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ELECTRON-IMPACT IONIZATION CROSS SECTIONS OF H, He, N, O, Ar, Xe, Au, Pb ATOMS AND THEIR IONS IN THE ELECTRON ENERGY RANGE FROM THE THRESHOLD UP TO 200 keV

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Introduction

Single and multiple-electron ionization arising in collisions of neutral species, positive and negative ions with electrons

$$X + e^- \rightarrow X^{m+} + (m+1)\, e^-, \qquad m \geq 1, \tag{1}$$

plays a critical role in practically all kinds of laboratory and astrophysical plasmas. Charge-state equilibrium and, hence, the spectrum of electromagnetic radiation emitted by a plasma, are strongly influenced by these processes. The state-of the art methods of plasma diagnostics impose stringent requirements on the accuracy of determination of elementary atomic characteristics, particularly, the electron-impact ionization cross sections. For example, the interpretation of the x-ray spectra of high-temperature plasmas involves determining the line intensities of the multicharged ions which concentration is very sensitive to the ionization cross-section values. Together with radiative characteristics of atoms and ions in plasmas such as energy levels, transition probabilities, lifetimes of excited states and others, ionization cross sections and the corresponding rate coefficients are needed for the modeling and understanding of plasma properties and elementary processes occurring in it.

The process (1) is a very complicated rearrangement reaction with different particles in the initial and final channels which interact through the long-range Coulomb potential. Moreover, the process (1) can occur either directly in one step by a single interaction or indirectly in two or more steps including several intermediate processes. The general problems of single and multiple-electron ionization processes are considered in many books and review articles (see, e.g., [1-16]). Bibliography on excitation and ionization cross-sections are given in [17].

In the present work, the single-electron ionization processes of neutral atoms and positively charged ions

$$X + e^- \rightarrow X^{1+} + 2\, e^-, \qquad m \geq 1, \tag{2}$$

are investigated. The data for the relevant cross sections have been compiled on the basis of experimental data [9-11] and calculations performed by the ATOM code described in [18]. The data presented are fitted by the least-square method (LSM) using seven free parameters.

1. Numerical calculations

Numerical calculations of the ionization cross sections have been performed by the ATOM computer code described in [18] using the Coulomb-Born approximation with exchange (CBE) in the partial-wave representation. In this code, the radial wave functions $P(r)$ of the *optical* electron are found by solving the Schroedinger equation with the cental-symmetrical potential $U_c(r)$ of the atomic core and a given energy value:

$$\left(\frac{d^2}{dr^2}-\frac{l(l+1)}{r^2}-\frac{2}{\omega}U_c(r/\omega)+\varepsilon\right)\cdot P(r)=-\sum_{\gamma,\kappa}\frac{2a}{\omega}\hat{G}^{\gamma}_{\kappa}\cdot P(r/\omega), \qquad (3)$$

where ε is the energy of the electron in Ry units; the right-hand side of the equation corresponds to the exchange interaction operator (see [18] for details). The factor ω is the eigen-value of the eq. (3). The effective field of the atomic core $U_c(r)$ is calculated with the Slater wave functions. For the bound *nl* states (ε < 0), the quantities ε are the electron binding energies. They can be taken from the tables [19-24], or calculated using the Grant code [25].

For continuum spectra (ε > 0), the wave functions $P_{\varepsilon\lambda}(r)$ are calculated with account of the maximum orbital momentum of the ejected electron λ_{max} =12.

For the wave functions of the incident and scattered electron, the Coulomb wave functions are used which are found as a solution of the Schroedinger equation with the Coulomb field $U_c(r)$= - Z/r:

$$\left(\frac{d^2}{dr^2}-\frac{\lambda(\lambda+1)}{r^2}+\frac{2Z}{r}+\varepsilon\right)\cdot F_{\varepsilon\lambda}(r)=0, \quad F_{\varepsilon\lambda}(0)=0, \qquad (4)$$

$$F_{\varepsilon\lambda}(r)\approx k^{-1}\sin\left(kr+\frac{Z}{r}\ln(2kr)-\frac{\pi\lambda}{2}+\delta_{\lambda}\right), \; r\to\infty, \quad k^2=\varepsilon. \qquad (5)$$

For neutral targets (*Z*=0) the function $F_{\varepsilon\lambda}(r)$ becomes to be a component $j_{\lambda}(kr)$ of the plane wave, and the CBE approximation comes into the Born approach in the partial-wave representation, the so-called *Born-Oppenheimer* approximation.

We also note, that the wave functions of the optical, *P(r),* and free electrons, *F(r),* are not orthogonal in general because they correspond to different potentials of the *(Z+1)/r* and *Zq/r* types. In the ATOM code, this disadvantage is removed by using the orthogonalized functions:

$$F^{o}_{\varepsilon\lambda}(r)=F_{\varepsilon\lambda}(r)-<F_{\varepsilon\lambda}(r)\,|\,P_{nl}>P_{nl}\,\delta_{l\lambda}. \qquad (6)$$

In the case of multicharged ions $Z >> 1$, the functions $F^{o}(r)$ and *F(r)* practically coincide because

$$<F_{\varepsilon\lambda}(r)\,|\,P_{nl}(r)\propto Z^{-1}. \qquad (7)$$

We note that in the case of multiply charged ions, calculations of the ionization cross sections in the CBE and widely used Distorted-Wave Approximation (DWA) give practically the identical results.

In the present work, for each value of cross sections, a contribution from at least three outer-most electron shells of the target was included. At high-energy limit, the Born approximation was used. More details about calculations can be found in [16, 18].

2. Comparison with the Lotz formulae

Direct ionization cross sections of neutral atoms and positive ions by electron impact (i.e. without contributions form excitation-auto-ionization and resonant ionization but with account of

inner-shell ionization and ionization from excited states) are often estimated by the semi-empirical Lotz formulae. For neutral atoms, they have been obtained on the basis of available experimental data and have the form

$$\sigma = 5.40\times10^{-17}\, cm^2\, Q(Ry/I)^2\, \frac{a\ln(u+1)}{u+1}(1-be^{-cu}), \qquad (8)$$

where $u = E/I - 1$ is the reduced electron energy, I is the binding energy of the nl^Q atomic shell, Q is the number of equivalent electrons. The fitting parameters a, b and c for different atomic subshells are presented in [26].

In the case of the ionization of positive highly charged ions, another Lotz formula is used without fitting parameters [27, 28]:

$$\sigma = 2.43\times10^{-16}\, cm^2\, Q(Ry/I)^2\, \frac{\ln(u+1)}{u+1}, \quad u = E/I - 1. \qquad (9)$$

Equation (9) has been deduced on the basis of numerical calculations for H-like ions in the Coulomb-Born approximation with exchange. A Maxwellian rate coefficient <σv> corresponding to the cross-section (9) has the form [27]:

$$<\sigma v> = 6.0\times10^{-8}\cdot cm^3/s\; Q\beta^{1/2}(Ry/I)^{3/2}\cdot e^{-\beta}\beta\cdot f(\beta), \quad u = E/I - 1. \qquad (10)$$

$$f(\beta) = e^{\beta}\,|\,Ei(-\beta)\,|, \quad \beta = I/T\ , \qquad (11)$$

where T is the electron temperature in the energy units and Ei(x) is the integral exponent. The function f(x) is fitted to within 5% by

$$f(x) = e^{x}\,|\,Ei(-x)\,| \approx \ln\left(1+\frac{0.562+1.4x}{x(1+1.4x)}\right), \quad x>0. \qquad (12)$$

Semi-empirical fitting parameters for ionization cross sections and rate coefficients for neutral and low-charged ions are presented in [16], while those calculated in the CBE approximation for highly charged ions are given in [18].

A comparison of the Lotz ionization cross sections with experimental data and ATOM calculations is given in Figs. 1 – 4. Scaled ionization cross sections of H-like ions are displayed in Fig. 1. It is seen that at scaled energies u > 50, the Lotz cross sections strongly overestimate the calculations performed by the ATOM code.

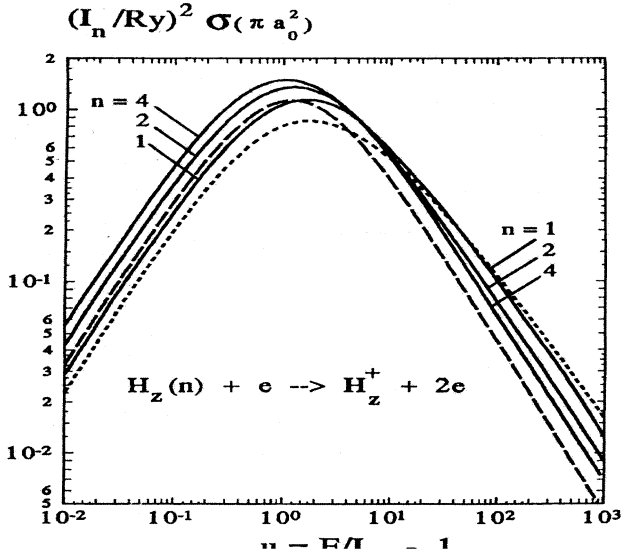

Fig. 1. Scaled ionization cross sections of H-like ions (Z = 10) from the states with the principal quantum numbers n = 1, 2 and 4 as a function of the reduced incident-electron energy $u=E/I_n - 1$. Solid curves – CBE result, ATOM code; C – classical Thomson cross section with the constant A=16/3; L – Lotz formula (9).

Figure 2 shows scaled ionization cross sections of K-electrons in neutral atoms. At energies around maximum cross sections, the experimental data lie in between the Lotz formula and ATOM-code calculations.

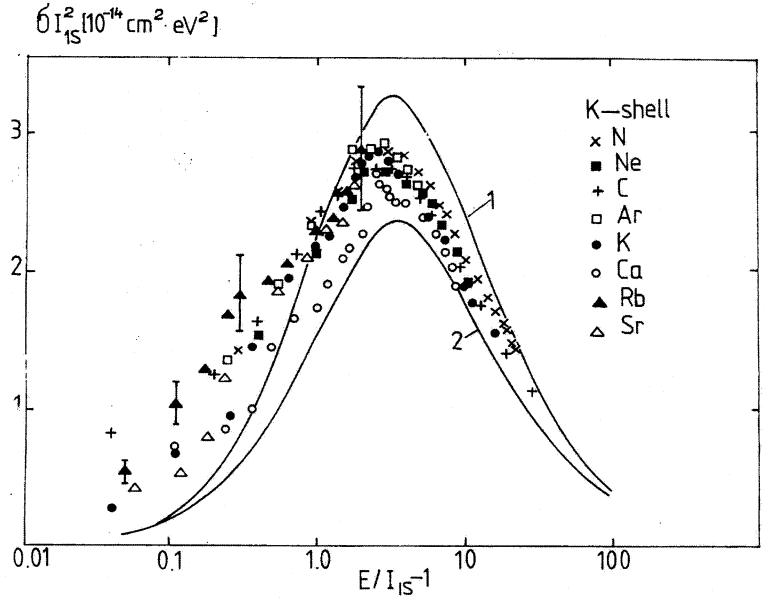

Fig. 2. Scaled K-shell ionization cross sections of neutral atoms from N to Sr. Symbols reproduce experimental data. Curve 1 – the Lotz formula (8), curve 2 - the ATOM code. Experimental data are taken from [18].

A comparison of the total ionization cross section calculated by the Lotz formula (9) with experimental data for uranium ions is shown in Fig. 3. It is seen that the Lotz results underestimate about 5 times the experimental data that most probably is associated with the contribution from excitation-auto-ionization processes.

Ionization cross sections of two outer-most shells of heavy low-charged Bi ions are displayed in Fig. 4. It is seen that the Lotz formula (9) underestimate the cross sections calculated by the ATOM code.

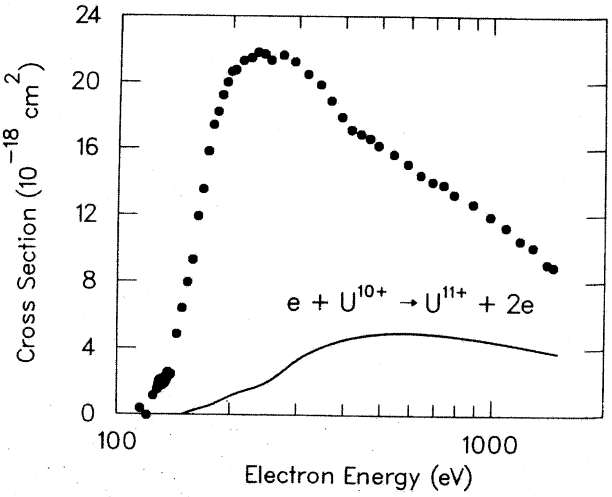

Fig. 3. Absolute ionization cross sections of U^{10+} ions. Solid circles - experimental data [29]. Solid curve – the Lotz formula (9).

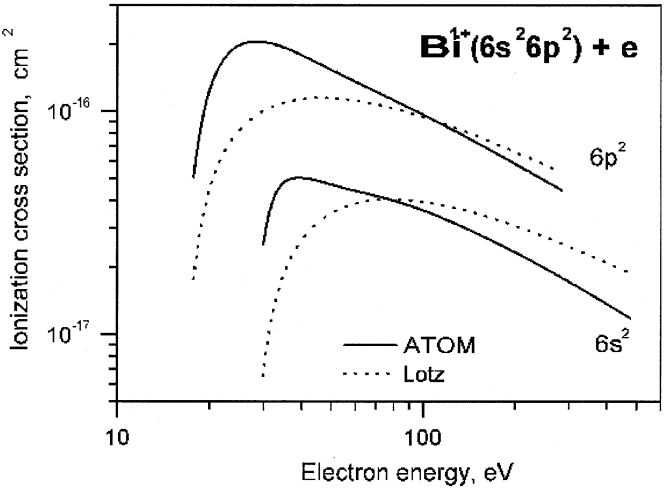

Fig. 4. Absolute ionization cross sections $Bi^{1+}(6s^26p^2)$ ions. Solid cirves – the ATOM code, present work, the dashed curves – the Lotz formula (9).

We note, that the Lotz formulae (9)-(11) have been obtained on the basis of numerical calculations of ionization cross-sections for H-like ions in the CBE approximation and, therefore,

produce errors for many-electron systems. Especially, they give insufficient results for heavy low-charged ions having a complicated atomic structure. However, the formulae are convenient and useful for the estimation of the ionization cross sections and rate coefficients with an accuracy of about a factor of 2-3.

3. Fitting parameters for ionization cross sections

The single ionization cross-sections in the whole energy range are usually fitted by the 1/E-expansion formula

$$\sigma(E) = 10^{-13}\, cm^2 \left(\frac{eV^2}{IE}\right)\left[\sum_i A_i (1 - I/E)^i + B\ln(E/I)\right], \qquad (13)$$

where E is the incident electron energy and I is the *first* ionization potential, A_i and B are the fitting coefficients. The parameter B is called a Bethe constant which is defined by the high-energy behavior of the ionization cross section

$$\sigma(E) \propto \frac{1}{IE}\left[A + B\ln(E/I)\right], \quad E >> I. \qquad (14)$$

The constant B can be calculated by fitting the equation (14) to the calculated Born cross section or from the relation

$$B = \frac{I}{\pi\alpha}\int_I^\infty \frac{\sigma^{ph}(\omega)}{\omega} d\omega, \qquad (15)$$

where $\sigma^{ph}(\omega)$ is the photoionization cross section from the same atomic state and α is the fine-structure constant.

The recommended fitting parameters A_i, B for some neutral atoms and low-charges light ions which are of interest for laboratory and astrophysical plasmas, are given in Tables [30]. They have been obtained from experimental data and sophisticated computer cross section calculations using the least-square method (LSM).

In the present work, ionization cross sections in a wide energy range have been approximated by eq. (13) with 7 parameters: $A_1,\ldots, A_6$ and B by the standard LSM method. The ionization cross sections calculated using the ATOM code in comparison with the 7-parametric fit, and the fitting parameters for H, He, N, O, Ar, Xe, Au, Pb atoms are given in Tables 1 – 8. The average accuracy of fitting is in general about 10%. These parameters can be used for solving plasma kinetics problems.

Tables.

Table 1.1. Ionization cross sections of hydrogen.

H 0+ (1s1) I = 13.6 eV				H 0+ (1s1) I = 13.6 eV			
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
1.50E+01	9.74E-18	1.00E-17	-2.65	1.89E+03	6.88E-18	6.83E-18	0.69
2.00E+01	2.94E-17	3.00E-17	-1.94	3.76E+03	3.75E-18	3.72E-18	0.67
3.00E+01	5.27E-17	5.20E-17	1.32	7.50E+03	2.01E-18	2.00E-18	0.57
5.00E+01	6.06E-17	6.15E-17	-1.49	1.50E+04	1.07E-18	1.07E-18	0.01
1.00E+02	5.33E-17	5.20E-17	2.53	3.00E+04	5.67E-19	5.68E-19	-0.27
2.00E+02	3.88E-17	4.00E-17	-3.07	5.99E+04	2.99E-19	3.00E-19	-0.26
4.82E+02	2.13E-17	2.14E-17	-0.38	1.20E+05	1.57E-19	1.58E-19	-0.57
9.49E+02	1.24E-17	1.23E-17	0.73				

Table 1.2. Fitting parameters for hydrogen.

H	A_1	A_2	A_3	A_4	A_5	A_6	B
0+	-3.0376E-03	6.8509E-01	-5.8343E+00	1.9582E+01	-2.5575E+01	1.2070E+01	1.8071E-01

Table 2.1. Ionization cross sections of helium and its ions.

He 0+ (1s2) I = 24.6 eV				He 1+ (1s1) I = 54.4 eV			
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
3.00E+01	7.79E-18	8.00E-18	-2.66	6.00E+01	1.00E-19	1.20E-19	33.5
5.00E+01	2.37E-17	2.40E-17	-1.19	8.00E+01	2.81E-18	3.00E-18	-6.48
8.00E+01	3.57E-17	3.50E-17	2.11	1.00E+02	4.24E-18	3.80E-18	11.47
1.00E+02	3.85E-17	4.00E-17	-3.71	2.00E+02	4.56E-18	4.80E-18	-5.05
2.00E+02	3.63E-17	3.50E-17	3.71	4.00E+02	3.85E-18	3.70E-18	4.16
4.00E+02	2.62E-17	2.60E-17	0.58	8.00E+02	2.62E-18	2.70E-18	-2.9
8.00E+02	1.64E-17	1.70E-17	-3.56	1.00E+03	2.25E-18	2.20E-18	2.07
1.00E+03	1.39E-17	1.40E-17	-0.96	2.00E+03	1.32E-18	1.30E-18	1.14
2.00E+03	7.98E-18	8.50E-18	-6.13	4.00E+03	7.35E-19	8.00E-19	-8.17
4.00E+03	4.45E-18	4.20E-18	6.01	8.00E+03	4.01E-19	3.90E-19	2.81
8.00E+03	2.44E-18	2.50E-18	-2.35	1.00E+04	3.29E-19	3.10E-19	6.11
1.00E+04	2.01E-18	2.00E-18	0.34	2.00E+04	1.77E-19	1.90E-19	-7
2.00E+04	1.09E-18	1.00E-18	8.54	4.00E+04	9.43E-20	9.20E-20	2.46
4.00E+04	5.83E-19	5.90E-19	-1.19	8.00E+04	5.00E-20	5.00E-20	0.07
8.00E+04	3.12E-19	3.10E-19	0.48	1.00E+05	4.08E-20	4.00E-20	1.93
1.00E+05	2.54E-19	2.60E-19	-2.19	2.00E+05	2.15E-20	2.20E-20	-2.11
2.00E+05	1.35E-19	1.40E-19	-3.5				

Table 2.2. Fitting parameters for helium and its ions.

He	A_1	A_2	A_3	A_4	A_5	A_6	B
0+	-3.8156E-01	1.4619E+00	-9.1110E+00	2.3538E+01	-2.5505E+01	1.1585E+01	5.6180E-01
1+	-1.1628E-01	-1.6566E+00	1.8974E+01	-4.8557E+01	4.9365E+01	-1.7136E+01	1.7922E-01

Table 3.1. Ionization cross sections of nitrogen and its ions.

N 0+ (2p3) I = 14.5 eV				N 1+ (2p2) I = 29.6 eV			
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
2.00E+01	3.57E-17	3.60E-17	-0.87	3.00E+01	6.66E-18	7.00E-18	-4.84
4.00E+01	1.27E-16	1.30E-16	-1.99	7.00E+01	5.02E-17	5.20E-17	-3.38
8.00E+01	1.79E-16	1.70E-16	5.26	1.00E+02	5.56E-17	5.60E-17	-0.73

1.00E+02	1.75E-16	1.80E-16	-2.63	2.00E+02	5.17E-17	5.10E-17	1.36
2.00E+02	1.36E-16	1.40E-16	-2.79	4.00E+02	3.65E-17	3.60E-17	1.38
4.00E+02	9.15E-17	9.20E-17	-0.58	8.00E+02	2.23E-17	2.20E-17	1.38
8.00E+02	5.74E-17	6.00E-17	-4.38	1.00E+03	1.87E-17	1.90E-17	-1.4
1.00E+03	4.89E-17	4.90E-17	-0.2	2.00E+03	1.06E-17	1.10E-17	-3.56
2.00E+03	2.91E-17	2.80E-17	4.05	4.00E+03	5.86E-18	6.00E-18	-2.3
4.00E+03	1.69E-17	1.70E-17	-0.48	8.00E+03	3.19E-18	3.10E-18	3.04
8.00E+03	9.64E-18	8.90E-18	8.3	1.00E+04	2.62E-18	2.60E-18	0.84
1.00E+04	8.02E-18	7.90E-18	1.45	2.00E+04	1.41E-18	1.40E-18	0.91
2.00E+04	4.48E-18	4.50E-18	-0.45	4.00E+04	7.57E-19	7.70E-19	-1.73
4.00E+04	2.48E-18	2.50E-18	-0.95	8.00E+04	4.03E-19	4.00E-19	0.84
8.00E+04	1.36E-18	1.40E-18	-3.12	1.00E+05	3.29E-19	3.20E-19	2.85
1.00E+05	1.12E-18	1.10E-18	1.4	2.00E+05	1.75E-19	1.80E-19	-3.04
2.00E+05	6.05E-19	6.40E-19	-5.47				

N 2+ (2p1)		**I = 47.4 eV**		**N 3+ (2s2)**		**I = 77.5 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
5.00E+01	3.03E-18	3.30E-18	-8.17	8.00E+01	1.36E-18	1.50E-18	-9.64
8.00E+01	1.56E-17	1.60E-17	-2.82	1.00E+02	4.20E-18	4.20E-18	0.05
1.00E+02	1.98E-17	2.00E-17	-0.92	2.00E+02	5.76E-18	5.80E-18	-0.63
2.00E+02	2.00E-17	1.90E-17	5.44	4.00E+02	4.99E-18	4.90E-18	1.78
4.00E+02	1.35E-17	1.40E-17	-3.95	1.00E+03	3.13E-18	3.20E-18	-2.34
8.00E+02	7.92E-18	8.00E-18	-1	2.00E+03	1.79E-18	1.80E-18	-0.59
1.00E+03	6.59E-18	6.90E-18	-4.55	4.00E+03	9.84E-19	1.00E-18	-1.58
2.00E+03	3.62E-18	3.60E-18	0.64	8.00E+03	5.37E-19	5.30E-19	1.4
4.00E+03	1.95E-18	1.90E-18	2.53	1.00E+04	4.42E-19	4.30E-19	2.81
8.00E+03	1.04E-18	1.00E-18	3.49	2.00E+04	2.41E-19	2.40E-19	0.25
1.00E+04	8.43E-19	8.20E-19	2.78	4.00E+04	1.30E-19	1.30E-19	0.32
2.00E+04	4.44E-19	4.60E-19	-3.51	8.00E+04	7.04E-20	7.00E-20	0.54
4.00E+04	2.33E-19	2.30E-19	1.23	1.00E+05	5.76E-20	5.90E-20	-2.3
8.00E+04	1.22E-19	1.20E-19	1.49	2.00E+05	3.09E-20	3.10E-20	-0.28
1.00E+05	9.88E-20	1.00E-19	-1.19				
2.00E+05	5.15E-20	5.30E-20	-2.77				

N 4+ (2s1)		**I = 97.9 eV**		**N 5+ (1s2)**		**I = 552.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.00E+02	1.88E-19	2.00E-19	-5.8	7.00E+02	4.02E-20	4.00E-20	0.54
2.00E+02	1.76E-18	1.80E-18	-2.29	1.00E+03	1.15E-19	1.20E-19	-4.07
4.00E+02	1.71E-18	1.70E-18	0.49	2.00E+03	1.23E-19	1.20E-19	2.08
8.00E+02	1.32E-18	1.30E-18	1.77	4.00E+03	9.26E-20	9.00E-20	2.93
1.00E+03	1.19E-18	1.20E-18	-0.89	8.00E+03	6.45E-20	7.00E-20	-7.87
2.00E+03	7.78E-19	7.90E-19	-1.55	1.00E+04	5.57E-20	5.90E-20	-5.62
4.00E+03	4.57E-19	4.80E-19	-4.84	2.00E+04	3.27E-20	3.10E-20	5.42
8.00E+03	2.52E-19	2.50E-19	0.94	4.00E+04	1.77E-20	1.70E-20	4.3
1.00E+04	2.07E-19	2.00E-19	3.43	8.00E+04	9.22E-21	9.00E-21	2.45
2.00E+04	1.10E-19	1.10E-19	-0.02	1.00E+05	7.43E-21	7.30E-21	1.79
4.00E+04	5.77E-20	5.50E-20	4.89	2.00E+05	3.76E-21	4.00E-21	-5.92
8.00E+04	3.01E-20	3.10E-20	-3.06				
1.00E+05	2.43E-20	2.40E-20	1.4				
2.00E+05	1.26E-20	1.30E-20	-2.97				

N 6+ (1s1)		**I = 667.0 eV**					
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**				
8.00E+02	6.92E-21	7.00E-21	-1.17				
1.00E+03	1.73E-20	1.70E-20	1.82				

2.00E+03	4.63E-20	4.80E-20	-3.45				
4.00E+03	3.38E-20	3.20E-20	5.59				
8.00E+03	1.96E-20	2.00E-20	-1.92				
1.00E+04	1.65E-20	1.70E-20	-3.2				
2.00E+04	9.71E-21	1.00E-20	-2.91				
4.00E+04	5.79E-21	5.60E-21	3.45				
8.00E+04	3.43E-21	3.30E-21	3.93				
1.00E+05	2.89E-21	2.80E-21	3.14				
2.00E+05	1.67E-21	1.80E-21	-6.99				

Table 3.2. Fitting parameters for nitrogen and its ions.

N	A_1	A_2	A_3	A_4	A_5	A_6	B
0+	-1.7601E+00	-1.3434E+00	7.8506E+00	-3.0252E+01	4.5556E+01	-2.1363E+01	1.9826E+00
1+	4.2532E+00	-5.3285E+01	2.2202E+02	-4.1133E+02	3.5625E+02	-1.1507E+02	8.4952E-01
2+	1.3658E+00	-6.5309E+00	2.2550E+01	-2.4173E+01	9.6599E+00	-4.0169E-01	2.8958E-01
3+	3.0883E+00	-3.3273E+01	1.7752E+02	-4.0857E+02	4.1605E+02	-1.5374E+02	4.7185E-01
4+	9.3277E-01	-9.0341E+00	3.5201E+01	-5.0902E+01	2.7249E+01	-1.8788E+00	1.1896E-01
5+	5.2714E-01	1.2203E-01	1.8669E+00	2.5607E+01	-6.1607E+01	3.7906E+01	-3.2334E-02
6+	-3.3556E-01	1.0214E+00	-8.2599E+00	2.7943E+01	-3.1192E+01	1.0380E+01	4.6651E-01

Table 4.1. Ionization cross sections of oxygen and its ions.

