	7.457E-20	5.723E-20	8.011E-20	1.244E-19	2.162E-19	2.620E-19
		2.500	1.623E-20	7.489E-20	5.714E-20	7.975E-20	1.230E-19	2.138E-19	2.608E-19
		2.750	1.623E-20	7.449E-20	5.654E-20	7.861E-20	1.205E-19	2.096E-19	2.569E-19
		3.000	1.612E-20	7.354E-20	5.564E-20	7.701E-20	1.175E-19	2.046E-19	2.517E-19
		3.500	1.565E-20	7.081E-20	5.332E-20	7.325E-20	1.109E-19	1.938E-19	2.395E-19
		4.000	1.508E-20	6.781E-20	5.092E-20	6.944E-20	1.044E-19	1.831E-19	2.268E-19
		5.000	1.384E-20	6.165E-20	4.633E-20	6.240E-20	9.263E-20	1.639E-19	2.033E-19
		6.000	1.268E-20	5.617E-20	4.221E-20	5.631E-20	8.281E-20	1.480E-19	1.835E-19
		8.000	1.081E-20	4.755E-20	3.560E-20	4.697E-20	6.809E-20	1.238E-19	1.530E-19
		10.00	9.392E-21	4.099E-20	3.074E-20	4.040E-20	5.789E-20	1.065E-19	1.311E-19
		12.00	8.273E-21	3.590E-20	2.703E-20	3.541E-20	5.012E-20	9.307E-20	1.142E-19
		15.00	7.002E-21	3.014E-20	2.280E-20	2.974E-20	4.146E-20	7.800E-20	9.535E-20

Z	Ion	u	Q(4d)	Q(4f)	Q(5s)	Q(5p)	Q(5d)	Q(5f)	Q(5g)
26	Fe^{15+}	1.125	1.444E-19	1.772E-19	2.166E-19	2.574E-19	3.361E-19	4.311E-19	4.644E-19
		1.250	2.339E-19	2.850E-19	3.521E-19	4.149E-19	5.447E-19	6.900E-19	7.431E-19
		1.500	3.255E-19	3.933E-19	4.970E-19	5.765E-19	7.646E-19	9.431E-19	1.017E-18
		1.750	3.615E-19	4.343E-19	5.581E-19	6.402E-19	8.537E-19	1.032E-18	1.116E-18
		2.000	3.727E-19	4.460E-19	5.809E-19	6.616E-19	8.832E-19	1.051E-18	1.140E-18
		2.250	3.721E-19	4.442E-19	5.845E-19	6.633E-19	8.849E-19	1.041E-18	1.131E-18
		2.500	3.658E-19	4.357E-19	5.780E-19	6.559E-19	8.719E-19	1.016E-18	1.105E-18
		2.750	3.569E-19	4.240E-19	5.666E-19	6.432E-19	8.515E-19	9.862E-19	1.072E-18
		3.000	3.468E-19	4.109E-19	5.521E-19	6.284E-19	8.276E-19	9.535E-19	1.035E-18
		3.500	3.254E-19	3.839E-19	5.205E-19	5.960E-19	7.758E-19	8.884E-19	9.624E-19
		4.000	3.050E-19	3.582E-19	4.896E-19	5.632E-19	7.271E-19	8.285E-19	8.945E-19
		5.000	2.699E-19	3.137E-19	4.343E-19	5.045E-19	6.424E-19	7.274E-19	7.792E-19
		6.000	2.417E-19	2.781E-19	3.896E-19	4.553E-19	5.732E-19	6.465E-19	6.876E-19
		8.000	1.997E-19	2.260E-19	3.230E-19	3.787E-19	4.711E-19	5.272E-19	5.542E-19
		10.00	1.697E-19	1.895E-19	2.744E-19	3.217E-19	3.970E-19	4.424E-19	4.622E-19
		12.00	1.471E-19	1.627E-19	2.388E-19	2.801E-19	3.441E-19	3.814E-19	3.955E-19
		15.00	1.221E-19	1.334E-19	1.996E-19	2.339E-19	2.861E-19	3.147E-19	3.233E-19

Z	Ion	u	Q(2s)	Q(2p)	Q(3s)	Q(3p)	Q(3d)	Q(4s)	Q(4p)
30	Zn^{19+}	1.125	2.404E-21	1.168E-20	9.171E-21	1.249E-20	1.952E-20	3.561E-20	4.129E-20
		1.250	4.024E-21	1.928E-20	1.498E-20	2.050E-20	3.168E-20	5.785E-20	6.719E-20
		1.500	5.953E-21	2.788E-20	2.126E-20	2.926E-20	4.440E-20	8.109E-20	9.500E-20
		1.750	6.950E-21	3.192E-20	2.406E-20	3.313E-20	4.961E-20	9.080E-20	1.070E-19
		2.000	7.460E-21	3.382E-20	2.526E-20	3.470E-20	5.145E-20	9.419E-20	1.119E-19
		2.250	7.702E-21	3.457E-20	2.566E-20	3.511E-20	5.165E-20	9.455E-20	1.132E-19
		2.500	7.794E-21	3.465E-20	2.562E-20	3.489E-20	5.100E-20	9.345E-20	1.125E-19
		2.750	7.784E-21	3.434E-20	2.533E-20	3.432E-20	4.992E-20	9.162E-20	1.108E-19
		3.000	7.709E-21	3.385E-20	2.491E-20	3.357E-20	4.865E-20	8.944E-20	1.085E-19
		3.500	7.474E-21	3.252E-20	2.389E-20	3.192E-20	4.583E-20	8.471E-20	1.032E-19
		4.000	7.175E-21	3.105E-20	2.279E-20	3.015E-20	4.309E-20	8.012E-20	9.771E-20
		5.000	6.576E-21	2.821E-20	2.068E-20	2.703E-20	3.824E-20	7.177E-20	8.740E-20
		6.000	6.022E-21	2.565E-20	1.886E-20	2.444E-20	3.421E-20	6.478E-20	7.865E-20
		8.000	5.116E-21	2.159E-20	1.593E-20	2.039E-20	2.810E-20	5.405E-20	6.530E-20
		10.00	4.455E-21	1.863E-20	1.370E-20	1.744E-20	2.378E-20	4.652E-20	5.607E-20
		12.00	3.929E-21	1.631E-20	1.203E-20	1.525E-20	2.059E-20	4.072E-20	4.893E-20
		15.00	3.322E-21	1.365E-20	1.014E-20	1.281E-20	1.704E-20	3.421E-20	4.090E-20

TABLE II. Direct Ionization Cross Sections for $2 \leq n \leq 5$ States of Na-like Ions (in cm^2)

See page 76 for Explanation of Tables

Z	Ion	u	Q(4d)	Q(4f)	Q(5s)	Q(5p)	Q(5d)	Q(5f)	Q(5g)
30	Zn^{19+}	1.125	6.047E-20	7.332E-20	9.477E-20	1.099E-19	1.404E-19	1.786E-19	1.916E-19
		1.250	9.776E-20	1.178E-19	1.539E-19	1.769E-19	2.275E-19	2.853E-19	3.066E-19
		1.500	1.358E-19	1.624E-19	2.169E-19	2.456E-19	3.187E-19	3.893E-19	4.191E-19
		1.750	1.507E-19	1.792E-19	2.431E-19	2.728E-19	3.556E-19	4.260E-19	4.596E-19
		2.000	1.551E-19	1.838E-19	2.528E-19	2.820E-19	3.678E-19	4.341E-19	4.694E-19
		2.250	1.546E-19	1.830E-19	2.539E-19	2.830E-19	3.679E-19	4.296E-19	4.651E-19
		2.500	1.520E-19	1.794E-19	2.506E-19	2.798E-19	3.625E-19	4.190E-19	4.542E-19
		2.750	1.481E-19	1.745E-19	2.453E-19	2.745E-19	3.533E-19	4.067E-19	4.403E-19
		3.000	1.438E-19	1.690E-19	2.388E-19	2.682E-19	3.434E-19	3.930E-19	4.253E-19
		3.500	1.349E-19	1.578E-19	2.250E-19	2.543E-19	3.221E-19	3.661E-19	3.952E-19
		4.000	1.265E-19	1.472E-19	2.114E-19	2.401E-19	3.012E-19	3.412E-19	3.671E-19
		5.000	1.117E-19	1.288E-19	1.874E-19	2.145E-19	2.651E-19	2.992E-19	3.194E-19
		6.000	9.981E-20	1.141E-19	1.679E-19	1.931E-19	2.365E-19	2.656E-19	2.818E-19
		8.000	8.221E-20	9.257E-20	1.392E-19	1.609E-19	1.946E-19	2.168E-19	2.272E-19
		10.00	7.015E-20	7.780E-20	1.192E-19	1.376E-19	1.650E-19	1.826E-19	1.896E-19
		12.00	6.085E-20	6.679E-20	1.038E-19	1.197E-19	1.429E-19	1.574E-19	1.623E-19
		15.00	5.052E-20	5.476E-20	8.678E-20	9.989E-20	1.186E-19	1.298E-19	1.326E-19

Z	Ion	u	Q(2s)	Q(2p)	Q(3s)	Q(3p)	Q(3d)	Q(4s)	Q(4p)
32	Ge^{21+}	1.125	1.753E-21	8.399E-21	6.488E-21	8.788E-21	1.345E-20	2.501E-20	2.885E-20
		1.250	2.931E-21	1.385E-20	1.059E-20	1.442E-20	2.181E-20	4.055E-20	4.694E-20
		1.500	4.329E-21	1.999E-20	1.503E-20	2.055E-20	3.055E-20	5.694E-20	6.616E-20
		1.750	5.046E-21	2.289E-20	1.700E-20	2.325E-20	3.412E-20	6.358E-20	7.466E-20
		2.000	5.413E-21	2.420E-20	1.784E-20	2.434E-20	3.536E-20	6.591E-20	7.806E-20
		2.250	5.580E-21	2.471E-20	1.811E-20	2.461E-20	3.548E-20	6.617E-20	7.889E-20
		2.500	5.642E-21	2.476E-20	1.809E-20	2.444E-20	3.503E-20	6.535E-20	7.841E-20
		2.750	5.632E-21	2.453E-20	1.790E-20	2.404E-20	3.427E-20	6.408E-20	7.718E-20
		3.000	5.576E-21	2.415E-20	1.759E-20	2.350E-20	3.337E-20	6.256E-20	7.556E-20
		3.500	5.403E-21	2.320E-20	1.689E-20	2.231E-20	3.145E-20	5.919E-20	7.179E-20
		4.000	5.184E-21	2.211E-20	1.610E-20	2.108E-20	2.955E-20	5.599E-20	6.797E-20
		5.000	4.744E-21	2.006E-20	1.459E-20	1.887E-20	2.618E-20	5.023E-20	6.085E-20
		6.000	4.345E-21	1.824E-20	1.329E-20	1.704E-20	2.342E-20	4.540E-20	5.474E-20
		8.000	3.687E-21	1.533E-20	1.124E-20	1.423E-20	1.926E-20	3.790E-20	4.538E-20
		10.00	3.208E-21	1.323E-20	9.667E-21	1.216E-20	1.627E-20	3.251E-20	3.883E-20
		12.00	2.831E-21	1.157E-20	8.474E-21	1.063E-20	1.407E-20	2.849E-20	3.391E-20
		15.00	2.395E-21	9.684E-21	7.133E-21	8.916E-21	1.165E-20	2.395E-20	2.839E-20

Z	Ion	u	Q(4d)	Q(4f)	Q(5s)	Q(5p)	Q(5d)	Q(5f)	Q(5g)
32	Ge^{21+}	1.125	4.164E-20	5.024E-20	6.638E-20	7.626E-20	9.671E-20	1.220E-19	1.313E-19
		1.250	6.729E-20	8.071E-20	1.077E-19	1.227E-19	1.566E-19	1.948E-19	2.099E-19
		1.500	9.354E-20	1.112E-19	1.517E-19	1.704E-19	2.193E-19	2.658E-19	2.870E-19
		1.750	1.036E-19	1.227E-19	1.699E-19	1.894E-19	2.444E-19	2.907E-19	3.146E-19
		2.000	1.067E-19	1.259E-19	1.762E-19	1.960E-19	2.527E-19	2.963E-19	3.212E-19
		2.250	1.063E-19	1.252E-19	1.771E-19	1.963E-19	2.531E-19	2.929E-19	3.181E-19
		2.500	1.044E-19	1.227E-19	1.749E-19	1.942E-19	2.488E-19	2.859E-19	3.107E-19
		2.750	1.018E-19	1.194E-19	1.710E-19	1.904E-19	2.428E-19	2.773E-19	3.011E-19
		3.000	9.881E-20	1.156E-19	1.664E-19	1.860E-19	2.358E-19	2.680E-19	2.908E-19
		3.500	9.265E-20	1.080E-19	1.569E-19	1.763E-19	2.210E-19	2.496E-19	2.702E-19
		4.000	8.686E-20	1.007E-19	1.473E-19	1.667E-19	2.066E-19	2.325E-19	2.509E-19
		5.000	7.675E-20	8.811E-20	1.306E-19	1.487E-19	1.819E-19	2.036E-19	2.182E-19
		6.000	6.853E-20	7.801E-20	1.169E-19	1.338E-19	1.620E-19	1.808E-19	1.925E-19
		8.000	5.634E-20	6.327E-20	9.691E-20	1.113E-19	1.331E-19	1.475E-19	1.552E-19
		10.00	4.802E-20	5.316E-20	8.311E-20	9.543E-20	1.133E-19	1.245E-19	1.296E-19
		12.00	4.170E-20	4.565E-20	7.245E-20	8.309E-20	9.818E-20	1.073E-19	1.109E-19
		15.00	3.463E-20	3.743E-20	6.059E-20	6.930E-20	8.149E-20	8.848E-20	9.061E-20

TABLE II. Direct Ionization Cross Sections for $2 \leq n \leq 5$ States of Na-like Ions (in cm^2)

See page 76 for Explanation of Tables

Z	Ion	u	Q(2s)	Q(2p)	Q(3s)	Q(3p)	Q(3d)	Q(4s)	Q(4p)
34	Se^{23+}	1.125	1.307E-21	6.192E-21	4.719E-21	6.364E-21	9.570E-21	1.807E-20	2.073E-20
		1.250	2.184E-21	1.020E-20	7.701E-21	1.044E-20	1.551E-20	2.932E-20	3.374E-20
		1.500	3.220E-21	1.471E-20	1.092E-20	1.486E-20	2.171E-20	4.108E-20	4.762E-20
		1.750	3.746E-21	1.682E-20	1.235E-20	1.679E-20	2.423E-20	4.586E-20	5.364E-20
		2.000	4.018E-21	1.778E-20	1.296E-20	1.756E-20	2.510E-20	4.752E-20	5.608E-20
		2.250	4.141E-21	1.813E-20	1.315E-20	1.774E-20	2.518E-20	4.766E-20	5.666E-20
		2.500	4.179E-21	1.816E-20	1.314E-20	1.762E-20	2.485E-20	4.708E-20	5.628E-20
		2.750	4.173E-21	1.799E-20	1.300E-20	1.732E-20	2.431E-20	4.612E-20	5.538E-20
		3.000	4.131E-21	1.770E-20	1.279E-20	1.694E-20	2.366E-20	4.505E-20	5.422E-20
		3.500	4.000E-21	1.699E-20	1.225E-20	1.608E-20	2.230E-20	4.265E-20	5.146E-20
		4.000	3.839E-21	1.618E-20	1.169E-20	1.519E-20	2.094E-20	4.030E-20	4.869E-20
		5.000	3.506E-21	1.466E-20	1.060E-20	1.357E-20	1.854E-20	3.617E-20	4.360E-20
		6.000	3.211E-21	1.333E-20	9.648E-21	1.224E-20	1.658E-20	3.273E-20	3.927E-20
		8.000	2.726E-21	1.119E-20	8.149E-21	1.023E-20	1.363E-20	2.734E-20	3.255E-20
		10.00	2.366E-21	9.643E-21	7.021E-21	8.741E-21	1.151E-20	2.341E-20	2.778E-20
		12.00	2.089E-21	8.439E-21	6.149E-21	7.630E-21	9.957E-21	2.051E-20	2.425E-20
		15.00	1.770E-21	7.060E-21	5.171E-21	6.394E-21	8.236E-21	1.724E-20	2.030E-20

Z	Ion	u	Q(4d)	Q(4f)	Q(5s)	Q(5p)	Q(5d)	Q(5f)	Q(5g)
34	Se^{23+}	1.125	2.966E-20	3.559E-20	4.786E-20	5.458E-20	6.879E-20	8.634E-20	9.292E-20
		1.250	4.788E-20	5.715E-20	7.769E-20	8.784E-20	1.113E-19	1.378E-19	1.485E-19
		1.500	6.648E-20	7.879E-20	1.091E-19	1.220E-19	1.559E-19	1.880E-19	2.031E-19
		1.750	7.362E-20	8.682E-20	1.222E-19	1.356E-19	1.736E-19	2.055E-19	2.224E-19
		2.000	7.577E-20	8.906E-20	1.268E-19	1.401E-19	1.794E-19	2.095E-19	2.271E-19
		2.250	7.546E-20	8.859E-20	1.272E-19	1.405E-19	1.795E-19	2.071E-19	2.250E-19
		2.500	7.414E-20	8.681E-20	1.256E-19	1.389E-19	1.767E-19	2.020E-19	2.196E-19
		2.750	7.225E-20	8.442E-20	1.229E-19	1.362E-19	1.722E-19	1.959E-19	2.129E-19
		3.000	7.013E-20	8.176E-20	1.196E-19	1.330E-19	1.672E-19	1.893E-19	2.055E-19
		3.500	6.565E-20	7.628E-20	1.127E-19	1.262E-19	1.567E-19	1.764E-19	1.909E-19
		4.000	6.155E-20	7.114E-20	1.059E-19	1.193E-19	1.465E-19	1.643E-19	1.773E-19
		5.000	5.443E-20	6.228E-20	9.384E-20	1.065E-19	1.289E-19	1.439E-19	1.542E-19
		6.000	4.863E-20	5.515E-20	8.403E-20	9.569E-20	1.148E-19	1.277E-19	1.360E-19
		8.000	3.995E-20	4.471E-20	6.956E-20	7.944E-20	9.423E-20	1.041E-19	1.096E-19
		10.00	3.395E-20	3.751E-20	5.964E-20	6.820E-20	8.027E-20	8.796E-20	9.155E-20
		12.00	2.948E-20	3.223E-20	5.205E-20	5.939E-20	6.956E-20	7.583E-20	7.833E-20
		15.00	2.451E-20	2.644E-20	4.356E-20	4.955E-20	5.776E-20	6.252E-20	6.401E-20

Z	Ion	u	Q(2s)	Q(2p)	Q(3s)	Q(3p)	Q(3d)	Q(4s)	Q(4p)
39	Y^{28+}	1.125	6.780E-22	3.155E-21	2.341E-21	3.134E-21	4.558E-21	8.878E-21	1.009E-20
		1.250	1.133E-21	5.193E-21	3.817E-21	5.133E-21	7.382E-21	1.436E-20	1.640E-20
		1.500	1.666E-21	7.469E-21	5.406E-21	7.291E-21	1.032E-20	2.009E-20	2.314E-20
		1.750	1.935E-21	8.518E-21	6.113E-21	8.233E-21	1.150E-20	2.241E-20	2.606E-20
		2.000	2.069E-21	8.994E-21	6.417E-21	8.600E-21	1.190E-20	2.321E-20	2.722E-20
		2.250	2.131E-21	9.160E-21	6.520E-21	8.675E-21	1.193E-20	2.329E-20	2.749E-20
		2.500	2.148E-21	9.155E-21	6.502E-21	8.599E-21	1.177E-20	2.301E-20	2.728E-20
		2.750	2.141E-21	9.065E-21	6.424E-21	8.452E-21	1.151E-20	2.254E-20	2.681E-20
		3.000	2.120E-21	8.921E-21	6.314E-21	8.263E-21	1.121E-20	2.197E-20	2.623E-20
		3.500	2.046E-21	8.545E-21	6.053E-21	7.825E-21	1.054E-20	2.084E-20	2.491E-20
		4.000	1.964E-21	8.137E-21	5.774E-21	7.397E-21	9.905E-21	1.968E-20	2.353E-20
		5.000	1.793E-21	7.350E-21	5.248E-21	6.610E-21	8.759E-21	1.762E-20	2.101E-20
		6.000	1.640E-21	6.675E-21	4.773E-21	5.951E-21	7.820E-21	1.593E-20	1.892E-20
		8.000	1.396E-21	5.600E-21	4.020E-21	4.963E-21	6.427E-21	1.336E-20	1.571E-20
		10.00	1.206E-21	4.806E-21	3.478E-21	4.249E-21	5.435E-21	1.143E-20	1.337E-20
		12.00	1.065E-21	4.206E-21	3.051E-21	3.705E-21	4.693E-21	9.995E-21	1.165E-20
		15.00	9.040E-22	3.522E-21	2.564E-21	3.100E-21	3.876E-21	8.393E-21	9.749E-21

TABLE II. Direct Ionization Cross Sections for $2 \leq n \leq 5$ States of Na-like Ions (in cm^2)

See page 76 for Explanation of Tables

Z	Ion	u	$Q(4d)$	$Q(4f)$	$Q(5s)$	$Q(5p)$	$Q(5d)$	$Q(5f)$	$Q(5g)$
39	Y^{28+}	1.125	1.413E-20	1.679E-20	2.336E-20	2.629E-20	3.271E-20	4.065E-20	4.379E-20
		1.250	2.281E-20	2.697E-20	3.782E-20	4.235E-20	5.293E-20	6.488E-20	6.997E-20
		1.500	3.162E-20	3.713E-20	5.317E-20	5.866E-20	7.401E-20	8.852E-20	9.565E-20
		1.750	3.498E-20	4.092E-20	5.943E-20	6.515E-20	8.246E-20	9.675E-20	1.047E-19
		2.000	3.597E-20	4.194E-20	6.155E-20	6.735E-20	8.517E-20	9.856E-20	1.069E-19
		2.250	3.583E-20	4.170E-20	6.176E-20	6.756E-20	8.508E-20	9.742E-20	1.058E-19
		2.500	3.515E-20	4.084E-20	6.087E-20	6.684E-20	8.367E-20	9.501E-20	1.033E-19
		2.750	3.422E-20	3.970E-20	5.952E-20	6.555E-20	8.160E-20	9.215E-20	1.001E-19
		3.000	3.319E-20	3.844E-20	5.793E-20	6.401E-20	7.920E-20	8.906E-20	9.665E-20
		3.500	3.110E-20	3.586E-20	5.441E-20	6.063E-20	7.420E-20	8.289E-20	8.972E-20
		4.000	2.909E-20	3.342E-20	5.112E-20	5.730E-20	6.940E-20	7.725E-20	8.333E-20
		5.000	2.570E-20	2.924E-20	4.541E-20	5.121E-20	6.106E-20	6.770E-20	7.247E-20
		6.000	2.298E-20	2.591E-20	4.075E-20	4.606E-20	5.431E-20	6.004E-20	6.386E-20
		8.000	1.891E-20	2.101E-20	3.379E-20	3.819E-20	4.444E-20	4.886E-20	5.143E-20
		10.00	1.599E-20	1.760E-20	2.877E-20	3.259E-20	3.780E-20	4.124E-20	4.296E-20
		12.00	1.388E-20	1.512E-20	2.514E-20	2.842E-20	3.279E-20	3.558E-20	3.677E-20
		15.00	1.154E-20	1.240E-20	2.108E-20	2.376E-20	2.726E-20	2.938E-20	3.006E-20

TABLE III. Fit Parameters for Direct Ionization Cross Sections for Individual Ions

