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J. Dubau, T. Kato and U.I. Safronova

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NAGOYA, JAPAN

Dielectronic Recombination Rate Coefficients to the Excited States of CI from CII

J.Dubau
Observatoire of Paris, Meudon, F-92195 MEUDON Cedex, France

T.Kato, and U.I.Safronova*
National Institute for Fusion Science, Oroshi-cho, Toki, Gifu, 509-52, Japan

Abstract

The dielectronic recombination rate coefficients to the excited states for n=2-6 are calculated including $1s^2 2l_1 2l_2 2l_3 nl$ (n=2-6, $l \leq$ (n-1)) states. The values for the excited states higher than n=6 are extrapolated and the total dielectronic recombination rate coefficients are derived. The rate coefficients to the excited states are fitted to an analytical formula and the fit parameters are given.

Keywords;

dielectronic recombination rate coefficients, autoionizing level, carbon atom, excited states, autoionization rate, radiative transition probabilities, satellite spectra

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*Permanent address: Institute of Spectroscopy, Russian Academy of Sciences, 142092, Russia

I. INTRODUCTION

Carbon is the main constituent of the graphite tiles which cover the inner side of the vacuum chamber of the latest tokamaks (JET, TFTR, JT-60). Carbon is also one of the most abundant elements of the Universe. The tokamak spectra are very rich in C lines emitted in the outer region of the plasma, the coolest part, where C is not completely ionized and can still emits line spectra.

To model the radiative energy plasma loss much atomic data is required. In particular, ionization and recombination rates are important to calculate the ionization state of C impurities. Many past calculations [1–5] have considered only the total recombination rate. In the present paper, the dielectronic recombination contribution on the population of the different ionic excited states is considered. The recombination rates will play an important role in the plasma cooling when more ionized species recombined progressively. Usual atomic models of hot plasmas, such as the collisional radiative model, consider electron excitation from lower levels and radiative decay from higher levels to be the dominant population mechanisms. Here, data of dielectronic recombination are given which can be added as a population process.

Different theoretical approaches have been used to calculate dielectronic recombination, the simplest of which being the Burgess formula [6]. This popular formula gives a very good estimate of the total recombination rate due to a "statistical" effect coming from summations of very large quantities of atomic data. Indeed, for most ions, the dielectronic recombination occurs diffusely through many excited levels. Summations over hundreds of levels have to be performed. In low density plasma, all the recombinations decay step by step from excited levels to the ground level. For ionization equilibrium calculations the total recombination is the interesting quantity to know. But now, if individual line intensities have to be evaluated for the plasma cooling, the contribution of this recombination must be known also for the individual excited states. It is then not possible to use the Burgess formula and a more detailed approach must be used, i.e. capture through individual autoionizing levels. The purpose of this paper is to present these data.

Dielectronic recombination (DR) process for C (C I from C II) can be schematically represented by

$$\begin{array}{l} 1s^22s^22p + e \Rightarrow 1s^22s2p^2nl,\ 1s^22s2p^3(LS),\ 1s^22p^3nl,\ 1s^22p^4 \\ \qquad\qquad\qquad\Downarrow \qquad\qquad\qquad\qquad\qquad \Downarrow \\ \quad 1s^22s^22p, 1s^22s2p^2+e \quad 1s^22s^22p^2, 1s^22s^22pnl, 1s^22s2p^3(L'S') + h\nu \,, \end{array} \tag{1.1}$$

where $LS = {}^3S, {}^1D, {}^1P$ and $L'S' = {}^5S, {}^3D, {}^3P$. We can see that levels of $1s^22s2p^3$ configuration can be autoionizing and non- autoionizing. Energies of five thresholds ($1s^22s^22p\,{}^2P$, $1s^22s2p^2$ ${}^4P$, ${}^2P$, ${}^2D$, ${}^2S$) considered in this paper are given on Fig. 1. An intensity factor Q_d for transitions from autoionizing levels $\gamma = 1s^22s2p^2nl$, $1s^22s2p^3(LS)$, $1s^22p^3nl$, $1s^22p^4$ to excited states $\gamma' = 1s^22s^22p^2$, $1s^22s^22pnl$, $1s^22s2p^3(LS)$ can be defined as follows:

$$Q_d(\gamma,\gamma'|\alpha_0) = g_\gamma A_r(\gamma,\gamma')K(\gamma,\alpha_0),\ \ K(\gamma,\alpha_0) = \frac{A_a(\gamma,\alpha_0)}{A_r(\gamma)+A_a(\gamma)}, \tag{1.2}$$

$$A_r(\gamma) = \sum_{\gamma''} A_r(\gamma,\gamma''),\ \ A_a(\gamma) = \sum_{\alpha'} A_a(\gamma,\alpha')\,,$$

where $A_r(\gamma,\gamma')$ is radiative transition probability and $A_a(\gamma,\alpha')$ is autoionization rate, $\alpha'=1s^22s^22p$, $1s^22s2p^2$ and $\alpha_0= 1s^22s^22p$.

In the present paper we review data for C (C I from C II) obtained by Nussbaumer and Storey [1,2], Badnell [3], Badnell and Pindzola [4], Ramadan and Hahn [6] and Dubau and Kato [7] . We used Cowan [8] and *SUPERSTRUCTURE* codes taking into account 28 even and 29 odd parity configurations $1s^22l_12l_22l_3nl$ with up to n=6 and $0\leq l \leq$(n-1). The contribution of the configurations with $6\leq n \leq 500$ are taken into account in the calculation of all $1s^22l_12l_22l_3nl[LSJ]$ states up to n=6. The importance of the contributions of highly excited state for DR rate coefficients was underlined by Hahn [9]. Since the DR rate coefficient to each excited state like $\alpha_d(1s^22s^2nl(LS))$ are not given in previous references, we present these data ($\alpha_d(1s^22s^2nl(LS))$) in this paper. We also compare our $\alpha_d(total)$ with results in [4] and [5], in order to show the important contribution of configurations with n$\leq$ 6 [10].

II. ENERGY LEVELS, RADIATIVE TRANSITION PROBABILITIES AND AUTOIONIZATION RATES

We carried out detailed calculations of radiative transition probabilities and autoionization rates for the intermediate states $1s^22s^22pnl$, $1s^22s2p^3$, $1s^22p^4$, $1s^22s2p^2nl$ and $1s^22p^3nl$ with n=2 - 6 (see Table I). The atomic energy levels, radiative transition probabilities and autoionization rates were obtained by using the atomic structure code of Cowan [8]. It was found (see for example Pindzola et al [11]) that using this code, one could obtain good agreement with experimental energies by scaling the electrostatic Slater parameters using the different factor (0.80 in [11] and 0.85 in our case) to correct for correlation effects.

Table II lists energies calculated by *Cowan* (a) and *SUPERSTRUCTURE* (b) codes together with theoretical data obtained by Nahar and Pradhan (c) [19] and recommended data (d) by Wiese et al [12] for C I with $1s^22s^22p^2$, $1s^22s2p^3$, $1s^22s^22p3l$ intermediate states. Difference in theoretical data (a) and (b) should be explained by different improving results using Hartree-Fock approximation. *Cowan* code allows to use scaled factor for radial integrals. We used scaled factor equal to 0.85. *SUPERSTRUCTURE* code based on scaled Thomas-Fermi-Dirac-Amadi potential. Scaled parameter is different for each angular momentum l. These parameters are iterated to give the minimum energy of a term or a group of term. It should be noted that both methods did not take into account correlation effects properly [13,15] that explains disagreement of the data (columns a and b in Table II) with recommended data (column c) for some states. The largest difference takes place for the states with equivalent electrons ($1s^22s^22p^2$ (^1D, ^1S), $1s^22s2p^3$ (^5S, ^3D, ^3P)) and can be explained by the correlation correction. This correction was calculated by perturbation theory in the frame of two orders by $1/Z$- expansion (see for example, Ivanova and Safronova [13]), Vainshtein and Safronova [14] . The second order contributions for the correlation corrections (E_2^{corr}) of C I for $1s^22s^22p^2$ (^3P, ^1D, ^1S) and $1s^22s2p^3$ (^5S, ^3D, ^3P) states are equal (in atomic unit) to -0.1828, 0.1976, -0.1686 and -0.1142, -0.1879, -0.1822 respectively. Data in [19] were obtained by using CI-type expansion. The computer code employed in the intial step (one-electron functions) was *SUPERSTRUCTURE* code. All the bound states of the type $2s^22pnl$, $2s2p^2nl$, $2s^23snl$, $2s^23pnl$, $2p^3nl$ with $n \leq$10 and l=s, p, d, f were included in [19]. We can see from Table II that these data [19] (c) agree sometimes better with recommended data [12] (d) than data in columns (a) and (b), sometimes vice versa. This conclusion confirms only that correlation effects can be only partly taken into account by any modification CI calculations with including one-electron functions.

Table III and IV list data for the even (Table III) and odd (Table IV) parity states with energies above the threshold $1s^22s^22p$. We compared the calculated data obtained by *Cowan* (a) and *SUPERSTRUCTURE* (b) codes. Only for one autoionization state ($1s^22s2p^23s\ ^5P$) we found the recommended (c) data [12]. It is difficult to make conclusion about accuracy of our calculation by comparing with only one this result. The difference for our theoretical results (a and b) for energies is about 2000 cm^{-1} - 6000 cm^{-1} and data in the column a are smaller than data in the column b for all levels given in Tables III and IV. It is difficult to explain these disagreements since for non- autoionization states (see Table II) some data in the column a were smaller, some larger than data in the column b. We compare the calculated data for radiative A_r and non-radiative transition probabilities A_a. Column $\sum(gA_r)$ represents weighted radiative transition probabilities summed for all lower levels (see Eq.(1.2)). We can see that there is only 10% disagreement in data obtained by two codes: *Cowan* and *SUPERSTRUCTURE*. The agreement is much worse in data for autoionization rate (column A_a in Tables III and IV). Probably this disagreement should be explained by different energies for free electron (continuous) functions used in two methods.

The excited $1s^22s^22p(^2P)nl[LSJ]$ levels (n=4, 5, 6) are considered in Table V. We compare energy data calculated by *Cowan* code (a) and obtained by Nahar and Pradhan (b) [19] with recommended data from Ref [12,16]. We can see that disagreement is 1000 -2000 cm^{-1} for energy data in columns (a), (b), (c). The values of energy (E) in column (c) are smaller than the values in column (b) and opposite larger than the values E in column (a). It should be noted that there are no complete set of data in Ref. [12] even for $1s^22s^22p(^2P)4l[LSJ]$ levels, only few for $1s^22s^22p(^2P)nl[LSJ]$ levels with n=5, 6. For some levels we found data in Ref. [16] (see marked as *). Any data in both Ref. [12,16] for $1s^22s^22p(^2P)6g[LSJ]$ and $1s^22s^22p(^2P)6h[LSJ]$ levels are not found. We hope that our calculated energy can help to fill a lack of these data. The last column in Table V gives the weighted radiative transition probabilities summed for all lower levels under given level. Unfortunately we could not find any data for comparison. In [12] the values of radiative transition probabilities are given for some transitions but these data are not enough to obtain $\sum(gA_r)$ for comparison with results given in Table III.

Table VI lists energy levels, weighted radiative transition probabilities and autoionization rates for autoionizing $1s^22s2p^2nl$, $1s^22p^3nl$ states with n=4. We did not include the similar data for levels with n=5 and 6 since this file will be very big. All data in Table VI are in the order of increasing the energy levels. We separated data for each l. As a result energies data for $1s^22s2p^24l$ levels are distributed between the first $1s^22s^22p\ ^2P$ threshold and the fifth $1s^22s2p^2\ ^2S$ threshold (this is the largest one in energy among four $1s^22s2p^2\ ^4P$, ^2P, ^2D, ^2S states). The energies of $1s^22p^34l$ levels are larger than energies of $1s^22s2p^24l$ levels and they are situated above the $1s^22s2p^2\ ^2S$ threshold. We can see that $A_a(\gamma, \alpha_0)$ for these states ($\alpha_0 = 1s^22s^22p\ ^2P$), the column $A_a(2s^22p(^2P))$ in Table VI, is much smaller than the total rate $A_a(\gamma) = \sum_{\alpha'} A_a(\gamma, \alpha')$, where α'=$1s^22s^22p\ ^2P$, $1s^22s2p^2\ ^4P$, ^2P, ^2D, ^2S. In this case the $1s^22p^34l$ states contribute to Q_d much smaller than $1s^22s2p^24l$ states (see Eq.(1.2)) due to the small value of $\frac{A_a(\gamma,\alpha_0)}{A_a(\gamma)}$. The same conclusion is for the similar states with n=5 and 6.

III. DIELECTRONIC RECOMBINATION RATE COEFFICIENTS TO THE EXCITED STATES

The dielectronic recombination rate coefficients $\alpha_d(\gamma'|\alpha_0)$, to the excited state are obtained by summing up the intensity factor $Q_d(\gamma,\gamma'|\alpha_0)$ multiplied the exponential factor over the autoionizing levels as follows,

$$\alpha_d(\gamma'|\alpha_0) = 3.3\times10^{-24}\left(\frac{I_H}{T_e}\right)\sum_\gamma e^{-\frac{E_S}{T_e}}Q_d(\gamma,\gamma'|\alpha_0)/g(\alpha_0)\,. \tag{3.1}$$

Here I_H is the hydrogen ionization potential (13.606eV) and E_S is the energy of the autoionizing states counted from the threshold ($1s^22s^22p\ ^2P$ in our case) and $g(\alpha_0)$ is the statistical weight of the threshold and equal to 6 in our case and
γ'=$1s^22s^22pnl$, $1s^22s2p^3$ (^5S, ^3D, ^3P),
γ=$1s^22s2p^3$ (^3S, ^1D, ^1P), $1s^22p^4$, $1s^22s2p^2nl$, $1s^22p^3nl$,
α_0=$1s^22s^22p$,
α'=$1s^22s^22p$, $1s^22s2p^2$, $1s^22p^3$.

Sum over γ means sum over all autoionization levels. We calculated $Q_d(\gamma,\gamma'|\alpha_0)$ values only up to n=6 by *Cowan* code and summed all the values up to n=6 to obtain $\alpha_d(\gamma'|2s^22p)$ for $\gamma' = 2s^22pnl$.

For $\alpha_d(\gamma'|2s^22p)$ with γ' of configuration $2s^22p^2$ and $2s2p^3$, the transitions $2s2p^2np \rightarrow 2s^22p^2$ and $2s2p^2ns, nd \rightarrow 2s2p^3$ will be also important for n higher than 6. Therefore we included the contributions of these transitions up to n = 30 in Eq.(3) using the following extrapolation for A_r and A_a with the value of n_0 = 6:

$$A_r(np,2s) \simeq A_r(n_0p,2s)\left(\frac{n_0}{n}\right)^3\left(\frac{\frac{1}{2^2}-\frac{1}{n^2}}{\frac{1}{2^2}-\frac{1}{n_0^2}}\right)^3, \tag{3.2}$$

$$A_r(2s2p^2np) = A_r(2s2p^2n_0p)\frac{A_r(2s2p^2np,2s^22p^2)}{A_r(2s2p^2n_0p,2s^22p^2)}, \tag{3.3}$$

$$A_a(2s2p^2np) = A_a(2s2p^2n_0p)\left(\frac{n_0}{n}\right)^3. \tag{3.4}$$

The value of $E_S(n>6)$ is assumed to be equal to $E_S(n_0)$. The same extrapolation are used for transitions $2s2p^2ns, nd \rightarrow 2s2p^3$.

Results of our calculations of $\alpha_d(\gamma'|\alpha_0)$ for 40 excited levels are shown on Fig. 2 (γ'=$2s^22p^2$ (^3P, ^1D, ^1S), $2s2p^3$ (^5S, ^3D, ^3P)), Fig. 3 (γ'=$2s^22p3l$ (LSJ)) and Fig. 4 (γ'=$2s^22p4l(LSJ)$) as a function of T_e. Table VII shows the part of atomic data used for $\alpha_d(\gamma'|2s^22p)$ to the excited states that can help us to explain the T_e dependence for $\alpha_d(\gamma'|2s^22p)$ shown on Fig. 2–Fig. 4. These data were chosen by the largest values of radiative transition probabilities $A_r(\gamma,\gamma')$ and accordingly $Q_d(\gamma,\gamma'|2s^22p)$. It should be noted that we have two sets of terms with one LS but different intermediate terms: $2p^2(^3P)2s[^2P]nl$ (LS) and $2p^2(^3P)2s[^4P]nl$ (LS). We used additional designations a and b to distinguish these terms.

We can see that the maximum of curves changes from 2eV (Fig. 2a) to 10eV (Fig. 4). The largest value of $A_r(\gamma,\gamma')$ for γ'=$2s^22p^2$ (^3P, ^1D, ^1S) came by transitions from the autoionizing γ=$2s2p^3$(^3S, ^1D, ^1P) and $2p^2(^3P)2s[^4P]np$ (^3Sb, ^3Db) states. The values of E_S for these levels are between 1.7eV to 3.7 eV. As a result the maxima of curves shown on Fig. 2a for $\alpha_d(\gamma'|2s^22p)$ with γ'=$2s^22p^2$(^3P, ^1D, ^1S) are around T_e=2eV. The maximum of the curve $\alpha_d(2s2p^3\ ^5S|2s^22p)$ (see Fig. 2b) is around 1eV that should be explained by the contribution of $2s2p^3\ ^5S$ - $2p^2(^3P)2s[^4P]3s\ ^5P$ transition since the value E_S for $2p^2(^3P)2s[^4P]3s$ ^5P term is equal to 1.022eV (see Table VII). There is also $2s2p^3\ ^5S$ - $2p^2(^3P)2s[^4P]3d\ ^5P$ transitions with the similar value of A_r as the first one but with the larger value of E_s for term $2p^2(^3P)2s[^4P]3d\ ^5P$ (3.273 eV). The contribution of the second transitions to the value of $\alpha_d(2s2p^3\ ^5S\ |2s^22p)$ should be less than the contribution of the first in 10 times by the exponential factor exp($-E_S/T_e$) with T_e = 1.022eV. This is why all maxima on Fig. 2–Fig. 4 are shifted for the smallest value of E_s among transitions given in Table VII for these excited states. Maximum for $\alpha_d(2s^22p3s\ ^{1,3}P\ |2s^22p)$ (see Fig. 3a) is around 6eV by the $2s^22p3s$ $^{1,3}P$ - $2p^2(^1D)2s3s\ ^{1,3}D$ transitions with E_S=5.6eV for these autoionizing levels. Maximum of $\alpha_d(2s^22p3d\ ^3P\ |2s^22p)$ (see Fig. 3c) is shifted to smaller T_e comparison with the other curves on this Fig. 3c. This shift can be explained by the contribution $2p^2(^3P)2s[^4P]3d\ ^3D_J$ levels with E_S =3.3 eV which did not shown in Table VII since the values of $gA_r(\gamma,\gamma')$ with γ= $2p^2(^3P)2s[^4P]3d\ ^3D_J$ are less than 10^9 s^{-1}. The same shift we can see for $\alpha_d(2s^22p4p$ $^3P|\ 2s^22p)$ and $\alpha_d(2s^22p4d\ ^3P,^3F|\ 2s^22p)$ (Fig. 4b, 4c). Maxima all other curves shown in Figs. 4a,4b, 4c are around 10eV by contributions $2p^22s4l$ (LS) states with E_S around 10eV (see Table VII). It should be noted that the largest values of $\alpha_d(\gamma'|\alpha_0)$ are for the first excited states as γ'=$1s^22s^22p^2$ (^3P, ^1D) and $1s^22s^22l4l$ (LS) are less than 10^{-13}cm^3/s.

IV. TOTAL DIELECTRONIC RECOMBINATION RATE COEFFICIENTS

The total dielectronic recombination rate coefficient is obtained by the sum of all the levels,

$$\alpha_d^t(\alpha_0) = 3.3\times10^{-24}\left(\frac{I_H}{T_e}\right)^{3/2}\sum_{\gamma,\gamma'} e^{-\frac{E_S}{T_e}}Q_d(\gamma,\gamma'|\alpha_0)/g(\alpha_0)\,. \tag{4.1}$$

Sum over γ means sum over all autoionization levels. As we already mentioned before we calculated numerically $Q_d(\gamma,\gamma'|\alpha_0)$ values with γ'=$1s^22s^22pnl$, $1s^22s2p^3$ (^5S, ^3D, ^3P) and γ=$1s^22s2p^3$ (^3S, ^1D, ^1P), $1s^22p^4$, $1s^22s2p^2nl$, $1s^22p^3nl$ up to n=6. We take into account the states with $n\geq6$ by scaling Q_d. It was shown in Ref. [17,18] that the largest contribution to Q_d for large n gives 2s-2p transitions. In our case it is the transitions as $2s^22pnl[LS]$-$2s2p^2(LS)nl[L'S']$. Radiative transition probabilities for these transitions are almost constant for large n and non-radiative transition probabilities (autoionizing rates) are proportional $\frac{1}{n^3}$:

$$\begin{aligned} &A_r(2s^22pnl[LS],\ 2s2p^2(L_{12}S_{12})nl[L'S'J'])\\ &= A_r(2s^22pn_0l[LS],\ 2s2p^2(L_{12}S_{12})n_0l[L'S'J'])\,, \end{aligned} \tag{4.2}$$

$$\begin{aligned} &A_a(2s2p^2(L_{12}S_{12})nl[L'S'J']|\ 2s^22p\ ^2P)\\ &= \left(\frac{n_0}{n}\right)^3 A_a(2s2p^2(L_{12}S_{12})n_0l[L'S'J']|\ 2s^22p\ ^2P)\,. \end{aligned} \tag{4.3}$$

Tables VIII and IX give these data for n=4, 5, 6 with l=s, p, d, f, g and all kind of $L'S'J'$. We chose for illustration the data with largest values of Q_d. Also we represented in Table IX the summed over LS data for A_r and Q_d. We can see from Tables VIII and IX that Eqs.(4.2,4.3) are correct for transitions with large values of A_r and A_a (see, for example, $2s^22pnp$ - $2s2p^2(^1D)np$ [$^1F_3,^3F_J$, ^3D_J, $^1D_2$, ^3P_J, $^1P_1$], $2s^22pnp$ - $2s2p^2(^1S)np$ [^3P_J, $^1P_1$]. Using this approximation we can represent Q_d for these transition in the next form:

$$Q_d^{n_0}(2s2p^2(L_{12}S_{12})nl[L'S'J'],\ 2s^22pnl[LS]|2s^22p\ ^2P) = (2J'+1)\frac{f(n_0)}{1+f'(n_0)\left(\frac{n}{n_0}\right)^3}, \qquad (4.4)$$

where

$$f(n_0) = A_r(2s^22pn_0l[LS],\ 2s2p^2(L_{12}S_{12})n_0l[L'S'J']) \qquad (4.5)$$
$$\times\frac{A_a(2s2p^2(L_{12}S_{12})n_0l[L'S'J']|\ 2s^22p\ ^2P)}{A_a(2s2p^2(L_{12}S_{12})n_0l[L'S'J'])},$$

$$f'(n_0) = \frac{A_r(2s2p^2(L_{12}S_{12})n_0l[L'S'J'])}{A_a(2s2p^2(L_{12}S_{12})n_0l[L'S'J'])}. \qquad (4.6)$$

By using these formulas we can calculate Q_d for above mentioned transitions with any n. The calculated values of Q_d for n_0=4, 5, 6, together with E_S are given in Tables VIII and IX. Using these values we can scale for any n. It is evident that results obtained by using different n_0 will be different and therefore the part of $\alpha_d^{n_0}(nl|\ 2s^22p\ ^2P)$ which includes sum over all LSJ momentum of initial and final states will be also different.

$$\alpha_d^{n_0}(nl|\ 2s^22p\ ^2P) = 0.55\times10^{-24}\left(\frac{I_H}{T_e}\right)^{3/2}\sum_{L'S'J'}\sum_{L_{12}S_{12}}\sum_{LS}e^{-\frac{E_S}{T_e}} \qquad (4.7)$$
$$\times Q_d^{n_0}(2s2p^2(L_{12}S_{12})nl[L'S'J'],\ 2s^22pnl[LS]|2s^22p\ ^2P).$$

We checked our conclusion by comparison $\alpha_d^{n_0}(nl|\ 2s^22p\ ^2P)$ for n_0=4 and n_0=6 on Fig. 5a and Fig. 5b. On these figures the value of $\alpha_d^{n_0}(nl|\ 2s^22p\ ^2P)$ is plotted as function of n with T_e=6eV. The curves of α_d^t are shown for different l and summed over l. We can see that n-dependence of $\alpha_d^{n_0}(nl|\ 2s^22p\ ^2P)$ and

$$\alpha_d^{n_0}(n|\ 2s^22p\ ^2P) = \sum_l \alpha_d^{n_0}(nl|\ 2s^22p\ ^2P) \qquad (4.8)$$

changes very much with n_0. We include additional contributions $\alpha_d^{n_0}(ng|\ 2s^22p\ ^2P)$ and $\alpha_d^{n_0}(nh|\ 2s^22p\ ^2P)$ by using data for n_0=6. We found that the values $\alpha_d^{n_0}(nl|\ 2s^22p\ ^2P)$ for l = s, p, d, f are decreased with increasing n_0. As a result the value of $\alpha_d^{n_0}(n|\ 2s^22p\ ^2P)$ is not so different for n_0 =4 and 6 (see Fig. 5a and Fig. 5b). Fig. 6a and Fig. 6b demonstrate sum of $\alpha_d^{n_0}(nl|\ 2s^22p\ ^2P)$ over n for different upper limit N:

$$\alpha_d^t(n_0, Nl|\ 2s^22p\ ^2P) = \sum_{n=n_o}^{N}\alpha_d^{n_0}(nl|\ 2s^22p\ ^2P). \qquad (4.9)$$

The N-dependencies of $\alpha_d^t(n_0, Nl|\,2s^22p\,^2P)$ are shown on Fig. 6a for n_0=4 and Fig. 6b for n_0=6. We can see $\alpha_d^t(n_0=4, Nl|\,2s^22p\,^2P)$ is larger than $\alpha_d^t(n_0=6, Nl|\,2s^22p\,^2P)$ for all l and N. Even additional contribution $\alpha_d^t(n_0=6, Ng|\,2s^22p\,^2P)$ and $\alpha_d^t(n_0=6, Nh|\,2s^22p\,^2P)$ did not increase sum over l for $\alpha_d^t(n_0=6, Nl|\,2s^22p\,^2P)$ comparison with sum over l for $\alpha_d^t(n_0=4, Nl|\,2s^22p\,^2P)$.

$$\alpha_d^t(n_0, N|\,2s^22p\,^2P) = \sum_l \alpha_d^t(n_0, Nl|\,2s^22p\,^2P)\,. \tag{4.10}$$

As a result the value of $\alpha_d^t(n_0=6, N|\,2s^22p\,^2P)$ is smaller than the value of $\alpha_d^t(n_0=4, N|\,2s^22p\,^2P)$ almost in two times for N=500. It is much smaller the difference between data obtained with $n_0=5$ and $n_0=6$. We consider sum over n up to n=500:

$$\alpha_d^t(n_0, l|\,2s^22p\,^2P) = \sum_{n=n_o}^{500} \alpha_d^t(n_0, nl|\,2s^22p\,^2P)\,. \tag{4.11}$$

The values of $\alpha_d^t(n_0, l|\,2s^22p\,^2P)$ for n_0 =5 and n_0 =6 are shown on Fig. 7 as a function of T_e. We can see that the difference in all curves with n_0 =5 and n_0 =6 is much smaller than we had for n_0 =4 and n_0 =6 (see Fig. 5 and Fig. 6). It should be noted that the largest contribution gives states with n_0d electrons: $2s^22pnd$- $2s2p^2$ $(L_{12}S_{12})nd$ transitions.

The value of α_d^t as a sum of contributions from excited states (n=2 -6) and states from n=7 up to n=500 is shown on Fig. 8. We can see that the $''n=2-6''$ contribution is smaller than the $''n=7-500''$ contribution in 15 times (in maximum). Only for very small T_e (T_e $\leq$1eV) the first one is important. Together with the α_d^t, scaled with n_0=6, we show on Fig. 8 the α_d^t, scaled with n_0=4. We can see that the $\alpha_d^t(n_0=6)$ is smaller than the $\alpha_d^t(n_0=4)$ in 1.7 times. It is interesting to note that results obtained by Badnell and Pindzola [4] and Ramadan and Hahn [5] are exactly between our results obtained with two different scaling ((n_0=6) and (n_0=4)). Probably in Ref. [4,5] the scaling with n_0=4 was used. It is difficult to say which is better but from mathematical point of view Eq.(4.1) it is more correct to calculate numerically as more as possible and the scaling used only it is not possible to calculate more numerically if the values are equally reliable. From this point of view our data with scale n_0=6 ($\alpha_d^t(n_0=6)$) are expected to be more precise than our data with scale n_0=4 ($\alpha_d^t(n_0=4)$) and consequently the data in Ref. [4,5].

V. CONCLUSION

Wavelengths, weighted radiative transitions probabilities and branching ratios together with factor intensities were calculated in order to build the dielectronic satellite spectra and to obtain dielectronic rates coefficients into the excited states. From comparison with available theoretical and experimental data we can be sure that accuracy of our data for energies is 0.1 - 1%. This is very important since we should be very accurate for dividing level on non-autoionizing and autoionizing for sum over all state for calculations of dielectronic rate coefficients. The accuracy of data for radiative and non-radiative transition probabilities is much worse than the energy, especially for the last one since these data depended on the energy of free electrons.

We have to note that the contributions from the $2s2p^2(^4P)3s\,^5P$ and $2s2p^3\,^1D$ state give the first maximum around the first threshold ($2s^22p\,^2P$) and $2p$-$2s$ transition with n=6-500 creates the second maximum around the third ($2s2p^2\ ^2D$) threshold. It should be noted that the first maximum at 1 eV is not a real maximum for α_d^t, it is only caused by the fact that for temperatures above 1 eV the $2p$-$2s$ transition with n=6-500 become dominant. At 10 eV the transitions with $n \leq 6$ contribute less than 8% to the total dielectronic recombination rate coefficient; including the contribution from higher levels ($n \leq 500$) provides another 92%. This confirms that it is very important to take into account these transitions.