O 0+ (2p4)		I = 13.6 eV		O 1+ (2p3)		I = 35.1 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
1.37E+01	2.26E-18	2.20E-18	2.77	4.00E+01	7.04E-18	7.00E-18	0.5
2.00E+01	3.54E-17	3.50E-17	1.07	5.00E+01	2.03E-17	2.10E-17	-3.58
3.00E+01	7.07E-17	7.00E-17	1.03	6.00E+01	2.84E-17	2.70E-17	5.07
4.00E+01	9.78E-17	1.00E-16	-2.25	8.00E+01	3.69E-17	3.80E-17	-2.94
5.00E+01	1.17E-16	1.20E-16	-2.22	1.00E+02	4.14E-17	4.20E-17	-1.5
6.00E+01	1.30E-16	1.03E-16	-0.15	2.00E+02	4.35E-17	4.10E-17	6.16
8.00E+01	1.41E-16	1.30E-16	8.09	4.00E+02	3.35E-17	3.60E-17	-7.03
1.00E+02	1.41E-16	1.02E-16	17.66	8.00E+02	2.21E-17	2.20E-17	0.38
2.00E+02	1.16E-16	1.20E-16	-3.61	1.00E+03	1.90E-17	1.90E-17	-0.15
4.00E+02	7.84E-17	8.00E-17	-1.99	2.00E+03	1.14E-17	1.20E-17	-4.66
8.00E+02	4.84E-17	5.07E-17	-15.07	4.00E+03	6.67E-18	6.80E-18	-1.99
1.00E+03	4.10E-17	4.07E-17	-12.85	8.00E+03	3.80E-18	3.60E-18	5.45
2.00E+03	2.38E-17	2.09E-17	-17.89	1.00E+04	3.16E-18	3.00E-18	5.18
4.00E+03	1.35E-17	1.30E-17	3.84	2.00E+04	1.76E-18	1.70E-18	3.6
8.00E+03	7.53E-18	7.30E-18	3.14	4.00E+04	9.72E-19	9.00E-19	8
1.00E+04	6.22E-18	6.00E-18	3.71	8.00E+04	5.32E-19	5.80E-19	-8.34
2.00E+04	3.42E-18	3.50E-18	-2.32	1.00E+05	4.37E-19	4.70E-19	-7.02
4.00E+04	1.86E-18	1.80E-18	3.47	2.00E+05	2.37E-19	2.40E-19	-1.36
8.00E+04	1.01E-18	1.00E-18	0.76				
1.00E+05	8.26E-19	8.50E-19	-2.86				
2.00E+05	4.43E-19	4.50E-19	-1.48				

O 2+ (2p2)		I = 54.9 eV		O 3+ (2p1)		I = 77.4 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
6.00E+01	3.68E-18	3.90E-18	-5.57	8.00E+01	9.16E-19	1.00E-18	-8.41
8.00E+01	1.31E-17	1.30E-17	0.52	1.00E+02	3.38E-18	3.40E-18	-0.63
1.00E+02	1.69E-17	1.80E-17	-6.39	2.00E+02	7.08E-18	7.10E-18	-0.31
2.00E+02	2.28E-17	2.10E-17	8.75	4.00E+02	6.52E-18	6.40E-18	1.87
4.00E+02	1.72E-17	1.90E-17	-9.3	8.00E+02	4.67E-18	4.90E-18	-4.65

8.00E+02	9.67E-18	1.00E-17	-3.32	1.00E+03	4.05E-18	4.00E-18	1.17
1.00E+03	7.87E-18	8.00E-18	-1.64	2.00E+03	2.45E-18	2.08E-18	-12.42
2.00E+03	4.13E-18	3.80E-18	8.61	4.00E+03	1.43E-18	1.40E-18	1.79
4.00E+03	2.20E-18	2.20E-18	-0.22	8.00E+03	8.11E-19	8.50E-19	-4.59
8.00E+03	1.18E-18	1.20E-18	-1.43	1.00E+04	6.74E-19	7.00E-19	-3.68
1.00E+04	9.71E-19	1.00E-18	-2.93	2.00E+04	3.77E-19	2.09E-19	29.93
2.00E+04	5.26E-19	5.00E-19	5.15	4.00E+04	2.08E-19	2.10E-19	-0.78
4.00E+04	2.84E-19	3.00E-19	-5.24	8.00E+04	1.14E-19	1.20E-19	-4.84
8.00E+04	1.53E-19	1.60E-19	-4.27	1.00E+05	9.39E-20	9.00E-20	4.37
1.00E+05	1.25E-19	1.20E-19	4.5	2.00E+05	5.10E-20	5.20E-20	-1.97
2.00E+05	6.72E-20	6.70E-20	0.28				

O 4+ (2s2)		I = 113.9 eV		O 5+ (2s1)		I = 138.1 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
1.20E+02	8.80E-19	1.00E-18	-12	1.50E+02	1.84E-19	2.00E-19	-7.96
2.00E+02	2.66E-18	2.80E-18	-5.02	2.00E+02	4.68E-19	4.90E-19	-4.59
4.00E+02	3.17E-18	3.00E-18	5.55	4.00E+02	7.23E-19	7.20E-19	0.42
8.00E+02	2.31E-18	2.40E-18	-3.89	8.00E+02	7.42E-19	7.00E-19	6.03
1.00E+03	1.98E-18	2.00E-18	-1.09	1.00E+03	6.51E-19	6.90E-19	-5.62
2.00E+03	1.17E-18	1.20E-18	-2.4	2.00E+03	4.07E-19	4.20E-19	-3.17
4.00E+03	6.88E-19	6.80E-19	1.21	4.00E+03	2.79E-19	2.90E-19	-3.94
8.00E+03	4.06E-19	4.00E-19	1.47	8.00E+03	1.99E-19	1.90E-19	4.91
1.00E+04	3.42E-19	3.20E-19	6.9	1.00E+04	1.78E-19	1.06E-19	11.25
2.00E+04	2.00E-19	2.10E-19	-4.96	2.00E+04	1.21E-19	1.20E-19	0.76
4.00E+04	1.15E-19	1.20E-19	-4.29	4.00E+04	7.80E-20	7.30E-20	6.85
8.00E+04	6.52E-20	6.50E-20	0.24	8.00E+04	4.82E-20	5.00E-20	-3.62
1.00E+05	5.41E-20	5.20E-20	4.11	1.00E+05	4.10E-20	4.40E-20	-6.9
2.00E+05	3.02E-20	3.10E-20	-2.54	2.00E+05	2.43E-20	3.00E-20	-19.13

O 6+ (1s2)		I = 739.0 eV		O 7+ (1s1)		I = 871.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
8.00E+02	6.53E-21	6.50E-21	0.4	1.00E+03	6.88E-21	7.10E-21	-3.05
1.00E+03	3.08E-20	3.10E-20	-0.56	2.00E+03	2.07E-20	2.10E-20	-1.53
2.00E+03	6.14E-20	6.10E-20	0.59	4.00E+03	2.03E-20	2.00E-20	1.67
4.00E+03	5.20E-20	5.30E-20	-1.87	8.00E+03	1.42E-20	1.40E-20	1.22
8.00E+03	3.42E-20	3.30E-20	3.67	1.00E+04	1.25E-20	1.30E-20	-3.91
1.00E+04	2.94E-20	3.00E-20	-2.15	2.00E+04	8.13E-21	8.10E-21	0.33
2.00E+04	1.80E-20	1.80E-20	0.17	4.00E+04	4.97E-21	4.90E-21	1.51
4.00E+04	1.10E-20	1.10E-20	-0.16	8.00E+04	2.91E-21	2.90E-21	0.33
8.00E+04	6.59E-21	6.60E-21	-0.11	1.00E+05	2.43E-21	2.40E-21	1.33
1.00E+05	5.57E-21	5.70E-21	-2.25	2.00E+05	1.37E-21	1.40E-21	-1.95
2.00E+05	3.26E-21	3.20E-21	1.94				

Table 4.2. Fitting parameters for oxygen and its ions.

O	A_1	A_2	A_3	A_4	A_5	A_6	B
0+	-1.0752E+00	-5.8825E-01	3.3262E+00	-8.4281E+00	5.6172E+00	1.6477E+00	1.1338E+00
1+	-1.2104E+00	-6.2146E-01	1.2598E+01	-4.0423E+01	5.0227E+01	-1.9900E+01	1.8442E+00
2+	7.3748E-01	-2.9058E+00	3.4619E+01	-1.1921E+02	1.7241E+02	-8.4175E+01	7.1881E-01
3+	1.2988E+00	-1.6941E+01	8.5888E+01	-1.8723E+02	1.8552E+02	-6.7704E+01	8.9738E-01
4+	1.7119E+00	-1.5639E+01	5.8569E+01	-1.1304E+02	1.1288E+02	-4.5412E+01	1.0364E+00
5+	-1.0165E+00	-1.8450E+00	9.7371E+00	-4.4941E+01	7.4737E+01	-4.1156E+01	1.5333E+00
6+	-6.2813E-01	-6.9153E-01	1.5653E+01	-4.9633E+01	6.2189E+01	-2.8117E+01	1.0727E+00
7+	-7.7255E-02	3.8042E+00	-2.9634E+01	8.1475E+01	-9.1003E+01	3.5849E+01	3.6750E-01

Table 5.1. Ionization cross sections of argon and its ions.

Ar 0+ (3p6)		I = 15.8 eV		Ar 1+ (3p5)		I = 27.7 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
2.00E+01	4.36E-17	4.50E-17	-3.03	3.00E+01	2.37E-17	2.50E-17	-5.25
4.00E+01	2.15E-16	2.30E-16	-6.57	5.00E+01	1.05E-16	1.10E-16	-4.56
8.00E+01	2.47E-16	2.40E-16	3.09	1.00E+02	1.26E-16	1.20E-16	4.97
1.00E+02	2.43E-16	2.40E-16	1.43	2.00E+02	8.82E-17	9.00E-17	-1.99
2.00E+02	2.02E-16	2.00E-16	0.94	4.00E+02	5.85E-17	6.00E-17	-2.45
4.00E+02	1.41E-16	1.50E-16	-6.22	8.00E+02	3.75E-17	3.90E-17	-3.83
8.00E+02	8.81E-17	9.00E-17	-2.14	1.00E+03	3.22E-17	3.30E-17	-2.39
1.00E+03	7.47E-17	7.50E-17	-0.43	2.00E+03	1.96E-17	1.90E-17	3.05
2.00E+03	4.35E-17	4.20E-17	3.57	4.00E+03	1.15E-17	1.10E-17	4.9
4.00E+03	2.46E-17	2.60E-17	-5.27	8.00E+03	6.65E-18	6.00E-18	10.66
8.00E+03	1.37E-17	1.30E-17	5.4	1.00E+04	5.54E-18	5.10E-18	8.65
1.00E+04	1.13E-17	1.10E-17	2.84	2.00E+04	3.12E-18	3.20E-18	-2.48
2.00E+04	6.20E-18	6.00E-18	3.29	4.00E+04	1.74E-18	1.80E-18	-3.6
4.00E+04	3.37E-18	3.20E-18	5.21	8.00E+04	9.55E-19	1.00E-18	-4.5
8.00E+04	1.82E-18	1.90E-18	-4.38	1.00E+05	7.87E-19	8.00E-19	-1.68
1.00E+05	1.49E-18	1.60E-18	-7.01	2.00E+05	4.28E-19	5.00E-19	14.4
2.00E+05	7.97E-19	8.00E-19	-0.36				

Ar 2+ (3p4)		I = 40.8 eV		Ar 3+ (3p3)		I = 59.8 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
5.00E+01	2.67E-17	2.80E-17	-4.55	7.00E+01	5.88E-18	6.00E-18	-2.07
8.00E+01	4.69E-17	4.90E-17	-4.38	1.00E+02	1.62E-17	1.70E-17	-4.93
1.00E+02	4.94E-17	4.80E-17	2.96	2.00E+02	1.74E-17	1.70E-17	2.04
2.00E+02	3.82E-17	3.90E-17	-2.15	4.00E+02	1.31E-17	1.30E-17	0.82
4.00E+02	2.30E-17	2.20E-17	4.49	8.00E+02	8.20E-18	8.40E-18	-2.4
8.00E+02	1.37E-17	1.60E-17	-18.75	1.00E+03	6.91E-18	7.10E-18	-2.7
1.00E+03	1.16E-17	1.20E-17	-3.33	2.00E+03	3.95E-18	4.00E-18	-1.2
2.00E+03	6.95E-18	7.00E-18	-0.72	4.00E+03	2.22E-18	2.10E-18	5.48
4.00E+03	4.12E-18	4.20E-18	-2.03	8.00E+03	1.23E-18	1.20E-18	2.33
8.00E+03	2.40E-18	2.30E-18	4.15	1.00E+04	1.01E-18	1.00E-18	1.37
1.00E+04	2.01E-18	2.00E-18	0.26	2.00E+04	5.56E-19	5.80E-19	-4.18
2.00E+04	1.14E-18	1.10E-18	3.85	4.00E+04	3.03E-19	3.00E-19	0.84
4.00E+04	6.42E-19	6.10E-19	5.22	8.00E+04	1.64E-19	1.80E-19	-9.1
8.00E+04	3.56E-19	3.80E-19	-6.2	1.00E+05	1.34E-19	1.30E-19	3.14
1.00E+05	2.94E-19	2.90E-19	1.49	2.00E+05	7.20E-20	7.00E-20	2.86
2.00E+05	1.61E-19	1.70E-19	-5.05				

Ar 4+ (3p2)		I = 75.0 eV		Ar 5+ (3p1)		I = 91.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
8.00E+01	3.60E-18	4.50E-18	19.91	1.00E+02	1.27E-18	1.30E-18	-2.68
1.00E+02	7.41E-18	7.60E-18	-2.54	2.00E+02	7.59E-18	8.00E-18	-5.08
2.00E+02	9.84E-18	9.90E-18	-0.64	4.00E+02	7.58E-18	6.80E-18	11.41
4.00E+02	9.90E-18	9.60E-18	3.14	8.00E+02	4.48E-18	4.80E-18	-6.66
8.00E+02	6.72E-18	6.80E-18	-1.13	1.00E+03	3.72E-18	4.00E-18	-7.07
1.00E+03	5.73E-18	5.90E-18	-2.91	2.00E+03	2.10E-18	2.00E-18	5.15
2.00E+03	3.35E-18	3.50E-18	-4.44	4.00E+03	1.21E-18	1.20E-18	0.88
4.00E+03	1.90E-18	1.80E-18	5.76	8.00E+03	6.98E-19	6.90E-19	1.14
8.00E+03	1.07E-18	1.10E-18	-2.65	1.00E+04	5.84E-19	5.90E-19	-1.1
1.00E+04	8.88E-19	8.40E-19	5.71	2.00E+04	3.32E-19	3.30E-19	0.7
2.00E+04	4.93E-19	5.00E-19	-1.34	4.00E+04	1.87E-19	1.90E-19	-1.55

4.00E+04	2.72E-19	2.70E-19	0.62	8.00E+04	1.04E-19	1.00E-19	4.13
8.00E+04	1.49E-19	1.60E-19	-7.22	1.00E+05	8.61E-20	8.50E-20	1.23
1.00E+05	1.22E-19	1.20E-19	1.69	2.00E+05	4.73E-20	5.00E-20	-5.39
2.00E+05	6.61E-20	6.50E-20	1.67				

Ar 6+ (3s2)		**I = 124.7 eV**		**Ar 7+ (3s1)**		**I = 153.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.30E+02	4.56E-19	5.00E-19	-8.81	2.00E+02	7.46E-19	7.50E-19	-0.54
2.00E+02	1.52E-18	1.50E-18	1	4.00E+02	3.21E-18	3.30E-18	-2.85
4.00E+02	3.94E-18	3.90E-18	1.05	8.00E+02	3.47E-18	3.40E-18	1.97
8.00E+02	3.09E-18	3.20E-18	-3.33	1.00E+03	3.05E-18	3.00E-18	1.74
1.00E+03	2.65E-18	2.60E-18	1.76	2.00E+03	1.72E-18	1.80E-18	-4.23
2.00E+03	1.50E-18	1.50E-18	-0.1	4.00E+03	9.03E-19	9.00E-19	0.38
4.00E+03	8.07E-19	8.00E-19	0.83	8.00E+03	4.80E-19	4.60E-19	4.32
8.00E+03	4.27E-19	4.10E-19	4.15	1.00E+04	3.93E-19	4.00E-19	-1.67
1.00E+04	3.47E-19	3.50E-19	-0.76	2.00E+04	2.14E-19	2.20E-19	-2.66
2.00E+04	1.82E-19	2.10E-19	13.19	4.00E+04	1.17E-19	1.20E-19	-2.25
4.00E+04	9.54E-20	9.20E-20	3.66	8.00E+04	6.42E-20	6.20E-20	3.52
8.00E+04	4.98E-20	5.00E-20	-0.46	1.00E+05	5.28E-20	5.10E-20	3.55
1.00E+05	4.04E-20	4.00E-20	0.87	2.00E+05	2.87E-20	3.30E-20	12.97
2.00E+05	2.10E-20	2.10E-20	0.01				

Ar 8+ (2p6)		**I = 422.5 eV**		**Ar 9+ (2p5)**		**I = 478.5 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
5.00E+02	3.73E-19	3.90E-19	-4.47	6.00E+02	1.74E-19	1.80E-19	-3.57
8.00E+02	6.90E-19	7.00E-19	-1.5	8.00E+02	2.99E-19	3.00E-19	-0.41
1.00E+03	8.15E-19	8.20E-19	-0.67	1.00E+03	3.48E-19	3.50E-19	-0.5
2.00E+03	7.49E-19	7.20E-19	4.07	2.00E+03	3.41E-19	3.40E-19	0.23
4.00E+03	4.66E-19	5.00E-19	-6.9	4.00E+03	2.47E-19	2.50E-19	-1.05
8.00E+03	2.77E-19	2.80E-19	-1.25	8.00E+03	1.63E-19	1.60E-19	1.9
1.00E+04	2.34E-19	2.20E-19	6.39	1.00E+04	1.41E-19	1.40E-19	0.57
2.00E+04	1.39E-19	1.40E-19	-0.45	2.00E+04	8.67E-20	8.80E-20	-1.49
4.00E+04	8.21E-20	8.20E-20	0.14	4.00E+04	5.16E-20	5.20E-20	-0.84
8.00E+04	4.76E-20	5.00E-20	-4.74	8.00E+04	2.99E-20	3.00E-20	-0.31
1.00E+05	3.98E-20	4.00E-20	-0.41	1.00E+05	2.50E-20	2.50E-20	-0.05
				2.00E+05	1.42E-20	1.40E-20	1.04

Ar 10+ (2p4)		**I = 539.0 eV**		**Ar 11+ (2p3)**		**I = 618.5 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
7.00E+02	2.56E-19	2.60E-19	-1.48	7.00E+02	1.01E-19	1.00E-19	1.39
8.00E+02	3.52E-19	3.60E-19	-2.36	8.00E+02	1.91E-19	2.00E-19	-4.43
1.00E+03	4.36E-19	4.20E-19	3.92	1.00E+03	2.89E-19	2.80E-19	3.29
2.00E+03	3.97E-19	4.10E-19	-3.16	2.00E+03	2.85E-19	2.90E-19	-1.58
4.00E+03	2.53E-19	2.50E-19	1.01	4.00E+03	1.60E-19	1.60E-19	-0.16
8.00E+03	1.53E-19	1.50E-19	1.91	8.00E+03	9.19E-20	9.00E-20	2.06
1.00E+04	1.31E-19	1.30E-19	0.44	1.00E+04	7.73E-20	7.70E-20	0.44
2.00E+04	8.07E-20	8.00E-20	0.84	2.00E+04	4.47E-20	4.50E-20	-0.64
4.00E+04	4.95E-20	5.10E-20	-2.89	4.00E+04	2.51E-20	2.70E-20	-7.18
8.00E+04	2.98E-20	3.20E-20	-6.81	8.00E+04	1.37E-20	1.30E-20	5.43
1.00E+05	2.52E-20	3.00E-20	-15.97	1.00E+05	1.13E-20	1.10E-20	2.23
2.00E+05	1.48E-20	1.20E-20	22.92	2.00E+05	6.04E-21	6.20E-21	-2.65

Ar 12+ (2p2)		**I = 686.5 eV**		**Ar 13+ (2p1)**		**I = 755.5 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
7.20E+02	4.67E-20	5.00E-20	-6.66	1.00E+03	1.61E-20	1.70E-20	-5.44

8.00E+02	1.01E-19	1.00E-19	0.76	2.00E+03	2.78E-20	2.90E-20	-4.17
1.00E+03	1.49E-19	1.50E-19	-0.84	4.00E+03	2.56E-20	2.50E-20	2.22
2.00E+03	1.81E-19	1.80E-19	0.51	8.00E+03	1.77E-20	1.80E-20	-1.65
4.00E+03	1.10E-19	1.10E-19	-0.34	1.00E+04	1.54E-20	1.50E-20	2.44
8.00E+03	6.31E-20	6.50E-20	-2.98	2.00E+04	9.62E-21	9.80E-21	-1.85
1.00E+04	5.32E-20	5.10E-20	4.34	4.00E+04	5.86E-21	5.90E-21	-0.72
2.00E+04	3.15E-20	3.20E-20	-1.55	8.00E+04	3.49E-21	3.50E-21	-0.39
4.00E+04	1.84E-20	1.90E-20	-3.25	1.00E+05	2.94E-21	2.90E-21	1.27
8.00E+04	1.05E-20	1.00E-20	5.18	2.00E+05	1.70E-21	1.70E-21	0.1
1.00E+05	8.76E-21	8.80E-21	-0.51				
2.00E+05	4.91E-21	5.00E-21	-1.89				

Ar 14+ (2s2)		**I = 855.0 eV**		**Ar 15+ (2s1)**		**I = 918.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.00E+03	1.16E-20	1.20E-20	-3.05	1.00E+03	2.00E-21	2.00E-21	-0.1
2.00E+03	3.99E-20	4.10E-20	-2.65	2.00E+03	1.85E-20	1.90E-20	-2.73
4.00E+03	3.60E-20	3.50E-20	2.86	4.00E+03	1.81E-20	1.80E-20	0.33
8.00E+03	2.12E-20	2.20E-20	-3.63	8.00E+03	1.56E-20	1.60E-20	-2.6
1.00E+04	1.78E-20	1.80E-20	-1.09	1.00E+04	1.45E-20	1.40E-20	3.45
2.00E+04	1.06E-20	1.00E-20	5.93	2.00E+04	1.01E-20	9.00E-21	11.11
4.00E+04	6.38E-21	6.50E-21	-1.84	4.00E+04	5.94E-21	6.00E-21	-1.03
8.00E+04	3.80E-21	3.90E-21	-2.55	8.00E+04	3.21E-21	3.50E-21	-8.4
1.00E+05	3.20E-21	3.30E-21	-2.9	1.00E+05	2.60E-21	3.00E-21	-13.36
2.00E+05	1.86E-21	1.80E-21	3.5	2.00E+05	1.33E-21	1.20E-21	10.42

Ar 16+ (1s2)		**I = 4120.9 eV**		**Ar 17+ (1s1)**		**I = 4425.9 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
6.00E+03	1.25E-21	1.30E-21	-3.57	6.00E+03	4.68E-22	4.80E-22	-2.5
8.00E+03	1.72E-21	1.70E-21	1.36	8.00E+03	7.43E-22	7.50E-22	-0.96
1.00E+04	1.85E-21	1.90E-21	-2.51	1.00E+04	8.19E-22	8.20E-22	-0.1
2.00E+04	1.81E-21	1.80E-21	0.77	2.00E+04	7.87E-22	7.90E-22	-0.4
4.00E+04	1.30E-21	1.30E-21	0.14	4.00E+04	5.87E-22	5.80E-22	1.22
8.00E+04	8.08E-22	8.00E-22	1.06	8.00E+04	3.85E-22	3.90E-22	-1.4
1.00E+05	6.85E-22	7.00E-22	-2.12	1.00E+05	3.31E-22	3.30E-22	0.17
2.00E+05	4.03E-22	4.00E-22	0.71	2.00E+05	2.01E-22	2.00E-22	0.38

Table 5.2. Fitting parameters for argon and its ions.

Ar	A_1	A_2	A_3	A_4	A_5	A_6	B
0+	-2.1470E+00	4.4666E+00	-4.1315E+01	1.3982E+02	-1.8680E+02	8.8275E+01	2.4232E+00
1+	-4.0421E-01	1.7895E+00	-4.0636E+01	1.5299E+02	-1.9718E+02	8.2334E+01	2.7847E+00
2+	-4.4960E-02	1.7257E+01	-8.9064E+01	1.8891E+02	-1.7359E+02	5.5412E+01	1.6819E+00
3+	4.6698E-01	-1.6275E+00	3.4834E+01	-1.0618E+02	1.2528E+02	-5.1129E+01	8.5260E-01
4+	3.0088E+00	-1.2233E+01	2.2061E+01	-3.5335E+01	5.2718E+01	-2.8996E+01	1.1013E+00
5+	-6.0296E-02	4.6989E+00	-4.4504E+01	1.4033E+02	-1.5597E+02	5.5411E+01	1.1305E+00
6+	1.6284E+00	-7.5886E+00	4.0222E+00	4.2879E+01	-5.8798E+01	2.0889E+01	2.9482E-01
7+	-5.6045E-01	-1.2786E+00	1.8091E+01	-7.4438E+01	1.3864E+02	-7.9406E+01	9.8698E-01
8+	-4.5412E-01	3.4585E+01	-2.1723E+02	5.0190E+02	-4.7406E+02	1.5344E+02	3.3781E+00
9+	-9.5627E-01	1.0345E+01	-4.6114E+01	9.5366E+01	-9.0057E+01	3.1176E+01	2.2801E+00
10+	-1.3438E+00	1.1230E+01	-2.2185E+01	9.9766E+00	1.5802E+01	-1.8228E+01	3.4680E+00
11+	1.8395E+00	1.6724E+01	-8.0959E+01	2.1834E+02	-2.6705E+02	1.1484E+02	6.5300E-01
12+	4.0609E+00	-1.0547E+01	-1.5701E+00	8.0064E+01	-1.3095E+02	5.9805E+01	1.0311E+00
13+	-3.1154E-01	2.3045E+00	-8.4664E+00	1.0940E+01	-3.1132E+00	-1.7253E+00	5.2515E-01
14+	-2.8680E-01	5.5096E+00	-3.9930E+01	1.0748E+02	-1.1433E+02	4.1070E+01	6.6933E-01

15+	2.3867E-01	1.7208E+00	-1.6659E+01	6.5441E+01	-9.4261E+01	4.6460E+01	-7.5786E-02
16+	-2.6350E-01	-1.5530E+00	2.2307E+01	-6.8930E+01	8.4268E+01	-3.5720E+01	8.0365E-01
17+	-2.0011E-01	1.4495E-01	4.2296E+00	-1.4769E+01	1.7952E+01	-7.3556E+00	4.6322E-01

Table 6.1. Ionization cross sections of xenon and its ions.