See page 76 for Explanation of Tables

Z	Transition	A	B	C	D	F(%)
18	$2s^22p^63s \rightarrow 2s2p^63s$	2.001E+01	-7.432E+00	1.083E+00	-1.632E+01	0.13
	$2s^22p^63s \rightarrow 2s^22p^53s$	7.023E+01	-2.765E+01	5.037E+00	-5.491E+01	0.28
	$2s^22p^63s \rightarrow 2s^22p^6$	3.624E+00	-1.347E+00	1.114E+00	-2.050E+00	0.26
	$2s^22p^63p \rightarrow 2s^22p^6$	4.312E+00	-1.125E+00	1.101E+00	-2.354E+00	0.40
	$2s^22p^63d \rightarrow 2s^22p^6$	1.408E+01	-4.753E+00	-3.688E-01	-9.147E+00	0.25
	$2s^22p^64s \rightarrow 2s^22p^6$	5.326E+00	-1.612E+00	5.220E-01	-2.876E+00	0.11
	$2s^22p^64p \rightarrow 2s^22p^6$	1.046E+01	-4.010E+00	-1.222E-02	-7.118E+00	0.09
	$2s^22p^64d \rightarrow 2s^22p^6$	8.656E+00	-2.911E+00	3.859E-01	-4.567E+00	0.15
	$2s^22p^64f \rightarrow 2s^22p^6$	1.418E+01	-4.819E+00	-6.126E-01	-8.348E+00	0.11
	$2s^22p^65s \rightarrow 2s^22p^6$	7.645E+00	-2.530E+00	1.010E-01	-4.563E+00	0.20
	$2s^22p^65p \rightarrow 2s^22p^6$	7.096E+00	-2.877E+00	5.113E-01	-3.921E+00	0.34
	$2s^22p^65d \rightarrow 2s^22p^6$	7.173E+00	-1.951E+00	3.923E-01	-3.336E+00	0.11
	$2s^22p^65f \rightarrow 2s^22p^6$	1.123E+01	-4.348E+00	2.425E-02	-5.836E+00	0.22
	$2s^22p^65g \rightarrow 2s^22p^6$	1.382E+01	-4.747E+00	-5.904E-01	-7.573E+00	0.11
22	$2s^22p^63s \rightarrow 2s2p^63s$	1.859E+01	-6.526E+00	1.090E+00	-1.450E+01	0.14
	$2s^22p^63s \rightarrow 2s^22p^53s$	7.049E+01	-2.590E+01	3.348E+00	-5.186E+01	0.28
	$2s^22p^63s \rightarrow 2s^22p^6$	3.826E+00	-1.667E+00	1.258E+00	-2.158E+00	0.19
	$2s^22p^63p \rightarrow 2s^22p^6$	3.983E+00	-1.054E+00	1.215E+00	-1.831E+00	0.31
	$2s^22p^63d \rightarrow 2s^22p^6$	1.063E+01	-3.389E+00	2.018E-01	-6.139E+00	0.11
	$2s^22p^64s \rightarrow 2s^22p^6$	3.370E+00	-1.038E+00	1.008E+00	-1.182E+00	0.14
	$2s^22p^64p \rightarrow 2s^22p^6$	9.053E+00	-3.322E+00	2.590E-01	-5.884E+00	0.14
	$2s^22p^64d \rightarrow 2s^22p^6$	8.276E+00	-2.856E+00	4.891E-01	-4.190E+00	0.33
	$2s^22p^64f \rightarrow 2s^22p^6$	1.345E+01	-4.534E+00	-4.923E-01	-7.646E+00	0.19
	$2s^22p^65s \rightarrow 2s^22p^6$	6.342E+00	-1.917E+00	3.456E-01	-3.385E+00	0.12
	$2s^22p^65p \rightarrow 2s^22p^6$	9.315E+00	-3.846E+00	2.384E-01	-5.803E+00	0.36
	$2s^22p^65d \rightarrow 2s^22p^6$	7.663E+00	-2.217E+00	3.316E-01	-3.719E+00	0.11
	$2s^22p^65f \rightarrow 2s^22p^6$	1.132E+01	-4.367E+00	4.102E-03	-5.925E+00	0.30
	$2s^22p^65g \rightarrow 2s^22p^6$	1.371E+01	-4.708E+00	-5.748E-01	-7.420E+00	0.13
24	$2s^22p^63s \rightarrow 2s2p^63s$	1.841E+01	-6.338E+00	1.024E+00	-1.411E+01	0.16
	$2s^22p^63s \rightarrow 2s^22p^53s$	7.191E+01	-2.595E+01	2.572E+00	-5.204E+01	0.27
	$2s^22p^63s \rightarrow 2s^22p^6$	7.685E+00	-3.112E+00	5.589E-01	-5.229E+00	0.29
	$2s^22p^63p \rightarrow 2s^22p^6$	6.449E+00	-1.933E+00	7.309E-01	-3.697E+00	0.22
	$2s^22p^63d \rightarrow 2s^22p^6$	1.201E+01	-3.971E+00	-4.345E-02	-7.204E+00	0.24
	$2s^22p^64s \rightarrow 2s^22p^6$	5.662E+00	-2.011E+00	6.538E-01	-3.023E+00	0.36
	$2s^22p^64p \rightarrow 2s^22p^6$	1.035E+01	-3.796E+00	2.577E-02	-6.880E+00	0.18
	$2s^22p^64d \rightarrow 2s^22p^6$	9.325E+00	-3.277E+00	3.000E-01	-5.004E+00	0.37
	$2s^22p^64f \rightarrow 2s^22p^6$	1.379E+01	-4.717E+00	-5.339E-01	-7.899E+00	0.20
	$2s^22p^65s \rightarrow 2s^22p^6$	6.601E+00	-2.004E+00	3.124E-01	-3.558E+00	0.11
	$2s^22p^65p \rightarrow 2s^22p^6$	1.032E+01	-4.222E+00	7.599E-02	-6.625E+00	0.31
	$2s^22p^65d \rightarrow 2s^22p^6$	7.944E+00	-2.319E+00	2.805E-01	-3.933E+00	0.11
	$2s^22p^65f \rightarrow 2s^22p^6$	1.141E+01	-4.371E+00	-2.113E-02	-6.004E+00	0.29
	$2s^22p^65g \rightarrow 2s^22p^6$	1.397E+01	-4.840E+00	-6.048E-01	-7.630E+00	0.14
26	$2s^22p^63s \rightarrow 2s2p^63s$	1.770E+01	-6.031E+00	1.111E+00	-1.338E+01	0.17
	$2s^22p^63s \rightarrow 2s^22p^53s$	7.184E+01	-2.566E+01	2.260E+00	-5.129E+01	0.29
	$2s^22p^63s \rightarrow 2s^22p^6$	8.180E+00	-3.329E+00	4.969E-01	-5.608E+00	0.30
	$2s^22p^63p \rightarrow 2s^22p^6$	6.794E+00	-2.071E+00	6.727E-01	-3.899E+00	0.16
	$2s^22p^63d \rightarrow 2s^22p^6$	1.203E+01	-3.982E+00	-5.764E-02	-7.164E+00	0.20
	$2s^22p^64s \rightarrow 2s^22p^6$	5.549E+00	-2.046E+00	7.184E-01	-2.909E+00	0.35
	$2s^22p^64p \rightarrow 2s^22p^6$	9.679E+00	-3.497E+00	1.381E-01	-6.282E+00	0.18
	$2s^22p^64d \rightarrow 2s^22p^6$	8.412E+00	-2.929E+00	4.581E-01	-4.219E+00	0.35
	$2s^22p^64f \rightarrow 2s^22p^6$	1.321E+01	-4.489E+00	-4.377E-01	-7.396E+00	0.21
	$2s^22p^65s \rightarrow 2s^22p^6$	6.285E+00	-1.902E+00	3.881E-01	-3.262E+00	0.17
	$2s^22p^65p \rightarrow 2s^22p^6$	1.079E+01	-4.417E+00	1.504E-02	-7.007E+00	0.35
	$2s^22p^65d \rightarrow 2s^22p^6$	8.091E+00	-2.389E+00	2.592E-01	-4.028E+00	0.19
	$2s^22p^65f \rightarrow 2s^22p^6$	1.172E+01	-4.531E+00	-6.227E-02	-6.245E+00	0.33
	$2s^22p^65g \rightarrow 2s^22p^6$	1.387E+01	-4.796E+00	-5.915E-01	-7.520E+00	0.16

TABLE III. Fit Parameters for Direct Ionization Cross Sections for Individual Ions

See page 76 for Explanation of Tables

Z	Transition	A	B	C	D	F(%)
30	$2s^22p^63s \rightarrow 2s2p^63s$	1.600E+01	-5.356E+00	1.374E+00	-1.177E+01	0.18
	$2s^22p^63s \rightarrow 2s^22p^53s$	7.012E+01	-2.474E+01	2.167E+00	-4.894E+01	0.29
	$2s^22p^63s \rightarrow 2s^22p^6$	8.760E+00	-3.549E+00	4.142E-01	-6.032E+00	0.30
	$2s^22p^63p \rightarrow 2s^22p^6$	6.969E+00	-2.144E+00	6.379E-01	-3.917E+00	0.21
	$2s^22p^63d \rightarrow 2s^22p^6$	1.222E+01	-4.093E+00	-9.852E-02	-7.243E+00	0.21
	$2s^22p^64s \rightarrow 2s^22p^6$	5.976E+00	-2.316E+00	7.078E-01	-3.225E+00	0.29
	$2s^22p^64p \rightarrow 2s^22p^6$	9.195E+00	-3.252E+00	2.148E-01	-5.804E+00	0.14
	$2s^22p^64d \rightarrow 2s^22p^6$	7.959E+00	-2.783E+00	5.422E-01	-3.784E+00	0.31
	$2s^22p^64f \rightarrow 2s^22p^6$	1.307E+01	-4.477E+00	-3.998E-01	-7.240E+00	0.19
	$2s^22p^65s \rightarrow 2s^22p^6$	5.121E+00	-1.497E+00	6.302E-01	-2.250E+00	0.21
	$2s^22p^65p \rightarrow 2s^22p^6$	1.030E+01	-4.221E+00	1.219E-01	-6.577E+00	0.26
	$2s^22p^65d \rightarrow 2s^22p^6$	7.189E+00	-2.058E+00	4.259E-01	-3.234E+00	0.22
	$2s^22p^65f \rightarrow 2s^22p^6$	1.123E+01	-4.379E+00	3.316E-02	-5.829E+00	0.30
	$2s^22p^65g \rightarrow 2s^22p^6$	1.348E+01	-4.661E+00	-5.199E-01	-7.157E+00	0.17
32	$2s^22p^63s \rightarrow 2s2p^63s$	1.564E+01	-5.217E+00	1.428E+00	-1.139E+01	0.15
	$2s^22p^63s \rightarrow 2s^22p^53s$	6.983E+01	-2.457E+01	2.089E+00	-4.836E+01	0.28
	$2s^22p^63s \rightarrow 2s^22p^6$	9.135E+00	-3.698E+00	3.591E-01	-6.320E+00	0.30
	$2s^22p^63p \rightarrow 2s^22p^6$	6.927E+00	-2.118E+00	6.402E-01	-3.833E+00	0.22
	$2s^22p^63d \rightarrow 2s^22p^6$	1.215E+01	-4.062E+00	-9.700E-02	-7.150E+00	0.22
	$2s^22p^64s \rightarrow 2s^22p^6$	6.268E+00	-2.477E+00	6.840E-01	-3.454E+00	0.33
	$2s^22p^64p \rightarrow 2s^22p^6$	9.450E+00	-3.340E+00	1.703E-01	-5.976E+00	0.08
	$2s^22p^64d \rightarrow 2s^22p^6$	7.862E+00	-2.717E+00	5.438E-01	-3.667E+00	0.28
	$2s^22p^64f \rightarrow 2s^22p^6$	1.290E+01	-4.397E+00	-3.762E-01	-7.076E+00	0.19
	$2s^22p^65s \rightarrow 2s^22p^6$	4.950E+00	-1.465E+00	6.815E-01	-2.090E+00	0.21
	$2s^22p^65p \rightarrow 2s^22p^6$	1.009E+01	-4.121E+00	1.622E-01	-6.382E+00	0.26
	$2s^22p^65d \rightarrow 2s^22p^6$	6.782E+00	-1.910E+00	5.012E-01	-2.879E+00	0.22
	$2s^22p^65f \rightarrow 2s^22p^6$	1.091E+01	-4.253E+00	9.403E-02	-5.536E+00	0.30
	$2s^22p^65g \rightarrow 2s^22p^6$	1.341E+01	-4.639E+00	-5.059E-01	-7.081E+00	0.17
34	$2s^22p^63s \rightarrow 2s2p^63s$	1.571E+01	-5.251E+00	1.415E+00	-1.138E+01	0.12
	$2s^22p^63s \rightarrow 2s^22p^53s$	6.905E+01	-2.417E+01	2.098E+00	-4.743E+01	0.27
	$2s^22p^63s \rightarrow 2s^22p^6$	9.347E+00	-3.782E+00	3.329E-01	-6.481E+00	0.30
	$2s^22p^63p \rightarrow 2s^22p^6$	7.193E+00	-2.228E+00	5.972E-01	-4.013E+00	0.23
	$2s^22p^63d \rightarrow 2s^22p^6$	1.232E+01	-4.141E+00	-1.298E-01	-7.266E+00	0.22
	$2s^22p^64s \rightarrow 2s^22p^6$	6.605E+00	-2.649E+00	6.485E-01	-3.719E+00	0.36
	$2s^22p^64p \rightarrow 2s^22p^6$	9.508E+00	-3.344E+00	1.574E-01	-5.994E+00	0.09
	$2s^22p^64d \rightarrow 2s^22p^6$	8.307E+00	-2.926E+00	4.794E-01	-4.013E+00	0.27
	$2s^22p^64f \rightarrow 2s^22p^6$	1.294E+01	-4.418E+00	-3.828E-01	-7.090E+00	0.18
	$2s^22p^65s \rightarrow 2s^22p^6$	5.059E+00	-1.529E+00	6.786E-01	-2.161E+00	0.17
	$2s^22p^65p \rightarrow 2s^22p^6$	1.006E+01	-4.101E+00	1.702E-01	-6.342E+00	0.25
	$2s^22p^65d \rightarrow 2s^22p^6$	6.656E+00	-1.868E+00	5.257E-01	-2.755E+00	0.21
	$2s^22p^65f \rightarrow 2s^22p^6$	1.092E+01	-4.275E+00	9.857E-02	-5.538E+00	0.29
	$2s^22p^65g \rightarrow 2s^22p^6$	1.336E+01	-4.628E+00	-4.939E-01	-7.024E+00	0.17
39	$2s^22p^63s \rightarrow 2s2p^63s$	1.496E+01	-4.970E+00	1.547E+00	-1.065E+01	0.14
	$2s^22p^63s \rightarrow 2s^22p^53s$	6.901E+01	-2.398E+01	1.881E+00	-4.682E+01	0.23
	$2s^22p^63s \rightarrow 2s^22p^6$	9.081E+00	-3.707E+00	4.161E-01	-6.246E+00	0.30
	$2s^22p^63p \rightarrow 2s^22p^6$	7.187E+00	-2.242E+00	6.085E-01	-3.939E+00	0.25
	$2s^22p^63d \rightarrow 2s^22p^6$	1.248E+01	-4.223E+00	-1.613E-01	-7.349E+00	0.24
	$2s^22p^64s \rightarrow 2s^22p^6$	6.904E+00	-2.796E+00	6.263E-01	-3.929E+00	0.36
	$2s^22p^64p \rightarrow 2s^22p^6$	9.525E+00	-3.309E+00	1.445E-01	-5.936E+00	0.10
	$2s^22p^64d \rightarrow 2s^22p^6$	8.556E+00	-3.040E+00	4.357E-01	-4.161E+00	0.30
	$2s^22p^64f \rightarrow 2s^22p^6$	1.299E+01	-4.456E+00	-3.882E-01	-7.102E+00	0.19
	$2s^22p^65s \rightarrow 2s^22p^6$	5.116E+00	-1.597E+00	6.989E-01	-2.164E+00	0.19
	$2s^22p^65p \rightarrow 2s^22p^6$	1.068E+01	-4.346E+00	7.708E-02	-6.813E+00	0.19
	$2s^22p^65d \rightarrow 2s^22p^6$	6.719E+00	-1.871E+00	5.057E-01	-2.758E+00	0.15
	$2s^22p^65f \rightarrow 2s^22p^6$	1.084E+01	-4.230E+00	1.076E-01	-5.444E+00	0.26
	$2s^22p^65g \rightarrow 2s^22p^6$	1.327E+01	-4.594E+00	-4.799E-01	-6.925E+00	0.16

TABLE IV. Fit Parameters for Direct Ionization Cross Sections for the Na Isoelectronic Sequence

See page 76 for Explanation of Tables

Transition	A_1	B_1	C_1	D_1
$2s^22p^63s \rightarrow 2s2p^63s$	1.350E+01	-4.101E+00	1.579E+00	-8.865E+00
$2s^22p^63s \rightarrow 2s^22p^53s$	6.712E+01	-2.171E+01	7.825E-01	-4.255E+01
$2s^22p^63s \rightarrow 2s^22p^6$	1.223E+01	-5.025E+00	-5.451E-02	-8.720E+00
$2s^22p^63p \rightarrow 2s^22p^6$	9.117E+00	-2.977E+00	2.662E-01	-5.251E+00
$2s^22p^63d \rightarrow 2s^22p^6$	1.141E+01	-3.823E+00	-1.409E-03	-6.305E+00
$2s^22p^64s \rightarrow 2s^22p^6$	6.997E+00	-3.034E+00	7.409E-01	-3.932E+00
$2s^22p^64p \rightarrow 2s^22p^6$	9.076E+00	-3.028E+00	2.351E-01	-5.475E+00
$2s^22p^64d \rightarrow 2s^22p^6$	7.677E+00	-2.745E+00	5.968E-01	-3.356E+00
$2s^22p^64f \rightarrow 2s^22p^6$	1.238E+01	-4.253E+00	-2.744E-01	-6.520E+00
$2s^22p^65s \rightarrow 2s^22p^6$	3.939E+00	-1.072E+00	9.263E-01	-1.103E+00
$2s^22p^65p \rightarrow 2s^22p^6$	1.219E+01	-4.990E+00	-1.049E-01	-8.094E+00
$2s^22p^65d \rightarrow 2s^22p^6$	6.753E+00	-1.939E+00	5.198E-01	-2.760E+00
$2s^22p^65f \rightarrow 2s^22p^6$	1.089E+01	-4.261E+00	1.036E-01	-5.496E+00
$2s^22p^65g \rightarrow 2s^22p^6$	1.324E+01	-4.606E+00	-4.663E-01	-6.848E+00

Transition	A_2	B_2	C_2	D_2
$2s^22p^63s \rightarrow 2s2p^63s$	1.503E+01	-5.117E+00	-3.866E-01	-2.832E+01
$2s^22p^63s \rightarrow 2s^22p^53s$	7.552E+01	-6.699E+01	2.533E+01	-1.406E+02
$2s^22p^63s \rightarrow 2s^22p^6$	-8.911E+01	3.736E+01	1.288E+01	6.976E+01
$2s^22p^63p \rightarrow 2s^22p^6$	-1.153E+02	4.945E+01	1.820E+01	8.661E+01
$2s^22p^63d \rightarrow 2s^22p^6$	1.802E+01	-6.277E+00	-2.201E+00	-2.027E+01
$2s^22p^64s \rightarrow 2s^22p^6$	-2.335E+01	1.590E+01	-2.736E-01	1.661E+01
$2s^22p^64p \rightarrow 2s^22p^6$	7.791E+00	-6.609E+00	-1.334E+00	-1.084E+01
$2s^22p^64d \rightarrow 2s^22p^6$	-1.773E+01	1.119E+01	1.778E+00	1.131E+01
$2s^22p^64f \rightarrow 2s^22p^6$	4.197E+00	6.100E-01	-1.390E+00	-6.238E+00
$2s^22p^65s \rightarrow 2s^22p^6$	2.774E+01	-1.008E+01	-6.625E+00	-2.621E+01
$2s^22p^65p \rightarrow 2s^22p^6$	-3.847E+01	1.588E+01	4.567E+00	3.118E+01
$2s^22p^65d \rightarrow 2s^22p^6$	-3.247E+00	3.313E+00	-2.030E-01	5.680E-01
$2s^22p^65f \rightarrow 2s^22p^6$	2.394E+00	-8.379E-02	-7.547E-01	-2.643E+00
$2s^22p^65g \rightarrow 2s^22p^6$	-2.469E+00	2.574E+00	-9.376E-02	5.550E-02

TABLE V. Autoionization Branching Ratio and Fit Parameters for Excitation Cross Sections for Individual Levels

See page 76 for Explanation of Tables

Z	Transition	J	I_{ex}	B_j^a	A	B	C	D	Q_{ea}
18	$2s \rightarrow 3s$	0.5	3.052E+02	9.998E-01	1.864E-01	3.440E-02	6.901E-03	-1.062E-03	3.977E-20
	$2s \rightarrow 3p$	0.5	3.360E+02	6.921E-01	-2.427E-03	1.296E-02	1.144E-02	7.251E-04	2.193E-21
		0.5	3.400E+02	9.923E-01	-3.000E-01	3.609E-01	-3.076E-02	3.497E-01	4.216E-21
		0.5	3.476E+02	9.988E-01	-6.594E-02	8.350E-02	5.501E-03	7.652E-02	3.102E-21
		1.5	3.362E+02	9.529E-01	4.151E-03	2.713E-03	3.900E-02	-1.246E-03	6.292E-21
		1.5	3.401E+02	9.932E-01	-6.571E-01	7.897E-01	-6.810E-02	7.657E-01	9.006E-21
		1.5	3.477E+02	9.990E-01	-1.164E-01	1.494E-01	1.269E-02	1.348E-01	6.143E-21
		2.5	3.363E+02	0.000E+00	-7.173E-03	3.905E-02	3.405E-02	1.856E-03	0.000E+00
	$2s \rightarrow 3d$	0.5	3.619E+02	0.000E+00	-4.856E-03	1.666E-02	3.120E-02	1.470E-03	0.000E+00
		1.5	3.619E+02	8.394E-01	-9.727E-03	3.335E-02	6.238E-02	2.945E-03	8.970E-21
		1.5	3.662E+02	9.995E-01	6.745E-01	-8.954E-01	3.660E-01	2.593E-02	1.761E-20
		1.5	3.708E+02	9.984E-01	4.235E-02	-3.762E-02	6.490E-02	5.693E-03	8.228E-21
		2.5	3.619E+02	8.347E-01	-1.457E-02	4.999E-02	9.363E-02	4.414E-03	1.338E-20
		2.5	3.662E+02	9.995E-01	1.013E+00	-1.344E+00	5.486E-01	3.963E-02	2.640E-20
		2.5	3.708E+02	9.984E-01	6.040E-02	-5.195E-02	9.583E-02	8.560E-03	1.232E-20
		3.5	3.619E+02	0.000E+00	-1.947E-02	6.674E-02	1.247E-01	5.895E-03	0.000E+00
	$2p \rightarrow 3s$	0.5	2.461E+02	8.178E-01	-3.523E-02	5.288E-02	-3.861E-03	5.658E-02	3.031E-21
		1.5	2.439E+02	8.343E-01	-6.874E-02	1.037E-01	-7.094E-03	1.122E-01	6.372E-21
	$2p \rightarrow 3p$	0.5	2.584E+02	1.899E-01	-1.409E-02	5.736E-02	-7.417E-03	4.334E-03	1.659E-21
		0.5	2.597E+02	8.193E-01	7.127E-03	8.857E-02	-3.391E-02	6.548E-03	1.221E-20
		0.5	2.606E+02	6.003E-02	-8.980E-03	7.201E-02	-2.340E-02	6.157E-03	5.701E-22
		0.5	2.617E+02	9.113E-01	3.513E-02	1.866E-01	-8.490E-02	1.117E-02	2.963E-20
		0.5	2.683E+02	9.811E-01	2.454E-02	7.965E-02	-3.484E-02	5.495E-03	1.538E-20
		0.5	2.735E+02	9.997E-01	1.670E+00	5.570E-01	-4.895E-01	-3.617E-02	3.779E-19
		1.5	2.554E+02	1.030E-03	-8.026E-02	3.448E-01	-1.313E-01	2.333E-02	3.425E-23
		1.5	2.578E+02	1.333E-02	-1.499E-02	1.028E-01	-1.431E-02	1.223E-02	2.398E-22
		1.5	2.592E+02	2.429E-02	3.507E-02	2.751E-02	6.444E-04	1.613E-02	3.720E-22
		1.5	2.603E+02	2.250E-02	2.391E-02	4.588E-02	-2.088E-03	1.561E-02	3.658E-22
		1.5	2.612E+02	1.900E-04	-2.742E-02	1.003E-01	-2.204E-02	8.880E-03	2.304E-24
		1.5	2.666E+02	6.589E-01	-1.449E-02	8.641E-02	-1.456E-02	1.142E-02	8.653E-21
		1.5	2.683E+02	7.988E-01	-4.284E-03	7.821E-02	-8.320E-03	1.293E-02	1.185E-20
		2.5	2.574E+02	2.350E-03	-3.278E-02	1.666E-01	-2.280E-02	1.666E-02	6.409E-23
		2.5	2.589E+02	2.622E-02	-4.103E-03	1.085E-01	-2.330E-02	1.936E-02	5.161E-22
		2.5	2.609E+02	9.410E-03	1.190E-01	-4.105E-02	3.496E-02	2.954E-02	2.541E-22
		2.5	2.659E+02	9.022E-01	8.960E-03	1.089E-01	-3.495E-03	2.144E-02	2.375E-20
		3.5	2.572E+02	0.000E+00	-5.707E-02	2.317E-01	-2.194E-02	1.658E-02	0.000E+00
	$2p \rightarrow 3d$	0.5	2.831E+02	4.790E-01	-2.814E-02	9.442E-02	6.763E-02	1.052E-02	1.302E-20
		0.5	2.865E+02	9.678E-01	-3.489E-02	1.000E-01	2.422E-02	1.548E-01	1.714E-20
		0.5	2.905E+02	9.920E-01	-1.684E-01	5.964E-01	1.111E-01	1.294E+00	1.031E-19
		0.5	2.947E+02	9.717E-01	-2.295E-01	6.934E-01	7.010E-02	1.341E+00	9.723E-20
		1.5	2.834E+02	8.110E-02	-6.234E-02	2.024E-01	1.232E-01	2.983E-02	4.326E-21
		1.5	2.852E+02	4.162E-02	-1.831E-02	4.617E-02	9.206E-02	9.135E-03	9.985E-22
		1.5	2.866E+02	9.723E-01	-6.945E-02	1.981E-01	5.258E-02	2.643E-01	3.490E-20
		1.5	2.879E+02	9.984E-01	-1.822E-02	4.402E-02	5.024E-02	2.193E-02	1.490E-20
		1.5	2.904E+02	9.906E-01	-4.778E-01	1.546E+00	1.703E-01	3.081E+00	2.368E-19
		1.5	2.939E+02	9.785E-01	-1.078E-01	3.192E-01	6.190E-02	5.966E-01	5.038E-20
		1.5	2.962E+02	9.790E-01	-2.993E-01	8.826E-01	1.030E-01	1.651E+00	1.246E-19
		2.5	2.838E+02	5.600E-04	-6.486E-02	2.251E-01	2.136E-01	1.952E-02	4.229E-23
		2.5	2.848E+02	5.390E-03	-1.398E-02	5.438E-02	1.400E-01	9.160E-03	1.951E-22
		2.5	2.860E+02	2.225E-02	6.287E-02	-7.435E-02	1.084E-01	3.869E-03	4.292E-22
		2.5	2.873E+02	1.641E-02	2.889E-02	-1.934E-02	1.119E-01	6.250E-03	3.928E-22
		2.5	2.881E+02	1.249E-02	-3.837E-03	1.079E-02	1.103E-01	3.905E-03	2.871E-22
		2.5	2.928E+02	9.891E-01	2.624E-03	7.925E-03	9.082E-02	4.392E-03	1.903E-20
		2.5	2.947E+02	9.892E-01	3.856E-03	5.023E-03	9.022E-02	4.157E-03	1.837E-20
		3.5	2.844E+02	4.000E-05	-2.537E-02	8.164E-02	1.953E-01	1.197E-02	2.025E-24
		3.5	2.858E+02	9.700E-04	3.659E-02	-4.228E-02	1.338E-01	5.640E-03	2.476E-23