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TABLES

TABLE I. Labeling of configurations for even and odd complexes

N	Even parity complex	N	Odd parity complex
1	$2s^22p^2$	1	$2s2p^3$
2	$2s^22p3p$	2	$2s^22p3s$
3	$2p^4$	3	$2s^22p3d$
4	$2s2p^23s$	4	$2s2p^23p$
5	$2s2p^23d$	5	$2p^33s$
6	$2p^33p$	6	$2p^33d$
7	$2s^22p4p$	7	$2s^22p4s$
8	$2s^22p4f$	8	$2s^22p4d$
9	$2s2p^24s$	9	$2s2p^24p$
10	$2s2p^24d$	10	$2s2p^24f$
11	$2p^34p$	11	$2p^34s$
12	$2p^34f$	12	$2p^34d$
13	$2s^22p5p$	13	$2s^22p5s$
14	$2s^22p5f$	14	$2s^22p5d$
15	$2s2p^25s$	15	$2s^22p5g$
16	$2s2p^25d$	16	$2s2p^25p$
17	$2s2p^25g$	17	$2s2p^25f$
18	$2p^35p$	18	$2p^35s$
19	$2p^35f$	19	$2p^35d$
20	$2s^22p6p$	20	$2p^35g$
21	$2s^22p6f$	21	$2s^22p6s$
22	$2s^22p6h$	22	$2s^22p6d$
23	$2s2p^26s$	23	$2s^22p6g$
24	$2s2p^26d$	24	$2s2p^26p$
25	$2s2p^26g$	25	$2s2p^26f$
26	$2p^36p$	26	$2s2p^26h$
27	$2p^36f$	27	$2p^36s$
28	$2p^36h$	28	$2p^36d$
		29	$2p^36g$

TABLE II. Energy ($10^3 cm^{-1}$) and sum of weighted radiative transition probabilities ($\sum(gA_r)$ in sec^{-1}) of carbon (C I) for $1s^2 2s2l_1 2l_2(L_{12}S_{12})nl[LSJ]$ states. Comparison of different methods and recommended data from [12]: a-Cowan code, b-SUPERSTRUCTURE code, c-[18], d - [12]

N	$2s2l_12l_2$	$L_{12}S_{12}$	LS	J	E in 10^3cm^{-1}				$\sum(gA_r)$
					a	b	c	d	a
1	$2s^22p^2$	(^3P)	^3P	0	0.000	0.000	0.000	0.000	0.0000+00
1	$2s^22p^2$	(^3P)	^3P	1	0.016	0.016	0.016	0.000	0.0000+00
1	$2s^22p^2$	(^3P)	^3P	2	0.046	0.043	0.044	0.000	0.0000+00
1	$2s^22p^2$	(^1D)	^1D	2	10.651	13.398	10.502	10.194	0.0000+00
1	$2s^22p^2$	(^1S)	^1S	0	18.953	20.411	23.023	21.648	0.0000+00
2	$2s^22p3p$	(^2P)	^1P	1	66.496	66.608	69.661	68.858	0.2661+08
2	$2s^22p3p$	(^2P)	^3D	1	67.049	67.373	69.650	69.690	0.4892+08
2	$2s^22p3p$	(^2P)	^3D	2	67.069	67.403	69.650	69.711	0.8172+08
2	$2s^22p3p$	(^2P)	^3D	3	67.102	67.451	69.650	69.744	0.1145+09
2	$2s^22p3p$	(^2P)	^3S	1	67.776	68.401	71.855	70.744	0.5717+08
2	$2s^22p3p$	(^2P)	^3P	0	70.418	70.859	72.722	71.353	0.4452+08
2	$2s^22p3p$	(^2P)	^3P	1	70.429	70.876	72.722	71.365	0.1337+09
2	$2s^22p3p$	(^2P)	^3P	2	70.451	70.906	72.722	71.386	0.2231+09
2	$2s^22p3p$	(^2P)	^1D	2	71.863	73.077	74.248	72.611	0.2293+09
2	$2s^22p3p$	(^2P)	^1S	0	73.420	76.223	75.992	73.976	0.5352+08
1	$2s2p^3$	(^4S)	^5S	2	31.866	24.432	32.515	33.735	0.0000+00
1	$2s2p^3$	(^2D)	^3D	1	67.674	66.917	63.943	64.092	0.1026+10
1	$2s2p^3$	(^2D)	^3D	2	67.675	66.919	63.943	64.093	0.1710+10
1	$2s2p^3$	(^2D)	^3D	3	67.676	66.922	63.943	64.089	0.2392+10
1	$2s2p^3$	(^2P)	^3P	2	78.757	76.158	76.014	75.256	0.4019+10
1	$2s2p^3$	(^2P)	^3P	1	78.763	76.186	76.014	75.256	0.2419+10
1	$2s2p^3$	(^2P)	^3P	0	78.766	76.197	76.014	75.256	0.8079+09
2	$2s^22p3s$	(^2P)	^3P	0	58.382	58.661	60.585	60.353	0.3020+09
2	$2s^22p3s$	(^2P)	^3P	1	58.402	58.689	60.585	60.353	0.9067+09
2	$2s^22p3s$	(^2P)	^3P	2	58.443	58.748	60.585	60.394	0.1513+10
2	$2s^22p3s$	(^2P)	^1P	1	59.686	61.388	62.385	61.982	0.1219+10
3	$2s^22p3d$	(^2P)	^3P	2	75.558	80.371	80.996	79.311	0.6703+09
3	$2s^22p3d$	(^2P)	^3P	1	75.570	80.375	80.996	79.319	0.4165+09
3	$2s^22p3d$	(^2P)	^3P	0	75.577	80.377	80.996	79.319	0.1413+09
3	$2s^22p3d$	(^2P)	^1D	2	76.069	76.288	79.350	77.681	0.3626+09
3	$2s^22p3d$	(^2P)	^3D	1	76.590	77.036	80.119	78.301	0.1001+10
3	$2s^22p3d$	(^2P)	^3D	2	76.606	77.050	80.119	78.307	0.1836+10
3	$2s^22p3d$	(^2P)	^3D	3	76.613	77.063	80.119	78.316	0.2513+10
3	$2s^22p3d$	(^2P)	^1F	3	76.682	77.433	80.327	78.531	0.1767+10
3	$2s^22p3d$	(^2P)	^3F	2	76.413	76.714	79.965	78.216	0.2023+09
3	$2s^22p3d$	(^2P)	^3F	3	76.429	76.739	79.965	78.216	0.3085+09
3	$2s^22p3d$	(^2P)	^3F	4	76.461	76.782	79.965	78.216	0.3402+09
3	$2s^22p3d$	(^2P)	^1P	1	76.644	77.653	79.877	78.728	0.2985+09

TABLE III. Energy ($10^3 cm^{-1}$), sum of weighted radiative transition probabilities ($\sum(gA_r)$ in sec^{-1}) and autoionization rates (A_a in sec^{-1}) of carbon (C I) for $1s^2 2s2l_1 2l_2 (L_{12}S_{12})nl[LSJ]$ (even parity) states. Comparison of different methods and recommended data from [12]: *a*-Cowan code, *b*-SUPERSTRUCTURE code (lebels of levels are given in the third column), *c* - [12]

				Even parity states					
N		$2s2l_12l_2$	$L_{12}S_{12}$	LS	J	E	$\sum(gA_r)$	$A_a(2s^22p(^2P)$	$\sum(A_a))$
4	*a*	$2s2p^23s$	(^3P)	^5P	1	99.068	0.5492+09	0.2000+10	0.2000+10
7	*b*	39				103.177	0.5283+09	0.8692+09	
	c					103.542			
4	*a*	$2s2p^23s$	(^3P)	^5P	2	99.089	0.9164+09	0.3000+10	0.3000+10
7	*b*	40				103.207	0.8805+09	0.1543+10	
	c					103.563			
4	*a*	$2s2p^23s$	(^3P)	^5P	3	99.120	0.1285+10	0.1000+07	0.1000+10
7	*b*	41				103.253	0.1232+10	0.2276+08	
	c					103.587			
4	*a*	$2s2p^23s$	(^3P)	^3Pb	0	103.501	0.2099+09	0.5689+15	0.5689+15
7	*b*	43				110.017	0.2926+09	0.3123+15	
4	*a*	$2s2p^23s$	(^3P)	^3Pb	1	103.518	0.6300+09	0.5889+15	0.5889+15
7	*b*	44				110.041	0.8775+09	0.3123+15	
4	*a*	$2s2p^23s$	(^3P)	^3Pb	2	103.552	0.1051+10	0.5890+15	0.5890+15
7	*b*	45				110.092	0.1463+10	0.3122+15	
4	*a*	$2s2p^23s$	(^1D)	^3D	1	136.012	0.2742+10	0.1696+15	0.2029+15
7	*b*	86				141.096	0.3210+10	0.1827+14	
4	*a*	$2s2p^23s$	(^1D)	^3D	2	136.012	0.4568+10	0.1696+15	0.2029+15
7	*b*	87				141.096	0.5345+10	0.1827+14	
4	*a*	$2s2p^23s$	(^1D)	^3D	3	136.012	0.6391+10	0.1696+15	0.2029+15
7	*b*	88				141.096	0.7476+10	0.1827+14	
4	*a*	$2s2p^23s$	(^1D)	^1D	2	139.156	0.2608+10	0.2394+15	0.4373+15
7	*b*	89				145.306	0.3145+10	0.2437+15	
5	*a*	$2s2p^23d$	(^3P)	^3Pb	0	117.254	0.8590+08	0.7360+12	0.7360+12
9	*b*	67				122.182	0.1437+09	0.1707+13	
5	*a*	$2s2p^23d$	(^3P)	^3Pb	1	117.245	0.2610+09	0.6860+12	0.6860+12
9	*b*	65				122.168	0.4302+09	0.1713+13	
5	*a*	$2s2p^23d$	(^3P)	^3Pb	2	117.228	0.4367+09	0.6080+12	0.6080+12
9	*b*	62				122.142	0.7155+09	0.1729+13	
5	*a*	$2s2p^23d$	(^3P)	^5P	1	117.293	0.9098+09	0.1000+11	0.1000+11
9	*b*	72				122.318	0.2029+09	0.2713+10	
5	*a*	$2s2p^23d$	(^3P)	^5P	2	117.292	0.1547+10	0.1200+11	0.1200+11
9	*b*	71				122.301	0.3392+09	0.3999+10	
5	*a*	$2s2p^23d$	(^3P)	^5P	3	117.287	0.2207+10	0.1000+07	0.1000+07
9	*b*	70				122.278	0.4747+09	0.2628+09	

N		$2s2l_12l_2$	$L_{12}S_{12}$	LS	J	E	$\sum(gA_r)$	$A_a(2s^22p(^2P))$	$\sum(A_a)$
5	*a*	$2s2p^23d$	(^3P)	^5F	1	117.363	0.1105+09	0.1000+07	0.1000+07
9	*b*	63				122.147			
5	*a*	$2s2p^23d$	(^3P)	^5F	2	117.369	0.1843+09	0.1000+07	0.1000+07
9	*b*	64				122.157	0.2794+09	0.3910+10	
5	*a*	$2s2p^23d$	(^3P)	^5F	3	117.380	0.2585+09	0.1000+07	0.1000+07
9	*b*	66				122.172			
5	*a*	$2s2p^23d$	(^3P)	^5F	4	117.394	0.3322+09	0.1000+07	0.1000+07
9	*b*	68				122.193			
5	*a*	$2s2p^23d$	(^3P)	^5F	5	117.412	0.4049+09	0.1000+07	0.1000+07
9	*b*	69				122.220			
5	*a*	$2s2p^23d$	(^3P)	^3Fb	2	117.624	0.7853+09	0.1480+12	0.1480+12
9	*b*	78				122.728	0.9800+09	0.2038+13	
5	*a*	$2s2p^23d$	(^3P)	^3Fb	3	117.641	0.1098+10	0.1490+12	0.1490+12
9	*b*	79				122.754	0.1368+10	0.2032+13	
5	*a*	$2s2p^23d$	(^3P)	^3Fb	4	117.665	0.1402+10	0.1480+12	0.1480+12
9	*b*	80				122.789	0.1753+10	0.2028+13	
5	*a*	$2s2p^23d$	(^3P)	^5D	0	117.703	0.3608+08	0.1000+10	0.1000+10
9	*b*	73				122.651			
5	*a*	$2s2p^23d$	(^3P)	^5D	1	117.705	0.1090+09	0.1000+10	0.1000+10
9	*b*	74				122.656	0.1653+09	0.1217+10	
5	*a*	$2s2p^23d$	(^3P)	^5D	2	117.709	0.1835+09	0.1000+10	0.1000+10
9	*b*	75				122.661	0.2765+09	0.3505+10	
5	*a*	$2s2p^23d$	(^3P)	^5D	3	117.715	0.2586+09	0.1000+07	0.1000+07
9	*b*	76				122.669	0.3895+09	0.9277+10	
5	*a*	$2s2p^23d$	(^3P)	^5D	4	117.722	0.3402+09	0.2000+10	0.2000+10
9	*b*	77				122.676	0.5044+09	0.1614+11	
5	*a*	$2s2p^23d$	(^3P)	^3Db	1	117.995	0.4124+09	0.1440+12	0.1440+12
9	*b*	81				123.334	0.6441+09	0.1660+13	
5	*a*	$2s2p^23d$	(^3P)	^3Db	2	118.001	0.6876+09	0.1460+12	0.1460+12
9	*b*	82				123.344	0.1074+10	0.1662+13	
5	*a*	$2s2p^23d$	(^3P)	^3Db	3	118.010	0.9645+09	0.1450+12	0.1450+12
9	*b*	83				123.356	0.1503+10	0.1665+13	
4	*a*	$2s2p^23s$	(^1D)	^3D	1	136.012	0.2742+10	0.1696+15	0.2029+15
7	*b*	86				141.096	0.3210+10	0.1827+14	
4	*a*	$2s2p^23s$	(^1D)	^3D	2	136.012	0.4568+10	0.1696+15	0.2029+15
7	*b*	87				141.096	0.5345+10	0.1827+14	
4	*a*	$2s2p^23s$	(^1D)	^3D	3	136.012	0.6391+10	0.1696+15	0.2029+15
7	*b*	88				141.096	0.7476+10	0.1827+14	

N		$2s2l_12l_2$	$L_{12}S_{12}$	LS	J	E	$\sum(gA_r)$	$A_a(2s^22p(^2P))$	$\sum(A_a)$
4	a	$2s2p^23s$	(^1D)	^1D	2	139.156	0.2608+10	0.2394+15	0.4373+15
7	b	89				145.306	0.3145+10	0.2437+15	
5	a	$2s2p^23d$	(^1D)	^1D	2	153.429	0.2940+10	0.6689+13	0.1294+15
9	b	103				158.438	0.4364+10	0.1632+10	
5	a	$2s2p^23d$	(^1D)	^3S	1	153.508	0.5480+10	0.4168+14	0.5663+14
9	b	120				161.305	0.4902+10	0.6102+13	
5	a	$2s2p^23d$	(^1D)	^3F	2	153.686	0.3362+10	0.1642+14	0.2894+14
9	b	106				158.729	0.3629+10	0.1897+13	
5	a	$2s2p^23d$	(^1D)	^3F	3	153.686	0.4703+10	0.1644+14	0.2896+14
9	b	105				158.729	0.5076+10	0.1898+13	
5	a	$2s2p^23d$	(^1D)	^3F	4	153.686	0.6042+10	0.1647+14	0.2898+14
9	b	104				158.729			
5	a	$2s2p^23d$	(^1D)	^1F	3	153.773	0.4555+10	0.1398+14	0.2770+14
9	b	107				158.843	0.6157+10	0.2378+11	
5	a	$2s2p^23d$	(^1D)	^3D	1	153.817	0.2384+10	0.8244+13	0.1227+14
9	b	108				159.089	0.2860+10	0.7489+12	
5	a	$2s2p^23d$	(^1D)	^3D	2	153.817	0.3971+10	0.8253+13	0.1228+14
9	b	109				159.089	0.4763+10	0.7493+12	
5	a	$2s2p^23d$	(^1D)	^3D	3	153.817	0.5556+10	0.8268+13	0.1230+14
9	b	110				159.089	0.6662+10	0.7500+12	
5	a	$2s2p^23d$	(^1D)	^3G	3	154.077	0.3326+10	0.4709+14	0.4916+14
9	b	111				159.218	0.3669+10	0.5648+13	
5	a	$2s2p^23d$	(^1D)	^3G	4	154.077	0.4272+10	0.4709+14	0.4916+14
9	b	112				159.219	0.4712+10	0.5648+13	
5	a	$2s2p^23d$	(^1D)	^3G	5	154.077	0.5216+10	0.4709+14	0.4916+14
9	b	113				159.219	0.5227+09	0.5648+13	
5	a	$2s2p^23d$	(^1D)	^1G	4	154.152	0.4082+10	0.3823+14	0.3847+14
9	b	114				159.323	0.4107+10	0.4348+11	
5	a	$2s2p^23d$	(^1D)	^1S	0	154.171	0.7749+09	0.6056+14	0.7131+14
9	b	115				159.503	0.1421+10	0.9614+13	
5	a	$2s2p^23d$	(^1D)	^3P	0	154.302	0.7193+09	0.6509+13	0.2096+14
9	b	116				159.677	0.1047+10	0.4812+12	
5	a	$2s2p^23d$	(^1D)	^3P	1	154.302	0.2157+10	0.6505+13	0.2095+14
9	b	117				159.677	0.3141+10	0.4812+12	
5	a	$2s2p^23d$	(^1D)	^3P	2	154.302	0.3594+10	0.6496+13	0.2092+14
9	b	118				159.678	0.5230+10	0.4812+12	
5	a	$2s2p^23d$	(^1D)	^1P	1	154.354	0.2043+10	0.5941+13	0.2092+14
9	b	119				159.725	0.3447+10	0.1983+09	

N		$2s2l_12l_2$	$L_{12}S_{12}$	LS	J	E	$\sum(gA_r)$	$A_a(2s^22p(^2P))$	$\sum(A_a)$
4	a	$2s2p^23s$	(^1S)	^3S	1	155.876	0.4520+10	0.1185+15	0.1370+15
7	b	102				158.111	0.7356+10	0.1762+14	
4	a	$2s2p^23s$	(^1S)	^1S	0	157.778	0.2007+10	0.1684+15	0.2819+15
7	b	121				163.315	0.2289+10	0.1191+15	
3	a	$2p^4$	(^3P)	^3P	0	168.535	0.4971+10	0.1214+14	0.4197+16
3	b	125				169.545	0.2499+11	0.3264+13	
3	a	$2p^4$	(^3P)	^3P	1	168.522	0.1492+11	0.1203+14	0.4203+16
3	b	126				169.602	0.2550+11	0.3238+13	
3	a	$2p^4$	(^3P)	^3P	2	168.495	0.2487+11	0.1181+14	0.4217+16
3	b	127				169.630	0.5300+10	0.3226+13	
4	a	$2s2p^23s$	(^3P)	^3Pa	0	171.223	0.4636+10	0.3789+14	0.4571+15
7	b	133				178.233	0.5955+10	0.1205+14	
4	a	$2s2p^23s$	(^3P)	^3Pa	1	171.234	0.1391+11	0.3833+14	0.4507+15
7	b	134				178.252	0.1787+11	0.1206+14	
4	a	$2s2p^23s$	(^3P)	^3Pa	2	171.259	0.2317+11	0.3815+14	0.4378+15
7	b	135				178.293	0.2979+11	0.1207+14	
4	a	$2s2p^23s$	(^3P)	^1P	1	171.906	0.1609+11	0.5042+15	0.5205+15
7	b	136				180.294	0.2075+11	0.5524+14	
5	a	$2s2p^23d$	(^1S)	^1D	2	172.914	0.1043+11	0.2300+14	0.2008+15
9	b	129				177.138	0.1286+11	0.1778+13	
5	a	$2s2p^23d$	(^1S)	^3D	1	172.998	0.6533+10	0.2481+14	0.2961+14
9	b	132				177.282	0.8079+10	0.5213+13	
5	a	$2s2p^23d$	(^1S)	^3D	2	172.998	0.1089+11	0.2488+14	0.2967+14
9	b	131				177.282	0.1345+11	0.5221+13	
5	a	$2s2p^23d$	(^1S)	^3D	3	172.998	0.1524+11	0.2499+14	0.2977+14
9	b	130				177.282	0.1881+11	0.5235+13	
3	a	$2p^4$	(^1D)	^1D	2	180.710	0.1607+11	0.1072+14	0.5877+16
3	b	137				183.164	0.1240+11	0.8649+13	
5	a	$2s2p^23d$	(^3P)	^1P	1	188.601	0.1456+11	0.1370+12	0.6124+13
9	b	153				196.221	0.2188+11	0.9593+11	
5	a	$2s2p^23d$	(^3P)	^3Fa	2	188.636	0.2160+11	0.9184+14	0.9561+14
9	b	148				195.772	0.2735+11	0.5411+13	
5	a	$2s2p^23d$	(^3P)	^3Fa	3	188.649	0.3025+11	0.9184+14	0.9568+14
9	b	149				195.792	0.3830+11	0.5423+13	
5	a	$2s2p^23d$	(^3P)	^3Fa	4	188.670	0.3889+11	0.9183+14	0.9559+14
9	b	50				195.821	0.4926+11	0.5406+13	
5	a	$2s2p^23d$	(^3P)	^3Pa	0	188.846	0.4987+10	0.3810+12	0.3240+14
9	b	154				196.232	0.7315+10	0.2803+09	

N		$2s2l_12l_2$	$L_{12}S_{12}$	LS	J	E	$\sum(gA_r)$	$A_a(2s^22p(^2P))$	$\sum(A_a)$
5	a	$2s2p^23d$	(^3P)	^3Pa	1	188.845	0.1500+11	0.6140+12	0.3485+14
9	b	153				196.221	0.2188+11	0.9593+11	
5	a	$2s2p^23d$	(^3P)	^3Pa	2	188.842	0.2513+11	0.5620+12	0.3951+14
9	b	152				196.197	0.3644+11	0.1245+12	
5	a	$2s2p^23d$	(^3P)	^1F	3	188.833	0.3181+11	0.9397+14	0.1078+15
9	b	155				196.260			
5	a	$2s2p^23d$	(^3P)	^3Da	1	189.006	0.1365+11	0.6969+14	0.7110+14
9	b	156				196.332	0.1934+11	0.3967+13	
5	a	$2s2p^23d$	(^3P)	^3Da	2	189.011	0.2275+11	0.6945+14	0.7088+14
9	b	157				196.338	0.3226+11	0.3940+13	
5	a	$2s2p^23d$	(^3P)	^3Da	3	189.018	0.3185+11	0.7015+14	0.7154+14
9	b	158				196.348	0.4480+11	0.4280+13	
5	a	$2s2p^23d$	(^3P)	^1D	2	189.288	0.2396+11	0.6645+14	0.1013+15
9	b	159				197.010	0.3371+11	0.6236+13	
3	a	$2p^4$	(^1S)	^1S	0	202.188	0.5373+10	0.8086+14	0.4952+16
3	b	161				210.890	0.5350+10	0.1079+14	
6	a	$2p^33p$	(^4S)	^5P	1	208.409	0.1362+11	0.1000+07	0.4397+13
11	b	163				216.896	0.1790+11	0.2681+07	
6	a	$2p^33p$	(^4S)	^5P	2	208.410	0.2269+11	0.1000+07	0.4397+13
11	b	164				216.898	0.2984+11	0.4844+07	
6	a	$2p^33p$	(^4S)	^5P	3	208.411	0.3177+11	0.1000+07	0.4397+13
11	b	165				216.902			
6	a	$2p^33p$	(^4S)	^3P	0	211.304	0.4345+10	0.3680+12	0.1972+15
11	b	168				220.915	0.5692+10	0.3236+11	
6	a	$2p^33p$	(^4S)	^3P	1	211.305	0.1304+11	0.3700+12	0.1971+15
11	b	167				220.915	0.1707+11	0.3217+11	
6	a	$2p^33p$	(^4S)	^3P	2	211.305	0.2173+11	0.3730+12	0.1970+15
11	b	166				220.915	0.2846+11	0.3182+11	
6	a	$2p^33p$	(^2D)	^3D	1	227.199	0.4872+10	0.6600+12	0.9134+13
11	b	181				235.165	0.6465+10	0.1813+11	
6	a	$2p^33p$	(^2D)	^3D	2	227.200	0.8120+10	0.6560+12	0.9143+13
11	b	182				235.165	0.1078+11	0.1818+11	
6	a	$2p^33p$	(^2D)	^3D	3	227.202	0.1137+11	0.6540+12	0.9160+13
11	b	183				235.165	0.1509+11	0.1833+11	
6	a	$2p^33p$	(^2D)	^1P	1	227.378	0.5307+10	0.4645+13	0.1927+14
11	b	184				235.439	0.7095+10	0.1194+12	
6	a	$2p^33p$	(^2D)	^3F	2	227.486	0.7898+10	0.8010+12	0.2630+14
11	b	185				235.626	0.1017+11	0.1096+12	

N		$2s2l_12l_2$	$L_{12}S_{12}$	LS	J	E	$\sum(gA_r)$	$A_a(2s^22p(^2P))$	$\sum(A_a)$
6	a	$2p^33p$	(^2D)	^3F	3	227.487	0.1106+11	0.8010+12	0.2630+14
11	b	186				235.626	0.1424+11	0.1096+12	
6	a	$2p^33p$	(^2D)	^3F	4	227.488	0.1422+11	0.8200+11	0.2630+14
11	b	187				235.626	0.1832+11	0.1096+12	
6	a	$2p^33p$	(^2D)	^1F	3	227.816	0.1101+11	0.8380+12	0.4645+14
11	b	188				236.208	0.1377+11	0.1375+12	
6	a	$2p^33p$	(^2D)	^3P	0	230.930	0.1684+10	0.1150+12	0.1128+15
11	b	189				241.091	0.2316+10	0.2990+12	
6	a	$2p^33p$	(^2D)	^3P	1	230.930	0.5054+10	0.1130+12	0.1128+15
11	b	190				241.091	0.6951+10	0.2972+12	
6	a	$2p^33p$	(^2D)	^3P	2	230.931	0.8424+10	0.1080+12	0.1128+15
11	b	191				241.091	0.1158+11	0.2938+12	
6	a	$2p^33p$	(^2D)	^1D	2	232.424	0.7237+10	0.4400+12	0.2025+15
11	b	92				244.196	0.1078+11	0.5725+12	
6	a	$2p^33p$	(^2P)	^3S	1	245.981	0.1099+11	0.6793+13	0.8219+13
11	b	215				253.853	0.1365+11	0.1794+12	
6	a	$2p^33p$	(^2P)	^3D	1	246.304	0.1073+11	0.4158+13	0.2579+14
11	b	216				254.347	0.1337+11	0.3538+12	
6	a	$2p^33p$	(^2P)	^3D	2	246.305	0.1788+11	0.4161+13	0.2578+14
11	b	217				254.347	0.2228+11	0.3536+12	
6	a	$2p^33p$	(^2P)	^3D	3	246.306	0.2503+11	0.4165+13	0.2577+14
11	b	218				254.347	0.3119+11	0.3534+12	
6	a	$2p^33p$	(^2P)	^1P	1	246.736	0.1051+11	0.9380+12	0.4032+14
11	b	219				255.016	0.1311+11	0.7506+12	
6	a	$2p^33p$	(^2P)	^3P	0	248.190	0.3410+10	0.1105+14	0.3195+14
11	b	222				257.606	0.4407+10	0.8271+12	
6	a	$2p^33p$	(^2P)	^3P	1	248.189	0.1023+11	0.1106+14	0.3193+14
11	b	221				257.606	0.1322+11	0.8295+12	
6	a	$2p^33p$	(^2P)	^3P	2	248.188	0.1705+11	0.1107+14	0.3188+14
11	b	220				257.606	0.2205+11	0.8341+12	
6	a	$2p^33p$	(^2P)	^1D	2	248.895	0.1565+11	0.1531+14	0.1182+15
11	b	223				258.451	0.2051+11	0.6700+12	
6	a	$2p^33p$	(^2P)	^1S	0	252.559	0.3436+10	0.3333+14	0.2519+15
11	b	236				266.407	0.4127+10	0.1610+11	

TABLE IV. Energy ($10^3 cm^{-1}$), sum of weighted radiative transition probabilities ($\sum(gA_r)$ in sec^{-1}) and autoionization rates (A_a in sec^{-1}) of carbon (C I) for $1s^2 2s 2l_1 2l_2 (L_{12}S_{12}) nl[LSJ]$ (odd parity) states. Comparison of different methods and recommended data from [12]: *a*-Cowan code, *b*-SUPERSTRUCTURE code (lebels of levels are given in the third column), *c* - [12]

						Odd parity states			
N		$2s2l_1 2l_2$	$L_{12}S_{12}$	LS	J	E	$\sum(gA_r)$	$A_a(2s^2 2p(^2P)$	$\sum(A_a))$
1	*a*	$2s2p^3$	(^4S)	^3S	1	117.123	0.1191+11	0.4500+11	0.4500+11
2	*b*	84				126.264	0.1910+11	0.3495+12	
1	*a*	$2s2p^3$	(^2P)	^1P	1	119.415	0.1819+11	0.9159+15	0.9159+15
2	*b*	85				127.768	0.2007+11	0.4544+15	
1	*a*	$2s2p^3$	(^2D)	^1D	2	109.558	0.2171+11	0.1506+16	0.1506+16
2	*b*	54				116.062	0.2134+11	0.2159+16	
4	*a*	$2s2p^2 3p$	(^3P)	^5D	0	108.121	0.1953+08	0.1000+07	0.1000+07
8	*b*	46				112.121			
4	*a*	$2s2p^2 3p$	(^3P)	^5D	1	108.126	0.5861+08	0.1000+07	0.1000+07
8	*b*	47				112.129			
4	*a*	$2s2p^2 3p$	(^3P)	^5D	2	108.137	0.9770+08	0.1000+07	0.1000+07
8	*b*	48				112.145			
4	*a*	$2s2p^2 3p$	(^3P)	^5D	3	108.153	0.1368+09	0.1000+07	0.1000+07
8	*b*	49				112.170			
4	*a*	$2s2p^2 3p$	(^3P)	^5D	4	108.175	0.1759+09	0.1000+07	0.1000+07
8	*b*	50				112.203			
4	*a*	$2s2p^2 3p$	(^3P)	^3Pb	0	113.333	0.4192+08	0.7679+14	0.7679+14
8	*b*	59				119.226	0.6893+08	0.2781+15	
4	*a*	$2s2p^2 3p$	(^3P)	^3Pb	1	113.341	0.1261+09	0.7675+14	0.7675+14
8	*b*	60				119.237	0.2073+09	0.2780+15	
4	*a*	$2s2p^2 3p$	(^3P)	^3Pb	2	113.357	0.2098+09	0.7668+14	0.7668+14
8	*b*	61				119.259	0.3446+09	0.2778+15	
4	*a*	$2s2p^2 3p$	(^3P)	^3Sb	1	104.817	0.8708+10	0.2000+10	0.2000+10
8	*b*	42				109.154	0.7320+10	0.4828+10	
4	*a*	$2s2p^2 3p$	(^3P)	^5P	1	108.710	0.6675+08	0.1000+07	0.1000+07
8	*b*	51				112.901			
4	*a*	$2s2p^2 3p$	(^3P)	^5P	2	108.721	0.1113+09	0.1000+07	0.1000+07
8	*b*	52				112.918			
4	*a*	$2s2p^2 3p$	(^3P)	^5P	3	108.737	0.1558+09	0.1000+10	0.1000+10
8	*b*	53				112.943			
4	*a*	$2s2p^2 3p$	(^3P)	^3Db	1	111.993	0.2234+09	0.7235+14	0.7235+14
8	*b*	55				117.243	0.5844+09	0.2260+15	
4	*a*	$2s2p^2 3p$	(^3P)	^3Db	2	112.010	0.3723+09	0.7231+14	0.7231+14
8	*b*	56				117.269	0.9750+09	0.2258+15	

N		$2s2l_12l_2$	$L_{12}S_{12}$	LS	J	E	$\sum(gA_r)$	$A_a(2s^22p(^2P))$	$\sum(A_a)$
4	a	$2s2p^23p$	(^3P)	^3Db	3	112.036	0.5215+09	0.7225+14	0.7225+14
8	b	57				117.306	0.1366+10	0.2255+15	
4	a	$2s2p^23p$	(^3P)	^5S	2	112.317	0.3099+09	0.3000+10	0.3000+10
8	b	58				118.698			
4	a	$2s2p^23p$	(^1D)	^3F	2	145.163	0.2429+10	0.5589+13	0.9300+14
8	b	90				149.737	0.2954+10	0.6746+14	
4	a	$2s2p^23p$	(^1D)	^3F	3	145.164	0.3397+10	0.5589+13	0.9300+14
8	b	91				149.740	0.4130+10	0.6746+14	
4	a	$2s2p^23p$	(^1D)	^3F	4	145.165	0.4363+10	0.5589+13	0.9300+14
8	b	92				149.743	0.5303+10	0.6746+14	
4	a	$2s2p^2p3$	(^1D)	^1F	3	146.318	0.5375+10	0.7429+14	0.8648+14
8	b	93				151.657	0.7707+10	0.3967+14	
4	a	$2s2p^23p$	(^1D)	^3D	1	146.966	0.1694+10	0.1000+07	0.4284+15
8	b	94				152.155	0.2399+10	0.1340+14	
4	a	$2s2p^23p$	(^1D)	^3D	2	146.966	0.2819+10	0.1000+07	0.4284+15
8	b	95				152.155	0.3995+10	0.1341+14	
4	a	$2s2p^23p$	(^1D)	^3D	3	146.966	0.3943+10	0.1000+10	0.4284+15
8	b	96				152.156	0.5585+10	0.1342+14	
4	a	$2s2p^23p$	(^1D)	^3P	0	147.574	0.6050+09	0.4481+14	0.4619+15
8	b	99				152.954	0.8938+09	0.1606+14	
4	a	$2s2p^23p$	(^1D)	^3P	1	147.574	0.1815+10	0.4481+14	0.4620+15
8	b	98				152.954	0.2679+10	0.1606+14	
4	a	$2s2p^23p$	(^1D)	^3P	2	147.574	0.3020+10	0.4481+14	0.4623+15
8	b	97				152.954	0.4457+10	0.1627+14	
4	a	$2s2p^23p$	(^1D)	^1D	2	148.002	0.2901+10	0.1178+15	0.5587+15
8	b	100				153.125			
4	a	$2s2p^23p$	(^1D)	^1P	1	148.826	0.1847+10	0.2042+14	0.4504+15
8	b	101				154.922	0.2520+10	0.5176+14	
4	a	$2s2p^23p$	(^1S)	^3P	0	165.178	0.2109+10	0.9257+13	0.1906+15
8	b	122				169.319	0.2726+10	0.4950+14	
4	a	$2s2p^23p$	(^1S)	^3P	1	165.179	0.6325+10	0.9253+13	0.1907+15
8	b	123				169.321	0.8175+10	0.4954+14	
4	a	$2s2p^23p$	(^1S)	^3P	2	165.181	0.1054+11	0.9244+13	0.1908+15
8	b	124				169.326	0.1362+11	0.4963+14	
4	a	$2s2p^23p$	(^1S)	^1P	1	166.064	0.6628+10	0.8302+14	0.2325+15
8	b	128				170.625	0.8880+10	0.5102+13	
4	a	$2s2p^23p$	(^3P)	^1S	0	178.427	0.4850+10	0.4000+10	0.1873+15
8	b	138				184.629	0.6674+10	0.1682+10	

