Canadian Journal of Physics
Revue canadienne de physique

**COLLISION STRENGTHS AND EFFECTIVE COLLISION
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FOR Ne-LIKE Ge**

Journal:	<i>Canadian Journal of Physics</i>
Manuscript ID	cjp-2016-0771.R3
Manuscript Type:	Article
Date Submitted by the Author:	28-Mar-2017
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Keyword:	effective collision strength, laser, atomic, COLLISION STRENGTHS, Ne-LIKE Ge
Is the invited manuscript for consideration in a Special Issue? :	N/A

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COLLISION STRENGTHS AND EFFECTIVE COLLISION STRENGTHS FOR Ne-LIKE Ge

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Abstract

We have carried out a calculation of 241 levels for Ne-like Ge ($Z=36$) in order to calculate electron impact collision strengths and effective collision strengths which belonging to $1s^2 2s^2 2p^5 nl$, $1s^2 2s^1 2p^6 nl$ ($n=3, 4, 5, 6$; $l=s, p, d, f, g$ and h) configurations which have been calculated by the fully relativistic flexible atomic code (FAC). Our calculations based on the distorted-wave method with large configuration interactions included. Collision strengths have been generated over an electron energy range of (10 --- 20000 eV) and they have been listed at seven representative energies of 65.33, 1714.98, 2944.1, 4868.3, 7564.6, 11040 and 15221eV in this work, and effective collision strengths data have been calculated from these at electron plasma temperatures (650, 850, 1050, 1250, 1450, 1650, 1850) eV. Our results are compared with those available in the literature. It is found that the resonance effects are important in calculating the effective collision strengths.

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1. Introduction

Electron impact collision strengths and effective collision strengths are of fundamental importance in analyzing the physical state and chemical composition of gaseous nebulae and laboratory plasmas. At present it is difficult to obtain such information experimentally; therefore, it has become necessary to rely on the results of quantum-mechanical calculations. The ions of germanium have along been important in astrophysical application but since their recent discovery in the plasma, the general interest in these ions has dramatically increased. Because Ne-like ions have a stable closed L-shell ground state, they show high abundance over a wide range of temperatures in ionization equilibrium for each iso-nuclear sequence (see Mazzotta et al. 1998, Bryans et al. 2006; 2009) [1,2,3]. Thus, they attract extensive studies for spectral diagnostic and modeling in astrophysical and laboratory plasmas, and in particular iron, due to its high cosmic abundance. X-ray lasers (Mathews et al. 1985, Tomasel et al. 1997) [4,5] based on Ne-like ions are another significant area of interest. However, the atomic structure and electron impact excitation (EIE) of Ne-like ions are extremely complex, which results in there being large uncertainties in line intensity ratios ($2p^5 3d^1 P_1 \rightarrow 2p^6 1S_0$ vs $2p^5 3d^1 D_1 \rightarrow 2p^6 1S_0$, this is usually designated $3C/3D$, as well as

$3s - 2p$ vs $3C$) between measurements or observations and predictions (Beiersdorfer et al. 2001; 2002, Gu et al. 2004) [6,7,8]. For example, even for iron, EIE of this ion has been investigated experimentally and theoretically for a long time (Smith et al. 1985, Chen et al. 2003, Loch et al. 2006, Beiersdorfer et al. 2001; 2002 and references therein) [9,10,11,6,7]. Resonances in electron-ion impact excitation have been observed in laboratory measurements (Brown et al. 2006) [12]. They play an important role in the spectral diagnostic and modeling of astrophysical and laboratory plasmas. On the other hand, collision strengths for electron impact excitation of Ne-like ions are also affected by the strong configuration mixing. Zhang and Sampson [13] systematically calculated the collision strengths for electron impact excitation to $n = 3$ and 4 excited levels in Ne-like ions using the fully relativistic distorted-wave method. Their calculation showed that the collision strengths for $(2p_{1/2}^{-1} 3S)_{J=1}$ and $(2p_{3/2}^{-1} 3d_{5/2})_{J=1}$ have Z-independence similar to that of the oscillator strengths, i.e. the collision strengths for the $2p^6 \rightarrow (2p_{1/2}^{-1} 3S)_{J=1}$ excitation is enhanced while that for the $2p^6 \rightarrow (2p_{3/2}^{-1} 3d_{5/2})_{J=1}$ excitation is suppressed with $Z = 22 \sim 55$. In the present work we give the collision strengths and effective collision strengths for the first ten fine-structure levels between the ground

level and the $n = 3, 4, 5$ and 6 levels of Ge XXIII. The data are compared with those given in Honglin Zhang and Douglas H. Sampson (1989) [14].

2. Theoretical method

The calculations of atomic structure and electron impact excitation have been carried out using the Flexible Atomic Code (FAC) developed by Gu [15]. A fully relativistic approach based on the Dirac equation is used throughout the entire package. In the calculation of atomic structure, the energy levels of an atomic ion are obtained by diagonalizing the relativistic Hamiltonian. An atomic state is approximated by a linear combination of configuration state functions (CSFs) with same symmetry

$$\Phi_\alpha(J\pi) = \sum_i^{n_c} a_i(\alpha) \varphi_\alpha(J\pi) \quad (1)$$

where, n_c is the number of CSFs and $a_i(\alpha)$ denotes the representation of the atomic state in this basis. The CSFs are anti-symmetrized products of a common set of orthonormal orbitals which are optimized on the basis of the relativistic Hamiltonian. The radial orbitals are derived from a modified Dirac-Fock-Slater iteration on a fictitious mean configuration with fractional occupation numbers, representing the average electron cloud of the configurations included in the calculation. Once the CI wavefunctions have been obtained, the radiative transition rates can be calculated in the single multipole approximation with arbitrary rank. The electron impact excitation has been calculated using the relativistic distorted-wave approximation. Special attention has been paid to the long range contributions to the continuum-continuum radial integral by using the phase-amplitude method for the continuum wavefunctions. To ensure the convergence of the collision strengths, large angular momentum contributions (the maximum partial waves up to 50) have been taken into account. Higher partial wave contributions have been included using the Coulomb-Bethe approximation [16]. Using the method described above, we calculated the energy levels, spontaneous radiative decay rates, oscillator strengths, and electron impact collision strengths for transitions among the 241 fine-structure levels belonging to the $1s^2 2s^2 2p^5nl$, $1s^2$

$2s^1 2p^6nl$ ($n=3, 4, 5, 6$; $l=s, p, d, f, g$ and h) configurations of Ne-like Ge. CI between the above configurations has been included in the calculations of atomic structure and collision strengths. For convenience of use, the effective collision strengths have also been obtained at electron plasma temperatures (650, 850, 1050, 1250, 1450, 1650, 1850) eV.

3. Energy levels and oscillator strengths

In this section, we deal with the atomic structure and calculated energy levels and oscillator strengths [17]. The energy levels are calculated with the notation for J-J atomic states corresponding to configurations $1s^2 2s^2 2p^5nl$, $1s^2 2s^1 2p^6nl$ ($n=3, 4, 5, 6$; $l=s, p, d, f, g$ and h). It is calculated by using the fully relativistic atomic structure program FAC (flexible atomic code) adopted from [15]. We calculated the bound states of the atomic system in the configuration mixing approximation, by using a modified self-consistent Dirac-Fock-Slater iteration to derive the radial orbitals for the construction of basis states. We present here the calculations of the atomic structure and energy levels of a Ne-like Ge. The energy levels of Ge XXIII are given in Table 1. The levels are placed according to ascending order of their energy. A comparison with the other data is also presented in Table 2. We concentrate our efforts on calculations of oscillator strengths for the configurations $1s^2 2s^2 2p^5nl$, $1s^2 2s^1 2p^6nl$ ($n=3, 4, 5, 6$; $l=s, p, d, f, g$ and h). The weighted oscillator strengths gf_{ij} [15] are given by

$$gf_{ij} = L^{-1} \omega (\alpha \omega)^{2L-2} S_{ij} \quad (2)$$

where ω is the transition energy, i is the statistical weight of the initial level of the transition (g) and S_{ij} is the line strength given as

$$S_{ij} = |\langle \psi_i || O^L || \psi_j \rangle| \quad (3)$$

Here, O^L denotes the spherical multipole operator of rank L representing the interactions of electrons with the electromagnetic field, and ψ_i and ψ_j are the initial and final states of the transition, respectively. Weighted oscillator strength values are presented in Table 2.

4. Collision strengths and effective collision strengths

The electron impact collision strengths have been calculated for transitions among the 241 levels at electron energies ranging from 10 to 20,000 eV. Tables (4) list the collision strengths at seven representative energies of 65.33, 1714.98, 2944.1, 4868.3, 7564.6, 11040 and 15221 eV. For brevity, the lower states are restricted to the lowest two levels in Tables (5). For Ne-like Ge, close-coupling calculations have been carried out by Honglin Zhang and Douglas H. Sampson (1989) [14] to calculate the collision strengths for transitions among the lowest 88 levels within the $n = 3$ and 4 levels using HFS. In Table 3, we compare our collision strengths with their results at two scattered electron energies of 65.332, and 1714.988 eV. Good agreement is found for the strong dipole-allowed transitions, especially at higher energies, and a maximum deviation about 9% between the two calculations. For some weak and forbidden transitions, however, the difference becomes evident. In the energy range shown above, there are no contributions of resonances. Therefore, the difference should not have been caused by the resonance effect. Recalling that we have included adequate partial wave summation, it cannot be attributed to a limited number of partial waves either. We suggest that the difference should primarily be attributed to the different CI wavefunctions. As mentioned above, inclusion of more CI leads to the decrease of the oscillator strengths, which scales directly to the collision strengths. The collision strength (Ω_{ij}) between an initial state " i " and final state " j " is defined in terms of the collision cross section (σ_{ij}) [18] as

$$\Omega_{ij} = \frac{(2J_i+1)k_i^2}{\pi} \sigma_{ij}, \quad (4)$$

where k_i^2 is the channel energy of the continuum electron (Rydberg) and J_i is the J -value of the initial level. In practical applications, one usually needs the excitation rate coefficients in the statistical equilibrium to obtain the populations of

the levels. The rate coefficients can be obtained from the effective collision strength, which can be obtained by integrating the collision strength over Maxwellian distribution of electron velocities to give the effective collision strength (Υ_{ij}) [18]:

$$\Upsilon_{ij}(T_e) = \int_0^\infty \Omega_{ij}(E_j) \exp(-E_j/kT_e) d(E_j/kT_e), \quad (5)$$

where E_j is the final kinetic energy of the electron, T_e is the electron temperature, and k is Boltzmann's constant. If the collision strengths are assumed to be independent of the incident electron energy, we have $\Upsilon_{ij} = \Omega_{ij}$. The integration in Equation (5) should be carried out using energy-dependent collision strengths from threshold to infinity. The collision strengths at higher energies are particularly important for the dipole-allowed transitions, where they grow as $\ln(E)$. In the case of the electric quadrupole or magnetic-dipole transitions, the collision strengths are approximately constant, whereas for intercombination transitions they rapidly decrease as $1/E^2$ in the asymptotic region. The collision strengths vary smoothly in high-energy region and the energy dependence of collision strengths for high energies can be properly accounted by using extrapolation technique. In astrophysical applications it is convenient to use excitation rate coefficients or thermally averaged collision strengths as a function of electron temperature. The excitation rates are obtained by averaging collision strengths over a Maxwellian distribution of electron energies. The collision excitation rate C_{ij} in (cm^3s^{-1}) [19] can be obtained immediately from Υ_{ij} as follows:

$$C_{ij} = \frac{8.629 \times 10^{-6}}{\omega_i \sqrt{T_e}} e^{-E_{ij}/kT_e} \Upsilon_{ij}, \quad (6)$$

Here ω_i is the statistical weight of level i and E_{ij} is the excitation energy.

5. Conclusion

In this work the collision strengths, and effective collision strengths of Ge XXIII have been calculated using the fully relativistic FAC and compared to those from available theoretical calculations. Our results for the energy levels are in good agreement with those from the NIST database or other theoretical and experimental data. For strong transitions, the differences are within 1%, 12%, and 19% compared with Honglin Zhang and Douglas H. Sampson work [14]. For weak transitions the differences are slightly larger. The different methods, the CI involved, or the level mixing may be the reason for the differences between different works. For the weighted oscillator strengths and spontaneous transition rates we suggest that the present results can be used for plasma diagnostics. The collision strengths have been calculated using the distorted wave method in FAC, and the effective collision strengths are given for transitions among 241 levels at electron plasma temperatures (650, 850, 1050, 1250, 1450, 1650, 1850) eV. To our knowledge, the present work is the first work of the lowest 241 levels including resonance contributions for electron impact excitation in Ge XXIII published in the literature. We expect that the present values of γ are comparatively accurate to those from the large-scale of calculations.

References

- [1] P. Mazzotta, G. Mazzitelli, S. Colafrancesco, & N. Vittorio. *A&AS*. 133, 403 (1998)
- [2] P. Bryans, N.R. Badnell, T.W.Gorczyca, J.M. Laming, W. Mitthumsiri, & D.W. Savin. *ApJ*. 691, 1540 (2006)
- [3] P. Bryans, E. Landi & D.W. Savin. *ApJS*. 167, 343 (2009)
- [4] D.L. Mathews, P.L. Hagelstein, M.D. Rosen, et al., *Phys. Rev. Lett.*, 54, 110 (1985)
- [5] F.G. Tomasel, J.J. Rocca, V.N. Shlyaptsev & C.D. Macchietto, *Phys. Rev. A*. 55, 1437 (1997)
- [6] P. Beiersdorfer, E. Behar, K.R.Boyce, et al. *ApJ*, 576, L169 (2002)
- [7] P. Beiersdorfer, S.V.Goeler, M. Bitter & D.B. Thorn, *Phys. Rev. A*, 64, 032705 (2001)
- [8] M.F. Gu, P. Beiersdorfer, G.V. Brown, et al. *ApJ*, 607, L143 (2004)
- [9] B.W. Smith, J.C. Raymond, & J.B. Mann. *ApJ*, 298, 898 (1985)
- [10] G.X. Chen, A.K. Pradhan, & W. Eissner, *J. Phys. B: At. Mol. Opt. Phys.*, 36, 453 (2003)
- [11] S.D. Loch, M.S.Pindzola, C.P. Ballance, & D.C. Griffin, *J. Phys. B: At. Mol. Opt. Phys.*, 39, 85 (2006)
- [12] G.V. Brown, P. Beiersdorfer, H. Chen, et al. *Phys. Rev. Lett.*, 96, 253201 (2006)
- [13] H. L. Zhang and D. H. Sampson: *At. Data Nucl. Data Tables* 43 (1989) 1.
- [14] HONG LIN ZHANG and DOUGLAS H. SAMPSON: *At. Data Nucl. Data Tables* 43, 1-69 (1989).
- [15] M.F. Gu, *Astrophys. J.* 582 (2003) 1241.
- [16] A. Burgess, V.B. Sheorey, *J. Phys. B* 7 (1974) 2403.
- [17] Abdelaziz, Wessameldin S. *Optics and Photonics Journal*, vol. 4, issue 09, pp. 246-269
- [18] C. E. Hudson, C. A. Ramsbottom, and M. P. Scott: *The Astrophysical Journal*, 750:65 (7pp), 2012 May 1
- [19] L. Di, J.R. Shi, G. Zhao, *Data and Nucl. Data Tables* 98 (2012) 437–480

Explanation of Tables

Table 1: Comparison of some energy levels for Ge XXIII.

Table 2: Table 2. Comparison between some weighted Oscillator strengths for Ge XXIII.

Table 3: Comparison of present (FAC) collision strengths with other theoretical results from HFS [14] for transitions from the ground level of Ne-like Ge to the lowest 55 levels at two scattered electron energies of 65.332, and 1714.988 eV.¹

Table 4. Collision strengths at seven scattered electron energies of 65.33, 1714.98, 2944.1, 4868.3, 7564.6, 11040 and 15221eV for Ne-like Ge ions.

Table 5. The effective collision strengths at electron plasma temperatures (650, 850, 1050, 1250, 1450, 1650, 1850) eV for Ne-like Ge ions.

Table 1. Comparison of some energy levels for Ge XXIII.

