Oscillator strengths, transition rates, and lifetimes for $n = 3$ states in Al-like ions

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Abstract

Transition rates, oscillator strengths, and line strengths are calculated for the 3220 possible electric-dipole (E1) transitions between the 73 even-parity $3s3p^2$, $3s^23d$, $3p^23d$, $3d^23s$ and $3d^3$ states and the 75 odd-parity $3s^23p$, $3p^3$, $3s3p3d$, and $3d^23p$ states in Al-like ions with the nuclear charges ranging from $Z = 15$ to 100. Relativistic many-body perturbation theory (MBPT), including the Breit interaction, is used to evaluate retarded E1 matrix elements in length and velocity forms. The calculations start from a $1s^22s^22p^6$ Dirac-Fock potential. First-order MBPT is used to obtain intermediate coupling coefficients and second-order MBPT is used to calculate transition matrix elements. Contributions from negative-energy states are included in the second-order E1 matrix elements to ensure gauge-independence of transition amplitudes. The transition energies used in the calculation of oscillator strengths and transition rates are from second-order MBPT. Transition rates, line strengths, and oscillator strengths are compared with critically evaluated experimental values and with results from other recent calculations. As a result, we present data for the selected transition, that includes transitions between the 10 even-parity $3s3p^2$, $3s^23d$ states and the 29 odd-parity $3s^23p$, $3p^3$, and $3s3p3d$ states in Al-like ions. Trends of the transition rates as functions of Z are illustrated graphically for the 220 transitions. Lifetimes of the 10 possible even-parity lower levels and the 27 possible odd-parity upper levels are given for $Z = 15$–100.

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1 Introduction

Many theoretical studies of transitions in Al-like ions have been made during the past 30-40 years, especially for electric-dipole (E1) transitions within the $n = 3$ complex of states. Transition rates and oscillator strengths for Al-like ions have been calculated using multi-configuration Dirac-Fock (MCDF) [1], multi-configuration Hartree-Fock (MCHF) [2, 3, 4, 5, 6], R-matrix [7], model potential [8, 9, 10] , and configuration interaction (CI) [11, 12, 13] methods. A correspondingly large number of experimental studies of the lifetimes of $n = 3$ states have been made using beam foil techniques. Most of these investigations concerned low-Z ions: Si^{1+}[14, 15], P^{2+} and S^{3+},[15], Cl^{4+} and Ar^{5+}[14], K^{6+} [15], Ti^{9+}[14, 16, 17, 18, 19], Fe^{13+} and Ni^{14+}[14, 15, 16, 18, 19], and Cu^{15+} [16]. Lifetime measurements for the high-Z ions, Br^{22+} [20], Xe^{41+} [21] and Au^{66+} [21, 22] have also been reported. A critical data compilation based on available theoretical and experimental sources was given in [23, 24, 25, 26, 27, 28, 29].

In the present paper, relativistic many-body perturbation theory (MBPT) is used to determine matrix elements, oscillator strengths, and transition rates for all allowed and forbidden electric-dipole transitions within the $n = 3$ complex of states in Al-like ions with nuclear charges ranging from $Z = 15$ to 100. Retarded E1 matrix elements are evaluated in both length and velocity forms. These calculations start from a $1s^2 2s^2 2p^6$ Dirac-Fock potential. First-order perturbation theory is used to obtain intermediate coupling coefficients and second-order MBPT is used to determine transition matrix elements. Contributions from negative-energy states are included in the second-order E1 matrix elements to ensure agreement between length-form and velocity-form amplitudes. The transition energies used in the calculation of oscillator strengths and transition rates are obtained from second-order MBPT.

Table 1: Comparison of the jj- and LS-coupling schemes for three-particle states in the n=3 complex.

jj scheme	LS scheme	J	jj scheme	LS scheme	J
$3p_{1/2}3p_{1/2}[0]3s_{1/2}$	$3p^2[^3P]3s\ ^4P$	1/2	$3s_{1/2}3s_{1/2}[0]3p_{1/2}$	$3s^2[^1S]3p\ ^2P$	1/2
$3p_{1/2}3p_{3/2}[1]3s_{1/2}$	$3p^2[^1S]3s\ ^2P$	1/2	$3p_{3/2}3p_{3/2}[0]3p_{1/2}$	$3p^2[^3P]3p\ ^2P$	1/2
$3p_{3/2}3p_{3/2}[0]3s_{1/2}$	$3p^2[^3P]3s\ ^2P$	1/2	$3s_{1/2}3p_{1/2}[1]3d_{3/2}$	$3s3p[^3P]3d\ ^4P$	1/2
			$3s_{1/2}3p_{3/2}[1]3d_{3/2}$	$3s3p[^3P]3d\ ^4D$	1/2
$3p_{1/2}3p_{3/2}[1]3s_{1/2}$	$3p^2[^3P]3s\ ^4P$	3/2	$3s_{1/2}3p_{3/2}[2]3d_{3/2}$	$3s3p[^3P]3d\ ^2P$	1/2
$3p_{1/2}3p_{3/2}[2]3s_{1/2}$	$3p^2[^1D]3s\ ^2D$	3/2	$3s_{1/2}3p_{3/2}[2]3d_{5/2}$	$3s3p[^1P]3d\ ^2P$	1/2
$3p_{3/2}3p_{3/2}[2]3s_{1/2}$	$3p^2[^3P]3s\ ^2P$	3/2			
$3s_{1/2}3s_{1/2}[0]3d_{3/2}$	$3s^2[^1S]3d\ ^2D$	3/2	$3p_{3/2}3p_{3/2}[2]3p_{1/2}$	$3p^2[^3P]3p\ ^2D$	5/2
			$3s_{1/2}3p_{1/2}[0]3d_{5/2}$	$3s3p[^3P]3d\ ^4F$	5/2
$3p_{1/2}3p_{3/2}[2]3s_{1/2}$	$3p^2[^3P]3s\ ^4P$	5/2	$3s_{1/2}3p_{1/2}[1]3d_{3/2}$	$3s3p[^3P]3d\ ^4P$	5/2
$3p_{3/2}3p_{3/2}[2]3s_{1/2}$	$3p^2[^1D]3s\ ^2D$	5/2	$3s_{1/2}3p_{1/2}[1]3d_{5/2}$	$3s3p[^3P]3d\ ^4D$	5/2
$3s_{1/2}3s_{1/2}[0]3d_{5/2}$	$3s^2[^1S]3d\ ^2D$	5/2	$3s_{1/2}3p_{3/2}[1]3d_{3/2}$	$3s3p[^3P]3d\ ^2D$	5/2
			$3s_{1/2}3p_{3/2}[1]3d_{5/2}$	$3s3p[^3P]3d\ ^2F$	5/2
$3s_{1/2}3s_{1/2}[0]3p_{3/2}$	$3s^2[^1S]3p\ ^2P$	3/2	$3s_{1/2}3p_{3/2}[2]3d_{3/2}$	$3s3p[^1P]3d\ ^2F$	5/2
$3p_{1/2}3p_{1/2}[0]3p_{3/2}$	$3p^2[^3P]3p\ ^4S$	3/2	$3s_{1/2}3p_{3/2}[2]3d_{5/2}$	$3s3p[^1P]3d\ ^2D$	5/2
$3p_{3/2}3p_{3/2}[2]3p_{1/2}$	$3p^2[^3P]3p\ ^2D$	3/2			
$3p_{3/2}3p_{3/2}[0]3p_{3/2}$	$3s3p[^3P]3d\ ^4F$	3/2	$3s_{1/2}3p_{1/2}[1]3d_{5/2}$	$3s3p[^3P]3d\ ^4F$	7/2
$3s_{1/2}3p_{1/2}[0]3d_{3/2}$	$3p^2[^3P]3p\ ^2P$	3/2	$3s_{1/2}3p_{3/2}[1]3d_{5/2}$	$3s3p[^3P]3d\ ^4D$	7/2
$3s_{1/2}3p_{1/2}[1]3d_{3/2}$	$3s3p[^3P]3d\ ^4P$	3/2	$3s_{1/2}3p_{3/2}[2]3d_{3/2}$	$3s3p[^3P]3d\ ^2F$	7/2
$3s_{1/2}3p_{1/2}[1]3d_{5/2}$	$3s3p[^3P]3d\ ^4D$	3/2	$3s_{1/2}3p_{3/2}[2]3d_{5/2}$	$3s3p[^1P]3d\ ^2F$	7/2
$3s_{1/2}3p_{3/2}[1]3d_{3/2}$	$3s3p[^3P]3d\ ^2D$	3/2			
$3s_{1/2}3p_{3/2}[1]3d_{5/2}$	$3s3p[^3P]3d\ ^2P$	3/2	$3s_{1/2}3p_{3/2}[2]3d_{5/2}$	$3s3p[^3P]3d\ ^4F$	9/2
$3s_{1/2}3p_{3/2}[2]3d_{3/2}$	$3s3p[^1P]3d\ ^2P$	3/2			
$3s_{1/2}3p_{3/2}[2]3d_{5/2}$	$3s3p[^1P]3d\ ^2D$	3/2			

2 Method

The evaluation of the first- and second-order reduced dipole matrix elements $Z^{(1)}$ and $Z^{(2)}$ for Al-like ions follows the pattern of the corresponding calculation for boronlike ions given in Ref. [30]. We use the second-order one- and two-particle matrix elements for Mg-like ions calculated in [31], but recoupled, to obtain the contributions from first- and second-order perturbation theory; the reader is referred to [31] for a discussion of the how the basic one- and two-particle matrix elements were evaluated. It should be noted that the uncoupled one- and

Table 2: Line strengths in length L and velocity V forms in Fe^{13+} (a.u.).