N		$2s2l_12l_2$	$L_{12}S_{12}$	LS	J	E	$\sum(gA_r)$	$A_a(2s^22p(^2P))$	$\sum(A_a)$
4	a	$2s2p^23p$	(^3P)	^3Da	1	179.946	0.1375+11	0.5516+14	0.1879+15
8	b	139				186.827	0.1841+11	0.1539+14	
4	a	$2s2p^23p$	(^3P)	^3Da	2	179.960	0.2293+11	0.5516+14	0.1878+15
8	b	140				186.848	0.3069+11	0.1538+14	
4	a	$2s2p^23p$	(^3P)	^3Da	3	179.981	0.3210+11	0.5517+14	0.1877+15
8	b	141				186.881	0.4297+11	0.1537+14	
4	a	$2s2p^23p$	(^3P)	^3Pa	0	180.633	0.4672+10	0.5654+14	0.2017+15
8	b	142				187.736	0.6484+10	0.1264+14	
4	a	$2s2p^23p$	(^3P)	^3Pa	1	180.639	0.1402+11	0.5657+14	0.2016+15
8	b	143				187.746	0.1946+11	0.1259+14	
4	a	$2s2p^23p$	(^3P)	^3Pa	2	180.652	0.2337+11	0.5664+14	0.2014+15
8	b	144				187.767	0.3244+11	0.1250+14	
4	a	$2s2p^23p$	(^3P)	^3Sa	1	182.796	0.1336+11	0.7000+10	0.2659+15
8	b	145				190.641	0.1829+11	0.1197+11	
4	a	$2s2p^23p$	(^3P)	^1D	2	182.998	0.2162+11	0.9230+12	0.5424+15
8	b	146				190.855	0.2859+11	0.1723+15	
4	a	$2s2p^23p$	(^3P)	^1P	1	184.380	0.1362+11	0.5711+14	0.8754+15
8	b	147				192.739	0.1987+11	0.1339+15	
5	a	$2p^33s$	(^4S)	^5S	2	199.956	0.1927+11	0.1000+07	0.5985+14
10	b	160				208.194			
5	a	$2p^33s$	(^4S)	^3S	1	204.937	0.1635+11	0.1000+07	0.1603+16
10	b	162				214.866	0.2190+11	0.3594+07	
5	a	$2p^33s$	(^2D)	^3D	1	219.563	0.4847+10	0.5490+12	0.3221+15
10	b	179				228.142	0.9723+10	0.2045+13	
5	a	$2p^33s$	(^2D)	^3D	2	219.563	0.8080+10	0.5500+12	0.3221+15
10	b	178				228.142	0.1620+11	0.2045+13	
5	a	$2p^33s$	(^2D)	^3D	3	219.563	0.1131+11	0.5510+12	0.3220+15
10	b	177				228.142	0.2267+11	0.2044+13	
5	a	$2p^33s$	(^2D)	^1D	2	221.589	0.1132+11	0.4530+13	0.1011+16
10	b	180				230.918	0.1378+11	0.1422+14	
5	a	$2p^33s$	(^2P)	^3P	0	238.652	0.3138+10	0.1420+12	0.2404+15
10	b	211				247.598	0.3605+10	0.1180+13	
5	a	$2p^33s$	(^2P)	^3P	1	238.653	0.9415+10	0.1420+12	0.2404+15
10	b	212				247.598	0.1082+11	0.1180+13	
5	a	$2p^33s$	(^2P)	^3P	2	238.654	0.1569+11	0.1420+12	0.2405+15
10	b	213				247.598	0.1804+11	0.1180+13	
5	a	$2p^33s$	(^2P)	^1P	1	240.233	0.1161+11	0.1124+13	0.7239+15
10	b	214				250.111	0.1419+11	0.1841+13	

N		$2s2l_12l_2$	$L_{12}S_{12}$	LS	J	E	$\sum(gA_r)$	$A_a(2s^22p(^2P))$	$\sum(A_a)$
6	a	$2p^33d$	(^4S)	^5D	0	217.143	0.4316+10	0.1000+07	0.2815+14
12	b	169				226.671			
6	a	$2p^33d$	(^4S)	^5D	1	217.143	0.1295+11	0.1000+07	0.2815+14
12	b	170				226.671			
6	a	$2p^33d$	(^4S)	^5D	2	217.143	0.2158+11	0.1000+07	0.2815+14
12	b	171				226.671			
6	a	$2p^33d$	(^4S)	^5D	3	217.143	0.3021+11	0.1000+07	0.2815+14
12	b	172				226.671			
6	a	$2p^33d$	(^4S)	^5D	4	217.143	0.3884+11	0.1000+07	0.2815+14
12	b	173				226.671			
6	a	$2p^33d$	(^4S)	^3D	1	217.447	0.1328+11	0.2100+12	0.3448+14
12	b	174				227.077	0.1442+11	0.6792+11	
6	a	$2p^33d$	(^4S)	^3D	2	217.447	0.2214+11	0.2100+12	0.3448+14
12	b	175				227.077	0.2405+11	0.6779+11	
6	a	$2p^33d$	(^4S)	^3D	3	217.447	0.3100+11	0.2110+12	0.3450+14
12	b	176				227.077	0.3367+11	0.6758+11	
6	a	$2p^33d$	(^2D)	^3P	0	235.656	0.2266+10	0.2840+12	0.4958+14
12	b	195				244.438	0.3348+10	0.4908+11	
6	a	$2p^33d$	(^2D)	^3P	1	235.656	0.6797+10	0.2830+12	0.4954+14
12	b	194				244.438	0.1004+11	0.4899+11	
6	a	$2p^33d$	(^2D)	^3P	2	235.655	0.1133+11	0.2830+12	0.4944+14
12	b	193				244.438	0.1673+11	0.4880+11	
6	a	$2p^33d$	(^2D)	^1P	1	235.800	0.5905+10	0.2300+11	0.7279+14
12	b	196				244.745	0.8574+10	0.7314+12	
6	a	$2p^33d$	(^2D)	^3D	1	236.006	0.4797+10	0.2000+11	0.1450+14
12	b	207				245.052	0.6840+10	0.4125+11	
6	a	$2p^33d$	(^2D)	^3D	2	236.005	0.7997+10	0.2000+11	0.1449+14
12	b	206				245.052	0.1140+11	0.4162+11	
6	a	$2p^33d$	(^2D)	^3D	3	236.005	0.1120+11	0.2000+11	0.1448+14
12	b	205				245.052	0.1597+11	0.4218+11	
6	a	$2p^33d$	(^2D)	^3S	1	236.363	0.5360+10	0.1000+07	0.5505+13
12	b	210				245.733	0.8409+10	0.1197+07	
6	a	$2p^33d$	(^2D)	^3F	2	235.871	0.7203+10	0.5000+10	0.2935+14
12	b	197				244.789	0.9460+10	0.9415+11	
6	a	$2p^33d$	(^2D)	^3F	3	235.872	0.1008+11	0.5000+10	0.2940+14
12	b	198				244.789	0.1324+11	0.9447+11	
6	a	$2p^33d$	(^2D)	^3F	4	235.872	0.1297+11	0.5000+10	0.2944+14
12	b	199				244.789	0.1704+11	0.9481+11	

N		$2s2l_12l_2$	$L_{12}S_{12}$	LS	J	E	$\sum(gA_r)$	$A_a(2s^22p(^2P))$	$\sum(A_a)$
6	a	$2p^33d$	(^2D)	^3G	3	235.883	0.9610+10	0.2000+10	0.5013+14
12	b	200				244.821			
6	a	$2p^33d$	(^2D)	^3G	4	235.883	0.1236+11	0.2000+10	0.5011+14
12	b	201				244.821			
6	a	$2p^33d$	(^2D)	^3G	5	235.883	0.1511+11	0.2000+10	0.5017+14
12	b	202				244.822			
6	a	$2p^33d$	(^2D)	^1G	4	235.910	0.1239+11	0.2000+10	0.5335+14
12	b	203				244.880			
6	a	$2p^33d$	(^2D)	^1S	0	235.957	0.1560+10	0.1000+07	0.2350+13
12	b	204				244.899	0.2320+10	0.2430+06	
6	a	$2p^33d$	(^2D)	^1F	3	236.243	0.1154+11	0.2700+11	0.3502+14
12	b	208				245.623	0.1576+11	0.5572+12	
6	a	$2p^33d$	(^2D)	^1D	2	236.318	0.8519+10	0.1436+13	0.2054+14
12	b	209				245.711	0.1307+11	0.4151+12	
6	a	$2p^33d$	(^2P)	^3D	1	254.980	0.1036+11	0.1700+12	0.4345+14
12	b	231				263.927	0.1308+11	0.2197+12	
6	a	$2p^33d$	(^2P)	^3D	2	254.981	0.1727+11	0.1690+12	0.4346+14
12	b	232				263.927	0.2180+11	0.2196+12	
6	a	$2p^33d$	(^2P)	^3D	3	254.982	0.2417+11	0.1700+12	0.4348+14
12	b	233				263.927	0.3050+11	0.2198+12	
6	a	$2p^33d$	(^2P)	^1P	1	255.305	0.1087+11	0.1895+13	0.3344+14
12	b	235				264.662	0.1469+11	0.1893+11	
6	a	$2p^33d$	(^2P)	^3P	0	254.896	0.3440+10	0.4300+11	0.2316+14
12	b	227				263.762	0.4420+10	0.4101+11	
6	a	$2p^33d$	(^2P)	^3P	1	254.897	0.1032+11	0.4400+11	0.2318+14
12	b	228				263.762	0.1325+11	0.4125+11	
6	a	$2p^33d$	(^2P)	^3P	2	254.897	0.1719+11	0.4400+11	0.2321+14
12	b	229				263.773	0.2209+11	0.4178+11	
6	a	$2p^33d$	(^2P)	^3F	2	254.808	0.1662+11	0.1370+12	0.5182+14
12	b	224				263.598	0.2092+11	0.9254+11	
6	a	$2p^33d$	(^2P)	^3F	3	254.808	0.2327+11	0.1370+12	0.5181+14
12	b	225				263.598	0.2927+11	0.9242+11	
6	a	$2p^33d$	(^2P)	^3F	4	254.809	0.2991+11	0.1370+12	0.5180+14
12	b	226				263.598	0.3763+11	0.9224+11	
6	a	$2p^33d$	(^2P)	^1D	2	254.936	0.1682+11	0.8000+10	0.4724+14
12	b	230				263.817	0.2143+11	0.3572+11	
6	a	$2p^33d$	(^2P)	^1F	3	255.003	0.2417+11	0.7770+12	0.5510+14
12	b	234				264.037	0.3022+11	0.4974+12	

TABLE V. Energy ($10^3 cm^{-1}$) and sum of weighted radiative transition probabilities ($\sum(gA_r)$ in sec^{-1}) of carbon (C I) for $1s^2 2s2l_1 2l_2(L_{12}S_{12})nl[LSJ]$ states. Comparison of different methods and recommended data from [12], [16]: *a*-Cowan code, *b*-Nahar and Pradhan [18], *c* - [12], [16] (marked as *)

N	$2s^2 l_1 2l_2$	$L_{12}S_{12}$	LS	J	E in $10^3 cm^{-1}$			$\sum(gA_r)$
					a	*b*	*c*	*a*
1	2	3	4	5	6	7	8	9
7o	$2s^2 2p4s$	(^2P)	^3P	0	76.383	79.680	78.105	1.453+08
7o	$2s^2 2p4s$	(^2P)	^3P	1	76.399	79.680	78.117	4.427+08
7o	$2s^2 2p4s$	(^2P)	^3P	2	76.440	79.680	78.148	7.682+08
7o	$2s^2 2p4s$	(^2P)	^1P	1	76.932	79.877	78.338	7.806+08
7e	$2s^2 2p4p$	(^2P)	^3D	1	79.010	82.119	80.173	1.105+07
7e	$2s^2 2p4p$	(^2P)	^3D	2	79.026	82.119	80.192	1.854+07
7e	$2s^2 2p4p$	(^2P)	^3D	3	79.058	82.119	80.223	2.619+07
7e	$2s^2 2p4p$	(^2P)	^1P	1	78.911	81.913	80.564	1.486+07
7e	$2s^2 2p4p$	(^2P)	^3S	1	79.189	82.371	81.106	1.204+07
7e	$2s^2 2p4p$	(^2P)	^3P	0	80.013	82.674	81.313	1.447+07
7e	$2s^2 2p4p$	(^2P)	^3P	1	80.025	82.674	81.326	4.327+07
7e	$2s^2 2p4p$	(^2P)	^3P	2	80.045	82.674	81.344	7.253+07
7e	$2s^2 2p4p$	(^2P)	^1D	2	80.914	83.168	81.770	1.012+08
7e	$2s^2 2p4p$	(^2P)	^1S	0	82.434	83.794	82.252	5.231+07
8o	$2s^2 2p4d$	(^2P)	^1D	2	81.941	85.271	83.500	2.507+08
8o	$2s^2 2p4d$	(^2P)	^3F	2	82.070	85.578	83.761	1.241+08
8o	$2s^2 2p4d$	(^2P)	^3F	3	82.082	85.578	83.761	2.587+08
8o	$2s^2 2p4d$	(^2P)	^3F	4	82.119	85.578	83.761	1.493+08
8o	$2s^2 2p4d$	(^2P)	^3D	1	82.147	85.681	83.830	6.559+08
8o	$2s^2 2p4d$	(^2P)	^3D	2	82.161	85.681	83.837	1.049+09
8o	$2s^2 2p4d$	(^2P)	^3D	3	82.172	85.681	83.847	1.426+09
8o	$2s^2 2p4d$	(^2P)	^1F	3	82.241	85.780	83.949	1.989+09
8o	$2s^2 2p4d$	(^2P)	^1P	1	82.284	85.886	84.032	7.536+08
8o	$2s^2 2p4d$	(^2P)	^3P	2	82.532	85.939	84.103	1.807+09
8o	$2s^2 2p4d$	(^2P)	^3P	1	82.550	85.939	84.112	1.082+09
8o	$2s^2 2p4d$	(^2P)	^3P	0	82.558	85.939		3.607+08
8e	$2s^2 2p4f$	(^2P)	^3F	2	82.300	85.863	83.920*	8.721+07
8e	$2s^2 2p4f$	(^2P)	^3F	3	82.300	85.863	83.920*	1.233+08
8e	$2s^2 2p4f$	(^2P)	^3F	4	82.307	85.863	83.926*	1.575+08
8e	$2s^2 2p4f$	(^2P)	^1F	3	82.306	85.863	83.926*	1.242+08
8e	$2s^2 2p4f$	(^2P)	^1D	2	82.385	85.897	84.013*	8.540+07
8e	$2s^2 2p4f$	(^2P)	^3D	1	82.405	85.897	84.036*	5.054+07
8e	$2s^2 2p4f$	(^2P)	^3D	2	82.406	85.897	84.036*	8.483+07
8e	$2s^2 2p4f$	(^2P)	^3D	3	82.384	85.897	84.013*	1.192+08
8e	$2s^2 2p4f$	(^2P)	^3G	3	82.363	85.888	83.986*	1.236+08
8e	$2s^2 2p4f$	(^2P)	^3G	4	82.364	85.888	83.986*	1.572+08
8e	$2s^2 2p4f$	(^2P)	^3G	5	82.391	85.888	84.016*	1.934+08

1	2	3	4	5	6	7	8	9
8e	$2s^22p4f$	(^2P)	^1G	4	82.391	85.888	84.016*	1.564+08
13o	$2s^22p5s$	(^2P)	^3P	0	82.189	85.575	83.740*	7.155+07
13o	$2s^22p5s$	(^2P)	^3P	1	82.203	85.575	83.752*	2.342+08
13o	$2s^22p5s$	(^2P)	^3P	2	82.249	85.575	83.791*	5.139+08
13o	$2s^22p5s$	(^2P)	^1P	1	82.443	85.661	83.882	3.972+08
13e	$2s^22p5p$	(^2P)	^1P	1	83.302	86.562	84.853	7.209+06
13e	$2s^22p5p$	(^2P)	^3D	1	83.344	86.645		4.347+06
13e	$2s^22p5p$	(^2P)	^3D	2	83.354	86.645	84.952	7.933+06
13e	$2s^22p5p$	(^2P)	^3D	3	83.386	86.645	84.986	1.125+07
13e	$2s^22p5p$	(^2P)	^3S	1	83.429	86.742		3.924+06
13e	$2s^22p5p$	(^2P)	^3P	0	83.768	86.854	85.170*	5.554+06
13e	$2s^22p5p$	(^2P)	^3P	1	83.781	86.854	85.189*	1.304+07
13e	$2s^22p5p$	(^2P)	^3P	2	83.800	86.854	85.204*	2.825+07
13e	$2s^22p5p$	(^2P)	^1D	2	84.186	87.062	85.400	4.708+07
13e	$2s^22p5p$	(^2P)	^1S	0	84.613	87.325	85.626	1.312+07
14o	$2s^22p5d$	(^2P)	^1D	2	84.692	88.012	86.187	0.7.284+07
14o	$2s^22p5d$	(^2P)	^3F	2	84.754	88.189	86.319	0.8.119+07
14o	$2s^22p5d$	(^2P)	^3F	3	84.760	88.189	86.327	0.1.701+08
14o	$2s^22p5d$	(^2P)	^3F	4	84.802	88.189		0.3.998+07
14o	$2s^22p5d$	(^2P)	^3D	1	84.791	88.248		0.2.602+08
14o	$2s^22p5d$	(^2P)	^3D	2	84.812	88.248	86.371	0.4.493+08
14o	$2s^22p5d$	(^2P)	^3D	3	84.827	88.248	86.396	0.5.959+08
14o	$2s^22p5d$	(^2P)	^1F	3	84.868	88.300	86.450	0.7.044+08
14o	$2s^22p5d$	(^2P)	^1P	1	84.860	88.358	86.491	0.1.335+08
14o	$2s^22p5d$	(^2P)	^3P	0	84.986	88.366	86.507*	1.007+08
14o	$2s^22p5d$	(^2P)	^3P	1	84.981	88.366	86.519*	2.858+08
14o	$2s^22p5d$	(^2P)	^3P	2	84.968	88.366	86.523*	4.159+08
14e	$2s^22p5f$	(^2P)	^3F	2	84.870	88.340	86.412*	4.229+07
14e	$2s^22p5f$	(^2P)	^3F	3	84.870	88.340	86.412*	6.028+07
14e	$2s^22p5f$	(^2P)	^3F	4	84.873	88.340	86.415*	7.757+07
14e	$2s^22p5f$	(^2P)	$^3G,^3F$	3	84.873	88.340	86.415*	6.153+07
14e	$2s^22p5f$	(^2P)	^1D	2	84.937	88.364	86.483*	4.207+07
14e	$2s^22p5f$	(^2P)	^3D	3	84.937	88.364	86.483*	5.895+07
14e	$2s^22p5f$	(^2P)	^3D	2	84.951	88.364	86.998*	4.148+07
14e	$2s^22p5f$	(^2P)	^3D	1	84.951	88.364	86.998*	1.316+07
14e	$2s^22p5f$	(^2P)	^3G	3	84.927	88.358	86.470*	6.149+07
14e	$2s^22p5f$	(^2P)	$^3F,^3G$	4	84.927	88.358	86.470*	7.754+07
14e	$2s^22p5f$	(^2P)	^3G	5	84.943	88.358		9.669+07
14e	$2s^22p5f$	(^2P)	^1G	4	84.944	88.358		7.750+07
15o	$2s^22p5g$	(^2P)	^3F	2	84.961			2.157+07
15o	$2s^22p5g$	(^2P)	^3F	3	84.961			3.033+07

1	2	3	4	5	6	7	8	9
15o	$2s^22p5g$	(^2P)	^3F	4	84.953			3.947+07
15o	$2s^22p5g$	(^2P)	$^3G,^1F$	3	84.892			3.073+07
15o	$2s^22p5g$	(^2P)	^3G	3	84.953			3.059+07
15o	$2s^22p5g$	(^2P)	$^3F,^3G$	4	84.892			3.951+07
15o	$2s^22p5g$	(^2P)	^3G	5	84.950			4.855+07
15o	$2s^22p5g$	(^2P)	^1G	4	84.950			3.965+07
15o	$2s^22p5g$	(^2P)	^3H	4	84.893			3.947+07
15o	$2s^22p5g$	(^2P)	^3H	5	84.893			4.825+07
15o	$2s^22p5g$	(^2P)	^3H	6	84.958			5.671+07
15o	$2s^22p5g$	(^2P)	^1H	5	84.958			4.797+07
21o	$2s^22p6s$	(^2P)	^3P	0	84.784	88.210	86.322*	3.488+07
21o	$2s^22p6s$	(^2P)	^3P	1	84.795	88.210	86.332*	1.316+08
21o	$2s^22p6s$	(^2P)	^3P	2	84.840	88.210	86.370*	2.606+08
21o	$2s^22p6s$	(^2P)	^1P	1	84.940	88.253	86.414	2.338+08
20e	$2s^22p6p$	(^2P)	^3P	0	85.625	88.877	87.077	4.477+06
20e	$2s^22p6p$	(^2P)	^3P	1	85.640	88.877	87.103	1.011+07
20e	$2s^22p6p$	(^2P)	^3P	2	85.657	88.877	87.113	2.291+07
20e	$2s^22p6p$	(^2P)	^3D	1	85.378	88.772	86.956*	4.670+06
20e	$2s^22p6p$	(^2P)	^3D	2	85.413	88.772	86.965*	4.249+06
20e	$2s^22p6p$	(^2P)	^3D	3	85.446	88.772	87.002*	6.304+06
20e	$2s^22p6p$	(^2P)	^1P	1	85.411	88.730	88.913*	4.935+06
20e	$2s^22p6p$	(^2P)	^3S	1	85.457	88.822		2.495+06
20e	$2s^22p6p$	(^2P)	^1D	2	86.033	88.985	87.218*	4.039+07
20e	$2s^22p6p$	(^2P)	^1S	0	87.120	89.121	87.341*	4.664+07
22o	$2s^22p6d$	(^2P)	^1D	2	86.127	89.489	87.632	1.786+08
22o	$2s^22p6d$	(^2P)	^3F	2	86.160	89.599	87.706	2.013+08
22o	$2s^22p6d$	(^2P)	^3F	3	86.160	89.599	87.713	4.025+08
22o	$2s^22p6d$	(^2P)	^3F	4	86.207	89.599		1.165+08
22o	$2s^22p6d$	(^2P)	^3D	1	86.182	89.635		3.620+08
22o	$2s^22p6d$	(^2P)	^3D	2	86.207	89.635	87.752	4.051+08
22o	$2s^22p6d$	(^2P)	^3D	3	86.221	89.635	87.773	5.733+08
22o	$2s^22p6d$	(^2P)	^1F	3	86.247	89.666	87.807	1.518+09
22o	$2s^22p6d$	(^2P)	^1P	1	86.258	89.700	87.831	6.514+08
22o	$2s^22p6d$	(^2P)	^3P	0	86.309	89.701		1.164+08
22o	$2s^22p6d$	(^2P)	^3P	1	86.304	89.701	87.839	3.643+08
22o	$2s^22p6d$	(^2P)	^3P	2	86.287	89.701	87.830	5.720+08
21e	$2s^22p6f$	(^2P)	^3D	1	86.293	89.704	87.838*	6.774+06
21e	$2s^22p6f$	(^2P)	^3D	2	86.294	89.704	87.838*	2.336+07
21e	$2s^22p6f$	(^2P)	^3D	3	86.221	89.704	87.827*	3.255+07
21e	$2s^22p6f$	(^2P)	$^3F,^1D$	2	86.222	89.704	87.827*	2.360+07
21e	$2s^22p6f$	(^2P)	^3F	2	86.284	89.689	87.863*	2.357+07

1	2	3	4	5	6	7	8	9
21e	$2s^22p6f$	(^2P)	$^3D,^3F$	3	86.284	89.689	87.863*	3.220+07
21e	$2s^22p6f$	(^2P)	^3F	4	86.279	89.689	87.862*	4.381+07
21e	$2s^22p6f$	(^2P)	^1F	3	86.279	89.688	87.862*	3.337+07
21e	$2s^22p6f$	(^2P)	^3G	3	86.223	89.700	87.820*	3.389+07
21e	$2s^22p6f$	(^2P)	^3G	4	86.223	89.700	87.820*	4.429+07
21e	$2s^22p6f$	(^2P)	^3G	5	86.289	89.700		5.466+07
21e	$2s^22p6f$	(^2P)	^1G	4	86.289	89.700		4.511+07
23o	$2s^22p6g$	(^2P)	^1G	4	86.294			2.288+07
23o	$2s^22p6g$	(^2P)	^1H	5	86.299			2.796+07
23o	$2s^22p6g$	(^2P)	$^3G,^1F$	3	86.234			1.761+07
23o	$2s^22p6g$	(^2P)	^3F	2	86.300			1.246+07
23o	$2s^22p6g$	(^2P)	^3F	3	86.300			1.751+07
23o	$2s^22p6g$	(^2P)	^3F	4	86.234			2.285+07
23o	$2s^22p6g$	(^2P)	^3G	3	86.295			1.756+07
23o	$2s^22p6g$	(^2P)	$^3F,^3G$	4	86.295			2.268+07
23o	$2s^22p6g$	(^2P)	^3G	5	86.294			2.800+07
23o	$2s^22p6g$	(^2P)	^3H	4	86.235			2.286+07
23o	$2s^22p6g$	(^2P)	^3H	5	86.235			2.801+07
23o	$2s^22p6g$	(^2P)	^3H	6	86.299			3.306+07
22e	$2s^22p6h$	(^2P)	^3G	3	86.300			1.144+07
22e	$2s^22p6h$	(^2P)	^3G	4	86.300			1.472+07
22e	$2s^22p6h$	(^2P)	^3G	5	86.236			1.813+07
22e	$2s^22p6h$	(^2P)	$^3H,^1G$	4	86.297			1.470+07
22e	$2s^22p6h$	(^2P)	^1H	5	86.296			1.810+07
22e	$2s^22p6h$	(^2P)	^3H	4	86.236			1.474+07
22e	$2s^22p6h$	(^2P)	$^3G,^3H$	5	86.297			1.809+07
22e	$2s^22p6h$	(^2P)	^3H	6	86.296			2.140+07
22e	$2s^22p6h$	(^2P)	^1I	6	86.299			2.141+07
22e	$2s^22p6h$	(^2P)	^3I	5	86.236			3.943+07
22e	$2s^22p6h$	(^2P)	^3I	7	86.299			2.470+07

TABLE VI. Energy ($10^3 cm^{-1}$), sum of weighted radiative transition probabilities ($\sum(gA_r)$ in sec^{-1}) and autoionization rates (A_a in sec^{-1}) of carbon (C I) for $1s^2 2s2l_1 2l_2(L_{12}S_{12})nl[LSJ]$ states with n=4

N	$2s^2l_12l_2$	$L_{12}S_{12}$	LS	J	E	$\sum(gA_r)$	(A_a) $2s^22p(^2P)$	$\sum(A_a)$
1	2	3	4	5	6	7	8	9
$9e$	$2s2p^24s$	(^3P)	^5P	1	117.524	1.028+08	5.000+09	5.000+09
$9e$	$2s2p^24s$	(^3P)	^5P	2	117.536	1.387+08	9.000+09	9.000+09
$9e$	$2s2p^24s$	(^3P)	^5P	3	117.556	1.589+08	1.000+06	1.000+06
$9e$	$2s2p^24s$	(^3P)	^3Pb	0	118.748	1.345+08	2.330+14	2.330+14
$9e$	$2s2p^24s$	(^3P)	^3Pb	1	118.765	4.033+08	2.331+14	2.331+14
$9e$	$2s2p^24s$	(^3P)	^3Pb	2	118.799	6.715+08	2.331+14	2.331+14
$9e$	$2s2p^24s$	(^1D)	^3D	1	154.129	1.831+09	5.265+13	5.838+13
$9e$	$2s2p^24s$	(^1D)	^3D	2	154.129	3.050+09	5.264+13	5.837+13
$9e$	$2s2p^24s$	(^1D)	^3D	3	154.129	4.268+09	5.263+13	5.836+13
$9e$	$2s2p^24s$	(^1D)	^1D	2	155.007	2.712+09	7.702+13	1.502+14
$9e$	$2s2p^24s$	(^1S)	^3S	1	173.015	6.565+09	5.667+13	6.681+13
$9e$	$2s2p^24s$	(^1S)	^1S	0	173.790	2.122+09	5.776+13	1.073+14
$9e$	$2s2p^24s$	(^3P)	^3Pa	0	189.099	4.622+09	2.895+13	7.804+13
$9e$	$2s2p^24s$	(^3P)	^3Pa	1	189.106	1.384+10	3.076+13	7.725+13
$9e$	$2s2p^24s$	(^3P)	^3Pa	2	189.124	2.291+10	2.957+13	7.148+13
$9e$	$2s2p^24s$	(^3P)	^1P	1	189.263	1.439+10	1.913+14	1.946+14
$9o$	$2s2p^24p$	(^3P)	^5D	0	120.119	4.382+06	1.000+09	1.000+09
$9o$	$2s2p^24p$	(^3P)	^5D	1	120.124	1.314+07	1.000+09	1.000+09
$9o$	$2s2p^24p$	(^3P)	^5D	2	120.133	2.190+07	1.000+09	1.000+09
$9o$	$2s2p^24p$	(^3P)	^5D	3	120.149	3.076+07	1.000+09	1.000+09
$9o$	$2s2p^24p$	(^3P)	^5D	4	120.172	3.933+07	1.000+06	1.000+06
$9o$	$2s2p^24p$	(^3P)	^5P	1	120.259	1.617+07	1.000+06	1.000+06
$9o$	$2s2p^24p$	(^3P)	^5P	2	120.270	2.678+07	1.000+09	1.000+09
$9o$	$2s2p^24p$	(^3P)	^5P	3	120.287	3.737+07	1.000+09	1.000+09
$9o$	$2s2p^24p$	(^3P)	^3Db	1	121.398	6.199+08	3.172+13	3.172+13
$9o$	$2s2p^24p$	(^3P)	^3Db	2	121.416	1.033+09	3.171+13	3.171+13
$9o$	$2s2p^24p$	(^3P)	^3Db	3	121.442	1.447+09	3.169+13	3.169+13
$9o$	$2s2p^24p$	(^3P)	^5S	2	121.766	1.963+08	9.000+09	9.000+09
$9o$	$2s2p^24p$	(^3P)	^3Sb	1	122.053	4.606+09	8.600+11	8.600+11
$9o$	$2s2p^24p$	(^3P)	^3Pb	0	122.184	1.221+08	4.999+13	4.999+13
$9o$	$2s2p^24p$	(^3P)	^3Pb	1	122.194	4.369+08	4.910+13	4.910+13
$9o$	$2s2p^24p$	(^3P)	^3Pb	2	122.209	6.112+08	4.986+13	4.986+13
$9o$	$2s2p^24p$	(^1D)	^3F	2	156.725	2.231+09	4.222+12	2.618+13
$9o$	$2s2p^24p$	(^1D)	^3F	3	156.725	3.120+09	4.222+12	2.618+13
$9o$	$2s2p^24p$	(^1D)	^3F	4	156.725	4.007+09	4.221+12	2.617+13
$9o$	$2s2p^24p$	(^1D)	^1F	3	157.048	5.592+09	3.047+13	3.489+13
$9o$	$2s2p^24p$	(^1D)	^3D	1	157.263	1.685+09	2.860+11	1.589+14

1	2	3	4	5	6	7	8	9
9*o*	$2s2p^24p$	(^1D)	^3D	2	157.263	2.806+09	2.880+11	1.589+14
9*o*	$2s2p^24p$	(^1D)	^3D	3	157.263	3.924+09	2.910+11	1.588+14
9*o*	$2s2p^24p$	(^1D)	^3P	0	157.444	6.477+08	2.413+13	1.812+14
9*o*	$2s2p^24p$	(^1D)	^3P	1	157.444	1.941+09	2.413+13	1.812+14
9*o*	$2s2p^24p$	(^1D)	^3P	2	157.444	3.232+09	2.414+13	1.813+14
9*o*	$2s2p^24p$	(^1D)	^1D	2	157.564	3.050+09	4.924+13	2.304+14
9*o*	$2s2p^24p$	(^1D)	^1P	1	157.914	1.942+09	4.061+12	2.001+14
9*o*	$2s2p^24p$	(^1S)	^3P	0	175.969	2.110+09	5.975+12	5.505+13
9*o*	$2s2p^24p$	(^1S)	^3P	1	175.969	6.328+09	5.974+12	5.508+13
9*o*	$2s2p^24p$	(^1S)	^3P	2	175.970	1.054+10	5.970+12	5.514+13
9*o*	$2s2p^24p$	(^1S)	^1P	1	176.158	6.941+09	3.294+13	5.706+13
9*o*	$2s2p^24p$	(^3P)	^1S	0	191.287	4.810+09	4.600+10	3.890+13
9*o*	$2s2p^24p$	(^3P)	^3Da	1	191.582	1.338+10	2.354+13	5.838+13
9*o*	$2s2p^24p$	(^3P)	^3Da	2	191.596	2.230+10	2.353+13	5.840+13
9*o*	$2s2p^24p$	(^3P)	^3Da	3	191.618	3.121+10	2.352+13	5.829+13
9*o*	$2s2p^24p$	(^3P)	^3Pa	0	191.764	4.759+09	2.628+13	6.462+13
9*o*	$2s2p^24p$	(^3P)	^3Pa	1	191.771	1.428+10	2.629+13	6.466+13
9*o*	$2s2p^24p$	(^3P)	^3Pa	2	191.785	2.379+10	2.631+13	6.459+13
9*o*	$2s2p^24p$	(^3P)	^3Sa	1	192.388	1.367+10	2.400+10	5.472+13
9*o*	$2s2p^24p$	(^3P)	^1D	2	192.681	2.128+10	6.251+12	2.808+14
9*o*	$2s2p^24p$	(^3P)	^1P	1	193.438	1.495+10	5.907+13	6.672+14
10*e*	$2s2p^24d$	(^3P)	^3Pb	0	123.137	1.287+08	2.890+11	2.890+11
10*e*	$2s2p^24d$	(^3P)	^3Pb	1	123.128	3.850+08	2.880+11	2.880+11
10*e*	$2s2p^24d$	(^3P)	^3Pb	2	123.110	6.472+08	2.950+11	2.950+11
10*e*	$2s2p^24d$	(^3P)	^5F	1	123.140	4.553+07	2.000+09	2.000+09
10*e*	$2s2p^24d$	(^3P)	^5F	2	123.146	7.580+07	1.000+09	1.000+09
10*e*	$2s2p^24d$	(^3P)	^5F	3	123.155	1.346+08	1.000+06	1.000+06
10*e*	$2s2p^24d$	(^3P)	^5F	4	123.170	1.368+08	1.000+06	1.000+06
10*e*	$2s2p^24d$	(^3P)	^5F	5	123.190	1.598+08	1.000+06	1.000+06
10*e*	$2s2p^24d$	(^3P)	^5P	1	123.194	3.102+08	1.000+09	1.000+09
10*e*	$2s2p^24d$	(^3P)	^5P	2	123.182	5.113+08	2.000+09	2.000+09
10*e*	$2s2p^24d$	(^3P)	^5P	3	123.166	6.905+08	1.000+06	1.000+06
10*e*	$2s2p^24d$	(^3P)	^5D	0	123.286	1.546+07	1.000+09	1.000+09
10*e*	$2s2p^24d$	(^3P)	^5D	1	123.289	4.999+07	1.000+09	1.000+09
10*e*	$2s2p^24d$	(^3P)	^5D	2	123.295	1.146+08	2.000+09	2.000+09
10*e*	$2s2p^24d$	(^3P)	^5D	3	123.298	6.655+08	2.900+10	2.900+10
10*e*	$2s2p^24d$	(^3P)	^5D	4	123.303	2.534+08	5.000+09	5.000+09
10*e*	$2s2p^24d$	(^3P)	^3Fb	2	123.285	1.198+09	8.300+10	8.300+10
10*e*	$2s2p^24d$	(^3P)	^3Fb	3	123.305	1.169+09	5.700+10	5.700+10
10*e*	$2s2p^24d$	(^3P)	^3Fb	4	123.329	2.086+09	8.200+10	8.200+10
10*e*	$2s2p^24d$	(^3P)	^3Db	1	123.471	8.457+08	1.030+11	1.030+11
10*e*	$2s2p^24d$	(^3P)	^3Db	2	123.478	1.408+09	1.040+11	1.040+11
10*e*	$2s2p^24d$	(^3P)	^3Db	3	123.487	1.976+09	1.040+11	1.040+11