Xe 0+ (5p6)		I = 12.1 eV		Xe 1+ (5p5)		I = 23.5 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
2.00E+01	2.25E-16	2.30E-16	-2.05	2.50E+01	9.17E-18	9.00E-18	1.9
4.00E+01	4.57E-16	4.90E-16	-6.75	4.00E+01	2.61E-16	2.80E-16	-6.84
8.00E+01	4.94E-16	4.80E-16	2.89	8.00E+01	2.12E-16	2.10E-16	0.96
1.00E+02	4.78E-16	4.70E-16	1.75	1.00E+02	1.95E-16	1.90E-16	2.44
2.00E+02	3.74E-16	3.70E-16	0.97	2.00E+02	1.48E-16	1.50E-16	-1.64
4.00E+02	2.50E-16	2.40E-16	4.23	4.00E+02	9.61E-17	1.00E-16	-3.89
8.00E+02	1.54E-16	1.70E-16	-9.57	8.00E+02	5.64E-17	5.60E-17	0.67
1.00E+03	1.30E-16	1.30E-16	-0.04	1.00E+03	4.69E-17	4.70E-17	-0.25
2.00E+03	7.54E-17	8.00E-17	-5.81	2.00E+03	2.59E-17	2.80E-17	-7.64
4.00E+03	4.27E-17	4.10E-17	4.02	4.00E+03	1.40E-17	1.30E-17	7.51
8.00E+03	2.38E-17	2.40E-17	-1.04	8.00E+03	7.47E-18	7.20E-18	3.76
1.00E+04	1.96E-17	1.90E-17	3.27	1.00E+04	6.10E-18	6.00E-18	1.62
2.00E+04	1.08E-17	1.10E-17	-2.12	2.00E+04	3.23E-18	3.20E-18	0.99
4.00E+04	5.86E-18	5.80E-18	1.03	4.00E+04	1.71E-18	1.70E-18	0.34
8.00E+04	3.17E-18	3.10E-18	2.17	8.00E+04	8.97E-19	9.00E-19	-0.29
1.00E+05	2.60E-18	2.60E-18	-0.2	1.00E+05	7.29E-19	7.20E-19	1.3
2.00E+05	1.39E-18	1.40E-18	-0.55	2.00E+05	3.82E-19	4.10E-19	-6.73

Xe 2+ (5p4)		I = 34.3 eV		Xe 3+ (5p3)		I = 39.7 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
4.00E+01	1.22E-16	1.30E-16	-6.56	5.00E+01	3.90E-17	4.00E-17	-2.52
8.00E+01	1.35E-16	1.40E-16	-3.86	8.00E+01	1.05E-16	1.00E-16	0.4
1.00E+02	1.31E-16	1.30E-16	1.03	1.00E+02	1.06E-16	1.10E-16	-4.06
2.00E+02	8.64E-17	8.10E-17	6.63	2.00E+02	6.00E-17	5.10E-17	17.64
4.00E+02	4.82E-17	5.10E-17	-5.44	4.00E+02	3.30E-17	3.40E-17	-2.94
8.00E+02	2.80E-17	3.00E-17	-6.8	8.00E+02	1.98E-17	2.00E-17	-1.22
1.00E+03	2.36E-17	2.70E-17	-14.81	1.00E+03	1.67E-17	1.80E-17	-7.25
2.00E+03	1.40E-17	1.30E-17	7.37	2.00E+03	9.62E-18	9.80E-18	-1.88
4.00E+03	8.16E-18	8.00E-18	2.05	4.00E+03	5.33E-18	5.10E-18	4.56
8.00E+03	4.70E-18	4.80E-18	-2.09	8.00E+03	2.89E-18	2.90E-18	-0.44
1.00E+04	3.92E-18	3.80E-18	3.19	1.00E+04	2.36E-18	2.20E-18	7.37
2.00E+04	2.21E-18	2.20E-18	0.6	2.00E+04	1.26E-18	1.20E-18	4.79
4.00E+04	1.23E-18	1.20E-18	2.82	4.00E+04	6.65E-19	7.50E-19	-12
8.00E+04	6.81E-19	7.00E-19	-2.74	8.00E+04	3.50E-19	3.50E-19	-0.03
1.00E+05	5.61E-19	5.60E-19	0.2	1.00E+05	2.84E-19	2.80E-19	1.56
2.00E+05	3.06E-19	4.20E-19	-28.57	2.00E+05	1.49E-19	1.60E-19	-6.85

Xe 4+ (5p2)		I = 47.8 eV		Xe 5+ (5p1)		I = 64.2 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
7.00E+01	7.73E-17	7.70E-17	0.41	8.00E+01	3.12E-17	3.20E-17	-2.52
8.00E+01	8.99E-17	9.00E-17	-0.14	1.00E+02	5.17E-17	5.20E-17	-0.6
1.00E+02	8.21E-17	8.50E-17	-3.38	2.00E+02	4.86E-17	5.00E-17	-2.77
2.00E+02	5.59E-17	5.50E-17	1.64	4.00E+02	4.49E-17	4.10E-17	9.39
4.00E+02	4.84E-17	4.60E-17	5.29	8.00E+02	3.44E-17	3.80E-17	-9.57
8.00E+02	3.16E-17	3.50E-17	-9.69	1.00E+03	3.01E-17	3.30E-17	-8.94
1.00E+03	2.65E-17	2.90E-17	-8.68	2.00E+03	1.79E-17	1.80E-17	-0.43

2.00E+03	1.44E-17	1.40E-17	2.49	4.00E+03	9.74E-18	9.00E-18	8.19
4.00E+03	7.39E-18	7.00E-18	5.5	8.00E+03	5.04E-18	5.30E-18	-4.83
8.00E+03	3.72E-18	3.60E-18	3.18	1.00E+04	4.06E-18	3.80E-18	6.78
1.00E+04	2.97E-18	2.90E-18	2.4	2.00E+04	2.04E-18	2.10E-18	-2.76
2.00E+04	1.48E-18	1.50E-18	-1.7	4.00E+04	1.02E-18	1.00E-18	1.75
4.00E+04	7.29E-19	7.20E-19	1.25	8.00E+04	5.04E-19	4.90E-19	2.94
8.00E+04	3.60E-19	3.60E-19	-0.1	1.00E+05	4.02E-19	4.00E-19	0.54
1.00E+05	2.86E-19	3.00E-19	-4.54	2.00E+05	1.99E-19	2.10E-19	-5.37
2.00E+05	1.41E-19	1.40E-19	0.76				

Xe 6+ (5s2)		**I = 98.0 eV**		**Xe 7+ (5s1)**		**I = 112.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.00E+02	5.45E-19	5.50E-19	-0.88	1.19E+02	2.82E-19	2.50E-19	12.85
2.00E+02	2.13E-17	2.20E-17	-3.17	1.30E+02	2.92E-18	3.00E-18	-2.72
4.00E+02	2.39E-17	2.30E-17	4.03	2.00E+02	1.81E-17	1.70E-17	6.48
8.00E+02	1.59E-17	1.70E-17	-6.4	4.00E+02	1.39E-17	1.60E-17	-13.12
1.00E+03	1.35E-17	1.30E-17	4.06	8.00E+02	1.12E-17	1.10E-17	1.55
4.00E+03	4.27E-18	7.70E-18	-45.45	1.00E+03	9.65E-18	9.00E-18	7.17
8.00E+03	2.28E-18	2.20E-18	3.47	2.00E+03	5.35E-18	5.40E-18	-0.89
1.00E+04	1.85E-18	1.80E-18	2.9	4.00E+03	2.79E-18	2.90E-18	-3.78
2.00E+04	9.69E-19	9.30E-19	4.21	8.00E+03	1.47E-18	1.50E-18	-1.98
4.00E+04	5.04E-19	5.00E-19	0.72	1.00E+04	1.20E-18	1.20E-18	0.1
8.00E+04	2.61E-19	2.70E-19	-3.46	2.00E+04	6.47E-19	6.30E-19	2.65
1.00E+05	2.11E-19	2.10E-19	0.35	4.00E+04	3.50E-19	3.50E-19	0.07
2.00E+05	1.09E-19	1.10E-19	-1.13	8.00E+04	1.90E-19	1.90E-19	-0.17
				1.00E+05	1.56E-19	1.60E-19	-2.74
				2.00E+05	8.39E-20	8.20E-20	2.32

Xe 8+ (4d10)		**I = 171.0 eV**		**Xe 9+ (4d9)**		**I = 202.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.82E+02	1.30E-18	1.30E-18	0.25	2.20E+02	1.05E-19	1.00E-19	4.63
1.92E+02	2.28E-18	2.30E-18	-1.04	3.00E+02	1.63E-18	1.40E-18	16.07
4.00E+02	9.03E-18	9.00E-18	0.32	4.00E+02	3.79E-18	4.10E-18	-7.68
8.00E+02	8.13E-18	8.10E-18	0.36	8.00E+02	6.01E-18	6.00E-18	0.15
1.00E+03	7.07E-18	7.20E-18	-1.82	1.00E+03	5.84E-18	5.80E-18	0.6
2.00E+03	4.23E-18	4.20E-18	0.81	2.00E+03	4.28E-18	4.10E-18	4.27
4.00E+03	2.39E-18	2.30E-18	3.68	4.00E+03	2.64E-18	2.70E-18	-2.07
8.00E+03	1.28E-18	1.30E-18	-1.27	8.00E+03	1.52E-18	1.60E-18	-5.26
1.00E+04	1.04E-18	1.10E-18	-5.1	1.00E+04	1.26E-18	1.20E-18	4.66
2.00E+04	5.42E-19	5.30E-19	2.17	2.00E+04	6.89E-19	7.00E-19	-1.6
4.00E+04	2.77E-19	2.80E-19	-1.1	4.00E+04	3.72E-19	3.80E-19	-2.15
8.00E+04	1.41E-19	1.40E-19	0.4	8.00E+04	1.99E-19	2.00E-19	-0.58
1.00E+05	1.13E-19	1.10E-19	2.62	1.00E+05	1.62E-19	1.60E-19	1.46
2.00E+05	5.70E-20	5.80E-20	-1.67	2.00E+05	8.62E-20	8.50E-20	1.35

Xe 10+ (4d8)		**I = 233.0 eV**		**Xe 11+ (4d7)**		**I = 263.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
2.47E+02	6.04E-19	6.10E-19	-0.99	3.00E+02	6.86E-19	7.00E-19	-1.97
3.00E+02	2.57E-18	2.60E-18	-1.36	5.00E+02	2.06E-18	2.00E-18	3.14
6.00E+02	4.84E-18	4.80E-18	0.85	8.00E+02	3.69E-18	3.90E-18	-5.32
8.00E+02	4.36E-18	4.30E-18	1.41	1.00E+03	3.85E-18	3.80E-18	1.29
1.00E+03	3.88E-18	4.00E-18	-3.02	2.00E+03	2.88E-18	2.80E-18	2.8
2.00E+03	2.48E-18	2.50E-18	-0.84	4.00E+03	1.68E-18	1.70E-18	-1.16
4.00E+03	1.48E-18	1.40E-18	5.46	8.00E+03	9.09E-19	9.10E-19	-0.14
8.00E+03	8.41E-19	8.70E-19	-3.33	1.00E+04	7.40E-19	7.30E-19	1.4

1.00E+04	6.97E-19	7.00E-19	-0.42	2.00E+04	3.87E-19	3.90E-19	-0.76
2.00E+04	3.84E-19	3.90E-19	-1.61	4.00E+04	2.00E-19	2.00E-19	0.18
4.00E+04	2.08E-19	2.10E-19	-0.85	8.00E+04	1.03E-19	1.10E-19	-6.15
8.00E+04	1.12E-19	1.10E-19	1.78	1.00E+05	8.33E-20	8.10E-20	2.88
1.00E+05	9.16E-20	9.10E-20	0.61	2.00E+05	4.28E-20	4.20E-20	1.89
2.00E+05	4.88E-20	4.90E-20	-0.34				

Xe 12+ (4d6)		**I = 294.0 eV**		**Xe 13+ (4d5)**		**I = 325.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
3.00E+02	9.69E-20	1.00E-19	-3.07	3.50E+02	1.15E-19	1.10E-19	4.74
5.00E+02	2.31E-18	2.40E-18	-3.7	4.00E+02	6.60E-19	6.50E-19	1.5
8.00E+02	3.23E-18	3.20E-18	1	6.00E+02	1.82E-18	1.80E-18	1.12
1.00E+03	3.30E-18	3.20E-18	3.05	8.00E+02	1.86E-18	1.90E-18	-1.91
2.00E+03	2.55E-18	2.70E-18	-5.43	1.00E+03	1.92E-18	1.90E-18	1.07
4.00E+03	1.52E-18	1.50E-18	1.16	2.00E+03	1.72E-18	1.70E-18	0.91
8.00E+03	8.24E-19	8.00E-19	2.97	4.00E+03	1.05E-18	1.10E-18	-4.82
1.00E+04	6.72E-19	6.80E-19	-1.14	8.00E+03	5.61E-19	5.30E-19	5.87
2.00E+04	3.55E-19	3.50E-19	1.5	1.00E+04	4.57E-19	4.50E-19	1.64
4.00E+04	1.87E-19	1.90E-19	-1.55	2.00E+04	2.45E-19	3.50E-19	-30
8.00E+04	9.83E-20	1.00E-19	-1.67	4.00E+04	1.33E-19	1.30E-19	2.62
1.00E+05	7.99E-20	8.10E-20	-1.34	8.00E+04	7.32E-20	7.60E-20	-3.75
2.00E+05	4.19E-20	4.10E-20	2.25	1.00E+05	6.03E-20	6.10E-20	-1.15
				2.00E+05	3.30E-20	3.20E-20	3.17

Xe 14+ (4d4)		**I = 358.0 eV**		**Xe 15+ (4d3)**		**I = 390.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
3.79E+02	1.30E-19	1.10E-19	17.27	4.00E+02	4.87E-20	5.00E-20	-2.51
4.02E+02	3.11E-19	4.00E-19	-22.5	6.00E+02	7.83E-19	8.00E-19	-2.18
4.46E+02	6.35E-19	6.60E-19	-3.77	8.00E+02	1.12E-18	1.10E-18	1.84
5.35E+02	9.63E-19	9.20E-19	4.64	1.00E+03	1.19E-18	1.20E-18	-0.61
7.14E+02	9.99E-19	1.00E-18	-0.07	2.00E+03	9.08E-19	9.10E-19	-0.21
1.00E+03	9.52E-19	9.80E-19	-2.82	4.00E+03	5.31E-19	5.30E-19	0.12
1.80E+03	8.51E-19	8.20E-19	3.76	8.00E+03	2.94E-19	3.00E-19	-2
3.20E+03	6.04E-19	6.20E-19	-2.57	1.00E+04	2.43E-19	2.40E-19	1.29
6.10E+03	3.54E-19	3.60E-19	-1.57	2.00E+04	1.35E-19	1.30E-19	4.16
9.30E+03	2.44E-19	2.40E-19	1.65	4.00E+04	7.57E-20	8.00E-20	-5.41
1.82E+04	1.35E-19	1.30E-19	3.52	8.00E+04	4.22E-20	4.20E-20	0.38
3.61E+04	7.39E-20	7.60E-20	-2.72	1.00E+05	3.49E-20	3.50E-20	-0.35
7.20E+04	4.06E-20	4.20E-20	-3.41	2.00E+05	1.93E-20	1.90E-20	1.36
1.43E+05	2.23E-20	2.20E-20	1.4				
2.86E+05	1.21E-20	1.20E-20	1.17				

Xe 16+ (4d2)		**I = 421.0 eV**		**Xe 17+ (4d1)**		**I = 452.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
4.51E+02	7.14E-20	7.10E-20	0.6	4.82E+02	2.24E-20	2.00E-20	11.85
6.00E+02	4.96E-19	5.10E-19	-2.78	5.10E+02	8.50E-20	9.00E-20	-5.59
8.00E+02	6.75E-19	6.50E-19	3.78	5.67E+02	2.98E-19	3.20E-19	-6.81
1.00E+03	6.81E-19	7.00E-19	-2.7	6.81E+02	5.89E-19	5.60E-19	5.23
2.00E+03	5.56E-19	5.60E-19	-0.72	9.08E+02	5.62E-19	5.30E-19	6.01
4.00E+03	3.44E-19	3.30E-19	4.18	1.40E+03	4.72E-19	5.20E-19	-9.22
8.00E+03	1.87E-19	1.90E-19	-1.68	2.30E+03	4.93E-19	4.80E-19	2.71
1.00E+04	1.53E-19	1.60E-19	-4.54	4.10E+03	3.70E-19	3.60E-19	2.66
2.00E+04	8.24E-20	8.20E-20	0.52	7.70E+03	2.09E-19	2.00E-19	4.72
4.00E+04	4.52E-20	4.50E-20	0.4	2.31E+04	7.06E-20	7.20E-20	-1.94
8.00E+04	2.49E-20	2.40E-20	3.88	4.60E+04	3.73E-20	3.90E-20	-4.38

1.00E+05	2.06E-20	2.00E-20	2.94	9.12E+04	2.03E-20	2.10E-20	-3.22
2.00E+05	1.13E-20	1.20E-20	-5.55	1.82E+05	1.11E-20	1.10E-20	1.25
				3.63E+05	6.11E-21	5.90E-21	3.61

Xe 18+ (4p6)		**I = 573.0 eV**		**Xe 19+ (4p5)**		**I = 608.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
6.08E+02	5.85E-20	5.30E-20	10.42	6.43E+02	4.76E-20	3.90E-20	22.07
6.44E+02	1.18E-19	1.30E-19	-9.31	6.80E+02	1.14E-19	1.60E-19	-28.56
7.16E+02	2.07E-19	2.10E-19	-1.47	7.56E+02	2.55E-19	2.70E-19	-5.76
8.59E+02	2.93E-19	2.90E-19	1.03	9.07E+02	4.25E-19	4.00E-19	6.12
1.20E+03	3.41E-19	3.40E-19	0.14	1.20E+03	4.76E-19	4.80E-19	-0.9
1.70E+03	3.30E-19	3.30E-19	0.1	1.80E+03	4.21E-19	4.30E-19	-2
2.90E+03	2.76E-19	2.80E-19	-1.31	3.00E+03	3.52E-19	3.50E-19	0.64
5.20E+03	2.10E-19	2.10E-19	-0.25	5.40E+03	2.58E-19	2.50E-19	3.25
9.70E+03	1.46E-19	1.30E-19	12	1.03E+04	1.63E-19	1.70E-19	-4.08
2.76E+04	7.03E-20	8.00E-20	-12.5	3.08E+04	6.62E-20	6.50E-20	1.9
5.46E+04	4.16E-20	4.40E-20	-5.42	6.10E+04	3.66E-20	4.60E-20	-20.34
1.09E+05	2.39E-20	2.40E-20	-0.6	1.22E+05	1.99E-20	1.90E-20	4.66
2.17E+05	1.35E-20	1.30E-20	3.6	2.43E+05	1.08E-20	1.10E-20	-2.27

Xe 20+ (4p4)		**I = 643.0 eV**		**Xe 21+ (4p3)**		**I = 678.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
6.54E+02	2.81E-20	2.80E-20	0.49	7.20E+02	2.80E-20	2.80E-20	-0.18
6.92E+02	1.00E-19	1.10E-19	-8.89	8.47E+02	8.51E-20	8.90E-20	-4.38
7.69E+02	1.96E-19	1.80E-19	8.79	1.00E+03	1.34E-19	1.30E-19	2.74
9.23E+02	3.16E-19	3.30E-19	-4.18	2.00E+03	3.31E-19	3.40E-19	-2.71
1.20E+03	3.98E-19	4.00E-19	-0.61	4.00E+03	2.90E-19	2.80E-19	3.54
1.80E+03	3.96E-19	3.90E-19	1.43	8.00E+03	1.92E-19	1.90E-19	1.07
3.10E+03	3.24E-19	3.20E-19	1.27	1.00E+04	1.64E-19	1.70E-19	-3.76
5.50E+03	2.31E-19	2.80E-19	-17.85	2.00E+04	9.43E-20	9.60E-20	-1.78
1.05E+04	1.42E-19	1.40E-19	1.49	4.00E+04	5.16E-20	5.10E-20	1.22
3.30E+04	5.40E-20	5.30E-20	1.9	8.00E+04	2.75E-20	2.70E-20	1.82
6.50E+04	2.97E-20	3.00E-20	-1.09	1.00E+05	2.24E-20	2.20E-20	1.67
1.30E+05	1.59E-20	1.60E-20	-0.39	2.00E+05	1.17E-20	1.20E-20	-2.46
2.60E+05	8.51E-21	8.50E-21	0.07				

Xe 22+ (4p2)		**I = 358.0 eV**		**Xe 23+ (4p1)**		**I = 762.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
8.12E+02	1.67E-20	1.70E-20	-1.72	8.12E+02	1.28E-20	1.30E-20	-1.84
9.55E+02	5.35E-20	5.20E-20	2.91	9.55E+02	4.07E-20	4.10E-20	-0.81
1.00E+03	6.43E-20	6.70E-20	-4.05	2.00E+03	2.00E-19	2.00E-19	-0.17
2.00E+03	1.90E-19	1.90E-19	0.13	4.00E+03	2.24E-19	2.20E-19	1.86
4.00E+03	2.14E-19	2.10E-19	2.1	8.00E+03	1.53E-19	1.60E-19	-4.32
8.00E+03	1.61E-19	1.70E-19	-5.04	1.00E+04	1.30E-19	1.30E-19	-0.1
1.00E+04	1.41E-19	1.40E-19	0.34	2.00E+04	7.37E-20	7.10E-20	3.76
2.00E+04	8.39E-20	8.30E-20	1.13	4.00E+04	4.02E-20	4.00E-20	0.38
4.00E+04	4.67E-20	4.60E-20	1.43	8.00E+04	2.15E-20	2.10E-20	2.52
8.00E+04	2.50E-20	3.50E-20	-28.57	1.00E+05	1.76E-20	1.90E-20	-7.47
1.00E+05	2.04E-20	2.00E-20	2.04	2.00E+05	9.33E-21	9.10E-21	2.54
2.00E+05	1.07E-20	1.10E-20	-2.51				

Xe 24+ (4s2)		**I = 853.0 eV**		**Xe 25+ (4s1)**		**I = 891.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
9.05E+02	6.18E-21	6.30E-21	-1.88	9.55E+02	2.91E-21	2.90E-21	0.3
1.10E+03	2.01E-20	2.00E-20	0.33	1.30E+03	2.28E-20	2.30E-20	-0.76

2.00E+03	2.00E-19	2.00E-19	-0.08	4.00E+03	1.75E-19	1.70E-19	3.16
4.00E+03	2.62E-19	2.60E-19	0.67	8.00E+03	1.19E-19	1.20E-19	-0.48
8.00E+03	1.90E-19	1.90E-19	0.2	1.00E+04	9.74E-20	1.00E-19	-2.6
1.00E+04	1.65E-19	1.70E-19	-3.07	2.00E+04	4.78E-20	5.10E-20	-6.29
2.00E+04	9.90E-20	9.50E-20	4.18	4.00E+04	2.31E-20	2.20E-20	5
4.00E+04	5.64E-20	5.80E-20	-2.73	8.00E+04	1.15E-20	1.10E-20	4.38
8.00E+04	3.13E-20	3.10E-20	0.97	1.00E+05	9.22E-21	9.30E-21	-0.82
1.00E+05	2.58E-20	2.60E-20	-0.77	2.00E+05	4.73E-21	4.90E-21	-3.38
2.00E+05	1.40E-20	1.40E-20	0.3				

Xe 26+ (3d10)		**I = 1394.0 eV**		**Xe 27+ (3d9)**		**I = 1491.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.51E+03	2.17E-20	2.20E-20	-1.22	1.78E+03	1.58E-20	1.40E-20	12.84
2.00E+03	1.08E-19	1.10E-19	-1.62	2.00E+03	4.43E-20	4.90E-20	-9.56
4.00E+03	1.70E-19	1.70E-19	-0.14	4.00E+03	1.25E-19	1.20E-19	4.46
8.00E+03	1.34E-19	1.30E-19	3.19	8.00E+03	9.45E-20	1.00E-19	-5.52
1.00E+04	1.17E-19	1.20E-19	-2.63	1.00E+04	8.34E-20	8.20E-20	1.74
2.00E+04	6.87E-20	7.00E-20	-1.84	2.00E+04	5.24E-20	5.20E-20	0.77
4.00E+04	3.77E-20	3.80E-20	-0.92	4.00E+04	3.01E-20	3.00E-20	0.45
8.00E+04	2.02E-20	1.90E-20	6.26	8.00E+04	1.65E-20	1.70E-20	-2.89
1.00E+05	1.65E-20	1.70E-20	-3	1.00E+05	1.35E-20	1.30E-20	3.99
2.00E+05	8.77E-21	8.90E-21	-1.49	2.00E+05	7.19E-21	7.30E-21	-1.55

Xe 28+ (3d8)		**I = 1587.0 eV**		**Xe 29+ (3d7)**		**I = 1684.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
2.00E+03	5.96E-20	6.30E-20	-5.44	2.00E+03	3.48E-20	3.60E-20	-3.35
4.00E+03	1.07E-19	1.10E-19	-2.42	4.00E+03	1.08E-19	1.10E-19	-2.05
8.00E+03	9.15E-20	9.00E-20	1.67	8.00E+03	1.01E-19	1.00E-19	1.31
1.00E+04	7.80E-20	8.00E-20	-2.57	1.00E+04	8.61E-20	8.60E-20	0.15
2.00E+04	4.22E-20	4.10E-20	2.94	2.00E+04	4.56E-20	4.70E-20	-2.92
4.00E+04	2.20E-20	2.20E-20	-0.16	4.00E+04	2.31E-20	2.20E-20	4.78
8.00E+04	1.16E-20	1.20E-20	-3.48	8.00E+04	1.17E-20	1.20E-20	-2.24
1.00E+05	9.46E-21	9.40E-21	0.61	1.00E+05	9.46E-21	9.70E-21	-2.45
2.00E+05	5.07E-21	5.00E-21	1.35	2.00E+05	4.88E-21	4.80E-21	1.65

Xe 30+ (3d6)		**I = 1781.0 eV**		**Xe 31+ (3d5)**		**I = 1877.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
2.00E+03	9.88E-21	1.00E-20	-1.17	2.00E+03	9.61E-21	1.00E-20	-3.9
4.00E+03	6.81E-20	7.00E-20	-2.68	4.00E+03	6.12E-20	6.20E-20	-1.35
8.00E+03	7.22E-20	7.10E-20	1.7	8.00E+03	6.23E-20	6.00E-20	3.87
1.00E+04	6.40E-20	6.30E-20	1.61	1.00E+04	5.34E-20	5.40E-20	-1.19
2.00E+04	3.87E-20	4.00E-20	-3.23	2.00E+04	3.02E-20	3.10E-20	-2.66
4.00E+04	2.15E-20	2.20E-20	-2.51	4.00E+04	1.65E-20	1.70E-20	-2.81
8.00E+04	1.14E-20	1.10E-20	3.5	8.00E+04	8.79E-21	8.40E-21	4.69
1.00E+05	9.23E-21	9.00E-21	2.57	1.00E+05	7.14E-21	7.00E-21	1.95
2.00E+05	4.76E-21	4.90E-21	-2.89	2.00E+05	3.68E-21	3.80E-21	-3.17

Xe 32+ (3d4)		**I = 1987.0 eV**		**Xe 33+ (3d3)**		**I = 2085.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
3.00E+03	2.32E-20	2.40E-20	-3.29	2.20E+03	7.63E-21	7.60E-21	0.42
5.00E+03	4.21E-20	4.20E-20	0.11	2.30E+03	1.33E-20	1.40E-20	-4.92
7.00E+03	4.63E-20	4.80E-20	-3.6	2.60E+03	2.43E-20	2.30E-20	5.74
1.00E+04	4.18E-20	4.20E-20	-0.55	3.10E+03	3.25E-20	3.30E-20	-1.54
2.00E+04	2.44E-20	2.40E-20	1.74	4.10E+03	3.90E-20	4.00E-20	-2.41
4.00E+04	1.26E-20	1.20E-20	5.04	6.20E+03	3.90E-20	3.80E-20	2.51

8.00E+04	6.79E-21	7.10E-21	-4.31	1.00E+04	3.13E-20	3.10E-20	1
1.00E+05	5.64E-21	6.00E-21	-5.97	1.87E+04	2.10E-20	2.20E-20	-4.36
2.00E+05	3.24E-21	3.10E-21	4.65	3.53E+04	1.31E-20	1.30E-20	1.05
				5.70E+04	8.86E-21	8.70E-21	1.8
				1.13E+05	4.84E-21	4.80E-21	0.72
				2.23E+05	2.57E-21	2.60E-21	-1.2