LS designations		MBPT		First order	
Low level	Upper level	L	V	L	V
$3s^2(^1S)3p\ ^2P_{1/2}$	$3p^2(^3P)3s\ ^4P_{1/2}$	1.86[-3]	1.86[-3]	1.77[-3]	1.91[-3]
$3s^2(^1S)3p\ ^2P_{1/2}$	$3p^2(^1S)3s\ ^2S_{1/2}$	3.43[-1]	3.43[-1]	3.31[-1]	3.40[-1]
$3s^2(^1S)3p\ ^2P_{1/2}$	$3p^2(^3P)3s\ ^2P_{1/2}$	2.27[-1]	2.28[-1]	2.24[-1]	2.32[-1]
$3p^2(^3P)3s\ ^4P_{1/2}$	$3p^2(^3P)3p\ ^2P_{1/2}$	1.94[-4]	1.94[-4]	2.05[-4]	1.89[-4]
$3p^2(^1S)3s\ ^2S_{1/2}$	$3p^2(^3P)3p\ ^2P_{1/2}$	5.32[-3]	5.32[-3]	6.00[-3]	6.31[-3]
$3p^2(^3P)3s\ ^2P_{1/2}$	$3p^2(^3P)3p\ ^2P_{1/2}$	1.90[-1]	1.90[-1]	1.89[-1]	1.89[-1]
$3p^2(^3P)3s\ ^4P_{1/2}$	$3s3p(^3P)3d\ ^4P_{1/2}$	3.70[-1]	3.73[-1]	3.54[-1]	3.88[-1]
$3p^2(^1S)3s\ ^2S_{1/2}$	$3s3p(^3P)3d\ ^4P_{1/2}$	5.08[-4]	5.11[-4]	4.84[-4]	5.67[-4]
$3p^2(^3P)3s\ ^2P_{1/2}$	$3s3p(^3P)3d\ ^4P_{1/2}$	4.64[-6]	4.85[-6]	4.56[-6]	8.04[-6]
$3p^2(^3P)3s\ ^4P_{1/2}$	$3s3p(^3P)3d\ ^4D_{1/2}$	5.79[-4]	5.89[-4]	5.86[-4]	6.69[-4]
$3p^2(^1S)3s\ ^2S_{1/2}$	$3s3p(^3P)3d\ ^4D_{1/2}$	3.45[-6]	3.49[-6]	3.57[-6]	4.35[-6]
$3p^2(^3P)3s\ ^2P_{1/2}$	$3s3p(^3P)3d\ ^4D_{1/2}$	4.23[-6]	4.19[-6]	4.14[-6]	4.22[-6]
$3p^2(^3P)3s\ ^4P_{1/2}$	$3s3p(^3P)3d\ ^2P_{1/2}$	6.39[-4]	6.41[-4]	6.01[-4]	6.00[-4]
$3p^2(^1S)3s\ ^2S_{1/2}$	$3s3p(^3P)3d\ ^2P_{1/2}$	1.38[-1]	1.39[-1]	1.32[-1]	1.44[-1]
$3p^2(^3P)3s\ ^2P_{1/2}$	$3s3p(^3P)3d\ ^2P_{1/2}$	3.49[-1]	3.51[-1]	3.32[-1]	3.54[-1]
$3p^2(^3P)3s\ ^4P_{1/2}$	$3s3p(^1P)3d\ ^2P_{1/2}$	1.85[-6]	1.86[-6]	1.17[-6]	2.00[-6]
$3p^2(^1S)3s\ ^2S_{1/2}$	$3s3p(^1P)3d\ ^2P_{1/2}$	1.56[-1]	1.56[-1]	1.48[-1]	1.61[-1]
$3p^2(^3P)3s\ ^2P_{1/2}$	$3s3p(^1P)3d\ ^2P_{1/2}$	7.62[-2]	7.66[-2]	7.34[-2]	7.76[-2]
$3s^2(^1S)3p\ ^2P_{1/2}$	$3p^2(^3P)3s\ ^4P_{3/2}$	6.34[-5]	6.33[-5]	6.66[-5]	6.54[-5]
$3s^2(^1S)3p\ ^2P_{1/2}$	$3p^2(^1D)3s\ ^2D_{3/2}$	1.56[-1]	1.56[-1]	1.58[-1]	1.56[-1]
$3s^2(^1S)3p\ ^2P_{1/2}$	$3p^2(^3P)3s\ ^2P_{3/2}$	2.35[-1]	2.36[-1]	2.30[-1]	2.38[-1]
$3s^2(^1S)3p\ ^2P_{1/2}$	$3s^2(^1S)3d\ ^2D_{3/2}$	6.43[-1]	6.46[-1]	6.15[-1]	6.64[-1]
$3p^2(^3P)3s\ ^4P_{3/2}$	$3p^2(^3P)3p\ ^2P_{1/2}$	3.04[-4]	3.05[-4]	2.96[-4]	3.02[-4]
$3p^2(^1D)3s\ ^2D_{3/2}$	$3p^2(^3P)3p\ ^2P_{1/2}$	2.96[-1]	2.97[-1]	2.89[-1]	2.96[-1]
$3p^2(^3P)3s\ ^2P_{3/2}$	$3p^2(^3P)3p\ ^2P_{1/2}$	4.58[-2]	4.59[-2]	4.52[-2]	4.45[-2]
$3s^2(^1S)3d\ ^2D_{3/2}$	$3p^2(^3P)3p\ ^2P_{1/2}$	3.46[-4]	3.41[-4]	1.15[-4]	1.03[-4]
$3p^2(^3P)3s\ ^4P_{3/2}$	$3s3p(^3P)3d\ ^4P_{1/2}$	5.89[-3]	5.95[-3]	5.72[-3]	6.37[-3]
$3p^2(^1D)3s\ ^2D_{3/2}$	$3s3p(^3P)3d\ ^4P_{1/2}$	1.37[-7]	1.27[-7]	8.38[-8]	1.92[-8]
$3p^2(^3P)3s\ ^2P_{3/2}$	$3s3p(^3P)3d\ ^4P_{1/2}$	9.81[-6]	9.93[-6]	9.79[-6]	1.27[-5]
$3s^2(^1S)3d\ ^2D_{3/2}$	$3s3p(^3P)3d\ ^4P_{1/2}$	1.28[-3]	1.29[-3]	1.40[-3]	1.53[-3]
$3p^2(^3P)3s\ ^4P_{3/2}$	$3s3p(^3P)3d\ ^4D_{1/2}$	2.59[-1]	2.60[-1]	2.46[-1]	2.68[-1]
$3p^2(^1D)3s\ ^2D_{3/2}$	$3s3p(^3P)3d\ ^4D_{1/2}$	5.07[-4]	5.10[-4]	4.83[-4]	5.38[-4]
$3p^2(^3P)3s\ ^2P_{3/2}$	$3s3p(^3P)3d\ ^4D_{1/2}$	1.52[-4]	1.52[-4]	1.43[-4]	1.66[-4]
$3s^2(^1S)3d\ ^2D_{3/2}$	$3s3p(^3P)3d\ ^4D_{1/2}$	1.84[-5]	1.83[-5]	1.80[-5]	2.09[-5]
$3p^2(^3P)3s\ ^4P_{3/2}$	$3s3p(^3P)3d\ ^2P_{1/2}$	6.43[-5]	6.48[-5]	6.50[-5]	6.78[-5]
$3p^2(^1D)3s\ ^2D_{3/2}$	$3s3p(^3P)3d\ ^2P_{1/2}$	1.10[-3]	1.09[-3]	7.83[-4]	6.64[-4]
$3p^2(^3P)3s\ ^2P_{3/2}$	$3s3p(^3P)3d\ ^2P_{1/2}$	6.47[-2]	6.51[-2]	6.14[-2]	6.48[-2]
$3s^2(^1S)3d\ ^2D_{3/2}$	$3s3p(^3P)3d\ ^2P_{1/2}$	1.01[-3]	1.02[-3]	1.52[-3]	1.74[-3]
$3p^2(^3P)3s\ ^4P_{3/2}$	$3s3p(^1P)3d\ ^2P_{1/2}$	1.62[-6]	1.61[-6]	1.32[-6]	1.34[-6]
$3p^2(^1D)3s\ ^2D_{3/2}$	$3s3p(^1P)3d\ ^2P_{1/2}$	8.20[-4]	8.28[-4]	8.89[-4]	9.02[-4]
$3p^2(^3P)3s\ ^2P_{3/2}$	$3s3p(^1P)3d\ ^2P_{1/2}$	1.06[-1]	1.07[-1]	1.03[-1]	1.10[-1]
$3s^2(^1S)3d\ ^2D_{3/2}$	$3s3p(^1P)3d\ ^2P_{1/2}$	5.43[-1]	5.45[-1]	5.69[-1]	5.90[-1]