1	2	3	4	5	6	7	8	9
10e	$2s2p^24d$	(^1D)	^1D	2	159.366	3.280+09	2.914+12	9.225+13
10e	$2s2p^24d$	(^1D)	^3F	2	159.579	2.926+09	7.730+12	1.405+13
10e	$2s2p^24d$	(^1D)	^3F	3	159.579	4.094+09	7.739+12	1.406+13
10e	$2s2p^24d$	(^1D)	^3F	4	159.579	5.257+09	7.750+12	1.407+13
10e	$2s2p^24d$	(^1D)	^1F	3	159.623	5.064+09	6.919+12	1.400+13
10e	$2s2p^24d$	(^1D)	^3D	1	159.669	2.209+09	4.036+12	4.563+12
10e	$2s2p^24d$	(^1D)	^3D	2	159.669	3.680+09	4.037+12	4.565+12
10e	$2s2p^24d$	(^1D)	^3D	3	159.669	5.149+09	4.039+12	4.568+12
10e	$2s2p^24d$	(^1D)	^3G	3	159.718	2.887+09	2.558+13	2.674+13
10e	$2s2p^24d$	(^1D)	^3G	4	159.718	3.708+09	2.558+13	2.674+13
10e	$2s2p^24d$	(^1D)	^3G	5	159.718	4.527+09	2.558+13	2.674+13
10e	$2s2p^24d$	(^1D)	^1G	4	159.762	3.497+09	2.158+13	2.173+13
10e	$2s2p^24d$	(^1D)	^3P	0	159.834	8.101+08	4.527+12	1.619+13
10e	$2s2p^24d$	(^1D)	^3P	1	159.834	2.430+09	4.524+12	1.617+13
10e	$2s2p^24d$	(^1D)	^3P	2	159.834	4.049+09	4.508+12	1.614+13
10e	$2s2p^24d$	(^1D)	^1P	1	159.871	2.732+09	4.722+12	1.476+13
10e	$2s2p^24d$	(^1D)	^1S	0	159.973	7.327+08	5.500+10	7.962+12
10e	$2s2p^24d$	(^1D)	^3S	1	160.076	2.452+09	1.877+13	2.299+13
10e	$2s2p^24d$	(^1S)	^1D	2	178.358	1.048+10	1.071+13	1.143+15
10e	$2s2p^24d$	(^1S)	^3D	1	178.689	6.412+09	1.320+13	1.593+13
10e	$2s2p^24d$	(^1S)	^3D	2	178.689	1.068+10	1.324+13	1.596+13
10e	$2s2p^24d$	(^1S)	^3D	3	178.689	1.495+10	1.329+13	1.602+13
10e	$2s2p^24d$	(^3P)	^1P	1	194.505	1.528+10	6.405+12	9.203+12
10e	$2s2p^24d$	(^3P)	^3Da	1	194.632	1.496+10	2.244+13	3.528+13
10e	$2s2p^24d$	(^3P)	^3Da	2	194.656	2.428+10	3.069+13	3.810+13
10e	$2s2p^24d$	(^3P)	^3Da	3	194.655	3.285+10	4.022+13	4.121+13
10e	$2s2p^24d$	(^3P)	^3Pa	0	194.649	5.288+09	4.680+12	3.072+13
10e	$2s2p^24d$	(^3P)	^3Pa	1	194.654	1.502+10	2.165+13	3.552+13
10e	$2s2p^24d$	(^3P)	^3Pa	2	194.618	2.566+10	1.418+13	3.361+13
10e	$2s2p^24d$	(^3P)	^3Fa	2	194.485	2.100+10	4.384+13	4.580+13
10e	$2s2p^24d$	(^3P)	^3Fa	3	194.496	2.946+10	4.397+13	4.606+13
10e	$2s2p^24d$	(^3P)	^3Fa	4	194.519	3.779+10	4.384+13	4.577+13
10e	$2s2p^24d$	(^3P)	^1F	3	194.598	3.084+10	4.895+13	5.632+13
10e	$2s2p^24d$	(^3P)	^1D	2	194.817	2.535+10	4.402+13	6.635+13
10o	$2s2p^24f$	(^3P)	^5D	0	123.497	1.820+07	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^5D	1	123.487	5.542+07	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^5D	2	123.487	9.210+07	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^5D	3	123.476	1.276+08	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^5D	4	123.457	1.641+08	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^3Db	1	123.497	5.564+07	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^3Db	2	123.476	9.278+07	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^3Db	3	123.457	1.312+08	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^3Gb	3	123.468	1.267+08	1.000+06	1.000+06

1	2	3	4	5	6	7	8	9
10o	$2s2p^24f$	(^3P)	^3Gb	4	123.496	1.620+08	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^3Gb	5	123.520	1.978+08	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^5G	2	123.468	9.154+07	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^5G	3	123.481	1.268+08	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^5G	4	123.481	1.632+08	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^5G	5	123.495	2.001+08	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^5G	6	123.520	2.378+08	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^5F	1	123.546	5.325+07	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^5F	2	123.554	8.809+07	1.000+09	1.000+09
10o	$2s2p^24f$	(^3P)	^5F	3	123.554	1.239+08	1.000+09	1.000+09
10o	$2s2p^24f$	(^3P)	^5F	4	123.559	1.601+08	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^5F	5	123.560	1.959+08	1.000+06	1.000+06
10o	$2s2p^24f$	(^3P)	^3Fb	2	123.547	8.789+07	1.000+09	1.000+09
10o	$2s2p^24f$	(^3P)	^3Fb	3	123.559	1.227+08	2.000+09	2.000+09
10o	$2s2p^24f$	(^3P)	^3Fb	4	123.561	1.566+08	2.000+09	2.000+09
10o	$2s2p^24f$	(^1D)	^3G	3	159.927	3.474+09	8.530+11	8.790+11
10o	$2s2p^24f$	(^1D)	^3G	4	159.927	4.465+09	8.530+11	8.800+11
10o	$2s2p^24f$	(^1D)	^3G	5	159.927	5.451+09	8.550+11	8.820+11
10o	$2s2p^24f$	(^1D)	^1G	4	159.927	4.461+09	8.450+11	8.710+11
10o	$2s2p^24f$	(^1D)	^3F	2	159.938	2.686+09	2.220+11	2.740+11
10o	$2s2p^24f$	(^1D)	^3F	3	159.938	3.760+09	2.220+11	2.740+11
10o	$2s2p^24f$	(^1D)	^3F	4	159.938	4.831+09	2.230+11	2.750+11
10o	$2s2p^24f$	(^1D)	^1F	3	159.938	3.761+09	2.330+11	2.850+11
10o	$2s2p^24f$	(^1D)	^3D	1	159.983	1.706+09	4.600+10	9.700+10
10o	$2s2p^24f$	(^1D)	^3D	2	159.983	2.843+09	4.600+10	9.700+10
10o	$2s2p^24f$	(^1D)	^3D	3	159.983	3.980+09	4.600+10	9.700+10
10o	$2s2p^24f$	(^1D)	^1D	2	159.983	2.834+09	1.300+10	4.900+10
10o	$2s2p^24f$	(^1D)	^3H	4	159.995	3.977+09	2.276+12	2.278+12
10o	$2s2p^24f$	(^1D)	^3H	5	159.995	4.857+09	2.276+12	2.278+12
10o	$2s2p^24f$	(^1D)	^3H	6	159.995	5.733+09	2.276+12	2.278+12
10o	$2s2p^24f$	(^1D)	^1H	5	159.995	4.852+09	2.251+12	2.257+12
10o	$2s2p^24f$	(^1D)	^3P	0	160.024	5.890+08	4.500+10	4.380+11
10o	$2s2p^24f$	(^1D)	^3P	1	160.024	1.767+09	4.500+10	4.370+11
10o	$2s2p^24f$	(^1D)	^3P	2	160.024	2.949+09	4.500+10	4.370+11
10o	$2s2p^24f$	(^1D)	^1P	1	160.026	1.763+09	5.200+10	5.110+11
10o	$2s2p^24f$	(^1S)	^3F	2	178.970	1.030+10	1.003+12	1.045+12
10o	$2s2p^24f$	(^1S)	^3F	3	178.970	1.440+10	1.008+12	1.050+12
10o	$2s2p^24f$	(^1S)	^3F	4	178.969	1.852+10	1.012+12	1.054+12
10o	$2s2p^24f$	(^1S)	^1F	3	178.970	1.441+10	1.000+12	1.049+12
10o	$2s2p^24f$	(^3P)	^1D	2	194.837	2.362+10	3.140+11	3.740+11
10o	$2s2p^24f$	(^3P)	^3Da	1	194.866	1.423+10	5.600+10	6.900+10
10o	$2s2p^24f$	(^3P)	^3Da	2	194.866	2.370+10	6.600+10	1.130+11
10o	$2s2p^24f$	(^3P)	^3Da	3	194.837	3.307+10	3.020+11	3.150+11

1	2	3	4	5	6	7	8	9
10o	$2s2p^24f$	(^3P)	^3Ga	3	194.838	3.003+10	4.201+12	4.233+12
10o	$2s2p^24f$	(^3P)	^3Ga	4	194.838	3.860+10	4.209+12	4.239+12
10o	$2s2p^24f$	(^3P)	^3Ga	5	194.873	4.706+10	4.248+12	4.281+12
10o	$2s2p^24f$	(^3P)	^1G	4	194.874	3.850+10	4.257+12	4.288+12
10o	$2s2p^24f$	(^3P)	^3Fa	2	194.916	2.275+10	3.065+12	3.074+12
10o	$2s2p^24f$	(^3P)	^3Fa	3	194.917	3.186+10	3.081+12	3.094+12
10o	$2s2p^24f$	(^3P)	^3Fa	4	194.923	4.071+10	3.347+12	3.353+12
10o	$2s2p^24f$	(^3P)	^1F	3	194.923	3.169+10	3.366+12	3.387+12
11o	$2p^34s$	(^4S)	^5S	2	217.485	2.114+10	1.000+06	8.989+12
11o	$2p^34s$	(^4S)	^3S	1	218.833	1.463+10	1.000+06	7.229+14
11o	$2p^34s$	(^2D)	^3D	1	236.387	4.532+09	2.300+10	9.436+13
11o	$2p^34s$	(^2D)	^3D	2	236.387	7.554+09	2.300+10	9.435+13
11o	$2p^34s$	(^2D)	^3D	3	236.387	1.058+10	2.300+10	9.435+13
11o	$2p^34s$	(^2D)	^1D	2	236.965	8.835+09	1.010+12	3.855+14
11o	$2p^34s$	(^2P)	^3P	0	255.269	3.661+09	1.240+11	9.366+13
11o	$2p^34s$	(^2P)	^3P	1	255.269	1.098+10	1.240+11	9.366+13
11o	$2p^34s$	(^2P)	^3P	2	255.271	1.830+10	1.240+11	9.368+13
11o	$2p^34s$	(^2P)	^1P	1	255.827	1.183+10	3.090+11	3.579+14
11e	$2p^34p$	(^4S)	^3P	0	220.805	4.448+09	1.660+11	5.953+13
11e	$2p^34p$	(^4S)	^3P	1	220.805	1.335+10	1.660+11	5.951+13
11e	$2p^34p$	(^4S)	^3P	2	220.805	2.224+10	1.670+11	5.948+13
11e	$2p^34p$	(^4S)	^5P	1	219.976	1.334+10	1.000+06	2.338+12
11e	$2p^34p$	(^4S)	^5P	2	219.976	2.223+10	1.000+06	2.338+12
11e	$2p^34p$	(^4S)	^5P	3	219.976	3.112+10	1.000+06	2.337+12
11e	$2p^34p$	(^2D)	^3D	1	238.706	4.790+09	1.390+11	2.891+12
11e	$2p^34p$	(^2D)	^3D	2	238.707	7.982+09	1.370+11	2.896+12
11e	$2p^34p$	(^2D)	^3D	3	238.707	1.118+10	1.370+11	2.900+12
11e	$2p^34p$	(^2D)	^1P	1	238.733	5.489+09	1.029+12	4.063+12
11e	$2p^34p$	(^2D)	^3F	2	238.775	7.307+09	4.500+10	6.296+12
11e	$2p^34p$	(^2D)	^3F	3	238.775	1.023+10	4.500+10	6.296+12
11e	$2p^34p$	(^2D)	^3F	4	238.775	1.316+10	4.500+10	6.298+12
11e	$2p^34p$	(^2D)	^1F	3	238.873	1.073+10	5.400+10	1.063+13
11e	$2p^34p$	(^2D)	^3P	0	240.134	1.607+09	1.870+11	6.223+13
11e	$2p^34p$	(^2D)	^3P	1	240.134	4.821+09	1.840+11	6.225+13
11e	$2p^34p$	(^2D)	^3P	2	240.135	8.034+09	1.800+11	6.228+13
11e	$2p^34p$	(^2D)	^1D	2	241.590	8.564+09	4.000+09	2.023+14
11e	$2p^34p$	(^2P)	^3S	1	257.596	1.081+10	1.594+12	2.571+12
11e	$2p^34p$	(^2P)	^3D	1	257.658	1.051+10	1.319+12	6.710+12
11e	$2p^34p$	(^2P)	^3D	2	257.659	1.752+10	1.320+12	6.706+12
11e	$2p^34p$	(^2P)	^3D	3	257.660	2.453+10	1.321+12	6.710+12
11e	$2p^34p$	(^2P)	^1P	1	257.761	1.088+10	5.830+11	1.075+13
11e	$2p^34p$	(^2P)	^3P	0	258.311	3.516+09	4.405+12	1.399+13

1	2	3	4	5	6	7	8	9
11e	$2p^34p$	(^2P)	^3P	1	258.311	1.055+10	4.404+12	1.398+13
11e	$2p^34p$	(^2P)	^3P	2	258.311	1.758+10	4.403+12	1.398+13
11e	$2p^34p$	(^2P)	^1D	2	258.557	1.726+10	7.645+12	3.980+13
11e	$2p^34p$	(^2P)	^1S	0	263.162	3.199+09	9.140+13	6.228+14
12o	$2p^34d$	(^4S)	^5D	0	222.908	4.354+09	1.000+06	1.560+13
12o	$2p^34d$	(^4S)	^5D	1	222.908	1.306+10	1.000+06	1.560+13
12o	$2p^34d$	(^4S)	^5D	2	222.908	2.177+10	1.000+06	1.560+13
12o	$2p^34d$	(^4S)	^5D	3	222.908	3.048+10	1.000+06	1.560+13
12o	$2p^34d$	(^4S)	^5D	4	222.908	3.919+10	1.000+06	1.560+13
12o	$2p^34d$	(^4S)	^3D	1	223.083	1.390+10	1.260+11	2.259+13
12o	$2p^34d$	(^4S)	^3D	2	223.083	2.316+10	1.270+11	2.259+13
12o	$2p^34d$	(^4S)	^3D	3	223.083	3.242+10	1.270+11	2.260+13
12o	$2p^34d$	(^2D)	^3F	2	241.635	7.312+09	2.000+09	1.630+13
12o	$2p^34d$	(^2D)	^3F	3	241.635	1.024+10	2.000+09	1.632+13
12o	$2p^34d$	(^2D)	^3F	4	241.636	1.317+10	2.000+09	1.634+13
12o	$2p^34d$	(^2D)	^3G	3	241.642	9.078+09	1.000+06	2.777+13
12o	$2p^34d$	(^2D)	^3G	4	241.643	1.167+10	1.000+06	2.777+13
12o	$2p^34d$	(^2D)	^3G	5	241.643	1.427+10	1.000+06	2.778+13
12o	$2p^34d$	(^2D)	^1G	4	241.657	1.168+10	1.000+06	2.996+13
12o	$2p^34d$	(^2D)	^1S	0	241.666	1.681+09	1.000+06	1.793+12
12o	$2p^34d$	(^2D)	^3D	1	241.704	5.188+09	1.400+10	9.112+12
12o	$2p^34d$	(^2D)	^3D	2	241.703	8.649+09	1.400+10	9.104+12
12o	$2p^34d$	(^2D)	^3D	3	241.703	1.211+10	1.400+10	9.091+12
12o	$2p^34d$	(^2D)	^1F	3	241.856	1.337+10	1.200+10	2.382+13
12o	$2p^34d$	(^2D)	^1D	2	241.896	1.014+10	9.830+11	1.289+13
12o	$2p^34d$	(^2D)	^3S	1	241.914	6.503+09	1.000+06	3.647+12
12o	$2p^34d$	(^2D)	^3P	0	241.919	1.949+09	8.600+10	2.012+13
12o	$2p^34d$	(^2D)	^3P	1	241.919	5.849+09	8.500+10	2.007+13
12o	$2p^34d$	(^2D)	^3P	2	241.918	9.750+09	8.500+10	2.007+13
12o	$2p^34d$	(^2D)	^1P	1	242.025	6.354+09	5.710+11	1.420+14
12o	$2p^34d$	(^2P)	^3F	2	260.560	1.672+10	7.200+10	2.881+13
12o	$2p^34d$	(^2P)	^3F	3	260.560	2.340+10	7.200+10	2.880+13
12o	$2p^34d$	(^2P)	^3F	4	260.561	3.008+10	7.200+10	2.878+13
12o	$2p^34d$	(^2P)	^3P	0	260.604	3.537+09	1.300+10	1.421+13
12o	$2p^34d$	(^2P)	^3P	1	260.604	1.061+10	1.300+10	1.423+13
12o	$2p^34d$	(^2P)	^3P	2	260.604	1.768+10	1.300+10	1.430+13
12o	$2p^34d$	(^2P)	^1D	2	260.618	1.731+10	1.000+06	2.763+13
12o	$2p^34d$	(^2P)	^3D	1	260.647	1.064+10	7.400+10	2.653+13
12o	$2p^34d$	(^2P)	^3D	2	260.647	1.774+10	7.400+10	2.636+13
12o	$2p^34d$	(^2P)	^3D	3	260.648	2.483+10	7.400+10	2.638+13
12o	$2p^34d$	(^2P)	^1F	3	260.673	2.476+10	4.440+11	3.413+13
12o	$2p^34d$	(^2P)	^1P	1	260.861	1.212+10	1.391+12	2.166+13

1	2	3	4	5	6	7	8	9
12e	$2p^34f$	(^4S)	^5F	1	223.253	1.292+10	1.000+06	1.000+06
12e	$2p^34f$	(^4S)	^5F	2	223.253	2.154+10	1.000+06	1.000+06
12e	$2p^34f$	(^4S)	^5F	3	223.253	3.015+10	1.000+06	1.000+06
12e	$2p^34f$	(^4S)	^5F	4	223.253	3.877+10	1.000+06	1.000+06
12e	$2p^34f$	(^4S)	^5F	5	223.253	4.738+10	1.000+06	1.000+06
12e	$2p^34f$	(^4S)	^3F	2	223.254	2.155+10	1.000+06	1.100+10
12e	$2p^34f$	(^4S)	^3F	3	223.254	3.017+10	1.000+06	1.100+10
12e	$2p^34f$	(^4S)	^3F	4	223.254	3.878+10	5.000+09	1.100+10
12e	$2p^34f$	(^2D)	^1H	5	241.980	1.473+10	1.000+06	1.000+06
12e	$2p^34f$	(^2D)	^3H	4	241.980	1.205+10	1.000+06	1.000+06
12e	$2p^34f$	(^2D)	^3H	5	241.980	1.472+10	1.000+06	1.000+06
12e	$2p^34f$	(^2D)	^3H	6	241.980	1.741+10	1.000+06	1.000+06
12e	$2p^34f$	(^2D)	^3G	3	241.983	9.921+09	2.000+09	2.000+09
12e	$2p^34f$	(^2D)	^3G	4	241.983	1.276+10	2.000+09	2.000+09
12e	$2p^34f$	(^2D)	^3G	5	241.984	1.559+10	2.000+09	2.000+09
12e	$2p^34f$	(^2D)	^3D	1	241.984	4.611+09	3.100+10	1.010+11
12e	$2p^34f$	(^2D)	^3D	2	241.984	7.687+09	3.100+10	1.020+11
12e	$2p^34f$	(^2D)	^3D	3	241.984	1.076+10	3.100+10	1.010+11
12e	$2p^34f$	(^2D)	^1G	4	241.985	1.275+10	2.000+09	1.100+10
12e	$2p^34f$	(^2D)	^3F	2	241.988	7.418+09	3.000+09	6.000+09
12e	$2p^34f$	(^2D)	^3F	3	241.988	1.039+10	3.000+09	6.000+09
12e	$2p^34f$	(^2D)	^3F	4	241.988	1.336+10	3.000+09	5.000+09
12e	$2p^34f$	(^2D)	^1F	3	241.989	1.042+10	4.000+09	2.800+10
12e	$2p^34f$	(^2D)	^1P	1	241.990	4.706+09	6.000+09	8.000+10
12e	$2p^34f$	(^2D)	^3P	0	241.992	1.572+09	2.000+09	1.520+11
12e	$2p^34f$	(^2D)	^3P	1	241.992	4.715+09	2.000+09	1.510+11
12e	$2p^34f$	(^2D)	^3P	2	241.992	7.858+09	2.000+09	1.520+11
12e	$2p^34f$	(^2D)	^1D	2	241.997	7.663+09	1.600+10	6.171+12
12e	$2p^34f$	(^2P)	^3G	3	260.904	2.298+10	7.000+09	7.000+09
12e	$2p^34f$	(^2P)	^3G	4	260.904	2.954+10	7.000+09	8.000+09
12e	$2p^34f$	(^2P)	^3G	5	260.906	3.609+10	7.000+09	7.000+09
12e	$2p^34f$	(^2P)	^1G	4	260.906	2.952+10	7.000+09	1.000+10
12e	$2p^34f$	(^2P)	^3F	2	260.910	1.659+10	6.000+09	1.200+10
12e	$2p^34f$	(^2P)	^3F	3	260.910	2.323+10	6.000+09	1.100+10
12e	$2p^34f$	(^2P)	^3F	4	260.912	2.979+10	6.000+09	9.000+09
12e	$2p^34f$	(^2P)	^1F	3	260.912	2.318+10	6.000+09	8.000+09
12e	$2p^34f$	(^2P)	^3D	1	260.913	1.002+10	6.000+09	8.000+09
12e	$2p^34f$	(^2P)	^3D	2	260.913	1.667+10	6.000+09	8.000+09
12e	$2p^34f$	(^2P)	^3D	3	260.913	2.331+10	6.000+09	6.000+09
12e	$2p^34f$	(^2P)	^1D	2	260.914	1.671+10	8.000+09	4.100+10

TABLE VII. Wavelengths (WL in Å), weighted radiative transition probabilities ((gA_r) in sec^{-1}) and ionization energies of upper level (E_S in eV) for dielectronic satellite lines of C I. We used additional designations (a and b) for terms as seniority numbers in the fourth column.

Lower level		Upper level			WL in Å	gA_r	E_S
LS	J	$L_{12}S_{12}$	$L'S'$	J'			
1	2	3	4	5	6	7	8
$2s^22p^2(LSJ)$		$2p^3(L_{12}S_{12})2s(L'S'J')$					
^3P	1	(^4S)	^3S	1	853.9	3.946+09	3.239
^3P	0	(^4S)	^3S	1	853.8	1.316+09	3.239
^3P	2	(^4S)	^3S	1	854.1	6.575+09	3.239
^1D	2	(^2D)	^1D	2	1011.0	2.168+10	2.301
^1D	2	(^2P)	^1P	1	919.4	1.352+10	3.522
^1S	0	(^2P)	^1P	1	995.4	4.621+09	3.522
$2s^22p^2(LSJ)$		$2p^2(L_{12}S_{12})2s3p(L'S'J')$					
^3P	1	(^3P)	^3Sb	1	954.1	2.893+09	1.714
^3P	2	(^3P)	^3Sb	1	954.4	4.824+09	1.714
^1D	2	(^1D)	^1F	3	737.0	1.015+09	6.859
$2s^22p^2(LSJ)$		$2p^2(L_{12}S_{12})2s4p(L'S'J')$					
^3P	2	(^3P)	^3Db	3	823.7	1.126+09	3.774
^3P	2	(^3P)	^3Sb	1	819.6	2.628+09	3.850
^3P	1	(^3P)	^3Sb	1	819.4	1.426+09	3.850
^1D	2	(^1D)	^1F	3	683.0	1.288+09	8.189
$2s2p^3(LSJ)$		$2p^2(L_{12}S_{12})2s3s(L'S'J')$					
^5S	2	(^3P)	^5P	3	1486.9	1.285+09	1.022
^3D	3	(^1D)	^3D	3	1463.3	1.675+09	5.596
^3D	2	(^3P)	^3Pa	1	965.6	1.303+09	9.962
^3D	3	(^3P)	^3Pa	2	965.4	2.381+09	9.965
$2s2p^3(LSJ)$		$2p^2(L_{12}S_{12})2s3d(L'S'J')$					
^3D	3	(^3P)	^3Fb	4	2000.4	1.242+09	3.320
^5S	2	(^3P)	^5P	3	1170.6	2.044+09	3.273
^5S	2	(^3P)	^5P	2	1170.6	1.426+09	3.275
^3D	2	(^1D)	^3D	2	1160.8	1.061+09	7.802
^3D	3	(^1D)	^3D	3	1160.8	1.896+09	7.802
^3P	2	(^1D)	^3P	2	1323.7	1.320+09	7.863
^3P	2	(^1S)	^3D	3	1061.1	2.576+09	10.18
^3P	1	(^1S)	^3D	2	1061.1	1.384+09	10.18
^3P	0	(^3P)	^3Da	1	907.1	1.366+09	12.16
^3P	1	(^3P)	^3Da	1	907.0	1.066+09	12.16
^3P	2	(^3P)	^3Da	2	906.9	1.055+09	12.17
^3P	2	(^3P)	^3Da	3	906.9	5.760+09	12.17
$2s2p^3(LSJ)$		$2p^2(L_{12}S_{12})2s4d(L'S'J')$					
^3D	3	(^3P)	^3Fb	4	1796.8	1.954+09	4.022
$2s2p^3(LSJ)$		$2p^2(L_{12}S_{12})2p^2(L'S'J')$					
^3D	3	(^3P)	^3P	2	991.8	1.196+10	9.623
^3D	2	(^3P)	^3P	2	991.8	2.154+09	9.623

1	2	3	4	5	6	7	8
^3D	1	(^3P)	^3P	1	991.5	2.134+09	9.626
^3D	2	(^3P)	^3P	1	991.6	6.365+09	9.626
^3D	1	(^3P)	^3P	0	991.4	2.823+09	9.627
^3P	2	(^3P)	^3P	2	1114.3	2.240+09	9.623
$2s^22p3s(LSJ)$		$2p^2(L_{12}S_{12})2s3s(L'S'J')$					
^3P	1	(^1D)	^3D	2	1288.4	2.070+09	5.596
^3P	2	(^1D)	^3D	3	1289.1	3.856+09	5.596
^1P	1	(^1D)	^1D	2	1258.3	1.847+09	5.985
^3P	2	(^1S)	^3S	1	1026.3	1.884+09	8.058
^3P	1	(^1S)	^3S	1	1025.9	1.139+09	8.058
^1P	1	(^1S)	^1S	0	1019.4	1.710+09	8.293
^3P	1	(^3P)	^3Pa	0	886.3	3.963+09	9.961
^3P	1	(^3P)	^3Pa	1	886.2	2.975+09	9.962
^3P	0	(^3P)	^3Pa	1	886.1	3.962+09	9.962
^3P	2	(^3P)	^3Pa	1	886.5	4.973+09	9.962
^3P	1	(^3P)	^3Pa	2	886.0	4.976+09	9.965
^3P	2	(^3P)	^3Pa	2	886.3	1.494+10	9.965
^1P	1	(^3P)	^1P	1	891.1	1.416+10	10.04
$2s^22p3s(LSJ)$		$2p^2(L_{12}S_{12})2s3d(L'S'J')$					
^3P	2	(^1D)	^3S	1	1051.9	1.570+09	7.764
$2s^22p3s(LSJ)$		$2p^2(L_{12}S_{12})2p^2(L'S'J')$					
^3P	2	(^3P)	^3P	2	908.6	1.201+09	9.623
$2s^22p3p(LSJ)$		$2p^2(L_{12}S_{12})2s3p(L'S'J')$					
^1P	1	(^1D)	^1D	2	1226.9	2.544+09	7.067
^1P	1	(^1S)	^1P	1	1004.3	2.838+09	9.306
^1P	1	(^3P)	^1S	0	893.4	4.835+09	10.84
^1P	1	(^3P)	^1D	2	858.3	4.294+09	11.41
^1P	1	(^3P)	^1P	1	848.2	2.189+09	11.58
^3D	1	(^1D)	^3F	2	1280.1	1.946+09	6.715
^3D	1	(^1S)	^3P	0	1019.0	1.299+09	9.197
^3D	1	(^3P)	^3Da	1	885.7	7.457+09	11.03
^3D	1	(^3P)	^3Da	2	885.6	2.532+09	11.03
^3D	1	(^3P)	^3Pa	0	880.4	1.831+09	11.11
^3D	1	(^3P)	^3Pa	1	880.3	1.454+09	11.11
^3D	2	(^1D)	^3F	3	1280.4	2.884+09	6.715
^3D	2	(^1S)	^3P	1	1019.2	2.913+09	9.197
^3D	2	(^3P)	^3Da	1	885.9	2.620+09	11.03
^3D	2	(^3P)	^3Da	2	885.8	1.151+10	11.03
^3D	2	(^3P)	^3Da	3	885.6	2.668+09	11.03
^3D	2	(^3P)	^3Pa	1	880.5	4.044+09	11.11
^3D	2	(^3P)	^3Pa	2	880.4	1.502+09	11.11