Xe 34+ (3d2)		I = 2183.0 eV		Xe 35+ (3d1)		I = 2281.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
2.30E+03	5.57E-21	6.10E-21	-8.65	2.40E+03	4.34E-21	4.70E-21	-7.68
2.50E+03	1.17E-20	1.10E-20	6.63	2.60E+03	9.02E-21	8.70E-21	3.72
2.70E+03	1.68E-20	1.80E-20	-6.48	2.80E+03	1.28E-20	1.50E-20	-14.66
3.30E+03	2.73E-20	2.70E-20	1.14	3.40E+03	2.10E-20	2.10E-20	-0.09
4.40E+03	3.21E-20	3.20E-20	0.15	4.60E+03	2.59E-20	2.60E-20	-0.57
6.60E+03	3.06E-20	3.10E-20	-1.23	6.80E+03	2.49E-20	2.50E-20	-0.31
1.10E+04	2.56E-20	2.50E-20	2.45	1.14E+04	2.06E-20	2.00E-20	3.1
1.97E+04	1.77E-20	1.80E-20	-1.52	2.05E+04	1.44E-20	1.50E-20	-3.93
3.72E+04	1.06E-20	1.10E-20	-3.9	3.90E+04	8.73E-21	8.90E-21	-1.92
5.60E+04	7.40E-21	7.10E-21	4.21	6.10E+04	5.97E-21	5.80E-21	2.89
1.12E+05	4.00E-21	4.00E-21	0	1.21E+05	3.26E-21	3.20E-21	2
2.21E+05	2.18E-21	2.20E-21	-0.74	2.40E+05	1.77E-21	1.80E-21	-1.96

Xe 36+ (3p6)		I = 2578.0 eV		Xe 37+ (3p5)		I = 2637.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
2.70E+03	3.06E-21	3.30E-21	-7.18	2.80E+03	2.96E-21	3.10E-21	-4.52
2.90E+03	6.30E-21	6.10E-21	3.27	3.00E+03	5.91E-21	5.70E-21	3.62
3.20E+03	9.90E-21	1.00E-20	-1.04	3.30E+03	9.46E-21	9.70E-21	-2.46
3.80E+03	1.49E-20	1.50E-20	-1.03	3.90E+03	1.40E-20	1.40E-20	0.02
5.10E+03	1.83E-20	1.80E-20	1.44	5.30E+03	1.72E-20	1.70E-20	1
7.60E+03	1.76E-20	1.80E-20	-2.16	7.90E+03	1.66E-20	1.70E-20	-2.33
1.27E+04	1.44E-20	1.40E-20	2.91	1.32E+04	1.35E-20	1.30E-20	3.69
2.29E+04	9.84E-21	1.00E-20	-1.57	2.37E+04	9.22E-21	9.50E-21	-2.94
4.33E+04	5.87E-21	6.10E-21	-3.79	4.47E+04	5.55E-21	5.70E-21	-2.68
6.62E+04	4.05E-21	3.90E-21	3.82	6.84E+04	3.84E-21	3.70E-21	3.75
1.30E+05	2.21E-21	2.20E-21	0.41	1.34E+05	2.10E-21	2.10E-21	0.03
2.57E+05	1.19E-21	1.20E-21	-0.9	2.66E+05	1.12E-21	1.13E-21	-0.76

Xe 38+ (3p4)		I = 2726.0 eV		Xe 39+ (3p3)		I = 2814.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
3.00E+03	3.00E-21	3.20E-21	-6.34	3.00E+03	1.96E-21	2.10E-21	-6.67
5.00E+03	9.13E-21	9.80E-21	-6.89	5.00E+03	9.57E-21	1.00E-20	-4.3
7.00E+03	1.17E-20	1.10E-20	6.28	8.00E+03	1.36E-20	1.30E-20	4.63
1.00E+04	1.20E-20	1.20E-20	0	1.00E+04	1.36E-20	1.35E-20	0.79
2.00E+04	8.64E-21	9.00E-21	-3.97	2.00E+04	1.03E-20	1.10E-20	-6.09
4.00E+04	5.08E-21	5.10E-21	-0.45	4.00E+04	6.35E-21	6.30E-21	0.73
8.00E+04	2.75E-21	2.80E-21	-1.7	8.00E+04	3.45E-21	3.30E-21	4.43
1.00E+05	2.24E-21	2.10E-21	6.62	1.00E+05	2.78E-21	2.80E-21	-0.68
2.00E+05	1.16E-21	1.20E-21	-3.35	2.00E+05	1.38E-21	1.40E-21	-1.73

Xe 40+ (3p2)		I = 3001.0 eV		Xe 41+ (3p1)		I = 3093.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
3.50E+03	2.89E-21	3.00E-21	-3.61	4.00E+03	2.63E-21	2.70E-21	-2.71
6.00E+03	7.63E-21	8.00E-21	-4.62	8.00E+03	5.82E-21	5.90E-21	-1.38
8.00E+03	9.07E-21	8.80E-21	3.08	1.00E+04	6.80E-21	6.70E-21	1.55
1.00E+04	9.18E-21	9.00E-21	2	2.00E+04	5.73E-21	5.80E-21	-1.17

2.00E+04	6.75E-21	7.00E-21	-3.56	4.00E+04	2.96E-21	2.90E-21	2.01
4.00E+04	4.12E-21	4.10E-21	0.47	8.00E+04	1.47E-21	1.50E-21	-1.95
8.00E+04	2.37E-21	2.30E-21	3.07	1.00E+05	1.20E-21	1.20E-21	0.25
1.00E+05	1.97E-21	2.00E-21	-1.5	2.00E+05	6.93E-22	6.90E-22	0.5
2.00E+05	1.09E-21	1.10E-21	-0.69				

Xe 42+ (3s2)		**I = 3296.0 eV**		**Xe 43+ (3s1)**		**I = 3386.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
4.00E+03	1.16E-21	1.20E-21	-2.97	4.00E+03	4.95E-22	5.00E-22	-1.02
8.00E+03	3.03E-21	3.00E-21	0.95	8.00E+03	2.22E-21	2.20E-21	0.69
1.00E+04	3.96E-21	4.00E-21	-0.97	1.00E+04	3.05E-21	3.00E-21	1.73
2.00E+04	4.89E-21	4.80E-21	1.86	2.00E+04	3.75E-21	3.80E-21	-1.44
4.00E+04	3.59E-21	3.70E-21	-2.88	4.00E+04	2.64E-21	2.70E-21	-2.38
8.00E+04	2.20E-21	2.20E-21	-0.11	8.00E+04	1.61E-21	1.60E-21	0.35
1.00E+05	1.84E-21	1.80E-21	2.42	1.00E+05	1.36E-21	1.30E-21	4.41
2.00E+05	1.04E-21	1.05E-21	-0.98	2.00E+05	7.98E-22	8.20E-22	-2.71

Xe 44+ (2p6)		**I = 7224.0 eV**		**Xe 45+ (2p5)**		**I = 7491.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
7.70E+03	5.17E-22	5.10E-22	1.3	7.80E+03	3.76E-22	4.10E-22	-8.4
8.10E+03	9.04E-22	9.20E-22	-1.77	8.40E+03	7.66E-22	7.40E-22	3.51
9.00E+03	1.50E-21	1.50E-21	0.2	9.40E+03	1.17E-21	1.20E-21	-2.24
1.10E+04	2.20E-21	2.20E-21	0.02	1.13E+04	1.78E-21	1.80E-21	-1.38
1.45E+04	2.72E-21	2.70E-21	0.54	1.50E+04	2.18E-21	2.10E-21	3.79
2.20E+04	2.57E-21	2.60E-21	-1.22	2.20E+04	2.00E-21	2.10E-21	-4.8
3.60E+04	2.03E-21	2.00E-21	1.55	3.70E+04	1.67E-21	1.60E-21	4.08
6.50E+04	1.48E-21	1.50E-21	-1.52	7.65E+04	1.15E-21	1.20E-21	-4.39
1.23E+05	8.98E-22	8.90E-22	0.95	1.28E+05	7.40E-22	7.20E-22	2.81
1.88E+05	5.78E-22	5.80E-22	-0.3	1.95E+05	4.67E-22	4.70E-22	-0.74

Xe 46+ (2p4)		**I = 7758.0 eV**		**Xe 47+ (2p3)**		**I = 8024.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
8.20E+03	3.10E-22	3.20E-22	-3.17	8.60E+03	2.44E-22	2.40E-22	1.45
8.70E+03	5.86E-22	5.80E-22	1.03	9.10E+03	4.37E-22	4.40E-22	-0.75
9.70E+03	9.67E-22	9.60E-22	0.71	1.00E+04	6.98E-22	7.20E-22	-3.09
1.16E+04	1.39E-21	1.40E-21	-0.91	1.20E+04	1.03E-21	1.00E-21	3.17
1.55E+04	1.70E-21	1.70E-21	0.08	1.60E+04	1.27E-21	1.30E-21	-2.14
2.30E+04	1.61E-21	1.60E-21	0.49	2.40E+04	1.21E-21	1.20E-21	0.85
3.90E+04	1.29E-21	1.30E-21	-0.47	4.00E+04	9.80E-22	9.80E-22	0.01
7.00E+04	9.49E-22	9.50E-22	-0.11	7.30E+04	7.17E-22	7.20E-22	-0.48
1.32E+05	5.73E-22	5.70E-22	0.59	1.37E+05	4.42E-22	4.40E-22	0.48
2.02E+05	3.69E-22	3.70E-22	-0.31	2.10E+05	2.90E-22	2.90E-22	-0.18

Xe 48+ (2p2)		**I = 8617.0 eV**		**Xe 49+ (2p1)**		**I = 8899.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
9.10E+03	1.63E-22	1.70E-22	-3.88	9.50E+03	1.04E-22	1.00E-22	4
9.70E+03	3.12E-22	3.10E-22	0.54	1.00E+04	1.90E-22	2.00E-22	-4.89
1.10E+04	5.13E-22	5.00E-22	2.66	1.10E+04	3.27E-22	3.20E-22	2.06
1.30E+04	7.13E-22	7.40E-22	-3.61	1.30E+04	4.78E-22	4.80E-22	-0.4
1.70E+04	9.08E-22	8.90E-22	2.04	1.80E+04	5.83E-22	5.80E-22	0.58
2.60E+04	8.64E-22	8.70E-22	-0.68	2.70E+04	5.64E-22	5.70E-22	-0.98
4.30E+04	6.91E-22	6.90E-22	0.18	4.50E+04	4.74E-22	4.70E-22	0.82
7.70E+04	5.18E-22	5.20E-22	-0.32	8.00E+04	3.50E-22	3.50E-22	-0.02
1.46E+05	3.22E-22	3.20E-22	0.53	1.52E+05	2.19E-22	2.20E-22	-0.67
2.24E+05	2.09E-22	2.10E-22	-0.26	2.32E+05	1.51E-22	1.50E-22	0.39

Xe 50+ (2s2)		I = 9330.0 eV		Xe 51+ (2s1)		I = 9569.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
1.00E+04	5.27E-23	5.60E-23	-5.93	1.00E+04	2.29E-23	2.50E-23	-8.44
1.10E+04	1.16E-22	1.10E-22	5.67	1.10E+04	5.47E-23	5.20E-23	5.2
1.20E+04	1.74E-22	1.80E-22	-3.57	1.20E+04	8.26E-23	8.70E-23	-5.03
1.40E+04	2.62E-22	2.70E-22	-2.85	1.40E+04	1.29E-22	1.30E-22	-1.04
1.90E+04	3.42E-22	3.30E-22	3.67	1.90E+04	1.65E-22	1.60E-22	3.33
2.80E+04	3.30E-22	3.40E-22	-2.96	2.90E+04	1.54E-22	1.60E-22	-3.7
4.70E+04	2.85E-22	2.80E-22	1.65	4.80E+04	1.33E-22	1.30E-22	2.3
8.50E+04	2.19E-22	2.20E-22	-0.63	8.70E+04	1.00E-22	1.00E-22	0.39
1.60E+05	1.40E-22	1.40E-22	-0.04	1.65E+05	6.44E-23	6.60E-23	-2.4
2.44E+05	9.61E-23	9.60E-23	0.09	2.52E+05	4.56E-23	4.50E-23	1.3
Xe 52+ (1s2)		**I = 39250.0 eV**		**Xe 53+ (1s1)**		**I = 40270.0 eV**	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	**error, %**	**E, eV**	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	**error, %**
4.20E+04	2.95E-24	3.00E-24	-1.78	4.40E+04	1.48E-24	1.40E-24	5.71
4.50E+04	5.67E-24	5.60E-24	1.3	4.60E+04	2.39E-24	2.60E-24	-7.93
5.00E+04	9.46E-24	9.60E-24	-1.44	5.20E+04	4.74E-24	4.50E-24	5.27
6.00E+04	1.51E-23	1.50E-23	0.61	6.20E+04	6.73E-24	6.90E-24	-2.46
8.00E+04	1.90E-23	1.90E-23	-0.18	8.30E+04	9.17E-24	9.10E-24	0.75
1.20E+05	2.10E-23	2.10E-23	0.05	1.24E+05	9.78E-24	9.80E-24	-0.19
2.00E+05	1.85E-23	1.85E-23	-0.01	2.06E+05	8.50E-24	8.50E-24	0.03

Table 6.2. Fitting parameters for xenon and its ions.

Xe	A_1	A_2	A_3	A_4	A_5	A_6	B
0+	-2.9887E+00	3.9033E+00	-3.2867E+01	1.0747E+02	-1.4667E+02	7.2740E+01	3.3153E+00
1+	-2.6659E-01	-1.1349E+01	2.0121E+02	-5.5796E+02	5.7551E+02	-2.0001E+02	1.1970E+00
2+	5.6805E+00	7.3020E+01	-4.8400E+02	1.0686E+03	-9.9730E+02	3.3304E+02	2.5369E+00
3+	1.5443E+00	9.6751E+00	-4.6803E+01	2.1718E+02	-3.4593E+02	1.6957E+02	7.7454E-01
4+	6.7933E+00	-6.1727E+01	5.1626E+02	-1.3639E+03	1.4402E+03	-5.2149E+02	-3.1091E-01
5+	5.8256E+00	1.1547E+01	4.5015E+01	-1.8631E+02	1.7271E+02	-1.9090E+01	-5.1323E-01
6+	1.7360E+00	2.4879E-01	-1.7928E+01	1.8142E+02	-2.7625E+02	1.2505E+02	9.2660E-01
7+	-1.2484E+00	-2.7242E+01	4.8639E+02	-1.5268E+03	1.8094E+03	-7.3699E+02	2.0345E+00
8+	5.3849E+00	3.1507E+01	-2.6103E+02	7.8621E+02	-9.0277E+02	3.5880E+02	2.0683E-01
9+	-2.3478E+00	-3.0627E+00	3.3269E+01	-1.9110E+01	3.4577E+00	3.1172E+00	2.8317E+00
10+	3.5757E+00	7.5656E+00	1.8722E+01	-4.5008E+01	1.7597E+01	6.7099E+00	2.0163E+00
11+	1.9847E+00	3.4203E+01	-2.4406E+02	6.1850E+02	-5.7225E+02	1.7877E+02	8.1158E-01
12+	3.0142E+00	-2.6734E+01	2.1996E+02	-5.4244E+02	6.1334E+02	-2.5355E+02	1.6940E+00
13+	-1.1328E+00	-1.8899E+01	3.2887E+02	-1.0643E+03	1.3276E+03	-5.6927E+02	2.8857E+00
14+	6.1764E-01	1.8262E+01	7.1499E+00	-1.9770E+02	3.4432E+02	-1.7039E+02	1.5156E+00
15+	1.0853E+00	-9.6260E+00	8.2479E+01	-1.7072E+02	1.6439E+02	-6.5877E+01	2.1211E+00
16+	4.7674E-01	-2.8276E+00	9.7581E+01	-3.1730E+02	3.8969E+02	-1.6651E+02	1.3571E+00
17+	-6.3521E-01	-1.5777E+01	3.0960E+02	-1.0424E+03	1.3015E+03	-5.5170E+02	1.3881E+00
18+	1.4263E-01	1.5426E+01	-7.1108E+01	1.3945E+02	-1.3245E+02	4.9628E+01	2.6420E+00
19+	6.8687E-01	1.8735E+01	2.6720E+01	-2.1536E+02	3.0327E+02	-1.2786E+02	1.6200E+00
20+	6.1101E+00	-2.2981E+01	1.1612E+02	-2.5170E+02	2.4871E+02	-8.9636E+01	1.2690E+00
21+	1.1618E+00	9.7075E+00	-7.8397E+01	2.5054E+02	-2.8689E+02	1.1531E+02	8.0665E-01
22+	3.3342E-01	1.7550E-01	1.4956E+01	-3.5663E+01	4.5451E+01	-1.3895E+01	8.7764E-01
23+	3.3823E-02	1.6390E+00	-1.0020E+01	2.7296E+01	8.1662E+00	-1.9226E+01	1.1423E+00
24+	-1.9117E+00	2.8265E+00	-5.5770E+01	2.2150E+02	-2.4692E+02	8.9910E+01	2.6455E+00
25+	-3.0614E-01	-1.8572E+00	3.6893E+01	-1.7197E+02	3.2895E+02	-1.8707E+02	6.5659E-01
26+	3.2830E+00	-2.7083E+00	1.4030E+02	-4.1695E+02	4.9821E+02	-2.0835E+02	2.1375E+00

27+	1.4806E+00	-4.2524E+01	3.5372E+02	-7.6144E+02	6.7006E+02	-2.0626E+02	1.3730E+00
28+	1.8404E+00	7.5574E+01	-3.8131E+02	7.7945E+02	-6.4749E+02	1.7812E+02	1.9792E+00
29+	3.0010E+00	6.2017E+01	-3.9291E+02	9.8636E+02	-9.6200E+02	3.1491E+02	1.0140E+00
30+	2.0845E+00	1.8778E+01	-1.4163E+02	4.6418E+02	-5.3481E+02	2.0766E+02	2.2340E-01
31+	5.6500E+00	1.3636E+01	-2.1327E+02	7.6047E+02	-9.2981E+02	3.7750E+02	1.9280E-02
32+	-1.6139E+00	-9.2233E+00	1.0940E+02	-3.5895E+02	5.1263E+02	-2.5795E+02	3.8024E+00
33+	5.9397E+00	1.4985E+01	-1.1247E+02	3.0799E+02	-3.4884E+02	1.4367E+02	2.3349E-01
34+	5.2308E+00	-2.8482E+01	1.7596E+02	-4.3632E+02	4.7628E+02	-1.8822E+02	1.2835E+00
35+	4.6910E+00	-2.2788E+01	1.3166E+02	-3.0403E+02	3.1270E+02	-1.1683E+02	9.1745E-01
36+	4.7282E+00	-2.1166E+01	1.1558E+02	-2.6423E+02	2.7378E+02	-1.0414E+02	7.1753E-01
37+	3.2332E+00	-3.0287E+00	3.7241E+01	-1.0512E+02	1.2188E+02	-4.8938E+01	5.7327E-01
38+	2.5273E+00	4.2473E+00	-4.4140E+01	1.2706E+02	-1.2804E+02	4.4661E+01	4.6265E-02
39+	3.9313E+00	-2.8178E+00	-1.2774E+01	9.9069E+01	-1.4174E+02	6.7137E+01	-1.0273E+00
40+	6.3261E-01	1.1790E+01	-7.4106E+01	1.8723E+02	-1.8991E+02	6.7697E+01	7.9255E-01
41+	-1.1881E+00	-6.3558E-01	3.3311E+01	-1.6631E+02	2.8014E+02	-1.5065E+02	2.0646E+00
42+	-3.7441E-01	3.0865E+00	-8.5678E+00	-1.3539E+01	5.4291E+01	-3.1624E+01	9.0536E-01
43+	-1.0848E+00	-6.3856E-01	9.8947E+00	-5.4255E+01	9.8277E+01	-5.2773E+01	1.4116E+00
44+	9.9458E+00	2.4412E+01	-1.4003E+02	4.2394E+02	-5.4525E+02	2.6074E+02	-6.1647E+00
45+	1.2055E+01	-3.0095E+01	1.4210E+02	-2.2651E+02	1.3065E+02	7.9480E-01	-5.4225E+00
46+	7.5017E+00	4.5922E+00	-2.8097E+01	1.2237E+02	-1.8906E+02	1.0485E+02	-3.9187E+00
47+	4.8440E+00	1.2319E+01	-5.7916E+01	1.6618E+02	-2.1388E+02	1.0545E+02	-2.8466E+00
48+	5.2936E+00	1.9868E+00	-2.3043E+01	1.1615E+02	-1.8372E+02	9.9491E+01	-2.8573E+00
49+	1.6282E+00	7.1059E+00	-2.8107E+01	6.1360E+01	-6.5910E+01	2.9789E+01	-5.7109E-01
50+	1.3844E+00	-8.7589E-01	1.1423E+01	-1.8177E+01	5.0773E+00	6.1783E+00	-6.1642E-01
51+	5.9276E-01	-3.2124E+00	1.9560E+01	-4.3949E+01	4.2032E+01	-1.3840E+01	2.0480E-02
52+	3.7551E+01	2.0338E+01	-2.9934E+00	9.0466E+01	-1.6488E+02	1.3836E+02	-3.6888E+01
53+	-2.6154E+01	-1.3134E+01	5.4264E+00	-8.2484E+01	1.4737E+02	-1.1350E+02	2.6394E+01

Table 7.1. Ionization cross sections of gold and its ions.

Au 0+ (6s1)		**I = 7.7 eV**		**Au 1+ (5d10)**		**I = 20.6 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.00E+01	2.10E-17	2.00E-17	5.14	2.40E+01	9.98E-16	1.00E-15	-0.18
1.10E+01	6.59E-17	5.04E-17	22.05	2.70E+01	1.56E-15	1.60E-15	-2.78
1.30E+01	2.79E-16	3.07E-16	-24.51	3.40E+01	1.94E-15	1.90E-15	2.08
1.60E+01	7.46E-16	8.00E-16	-6.76	4.80E+01	1.88E-15	1.90E-15	-0.91
2.30E+01	1.59E-15	1.60E-15	-0.49	7.50E+01	1.70E-15	1.70E-15	0.24
3.60E+01	2.03E-15	1.63E-15	24.66	1.29E+02	1.40E-15	1.40E-15	-0.17
6.40E+01	1.83E-15	1.76E-15	3.77	2.38E+02	9.90E-16	9.96E-16	-0.6
1.18E+02	1.35E-15	1.40E-15	-3.41	4.56E+02	6.28E-16	6.20E-16	1.23
2.27E+02	9.04E-16	9.00E-16	0.46	8.90E+02	3.73E-16	3.70E-16	0.77
8.59E+02	3.53E-16	3.08E-16	-7.1	3.40E+03	1.22E-16	1.20E-16	1.42
1.70E+03	2.09E-16	2.20E-16	-4.92	6.80E+03	6.68E-17	6.70E-17	-0.34
3.40E+03	1.20E-16	1.24E-16	-2.9	1.36E+04	3.63E-17	3.70E-17	-1.88
6.80E+03	6.82E-17	7.00E-17	-2.64	2.72E+04	1.96E-17	2.00E-17	-1.99
1.40E+04	3.71E-17	3.80E-17	-2.26	5.44E+04	1.05E-17	1.10E-17	-4.34
2.70E+04	2.12E-17	2.10E-17	0.8	1.09E+05	5.61E-18	5.70E-18	-1.54
5.40E+04	1.16E-17	1.10E-17	5.38	2.18E+05	2.99E-18	2.80E-18	6.63
1.09E+05	6.25E-18	6.20E-18	0.78				
2.18E+05	3.37E-18	3.30E-18	2.24				
Au 2+ (5d9)		**I = 37.4 eV**		**Au 3+ (5d8)**		**I = 54.2 eV**	

E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
4.50E+01	5.68E-16	5.80E-16	-2	6.80E+01	7.92E-16	8.00E-16	-0.98
5.30E+01	9.24E-16	9.30E-16	-0.6	8.10E+01	1.02E-15	1.10E-15	-7.65
6.80E+01	1.21E-15	1.20E-15	0.49	1.09E+02	1.08E-15	1.01E-15	-1.72
9.90E+01	1.30E-15	1.30E-15	-0.28	1.63E+02	8.86E-16	8.80E-16	0.63
1.60E+02	1.10E-15	1.10E-15	-0.23	2.72E+02	5.32E-16	5.90E-16	-9.78
2.82E+02	7.62E-16	7.60E-16	0.29	4.89E+02	3.13E-16	3.06E-16	-13.08
5.30E+02	4.70E-16	4.70E-16	0.06	9.25E+02	1.95E-16	2.00E-16	-2.38
1.00E+03	2.81E-16	2.80E-16	0.5	1.10E+03	1.72E-16	1.01E-16	56
2.00E+03	1.58E-16	1.60E-16	-1.06	3.60E+03	6.37E-17	6.20E-17	2.78
1.50E+04	2.81E-17	2.80E-17	0.39	1.10E+04	2.21E-17	2.20E-17	0.51
3.00E+04	1.53E-17	1.50E-17	1.83	2.20E+04	1.12E-17	1.20E-17	-7.03
6.10E+04	8.13E-18	8.30E-18	-2.09	4.40E+04	5.58E-18	6.03E-18	-11.49
1.22E+05	4.36E-18	4.40E-18	-0.82	8.70E+04	2.81E-18	3.03E-18	-15.15
2.45E+05	2.32E-18	2.30E-18	1.04	1.74E+05	1.39E-18	1.08E-18	-22.77
				3.48E+05	6.90E-19	5.02E-19	-27.25

Au 4+ (5d7)		I = 71.0 eV		Au 5+ (5d6)		I = 87.8 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
9.20E+01	5.24E-16	5.50E-16	-4.79	1.18E+02	1.75E-16	1.80E-16	-3.07
1.13E+02	6.70E-16	6.70E-16	0.06	1.49E+02	2.50E-16	2.50E-16	-0.21
1.56E+02	6.06E-16	6.00E-16	0.94	2.10E+02	2.50E-16	2.50E-16	0.14
2.41E+02	4.29E-16	4.30E-16	-0.32	3.33E+02	1.98E-16	2.00E-16	-1.22
4.11E+02	2.65E-16	2.70E-16	-1.74	5.77E+02	1.32E-16	1.30E-16	1.38
7.51E+02	1.52E-16	1.50E-16	1.56	1.10E+03	7.46E-17	7.50E-17	-0.61
1.40E+03	8.56E-17	8.40E-17	1.84	2.00E+03	4.26E-17	4.20E-17	1.48
2.80E+03	4.49E-17	4.60E-17	-2.42	4.00E+03	2.23E-17	2.30E-17	-3.04
5.50E+03	2.39E-17	2.40E-17	-0.42	7.90E+03	1.19E-17	1.20E-17	-0.81
1.70E+04	8.30E-18	8.30E-18	-0.05	2.46E+04	4.21E-18	4.00E-18	5.36
3.40E+04	4.32E-18	4.30E-18	0.49	4.90E+04	2.25E-18	2.30E-18	-2.37
6.80E+04	2.25E-18	2.20E-18	2.13	9.80E+04	1.19E-18	1.20E-18	-0.85
1.36E+05	1.17E-18	1.20E-18	-2.78	1.96E+05	6.29E-19	6.30E-19	-0.17
2.72E+05	6.05E-19	6.00E-19	0.81				