Index	State Configuration	J ^π	FAC	NIST	Exp.
1	2p ⁶	0 ^e	0.00000E+00	0.00000E+00	0.00000E+00
2	2p _{3/2} 3s _{1/2}	2 ^o	1.23421E+03		1.236122E+03
3	2p _{3/2} 3s _{1/2}	1 ^o	1.23709E+03	1.23900E+03	1.238602E+03
4	2p _{1/2} 3s _{1/2}	0 ^o	1.26664E+03		1.268358E+03
5	2p _{1/2} 3s _{1/2}	1 ^o	1.26822E+03	1.27009E+03	1.269598E+03
6	2p _{3/2} 3p _{1/2}	1 ^e	1.27690E+03	---	1.278277E+03
7	2p _{3/2} 3p _{1/2}	2 ^e	1.28046E+03	---	1.281997E+03
8	2p _{3/2} 3p _{3/2}	3 ^e	1.28642E+03	---	1.288196E+03
9	2p _{3/2} 3p _{3/2}	1 ^e	1.28726E+03	---	1.288196E+03
10	2p _{3/2} 3p _{3/2}	2 ^e	1.29059E+03	1.29204E+03	1.291915E+03
11	2p _{3/2} 3p _{3/2}	0 ^e	1.30216E+03	---	1.303074E+03
12	2p _{1/2} 3p _{1/2}	1 ^e	1.31186E+03	---	1.314232E+03
13	2p _{1/2} 3p _{3/2}	1 ^e	1.31985E+03	---	1.321671E+03
14	2p _{1/2} 3p _{3/2}	2 ^e	1.32083E+03	1.32254E+03	1.322911E+03
15	2p _{1/2} 3p _{1/2}	0 ^e	1.33447E+03	1.33333E+03	1.332830E+03
16	2p _{3/2} 3d _{3/2}	0 ^o	1.34070E+03	---	1.342749E+03
17	2p _{3/2} 3d _{3/2}	1 ^o	1.34247E+03	1.34473E+03	1.343989E+03
18	2p _{3/2} 3d _{5/2}	4 ^o	1.34553E+03	---	---
19	2p _{3/2} 3d _{5/2}	2 ^o	1.34575E+03	---	1.347708E+03
20	2p _{3/2} 3d _{3/2}	3 ^o	1.34594E+03	---	1.347708E+03
21	2p _{3/2} 3d _{3/2}	2 ^o	1.34871E+03	---	1.350188E+03
22	2p _{3/2} 3d _{5/2}	3 ^o	1.35077E+03	---	1.352668E+03
23	2p _{3/2} 3d _{5/2}	1 ^o	1.35938E+03	1.36085E+03	1.361346E+03
24	2p _{1/2} 3d _{3/2}	2 ^o	1.37811E+03	---	---
25	2p _{1/2} 3d _{5/2}	2 ^o	1.37971E+03	---	---

Table 2. Comparison between some weighted Oscillator strengths for Ge XXIII.

j	i	gf (FAC)	gf (CIV3)	gf (RCI)
3	1	1.29E-01	1.280E-01	----
5	1	8.88E-02	8.480E-02	----
6	2	2.26E-01	2.257E-01	0.2685
7	2	2.13E-01	2.113E-01	0.2246
7	3	2.15E-01	2.185E-01	0.2204
8	2	7.00E-01	7.002E-01	0.7275
9	2	4.53E-04	4.000E-04	0.0001
9	3	2.84E-01	2.827E-01	0.2914
10	2	2.91E-01	2.923E-01	0.3092
10	3	2.52E-01	2.480E-01	0.2431
10	5	6.21E-04	5.000E-04	----
11	3	1.08E-01	1.102E-01	0.0930
11	5	1.26E-02	1.130E-02	----
12	2	6.08E-04	7.000E-04	0.0000
12	3	5.51E-04	7.000E-04	0.0076
12	4	8.97E-02	8.920E-02	0.1111
12	5	1.59E-01	1.601E-01	0.1542
13	2	1.24E-02	1.300E-02	----
13	3	2.86E-04	4.000E-04	----
13	4	1.96E-01	1.952E-01	0.2017
13	5	9.70E-02	9.450E-02	0.1224
14	2	1.78E-03	1.800E-03	----
14	3	1.08E-03	1.000E-03	----
14	5	5.08E-01	5.074E-01	0.5590
15	3	5.19E-02	4.470E-02	----
15	5	1.15E-01	1.125E-01	0.1002

Comparison of present (FAC) collision strengths with other theoretical results from HFS [14] for transitions from the ground level of Ne-like Ge to the lowest 55 levels at two scattered electron energies of 65.332, and 1714.988 eV.1

I	J	State Configuration	state symbol HFS[14]	this work		HFS [14]	
				65.332	1714.988	65.332	1714.988
1	2	(2p _{3/2} 3s _{1/2}) ₂	L1	9.89E-04	4.27E-04	9.67E-04	4.04E-04
1	3	(2p _{3/2} 3s _{1/2}) ₁	K1	1.09E-03	2.90E-03	1.14E-03	3.20E-03
1	4	(2p _{1/2} 3s _{1/2}) ₀	J1	1.93E-04	8.41E-05	1.97E-04	8.15E-05
1	5	(2p _{1/2} 3s _{1/2}) ₁	K2	9.01E-04	1.95E-03	9.43E-04	2.16E-03
1	6	(2p _{3/2} 3p _{1/2}) ₁	E1	2.30E-03	9.28E-04	2.34E-03	9.18E-04
1	7	(2p _{3/2} 3p _{1/2}) ₂	F1	2.38E-03	2.09E-03	2.42E-03	2.14E-03
1	8	(2p _{3/2} 3p _{3/2}) ₃	G1	2.86E-03	1.02E-03	2.84E-03	9.82E-04
1	9	(2p _{3/2} 3p _{3/2}) ₁	E2	1.20E-03	4.39E-04	1.17E-03	4.13E-04
1	10	(2p _{3/2} 3p _{3/2}) ₂	F2	1.89E-03	1.83E-03	1.92E-03	1.90E-03
1	11	(2p _{3/2} 3p _{3/2}) ₀	D1	5.11E-03	5.62E-03	4.66E-03	5.12E-03
1	12	(2p _{1/2} 3p _{1/2}) ₁	E3	1.14E-03	4.11E-04	1.15E-03	4.00E-04
1	13	(2p _{1/2} 3p _{3/2}) ₁	E4	1.29E-03	4.86E-04	1.29E-03	4.69E-04
1	14	(2p _{1/2} 3p _{3/2}) ₂	F3	2.20E-03	1.99E-03	2.25E-03	2.06E-03
1	15	(2p _{1/2} 3p _{1/2}) ₀	D2	2.32E-02	2.62E-02	2.28E-02	2.58E-02
1	16	(2p _{3/2} 3d _{3/2}) ₀	J2	1.33E-03	4.40E-04	1.30E-03	4.12E-04
1	17	(2p _{3/2} 3d _{3/2}) ₁	K3	3.81E-03	1.58E-03	3.70E-03	1.48E-03
1	18	(2p _{3/2} 3d _{5/2}) ₄	N1	4.46E-03	1.33E-03	4.38E-03	1.26E-03
1	19	(2p _{3/2} 3d _{5/2}) ₂	L2	4.51E-03	1.43E-03	4.45E-03	1.36E-03
1	20	(2p _{3/2} 3d _{3/2}) ₃	M1	3.10E-03	2.00E-03	3.07E-03	2.03E-03
1	21	(2p _{3/2} 3d _{3/2}) ₂	L3	1.82E-03	4.85E-04	1.75E-03	4.43E-04
1	22	(2p _{3/2} 3d _{5/2}) ₃	M2	2.15E-03	1.62E-03	2.11E-03	1.64E-03
1	23	(2p _{3/2} 3d _{5/2}) ₁	K4	2.86E-02	5.02E-02	2.86E-02	5.11E-02
1	24	(2p _{1/2} 3d _{3/2}) ₂	L4	2.12E-03	6.20E-04	2.09E-03	5.83E-04
1	25	(2p _{1/2} 3d _{5/2}) ₂	L5	3.10E-03	9.49E-04	3.04E-03	8.96E-04
1	26	(2p _{1/2} 3d _{5/2}) ₃	M3	2.62E-03	1.90E-03	2.61E-03	1.93E-03
1	27	(2p _{1/2} 3d _{3/2}) ₁	K5	4.84E-02	8.63E-02	4.75E-02	8.64E-02
1	28	(2s _{1/2} 3s _{1/2}) ₁	E5	6.76E-04	2.32E-04	6.59E-04	2.20E-04
1	29	(2s _{1/2} 3s _{1/2}) ₀	D3	1.02E-02	1.21E-02	9.69E-03	1.15E-02
1	30	(2s _{1/2} 3p _{1/2}) ₀	J3	1.69E-04	7.02E-05	1.67E-04	6.73E-05
1	31	(2s _{1/2} 3p _{1/2}) ₁	K6	7.57E-04	1.34E-03	7.60E-04	1.33E-03
1	32	(2s _{1/2} 3p _{3/2}) ₂	L6	8.16E-04	3.45E-04	7.93E-04	3.27E-04
1	33	(2s _{1/2} 3p _{3/2}) ₁	K7	1.55E-03	4.91E-03	1.51E-03	4.91E-03
1	34	(2s _{1/2} 3d _{3/2}) ₁	E6	1.21E-03	4.28E-04	1.19E-03	4.09E-04
1	35	(2s _{1/2} 3d _{3/2}) ₂	F4	2.08E-03	8.60E-04	2.05E-03	8.28E-04
1	36	(2s _{1/2} 3d _{5/2}) ₃	G2	2.80E-03	9.86E-04	2.76E-03	9.43E-04
1	37	(2s _{1/2} 3d _{5/2}) ₂	F5	9.86E-03	1.73E-02	9.76E-03	1.76E-02
1	38	(2p _{3/2} 4s _{1/2}) ₂	L7	3.14E-04	1.36E-04	3.11E-04	1.32E-04
1	39	(2p _{3/2} 4s _{1/2}) ₁	K8	1.82E-04	3.79E-04	2.04E-04	4.52E-04
1	40	(2p _{3/2} 4p _{1/2}) ₁	E7	6.01E-04	2.43E-04	6.25E-04	2.47E-04
1	41	(2p _{3/2} 4p _{1/2}) ₂	F6	6.62E-04	4.52E-04	6.76E-04	4.66E-04
1	42	(2p _{3/2} 4p _{3/2}) ₃	G3	9.70E-04	3.50E-04	9.71E-04	3.42E-04
1	43	(2p _{3/2} 4p _{3/2}) ₁	E8	4.00E-04	1.48E-04	3.97E-04	1.42E-04
1	44	(2p _{3/2} 4p _{3/2}) ₂	F7	5.19E-04	3.73E-04	5.28E-04	3.86E-04
1	45	(2p _{3/2} 4p _{3/2}) ₀	D4	3.86E-03	4.42E-03	3.60E-03	4.11E-03
1	46	(2p _{1/2} 4s _{1/2}) ₀	J4	6.27E-05	2.70E-05	6.47E-05	2.69E-05
1	47	(2p _{1/2} 4s _{1/2}) ₁	K9	2.21E-04	3.59E-04	2.47E-04	4.14E-04
1	48	(2p _{3/2} 4d _{3/2}) ₀	J5	4.27E-04	1.46E-04	4.34E-04	1.42E-04
1	49	(2p _{3/2} 4d _{3/2}) ₁	K10	1.15E-03	4.56E-04	1.15E-03	4.44E-04
1	50	(2p _{3/2} 4d _{5/2}) ₄	N2	1.50E-03	4.66E-04	1.51E-03	4.50E-04
1	51	(2p _{3/2} 4d _{3/2}) ₃	M4	8.85E-04	4.52E-04	8.83E-04	4.54E-04
1	52	(2p _{3/2} 4d _{5/2}) ₂	L8	1.30E-03	4.18E-04	1.34E-03	4.12E-04
1	53	(2p _{3/2} 4d _{3/2}) ₂	L9	6.80E-04	1.91E-04	6.60E-04	1.75E-04
1	54	(2p _{3/2} 4d _{5/2}) ₃	M5	6.45E-04	3.23E-04	6.37E-04	3.22E-04
1	55	(2p _{3/2} 4d _{5/2}) ₁	K11	1.03E-02	1.75E-02	9.99E-03	1.72E-02

Table 4. Collision strengths at seven scattered electron energies of 65.33, 1714.98, 2944.1, 4868.3, 7564.6, 11040 and 15221eV for Ne-like Ge ions.

i	j	collision strengths at energies						
		65.33 eV	1714.98 eV	2944.1 eV	4868.3 eV	7564.6 eV	11040 eV	15221 eV
1	2	4.04E-04	9.67E-04	1.65E-04	7.33E-05	3.58E-05	1.93E-05	0.00E+00
	3	3.20E-03	1.14E-03	5.66E-03	8.01E-03	1.02E-02	1.21E-02	2.51E-02
	4	8.15E-05	1.97E-04	3.34E-05	1.48E-05	7.25E-06	3.92E-06	0.00E+00
	5	2.16E-03	9.43E-04	3.73E-03	5.26E-03	6.70E-03	7.98E-03	1.67E-02
	6	9.18E-04	2.34E-03	3.81E-04	1.74E-04	8.75E-05	4.85E-05	0.00E+00
	7	2.14E-03	2.42E-03	2.32E-03	2.54E-03	2.72E-03	2.87E-03	2.85E-03
	8	9.82E-04	2.84E-03	3.69E-04	1.55E-04	7.25E-05	3.79E-05	0.00E+00
	9	4.13E-04	1.17E-03	1.54E-04	6.48E-05	3.07E-05	1.62E-05	0.00E+00
	10	1.90E-03	1.92E-03	2.17E-03	2.43E-03	2.63E-03	2.78E-03	2.79E-03
	11	5.12E-03	4.66E-03	5.35E-03	5.48E-03	5.58E-03	5.68E-03	5.34E-03
	12	4.00E-04	1.15E-03	1.48E-04	6.15E-05	2.86E-05	1.49E-05	0.00E+00
	13	4.69E-04	1.29E-03	1.80E-04	7.71E-05	3.71E-05	1.99E-05	0.00E+00
	14	2.06E-03	2.25E-03	2.29E-03	2.53E-03	2.73E-03	2.88E-03	2.90E-03
	15	2.58E-02	2.28E-02	2.72E-02	2.80E-02	2.85E-02	2.90E-02	2.74E-02
	16	4.12E-04	1.30E-03	1.45E-04	5.85E-05	2.69E-05	1.37E-05	0.00E+00
	17	1.48E-03	3.70E-03	9.35E-04	8.59E-04	9.16E-04	1.01E-03	1.86E-03
	18	1.26E-03	4.38E-03	4.08E-04	1.58E-04	7.11E-05	3.58E-05	0.00E+00
	19	1.36E-03	4.45E-03	4.66E-04	1.85E-04	8.45E-05	4.30E-05	0.00E+00
	20	2.03E-03	3.07E-03	1.96E-03	2.05E-03	2.17E-03	2.27E-03	2.34E-03
	21	4.43E-04	1.75E-03	1.28E-04	4.50E-05	1.93E-05	9.83E-06	0.00E+00
	22	1.64E-03	2.11E-03	1.77E-03	1.94E-03	2.07E-03	2.18E-03	2.28E-03
	23	5.11E-02	2.86E-02	7.37E-02	9.44E-02	1.13E-01	1.31E-01	2.43E-01
	24	5.83E-04	2.09E-03	1.83E-04	6.89E-05	3.07E-05	1.55E-05	0.00E+00
	25	8.96E-04	3.04E-03	2.96E-04	1.14E-04	5.15E-05	2.62E-05	0.00E+00
	26	1.93E-03	2.61E-03	1.98E-03	2.13E-03	2.26E-03	2.37E-03	2.47E-03
	27	8.65E-02	4.76E-02	1.25E-01	1.61E-01	1.94E-01	2.23E-01	4.17E-01
	28	2.20E-04	6.59E-04	8.62E-05	3.92E-05	1.98E-05	1.09E-05	0.00E+00
	29	1.15E-02	9.69E-03	1.24E-02	1.29E-02	1.33E-02	1.36E-02	1.31E-02
	30	6.73E-05	1.67E-04	2.72E-05	1.18E-05	5.55E-06	2.84E-06	0.00E+00
	31	1.33E-03	7.61E-04	2.19E-03	3.09E-03	3.95E-03	4.75E-03	1.03E-02
	32	3.27E-04	7.93E-04	1.34E-04	5.85E-05	2.77E-05	1.44E-05	0.00E+00
	33	4.91E-03	1.51E-03	9.01E-03	1.31E-02	1.69E-02	2.03E-02	4.48E-02
	34	4.09E-04	1.19E-03	1.52E-04	6.49E-05	3.12E-05	1.63E-05	0.00E+00
	35	8.28E-04	2.05E-03	4.57E-04	3.46E-04	3.12E-04	3.04E-04	2.70E-04
	36	9.43E-04	2.76E-03	3.51E-04	1.49E-04	7.17E-05	3.76E-05	0.00E+00
	37	1.76E-02	9.76E-03	2.31E-02	2.69E-02	2.93E-02	3.12E-02	3.11E-02
	38	1.32E-04	3.11E-04	5.43E-05	2.42E-05	1.19E-05	6.40E-06	0.00E+00
	39	4.52E-04	2.05E-04	7.76E-04	1.10E-03	1.39E-03	1.66E-03	3.37E-03
	40	2.47E-04	6.25E-04	1.02E-04	4.63E-05	2.32E-05	1.27E-05	0.00E+00
	41	4.66E-04	6.76E-04	4.50E-04	4.85E-04	5.18E-04	5.46E-04	5.47E-04
	42	3.42E-04	9.71E-04	1.29E-04	5.47E-05	2.58E-05	1.34E-05	0.00E+00
	43	1.42E-04	3.97E-04	5.34E-05	2.26E-05	1.07E-05	5.68E-06	0.00E+00
	44	3.86E-04	5.28E-04	3.93E-04	4.36E-04	4.71E-04	5.00E-04	5.07E-04
	45	4.11E-03	3.60E-03	4.38E-03	4.53E-03	4.64E-03	4.73E-03	4.47E-03
	46	2.69E-05	6.47E-05	1.09E-05	4.81E-06	2.35E-06	1.25E-06	0.00E+00
	47	4.14E-04	2.47E-04	6.63E-04	9.25E-04	1.16E-03	1.38E-03	2.86E-03
	48	1.42E-04	4.34E-04	5.13E-05	2.12E-05	1.00E-05	5.29E-06	0.00E+00
	49	4.44E-04	1.15E-03	2.50E-04	2.06E-04	2.06E-04	2.19E-04	3.82E-04
	50	4.50E-04	1.51E-03	1.50E-04	5.91E-05	2.73E-05	1.42E-05	0.00E+00
	51	4.54E-04	8.83E-04	4.01E-04	4.20E-04	4.52E-04	4.83E-04	5.22E-04
	52	4.12E-04	1.34E-03	1.42E-04	5.69E-05	2.63E-05	1.37E-05	0.00E+00
	53	1.75E-04	6.60E-04	5.19E-05	1.84E-05	7.91E-06	4.02E-06	0.00E+00
	54	3.22E-04	6.37E-04	3.09E-04	3.40E-04	3.73E-04	4.02E-04	4.42E-04
	55	1.72E-02	9.99E-03	2.42E-02	3.05E-02	3.62E-02	4.13E-02	7.44E-02
	56	1.46E-04	4.13E-04	5.45E-05	2.29E-05	1.07E-05	5.58E-06	0.00E+00
	57	1.72E-04	4.63E-04	6.69E-05	2.92E-05	1.42E-05	7.64E-06	0.00E+00
	58	4.72E-04	6.78E-04	4.63E-04	5.05E-04	5.42E-04	5.74E-04	5.83E-04
	59	5.23E-05	2.20E-04	1.46E-05	4.91E-06	1.90E-06	8.21E-07	0.00E+00
	60	1.59E-04	2.41E-04	1.73E-04	1.96E-04	2.13E-04	2.25E-04	2.19E-04
	61	3.25E-04	3.72E-04	4.07E-04	4.81E-04	5.40E-04	5.82E-04	6.13E-04
	62	7.63E-05	3.54E-04	2.18E-05	7.80E-06	3.18E-06	1.46E-06	0.00E+00
	63	5.97E-05	2.73E-04	1.55E-05	5.15E-06	2.02E-06	8.84E-07	0.00E+00
	64	1.41E-03	5.56E-04	2.07E-03	2.51E-03	2.83E-03	3.05E-03	3.18E-03
	65	3.63E-05	1.81E-04	8.95E-06	3.00E-06	1.24E-06	5.77E-07	0.00E+00
	66	6.78E-05	1.71E-04	6.09E-05	6.70E-05	7.27E-05	7.66E-05	7.48E-05
	67	3.94E-03	3.45E-03	4.20E-03	4.35E-03	4.45E-03	4.55E-03	4.30E-03