1	2	3	4	5	6	7	8
^3D	3	(^1D)	^3F	4	1281.0	4.163+09	6.715
^3D	3	(^1D)	^3D	3	1252.1	1.201+09	6.938
^3D	3	(^1S)	^3P	2	1019.5	5.443+09	9.197
^3D	3	(^3P)	^3Da	2	886.0	2.805+09	11.03
^3D	3	(^3P)	^3Da	3	885.8	2.099+10	11.03
^3D	3	(^3P)	^3Pa	2	880.6	7.525+09	11.12
^3S	1	(^1D)	^3P	1	1253.1	1.035+09	7.014
^3S	1	(^1D)	^3P	2	1253.1	1.705+09	7.014
^3S	1	(^3P)	^3Pa	0	886.0	1.463+09	11.11
^3S	1	(^3P)	^3Pa	1	886.0	4.410+09	11.11
^3S	1	(^3P)	^3Pa	2	885.9	7.455+09	11.12
^3P	2	(^1D)	^3D	3	1306.9	2.073+09	6.938
^3P	1	(^1D)	^3D	2	1306.5	1.114+09	6.938
^3P	2	(^1S)	^3P	2	1055.6	2.188+09	9.197
^3P	1	(^3P)	^3Da	1	913.1	1.380+09	11.03
^3P	0	(^3P)	^3Da	1	913.0	1.885+09	11.03
^3P	1	(^3P)	^3Da	2	912.9	4.216+09	11.03
^3P	2	(^3P)	^3Da	2	913.1	1.338+09	11.03
^3P	2	(^3P)	^3Da	3	912.9	7.713+09	11.03
^3P	1	(^3P)	^3Pa	0	907.4	1.181+09	11.11
^3P	0	(^3P)	^3Pa	1	907.2	1.110+09	11.11
^3P	2	(^3P)	^3Pa	1	907.5	1.489+09	11.11
^3P	1	(^3P)	^3Pa	2	907.2	1.315+09	11.12
^3P	2	(^3P)	^3Pa	2	907.4	4.491+09	11.12
^3P	1	(^3P)	^3Sa	1	889.9	4.397+09	11.38
^3P	0	(^3P)	^3Sa	1	889.8	1.473+09	11.38
^3P	2	(^3P)	^3Sa	1	890.1	7.251+09	11.38
^1D	2	(^1D)	^1F	3	1343.0	4.015+09	6.859
^1D	2	(^1S)	^1P	1	1061.5	2.357+09	9.306
^1D	2	(^3P)	^1D	2	899.8	1.636+10	11.41
^1D	2	(^3P)	^1P	1	888.7	6.039+09	11.58
^1S	0	(^3P)	^1P	1	901.2	4.078+09	11.58
$2s^22p3d(LSJ)$		$2p^2(L_{12}S_{12})2s3d(L'S'J')$					
^1D	2	(^1D)	^1D	2	1292.6	1.609+09	7.755
^3P	2	(^1D)	^3S	1	1282.8	1.188+09	7.764
^1D	2	(^1D)	^1F	3	1286.9	2.356+09	7.797
^1F	3	(^1D)	^1F	3	1297.1	1.200+09	7.797
^3F	2	(^1D)	^3G	3	1287.5	2.741+09	7.835
^3F	4	(^1D)	^3F	4	1294.9	1.544+09	7.786
^3F	3	(^1D)	^3F	3	1294.3	1.182+09	7.786
^3D	1	(^1D)	^3F	2	1297.0	1.368+09	7.786
^3D	2	(^1D)	^3F	3	1297.3	2.369+09	7.786

1	2	3	4	5	6	7	8
^3D	3	(^1D)	^3F	4	1297.4	3.290+09	7.786
^3F	4	(^1D)	^3G	5	1288.3	4.730+09	7.835
^3F	3	(^1D)	^3G	4	1287.8	3.553+09	7.835
^1F	3	(^1D)	^1G	4	1290.8	3.573+09	7.845
^1F	3	(^1S)	^1D	2	1039.1	4.626+09	10.17
^1D	2	(^1S)	^1D	2	1032.5	3.059+09	10.17
^3D	3	(^1S)	^3D	3	1037.5	3.212+09	10.18
^3D	2	(^1S)	^3D	2	1037.4	1.929+09	10.18
^3D	1	(^1S)	^3D	1	1037.2	1.201+09	10.18
^3F	4	(^1S)	^3D	3	1035.8	6.587+09	10.18
^3F	3	(^1S)	^3D	2	1035.5	4.160+09	10.18
^3F	2	(^1S)	^3D	1	1035.3	2.870+09	10.18
^1D	2	(^3P)	^1P	1	888.6	1.013+10	12.12
^1D	2	(^3P)	^1F	3	886.8	8.167+09	12.14
^1D	2	(^3P)	^1D	2	883.2	1.608+09	12.20
^3F	2	(^3P)	^3Fa	2	891.0	1.215+10	12.12
^3F	4	(^3P)	^3Fa	4	891.1	2.498+10	12.12
^3F	3	(^3P)	^3Fa	3	891.1	1.599+10	12.12
^3F	4	(^3P)	^3Da	3	888.4	1.426+10	12.17
^3F	2	(^3P)	^3Da	1	888.1	6.942+09	12.17
^3F	3	(^3P)	^3Fa	2	891.2	1.786+09	12.12
^3F	2	(^3P)	^3Fa	3	890.9	2.313+09	12.12
^3F	3	(^3P)	^3Da	2	888.2	9.828+09	12.17
^3F	2	(^3P)	^3Da	2	888.1	1.218+09	12.17
^3F	4	(^3P)	^3Fa	3	891.3	2.057+09	12.12
^3F	3	(^3P)	^3Fa	4	890.9	2.740+09	12.12
^3F	3	(^3P)	^3Da	3	888.1	1.220+09	12.17
^1F	3	(^3P)	^1D	2	888.0	1.118+10	12.20
^1F	3	(^3P)	^1F	3	891.6	1.947+10	12.14
^3P	0	(^3P)	^3Da	1	881.6	1.510+09	12.16
^3P	1	(^3P)	^3Da	1	881.5	1.187+09	12.16
^3P	1	(^3P)	^3Da	2	881.5	3.493+09	12.17
^3P	2	(^3P)	^3Pa	2	882.7	1.385+09	12.15
^3P	2	(^3P)	^3Da	2	881.4	1.168+09	12.17
^3D	3	(^3P)	^3Pa	2	891.0	1.054+10	12.15
^3D	3	(^3P)	^3Fa	4	892.4	1.003+10	12.12
^3D	1	(^3P)	^3Pa	1	890.8	1.366+09	12.15
^3D	1	(^3P)	^3Pa	0	890.8	1.986+09	12.15
^3D	1	(^3P)	^3Fa	2	892.4	4.959+09	12.12
^3D	2	(^3P)	^3Pa	1	890.9	5.664+09	12.15
^3D	2	(^3P)	^3Fa	2	892.6	1.628+09	12.12
^3D	2	(^3P)	^3Fa	3	892.5	7.495+09	12.12

1	2	3	4	5	6	7	8
^3D	2	(^3P)	^3Pa	2	890.9	1.452+09	12.15
^3D	2	(^3P)	^3Da	2	889.6	1.705+09	12.17
^3D	3	(^3P)	^3Fa	3	892.5	1.881+09	12.12
^3D	3	(^3P)	^3F	3	891.1	1.324+09	12.14
^3D	3	(^3P)	^3Da	3	889.6	2.537+09	12.17
^1P	1	(^3P)	^1P	1	893.1	2.954+09	12.12
^1P	1	(^3P)	^1D	2	887.7	3.715+09	12.20
$2s^22p3d(LSJ)$		$2p^2(L_{12}S_{12})2s4s(L'S'J')$					
^3P	2	(^1D)	^3D	3	1272.7	1.235+09	7.842
^1P	1	(^1D)	^1D	2	1276.1	1.099+09	7.950
^3P	1	(^3P)	^3Pa	2	880.6	1.001+09	12.18
^3P	2	(^3P)	^3Pa	2	880.5	1.927+09	12.18
^3D	1	(^3P)	^3Pa	0	888.8	1.120+09	12.18
^3D	2	(^3P)	^3Pa	1	888.8	2.271+09	12.18
^1P	1	(^3P)	^1P	1	887.9	5.094+09	12.20
^3D	3	(^3P)	^3Pa	2	888.8	3.559+09	12.18
$2s^22p3d(LSJ)$		$2p^2(L_{12}S_{12})2p^2(L'S'J')$					
^3P	2	(^3P)	^3P	2	1075.9	1.916+09	9.623
$2s^22p4s(LSJ)$		$2p^2(L_{12}S_{12})2s3d(L'S'J')$					
^3P	2	(^1D)	^3D	3	1292.3	1.488+09	7.802
^1P	1	(^1S)	^1D	2	1041.8	1.018+09	10.17
^1P	1	(^3P)	^1D	2	890.0	4.781+09	12.20
^3P	1	(^3P)	^3Pa	1	889.3	1.441+09	12.15
^3P	1	(^3P)	^3Pa	0	889.3	1.849+09	12.15
^3P	0	(^3P)	^3Pa	1	889.1	1.712+09	12.15
^3P	2	(^3P)	^3Pa	1	889.6	2.033+09	12.15
^3P	1	(^3P)	^3Pa	2	889.3	1.699+09	12.15
^3P	2	(^3P)	^3Pa	2	889.6	5.723+09	12.15
$2s^22p4s(LSJ)$		$2p^2(L_{12}S_{12})2s4s(L'S'J')$					
^3P	1	(^1D)	^3D	2	1286.5	1.010+09	7.842
^3P	2	(^1D)	^3D	3	1287.1	1.935+09	7.842
^1P	1	(^1D)	^1D	2	1280.8	1.027+09	7.950
^3P	1	(^1S)	^3S	1	1035.0	1.889+09	10.18
^3P	2	(^1S)	^3S	1	1035.4	3.138+09	10.18
^3P	2	(^3P)	^3Pa	2	887.4	1.043+10	12.18
^3P	1	(^3P)	^3Pa	0	887.3	2.387+09	12.18
^3P	1	(^3P)	^3Pa	1	887.2	1.894+09	12.18
^3P	0	(^3P)	^3Pa	1	887.1	2.359+09	12.18
^3P	2	(^3P)	^3Pa	1	887.5	3.277+09	12.18
^3P	1	(^3P)	^3Pa	2	887.1	3.280+09	12.18
^1P	1	(^3P)	^1P	1	890.2	7.566+09	12.20

1	2	3	4	5	6	7	8
$2s^22p4p(LSJ)$		$2p^2(L_{12}S_{12})2s4p(L'S'J')$					
^1P	1	(^1D)	^1D	2	1271.4	1.842+09	8.252
^1P	1	(^1S)	^1P	1	1028.3	1.867+09	10.56
^1P	1	(^3P)	^1S	0	889.8	4.636+09	12.43
^1P	1	(^3P)	^1D	2	878.9	4.162+09	12.61
^1P	1	(^3P)	^1P	1	873.1	2.798+09	12.70
^3D	2	(^1D)	^3F	3	1287.0	2.743+09	8.148
^3D	1	(^1D)	^3F	2	1286.7	1.782+09	8.148
^3D	3	(^1S)	^3P	2	1031.8	5.165+09	10.54
^3D	2	(^1S)	^3P	1	1031.5	2.729+09	10.54
^3D	1	(^1S)	^3P	0	1031.3	1.185+09	10.54
^3D	1	(^3P)	^3Da	1	888.3	6.800+09	12.47
^3D	2	(^3P)	^3Da	1	888.4	2.834+09	12.47
^3D	1	(^3P)	^3Da	2	888.2	2.468+09	12.47
^3D	3	(^3P)	^3Da	2	888.5	3.263+09	12.47
^3D	2	(^3P)	^3Da	2	888.3	1.090+10	12.47
^3D	3	(^3P)	^3Da	3	888.4	2.083+10	12.48
^3D	2	(^3P)	^3Da	3	888.1	2.753+09	12.48
^3D	1	(^3P)	^3Pa	0	886.8	2.003+09	12.49
^3D	1	(^3P)	^3Pa	1	886.8	1.880+09	12.49
^3D	2	(^3P)	^3Pa	1	886.9	4.386+09	12.49
^3D	3	(^3P)	^3Pa	2	887.1	8.016+09	12.50
^3D	2	(^3P)	^3Pa	2	886.8	2.037+09	12.50
^3S	1	(^1D)	^3P	2	1277.8	1.567+09	8.238
^3S	1	(^3P)	^3Pa	0	888.2	1.373+09	12.49
^3S	1	(^3P)	^3Pa	1	888.2	4.042+09	12.49
^3S	1	(^3P)	^3Pa	2	888.1	7.128+09	12.50
^3P	1	(^1D)	^3D	2	1294.6	1.267+09	8.215
^3P	2	(^1D)	^3D	3	1295.0	2.358+09	8.215
^3P	2	(^1S)	^3P	2	1042.4	2.135+09	10.54
^3P	1	(^3P)	^3Da	1	896.3	1.278+09	12.47
^3P	0	(^3P)	^3Da	1	896.3	1.880+09	12.47
^3P	1	(^3P)	^3Da	2	896.2	4.124+09	12.47
^3P	2	(^3P)	^3Da	2	896.4	1.124+09	12.47
^3P	2	(^3P)	^3Da	3	896.2	7.179+09	12.48
^3P	1	(^3P)	^3Pa	0	894.9	1.238+09	12.49
^3P	1	(^3P)	^3Pa	1	894.8	1.058+09	12.49
^3P	0	(^3P)	^3Pa	1	894.7	1.010+09	12.49
^3P	2	(^3P)	^3Pa	1	895.0	1.624+09	12.49
^3P	1	(^3P)	^3Pa	2	894.7	1.057+09	12.50
^3P	2	(^3P)	^3Pa	2	894.9	4.955+09	12.50
^3P	1	(^3P)	^3Sa	1	889.9	4.569+09	12.57

1	2	3	4	5	6	7	8
^3P	0	(^3P)	^3Sa	1	889.8	1.553+09	12.57
^3P	2	(^3P)	^3Sa	1	890.1	7.285+09	12.57
^1D	2	(^1D)	^1F	3	1313.4	4.253+09	8.189
^1D	2	(^1S)	^1P	1	1049.9	2.901+09	10.56
^1D	2	(^3P)	^1D	2	894.7	1.658+10	12.61
^1D	2	(^3P)	^1P	1	888.7	7.707+09	12.70
^1S	0	(^1S)	^1P	1	1066.9	1.155+09	10.56
^1S	0	(^3P)	^1P	1	900.8	3.584+09	12.70
$2s^22p4d(LSJ)$		$2p^2(L_{12}S_{12})2s4d(L'S'J')$					
^3P	2	(^1D)	^3P	2	1293.6	2.015+09	8.549
^1D	2	(^1D)	^1D	2	1291.5	1.577+09	8.491
^1D	2	(^1D)	^1F	3	1287.3	2.207+09	8.523
^3F	2	(^1D)	^3G	3	1287.8	2.420+09	8.534
^3F	4	(^1D)	^3F	4	1290.9	1.628+09	8.517
^3F	3	(^1D)	^3F	3	1290.3	1.297+09	8.517
^3F	4	(^1D)	^3G	5	1288.6	4.380+09	8.534
^3F	3	(^1D)	^3G	4	1288.0	3.063+09	8.534
^3D	1	(^1D)	^3F	2	1291.4	1.262+09	8.517
^3D	2	(^1D)	^3F	3	1291.7	2.034+09	8.517
^3D	2	(^1D)	^3D	2	1290.1	1.183+09	8.529
^3D	3	(^1D)	^3F	4	1291.8	2.833+09	8.517
^3D	3	(^1D)	^3D	3	1290.3	1.927+09	8.529
^1F	3	(^1D)	^1F	3	1292.2	1.309+09	8.523
^1F	3	(^1D)	^1G	4	1289.9	3.221+09	8.540
^1P	1	(^1D)	^1P	1	1288.8	1.318+09	8.554
^3P	1	(^1S)	^3D	2	1040.1	1.201+09	10.89
^3P	2	(^1S)	^3D	3	1039.9	2.233+09	10.89
^1D	2	(^1S)	^1D	2	1037.1	2.604+09	10.84
^3F	2	(^1S)	^3D	1	1034.9	2.678+09	10.89
^3F	3	(^1S)	^3D	2	1035.1	3.761+09	10.89
^3F	2	(^1S)	^3D	2	1034.9	1.073+09	10.89
^3F	4	(^1S)	^3D	3	1035.5	7.025+09	10.89
^3F	3	(^1S)	^3D	3	1035.1	1.508+09	10.89
^3D	1	(^1S)	^3D	1	1035.8	1.259+09	10.89
^3D	3	(^1S)	^3D	2	1036.0	1.567+09	10.89
^3D	2	(^1S)	^3D	2	1035.9	1.549+09	10.89
^3D	3	(^1S)	^3D	3	1036.0	2.714+09	10.89
^1F	3	(^1S)	^1D	2	1040.4	4.197+09	10.84
^1P	1	(^1S)	^1D	2	1040.8	1.439+09	10.84
^3P	2	(^3P)	^3Da	3	891.8	1.082+10	12.87
^3P	1	(^3P)	^3Da	1	892.2	2.572+09	12.86

1	2	3	4	5	6	7	8
^3P	0	(^3P)	^3Pa	1	892.0	3.502+09	12.87
^3P	1	(^3P)	^3Pa	0	892.0	1.200+09	12.87
^3P	2	(^3P)	^3Da	1	892.0	1.450+09	12.86
^3P	1	(^3P)	^3Da	2	892.0	7.099+09	12.87
^3P	2	(^3P)	^3Pa	2	892.1	5.556+09	12.86
^1D	2	(^3P)	^1P	1	888.3	1.104+10	12.85
^1D	2	(^3P)	^1F	3	887.6	7.662+09	12.86
^1D	2	(^3P)	^1D	2	885.9	1.604+09	12.89
^3F	2	(^3P)	^3Fa	2	889.5	1.060+10	12.84
^3F	4	(^3P)	^3Fa	4	889.6	2.504+10	12.85
^3F	3	(^3P)	^3Fa	3	889.5	1.398+10	12.85
^3F	4	(^3P)	^3Da	3	888.6	1.477+10	12.87
^3P	2	(^3P)	^3Da	3	891.8	1.082+10	12.87
^3F	2	(^3P)	^3Da	1	888.3	5.720+09	12.86
^3F	2	(^3P)	^3Pa	1	888.2	2.317+09	12.87
^3F	3	(^3P)	^3Fa	2	889.6	1.919+09	12.84
^3F	2	(^3P)	^3Fa	3	889.4	3.244+09	12.85
^3F	3	(^3P)	^3Pa	2	888.6	6.355+09	12.86
^3F	3	(^3P)	^3Da	2	888.3	5.074+09	12.87
^3F	4	(^3P)	^3Fa	3	889.8	2.729+09	12.85
^3F	3	(^3P)	^3Fa	4	889.3	4.117+09	12.85
^3F	3	(^3P)	^3Da	3	888.3	1.269+09	12.87
^3D	1	(^3P)	^3Pa	0	888.8	3.466+09	12.87
^3D	1	(^3P)	^3Pa	1	888.8	3.230+09	12.87
^3D	1	(^3P)	^3Fa	2	890.1	5.015+09	12.84
^3D	2	(^3P)	^3Da	1	889.1	3.529+09	12.86
^3D	2	(^3P)	^3Pa	1	888.9	4.148+09	12.87
^3D	2	(^3P)	^3Fa	2	890.2	2.364+09	12.84
^3D	2	(^3P)	^3Fa	3	890.1	5.804+09	12.85
^3D	3	(^3P)	^3Pa	2	889.3	9.649+09	12.86
^3D	3	(^3P)	^3Da	2	889.0	5.133+09	12.87
^3D	2	(^3P)	^3Da	2	888.9	4.209+09	12.87
^3D	3	(^3P)	^3Fa	3	890.2	2.982+09	12.85
^3D	3	(^3P)	^3Fa	4	890.1	7.562+09	12.85
^3D	3	(^3P)	^3F	3	889.4	1.738+09	12.86
^3D	3	(^3P)	^3Da	3	889.0	2.971+09	12.87
^1F	3	(^3P)	^1D	2	888.2	1.237+10	12.89
^1F	3	(^3P)	^1F	3	890.0	1.893+10	12.86
^1P	1	(^3P)	^1P	1	891.0	3.163+09	12.85
^1P	1	(^3P)	^1D	2	888.6	8.324+09	12.89
$2s^22p4f(LSJ)$		$2p^2(L_{12}S_{12})2s4f(L'S'J')$					
^3F	2	(^1D)	^3G	3	1288.2	1.509+09	8.546

1	2	3	4	5	6	7	8
^3F	4	(^1D)	^3G	5	1288.3	1.705+09	8.546
^3F	3	(^1D)	^3G	4	1288.2	1.310+09	8.546
^3F	4	(^1D)	^3F	4	1288.1	1.714+09	8.548
^3F	2	(^1D)	^3F	2	1288.0	1.443+09	8.548
^3F	3	(^1D)	^3F	3	1288.0	1.256+09	8.548
^3F	2	(^1S)	^3F	3	1034.4	1.047+09	10.91
^3F	2	(^1S)	^3F	2	1034.4	2.039+09	10.91
^3F	4	(^1S)	^3F	4	1034.5	4.890+09	10.91
^3F	4	(^1S)	^1F	3	1034.5	1.118+09	10.91
^3F	3	(^1S)	^3F	4	1034.4	1.432+09	10.91
^3F	3	(^1S)	^1F	3	1034.4	2.057+09	10.91
^3F	3	(^3P)	^3Da	3	888.5	3.592+09	12.87
^3F	4	(^3P)	^3Da	3	888.6	1.832+10	12.87
^3F	3	(^3P)	^3Ga	4	888.5	1.302+10	12.87
^3F	4	(^3P)	^3Ga	4	888.6	5.277+09	12.87
^3F	2	(^3P)	^1D	2	888.5	2.478+09	12.87
^3F	2	(^3P)	^3Ga	3	888.5	9.728+09	12.87
^3F	2	(^3P)	^3Da	1	888.3	6.728+09	12.88
^3F	3	(^3P)	^3Da	2	888.3	1.045+10	12.88
^3F	4	(^3P)	^3Ga	5	888.3	1.424+10	12.88
^3F	4	(^3P)	^3Fa	3	888.0	1.943+09	12.88
^3F	3	(^3P)	^3Fa	3	887.9	1.361+09	12.88
^3F	3	(^3P)	^3Fa	4	887.9	1.223+09	12.88
^1F	3	(^1D)	^1G	4	1288.3	1.058+09	8.546
^1F	3	(^1D)	^3H	4	1287.1	1.205+09	8.554
^1F	3	(^1S)	^3F	3	1034.5	2.535+09	10.91
^1F	3	(^1S)	^1F	3	1034.5	1.266+09	10.91
^1F	3	(^3P)	^3Ga	3	888.6	4.193+09	12.87
^1F	3	(^3P)	^1D	2	888.6	1.346+10	12.87
^1F	3	(^3P)	^1G	4	888.3	1.125+10	12.88
^1F	3	(^3P)	^3Fa	2	888.0	1.453+09	12.88
^3G	5	(^1D)	^3G	5	1289.7	2.103+09	8.546
^3G	4	(^1D)	^3G	5	1289.2	1.403+09	8.546
^3G	4	(^1D)	^3F	4	1289.0	1.116+09	8.547
^3G	5	(^1D)	^3H	6	1288.5	5.499+09	8.554
^3G	4	(^1D)	^3H	5	1288.1	1.980+09	8.554
^3G	4	(^1D)	^1H	5	1288.1	1.074+09	8.554
^3G	3	(^1D)	^3H	4	1288.1	2.423+09	8.554
^3G	5	(^1S)	^3F	4	1035.4	8.204+09	10.91
^3G	4	(^1S)	^3F	3	1035.1	2.959+09	10.91
^3G	3	(^1S)	^3F	2	1035.1	4.090+09	10.91

1	2	3	4	5	6	7	8
^3G	4	(^1S)	^1F	3	1035.1	2.612+09	10.91
^3G	4	(^3P)	^3Da	3	889.0	2.688+09	12.87
^3G	3	(^3P)	^1D	2	889.0	2.045+09	12.87
^3G	5	(^3P)	^3Ga	4	889.3	3.298+09	12.87
^3G	4	(^3P)	^3Ga	4	889.0	1.580+10	12.87
^3G	3	(^3P)	^3Ga	3	889.0	1.212+10	12.87
^3G	4	(^3P)	^3Ga	5	888.8	2.630+09	12.88
^3G	5	(^3P)	^3Ga	5	889.0	2.943+10	12.88
^3G	3	(^3P)	^1G	4	888.8	2.161+09	12.88
^3G	4	(^3P)	^3Fa	3	888.4	1.378+10	12.88
^3G	3	(^3P)	^3Fa	2	888.4	1.040+10	12.88
^3G	4	(^3P)	^3Fa	4	888.4	5.193+09	12.88
^3G	3	(^3P)	^1F	3	888.4	3.720+09	12.88
^3G	5	$(^P)$	^3Fa	4	888.6	1.799+10	12.88
^1D	2	(^1S)	^3F	2	1035.3	1.023+09	10.91
^1D	2	(^1S)	^1F	3	1035.3	1.204+09	10.91
^1D	2	(^3P)	^1D	2	889.2	4.942+09	12.87
^1D	2	(^3P)	^3Da	1	889.0	3.463+09	12.88
^1D	2	(^3P)	^1F	3	888.5	1.153+10	12.88
^1G	4	(^1D)	^1G	4	1289.7	1.182+09	8.546
^1G	4	(^1D)	^1H	5	1288.5	1.538+09	8.554
^1G	4	(^1D)	^1H	5	1288.5	3.034+09	8.554
^1G	4	(^1S)	^1F	3	1035.4	3.505+09	10.91
^1G	4	(^1S)	^1F	3	1035.4	3.014+09	10.91
^1G	4	(^3P)	^1Ga	3	889.3	2.536+09	12.87
^1G	4	(^3P)	^1G	4	889.0	2.400+10	12.88
^1G	4	(^3P)	^1F	3	888.6	1.432+10	12.88
^3D	3	(^1D)	^3F	4	1289.4	1.278+09	8.548
^3D	3	(^1D)	^3D	3	1288.6	2.128+09	8.553
^3D	3	(^1D)	^3P	2	1288.0	2.006+09	8.557
^3D	1	(^1S)	^3F	2	1035.5	1.759+09	10.91
^3D	2	(^1S)	^3F	3	1035.5	1.179+09	10.91
^3D	2	(^1S)	^1F	3	1035.5	1.574+09	10.91
^3D	3	(^1S)	^3F	4	1035.3	2.575+09	10.91
^3D	3	(^1S)	^3F	3	1035.3	1.071+09	10.91
^3D	3	(^3P)	^3Da	3	889.2	7.025+09	12.87
^3D	1	(^3P)	^3Da	1	889.1	3.357+09	12.88
^3D	2	(^3P)	^3Da	2	889.2	6.096+09	12.88
^3D	3	(^3P)	^3Da	2	889.0	5.302+09	12.87
^3D	1	(^3P)	^3Fa	2	888.8	8.548+09	12.88
^3D	2	(^3P)	^3Fa	3	888.8	1.320+10	12.88
^3D	3	(^3P)	^3Fa	4	888.5	1.561+10	12.88

TABLE VIII. Energies from the threshold $1s^22s^22p\ ^2P$ (E_S in eV), weighted radiative transition probabilities ((gA_r) in sec^{-1}), autoionization rate (A_a in sec^{-1}) and factor intensities (Q_d in sec^{-1}) for $2s^22pnl(LS)$-$2s2p^2(L_{12}S_{12})nl(L'S'J')$ transitions with n=4, 5, and 6

Down level		Upper level			(A_a)	$\sum(A_a)$	gA_r	$\sum(gA_r)$	Q_d	E_S
n	LS	$L_{12}S_{12}$	$L'S'$	J'						
1	2	3	4	5	6	7	8	9	10	11
$2s^22pns(LS)$		$2s2p^2(L_{12}S_{12})ns(L'S'J')$								
5	^1P	(^1D)	^3D	1	1.269+13	2.032+13	8.878+08	1.339+06	1.393+05	8.553
6	^1P	(^1D)	^3D	1	6.909+12	1.047+13	8.222+08	5.200+06	5.720+05	8.871
4	^1P	(^1D)	^3D	2	5.264+13	5.837+13	3.050+09	2.806+06	4.218+05	7.840
5	^1P	(^1D)	^3D	2	1.269+13	2.032+13	2.736+09	1.664+07	1.731+06	8.553
6	^1P	(^1D)	^3D	2	6.908+12	1.047+13	2.610+09	4.478+07	4.925+06	8.871
4	^1P	(^1D)	^1D	2	7.702+13	1.502+14	2.712+09	1.027+09	8.777+07	7.948
5	^1P	(^1D)	^1D	2	3.574+13	7.562+13	3.327+09	1.338+09	1.054+08	8.599
6	^1P	(^1D)	^1D	2	2.426+13	5.127+13	2.577+09	1.398+09	1.102+08	8.897
4	^1P	(^1S)	^3S	1	5.667+13	6.681+13	6.565+09	2.855+06	4.036+05	10.18
5	^1P	(^1S)	^3S	1	1.303+13	2.505+13	5.631+09	1.924+07	1.668+06	10.90
6	^1P	(^1S)	^3S	1	6.404+12	1.216+13	5.527+09	5.442+07	4.777+06	11.22
4	^1P	(^1S)	^1S	0	5.776+13	1.073+14	2.122+09	9.322+08	8.366+07	10.28
5	^1P	(^1S)	^1S	0	2.784+13	4.506+13	2.092+09	1.190+09	1.225+08	10.94
6	^1P	(^1S)	^1S	0	1.661+13	2.693+13	2.079+09	1.235+09	1.270+08	11.24
4	^1P	(^3P)	^3Pa	0	2.895+13	7.804+13	4.622+09	1.449+07	8.957+05	12.17
5	^1P	(^3P)	^3Pa	0	2.457+12	9.722+12	4.551+09	5.785+07	2.436+06	12.88
6	^1P	(^3P)	^3Pa	0	2.402+12	1.154+13	4.572+09	1.382+08	4.790+06	13.20
4	^1P	(^3P)	^3Pa	1	3.076+13	7.725+13	1.384+10	7.384+07	4.900+06	12.17
5	^1P	(^3P)	^3Pa	1	4.116+12	1.121+13	1.007+10	2.622+08	1.604+07	12.88
6	^1P	(^3P)	^3Pa	1	4.544+12	1.239+13	1.043+10	6.291+08	3.843+07	13.20
4	^1P	(^3P)	^3Pa	2	2.957+13	7.148+13	2.291+10	1.966+07	1.356+06	12.18
5	^1P	(^3P)	^3Pa	2	4.286+13	4.594+13	2.258+10	1.537+08	2.390+07	12.88
6	^1P	(^3P)	^3Pa	2	2.757+12	9.154+12	2.256+10	5.098+08	2.558+07	13.20
4	^1P	(^3P)	^1P	1	1.913+14	1.946+14	1.439+10	7.566+09	1.239+09	12.19
5	^1P	(^3P)	^1P	1	2.449+12	9.703+12	2.187+10	8.810+09	3.703+08	12.89
6	^1P	(^3P)	^1P	1	2.360+13	2.536+13	1.321+10	8.560+09	1.327+09	13.21
4	^3P	(^3P)	^3Pb	0	2.330+14	2.330+14	1.345+08	1.657+06	2.762+05	3.453
5	^3P	(^3P)	^3Pb	0	8.142+13	8.142+13	7.550+07	5.483+05	9.138+04	4.088
4	^3P	(^3P)	^3Pb	1	2.331+14	2.331+14	4.033+08	7.407+06	1.235+06	3.456
5	^3P	(^3P)	^3Pb	1	8.140+13	8.140+13	2.034+08	5.371+05	8.952+04	4.091
6	^3P	(^3P)	^3Pb	1	6.057+13	6.057+13	1.293+08	2.818+05	4.697+04	4.386
4	^3P	(^3P)	^3Pb	2	2.331+14	2.331+14	6.715+08	8.1-7+06	1.351+06	3.461
5	^3P	(^3P)	^3Pb	2	8.138+13	8.138+13	3.767+08	2.482+06	4.138+05	4.094
6	^3P	(^3P)	^3Pb	2	6.037+13	6.037+13	2.378+08	7.040+05	1.173+05	4.389

1	2	3	4	5	6	7	8	9	10	11
4	^3P	(^1D)	^3D	1	5.265+13	5.838+13	1.831+09	7.890+08	1.186+08	7.840
5	^3P	(^1D)	^3D	1	1.269+13	2.032+13	8.878+08	8.712+08	9.065+07	8.553
6	^3P	(^1D)	^3D	1	6.909+12	1.047+13	8.222+08	1.061+09	1.168+08	8.871
4	^3P	(^1D)	^3D	2	5.264+13	5.837+13	3.050+09	1.328+09	1.995+08	7.840
5	^3P	(^1D)	^3D	2	1.269+13	2.032+13	2.736+09	1.772+09	1.844+08	8.553
6	^3P	(^1D)	^3D	2	6.908+12	1.047+13	2.610+09	1.130+08	1.243+08	8.871
4	^3P	(^1D)	^3D	3	5.263+13	5.836+13	4.268+09	1.935+09	2.908+08	7.840
5	^3P	(^1D)	^3D	3	1.269+13	2.032+13	3.827+09	1.256+09	1.307+08	8.553
6	^3P	(^1D)	^3D	3	6.907+12	1.047+13	3.650+09	1.673+09	1.840+08	8.871
4	^3P	(^1D)	^1D	2	7.702+13	1.502+14	2.712+09	1.606+07	1.372+06	7.948
5	^3P	(^1D)	^1D	2	3.574+13	7.562+13	3.327+09	6.285+07	4.951+06	8.599
6	^3P	(^1D)	^1D	2	2.426+13	5.127+13	2.577+09	2.420+08	1.908+07	8.897
4	^3P	(^1S)	^3S	1	5.667+13	6.681+13	6.565+09	5.666+09	8.010+08	10.18
5	^3P	(^1S)	^3S	1	1.303+13	2.505+13	5.631+09	4.660+09	4.040+08	10.90
6	^3P	(^1S)	^3S	1	6.404+12	1.216+13	5.527+09	4.483+09	3.935+08	11.22
4	^3P	(^1S)	^1S	0	5.776+13	1.073+14	2.122+09	1.478+07	1.326+06	10.28
5	^3P	(^1S)	^1S	0	2.784+13	4.506+13	2.092+09	5.523+07	5.686+06	10.94
6	^3P	(^1S)	^1S	0	1.661+13	2.693+13	2.079+09	1.971+08	2.026+07	11.24
4	^3P	(^3P)	^3Pa	0	2.895+13	7.804+13	4.622+09	2.387+09	1.476+08	12.17
5	^3P	(^3P)	^3Pa	0	2.457+12	9.722+12	4.551+09	2.771+09	1.167+08	12.88
6	^3P	(^3P)	^3Pa	0	2.402+12	1.154+13	4.572+09	3.769+08	1.306+07	13.20
4	^3P	(^3P)	^3Pa	1	3.076+13	7.725+13	1.384+10	7.530+09	4.997+08	12.17
5	^3P	(^3P)	^3Pa	1	4.116+12	1.121+13	1.007+10	4.884+09	2.988+08	12.88
6	^3P	(^3P)	^3Pa	1	4.544+12	1.239+13	1.043+10	6.247+09	3.816+08	13.20
4	^3P	(^3P)	^3Pa	2	2.957+13	7.148+13	2.291+10	1.371+10	9.453+08	12.18
5	^3P	(^3P)	^3Pa	2	4.286+13	4.594+13	2.258+10	1.430+10	2.223+09	12.88
6	^3P	(^3P)	^3Pa	2	2.757+12	9.154+12	2.256+10	1.505+10	7.550+08	13.20
4	^3P	(^3P)	^1P	1	1.913+14	1.946+14	1.439+10	9.905+07	1.622+07	12.19
5	^3P	(^3P)	^1P	1	2.449+12	9.703+12	2.187+10	2.850+08	1.198+07	12.89
6	^3P	(^3P)	^1P	1	2.360+13	2.536+13	1.321+10	8.994+08	1.395+08	13.21