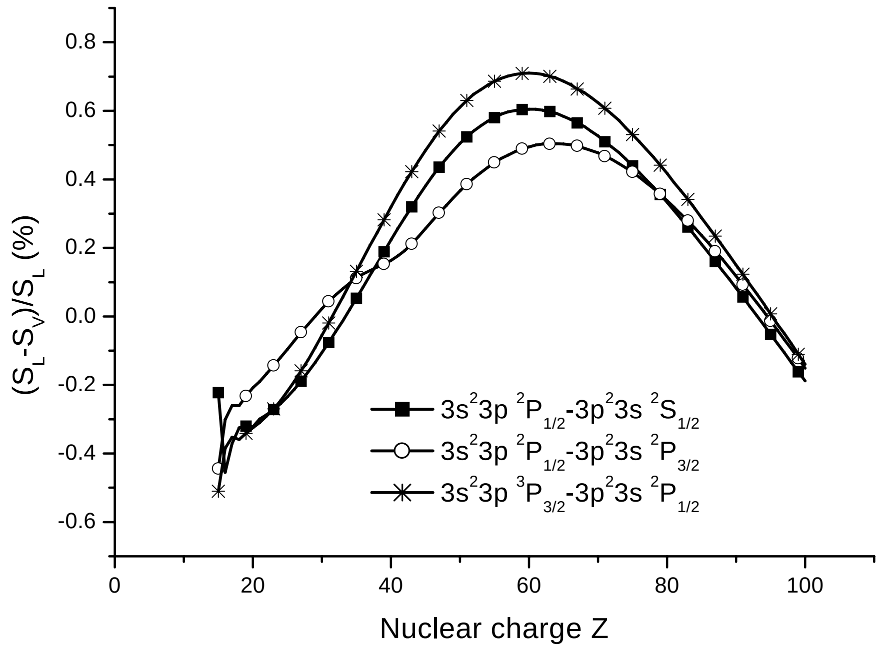

Figure 1: Z-dependence of the ratio $(S_L - S_V)/S_L$ in %, where line strengths S are calculated in length $S(L)$ and velocity $S(V)$ forms.

two-particle matrix elements calculated in [31] are the only data needed in the present second-order MBPT calculation for Al-like ions. This is in contrast to calculations of the second-order energy $E^{(2)}$ for systems with three valence electrons, where additional three-particle diagrams must be evaluated [32, 33].

The model space for $n = 3$ states of aluminiumlike ions includes 75 odd-parity states consisting of 13 J=1/2 states, 22 J=3/2 states, 19 J=5/2 states, 13 J=7/2 states, 6 J=9/2 states, and two J=11/2 states. Additionally, there are 73 even-parity states consisting of 13 J=1/2 states, 21 J=3/2 states, 20 J=5/2 states, 11 J=7/2 states, 7 J=9/2 states, and one J=11/2 states.

In this paper, we present results for the low-lying states. This set of states includes $3s_{1/2}3s_{1/2}[0]3p_j(J)$, $3s_{1/2}3p_j[J_{12}]3d_{j'}(J)$, $3s_{1/2}3s_{1/2}[0]3d_j(J)$, and $3s_{1/2}3p_j[J_{12}]3p_{j'}(J)$ levels, together 40 levels. The second set of states includes all other 108 states, $3d_j3d_{j'}[J_{12}]3p_{j''}(J)$, $3p_j3p_{j'}[J_{12}]3d_{j''}(J)$, and $3d_j3d_{j'}[J_{12}]3d_{j''}(J)$ levels. The first group of states is studied experimentally, however, it is not any experimental data for the second group of levels. Below, we discuss about the first group of levels only. For these 40 levels, we use not only jj designations but also LS designations. When starting calculations from relativistic Dirac-Fock wavefunctions, it is natural to use jj designations for uncoupled energy matrix elements; however, neither jj nor LS coupling describes the *physical* states properly, except for the single-configuration state $3d_{5/2}3d_{5/2}(4)3d_{3/2} \equiv 3d^3\ {}^3G_{11/2}$. Both designations are given in Table 1 for 40 levels in Al-like ions.

In Table 2, we present values of line strengths calculated in length L and velocity V forms for the 42 transitions between odd-parity stares with J=1/2 and even-parity states with J=1/2 and 3/2 for the special case of Al-like iron, $Z = 26$. Although we use an intermediate-coupling scheme, it is nevertheless convenient to label the physical states using the LS scheme for low-Z ions and the jj scheme for high-Z ions. Both designations are given in Table 2 for considered transitions. The last two columns in Table 2 show L and V values of line strengths calculated in the first order. The $L-V$ difference is about 10% (50%) for the LS-allowed (forbidden) transitions with large (small) values of line strengths. Including the second-order contribution (columns headed MBPT in Table 2) decreases the $L-V$ difference to 0.2% (1%) for the LS-allowed (forbidden) transitions with large (small) values of line strengths. This extremely small $L-V$ difference arises because we start our MBPT calculations using a non-local Dirac-Fock (DF) potential. If we were to replace the DF potential by a local potential, the differences would disappear completely. It should be emphasized that we include the negative energy state (NES) contributions to sums over intermediate states (see Ref. [34] for details). Neglecting the NES contributions leads to small changes in the L-form matrix elements but substantial changes in some of the V-form matrix elements with a consequent loss of gauge independence.

In Fig. 1, we illustrate the Z-dependence of the differences between line strengths calculated in length $S(L)$ and velocity $S(V)$ forms. We plot the ratio $(S_L - S_V)/S_L$ in percent. One can see that the ratio $(S_L - S_V)/S_L$

is about 0.2-0.7% for all transitions shown on Fig. 1.

In view of the gauge independence discussed above, our results are presented in L form only. Uncertainties in the recommended values given in [35] were estimated to be less than 10% based on comparisons with experimental results from lifetime and emission measurements. The agreement between theoretical L-form and V-form results were also used in [35] as an indicator of accuracy. Since the present transition data are obtained using a single method for all Z and are expected to improve in accuracy with increasing Z, we expect that our data for high Z will be very reliable.

3 Comparison and Discussion

In Table 3, we compare our results for wavelengths λ, transition probabilities A, oscillator strengths f, and line strengths S for selected transitions for Al-like Fe, Z=26. These transitions are selected among the 3220 transitions because we found data for these transitions in Ref. [28]. In Table 3, we compare our results with theoretical results obtained by Huang in Ref. [1]. The multiconfiguration Dirac-Fock method (MCDF) was used in that paper to calculate energies for 40 low-lying levels and transition probabilities A, oscillator strengths f, and line strengths S for the 87 transitions. The 17 E1 allowed $3s^23p\ ^2P_J - 3p^23s\ ^4P_{J'}$, $^2S_{1/2}$, $^2P_{J'}$, $^2D_{J'}$, $3s^23p\ ^2P_J - 3s^23d\ ^2D_{J'}$ transitions and the 70 E1 allowed $3p^23s\ ^4P_{3/2,5/2}$, $^2P_{3/2}$, $^2D_{3/2,5/2}$, $3s^23d\ ^2D_{3/2,5/2} - 3p^3\ ^4S_{3/2}$, $^2P_{3/2}$, $^2D_{3/2,5/2}$,
$3s3p(^{1,3}P)3d\ ^2D_{3/2,5/2}$, $^2P_{3/2}$, $^2F_{5/2,7/2}$, $3s3p(^3P)3d\ ^4P_{3/2,5/2}$, $^4D_{3/2,5/2,7/2}$, $^4F_{3/2,5/2,7/2}$ transitions presented in Ref. [1]. It can be seen from Table 3, our MBPT data for wavelengths agree better with the recommended values given in [28] than with data from Ref. [1]. The difference in values of transition probabilities A, oscillator strengths f, and line strengths S presented in Table 3 is about 5-10%. This difference between our MBPT results and MCDF results from Ref. [1] could be explained by the second order contribution in the dipole matrix elements. This conclusion is followed from comparison of data given in columns headed 'MBPT' and 'First order'. The last one is almost equivalent to a result of MCDF approximation since we used Dirac-Fock functions to calculate the 'First order' data. We also expect that our values are more accurate than the recommended data from [28] for transitions presented in Table 3, since Coulomb and Breit correlation corrections are included in our calculations as well as retardation.