Table 4 (continued)

i	j	collision strengths at energies						
		65.33 eV	1714.98 eV	2944.1 eV	4868.3 eV	7564.6 eV	11040 eV	15221 eV
68		2.24E-04	7.67E-04	7.26E-05	2.79E-05	1.27E-05	6.56E-06	0.00E+00
69		3.72E-04	1.21E-03	1.28E-04	5.07E-05	2.34E-05	1.22E-05	0.00E+00
70		4.10E-04	7.98E-04	3.67E-04	3.89E-04	4.20E-04	4.49E-04	4.88E-04
71		1.29E-02	7.52E-03	1.81E-02	2.28E-02	2.72E-02	3.11E-02	5.64E-02
72		3.96E-05	1.88E-04	1.08E-05	3.83E-06	1.58E-06	7.29E-07	0.00E+00
73		1.08E-04	2.08E-04	1.07E-04	1.19E-04	1.30E-04	1.37E-04	1.33E-04
74		7.90E-04	3.91E-04	1.14E-03	1.38E-03	1.56E-03	1.68E-03	1.76E-03
75		7.37E-05	3.21E-04	1.97E-05	6.57E-06	2.55E-06	1.10E-06	0.00E+00
76		7.02E-05	1.61E-04	2.90E-05	1.30E-05	6.39E-06	3.42E-06	0.00E+00
77		1.89E-04	9.22E-05	3.24E-04	4.64E-04	5.89E-04	7.02E-04	1.44E-03
78		1.42E-04	3.99E-04	5.64E-05	2.57E-05	1.30E-05	7.09E-06	0.00E+00
79		1.74E-03	1.43E-03	1.91E-03	2.01E-03	2.08E-03	2.13E-03	2.06E-03
80		2.26E-04	3.25E-04	2.20E-04	2.37E-04	2.55E-04	2.69E-04	2.71E-04
81		6.54E-05	1.70E-04	2.61E-05	1.16E-05	5.72E-06	3.10E-06	0.00E+00
82		1.61E-04	4.61E-04	6.01E-05	2.53E-05	1.19E-05	6.14E-06	0.00E+00
83		6.19E-05	1.68E-04	2.38E-05	1.02E-05	4.96E-06	2.65E-06	0.00E+00
84		1.86E-04	2.55E-04	1.89E-04	2.09E-04	2.27E-04	2.41E-04	2.45E-04
85		2.42E-03	2.08E-03	2.59E-03	2.70E-03	2.77E-03	2.83E-03	2.69E-03
86		4.70E-05	1.44E-04	1.67E-05	6.68E-06	2.94E-06	1.36E-06	0.00E+00
87		2.70E-04	3.98E-04	3.15E-04	4.07E-04	5.03E-04	5.97E-04	1.25E-03
88		4.66E-05	1.27E-04	1.83E-05	8.07E-06	4.02E-06	2.26E-06	0.00E+00
89		6.19E-04	5.41E-04	8.55E-04	1.12E-03	1.38E-03	1.62E-03	3.30E-03
90		2.07E-04	6.82E-04	7.02E-05	2.74E-05	1.23E-05	6.08E-06	0.00E+00
91		1.78E-04	3.89E-04	1.49E-04	1.55E-04	1.67E-04	1.81E-04	2.00E-04
92		2.10E-04	6.96E-04	7.07E-05	2.80E-05	1.30E-05	6.84E-06	0.00E+00
93		7.84E-05	2.99E-04	2.29E-05	7.92E-06	3.30E-06	1.63E-06	0.00E+00
94		1.23E-04	2.94E-04	1.08E-04	1.18E-04	1.30E-04	1.42E-04	1.60E-04
95		1.02E-04	2.37E-04	4.28E-05	1.93E-05	9.44E-06	5.07E-06	0.00E+00
96		5.70E-03	2.65E-03	8.87E-03	1.18E-02	1.46E-02	1.70E-02	3.38E-02
97		3.28E-03	2.22E-03	4.22E-03	5.03E-03	5.74E-03	6.41E-03	1.01E-02
98		5.12E-05	1.98E-04	1.55E-05	5.64E-06	2.34E-06	1.08E-06	0.00E+00
99		2.28E-04	3.24E-04	2.56E-04	2.94E-04	3.25E-04	3.50E-04	3.66E-04
100		8.69E-05	1.49E-04	9.22E-05	1.04E-04	1.15E-04	1.22E-04	1.20E-04
101		5.11E-05	2.27E-04	1.50E-05	5.51E-06	2.29E-06	1.06E-06	0.00E+00
102		5.87E-05	2.43E-04	1.69E-05	6.09E-06	2.57E-06	1.20E-06	0.00E+00
103		6.46E-06	3.15E-05	1.59E-06	4.83E-07	1.63E-07	6.14E-08	0.00E+00
104		4.75E-05	4.49E-05	5.71E-05	6.29E-05	6.65E-05	6.94E-05	6.52E-05
105		2.11E-05	1.07E-04	5.20E-06	1.77E-06	7.74E-07	3.80E-07	0.00E+00
106		9.40E-04	3.79E-04	1.37E-03	1.67E-03	1.88E-03	2.03E-03	2.12E-03
107		4.06E-05	1.13E-04	3.48E-05	3.82E-05	4.18E-05	4.45E-05	4.38E-05
108		6.68E-06	1.47E-05	6.62E-06	7.13E-06	7.52E-06	7.86E-06	7.52E-06
109		3.76E-05	2.33E-05	4.82E-05	5.37E-05	5.69E-05	5.95E-05	5.57E-05
110		3.52E-06	1.94E-05	8.99E-07	2.83E-07	1.04E-07	4.27E-08	0.00E+00
111		5.44E-06	2.70E-05	1.30E-06	3.97E-07	1.39E-07	5.42E-08	0.00E+00
112		1.39E-06	7.97E-06	2.85E-07	8.70E-08	3.47E-08	1.54E-08	0.00E+00
113		2.62E-06	8.63E-06	2.00E-06	2.08E-06	2.18E-06	2.27E-06	2.18E-06
114		1.03E-05	2.42E-05	4.21E-06	1.87E-06	9.32E-07	5.06E-07	0.00E+00
115		6.41E-05	9.00E-05	6.14E-05	6.66E-05	7.31E-05	7.93E-05	1.00E-04
116		7.15E-05	2.13E-04	2.56E-05	1.05E-05	4.84E-06	2.43E-06	0.00E+00
117		2.96E-04	4.35E-04	2.85E-04	3.04E-04	3.26E-04	3.42E-04	3.44E-04
118		8.01E-05	2.14E-04	3.13E-05	1.37E-05	6.71E-06	3.62E-06	0.00E+00
119		1.34E-03	1.17E-03	1.43E-03	1.49E-03	1.53E-03	1.56E-03	1.49E-03
120		3.09E-04	8.33E-04	1.20E-04	5.24E-05	2.58E-05	1.40E-05	0.00E+00
121		1.16E-04	2.95E-04	4.69E-05	2.08E-05	1.04E-05	5.73E-06	0.00E+00
122		6.21E-04	7.06E-04	6.56E-04	7.12E-04	7.64E-04	8.03E-04	7.94E-04
123		2.81E-03	1.61E-03	3.73E-03	4.34E-03	4.78E-03	5.07E-03	5.08E-03
124		1.03E-04	3.51E-04	3.38E-05	1.30E-05	5.97E-06	3.12E-06	0.00E+00
125		1.79E-04	5.71E-04	6.21E-05	2.49E-05	1.16E-05	6.10E-06	0.00E+00
126		1.20E-04	3.47E-04	7.73E-05	7.34E-05	7.87E-05	8.59E-05	9.91E-05
127		3.57E-04	2.94E-04	4.31E-04	4.73E-04	5.02E-04	5.20E-04	4.99E-04
128		8.49E-05	3.34E-04	2.53E-05	8.86E-06	3.44E-06	1.43E-06	0.00E+00
129		4.28E-03	2.57E-03	5.95E-03	7.46E-03	8.84E-03	1.01E-02	1.81E-02
130		4.90E-05	1.84E-04	1.50E-05	5.37E-06	2.13E-06	9.13E-07	0.00E+00
131		5.09E-04	3.47E-04	6.28E-04	6.92E-04	7.34E-04	7.61E-04	7.34E-04
132		2.69E-05	1.23E-04	7.53E-06	2.72E-06	1.14E-06	5.32E-07	0.00E+00
133		6.25E-05	1.33E-04	5.98E-05	6.61E-05	7.26E-05	7.70E-05	7.60E-05
134		4.05E-04	2.08E-04	5.87E-04	7.18E-04	8.09E-04	8.81E-04	9.23E-04
135		4.21E-05	1.89E-04	1.08E-05	3.47E-06	1.29E-06	5.37E-07	0.00E+00

Table 4 (continued)

i	j	collision strengths at energies						
		65.33 eV	1714.98 eV	2944.1 eV	4868.3 eV	7564.6 eV	11040 eV	15221 eV
136		1.88E-06	1.05E-05	4.58E-07	1.44E-07	5.37E-08	2.25E-08	0.00E+00
137		4.39E-06	1.17E-05	3.90E-06	4.13E-06	4.33E-06	4.50E-06	4.35E-06
138		1.22E-05	1.06E-05	1.40E-05	1.55E-05	1.44E-05	1.74E-05	1.68E-05
139		3.47E-06	1.06E-05	1.09E-06	4.16E-07	1.82E-07	8.45E-08	0.00E+00
140		3.29E-05	7.55E-05	1.35E-05	6.04E-06	2.99E-06	1.61E-06	0.00E+00
141		6.39E-05	4.02E-05	1.05E-04	1.49E-04	1.88E-04	2.23E-04	4.47E-04
142		5.47E-05	1.40E-04	2.23E-05	1.01E-05	5.04E-06	2.75E-06	0.00E+00
143		9.80E-05	1.61E-04	8.82E-05	9.28E-05	9.97E-05	1.05E-04	1.07E-04
144		8.71E-05	2.47E-04	3.29E-05	1.40E-05	6.60E-06	3.44E-06	0.00E+00
145		3.66E-05	1.02E-04	1.39E-05	5.88E-06	2.82E-06	1.49E-06	0.00E+00
146		8.00E-05	1.27E-04	7.58E-05	8.23E-05	8.97E-05	9.52E-05	9.79E-05
147		1.17E-03	1.00E-03	1.26E-03	1.31E-03	1.35E-03	1.38E-03	1.31E-03
148		3.41E-05	1.03E-04	1.25E-05	5.20E-06	2.47E-06	1.31E-06	0.00E+00
149		1.02E-04	2.66E-04	5.62E-05	4.52E-05	4.46E-05	4.73E-05	8.23E-05
150		9.14E-05	2.06E-04	7.54E-05	7.84E-05	8.48E-05	9.18E-05	1.03E-04
151		1.13E-04	3.72E-04	3.81E-05	1.51E-05	7.06E-06	3.72E-06	0.00E+00
152		8.97E-05	2.93E-04	3.08E-05	1.23E-05	5.67E-06	2.97E-06	0.00E+00
153		5.12E-05	1.85E-04	1.59E-05	5.80E-06	2.53E-06	1.29E-06	0.00E+00
154		6.37E-05	1.59E-04	5.47E-05	5.96E-05	6.60E-05	7.22E-05	8.22E-05
155		4.03E-03	2.34E-03	5.61E-03	7.03E-03	8.30E-03	9.47E-03	1.68E-02
156		2.40E-05	9.77E-05	6.91E-06	2.41E-06	9.50E-07	4.14E-07	0.00E+00
157		5.00E-05	9.12E-05	5.21E-05	5.88E-05	6.54E-05	6.93E-05	6.88E-05
158		9.64E-05	1.56E-04	1.04E-04	1.20E-04	1.33E-04	1.44E-04	1.51E-04
159		3.24E-05	1.41E-04	9.62E-06	3.58E-06	1.51E-06	6.99E-07	0.00E+00
160		2.56E-05	1.15E-04	6.87E-06	2.34E-06	9.55E-07	4.36E-07	0.00E+00
161		1.64E-05	7.96E-05	4.15E-06	1.40E-06	5.94E-07	2.85E-07	0.00E+00
162		4.95E-04	2.00E-04	7.28E-04	8.94E-04	1.00E-03	1.09E-03	1.14E-03
163		2.45E-05	7.25E-05	2.04E-05	2.23E-05	2.47E-05	2.61E-05	2.60E-05
164		3.16E-06	1.67E-05	7.12E-07	2.03E-07	6.43E-08	2.31E-08	0.00E+00
165		5.90E-06	1.36E-05	5.74E-06	6.24E-06	6.59E-06	6.89E-06	6.63E-06
166		1.33E-07	6.68E-07	2.11E-08	3.94E-09	9.98E-10	3.85E-10	0.00E+00
167		5.74E-07	7.61E-07	5.92E-07	6.47E-07	6.98E-07	8.68E-07	6.84E-07
168		1.63E-07	3.99E-07	1.32E-07	1.37E-07	1.57E-07	1.55E-07	1.55E-07
169		3.39E-06	1.86E-05	8.84E-07	2.83E-07	1.05E-07	4.34E-08	0.00E+00
170		1.74E-05	2.21E-05	2.02E-05	2.23E-05	2.36E-05	2.43E-05	2.32E-05
171		9.38E-08	5.47E-07	1.54E-08	3.67E-09	1.08E-09	4.31E-10	0.00E+00
172		3.89E-07	2.42E-07	4.40E-07	4.88E-07	5.28E-07	6.44E-07	5.15E-07
173		6.02E-08	1.86E-07	9.29E-09	2.19E-09	6.47E-10	2.37E-10	0.00E+00
174		1.98E-05	1.22E-05	2.61E-05	2.94E-05	3.12E-05	3.22E-05	3.06E-05
175		7.52E-08	2.59E-07	1.17E-08	2.58E-09	7.32E-10	2.70E-10	0.00E+00
176		1.59E-06	9.41E-06	3.31E-07	9.86E-08	3.78E-08	1.64E-08	0.00E+00
177		6.76E-08	5.64E-08	4.17E-08	4.10E-08	4.66E-08	4.56E-08	4.59E-08
178		2.56E-06	1.43E-05	5.42E-07	1.56E-07	5.41E-08	2.16E-08	0.00E+00
179		2.41E-06	8.76E-06	1.76E-06	1.84E-06	1.92E-06	2.01E-06	1.94E-06
180		6.77E-06	1.56E-05	2.80E-06	1.26E-06	6.25E-07	3.39E-07	0.00E+00
181		3.74E-05	4.59E-05	4.56E-05	5.91E-05	7.24E-05	8.45E-05	1.63E-04
182		3.70E-05	1.04E-04	1.39E-05	5.87E-06	2.78E-06	1.45E-06	0.00E+00
183		4.43E-05	1.18E-04	1.74E-05	7.63E-06	3.74E-06	2.02E-06	0.00E+00
184		9.29E-05	1.56E-04	8.22E-05	8.62E-05	9.25E-05	9.76E-05	1.01E-04
185		6.42E-04	5.57E-04	6.88E-04	7.16E-04	7.35E-04	7.51E-04	7.19E-04
186		5.76E-05	1.94E-04	1.90E-05	7.36E-06	3.37E-06	1.76E-06	0.00E+00
187		9.67E-05	3.08E-04	3.37E-05	1.35E-05	6.29E-06	3.31E-06	0.00E+00
188		8.33E-05	1.95E-04	6.68E-05	6.89E-05	7.45E-05	8.06E-05	9.04E-05
189		2.13E-03	1.29E-03	2.96E-03	3.71E-03	4.38E-03	5.00E-03	8.92E-03
190		1.73E-05	7.83E-05	4.91E-06	1.79E-06	7.57E-07	3.56E-07	0.00E+00
191		3.41E-05	1.43E-04	9.53E-06	3.29E-06	1.33E-06	5.99E-07	0.00E+00
192		3.69E-05	8.35E-05	3.45E-05	3.80E-05	4.20E-05	4.47E-05	4.43E-05
193		2.73E-04	1.50E-04	3.91E-04	4.79E-04	5.38E-04	5.86E-04	6.13E-04
194		1.84E-06	1.04E-05	4.55E-07	1.44E-07	5.44E-08	2.30E-08	0.00E+00
195		4.08E-07	4.04E-07	4.48E-07	4.96E-07	5.25E-07	5.67E-07	5.25E-07
196		1.78E-05	1.49E-05	2.26E-05	2.54E-05	2.69E-05	2.76E-05	2.64E-05
197		5.41E-08	2.70E-07	8.67E-09	2.13E-09	6.37E-10	2.47E-10	0.00E+00
198		1.27E-07	5.93E-07	2.02E-08	4.02E-09	1.05E-09	3.97E-10	0.00E+00
199		3.96E-06	1.13E-05	3.43E-06	3.66E-06	3.83E-06	4.00E-06	3.87E-06
200		1.06E-07	2.65E-07	7.84E-08	7.95E-08	8.64E-08	9.54E-08	8.83E-08
201		3.71E-06	1.98E-05	8.24E-07	2.38E-07	7.86E-08	2.96E-08	0.00E+00
202		4.06E-05	1.21E-04	1.59E-05	7.24E-06	3.69E-06	2.02E-06	0.00E+00
203		8.85E-04	7.20E-04	9.74E-04	1.02E-03	1.06E-03	1.08E-03	1.05E-03