TABLE V. Autoionization Branching Ratio and Fit Parameters for Excitation Cross Sections for Individual Levels

See page 76 for Explanation of Tables

Z	Transition	J	I_{ex}	B_j^a	A	B	C	D	Q_{ea}
18	$2p \rightarrow 3d$	3.5	2.878E+02	5.940E-03	1.191E-01	-1.443E-01	1.579E-01	3.880E-03	1.548E-22
		3.5	2.920E+02	9.967E-01	1.134E-02	2.048E-02	1.390E-01	9.125E-03	3.250E-20
		4.5	2.840E+02	0.000E+00	-3.900E-02	1.037E-01	2.731E-01	1.238E-02	0.000E+00
	$2p \rightarrow 3d(3p^2)$	0.5	2.759E+02	9.969E-01	-1.692E-02	5.406E-02	3.492E-03	5.982E-02	8.661E-21
		0.5	2.852E+02	9.993E-01	-8.986E-03	2.904E-02	1.854E-02	5.108E-03	7.716E-21
		0.5	2.883E+02	9.989E-01	-1.148E-02	3.366E-02	7.295E-03	2.779E-02	5.764E-21
		1.5	2.762E+02	9.967E-01	-2.507E-02	7.841E-02	5.402E-03	8.384E-02	1.249E-20
		1.5	2.797E+02	9.906E-01	-4.608E-03	1.079E-02	9.893E-03	7.088E-03	3.312E-21
		1.5	2.845E+02	9.948E-01	-1.414E-02	4.227E-02	1.087E-02	2.256E-02	7.800E-21
		1.5	2.875E+02	9.984E-01	-3.701E-02	1.007E-01	4.316E-02	6.188E-02	2.100E-20
		2.5	2.776E+02	8.699E-01	1.321E-03	4.139E-03	2.687E-02	1.905E-03	5.939E-21
		2.5	2.794E+02	8.554E-01	4.097E-04	2.697E-03	2.461E-02	1.373E-03	4.942E-21
		3.5	2.766E+02	9.028E-01	5.127E-03	5.828E-03	3.858E-02	3.333E-03	9.513E-21
	$2p \rightarrow 4p$	0.5	3.265E+02	9.859E-01	-2.679E-03	5.575E-02	-2.045E-02	5.120E-03	4.909E-21
		0.5	3.268E+02	2.925E-02	-4.806E-03	1.854E-02	-3.297E-04	1.689E-03	5.975E-23
		0.5	3.278E+02	9.964E-01	3.129E-02	3.416E-02	-1.556E-02	2.530E-03	7.530E-21
		0.5	3.284E+02	9.900E-01	3.828E-03	3.223E-02	-9.754E-03	3.033E-03	3.929E-21
		0.5	3.293E+02	3.298E-01	-4.622E-03	2.509E-02	-5.263E-03	2.485E-03	7.524E-22
		0.5	3.311E+02	9.975E-01	3.940E-01	1.099E-01	-1.090E-01	-3.364E-03	5.846E-20
		1.5	3.255E+02	8.000E-05	-2.524E-02	9.790E-02	-2.360E-02	7.514E-03	6.028E-25
		1.5	3.263E+02	3.763E-02	-4.266E-03	2.626E-02	1.243E-03	3.911E-03	1.337E-22
		1.5	3.269E+02	1.517E-01	-8.005E-03	2.943E-02	3.314E-03	2.806E-03	5.716E-22
		1.5	3.271E+02	3.468E-02	1.718E-02	-1.929E-04	6.412E-03	5.413E-03	1.234E-22
		1.5	3.284E+02	4.594E-01	1.421E-03	2.222E-02	1.520E-03	4.855E-03	1.744E-21
		1.5	3.290E+02	2.261E-01	-7.219E-03	2.942E-02	6.018E-03	2.870E-03	9.593E-22
		1.5	3.294E+02	7.410E-03	-8.374E-03	3.088E-02	-6.423E-04	3.451E-03	2.430E-23
		2.5	3.261E+02	6.693E-01	6.217E-03	2.555E-02	8.479E-03	6.735E-03	4.122E-21
		2.5	3.263E+02	5.757E-01	6.052E-03	2.327E-02	5.994E-03	6.645E-03	3.108E-21
		2.5	3.269E+02	2.539E-01	-1.155E-02	4.163E-02	8.178E-03	3.663E-03	1.479E-21
		2.5	3.293E+02	1.603E-01	1.944E-02	7.643E-03	1.332E-02	7.380E-03	9.720E-22
		3.5	3.260E+02	0.000E+00	-1.600E-02	6.046E-02	1.614E-02	4.727E-03	0.000E+00
	$2p \rightarrow 4d$	0.5	3.341E+02	6.687E-01	-1.061E-02	3.033E-02	3.371E-02	4.165E-03	5.209E-21
		0.5	3.353E+02	9.759E-01	-8.073E-03	5.761E-02	3.366E-02	9.149E-02	1.175E-20
		0.5	3.358E+02	9.207E-01	9.039E-03	3.484E-02	2.895E-02	1.422E-01	9.677E-21
		0.5	3.388E+02	8.370E-01	3.528E-02	1.301E-01	7.193E-02	5.348E-01	2.816E-20
		1.5	3.343E+02	8.004E-01	-1.589E-02	4.798E-02	6.919E-02	1.001E-02	1.180E-20
		1.5	3.351E+02	9.680E-01	-5.905E-03	3.311E-02	4.046E-02	5.863E-02	9.492E-21
		1.5	3.355E+02	9.610E-01	-9.997E-03	2.837E-02	4.976E-02	1.311E-02	9.466E-21
		1.5	3.362E+02	9.087E-01	3.173E-03	1.037E-01	4.994E-02	3.003E-01	2.052E-20
		1.5	3.372E+02	9.572E-01	-1.527E-03	5.971E-02	4.908E-02	1.505E-01	1.469E-20
		1.5	3.379E+02	4.491E-01	-8.328E-03	4.176E-02	4.689E-02	6.145E-02	5.141E-21
		1.5	3.386E+02	8.705E-01	6.160E-02	2.331E-01	1.260E-01	9.582E-01	5.197E-20
		2.5	3.345E+02	5.268E-01	-1.093E-02	3.266E-02	1.033E-01	3.404E-03	9.582E-21
		2.5	3.349E+02	9.383E-01	4.364E-03	-8.065E-03	6.456E-02	1.219E-03	8.285E-21
		2.5	3.355E+02	8.853E-01	-1.217E-03	-3.880E-04	6.786E-02	1.060E-03	8.480E-21
		2.5	3.356E+02	3.284E-01	2.982E-02	-5.002E-02	5.798E-02	-6.315E-04	1.793E-21
		2.5	3.370E+02	9.853E-01	1.050E-02	-1.602E-02	6.434E-02	1.031E-03	8.303E-21
		2.5	3.377E+02	8.454E-01	-2.871E-03	3.269E-03	7.335E-02	1.528E-03	8.896E-21
		2.5	3.380E+02	4.656E-01	2.524E-03	-9.440E-03	5.965E-02	3.354E-04	3.497E-21
		3.5	3.346E+02	9.873E-01	4.554E-03	-6.283E-03	9.121E-02	2.277E-03	1.284E-20
		3.5	3.349E+02	9.965E-01	3.200E-02	-5.304E-02	7.907E-02	1.160E-04	8.390E-21
		3.5	3.355E+02	8.743E-01	-1.178E-03	-5.985E-03	9.190E-02	6.187E-04	1.071E-20
		3.5	3.378E+02	4.234E-01	2.912E-02	-4.642E-02	8.437E-02	5.924E-04	4.050E-21
		4.5	3.345E+02	0.000E+00	-6.770E-03	8.305E-03	1.365E-01	2.368E-03	0.000E+00
22	$2s \rightarrow 3s$	0.5	5.556E+02	9.995E-01	2.526E-01	-4.589E-02	7.481E-03	-7.189E-03	1.128E-20

TABLE V. Autoionization Branching Ratio and Fit Parameters for Excitation Cross Sections for Individual Levels

See page 76 for Explanation of Tables

Z	Transition	J	I_{ex}	B_j^a	A	B	C	D	Q_{ea}
22	$2s\rightarrow 3p$	0.5	5.753E+02	9.613E-01	-7.748E-03	2.720E-02	1.465E-04	3.246E-03	9.265E-22
		0.5	5.808E+02	9.859E-01	-3.368E-01	4.371E-01	-5.678E-02	4.185E-01	2.071E-21
		0.5	5.906E+02	7.841E-01	-4.138E-02	6.169E-02	-6.942E-03	4.706E-02	4.890E-22
		1.5	5.755E+02	9.520E-01	-1.882E-02	6.185E-02	-7.604E-04	9.136E-03	1.977E-21
		1.5	5.815E+02	9.828E-01	-6.782E-01	8.792E-01	-1.155E-01	8.407E-01	4.042E-21
		1.5	5.914E+02	9.967E-01	-1.469E-01	2.227E-01	-2.498E-02	1.650E-01	2.357E-21
		2.5	5.761E+02	0.000E+00	-1.926E-02	7.831E-02	5.507E-03	5.592E-03	0.000E+00
	$2s\rightarrow 3d$	0.5	6.131E+02	0.000E+00	-8.434E-03	3.057E-02	2.617E-02	2.527E-03	0.000E+00
		1.5	6.131E+02	5.020E-03	-1.677E-02	6.093E-02	5.247E-02	5.033E-03	2.100E-23
		1.5	6.199E+02	9.989E-01	8.311E-01	-9.667E-01	3.695E-01	5.348E-02	9.894E-21
		1.5	6.251E+02	9.965E-01	5.635E-02	-2.747E-02	5.806E-02	1.140E-02	3.608E-21
		2.5	6.132E+02	2.387E-02	-2.534E-02	9.190E-02	7.834E-02	7.624E-03	1.497E-22
		2.5	6.200E+02	9.986E-01	1.260E+00	-1.467E+00	5.596E-01	8.059E-02	1.490E-20
		2.5	6.252E+02	9.966E-01	7.083E-02	-2.487E-02	8.253E-02	1.613E-02	5.331E-21
		3.5	6.133E+02	0.000E+00	-3.375E-02	1.223E-01	1.046E-01	1.011E-02	0.000E+00
	$2p\rightarrow 3s$	0.5	4.546E+02	7.543E-01	-4.698E-02	7.850E-02	-1.282E-02	5.611E-02	1.111E-21
		1.5	4.488E+02	7.823E-01	-9.292E-02	1.566E-01	-2.598E-02	1.116E-01	2.383E-21
	$2p\rightarrow 3p$	0.5	4.710E+02	3.680E-03	-9.749E-03	5.898E-02	-9.203E-03	4.658E-03	1.081E-23
		0.5	4.732E+02	6.873E-02	7.444E-02	8.474E-02	-2.609E-02	1.932E-03	6.648E-22
		0.5	4.752E+02	2.340E-01	-1.121E-02	5.697E-02	-7.886E-03	4.558E-03	6.386E-22
		0.5	4.767E+02	9.632E-01	-4.964E-03	1.059E-01	-2.923E-02	6.980E-03	4.945E-21
		0.5	4.863E+02	9.801E-01	1.787E-01	-3.140E-03	2.346E-03	-1.042E-02	1.200E-20
		0.5	4.937E+02	9.992E-01	2.461E+00	-6.862E-01	1.149E-01	-2.022E-01	1.260E-19
		1.5	4.664E+02	3.240E-03	-6.594E-02	2.991E-01	-8.293E-02	1.888E-02	3.642E-23
		1.5	4.698E+02	1.625E-01	9.108E-03	7.040E-02	3.122E-04	1.417E-02	9.563E-22
		1.5	4.719E+02	1.652E-01	3.884E-02	2.106E-02	1.080E-02	1.623E-02	8.536E-22
		1.5	4.757E+02	1.615E-01	1.204E-02	6.088E-02	2.414E-03	1.411E-02	8.750E-22
		1.5	4.769E+02	3.400E-04	-2.659E-02	9.957E-02	-1.122E-02	7.971E-03	1.502E-24
		1.5	4.821E+02	2.855E-01	-1.356E-02	8.007E-02	-6.753E-03	1.056E-02	1.194E-21
		1.5	4.870E+02	6.128E-01	8.116E-03	6.227E-02	3.950E-03	1.334E-02	3.126E-21
		2.5	4.692E+02	1.449E-01	-1.833E-02	1.458E-01	-1.011E-02	1.765E-02	1.257E-21
		2.5	4.716E+02	1.996E-01	1.960E-02	7.335E-02	8.532E-04	2.050E-02	1.370E-21
		2.5	4.769E+02	1.424E-01	1.180E-01	-4.192E-02	4.664E-02	2.884E-02	1.251E-21
		2.5	4.809E+02	7.502E-01	1.225E-02	1.041E-01	6.107E-03	2.021E-02	6.464E-21
		3.5	4.691E+02	0.000E+00	-5.772E-02	2.348E-01	-1.412E-02	1.678E-02	0.000E+00
	$2p\rightarrow 3d$	0.5	5.064E+02	8.577E-02	-3.889E-02	1.336E-01	4.727E-02	1.553E-02	7.726E-22
		0.5	5.128E+02	9.726E-01	-7.659E-02	2.498E-01	-9.681E-03	3.240E-01	9.842E-21
		0.5	5.193E+02	9.935E-01	9.876E-02	2.917E-03	1.793E-01	4.518E-01	1.685E-20
		0.5	5.246E+02	6.942E-01	-6.386E-01	2.059E+00	-2.095E-01	2.885E+00	4.973E-20
		1.5	5.070E+02	3.899E-01	-9.023E-02	2.935E-01	7.291E-02	4.822E-02	6.818E-21
		1.5	5.103E+02	1.221E-01	-2.983E-02	8.126E-02	4.812E-02	2.004E-02	7.596E-22
		1.5	5.126E+02	9.574E-01	-1.530E-01	4.968E-01	-1.082E-02	5.381E-01	1.974E-20
		1.5	5.147E+02	9.984E-01	-4.963E-02	1.416E-01	2.281E-02	6.719E-02	7.039E-21
		1.5	5.154E+02	9.902E-01	-5.025E-02	1.387E-01	2.706E-02	9.685E-02	7.004E-21
		1.5	5.224E+02	7.550E-01	-4.094E-01	1.338E+00	-9.931E-02	1.888E+00	3.735E-20
		1.5	5.278E+02	9.073E-01	-6.146E-01	1.970E+00	-1.703E-01	2.721E+00	6.282E-20
		2.5	5.080E+02	9.900E-04	-9.897E-02	3.403E-01	1.184E-01	3.012E-02	2.246E-23
		2.5	5.093E+02	4.869E-01	-6.583E-03	7.519E-02	8.406E-02	1.233E-02	4.664E-21
		2.5	5.112E+02	4.430E-01	6.871E-02	-5.216E-02	9.068E-02	7.269E-03	2.958E-21
		2.5	5.152E+02	4.902E-01	8.440E-03	4.086E-02	9.070E-02	1.037E-02	4.207E-21
		2.5	5.161E+02	2.112E-01	-1.175E-02	5.311E-02	9.836E-02	8.334E-03	1.803E-21
		2.5	5.201E+02	9.255E-01	-2.925E-03	2.727E-02	6.984E-02	5.828E-03	5.244E-21
		2.5	5.250E+02	9.675E-01	5.782E-03	2.623E-02	6.807E-02	7.056E-03	5.717E-21
		3.5	5.086E+02	6.187E-01	-2.761E-02	1.253E-01	1.151E-01	1.604E-02	8.282E-21
		3.5	5.109E+02	5.752E-01	4.746E-02	-2.722E-02	1.165E-01	9.179E-03	4.903E-21
		3.5	5.161E+02	6.318E-01	1.186E-01	-9.616E-02	1.247E-01	9.302E-03	5.681E-21
		3.5	5.186E+02	9.852E-01	8.200E-03	6.080E-02	8.663E-02	1.276E-02	9.277E-21

TABLE V. Autoionization Branching Ratio and Fit Parameters for Excitation Cross Sections for Individual Levels

See page 76 for Explanation of Tables

Z	Transition	J	I_{ex}	B_j^a	A	B	C	D	Q_{ea}
22	$2p \rightarrow 3d$	4.5	5.080E+02	0.000E+00	-4.855E-02	1.608E-01	1.774E-01	1.479E-02	0.000E+00
	$2p \rightarrow 3d(3p^2)$	0.5	4.979E+02	9.867E-01	-1.582E-02	5.516E-02	-1.788E-03	5.273E-02	2.432E-21
		0.5	5.103E+02	9.975E-01	-1.131E-02	3.999E-02	1.962E-02	3.820E-03	3.011E-21
		0.5	5.145E+02	9.990E-01	-4.664E-03	1.384E-02	3.273E-03	3.902E-03	7.644E-22
		1.5	4.981E+02	9.857E-01	-1.500E-02	5.139E-02	-1.097E-03	4.741E-02	2.282E-21
		1.5	4.994E+02	9.903E-01	-1.170E-02	3.929E-02	-4.976E-04	3.515E-02	1.751E-21
		1.5	5.042E+02	9.965E-01	-1.271E-03	2.524E-03	7.589E-03	6.465E-04	5.640E-22
		1.5	5.085E+02	6.443E-01	-1.534E-02	4.808E-02	1.237E-03	2.882E-02	1.378E-21
		1.5	5.183E+02	9.816E-01	-3.912E-01	1.316E+00	-1.014E-01	1.744E+00	4.896E-20
		2.5	5.005E+02	8.863E-01	-6.152E-04	8.510E-03	1.713E-02	1.825E-03	1.441E-21
		2.5	5.044E+02	9.199E-01	8.494E-04	7.206E-03	1.475E-02	1.787E-03	1.342E-21
		3.5	4.989E+02	9.332E-01	4.549E-03	1.246E-02	1.966E-02	3.318E-03	2.237E-21
	$2p \rightarrow 4p$	0.5	6.054E+02	9.582E-01	1.631E-03	4.509E-02	-1.005E-02	3.658E-03	1.560E-21
		0.5	6.062E+02	5.886E-01	-1.206E-03	1.731E-02	9.408E-04	1.702E-03	4.443E-22
		0.5	6.084E+02	9.885E-01	1.570E-01	-2.572E-02	3.981E-04	-8.765E-03	5.723E-21
		0.5	6.107E+02	9.646E-01	3.265E-03	2.055E-02	1.549E-04	1.799E-03	1.009E-21
		0.5	6.119E+02	1.881E-01	-5.321E-03	2.118E-02	1.190E-03	1.830E-03	1.394E-22
		0.5	6.142E+02	9.921E-01	4.593E-01	-7.117E-02	-2.101E-02	-2.300E-02	1.571E-20
		1.5	6.042E+02	2.100E-04	-2.055E-02	8.240E-02	-5.654E-03	6.062E-03	5.260E-25
		1.5	6.054E+02	5.999E-02	-2.558E-03	2.342E-02	6.350E-03	3.889E-03	7.248E-23
		1.5	6.062E+02	1.296E-01	-3.004E-03	2.397E-02	8.108E-03	3.689E-03	1.669E-22
		1.5	6.068E+02	5.908E-02	1.676E-02	-1.094E-03	1.120E-02	5.031E-03	7.017E-23
		1.5	6.110E+02	1.340E-03	1.930E-03	2.135E-02	7.394E-03	4.661E-03	1.792E-24
		1.5	6.115E+02	1.480E-01	-7.697E-03	2.838E-02	1.208E-02	2.475E-03	2.110E-22
		1.5	6.121E+02	7.870E-03	-6.573E-03	3.026E-02	4.783E-03	3.784E-03	9.732E-24
		2.5	6.048E+02	3.929E-02	1.467E-02	1.298E-02	1.884E-02	6.693E-03	8.126E-23
		2.5	6.054E+02	1.981E-01	5.284E-03	2.229E-02	1.359E-02	6.183E-03	3.620E-22
		2.5	6.064E+02	1.761E-01	-1.004E-02	4.172E-02	1.381E-02	4.601E-03	3.545E-22
		2.5	6.121E+02	1.461E-01	2.314E-02	1.384E-03	2.195E-02	7.067E-03	2.949E-22
		3.5	6.049E+02	0.000E+00	-1.625E-02	6.041E-02	2.707E-02	4.826E-03	0.000E+00
	$2p \rightarrow 4d$	0.5	6.170E+02	5.139E-02	-9.108E-03	2.974E-02	3.584E-02	3.718E-03	1.240E-22
		0.5	6.188E+02	9.181E-01	-1.416E-02	7.454E-02	2.051E-02	6.924E-02	3.156E-21
		0.5	6.201E+02	7.172E-01	2.078E-02	1.094E-01	1.246E-02	2.748E-01	4.329E-21
		0.5	6.264E+02	5.320E-01	2.296E-02	2.354E-01	4.606E-03	5.357E-01	5.801E-21
		1.5	6.173E+02	3.220E-01	-2.083E-02	6.517E-02	5.943E-02	1.296E-02	1.427E-21
		1.5	6.187E+02	8.984E-01	-1.305E-02	6.514E-02	2.767E-02	7.012E-02	3.046E-21
		1.5	6.193E+02	7.857E-01	-5.343E-03	1.585E-02	5.364E-02	1.684E-03	2.139E-21
		1.5	6.209E+02	6.091E-01	1.184E-02	3.149E-01	-3.001E-03	6.416E-01	8.323E-21
		1.5	6.239E+02	7.932E-01	-1.083E-02	6.425E-02	2.378E-02	8.118E-02	2.560E-21
		1.5	6.248E+02	6.677E-01	-1.653E-02	5.218E-02	4.127E-02	2.408E-02	2.141E-21
		1.5	6.261E+02	6.353E-01	3.946E-02	4.012E-01	8.072E-03	9.218E-01	1.184E-20
		2.5	6.178E+02	7.122E-02	-1.168E-02	3.753E-02	9.311E-02	3.575E-03	3.612E-22
		2.5	6.183E+02	7.832E-01	4.220E-03	-2.073E-03	5.407E-02	2.032E-03	1.874E-21
		2.5	6.193E+02	6.471E-02	8.577E-04	-1.165E-03	6.014E-02	7.737E-04	1.643E-22
		2.5	6.196E+02	3.587E-01	2.567E-02	-3.508E-02	5.402E-02	1.491E-03	6.782E-22
		2.5	6.239E+02	9.076E-01	1.621E-03	9.854E-03	5.486E-02	3.508E-03	2.517E-21
		2.5	6.247E+02	2.591E-01	-3.767E-03	9.253E-03	6.069E-02	1.412E-03	7.150E-22
		2.5	6.250E+02	2.993E-01	1.787E-03	2.810E-04	5.841E-02	1.744E-03	7.541E-22
		3.5	6.179E+02	9.530E-01	5.396E-03	2.595E-03	6.902E-02	3.452E-03	3.128E-21
		3.5	6.184E+02	9.594E-01	2.578E-02	-3.284E-02	6.682E-02	2.378E-03	2.440E-21
		3.5	6.193E+02	1.503E-01	-2.591E-03	5.858E-03	7.520E-02	1.770E-03	5.004E-22
		3.5	6.249E+02	4.837E-02	2.627E-02	-3.175E-02	6.780E-02	2.547E-03	1.256E-22
		4.5	6.176E+02	0.000E+00	-9.208E-03	2.562E-02	1.028E-01	2.902E-03	0.000E+00
24	$2s \rightarrow 3s$	0.5	6.942E+02	9.992E-01	2.818E-01	-8.896E-02	2.973E-02	-1.385E-02	7.510E-21
	$2s \rightarrow 3p$	0.5	7.182E+02	9.328E-01	-9.751E-03	3.085E-02	-2.396E-03	4.709E-03	5.504E-22