Au 6+ (5d5)		I = 104.6 eV		Au 7+ (5d4)		I = 123.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
1.46E+02	1.35E-16	1.40E-16	-3.26	1.77E+02	8.58E-17	9.00E-17	-4.64
1.88E+02	1.80E-16	1.80E-16	-0.01	2.32E+02	1.11E-16	1.10E-16	1.22
2.70E+02	1.58E-16	1.60E-16	-1.28	3.41E+02	9.92E-17	1.00E-16	-0.8
4.38E+02	1.11E-16	1.10E-16	0.56	5.58E+02	7.02E-17	7.10E-17	-1.12
7.70E+02	7.02E-17	7.00E-17	0.29	9.93E+02	4.34E-17	4.30E-17	0.89
1.44E+03	4.01E-17	4.00E-17	0.33	1.90E+03	2.40E-17	2.40E-17	-0.01
2.80E+03	2.14E-17	2.20E-17	-2.72	3.60E+03	1.31E-17	1.30E-17	0.75
5.40E+03	1.14E-17	1.10E-17	3.74	7.10E+03	6.83E-18	6.80E-18	0.5
1.10E+04	5.78E-18	6.00E-18	-3.65	1.40E+04	3.56E-18	3.60E-18	-1.06
3.34E+04	2.01E-18	2.00E-18	0.42	4.36E+04	1.20E-18	1.20E-18	-0.24
6.70E+04	1.04E-18	1.00E-18	3.62	8.70E+04	6.17E-19	6.20E-19	-0.56
1.33E+05	5.40E-19	5.50E-19	-1.87	1.74E+05	3.17E-19	3.20E-19	-1.04
2.67E+05	2.78E-19	2.80E-19	-0.73	3.48E+05	1.63E-19	1.60E-19	1.61

Au 8+ (5d5)		I = 141.0 eV		Au 9+ (5d4)		I = 159.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
2.09E+02	6.02E-17	6.30E-17	-4.45	2.44E+02	4.48E-17	4.60E-17	-2.7
2.78E+02	7.89E-17	7.80E-17	1.15	3.29E+02	5.54E-17	5.60E-17	-1.02
4.16E+02	6.98E-17	7.00E-17	-0.24	5.00E+02	4.86E-17	4.90E-17	-0.86

6.91E+02	4.77E-17	4.90E-17	-2.74	8.40E+02	3.54E-17	3.40E-17	4.05
1.20E+03	2.95E-17	2.90E-17	1.73	1.53E+03	2.16E-17	2.40E-17	-10.13
2.30E+03	1.63E-17	1.60E-17	2.12	2.90E+03	1.17E-17	1.10E-17	6.51
4.60E+03	8.56E-18	8.70E-18	-1.62	5.60E+03	6.13E-18	6.00E-18	2.09
8.90E+03	4.58E-18	4.60E-18	-0.43	1.10E+04	3.17E-18	3.20E-18	-0.9
1.80E+04	2.34E-18	2.40E-18	-2.65	2.20E+04	1.63E-18	1.70E-18	-4.05
2.80E+04	1.53E-18	1.50E-18	1.93	1.36E+05	2.91E-19	2.90E-19	0.44
5.50E+04	7.98E-19	7.90E-19	1.06	2.72E+05	1.52E-19	1.50E-19	0.99
1.10E+05	4.09E-19	4.10E-19	-0.21				
2.20E+05	2.10E-19	2.10E-19	-0.25				

Au 10+ (5d3)		**I = 176.0 eV**		**Au 11+ (5d2)**		**I = 250.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
2.80E+02	3.39E-17	3.50E-17	-3.17	3.72E+02	2.10E-17	2.20E-17	-4.67
3.80E+02	4.19E-17	4.20E-17	-0.29	4.95E+02	2.64E-17	2.60E-17	1.39
5.88E+02	3.59E-17	3.60E-17	-0.28	7.39E+02	2.27E-17	2.30E-17	-1.12
1.00E+03	2.48E-17	2.50E-17	-0.67	1.23E+03	1.58E-17	1.60E-17	-1.47
1.80E+03	1.52E-17	1.50E-17	1.24	2.20E+03	9.65E-18	9.50E-18	1.6
3.50E+03	8.28E-18	8.30E-18	-0.19	4.20E+03	5.34E-18	5.30E-18	0.73
6.80E+03	4.44E-18	4.50E-18	-1.36	8.10E+03	2.87E-18	2.90E-18	-0.95
1.30E+04	2.40E-18	2.40E-18	0.16	1.60E+04	1.51E-18	1.50E-18	0.41
2.65E+04	1.22E-18	1.20E-18	1.98	3.20E+04	7.81E-19	7.90E-19	-1.13
8.25E+04	4.17E-19	4.20E-19	-0.84	9.80E+04	2.71E-19	2.70E-19	0.29
1.65E+05	2.16E-19	2.20E-19	-2.05	1.96E+05	1.40E-19	1.40E-19	0.32
3.29E+05	1.12E-19	1.10E-19	1.56				

Au 12+ (4f13) I = 274.0 eV				**Au 13+ (4f12) I = 299.0 eV**			
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
4.18E+02	1.53E-17	1.60E-17	-4.22	4.65E+02	9.70E-18	1.00E-17	-3
5.62E+02	1.93E-17	1.90E-17	1.44	6.32E+02	1.19E-17	1.20E-17	-0.93
8.49E+02	1.64E-17	1.70E-17	-3.35	9.65E+02	1.01E-17	1.00E-17	0.49
1.42E+03	1.13E-17	1.10E-17	2.28	1.60E+03	7.14E-18	7.20E-18	-0.78
2.60E+03	6.79E-18	6.90E-18	-1.57	3.00E+03	4.29E-18	4.30E-18	-0.25
4.90E+03	3.86E-18	3.80E-18	1.55	5.60E+03	2.44E-18	2.40E-18	1.69
9.50E+03	2.09E-18	2.10E-18	-0.55	1.10E+04	1.29E-18	1.30E-18	-0.51
1.90E+04	1.08E-18	1.10E-18	-1.45	2.20E+04	6.69E-19	6.80E-19	-1.58
3.70E+04	5.74E-19	5.70E-19	0.62	4.30E+04	3.54E-19	3.50E-19	1.03
1.15E+05	1.93E-19	1.90E-19	1.53	1.34E+05	1.20E-19	1.20E-19	-0.18
2.30E+05	9.89E-20	1.00E-19	-1.1	2.67E+05	6.21E-20	6.20E-20	0.13

Au 14+ (4f11)		**I = 323.0 eV**		**Au 15+ (4f10) I = 365.0 eV**			
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
5.15E+02	8.85E-18	9.20E-18	-3.79	5.82E+02	6.79E-18	7.00E-18	-3.07
7.06E+02	1.10E-17	1.10E-17	0.24	8.00E+02	8.34E-18	8.40E-18	-0.7
1.10E+03	9.45E-18	9.40E-18	0.55	1.20E+03	7.30E-18	7.30E-18	0.01
1.90E+03	6.36E-18	6.50E-18	-2.19	2.10E+03	5.01E-18	5.00E-18	0.23
3.40E+03	3.82E-18	3.90E-18	-2.14	3.90E+03	2.95E-18	3.00E-18	-1.73
6.40E+03	2.11E-18	2.00E-18	5.72	7.30E+03	1.64E-18	1.60E-18	2.32
1.26E+04	1.12E-18	1.10E-18	1.46	1.40E+04	8.80E-19	8.80E-19	-0.03
2.50E+04	5.87E-19	6.10E-19	-3.82	2.80E+04	4.56E-19	4.60E-19	-0.8
4.90E+04	3.13E-19	3.20E-19	-2.2	5.60E+04	2.38E-19	2.40E-19	-0.82
1.53E+05	1.08E-19	1.10E-19	-1.59	1.74E+05	8.25E-20	8.20E-20	0.6
3.06E+05	5.67E-20	5.50E-20	3.03	3.49E+05	4.30E-20	4.30E-20	0.08

Au 16+ (4f9)	**I = 391.0 eV**	**Au 17+ (4f8)**	**I = 432.0 eV**

E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
6.36E+02	5.40E-18	5.60E-18	-3.54	5.57E+02	2.13E-18	2.24E-18	-5.03
8.82E+02	6.60E-18	6.60E-18	0.05	8.32E+02	3.15E-18	3.20E-18	-1.47
1.37E+03	5.67E-18	5.70E-18	-0.52	1.40E+03	3.30E-18	3.30E-18	0
2.40E+03	3.86E-18	3.90E-18	-1.14	2.50E+03	2.69E-18	2.70E-18	-0.23
4.30E+03	2.35E-18	2.30E-18	2.15	4.70E+03	1.77E-18	1.80E-18	-1.48
8.30E+03	1.28E-18	1.30E-18	-1.54	9.10E+03	1.05E-18	1.00E-18	5.03
1.60E+04	6.88E-19	6.80E-19	1.15	1.80E+04	5.94E-19	6.10E-19	-2.68
3.20E+04	3.56E-19	3.60E-19	-1.03	3.60E+04	3.28E-19	3.40E-19	-3.4
6.30E+04	1.88E-19	1.90E-19	-1.34	7.10E+04	1.83E-19	1.80E-19	1.39
9.87E+04	1.23E-19	1.20E-19	2.1	1.10E+05	1.25E-19	1.24E-19	0.41
1.97E+05	6.37E-20	6.40E-20	-0.55	2.21E+05	6.73E-20	6.70E-20	0.51

Au 18+ (4f7)		**I = 487.0 eV**		**Au 19+ (4f6)**		**I = 516.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
6.14E+02	1.61E-18	1.70E-18	-5.2	6.81E+02	2.63E-18	2.80E-18	-6.06
9.21E+02	2.47E-18	2.50E-18	-1.27	1.00E+03	3.39E-18	3.40E-18	-0.35
1.50E+03	2.58E-18	2.60E-18	-0.69	1.70E+03	2.95E-18	3.00E-18	-1.55
2.80E+03	2.03E-18	2.00E-18	1.38	3.10E+03	2.12E-18	2.10E-18	0.83
5.20E+03	1.38E-18	1.40E-18	-1.44	5.80E+03	1.30E-18	1.30E-18	0.2
1.00E+04	8.53E-19	8.50E-19	0.3	1.10E+04	7.46E-19	7.40E-19	0.79
2.00E+04	4.86E-19	4.80E-19	1.33	2.20E+04	3.99E-19	4.00E-19	-0.2
4.00E+04	2.69E-19	2.70E-19	-0.38	4.40E+04	2.12E-19	2.20E-19	-3.5
8.00E+04	1.46E-19	1.50E-19	-2.61	8.70E+04	1.14E-19	1.10E-19	3.43
1.23E+05	9.95E-20	9.80E-20	1.48	1.36E+05	7.55E-20	7.60E-20	-0.65
2.46E+05	5.32E-20	5.30E-20	0.34	2.72E+05	3.99E-20	4.00E-20	-0.3

Au 20+ (4f5)		**I = 545.0 eV**		**Au 21+ (4f4)**		**I = 600.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
7.50E+02	2.06E-18	2.20E-18	-6.27	1.00E+03	9.84E-19	1.00E-18	-1.57
1.13E+03	2.71E-18	2.70E-18	0.43	1.40E+03	1.48E-18	1.50E-18	-1.26
1.90E+03	2.35E-18	2.40E-18	-2.17	2.20E+03	1.61E-18	1.60E-18	0.55
3.40E+03	1.68E-18	1.70E-18	-1.31	3.90E+03	1.30E-18	1.30E-18	-0.36
6.40E+03	1.04E-18	1.00E-18	3.47	7.20E+03	8.66E-19	8.60E-19	0.72
1.20E+04	6.05E-19	6.00E-19	0.89	1.40E+04	5.15E-19	5.20E-19	-1.06
2.40E+04	3.27E-19	3.30E-19	-0.9	2.70E+04	2.96E-19	3.00E-19	-1.39
4.80E+04	1.75E-19	1.80E-19	-2.9	5.30E+04	1.64E-19	1.60E-19	2.67
9.60E+04	9.29E-20	9.30E-20	-0.11	1.06E+05	8.87E-20	8.90E-20	-0.34
1.50E+05	6.17E-20	6.20E-20	-0.47	3.30E+05	3.18E-20	3.20E-20	-0.59
3.00E+05	3.26E-20	3.20E-20	1.87				

Au 22+ (4f3)		**I = 654.0 eV**		**Au 23+ (4f2)**		**I = 709.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.10E+03	8.80E-19	8.90E-19	-1.16	1.20E+03	7.55E-19	7.70E-19	-1.98
1.60E+03	1.24E-18	1.30E-18	-4.29	1.70E+03	1.09E-18	1.10E-18	-1.14
2.45E+03	1.28E-18	1.20E-18	6.54	2.70E+03	1.11E-18	1.10E-18	0.57
4.20E+03	1.05E-18	1.10E-18	-4.79	4.60E+03	8.80E-19	8.90E-19	-1.18
7.80E+03	7.05E-19	7.10E-19	-0.72	8.50E+03	5.88E-19	5.80E-19	1.29
1.50E+04	4.23E-19	4.22E-19	0.33	1.60E+04	3.59E-19	3.60E-19	-0.33
2.90E+04	2.43E-19	2.40E-19	1.12	3.20E+04	1.99E-19	2.00E-19	-0.28
5.80E+04	1.32E-19	1.30E-19	1.74	6.30E+04	1.10E-19	1.10E-19	-0.43
1.16E+05	7.12E-20	7.20E-20	-1.08	1.26E+05	5.85E-20	5.80E-20	0.85
1.81E+05	4.77E-20	4.80E-20	-0.67	1.97E+05	3.89E-20	3.90E-20	-0.37

Au 24+ (4f1)	**I = 763.0 eV**	**Au 25+ (5p6)**	**I = 818.0 eV**

E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
1.30E+03	6.55E-19	6.70E-19	-2.28	1.40E+03	5.55E-19	5.70E-19	-2.62
1.80E+03	9.14E-19	9.18E-19	-0.47	2.00E+03	7.66E-19	7.70E-19	-0.54
2.90E+03	9.51E-19	9.50E-19	0.05	3.10E+03	7.89E-19	7.90E-19	-0.15
5.00E+03	7.50E-19	7.50E-19	-0.05	5.40E+03	6.25E-19	6.20E-19	0.74
9.30E+03	4.85E-19	4.90E-19	-0.98	1.00E+04	4.05E-19	4.10E-19	-1.34
1.78E+04	2.85E-19	2.80E-19	1.76	1.92E+04	2.36E-19	2.35E-19	0.36
3.48E+04	1.59E-19	1.60E-19	-0.51	3.80E+04	1.30E-19	1.30E-19	0.12
6.90E+04	8.66E-20	8.70E-20	-0.49	7.40E+04	7.21E-20	7.15E-20	0.82
1.37E+05	4.67E-20	4.70E-20	-0.73	1.48E+05	3.88E-20	3.90E-20	-0.61
2.13E+05	3.13E-20	3.10E-20	0.82	3.69E+05	1.70E-20	1.70E-20	-0.05

Au 26+ (5p5)		I = 872.0 eV		Au 27+ (5p4)		I = 931.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
1.00E+03	1.03E-20			1.00E+03	1.82E-20		
2.10E+03		6.60E-19		2.30E+03	5.26E-19	5.60E-19	-6.02
3.40E+03	5.95E-19	6.70E-19	-11.14	3.60E+03	5.72E-19	5.60E-19	2.05
5.80E+03	5.31E-19	5.20E-19	2.2	6.30E+03	4.39E-19	4.30E-19	2.16
1.10E+04	3.40E-19	3.34E-19	1.68	1.20E+04	2.72E-19	2.80E-19	-2.94
2.10E+04	1.95E-19	1.90E-19	2.37	2.20E+04	1.63E-19	1.60E-19	1.99
4.10E+04	1.07E-19	1.10E-19	-2.74	4.40E+04	8.89E-20	9.00E-20	-1.24
8.00E+04	5.89E-20	5.90E-20	-0.19	8.60E+04	4.89E-20	4.90E-20	-0.28
1.60E+05	3.17E-20	3.20E-20	-0.8	1.72E+05	2.62E-20	2.60E-20	0.57
3.18E+05	1.72E-20	1.70E-20	1.09	3.42E+05	1.40E-20	1.40E-20	0

Au 28+ (5p3)		I = 986.0 eV		Au 29+ (5p2)		I = 1042.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
1.00E+03	1.75E-20			1.10E+03	1.81E-20		
2.40E+03	4.62E-19	4.80E-19	-3.81	2.60E+03	3.81E-19	4.00E-19	-4.83
3.90E+03	4.88E-19	4.80E-19	1.62	4.00E+03	4.13E-19	4.00E-19	3.32
6.70E+03	3.71E-19	3.70E-19	0.2	7.20E+03	3.08E-19	3.10E-19	-0.66
1.24E+04	2.36E-19	2.35E-19	0.41	1.30E+04	1.96E-19	2.00E-19	-1.84
2.40E+04	1.37E-19	1.40E-19	-2.4	2.50E+04	1.13E-19	1.10E-19	2.98
4.70E+04	7.61E-20	7.60E-20	0.1	5.00E+04	6.20E-20	6.30E-20	-1.53
9.20E+04	4.17E-20	4.10E-20	1.77	1.00E+05	3.37E-20	3.40E-20	-0.98
1.84E+05	2.22E-20	2.20E-20	1.09	2.00E+05	1.82E-20	1.80E-20	0.87
3.67E+05	1.18E-20	1.20E-20	-1.56				

Au 30+ (5p1)		I = 1097.0 eV		Au 31+ (5s2)		I = 1152.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
1.30E+03	2.02E-20			1.40E+03	1.03E-20		
2.70E+03	3.22E-19	3.40E-19	-5.18	2.90E+03	2.84E-19	3.00E-19	-5.27
4.40E+03	3.39E-19	3.34E-19	1.57	4.60E+03	2.98E-19	2.90E-19	2.57
7.60E+03	2.52E-19	2.50E-19	0.79	8.10E+03	2.19E-19	2.20E-19	-0.43
1.40E+04	1.59E-19	1.60E-19	-0.45	1.50E+04	1.39E-19	1.40E-19	-0.66
2.70E+04	9.25E-20	9.30E-20	-0.52	2.90E+04	8.10E-20	8.10E-20	0.04
5.30E+04	5.16E-20	5.14E-20	0.4	5.70E+04	4.50E-20	4.50E-20	-0.04
1.06E+05	2.79E-20	2.80E-20	-0.42	1.13E+05	2.43E-20	2.40E-20	1.04
2.10E+05	1.51E-20	1.50E-20	0.3	2.24E+05	1.29E-20	1.30E-20	-0.7

Au 32+ (5s1)		I = 1207.0 eV		Au 33+ (4d10)		I = 1516.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
1.40E+03	2.96E-20			1.60E+03	1.00E-20		
3.10E+03	2.43E-19	2.57E-19	-5.48	3.40E+03	1.69E-19	1.75E-19	-3.35

4.90E+03	2.57E-19	2.50E-19	2.69	5.40E+03	1.89E-19	1.84E-19	2.47
8.60E+03	1.92E-19	1.90E-19	0.81	9.30E+03	1.46E-19	1.47E-19	-0.73
1.60E+04	1.19E-19	1.20E-19	-0.65	1.70E+04	9.65E-20	9.70E-20	-0.56
3.10E+04	6.80E-20	6.90E-20	-1.39	3.30E+04	5.74E-20	5.80E-20	-1
6.00E+04	3.80E-20	3.80E-20	0.06	6.40E+04	3.28E-20	3.20E-20	2.38
1.20E+05	2.04E-20	2.00E-20	2.03	1.27E+05	1.78E-20	1.80E-20	-1.03
2.40E+05	1.09E-20	1.10E-20	-1.14	2.53E+05	9.49E-21	9.50E-21	-0.1

Au 34+ (4d9)		**I = 1575.0 eV**		**Au 35+ (4d8)**		**I = 1634.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
3.70E+03	1.43E-19	1.50E-19	-4.97	1.70E+03	9.72E-21		
5.70E+03	1.60E-19	1.56E-19	2.54	3.80E+03	1.28E-19	1.30E-19	-1.57
1.00E+04	1.25E-19	1.30E-19	-3.53	6.00E+03	1.41E-19	1.40E-19	0.69
1.80E+04	8.40E-20	8.30E-20	1.16	1.00E+04	1.11E-19	1.10E-19	0.66
3.50E+04	4.96E-20	5.00E-20	-0.73	1.90E+04	7.18E-20	7.30E-20	-1.69
6.80E+04	2.81E-20	2.80E-20	0.39	3.70E+04	4.29E-20	4.30E-20	-0.35
1.35E+05	1.52E-20	1.50E-20	1.42	7.20E+04	2.44E-20	2.40E-20	1.71
2.68E+05	8.11E-21	8.20E-21	-1.13	1.43E+05	1.32E-20	1.32E-20	0.27
				2.84E+05	7.04E-21	7.10E-21	-0.81

Au 36+ (4d7)		**I = 1692.0 eV**		**Au 37+ (4d6)**		**I = 1751.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.80E+03	9.91E-21			1.80E+03	9.44E-21		
4.00E+03	1.13E-19	1.16E-19	-2.91	4.20E+03	9.85E-20	1.00E-19	-1.51
6.40E+03	1.23E-19	1.20E-19	2.71	6.70E+03	1.10E-19	1.10E-19	-0.13
1.10E+04	9.54E-20	9.66E-20	-1.21	1.16E+04	8.59E-20	8.50E-20	1.08
2.00E+04	6.36E-20	6.40E-20	-0.62	2.14E+04	5.55E-20	5.60E-20	-0.87
3.90E+04	3.77E-20	3.80E-20	-0.68	4.10E+04	3.26E-20	3.30E-20	-1.14
7.60E+04	2.14E-20	2.10E-20	1.72	8.00E+04	1.83E-20	1.80E-20	1.82
1.51E+05	1.15E-20	1.15E-20	0.24	1.59E+05	9.98E-21	1.00E-20	-0.25
3.00E+05	6.11E-21	6.16E-21	-0.78	3.16E+05	5.38E-21	5.40E-21	-0.37

Au 38+ (4d5)		**I = 1810.0 eV**		**Au 39+ (4d4)**		**I = 1888.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.90E+03	9.65E-21			1.91E+03	9.60E-21		
4.40E+03	8.93E-20	9.10E-20	-1.89	4.60E+03	9.51E-20	1.00E-19	-4.94
7.00E+03	9.58E-20	9.40E-20	1.94	7.30E+03	1.02E-19	1.00E-19	1.52
1.20E+04	7.39E-20	7.40E-20	-0.16	1.28E+04	8.32E-20	8.30E-20	0.19
2.30E+04	4.76E-20	4.90E-20	-2.88	2.40E+04	5.42E-20	5.40E-20	0.28
4.30E+04	2.92E-20	2.90E-20	0.75	4.50E+04	3.22E-20	3.20E-20	0.57
8.50E+04	1.63E-20	1.60E-20	1.92	8.90E+04	1.77E-20	1.80E-20	-1.52
1.67E+05	8.85E-21	8.80E-21	0.51	1.76E+05	9.68E-21	9.70E-21	-0.22
3.33E+05	4.64E-21	4.70E-21	-1.25	3.50E+05	5.24E-21	5.20E-21	0.74

Au 40+ (4d3)		**I = 1948.0 eV**		**Au 41+ (4d2)**		**I = 2009.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
2.00E+03	9.45E-21			2.10E+03	9.39E-21		
4.80E+03	9.67E-20	1.00E-19	-3.34	5.00E+03	6.13E-20	6.20E-20	-1.14
7.70E+03	1.03E-19	1.00E-19	2.82	8.00E+03	6.49E-20	6.40E-20	1.4
1.34E+04	8.01E-20	8.10E-20	-1.18	1.40E+04	4.95E-20	5.00E-20	-1.08
2.50E+04	5.23E-20	5.30E-20	-1.29	2.60E+04	3.25E-20	3.30E-20	-1.56
4.80E+04	3.11E-20	3.10E-20	0.38	5.00E+04	1.94E-20	1.90E-20	2.3
9.30E+04	1.76E-20	1.74E-20	1.25	9.80E+04	1.09E-20	1.10E-20	-1.01
1.85E+05	9.51E-21	9.50E-21	0.13	1.94E+05	5.86E-21	5.80E-21	0.97
3.68E+05	5.07E-21	5.10E-21	-0.67	3.86E+05	3.08E-21	3.10E-21	-0.7

Au 42+ (4d1)		I = 2069.0 eV		Au 43+ (4p6)		I = 2325.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
2.20E+03	9.59E-21			5.70E+03	1.68E-20	1.70E-20	-1.43
5.20E+03	5.41E-20	5.45E-20	-0.69	9.00E+03	2.46E-20	2.50E-20	-1.73
8.40E+03	5.67E-20	5.60E-20	1.27	1.60E+04	2.33E-20	2.30E-20	1.1
1.46E+04	4.31E-20	4.40E-20	-2.12	2.90E+04	1.66E-20	1.70E-20	-2.44
2.70E+04	2.85E-20	2.83E-20	0.68	5.50E+04	1.03E-20	1.00E-20	2.63
5.20E+04	1.70E-20	1.70E-20	0.21	1.08E+05	5.92E-21	6.00E-21	-1.39
1.03E+05	9.37E-21	9.30E-21	0.7	2.13E+05	3.34E-21	3.33E-21	0.23
2.03E+05	4.97E-21	5.00E-21	-0.6				

Au 44+ (4p5)		I = 2387.0 eV		Au 45+ (4p4)		I = 2448.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
5.80E+03	1.48E-20	1.50E-20	-1.5	6.00E+03	1.19E-20	1.20E-20	-1
9.30E+03	2.16E-20	2.20E-20	-1.7	9.60E+03	1.75E-20	1.80E-20	-2.71
1.60E+04	2.10E-20	2.10E-20	-0.12	1.70E+04	1.67E-20	1.64E-20	2.04
3.00E+04	1.51E-20	1.50E-20	0.71	3.20E+04	1.18E-20	1.20E-20	-1.57
5.80E+04	9.26E-21	9.30E-21	-0.4	6.00E+04	7.36E-21	7.30E-21	0.86
1.13E+05	5.29E-21	5.30E-21	-0.11	1.18E+05	4.18E-21	4.20E-21	-0.45
2.23E+05	2.90E-21	2.90E-21	0.12	2.33E+05	2.30E-21	2.30E-21	0.16

Au 46+ (4p3)		I = 2510.0 eV		Au 47+ (4p2)		I = 2671.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
6.30E+03	1.10E-20	1.10E-20	0	6.70E+03	9.59E-21	9.70E-21	-1.14
1.00E+04	1.69E-20	1.76E-20	-4.19	1.10E+04	1.46E-20	1.50E-20	-2.47
1.75E+04	1.66E-20	1.60E-20	3.76	1.85E+04	1.40E-20	1.40E-20	0.2
3.30E+04	1.18E-20	1.20E-20	-1.44	3.40E+04	1.01E-20	1.00E-20	0.52
6.30E+04	7.29E-21	7.30E-21	-0.11	6.60E+04	6.14E-21	6.10E-21	0.63
1.23E+05	4.18E-21	4.20E-21	-0.52	1.28E+05	3.58E-21	3.64E-21	-1.57
2.43E+05	2.31E-21	2.30E-21	0.5	2.54E+05	2.01E-21	2.00E-21	0.72

Au 48+ (4p1)		I = 2738.0 eV		Au 49+ (4s2)		I = 2924.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
7.00E+03	7.60E-21	7.60E-21	-0.01	7.20E+03	6.02E-21	6.00E-21	0.35
1.10E+04	1.21E-20	1.25E-20	-3.39	1.14E+04	1.06E-20	1.10E-20	-3.44
1.90E+04	1.22E-20	1.20E-20	2.02	2.00E+04	1.11E-20	1.10E-20	1.21
3.60E+04	8.75E-21	8.75E-21	-0.03	3.70E+04	8.08E-21	8.00E-21	1.05
6.80E+04	5.42E-21	5.44E-21	-0.31	7.10E+04	4.97E-21	5.00E-21	-0.61
1.33E+05	3.10E-21	3.12E-21	-0.69	1.39E+05	2.87E-21	2.90E-21	-1.13
2.64E+05	1.71E-21	1.70E-21	0.52	2.75E+05	1.61E-21	1.60E-21	0.79