Table 4 (continued)

i	j	collision strengths at energies						
		65.33 eV	1714.98 eV	2944.1 eV	4868.3 eV	7564.6 eV	11040 eV	15221 eV
2	204	1.26E-05	3.27E-05	4.98E-06	2.14E-06	9.99E-07	4.95E-07	0.00E+00
	205	2.15E-04	1.44E-04	3.33E-04	4.57E-04	5.76E-04	6.82E-04	1.41E-03
	206	6.05E-05	1.55E-04	2.41E-05	1.04E-05	4.88E-06	2.43E-06	0.00E+00
	207	6.18E-04	2.33E-04	1.08E-03	1.53E-03	1.94E-03	2.31E-03	4.88E-03
	208	6.00E-05	1.58E-04	2.37E-05	1.04E-05	5.14E-06	2.81E-06	0.00E+00
	209	1.22E-04	2.71E-04	7.02E-05	5.39E-05	4.90E-05	4.80E-05	4.28E-05
	210	1.39E-04	3.66E-04	5.47E-05	2.40E-05	1.19E-05	6.48E-06	0.00E+00
	211	1.21E-03	6.99E-04	1.61E-03	1.87E-03	2.07E-03	2.20E-03	2.20E-03
	212	3.15E-05	1.17E-04	9.78E-06	3.55E-06	1.43E-06	6.13E-07	0.00E+00
	213	7.21E-05	1.66E-04	5.33E-05	5.05E-05	5.07E-05	5.08E-05	4.86E-05
	214	5.62E-05	2.09E-04	1.75E-05	6.34E-06	2.55E-06	1.10E-06	0.00E+00
	215	3.86E-04	2.01E-04	5.02E-04	5.64E-04	6.00E-04	6.14E-04	6.03E-04
	216	9.33E-06	1.51E-05	9.63E-06	1.05E-05	1.14E-05	1.31E-05	1.16E-05
	217	2.37E-06	1.31E-05	5.41E-07	1.63E-07	5.77E-08	2.42E-08	0.00E+00
	218	3.72E-06	2.05E-05	8.47E-07	2.56E-07	9.05E-08	3.80E-08	0.00E+00
	219	1.23E-05	1.42E-05	1.39E-05	1.55E-05	1.68E-05	1.93E-05	1.72E-05
	220	2.38E-05	7.05E-05	9.29E-06	4.23E-06	2.16E-06	1.18E-06	0.00E+00
	221	4.37E-04	3.52E-04	4.82E-04	5.07E-04	5.23E-04	5.36E-04	5.19E-04
	222	7.14E-06	1.86E-05	2.83E-06	1.21E-06	5.67E-07	2.81E-07	0.00E+00
	223	1.17E-04	8.05E-05	1.79E-04	2.45E-04	3.09E-04	3.67E-04	7.56E-04
	224	3.42E-05	8.77E-05	1.36E-05	5.88E-06	2.75E-06	1.37E-06	0.00E+00
	225	3.30E-04	1.25E-04	5.72E-04	8.10E-04	1.03E-03	1.23E-03	2.58E-03
	226	3.20E-05	8.36E-05	1.27E-05	5.57E-06	2.76E-06	1.51E-06	0.00E+00
	227	6.55E-05	1.44E-04	3.85E-05	3.02E-05	2.77E-05	2.73E-05	2.46E-05
	228	7.40E-05	1.94E-04	2.93E-05	1.29E-05	6.38E-06	3.49E-06	0.00E+00
	229	5.81E-04	3.39E-04	7.74E-04	9.04E-04	9.99E-04	1.07E-03	1.07E-03
	230	2.00E-05	7.29E-05	6.29E-06	2.31E-06	9.42E-07	4.09E-07	0.00E+00
	231	4.13E-05	1.03E-04	2.77E-05	2.51E-05	2.48E-05	2.49E-05	2.35E-05
	232	3.58E-05	1.31E-04	1.13E-05	4.13E-06	1.69E-06	7.31E-07	0.00E+00
	233	2.25E-04	1.16E-04	2.96E-04	3.34E-04	3.56E-04	3.68E-04	3.59E-04
	234	2.31E-06	1.28E-05	5.38E-07	1.65E-07	5.91E-08	2.49E-08	0.00E+00
	235	7.95E-06	1.48E-05	7.92E-06	8.70E-06	9.40E-06	9.93E-06	9.59E-06
	236	2.23E-07	7.54E-07	2.26E-07	6.75E-07	2.83E-07	3.00E-07	2.35E-07
	237	6.52E-08	6.59E-07	1.21E-08	2.88E-09	9.29E-10	3.51E-10	0.00E+00
	238	3.63E-06	2.00E-05	8.44E-07	2.59E-07	9.27E-08	3.89E-08	0.00E+00
	239	9.41E-08	9.50E-07	1.75E-08	4.16E-09	1.34E-09	5.07E-10	0.00E+00
	240	2.51E-07	7.38E-07	2.68E-07	8.13E-07	3.39E-07	3.60E-07	2.83E-07
	241	1.14E-05	1.35E-05	1.30E-05	1.46E-05	1.59E-05	1.68E-05	1.64E-05
2	3	1.07E-02	2.78E-02	1.12E-02	8.00E-03	6.46E-03	5.78E-03	5.10E-03
	4	5.43E-03	7.39E-03	5.47E-03	5.21E-03	5.21E-03	5.32E-03	5.42E-03
	5	1.32E-02	2.54E-02	1.36E-02	1.06E-02	9.00E-03	8.30E-03	7.32E-03
	6	1.63E+00	9.63E-01	1.60E+00	1.83E+00	2.01E+00	2.16E+00	2.85E+00
	7	1.39E+00	8.32E-01	1.37E+00	1.56E+00	1.72E+00	1.85E+00	2.46E+00
	8	3.87E+00	2.32E+00	3.81E+00	4.34E+00	4.79E+00	5.18E+00	6.96E+00
	9	3.60E-03	7.35E-03	3.63E-03	3.49E-03	3.58E-03	3.75E-03	4.90E-03
	10	1.45E+00	8.82E-01	1.43E+00	1.63E+00	1.80E+00	1.95E+00	2.64E+00
	11	1.91E-04	1.33E-03	2.09E-04	8.92E-05	3.56E-05	1.26E-05	0.00E+00
	12	2.04E-03	1.29E-03	2.01E-03	2.29E-03	2.55E-03	2.77E-03	3.84E-03
	13	3.65E-02	2.28E-02	3.59E-02	4.12E-02	4.59E-02	5.00E-02	6.97E-02
2	14	5.14E-03	3.22E-03	5.06E-03	5.80E-03	6.46E-03	7.05E-03	9.84E-03
	15	7.95E-05	5.08E-04	8.67E-05	3.79E-05	1.57E-05	6.08E-06	0.00E+00
	16	1.82E-02	1.62E-02	1.82E-02	1.86E-02	1.90E-02	1.92E-02	1.86E-02
	17	5.27E-02	4.69E-02	5.25E-02	5.38E-02	5.48E-02	5.55E-02	5.36E-02
	18	1.60E-01	1.41E-01	1.59E-01	1.63E-01	1.66E-01	1.68E-01	1.63E-01
	19	7.49E-02	6.73E-02	7.47E-02	7.65E-02	7.78E-02	7.88E-02	7.61E-02
	20	5.56E-02	5.46E-02	5.55E-02	5.63E-02	5.71E-02	5.77E-02	5.57E-02
	21	1.39E-02	1.79E-02	1.39E-02	1.36E-02	1.36E-02	1.37E-02	1.32E-02
	22	6.85E-02	6.45E-02	6.84E-02	6.97E-02	7.08E-02	7.17E-02	6.92E-02
	23	1.93E-03	5.35E-03	1.99E-03	1.61E-03	1.47E-03	1.42E-03	1.33E-03
	24	5.16E-05	8.02E-05	5.20E-05	4.92E-05	4.87E-05	4.88E-05	4.65E-05
2	25	1.14E-03	9.99E-04	1.13E-03	1.17E-03	1.19E-03	1.21E-03	1.17E-03
	26	5.01E-04	4.35E-04	4.99E-04	5.15E-04	5.26E-04	5.34E-04	5.15E-04
	27	2.41E-04	6.28E-04	2.48E-04	2.04E-04	1.87E-04	1.81E-04	1.68E-04
	28	3.71E-01	2.60E-01	3.65E-01	4.18E-01	4.68E-01	5.14E-01	7.47E-01
	29	1.13E-03	2.45E-03	1.19E-03	7.17E-04	4.17E-04	2.44E-04	0.00E+00
	30	7.04E-06	1.03E-05	7.06E-06	7.10E-06	7.50E-06	7.97E-06	8.70E-06
	31	1.40E-05	2.47E-05	1.42E-05	1.32E-05	1.33E-05	1.37E-05	1.46E-05
	32	1.83E-04	2.18E-04	1.84E-04	1.75E-04	1.71E-04	1.68E-04	1.83E-04

Table 4 (continued)

i	j	collision strengths at energies						
		65.33 eV	1714.98 eV	2944.1 eV	4868.3 eV	7564.6 eV	11040 eV	15221 eV
33		7.82E-06	1.89E-05	8.07E-06	6.34E-06	5.59E-06	5.32E-06	4.90E-06
34		7.11E-05	6.79E-05	7.07E-05	7.51E-05	7.52E-05	8.20E-05	8.74E-05
35		8.14E-05	8.31E-05	8.10E-05	8.56E-05	8.69E-05	9.34E-05	1.00E-04
36		6.95E-05	8.06E-05	6.92E-05	7.21E-05	7.35E-05	7.80E-05	8.26E-05
37		5.36E-06	3.02E-05	5.77E-06	3.11E-06	2.10E-06	1.72E-06	1.76E-06
38		1.52E-01	1.31E-01	1.51E-01	1.55E-01	1.56E-01	1.59E-01	1.55E-01
39		2.45E-04	1.72E-03	2.70E-04	1.06E-04	4.60E-05	2.42E-05	2.49E-06
40		2.70E-02	5.48E-03	2.58E-02	3.82E-02	5.04E-02	6.22E-02	1.41E-01
41		2.19E-02	5.56E-03	2.09E-02	3.08E-02	4.06E-02	5.01E-02	1.13E-01
42		5.81E-02	1.15E-02	5.53E-02	8.26E-02	1.09E-01	1.35E-01	3.09E-01
43		2.38E-04	1.31E-03	2.49E-04	1.95E-04	2.06E-04	2.37E-04	5.11E-04
44		1.99E-02	4.93E-03	1.89E-02	2.82E-02	3.74E-02	4.64E-02	1.06E-01
45		4.35E-05	4.05E-04	4.84E-05	1.74E-05	7.04E-06	3.02E-06	0.00E+00
46		1.47E-05	8.01E-06	1.44E-05	1.66E-05	1.81E-05	1.91E-05	1.98E-05
47		2.44E-05	1.98E-05	2.41E-05	2.70E-05	2.92E-05	3.07E-05	3.18E-05
48		5.67E-03	3.21E-03	5.55E-03	6.40E-03	7.00E-03	7.38E-03	7.67E-03
49		1.66E-02	9.36E-03	1.62E-02	1.87E-02	2.04E-02	2.16E-02	2.24E-02
50		4.91E-02	2.77E-02	4.80E-02	5.54E-02	6.06E-02	6.40E-02	6.66E-02
51		1.69E-02	1.10E-02	1.66E-02	1.90E-02	2.07E-02	2.19E-02	2.27E-02
52		2.49E-02	1.42E-02	2.44E-02	2.81E-02	3.08E-02	3.25E-02	3.38E-02
53		2.27E-03	2.90E-03	2.26E-03	2.41E-03	2.58E-03	2.70E-03	2.79E-03
54		2.05E-02	1.26E-02	2.01E-02	2.30E-02	2.52E-02	2.66E-02	2.77E-02
55		2.67E-04	1.17E-03	2.84E-04	2.07E-04	1.86E-04	1.83E-04	1.83E-04
56		1.63E-05	1.31E-05	1.61E-05	1.77E-05	1.91E-05	2.03E-05	2.67E-05
57		6.69E-05	4.66E-05	6.53E-05	7.55E-05	8.49E-05	9.40E-05	1.50E-04
58		2.63E-04	2.18E-04	2.62E-04	2.74E-04	2.83E-04	2.89E-04	2.96E-04
59		1.14E-02	9.21E-03	1.13E-02	1.19E-02	1.22E-02	1.24E-02	1.26E-02
60		9.01E-03	1.20E-02	9.06E-03	8.99E-03	9.07E-03	9.17E-03	9.26E-03
61		1.50E-02	1.28E-02	1.50E-02	1.56E-02	1.60E-02	1.63E-02	1.65E-02
62		4.17E-02	3.38E-02	4.16E-02	4.35E-02	4.48E-02	4.56E-02	4.63E-02
63		2.56E-02	2.08E-02	2.55E-02	2.67E-02	2.75E-02	2.80E-02	2.84E-02
64		4.08E-03	6.04E-03	4.12E-03	4.02E-03	4.04E-03	4.07E-03	4.11E-03
65		1.25E-03	5.63E-03	1.33E-03	9.10E-04	7.58E-04	7.12E-04	7.07E-04
66		2.54E-02	2.21E-02	2.54E-02	2.64E-02	2.71E-02	2.76E-02	2.79E-02
67		1.28E-06	1.06E-05	1.46E-06	5.74E-07	2.44E-07	9.46E-08	0.00E+00
68		7.73E-07	1.40E-06	7.63E-07	8.12E-07	9.13E-07	1.06E-06	1.00E-06
69		1.97E-05	1.27E-05	1.94E-05	2.23E-05	2.43E-05	2.58E-05	2.81E-05
70		6.91E-06	4.56E-06	6.76E-06	7.96E-06	8.81E-06	9.39E-06	9.99E-06
71		6.19E-06	1.58E-05	6.35E-06	5.91E-06	6.00E-06	6.23E-06	6.53E-06
72		1.40E-06	1.69E-06	1.40E-06	1.50E-06	1.60E-06	1.68E-06	2.24E-06
73		3.79E-06	3.56E-06	3.81E-06	3.96E-06	4.06E-06	4.04E-06	4.12E-06
74		4.13E-06	3.07E-06	4.08E-06	4.71E-06	5.31E-06	5.80E-06	9.30E-06
75		2.47E-05	1.15E-05	2.39E-05	3.12E-05	3.85E-05	4.54E-05	9.20E-05
76		2.78E-02	2.20E-02	2.76E-02	2.82E-02	2.86E-02	2.93E-02	2.79E-02
77		9.64E-05	5.73E-04	1.07E-04	4.20E-05	1.72E-05	8.80E-06	6.19E-07
78		4.10E-04	1.55E-04	4.03E-04	5.86E-04	7.58E-04	9.23E-04	2.04E-03
79		4.83E-07	2.25E-06	5.33E-07	2.71E-07	1.42E-07	8.04E-08	0.00E+00
80		4.54E-03	2.15E-03	4.49E-03	6.48E-03	8.38E-03	1.02E-02	2.26E-02
81		4.95E-03	1.89E-03	4.88E-03	7.11E-03	9.23E-03	1.13E-02	2.50E-02
82		1.24E-02	4.66E-03	1.22E-02	1.79E-02	2.33E-02	2.85E-02	6.39E-02
83		3.66E-04	6.06E-04	3.68E-04	4.72E-04	6.03E-04	7.25E-04	1.63E-03
84		4.43E-03	2.10E-03	4.35E-03	6.32E-03	8.23E-03	1.01E-02	2.26E-02
85		1.96E-05	1.85E-04	2.28E-05	7.99E-06	3.05E-06	1.34E-06	0.00E+00
86		3.02E-04	1.88E-04	2.96E-04	3.37E-04	3.67E-04	3.89E-04	4.00E-04
87		8.14E-04	5.11E-04	8.00E-04	9.08E-04	9.90E-04	1.05E-03	1.08E-03
88		1.06E-03	6.70E-04	1.04E-03	1.18E-03	1.29E-03	1.36E-03	1.40E-03
89		3.10E-03	1.96E-03	3.04E-03	3.45E-03	3.76E-03	3.98E-03	4.08E-03
90		5.16E-03	3.32E-03	5.06E-03	5.74E-03	6.25E-03	6.62E-03	6.81E-03
91		4.16E-03	3.19E-03	4.10E-03	4.58E-03	4.96E-03	5.24E-03	5.38E-03
92		1.20E-02	7.54E-03	1.18E-02	1.34E-02	1.45E-02	1.54E-02	1.59E-02
93		1.05E-03	1.26E-03	1.04E-03	1.11E-03	1.18E-03	1.24E-03	1.26E-03
94		5.19E-03	3.70E-03	5.11E-03	5.74E-03	6.24E-03	6.60E-03	6.80E-03
95		5.94E-04	4.23E-04	5.86E-04	6.56E-04	7.09E-04	7.49E-04	7.51E-04
96		1.50E-04	2.08E-04	1.50E-04	1.56E-04	1.64E-04	1.72E-04	1.75E-04
97		4.95E-05	3.53E-04	5.51E-05	2.19E-05	8.75E-06	3.86E-06	1.42E-06
98		1.57E-03	1.44E-03	1.56E-03	1.67E-03	1.79E-03	1.87E-03	1.92E-03
99		2.26E-03	2.24E-03	2.24E-03	2.39E-03	2.54E-03	2.65E-03	2.73E-03
100		1.48E-03	2.78E-03	1.50E-03	1.43E-03	1.46E-03	1.50E-03	1.52E-03

Table 4 (continued)