TABLE IX. Energies from the threshold $1s^22s^22p\ ^2P$ (E_S in eV), weighted radiative transition probabilities ((gA_r) in sec^{-1}), autoionization rate (A_a in sec^{-1}) and factor intensities (Q_d in sec^{-1}) for $2s^22pnl$-$2s2p^2(L_{12}S_{12})nl(L'S'J')$ transitions with n=4, 5, and 6

	Upper level			(A_a)	$\sum(A_a)$	gA_r	$\sum(gA_r)$	Q_d	E_S
n	$L_{12}S_{12}$	$L'S'$	J'						
1	2	3	4	5	6	7	8	9	10
$2s^22pnp$	$2s2p^2(L_{12}S_{12})np(L'S'J')$								
4	(^3P)	^3Db	1	3.172+13	3.172+13	6.199+08	3.116+07	5.193+06	3.768
5	(^3P)	^3Db	1	1.219+13	1.219+13	1.442+08	3.051+06	5.085+05	4.232
6	(^3P)	^3Db	1	1.105+13	1.105+13	8.357+08	8.951+06	1.492+06	4.459
4	(^3P)	^3Db	2	3.171+13	3.171+13	1.033+09	5.189+07	8.649+06	3.769
5	(^3P)	^3Db	2	1.338+13	1.338+13	2.400+08	5.167+06	8.611+05	4.234
6	(^3P)	^3Db	2	1.106+13	1.106+13	1.393+09	1.507+07	2.508+06	4.461
4	(^3P)	^3Db	3	3.168+13	3.168+13	1.447+09	7.265+07	1.211+07	3.773
5	(^3P)	^3Db	3	1.337+13	1.337+13	3.374+08	7.247+06	1.208+06	4.237
6	(^3P)	^3Db	3	1.102+13	1.102+13	1.949+09	2.097+07	3.495+06	4.465
4	(^3P)	^3Sb	1	8.600+11	8.600+11	4.606+09	2.180+07	3.627+06	3.849
5	(^3P)	^3Sb	1	1.297+12	1.297+12	8.299+08	2.115+06	3.525+05	4.224
6	(^3P)	^3Sb	1	8.500+10	8.500+10	1.754+08	6.595+06	1.098+06	4.447
4	(^3P)	^3Pb	0	4.999+13	4.999+13	1.221+08	9.049+06	1.508+06	3.865
5	(^3P)	^3Pb	0	1.447+13	1.447+13	1.291+07	5.718+05	9.530+04	4.271
6	(^3P)	^3Pb	0	1.857+13	1.857+13	2.550+08	2.750+06	4.583+05	4.501
4	(^3P)	^3Pb	1	4.910+13	4.910+13	4.369+08	2.718+07	4.530+06	3.866
5	(^3P)	^3Pb	1	1.436+13	1.436+13	4.121+07	1.886+06	3.143+05	4.273
6	(^3P)	^3Pb	1	1.846+13	1.846+13	7.645+08	8.362+06	1.397+06	4.502
4	(^3P)	^3Pb	2	4.986+13	4.986+13	6.112+08	4.551+07	7.582+06	3.869
5	(^3P)	^3Pb	2	1.440+13	1.440+13	6.580+07	3.162+06	5.277+05	4.274
6	(^3P)	^3Pb	2	1.845+13	1.845+13	1.274+09	1.391+06	2.318+06	4.503
4	(^1D)	^3F	2	4.222+12	2.618+13	2.231+09	2.205+09	5.928+07	8.146
5	(^1D)	^3F	2	4.520+11	1.518+13	2.366+09	2.351+09	1.166+07	8.693
6	(^1D)	^3F	2	1.560+11	6.362+12	2.291+09	2.255+09	9.215+06	8.944
4	(^1D)	^3F	3	4.222+12	2.618+13	3.120+09	2.744+09	7.375+07	8.146
5	(^1D)	^3F	3	4.520+11	1.518+13	3.310+09	3.289+09	1.633+07	8.693
6	(^1D)	^3F	3	1.560+11	6.362+12	3.203+09	3.155+09	1.289+07	8.944
5	(^1D)	^3F	4	4.520+11	1.518+13	4.251+09	4.223+09	2.096+07	8.693
6	(^1D)	^3F	4	1.560+11	6.362+12	4.114+09	4.051+09	1.655+07	8.944
4	(^1D)	^1F	3	3.047+13	3.489+13	5.592+09	4.254+09	6.193+08	8.187
5	(^1D)	^1F	3	4.854+12	7.879+12	4.192+09	3.281+09	3.368+08	8.710
6	(^1D)	^1F	3	2.633+12	4.188+12	5.308+09	3.802+09	3.984+08	8.954
4	(^1D)	^3D	1	2.860+11	1.589+14	1.685+09	1.491+09	4.474+05	8.213
5	(^1D)	^3D	1	4.050+11	8.230+13	1.561+09	1.444+09	1.183+06	8.722
6	(^1D)	^3D	1	2.140+11	4.941+13	1.663+09	1.497+09	1.081+06	8.960

1	2	3	4	5	6	7	8	9	10
4	(^1D)	^3D	2	2.880+11	1.589+14	2.806+09	2.484+09	7.503+05	8.213
5	(^1D)	^3D	2	4.050+11	8.229+13	2.601+09	2.301+09	1.971+06	8.722
6	(^1D)	^3D	2	2.130+11	4.940+13	2.770+09	2.494+09	1.793+06	8.960
4	(^1D)	^3D	3	2.910+11	1.588+14	3.924+09	2.466+09	7.528+05	8.213
5	(^1D)	^3D	3	4.040+11	8.228+13	3.638+09	3.360+09	2.749+06	8.722
6	(^1D)	^3D	3	2.130+11	4.939+13	3.875+09	3.490+09	2.508+06	8.960
4	(^1D)	^3P	0	2.413+13	1.812+14	6.477+08	5.839+08	1.296+06	8.235
5	(^1D)	^3P	0	5.185+12	7.687+13	5.543+08	5.014+08	5.637+06	8.731
6	(^1D)	^3P	0	3.760+12	4.452+13	6.157+08	5.760+08	8.108+06	8.965
4	(^1D)	^3P	1	2.413+13	1.812+14	1.941+09	1.750+09	3.885+07	8.235
5	(^1D)	^3P	1	5.184+12	7.689+13	1.662+09	1.503+09	1.612+07	8.731
6	(^1D)	^3P	1	3.759+12	4.453+13	1.847+09	1.727+09	2.429+07	8.965
4	(^1D)	^3P	2	2.414+13	1.813+14	3.232+09	2.914+09	6.464+07	8.235
5	(^1D)	^3P	2	5.184+12	7.694+13	2.767+09	2.502+09	2.810+07	8.731
6	(^1D)	^3P	2	3.759+12	4.456+13	3.077+09	2.873+09	4.040+07	8.965
4	(^1D)	^1D	2	4.924+13	2.304+14	3.050+09	2.083+09	7.417+07	8.250
5	(^1D)	^1D	2	9.543+12	9.443+13	2.689+09	2.151+09	3.623+07	8.734
6	(^1D)	^1D	2	6.366+12	6.451+13	3.430+09	2.046+09	3.365+07	8.967
4	(^1D)	^1P	1	4.061+12	2.001+14	1.942+09	8.538+08	2.888+06	8.294
5	(^1D)	^1P	1	1.334+12	8.105+13	1.595+09	1.184+09	3.248+06	8.752
6	(^1D)	^1P	1	7.180+11	6.242+13	2.329+09	1.390+09	2.664+06	8.979
4	(^1S)	^3P	0	5.975+12	5.505+13	2.110+09	1.997+09	3.613+07	10.53
5	(^1S)	^3P	0	4.009+12	2.651+13	2.420+09	1.778+09	4.481+07	11.05
6	(^1S)	^3P	0	1.930+11	2.539+13	2.042+09	1.975+09	2.502+06	11.31
4	(^1S)	^3P	1	5.974+12	5.508+13	6.328+09	5.990+09	1.083+08	10.53
5	(^1S)	^3P	1	3.952+12	2.791+13	7.293+09	5.302+09	1.252+08	11.05
6	(^1S)	^3P	1	1.910+11	2.542+13	6.126+09	5.922+09	7.417+06	11.31
4	(^1S)	^3P	2	5.970+12	5.514+13	1.054+10	9.980+09	1.801+08	10.53
5	(^1S)	^3P	2	3.897+12	2.750+13	1.241+10	8.614+09	2.035+08	11.05
6	(^1S)	^3P	2	1.880+11	2.550+13	1.021+10	9.864+09	1.212+07	11.31
4	(^1S)	^1P	1	3.294+13	5.706+13	6.941+09	4.851+09	4.669+08	10.56
5	(^1S)	^1P	1	3.572+12	1.468+13	6.584+09	5.073+09	2.057+08	11.06
6	(^1S)	^1P	1	2.153+12	2.207+13	6.966+09	5.306+09	8.626+07	11.30
4	(^3P)	^1S	0	4.600+10	3.890+13	4.810+09	4.785+09	9.428+05	12.43
5	(^3P)	^1S	0	1.800+10	3.494+13	4.604+09	4.598+09	3.940+05	13.00
6	(^3P)	^1S	0	6.200+10	1.230+13	4.737+09	4.680+09	3.929+05	13.26
4	(^3P)	^3Da	1	2.354+13	5.838+13	1.338+10	1.318+10	8.859+08	12.47
5	(^3P)	^3Da	1	3.730+11	2.372+13	1.339+10	1.319+10	3.456+07	13.01
6	(^3P)	^3Da	1	2.340+11	1.041+13	1.329+10	1.311+10	3.709+07	13.27

1	2	3	4	5	6	7	8	9	10
4	(^3P)	^3Da	2	2.353+13	5.840+13	2.230+10	2.198+10	1.476+09	12.47
5	(^3P)	^3Da	2	3.920+11	2.381+13	2.233+10	2.199+10	6.033+07	13.02
6	(^3P)	^3Da	2	2.640+11	1.073+13	2.217+10	2.186+10	8.962+07	13.27
4	(^3P)	^3Da	3	2.352+13	5.829+13	3.121+10	3.077+10	2.069+09	12.47
5	(^3P)	^3Da	3	3.510+11	2.363+13	3.125+10	3.078+10	7.618+07	13.02
6	(^3P)	^3Da	3	1.910+11	1.024+13	3.096+10	3.053+09	1.022+08	13.27
4	(^3P)	^3Pa	0	2.628+13	6.462+13	4.759+09	4.677+09	3.170+08	12.49
5	(^3P)	^3Pa	0	2.890+12	2.462+13	4.581+09	4.493+09	8.789+07	13.03
6	(^3P)	^3Pa	0	1.449+12	1.181+13	4.671+09	4.610+09	9.419+07	13.28
4	(^3P)	^3Pa	1	2.629+13	6.466+13	1.428+10	1.403+10	9.507+08	12.49
5	(^3P)	^3Pa	1	2.874+12	2.449+13	1.374+10	1.357+10	2.634+08	13.03
6	(^3P)	^3Pa	1	1.364+12	1.126+13	1.397+10	1.378+10	2.778+08	13.28
4	(^3P)	^3Pa	2	2.630+13	6.458+13	2.379+10	2.339+10	1.587+09	12.49
5	(^3P)	^3Pa	2	2.884+12	2.456+13	2.290+10	2.246+10	4.393+08	13.03
6	(^3P)	^3Pa	2	1.454+12	1.178+13	2.328+10	2.297+10	4.725+08	13.28
4	(^3P)	^3Sa	1	2.400+10	5.472+13	1.367+10	1.341+10	9.800+05	12.57
5	(^3P)	^3Sa	1	3.200+10	6.560+12	1.348+10	1.317+10	1.070+07	13.05
6	(^3P)	^3Sa	1	1.360+11	3.580+12	1.392+10	1.358+10	8.585+07	13.28
4	(^3P)	^1D	2	6.251+12	2.808+14	2.128+10	2.093+09	7.765+07	12.60
5	(^3P)	^1D	2	3.247+12	1.193+14	2.212+10	2.088+10	9.473+07	13.08
6	(^3P)	^1D	2	2.385+12	9.895+13	2.149+10	2.078+10	6.700+07	13.31
4	(^3P)	^1P	1	5.907+13	6.672+14	1.495+10	1.064+10	1.570+08	12.70
5	(^3P)	^1P	1	1.214+13	2.102+14	1.370+10	1.235+10	1.189+08	13.12
6	(^3P)	^1P	1	1.593+13	2.729+14	1.510+10	1.398+10	1.360+08	13.35
$2s^22pnd$	$2s2p^2(L_{12}S_{12})nd(L'S'J')$								
4	(^3P)	^3Pb	0	2.890+11	2.890+11	1.287+08	6.909+06	1.151+06	3.998
5	(^3P)	^3Pb	0	8.700+10	8.700+10	3.312+07	3.984+05	6.637+04	4.339
6	(^3P)	^3Pb	0	1.510+11	1.510+11	1.319+08	8.380+05	1.395+05	4.516
4	(^3P)	^3Pb	1	2.880+11	2.880+11	3.850+08	2.063+07	3.437+06	3.996
5	(^3P)	^3Pb	1	5.200+10	4.827+12	6.866+07	1.147+06	2.059+03	4.337
6	(^3P)	^3Pb	1	1.590+11	1.590+11	2.662+08	2.746+06	4.574+05	4.515
4	(^3P)	^3Pb	2	2.950+11	2.950+11	6.472+08	3.480+07	5.797+06	3.995
5	(^3P)	^3Pb	2	2.100+10	2.100+10	1.746+08	1.974+06	3.284+05	4.335
6	(^3P)	^3Pb	2	1.010+11	1.010+11	4.227+08	2.482+06	4.134+05	4.512
6	(^3P)	^5P	1	2.000+10	2.000+10	8.477+07	3.751+05	6.243+04	4.518
4	(^3P)	^5P	2	2.000+09	2.000+09	5.113+08	1.558+05	2.470+04	4.004
6	(^3P)	^5P	2	8.000+09	8.000+09	1.617+08	2.661+05	4.417+04	4.517
6	(^3P)	^5D	0	2.900+10	2.900+10	3.295+07	1.646+05	2.740+04	4.519

1	2	3	4	5	6	7	8	9	10
4	(^3P)	^5D	2	2.000+09	2.000+09	1.146+08	1.804+05	2.973+04	4.017
4	(^3P)	^5D	3	2.900+10	2.900+10	6.655+08	4.864+06	8.081+05	4.017
5	(^3P)	^5D	3	5.700+10	5.700+10	2.247+08	3.745+05	6.238+04	4.348
6	(^3P)	^5D	3	3.000+09	3.000+09	1.579+08	1.099+05	1.818+04	4.522
4	(^3P)	^5D	4	5.000+09	5.000+09	2.534+08	8.691+05	1.440+05	4.019
6	(^3P)	^5D	4	3.000+09	3.000+09	1.735+08	1.012+05	1.676+04	4.522
4	(^3P)	^3Fb	2	8.300+10	8.300+10	1.198+09	9.537+06	1.585+06	4.016
5	(^3P)	^3Fb	2	1.290+11	1.290+11	3.419+08	4.768+05	7.942+04	4.346
6	(^3P)	^3Fb	2	8.600+10	8.600+10	1.282+09	2.289+06	3.803+05	4.519
4	(^3P)	^3Fb	3	5.700+10	5.700+10	1.169+09	9.151+06	1.521+06	4.019
5	(^3P)	^3Fb	3	7.600+10	7.600+10	3.244+08	6.129+05	1.021+05	4.348
6	(^3P)	^3Fb	3	8.200+10	8.200+10	1.737+09	3.573+06	5.936+05	4.521
4	(^3P)	^3Fb	4	8.200+10	8.200+10	2.086+09	1.624+07	2.699+06	4.021
5	(^3P)	^3Fb	4	1.290+11	1.290+11	1.786+05	1.557+06	2.595+05	4.352
6	(^3P)	^3Fb	4	8.300+10	8.300+10	2.211+09	3.912+06	6.502+05	4.524
4	(^3P)	^3Db	1	1.030+11	1.030+11	8.457+08	4.450+07	7.423+06	4.040
5	(^3P)	^3Db	1	1.010+11	9.819+12	1.516+08	2.372+06	4.223+03	4.360
6	(^3P)	^3Db	1	7.700+10	7.700+10	6.334+08	6.575+06	1.093+06	4.528
4	(^3P)	^3Db	2	1.040+11	1.040+11	1.408+09	7.435+07	1.236+07	4.040
5	(^3P)	^3Db	2	1.010+11	1.010+11	3.392+08	3.882+06	6.466+05	4.361
6	(^3P)	^3Db	2	7.800+10	7.800+10	1.629+09	1.530+07	1.786+06	4.529
4	(^3P)	^3Db	3	1.040+11	1.040+11	1.976+09	1.049+08	1.744+07	4.041
5	(^3P)	^3Db	3	9.900+10	9.900+10	4.792+08	5.633+06	9.381+05	4.362
6	(^3P)	^3Db	3	7.600+10	7.600+10	2.301+09	1.514+07	2.511+06	4.531
4	(^1D)	^1D	2	2.914+12	9.225+13	3.280+09	2.600+09	1.368+07	8.488
5	(^1D)	^1D	2	6.700+11	7.998+13	2.645+09	2.082+09	2.907+06	8.838
6	(^1D)	^1D	2	4.980+11	3.557+13	3.420+09	2.486+09	5.801+06	9.024
4	(^1D)	^3F	2	7.730+12	1.405+13	2.926+09	2.531+09	2.321+08	8.514
5	(^1D)	^3F	2	2.475+12	6.963+12	2.674+09	2.145+09	1.271+08	8.857
6	(^1D)	^3F	2	1.331+12	3.722+12	2.759+09	2.457+09	1.464+08	9.034
4	(^1D)	^3F	3	7.739+12	1.406+13	4.094+09	3.542+09	3.243+08	8.514
5	(^1D)	^3F	3	2.478+12	6.965+12	3.742+09	3.277+09	1.943+08	8.857
6	(^1D)	^3F	3	1.332+12	3.723+12	3.860+09	3.436+09	2.049+08	9.034
4	(^1D)	^3F	4	7.750+12	1.407+13	5.257+09	4.548+09	4.141+08	8.514
5	(^1D)	^3F	4	2.481+12	6.967+12	5.419+09	4.456+09	2.644+08	8.857
6	(^1D)	^3F	4	1.334+12	3.724+12	4.959+09	4.414+09	2.636+08	9.034
4	(^1D)	^1F	3	6.919+12	1.400+13	5.064+09	3.661+09	3.009+08	8.520
5	(^1D)	^1F	3	1.643+12	5.646+12	3.898+09	3.431+09	1.696+08	8.859
6	(^1D)	^1F	3	9.360+11	3.176+12	5.229+09	3.569+09	1.752+08	9.035

1	2	3	4	5	6	7	8	9	10
4	(^1D)	^3D	1	4.036+12	4.563+12	2.209+09	1.448+09	2.134+08	8.527
5	(^1D)	^3D	1	4.620+11	1.987+12	1.694+09	1.198+09	4.643+07	8.860
6	(^1D)	^3D	1	7.120+11	1.580+12	1.622+09	1.546+09	1.160+08	9.037
4	(^1D)	^3D	2	4.037+12	4.565+12	3.680+09	2.412+09	2.690+08	8.527
5	(^1D)	^3D	2	4.630+11	1.988+12	2.931+09	1.846+09	7.162+07	8.860
6	(^1D)	^3D	2	7.120+11	1.580+12	3.394+09	2.508+09	1.933+08	9.037
4	(^1D)	^3D	3	4.039+12	4.568+12	5.149+09	3.372+09	4.968+08	8.527
5	(^1D)	^3D	3	4.650+11	1.990+12	4.103+09	2.071+09	8.063+07	8.860
6	(^1D)	^3D	3	7.130+11	1.580+12	4.747+09	3.602+09	2.707+08	9.037
4	(^1D)	^3G	3	2.558+13	2.674+13	2.887+09	2.793+09	4.452+08	8.532
5	(^1D)	^3G	3	7.472+12	8.892+12	3.225+09	3.179+09	4.452+08	8.864
6	(^1D)	^3G	3	4.567+12	5.366+12	3.112+09	30.42+09	4.315+08	9.039
4	(^1D)	^3G	4	2.558+13	2.674+13	3.708+09	3.588+09	5.720+08	8.532
5	(^1D)	^3G	4	7.472+12	8.892+12	4.143+09	4.093+09	5.733+08	8.864
6	(^1D)	^3G	4	4.567+12	5.366+12	3.999+09	3.908+09	5.543+08	9.039
4	(^1D)	^3G	5	2.558+13	2.674+13	4.527+09	4.380+09	6.983+08	8.532
5	(^1D)	^3G	5	7.472+12	8.892+12	5.058+09	4.997+09	6.998+08	8.864
6	(^1D)	^3G	5	4.567+12	5.366+12	4.883+09	4.771+09	6.767+08	9.039
4	(^1D)	^1G	4	2.158+13	2.173+13	3.497+09	3.406+09	5.637+08	8.538
5	(^1D)	^1G	4	4.645+12	5.971+12	4.082+09	4.042+09	5.241+08	8.868
6	(^1D)	^1G	4	3.002+12	3.791+12	3.860+09	3.750+09	4.948+08	9.040
4	(^1D)	^3P	0	4.527+12	1.618+13	8.101+08	7.040+08	3.282+07	8.547
5	(^1D)	^3P	0	1.084+12	8.662+12	6.042+08	5.412+08	1.129+07	8.873
6	(^1D)	^3P	0	7.830+11	7.340+12	7.924+08	6.034+08	1.073+07	9.042
4	(^1D)	^3P	1	4.524+12	1.617+13	2.430+09	2.112+09	9.847+07	8.547
5	(^1D)	^3P	1	1.084+12	8.655+12	4.531+08	1.595+09	3.329+07	8.873
6	(^1D)	^3P	1	7.820+11	7.341+12	1.778+09	1.810+09	3.213+07	9.042
4	(^1D)	^3P	2	4.508+12	1.614+13	4.049+09	3.519+09	1.638+08	8.547
5	(^1D)	^3P	2	1.082+12	8.642+12	3.019+09	2.530+09	5.279+07	8.873
6	(^1D)	^3P	2	7.810+11	7.336+12	3.959+09	3.015+09	5.349+07	9.042
4	(^1D)	^1P	1	4.722+12	1.476+13	2.732+09	1.928+09	1.028+08	8.551
5	(^1D)	^1P	1	7.280+11	6.194+12	1.295+09	1.100+09	2.155+07	8.875
6	(^1D)	^1P	1	5.650+11	4.585+12	2.824+09	1.775+09	3.645+07	9.045
4	(^1D)	^1S	0	5.500+10	7.962+12	7.327+08	5.728+08	6.593+05	8.564
5	(^1D)	^1S	0	6.890+11	1.029+12	5.616+08	3.097+08	3.454+07	8.874
6	(^1D)	^1S	0	9.170+11	9.990+11	7.838+08	5.773+07	8.825+07	9.044
4	(^1D)	^3S	1	1.877+13	2.299+13	2.452+09	1.617+09	2.201+08	8.576
5	(^1D)	^3S	1	2.302+12	7.855+12	1.587+09	1.343+09	6.560+07	8.884
6	(^1D)	^3S	1	1.584+12	5.844+12	2.278+09	1.717+09	7.751+07	9.050

1	2	3	4	5	6	7	8	9	10
4	(^1S)	^1D	2	1.071+13	1.143+15	1.048+10	8.604+09	1.344+07	10.84
5	(^1S)	^1D	2	2.760+12	9.465+14	1.225+10	6.317+09	3.037+06	11.27
6	(^1S)	^1D	2	2.266+12	3.135+14	1.283+10	9.205+09	1.109+07	11.41
4	(^1S)	^3D	1	1.320+13	1.593+13	6.412+09	6.156+09	8.502+08	10.88
5	(^1S)	^3D	1	3.826+12	7.022+12	5.570+09	5.240+09	4.986+08	11.22
6	(^1S)	^3D	1	2.308+12	4.184+12	5.715+09	6.080+09	5.587+08	11.39
4	(^1S)	^3D	2	1.324+13	1.596+13	1.068+10	1.026+10	1.417+09	10.88
5	(^1S)	^3D	2	3.836+12	7.032+12	1.043+10	9.779+09	8.888+08	11.22
6	(^1S)	^3D	2	2.314+12	4.190+12	1.073+10	1.013+10	9.319+08	11.39
4	(^1S)	^3D	3	1.329+13	1.602+13	1.495+10	1.435+10	1.984+09	10.88
5	(^1S)	^3D	3	3.851+12	7.046+12	1.460+10	1.420+10	1.293+09	11.22
6	(^1S)	^3D	3	2.323+12	4.198+12	1.501+10	1.417+10	1.306+10	11.39
4	(^3P)	^1P	1	6.405+12	9.203+12	1.528+10	1.458+10	1.691+09	12.84
5	(^3P)	^1P	1	6.090+11	3.057+12	1.390+10	1.317+10	4.366+08	13.18
6	(^3P)	^1P	1	2.039+12	3.334+12	1.449+10	1.396+10	1.421+09	13.36
4	(^3P)	^3Da	1	2.244+13	3.528+13	1.496+10	1.678+10	1.886+09	12.86
5	(^3P)	^3Da	1	7.651+12	8.853+12	9.538+09	7.891+09	1.136+09	13.19
6	(^3P)	^3Da	1	4.135+12	5.626+12	1.354+10	1.374+10	1.682+09	13.37
4	(^3P)	^3Da	2	3.069+13	3.810+13	2.428+10	2.279+10	3.059+09	12.86
5	(^3P)	^3Da	2	7.886+12	9.481+12	2.295+10	2.207+10	3.058+09	13.19
6	(^3P)	^3Da	2	4.296+12	6.634+12	2.449+10	2.294+10	2.474+09	13.37
4	(^3P)	^3Da	3	4.022+13	4.121+13	3.285+10	3.113+10	5.062+09	12.86
5	(^3P)	^3Da	3	1.066+13	1.141+13	3.171+10	3.022+10	4.687+09	13.19
6	(^3P)	^3Da	3	6.924+12	7.581+12	3.307+10	3.114+10	4.738+09	13.37
4	(^3P)	^3Pa	0	4.680+12	3.074+13	5.288+09	4.839+09	1.228+08	12.86
5	(^3P)	^3Pa	0	2.000+09	4.147+12	4.684+09	1.228+09	9.856+04	13.19
6	(^3P)	^3Pa	0	6.870+11	6.425+12	5.097+09	4.750+09	8.459+07	13.37
4	(^3P)	^3Pa	1	2.165+13	3.552+13	1.502+10	1.397+10	1.419+09	12.86
5	(^3P)	^3Pa	1	2.284+12	6.415+12	1.317+10	9.129+09	5.414+08	13.19
6	(^3P)	^3Pa	1	2.127+12	6.492+12	1.197+10	1.407+10	7.678+08	13.37
4	(^3P)	^3Pa	2	1.418+13	3.360+13	2.566+10	2.367+10	1.664+09	12.86
5	(^3P)	^3Pa	2	2.731+12	8.567+12	2.183+10	1.657+10	1.078+09	13.19
6	(^3P)	^3Pa	2	3.139+12	6.912+12	2.483+10	2.317+10	1.753+09	13.36
4	(^3P)	^3Fa	2	4.384+13	4.580+13	2.100+10	2.075+10	3.310+09	12.84
5	(^3P)	^3Fa	2	1.278+13	1.482+13	2.183+10	2.017+10	1.881+09	13.18
6	(^3P)	^3Fa	2	6.991+12	8.113+12	2.189+10	2.139+10	3.071+09	13.36
4	(^3P)	^3Fa	3	4.397+13	4.606+13	2.946+10	2.904+10	4.622+09	12.84
5	(^3P)	^3Fa	3	1.288+13	1.503+13	3.062+10	3.006+10	4.290+09	13.18
6	(^3P)	^3Fa	3	7.243+12	8.503+12	3.084+10	3.000+10	4.256+09	13.36

1	2	3	4	5	6	7	8	9	10
4	(^3P)	^3Fa	4	4.384+13	4.577+13	3.779+10	3.365+10	5.962+09	12.85
5	(^3P)	^3Fa	4	1.282+13	1.484+13	3.928+10	3.912+10	5.632+09	13.19
6	(^3P)	^3Fa	4	7.000+12	8.073+12	3.922+10	3.843+10	5.550+09	13.36
4	(^3P)	^1F	3	4.895+13	5.632+13	3.084+10	2.895+10	4.194+09	12.86
5	(^3P)	^1F	3	1.418+13	1.831+13	3.114+10	3.006+10	3.879+09	13.19
6	(^3P)	^1F	3	8.314+12	1.050+13	3.144+10	3.009+10	3.968+09	13.37
4	(^3P)	^1D	2	4.402+13	6.635+13	2.535+10	2.301+10	2.549+09	12.88
5	(^3P)	^1D	2	9.937+12	2.108+13	2.323+10	1.888+10	1.483+09	13.20
6	(^3P)	^1D	2	8.070+12	1.666+13	2.565+10	2.282+10	1.841+09	13.37
$2s^22pnf$	$2s2p^2(L_{12}S_{12})nf(L'S'J')$								
4	(^1D)	^3G	3	8.530+11	8.790+11	3.474+09	3.343+09	5.404+08	8.544
5	(^1D)	^3G	3	1.650+11	3.160+11	3.460+09	3.390+09	2.946+08	8.877
6	(^1D)	^3G	3	1.130+11	2.100+11	3.423+09	3.387+09	3.032+08	9.046
4	(^1D)	^3G	4	8.530+11	8.800+11	4.465+09	4.296+09	6.937+08	8.544
5	(^1D)	^3G	4	1.650+11	3.160+11	4.445+09	4.358+09	3.787+08	8.877
6	(^1D)	^3G	4	1.130+11	2.100+11	4.389+09	4.355+09	3.897+08	9.046
4	(^1D)	^3G	5	8.550+11	8.820+11	5.451+09	5.245+09	8.469+08	8.544
5	(^1D)	^3G	5	1.660+11	3.170+11	5.429+09	5.321+09	4.636+08	8.877
6	(^1D)	^3G	5	1.130+11	2.110+11	5.371+09	5.317+09	4.735+08	9.046
4	(^1D)	^1G	4	8.450+11	8.710+11	4.461+09	4.294+09	6.840+08	8.544
5	(^1D)	^1G	4	1.570+11	3.070+11	4.442+09	4.355+09	3.822+08	8.877
6	(^1D)	^1G	4	1.080+11	2.040+11	4.396+09	4.351+09	3.828+08	9.046
4	(^1D)	^3F	2	2.220+11	2.740+11	2.686+09	2.594+09	3.495+08	8.545
5	(^1D)	^3F	2	4.100+10	2.090+11	2.538+09	2.490+09	8.121+07	8.879
6	(^1D)	^3F	2	2.800+10	1.430+11	2.541+09	2.504+09	8.141+07	9.046
4	(^1D)	^3F	3	2.220+11	2.740+11	3.760+09	3.629+09	4.892+08	8.545
5	(^1D)	^3F	3	4.100+10	2.090+11	3.551+09	3.485+09	1.137+08	8.879
6	(^1D)	^3F	3	2.800+10	1.430+11	3.555+09	3.505+09	1.140+08	9.046
4	(^1D)	^3F	4	2.230+11	2.750+11	4.831+09	4.663+09	6.289+08	8.545
5	(^1D)	^3F	4	4.100+10	2.100+11	4.564+09	4.479+09	1.454+08	8.879
6	(^1D)	^3F	4	2.900+10	1.430+11	4.570+09	4.139+09	1.519+08	9.046
4	(^1D)	^1F	3	2.330+11	2.850+11	3.761+09	3.629+09	4.936+08	8.545
5	(^1D)	^1F	3	4.100+10	2.130+11	3.552+09	3.485+09	1.115+08	8.879
6	(^1D)	^1F	3	3.000+10	1.480+11	3.555+09	3.506+09	1.180+08	9.046
4	(^1D)	^3D	1	4.600+10	9.700+10	1.706+09	1.645+09	1.292+08	8.550
5	(^1D)	^3D	1	8.000+09	3.400+10	1.554+09	1.520+09	5.872+07	8.881
6	(^1D)	^3D	1	5.000+09	4.200+10	1.615+09	1.540+09	3.016+07	9.048
4	(^1D)	^3D	2	4.600+10	9.700+10	2.843+09	2.741+09	2.154+08	8.550
5	(^1D)	^3D	2	8.000+09	3.400+10	2.590+09	2.534+09	9.786+07	8.881
6	(^1D)	^3D	2	5.000+09	4.200+10	2.692+09	3.566+09	5.027+07	9.048