TABLE V. Autoionization Branching Ratio and Fit Parameters for Excitation Cross Sections for Individual Levels

See page 76 for Explanation of Tables

Z	Transition	J	I_{ex}	B_j^a	A	B	C	D	Q_{ea}
24	$2s\rightarrow3p$	0.5	7.249E+02	9.781E-01	-3.769E-01	5.081E-01	-7.577E-02	4.742E-01	1.679E-21
		0.5	7.367E+02	9.865E-01	-1.100E-01	1.670E-01	-2.786E-02	1.228E-01	8.618E-22
		1.5	7.191E+02	4.385E-01	-1.772E-02	5.646E-02	-4.194E-03	8.436E-03	4.767E-22
		1.5	7.258E+02	9.729E-01	-8.437E-01	1.159E+00	-2.043E-01	1.014E+00	3.352E-21
		1.5	7.373E+02	9.459E-01	-1.184E-01	1.855E-01	-3.160E-02	1.280E-01	1.006E-21
		2.5	7.200E+02	0.000E+00	-2.013E-02	8.095E-02	2.453E-03	5.863E-03	0.000E+00
	$2s\rightarrow3d$	0.5	7.611E+02	6.152E-02	-9.410E-03	3.479E-02	2.406E-02	2.806E-03	8.545E-23
		1.5	7.612E+02	1.133E-01	-1.892E-02	6.995E-02	4.782E-02	5.677E-03	3.145E-22
		1.5	7.692E+02	9.986E-01	8.792E-01	-9.926E-01	3.804E-01	6.096E-02	7.335E-21
		1.5	7.748E+02	9.948E-01	6.651E-02	-3.195E-02	5.837E-02	1.316E-02	2.506E-21
		2.5	7.613E+02	1.831E-01	-2.821E-02	1.046E-01	7.192E-02	8.482E-03	7.623E-22
		2.5	7.693E+02	9.978E-01	1.343E+00	-1.519E+00	5.802E-01	9.244E-02	1.110E-20
		2.5	7.748E+02	9.950E-01	7.546E-02	-2.001E-02	7.977E-02	1.776E-02	3.647E-21
		3.5	7.614E+02	0.000E+00	-3.773E-02	1.393E-01	9.617E-02	1.126E-02	0.000E+00
	$2p\rightarrow3s$	0.5	5.824E+02	6.930E-01	-4.882E-02	8.268E-02	-1.517E-02	5.540E-02	6.215E-22
		1.5	5.737E+02	7.319E-01	-9.370E-02	1.605E-01	-2.920E-02	1.087E-01	1.361E-21
	$2p\rightarrow3p$	0.5	5.985E+02	5.370E-02	-6.172E-03	6.248E-02	-1.180E-02	5.106E-03	1.086E-22
		0.5	6.013E+02	1.931E-01	8.504E-02	1.024E-01	-3.722E-02	4.343E-03	1.305E-21
		0.5	6.049E+02	2.526E-01	-1.324E-02	5.390E-02	-4.204E-03	4.230E-03	4.096E-22
		0.5	6.063E+02	9.723E-01	-1.936E-02	9.052E-02	-1.915E-02	6.470E-03	2.239E-21
		0.5	6.174E+02	9.805E-01	2.860E-01	1.333E-02	-1.721E-02	-8.225E-03	1.181E-20
		0.5	6.257E+02	9.987E-01	2.297E+00	-4.017E-01	1.403E-02	-1.185E-01	7.924E-20
		1.5	5.933E+02	3.380E-03	-6.186E-02	2.836E-01	-7.085E-02	1.766E-02	2.357E-23
		1.5	5.971E+02	1.860E-01	2.090E-02	5.600E-02	6.181E-03	1.509E-02	7.053E-22
		1.5	5.996E+02	1.763E-01	3.399E-02	2.851E-02	1.015E-02	1.582E-02	5.798E-22
		1.5	6.058E+02	1.619E-01	7.836E-03	6.677E-02	2.689E-03	1.369E-02	5.549E-22
		1.5	6.072E+02	2.140E-03	-2.732E-02	1.043E-01	-1.039E-02	8.044E-03	6.286E-24
		1.5	6.113E+02	1.826E-01	-1.311E-02	7.868E-02	-5.230E-03	1.040E-02	4.798E-22
		1.5	6.189E+02	5.265E-01	1.199E-02	5.839E-02	6.700E-03	1.377E-02	1.724E-21
		2.5	5.963E+02	1.681E-01	-1.208E-02	1.373E-01	-6.302E-03	1.822E-02	9.152E-22
		2.5	5.994E+02	2.225E-01	2.718E-02	6.393E-02	6.717E-03	2.129E-02	9.858E-22
		2.5	6.075E+02	1.343E-01	1.232E-01	-4.675E-02	5.101E-02	2.997E-02	7.549E-22
		2.5	6.098E+02	6.562E-01	2.955E-04	1.220E-01	2.116E-03	1.955E-02	3.572E-21
		3.5	5.965E+02	0.000E+00	-5.759E-02	2.351E-01	-1.228E-02	1.673E-02	0.000E+00
	$2p\rightarrow3d$	0.5	6.406E+02	4.349E-01	-4.377E-02	1.498E-01	3.771E-02	1.824E-02	2.479E-21
		0.5	6.461E+02	9.892E-01	-3.662E-02	1.129E-01	3.907E-03	4.683E-02	3.093E-21
		0.5	6.489E+02	9.736E-01	-1.131E-01	3.751E-01	-5.321E-02	4.216E-01	7.857E-21
		0.5	6.629E+02	3.377E-01	-9.258E-01	2.964E+00	-5.508E-01	3.453E+00	1.860E-20
		1.5	6.414E+02	6.547E-01	-1.005E-01	3.259E-01	5.076E-02	5.709E-02	7.153E-21
		1.5	6.454E+02	1.144E-01	-3.470E-02	9.449E-02	3.787E-02	2.669E-02	4.364E-22
		1.5	6.483E+02	8.880E-01	-2.298E-01	7.416E-01	-9.122E-02	7.077E-01	1.446E-20
		1.5	6.516E+02	9.949E-01	-9.926E-02	3.055E-01	-1.577E-02	2.387E-01	7.263E-21
		1.5	6.528E+02	9.767E-01	-5.560E-02	1.547E-01	1.958E-02	8.726E-02	4.425E-21
		1.5	6.598E+02	2.358E-02	-8.713E-01	2.774E+00	-5.076E-01	3.159E+00	1.230E-21
		1.5	6.672E+02	8.532E-01	-8.183E-01	2.598E+00	-4.515E-01	2.983E+00	4.141E-20
		2.5	6.427E+02	1.240E-02	-7.835E-02	2.866E-01	1.466E-01	2.333E-02	1.733E-22
		2.5	6.442E+02	5.221E-01	-4.223E-04	7.586E-02	7.722E-02	1.361E-02	3.125E-21
		2.5	6.463E+02	4.749E-01	6.548E-02	-4.066E-02	8.637E-02	8.659E-03	2.057E-21
		2.5	6.528E+02	5.139E-01	-1.957E-04	6.439E-02	8.526E-02	1.216E-02	2.933E-21
		2.5	6.537E+02	3.850E-01	-1.403E-02	7.165E-02	9.110E-02	1.046E-02	2.180E-21
		2.5	6.564E+02	8.226E-01	-7.445E-03	3.624E-02	6.776E-02	6.299E-03	3.000E-21
		2.5	6.639E+02	9.481E-01	7.038E-03	3.207E-02	6.345E-02	8.099E-03	3.590E-21
		3.5	6.433E+02	6.598E-01	-2.705E-02	1.354E-01	1.040E-01	1.768E-02	5.510E-21
		3.5	6.460E+02	6.132E-01	4.991E-02	-2.176E-02	1.109E-01	1.070E-02	3.324E-21
		3.5	6.539E+02	8.451E-01	1.457E-01	-1.246E-01	1.230E-01	9.839E-03	4.635E-21
		3.5	6.545E+02	9.555E-01	-1.849E-02	1.044E-01	8.305E-02	1.407E-02	6.133E-21
		4.5	6.425E+02	0.000E+00	-5.343E-02	1.803E-01	1.649E-01	1.622E-02	0.000E+00

TABLE V. Autoionization Branching Ratio and Fit Parameters for Excitation Cross Sections for Individual Levels

See page 76 for Explanation of Tables

Z	Transition	J	I_{ex}	B_j^a	A	B	C	D	Q_{ea}
24	$2p \rightarrow 3d(3p^2)$	0.5	6.296E+02	9.847E-01	-1.798E-02	6.515E-02	-4.894E-03	5.603E-02	1.709E-21
		0.5	6.330E+02	9.920E-01	-4.059E-03	1.394E-02	-1.167E-03	1.091E-02	3.510E-22
		0.5	6.382E+02	9.975E-01	-5.057E-03	1.420E-02	-1.822E-03	7.627E-03	2.918E-22
		0.5	6.536E+02	9.959E-01	-5.852E-03	1.786E-02	1.825E-03	5.485E-03	5.247E-22
		0.5	6.564E+02	3.850E-01	-7.170E-02	2.268E-01	-2.367E-02	1.941E-01	1.911E-21
		1.5	6.298E+02	9.845E-01	-1.533E-02	5.425E-02	-3.236E-03	4.460E-02	1.441E-21
		1.5	6.316E+02	9.882E-01	-1.425E-02	4.809E-02	-2.936E-03	3.750E-02	1.246E-21
		1.5	6.388E+02	9.970E-01	-3.918E-03	1.028E-02	4.709E-03	3.543E-03	4.403E-22
		1.5	6.404E+02	9.970E-01	-6.195E-03	1.859E-02	2.453E-03	5.876E-03	5.875E-22
		1.5	6.442E+02	9.584E-01	-1.456E-02	4.517E-02	2.978E-03	1.413E-02	1.262E-21
		1.5	6.575E+02	9.903E-01	-3.203E-01	1.029E+00	-1.684E-01	1.113E+00	2.014E-20
		2.5	6.331E+02	8.168E-01	-1.365E-03	9.917E-03	1.616E-02	1.896E-03	8.195E-22
		2.5	6.402E+02	8.881E-01	1.126E-03	9.837E-03	1.531E-02	2.275E-03	9.265E-22
		2.5	6.432E+02	5.568E-01	1.077E-04	1.751E-03	3.007E-03	4.022E-04	1.066E-22
		3.5	6.308E+02	9.065E-01	4.762E-03	1.620E-02	1.969E-02	3.971E-03	1.507E-21
		3.5	6.334E+02	8.042E-01	6.072E-04	1.793E-03	2.326E-03	4.575E-04	1.542E-22
	$2p \rightarrow 4p$	0.5	7.743E+02	9.323E-01	1.721E-03	4.209E-02	-6.704E-03	3.220E-03	9.391E-22
		0.5	7.753E+02	6.348E-01	1.710E-03	1.577E-02	1.483E-03	1.483E-03	3.260E-22
		0.5	7.781E+02	9.839E-01	2.140E-01	-2.549E-02	-1.038E-02	-9.811E-03	4.710E-21
		0.5	7.823E+02	9.404E-01	2.023E-03	1.870E-02	2.307E-03	1.596E-03	5.760E-22
		0.5	7.838E+02	3.582E-01	-5.112E-03	1.928E-02	3.576E-03	1.554E-03	1.683E-22
		0.5	7.862E+02	9.863E-01	4.253E-01	-6.759E-02	-2.118E-02	-2.127E-02	8.740E-21
		1.5	7.728E+02	2.100E-04	-1.902E-02	7.686E-02	-8.203E-04	5.605E-03	3.263E-25
		1.5	7.743E+02	8.079E-02	-1.988E-03	2.346E-02	7.521E-03	3.992E-03	6.357E-23
		1.5	7.752E+02	1.187E-01	-3.866E-04	2.045E-02	1.003E-02	3.824E-03	9.675E-23
		1.5	7.760E+02	4.786E-02	1.469E-02	1.636E-03	1.155E-02	4.992E-03	3.605E-23
		1.5	7.829E+02	2.627E-02	2.023E-03	2.127E-02	9.253E-03	4.561E-03	2.270E-23
		1.5	7.832E+02	1.158E-01	-7.606E-03	2.790E-02	1.365E-02	2.378E-03	1.043E-22
		1.5	7.840E+02	8.800E-03	-5.604E-03	2.971E-02	6.674E-03	3.889E-03	7.171E-24
		2.5	7.736E+02	5.500E-04	1.642E-02	1.072E-02	2.117E-02	6.699E-03	7.224E-25
		2.5	7.745E+02	1.384E-01	5.754E-03	2.134E-02	1.565E-02	6.051E-03	1.605E-22
		2.5	7.756E+02	1.526E-01	-8.584E-03	4.025E-02	1.565E-02	4.798E-03	1.953E-22
		2.5	7.841E+02	1.275E-01	2.343E-02	1.002E-03	2.405E-02	7.013E-03	1.636E-22
		3.5	7.738E+02	0.000E+00	-1.617E-02	6.024E-02	2.959E-02	4.799E-03	0.000E+00
	$2p \rightarrow 4d$	0.5	7.891E+02	1.350E-03	-9.673E-03	3.196E-02	3.502E-02	3.904E-03	2.022E-24
		0.5	7.912E+02	8.689E-01	-1.357E-02	7.342E-02	2.026E-02	6.017E-02	1.809E-21
		0.5	7.929E+02	5.781E-01	3.298E-02	1.422E-01	9.389E-03	3.379E-01	2.761E-21
		0.5	8.021E+02	4.384E-01	2.462E-02	1.328E-01	5.709E-03	3.000E-01	1.809E-21
		1.5	7.895E+02	1.486E-01	-2.129E-02	6.787E-02	5.758E-02	1.320E-02	4.041E-22
		1.5	7.911E+02	8.369E-01	-9.403E-03	6.339E-02	3.009E-02	6.880E-02	1.830E-21
		1.5	7.918E+02	6.403E-01	-6.687E-03	1.985E-02	5.092E-02	2.479E-03	1.065E-21
		1.5	7.940E+02	4.260E-01	7.447E-02	3.210E-01	1.962E-02	7.612E-01	4.564E-21
		1.5	7.991E+02	6.532E-01	-8.233E-03	5.254E-02	2.521E-02	5.877E-02	1.157E-21
		1.5	8.002E+02	6.332E-01	-1.522E-02	4.867E-02	4.388E-02	1.795E-02	1.244E-21
		1.5	8.014E+02	5.224E-01	4.587E-02	2.277E-01	8.135E-03	5.298E-01	3.729E-21
		2.5	7.901E+02	3.240E-03	-1.159E-02	3.750E-02	8.939E-02	3.540E-03	9.738E-24
		2.5	7.907E+02	6.515E-01	4.484E-03	-1.353E-03	5.466E-02	2.247E-03	9.799E-22
		2.5	7.919E+02	6.060E-03	1.754E-03	1.387E-03	5.345E-02	1.964E-03	8.899E-24
		2.5	7.923E+02	2.501E-01	2.082E-02	-2.743E-02	5.492E-02	1.807E-03	3.132E-22
		2.5	7.991E+02	7.979E-01	2.606E-03	6.546E-03	6.215E-02	2.955E-03	1.450E-21
		2.5	7.999E+02	4.910E-02	-4.106E-03	1.080E-02	6.139E-02	1.558E-03	8.502E-23
		2.5	8.003E+02	2.122E-01	2.171E-03	2.161E-03	5.777E-02	2.135E-03	3.348E-22
		3.5	7.902E+02	9.156E-01	6.450E-03	1.965E-03	6.902E-02	3.645E-03	1.848E-21
		3.5	7.908E+02	8.983E-01	2.490E-02	-3.061E-02	6.731E-02	2.727E-03	1.440E-21
		3.5	7.919E+02	4.750E-03	-2.531E-03	7.788E-03	7.427E-02	2.127E-03	9.803E-24
		3.5	8.002E+02	1.099E-01	2.596E-02	-3.071E-02	6.871E-02	2.784E-03	1.787E-22
		4.5	7.899E+02	0.000E+00	-9.817E-03	2.838E-02	1.027E-01	3.073E-03	0.000E+00
26	$2s \rightarrow 3s$	0.5	8.516E+02	9.989E-01	2.929E-01	-9.411E-02	3.020E-02	-1.450E-02	5.132E-21

TABLE V. Autoionization Branching Ratio and Fit Parameters for Excitation Cross Sections for Individual Levels

See page 76 for Explanation of Tables

Z	Transition	J	I_{ex}	B_j^a	A	B	C	D	Q_{ea}
26	$2s\rightarrow3p$	0.5	8.774E+02	9.163E-01	-1.245E-02	3.849E-02	-4.047E-03	6.261E-03	4.260E-22
		0.5	8.851E+02	9.705E-01	-4.173E-01	5.876E-01	-1.050E-01	5.116E-01	1.316E-21
		0.5	8.982E+02	9.220E-01	-7.620E-02	1.164E-01	-2.092E-02	8.675E-02	3.578E-22
		1.5	8.782E+02	2.688E-01	-1.247E-02	3.744E-02	-4.214E-03	6.634E-03	1.177E-22
		1.5	8.865E+02	9.593E-01	-9.351E-01	1.328E+00	-2.589E-01	1.112E+00	2.662E-21
		1.5	8.989E+02	9.931E-01	-1.446E-01	2.359E-01	-3.496E-02	1.628E-01	1.128E-21
		2.5	8.800E+02	0.000E+00	-2.145E-02	8.552E-02	3.823E-04	6.268E-03	0.000E+00
	$2s\rightarrow3d$	0.5	9.282E+02	0.000E+00	-1.020E-02	3.817E-02	2.211E-02	3.035E-03	0.000E+00
		1.5	9.283E+02	1.464E-01	-2.049E-02	7.678E-02	4.384E-02	6.160E-03	2.768E-22
		1.5	9.375E+02	9.984E-01	3.957E-01	-2.342E-03	-1.096E-01	2.694E-01	5.245E-21
		1.5	9.434E+02	9.924E-01	7.896E-02	-4.095E-02	6.029E-02	1.467E-02	1.784E-21
		2.5	9.284E+02	2.448E-01	-3.060E-02	1.149E-01	6.600E-02	9.256E-03	6.947E-22
		2.5	9.377E+02	9.966E-01	6.274E-01	-4.886E-02	-1.454E-01	4.090E-01	7.990E-21
		2.5	9.435E+02	9.930E-01	7.697E-02	-1.306E-02	7.576E-02	1.916E-02	2.535E-21
		3.5	9.287E+02	0.000E+00	-4.071E-02	1.524E-01	8.877E-02	1.211E-02	0.000E+00
	$2p\rightarrow3s$	0.5	7.260E+02	6.211E-01	-5.257E-02	9.025E-02	-1.900E-02	5.575E-02	3.582E-22
		1.5	7.134E+02	6.733E-01	-9.910E-02	1.715E-01	-3.473E-02	1.086E-01	8.117E-22
	$2p\rightarrow3p$	0.5	7.436E+02	1.128E-01	-5.258E-04	6.245E-02	-1.177E-02	4.857E-03	1.665E-22
		0.5	7.472E+02	2.186E-01	9.862E-02	9.253E-02	-3.014E-02	2.483E-03	1.026E-21
		0.5	7.532E+02	2.276E-01	-1.308E-02	5.142E-02	-1.313E-03	3.850E-03	2.418E-22
		0.5	7.542E+02	9.792E-01	-1.688E-02	8.110E-02	-1.475E-02	5.806E-03	1.386E-21
		0.5	7.670E+02	9.804E-01	4.973E-01	-8.032E-02	1.574E-02	-2.801E-02	1.174E-20
		0.5	7.762E+02	9.980E-01	2.329E+00	-5.999E-01	1.144E-01	-1.527E-01	4.969E-20
		1.5	7.378E+02	2.130E-03	-5.770E-02	2.669E-01	-5.982E-02	1.642E-02	9.515E-24
		1.5	7.419E+02	1.861E-01	3.101E-02	4.466E-02	1.096E-02	1.628E-02	4.766E-22
		1.5	7.451E+02	1.651E-01	2.765E-02	3.801E-02	8.524E-03	1.543E-02	3.590E-22
		1.5	7.545E+02	1.398E-01	4.836E-03	7.037E-02	3.131E-03	1.342E-02	3.130E-22
		1.5	7.562E+02	6.185E-02	-2.779E-02	1.079E-01	-9.259E-03	8.198E-03	1.247E-22
		1.5	7.582E+02	1.041E-01	-1.305E-02	7.931E-02	-4.217E-03	1.040E-02	1.829E-22
		1.5	7.694E+02	4.405E-01	1.535E-02	5.487E-02	9.111E-03	1.429E-02	9.607E-22
		2.5	7.411E+02	1.652E-01	-6.498E-03	1.297E-01	-2.790E-03	1.897E-02	5.894E-22
		2.5	7.450E+02	2.199E-01	3.436E-02	5.438E-02	1.241E-02	2.167E-02	6.522E-22
		2.5	7.562E+02	9.041E-01	1.208E-01	-3.818E-02	5.209E-02	3.037E-02	3.466E-21
		2.5	7.570E+02	3.280E-01	-3.032E-03	1.237E-01	1.696E-03	1.952E-02	1.139E-21
		3.5	7.417E+02	0.000E+00	-5.755E-02	2.354E-01	-1.067E-02	1.671E-02	0.000E+00
	$2p\rightarrow3d$	0.5	7.899E+02	8.523E-01	-4.663E-02	1.604E-01	3.078E-02	2.067E-02	3.213E-21
		0.5	7.969E+02	9.479E-01	-5.504E-02	1.802E-01	-1.039E-02	1.149E-01	2.789E-21
		0.5	8.006E+02	9.691E-01	-1.149E-01	4.304E-01	-6.240E-02	4.926E-01	6.227E-21
		0.5	8.172E+02	6.960E-02	-9.292E-01	3.212E+00	-6.236E-01	3.664E+00	2.814E-21
		1.5	7.908E+02	6.196E-02	-1.024E-01	3.378E-01	4.162E-02	5.947E-02	4.466E-22
		1.5	7.954E+02	2.550E-01	-2.666E-02	7.555E-02	3.185E-02	1.738E-02	5.296E-22
		1.5	7.993E+02	6.264E-01	-2.481E-01	8.870E-01	-1.192E-01	8.835E-01	8.292E-21
		1.5	8.042E+02	9.832E-01	-1.718E-01	5.735E-01	-7.664E-02	5.202E-01	8.042E-21
		1.5	8.062E+02	9.527E-01	-4.956E-02	1.403E-01	2.223E-02	6.007E-02	2.694E-21
		1.5	8.133E+02	4.785E-01	-8.304E-01	3.246E+00	-5.335E-01	3.956E+00	2.215E-20
		1.5	8.226E+02	7.939E-01	-8.634E-01	2.840E+00	-5.780E-01	3.035E+00	2.670E-20
		2.5	7.925E+02	6.495E-01	-5.205E-02	1.927E-01	8.711E-02	1.620E-02	3.832E-21
		2.5	7.941E+02	5.090E-01	6.775E-03	7.385E-02	7.261E-02	1.459E-02	2.013E-21
		2.5	7.966E+02	4.644E-01	4.686E-02	-1.341E-02	7.386E-02	9.400E-03	1.278E-21
		2.5	8.065E+02	4.293E-01	-8.742E-03	8.541E-02	8.173E-02	1.336E-02	1.701E-21
		2.5	8.069E+02	9.877E-01	3.281E-03	4.512E-02	7.158E-02	9.799E-03	2.962E-21
		2.5	8.082E+02	3.744E-01	-2.030E-02	6.336E-02	9.301E-02	6.336E-03	1.269E-21
		2.5	8.188E+02	9.212E-01	8.218E-03	3.634E-02	5.940E-02	8.933E-03	2.325E-21
		3.5	7.930E+02	6.623E-01	-2.519E-02	1.408E-01	9.572E-02	1.879E-02	3.622E-21
		3.5	7.962E+02	6.092E-01	5.117E-02	-1.619E-02	1.055E-01	1.203E-02	2.197E-21
		3.5	8.054E+02	9.670E-01	2.598E-02	5.185E-02	7.563E-02	1.457E-02	3.723E-21
		3.5	8.079E+02	4.578E-01	9.053E-02	-3.503E-02	1.101E-01	1.420E-02	1.891E-21
		4.5	7.922E+02	0.000E+00	-5.714E-02	1.954E-01	1.542E-01	1.730E-02	0.000E+00