i	j	collision strengths at energies						
		2944.1 eV	4868.3 eV	7564.6 eV	11040 eV	15221 eV	65.33 eV	1714.98 eV
101		5.83E-03	5.35E-03	5.79E-03	6.21E-03	6.63E-03	6.93E-03	7.10E-03
102		3.16E-03	3.13E-03	3.14E-03	3.34E-03	3.56E-03	3.73E-03	3.83E-03
103		1.84E-03	1.49E-03	1.74E-03	1.95E-03	2.09E-03	2.28E-03	2.18E-03
104		1.22E-03	1.53E-03	1.16E-03	1.25E-03	1.32E-03	1.44E-03	1.37E-03
105		7.59E-04	1.95E-03	7.82E-04	6.84E-04	6.71E-04	6.76E-04	6.82E-04
106		5.36E-04	1.40E-03	5.53E-04	4.81E-04	4.71E-04	4.81E-04	4.76E-04
107		3.57E-03	3.78E-03	3.55E-03	3.75E-03	3.98E-03	4.16E-03	4.25E-03
108		1.02E-03	2.02E-03	9.85E-04	9.90E-04	1.02E-03	1.11E-03	1.05E-03
109		1.43E-03	1.60E-03	1.36E-03	1.49E-03	1.58E-03	1.72E-03	1.64E-03
110		4.72E-03	3.82E-03	4.46E-03	5.01E-03	5.35E-03	5.86E-03	5.59E-03
111		2.48E-03	2.31E-03	2.35E-03	2.61E-03	2.78E-03	3.04E-03	2.90E-03
112		8.85E-04	1.65E-03	8.56E-04	8.71E-04	9.03E-04	9.81E-04	9.28E-04
113		3.08E-03	2.83E-03	2.92E-03	3.25E-03	3.46E-03	3.79E-03	3.61E-03
114		6.47E-08	4.33E-08	6.35E-08	7.78E-08	8.84E-08	8.99E-08	1.07E-07
115		2.93E-07	1.01E-06	3.05E-07	2.48E-07	2.38E-07	2.34E-07	2.57E-07
116		6.06E-06	5.07E-06	6.11E-06	6.51E-06	8.09E-06	7.37E-06	7.25E-06
117		9.91E-06	8.93E-06	9.92E-06	1.07E-05	2.26E-05	1.21E-05	1.40E-05
118		1.36E-06	1.34E-06	1.36E-06	1.43E-06	7.94E-06	1.54E-06	1.57E-06
119		1.67E-07	1.43E-06	1.87E-07	7.49E-08	3.27E-08	1.33E-08	0.00E+00
120		1.91E-05	1.81E-05	1.88E-05	2.12E-05	2.44E-05	2.61E-05	4.46E-05
121		1.42E-05	1.24E-05	1.43E-05	1.53E-05	1.70E-05	1.15E-05	1.66E-05
122		1.51E-05	1.40E-05	1.52E-05	1.63E-05	2.08E-05	1.65E-05	1.94E-05
123		9.28E-07	4.15E-06	9.94E-07	7.00E-07	1.57E-06	4.83E-07	5.80E-07
124		2.09E-07	2.10E-07	1.15E-07	4.68E-07	1.60E-08	4.48E-07	1.96E-07
125		4.18E-06	2.48E-06	3.24E-06	3.60E-06	3.88E-06	5.93E-06	2.99E-06
126		4.47E-07	6.70E-07	4.50E-07	5.39E-07	3.23E-07	5.58E-07	5.64E-07
127		1.37E-05	1.29E-05	1.35E-05	1.51E-05	1.66E-05	1.74E-05	1.86E-05
128		8.00E-05	4.72E-05	7.80E-05	9.03E-05	1.01E-04	1.07E-04	1.14E-04
129		4.47E-07	1.89E-06	4.83E-07	3.19E-07	2.70E-07	2.55E-07	2.57E-07
130		4.74E-06	5.02E-06	4.72E-06	5.23E-06	5.62E-06	5.56E-06	6.25E-06
131		9.29E-06	8.87E-06	9.14E-06	1.02E-05	1.13E-05	1.16E-05	1.26E-05
132		1.13E-07	2.21E-07	1.13E-07	1.26E-07	1.87E-07	-6.05E-07	2.54E-07
133		1.68E-07	3.54E-07	1.72E-07	1.68E-07	2.48E-07	2.09E-07	1.72E-07
134		4.14E-07	3.87E-07	3.98E-07	5.27E-07	7.30E-07	5.89E-07	1.86E-06
135		4.45E-06	1.84E-06	4.19E-06	6.00E-06	7.99E-06	9.81E-06	2.32E-05
136		4.43E-08	9.39E-08	4.10E-08	4.64E-08	5.18E-08	5.23E-08	5.61E-08
137		2.79E-08	1.24E-07	2.72E-08	2.49E-08	2.31E-08	2.34E-08	2.63E-08
138		5.41E-07	7.79E-07	5.31E-07	5.60E-07	6.33E-07	5.49E-07	6.57E-07
139		4.53E-06	3.02E-06	4.36E-06	4.99E-06	5.63E-06	5.79E-06	6.21E-06
140		1.03E-02	7.95E-03	1.01E-02	1.02E-02	1.04E-02	1.04E-02	9.93E-03
141		4.97E-05	2.97E-04	5.49E-05	2.15E-05	8.51E-06	4.18E-06	1.80E-07
142		2.11E-03	8.31E-04	2.16E-03	3.20E-03	4.12E-03	5.02E-03	1.05E-02
143		1.77E-03	9.19E-04	1.82E-03	2.66E-03	3.42E-03	4.15E-03	8.62E-03
144		4.71E-03	1.88E-03	4.82E-03	7.19E-03	9.29E-03	1.13E-02	2.38E-02
145		5.94E-05	2.77E-04	6.55E-05	5.71E-05	6.30E-05	7.37E-05	1.62E-04
146		1.70E-03	9.02E-04	1.75E-03	2.58E-03	3.32E-03	4.04E-03	8.39E-03
147		1.13E-05	1.03E-04	1.33E-05	4.68E-06	1.73E-06	7.55E-07	0.00E+00
148		5.36E-04	3.51E-04	5.25E-04	5.98E-04	6.45E-04	6.88E-04	6.96E-04
149		1.60E-03	1.05E-03	1.57E-03	1.78E-03	1.92E-03	2.05E-03	2.08E-03
150		1.69E-03	1.41E-03	1.67E-03	1.86E-03	1.99E-03	2.12E-03	2.14E-03
151		4.78E-03	3.12E-03	4.68E-03	5.33E-03	5.76E-03	6.13E-03	6.22E-03
152		2.63E-03	1.73E-03	2.58E-03	2.94E-03	3.17E-03	3.38E-03	3.42E-03
153		9.79E-05	4.40E-04	1.03E-04	7.04E-05	5.93E-05	5.65E-05	5.37E-05
154		2.12E-03	1.62E-03	2.08E-03	2.34E-03	2.52E-03	2.68E-03	2.70E-03
155		4.48E-05	2.75E-04	4.85E-05	2.47E-05	1.57E-05	1.24E-05	1.03E-05
156		5.18E-04	5.18E-04	5.12E-04	5.09E-04	5.95E-04	6.07E-04	6.56E-04
157		5.31E-04	1.18E-03	5.40E-04	4.62E-04	5.01E-04	5.02E-04	5.35E-04
158		7.75E-04	8.34E-04	7.67E-04	7.51E-04	8.81E-04	8.96E-04	9.71E-04
159		1.90E-03	1.90E-03	1.88E-03	1.84E-03	2.17E-03	2.22E-03	2.41E-03
160		1.20E-03	1.21E-03	1.19E-03	1.16E-03	1.37E-03	1.40E-03	1.52E-03
161		1.32E-04	8.13E-04	1.47E-04	7.03E-05	4.57E-05	3.13E-05	2.79E-05
162		1.74E-04	6.18E-04	1.83E-04	1.31E-04	1.26E-04	1.23E-04	1.27E-04
163		1.18E-03	1.42E-03	1.17E-03	1.11E-03	1.31E-03	1.33E-03	1.44E-03
164		9.21E-04	7.72E-04	8.52E-04	9.73E-04	1.05E-03	-2.04E-04	1.12E-03
165		5.45E-04	1.24E-03	5.22E-04	5.15E-04	5.28E-04	-5.10E-05	5.50E-04
166		1.68E-04	1.66E-04	1.69E-04	1.78E-04	1.85E-04	1.92E-04	1.81E-04
167		9.82E-05	1.83E-04	1.00E-04	1.00E-04	1.03E-04	1.07E-04	1.00E-04
168		8.06E-05	2.46E-04	8.34E-05	7.81E-05	7.86E-05	8.08E-05	7.58E-05

Table 4 (continued)

i	j	collision strengths at energies						
		2944.1 eV	4868.3 eV	7564.6 eV	11040 eV	15221 eV	65.33 eV	1714.98 eV
169		2.39E-03	2.00E-03	2.21E-03	2.52E-03	2.72E-03	-1.91E-03	2.90E-03
170		7.60E-04	9.15E-04	7.11E-04	7.81E-04	8.33E-04	-3.56E-04	8.84E-04
171		3.57E-04	3.54E-04	3.60E-04	3.78E-04	3.93E-04	4.08E-04	3.85E-04
172		1.24E-04	1.86E-04	1.26E-04	1.29E-04	1.33E-04	1.38E-04	1.30E-04
173		2.48E-04	2.53E-04	2.50E-04	2.62E-04	2.72E-04	2.82E-04	2.66E-04
174		5.94E-04	8.60E-04	5.57E-04	5.99E-04	6.33E-04	-5.93E-05	6.68E-04
175		2.26E-05	1.93E-04	2.49E-05	1.62E-05	1.42E-05	1.40E-05	1.30E-05
176		1.37E-03	1.29E-03	1.27E-03	1.44E-03	1.54E-03	-4.43E-04	1.64E-03
177		2.39E-04	2.84E-04	2.41E-04	2.51E-04	2.60E-04	2.69E-04	2.54E-04
178		3.61E-04	9.79E-04	3.50E-04	3.29E-04	3.32E-04	-3.13E-04	3.43E-04
179		1.57E-03	1.54E-03	1.46E-03	1.64E-03	1.76E-03	-1.20E-03	1.88E-03
180		1.34E-08	8.84E-09	6.69E-09	9.98E-09	1.83E-08	1.86E-08	9.33E-08
181		3.87E-08	1.15E-07	2.92E-08	2.51E-08	3.49E-08	3.44E-08	1.55E-07
182		1.22E-07	1.10E-07	1.12E-07	1.46E-07	1.55E-07	1.77E-07	2.01E-07
183		1.00E-07	1.63E-07	1.01E-07	1.30E-07	1.46E-07	1.53E-07	4.90E-07
184		3.12E-07	3.17E-07	2.89E-07	3.11E-07	3.47E-07	3.79E-07	9.19E-07
185		7.05E-08	6.29E-07	8.02E-08	3.09E-08	1.33E-08	5.50E-09	0.00E+00
186		7.50E-08	9.25E-08	3.54E-08	4.07E-08	2.78E-08	9.01E-08	1.75E-07
187		1.95E-06	9.09E-07	1.17E-06	1.47E-06	1.56E-06	1.66E-06	3.05E-06
188		1.33E-07	1.89E-07	1.38E-07	1.48E-07	1.33E-07	1.64E-07	1.76E-07
189		2.03E-07	9.02E-07	2.24E-07	1.46E-07	1.21E-07	1.07E-07	1.13E-07
190		4.96E-08	1.08E-07	5.26E-08	2.29E-07	3.34E-08	6.62E-08	1.55E-07
191		1.12E-06	6.00E-07	1.10E-06	1.41E-06	1.64E-06	1.97E-06	7.14E-06
192		6.78E-08	1.67E-07	7.06E-08	1.28E-07	6.06E-08	3.83E-08	7.61E-08
193		1.37E-07	1.82E-07	1.38E-07	2.33E-09	1.36E-07	1.78E-07	5.79E-07
194		3.20E-08	6.30E-08	3.53E-08	3.03E-08	4.06E-08	4.48E-08	4.44E-08
195		1.32E-08	3.57E-08	1.32E-08	-1.50E-08	-1.15E-08	-1.56E-08	1.41E-08
196		8.79E-08	1.11E-07	9.27E-08	1.10E-07	1.24E-07	1.51E-07	1.36E-07
197		7.39E-09	1.77E-08	1.13E-08	-4.56E-09	2.68E-08	-2.11E-09	8.13E-09
198		7.23E-08	6.55E-08	6.84E-08	-1.49E-07	-5.72E-08	-3.39E-08	8.26E-08
199		1.70E-08	8.21E-08	1.94E-08	1.01E-08	1.68E-08	2.83E-08	1.81E-08
200		4.44E-09	2.22E-08	6.33E-09	2.75E-09	6.45E-09	-1.38E-08	4.59E-09
201		7.06E-07	3.68E-07	7.35E-07	9.21E-07	1.06E-06	1.18E-06	1.14E-06
202		4.55E-07	7.77E-07	5.72E-07	5.82E-07	6.40E-07	6.73E-07	6.31E-07
203		1.01E-07	6.33E-07	1.11E-07	5.29E-08	2.62E-08	1.35E-08	0.00E+00
204		2.30E-07	3.28E-07	2.25E-07	2.26E-07	2.56E-07	3.07E-07	2.82E-07
205		4.69E-07	1.01E-06	4.67E-07	4.28E-07	4.64E-07	5.50E-07	5.01E-07
206		1.04E-05	4.10E-06	2.38E-06	1.81E-06	4.90E-07	2.65E-05	3.55E-06
207		2.92E-07	1.14E-06	3.10E-07	2.05E-07	1.76E-07	1.86E-07	1.54E-07
208		1.64E-06	1.91E-06	1.67E-06	2.52E-06	6.33E-05	1.91E-06	2.14E-06
209		3.38E-06	3.16E-06	3.58E-06	5.02E-06	1.15E-04	5.57E-06	9.30E-06
210		1.05E-05	5.86E-06	1.15E-05	1.58E-05	1.95E-04	2.26E-05	4.41E-05
211		3.30E-07	2.03E-06	3.73E-07	2.14E-07	4.85E-05	1.34E-07	1.92E-07
212		2.08E-06	2.62E-06	2.05E-06	2.31E-06	1.60E-06	7.10E-06	2.81E-06
213		6.50E-06	6.15E-06	6.36E-06	7.16E-06	7.23E-06	9.71E-06	8.52E-06
214		2.30E-05	1.55E-05	2.24E-05	2.56E-05	2.78E-05	2.67E-05	3.06E-05
215		9.91E-07	3.88E-06	1.04E-06	7.96E-07	8.18E-07	-9.51E-07	6.91E-07
216		1.35E-06	2.30E-06	1.41E-06	1.48E-06	1.71E-06	7.70E-06	1.58E-06
217		1.10E-06	1.53E-06	1.13E-06	1.22E-06	1.35E-06	5.14E-06	1.36E-06
218		5.08E-06	4.15E-06	5.29E-06	5.91E-06	7.19E-06	3.50E-05	6.42E-06
219		9.79E-07	2.12E-06	1.03E-06	1.03E-06	1.17E-06	5.19E-06	1.07E-06
220		8.74E-07	5.64E-07	8.70E-07	1.46E-06	2.04E-06	2.51E-06	2.90E-06
221		4.53E-08	3.11E-07	5.03E-08	2.33E-08	1.11E-08	5.66E-09	0.00E+00
222		1.79E-07	2.03E-07	1.90E-07	2.31E-07	2.37E-07	2.40E-07	3.59E-07
223		3.61E-07	6.62E-07	3.86E-07	4.30E-07	4.29E-07	4.29E-07	6.32E-07
224		7.41E-06	4.54E-06	4.68E-06	4.67E-06	1.39E-05	1.80E-05	6.54E-06
225		1.79E-07	6.73E-07	1.96E-07	1.50E-07	1.27E-07	1.17E-07	1.79E-07
226		8.19E-07	9.66E-07	8.28E-07	1.39E-06	8.70E-07	1.06E-06	1.22E-06
227		2.00E-06	1.69E-06	2.01E-06	3.14E-06	3.18E-06	3.94E-06	5.68E-06
228		7.15E-06	3.29E-06	7.07E-06	1.10E-05	1.45E-05	1.81E-05	2.85E-05
229		2.00E-07	1.16E-06	2.24E-07	1.27E-07	1.04E-07	1.01E-07	1.28E-07
230		1.00E-06	1.43E-06	1.00E-06	1.10E-06	1.30E-06	1.38E-06	1.46E-06
231		2.88E-06	3.06E-06	2.86E-06	3.25E-06	3.65E-06	3.87E-06	3.96E-06
232		9.61E-06	7.01E-06	9.49E-06	1.12E-05	1.24E-05	1.32E-05	1.34E-05
233		4.70E-07	2.24E-06	5.03E-07	3.46E-07	2.96E-07	2.79E-07	2.63E-07
234		8.03E-07	1.20E-06	8.31E-07	1.18E-06	9.15E-07	6.98E-07	1.03E-06
235		9.72E-07	1.72E-06	9.92E-07	1.04E-06	1.02E-06	8.42E-07	1.12E-06
236		9.02E-08	2.82E-07	9.64E-08	2.16E-07	-1.12E-07	4.31E-07	1.02E-07

Table 4 (continued)

i	j	collision strengths at energies						
		2944.1 eV	4868.3 eV	7564.6 eV	11040 eV	15221 eV	65.33 eV	1714.98 eV
	237	1.10E-07	2.17E-07	1.06E-07	1.98E-07	2.64E-07	-1.82E-07	1.26E-07
	238	3.33E-06	2.88E-06	3.32E-06	3.03E-06	3.73E-06	3.23E-06	4.05E-06
	239	2.79E-07	3.93E-07	3.18E-07	9.14E-07	-1.27E-06	3.08E-06	3.70E-07
	240	7.78E-08	2.73E-07	8.38E-08	1.81E-07	-9.46E-08	3.60E-07	8.47E-08
	241	6.50E-07	1.67E-06	6.78E-07	6.46E-07	6.27E-07	4.97E-07	6.57E-07

For Review Only

Table 5. The effective collision strengths at electron plasma temperatures (650, 850, 1050, 1250, 1450, 1650, 1850) eV for Ne-like Ge ions.

I	J	Effective collision strengths at temperatures						
		650 eV	850 eV	1050 eV	1250 eV	1450 eV	1650 eV	1850 eV
1	2	2.82E-04	3.10E-04	2.74E-04	2.84E-04	2.96E-04	3.46E-04	4.02E-04
	3	1.01E-02	9.93E-03	1.13E-02	1.03E-02	9.39E-03	7.68E-03	5.74E-03
	4	5.73E-05	6.30E-05	5.55E-05	5.76E-05	6.01E-05	7.03E-05	8.15E-05
	5	6.71E-03	6.62E-03	7.47E-03	6.88E-03	6.26E-03	5.13E-03	3.84E-03
	6	6.75E-04	7.40E-04	6.48E-04	6.72E-04	7.00E-04	8.23E-04	9.58E-04
	7	2.59E-03	2.56E-03	2.53E-03	2.51E-03	2.49E-03	2.48E-03	2.46E-03
	8	7.90E-04	8.62E-04	7.43E-04	7.67E-04	7.97E-04	9.49E-04	1.12E-03
	9	3.27E-04	3.57E-04	3.09E-04	3.19E-04	3.31E-04	3.94E-04	4.62E-04
	10	2.40E-03	2.35E-03	2.34E-03	2.31E-03	2.29E-03	2.25E-03	2.21E-03
	11	5.28E-03	5.24E-03	5.22E-03	5.22E-03	5.22E-03	5.20E-03	5.18E-03
	12	3.21E-04	3.50E-04	3.02E-04	3.12E-04	3.24E-04	3.85E-04	4.53E-04
	13	3.63E-04	3.97E-04	3.45E-04	3.56E-04	3.71E-04	4.39E-04	5.14E-04
	14	2.56E-03	2.52E-03	2.50E-03	2.47E-03	2.45E-03	2.42E-03	2.40E-03
	15	2.67E-02	2.65E-02	2.65E-02	2.64E-02	2.64E-02	2.62E-02	2.61E-02
	16	3.53E-04	3.85E-04	3.29E-04	3.38E-04	3.51E-04	4.21E-04	4.98E-04
	17	1.77E-03	1.83E-03	1.79E-03	1.76E-03	1.73E-03	1.80E-03	1.88E-03
	18	1.16E-03	1.26E-03	1.07E-03	1.10E-03	1.14E-03	1.37E-03	1.63E-03
	19	1.20E-03	1.30E-03	1.11E-03	1.14E-03	1.18E-03	1.43E-03	1.69E-03
	20	2.37E-03	2.37E-03	2.31E-03	2.30E-03	2.29E-03	2.33E-03	2.38E-03
	21	4.53E-04	4.89E-04	4.08E-04	4.18E-04	4.32E-04	5.28E-04	6.33E-04
	22	2.05E-03	2.03E-03	2.01E-03	1.99E-03	1.97E-03	1.97E-03	1.96E-03
	23	1.11E-01	1.10E-01	1.20E-01	1.13E-01	1.05E-01	8.98E-02	7.25E-02
	24	5.53E-04	5.99E-04	5.05E-04	5.18E-04	5.36E-04	6.50E-04	7.75E-04
	25	8.13E-04	8.83E-04	7.48E-04	7.69E-04	7.96E-04	9.61E-04	1.14E-03
	26	2.33E-03	2.31E-03	2.28E-03	2.26E-03	2.24E-03	2.26E-03	2.27E-03
	27	1.90E-01	1.87E-01	2.05E-01	1.93E-01	1.79E-01	1.53E-01	1.23E-01
	28	1.83E-04	2.00E-04	1.72E-04	1.77E-04	1.84E-04	2.20E-04	2.59E-04
	29	1.22E-02	1.21E-02	1.21E-02	1.21E-02	1.21E-02	1.19E-02	1.18E-02
	30	4.84E-05	5.31E-05	4.66E-05	4.83E-05	5.03E-05	5.90E-05	6.86E-05
	31	4.10E-03	4.06E-03	4.56E-03	4.22E-03	3.83E-03	3.14E-03	2.34E-03
	32	2.31E-04	2.53E-04	2.23E-04	2.31E-04	2.41E-04	2.83E-04	3.28E-04
	33	1.72E-02	1.71E-02	1.97E-02	1.77E-02	1.60E-02	1.29E-02	9.31E-03
	34	3.31E-04	3.61E-04	3.11E-04	3.21E-04	3.34E-04	3.98E-04	4.68E-04
	35	7.47E-04	7.83E-04	7.18E-04	7.31E-04	7.49E-04	8.45E-04	9.51E-04
	36	7.64E-04	8.34E-04	7.19E-04	7.42E-04	7.70E-04	9.18E-04	1.08E-03
	37	2.38E-02	2.30E-02	2.33E-02	2.29E-02	2.25E-02	2.15E-02	2.04E-02
	38	9.12E-05	1.00E-04	8.87E-05	9.21E-05	9.61E-05	1.12E-04	1.30E-04
	39	1.38E-03	1.36E-03	1.52E-03	1.41E-03	1.28E-03	1.06E-03	8.01E-04
	40	1.81E-04	1.98E-04	1.74E-04	1.80E-04	1.87E-04	2.20E-04	2.56E-04
	41	5.47E-04	5.46E-04	5.34E-04	5.30E-04	5.28E-04	5.36E-04	5.46E-04
	42	2.71E-04	2.96E-04	2.56E-04	2.64E-04	2.75E-04	3.26E-04	3.83E-04
	43	1.11E-04	1.21E-04	1.05E-04	1.09E-04	1.13E-04	1.34E-04	1.57E-04
	44	4.76E-04	4.72E-04	4.64E-04	4.59E-04	4.56E-04	4.58E-04	4.61E-04
	45	4.31E-03	4.27E-03	4.27E-03	4.26E-03	4.25E-03	4.22E-03	4.19E-03
	46	1.89E-05	2.07E-05	1.83E-05	1.89E-05	1.98E-05	2.31E-05	2.68E-05
	47	1.18E-03	1.17E-03	1.30E-03	1.21E-03	1.11E-03	9.17E-04	7.01E-04
	48	1.19E-04	1.30E-04	1.11E-04	1.15E-04	1.19E-04	1.42E-04	1.68E-04
	49	4.74E-04	4.95E-04	4.74E-04	4.71E-04	4.70E-04	5.06E-04	5.44E-04
	50	4.04E-04	4.39E-04	3.73E-04	3.83E-04	3.97E-04	4.79E-04	5.69E-04
	51	5.56E-04	5.59E-04	5.40E-04	5.36E-04	5.33E-04	5.54E-04	5.76E-04
	52	3.62E-04	3.93E-04	3.35E-04	3.45E-04	3.57E-04	4.30E-04	5.09E-04
	53	1.72E-04	1.86E-04	1.56E-04	1.60E-04	1.65E-04	2.02E-04	2.41E-04
	54	4.34E-04	4.33E-04	4.20E-04	4.15E-04	4.11E-04	4.22E-04	4.35E-04
	55	3.52E-02	3.47E-02	3.78E-02	3.57E-02	3.33E-02	2.88E-02	2.36E-02
	56	1.15E-04	1.26E-04	1.09E-04	1.12E-04	1.17E-04	1.39E-04	1.63E-04
	57	1.31E-04	1.43E-04	1.25E-04	1.29E-04	1.34E-04	1.59E-04	1.86E-04
	58	5.67E-04	5.64E-04	5.53E-04	5.48E-04	5.45E-04	5.51E-04	5.59E-04
	59	5.65E-05	6.09E-05	5.05E-05	5.16E-05	5.32E-05	6.55E-05	7.88E-05
	60	2.11E-04	2.09E-04	2.03E-04	2.01E-04	2.00E-04	2.03E-04	2.06E-04
	61	4.85E-04	4.73E-04	4.72E-04	4.62E-04	4.54E-04	4.43E-04	4.31E-04
	62	8.99E-05	9.66E-05	7.96E-05	8.11E-05	8.36E-05	1.03E-04	1.25E-04
	63	6.92E-05	7.45E-05	6.14E-05	6.26E-05	6.45E-05	7.98E-05	9.65E-05
	64	2.20E-03	2.11E-03	2.16E-03	2.10E-03	2.05E-03	1.92E-03	1.77E-03
	65	4.54E-05	4.88E-05	3.99E-05	4.06E-05	4.18E-05	5.20E-05	6.32E-05
	66	9.28E-05	9.33E-05	8.78E-05	8.72E-05	8.72E-05	9.32E-05	9.98E-05
	67	4.14E-03	4.10E-03	4.09E-03	4.09E-03	4.08E-03	4.05E-03	4.02E-03
	68	2.04E-04	2.22E-04	1.88E-04	1.93E-04	2.00E-04	2.42E-04	2.87E-04
	69	3.27E-04	3.55E-04	3.02E-04	3.11E-04	3.22E-04	3.88E-04	4.59E-04