1	2	3	4	5	6	7	8	9	10
4	(^1D)	^3D	3	4.600+10	9.700+10	3.980+09	3.838+09	3.015+08	8.550
5	(^1D)	^3D	3	8.000+09	3.400+10	3.627+09	3.547+09	1.370+08	8.881
6	(^1D)	^3D	3	5.000+09	4.200+10	3.770+09	3.593+09	7.039+07	9.048
4	(^1D)	^3H	4	2.276+12	2.278+12	3.977+09	3.744+09	6.348+08	8.551
5	(^1D)	^3H	4	4.280+11	6.510+11	4.289+09	4.131+09	4.592+08	8.882
6	(^1D)	^3H	4	3.150+11	4.660+11	4.208+09	4.143+09	4.655+08	9.048
4	(^1D)	^3H	5	2.276+12	2.278+12	4.857+09	4.659+09	7.757+08	8.551
5	(^1D)	^3H	5	4.280+11	6.510+11	5.238+09	5.124+09	5.610+08	8.882
6	(^1D)	^3H	5	3.150+11	4.650+11	5.117+09	5.060+09	5.708+08	9.048
4	(^1D)	^3H	6	2.276+12	2.278+12	5.733+09	5.499+09	9.155+08	8.551
5	(^1D)	^3H	6	4.280+11	6.510+11	6.183+09	6.047+09	6.621+08	8.882
6	(^1D)	^3H	6	3.150+11	4.660+11	6.040+09	5.972+09	6.721+08	9.048
4	(^1D)	^1H	5	2.251+12	2.257+12	4.852+09	4.655+09	7.736+08	8.551
5	(^1D)	^1H	5	4.070+11	6.330+11	5.233+09	5.120+09	5.483+08	8.882
6	(^1D)	^1H	5	3.000+11	4.530+11	5.111+09	5.052+09	5.570+08	9.048
4	(^1D)	^3P	0	4.500+10	4.380+11	5.890+08	5.670+08	9.696+06	8.555
5	(^1D)	^3P	0	6.400+10	8.460+11	5.281+08	5.109+08	6.438+06	8.884
6	(^1D)	^3P	0	9.700+10	2.482+12	5.575+08	5.220+08	3.399+06	9.048
4	(^1D)	^3P	1	4.500+10	4.370+11	1.767+09	1.702+09	2.916+07	8.555
5	(^1D)	^3P	1	6.400+10	8.450+11	1.586+09	1.533+09	1.934+07	8.884
6	(^1D)	^3P	1	9.700+10	2.479+12	1.673+09	1.567+09	1.028+07	9.048
4	(^1D)	^3P	2	4.500+10	4.370+11	2.949+09	2.838+09	4.648+07	8.555
5	(^1D)	^3P	2	6.400+10	8.430+11	2.646+09	2.558+09	3.235+07	8.884
6	(^1D)	^3P	2	9.600+10	2.472+12	2.792+09	2.614+09	1.691+07	9.048
4	(^1S)	^3F	2	1.003+12	1.045+12	1.030+10	1.020+10	1.629+09	10.90
5	(^1S)	^3F	2	1.920+11	4.780+11	1.026+10	1.020+10	6.801+08	11.24
6	(^1S)	^3F	2	1.370+11	3.300+11	1.027+10	1.021+10	5.823+08	11.40
4	(^1S)	^3F	3	1.008+12	1.050+12	1.440+10	1.428+10	2.280+09	10.90
5	(^1S)	^3F	3	1.930+11	4.780+11	1.436+10	1.426+10	9.571+08	11.24
6	(^1S)	^3F	3	1.380+11	3.310+11	1.437+10	1.421+10	9.871+08	11.40
4	(^1S)	^3F	4	1.012+12	1.054+12	1.852+10	1.836+10	2.931+09	10.90
5	(^1S)	^3F	4	1.930+11	4.790+11	1.847+10	1.836+10	1.228+09	11.24
6	(^1S)	^3F	4	1.390+11	3.320+11	1.847+10	1.837+10	1.369+09	11.40
4	(^1S)	^1F	3	1.000+12	1.049+12	1.441+10	1.428+10	2.264+09	10.90
5	(^1S)	^1F	3	1.850+11	4.790+11	1.436+10	1.428+10	9.153+08	11.24
6	(^1S)	^1F	3	1.320+11	3.310+11	1.437+10	1.429+10	9.442+08	11.40
4	(^3P)	^1D	2	3.140+11	3.740+11	2.362+10	2.351+10	3.429+09	12.87
5	(^3P)	^1D	2	1.970+11	1.460+11	2.273+10	2.266+10	2.405+09	13.20
6	(^3P)	^1D	2	1.170+11	1.670+11	2.286+10	2.271+10	2.581+09	13.37

1	2	3	4	5	6	7	8	9	10
4	(^3P)	^3Da	1	5.600+10	6.900+10	1.423+10	1.416+10	1.792+09	12.87
5	(^3P)	^3Da	1	3.000+09	3.100+10	1.367+10	1.364+10	1.918+08	13.21
6	(^3P)	^3Da	1	3.000+09	2.100+10	1.380+10	1.370+10	2.676+08	13.38
4	(^3P)	^3Da	2	6.600+10	1.130+11	2.370+10	2.359+10	2.204+09	12.87
5	(^3P)	^3Da	2	5.000+09	4.200+10	2.279+10	2.272+10	4.068+08	13.21
6	(^3P)	^3Da	2	3.000+09	4.900+10	2.299+10	2.284+10	2.130+08	13.38
4	(^3P)	^3Da	3	3.020+11	3.150+11	3.307+10	3.289+10	5.177+09	12.87
5	(^3P)	^3Da	3	1.060+11	1.340+11	3.182+10	3.172+10	4.046+09	13.20
6	(^3P)	^3Da	3	1.180+11	1.370+11	3.205+10	3.180+10	4.417+09	13.37
4	(^3P)	^3Ga	3	4.201+12	4.233+12	3.003+10	2.990+10	4.940+09	12.87
5	(^3P)	^3Ga	3	7.880+11	9.260+11	3.089+10	3.079+10	4.347+09	13.20
6	(^3P)	^3Ga	3	5.450+11	6.320+11	3.082+10	3.074+10	4.387+09	13.37
4	(^3P)	^3Ga	4	4.209+12	4.239+12	3.860+10	3.844+10	6.354+09	12.87
5	(^3P)	^3Ga	4	7.930+11	9.280+11	3.970+10	3.958+10	5.611+09	13.20
6	(^3P)	^3Ga	4	5.480+11	6.320+11	3.960+10	3.953+10	5.673+09	13.37
4	(^3P)	^3Ga	5	4.248+12	4.281+12	4.706+10	4.686+10	7.742+09	12.87
5	(^3P)	^3Ga	5	8.080+11	9.580+11	4.845+10	4.831+10	6.761+09	13.21
6	(^3P)	^3Ga	5	5.610+11	6.580+11	4.822+10	4.816+10	6.798+09	13.38
4	(^3P)	^1G	4	4.257+12	4.288+12	3.850+10	3.839+10	6.337+09	12.87
5	(^3P)	^1G	4	8.150+11	9.620+11	3.964+10	3.953+10	5.556+09	13.21
6	(^3P)	^1G	4	5.670+11	6.620+11	3.945+10	3.941+10	5.589+09	13.38
4	(^3P)	^3Fa	2	3.065+12	3.074+12	2.275+10	2.265+10	3.759+09	12.88
5	(^3P)	^3Fa	2	5.000+11	5.210+11	2.250+10	2.243+10	3.557+09	13.21
6	(^3P)	^3Fa	2	3.300+11	3.550+11	2.266+10	2.253+10	3.446+09	13.38
4	(^3P)	^3Fa	3	3.081+12	3.094+12	3.186+10	3.170+10	5.254+09	12.88
5	(^3P)	^3Fa	3	5.060+11	5.320+11	3.152+10	3.140+10	4.936+09	13.21
6	(^3P)	^3Fa	3	3.350+11	3.540+11	3.180+10	3.153+10	4.910+09	13.38
4	(^3P)	^3Fa	4	3.347+12	3.353+12	4.071+10	4.053+10	6.734+09	12.88
5	(^3P)	^3Fa	4	6.210+11	6.510+11	4.033+10	4.019+10	6.346+09	13.21
6	(^3P)	^3Fa	4	4.610+11	4.850+11	4.042+10	4.021+10	6.311+09	13.38
4	(^3P)	^1F	3	3.366+12	3.387+12	3.169+10	3.152+10	5.213+09	12.88
5	(^3P)	^1F	3	6.290+11	6.720+11	3.139+10	3.126+10	4.844+09	13.21
6	(^3P)	^1F	3	4.660+11	5.000+11	3.162+10	3.124+10	4.809+09	13.38
$2s^22png$	$2s2p^2(L_{12}S_{12})ng(L'S'J')$								
5	(^1D)	^3G	3	1.0+09	7.0+09	3.482+09	3.451+09	7.670+07	8.881
6	(^1D)	^3G	3	1.0+09	7.0+09	3.513+09	3.492+08	7.758+07	9.049
5	(^1D)	^3G	4	1.0+09	7.0+09	4.478+09	4.437+09	9.862+07	8.881
6	(^1D)	^3G	4	1.0+09	7.0+09	4.516+09	4.489+09	9.973+07	9.049

1	2	3	4	5	6	7	8	9	10
5	(^1D)	^3G	5	2.0+09	7.0+09	5.469+09	5.419+09	2.410+08	8.881
6	(^1D)	^3G	5	1.0+09	7.0+09	5.515+09	5.483+09	1.218+08	9.049
5	(^1D)	^1G	4	1.0+09	7.0+09	4.474+09	4.434+09	9.856+07	8.881
6	(^1D)	^1G	4	1.0+09	7.0+09	4.512+09	4.486+09	9.967+07	9.049
5	(^1D)	^3H	4	4.0+09	1.1+10	4.409+09	4.366+09	2.969+08	8.881
6	(^1D)	^3H	4	5.0+09	1.1+10	4.355+09	4.332+09	3.144+08	9.049
5	(^1D)	^3H	5	4.0+09	1.1+10	5.389+09	5.336+09	3.096+08	8.881
6	(^1D)	^3H	5	5.0+09	1.1+10	5.323+09	5.294+09	3.842+08	9.049
5	(^1D)	^3H	6	4.0+09	1.1+10	6.360+09	6.296+09	3.653+08	8.881
6	(^1D)	^3H	6	5.0+09	1.1+10	6.282+09	6.248+09	4.534+08	9.049
5	(^1D)	^1H	5	4.0+09	1.1+10	5.381+09	5.328+09	3.092+08	8.881
6	(^1D)	^1H	5	5.0+09	1.1+10	5.315+09	5.287+09	3.836+08	9.049
5	(^1D)	^1F	3	1.0+06	1.0+06	3.523+09	3.491+09	1.154+06	8.883
6	(^1D)	^1F	3	1.0+06	1.0+06	3.614+09	3.589+09	1.156+06	9.050
5	(^1D)	^3I	5	1.0+10	2.4+10	5.286+09	5.227+09	3.566+08	8.884
6	(^1D)	^3I	5	1.2+10	2.5+10	5.084+09	5.056+09	3.970+08	9.050
5	(^1D)	^3I	6	1.0+10	2.4+10	6.247+09	6.177+09	4.206+08	8.884
6	(^1D)	^3I	6	1.2+10	2.5+10	6.008+09	5.974+09	4.693+08	9.050
5	(^1D)	^3I	7	1.0+09	2.0+09	7.194+09	7.114+09	4.782+08	8.884
6	(^1D)	^3I	7	1.0+09	2.0+09	6.919+09	6.880+09	4.659+08	9.050
5	(^1D)	^1I	6	1.0+10	2.4+10	6.235+09	6.165+09	4.198+08	8.884
6	(^1D)	^1I	6	1.2+10	2.5+10	5.996+09	5.962+09	4.683+08	9.050
5	(^1S)	^3G	3	4.0+09	1.7+10	1.434+10	1.430+10	5.005+08	11.24
6	(^1S)	^3G	3	5.0+09	1.8+10	1.433+10	1.430+10	5.946+08	11.40
5	(^1S)	^3G	4	4.0+09	1.7+10	1.843+10	1.831+10	6.435+08	11.24
6	(^1S)	^3G	4	5.0+09	1.8+10	1.843+10	1.839+10	7.645+08	11.40
5	(^1S)	^3G	5	4.0+09	1.7+10	2.253+10	2.247+10	7.862+08	11.24
6	(^1S)	^3G	5	4.0+09	1.8+10	2.251+10	2.247+10	7.474+08	11.40
5	(^1S)	^1G	4	4.0+09	1.7+10	1.843+10	1.838+10	6.433+08	11.24
6	(^1S)	^1G	4	5.0+09	1.8+10	1.842+10	1.839+10	7.643+08	11.40
5	(^3P)	^1G	4	1.6+10	1.8+10	4.021+10	4.015+10	4.766+09	13.21
6	(^3P)	^1G	4	1.8+10	2.0+10	4.020+10	4.016+10	4.923+09	13.38
5	(^3P)	^1H	5	1.9+10	2.5+10	4.870+10	4.862+10	5.231+09	13.21
6	(^3P)	^1H	5	2.1+10	2.7+10	4.813+10	4.810+10	5.366+09	13.38
5	(^3P)	^3Fa	2	1.0+09	1.0+09	2.259+10	2.256+10	6.815+08	13.21
6	(^3P)	^3Fa	2	5.0+08	1.0+09	2.289+10	2.287+10	3.423+08	13.38

1	2	3	4	5	6	7	8	9	10
5	(^3P)	^3Fa	3	1.0+09	1.0+09	3.163+10	3.159+10	9.541+08	13.21
6	(^3P)	^3Fa	3	5.0+08	1.0+09	3.206+10	3.202+10	4.781+08	13.38
5	(^3P)	^3Fa	4	4.0+09	5.0+09	4.054+10	4.050+10	2.841+09	13.21
6	(^3P)	^3Fa	4	6.0+09	6.0+09	4.093+10	4.085+10	3.877+09	13.37
5	(^3P)	^1F	3	5.0+09	5.0+09	3.153+10	3.150+10	2.762+09	13.21
6	(^3P)	^1F	3	6.0+09	6.0+09	3.185+10	3.180+10	3.015+09	13.37
5	(^3P)	^3Ga	3	1.2+10	1.3+10	3.142+10	3.136+10	3.587+09	13.21
6	(^3P)	^3Ga	3	1.2+10	1.3+10	3.163+10	3.159+10	3.608+09	13.38
5	(^3P)	^3Ga	4	1.2+10	1.3+10	4.038+10	4.033+10	4.338+09	13.21
6	(^3P)	^3Ga	4	1.2+10	1.3+10	4.066+10	4.062+10	4.650+09	13.38
5	(^3P)	^3Ga	5	1.6+10	1.8+10	4.915+10	4.907+10	5.824+09	13.21
6	(^3P)	^3Ga	5	1.8+10	2.0+10	4.914+10	4.907+10	6.017+09	13.38
5	(^3P)	^3Ha	4	1.8+10	2.4+10	3.991+10	3.985+10	4.039+09	13.21
6	(^3P)	^3Ha	4	2.0+10	2.6+10	3.958+10	3.955+10	4.337+09	13.37
5	(^3P)	^3Ha	5	1.8+10	2.4+10	4.878+10	4.870+10	5.137+09	13.21
6	(^3P)	^3Ha	5	2.0+10	2.6+10	4.838+10	4.834+10	5.302+09	13.37
5	(^3P)	^3Ha	6	1.9+10	2.5+10	5.756+10	5.748+10	6.186+09	13.21
6	(^3P)	^3Ha	6	2.1+10	2.7+10	5.688+10	5.684+10	6.341+09	13.38

FIGURES

FIG. 1. Energy diagram of carbon atom: excited states ($1s^22s2p^3(^5S,^3D,^3P)$, $1s^22s^22p(^2P)nl$), autoionizing states ($1s^22s2p^3(^1D,^3S,^1P)$, $1s^22p^2(^3P)2s^4Pnl$, $1s^22p^22s(^2D)nl$, $1s^22p^4(^3P,^1D)$, $1s^22p^2(^1S)2snl$, $1s^22p^2(^3P)2s^2Pnl$) and thresholds ($1s^22s^22p(^2P)$, $1s^22p^22s(^4P)$, $1s^22p^22s(^2D)$, $1s^22p^22s(^2S)$, $1s^22p^22s(^2P)$)

FIG. 2. Dielectronic Recombination Rate Coefficient $\alpha_d(\gamma'|2s)$ for the first excited states as function of T_e:
a) $\gamma'=2s^22p^2$ (^3P), $2s^22p^2$ (^1D), $2s^22p^2$ (^1S),
b) $\gamma'=2s2p^3$ $(3P)$, $2s2p^3$ (^3D), $2s2p^3$ (^5S)

FIG. 3. Dielectronic Recombination Rate Coefficient $\alpha_d(\gamma'|2s)$ for the excited states with $n=3$ as function of T_e:
a) $\gamma'=2s^22p3s$ (^3P), $2s^22p3s$ (^1P),
b) $\gamma'=2s^22p3p$ (^3P), $2s^22p3p$ (^1P), $2s^22p3p$ (^3S), $2s^22p3p$ (^1S), $2s^22p3p$ (^3D), $2s^22p3p$ (^1D),
c) $\gamma'=2s^22p3d$ (^3P), $2s^22p3d$ (^1P), $2s^22p3d$ (^3D), $2s^22p3d$ (^1D), $2s^22p3d$ (^3F), $2s^22p3d$ (^1F)

FIG. 4. Dielectronic Recombination Rate Coefficient $\alpha_d(\gamma'|2s)$ for the excited states with $n=4$ as function of T_e:
a) $\gamma'=2s^22p4s$ (^3P), $2s^22p4s$ (^1P),
b) $\gamma'=2s^22p4p$ (^3P), $2s^22p4p$ (^1P), $2s^22p4p$ (^3S), $2s^22p4p$ (^1S), $2s^22p4p$ (^3D), $2s^22p4p$ (^1D),
c) $\gamma'=2s^22p4d$ (^3P), $2s^22p4d$ (^1P), $2s^22p4d$ (^3D), $2s^22p4d$ (^1D), $2s^22p4d$ (^3F), $2s^22p4d$ (^1F),
d) $\gamma'=2s^22p4f$ (^3D), $2s^22p4f$ (^1D), $2s^22p4f$ (^3F), $2s^22p4f$ (^1F), $2s^22p4f$ (^3G), $2s^22p4f$ (^1G)

FIG. 5. Dielectronic Recombination Rate Coefficient $\alpha_d^t(n_0, nl|\ 2s^22p\ ^2P)$ as function of n for Te =6 eV:
a) n_0 =4,
b) n_0 =6

FIG. 6. Total Dielectronic Recombination Rate Coefficient $\alpha_d^t(n_0, Nl|\ 2s^22p\ ^2P)$ as function of N for T_e =6 eV:
a) n_0 =4,
b) n_0 =6

FIG. 7. Dielectronic Recombination Rate Coefficient $\alpha_d^t(n_0, l|\ 2s^22p\ ^2P)$ as function of of T_e

FIG. 8. Dielectronic Recombination Rate Coefficient $\alpha_d^t(2s^22p\ ^2P)$ as function of T_e

$1s^2 2p^3 nl$ ____________________

$1s^2 2p^4\ (^1S)$ ____________________

$1s^2 2p^2 2s\ (^2P)$ **************************13.71eV

$1s^2 2p^2 [^3P] 2s \{^2P\} nl$ ____________________

$1s^2 2p^2 2s\ (^2S)$ **************************11.96eV

$1s^2 2p^2 [^1S] 2snl$ ____________________

$1s^2 2p^4\ (^3P,\ ^1D)$ ____________________

$1s^2 2p^2 2s\ (^2D)$ *************************9.28eV

$1s^2 2p^2 [^1D] 2snl$ ____________________

$1s^2 2p^2 2s(^4P)$*********************5.330eV(Es)

$1s^2 2p^2 [^3P] 2s \{^4P\} nl$ ____________________

$1s^2 2s 2p^3\ (^3S,\ ^1D,\ ^1P)$ ____________________

$1s^2 2s^2 2p\ (^2P)$ ************************11.267eV

$1s^2 2s^2 2pnl$ ____________________
$1s^2 2s 2p^3\ (^5S,\ ^3D,\ ^3P)$ ____________________
$1s^2 2s^2 2p^2\ (^3P,\ ^1D,\ ^1S)$ ____________________

Fig. 1

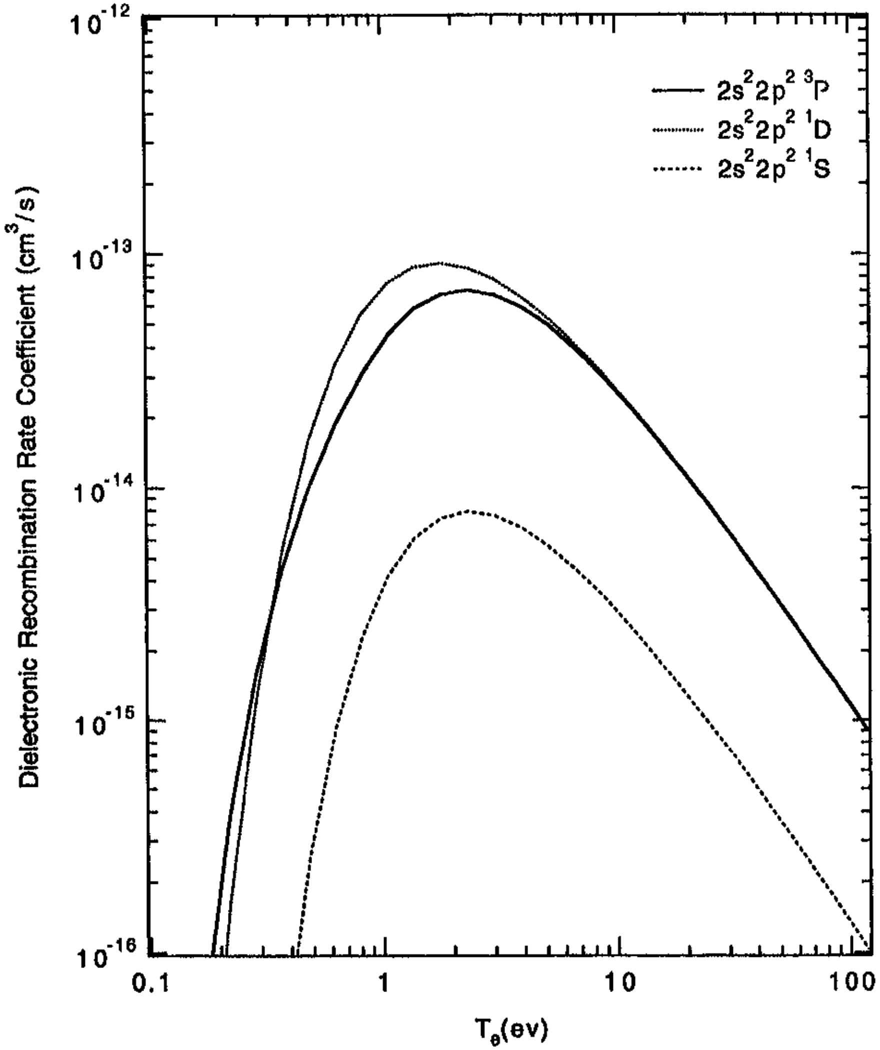


Fig.2(a)

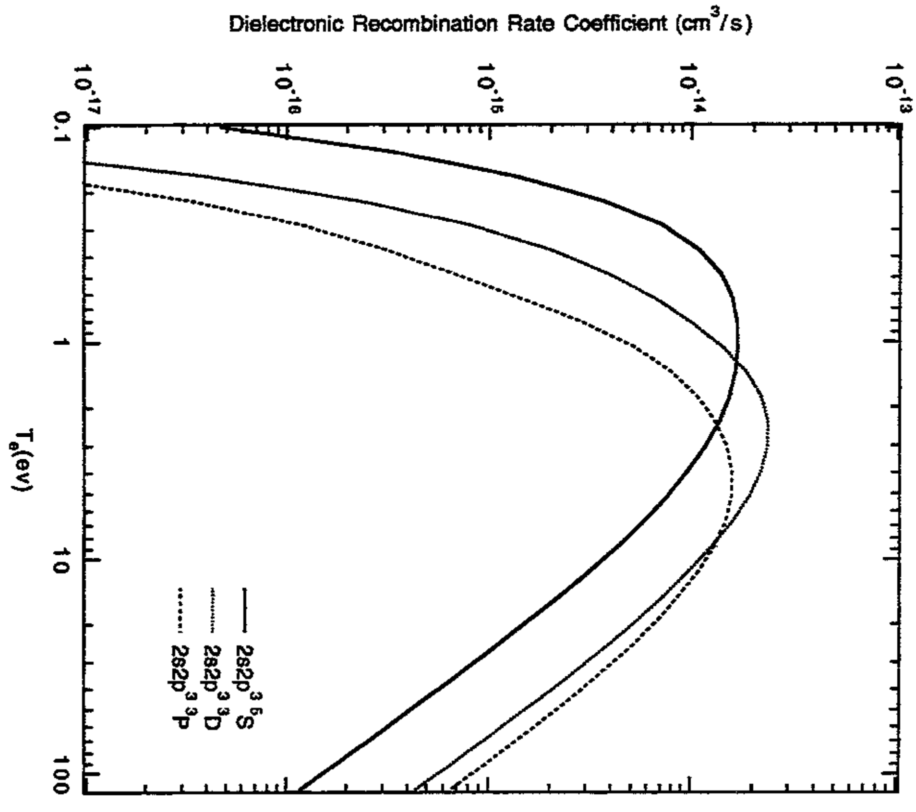

Dielectronic Recombination Rate Coefficient (cm^3/s)
10^-17
10^-16
10^-15
10^-14
10^-13
0.1
1
10
100
T_e(ev)
2s2p^3 5S
2s2p^3 3D
2s2p^3 3P

Fig.2(b)

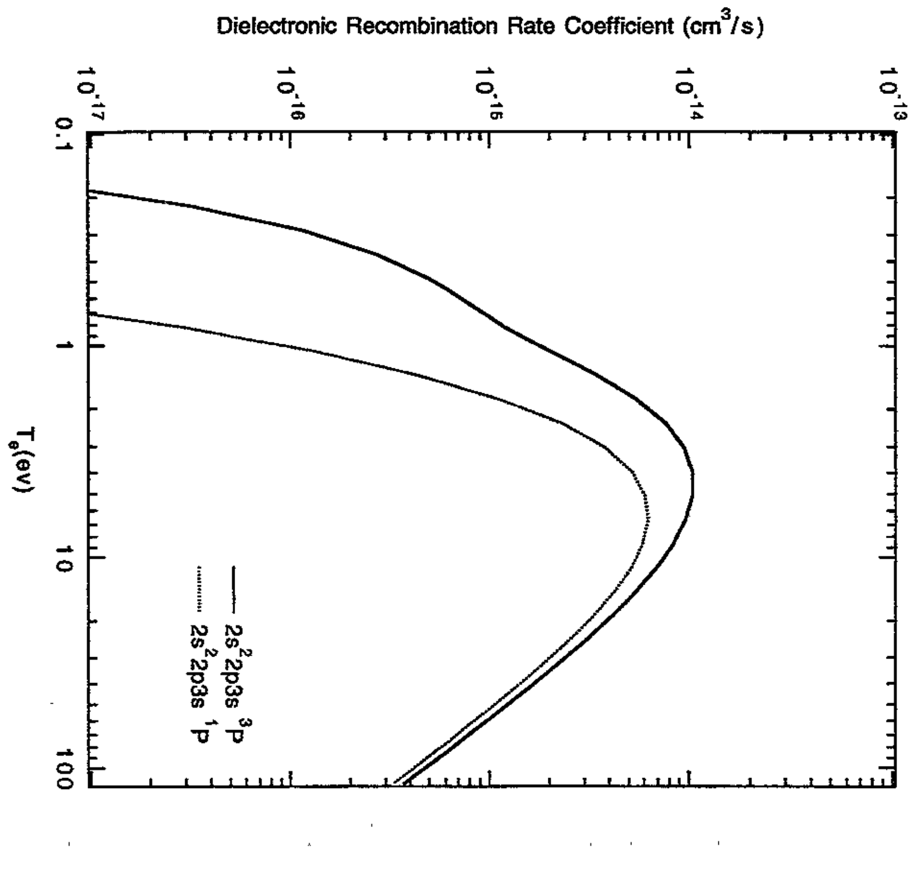
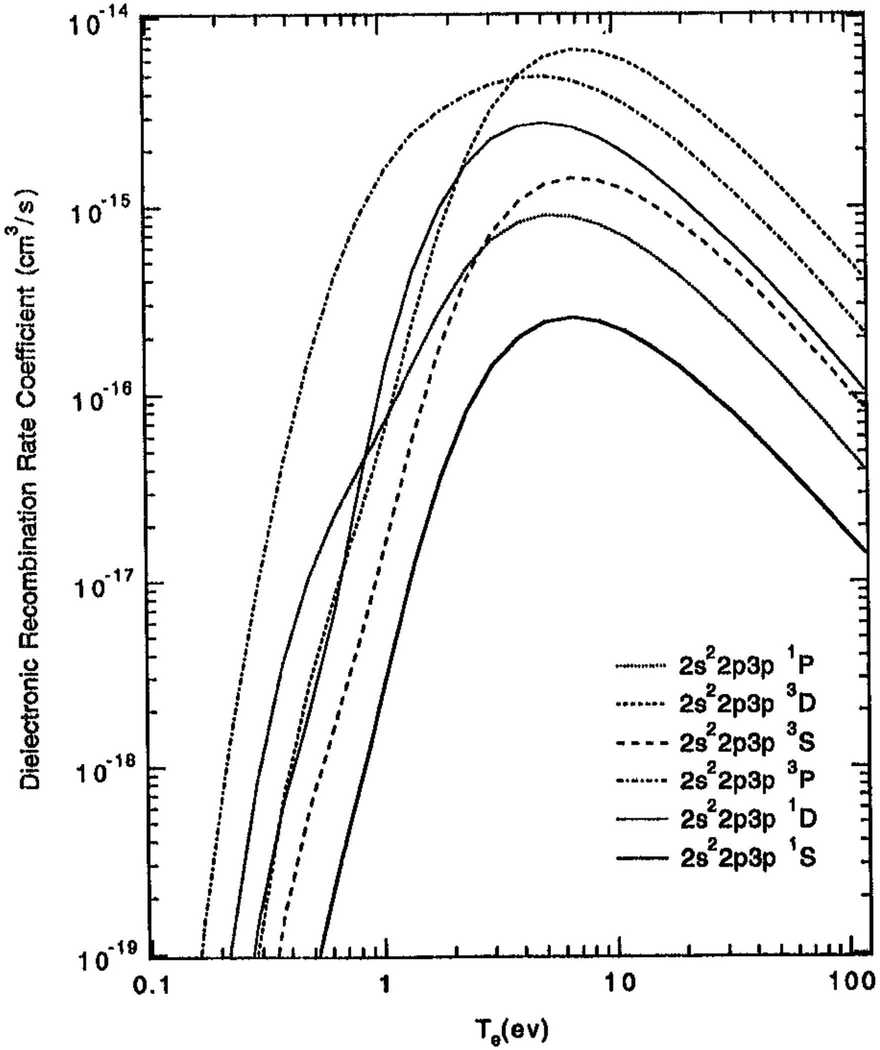
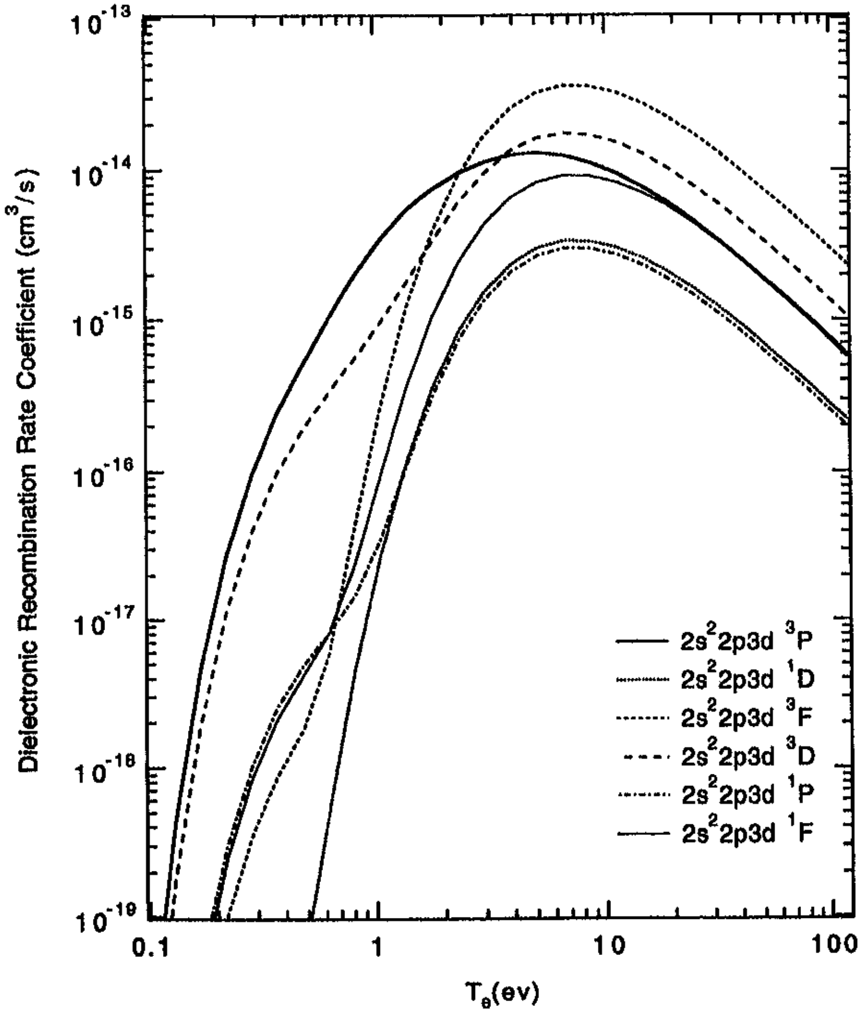