Au 50+ (4s1)		I = 2991.0 eV		Au 51+ (3d10)		I = 4516.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
7.40E+03	4.48E-21	4.40E-21	1.77	9.15E+03	8.03E-21	8.40E-21	-4.43
1.20E+04	8.94E-21	9.50E-21	-5.95	1.38E+04	1.02E-20	1.00E-20	1.89
2.10E+04	9.60E-21	9.30E-21	3.2	2.29E+04	9.63E-21	9.90E-21	-2.76
3.80E+04	7.10E-21	6.90E-21	2.93	4.10E+04	7.25E-21	7.20E-21	0.63
7.74E+04	4.15E-21	4.30E-21	-3.5	7.80E+04	4.59E-21	4.60E-21	-0.25
1.44E+05	2.47E-21	2.50E-21	-1.13	1.52E+05	2.63E-21	2.60E-21	1.12
2.86E+05	1.37E-21	1.35E-21	1.53	2.99E+05	1.43E-21	1.44E-21	-0.67

Au 52+ (3d9)		I = 4676.0 eV		Au 53+ (3d8)		I = 4837.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
9.44E+03	7.94E-21	8.23E-21	-3.55	1.00E+04	5.90E-21	6.10E-21	-3.29

1.40E+04	1.01E-20	1.00E-20	0.58	1.52E+04	7.73E-21	7.70E-21	0.39
2.40E+04	9.12E-21	9.20E-21	-0.84	2.50E+04	7.32E-21	7.40E-21	-1.12
4.30E+04	6.66E-21	6.70E-21	-0.54	4.50E+04	5.49E-21	5.50E-21	-0.2
8.10E+04	4.21E-21	4.20E-21	0.25	8.50E+04	3.50E-21	3.50E-21	-0.04
1.57E+05	2.42E-21	2.40E-21	0.86	1.64E+05	2.02E-21	2.00E-21	1.03
3.10E+05	1.31E-21	1.32E-21	-0.56	3.23E+05	1.09E-21	1.10E-21	-0.6

Au 54+ (3d7)		**I = 4997.0 eV**		**Au 55+ (3d6)**		**I = 5158.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.00E+04	6.62E-21	6.90E-21	-4.06	1.00E+04	6.03E-21	6.30E-21	-4.35
1.50E+04	8.29E-21	8.20E-21	1.04	1.60E+04	7.23E-21	7.20E-21	0.42
2.60E+04	7.50E-21	7.60E-21	-1.27	2.50E+04	6.43E-21	6.50E-21	-1.02
4.60E+04	5.57E-21	5.60E-21	-0.62	4.76E+04	4.58E-21	4.60E-21	-0.51
8.70E+04	3.52E-21	3.50E-21	0.67	9.00E+04	2.90E-21	2.90E-21	0.07
1.70E+05	2.01E-21	2.00E-21	0.63	1.75E+05	1.67E-21	1.65E-21	1.16
3.34E+05	1.09E-21	1.10E-21	-0.53	3.46E+05	9.04E-22	9.10E-22	-0.7

Au 56+ (3d5)		**I = 5319.0 eV**		**Au 57+ (3d4)**		**I = 5566.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.08E+04	4.88E-21	5.10E-21	-4.24	1.13E+04	4.22E-21	4.40E-21	-4.19
1.64E+04	5.98E-21	5.90E-21	1.3	1.70E+04	5.17E-21	5.10E-21	1.35
2.74E+04	5.39E-21	5.50E-21	-1.99	2.80E+04	4.70E-21	4.80E-21	-2.01
5.00E+04	3.99E-21	4.00E-21	-0.26	5.10E+04	3.50E-21	3.50E-21	-0.01
9.40E+04	2.57E-21	2.54E-21	1.33	9.70E+04	2.25E-21	2.23E-21	0.76
1.82E+05	1.49E-21	1.50E-21	-0.45	1.89E+05	1.30E-21	1.30E-21	0.03
3.59E+05	8.09E-22	8.10E-22	-0.09	3.72E+05	7.08E-22	7.10E-22	-0.24

Au 58+ (3d3)		**I = 5731.0 eV**		**Au 59+ (3d2)**		**I = 5891.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.17E+04	3.54E-21	3.70E-21	-4.47	8.95E+03	2.20E-21		
1.76E+04	4.37E-21	4.30E-21	1.67	1.20E+04	3.30E-21	3.34E-21	-1.36
2.90E+04	4.03E-21	4.10E-21	-1.71	1.80E+04	3.83E-21	3.80E-21	0.81
5.30E+04	2.98E-21	3.00E-21	-0.74	3.00E+04	3.59E-21	3.60E-21	-0.29
1.00E+05	1.91E-21	1.90E-21	0.6	5.50E+04	2.68E-21	2.70E-21	-0.65
1.95E+05	1.11E-21	1.10E-21	1.07	1.04E+05	1.72E-21	1.70E-21	0.91
3.84E+05	6.15E-22	6.20E-22	-0.79	2.02E+05	9.97E-22	1.00E-21	-0.35

Au 60+ (3d1)		**I = 6061.0 eV**		**Au 61+ (3p6)**		**I = 6500.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
9.20E+03	1.85E-21			9.75E+03	1.62E-21		
1.24E+04	2.76E-21	2.80E-21	-1.35	1.30E+04	2.20E-21	2.23E-21	-1.32
1.87E+04	3.22E-21	3.20E-21	0.51	2.00E+04	2.64E-21	2.60E-21	1.59
3.10E+04	3.02E-21	3.00E-21	0.74	3.30E+04	2.65E-21	2.70E-21	-1.96
5.70E+04	2.24E-21	2.30E-21	-2.53	5.90E+04	2.02E-21	2.00E-21	1.04
1.07E+05	1.43E-21	1.40E-21	2.41	1.11E+05	1.30E-21	1.30E-21	-0.08
2.08E+05	8.33E-22	8.40E-22	-0.85	2.16E+05	7.79E-22	7.80E-22	-0.1

Au 62+ (3p5)		**I = 6644.0 eV**		**Au 63+ (3p4)**		**I = 6787.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.00E+04	1.29E-21			1.03E+04	1.04E-21		
1.34E+04	1.86E-21	1.90E-21	-2.1	1.40E+04	1.48E-21	1.50E-21	-1.2
2.00E+04	2.26E-21	2.20E-21	2.6	2.10E+04	1.83E-21	1.80E-21	1.41
3.40E+04	2.24E-21	2.30E-21	-2.53	3.50E+04	1.87E-21	1.90E-21	-1.52
6.10E+04	1.71E-21	1.70E-21	0.66	6.30E+04	1.46E-21	1.45E-21	0.5
1.15E+05	1.11E-21	1.10E-21	0.73	1.18E+05	9.53E-22	9.50E-22	0.35

2.23E+05	6.67E-22	6.70E-22	-0.45	2.30E+05	5.69E-22	5.70E-22	-0.24

Au 64+ (3p3)		I = 6931.0 eV		Au 65+ (3p2)		I = 7615.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
1.05E+04	8.31E-22			1.13E+04	5.36E-22		
1.40E+04	1.18E-21	1.20E-21	-1.66	1.50E+04	7.70E-22	7.90E-22	-2.59
2.10E+04	1.43E-21	1.40E-21	1.76	2.20E+04	1.01E-21	9.70E-22	3.69
3.60E+04	1.48E-21	1.50E-21	-1.49	3.70E+04	1.15E-21	1.20E-21	-4.08
6.40E+04	1.20E-21	1.20E-21	-0.2	6.70E+04	9.53E-22	9.40E-22	1.41
1.22E+05	7.90E-22	7.80E-22	1.25	1.26E+05	6.35E-22	6.30E-22	0.8
2.37E+05	4.67E-22	4.70E-22	-0.59	2.45E+05	3.78E-22	3.80E-22	-0.59

Au 66+ (3p1)		I = 7772.0 eV		Au 67+ (3s2)		I = 8111.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
1.16E+04	3.96E-22			1.20E+04	2.41E-22		
1.54E+04	5.58E-22	5.70E-22	-2.11	1.60E+04	3.44E-22	3.50E-22	-1.62
2.30E+04	7.54E-22	7.30E-22	3.28	2.40E+04	5.27E-22	5.10E-22	3.23
3.80E+04	9.03E-22	9.40E-22	-3.94	4.00E+04	6.81E-22	7.10E-22	-4.16
6.90E+04	7.80E-22	7.70E-22	1.28	7.10E+04	6.05E-22	6.00E-22	0.88
1.30E+05	5.25E-22	5.20E-22	0.97	1.34E+05	4.19E-22	4.12E-22	1.8
2.52E+05	3.08E-22	3.10E-22	-0.65	2.60E+05	2.57E-22	2.60E-22	-1.04

Au 68+ (3s1)		I = 8258.0 eV		Au 69+ (2p6)		I = 17090.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
1.23E+04	1.15E-22			2.17E+04	7.86E-23		
1.60E+04	1.71E-22	1.70E-22	0.28	2.60E+04	1.75E-22	1.80E-22	-2.8
2.40E+04	3.34E-22	3.30E-22	1.18	3.40E+04	3.06E-22	3.00E-22	2
4.10E+04	5.06E-22	5.20E-22	-2.75	5.10E+04	3.72E-22	3.70E-22	0.58
7.30E+04	4.67E-22	4.60E-22	1.62	8.40E+04	3.33E-22	3.40E-22	-2.06
1.38E+05	3.21E-22	3.20E-22	0.3	1.51E+05	2.44E-22	2.40E-22	1.61
2.67E+05	1.89E-22	1.90E-22	-0.4	2.84E+05	1.49E-22	1.50E-22	-0.47

Au 70+ (2p5)		I = 17500.0 eV		Au 71+ (2p4)		I = 17910.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
2.23E+04	6.65E-23			2.29E+04	5.62E-23		
2.70E+04	1.48E-22	1.50E-22	-1.06	2.70E+04	1.16E-22	1.20E-22	-3.64
3.50E+04	2.52E-22	2.50E-22	0.69	3.60E+04	2.06E-22	2.00E-22	2.87
5.20E+04	3.02E-22	3.00E-22	0.52	5.40E+04	2.43E-22	2.44E-22	-0.54
8.70E+04	2.67E-22	2.70E-22	-1.15	8.90E+04	2.18E-22	2.20E-22	-1.07
1.55E+05	2.02E-22	2.00E-22	0.89	1.60E+05	1.62E-22	1.60E-22	1.12
2.92E+05	1.30E-22	1.30E-22	-0.26	3.01E+05	9.96E-23	1.00E-22	-0.36

Au 72+ (2p3)		I = 18321.0 eV		Au 73+ (2p2)		I = 20570.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
2.36E+04	4.67E-23			2.51E+04	3.55E-23		
2.80E+04	9.49E-23	9.80E-23	-3.17	2.97E+04	7.02E-23	7.10E-23	-1.15
3.70E+04	1.62E-22	1.58E-22	2.38	3.90E+04	1.13E-22	1.12E-22	0.62
5.50E+04	1.90E-22	1.90E-22	-0.11	5.80E+04	1.36E-22	1.36E-22	-0.19
9.20E+04	1.72E-22	1.74E-22	-1.36	9.50E+04	1.27E-22	1.27E-22	-0.07
1.64E+05	1.32E-22	1.30E-22	1.28	1.69E+05	9.71E-23	9.70E-23	0.11
3.09E+05	8.42E-23	8.45E-23	-0.41	3.18E+05	6.40E-23	6.40E-23	-0.04

Au 74+ (2p1)		I = 21040.0 eV		Au 75+ (2s2)		I = 21870.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
2.55E+04	2.61E-23			2.70E+04	1.72E-23		

3.00E+04	5.06E-23	5.13E-23	-1.34	3.18E+04	3.17E-23	3.20E-23	-0.95
4.00E+04	8.09E-23	8.00E-23	1.11	4.16E+04	4.82E-23	4.80E-23	0.47
5.90E+04	9.50E-23	9.60E-23	-1	6.10E+04	5.59E-23	5.60E-23	-0.19
9.70E+04	8.97E-23	8.90E-23	0.76	1.01E+05	5.40E-23	5.40E-23	0.03
1.74E+05	6.97E-23	7.00E-23	-0.41	1.79E+05	4.50E-23	4.50E-23	0.02
3.27E+05	4.71E-23	4.70E-23	0.11	3.36E+05	3.20E-23	3.20E-23	-0.01

Au 76+ (2s1)		I = 22260.0 eV		Au 77+ (1s2)		I = 89680.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
2.75E+04	8.22E-24			9.50E+04	1.38E-25		
3.26E+04	1.53E-23	1.54E-23	-0.78	1.00E+05	3.35E-25	3.42E-25	-2.06
4.27E+04	2.33E-23	2.30E-23	1.39	1.10E+05	8.38E-25	8.18E-25	2.42
6.30E+04	2.65E-23	2.70E-23	-1.89	1.31E+05	1.68E-24	1.70E-24	-1.04
1.03E+05	2.65E-23	2.60E-23	1.9	1.73E+05	2.91E-24	2.90E-24	0.36
1.84E+05	2.37E-23	2.40E-23	-1.39	2.55E+05	3.80E-24	3.80E-24	-0.1
3.45E+05	1.71E-23	1.70E-23	0.4	4.21E+05	3.72E-24	3.72E-24	0.01

Au 78+ (1s1)		I = 91290.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
9.73E+04	6.50E-26		
1.03E+05	1.64E-25	1.64E-25	-0.27
1.13E+05	3.93E-25	3.90E-25	0.81
1.34E+05	8.17E-25	8.20E-25	-0.33
1.77E+05	1.40E-24	1.40E-24	0.1
2.62E+05	1.80E-24	1.80E-24	-0.03
4.20E+05	1.75E-24	1.75E-24	0

Table 7.2. Fitting parameters for gold and its ions.

Au	A_1	A_2	A_3	A_4	A_5	A_6	B
0+	-6.0562E+00	-1.8161E+00	-1.1989E+01	1.8829E+01	2.8820E+01	-3.3167E+01	6.0656E+00
1+	1.1342E+01	1.3379E+02	-4.7283E+02	5.5314E+02	-1.9931E+02	1.9844E-01	1.1628E+01
2+	1.5961E+01	2.0474E+02	-7.5174E+02	1.3997E+03	-1.1647E+03	3.3491E+02	1.9813E+01
3+	4.8542E+01	1.3903E+03	-7.1095E+03	1.6091E+04	-1.6859E+04	6.5858E+03	-1.9557E+00
4+	6.3082E+01	7.7763E+02	-2.5257E+03	3.3054E+03	-2.0594E+03	5.0623E+02	6.0122E+00
5+	3.0080E+01	8.1913E+01	5.4979E+02	-2.1812E+03	2.6741E+03	-1.1125E+03	8.5630E+00
6+	3.7071E+01	-2.2904E+01	1.2592E+03	-3.8263E+03	4.1556E+03	-1.5540E+03	3.6922E+00
7+	2.6963E+01	4.9920E+01	5.8136E+02	-1.8942E+03	2.0274E+03	-7.4268E+02	2.6234E+00
8+	2.3352E+01	2.8148E+01	4.9437E+02	-1.2826E+03	1.1083E+03	-3.2244E+02	2.1571E+00
9+	2.5963E+01	-1.6759E+02	1.6243E+03	-4.1396E+03	4.3422E+03	-1.6481E+03	3.7876E+00
10+	2.1725E+01	-1.2278E+02	1.1511E+03	-2.6288E+03	2.4612E+03	-8.4096E+02	3.0763E+00
11+	2.5766E+01	-1.7637E+01	9.1043E+02	-2.5308E+03	2.5884E+03	-9.3175E+02	3.6554E+00
12+	2.3731E+01	-5.2471E+01	8.9961E+02	-2.1837E+03	2.0100E+03	-6.4937E+02	2.1606E+00
13+	1.9314E+01	-1.1085E+02	1.0800E+03	-2.6109E+03	2.5577E+03	-9.0150E+02	2.3169E+00
14+	1.6728E+01	-8.0457E+01	8.5100E+02	-1.9457E+03	1.8231E+03	-6.3422E+02	3.7185E+00
15+	1.8447E+01	-1.2523E+02	1.1201E+03	-2.6362E+03	2.5898E+03	-9.3706E+02	3.6223E+00
16+	1.6572E+01	-1.0439E+02	9.2052E+02	-2.0789E+03	1.9642E+03	-6.8532E+02	2.6222E+00
17+	3.5613E+00	1.1189E+02	-3.8598E+02	4.9418E+02	-1.5606E+02	-4.9718E+01	7.4318E+00
18+	5.3691E+00	1.5350E+02	-7.2498E+02	1.4847E+03	-1.3653E+03	4.7512E+02	5.6903E+00
19+	1.1998E+01	2.0591E+02	-6.7565E+02	8.5914E+02	-3.7947E+02	6.5877E+00	4.3731E+00
20+	8.3094E+00	1.3151E+02	-3.1206E+02	2.4482E+02	4.1197E+01	-8.6393E+01	4.1078E+00
21+	6.3569E-01	-1.0303E+01	1.1967E+02	-1.8044E+02	1.5958E+02	-6.1633E+01	5.6347E+00
22+	3.1097E+00	-4.8421E+01	3.5928E+02	-7.6174E+02	7.4440E+02	-2.6929E+02	5.2038E+00
23+	2.3544E+00	-8.8637E+00	1.0718E+02	-9.5394E+01	-3.9236E+00	2.9929E+01	4.1402E+00

24+	2.8943E+00	-3.0717E+01	2.5694E+02	-5.2573E+02	5.2812E+02	-2.0612E+02	4.5201E+00
25+	3.1530E+00	-4.7310E+01	3.6464E+02	-8.2435E+02	8.7417E+02	-3.4851E+02	4.8202E+00
26+	-4.5910E+00	-7.0795E+00	5.9870E+01	-2.4685E+02	5.5480E+02	-3.3957E+02	5.2287E+00
27+	-1.8489E+00	3.2484E+00	-6.0591E+00	1.7496E+02	-2.1110E+02	6.2284E+01	3.9118E+00
28+	1.0134E+01	-8.7684E+01	2.5408E+02	-1.3006E+02	-9.9032E+01	7.5664E+01	3.3346E+00
29+	-6.3153E-01	1.4427E+01	-1.3685E+02	5.0955E+02	-5.5820E+02	1.8849E+02	4.0003E+00
30+	-1.8275E+00	6.4532E+00	-8.4523E+01	4.6231E+02	-6.0752E+02	2.4397E+02	3.0395E+00
31+	-1.6278E+00	9.9636E+00	-1.3834E+02	6.5709E+02	-8.6395E+02	3.5965E+02	2.0643E+00
32+	-4.0801E-01	2.2112E+01	-1.6416E+02	5.3366E+02	-5.7149E+02	1.9754E+02	2.7043E+00
33+	1.6988E+00	1.7736E+01	-1.7638E+02	7.1190E+02	-9.1482E+02	3.8493E+02	2.3179E+00
34+	-1.3533E+00	4.4608E+01	-2.7203E+02	8.1972E+02	-9.3007E+02	3.6290E+02	2.1200E+00
35+	5.2518E+00	3.9774E+00	-2.0477E+02	8.5352E+02	-1.0928E+03	4.5891E+02	1.7740E+00
36+	2.7776E+00	2.1654E+01	-2.3594E+02	8.2735E+02	-1.0007E+03	4.0813E+02	1.5861E+00
37+	1.0081E+01	-7.7207E+01	1.9899E+02	-1.1340E+02	-3.6513E+01	3.3575E+01	2.7620E+00
38+	6.0050E+00	8.0270E+00	-2.3522E+02	8.8456E+02	-1.0909E+03	4.5070E+02	1.0368E+00
39+	3.0154E+01	-3.5611E+02	1.5065E+03	-2.8292E+03	2.5358E+03	-8.7250E+02	3.7793E+00
40+	1.4230E+01	-1.0481E+02	2.7538E+02	-1.5028E+02	-1.0572E+02	9.5141E+01	2.4338E+00
41+	9.4040E+00	-2.4553E+01	-1.0449E+02	5.9234E+02	-7.8769E+02	3.3439E+02	9.3174E-01
42+	7.2084E+00	1.7200E+01	-2.9587E+02	9.8556E+02	-1.1652E+03	4.7329E+02	-4.6510E-02
43+	-1.1056E+00	-1.2902E+01	8.0655E+01	-2.2574E+02	3.0587E+02	-1.4163E+02	2.5030E+00
44+	-5.0866E-01	-2.5411E+00	2.3561E+01	-7.2638E+01	1.1800E+02	-5.5862E+01	1.2696E+00
45+	-6.0481E-01	-3.2884E+00	2.7627E+01	-8.7139E+01	1.3563E+02	-6.4760E+01	1.2846E+00
46+	-5.2171E-01	-9.6474E+00	6.4073E+01	-1.8429E+02	2.4837E+02	-1.1077E+02	1.5356E+00
47+	-6.6070E-01	-1.6124E+01	9.5546E+01	-2.5731E+02	3.2700E+02	-1.4439E+02	2.0970E+00
48+	1.9252E-01	-2.0270E+01	1.1803E+02	-3.0880E+02	3.7459E+02	-1.5792E+02	1.4399E+00
49+	1.7862E-02	-2.8163E+01	1.6326E+02	-4.2964E+02	5.1746E+02	-2.1934E+02	2.0345E+00
50+	6.1304E-01	-3.2165E+01	1.8512E+02	-4.8162E+02	5.6848E+02	-2.3614E+02	1.6166E+00
51+	2.3052E+00	-1.8781E+01	1.0763E+02	-1.7244E+02	1.3122E+02	-3.2821E+01	7.2563E-01
52+	1.6846E+00	-4.3454E+00	2.2893E+01	4.3786E+01	-1.0562E+02	5.8748E+01	6.6169E-01
53+	1.2651E+00	8.6210E-02	-4.7532E-01	6.9493E+01	-1.0799E+02	5.4233E+01	3.2938E-01
54+	2.2182E+00	-1.2839E+01	7.2530E+01	-7.6001E+01	1.4623E+01	1.6339E+01	5.4220E-01
55+	2.6670E+00	-1.8569E+01	1.0809E+02	-1.5214E+02	7.3059E+01	2.0072E+00	4.4138E-01
56+	1.8691E+00	-6.1190E+00	2.9560E+01	2.5542E+01	-9.9729E+01	6.4538E+01	1.8278E-01
57+	1.6400E+00	-5.3454E+00	2.5428E+01	2.8951E+01	-9.7679E+01	6.1444E+01	2.6974E-01
58+	1.0868E+00	-1.1074E+01	5.8845E+01	-7.2466E+01	3.1587E+01	2.1795E+00	9.2934E-01
59+	8.4395E-01	-5.0478E+00	5.9616E+01	-1.3926E+02	1.4338E+02	-5.0178E+01	9.3639E-01
60+	5.6882E-01	-5.7801E+00	6.2662E+01	-1.5516E+02	1.6905E+02	-6.4094E+01	1.0662E+00
61+	-1.1184E+00	-1.4974E+01	1.3206E+02	-3.8358E+02	4.6776E+02	-2.0096E+02	3.1032E+00
62+	-8.1778E-01	-1.0107E+01	8.8753E+01	-2.4788E+02	2.9729E+02	-1.2606E+02	2.3740E+00
63+	-5.1957E-01	-9.1521E+00	8.1149E+01	-2.3022E+02	2.7762E+02	-1.1661E+02	1.8396E+00
64+	3.3292E-01	-5.8824E+00	5.5561E+01	-1.4675E+02	1.6353E+02	-6.1110E+01	7.2336E-01
65+	-1.3217E-01	-6.9070E+00	6.1785E+01	-1.7806E+02	2.1658E+02	-8.9733E+01	1.0613E+00
66+	4.6377E-01	-5.1448E+00	4.8255E+01	-1.3687E+02	1.6228E+02	-6.3212E+01	2.4848E-01
67+	-5.0463E-01	-4.7825E+00	4.0861E+01	-1.2449E+02	1.5709E+02	-6.6130E+01	1.0162E+00
68+	1.7892E-01	-2.5113E+00	2.3774E+01	-7.4441E+01	9.6625E+01	-3.9234E+01	8.2519E-02
69+	3.3795E+00	6.9102E-01	6.8260E+00	5.2200E+01	-1.1348E+02	6.8472E+01	-2.4571E+00
70+	2.2432E+00	2.8713E+00	-1.4200E+01	1.0266E+02	-1.6996E+02	9.0742E+01	-1.5081E+00
71+	2.8053E+00	2.2844E-01	8.3241E+00	3.1081E+01	-7.9534E+01	5.1615E+01	-2.0934E+00
72+	1.9121E+00	5.7270E-01	2.4298E+00	3.7287E+01	-8.0169E+01	4.9132E+01	-1.3286E+00
73+	2.4677E-02	-4.4035E-01	1.3672E+01	-2.8463E+01	2.5942E+01	-7.9605E+00	6.9502E-01
74+	-2.1898E-01	-4.1150E-01	1.1359E+01	-2.8006E+01	2.8780E+01	-1.0203E+01	7.9108E-01

75+	-3.7600E-02	7.7694E-02	4.3797E+00	-6.6490E+00	3.6255E-01	3.6927E+00	4.0057E-01
76+	4.4373E-01	7.2721E-01	-1.7652E+00	1.1261E+01	-2.1513E+01	1.3805E+01	-2.7691E-01
77+	-5.7539E+01	-2.9859E+01	1.2048E+01	-1.5970E+02	2.7463E+02	-2.1724E+02	5.7729E+01
78+	-1.9270E+01	-1.0273E+01	7.8903E+00	-6.4138E+01	1.0472E+02	-7.8188E+01	1.9358E+01

Table 8.1. Ionization cross sections of lead and its ions.