Table 5 (continued)

I	j	Effective collision strengths at temperatures						
		650 eV	850 eV	1050 eV	1250 eV	1450 eV	1650 eV	1850 eV
	70	5.11E-04	5.13E-04	4.95E-04	4.91E-04	4.88E-04	5.06E-04	5.25E-04
	71	2.65E-02	2.61E-02	2.85E-02	2.69E-02	2.51E-02	2.17E-02	1.77E-02
	72	4.75E-05	5.10E-05	4.20E-05	4.27E-05	4.40E-05	5.46E-05	6.61E-05
	73	1.43E-04	1.43E-04	1.37E-04	1.36E-04	1.35E-04	1.40E-04	1.46E-04
	74	1.23E-03	1.19E-03	1.21E-03	1.18E-03	1.15E-03	1.08E-03	1.01E-03
	75	8.18E-05	8.81E-05	7.29E-05	7.44E-05	7.67E-05	9.45E-05	1.14E-04
	76	4.76E-05	5.25E-05	4.65E-05	4.83E-05	5.04E-05	5.87E-05	6.79E-05
	77	5.87E-04	5.78E-04	6.48E-04	5.98E-04	5.45E-04	4.49E-04	3.39E-04
	78	1.12E-04	1.23E-04	1.06E-04	1.10E-04	1.14E-04	1.36E-04	1.59E-04
	79	1.89E-03	1.86E-03	1.87E-03	1.86E-03	1.86E-03	1.83E-03	1.80E-03
	80	2.67E-04	2.66E-04	2.61E-04	2.59E-04	2.58E-04	2.61E-04	2.65E-04
	81	4.86E-05	5.32E-05	4.65E-05	4.82E-05	5.01E-05	5.91E-05	6.89E-05
	82	1.28E-04	1.40E-04	1.21E-04	1.25E-04	1.30E-04	1.54E-04	1.81E-04
	83	4.75E-05	5.20E-05	4.51E-05	4.67E-05	4.86E-05	5.75E-05	6.73E-05
	84	2.29E-04	2.27E-04	2.24E-04	2.21E-04	2.20E-04	2.21E-04	2.22E-04
	85	2.56E-03	2.53E-03	2.53E-03	2.52E-03	2.52E-03	2.49E-03	2.47E-03
	86	3.94E-05	4.29E-05	3.68E-05	3.79E-05	3.93E-05	4.71E-05	5.55E-05
	87	5.90E-04	5.90E-04	6.38E-04	6.01E-04	5.57E-04	4.90E-04	4.12E-04
	88	3.58E-05	3.92E-05	3.41E-05	3.52E-05	3.67E-05	4.34E-05	5.08E-05
	89	1.46E-03	1.45E-03	1.59E-03	1.49E-03	1.38E-03	1.17E-03	9.39E-04
	90	1.84E-04	1.99E-04	1.70E-04	1.74E-04	1.81E-04	2.18E-04	2.58E-04
	91	2.22E-04	2.24E-04	2.14E-04	2.13E-04	2.12E-04	2.22E-04	2.34E-04
	92	1.87E-04	2.03E-04	1.73E-04	1.78E-04	1.84E-04	2.22E-04	2.63E-04
	93	7.80E-05	8.44E-05	7.06E-05	7.23E-05	7.47E-05	9.12E-05	1.09E-04
	94	1.70E-04	1.70E-04	1.63E-04	1.61E-04	1.60E-04	1.67E-04	1.76E-04
	95	7.00E-05	7.70E-05	6.81E-05	7.08E-05	7.39E-05	8.62E-05	9.97E-05
	96	1.44E-02	1.42E-02	1.58E-02	1.48E-02	1.36E-02	1.13E-02	8.80E-03
	97	5.47E-03	5.39E-03	5.74E-03	5.50E-03	5.21E-03	4.68E-03	4.07E-03
	98	5.15E-05	5.57E-05	4.66E-05	4.77E-05	4.93E-05	6.02E-05	7.21E-05
	99	3.18E-04	3.13E-04	3.08E-04	3.03E-04	2.99E-04	2.98E-04	2.97E-04
	100	1.18E-04	1.17E-04	1.13E-04	1.12E-04	1.11E-04	1.14E-04	1.17E-04
	101	5.80E-05	6.24E-05	5.16E-05	5.27E-05	5.43E-05	6.70E-05	8.09E-05
	102	6.25E-05	6.75E-05	5.61E-05	5.74E-05	5.92E-05	7.27E-05	8.74E-05
	103	7.90E-06	8.48E-06	6.95E-06	7.07E-06	7.28E-06	9.05E-06	1.10E-05
	104	5.90E-05	5.78E-05	5.74E-05	5.69E-05	5.65E-05	5.58E-05	5.52E-05
	105	2.68E-05	2.87E-05	2.35E-05	2.39E-05	2.46E-05	3.06E-05	3.73E-05
	106	1.47E-03	1.41E-03	1.44E-03	1.40E-03	1.36E-03	1.28E-03	1.18E-03
	107	5.69E-05	5.74E-05	5.36E-05	5.32E-05	5.32E-05	5.75E-05	6.22E-05
	108	8.93E-06	8.93E-06	8.48E-06	8.43E-06	8.42E-06	8.90E-06	9.41E-06
	109	4.69E-05	4.55E-05	4.58E-05	4.53E-05	4.48E-05	4.35E-05	4.20E-05
	110	4.83E-06	5.16E-06	4.20E-06	4.26E-06	4.38E-06	5.49E-06	6.70E-06
	111	6.75E-06	7.25E-06	5.93E-06	6.03E-06	6.21E-06	7.72E-06	9.38E-06
	112	1.96E-06	2.10E-06	1.70E-06	1.72E-06	1.77E-06	2.22E-06	2.72E-06
	113	3.61E-06	3.67E-06	3.36E-06	3.36E-06	3.38E-06	3.76E-06	4.19E-06
	114	7.11E-06	7.82E-06	6.91E-06	7.17E-06	7.48E-06	8.74E-06	1.01E-05
	115	8.04E-05	8.03E-05	8.06E-05	7.91E-05	7.76E-05	7.65E-05	7.51E-05
	116	5.85E-05	6.39E-05	5.49E-05	5.66E-05	5.88E-05	7.01E-05	8.26E-05
	117	3.47E-04	3.46E-04	3.38E-04	3.36E-04	3.35E-04	3.41E-04	3.47E-04
	118	6.07E-05	6.65E-05	5.79E-05	5.99E-05	6.23E-05	7.37E-05	8.61E-05
	119	1.42E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.38E-03	1.37E-03
	120	2.36E-04	2.58E-04	2.25E-04	2.32E-04	2.42E-04	2.86E-04	3.34E-04
	121	8.49E-05	9.31E-05	8.16E-05	8.45E-05	8.80E-05	1.04E-04	1.21E-04
	122	7.34E-04	7.26E-04	7.19E-04	7.13E-04	7.08E-04	7.06E-04	7.04E-04
	123	3.86E-03	3.74E-03	3.79E-03	3.72E-03	3.66E-03	3.49E-03	3.31E-03
	124	9.37E-05	1.02E-04	8.63E-05	8.86E-05	9.18E-05	1.11E-04	1.32E-04
	125	1.55E-04	1.68E-04	1.44E-04	1.48E-04	1.53E-04	1.84E-04	2.18E-04
	126	1.45E-04	1.49E-04	1.39E-04	1.38E-04	1.39E-04	1.52E-04	1.67E-04
	127	4.35E-04	4.26E-04	4.27E-04	4.23E-04	4.19E-04	4.11E-04	4.02E-04
	128	8.69E-05	9.38E-05	7.83E-05	8.02E-05	8.28E-05	1.01E-04	1.21E-04
	129	8.61E-03	8.49E-03	9.24E-03	8.74E-03	8.16E-03	7.07E-03	5.83E-03
	130	4.83E-05	5.22E-05	4.38E-05	4.49E-05	4.64E-05	5.65E-05	6.75E-05
	131	6.19E-04	6.04E-04	6.08E-04	6.02E-04	5.96E-04	5.79E-04	5.61E-04
	132	3.13E-05	3.37E-05	2.78E-05	2.83E-05	2.92E-05	3.61E-05	4.36E-05
	133	8.43E-05	8.41E-05	8.03E-05	7.96E-05	7.94E-05	8.31E-05	8.72E-05
	134	6.44E-04	6.19E-04	6.29E-04	6.13E-04	5.97E-04	5.61E-04	5.23E-04
	135	4.79E-05	5.16E-05	4.26E-05	4.34E-05	4.47E-05	5.53E-05	6.68E-05
	136	2.60E-06	2.78E-06	2.26E-06	2.29E-06	2.35E-06	2.95E-06	3.60E-06
	137	5.90E-06	5.95E-06	5.56E-06	5.54E-06	5.55E-06	6.01E-06	6.50E-06
	138	1.48E-05	1.44E-05	1.42E-05	1.39E-05	1.37E-05	1.34E-05	1.31E-05
	139	2.88E-06	3.14E-06	2.69E-06	2.77E-06	2.87E-06	3.43E-06	4.05E-06

Table 5 (continued)

i	j	Effective collision strengths at temperatures						
		650 eV	850 eV	1050 eV	1250 eV	1450 eV	1650 eV	1850 eV
140		2.23E-05	2.45E-05	2.17E-05	2.26E-05	2.36E-05	2.75E-05	3.18E-05
141		1.88E-04	1.85E-04	2.05E-04	1.91E-04	1.74E-04	1.45E-04	1.12E-04
142		4.02E-05	4.41E-05	3.86E-05	4.00E-05	4.17E-05	4.90E-05	5.71E-05
143		1.13E-04	1.13E-04	1.10E-04	1.09E-04	1.09E-04	1.12E-04	1.16E-04
144		6.89E-05	7.52E-05	6.51E-05	6.72E-05	6.98E-05	8.30E-05	9.73E-05
145		2.85E-05	3.12E-05	2.70E-05	2.79E-05	2.90E-05	3.44E-05	4.03E-05
146		9.71E-05	9.69E-05	9.45E-05	9.37E-05	9.32E-05	9.50E-05	9.69E-05
147		1.24E-03	1.23E-03	1.23E-03	1.22E-03	1.22E-03	1.21E-03	1.20E-03
148		2.83E-05	3.09E-05	2.65E-05	2.73E-05	2.84E-05	3.39E-05	4.00E-05
149		1.07E-04	1.12E-04	1.07E-04	1.06E-04	1.06E-04	1.15E-04	1.24E-04
150		1.15E-04	1.16E-04	1.11E-04	1.10E-04	1.09E-04	1.15E-04	1.21E-04
151		1.00E-04	1.09E-04	9.24E-05	9.51E-05	9.85E-05	1.19E-04	1.41E-04
152		7.90E-05	8.58E-05	7.31E-05	7.52E-05	7.79E-05	9.38E-05	1.11E-04
153		4.88E-05	5.29E-05	4.45E-05	4.57E-05	4.73E-05	5.74E-05	6.85E-05
154		8.85E-05	8.91E-05	8.49E-05	8.39E-05	8.32E-05	8.76E-05	9.24E-05
155		8.05E-03	7.93E-03	8.63E-03	8.16E-03	7.62E-03	6.61E-03	5.45E-03
156		2.52E-05	2.72E-05	2.27E-05	2.32E-05	2.39E-05	2.93E-05	3.52E-05
157		6.88E-05	6.81E-05	6.59E-05	6.52E-05	6.47E-05	6.65E-05	6.83E-05
158		1.36E-04	1.34E-04	1.31E-04	1.29E-04	1.27E-04	1.28E-04	1.29E-04
159		3.62E-05	3.90E-05	3.23E-05	3.30E-05	3.40E-05	4.19E-05	5.05E-05
160		2.92E-05	3.14E-05	2.59E-05	2.65E-05	2.73E-05	3.37E-05	4.07E-05
161		2.00E-05	2.15E-05	1.76E-05	1.80E-05	1.85E-05	2.30E-05	2.79E-05
162		7.86E-04	7.54E-04	7.69E-04	7.49E-04	7.29E-04	6.81E-04	6.30E-04
163		3.48E-05	3.51E-05	3.27E-05	3.25E-05	3.25E-05	3.54E-05	3.84E-05
164		4.15E-06	4.44E-06	3.62E-06	3.67E-06	3.78E-06	4.72E-06	5.75E-06
165		7.98E-06	7.99E-06	7.57E-06	7.52E-06	7.52E-06	7.97E-06	8.46E-06
166		1.66E-07	1.77E-07	1.44E-07	1.47E-07	1.51E-07	1.88E-07	2.29E-07
167		7.24E-07	7.02E-07	6.63E-07	6.55E-07	6.53E-07	6.67E-07	6.85E-07
168		2.03E-07	2.05E-07	1.94E-07	1.95E-07	1.96E-07	2.10E-07	2.26E-07
169		4.62E-06	4.93E-06	4.01E-06	4.08E-06	4.19E-06	5.25E-06	6.40E-06
170		2.23E-05	2.19E-05	2.16E-05	2.14E-05	2.13E-05	2.14E-05	2.15E-05
171		1.34E-07	1.43E-07	1.15E-07	1.17E-07	1.20E-07	1.51E-07	1.85E-07
172		4.66E-07	4.46E-07	4.33E-07	4.27E-07	4.24E-07	4.15E-07	4.07E-07
173		4.87E-08	5.32E-08	4.51E-08	4.63E-08	4.80E-08	5.75E-08	6.80E-08
174		2.54E-05	2.46E-05	2.48E-05	2.46E-05	2.43E-05	2.35E-05	2.27E-05
175		6.69E-08	7.26E-08	6.10E-08	6.25E-08	6.46E-08	7.82E-08	9.31E-08
176		2.31E-06	2.47E-06	1.99E-06	2.02E-06	2.07E-06	2.61E-06	3.20E-06
177		4.85E-08	5.02E-08	5.08E-08	5.14E-08	5.21E-08	5.18E-08	5.15E-08
178		3.52E-06	3.76E-06	3.05E-06	3.10E-06	3.18E-06	3.99E-06	4.88E-06
179		3.44E-06	3.52E-06	3.19E-06	3.19E-06	3.21E-06	3.61E-06	4.06E-06
180		4.61E-06	5.08E-06	4.50E-06	4.67E-06	4.87E-06	5.68E-06	6.57E-06
181		7.88E-05	7.85E-05	8.46E-05	7.99E-05	7.44E-05	6.55E-05	5.53E-05
182		2.91E-05	3.18E-05	2.75E-05	2.84E-05	2.95E-05	3.51E-05	4.11E-05
183		3.35E-05	3.67E-05	3.20E-05	3.31E-05	3.44E-05	4.07E-05	4.75E-05
184		1.07E-04	1.07E-04	1.04E-04	1.04E-04	1.04E-04	1.07E-04	1.10E-04
185		6.81E-04	6.74E-04	6.74E-04	6.72E-04	6.71E-04	6.64E-04	6.57E-04
186		5.19E-05	5.64E-05	4.78E-05	4.92E-05	5.09E-05	6.15E-05	7.30E-05
187		8.35E-05	9.09E-05	7.76E-05	7.99E-05	8.28E-05	9.94E-05	1.18E-04
188		1.04E-04	1.06E-04	1.01E-04	9.98E-05	9.95E-05	1.05E-04	1.12E-04
189		4.27E-03	4.21E-03	4.58E-03	4.33E-03	4.04E-03	3.51E-03	2.89E-03
190		2.00E-05	2.15E-05	1.77E-05	1.81E-05	1.86E-05	2.30E-05	2.78E-05
191		3.68E-05	3.97E-05	3.29E-05	3.36E-05	3.47E-05	4.27E-05	5.14E-05
192		5.02E-05	5.02E-05	4.77E-05	4.74E-05	4.72E-05	4.97E-05	5.25E-05
193		4.31E-04	4.15E-04	4.22E-04	4.11E-04	4.00E-04	3.77E-04	3.52E-04
194		2.57E-06	2.75E-06	2.23E-06	2.26E-06	2.32E-06	2.92E-06	3.57E-06
195		4.86E-07	4.77E-07	4.71E-07	4.66E-07	4.63E-07	4.60E-07	4.57E-07
196		2.28E-05	2.23E-05	2.23E-05	2.21E-05	2.19E-05	2.14E-05	2.10E-05
197		6.71E-08	7.19E-08	5.87E-08	5.96E-08	6.13E-08	7.64E-08	9.29E-08
198		1.48E-07	1.59E-07	1.30E-07	1.32E-07	1.36E-07	1.69E-07	2.05E-07
199		5.44E-06	5.49E-06	5.11E-06	5.09E-06	5.10E-06	5.55E-06	6.05E-06
200		1.28E-07	1.29E-07	1.20E-07	1.20E-07	1.21E-07	1.31E-07	1.43E-07
201		4.90E-06	5.25E-06	4.27E-06	4.34E-06	4.46E-06	5.58E-06	6.80E-06
202		3.36E-05	3.66E-05	3.16E-05	3.26E-05	3.38E-05	4.04E-05	4.75E-05
203		9.60E-04	9.47E-04	9.50E-04	9.46E-04	9.42E-04	9.27E-04	9.12E-04
204		9.33E-06	1.02E-05	8.92E-06	9.24E-06	9.62E-06	1.13E-05	1.32E-05
205		5.91E-04	5.84E-04	6.49E-04	6.05E-04	5.54E-04	4.61E-04	3.56E-04
206		4.43E-05	4.86E-05	4.25E-05	4.40E-05	4.59E-05	5.40E-05	6.29E-05
207		1.94E-03	1.92E-03	2.18E-03	1.99E-03	1.81E-03	1.48E-03	1.10E-03
208		4.50E-05	4.93E-05	4.30E-05	4.46E-05	4.64E-05	5.47E-05	6.39E-05
209		1.05E-04	1.10E-04	1.02E-04	1.04E-04	1.07E-04	1.19E-04	1.32E-04