TABLE V. Autoionization Branching Ratio and Fit Parameters for Excitation Cross Sections for Individual Levels

See page 76 for Explanation of Tables

Z	Transition	J	I_{ex}	B_j^a	A	B	C	D	Q_{ea}
26	$2p \rightarrow 3d(3p^2)$	0.5	7.778E+02	9.764E-01	-1.899E-02	6.893E-02	-8.029E-03	5.471E-02	1.101E-21
		0.5	7.822E+02	9.883E-01	-5.586E-03	1.994E-02	-1.974E-03	1.477E-02	3.255E-22
		0.5	7.886E+02	9.967E-01	-5.487E-03	1.823E-02	-8.169E-04	8.929E-03	3.111E-22
		0.5	8.074E+02	9.663E-01	-7.492E-03	2.359E-02	2.801E-03	5.392E-03	4.559E-22
		0.5	8.089E+02	9.997E-01	-2.029E-02	6.360E-02	3.213E-03	1.931E-02	1.157E-21
		1.5	7.777E+02	9.775E-01	-1.326E-02	4.654E-02	-4.790E-03	3.499E-02	7.493E-22
		1.5	7.800E+02	9.802E-01	-1.721E-02	5.879E-02	-5.484E-03	4.298E-02	9.464E-22
		1.5	7.892E+02	9.958E-01	-6.717E-03	1.979E-02	3.646E-03	6.770E-03	4.351E-22
		1.5	7.923E+02	9.974E-01	-4.331E-03	1.306E-02	2.661E-03	3.393E-03	2.945E-22
		1.5	7.960E+02	2.848E-01	-1.731E-02	5.208E-02	1.512E-02	1.142E-02	3.649E-22
		1.5	8.106E+02	9.972E-01	-5.461E-02	1.745E-01	-1.312E-02	1.446E-01	2.637E-21
		2.5	7.818E+02	7.622E-01	-1.509E-03	8.734E-03	1.244E-02	1.551E-03	3.990E-22
		2.5	7.827E+02	8.364E-01	-6.075E-04	3.406E-03	4.942E-03	6.014E-04	1.720E-22
		2.5	7.924E+02	8.280E-01	-2.919E-02	1.157E-01	5.033E-02	1.073E-02	2.936E-21
		2.5	7.963E+02	2.896E-01	1.407E-02	-1.286E-02	1.189E-02	9.805E-04	9.732E-23
		3.5	7.791E+02	8.929E-01	4.662E-03	1.701E-02	1.785E-02	4.020E-03	9.461E-22
		3.5	7.824E+02	7.745E-01	8.842E-04	2.876E-03	3.148E-03	7.029E-04	1.422E-22
	$2p \rightarrow 4p$	0.5	9.664E+02	8.920E-01	2.085E-04	4.074E-02	-4.286E-03	3.150E-03	5.698E-22
		0.5	9.675E+02	6.691E-01	4.872E-03	1.452E-02	2.029E-03	1.334E-03	2.492E-22
		0.5	9.710E+02	9.786E-01	2.726E-01	-4.319E-02	-6.601E-03	-1.260E-02	3.763E-21
		0.5	9.781E+02	9.055E-01	9.634E-04	1.784E-02	3.723E-03	1.556E-03	3.470E-22
		0.5	9.799E+02	4.174E-01	-4.933E-03	1.862E-02	4.717E-03	1.481E-03	1.302E-22
		0.5	9.821E+02	9.748E-01	3.739E-01	-6.879E-02	-9.561E-03	-1.854E-02	4.861E-21
		1.5	9.646E+02	1.000E-04	-1.760E-02	7.161E-02	3.022E-03	5.199E-03	9.973E-26
		1.5	9.664E+02	8.457E-02	-8.051E-04	2.285E-02	9.197E-03	4.059E-03	4.604E-23
		1.5	9.673E+02	1.040E-01	1.207E-03	1.786E-02	1.167E-02	3.799E-03	5.559E-23
		1.5	9.685E+02	3.738E-02	1.376E-02	2.187E-03	1.273E-02	4.740E-03	1.860E-23
		1.5	9.790E+02	9.745E-02	2.464E-03	2.034E-02	1.129E-02	4.408E-03	5.641E-23
		1.5	9.790E+02	8.701E-02	-7.497E-03	2.734E-02	1.512E-02	2.245E-03	5.165E-23
		1.5	9.801E+02	8.710E-03	-4.231E-03	2.783E-02	8.989E-03	3.833E-03	4.808E-24
		2.5	9.654E+02	4.730E-03	1.768E-02	8.949E-03	2.310E-02	6.695E-03	4.107E-24
		2.5	9.666E+02	1.027E-01	6.675E-03	1.950E-02	1.790E-02	5.907E-03	7.883E-23
		2.5	9.680E+02	1.300E-01	-7.141E-03	3.836E-02	1.756E-02	4.892E-03	1.101E-22
		2.5	9.802E+02	1.057E-01	2.384E-02	2.180E-04	2.605E-02	6.939E-03	8.970E-23
		3.5	9.659E+02	0.000E+00	-1.603E-02	5.980E-02	3.174E-02	4.754E-03	0.000E+00
	$2p \rightarrow 4d$	0.5	9.817E+02	5.270E-03	-9.977E-03	3.340E-02	3.427E-02	3.954E-03	5.134E-24
		0.5	9.841E+02	8.053E-01	-1.327E-02	7.198E-02	1.953E-02	5.214E-02	1.059E-21
		0.5	9.863E+02	4.446E-01	4.385E-02	1.832E-01	-4.415E-03	3.936E-01	1.656E-21
		0.5	9.995E+02	1.182E-01	4.821E-02	1.805E-01	-3.851E-03	4.080E-01	4.328E-22
		1.5	9.822E+02	5.536E-02	-2.104E-02	6.842E-02	5.633E-02	1.282E-02	9.685E-23
		1.5	9.840E+02	7.551E-01	-7.812E-03	6.506E-02	2.918E-02	6.800E-02	1.097E-21
		1.5	9.848E+02	4.974E-01	-8.335E-03	2.481E-02	4.779E-02	3.745E-03	5.363E-22
		1.5	9.875E+02	2.776E-01	3.481E-02	5.247E-01	-6.967E-02	8.929E-01	2.269E-21
		1.5	9.957E+02	5.416E-01	-6.370E-03	4.659E-02	2.413E-02	4.913E-02	5.720E-22
		1.5	9.969E+02	6.340E-01	-1.245E-02	3.883E-02	4.263E-02	1.036E-02	7.164E-22
		1.5	9.989E+02	3.177E-01	2.158E-01	1.754E-01	9.982E-02	8.342E-01	2.544E-21
		2.5	9.829E+02	1.189E-02	-1.132E-02	3.676E-02	8.558E-02	3.465E-03	2.223E-23
		2.5	9.835E+02	5.083E-01	4.495E-03	1.199E-04	5.517E-02	2.507E-03	5.112E-22
		2.5	9.849E+02	4.843E-02	4.434E-03	-1.662E-03	5.197E-02	2.191E-03	4.448E-23
		2.5	9.854E+02	1.566E-01	1.684E-02	-2.119E-02	5.487E-02	2.043E-03	1.326E-22
		2.5	9.958E+02	6.091E-01	9.543E-04	9.890E-03	6.159E-02	3.018E-03	7.241E-22
		2.5	9.967E+02	1.000E-04	-4.129E-03	1.207E-02	5.901E-02	1.807E-03	1.097E-25
		2.5	9.971E+02	1.485E-01	3.476E-03	5.266E-04	5.105E-02	2.130E-03	1.338E-22
		3.5	9.829E+02	8.629E-01	7.117E-03	2.124E-03	6.810E-02	3.919E-03	1.124E-21
		3.5	9.837E+02	7.774E-01	2.395E-02	-2.834E-02	6.724E-02	3.019E-03	8.216E-22
		3.5	9.849E+02	1.246E-02	-2.580E-03	9.636E-03	7.296E-02	2.454E-03	1.673E-23
		3.5	9.971E+02	1.309E-01	2.530E-02	-2.896E-02	6.881E-02	3.052E-03	1.396E-22
		4.5	9.826E+02	0.000E+00	-1.059E-02	3.150E-02	1.016E-01	3.298E-03	0.000E+00

TABLE V. Autoionization Branching Ratio and Fit Parameters for Excitation Cross Sections for Individual Levels

See page 76 for Explanation of Tables

Z	Transition	J	I_{ex}	B_j^a	A	B	C	D	Q_{ea}
30	$2s\rightarrow3s$	0.5	1.212E+03	9.980E-01	3.022E-01	-9.394E-02	3.189E-02	-1.267E-02	2.655E-21
	$2s\rightarrow3p$	0.5	1.244E+03	8.470E-01	-1.774E-02	4.843E-02	-7.213E-03	1.137E-02	2.089E-22
		0.5	1.254E+03	9.482E-01	-4.252E-01	6.319E-01	-1.303E-01	5.239E-01	7.498E-22
		0.5	1.271E+03	9.634E-01	-1.635E-01	2.563E-01	-5.173E-02	1.903E-01	3.985E-22
		1.5	1.246E+03	4.214E-02	-3.329E-02	7.877E-02	-1.316E-02	2.667E-02	1.428E-23
		1.5	1.257E+03	9.179E-01	-1.024E+00	1.512E+00	-3.159E-01	1.254E+00	1.629E-21
		1.5	1.272E+03	9.701E-01	-9.321E-02	1.619E-01	-3.194E-02	9.997E-02	3.584E-22
		2.5	1.249E+03	0.000E+00	-2.214E-02	8.853E-02	5.508E-04	6.461E-03	0.000E+00
	$2s\rightarrow3d$	0.5	1.309E+03	0.000E+00	-1.076E-02	4.142E-02	2.046E-02	3.176E-03	0.000E+00
		1.5	1.309E+03	3.488E-02	-2.179E-02	8.421E-02	3.968E-02	6.636E-03	3.381E-23
		1.5	1.321E+03	9.984E-01	9.517E-01	-1.021E+00	4.025E-01	7.238E-02	3.101E-21
		1.5	1.328E+03	9.844E-01	1.127E-01	-7.400E-02	7.066E-02	1.684E-02	9.940E-22
		2.5	1.310E+03	1.719E-01	-3.238E-02	1.263E-01	5.934E-02	1.004E-02	2.500E-22
		2.5	1.321E+03	9.919E-01	1.508E+00	-1.624E+00	6.331E-01	1.149E-01	4.784E-21
		2.5	1.328E+03	9.866E-01	7.515E-02	-1.903E-03	7.058E-02	1.959E-02	1.310E-21
		3.5	1.310E+03	0.000E+00	-4.310E-02	1.657E-01	8.191E-02	1.273E-02	0.000E+00
	$2p\rightarrow3s$	0.5	1.061E+03	4.694E-01	-5.270E-02	9.189E-02	-2.024E-02	5.413E-02	1.285E-22
		1.5	1.037E+03	5.505E-01	-1.036E-01	1.837E-01	-4.210E-02	1.069E-01	3.168E-22
	$2p\rightarrow3p$	0.5	1.075E+03	1.871E-01	1.048E-02	5.837E-02	-8.992E-03	3.641E-03	1.576E-22
		0.5	1.082E+03	1.671E-01	1.194E-01	5.954E-02	-1.115E-02	-2.914E-03	3.900E-22
		0.5	1.094E+03	9.875E-01	1.038E-01	5.142E-02	-1.277E-02	-2.610E-04	1.914E-21
		0.5	1.095E+03	1.184E-01	-1.278E-02	5.236E-02	-2.682E-04	3.886E-03	6.312E-23
		0.5	1.111E+03	9.776E-01	9.724E-01	-1.772E-01	2.140E-02	-5.253E-02	1.052E-20
		0.5	1.123E+03	9.957E-01	1.938E+00	-6.105E-01	1.579E-01	-1.454E-01	1.910E-20
		1.5	1.069E+03	2.550E-03	-5.174E-02	2.391E-01	-4.636E-02	1.491E-02	5.123E-24
		1.5	1.073E+03	1.605E-01	4.891E-02	2.426E-02	2.103E-02	1.733E-02	2.136E-22
		1.5	1.079E+03	1.235E-01	1.576E-02	5.547E-02	6.331E-03	1.379E-02	1.340E-22
		1.5	1.094E+03	5.495E-02	-3.529E-04	5.861E-02	3.754E-03	1.099E-02	4.633E-23
		1.5	1.098E+03	1.039E-01	-1.286E-02	9.213E-02	2.649E-04	1.088E-02	1.116E-22
		1.5	1.101E+03	2.040E-03	-2.665E-02	1.184E-01	-1.042E-02	1.008E-02	2.226E-24
		1.5	1.117E+03	2.841E-01	2.374E-02	4.292E-02	1.644E-02	1.435E-02	3.079E-22
		2.5	1.072E+03	1.321E-01	7.214E-03	1.088E-01	7.027E-03	1.913E-02	2.300E-22
		2.5	1.079E+03	1.882E-01	4.639E-02	3.679E-02	2.316E-02	2.158E-02	2.798E-22
		2.5	1.092E+03	4.990E-01	2.959E-02	8.331E-02	1.936E-02	2.136E-02	9.007E-22
		2.5	1.102E+03	1.551E-01	8.421E-02	4.637E-03	4.357E-02	2.610E-02	2.752E-22
		3.5	1.075E+03	0.000E+00	-5.583E-02	2.310E-01	-4.572E-03	1.615E-02	0.000E+00
	$2p\rightarrow3d$	0.5	1.134E+03	8.984E-01	-4.654E-02	1.639E-01	2.635E-02	1.909E-02	1.635E-21
		0.5	1.144E+03	2.168E-01	-1.298E-01	4.416E-01	-8.785E-02	3.516E-01	6.038E-22
		0.5	1.151E+03	9.145E-01	-2.100E-01	7.247E-01	-1.741E-01	6.580E-01	3.825E-21
		0.5	1.175E+03	8.460E-03	-8.529E-02	1.751E+00	4.517E-02	3.188E+00	1.708E-22
		1.5	1.135E+03	8.619E-01	-9.625E-02	3.240E-01	3.035E-02	5.183E-02	2.810E-21
		1.5	1.141E+03	2.231E-01	-3.982E-02	1.135E-01	2.654E-02	3.824E-02	2.795E-22
		1.5	1.146E+03	4.087E-02	-1.579E-01	5.594E-01	-9.989E-02	4.432E-01	1.527E-22
		1.5	1.156E+03	7.068E-01	-4.498E-01	1.610E+00	-3.581E-01	1.493E+00	6.910E-21
		1.5	1.162E+03	9.474E-01	-3.920E-02	1.139E-01	2.957E-02	2.932E-02	1.190E-21
		1.5	1.170E+03	6.229E-01	-9.947E-01	3.676E+00	-8.484E-01	3.695E+00	1.357E-20
		1.5	1.183E+03	6.722E-01	-9.313E-01	3.088E+00	-7.748E-01	2.877E+00	1.081E-20
		2.5	1.138E+03	6.993E-02	-7.053E-02	2.629E-01	1.156E-01	2.123E-02	2.709E-22
		2.5	1.139E+03	4.642E-01	1.697E-02	7.233E-02	7.185E-02	1.549E-02	9.380E-22
		2.5	1.142E+03	3.526E-01	6.035E-02	-2.366E-02	8.081E-02	1.020E-02	5.167E-22
		2.5	1.155E+03	6.622E-01	8.996E-04	2.987E-02	5.752E-02	6.922E-03	7.127E-22
		2.5	1.163E+03	3.937E-01	-8.123E-03	9.367E-02	7.736E-02	1.410E-02	7.714E-22
		2.5	1.164E+03	3.000E-03	-3.559E-02	1.327E-01	9.562E-02	1.316E-02	6.942E-24
		2.5	1.178E+03	8.441E-01	1.317E-02	3.471E-02	5.756E-02	9.116E-03	1.044E-21
		3.5	1.138E+03	6.274E-01	-1.733E-02	1.371E-01	9.039E-02	1.918E-02	1.657E-21
		3.5	1.142E+03	5.549E-01	5.728E-02	-1.846E-02	1.043E-01	1.225E-02	9.910E-22
		3.5	1.153E+03	9.081E-01	1.965E-02	6.641E-02	7.091E-02	1.504E-02	1.746E-21

TABLE V. Autoionization Branching Ratio and Fit Parameters for Excitation Cross Sections for Individual Levels

See page 76 for Explanation of Tables

Z	Transition	J	I_{ex}	B_j^a	A	B	C	D	Q_{ea}
30	$2p \rightarrow 3d$	3.5	1.165E+03	4.579E-01	9.705E-02	-3.551E-02	1.101E-01	1.459E-02	9.424E-22
		4.5	1.137E+03	0.000E+00	-5.892E-02	2.064E-01	1.482E-01	1.774E-02	0.000E+00
	$2p \rightarrow 3d(3p^2)$	0.5	1.120E+03	9.499E-01	-2.007E-02	7.251E-02	-1.246E-02	5.118E-02	4.928E-22
		0.5	1.127E+03	9.778E-01	-1.134E-02	3.961E-02	-5.969E-03	2.468E-02	2.795E-22
		0.5	1.135E+03	9.944E-01	-1.100E-02	3.599E-02	-2.372E-03	1.321E-02	2.841E-22
		0.5	1.160E+03	9.957E-01	-4.469E-02	1.471E-01	-2.129E-02	9.530E-02	9.779E-22
		1.5	1.122E+03	9.484E-01	-1.949E-02	7.338E-02	-6.901E-03	5.310E-02	5.762E-22
		1.5	1.136E+03	9.887E-01	-1.508E-02	5.612E-02	8.786E-03	2.399E-02	6.211E-22
		1.5	1.147E+03	9.608E-02	-2.028E-01	7.660E-01	-1.537E-01	7.360E-01	4.864E-22
		1.5	1.152E+03	8.649E-01	-2.192E-02	7.721E-02	-1.238E-02	7.096E-02	4.552E-22
		1.5	1.164E+03	9.976E-01	-9.502E-03	2.559E-02	6.069E-03	1.228E-02	2.653E-22
		2.5	1.124E+03	6.513E-01	-1.732E-03	8.060E-03	9.395E-03	1.290E-03	1.318E-22
		2.5	1.127E+03	7.133E-01	-1.322E-03	5.987E-03	6.989E-03	9.471E-04	1.065E-22
		2.5	1.146E+03	7.675E-01	-1.811E-03	1.611E-02	1.186E-02	2.480E-03	2.487E-22
		2.5	1.153E+03	4.620E-01	-7.854E-04	5.256E-03	5.009E-03	8.285E-04	5.363E-23
		3.5	1.121E+03	8.556E-01	6.267E-03	1.362E-02	1.793E-02	3.474E-03	4.190E-22
		3.5	1.127E+03	6.581E-01	1.692E-03	5.209E-03	4.822E-03	1.257E-03	9.886E-23
	$2p \rightarrow 4p$	0.5	1.409E+03	7.376E-01	-3.197E-03	3.578E-02	3.064E-04	2.709E-03	1.989E-22
		0.5	1.411E+03	7.225E-01	1.218E-02	1.257E-02	2.959E-03	8.967E-04	1.638E-22
		0.5	1.416E+03	9.637E-01	3.636E-01	-7.104E-02	-4.357E-03	-1.705E-02	2.256E-21
		0.5	1.432E+03	3.819E-01	-3.390E-04	1.463E-02	5.335E-03	1.289E-03	5.952E-23
		0.5	1.435E+03	5.587E-01	-4.919E-03	2.019E-02	5.285E-03	1.582E-03	9.077E-23
		0.5	1.437E+03	9.673E-01	3.677E-01	-9.294E-02	7.749E-03	-1.956E-02	2.155E-21
		1.5	1.407E+03	8.000E-05	-1.499E-02	6.180E-02	8.632E-03	4.498E-03	3.649E-26
		1.5	1.409E+03	7.408E-02	5.849E-03	1.781E-02	1.370E-02	4.534E-03	2.268E-23
		1.5	1.410E+03	7.454E-02	-1.708E-03	1.932E-02	1.261E-02	3.171E-03	1.845E-23
		1.5	1.412E+03	2.351E-02	1.330E-02	1.368E-03	1.518E-02	4.199E-03	5.728E-24
		1.5	1.433E+03	3.313E-02	-7.085E-03	2.628E-02	1.709E-02	2.202E-03	9.529E-24
		1.5	1.434E+03	3.955E-01	4.305E-03	9.003E-03	9.094E-03	2.695E-03	7.014E-23
		1.5	1.435E+03	3.410E-03	-2.786E-03	2.628E-02	1.218E-02	3.735E-03	9.616E-25
		2.5	1.407E+03	1.968E-02	2.003E-02	5.052E-03	2.696E-02	6.371E-03	8.414E-24
		2.5	1.410E+03	6.298E-02	8.806E-03	1.545E-02	2.181E-02	5.527E-03	2.376E-23
		2.5	1.411E+03	9.287E-02	-4.466E-03	3.431E-02	2.112E-02	4.820E-03	3.867E-23
		2.5	1.435E+03	6.404E-02	2.538E-02	-3.103E-03	3.016E-02	6.449E-03	2.653E-23
		3.5	1.409E+03	0.000E+00	-1.546E-02	5.803E-02	3.609E-02	4.576E-03	0.000E+00
	$2p \rightarrow 4d$	0.5	1.428E+03	3.449E-02	-9.830E-03	3.383E-02	3.413E-02	3.678E-03	1.600E-23
		0.5	1.431E+03	6.461E-01	-1.173E-02	6.446E-02	2.044E-02	3.741E-02	3.756E-22
		0.5	1.434E+03	2.495E-01	9.700E-03	3.656E-01	-8.957E-02	5.011E-01	5.639E-22
		0.5	1.458E+03	3.036E-01	5.421E-02	1.907E-01	-1.874E-02	3.720E-01	5.254E-22
		1.5	1.429E+03	6.600E-04	-1.954E-02	6.551E-02	5.582E-02	1.075E-02	5.354E-25
		1.5	1.431E+03	5.429E-01	-3.806E-03	6.526E-02	2.700E-02	6.665E-02	3.815E-22
		1.5	1.432E+03	2.942E-01	-9.069E-03	2.794E-02	4.677E-02	4.200E-03	1.532E-22
		1.5	1.436E+03	1.084E-01	1.844E-01	4.562E-01	-2.714E-02	9.991E-01	5.247E-22
		1.5	1.454E+03	2.099E-01	-7.049E-03	3.732E-02	2.615E-02	2.734E-02	9.114E-23
		1.5	1.456E+03	5.443E-01	-1.027E-02	3.380E-02	3.573E-02	8.962E-03	2.476E-22
		1.5	1.458E+03	1.403E-01	1.163E-01	3.841E-01	-3.906E-02	7.655E-01	4.953E-22
		2.5	1.430E+03	1.175E-01	-9.991E-03	3.271E-02	7.876E-02	3.206E-03	9.491E-23
		2.5	1.431E+03	2.799E-01	3.982E-03	4.657E-03	5.735E-02	3.107E-03	1.468E-22
		2.5	1.432E+03	8.554E-02	6.925E-03	-4.630E-03	5.092E-02	2.402E-03	3.611E-23
		2.5	1.433E+03	6.052E-02	1.235E-02	-1.419E-02	5.430E-02	2.271E-03	2.515E-23
		2.5	1.455E+03	3.591E-01	-1.331E-05	1.490E-02	6.313E-02	3.618E-03	2.154E-22
		2.5	1.455E+03	3.990E-03	-5.554E-03	1.616E-02	6.560E-02	1.813E-03	2.336E-24
		2.5	1.456E+03	3.177E-02	2.104E-03	7.328E-03	5.796E-02	2.930E-03	1.643E-23
		3.5	1.430E+03	7.321E-01	9.390E-03	-2.748E-04	6.800E-02	4.143E-03	4.494E-22
		3.5	1.431E+03	3.619E-01	2.174E-02	-2.387E-02	6.694E-02	3.455E-03	1.864E-22
		3.5	1.433E+03	6.021E-02	-2.053E-03	1.065E-02	7.218E-02	2.751E-03	3.857E-23
		3.5	1.456E+03	1.032E-01	2.308E-02	-2.504E-02	6.810E-02	3.338E-03	5.239E-23
		4.5	1.430E+03	0.000E+00	-1.086E-02	3.333E-02	1.028E-01	3.361E-03	0.000E+00