Pb 0+		I = 7.4 eV		Pb 1+		I = 15.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
8.26E+00	2.29E-16	2.24E-16	2.26	1.81E+01	1.14E-16	1.18E-16	-3.67
9.11E+00	3.94E-16	4.21E-16	-6.47	2.86E+01	2.57E-16	2.64E-16	-2.55
1.08E+01	7.30E-16	6.75E-16	8.17	6.94E+01	3.61E-16	3.50E-16	3.02
1.42E+01	1.43E-15	1.55E-15	-8.04	2.33E+02	2.32E-16	2.53E-16	-8.18
2.10E+01	1.69E-15	1.70E-15	-0.39	8.85E+02	9.18E-17	8.78E-17	4.54
3.46E+01	1.31E-15	1.23E-15	6.42	1.71E+03	5.43E-17	5.28E-17	2.8
6.18E+01	9.90E-16	1.04E-15	-4.81	6.81E+03	1.70E-17	1.69E-17	0.32
1.16E+02	7.52E-16	7.74E-16	-2.86	2.72E+04	5.05E-18	5.10E-18	-1.02
2.25E+02	5.16E-16	5.28E-16	-2.32	1.09E+05	1.46E-18	1.48E-18	-1.44
8.57E+02	1.93E-16	1.86E-16	3.9	4.35E+05	4.15E-19	4.16E-19	-0.21
1.71E+03	1.10E-16	1.07E-16	2.51				
3.41E+03	6.11E-17	5.98E-17	2.12				
6.81E+03	3.35E-17	3.29E-17	1.9				
1.36E+04	1.82E-17	1.80E-17	1.31				
2.72E+04	9.84E-18	9.79E-18	0.49				
5.44E+04	5.28E-18	5.32E-18	-0.8				
1.09E+05	2.81E-18	2.89E-18	-2.67				
2.18E+05	1.50E-18	1.55E-18	-3.51				

Pb 2+		I = 27.7 eV		Pb 3+		I = 37.9 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
3.50E+01	3.76E-17	3.80E-17	-1.18	5.15E+01	1.03E-17	1.00E-17	3.24
5.80E+01	1.53E-16	1.56E-16	-1.71	9.23E+01	1.09E-16	1.12E-16	-2.28
1.50E+02	1.76E-16	1.76E-16	0.17	2.55E+02	1.08E-16	1.08E-16	-0.13
5.17E+02	8.64E-17	8.58E-17	0.64	9.08E+02	4.13E-17	4.00E-17	3.21
1.99E+03	3.14E-17	3.13E-17	0.22	3.52E+03	1.37E-17	1.38E-17	-0.74
6.15E+03	1.24E-17	1.26E-17	-1.45	1.09E+04	5.32E-18	5.50E-18	-3.28
2.45E+04	3.80E-18	3.80E-18	-0.1	4.36E+04	1.61E-18	1.64E-18	-1.65
9.79E+04	1.12E-18	1.12E-18	-0.09	1.74E+05	4.76E-19	4.80E-19	-0.89
3.92E+05	3.22E-19	3.19E-19	0.82	6.96E+05	1.37E-19	1.32E-19	3.7

Pb 4+		I = 70.0 eV		Pb 5+		I = 87.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
9.13E+01	3.48E-17	3.66E-17	-5.05	1.18E+02	2.46E-17	2.60E-17	-5.23
1.55E+02	6.26E-17	6.45E-17	-2.93	2.09E+02	4.30E-17	4.50E-17	-4.46
4.10E+02	4.91E-17	4.87E-17	0.81	5.77E+02	2.68E-17	2.63E-17	1.75
1.43E+03	2.09E-17	2.10E-17	-0.47	2.05E+03	1.10E-17	1.12E-17	-2.11
5.51E+03	7.08E-18	7.00E-18	1.13	7.92E+03	3.74E-18	3.65E-18	2.43
1.28E+04	3.46E-18	3.50E-18	-1.04	1.84E+04	1.84E-18	1.86E-18	-1.35
5.11E+04	1.03E-18	1.04E-18	-0.55	7.35E+04	5.49E-19	5.51E-19	-0.32
2.04E+05	3.00E-19	3.00E-19	0.12	2.94E+05	1.60E-19	1.59E-19	0.31
8.16E+05	8.54E-20	8.50E-20	0.47				

Pb 6+		I = 105.7 eV		Pb 7+		I = 129.5 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %

1.47E+02	1.55E-17	1.63E-17	-5.2	1.81E+02	8.98E-18	9.44E-18	-4.88
2.72E+02	2.34E-17	2.43E-17	-3.85	3.44E+02	1.64E-17	1.73E-17	-5.01
7.72E+02	1.64E-17	1.62E-17	1.41	9.97E+02	1.10E-17	1.08E-17	2.22
2.77E+03	6.62E-18	6.63E-18	-0.13	3.61E+03	4.38E-18	4.42E-18	-0.92
1.08E+04	2.21E-18	2.19E-18	1.02	1.41E+04	1.48E-18	1.46E-18	1.18
2.51E+04	1.09E-18	1.12E-18	-2.57	3.28E+04	7.31E-19	7.49E-19	-2.35
1.00E+05	3.32E-19	3.33E-19	-0.39	1.31E+05	2.23E-19	2.24E-19	-0.47
4.00E+05	9.75E-20	9.61E-20	1.45	5.22E+05	6.60E-20	6.50E-20	1.47

Pb 8+		**I = 142.0 eV**		**Pb 9+**		**I = 162.4 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
2.10E+02	5.62E-18	5.81E-18	-3.33	2.47E+02	3.31E-18	3.39E-18	-2.32
4.17E+02	1.16E-17	1.21E-17	-4.54	5.02E+02	8.33E-18	8.66E-18	-3.85
1.24E+03	8.50E-18	8.30E-18	2.41	1.52E+03	6.39E-18	6.20E-18	2.98
4.55E+03	3.16E-18	3.15E-18	0.29	5.60E+03	2.30E-18	2.37E-18	-3.05
1.78E+04	1.05E-18	1.05E-18	0.18	2.02E+04	8.18E-19	7.80E-19	4.83
4.15E+04	5.23E-19	5.42E-19	-3.52	5.12E+04	3.82E-19	4.03E-19	-5.27
1.65E+05	1.62E-19	1.63E-19	-0.59	2.04E+05	1.19E-19	1.20E-19	-0.74
6.61E+05	4.82E-20	4.70E-20	2.6	8.16E+05	3.57E-20	3.50E-20	2.09

Pb 10+		**I = 182.0 eV**		**Pb 11+**		**I = 203.5 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
2.85E+02	2.44E-18	2.50E-18	-2.29	3.26E+02	1.91E-18	5.60E-18	-65.86
5.93E+02	6.30E-18	6.54E-18	-3.65	6.93E+02	5.76E-18	1.68E-17	-65.38
1.83E+03	4.89E-18	4.78E-18	2.2	2.16E+03	4.30E-18	1.46E-17	-70.61
6.76E+03	1.81E-18	1.81E-18	0.04	8.05E+03	1.37E-18	5.10E-18	-73.13
2.65E+04	6.03E-19	6.00E-19	0.48	3.15E+04	4.49E-19	1.34E-18	-66.5
6.19E+04	2.99E-19	3.10E-19	-3.46	7.36E+04	2.26E-19	2.42E-19	-6.7
2.47E+05	9.24E-20	9.28E-20	-0.42	2.94E+05	7.14E-20	7.26E-20	-1.61
9.88E+05	2.75E-20	2.69E-20	2.33	1.18E+06	2.17E-20	2.11E-20	2.58

Pb 12+		**I = 224.0 eV**		**Pb 13+**		**I = 246.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
3.68E+02	1.68E-18	1.73E-18	-2.87	4.12E+02	1.40E-18	1.44E-18	-2.79
7.99E+02	3.97E-18	4.08E-18	-2.79	9.12E+02	3.63E-18	3.81E-18	-4.77
2.52E+03	2.99E-18	2.96E-18	0.86	2.91E+03	2.49E-18	2.42E-18	2.77
9.42E+03	1.11E-18	1.11E-18	0.36	1.09E+04	8.98E-19	9.00E-19	-0.23
3.70E+04	3.70E-19	3.67E-19	0.9	4.30E+04	2.96E-19	2.96E-19	0.14
8.64E+04	1.83E-19	1.88E-19	-2.59	1.00E+05	1.47E-19	1.52E-19	-3.13
3.45E+05	5.62E-20	5.64E-20	-0.43	4.00E+05	4.52E-20	4.54E-20	-0.48
1.38E+06	1.66E-20	1.64E-20	1.48	1.60E+06	1.34E-20	1.31E-20	2.4

Pb 14+		**I = 360.0 eV**		**Pb 15+**		**I = 390.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
5.51E+02	1.69E-18	1.75E-18	-3.31	6.08E+02	1.42E-18	1.47E-18	-3.48
1.12E+03	2.98E-18	3.10E-18	-3.77	1.26E+03	2.52E-18	2.64E-18	-4.59
3.42E+03	2.04E-18	1.98E-18	3.22	3.87E+03	1.66E-18	1.62E-18	2.73
1.26E+04	7.14E-19	7.40E-19	-3.55	1.43E+04	5.97E-19	5.97E-19	0.05
4.93E+04	2.34E-19	2.42E-19	-3.17	5.61E+04	1.96E-19	1.96E-19	0.08
7.69E+04	1.63E-19	1.52E-19	7.02	8.74E+04	1.36E-19	1.40E-19	-2.92
3.06E+05	5.11E-20	5.30E-20	-3.52	3.49E+05	4.22E-20	4.25E-20	-0.79
1.22E+06	1.55E-20	1.54E-20	0.56	1.40E+06	1.26E-20	1.23E-20	2.35

Pb 16+		**I = 419.0 eV**		**Pb 17+**		**I = 454.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**

6.65E+02	1.28E-19	1.24E-19	3.5	7.29E+02	1.02E-18	1.06E-18	-3.46
1.40E+03	2.06E-18	2.40E-18	-14.12	1.56E+03	1.88E-18	2.00E-18	-5.97
4.35E+03	1.58E-18	1.33E-18	18.95	4.86E+03	1.14E-18	1.10E-18	3.83
1.61E+04	4.94E-19	4.84E-19	2.12	1.81E+04	3.99E-19	4.00E-19	-0.26
6.33E+04	1.56E-19	1.59E-19	-1.98	7.10E+04	1.30E-19	1.30E-19	-0.11
9.87E+04	1.08E-19	1.14E-19	-5.28	1.11E+05	8.95E-20	9.30E-20	-3.77
3.93E+05	3.40E-20	3.40E-20	-0.09	4.41E+05	2.77E-20	2.78E-20	-0.34
1.57E+06	1.03E-20	9.93E-21	3.84	1.76E+06	8.27E-21	8.06E-21	2.63

Pb 18+	**I = 488.0 eV**			**Pb 19+**	**I = 521.0 eV**		
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
7.95E+02	8.80E-19	9.09E-19	-3.2	8.61E+02	7.48E-19	7.75E-19	-3.47
1.72E+03	1.66E-18	1.71E-18	-3.21	1.88E+03	1.38E-18	1.47E-18	-5.92
5.40E+03	1.14E-18	9.10E-19	25.27	5.96E+03	7.91E-19	7.60E-19	4.07
2.01E+04	3.85E-19	1.23E-18	-68.69	2.23E+04	2.66E-19	2.70E-19	-1.63
7.90E+04	1.16E-19	1.10E-19	4.99	8.76E+04	8.65E-20	8.70E-20	-0.54
1.23E+05	7.80E-20	7.60E-20	2.58	2.73E+05	3.36E-20	3.45E-20	-2.62
4.91E+05	2.26E-20	2.27E-20	-0.55	1.09E+06	1.03E-20	1.00E-20	2.73
1.96E+06	6.43E-21	6.57E-21	-2.12				

Pb 20+	**I = 618.0 eV**			**Pb 21+**	**I = 648.0 eV**		
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
9.92E+02	6.03E-19	6.24E-19	-3.43	1.06E+03	5.40E-19	5.60E-19	-3.52
2.12E+03	1.13E-18	1.20E-18	-6.04	2.29E+03	9.70E-19	1.03E-18	-5.88
6.62E+03	6.56E-19	6.30E-19	4.04	7.23E+03	5.51E-19	5.30E-19	3.99
2.46E+04	2.20E-19	2.23E-19	-1.45	2.70E+04	1.84E-19	1.87E-19	-1.65
9.66E+04	7.14E-20	7.22E-20	-1.18	1.06E+05	5.96E-20	6.00E-20	-0.74
3.00E+05	2.78E-20	2.82E-20	-1.51	3.30E+05	2.31E-20	2.35E-20	-1.83
1.20E+06	8.48E-21	8.30E-21	2.21	1.32E+06	7.03E-21	6.87E-21	2.25

Pb 22+	**I = 806.0 eV**			**Pb 23+**	**I = 857.0 eV**		
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.26E+03	6.14E-19	6.40E-19	-4.12	1.35E+03	5.34E-19	5.57E-19	-4.12
2.61E+03	8.10E-19	8.42E-19	-3.82	2.82E+03	6.92E-19	7.19E-19	-3.71
8.00E+03	4.79E-19	4.68E-19	2.26	8.69E+03	4.01E-19	3.93E-19	2.14
2.96E+04	1.66E-19	1.67E-19	-0.69	3.22E+04	1.37E-19	1.38E-19	-0.46
1.16E+05	5.35E-20	5.36E-20	-0.17	1.26E+05	4.41E-20	4.42E-20	-0.2
3.61E+05	2.06E-20	2.10E-20	-1.98	3.93E+05	1.69E-20	1.73E-20	-2.37
1.44E+06	6.24E-21	6.13E-21	1.78	1.57E+06	5.10E-21	5.00E-21	2.03

Pb 24+	**I = 915.0 eV**			**Pb 25+**	**I = 971.0 eV**		
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.45E+03	4.48E-19	4.67E-19	-4.1	1.40E+03	4.17E-19	4.40E-19	-5.22
3.00E+03	5.79E-19	6.00E-19	-3.56	3.10E+03	5.70E-19	6.00E-19	-5.02
9.41E+03	3.31E-19	3.25E-19	1.96	1.00E+04	3.04E-19	2.94E-19	3.41
3.49E+04	1.13E-19	1.13E-19	-0.29	3.76E+04	9.79E-20	9.90E-20	-1.07
1.37E+05	3.59E-20	3.60E-20	-0.39	1.48E+05	3.08E-20	3.10E-20	-0.78
4.26E+05	1.37E-20	1.40E-20	-2.11	4.60E+05	1.17E-20	1.20E-20	-2.13
1.70E+06	4.13E-21	4.05E-21	1.9	1.84E+06	3.53E-21	3.45E-21	2.32

Pb 26+	**I = 1026.0 eV**			**Pb 27+**	**I = 1057.0 eV**		
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.65E+03	3.39E-18	3.43E-18	-1.23	1.60E+03	3.55E-19	3.73E-19	-4.72
3.51E+03	3.35E-19	4.25E-19	-21.25	3.60E+03	3.96E-19	4.12E-19	-3.95
1.10E+04	2.30E-20	2.30E-20	-0.1	1.16E+04	2.06E-19	2.00E-19	2.99

4.10E+04	6.74E-20	7.80E-20	-13.54	4.40E+04	6.71E-20	6.80E-20	-1.4
1.60E+05	2.50E-20	2.43E-20	2.9	1.72E+05	2.11E-20	2.10E-20	0.31
4.97E+05	9.43E-21	9.56E-21	-1.41	5.34E+05	7.98E-21	8.20E-21	-2.7
1.98E+06	2.73E-21	2.74E-21	-0.35	2.13E+06	2.38E-21	2.33E-21	2.2

Pb 28+		**I = 1087.0 eV**		**Pb 29+**		**I = 1100.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.71E+03	2.97E-19	3.10E-19	-4.26	1.89E+03	2.16E-19	2.26E-19	-4.41
3.85E+03	3.34E-19	3.45E-19	-3.26	4.20E+03	2.62E-19	2.70E-19	-2.9
1.24E+04	1.74E-19	1.70E-19	2.39	1.34E+04	1.37E-19	1.35E-19	1.18
4.70E+04	5.57E-20	5.63E-20	-1.11	5.00E+04	4.50E-20	4.50E-20	-0.01
1.84E+05	1.74E-20	1.73E-20	0.73	1.97E+05	1.41E-20	1.40E-20	0.36
5.73E+05	6.60E-21	6.80E-21	-3	6.13E+05	5.31E-21	5.45E-21	-2.66
2.29E+06	1.97E-21	1.93E-21	2.12	2.45E+06	1.58E-21	1.55E-21	1.8

Pb 30+		**I = 1128.0 eV**		**Pb 31+**		**I = 1179.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.93E+03	2.10E-19	2.20E-19	-4.44	2.05E+03	1.75E-19	1.83E-19	-4.52
4.38E+03	2.47E-19	2.53E-19	-2.56	4.70E+03	2.07E-19	2.15E-19	-3.68
1.42E+04	1.24E-19	1.23E-19	1.03	1.50E+04	1.02E-19	1.00E-19	2.29
5.34E+04	3.99E-20	4.00E-20	-0.27	5.70E+04	3.35E-20	3.40E-20	-1.52
2.10E+05	1.24E-20	1.23E-20	0.99	1.75E+05	1.31E-20	1.40E-20	-6.32
6.55E+05	4.68E-21	4.82E-21	-2.87	2.24E+05	1.07E-20	1.00E-20	6.62
2.62E+06	1.39E-21	1.37E-21	1.67	6.97E+05	4.07E-21	4.10E-21	-0.8

Pb 32+		**I = 1240.0 eV**		**Pb 33+**		**I = 1300.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
2.20E+03	1.72E-19	1.80E-19	-4.68	2.28E+03	1.48E-19	1.55E-19	-4.55
4.94E+03	1.93E-19	2.00E-19	-3.28	5.23E+03	1.68E-19	1.75E-19	-4.19
1.60E+04	9.02E-20	8.90E-20	1.38	1.70E+04	7.86E-20	7.62E-20	3.18
6.10E+04	2.90E-20	2.90E-20	0.1	5.00E+04	3.15E-20	3.30E-20	-4.48
1.86E+05	1.14E-20	1.20E-20	-5.19	6.40E+04	2.55E-20	2.49E-20	2.41
2.38E+05	9.24E-21	8.90E-21	3.86	1.98E+05	9.65E-21	1.00E-20	-3.52
7.42E+05	3.51E-21	3.50E-21	0.26	2.53E+05	7.81E-21	7.56E-21	3.24

Pb 34+		**I = 1361.0 eV**		**Pb 35+**		**I = 1421.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
2.40E+03	1.24E-19	1.30E-19	-4.6	2.52E+03	1.16E-20	1.15E-20	0.72
5.50E+03	1.44E-19	1.50E-19	-3.79	5.80E+03	9.97E-20	1.31E-19	-24.42
1.80E+04	6.72E-20	6.50E-20	3.31	1.90E+04	6.00E-20	5.60E-20	7.09
5.30E+04	2.65E-20	2.83E-20	-6.34	5.65E+04	2.27E-20	2.45E-20	-7.25
6.80E+04	2.14E-20	2.10E-20	1.88	7.20E+04	1.84E-20	1.83E-20	0.34
2.68E+05	6.64E-21	6.40E-21	3.71	2.83E+05	5.70E-21	5.50E-21	3.68
8.34E+05	2.50E-21	2.55E-21	-2.07	8.83E+05	2.17E-21	2.20E-21	-1.47

Pb 36+		**I = 1737.0 eV**		**Pb 37+**		**I = 1790.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
2.90E+03	8.43E-20	8.80E-20	-4.19	3.00E+03	7.49E-20	7.82E-20	-4.25
6.40E+03	1.12E-19	1.20E-19	-6.31	6.70E+03	9.54E-20	1.00E-19	-4.61
2.00E+04	5.46E-20	5.20E-20	5.05	2.14E+04	4.77E-20	4.60E-20	3.71
6.00E+04	2.14E-20	2.30E-20	-6.79	6.30E+04	1.90E-20	2.00E-20	-5.22
7.60E+04	1.75E-20	1.70E-20	3.13	8.00E+04	1.55E-20	1.50E-20	2.98
2.34E+05	6.77E-21	7.15E-21	-5.27	2.47E+05	5.93E-21	6.28E-21	-5.59
3.00E+05	5.49E-21	5.23E-21	4.92	3.16E+05	4.81E-21	4.59E-21	4.79

Pb 38+		I = 1864.0 eV		Pb 39+		I = 1922.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
3.20E+03	6.48E-20	6.76E-20	-4.11	3.30E+03	5.66E-20	5.90E-20	-4.13
7.00E+03	8.78E-20	9.30E-20	-5.59	7.40E+03	7.80E-20	8.30E-20	-5.99
2.30E+04	4.18E-20	4.00E-20	4.5	2.40E+04	3.77E-20	3.60E-20	4.8
5.36E+04	2.02E-20	2.10E-20	-3.98	5.60E+04	1.81E-20	1.86E-20	-2.56
8.50E+04	1.35E-20	1.32E-20	2.48	8.90E+04	1.21E-20	1.20E-20	0.71
2.09E+05	6.25E-21	6.70E-21	-6.79	2.20E+05	5.50E-21	5.90E-21	-6.74
3.33E+05	4.19E-21	4.00E-21	4.68	3.50E+05	3.68E-21	3.50E-21	5.04

Pb 40+		I = 1983.0 eV		Pb 41+		I = 2044.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
3.40E+03	4.95E-20	5.16E-20	-4.15	3.54E+03	4.31E-20	4.50E-20	-4.15
7.70E+03	6.88E-20	7.32E-20	-6.03	8.00E+03	6.12E-20	6.50E-20	-5.89
2.50E+04	3.30E-20	3.14E-20	5.19	2.60E+04	2.93E-20	2.80E-20	4.68
5.90E+04	1.57E-20	1.64E-20	-4.36	7.70E+04	1.14E-20	1.20E-20	-5.38
9.34E+04	1.05E-20	1.03E-20	2.23	9.80E+04	9.21E-21	9.00E-21	2.36
2.31E+05	4.84E-21	5.20E-21	-6.85	3.02E+05	3.52E-21	3.76E-21	-6.44
3.68E+05	3.25E-21	3.10E-21	4.91	3.86E+05	2.85E-21	2.70E-21	5.69

Pb 42+		I = 2108.0 eV		Pb 43+		I = 2172.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
3.70E+03	3.70E-20	3.85E-20	-3.96	3.80E+03	3.12E-20	3.24E-20	-3.75
8.40E+03	5.39E-20	5.80E-20	-7.1	8.80E+03	4.53E-20	5.00E-20	-9.45
2.70E+04	2.60E-20	2.45E-20	6.18	1.86E+04	2.96E-20	2.76E-20	7.13
8.10E+04	1.01E-20	1.10E-20	-8.26	2.85E+04	2.11E-20	2.15E-20	-1.97
1.03E+05	8.20E-21	7.94E-21	3.25	1.07E+05	6.97E-21	7.00E-21	-0.48
3.16E+05	3.12E-21	3.30E-21	-5.37	2.65E+05	3.27E-21	3.50E-21	-6.57
4.04E+05	2.53E-21	2.40E-21	5.28	4.23E+05	2.21E-21	2.10E-21	5.19

Pb 44+		I = 2236.0 eV		Pb 45+		I = 2300.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
4.00E+03	2.59E-20	2.70E-20	-4.21	4.10E+03	1.97E-20	2.10E-20	-6.27
5.70E+03	3.72E-20	3.60E-20	3.31	5.90E+03	2.58E-20	2.45E-20	5.38
9.12E+03	4.17E-20	4.50E-20	-7.28	9.50E+03	3.12E-20	3.60E-20	-13.42
1.60E+04	3.22E-20	3.10E-20	3.88	1.67E+04	2.56E-20	2.50E-20	2.2
3.00E+04	1.92E-20	1.90E-20	1.1	3.10E+04	1.56E-20	1.50E-20	3.66
5.70E+04	1.08E-20	1.10E-20	-1.67	6.00E+04	8.53E-21	8.70E-21	-1.98
1.12E+05	6.06E-21	6.12E-21	-1.05	1.17E+05	4.77E-21	4.90E-21	-2.6
2.23E+05	3.44E-21	3.40E-21	1.08	2.33E+05	2.71E-21	2.66E-21	1.89

Pb 46+		I = 2676.0 eV		Pb 47+		I = 2744.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
4.60E+03	1.76E-20	1.70E-20	3.48	4.70E+03	1.48E-20	1.41E-20	4.66
6.40E+03	3.38E-20	3.60E-20	-6.15	6.70E+03	3.14E-20	4.63E-20	-32.27
1.02E+04	3.58E-20	3.50E-20	2.35	1.10E+04	3.21E-20	3.14E-20	2.22
1.80E+04	2.48E-20	2.46E-20	0.66	1.84E+04	2.24E-20	2.20E-20	1.72
3.30E+04	1.52E-20	1.53E-20	-0.84	3.40E+04	1.35E-20	1.36E-20	-0.91
6.30E+04	8.86E-21	8.87E-21	-0.13	6.54E+04	7.82E-21	7.90E-21	-0.96
1.23E+05	4.99E-21	4.98E-21	0.17	1.28E+05	4.42E-21	4.40E-21	0.46
2.43E+05	2.73E-21	2.73E-21	0.05	2.53E+05	2.43E-21	2.43E-21	0.16

Pb 48+		I = 2804.0 eV		Pb 49+		I = 2872.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %

4.85E+03	1.12E-20	1.14E-20	-1.76	5.00E+03	9.63E-21	9.10E-21	5.77
6.90E+03	2.04E-20	2.00E-20	1.93	7.12E+03	2.20E-20	2.50E-20	-11.84
1.10E+04	2.58E-20	2.80E-20	-8.05	1.14E+04	2.53E-20	2.50E-20	1.15
1.90E+04	2.06E-20	1.96E-20	4.98	2.00E+04	1.82E-20	1.75E-20	3.83
3.55E+04	1.23E-20	1.21E-20	1.65	3.70E+04	1.09E-20	1.10E-20	-1.22
6.80E+04	6.83E-21	7.00E-21	-2.39	7.10E+04	6.17E-21	6.23E-21	-0.95
1.33E+05	3.83E-21	3.90E-21	-1.7	1.39E+05	3.46E-21	3.50E-21	-1.17
2.64E+05	2.19E-21	2.15E-21	1.7	2.75E+05	1.92E-21	1.90E-21	1.25

Pb 50+		**I = 2978.0 eV**		**Pb 51+**	**I = 3006.0 eV**		
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
5.15E+03	7.47E-21	7.00E-21	6.71	5.30E+03	5.56E-21	5.20E-21	6.88
7.40E+03	1.91E-20	2.60E-20	-26.5	7.60E+03	1.47E-20	2.27E-20	-35.42
1.20E+04	2.27E-20	2.25E-20	1.03	1.22E+04	1.88E-20	1.90E-20	-1.27
2.10E+04	1.63E-20	1.56E-20	4.23	2.14E+04	1.39E-20	1.30E-20	7.23
3.83E+04	9.62E-21	9.60E-21	0.24	4.00E+04	8.00E-21	8.00E-21	0.05
7.40E+04	5.36E-21	5.50E-21	-2.48	7.70E+04	4.39E-21	4.60E-21	-4.53
1.44E+05	3.05E-21	3.10E-21	-1.59	1.50E+05	2.48E-21	2.50E-21	-0.63
2.86E+05	1.73E-21	1.70E-21	1.92	2.97E+05	1.43E-21	1.40E-21	2.01

Pb 52+		**I = 3248.0 eV**		**Pb 53+**	**I = 3318.0 eV**		
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
5.64E+03	4.93E-21	4.60E-21	7.22	5.80E+03	5.68E-21	5.40E-21	5.23
8.00E+03	1.27E-20	1.90E-20	-33.16	8.30E+03	1.30E-20	1.80E-20	-28
1.28E+04	1.60E-20	1.60E-20	0.15	1.32E+04	1.51E-20	1.50E-20	0.68
2.23E+04	1.20E-20	1.13E-20	5.84	2.30E+04	1.11E-20	1.07E-20	3.88
4.20E+04	6.95E-21	7.00E-21	-0.7	4.30E+04	6.62E-21	6.65E-21	-0.53
8.00E+04	3.89E-21	4.00E-21	-2.69	8.30E+04	3.73E-21	3.80E-21	-1.98
1.56E+05	2.18E-21	2.20E-21	-1.05	1.62E+05	2.09E-21	2.10E-21	-0.49
3.09E+05	1.22E-21	1.20E-21	1.7	3.21E+05	1.16E-21	1.15E-21	1.08

Pb 54+		**I = 5474.0 eV**		**Pb 55+**	**I = 5636.0 eV**		
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
8.00E+03	9.05E-21	9.60E-21	-5.78	8.30E+03	8.12E-21	8.50E-21	-4.49
1.10E+04	1.24E-20	1.20E-20	3.48	1.10E+04	1.01E-20	1.00E-20	1.34
1.60E+04	1.23E-20	1.13E-20	8.67	1.63E+04	9.88E-21	1.00E-20	-1.16
2.60E+04	9.62E-21	9.60E-21	0.23	2.70E+04	8.33E-21	8.50E-21	-2.05
4.70E+04	6.07E-21	3.85E-21	57.76	4.80E+04	5.58E-21	5.40E-21	3.34
8.80E+04	3.51E-21	3.60E-21	-2.46	9.10E+04	3.16E-21	3.17E-21	-0.2
1.70E+05	1.98E-21	2.00E-21	-1.06	1.76E+05	1.75E-21	1.80E-21	-2.7
3.35E+05	1.11E-21	1.10E-21	1.03	3.47E+05	9.84E-22	9.70E-22	1.44

Pb 56+		**I = 5797.0 eV**		**Pb 57+**	**I = 5923.0 eV**		
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
8.60E+03	7.34E-21	7.60E-21	-3.42	8.80E+03	6.51E-21	6.72E-21	-3.19
1.13E+04	9.15E-21	9.15E-21	0.01	1.16E+04	8.08E-21	8.10E-21	-0.31
1.70E+04	8.82E-21	8.80E-21	0.26	1.74E+04	7.77E-21	7.74E-21	0.38
2.80E+04	7.35E-21	7.50E-21	-1.97	2.90E+04	6.51E-21	6.64E-21	-2.01
5.00E+04	4.86E-21	4.80E-21	1.29	5.20E+04	4.32E-21	4.22E-21	2.3
9.40E+04	2.77E-21	2.70E-21	2.39	9.74E+04	2.47E-21	2.47E-21	-0.2
1.83E+05	1.53E-21	1.60E-21	-4.34	1.89E+05	1.36E-21	1.38E-21	-1.5
3.59E+05	8.76E-22	8.60E-22	1.81	3.72E+05	7.66E-22	7.60E-22	0.81