Table 5 (continued)

i	j	Effective collision strengths at temperatures						
		650 eV	850 eV	1050 eV	1250 eV	1450 eV	1650 eV	1850 eV
2	210	1.04E-04	1.14E-04	9.96E-05	1.03E-04	1.07E-04	1.27E-04	1.48E-04
	211	1.67E-03	1.62E-03	1.64E-03	1.61E-03	1.58E-03	1.51E-03	1.43E-03
	212	3.06E-05	3.31E-05	2.78E-05	2.85E-05	2.95E-05	3.59E-05	4.29E-05
	213	7.74E-05	7.93E-05	7.44E-05	7.49E-05	7.57E-05	8.23E-05	8.96E-05
	214	5.48E-05	5.93E-05	4.98E-05	5.10E-05	5.28E-05	6.42E-05	7.67E-05
	215	4.82E-04	4.69E-04	4.77E-04	4.71E-04	4.66E-04	4.47E-04	4.26E-04
	216	1.22E-05	1.19E-05	1.14E-05	1.13E-05	1.12E-05	1.16E-05	1.19E-05
	217	3.24E-06	3.46E-06	2.81E-06	2.85E-06	2.93E-06	3.68E-06	4.49E-06
	218	5.07E-06	5.43E-06	4.41E-06	4.47E-06	4.59E-06	5.76E-06	7.03E-06
	219	1.61E-05	1.56E-05	1.51E-05	1.50E-05	1.48E-05	1.48E-05	1.49E-05
	220	1.96E-05	2.14E-05	1.84E-05	1.90E-05	1.98E-05	2.36E-05	2.77E-05
	221	4.74E-04	4.68E-04	4.70E-04	4.68E-04	4.66E-04	4.58E-04	4.50E-04
	222	5.30E-06	5.81E-06	5.07E-06	5.25E-06	5.47E-06	6.44E-06	7.51E-06
	223	3.17E-04	3.14E-04	3.48E-04	3.25E-04	2.98E-04	2.49E-04	1.92E-04
	224	2.51E-05	2.76E-05	2.41E-05	2.50E-05	2.60E-05	3.06E-05	3.56E-05
	225	1.03E-03	1.02E-03	1.16E-03	1.06E-03	9.63E-04	7.86E-04	5.85E-04
	226	2.39E-05	2.61E-05	2.28E-05	2.36E-05	2.46E-05	2.90E-05	3.39E-05
	227	5.71E-05	5.97E-05	5.54E-05	5.64E-05	5.77E-05	6.40E-05	7.10E-05
	228	5.53E-05	6.06E-05	5.29E-05	5.47E-05	5.70E-05	6.72E-05	7.84E-05
	229	8.10E-04	7.83E-04	7.92E-04	7.77E-04	7.64E-04	7.29E-04	6.91E-04
	230	1.92E-05	2.08E-05	1.75E-05	1.79E-05	1.86E-05	2.25E-05	2.69E-05
	231	4.33E-05	4.47E-05	4.14E-05	4.18E-05	4.24E-05	4.68E-05	5.17E-05
	232	3.44E-05	3.72E-05	3.13E-05	3.21E-05	3.32E-05	4.04E-05	4.82E-05
	233	2.86E-04	2.77E-04	2.82E-04	2.78E-04	2.74E-04	2.63E-04	2.51E-04
	234	3.16E-06	3.38E-06	2.75E-06	2.79E-06	2.86E-06	3.59E-06	4.38E-06
	235	1.03E-05	1.03E-05	9.89E-06	9.82E-06	9.79E-06	1.01E-05	1.05E-05
	236	4.27E-07	4.55E-07	4.11E-07	3.88E-07	3.62E-07	3.93E-07	4.33E-07
	237	1.57E-07	1.64E-07	1.31E-07	1.30E-07	1.32E-07	1.72E-07	2.18E-07
	238	4.95E-06	5.30E-06	4.30E-06	4.37E-06	4.49E-06	5.62E-06	6.87E-06
	239	2.26E-07	2.37E-07	1.89E-07	1.87E-07	1.91E-07	2.47E-07	3.14E-07
	240	4.75E-07	5.07E-07	4.61E-07	4.34E-07	4.01E-07	4.28E-07	4.66E-07
	241	1.48E-05	1.45E-05	1.43E-05	1.42E-05	1.40E-05	1.40E-05	1.39E-05
	3	1.09E-02	1.13E-02	1.04E-02	1.05E-02	1.07E-02	1.20E-02	1.33E-02
	4	5.89E-03	5.89E-03	5.75E-03	5.74E-03	5.75E-03	5.88E-03	6.02E-03
	5	1.23E-02	1.27E-02	1.20E-02	1.21E-02	1.23E-02	1.33E-02	1.44E-02
	6	2.10E+00	2.06E+00	2.14E+00	2.09E+00	2.03E+00	1.90E+00	1.75E+00
	7	1.80E+00	1.77E+00	1.84E+00	1.79E+00	1.74E+00	1.63E+00	1.50E+00
	8	5.06E+00	4.97E+00	5.17E+00	5.04E+00	4.90E+00	4.58E+00	4.21E+00
	9	4.94E-03	4.95E-03	4.84E-03	4.76E-03	4.70E-03	4.81E-03	4.92E-03
	10	1.92E+00	1.88E+00	1.96E+00	1.91E+00	1.85E+00	1.73E+00	1.59E+00
	11	3.24E-04	3.44E-04	2.75E-04	2.78E-04	2.85E-04	3.63E-04	4.47E-04
	12	2.75E-03	2.71E-03	2.81E-03	2.74E-03	2.66E-03	2.48E-03	2.27E-03
	13	4.97E-02	4.88E-02	5.08E-02	4.94E-02	4.79E-02	4.46E-02	4.08E-02
	14	7.01E-03	6.88E-03	7.17E-03	6.97E-03	6.76E-03	6.28E-03	5.75E-03
	15	1.24E-04	1.32E-04	1.06E-04	1.08E-04	1.11E-04	1.40E-04	1.72E-04
	16	1.85E-02	1.84E-02	1.84E-02	1.84E-02	1.84E-02	1.83E-02	1.82E-02
	17	5.34E-02	5.31E-02	5.30E-02	5.30E-02	5.30E-02	5.28E-02	5.25E-02
	18	1.62E-01	1.61E-01	1.61E-01	1.61E-01	1.61E-01	1.60E-01	1.59E-01
	19	7.60E-02	7.55E-02	7.54E-02	7.54E-02	7.54E-02	7.51E-02	7.48E-02
	20	5.69E-02	5.66E-02	5.63E-02	5.63E-02	5.64E-02	5.65E-02	5.66E-02
	21	1.46E-02	1.46E-02	1.44E-02	1.44E-02	1.44E-02	1.47E-02	1.51E-02
	22	6.99E-02	6.95E-02	6.92E-02	6.92E-02	6.93E-02	6.92E-02	6.92E-02
	23	2.31E-03	2.36E-03	2.18E-03	2.19E-03	2.22E-03	2.45E-03	2.71E-03
	24	5.61E-05	5.62E-05	5.43E-05	5.43E-05	5.46E-05	5.67E-05	5.91E-05
	25	1.10E-03	1.11E-03	1.15E-03	1.16E-03	1.16E-03	1.14E-03	1.12E-03
	26	5.10E-04	5.06E-04	5.06E-04	5.06E-04	5.06E-04	5.03E-04	5.00E-04
	27	2.83E-04	2.88E-04	2.68E-04	2.69E-04	2.72E-04	2.99E-04	3.28E-04
	28	5.26E-01	5.17E-01	5.38E-01	5.22E-01	5.05E-01	4.69E-01	4.29E-01
	29	7.40E-04	8.18E-04	7.30E-04	7.60E-04	7.94E-04	9.20E-04	1.06E-03
	30	8.72E-06	8.65E-06	8.44E-06	8.38E-06	8.34E-06	8.48E-06	8.63E-06
	31	1.66E-05	1.66E-05	1.60E-05	1.60E-05	1.60E-05	1.66E-05	1.73E-05
	32	1.46E-04	1.25E-04	1.92E-04	2.10E-04	2.11E-04	1.83E-04	1.54E-04
	33	8.46E-06	8.67E-06	8.07E-06	8.13E-06	8.23E-06	9.04E-06	9.92E-06
	34	8.02E-05	7.93E-05	7.92E-05	7.86E-05	7.81E-05	7.73E-05	7.64E-05
	35	9.29E-05	9.19E-05	9.16E-05	9.09E-05	9.04E-05	8.97E-05	8.90E-05
	36	7.97E-05	7.91E-05	7.82E-05	7.78E-05	7.74E-05	7.76E-05	7.78E-05
	37	8.29E-06	8.68E-06	7.47E-06	7.51E-06	7.63E-06	9.27E-06	1.11E-05
	38	1.04E-01	1.11E-01	1.55E-01	1.62E-01	1.63E-01	1.52E-01	1.35E-01
	39	4.19E-04	4.45E-04	3.58E-04	3.61E-04	3.70E-04	4.70E-04	5.79E-04

Table 5 (continued)

I	J	Effective collision strengths at temperatures						
		650 eV	850 eV	1050 eV	1250 eV	1450 eV	1650 eV	1850 eV
	40	7.15E-02	7.07E-02	7.94E-02	7.36E-02	6.77E-02	5.63E-02	4.33E-02
	41	5.78E-02	5.70E-02	6.40E-02	5.95E-02	5.48E-02	4.56E-02	3.52E-02
	42	1.56E-01	1.55E-01	1.74E-01	1.61E-01	1.48E-01	1.23E-01	9.39E-02
	43	5.57E-04	5.69E-04	5.42E-04	5.25E-04	5.09E-04	5.44E-04	5.80E-04
	44	5.38E-02	5.31E-02	5.98E-02	5.55E-02	5.09E-02	4.23E-02	3.25E-02
	45	9.69E-05	1.02E-04	8.13E-05	8.08E-05	8.25E-05	1.07E-04	1.34E-04
	46	1.66E-05	1.63E-05	1.66E-05	1.65E-05	1.63E-05	1.57E-05	1.51E-05
	47	2.82E-05	2.78E-05	2.80E-05	2.79E-05	2.77E-05	2.71E-05	2.65E-05
	48	6.43E-03	6.31E-03	6.44E-03	6.39E-03	6.34E-03	6.11E-03	5.87E-03
	49	1.88E-02	1.84E-02	1.88E-02	1.87E-02	1.85E-02	1.79E-02	1.71E-02
	50	5.57E-02	5.47E-02	5.58E-02	5.54E-02	5.50E-02	5.30E-02	5.08E-02
	51	1.94E-02	1.90E-02	1.94E-02	1.92E-02	1.91E-02	1.85E-02	1.78E-02
	52	2.83E-02	2.78E-02	2.84E-02	2.82E-02	2.79E-02	2.69E-02	2.58E-02
	53	2.74E-03	2.72E-03	2.69E-03	2.68E-03	2.67E-03	2.69E-03	2.71E-03
	54	2.34E-02	2.30E-02	2.34E-02	2.32E-02	2.31E-02	2.23E-02	2.15E-02
	55	4.08E-04	4.19E-04	3.74E-04	3.74E-04	3.78E-04	4.37E-04	5.01E-04
	56	2.06E-05	2.04E-05	2.09E-05	2.05E-05	2.00E-05	1.90E-05	1.78E-05
	57	1.00E-04	9.87E-05	1.04E-04	1.00E-04	9.60E-05	8.77E-05	7.82E-05
	58	2.77E-04	2.74E-04	2.74E-04	2.73E-04	2.72E-04	2.68E-04	2.64E-04
	59	1.18E-02	1.17E-02	1.17E-02	1.17E-02	1.16E-02	1.15E-02	1.13E-02
	60	9.92E-03	9.89E-03	9.66E-03	9.64E-03	9.64E-03	9.84E-03	1.01E-02
	61	1.57E-02	1.55E-02	1.55E-02	1.55E-02	1.54E-02	1.53E-02	1.51E-02
	62	4.35E-02	4.30E-02	4.30E-02	4.29E-02	4.27E-02	4.22E-02	4.16E-02
	63	2.67E-02	2.64E-02	2.64E-02	2.63E-02	2.62E-02	2.59E-02	2.55E-02
	64	4.57E-03	4.56E-03	4.43E-03	4.42E-03	4.42E-03	4.55E-03	4.70E-03
	65	1.84E-03	1.90E-03	1.68E-03	1.68E-03	1.70E-03	2.00E-03	2.31E-03
	66	2.66E-02	2.64E-02	2.63E-02	2.62E-02	2.62E-02	2.59E-02	2.57E-02
	67	2.56E-06	2.70E-06	2.15E-06	2.16E-06	2.20E-06	2.83E-06	3.51E-06
	68	1.02E-06	1.04E-06	1.02E-06	9.96E-07	9.64E-07	9.83E-07	1.00E-06
	69	2.31E-05	2.27E-05	2.31E-05	2.29E-05	2.27E-05	2.18E-05	2.09E-05
	70	8.27E-06	8.13E-06	8.29E-06	8.21E-06	8.12E-06	7.85E-06	7.54E-06
	71	8.36E-06	8.45E-06	8.01E-06	7.98E-06	7.98E-06	8.55E-06	9.15E-06
	72	1.86E-06	1.84E-06	1.86E-06	1.82E-06	1.78E-06	1.73E-06	1.68E-06
	73	3.98E-06	3.95E-06	3.95E-06	3.94E-06	3.93E-06	3.90E-06	3.88E-06
	74	6.24E-06	6.15E-06	6.47E-06	6.24E-06	5.98E-06	5.47E-06	4.91E-06
	75	5.16E-05	5.06E-05	5.50E-05	5.20E-05	4.85E-05	4.18E-05	3.43E-05
	76	2.91E-02	2.84E-02	2.76E-02	2.75E-02	2.75E-02	2.74E-02	2.74E-02
	77	1.41E-04	1.51E-04	1.22E-04	1.24E-04	1.27E-04	1.60E-04	1.96E-04
	78	1.07E-03	1.05E-03	1.16E-03	1.09E-03	1.01E-03	8.48E-04	6.67E-04
	79	5.79E-07	6.21E-07	5.14E-07	5.24E-07	5.40E-07	6.68E-07	8.07E-07
	80	1.19E-02	1.17E-02	1.29E-02	1.21E-02	1.12E-02	9.49E-03	7.51E-03
	81	1.31E-02	1.28E-02	1.41E-02	1.33E-02	1.23E-02	1.03E-02	8.12E-03
	82	3.32E-02	3.26E-02	3.60E-02	3.38E-02	3.12E-02	2.62E-02	2.05E-02
	83	9.55E-04	9.45E-04	1.01E-03	9.56E-04	8.91E-04	7.93E-04	6.79E-04
	84	1.18E-02	1.16E-02	1.28E-02	1.20E-02	1.11E-02	9.38E-03	7.40E-03
	85	4.40E-05	4.63E-05	3.70E-05	3.67E-05	3.75E-05	4.84E-05	6.10E-05
	86	3.55E-04	3.43E-04	3.42E-04	3.39E-04	3.37E-04	3.29E-04	3.21E-04
	87	9.58E-04	9.27E-04	9.22E-04	9.14E-04	9.10E-04	8.88E-04	8.65E-04
	88	1.24E-03	1.20E-03	1.20E-03	1.19E-03	1.18E-03	1.15E-03	1.12E-03
	89	3.63E-03	3.52E-03	3.50E-03	3.47E-03	3.45E-03	3.37E-03	3.29E-03
	90	6.06E-03	5.87E-03	5.83E-03	5.79E-03	5.76E-03	5.63E-03	5.49E-03
	91	4.93E-03	4.78E-03	4.73E-03	4.70E-03	4.68E-03	4.61E-03	4.53E-03
	92	1.41E-02	1.36E-02	1.36E-02	1.34E-02	1.34E-02	1.31E-02	1.27E-02
	93	1.28E-03	1.25E-03	1.22E-03	1.21E-03	1.21E-03	1.22E-03	1.24E-03
	94	6.14E-03	5.95E-03	5.90E-03	5.86E-03	5.83E-03	5.72E-03	5.61E-03
	95	6.88E-04	6.68E-04	6.63E-04	6.58E-04	6.56E-04	6.45E-04	6.33E-04
	96	1.85E-04	1.82E-04	1.76E-04	1.75E-04	1.75E-04	1.78E-04	1.83E-04
	97	8.57E-05	9.09E-05	7.32E-05	7.39E-05	7.57E-05	9.62E-05	1.19E-04
	98	1.78E-03	1.75E-03	1.75E-03	1.74E-03	1.73E-03	1.72E-03	1.70E-03
	99	2.57E-03	2.54E-03	2.53E-03	2.51E-03	2.50E-03	2.49E-03	2.47E-03
	100	1.80E-03	1.80E-03	1.72E-03	1.72E-03	1.72E-03	1.80E-03	1.89E-03
	101	6.60E-03	6.50E-03	6.49E-03	6.45E-03	6.42E-03	6.36E-03	6.29E-03
	102	3.61E-03	3.56E-03	3.54E-03	3.52E-03	3.50E-03	3.48E-03	3.46E-03
	103	2.02E-03	1.99E-03	2.00E-03	1.99E-03	1.99E-03	1.96E-03	1.93E-03
	104	1.40E-03	1.39E-03	1.37E-03	1.37E-03	1.37E-03	1.39E-03	1.40E-03
	105	9.71E-04	9.81E-04	9.17E-04	9.17E-04	9.21E-04	9.99E-04	1.08E-03
	106	6.88E-04	6.95E-04	6.49E-04	6.49E-04	6.52E-04	7.09E-04	7.71E-04
	107	4.09E-03	4.03E-03	4.00E-03	3.98E-03	3.96E-03	3.96E-03	3.96E-03
	108	1.27E-03	1.27E-03	1.22E-03	1.22E-03	1.22E-03	1.28E-03	1.35E-03
	109	1.63E-03	1.61E-03	1.60E-03	1.59E-03	1.59E-03	1.60E-03	1.61E-03