In Tables 4 and 5, wavelengths and electric dipole transition rates are presented for transitions in Al-like Ti, Fe, and Ni. We limit the table to those transitions given in Refs. [18] and [19]. The doublet - doublet transitions ($3p^23s\ ^2S$, ^2P, $^2D +\ 3s^23d\ ^2D - 3p^3\ ^2P$, $^2D +\ 3s3p3d\ ^2P$, ^2D, ^2F) are listed in Table 4 and transitions from $3s3p3d\ ^4F_J$ levels into $3p^23s\ ^4P_J$ and $3s^23d\ ^2D_J$ levels are listed in Tables 5. It can be seen from Tables 4 and 5, the agreement between our MBPT wavelengths and the experimental values is about 0.04-0.4% for Ti^{9+} and decreases with the increase of Z: 0.01-0.03% for Ni^{15+}. We found disagreement between our MBPT results and experimental wavelengths from Ref. [18] for $3p^2(^3P)3s\ ^2P_{3/2} - 3s3p(^1P)3d\ ^2P_{3/2}$ transition in Ti^{9+}, Fe^{13+}, and Ni^{15+} and experimental wavelengths from Ref. [19] for $3p^2(^3P)3s\ ^2D_{3/2,5/2} - 3s3p(^3P)3d\ ^4F_{3/2}$ in Ti^{9+}. This disagreement could be caused by the difference in identification of levels. For this point, we included in Tables 4 and 5 not only wavelengths but also transition rates. It is very common, that the relative intensities of observed spectral lines are in a reasonable agreement with calculated A-values. The ratio of intensities is proportional to the ratio of transition rates and transitions with large A-values are more reasonably be observed than transitions with small A-values.

A limited subset of our lifetime calculations is presented below to compare with available experimental data. Our lifetime data are compared with experimental measurements from Refs. [18] and [19] for Al-like Ti, Fe, and Ni in Table 6. The intensity decay curves were analyzed in Ref. [18] using a variety of techniques. As a result, three different lifetimes values were given for the seven levels presented in that paper. One of those lifetimes results are given in Table 6. We can see from this table that our MBPT lifetimes data are in reasonable agreement with experimental values.

Lifetime data for Al-like ions from P^{2+} through Ar^{5+} are presented in Table 7. The experimental measurements are taken from Ref. [10]. In that paper, the Multiconfiguration Optimized Potential Model (MCOMP) method was used to determine the lifetimes of 14 low-lying excited terms along the sequence. There was no discussion about relativistic effects in Ref. [10] and the lifetime data were presented without term splitting. We average our MBPT lifetimes obtained for each level to perform the comparison with the lifetimes of 11 low-lying excited terms. It should be noted that we did not include in Table 7 the three terms with n=4. As can be seen from Table 7, our theoretical lifetimes agree with measured lifetimes to within one or two times the experimental error limits for many cases.

Results of the present calculations for lifetimes are obtained by summing E1 transitions rates from each upper level to all possible lower levels. The contributions of different channels to the lifetimes of the $3p^3\ ^4S_{3/2}$ and $3p^3\ ^2P_{1/2}$ levels are shown in Figs. 2 and 3, respectively. The curves represent the ratios of individual transition probabilities A to the sum of all transition probabilities $\sum A$ for the level considered. It is seen from Fig. 2, that the largest contribution for the lifetime of the $3p^3\ ^4S_{3/2}$ level is from the $A(3p^23s\ ^4P_{5/2} - 3p^3\ ^4S_{3/2})$

Table 3: Wavelengths λ in Å transition probabilities A in s^{-1}, oscillator strengths f, and line strengths S in a.u. for Al-like Fe, Z=26: (a) - present, (b)- MCDF data Ref. [1], (c)- NIST data Ref. [28]. Numbers in brackets represent powers of 10.

Lower level	Upper level		λ	A, s^{-1}	f, a.u.	S, a.u.
$3s^2(^1S)3p\ ^2P_{1/2}$	$3p^2(^3P)3s\ ^4P_{1/2}$	a	444.076	2.15[07]	6.35[-4]	1.86[-3]
		b	447.690	2.48[07]	7.45[-4]	2.20[-3]
		c	444.25			
$3s^2(^1S)3p\ ^2P_{1/2}$	$3p^2(^3P)3s\ ^4P_{3/2}$	a	429.389	4.05[05]	2.25[-5]	6.34[-5]
		b	432.907	5.14[05]	8.23[-5]	6.34[-5]
$3s^2(^1S)3p\ ^2P_{3/2}$	$3p^2(^3P)3s\ ^4P_{1/2}$	a	484.600	8.41[06]	1.49[-4]	9.45[-4]
		b	488.927	9.18[06]	1.64[-4]	1.06[-3]
		c	484.60			
$3s^2(^1S)3p\ ^2P_{3/2}$	$3p^2(^3P)3s\ ^4P_{3/2}$	a	467.163	4.99[06]	1.64[-4]	1.01[-3]
		b	471.347	6.03[06]	2.01[-4]	1.24[-3]
		c	467.40			
$3s^2(^1S)3p\ ^2P_{3/2}$	$3p^2(^3P)3s\ ^4P_{5/2}$	a	447.187	1.97[07]	8.89[-4]	5.24[-3]
		b	450.925	2.45[07]	1.12[-3]	6.65[-3]
		c	447.36			
$3s^2(^1S)3p\ ^2P_{1/2}$	$3p^2(^1S)3s\ ^2S_{1/2}$	a	274.524	1.68[10]	1.89[-1]	3.43[-1]
		b	269.790	1.86[10]	2.03[-1]	3.60[-1]
		c	274.203	2.1 [10]	2.4 [-1]	
$3s^2(^1S)3p\ ^2P_{3/2}$	$3p^2(^1S)3s\ ^2S_{1/2}$	a	289.489	1.39[09]	8.77[-3]	3.35[-2]
		b	284.239	1.23[09]	7.48[-3]	2.80[-2]
		c	289.160	1.1 [09]	6.9 [-3]	
$3s^2(^1S)3p\ ^2P_{1/2}$	$3p^2(^3P)3s\ ^2P_{1/2}$	a	257.694	1.34[10]	1.34[-1]	2.27[-1]
		b	253.694	1.46[10]	1.40[-1]	2.34[-1]
		c	257.392	1.8 [10]	1.8 [-1]	
$3s^2(^1S)3p\ ^2P_{1/2}$	$3p^2(^3P)3s\ ^2P_{3/2}$	a	252.492	7.38[09]	1.42[-1]	2.35[-1]
		b	247.913	7.97[09]	1.47[-1]	2.40[-1]
		c	252.197	1.1 [10]	2.1 [-1]	
$3s^2(^1S)3p\ ^2P_{3/2}$	$3p^2(^3P)3s\ ^2P_{1/2}$	a	270.837	2.02[10]	1.11[-1]	3.97[-1]
		b	265.724	2.24[10]	1.19[-1]	4.15[-1]
		c	270.524	2.6 [10]	1.4 [-1]	
$3s^2(^1S)3p\ ^2P_{3/2}$	$3p^2(^3P)3s\ ^2P_{3/2}$	a	265.097	3.18[10]	3.34[-1]	1.17[0]
		b	260.058	3.57[10]	3.62[-1]	1.24[0]
		c	264.787	4.3 [07]	4.5 [-1]	
$3s^2(^1S)3p\ ^2P_{1/2}$	$3p^2(^1D)3s\ ^2D_{3/2}$	a	334.557	2.11[09]	7.08[-2]	1.56[-1]
		b	332.557	2.36[09]	7.84[-2]	1.72[-1]
		c	334.171	2.49[09]	7.9 [-2]	
$3s^2(^1S)3p\ ^2P_{1/2}$	$3s^2(^1S)3d\ ^2D_{3/2}$	a	211.739	3.43[10]	4.61[-1]	6.43[-1]
		b	207.154	3.83[10]	4.93[-1]	6.72[-1]
		c	211.316	3.7[10]	5.0 [-1]	
$3s^2(^1S)3p\ ^2P_{3/2}$	$3p^2(^1D)3s\ ^2D_{3/2}$	a	357.051	7.32[07]	1.40[-3]	6.60[-3]
		b	354.695	7.60[07]	1.43[-3]	6.70[-3]
		c	356.60	6.3[07]	1.2 [-3]	
$3s^2(^1S)3p\ ^2P_{3/2}$	$3p^2(^1D)3s\ ^2D_{5/2}$	a	354.239	1.72[09]	4.84[-2]	2.26[-1]
		b	351.924	1.91[09]	5.33[-2]	2.47[-1]
		c	353.833	1.9 [09]	5.4 [-2]	

Table 4: Wavelengths λ in (nm) and transition probabilities A in s^{-1} for LS-allowed transitions in Ti^{9+}, Fe^{13+}, and Ni^{15+}: (a) - present, (b)-measurement data from Ref. [18]. Numbers in brackets represent powers of 10.