TABLE V. Autoionization Branching Ratio and Fit Parameters for Excitation Cross Sections for Individual Levels

See page 76 for Explanation of Tables

Z	Transition	J	I_{ex}	B_j^a	A	B	C	D	Q_{ea}
32	$2s\rightarrow3s$	0.5	1.417E+03	9.974E-01	2.925E-01	-6.256E-02	1.180E-02	-7.289E-03	1.954E-21
	$2s\rightarrow3p$	0.5	1.453E+03	8.066E-01	-2.085E-02	5.362E-02	-8.781E-03	1.498E-02	1.493E-22
		0.5	1.463E+03	9.347E-01	-3.760E-01	5.465E-01	-8.722E-02	5.031E-01	5.915E-22
		0.5	1.482E+03	9.392E-01	-1.715E-01	2.657E-01	-4.775E-02	2.115E-01	3.228E-22
		1.5	1.455E+03	4.527E-01	-5.995E-02	1.234E-01	-3.037E-02	4.767E-02	1.151E-22
		1.5	1.468E+03	8.495E-01	-7.344E-01	1.023E+00	-1.172E-01	1.065E+00	1.097E-21
		1.5	1.483E+03	9.897E-01	-1.270E-01	2.289E-01	-4.256E-02	1.365E-01	4.342E-22
		2.5	1.459E+03	0.000E+00	-2.414E-02	9.586E-02	-1.510E-03	7.064E-03	0.000E+00
	$2s\rightarrow3d$	0.5	1.525E+03	0.000E+00	-1.164E-02	4.471E-02	1.763E-02	3.441E-03	0.000E+00
		1.5	1.525E+03	0.000E+00	-2.343E-02	9.073E-02	3.402E-02	7.225E-03	0.000E+00
		1.5	1.538E+03	9.987E-01	9.390E-01	-9.782E-01	3.828E-01	7.984E-02	2.361E-21
		1.5	1.545E+03	9.778E-01	1.286E-01	-8.542E-02	7.141E-02	1.969E-02	7.637E-22
		2.5	1.526E+03	9.154E-02	-3.511E-02	1.371E-01	5.004E-02	1.116E-02	9.732E-23
		2.5	1.539E+03	9.874E-01	1.520E+00	-1.594E+00	6.152E-01	1.279E-01	3.673E-21
		2.5	1.546E+03	9.819E-01	6.797E-02	1.251E-02	6.240E-02	2.028E-02	9.557E-22
		3.5	1.526E+03	0.000E+00	-4.657E-02	1.788E-01	7.070E-02	1.377E-02	0.000E+00
	$2p\rightarrow3s$	0.5	1.253E+03	3.980E-01	-5.493E-02	9.692E-02	-2.310E-02	5.446E-02	7.786E-23
		1.5	1.221E+03	4.925E-01	-1.049E-01	1.880E-01	-4.505E-02	1.062E-01	2.047E-22
	$2p\rightarrow3p$	0.5	1.263E+03	2.069E-01	1.083E-02	6.376E-02	-1.196E-02	4.197E-03	1.321E-22
		0.5	1.272E+03	1.336E-01	1.157E-01	6.834E-02	-1.704E-02	-1.444E-03	2.245E-22
		0.5	1.286E+03	9.890E-01	2.601E-01	-5.015E-03	-4.686E-05	-1.248E-02	2.481E-21
		0.5	1.291E+03	9.294E-02	-1.305E-02	5.549E-02	-2.447E-03	4.197E-03	3.629E-23
		0.5	1.308E+03	9.745E-01	1.258E+00	-3.415E-01	7.735E-02	-8.600E-02	9.208E-21
		0.5	1.321E+03	9.936E-01	1.527E+00	-3.223E-01	1.806E-02	-8.988E-02	1.133E-20
		1.5	1.256E+03	2.313E-02	-4.934E-02	2.280E-01	-4.466E-02	1.445E-02	3.197E-23
		1.5	1.261E+03	1.436E-01	5.001E-02	2.981E-02	1.689E-02	1.950E-02	1.421E-22
		1.5	1.268E+03	1.022E-01	6.264E-03	7.380E-02	-1.480E-03	1.439E-02	8.129E-23
		1.5	1.285E+03	3.541E-02	-2.666E-03	6.378E-02	4.223E-04	1.155E-02	2.149E-23
		1.5	1.294E+03	8.426E-02	-1.515E-02	9.837E-02	-3.285E-03	1.153E-02	6.549E-23
		1.5	1.299E+03	6.330E-03	-2.808E-02	1.249E-01	-1.330E-02	1.068E-02	5.100E-24
		1.5	1.316E+03	2.179E-01	2.351E-02	4.731E-02	1.284E-02	1.582E-02	1.714E-22
		2.5	1.260E+03	1.121E-01	8.731E-03	1.114E-01	2.709E-03	2.103E-02	1.411E-22
		2.5	1.269E+03	1.685E-01	4.491E-02	4.407E-02	1.801E-02	2.363E-02	1.823E-22
		2.5	1.283E+03	4.267E-01	1.915E-02	1.027E-01	9.643E-03	2.241E-02	5.552E-22
		2.5	1.300E+03	1.277E-01	7.878E-02	1.902E-02	3.500E-02	2.871E-02	1.633E-22
		3.5	1.264E+03	0.000E+00	-5.814E-02	2.384E-01	-1.109E-02	1.687E-02	0.000E+00
	$2p\rightarrow3d$	0.5	1.328E+03	5.551E-01	-5.074E-02	1.771E-01	1.732E-02	2.177E-02	7.357E-22
		0.5	1.340E+03	6.346E-01	-1.437E-01	5.359E-01	-1.090E-01	4.646E-01	1.628E-21
		0.5	1.350E+03	7.432E-01	1.522E-01	1.228E-01	1.681E-01	6.555E-01	2.940E-21
		0.5	1.378E+03	2.222E-02	-8.667E-01	3.244E+00	-7.450E-01	3.309E+00	3.108E-22
		1.5	1.330E+03	4.959E-01	-1.063E-01	3.561E-01	1.576E-02	6.011E-02	1.212E-21
		1.5	1.337E+03	3.400E-04	-4.412E-02	1.256E-01	1.905E-02	4.271E-02	3.114E-25
		1.5	1.343E+03	3.699E-01	-4.340E-01	1.598E+00	-3.517E-01	1.396E+00	2.710E-21
		1.5	1.354E+03	2.349E-02	-4.229E-01	1.567E+00	-3.534E-01	1.474E+00	1.649E-22
		1.5	1.365E+03	9.770E-01	-3.670E-02	1.075E-01	2.605E-02	2.349E-02	8.259E-22
		1.5	1.374E+03	5.548E-01	-9.766E-01	3.544E+00	-8.143E-01	3.441E+00	8.387E-21
		1.5	1.388E+03	6.130E-01	-7.288E-01	2.664E+00	-5.890E-01	2.650E+00	6.975E-21
		2.5	1.333E+03	1.698E-01	-7.025E-02	2.611E-01	9.478E-02	2.165E-02	4.444E-22
		2.5	1.334E+03	4.206E-01	1.670E-02	8.660E-02	6.315E-02	1.791E-02	6.398E-22
		2.5	1.338E+03	3.106E-01	4.873E-02	-4.653E-04	7.156E-02	1.222E-02	3.383E-22
		2.5	1.352E+03	5.420E-01	-2.701E-03	3.587E-02	5.181E-02	7.426E-03	4.098E-22
		2.5	1.367E+03	3.110E-01	-9.315E-03	9.998E-02	6.833E-02	1.509E-02	4.308E-22
		2.5	1.368E+03	2.620E-03	-4.344E-02	1.587E-01	8.954E-02	1.493E-02	4.667E-24
		2.5	1.383E+03	7.971E-01	-3.964E-03	7.736E-02	2.942E-02	1.593E-02	6.974E-22
		3.5	1.333E+03	6.028E-01	-1.876E-02	1.478E-01	7.788E-02	2.092E-02	1.143E-21
		3.5	1.338E+03	5.189E-01	5.341E-02	-4.850E-03	9.392E-02	1.439E-02	6.722E-22

TABLE V. Autoionization Branching Ratio and Fit Parameters for Excitation Cross Sections for Individual Levels

See page 76 for Explanation of Tables

Z	Transition	J	I_{ex}	B_j^a	A	B	C	D	Q_{ea}
32	$2p \rightarrow 3d$	3.5	1.349E+03	8.661E-01	1.484E-02	7.888E-02	6.160E-02	1.640E-02	1.203E-21
		3.5	1.369E+03	4.140E-01	9.161E-02	-1.914E-02	1.004E-01	1.681E-02	6.215E-22
		4.5	1.332E+03	0.000E+00	-6.392E-02	2.244E-01	1.305E-01	1.925E-02	0.000E+00
	$2p \rightarrow 3d(3p^2)$	0.5	1.313E+03	9.305E-01	-1.960E-02	7.142E-02	-1.317E-02	4.874E-02	3.392E-22
		0.5	1.322E+03	9.717E-01	-1.443E-02	5.098E-02	-7.615E-03	2.975E-02	2.618E-22
		0.5	1.331E+03	9.932E-01	-1.059E-02	3.493E-02	-1.253E-03	9.245E-03	2.105E-22
		0.5	1.359E+03	9.927E-01	-4.697E-02	1.669E-01	-3.187E-02	1.321E-01	7.707E-22
		1.5	1.316E+03	9.217E-01	-2.474E-02	8.907E-02	-1.373E-02	5.856E-02	4.385E-22
		1.5	1.333E+03	9.840E-01	-2.007E-02	6.411E-02	7.333E-04	1.886E-02	4.036E-22
		1.5	1.349E+03	7.993E-01	-1.346E-02	4.740E-02	-8.305E-03	4.167E-02	1.834E-22
		1.5	1.356E+03	7.258E-01	-1.505E-01	5.534E-01	-1.249E-01	5.087E-01	1.787E-21
		1.5	1.367E+03	9.968E-01	-7.441E-03	2.065E-02	9.324E-03	4.394E-03	1.957E-22
		2.5	1.318E+03	5.995E-01	-1.936E-03	8.344E-03	8.624E-03	1.277E-03	8.437E-23
		2.5	1.323E+03	6.280E-01	-1.666E-03	6.974E-03	7.386E-03	1.051E-03	7.415E-23
		2.5	1.348E+03	7.448E-01	-4.180E-04	1.451E-02	1.092E-02	2.500E-03	1.668E-22
		2.5	1.357E+03	1.997E-01	1.170E-04	6.888E-03	5.223E-03	1.229E-03	2.159E-23
		3.5	1.315E+03	8.338E-01	4.490E-03	1.824E-02	1.354E-02	4.110E-03	2.847E-22
		3.5	1.322E+03	5.691E-01	2.216E-03	6.658E-03	5.569E-03	1.617E-03	7.649E-23
	$2p \rightarrow 4p$	0.5	1.661E+03	6.215E-01	-5.359E-03	3.490E-02	6.846E-04	2.744E-03	1.109E-22
		0.5	1.663E+03	7.322E-01	1.453E-02	1.386E-02	2.609E-03	9.870E-04	1.336E-22
		0.5	1.669E+03	9.535E-01	3.907E-01	-7.481E-02	-1.193E-03	-1.608E-02	1.754E-21
		0.5	1.691E+03	8.252E-01	-8.301E-04	1.736E-02	5.529E-03	1.553E-03	1.035E-22
		0.5	1.695E+03	5.638E-01	-4.971E-03	2.119E-02	4.555E-03	1.710E-03	6.632E-23
		0.5	1.697E+03	9.729E-01	3.534E-01	2.525E-03	-4.547E-02	-1.431E-03	1.707E-21
		1.5	1.658E+03	5.600E-04	-1.485E-02	6.058E-02	7.715E-03	4.533E-03	1.772E-25
		1.5	1.661E+03	6.370E-02	1.148E-02	1.262E-02	1.527E-02	5.254E-03	1.480E-23
		1.5	1.662E+03	5.933E-02	-6.861E-03	2.560E-02	1.143E-02	2.591E-03	1.055E-23
		1.5	1.665E+03	1.900E-02	1.185E-02	4.302E-03	1.380E-02	4.523E-03	3.342E-24
		1.5	1.693E+03	4.047E-02	-7.630E-03	2.785E-02	1.675E-02	2.341E-03	8.498E-24
		1.5	1.694E+03	1.127E-01	1.771E-03	1.562E-02	9.525E-03	3.291E-03	1.720E-23
		1.5	1.696E+03	6.970E-03	-2.436E-03	2.691E-02	1.165E-02	4.016E-03	1.425E-24
		2.5	1.659E+03	2.290E-02	1.876E-02	8.666E-03	2.498E-02	6.999E-03	7.098E-24
		2.5	1.662E+03	5.031E-02	7.936E-03	1.808E-02	2.028E-02	5.978E-03	1.372E-23
		2.5	1.664E+03	7.763E-02	-4.668E-03	3.599E-02	1.985E-02	5.187E-03	2.335E-23
		2.5	1.696E+03	6.713E-02	2.178E-02	1.417E-03	2.627E-02	6.615E-03	1.880E-23
		3.5	1.661E+03	0.000E+00	-1.633E-02	6.076E-02	3.424E-02	4.850E-03	0.000E+00
	$2p \rightarrow 4d$	0.5	1.682E+03	5.275E-02	-1.012E-02	3.501E-02	3.277E-02	3.609E-03	1.749E-23
		0.5	1.686E+03	5.604E-01	-1.291E-02	6.342E-02	1.945E-02	3.117E-02	2.245E-22
		0.5	1.689E+03	1.890E-01	1.115E-01	2.151E-01	-1.211E-02	4.967E-01	3.389E-22
		0.5	1.721E+03	3.108E-01	9.321E-02	1.774E-01	-2.986E-03	4.185E-01	4.571E-22
		1.5	1.683E+03	3.000E-03	-1.951E-02	6.533E-02	5.396E-02	9.609E-03	1.720E-24
		1.5	1.686E+03	4.246E-01	-3.999E-03	6.890E-02	2.350E-02	6.723E-02	2.150E-22
		1.5	1.687E+03	2.333E-01	-9.162E-03	2.871E-02	4.679E-02	3.648E-03	8.853E-23
		1.5	1.691E+03	6.720E-02	1.912E-01	5.324E-01	-6.399E-02	1.056E+00	2.523E-22
		1.5	1.717E+03	9.608E-02	-8.025E-03	3.843E-02	2.511E-02	2.477E-02	2.946E-23
		1.5	1.719E+03	3.432E-01	-1.601E-02	6.265E-02	3.836E-02	2.540E-02	1.607E-22
		1.5	1.721E+03	3.529E-02	1.461E-01	4.230E-01	-4.251E-02	8.431E-01	1.021E-22
		2.5	1.684E+03	1.682E-01	-1.003E-02	3.305E-02	7.186E-02	3.395E-03	9.157E-23
		2.5	1.685E+03	2.060E-01	-7.926E-04	1.773E-02	5.228E-02	4.951E-03	8.172E-23
		2.5	1.687E+03	8.499E-02	6.112E-03	-2.275E-03	4.877E-02	2.775E-03	2.557E-23
		2.5	1.688E+03	3.954E-02	1.007E-02	-9.603E-03	5.208E-02	2.716E-03	1.187E-23
		2.5	1.717E+03	2.444E-01	-4.661E-04	1.618E-02	5.957E-02	3.851E-03	1.015E-22
		2.5	1.718E+03	7.910E-03	-6.551E-03	1.956E-02	6.502E-02	2.072E-03	3.403E-24
		2.5	1.719E+03	1.000E-05	1.644E-03	8.616E-03	5.303E-02	3.132E-03	3.485E-27
		3.5	1.684E+03	6.652E-01	9.099E-03	2.133E-03	6.505E-02	4.756E-03	2.912E-22
		3.5	1.685E+03	1.781E-01	1.909E-02	-1.817E-02	6.434E-02	4.093E-03	6.660E-23
		3.5	1.687E+03	6.923E-02	-2.932E-03	1.403E-02	6.909E-02	3.230E-03	3.174E-23
		3.5	1.719E+03	2.114E-02	2.145E-02	-2.032E-02	6.459E-02	3.994E-03	7.652E-24
		4.5	1.684E+03	0.000E+00	-1.220E-02	3.809E-02	9.876E-02	3.769E-03	0.000E+00

TABLE V. Autoionization Branching Ratio and Fit Parameters for Excitation Cross Sections for Individual Levels

See page 76 for Explanation of Tables

Z	Transition	J	I_{ex}	B_j^a	A	B	C	D	Q_{ea}
34	$2s\rightarrow3s$	0.5	1.639E+03	9.967E-01	3.040E-01	-8.197E-02	2.375E-02	-1.001E-02	1.485E-21
	$2s\rightarrow3p$	0.5	1.677E+03	7.839E-01	-1.855E-02	4.744E-02	-5.367E-03	1.691E-02	1.066E-22
		0.5	1.689E+03	9.193E-01	-3.002E-01	4.353E-01	-5.050E-02	4.605E-01	4.439E-22
		0.5	1.711E+03	9.008E-01	-1.510E-01	2.290E-01	-2.658E-02	2.208E-01	2.575E-22
		1.5	1.680E+03	5.549E-01	-6.738E-02	1.387E-01	-1.612E-02	8.075E-02	1.764E-22
		1.5	1.696E+03	8.518E-01	-7.627E-01	1.088E+00	-1.246E-01	1.176E+00	9.694E-22
		1.5	1.712E+03	9.884E-01	-8.976E-02	1.695E-01	-1.957E-02	1.123E-01	3.304E-22
		2.5	1.687E+03	0.000E+00	-2.455E-02	9.753E-02	-1.570E-03	7.181E-03	0.000E+00
	$2s\rightarrow3d$	0.5	1.758E+03	0.000E+00	-1.192E-02	4.605E-02	1.662E-02	3.521E-03	0.000E+00
		1.5	1.758E+03	3.582E-02	-2.383E-02	9.309E-02	3.181E-02	7.381E-03	1.906E-23
		1.5	1.772E+03	9.991E-01	9.600E-01	-1.005E+00	3.976E-01	6.961E-02	1.823E-21
		1.5	1.780E+03	9.683E-01	1.553E-01	-1.163E-01	8.161E-02	1.904E-02	5.994E-22
		2.5	1.759E+03	1.786E-02	-3.547E-02	1.409E-01	4.651E-02	1.155E-02	1.428E-23
		2.5	1.774E+03	9.807E-01	1.589E+00	-1.677E+00	6.507E-01	1.129E-01	2.857E-21
		2.5	1.781E+03	9.759E-01	6.484E-02	1.596E-02	6.049E-02	1.847E-02	7.076E-22
		3.5	1.760E+03	0.000E+00	-4.764E-02	1.839E-01	6.681E-02	1.407E-02	0.000E+00
	$2p\rightarrow3s$	0.5	1.462E+03	3.331E-01	-4.603E-02	8.149E-02	-1.615E-02	5.012E-02	4.898E-23
		1.5	1.419E+03	4.390E-01	-8.650E-02	1.566E-01	-3.137E-02	9.722E-02	1.375E-22
	$2p\rightarrow3p$	0.5	1.465E+03	2.192E-01	1.494E-02	5.748E-02	-7.745E-03	2.998E-03	1.075E-22
		0.5	1.476E+03	1.031E-01	1.284E-01	3.708E-02	1.869E-03	-6.078E-03	1.290E-22
		0.5	1.493E+03	9.894E-01	5.037E-01	-1.721E-01	7.641E-02	-4.284E-02	2.947E-21
		0.5	1.502E+03	7.023E-02	-1.243E-02	5.642E-02	-2.678E-03	4.275E-03	2.092E-23
		0.5	1.521E+03	9.706E-01	1.569E+00	-6.835E-01	2.597E-01	-1.442E-01	7.825E-21
		0.5	1.535E+03	9.903E-01	1.368E+00	-6.039E-01	2.298E-01	-1.294E-01	6.802E-21
		1.5	1.457E+03	6.377E-02	-4.560E-02	2.131E-01	-3.913E-02	1.374E-02	6.273E-23
		1.5	1.463E+03	1.266E-01	5.788E-02	1.992E-02	2.210E-02	1.810E-02	9.619E-23
		1.5	1.472E+03	8.310E-02	2.901E-03	7.950E-02	-1.531E-03	1.298E-02	5.051E-23
		1.5	1.490E+03	2.158E-02	1.129E-03	5.768E-02	3.567E-03	1.096E-02	9.872E-24
		1.5	1.505E+03	6.791E-02	-1.572E-02	9.855E-02	-1.835E-03	1.073E-02	3.950E-23
		1.5	1.512E+03	8.440E-03	-2.821E-02	1.270E-01	-1.254E-02	1.085E-02	5.178E-24
		1.5	1.531E+03	1.610E-01	3.003E-02	3.693E-02	1.818E-02	1.465E-02	9.522E-23
		2.5	1.462E+03	9.338E-02	2.444E-03	1.317E-01	-1.113E-02	2.548E-02	8.749E-23
		2.5	1.472E+03	1.491E-01	5.367E-02	2.960E-02	2.549E-02	2.141E-02	1.217E-22
		2.5	1.487E+03	3.628E-01	1.870E-02	1.012E-01	1.224E-02	2.013E-02	3.529E-22
		2.5	1.514E+03	1.039E-01	8.753E-02	2.980E-03	4.410E-02	2.530E-02	9.932E-23
		3.5	1.467E+03	0.000E+00	-5.764E-02	2.373E-01	-9.516E-03	1.670E-02	0.000E+00
	$2p\rightarrow3d$	0.5	1.538E+03	5.100E-04	-4.740E-02	1.726E-01	1.841E-02	2.149E-02	5.038E-25
		0.5	1.552E+03	7.330E-01	-3.273E-02	4.014E-01	-3.315E-02	5.031E-01	1.662E-21
		0.5	1.564E+03	1.538E-01	-4.695E-02	6.966E-01	-7.040E-02	9.411E-01	5.925E-22
		0.5	1.599E+03	3.005E-02	-9.729E-02	1.840E+00	-1.714E-01	2.780E+00	3.004E-22
		1.5	1.540E+03	2.601E-01	-9.114E-02	3.281E-01	2.698E-02	5.408E-02	4.711E-22
		1.5	1.547E+03	4.060E-02	-3.300E-02	1.079E-01	2.702E-02	4.172E-02	2.813E-23
		1.5	1.556E+03	5.665E-01	-7.872E-02	1.149E+00	-1.058E-01	1.500E+00	3.675E-21
		1.5	1.566E+03	2.252E-01	-6.334E-03	6.380E-01	-2.763E-02	9.714E-01	9.023E-22
		1.5	1.586E+03	9.927E-01	-2.434E-02	7.718E-02	2.352E-02	1.770E-02	4.907E-22
		1.5	1.595E+03	4.607E-01	-1.172E-01	1.976E+00	-1.612E-01	2.878E+00	5.004E-21
		1.5	1.610E+03	5.570E-01	-9.534E-02	1.497E+00	-1.087E-01	2.211E+00	4.521E-21
		2.5	1.543E+03	3.043E-01	-6.545E-02	2.462E-01	8.339E-02	2.114E-02	5.494E-22
		2.5	1.545E+03	3.748E-01	4.935E-02	2.854E-02	1.002E-01	7.646E-03	4.551E-22
		2.5	1.549E+03	2.626E-01	4.244E-02	1.110E-02	6.909E-02	1.258E-02	2.185E-22
		2.5	1.564E+03	4.347E-01	-2.279E-03	3.648E-02	4.962E-02	7.549E-03	2.423E-22
		2.5	1.587E+03	2.184E-01	-5.930E-03	9.419E-02	6.495E-02	1.481E-02	2.161E-22
		2.5	1.588E+03	2.200E-04	-4.868E-02	1.760E-01	9.209E-02	1.555E-02	3.114E-25
		2.5	1.605E+03	7.482E-01	1.426E-02	3.924E-02	4.972E-02	1.002E-02	4.878E-22
		3.5	1.543E+03	5.748E-01	-1.667E-02	1.480E-01	7.453E-02	2.129E-02	8.085E-22
		3.5	1.549E+03	4.794E-01	5.528E-02	-5.300E-03	9.298E-02	1.435E-02	4.649E-22