Table 5 (continued)

i	j	Effective collision strengths at temperatures						
		650 eV	850 eV	1050 eV	1250 eV	1450 eV	1650 eV	1850 eV
	110	5.18E-03	5.10E-03	5.13E-03	5.11E-03	5.10E-03	5.03E-03	4.95E-03
	111	2.76E-03	2.72E-03	2.72E-03	2.71E-03	2.71E-03	2.69E-03	2.67E-03
	112	1.09E-03	1.09E-03	1.05E-03	1.05E-03	1.05E-03	1.10E-03	1.15E-03
	113	3.42E-03	3.38E-03	3.38E-03	3.37E-03	3.37E-03	3.34E-03	3.31E-03
	114	7.74E-08	7.45E-08	7.78E-08	7.79E-08	7.82E-08	7.48E-08	7.06E-08
	115	4.07E-07	4.14E-07	3.82E-07	3.84E-07	3.87E-07	4.32E-07	4.79E-07
	116	6.92E-06	6.73E-06	6.59E-06	6.53E-06	6.49E-06	6.43E-06	6.37E-06
	117	1.24E-05	1.20E-05	1.19E-05	1.17E-05	1.15E-05	1.12E-05	1.10E-05
	118	1.55E-06	1.49E-06	1.45E-06	1.46E-06	1.48E-06	1.49E-06	1.49E-06
	119	3.43E-07	3.62E-07	2.88E-07	2.89E-07	2.95E-07	3.79E-07	4.72E-07
	120	3.14E-05	3.07E-05	3.16E-05	3.03E-05	2.90E-05	2.69E-05	2.45E-05
	121	1.74E-05	1.67E-05	1.56E-05	1.53E-05	1.51E-05	1.52E-05	1.54E-05
	122	1.93E-05	1.85E-05	1.75E-05	1.71E-05	1.69E-05	1.68E-05	1.68E-05
	123	1.49E-06	1.53E-06	1.33E-06	1.31E-06	1.30E-06	1.52E-06	1.76E-06
	124	3.13E-07	3.29E-07	3.11E-07	2.91E-07	2.66E-07	2.69E-07	2.79E-07
	125	4.92E-06	5.25E-06	4.91E-06	4.59E-06	4.19E-06	4.15E-06	4.25E-06
	126	6.04E-07	5.83E-07	5.55E-07	5.54E-07	5.58E-07	5.74E-07	5.93E-07
	127	1.68E-05	1.64E-05	1.62E-05	1.59E-05	1.56E-05	1.54E-05	1.52E-05
	128	9.49E-05	9.26E-05	9.37E-05	9.27E-05	9.16E-05	8.83E-05	8.48E-05
	129	6.52E-07	6.62E-07	5.79E-07	5.82E-07	5.94E-07	6.94E-07	8.03E-07
	130	6.13E-06	5.81E-06	5.27E-06	4.99E-06	4.74E-06	4.74E-06	4.80E-06
	131	1.14E-05	1.11E-05	1.09E-05	1.08E-05	1.06E-05	1.05E-05	1.04E-05
	132	2.09E-07	2.02E-07	1.98E-07	1.92E-07	1.86E-07	1.83E-07	1.80E-07
	133	2.72E-07	2.46E-07	1.98E-07	1.93E-07	1.94E-07	2.15E-07	2.42E-07
	134	1.05E-06	1.02E-06	1.09E-06	1.03E-06	9.50E-07	8.23E-07	6.78E-07
	135	1.19E-05	1.17E-05	1.29E-05	1.21E-05	1.11E-05	9.24E-06	7.13E-06
	136	5.44E-08	6.07E-08	6.22E-08	5.96E-08	4.83E-08	4.53E-08	4.91E-08
	137	4.73E-08	4.51E-08	3.94E-08	4.04E-08	4.23E-08	4.91E-08	5.62E-08
	138	6.75E-07	6.54E-07	6.27E-07	6.24E-07	6.25E-07	6.40E-07	6.57E-07
	139	5.33E-06	5.18E-06	5.22E-06	5.18E-06	5.15E-06	5.01E-06	4.86E-06
	140	1.01E-02	9.96E-03	9.96E-03	9.99E-03	1.00E-02	9.95E-03	9.88E-03
	141	7.31E-05	7.81E-05	6.32E-05	6.40E-05	6.56E-05	8.27E-05	1.01E-04
	142	5.62E-03	5.48E-03	5.99E-03	5.62E-03	5.21E-03	4.42E-03	3.53E-03
	143	4.67E-03	4.56E-03	4.96E-03	4.66E-03	4.33E-03	3.70E-03	2.99E-03
	144	1.27E-02	1.24E-02	1.35E-02	1.27E-02	1.18E-02	9.99E-03	7.97E-03
	145	1.45E-04	1.47E-04	1.43E-04	1.38E-04	1.32E-04	1.35E-04	1.38E-04
	146	4.54E-03	4.43E-03	4.82E-03	4.53E-03	4.21E-03	3.60E-03	2.91E-03
	147	2.46E-05	2.59E-05	2.07E-05	2.05E-05	2.10E-05	2.71E-05	3.40E-05
	148	6.25E-04	6.07E-04	6.03E-04	5.98E-04	5.95E-04	5.82E-04	5.68E-04
	149	1.86E-03	1.81E-03	1.80E-03	1.78E-03	1.77E-03	1.73E-03	1.69E-03
	150	2.00E-03	1.95E-03	1.92E-03	1.91E-03	1.90E-03	1.88E-03	1.86E-03
	151	5.57E-03	5.41E-03	5.38E-03	5.33E-03	5.30E-03	5.18E-03	5.06E-03
	152	3.07E-03	2.98E-03	2.96E-03	2.94E-03	2.92E-03	2.86E-03	2.79E-03
	153	1.45E-04	1.49E-04	1.31E-04	1.32E-04	1.33E-04	1.57E-04	1.82E-04
	154	2.49E-03	2.42E-03	2.40E-03	2.38E-03	2.37E-03	2.33E-03	2.30E-03
	155	7.26E-05	7.59E-05	6.42E-05	6.47E-05	6.60E-05	8.16E-05	9.86E-05
	156	6.07E-04	5.99E-04	5.97E-04	5.93E-04	5.90E-04	5.85E-04	5.80E-04
	157	6.74E-04	6.78E-04	6.43E-04	6.41E-04	6.41E-04	6.82E-04	7.26E-04
	158	9.16E-04	9.05E-04	8.97E-04	8.91E-04	8.86E-04	8.83E-04	8.80E-04
	159	2.26E-03	2.22E-03	2.19E-03	2.17E-03	2.16E-03	2.15E-03	2.13E-03
	160	1.41E-03	1.39E-03	1.39E-03	1.37E-03	1.37E-03	1.35E-03	1.34E-03
	161	2.12E-04	2.22E-04	1.87E-04	1.89E-04	1.92E-04	2.38E-04	2.88E-04
	162	2.39E-04	2.45E-04	2.23E-04	2.23E-04	2.25E-04	2.54E-04	2.86E-04
	163	1.40E-03	1.39E-03	1.37E-03	1.36E-03	1.35E-03	1.36E-03	1.37E-03
	164	1.04E-03	1.02E-03	1.01E-03	1.01E-03	1.00E-03	9.92E-04	9.81E-04
	165	7.12E-04	7.11E-04	6.69E-04	6.67E-04	6.68E-04	7.13E-04	7.63E-04
	166	1.81E-04	1.82E-04	1.81E-04	1.80E-04	1.78E-04	1.78E-04	1.78E-04
	167	1.21E-04	1.22E-04	1.17E-04	1.17E-04	1.16E-04	1.21E-04	1.27E-04
	168	1.16E-04	1.17E-04	1.09E-04	1.08E-04	1.08E-04	1.19E-04	1.30E-04
	169	2.71E-03	2.65E-03	2.63E-03	2.61E-03	2.60E-03	2.57E-03	2.54E-03
	170	8.96E-04	8.82E-04	8.62E-04	8.57E-04	8.55E-04	8.64E-04	8.75E-04
	171	3.86E-04	3.88E-04	3.86E-04	3.83E-04	3.80E-04	3.79E-04	3.79E-04
	172	1.45E-04	1.47E-04	1.43E-04	1.42E-04	1.41E-04	1.45E-04	1.49E-04
	173	2.69E-04	2.71E-04	2.69E-04	2.67E-04	2.65E-04	2.64E-04	2.65E-04
	174	7.17E-04	7.08E-04	6.85E-04	6.82E-04	6.80E-04	6.97E-04	7.16E-04
	175	5.36E-05	5.53E-05	4.69E-05	4.67E-05	4.72E-05	5.81E-05	7.01E-05
	176	1.57E-03	1.54E-03	1.52E-03	1.51E-03	1.50E-03	1.50E-03	1.49E-03
	177	2.67E-04	2.68E-04	2.65E-04	2.63E-04	2.61E-04	2.63E-04	2.66E-04
	178	4.91E-04	4.93E-04	4.58E-04	4.56E-04	4.58E-04	4.98E-04	5.43E-04
	179	1.81E-03	1.77E-03	1.75E-03	1.74E-03	1.73E-03	1.73E-03	1.72E-03

Table 5 (continued)

i	j	Effective collision strengths at temperatures						
		650 eV	850 eV	1050 eV	1250 eV	1450 eV	1650 eV	1850 eV
180		4.29E-08	4.19E-08	4.52E-08	4.16E-08	3.76E-08	3.13E-08	2.41E-08
181		9.53E-08	9.52E-08	9.67E-08	9.12E-08	8.53E-08	8.06E-08	7.51E-08
182		1.66E-07	1.62E-07	1.63E-07	1.62E-07	1.61E-07	1.57E-07	1.52E-07
183		3.01E-07	2.97E-07	3.33E-07	3.17E-07	2.99E-07	2.56E-07	2.06E-07
184		5.60E-07	5.58E-07	6.05E-07	5.72E-07	5.34E-07	4.69E-07	3.94E-07
185		1.51E-07	1.59E-07	1.27E-07	1.26E-07	1.29E-07	1.66E-07	2.08E-07
186		1.19E-07	1.17E-07	1.21E-07	1.16E-07	1.09E-07	1.03E-07	9.55E-08
187		2.49E-06	2.45E-06	2.47E-06	2.38E-06	2.27E-06	2.15E-06	2.01E-06
188		1.90E-07	1.83E-07	1.72E-07	1.71E-07	1.70E-07	1.74E-07	1.80E-07
189		3.07E-07	3.14E-07	2.73E-07	2.74E-07	2.77E-07	3.25E-07	3.78E-07
190		1.07E-07	1.07E-07	1.13E-07	1.08E-07	1.02E-07	9.51E-08	8.71E-08
191		3.34E-06	3.35E-06	3.94E-06	3.59E-06	3.21E-06	2.52E-06	1.72E-06
192		6.34E-08	6.88E-08	7.72E-08	7.93E-08	8.04E-08	8.29E-08	8.39E-08
193		3.15E-07	3.14E-07	3.48E-07	3.24E-07	2.95E-07	2.50E-07	1.98E-07
194		4.51E-08	4.35E-08	4.21E-08	4.26E-08	4.34E-08	4.52E-08	4.69E-08
195		3.91E-08	4.88E-08	4.43E-08	3.75E-08	2.88E-08	2.85E-08	3.05E-08
196		1.10E-07	1.04E-07	1.05E-07	1.07E-07	1.10E-07	1.10E-07	1.09E-07
197		3.70E-08	3.44E-08	2.08E-08	1.58E-08	1.14E-08	1.39E-08	1.88E-08
198		1.13E-07	1.44E-07	1.49E-07	1.35E-07	1.14E-07	1.07E-07	1.04E-07
199		2.83E-08	2.79E-08	2.48E-08	2.40E-08	2.66E-08	3.45E-08	4.02E-08
200		4.17E-08	5.16E-08	4.23E-08	3.17E-08	1.96E-08	2.12E-08	2.65E-08
201		8.74E-07	8.58E-07	8.89E-07	8.78E-07	8.65E-07	8.24E-07	7.78E-07
202		4.13E-07	4.74E-07	8.03E-07	9.75E-07	1.14E-06	1.15E-06	1.11E-06
203		1.57E-07	1.67E-07	1.35E-07	1.36E-07	1.40E-07	1.77E-07	2.17E-07
204		2.87E-07	2.58E-07	2.38E-07	2.45E-07	2.61E-07	2.73E-07	2.84E-07
205		6.09E-07	5.63E-07	5.09E-07	5.23E-07	5.52E-07	5.98E-07	6.45E-07
206		1.08E-05	1.35E-05	1.45E-05	1.37E-05	1.16E-05	9.97E-06	9.19E-06
207		3.89E-07	3.89E-07	3.38E-07	3.45E-07	3.58E-07	4.19E-07	4.86E-07
208		1.35E-06	1.52E-06	2.01E-06	2.05E-06	2.03E-06	1.89E-06	1.70E-06
209		5.20E-06	5.49E-06	6.42E-06	6.27E-06	6.01E-06	5.37E-06	4.60E-06
210		2.42E-05	2.40E-05	2.67E-05	2.56E-05	2.42E-05	2.10E-05	1.73E-05
211		5.64E-07	5.97E-07	5.33E-07	5.34E-07	5.38E-07	6.39E-07	7.47E-07
212		2.78E-06	2.72E-06	2.65E-06	2.63E-06	2.61E-06	2.64E-06	2.67E-06
213		7.98E-06	7.78E-06	7.68E-06	7.62E-06	7.59E-06	7.54E-06	7.49E-06
214		2.71E-05	2.64E-05	2.63E-05	2.61E-05	2.59E-05	2.54E-05	2.47E-05
215		1.43E-06	1.46E-06	1.31E-06	1.31E-06	1.33E-06	1.52E-06	1.73E-06
216		2.41E-06	2.16E-06	1.61E-06	1.46E-06	1.35E-06	1.48E-06	1.69E-06
217		2.15E-06	1.82E-06	1.31E-06	1.22E-06	1.20E-06	1.34E-06	1.53E-06
218		8.18E-06	7.35E-06	5.51E-06	4.76E-06	4.11E-06	4.24E-06	4.61E-06
219		1.76E-06	1.59E-06	1.20E-06	1.10E-06	1.03E-06	1.15E-06	1.32E-06
220		1.77E-06	1.72E-06	1.86E-06	1.86E-06	1.86E-06	1.73E-06	1.58E-06
221		7.64E-08	8.10E-08	6.51E-08	6.58E-08	6.74E-08	8.56E-08	1.05E-07
222		2.83E-07	2.72E-07	2.66E-07	2.56E-07	2.47E-07	2.39E-07	2.30E-07
223		5.71E-07	5.55E-07	5.32E-07	5.16E-07	5.02E-07	5.05E-07	5.09E-07
224		1.06E-05	9.08E-06	7.87E-06	8.32E-06	9.13E-06	9.71E-06	1.04E-05
225		2.61E-07	2.70E-07	2.52E-07	2.50E-07	2.49E-07	2.75E-07	3.03E-07
226		9.92E-07	9.59E-07	9.79E-07	9.88E-07	1.00E-06	9.93E-07	9.74E-07
227		3.65E-06	3.51E-06	3.65E-06	3.56E-06	3.47E-06	3.23E-06	2.95E-06
228		1.64E-05	1.58E-05	1.66E-05	1.59E-05	1.52E-05	1.36E-05	1.18E-05
229		3.41E-07	3.55E-07	3.12E-07	3.13E-07	3.17E-07	3.77E-07	4.41E-07
230		1.40E-06	1.38E-06	1.34E-06	1.33E-06	1.32E-06	1.33E-06	1.35E-06
231		3.70E-06	3.62E-06	3.57E-06	3.54E-06	3.52E-06	3.50E-06	3.49E-06
232		1.18E-05	1.15E-05	1.15E-05	1.14E-05	1.13E-05	1.10E-05	1.08E-05
233		7.24E-07	7.46E-07	6.55E-07	6.57E-07	6.66E-07	7.84E-07	9.13E-07
234		9.67E-07	9.00E-07	8.75E-07	8.95E-07	9.30E-07	9.59E-07	9.81E-07
235		1.22E-06	1.17E-06	1.09E-06	1.07E-06	1.07E-06	1.12E-06	1.17E-06
236		2.30E-07	2.15E-07	1.63E-07	1.60E-07	1.59E-07	1.80E-07	2.10E-07
237		2.07E-07	1.60E-07	9.36E-08	8.11E-08	6.72E-08	7.11E-08	1.03E-07
238		3.79E-06	3.63E-06	3.40E-06	3.27E-06	3.15E-06	3.11E-06	3.09E-06
239		9.84E-07	9.56E-07	8.17E-07	8.01E-07	7.99E-07	8.58E-07	9.47E-07
240		2.09E-07	2.02E-07	1.56E-07	1.50E-07	1.44E-07	1.64E-07	1.91E-07
241		8.60E-07	8.42E-07	7.70E-07	7.65E-07	7.66E-07	8.33E-07	9.05E-07