Lower level	Upper level	Ti^{9+}			Fe^{13+}		
		λ^a	λ^b	A^a	λ^a	λ^b	A^a
$3p^2(^1S)3s\ ^2S_{1/2}$	$3p^2(^3P)3p\ ^2P_{1/2}$	50.65	50.60	3.46[08]	36.05		1.15[08]
$3p^2(^1S)3s\ ^2S_{1/2}$	$3p^2(^3P)3p\ ^2P_{3/2}$	50.12	50.47	9.82[08]	35.59	35.63	1.77[09]
$3p^2(^1S)3s\ ^2S_{1/2}$	$3p^2(^3P)3p\ ^2D_{3/2}$	67.17		4.27[07]	47.21		3.07[08]
$3p^2(^3P)3s\ ^2P_{1/2}$	$3p^2(^3P)3p\ ^2P_{1/2}$	55.26	55.20	1.48[09]	39.43	39.39	3.13[09]
$3p^2(^3P)3s\ ^2P_{1/2}$	$3p^2(^3P)3p\ ^2D_{3/2}$	75.53	75.57	2.79[08]	53.19		4.45[08]
$3p^2(^3P)3s\ ^2P_{3/2}$	$3p^2(^3P)3p\ ^2P_{3/2}$	55.90	56.33	1.41[09]	40.13	40.17	2.57[09]
$3p^2(^3P)3s\ ^2P_{3/2}$	$3p^2(^3P)3p\ ^2D_{3/2}$	77.98	78.02	3.12[07]	55.55		2.69[07]
$3p^2(^3P)3s\ ^2P_{3/2}$	$3p^2(^3P)3p\ ^2D_{5/2}$	77.40	77.42	3.06[08]	54.39	54.43	5.96[08]
$3p^2(^1D)3s\ ^2D_{3/2}$	$3p^2(^3P)3p\ ^2P_{1/2}$	40.03	39.983	7.39[09]	29.17	29.15	1.21[10]
$3p^2(^1D)3s\ ^2D_{3/2}$	$3p^2(^3P)3p\ ^2P_{3/2}$	39.69	39.912	7.19[08]	28.87		1.13[09]
$3p^2(^1D)3s\ ^2D_{3/2}$	$3p^2(^3P)3p\ ^2D_{3/2}$	49.68	49.67	1.33[09]	36.08		2.01[09]
$3p^2(^1D)3s\ ^2D_{3/2}$	$3p^2(^3P)3p\ ^2D_{5/2}$	49.45		1.33[08]	35.59	35.59	2.73[08]
$3p^2(^1D)3s\ ^2D_{5/2}$	$3p^2(^3P)3p\ ^2P_{3/2}$	39.78	39.985	6.39[09]	29.06	29.07	9.67[09]
$3p^2(^1D)3s\ ^2D_{5/2}$	$3p^2(^3P)3p\ ^2D_{3/2}$	49.82	49.801	3.20[08]	36.37		8.10[08]
$3p^2(^1D)3s\ ^2D_{5/2}$	$3p^2(^3P)3p\ ^2D_{5/2}$	49.58	49.57	1.57[09]	35.87	35.88	2.74[09]
$3p^2(^1S)3s\ ^2S_{1/2}$	$3s3p(^3P)3d\ ^2P_{1/2}$	30.50	30.42	1.44[10]	22.23		1.27[10]
$3p^2(^1S)3s\ ^2S_{1/2}$	$3s3p(^3P)3d\ ^2P_{3/2}$	30.75	30.676	2.33[10]	22.63	22.60	3.78[10]
$3p^2(^3P)3s\ ^2P_{3/2}$	$3s3p(^3P)3d\ ^2P_{3/2}$	32.83		8.60[09]	24.39	24.36	1.06[10]
$3p^2(^1D)3s\ ^2D_{3/2}$	$3s3p(^3P)3d\ ^2D_{3/2}$	32.61	32.573	2.08[10]	23.94	23.93	3.04[10]
$3p^2(^1D)3s\ ^2D_{3/2}$	$3s3p(^3P)3d\ ^2D_{5/2}$	32.61		1.89[09]	23.91		3.56[09]
$3p^2(^1D)3s\ ^2D_{3/2}$	$3s3p(^3P)3d\ ^2F_{5/2}$	30.30	30.205	8.93[09]	22.48	22.44	1.25[10]
$3p^2(^1D)3s\ ^2D_{5/2}$	$3s3p(^3P)3d\ ^2D_{3/2}$	32.67		2.03[09]	24.07		2.64[09]
$3p^2(^1D)3s\ ^2D_{5/2}$	$3s3p(^3P)3d\ ^2D_{5/2}$	32.66	32.626	2.10[10]	24.04	24.016	2.93[10]
$3p^2(^1D)3s\ ^2D_{5/2}$	$3s3p(^3P)3d\ ^2F_{5/2}$	30.35		1.01[09]	22.59		2.31[09]
$3p^2(^1D)3s\ ^2D_{5/2}$	$3s3p(^3P)3d\ ^2F_{7/2}$	29.81	29.72	1.02[10]	21.86	21.82	1.55[10]
$3p^2(^1S)3s\ ^2S_{1/2}$	$3s3p(^1P)3d\ ^2P_{1/2}$	28.85	28.72	8.98[09]	21.12	21.07	1.67[10]
$3p^2(^1S)3s\ ^2S_{1/2}$	$3s3p(^1P)3d\ ^2P_{3/2}$	28.81	28.66	1.45[09]	21.06	20.87	7.35[08]
$3p^2(^1S)3s\ ^2S_{1/2}$	$3s3p(^1P)3d\ ^2D_{3/2}$	28.50		3.76[09]	20.92		6.24[09]
$3p^2(^3P)3s\ ^2P_{1/2}$	$3s3p(^1P)3d\ ^2P_{3/2}$	30.24	30.129	2.44[10]	22.17	21.97	4.62[10]
$3p^2(^3P)3s\ ^2P_{1/2}$	$3s3p(^1P)3d\ ^2D_{3/2}$	29.90	29.83	9.72[09]	22.01	22.11	6.32[07]
$3p^2(^3P)3s\ ^2P_{3/2}$	$3s3p(^1P)3d\ ^2P_{1/2}$	30.68		5.49[09]	22.64	22.58	9.23[09]
$3p^2(^3P)3s\ ^2P_{3/2}$	$3s3p(^1P)3d\ ^2P_{3/2}$	30.63	30.488	7.42[08]	22.57	22.36	3.99[09]
$3p^2(^3P)3s\ ^2P_{3/2}$	$3s3p(^1P)3d\ ^2D_{5/2}$	30.19	30.129	3.96[10]	22.36	22.32	5.60[10]
$3p^2(^1D)3s\ ^2D_{3/2}$	$3s3p(^1P)3d\ ^2F_{5/2}$	26.11	26.01	1.81[10]	19.23	19.18	2.43[10]
$3p^2(^1D)3s\ ^2D_{5/2}$	$3s3p(^1P)3d\ ^2F_{7/2}$	26.25	26.15	1.94[10]	19.42	19.37	2.53[10]
$3s^2(^1S)3d\ ^2D_{3/2}$	$3s3p(^1P)3d\ ^2P_{1/2}$	37.56	37.40	1.70[10]	27.36	27.30	2.68[10]
$3s^2(^1S)3d\ ^2D_{3/2}$	$3s3p(^1P)3d\ ^2P_{3/2}$	37.48	37.33	8.51[08]	27.26	26.99	9.79[09]
$3s^2(^1S)3d\ ^2D_{3/2}$	$3s3p(^1P)3d\ ^2D_{3/2}$	36.96	36.90	1.19[10]	27.03	27.21	1.04[10]
$3s^2(^1S)3d\ ^2D_{3/2}$	$3s3p(^1P)3d\ ^2F_{5/2}$	39.97	39.818	1.33[10]	28.85	28.78	2.23[10]
$3s^2(^1S)3d\ ^2D_{5/2}$	$3s3p(^1P)3d\ ^2D_{3/2}$	37.03		2.70[09]	27.18	27.35	1.74[10]
$3s^2(^1S)3d\ ^2D_{5/2}$	$3s3p(^1P)3d\ ^2D_{5/2}$	36.91	36.85	1.14[10]	27.10	27.08	1.83[10]
$3s^2(^1S)3d\ ^2D_{5/2}$	$3s3p(^1P)3d\ ^2F_{7/2}$	40.28	40.134	1.35[10]	29.27	29.30	2.20[10]

Table 5: Wavelengths λ in (nm) and transition probabilities, A in s^{-1} for LS-allowed transitions in Ti^{9+}, Fe^{13+}, and Ni^{15+}: (a) - present, (b)-measurement data from Ref. [19]. Numbers in brackets represent powers of 10.