Pb 58+		**I = 6083.0 eV**		**Pb 59+**	**I = 6247.0 eV**		
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**

9.00E+03	5.71E-21	5.90E-21	-3.25	9.30E+03	4.98E-21	5.14E-21	-3.13
1.20E+04	7.06E-21	7.10E-21	-0.53	1.24E+04	6.16E-21	6.20E-21	-0.59
1.80E+04	6.75E-21	6.70E-21	0.74	1.85E+04	5.94E-21	5.90E-21	0.72
3.00E+04	5.69E-21	5.86E-21	-2.9	3.10E+04	4.99E-21	5.12E-21	-2.47
5.34E+04	3.83E-21	3.70E-21	3.43	5.52E+04	3.33E-21	3.25E-21	2.58
1.01E+05	2.18E-21	2.20E-21	-1.07	1.04E+05	1.90E-21	1.90E-21	-0.1
1.95E+05	1.21E-21	1.22E-21	-1.2	2.02E+05	1.05E-21	1.07E-21	-1.79
3.85E+05	6.75E-22	6.70E-22	0.78	3.98E+05	5.96E-22	5.90E-22	0.94

Pb 60+	**I = 6410.0 eV**			**Pb 61+**	**I = 6562.0 eV**		
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
9.60E+03	4.26E-21	4.40E-21	-3.19	9.84E+03	3.68E-21	3.80E-21	-3.23
1.27E+04	5.28E-21	5.30E-21	-0.34	1.30E+04	4.52E-21	4.53E-21	-0.2
1.90E+04	5.14E-21	5.10E-21	0.75	2.00E+04	4.45E-21	4.43E-21	0.45
3.20E+04	4.32E-21	4.45E-21	-3.01	3.30E+04	3.80E-21	3.89E-21	-2.37
5.70E+04	2.89E-21	2.80E-21	3.36	5.90E+04	2.52E-21	2.45E-21	2.75
1.08E+05	1.65E-21	1.66E-21	-0.58	1.11E+05	1.43E-21	1.44E-21	-0.47
2.09E+05	9.18E-22	9.35E-22	-1.82	2.16E+05	8.02E-22	8.14E-22	-1.52
4.11E+05	5.18E-22	5.13E-22	1.03	4.25E+05	4.64E-22	4.60E-22	0.89

Pb 62+	**I = 6725.0 eV**			**Pb 63+**	**I = 6880.0 eV**		
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.00E+04	3.10E-21	3.21E-21	-3.51	1.03E+04	2.63E-21	2.70E-21	-2.46
1.35E+04	3.81E-21	3.82E-21	-0.2	1.39E+04	3.16E-21	3.21E-21	-1.49
2.00E+04	3.76E-21	3.75E-21	0.23	2.08E+04	3.24E-21	3.20E-21	1.25
3.40E+04	3.24E-21	3.32E-21	-2.4	3.45E+04	2.87E-21	2.90E-21	-0.92
6.10E+04	2.17E-21	2.11E-21	2.88	6.30E+04	1.81E-21	1.81E-21	-0.05
1.15E+05	1.24E-21	1.24E-21	0.08	1.18E+05	1.00E-21	1.00E-21	0.43
2.23E+05	6.92E-22	7.10E-22	-2.49	2.30E+05	5.89E-22	5.90E-22	-0.2
4.39E+05	3.95E-22	3.90E-22	1.29				

Pb 64+	**I = 7122.0 eV**			**Pb 65+**	**I = 7882.0 eV**		
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.15E+04	1.95E-21	2.00E-21	-2.28	1.16E+04	1.63E-21	1.68E-21	-2.96
1.48E+04	2.42E-21	2.45E-21	-1.24	1.53E+04	2.06E-21	2.07E-21	-0.29
2.19E+04	2.72E-21	2.63E-21	3.45	2.27E+04	2.24E-21	2.23E-21	0.24
3.64E+04	2.47E-21	2.59E-21	-4.74	3.75E+04	2.08E-21	2.12E-21	-1.78
6.53E+04	1.65E-21	1.60E-21	2.94	6.69E+04	1.42E-21	1.38E-21	2.82
1.22E+05	9.60E-22	9.70E-22	-1.02	1.26E+05	8.23E-22	8.42E-22	-2.24
2.37E+05	5.61E-22	5.60E-22	0.12	2.44E+05	4.89E-22	4.86E-22	0.7

Pb 66+	**I = 8012.0 eV**			**Pb 67+**	**I = 8195.0 eV**		
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.18E+04	1.32E-21	1.36E-21	-2.8	1.21E+04	1.06E-21	1.10E-21	-3.38
1.56E+04	1.66E-21	1.67E-21	-0.5	1.64E+04	1.30E-21	1.30E-21	0.13
2.33E+04	1.86E-21	1.85E-21	0.54	2.43E+04	1.52E-21	1.52E-21	-0.17
3.85E+04	1.80E-21	1.83E-21	-1.91	4.00E+04	1.51E-21	1.54E-21	-1.96
6.91E+04	1.23E-21	1.20E-21	2.67	7.10E+04	1.04E-21	1.00E-21	3.62
1.30E+05	7.15E-22	7.30E-22	-2.01	1.33E+05	6.01E-22	6.20E-22	-3.02
2.52E+05	4.24E-22	4.21E-22	0.62	2.59E+05	3.65E-22	3.61E-22	0.97

Pb 68+	**I = 8320.0 eV**			**Pb 69+**	**I = 8442.0 eV**		
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.24E+04	7.91E-22	8.13E-22	-2.77	1.26E+04	5.39E-22	5.60E-22	-3.73
1.65E+04	9.79E-22	9.83E-22	-0.38	1.68E+04	6.97E-22	6.85E-22	1.81

2.50E+04	1.21E-21	1.20E-21	1	2.50E+04	9.74E-22	1.32E-21	-26.21
4.10E+04	1.24E-21	1.28E-21	-2.8	4.20E+04	1.04E-21	1.04E-21	0.25
7.30E+04	8.74E-22	8.46E-22	3.29	7.50E+04	7.20E-22	6.99E-22	2.97
1.38E+05	5.10E-22	5.22E-22	-2.27	1.42E+05	4.19E-22	4.33E-22	-3.36
2.67E+05	3.07E-22	3.05E-22	0.67	2.75E+05	2.58E-22	2.55E-22	1.22

Pb 70+		**I = 9022.0 eV**		**Pb 71+**		**I = 9148.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
1.32E+04	2.94E-22	3.10E-22	-5.06	1.35E+04	1.44E-22	1.50E-22	-3.97
1.74E+04	3.98E-22	3.80E-22	4.83	1.80E+04	2.01E-22	1.90E-22	5.68
2.60E+04	7.23E-22	1.00E-21	-28	2.70E+04	5.31E-22	8.90E-22	-40.45
4.30E+04	8.50E-22	8.10E-22	4.91	4.43E+04	6.99E-22	6.70E-22	4.25
7.70E+04	5.77E-22	5.56E-22	3.78	8.00E+04	4.82E-22	4.60E-22	4.71
1.46E+05	3.30E-22	3.53E-22	-6.49	1.50E+05	2.71E-22	2.90E-22	-6.61
2.83E+05	2.16E-22	2.10E-22	2.61	2.91E+05	1.69E-22	1.65E-22	2.39

Pb 72+		**I = 21030.0 eV**		**Pb 73+**		**I = 21180.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
2.57E+04	1.83E-22	1.88E-22	-2.46	2.53E+04	1.54E-22	1.60E-22	-3.78
3.00E+04	2.78E-22	2.78E-22	-0.08	3.10E+04	2.40E-22	2.40E-22	0.08
3.90E+04	3.42E-22	3.41E-22	0.31	4.00E+04	2.90E-22	2.93E-22	-0.93
5.74E+04	3.44E-22	3.46E-22	-0.69	5.80E+04	2.97E-22	2.95E-22	0.63
9.40E+04	2.86E-22	2.84E-22	0.7	9.60E+04	2.39E-22	2.40E-22	-0.34
1.66E+05	1.99E-22	2.00E-22	-0.41	1.70E+05	1.70E-22	1.70E-22	0.15
3.11E+05	1.21E-22	1.21E-22	0.1	3.19E+05	1.04E-22	1.04E-22	-0.03

Pb 74+		**I = 21540.0 eV**		**Pb 75+**		**I = 21870.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
2.63E+04	1.29E-22	1.32E-22	-2.25	2.68E+04	1.09E-22	1.10E-22	-1.27
3.10E+04	1.91E-22	1.95E-22	-2.31	3.00E+04	1.54E-22	1.55E-22	-1
4.10E+04	2.54E-22	2.40E-22	5.72	4.00E+04	1.93E-22	1.90E-22	1.68
6.00E+04	2.74E-22	2.40E-22	14.08	6.00E+04	1.86E-22	1.90E-22	-1.95
9.80E+04	2.12E-22	2.00E-22	6.09	9.92E+04	1.59E-22	1.56E-22	1.73
1.75E+05	1.35E-22	1.40E-22	-3.36	1.78E+05	1.12E-22	1.13E-22	-1.02
3.28E+05	8.57E-23	8.50E-23	0.83	3.35E+05	6.87E-23	6.85E-23	0.26

Pb 76+		**I = 22387.0 eV**		**Pb 77+**		**I = 22460.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
2.73E+04	7.80E-23	8.00E-23	-2.55	2.76E+04	5.32E-23	5.51E-23	-3.37
3.22E+04	1.20E-22	1.20E-22	-0.32	3.28E+04	8.05E-23	8.00E-23	0.59
4.23E+04	1.46E-22	1.45E-22	0.57	4.30E+04	9.97E-23	1.00E-22	-0.28
6.25E+04	1.45E-22	1.46E-22	-0.99	6.40E+04	9.96E-23	1.00E-22	-0.4
1.03E+05	1.21E-22	1.20E-22	0.99	1.05E+05	8.37E-23	8.32E-23	0.63
1.83E+05	8.75E-23	8.80E-23	-0.61	1.88E+05	6.22E-23	6.25E-23	-0.46
3.45E+05	5.46E-23	5.45E-23	0.16	3.53E+05	3.94E-23	3.93E-23	0.13

Pb 78+		**I = 24440.0 eV**		**Pb 79+**		**I = 24780.0 eV**	
E, eV	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**	**E, eV**	**$\sigma_{Fitt.}$, cm^2**	**σ_{Atom}, cm^2**	**error, %**
2.97E+04	2.76E-23	2.84E-23	-2.76	3.00E+04	1.35E-23	1.40E-23	-3.36
3.51E+04	4.30E-23	4.30E-23	0.04	3.60E+04	2.11E-23	2.10E-23	0.26
4.57E+04	5.43E-23	5.42E-23	0.17	4.65E+04	2.64E-23	2.64E-23	-0.17
6.69E+04	5.61E-23	5.65E-23	-0.64	6.83E+04	2.79E-23	2.80E-23	-0.4
1.09E+05	5.04E-23	5.00E-23	0.75	1.12E+05	2.62E-23	2.60E-23	0.64
1.94E+05	3.98E-23	4.00E-23	-0.51	1.99E+05	2.19E-23	2.20E-23	-0.5
3.64E+05	2.61E-23	2.61E-23	0.14	3.73E+05	1.45E-23	1.45E-23	0.14

Pb 80+		I = 98340.0 eV		Pb 81+		I = 99720.0 eV	
E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %	E, eV	$\sigma_{Fitt.}$, cm^2	σ_{Atom}, cm^2	error, %
1.04E+05	5.18E-25	5.15E-25	0.63	1.05E+05	2.47E-25	2.55E-25	-3.06
1.09E+05	9.31E-25	9.50E-25	-1.99	1.11E+05	4.75E-25	4.70E-25	1.06
1.21E+05	1.66E-24	1.62E-24	2.17	1.23E+05	8.09E-25	8.00E-25	1.07
1.43E+05	2.46E-24	2.50E-24	-1.53	1.45E+05	1.20E-24	1.22E-24	-1.75
1.88E+05	3.33E-24	3.30E-24	0.83	1.91E+05	1.62E-24	1.60E-24	1.24
2.77E+05	3.59E-24	3.60E-24	-0.41	2.83E+05	1.79E-24	1.80E-24	-0.71
4.55E+05	3.15E-24	3.14E-24	0.15	4.66E+05	1.57E-24	1.57E-24	0.28
8.12E+05	2.20E-24	2.20E-24	-0.03	8.31E+05	1.20E-24	1.20E-24	-0.06

Table 8.2. Fitting parameters for lead and its ions.

Pb	A_1	A_2	A_3	A_4	A_5	A_6	B
0+	-1.1969E+00	1.0353E+01	-9.4152E+01	3.3679E+02	-4.5813E+02	2.0916E+02	2.0773E+00
1+	-1.2531E+00	8.5870E+00	-5.0224E+01	1.1791E+02	-1.2128E+02	4.9344E+01	2.3360E+00
2+	-2.3472E+00	6.0766E+00	-4.7109E+01	1.7026E+02	-2.0742E+02	8.3959E+01	3.3008E+00
3+	-3.3089E+00	8.9979E+00	-9.2600E+01	3.0091E+02	-3.0418E+02	9.2715E+01	3.4178E+00
4+	1.8212E-02	5.1647E+01	-2.2313E+02	4.7138E+02	-4.4844E+02	1.5758E+02	4.2425E+00
5+	-7.3069E-02	4.5044E+01	-1.8498E+02	4.4202E+02	-4.9421E+02	1.9991E+02	4.0726E+00
6+	-6.1159E-01	2.1457E+01	-1.4634E+01	-8.1786E+01	1.6423E+02	-8.4089E+01	4.4482E+00
7+	-1.8131E+00	2.4051E+01	-7.2636E+01	1.3721E+02	-1.1118E+02	2.8297E+01	4.8974E+00
8+	-2.7336E+00	-3.7235E+00	7.8907E+01	-2.7078E+02	3.9526E+02	-1.9631E+02	5.2839E+00
9+	-3.5459E+00	-1.3400E+01	1.2722E+02	-4.2063E+02	6.0997E+02	-3.0112E+02	5.7296E+00
10+	-3.6737E+00	-1.7059E+01	1.4340E+02	-4.5667E+02	6.3876E+02	-3.0485E+02	5.7648E+00
11+	-3.3449E+00	-5.1497E+01	3.9302E+02	-1.2212E+03	1.6374E+03	-7.6063E+02	6.7186E+00
12+	-3.2632E+00	-2.9474E+01	2.1878E+02	-6.4321E+02	8.2595E+02	-3.6816E+02	5.8244E+00
13+	-3.6492E+00	-2.6797E+01	1.9889E+02	-6.0068E+02	8.0398E+02	-3.7199E+02	6.0409E+00
14+	-2.9035E+00	-3.5097E+01	3.4209E+02	-1.0338E+03	1.3336E+03	-6.0532E+02	8.5377E+00
15+	-3.1402E+00	-2.7330E+01	2.6911E+02	-7.9159E+02	1.0127E+03	-4.5846E+02	8.2315E+00
16+	-7.8594E+00	-1.9739E+01	1.6848E+02	-7.4473E+02	1.3319E+03	-7.3211E+02	8.7308E+00
17+	-3.1523E+00	-2.3118E+01	2.2115E+02	-6.3757E+02	8.3268E+02	-3.8781E+02	7.7317E+00
18+	7.0837E-01	-6.0246E+01	4.7968E+02	-1.3487E+03	1.6558E+03	-7.1048E+02	5.3902E+00
19+	-2.9531E+00	-3.6537E+01	2.9957E+02	-8.5550E+02	1.1051E+03	-5.1077E+02	7.7651E+00
20+	-3.2942E+00	-2.8024E+01	2.6470E+02	-7.7838E+02	1.0372E+03	-4.9294E+02	8.4021E+00
21+	-2.6850E+00	-3.5086E+01	3.0178E+02	-8.5947E+02	1.1077E+03	-5.1249E+02	7.9072E+00
22+	7.2027E-01	-6.0198E+01	5.7896E+02	-1.6029E+03	1.8604E+03	-7.7368E+02	9.2113E+00
23+	1.2841E+00	-6.5397E+01	6.0316E+02	-1.6508E+03	1.9022E+03	-7.8684E+02	8.6408E+00
24+	1.6126E+00	-6.5237E+01	5.8698E+02	-1.5894E+03	1.8198E+03	-7.4923E+02	7.9229E+00
25+	9.4398E-01	1.1028E+01	2.3421E+02	-9.3522E+02	1.2892E+03	-5.9623E+02	7.8209E+00
26+	1.4444E+02	-1.9072E+03	1.3331E+04	-3.2124E+04	3.0972E+04	-1.0399E+04	5.0277E+00
27+	3.4676E+00	-4.2515E+01	5.2974E+02	-1.5528E+03	1.8078E+03	-7.4006E+02	6.3092E+00
28+	3.6015E+00	-7.1693E+01	6.4311E+02	-1.7564E+03	1.9931E+03	-8.0763E+02	5.8734E+00
29+	2.6047E+00	-7.6367E+01	5.4389E+02	-1.3572E+03	1.4838E+03	-5.9250E+02	4.9525E+00
30+	3.2723E+00	-8.5557E+01	6.0972E+02	-1.5334E+03	1.6805E+03	-6.7086E+02	4.8287E+00
31+	1.8927E+00	-6.6486E+01	4.6539E+02	-1.1401E+03	1.2331E+03	-4.9164E+02	4.8778E+00
32+	2.6140E+00	-7.0616E+01	4.7799E+02	-1.1304E+03	1.1895E+03	-4.6652E+02	4.6362E+00
33+	2.7528E+00	-5.6144E+01	3.9351E+02	-9.1976E+02	9.5322E+02	-3.6739E+02	3.6525E+00
34+	2.5192E+00	-6.2283E+01	4.2821E+02	-1.0296E+03	1.1016E+03	-4.3692E+02	3.8416E+00
35+	-2.7627E+00	-2.6424E+01	2.0196E+02	-6.9883E+02	1.0349E+03	-5.0814E+02	4.0891E+00
36+	6.9696E-01	-2.9147E+01	2.5423E+02	-6.2479E+02	6.9587E+02	-2.9298E+02	4.7205E+00
37+	1.6140E+00	-5.0338E+01	3.9055E+02	-9.9245E+02	1.1080E+03	-4.5389E+02	4.5036E+00

38+	1.0539E+00	-3.4585E+01	2.6906E+02	-6.5808E+02	7.3772E+02	-3.1020E+02	3.9855E+00
39+	1.2106E+00	-3.3182E+01	2.5901E+02	-6.4080E+02	7.2586E+02	-3.0595E+02	3.5128E+00
40+	8.0148E-01	-3.4543E+01	2.6578E+02	-6.7047E+02	7.7007E+02	-3.2787E+02	3.7535E+00
41+	6.6217E-01	-3.5259E+01	2.6389E+02	-6.7007E+02	7.7789E+02	-3.3417E+02	3.6630E+00
42+	2.5142E-01	-2.2655E+01	1.7434E+02	-4.3080E+02	5.0612E+02	-2.2279E+02	3.1955E+00
43+	-7.5341E-01	-1.1947E+01	1.0006E+02	-2.3753E+02	2.8594E+02	-1.3385E+02	3.4391E+00
44+	-7.8732E-01	-3.3652E+01	2.3752E+02	-6.3766E+02	7.9012E+02	-3.5848E+02	4.1440E+00
45+	4.1900E-01	-5.8477E+01	3.9718E+02	-1.0662E+03	1.2644E+03	-5.4144E+02	3.8026E+00
46+	-2.4985E+00	6.2376E+01	-4.0488E+02	1.1290E+03	-1.2500E+03	4.7735E+02	1.5061E+00
47+	-3.1985E+00	7.1018E+01	-4.6548E+02	1.2823E+03	-1.4120E+03	5.3744E+02	1.5910E+00
48+	-2.5809E+00	-7.6132E+00	7.1422E+01	-2.4748E+02	4.0902E+02	-2.2635E+02	4.1128E+00
49+	-3.5573E+00	4.9434E+01	-3.1284E+02	8.0550E+02	-8.0641E+02	2.7240E+02	2.2943E+00
50+	-4.3405E+00	4.3092E+01	-2.7356E+02	6.7991E+02	-6.3640E+02	1.9101E+02	3.1741E+00
51+	-3.9574E+00	2.5308E+01	-1.5014E+02	3.2079E+02	-2.1008E+02	1.4932E+01	3.2905E+00
52+	-3.2853E+00	3.3233E+01	-2.0726E+02	5.0218E+02	-4.4813E+02	1.2425E+02	2.3720E+00
53+	-2.8089E+00	3.4654E+01	-2.1593E+02	5.4414E+02	-5.2315E+02	1.6616E+02	1.9882E+00
54+	1.2532E+00	2.1658E+01	3.2721E+01	-1.9115E+02	2.7184E+02	-1.3379E+02	4.0997E+00
55+	1.4602E+00	-2.1398E+01	3.2191E+02	-1.0080E+03	1.2393E+03	-5.3679E+02	5.0431E+00
56+	1.2132E+00	-3.4629E+01	3.8358E+02	-1.1301E+03	1.3467E+03	-5.7309E+02	5.4480E+00
57+	1.7194E+00	-3.5896E+01	3.8007E+02	-1.1075E+03	1.3110E+03	-5.5327E+02	4.5874E+00
58+	1.7539E+00	-3.2696E+01	3.5392E+02	-1.0411E+03	1.2372E+03	-5.2191E+02	4.1103E+00
59+	1.2418E+00	-3.2729E+01	3.3681E+02	-9.8004E+02	1.1616E+03	-4.9105E+02	4.1831E+00
60+	1.2817E+00	-2.8857E+01	2.9534E+02	-8.5080E+02	1.0020E+03	-4.2129E+02	3.5306E+00
61+	2.1745E-01	-2.9853E+01	2.9258E+02	-8.5419E+02	1.0231E+03	-4.3823E+02	4.2446E+00
62+	5.1632E-01	-2.3707E+01	2.4857E+02	-7.4056E+02	8.9525E+02	-3.8384E+02	3.3906E+00
63+	-2.7985E+00	-3.7789E+01	3.2347E+02	-9.6446E+02	1.1919E+03	-5.2964E+02	6.7965E+00
64+	-1.6631E+00	-3.3222E+01	2.4719E+02	-6.7984E+02	8.1286E+02	-3.5544E+02	4.7414E+00
65+	-2.8156E+00	-2.2078E+01	2.0930E+02	-6.5097E+02	8.2835E+02	-3.7615E+02	5.8106E+00
66+	-2.6317E+00	-2.1417E+01	1.9666E+02	-6.1412E+02	7.8692E+02	-3.5840E+02	5.2355E+00
67+	-3.6755E+00	-2.1418E+01	1.9045E+02	-6.1101E+02	8.0012E+02	-3.7124E+02	5.9424E+00
68+	-2.6746E+00	-1.8945E+01	1.6086E+02	-5.0532E+02	6.5677E+02	-3.0236E+02	4.4853E+00
69+	-3.3206E+00	-1.4086E+01	1.1839E+02	-3.9168E+02	5.3411E+02	-2.5632E+02	4.5805E+00
70+	-5.2088E+00	-1.1139E+01	9.0071E+01	-3.3439E+02	4.9690E+02	-2.5549E+02	6.0268E+00
71+	-4.1365E+00	-1.2366E+01	9.4195E+01	-3.3808E+02	4.9571E+02	-2.5063E+02	4.7473E+00
72+	2.7249E+00	1.9517E+01	-5.7396E+01	7.4035E+01	-3.4408E+01	2.4251E+00	6.0778E-01
73+	7.3610E+00	3.4555E+01	-1.8212E+02	4.6418E+02	-5.2605E+02	2.2730E+02	-4.3546E+00
74+	-1.4094E+00	2.5217E+01	-1.3867E+02	3.2268E+02	-3.2609E+02	1.1312E+02	3.4823E+00
75+	8.7078E-01	8.4897E+00	-3.7585E+00	-6.0360E+01	1.1419E+02	-5.8506E+01	1.2781E+00
76+	1.8374E+00	1.0799E+01	-3.6912E+01	6.5447E+01	-5.7749E+01	2.2642E+01	-2.3851E-01
77+	2.1841E+00	9.7928E+00	-4.1862E+01	1.0128E+02	-1.1612E+02	5.3186E+01	-1.1840E+00
78+	1.5153E+00	5.6592E+00	-2.2465E+01	5.3855E+01	-6.2704E+01	3.0354E+01	-8.3941E-01
79+	1.2656E+00	3.8844E+00	-1.7838E+01	4.7768E+01	-5.8579E+01	2.8816E+01	-9.3389E-01
80+	5.0046E+00	5.5869E+00	-2.2220E+01	7.6735E+01	-1.0343E+02	5.5040E+01	-4.1629E+00
81+	-5.1001E-02	-8.6416E-02	-1.9022E+00	7.4808E+00	-9.6252E+00	3.8957E+00	5.5942E-01

Conclusion

The single electron-impact ionization cross sections of H, He, N, O, Ar, Xe, Au, Pb atoms and their positive ions (i.e. all ionization stages) in the electron energy range from the threshold up to 200 keV are presented. The data-set for the cross sections has been created on the basis of available experimental data and calculations performed by the computer code ATOM. The accuracy of the calculated data is within a factor of 1,5-2. Consistent data for the ionization cross sections have been fitted by seven parameters function using the LSM method. The fitting parameters for all atoms and ions listed above may be used for quick evaluations in various technical tasks and for the planing of the experiments.

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Сечение ионизации электронным ударом атомов
и ионов H, He, N, O, Ar, Xe, Au, Pb от порога ионизации до 200 кэВ

Приведены однократные сечения ионизации электронным ударом атомов H, He, N, O, Ar, Xe, Au, Pb и их положительных ионов всех возможных ионизированных состояний при энергиях от порога ионизации до 200 кэВ. Система данных для сечений ионизации создана на основе экспериментальных данных и расчетов, выполненных с помощью компьютерной программы ATOM. Согласованные данные для сечений ионизации получены в результате фитирования с семью параметрами методом наименьших квадратов.

Точность представленных расчетных данных находится в пределах двукратной ошибки, что во многих случаях достаточно для решения кинетических задач в плазме. Вклад процессов ионизации в результате возбуждения и резонансной ионизации, так же как многократная ионизация атомов и ионов, здесь не рассматривается. Проведено сравнение результатов численных расчетов с хорошо известной формулой Лотса для ионизации нейтральных атомов и положительных ионов. Работа содержит графики и таблицы сечений ионизации электронным ударом, энергий связи и параметров фитирования.

Представленные данные можно рассматривать как предварительный результат для сечения ионизации электронным ударом, которые могут быть исправлены и улучшены в будущем при использовании новых экспериментальных данных или более точных расчетов.

Работа выполнена в Лаборатории физики частиц ОИЯИ.

Сообщение Объединенного института ядерных исследований. Дубна, 2001

Povyshev V.M. et al. E9-2001-148
Electron-Impact Ionization Cross Sections
of H, He, N, O, Ar, Xe, Au, Pb Atoms and Their Ions
in the Electron Energy Range from the Threshold up to 200 keV

Single electron-impact ionization cross sections of H, He, N, O, Ar, Xe, Au, Pb atoms and their positive ions (i.e. all ionization stages) are presented in the electron energy range from the threshold up to 200 keV. The data-set for the cross sections has been created on the basis of available experimental data and calculations performed by the computer code ATOM. Consistent data for the ionization cross sections have been fitted by seven parameters using the LSM method.

The accuracy of the calculated data presented is within a factor of 2 that in many cases is sufficient to solve the plasma kinetics problems. Contributions from excitation-autoionization and resonant-ionization processes as well as ionization of atoms and ions are not considered here. The results of the numerical calculations are compared with the well-known Lotz formulae for ionization of neutral atoms and positive ions. The material is illustrated by figures and includes tables of ionization cross sections, binding energies and fitting parameters.

The data presented can be considered as a preliminary result for ionization cross sections which can be corrected and improved in the future by new experimental data or more sophisticated calculations.

The investigation has been performed at the Laboratory of Particle Physics, JINR.

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