Dielectronic Recombination Rate Coefficient (cm^3/s)
10^-17
10^-16
10^-15
10^-14
10^-13
0.1
1
10
100
T_e(ev)
2s^2 2p3s 3P
2s^2 2p3s 1P

Fig.3(a)



Dielectronic Recombination Rate Coefficient (cm^3/s)
10^-14
10^-15
10^-16
10^-17
10^-18
10^-19
0.1
1
10
100
T_e(ev)
2s^2 2p3p ^1P
2s^2 2p3p ^3D
2s^2 2p3p ^3S
2s^2 2p3p ^3P
2s^2 2p3p ^1D
2s^2 2p3p ^1S

Fig.3(b)



Dielectronic Recombination Rate Coefficient (cm^3/s)
10^-13
10^-14
10^-15
10^-16
10^-17
10^-18
10^-19
0.1
1
10
100
T_e(ev)
2s^2 2p3d ^3P
2s^2 2p3d ^1D
2s^2 2p3d ^3F
2s^2 2p3d ^3D
2s^2 2p3d ^1P
2s^2 2p3d ^1F

Fig.3(c)

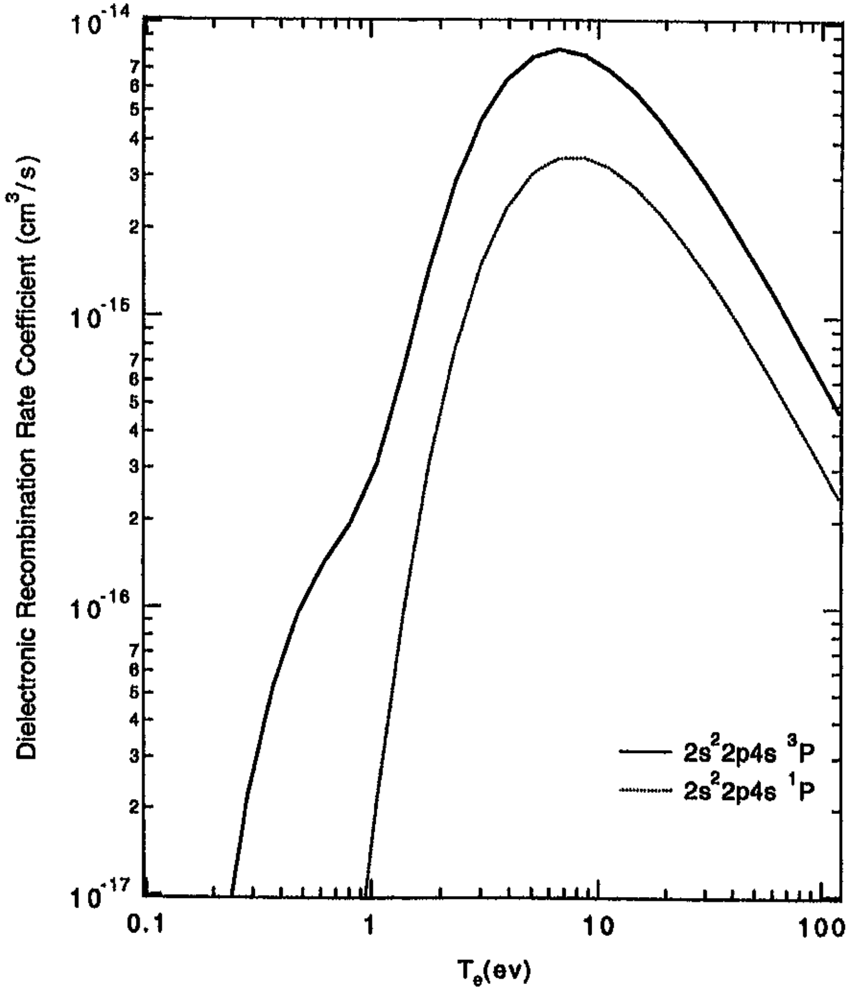

Dielectronic Recombination Rate Coefficient (cm^3/s)
T_e(ev)
2s^2 2p4s ^3P
2s^2 2p4s ^1P

Fig.4(a)

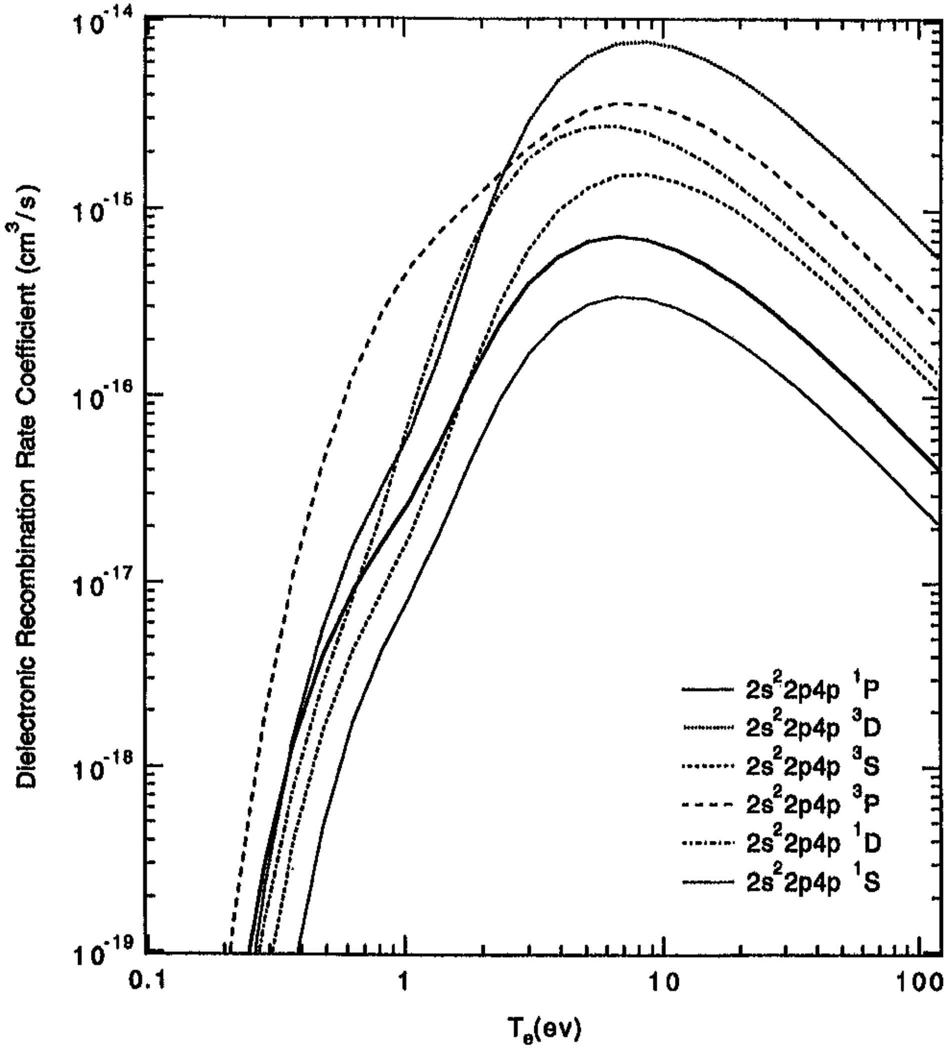

Dielectronic Recombination Rate Coefficient (cm^3/s)
T_e(ev)
2s^2 2p4p ^1P
2s^2 2p4p ^3D
2s^2 2p4p ^3S
2s^2 2p4p ^3P
2s^2 2p4p ^1D
2s^2 2p4p ^1S

Fig.4(b)

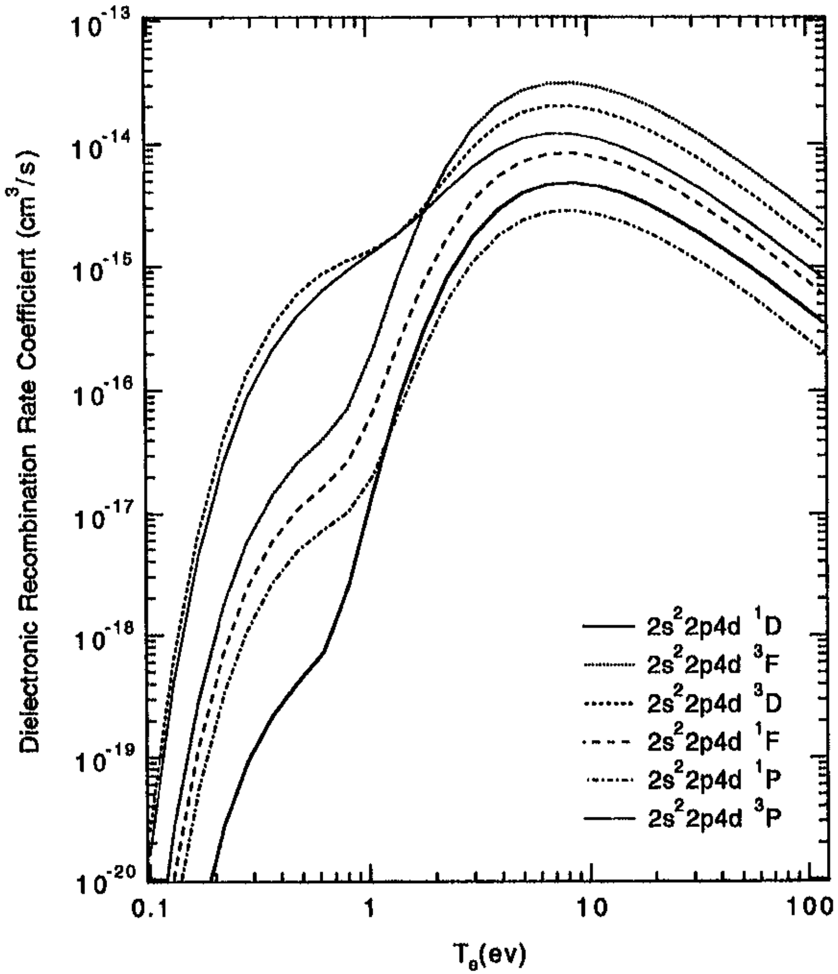

Dielectronic Recombination Rate Coefficient (cm^3/s)
10^-13
10^-14
10^-15
10^-16
10^-17
10^-18
10^-19
10^-20
0.1
1
10
100
T_e(ev)
2s^2 2p4d ^1D
2s^2 2p4d ^3F
2s^2 2p4d ^3D
2s^2 2p4d ^1F
2s^2 2p4d ^1P
2s^2 2p4d ^3P

Fig.4(c)

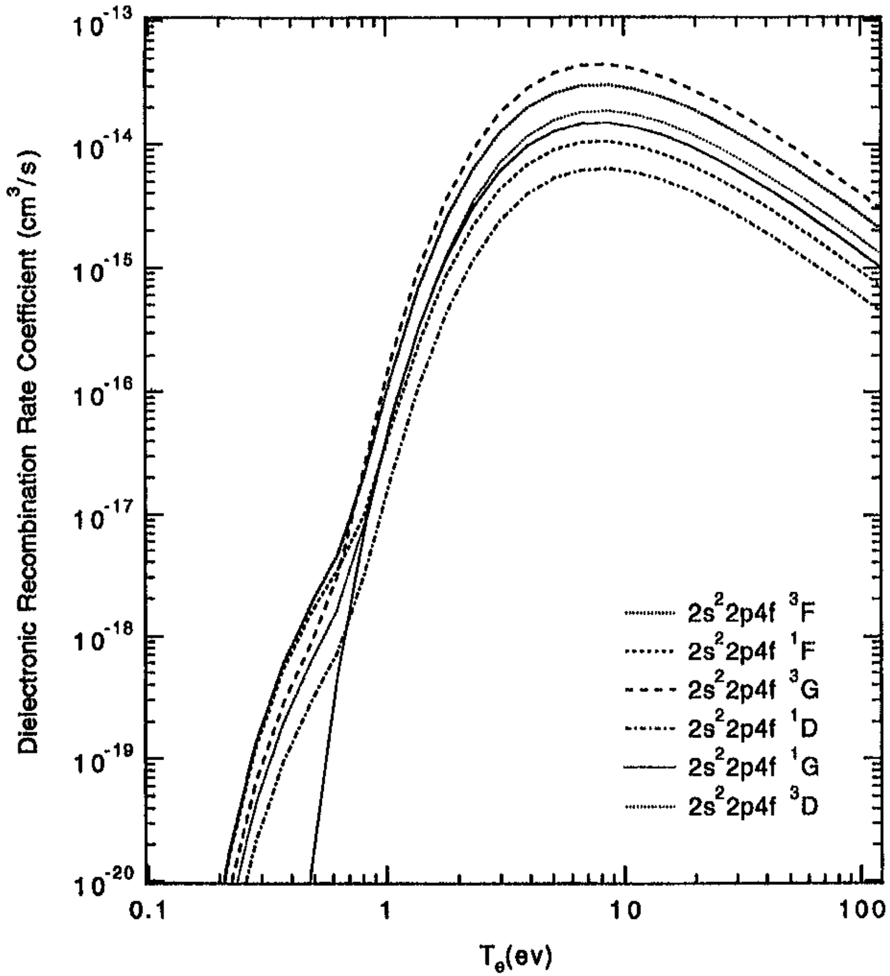

Dielectronic Recombination Rate Coefficient (cm^3/s)
10^-13
10^-14
10^-15
10^-16
10^-17
10^-18
10^-19
10^-20
0.1
1
10
100
T_e(ev)
2s^2 2p4f ^3F
2s^2 2p4f ^1F
2s^2 2p4f ^3G
2s^2 2p4f ^1D
2s^2 2p4f ^1G
2s^2 2p4f ^3D

Fig.4(d)

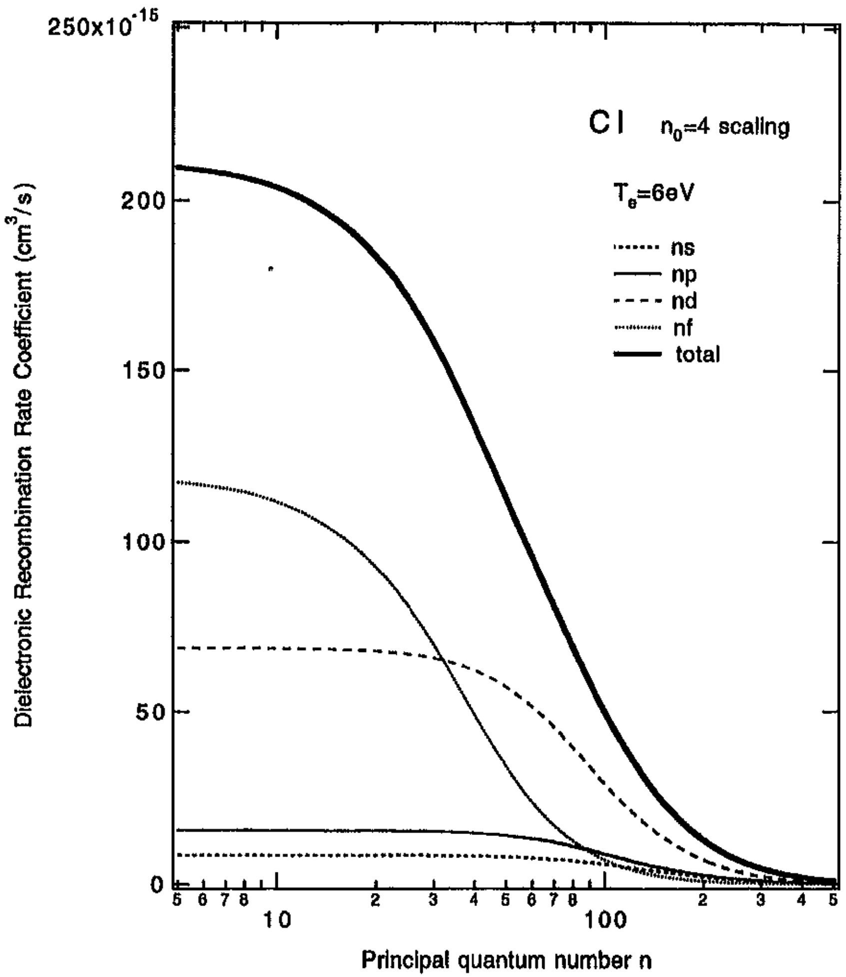

250x10^-15
Dielectronic Recombination Rate Coefficient (cm^3/s)
C I n0=4 scaling
Te=6eV
ns
np
nd
nf
total
Principal quantum number n

Fig.5(a)

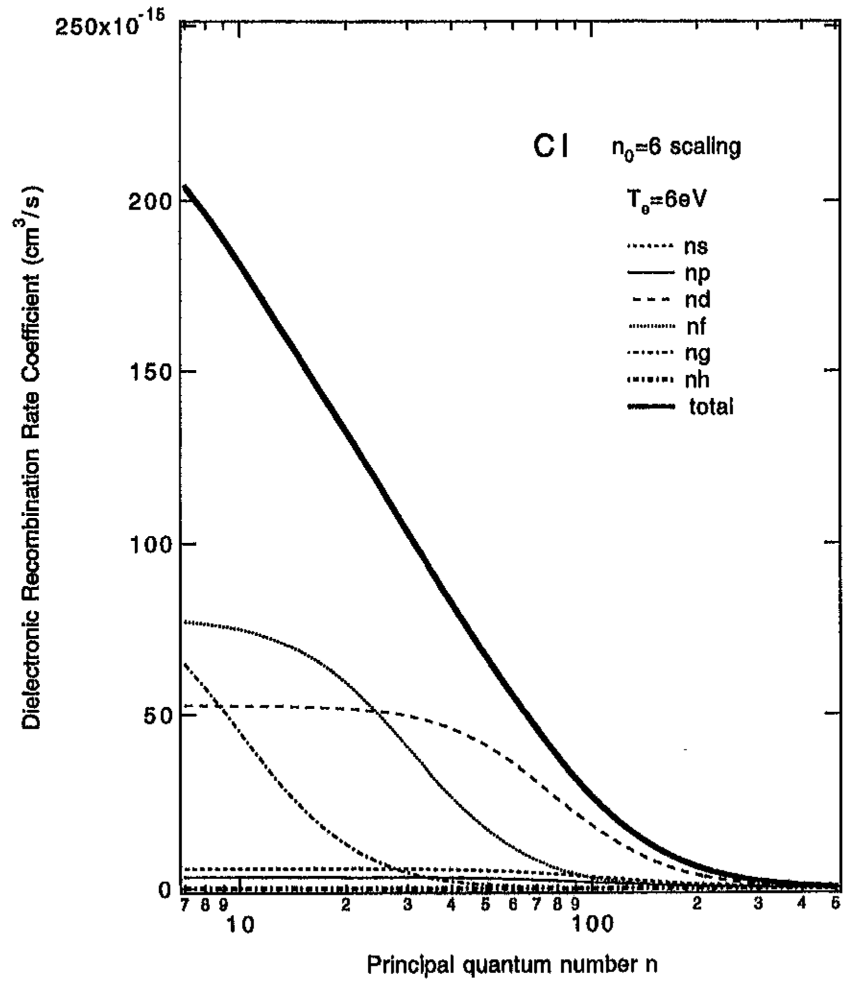

250x10^-15
Dielectronic Recombination Rate Coefficient (cm^3/s)
C I n0=6 scaling
Te=6eV
ns
np
nd
nf
ng
nh
total
Principal quantum number n

Fig.5(b)

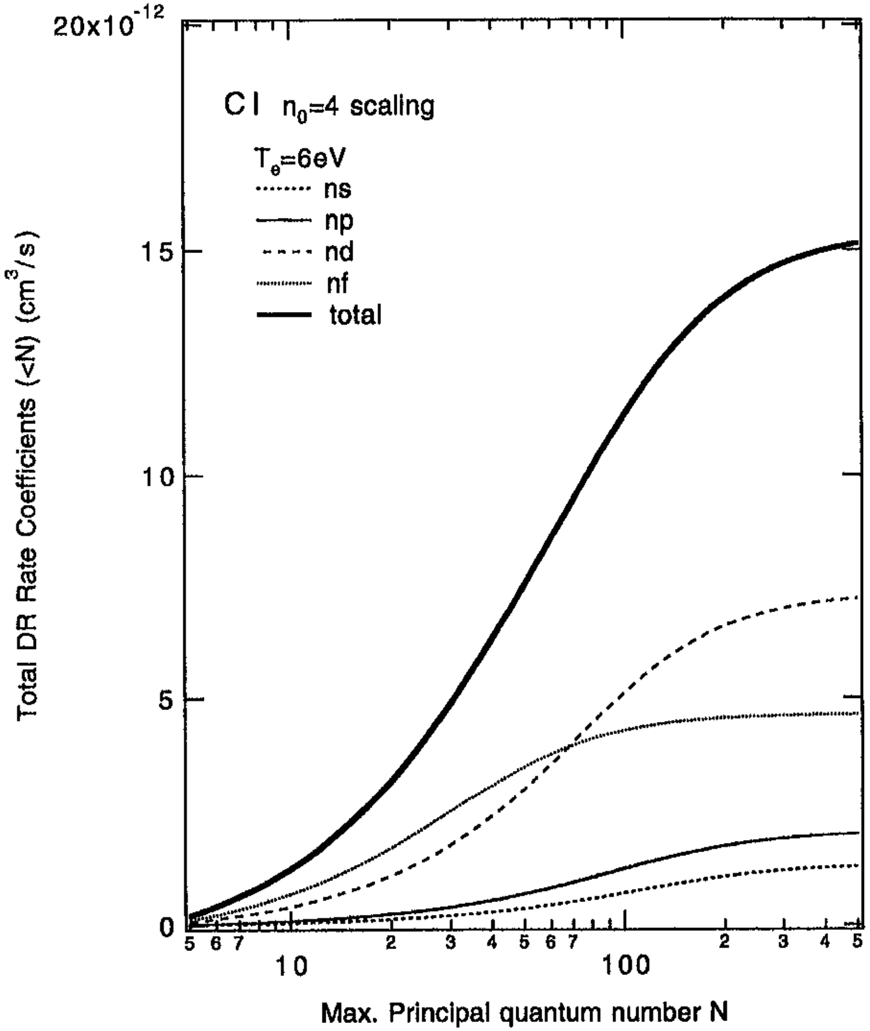

C I n0=4 scaling
Te=6eV
ns
np
nd
nf
total
20x10-12
15
10
5
0
5 6 7 10 2 3 4 5 6 7 100 2 3 4 5
Total DR Rate Coefficients (<N) (cm3/s)
Max. Principal quantum number N

Fig.6(a)

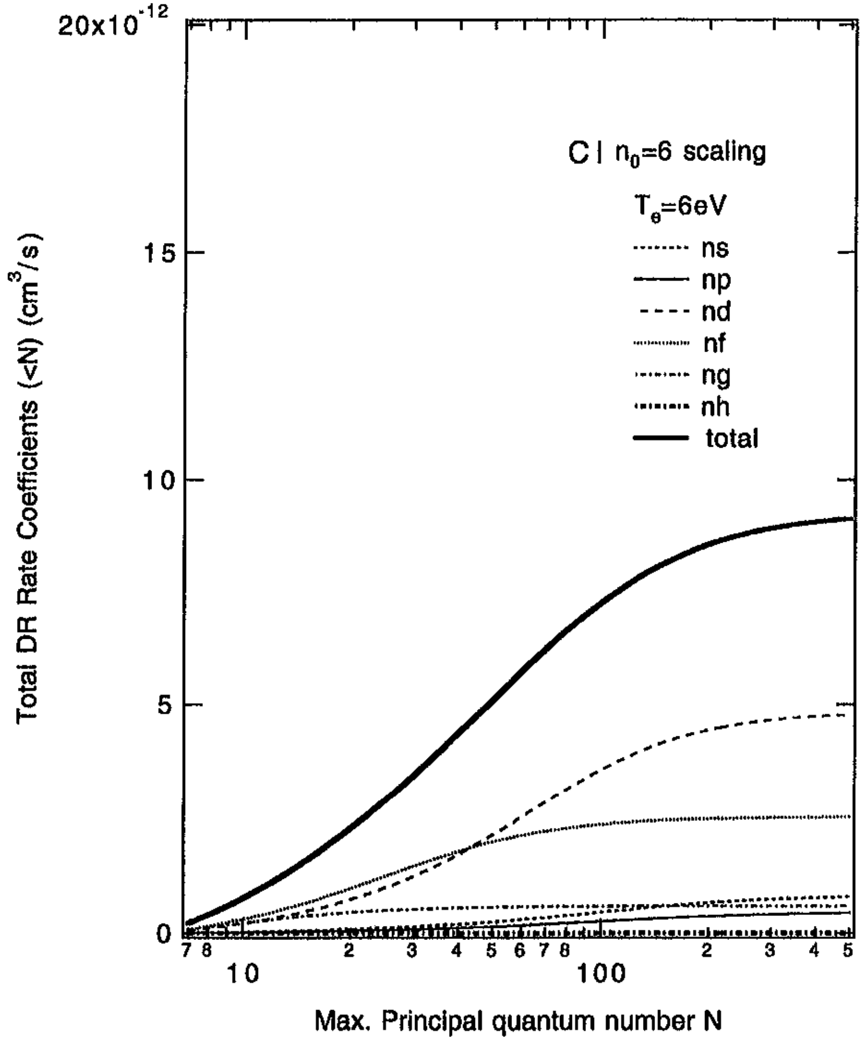
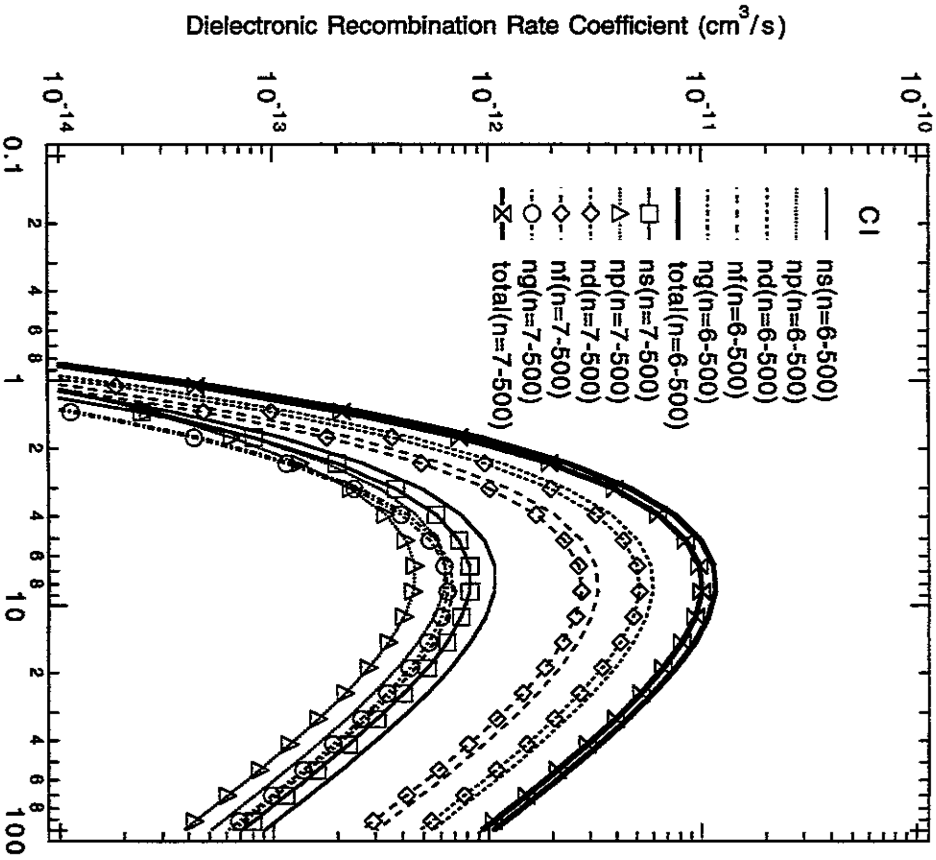
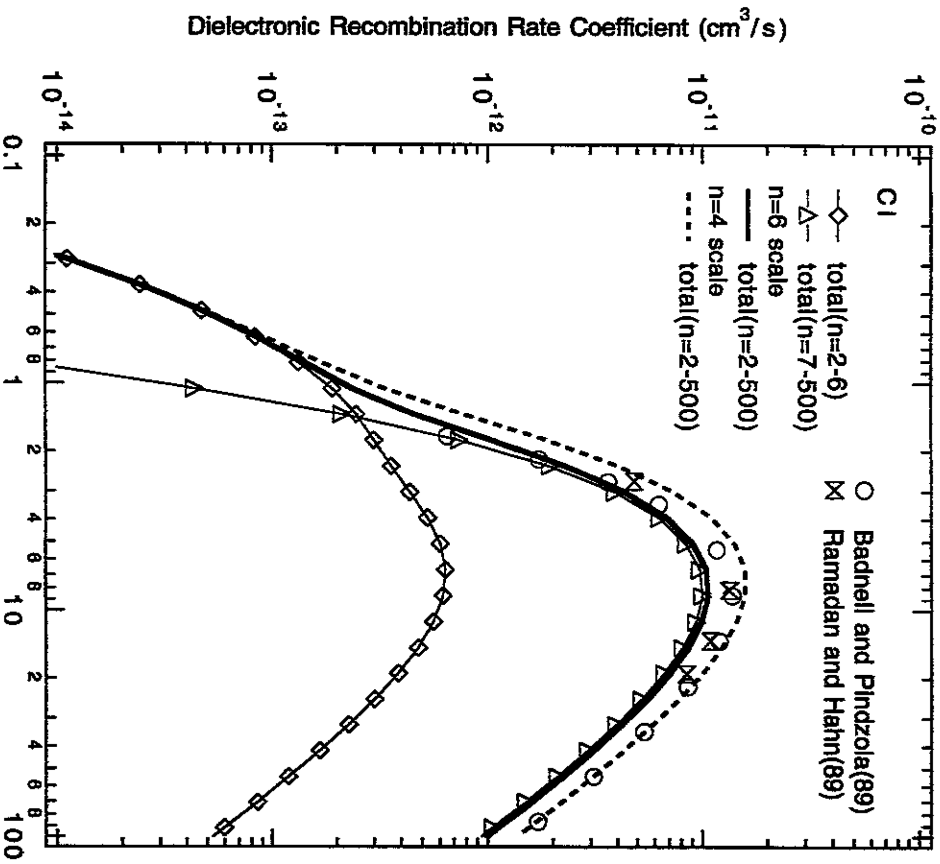

C I n0=6 scaling
Te=6eV
ns
np
nd
nf
ng
nh
total
20x10-12
15
10
5
0
7 8 10 2 3 4 5 6 7 8 100 2 3 4 5
Total DR Rate Coefficients (<N) (cm3/s)
Max. Principal quantum number N

Fig.6(b)



Dielectronic Recombination Rate Coefficient (cm^3/s)
T_e(eV)
CI
ns(n=6-500)
np(n=6-500)
nd(n=6-500)
nf(n=6-500)
ng(n=6-500)
total(n=6-500)
ns(n=7-500)
np(n=7-500)
nd(n=7-500)
nf(n=7-500)
ng(n=7-500)
total(n=7-500)

Fig.7



Dielectronic Recombination Rate Coefficient (cm^3/s)
T_e(eV)
CI
total(n=2-6)
total(n=7-500)
n=6 scale
total(n=2-500)
n=4 scale
total(n=2-500)
Badnell and Pindzola(89)
Ramadan and Hahn(89)

Fig.8

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