Lower level	Upper level	Ti^{9+}			Fe^{13+}		
		λ^a	λ^b	A^a	λ^a	λ^b	A^a
$3p^2(^3P)3s\ ^4P_{3/2}$	$3s3p(^3P)3d\ ^4F_{5/2}$	33.14	33.06	2.68[07]	24.25	24.20	1.37[08]
$3p^2(^3P)3s\ ^4P_{5/2}$	$3s3p(^3P)3d\ ^4F_{7/2}$	33.33	33.26	4.41[07]	24.46	24.41	2.44[08]
$3p^2(^3P)3s\ ^4P_{3/2}$	$3s3p(^3P)3d\ ^4F_{3/2}$	33.48		1.20[07]	24.49		7.52[07]
$3p^2(^3P)3s\ ^4P_{5/2}$	$3s3p(^3P)3d\ ^4F_{5/2}$	33.59	33.51	1.25[07]	24.82	24.78	7.10[07]
$3p^2(^1D)3s\ ^2D_{5/2}$	$3s3p(^3P)3d\ ^4F_{5/2}$	39.54	39.50	1.33[07]	29.05	29.04	6.82[07]
$3p^2(^1D)3s\ ^2D_{3/2}$	$3s3p(^3P)3d\ ^4F_{3/2}$	39.94	39.63	1.64[07]	29.21	29.16	8.87[07]
$3p^2(^1D)3s\ ^2D_{5/2}$	$3s3p(^3P)3d\ ^4F_{3/2}$	40.02	39.79	1.84[07]	29.40	29.35	9.30[07]

Table 6: Lifetimes, τ of the low-lying levels in Ti^{9+}, Fe^{13+}, and Ni^{15+}: (a) - present, , measurement data from Refs. [18] – (b) and [19] – (c) .

Level	Ti^{9+}		Fe^{13+}		Ni^{15+}	
	τ^a,ps	τ^b,ps	τ^a,ps	τ^b,ps	τ^a,ps	τ^b,ps
$3p^2(^1S)3s\ ^2S_{1/2}$	108	109±10	55.0	61±6	40.3	38±4
$3p^2(^3P)3s\ ^2P_{1/2}$	42.2	43±5	29.8	35±7	26.5	24±6
$3p^2(^3P)3s\ ^2P_{3/2}$	40.2	34±5	25.5	34±7	21.0	21±2
$3p^2(^1D)3s\ ^2D_{3/2}$	921	850±60	458	340±60	340	290±20
$3p^2(^1D)3s\ ^2D_{5/2}$	1050	950±50	581	530±40	472	400±30
$3s^2(^1S)3d\ ^2D_{3/2}$	35.2	37±5	23.9	32±6	20.2	25±3
$3s^2(^1S)3d\ ^2D_{5/2}$	37.2	44±6	26.3	32±6	22.8	30±5
	τ^a, ns	τ^c, ns	τ^a, ns	τ^c, ns	τ^a, ns	τ^c, ns
$3s3p(^3P)3d\ ^4F_{3/2}$	17.7	16 ±1.5	3.32	1.5±0.2	1.84	1.8 ±0.2
$3s3p(^3P)3d\ ^4F_{5/2}$	18.8	13 ±1.5	3.55	1.9±0.1	1.81	1.98±0.2
$3s3p(^3P)3d\ ^4F_{7/2}$	22.0	18.5±2	4.00	2.8±0.2	1.98	2.2±0.2

channel for low-Z ions and $A(3p^23s\ ^4P_{1/2} - 3p^3\ ^4S_{3/2})$ channel for high-Z ions. We can see from Fig. 3, that the largest contribution for the lifetime of the $3p^3\ ^2P_{1/2}$ level is from the $A(3p^23s\ ^2D_{3/2} - 3p^3\ ^2P_{1/2})$ channel for low-Z ions and $A(3p^23s\ ^4P_{1/2} - 3p^3\ ^2P_{1/2})$ channel for high-Z ions.

Our lifetime data are compared with experimental measurements from Refs. [20] and [22] for high-Z ions, Br^{22+} and Au^{66+}, in Table 8. Our theoretical lifetimes agree with measured lifetimes to within one or two times the experimental error limits. We also compare in this table wavelengths data. We obtain excellent agreement between our MBPT theoretical results and measurements by Träbert *et al.* [20] for Br^{22+}. We include additional column in Table 8 with transition rates data. It can be seen from these data that the lifetimes values of $3p^23s\ ^4P_{1/2}$ and $3p^23s\ ^4P_{3/2}$ levels are completed by two transitions each. The contribution of additional transitions, $3s^23p\ ^2P_{3/2}$– $3p^23s\ ^4P_{1/2}$ and $3s^23p\ ^2P_{1/2}$– $3p^23s\ ^4P_{3/2}$ to the lifetimes of $3p^23s\ ^4P_{1/2}$ and $3p^23s\ ^4P_{3/2}$ levels, respectively, is about 10%. It happened that for Au^{66+}, there is no similar contribution for the lifetime of $3p^23s\ ^4P_{1/2}$ level since this level moves under the $3s^23p\ ^2P_{3/2}$ level. This reverting of $3p^23s\ ^4P_{1/2}$ and $3s^23p\ ^2P_{3/2}$ levels becomes for ions with $Z \geq$57. The change of the lower level to the upper level occurs for the $3p^23s\ ^2P_{1/2}$, $3p^23s\ ^2D_{5/2}$, and $3s^23d\ ^2D_{3/2,5/2}$ levels.

Let us remind that among the 40 levels considered in our paper, the lowest levels are the odd-parity levels $3s^23p\ ^2P_J$ and between other 28 odd-parity levels there are the 10 even-parity levels. We found that the four even-parity levels become lower levels relative the nine odd-parity levels for high-Z ions. Let us list the values of nuclear charge Z, when such a revert occurs.

	1*odd*	2*odd*	3*odd*	4*odd*	5*odd*	6*odd*	7*odd*	8*odd*	9*odd*
1*even*	58	58	60	62	68	67	63	65	66
2*even*	63	63	64	66	72	71	67	69	70
3*even*	59	59	60	63	68	68	63	65	67
4*even*	88	88	90	95			97		

Table 7: Lifetimes, τ in (ns) of the low-lying levels in P^{2+} – Ar^{5+}: (*a*) - present, (*b*) – measurement data presented in Ref. [10].

Level	P^{2+}		S^{3+}		K^{4+}	
	τ^a	τ^b	τ^a	τ^b	τ^a	τ^b
$3p^2(^3P)3p\ ^4S$	0.189		0.134	0.15 ±0.02	0.104	0.11±0.01
$3s3p(^3P)3d\ ^4P$	0.262		0.172	0.19 ±0.01	0.129	0.10±0.01
$3s3p(^3P)3d\ ^4D$	0.151	0.16±0.02	0.100	0.099±0.006	0.0758	
$3p^2(^1D)3s\ ^2D$	106	18±2	10.2	6.95 ±0.36	4.55	4.0 ±0.1
$3p^2(^1S)3s\ ^2S$	0.551	0.45±0.07	0.329	0.428±0.08	0.262	0.33±0.02
$3p^2(^3P)3s\ ^2P$	0.180	0.21±0.02	0.125	0.15 ±0.04	0.0957	0.11±0.01
$3s^2(^1S)3d\ ^2D$	0.171	0.19±0.02	0.108	0.12 ±0.02	0.0794	
$3p^2(^3P)3p\ ^2D$	12.1	10 ±1	4.32	3.8 ±0.2	2.19	
$3p^2(^3P)3p\ ^2P$	0.643		0.363	0.83 ±0.1	0.264	
$3s3p(^3P)3d\ ^2D$	0.178		0.120	0.12 ±0.02	0.0918	
$3s3p(^3P)3d\ ^2P$	0.160		0.0988		0.0700	

Table 8: Wavelengths λ in (nm) and transition probabilities A in s^{-1}, and lifetimes results τ in (ns) for low-lying levels in Br^{22+} and Au^{66+}: (*a*) - present, measurement data from Refs. [20] – (*b*) and [22] – (*c*). Numbers in brackets represent powers of 10.