TABLE V. Autoionization Branching Ratio and Fit Parameters for Excitation Cross Sections for Individual Levels

See page 76 for Explanation of Tables

Z	Transition	J	I_{ex}	B_j^a	A	B	C	D	Q_{ea}
34	$2p \rightarrow 3d$	3.5	1.561E+03	8.155E-01	1.388E-02	8.137E-02	5.865E-02	1.624E-02	8.381E-22
		3.5	1.590E+03	3.630E-01	9.734E-02	-2.727E-02	1.052E-01	1.479E-02	4.094E-22
		4.5	1.543E+03	0.000E+00	-6.533E-02	2.305E-01	1.253E-01	1.966E-02	0.000E+00
	$2p \rightarrow 3d(3p^2)$	0.5	1.522E+03	9.071E-01	-1.866E-02	6.911E-02	-1.329E-02	4.601E-02	2.367E-22
		0.5	1.533E+03	9.661E-01	-1.873E-02	6.561E-02	-1.004E-02	3.434E-02	2.465E-22
		0.5	1.543E+03	9.918E-01	-8.918E-03	3.010E-02	9.933E-04	4.816E-03	1.504E-22
		0.5	1.574E+03	9.932E-01	-2.906E-02	1.079E-01	-2.263E-02	9.012E-02	3.668E-22
		1.5	1.524E+03	8.875E-01	-2.780E-02	9.835E-02	-1.746E-02	6.178E-02	3.300E-22
		1.5	1.545E+03	9.753E-01	-2.061E-02	6.682E-02	4.965E-03	1.230E-02	3.405E-22
		1.5	1.551E+03	9.825E-01	-1.622E-02	6.019E-02	-1.194E-02	4.754E-02	2.128E-22
		1.5	1.568E+03	2.783E-02	-3.025E-01	1.102E+00	-2.735E-01	9.964E-01	9.687E-23
		1.5	1.577E+03	8.706E-01	-6.214E-02	2.295E-01	-4.735E-02	1.971E-01	6.840E-22
		1.5	1.586E+03	9.938E-01	-8.300E-03	2.722E-02	2.345E-02	2.608E-03	2.723E-22
		2.5	1.528E+03	5.490E-01	-2.087E-03	8.555E-03	8.214E-03	1.264E-03	5.621E-23
		2.5	1.534E+03	5.243E-01	-2.057E-03	8.049E-03	7.878E-03	1.156E-03	5.030E-23
		2.5	1.567E+03	7.125E-01	-4.231E-04	1.446E-02	1.029E-02	2.488E-03	1.148E-22
		2.5	1.578E+03	1.621E-01	-5.417E-04	8.985E-03	6.027E-03	1.462E-03	1.533E-23
		3.5	1.524E+03	8.094E-01	4.615E-03	1.825E-02	1.256E-02	4.106E-03	2.010E-22
		3.5	1.534E+03	4.526E-01	3.078E-03	8.036E-03	6.532E-03	2.038E-03	5.527E-23
	$2p \rightarrow 4p$	0.5	1.932E+03	4.987E-01	-5.924E-03	3.167E-02	2.453E-03	2.428E-03	6.132E-23
		0.5	1.935E+03	7.279E-01	1.788E-02	1.172E-02	4.364E-03	4.174E-04	1.075E-22
		0.5	1.941E+03	9.413E-01	4.621E-01	-1.800E-01	5.437E-02	-3.484E-02	1.368E-21
		0.5	1.972E+03	7.727E-01	-9.335E-04	1.631E-02	6.264E-03	1.411E-03	6.993E-23
		0.5	1.978E+03	6.758E-01	-4.550E-03	2.100E-02	4.903E-03	1.710E-03	6.004E-23
		0.5	1.978E+03	9.497E-01	4.175E-01	-1.575E-01	4.403E-02	-3.055E-02	1.200E-21
		1.5	1.929E+03	1.780E-03	-1.396E-02	5.725E-02	8.903E-03	4.325E-03	4.064E-25
		1.5	1.932E+03	5.318E-02	1.509E-02	5.843E-03	1.822E-02	4.719E-03	9.076E-24
		1.5	1.933E+03	4.158E-02	-7.608E-03	2.755E-02	1.294E-02	2.294E-03	5.952E-24
		1.5	1.937E+03	1.561E-02	1.240E-02	3.050E-03	1.489E-02	4.152E-03	2.055E-24
		1.5	1.974E+03	2.912E-02	-6.612E-03	2.425E-02	1.538E-02	2.028E-03	4.016E-24
		1.5	1.976E+03	1.528E-02	2.834E-03	2.026E-02	1.453E-02	4.124E-03	2.396E-24
		1.5	1.978E+03	1.710E-03	-1.693E-03	2.567E-02	1.294E-02	3.847E-03	2.626E-25
		2.5	1.930E+03	2.464E-02	2.090E-02	4.833E-03	2.750E-02	6.314E-03	5.734E-24
		2.5	1.934E+03	4.043E-02	9.484E-03	1.523E-02	2.225E-02	5.494E-03	8.262E-24
		2.5	1.936E+03	6.482E-02	-3.420E-03	3.393E-02	2.133E-02	4.996E-03	1.459E-23
		2.5	1.978E+03	2.829E-02	2.382E-02	-1.623E-03	2.923E-02	6.045E-03	6.051E-24
		3.5	1.933E+03	0.000E+00	-1.617E-02	6.034E-02	3.541E-02	4.796E-03	0.000E+00
	$2p \rightarrow 4d$	0.5	1.957E+03	1.606E-01	-9.608E-03	3.405E-02	3.284E-02	3.405E-03	3.911E-23
		0.5	1.961E+03	4.895E-01	-8.436E-03	4.932E-02	2.508E-02	2.171E-02	1.367E-22
		0.5	1.965E+03	1.509E-01	1.931E-01	1.082E-01	3.609E-02	4.888E-01	2.146E-22
		0.5	2.006E+03	6.643E-01	1.095E-01	7.114E-02	2.585E-02	2.960E-01	5.549E-22
		1.5	1.958E+03	2.346E-02	-1.654E-02	5.757E-02	5.699E-02	7.161E-03	9.766E-24
		1.5	1.961E+03	3.107E-01	9.902E-03	4.458E-02	3.341E-02	6.136E-02	1.156E-22
		1.5	1.962E+03	1.931E-01	-7.895E-03	2.579E-02	5.036E-02	2.549E-03	5.574E-23
		1.5	1.967E+03	4.220E-02	3.990E-01	2.288E-01	7.527E-02	1.015E+00	1.248E-22
		1.5	2.002E+03	5.622E-02	-3.771E-03	2.734E-02	3.044E-02	1.864E-02	1.233E-23
		1.5	2.004E+03	1.219E-01	-2.864E-03	3.783E-02	2.821E-02	2.733E-02	3.120E-23
		1.5	2.006E+03	1.553E-01	2.715E-01	1.764E-01	6.379E-02	7.368E-01	3.213E-22
		2.5	1.959E+03	1.911E-01	-9.119E-03	3.052E-02	6.773E-02	3.359E-03	7.225E-23
		2.5	1.960E+03	1.542E-01	1.505E-03	1.460E-02	5.784E-02	4.261E-03	4.831E-23
		2.5	1.962E+03	7.925E-02	5.788E-03	-1.874E-03	4.875E-02	2.773E-03	1.765E-23
		2.5	1.963E+03	2.705E-02	9.490E-03	-8.766E-03	5.217E-02	2.688E-03	6.042E-24
		2.5	2.003E+03	1.232E-01	-1.084E-03	1.744E-02	5.989E-02	3.894E-03	3.812E-23
		2.5	2.003E+03	2.500E-04	-7.513E-03	2.307E-02	6.872E-02	2.322E-03	8.545E-26
		2.5	2.004E+03	1.490E-02	2.489E-03	8.995E-03	5.597E-02	3.464E-03	4.071E-24
		3.5	1.959E+03	6.040E-01	1.037E-02	5.795E-04	6.507E-02	4.846E-03	1.948E-22
		3.5	1.960E+03	7.024E-02	1.809E-02	-1.649E-02	6.461E-02	4.104E-03	1.969E-23
		3.5	1.962E+03	7.117E-02	-2.746E-03	1.432E-02	6.869E-02	3.343E-03	2.414E-23
		3.5	2.004E+03	6.369E-02	2.330E-02	-2.302E-02	6.771E-02	4.030E-03	1.754E-23
		4.5	1.959E+03	0.000E+00	-1.247E-02	3.927E-02	9.858E-02	3.847E-03	0.000E+00

TABLE V. Autoionization Branching Ratio and Fit Parameters for Excitation Cross Sections for Individual Levels

See page 76 for Explanation of Tables

Z	Transition	J	I_{ex}	B_j^a	A	B	C	D	Q_{ea}
39	$2s\rightarrow3s$	0.5	2.268E+03	9.946E-01	3.104E-01	-7.987E-02	2.146E-02	-9.957E-03	7.932E-22
	$2s\rightarrow3p$	0.5	2.314E+03	6.150E-01	-3.425E-02	7.556E-02	-1.426E-02	3.161E-02	5.056E-23
		0.5	2.330E+03	8.094E-01	-3.229E-01	5.018E-01	-9.811E-02	4.235E-01	1.961E-22
		0.5	2.359E+03	7.203E-01	-2.432E-01	3.807E-01	-7.231E-02	3.128E-01	1.373E-22
		1.5	2.319E+03	4.200E-02	-9.956E-02	1.832E-01	-3.657E-02	1.124E-01	5.980E-24
		1.5	2.343E+03	6.593E-01	-9.932E-01	1.511E+00	-2.935E-01	1.310E+00	4.388E-22
		1.5	2.361E+03	9.868E-01	-8.798E-02	1.802E-01	-3.382E-02	8.687E-02	1.681E-22
		2.5	2.332E+03	0.000E+00	-2.472E-02	9.858E-02	4.965E-04	7.221E-03	0.000E+00
	$2s\rightarrow3d$	0.5	2.418E+03	0.000E+00	-1.199E-02	4.721E-02	1.590E-02	3.524E-03	0.000E+00
		1.5	2.419E+03	1.723E-01	-1.888E-02	9.368E-02	2.580E-02	9.217E-03	4.821E-23
		1.5	2.436E+03	9.999E-01	9.166E-01	-9.355E-01	3.816E-01	7.656E-02	9.942E-22
		1.5	2.447E+03	9.181E-01	2.066E-01	-1.721E-01	9.888E-02	2.370E-02	3.326E-22
		2.5	2.421E+03	3.144E-01	-3.396E-02	1.344E-01	4.442E-02	1.018E-02	1.265E-22
		2.5	2.439E+03	9.491E-01	1.590E+00	-1.642E+00	6.520E-01	1.311E-01	1.557E-21
		2.5	2.448E+03	9.513E-01	4.559E-02	3.740E-02	4.997E-02	1.732E-02	3.436E-22
		3.5	2.422E+03	0.000E+00	-4.781E-02	1.882E-01	6.429E-02	1.404E-02	0.000E+00
	$2p\rightarrow3s$	0.5	2.058E+03	2.023E-01	-5.613E-02	1.000E-01	-2.417E-02	5.422E-02	1.535E-23
		1.5	1.978E+03	3.283E-01	-1.046E-01	1.910E-01	-4.678E-02	1.044E-01	5.411E-23
	$2p\rightarrow3p$	0.5	2.036E+03	2.283E-01	1.123E-02	6.323E-02	-1.002E-02	3.592E-03	5.774E-23
		0.5	2.056E+03	4.881E-02	1.194E-01	5.103E-02	-7.450E-03	-3.289E-03	3.063E-23
		0.5	2.080E+03	9.867E-01	1.013E+00	-3.069E-01	9.257E-02	-7.305E-02	2.964E-21
		0.5	2.109E+03	3.526E-02	-1.138E-02	6.004E-02	-4.055E-03	4.784E-03	5.756E-24
		0.5	2.130E+03	9.559E-01	1.627E+00	-3.771E-01	3.574E-02	-9.710E-02	4.408E-21
		0.5	2.150E+03	9.699E-01	5.645E-01	-8.295E-02	2.537E-03	-3.013E-02	1.652E-21
		1.5	2.027E+03	8.264E-02	-3.650E-02	1.811E-01	-2.882E-02	1.273E-02	3.789E-23
		1.5	2.034E+03	8.836E-02	5.710E-02	2.629E-02	2.151E-02	1.963E-02	3.646E-23
		1.5	2.050E+03	4.744E-02	-9.289E-03	1.030E-01	-7.185E-03	1.268E-02	1.588E-23
		1.5	2.071E+03	4.760E-03	7.508E-03	5.037E-02	6.931E-03	1.200E-02	1.170E-24
		1.5	2.113E+03	3.452E-02	-2.068E-02	1.054E-01	-1.648E-03	1.024E-02	1.045E-23
		1.5	2.128E+03	7.450E-03	-2.704E-02	1.273E-01	-9.043E-03	1.062E-02	2.442E-24
		1.5	2.149E+03	5.965E-02	3.472E-02	3.192E-02	2.155E-02	1.626E-02	1.854E-23
		2.5	2.033E+03	5.676E-02	2.972E-02	8.226E-02	1.546E-02	2.190E-02	2.848E-23
		2.5	2.052E+03	1.062E-01	5.569E-02	2.879E-02	2.748E-02	2.338E-02	4.597E-23
		2.5	2.068E+03	2.338E-01	6.142E-03	1.183E-01	8.445E-03	1.993E-02	1.182E-22
		2.5	2.129E+03	5.698E-02	8.367E-02	9.364E-03	4.485E-02	2.753E-02	2.820E-23
		3.5	2.046E+03	0.000E+00	-5.658E-02	2.349E-01	-6.044E-03	1.635E-02	0.000E+00
	$2p\rightarrow3d$	0.5	2.129E+03	9.295E-01	-5.415E-02	1.850E-01	-4.734E-03	3.605E-02	4.210E-22
		0.5	2.147E+03	7.487E-01	-2.088E-01	8.337E-01	-2.126E-01	7.117E-01	1.090E-21
		0.5	2.165E+03	2.208E-01	-3.927E-01	1.677E+00	-4.138E-01	1.553E+00	6.669E-22
		0.5	2.229E+03	2.032E-01	-4.278E-01	1.652E+00	-4.302E-01	1.537E+00	5.285E-22
		1.5	2.131E+03	7.233E-02	-9.793E-02	3.373E-01	1.307E-02	5.065E-02	6.544E-23
		1.5	2.140E+03	1.964E-01	-4.703E-02	1.427E-01	1.125E-02	4.926E-02	7.464E-23
		1.5	2.155E+03	7.189E-01	-6.204E-01	2.449E+00	-6.613E-01	2.154E+00	2.941E-21
		1.5	2.167E+03	4.291E-01	-5.447E-01	2.268E+00	-5.609E-01	2.106E+00	1.728E-21
		1.5	2.214E+03	3.109E-01	-1.896E-02	6.468E-02	5.380E-02	5.751E-03	1.028E-22
		1.5	2.225E+03	2.020E-01	-8.932E-01	3.354E+00	-8.622E-01	2.984E+00	1.062E-21
		1.5	2.243E+03	4.295E-01	-3.797E-02	1.119E+00	1.675E-02	1.784E+00	1.524E-21
		2.5	2.135E+03	3.893E-01	-3.906E-02	1.808E-01	6.372E-02	1.900E-02	2.856E-22
		2.5	2.137E+03	2.682E-01	8.312E-03	1.387E-01	6.206E-02	2.227E-02	1.998E-22
		2.5	2.143E+03	1.558E-01	2.603E-02	4.016E-02	6.524E-02	1.344E-02	7.258E-23
		2.5	2.162E+03	2.710E-01	-6.580E-04	3.338E-02	4.616E-02	7.212E-03	7.445E-23
		2.5	2.217E+03	6.170E-02	4.166E-03	7.353E-02	6.188E-02	1.342E-02	2.853E-23
		2.5	2.218E+03	4.100E-03	-5.440E-02	1.989E-01	1.005E-01	1.619E-02	3.322E-24
		2.5	2.239E+03	6.401E-01	1.843E-02	3.188E-02	4.727E-02	9.259E-03	2.028E-22
		3.5	2.135E+03	4.843E-01	-1.433E-02	1.440E-01	7.158E-02	2.050E-02	3.479E-22
		3.5	2.143E+03	3.811E-01	5.778E-02	-5.973E-03	9.240E-02	1.446E-02	1.947E-22
		3.5	2.158E+03	6.701E-01	9.940E-03	8.328E-02	5.305E-02	1.544E-02	3.426E-22
		3.5	2.221E+03	2.323E-01	9.284E-02	-1.368E-02	1.003E-01	1.690E-02	1.376E-22

TABLE V. Autoionization Branching Ratio and Fit Parameters for Excitation Cross Sections for Individual Levels

See page 76 for Explanation of Tables

Z	Transition	J	I_{ex}	B_j^a	A	B	C	D	Q_{ea}
39	$2p \rightarrow 3d$	4.5	2.136E+03	0.000E+00	-6.512E-02	2.336E-01	1.235E-01	1.952E-02	0.000E+00
	$2p \rightarrow 3d(3p^2)$	0.5	2.111E+03	8.332E-01	-1.637E-02	6.219E-02	-1.264E-02	3.903E-02	1.010E-22
		0.5	2.127E+03	9.568E-01	-3.331E-02	1.141E-01	-6.582E-03	2.660E-02	2.553E-22
		0.5	2.138E+03	9.860E-01	-6.315E-03	2.137E-02	-1.203E-03	5.908E-03	4.863E-23
		0.5	2.228E+03	1.171E-01	-2.772E-01	1.169E+00	-2.843E-01	1.151E+00	2.333E-22
		1.5	2.113E+03	7.695E-01	-2.627E-02	9.915E-02	-1.799E-02	6.221E-02	1.540E-22
		1.5	2.142E+03	9.366E-01	-2.060E-02	7.633E-02	2.982E-02	6.147E-03	2.842E-22
		1.5	2.151E+03	6.619E-01	-1.628E-01	6.458E-01	-1.650E-01	5.474E-01	7.404E-22
		1.5	2.193E+03	4.744E-01	-2.972E-02	1.189E-01	-2.719E-02	1.033E-01	9.957E-23
		1.5	2.208E+03	9.505E-01	-7.550E-02	2.712E-01	-5.489E-02	2.019E-01	4.468E-22
		2.5	2.117E+03	4.382E-01	-2.169E-03	8.380E-03	8.225E-03	1.155E-03	2.297E-23
		2.5	2.130E+03	2.420E-01	-3.598E-03	1.233E-02	1.217E-02	1.525E-03	1.814E-23
		2.5	2.193E+03	5.709E-01	-5.742E-04	1.509E-02	9.415E-03	2.553E-03	4.624E-23
		2.5	2.211E+03	1.565E-02	-5.121E-03	2.236E-02	1.329E-02	2.550E-03	1.590E-24
		3.5	2.112E+03	7.436E-01	4.981E-01	-1.748E+00	2.558E+00	-1.451E-01	3.549E-21
		3.5	2.130E+03	4.727E-02	5.252E-01	-1.802E+00	2.538E+00	-1.527E-01	2.140E-22
	$2p \rightarrow 4p$	0.5	2.702E+03	2.668E-01	-6.080E-03	2.606E-02	5.260E-03	1.948E-03	1.501E-23
		0.5	2.707E+03	6.741E-01	1.967E-02	1.528E-02	3.474E-03	7.573E-04	5.750E-23
		0.5	2.716E+03	8.996E-01	4.782E-01	-1.419E-01	2.551E-02	-2.741E-02	7.183E-22
		0.5	2.779E+03	7.133E-01	-1.578E-03	1.423E-02	6.852E-03	1.266E-03	2.933E-23
		0.5	2.785E+03	8.918E-01	3.583E-01	-9.531E-02	1.244E-02	-1.815E-02	5.153E-22
		0.5	2.788E+03	1.363E-01	-4.614E-03	1.890E-02	7.023E-03	1.489E-03	6.083E-24
		1.5	2.698E+03	1.083E-02	-1.217E-02	5.072E-02	1.128E-02	3.932E-03	1.206E-24
		1.5	2.702E+03	3.299E-02	1.460E-02	4.572E-03	1.934E-02	4.626E-03	2.832E-24
		1.5	2.706E+03	5.190E-03	-8.240E-03	3.407E-02	1.184E-02	3.126E-03	4.345E-25
		1.5	2.710E+03	1.006E-02	1.207E-02	3.139E-03	1.597E-02	4.116E-03	6.950E-25
		1.5	2.780E+03	1.885E-02	-7.216E-03	2.667E-02	1.971E-02	2.176E-03	1.554E-24
		1.5	2.786E+03	1.143E-02	3.317E-03	1.929E-02	1.654E-02	4.151E-03	9.384E-25
		1.5	2.787E+03	5.930E-03	-1.148E-03	2.489E-02	1.486E-02	3.846E-03	4.795E-25
		2.5	2.699E+03	2.516E-02	2.135E-02	4.421E-03	2.916E-02	6.566E-03	3.087E-24
		2.5	2.707E+03	2.387E-02	9.639E-03	1.510E-02	2.340E-02	5.575E-03	2.553E-24
		2.5	2.709E+03	4.095E-02	-1.779E-03	3.141E-02	2.340E-02	5.033E-03	4.815E-24
		2.5	2.788E+03	2.100E-02	2.542E-02	-2.536E-03	3.294E-02	6.583E-03	2.454E-24
		3.5	2.706E+03	0.000E+00	-1.566E-02	5.884E-02	3.861E-02	4.633E-03	0.000E+00
	$2p \rightarrow 4d$	0.5	2.732E+03	4.781E-02	-9.023E-03	3.250E-02	3.393E-02	2.822E-03	5.983E-24
		0.5	2.737E+03	2.631E-01	-1.283E-02	5.224E-02	2.284E-02	1.553E-02	3.557E-23
		0.5	2.743E+03	6.207E-02	1.309E-01	3.011E-01	-5.500E-02	5.647E-01	5.061E-23
		0.5	2.820E+03	1.238E-02	9.248E-02	1.964E-01	-2.200E-02	3.929E-01	6.761E-24
		1.5	2.734E+03	3.352E-02	-1.505E-02	5.222E-02	5.805E-02	5.213E-03	6.951E-24
		1.5	2.738E+03	7.134E-02	2.854E-03	5.863E-02	2.071E-02	6.424E-02	1.273E-23
		1.5	2.739E+03	1.507E-01	-1.445E-02	4.954E-02	4.348E-02	1.004E-02	2.569E-23
		1.5	2.745E+03	1.457E-02	2.600E-01	6.030E-01	-1.071E-01	1.127E+00	2.378E-23
		1.5	2.814E+03	1.148E-01	-6.384E-03	2.763E-02	2.868E-02	1.344E-02	1.178E-23
		1.5	2.819E+03	3.601E-01	-2.796E-03	5.837E-02	2.373E-02	4.855E-02	5.850E-23
		1.5	2.820E+03	5.344E-02	1.651E-01	3.514E-01	-3.605E-02	7.024E-01	5.253E-23
		2.5	2.735E+03	1.512E-01	-5.687E-03	2.190E-02	6.060E-02	3.106E-03	2.527E-23
		2.5	2.737E+03	8.321E-02	1.105E-03	2.056E-02	6.144E-02	5.036E-03	1.502E-23
		2.5	2.739E+03	5.813E-02	3.078E-03	1.085E-03	5.002E-02	2.495E-03	6.834E-24
		2.5	2.741E+03	1.247E-02	8.559E-03	-7.413E-03	5.244E-02	2.708E-03	1.447E-24
		2.5	2.816E+03	2.841E-02	-1.442E-03	1.185E-02	5.430E-02	2.688E-03	3.772E-24
		2.5	2.817E+03	1.915E-01	-6.594E-03	2.481E-02	5.678E-02	2.975E-03	2.946E-23
		2.5	2.819E+03	1.050E-03	3.887E-03	7.022E-03	5.579E-02	3.438E-03	1.435E-25
		3.5	2.735E+03	4.857E-01	1.358E-02	-4.006E-03	6.598E-02	5.000E-03	7.983E-23
		3.5	2.738E+03	8.900E-04	1.494E-02	-1.156E-02	6.522E-02	4.176E-03	1.326E-25
		3.5	2.740E+03	6.160E-02	-1.835E-03	1.334E-02	6.899E-02	3.430E-03	1.075E-23
		3.5	2.819E+03	3.282E-02	2.278E-02	-2.255E-02	6.821E-02	3.975E-03	4.601E-24
		4.5	2.736E+03	0.000E+00	-1.226E-02	3.928E-02	1.007E-01	3.768E-03	0.000E+00