Br^{22+}						
Lower level	Upper level	λ^a	λ^b	A^a	τ^a	τ^b
$3s^2(^1S)3p\ ^2P_{1/2}$	$3p^2(^3P)3s\ ^4P_{1/2}$	25.51	25.56±0.03	4.74[08]	1.88	1.9 ±0.2
$3s^2(^1S)3p\ ^2P_{3/2}$	$3p^2(^3P)3s\ ^4P_{1/2}$	32.54		5.69[07]		
$3s^2(^1S)3p\ ^2P_{1/2}$	$3p^2(^3P)3s\ ^4P_{3/2}$	22.92		8.74[06]		
$3s^2(^1S)3p\ ^2P_{3/2}$	$3p^2(^3P)3s\ ^4P_{3/2}$	28.45	28.74±0.15	6.24[07]	14.1	12 ±5
$3s^2(^1S)3p\ ^2P_{3/2}$	$3p^2(^3P)3s\ ^4P_{5/2}$	26.01	26.01±0.03	4.27[08]	2.34	2.05 ±0.10
$3s^2(^1S)3p\ ^2P_{3/2}$	$3p^2(^1D)3s\ ^2D_{5/2}$	20.53	20.58±0.03	3.45[09]	0.290	0.235±0.02
Au^{66+}						
Lower level	Upper level	λ^a	λ^c	A^a	τ^a	τ^c
$3s^2(^1S)3p\ ^2P_{1/2}$	$3p^2(^3P)3s\ ^4P_{1/2}$	6.65	6.60±0.02	4.58[10]	0.0218	0.022 ±0.004
$3p^2(^3P)3s\ ^4P_{1/2}$	$3s^2(^1S)3p\ ^2P_{3/2}$	3.99		7.45[08]		
$3s^2(^1S)3p\ ^2P_{3/2}$	$3p^2(^3P)3s\ ^4P_{5/2}$	7.18	7.27±0.01	1.66[10]	0.0602	0.0505±0.002

Here, we use the following labels for the levels:
1even=$3s^2(^1S)3d\ ^2D_{3/2}$, 2even=$3s^2(^1S)3d\ ^2D_{3/2}$,
3even=$3p^2(^3P)3s\ ^2P_{1/2}$, 4even=$3p^2(^1D)3s\ ^2D_{5/2}$,
1odd=$3p^2(^3P)3p\ ^4S_{3/2}$, 2odd=$3p^2(^3P)3p\ ^2D_{3/2}$, 3odd=$3p^2(^3P)3p\ ^2D_{5/2}$,
4odd=$3p^2(^3P)3p\ ^2P_{1/2}$, 5odd=$3p^2(^3P)3p\ ^2P_{3/2}$, 6odd=$3s3p(^3P)3d\ ^4P_{5/2}$,
7odd=$3s3p(^3P)3d\ ^4F_{3/2}$, 8odd=$3s3p(^3P)3d\ ^4F_{5/2}$, 9odd=$3s3p(^3P)3d\ ^4F_{7/2}$. We take into account this change of the levels position when we sum transitions rate to calculate the lifetime of levels.

It is of some interest to consider theoretical rates A_J for $3s^23p\ ^2P_J$–$3s3p^2\ ^2S_{1/2}$ and $3s^23p\ ^2P_J$–$3s3p^2\ ^2P_{1/2}$ transitions for J=1/2 and 3/2. The branching ratio $A_{3/2}/A_{1/2}$ for the former transition is equal to 2 in the LS-coupling limit, as is the ratio $A_{1/2}/A_{3/2}$ for the later one. Deviation of either ratio from 2 indicates the presence of relativistic (spin-orbit) effects. The model space for even-parity states with J=1/2 includes three states without including 3d electrons: $3p_{1/2}3p_{1/2}[0]3s_{1/2}$, $3p_{1/2}3p_{3/2}[1]3s_{1/2}$, and $3p_{3/2}3p_{3/2}[0]3s_{1/2}$. The largest contribution to the eigenvector of $3s3p^2\ ^2S_{1/2}$ level gives the $3p_{1/2}3p_{3/2}[1]3s_{1/2}$ state for small Z values up to Z=23 and the $3p_{3/2}3p_{3/2}[0]3s_{1/2}$ state for ions with Z >35. Completely reversed situation takes place for the $3s3p^2\ ^2P_{1/2}$ level. The $3p_{1/2}3p_{1/2}[0]3s_{1/2}$ state contributes to the eigenvector of this level about 20-30% in the range of 15≤Z≤45. The change of these three contribution of states with Z originates rather complicated Z-dependence of transition rates with including $3s3p^2\ ^2S_{1/2}$ and $3s3p^2\ ^2P_{1/2}$ levels. The branching ratio $A_{3/2}/A_{1/2}$ with including $3s^23p\ ^2P_J$–$3s3p^2\ ^2S_{1/2}$ and $3s^23p\ ^2P_J$–$3s3p^2\ ^2P_{1/2}$ transitions for J=1/2 and 3/2 are presented in Table 9 for for Al-like ions from P^{2+} through Ni^{15+}. We limit the table to those ions given in Ref. [15]. It should be noted that measurements of intensity ratios presented in Ref. [15] were compilation of the laboratory and

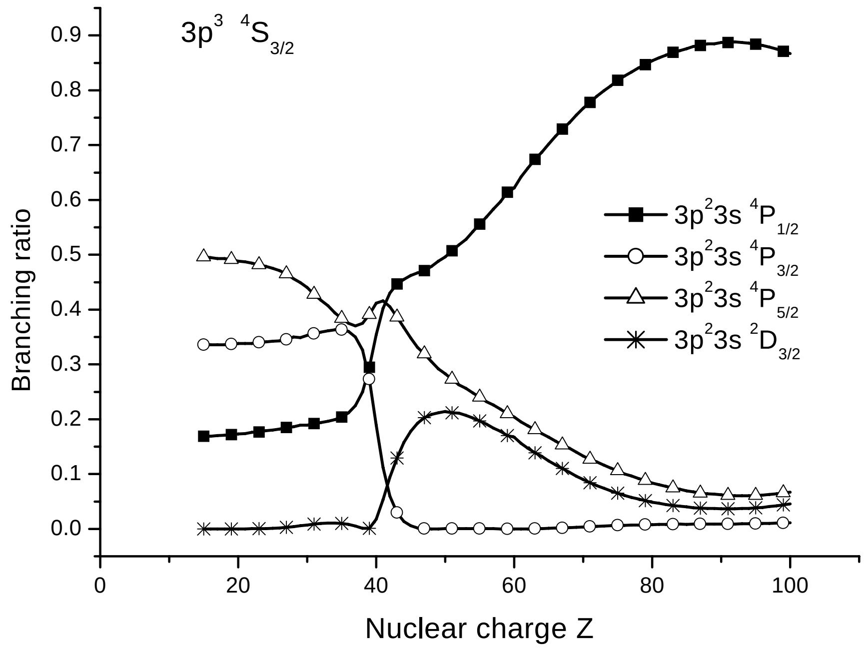

Figure 2: Channel contribution to the $3p^3\ ^4S_{3/2}$ lifetime as functions of Z

solar observations. Probably, this is an explanation that for some ions we obtain excellent agreement between our calculations and experimental data (Cl^{4+}) but for some ions disagreement is about 30% (P^{2+} and Fe^{13+}). It is more strange situation when the theoretical and experimental values for one branching ratio are almost coincide but for the other one differ in 20-40% (S^{3+}, Ar^{5+}, and Ti^{9+}). It should be noted that the trend of the experiments follows the theoretical calculations fairly well.

4 Results

In Table 10, we present our results for wavelengths λ, transition probabilities A, oscillator strengths f, and line strengths S for selected transitions in Al-like from Z=15 up to Z=100. These transitions are selected among the 3220 transitions by consideration transitions between low-lying excited states. That gives us the 220 transitions instead of the 3220 ones. The second selection was done by listing only transitions with larger values of rates A. The A minimum changes with Z to keep the equal number of transitions for each of ion. The set of transitions changes with Z from LS allowed transitions for low-Z ions to the doublet-quartet transitions for high-Z ions.

The general trends of the Z-dependence of transition rates are presented for the 220 transitions in Figs. 4 - 19. The $3s^23p\ ^2P_J$–$3p^23s\ ^2D_{J'}$, $^2P_{J'}$, $^2S_{1/2}$, $^4P_{J'}$ transitions are presented in Fig. 4. Next figures are organized from the transitions between the 27 $3p^3$, $3s3p(^{1,3}P)3d$ upper levels and the 10 $3s3p^2$, $3s^23d$ lower levels. We fix lower level and consider all transitions from all upper levels. Among the 27 upper levels, there are the 5, 10, 8, and 4 levels with J=1/2, 3/2, 5/2, and 7/2, respectively. There are no transitions from $3s3p(^3P)3d\ ^4F_{9/2}$ level. The set with J=1/2 includes $3p^3\ ^2P$, $3s3p(^3P)3d\ ^2P$, $3s3p(^1P)3d\ ^2P$, $3s3p(^3P)3d\ ^4P$, and $3s3p(^3P)3d\ ^4D$ levels; the set with J=3/2 includes the five levels included in the set with J=1/2 and additionally $3p^3\ ^4S$, $3p^3\ ^2D$, $3s3p(^3P)3d\ ^2D$, $3s3p(^1P)3d\ ^2D$, and $3s3p(^3P)3d\ ^4F$ levels; the set with J=5/2 includes the three ^2D levels from set with J=3/2, the three quartet levels with L=1–3 and $3s3p(^3P)3d\ ^2F$, $3s3p(^1P)3d\ ^2F$ levels; the set with J=7/2 includes the two quartet levels with L= 2, 3 and two ^2F levels from set with J=5/2. In Figs. 5 - 8, we present the Z-dependence of transition rates for the 60 transitions between the 27 upper levels and $3p^23s\ ^4P_J$ levels. The 24 quartet-quartet transitions are shown in Figs. 5 and 6; the 36 intercombination transitions are given in Figs. 7 and 8. The 45 $3p^23s\ ^2D_{J'}$–$3p^3\ ^{2S+1}L_J$, $3s3p(^{1,3}P)3d\ ^{2S+1}L_J$, 15 $3p^23s\ ^2S_{1/2}$–$3p^3\ ^{2S+1}L_J$, $3s3p(^{1,3}P)3d\ ^{2S+1}L_J$, 38 $3p^23s\ ^2P_{J'}$–$3p^3\ ^{2S+1}L_J$, $3s3p(^{1,3}P)3d\ ^{2S+1}L_J$, and 45 $3s^23d\ ^2D_{J'}$–$3p^3\ ^{2S+1}L_J$, $3s3p(^{1,3}P)3d\ ^{2S+1}L_J$, transitions are presented in Figs. 9 - 11, Figs. 12 - 13, Figs. 14 - 16, and Figs. 17 - 19, respectively.