TABLE VI. Excitation Energy of the $2p^6 3s\ ^2S_{1/2} \rightarrow 2p^5 3s^2\ ^2P_{3/2}$ Transition (in eV)

See page 76 for Explanation of Tables

Z	I'_{ex}	Z	I'_{ex}	Z	I'_{ex}	Z	I'_{ex}
18	2.439E+02	24	5.737E+02	30	1.037E+03	36	1.632E+03
19	2.895E+02	25	6.417E+02	31	1.127E+03	37	1.744E+03
20	3.389E+02	26	7.134E+02	32	1.221E+03	38	1.859E+03
21	3.920E+02	27	7.887E+02	33	1.318E+03	39	1.978E+03
22	4.488E+02	28	8.678E+02	34	1.419E+03		
23	5.094E+02	29	9.505E+02	35	1.524E+03		

TABLE VII. Fit Parameters for the Total Excitation-Autoionization Cross Section

See page 77 for Explanation of Tables

Z	$A(\mathrm{cm}^2)$	B
18	2.111E-13	-6.223E-2
22	1.512E-13	3.520E-2
24	9.580E-14	3.236E-1
26	8.574E-14	3.968E-1
30	7.103E-14	4.233E-1
32	6.079E-14	5.083E-1
34	5.535E-14	5.337E-1
39	4.882E-14	6.495E-1

TABLE VIII. Ionization Rate Coefficients for the $2s^2 2p^6 3s$ Ground State (in cm^3/s)

See page 77 for Explanation of Tables

	Ar^{7+}		Ti^{11+}		Cr^{13+}		Fe^{15+}	
kT	α_d	α_t	α_d	α_t	α_d	α_t	α_d	α_t
1.644E+01	7.813E-14	7.839E-14						
2.009E+01	4.089E-13	4.140E-13						
2.453E+01	1.600E-12	1.658E-12						
2.996E+01	4.931E-12	5.351E-12	1.024E-14	1.039E-14				
3.660E+01	1.249E-11	1.463E-11	6.431E-14	6.715E-14				
4.470E+01	2.695E-11	3.501E-11	2.921E-13	3.238E-13	2.239E-14	2.357E-14		
5.460E+01	5.112E-11	7.482E-11	1.017E-12	1.244E-12	1.141E-13	1.283E-13	1.077E-14	1.153E-14
6.669E+01	8.758E-11	1.445E-10	2.848E-12	3.978E-12	4.370E-13	5.452E-13	5.872E-14	6.823E-14
8.145E+01	1.388E-10	2.542E-10	6.675E-12	1.085E-11	1.323E-12	1.891E-12	2.376E-13	3.122E-13
9.948E+01	2.072E-10	4.115E-10	1.356E-11	2.563E-11	3.308E-12	5.493E-12	7.528E-13	1.152E-12
1.215E+02	2.957E-10	6.188E-10	2.463E-11	5.313E-11	7.085E-12	1.361E-11	1.953E-12	3.517E-12
1.484E+02	4.063E-10	8.727E-10	4.102E-11	9.810E-11	1.342E-11	2.925E-11	4.313E-12	9.045E-12
1.813E+02	5.425E-10	1.168E-09	6.401E-11	1.639E-10	2.314E-11	5.548E-11	8.379E-12	1.997E-11
2.214E+02	7.004E-10	1.490E-09	9.491E-11	2.513E-10	3.710E-11	9.454E-11	1.474E-11	3.860E-11
2.704E+02	8.755E-10	1.825E-09	1.349E-10	3.588E-10	5.623E-11	1.472E-10	2.405E-11	6.665E-11
3.303E+02	1.061E-09	2.158E-09	1.848E-10	4.828E-10	8.135E-11	2.125E-10	3.699E-11	1.047E-10
4.034E+02	1.250E-09	2.482E-09	2.445E-10	6.185E-10	1.133E-10	2.886E-10	5.419E-11	1.522E-10
4.927E+02	1.443E-09	2.791E-09	3.117E-10	7.590E-10	1.525E-10	3.728E-10	7.612E-11	2.073E-10
6.018E+02	1.625E-09	3.068E-09	3.836E-10	8.974E-10	1.972E-10	4.605E-10	1.035E-10	2.687E-10
7.351E+02	1.788E-09	3.308E-09	4.567E-10	1.031E-09	2.457E-10	5.472E-10	1.350E-10	3.325E-10
8.978E+02	1.932E-09	3.510E-09	5.326E-10	1.158E-09	2.955E-10	6.317E-10	1.694E-10	3.956E-10
1.097E+03	2.050E-09	3.670E-09	6.035E-10	1.270E-09	3.469E-10	7.114E-10	2.050E-10	4.570E-10
1.339E+03	2.142E-09	3.787E-09	6.678E-10	1.366E-09	3.959E-10	7.827E-10	2.415E-10	5.146E-10
1.636E+03	2.208E-09	3.865E-09	7.234E-10	1.446E-09	4.405E-10	8.442E-10	2.768E-10	5.665E-10
1.998E+03	2.242E-09	3.899E-09	7.696E-10	1.508E-09	4.790E-10	8.944E-10	3.090E-10	6.110E-10
2.441E+03	2.262E-09	3.907E-09	8.052E-10	1.552E-09	5.117E-10	9.342E-10	3.372E-10	6.477E-10
2.981E+03	2.258E-09	3.882E-09	8.303E-10	1.580E-09	5.368E-10	9.625E-10	3.606E-10	6.762E-10
3.641E+03	2.230E-09	3.825E-09	8.455E-10	1.592E-09	5.544E-10	9.800E-10	3.789E-10	6.967E-10
4.447E+03	2.184E-09	3.743E-09	8.504E-10	1.589E-09	5.650E-10	9.874E-10	3.919E-10	7.094E-10
5.432E+03	2.123E-09	3.640E-09	8.484E-10	1.576E-09	5.684E-10	9.852E-10	3.997E-10	7.148E-10
6.634E+03	2.051E-09	3.522E-09	8.373E-10	1.550E-09	5.669E-10	9.760E-10	4.023E-10	7.131E-10
8.103E+03	1.971E-09	3.391E-09	8.191E-10	1.513E-09	5.595E-10	9.591E-10	4.016E-10	7.066E-10
9.897E+03	1.885E-09	3.252E-09	7.953E-10	1.469E-09	5.469E-10	9.356E-10	3.966E-10	6.945E-10
1.209E+04	1.795E-09	3.107E-09	7.673E-10	1.419E-09	5.304E-10	9.071E-10	3.878E-10	6.777E-10
1.476E+04	1.703E-09	2.959E-09	7.363E-10	1.365E-09	5.110E-10	8.748E-10	3.762E-10	6.572E-10
1.803E+04	1.609E-09	2.808E-09	7.030E-10	1.307E-09	4.895E-10	8.396E-10	3.625E-10	6.339E-10
2.203E+04	1.516E-09	2.658E-09	6.684E-10	1.247E-09	4.664E-10	8.025E-10	3.472E-10	6.086E-10
2.690E+04	1.424E-09	2.509E-09	6.330E-10	1.186E-09	4.425E-10	7.641E-10	3.308E-10	5.818E-10
3.286E+04	1.334E-09	2.362E-09	5.973E-10	1.124E-09	4.181E-10	7.251E-10	3.138E-10	5.541E-10
4.013E+04	1.246E-09	2.220E-09	5.618E-10	1.063E-09	3.935E-10	6.860E-10	2.964E-10	5.260E-10
4.902E+04	1.162E-09	2.081E-09	5.268E-10	1.002E-09	3.691E-10	6.471E-10	2.789E-10	4.978E-10
5.987E+04	1.081E-09	1.948E-09	4.926E-10	9.431E-10	3.452E-10	6.089E-10	2.616E-10	4.697E-10
7.313E+04	1.004E-09	1.821E-09	4.596E-10	8.854E-10	3.219E-10	5.715E-10	2.445E-10	4.420E-10
8.932E+04	9.314E-10	1.699E-09	4.278E-10	8.297E-10	2.994E-10	5.353E-10	2.280E-10	4.150E-10
1.091E+05	8.628E-10	1.584E-09	3.974E-10	7.762E-10	2.778E-10	5.004E-10	2.119E-10	3.889E-10
1.333E+05	7.984E-10	1.475E-09	3.685E-10	7.249E-10	2.573E-10	4.670E-10	1.966E-10	3.636E-10
1.628E+05	7.382E-10	1.372E-09	3.413E-10	6.761E-10	2.379E-10	4.351E-10	1.820E-10	3.394E-10
1.988E+05	6.821E-10	1.275E-09	3.157E-10	6.299E-10	2.196E-10	4.049E-10	1.682E-10	3.163E-10
2.428E+05	6.299E-10	1.184E-09	2.917E-10	5.861E-10	2.024E-10	3.763E-10	1.552E-10	2.944E-10
2.966E+05	5.815E-10	1.099E-09	2.692E-10	5.449E-10	1.864E-10	3.493E-10	1.430E-10	2.737E-10
3.622E+05	5.368E-10	1.019E-09	2.484E-10	5.062E-10	1.716E-10	3.240E-10	1.316E-10	2.542E-10
4.424E+05	4.954E-10	9.454E-10	2.290E-10	4.699E-10	1.578E-10	3.004E-10	1.211E-10	2.358E-10
5.404E+05	4.574E-10	8.764E-10	2.111E-10	4.359E-10	1.451E-10	2.782E-10	1.113E-10	2.186E-10
6.600E+05	4.224E-10	8.122E-10	1.946E-10	4.042E-10	1.334E-10	2.576E-10	1.023E-10	2.026E-10
8.061E+05	3.902E-10	7.528E-10	1.793E-10	3.746E-10	1.226E-10	2.384E-10	9.397E-11	1.876E-10
9.846E+05	3.608E-10	6.977E-10	1.653E-10	3.471E-10	1.127E-10	2.206E-10	8.634E-11	1.737E-10
1.203E+06	3.339E-10	6.467E-10	1.524E-10	3.215E-10	1.037E-10	2.041E-10	7.934E-11	1.607E-10
1.469E+06	3.095E-10	5.997E-10	1.407E-10	2.978E-10	9.542E-11	1.889E-10	7.294E-11	1.487E-10
1.794E+06	2.872E-10	5.564E-10	1.299E-10	2.758E-10	8.791E-11	1.747E-10	6.710E-11	1.376E-10
2.191E+06	2.670E-10	5.165E-10	1.200E-10	2.555E-10	8.108E-11	1.617E-10	6.179E-11	1.273E-10
2.676E+06	2.489E-10	4.799E-10	1.111E-10	2.367E-10	7.489E-11	1.498E-10	5.696E-11	1.178E-10

TABLE VIII. Ionization Rate Coefficients for the $2s^2 2p^6 3s$ Ground State (in cm^3/s)

See page 77 for Explanation of Tables

	Zn^{19+}		Ge^{21+}		Se^{23+}		Y^{28+}	
kT	α_d	α_t	α_d	α_t	α_d	α_t	α_d	α_t
9.948E+01	2.996E-14	3.796E-14						
1.215E+02	1.229E-13	1.815E-13	2.756E-14	3.686E-14				
1.484E+02	3.939E-13	6.900E-13	1.097E-13	1.725E-13	2.862E-14	4.099E-14		
1.813E+02	1.032E-12	2.137E-12	3.428E-13	6.401E-13	1.085E-13	1.841E-13		
2.214E+02	2.300E-12	5.514E-12	8.804E-13	1.932E-12	3.261E-13	6.556E-13	2.283E-14	4.079E-14
2.704E+02	4.507E-12	1.213E-11	1.932E-12	4.855E-12	8.116E-13	1.900E-12	8.219E-14	1.776E-13
3.303E+02	8.003E-12	2.327E-11	3.744E-12	1.042E-11	1.738E-12	4.603E-12	2.369E-13	6.065E-13
4.034E+02	1.317E-11	3.985E-11	6.596E-12	1.958E-11	3.307E-12	9.566E-12	5.703E-13	1.677E-12
4.927E+02	2.044E-11	6.209E-11	1.080E-11	3.293E-11	5.750E-12	1.748E-11	1.191E-12	3.872E-12
6.018E+02	3.016E-11	8.953E-11	1.668E-11	5.055E-11	9.324E-12	2.873E-11	2.226E-12	7.688E-12
7.351E+02	4.254E-11	1.211E-10	2.453E-11	7.199E-11	1.429E-11	4.328E-11	3.824E-12	1.348E-11
8.978E+02	5.814E-11	1.560E-10	3.455E-11	9.649E-11	2.086E-11	6.070E-11	6.148E-12	2.136E-11
1.097E+03	7.597E-11	1.921E-10	4.694E-11	1.232E-10	2.923E-11	8.042E-11	9.357E-12	3.116E-11
1.339E+03	9.541E-11	2.277E-10	6.105E-11	1.507E-10	3.939E-11	1.016E-10	1.356E-11	4.251E-11
1.636E+03	1.155E-10	2.620E-10	7.629E-11	1.777E-10	5.083E-11	1.231E-10	1.889E-11	5.502E-11
1.998E+03	1.360E-10	2.940E-10	9.187E-11	2.033E-10	6.304E-11	1.443E-10	2.522E-11	6.811E-11
2.441E+03	1.556E-10	3.225E-10	1.079E-10	2.272E-10	7.537E-11	1.640E-10	3.225E-11	8.107E-11
2.981E+03	1.734E-10	3.467E-10	1.229E-10	2.483E-10	8.807E-11	1.824E-10	3.964E-11	9.359E-11
3.641E+03	1.889E-10	3.665E-10	1.365E-10	2.660E-10	9.973E-11	1.983E-10	4.718E-11	1.052E-10
4.447E+03	2.017E-10	3.816E-10	1.479E-10	2.801E-10	1.102E-10	2.115E-10	5.458E-11	1.157E-10
5.432E+03	2.116E-10	3.921E-10	1.577E-10	2.910E-10	1.189E-10	2.218E-10	6.137E-11	1.247E-10
6.634E+03	2.185E-10	3.983E-10	1.649E-10	2.982E-10	1.262E-10	2.295E-10	6.736E-11	1.320E-10
8.103E+03	2.225E-10	4.003E-10	1.698E-10	3.021E-10	1.315E-10	2.344E-10	7.232E-11	1.376E-10
9.897E+03	2.235E-10	3.984E-10	1.726E-10	3.029E-10	1.349E-10	2.366E-10	7.630E-11	1.416E-10
1.209E+04	2.228E-10	3.940E-10	1.730E-10	3.008E-10	1.367E-10	2.365E-10	7.914E-11	1.440E-10
1.476E+04	2.197E-10	3.865E-10	1.721E-10	2.968E-10	1.367E-10	2.343E-10	8.089E-11	1.448E-10
1.803E+04	2.145E-10	3.764E-10	1.694E-10	2.905E-10	1.356E-10	2.304E-10	8.148E-11	1.441E-10
2.203E+04	2.079E-10	3.643E-10	1.651E-10	2.823E-10	1.331E-10	2.248E-10	8.146E-11	1.426E-10
2.690E+04	2.001E-10	3.508E-10	1.598E-10	2.727E-10	1.295E-10	2.179E-10	8.052E-11	1.399E-10
3.286E+04	1.914E-10	3.363E-10	1.535E-10	2.621E-10	1.251E-10	2.099E-10	7.880E-11	1.362E-10
4.013E+04	1.823E-10	3.210E-10	1.468E-10	2.508E-10	1.200E-10	2.013E-10	7.649E-11	1.319E-10
4.902E+04	1.727E-10	3.053E-10	1.396E-10	2.390E-10	1.146E-10	1.922E-10	7.372E-11	1.269E-10
5.987E+04	1.630E-10	2.894E-10	1.321E-10	2.270E-10	1.088E-10	1.827E-10	7.062E-11	1.216E-10
7.313E+04	1.533E-10	2.735E-10	1.246E-10	2.148E-10	1.029E-10	1.732E-10	6.730E-11	1.160E-10
8.932E+04	1.437E-10	2.578E-10	1.171E-10	2.027E-10	9.695E-11	1.636E-10	6.384E-11	1.103E-10
1.091E+05	1.343E-10	2.424E-10	1.096E-10	1.908E-10	9.100E-11	1.540E-10	6.030E-11	1.045E-10
1.333E+05	1.251E-10	2.273E-10	1.024E-10	1.791E-10	8.514E-11	1.447E-10	5.674E-11	9.868E-11
1.628E+05	1.162E-10	2.128E-10	9.530E-11	1.678E-10	7.942E-11	1.356E-10	5.321E-11	9.294E-11
1.988E+05	1.078E-10	1.988E-10	8.850E-11	1.568E-10	7.389E-11	1.268E-10	4.974E-11	8.731E-11
2.428E+05	9.974E-11	1.854E-10	8.201E-11	1.463E-10	6.858E-11	1.183E-10	4.637E-11	8.183E-11
2.966E+05	9.214E-11	1.726E-10	7.585E-11	1.363E-10	6.351E-11	1.102E-10	4.311E-11	7.653E-11
3.622E+05	8.500E-11	1.605E-10	7.003E-11	1.268E-10	5.870E-11	1.025E-10	3.998E-11	7.144E-11
4.424E+05	7.831E-11	1.491E-10	6.457E-11	1.178E-10	5.418E-11	9.519E-11	3.701E-11	6.658E-11
5.404E+05	7.207E-11	1.384E-10	5.946E-11	1.093E-10	4.993E-11	8.830E-11	3.420E-11	6.195E-11
6.600E+05	6.628E-11	1.283E-10	5.471E-11	1.013E-10	4.596E-11	8.183E-11	3.155E-11	5.756E-11
8.061E+05	6.092E-11	1.189E-10	5.029E-11	9.385E-11	4.228E-11	7.576E-11	2.907E-11	5.343E-11
9.846E+05	5.598E-11	1.101E-10	4.621E-11	8.688E-11	3.886E-11	7.009E-11	2.676E-11	4.954E-11
1.203E+06	5.143E-11	1.019E-10	4.245E-11	8.038E-11	3.570E-11	6.481E-11	2.461E-11	4.589E-11
1.469E+06	4.724E-11	9.430E-11	3.899E-11	7.434E-11	3.279E-11	5.989E-11	2.262E-11	4.249E-11
1.794E+06	4.341E-11	8.722E-11	3.581E-11	6.873E-11	3.011E-11	5.533E-11	2.078E-11	3.931E-11
2.191E+06	3.991E-11	8.067E-11	3.291E-11	6.353E-11	2.766E-11	5.111E-11	1.909E-11	3.635E-11
2.676E+06	3.672E-11	7.461E-11	3.025E-11	5.872E-11	2.541E-11	4.720E-11	1.753E-11	3.361E-11
3.269E+06	3.381E-11	6.901E-11	2.783E-11	5.428E-11	2.336E-11	4.359E-11	1.610E-11	3.106E-11
3.993E+06	3.117E-11	6.385E-11	2.562E-11	5.018E-11	2.149E-11	4.026E-11	1.480E-11	2.870E-11
4.877E+06	2.878E-11	5.911E-11	2.362E-11	4.641E-11	1.979E-11	3.720E-11	1.360E-11	2.652E-11
5.957E+06	2.662E-11	5.474E-11	2.182E-11	4.295E-11	1.825E-11	3.439E-11	1.252E-11	2.451E-11
7.275E+06	2.468E-11	5.074E-11	2.019E-11	3.977E-11	1.686E-11	3.181E-11	1.153E-11	2.266E-11
8.886E+06	2.294E-11	4.708E-11	1.872E-11	3.686E-11	1.561E-11	2.944E-11	1.064E-11	2.095E-11
1.085E+07	2.140E-11	4.374E-11	1.741E-11	3.421E-11	1.449E-11	2.729E-11	9.831E-12	1.939E-11
1.326E+07	2.003E-11	4.071E-11	1.625E-11	3.179E-11	1.348E-11	2.532E-11	9.103E-12	1.796E-11
1.619E+07	1.883E-11	3.796E-11	1.523E-11	2.960E-11	1.259E-11	2.354E-11	8.450E-12	1.665E-11

TABLE IX. Fit Parameters for Total Ionization Rate Coefficients for Individual Ions

See page 77 for Explanation of Tables

Ion	Ar^{7+}	Ti^{11+}	Cr^{13+}	Fe^{15+}
kT_1	15	30	40	50
kT_2	2.7E+06	2.7E+06	2.7E+06	2.7E+06
a_0	-1.03775E+02	-1.49169E+02	-1.79781E+02	-2.09076E+02
a_1	5.70912E+01	7.61154E+01	9.26290E+01	1.06103E+02
a_2	-1.76328E+01	-1.89023E+01	-2.23773E+01	-2.41803E+01
a_3	3.24059E+00	2.46892E+00	2.75106E+00	2.60686E+00
a_4	-3.83464E-01	-1.65329E-01	-1.53954E-01	-8.17657E-02
a_5	2.95680E-02	3.08321E-03	-1.15992E-03	-1.05585E-02
a_6	-1.43915E-03	2.90055E-04	6.47261E-04	1.26279E-03
a_7	4.01877E-05	-1.91365E-05	-3.28184E-05	-5.35643E-05
a_8	-4.90734E-07	3.51111E-07	5.56840E-07	8.43710E-07

Ion	Zn^{19+}	Ge^{21+}	Se^{23+}	Y^{28+}
kT_1	90	120	140	220
kT_2	1.6E+07	1.6E+07	1.6E+07	1.6E+07
a_0	-3.71601E+02	-4.40007E+02	-5.17282E+02	-7.53674E+02
a_1	2.29861E+02	2.76185E+02	3.28829E+02	4.87467E+02
a_2	-6.67843E+01	-8.07285E+01	-9.66385E+01	-1.43398E+02
a_3	1.11448E+01	1.35556E+01	1.63143E+01	2.41724E+01
a_4	-1.16168E+00	-1.42227E+00	-1.72101E+00	-2.54246E+00
a_5	7.71254E-02	9.50997E-02	1.15725E-01	1.70351E-01
a_6	-3.17754E-03	-3.94858E-03	-4.83338E-03	-7.08849E-03
a_7	7.41812E-05	9.29613E-05	1.14497E-04	1.67317E-04
a_8	-7.50776E-07	-9.49443E-07	-1.17697E-06	-1.71432E-06