We can see from all these figures, that smooth Z-dependence is happened more seldom than the sharp feature. Those singularity could be explained by the deviation from LS coupling scheme for small Z-ions and by the

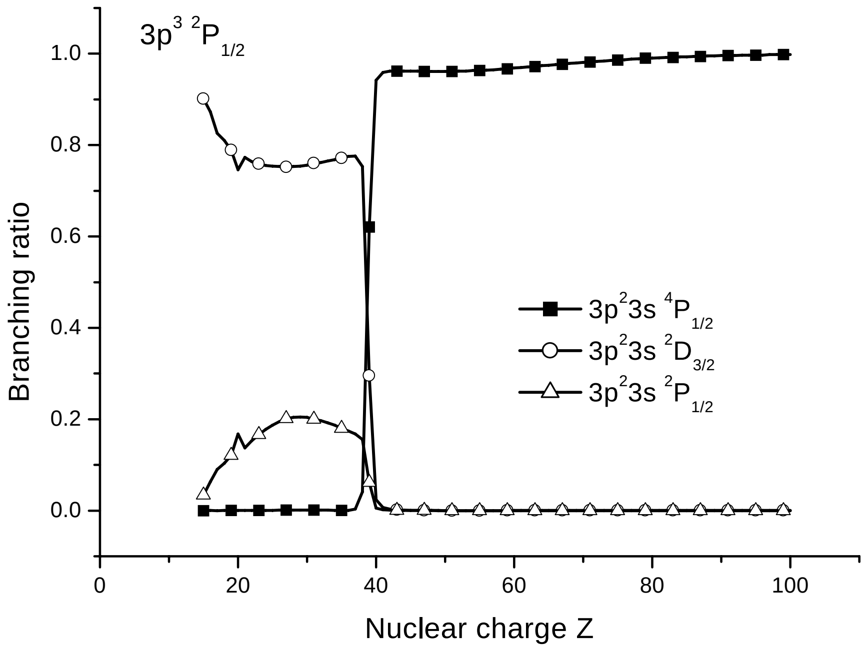

Figure 3: Channel contribution to the $3p^3\ ^2P_{1/2}$ lifetime as functions of Z

deviation from jj coupling scheme for high Z-ions. The most sharp feature is happened for the $3s^23d\ ^2D_{J'}$–$3p^3\ ^{2S+1}L_J$, $3s3p(^{1,3}P)3d\ ^{2S+1}L_J$ transitions (see Figs. 17 - 19). We already mentioned that the $3s^23d\ ^2D_{J'}$ levels becomes upper levels relative to the nine odd-parity levels for high-Z ions. When it happens, the energy difference between those levels becomes small that causes the rapid decrease of the transition rates. We can see very sharp minima in Figs. 17 - 19. The smooth Z-dependence takes place for the 34 transitions: the nine $3s^23p\ ^2P_{1/2}$–$3p^23s\ ^4P_{1/2,3/2}$, $^2D_{3/2}$, $^2S_{1/2}$, $^2P_{1/2,3/2}$, $3s^23p\ ^2P_{3/2}$–$3p^23s\ ^4P_{3/2,5/2}$, $^2P_{1/2}$ transitions in Fig. 4; the $3p^23s\ ^4P_{5/2}$–$3s3p(^3P)\ ^4D_{7/2}$ and $3p^23s\ ^4P_{3/2}$–$3s3p(^3P)\ ^4P_{5/2}$ transitions in Figs. 5 and 6, respectively; the four quartet-doublet transitions in Fig. 8; the $3p^23s\ ^2D_{5/2}$–$3s3p(^1P)\ ^2P_{3/2}$ transition in Fig. 9, the three $3p^23s\ ^2D_J$–$3s3p(^3P)\ ^4D_{J'}$ transitions in Fig. 11, the 3 doublet-doublet transitions in Fig. 12; the $3p^23s\ ^2S_{1/2}$–$3s3p(^1P)\ ^4P_{1/2}$ transition in Fig. 13; the $^2P_{3/2}$–$3p^3\ ^2D_{5/2}$, $3s3p(^1P)3d\ ^2D_{5/2}$ transitions in Fig. 15, and the two the $^2P_{1/2,3/2}$–$3s3p(^3P)3d\ ^4D_{1/2}$ transitions in Fig. 16. It can be seen from the list of transitions with smooth Z-dependence, that all kind of transitions are included in this list: doublet-doublet, quartet-quartet and doublet-quartet. There are transitions with small J and large J. Only one conclusion we can derived from this list: the smooth Z-dependence is happened more frequently for transition with including the two ground state levels (9 among 17) than from transitions between excited states (25 among 203).

In Table 11, we present our lifetime calculations for the 37 excited levels in Al-like ions from Z=15 up to Z=100. The difference in the lifetimes of the individual multiplet levels is about 10% up to Z=20.

The general trends of the Z-dependence of lifetime data for the $3p^23s\ ^{2S+1}L_J$, $3p^3\ ^4S_{3/2}$, and $3s3p(^3P)3d\ ^4L_J$ levels in Al-like ions are presented in Figs. 20 and 21. We did not include lifetimes data for $3s^23p\ ^2P_{3/2}$ since we did not consider magnetic-dipole transitions. The non-zero lifetime data for this levels jumps up by electric dipole (E1) transition for high-Z ions, $Z \geq 57$, when the $3s^23p\ ^2P_{3/2}$ level becomes above the $3p^23s\ ^4P_{1/2}$ level . There is no E1 transition from the odd-parity $3s3p(^3P)3d\ ^3F_{9/2}$ level into any even-parity levels. It can be seen from Figs. 20 and 21, that the Z-dependence of lifetime data looks more smooth than Z-dependence of transitions rates presented in Figs. 4 - 19. The sharp maximum in the curve of the $3p^23s\ ^2D_{5/2}$ lifetime is arisen by strong mixing the $3p_{3/2}3p_{3/2}[2]3s_{1/2}$ and $3s_{1/2}3s_{1/2}[0]3d_{5/2}$ states with J=5/2. The largest contribution of these states into the eigenvectors of $3p^23s\ ^2D_{5/2}$ and $3s^23d\ ^2D_{5/2}$ levels changes at the Z=50. The $3s^23p\ ^2P_{3/2}$–$3p^23s\ ^2D_{5/2}$ transition rate in factor 100 is smaller than the $3s^23p\ ^2P_{3/2}$–$3s^23d\ ^2D_{5/2}$ transition rate. This is why, this strong mixing of $3p_{3/2}3p_{3/2}[2]3s_{1/2}$ and $3s_{1/2}3s_{1/2}[0]3d_{5/2}$ states affects only the first transition with small value of transition rate. The $3s^23p\ ^2P_{3/2}$–$3p^23s\ ^2D_{5/2}$ transition rate becomes very small at Z=50 and that leads to the sharp increasing of the lifetime data for the $3p^23s\ ^2D_{5/2}$ level in the region of Z=50. We can see the sharp feature in the curves describing the Z-dependence of lifetimes data for $3s^23d\ ^2D_{3/2}$ and $3s^23d\ ^2D_{5/2}$ levels in the region of Z=74-75 and Z=83-84, respectively. This sharp change of transition rates can also be explained by strong mixing of different states. We already mentioned before that the largest contribution to

Table 9: Branching ratios: $A(^2P_{3/2} - {}^2S_{1/2})/A(^2P_{1/2} - {}^2S_{1/2})$ for transitions $3s^23p\ {}^2P_J$–$3s3p^2\ {}^2S_{1/2}$ and $A(^2P_{3/2} - {}^2P_{1/2})/A(^2P_{1/2} - {}^2P_{1/2})$ transitions $3s^23p\ {}^2P_J$–$3s3p^2\ {}^2P_{1/2}$. The experimental ratios are from Ref. [15].

Ion	$^2P_J - {}^2S_{1/2}$		$^2P_J - {}^2P_{1/2}$	
	MBPT	Expt.	MBPT	Expt.
P^{2+}	1.65	1.40±0.08	0.545	0.60±0.10
S^{3+}	1.47	1.12±0.1	0.559	0.52±0.02
Cl^{4+}	1.29	1.29±0.13	0.584	0.58±0.02
Ar^{5+}	1.12	0.87±0.05	0.620	0.61±0.03
K^{6+}	0.944	0.75±0.10	0.664	
Ca^{7+}	0.918		0.791	
Sc^{8+}	0.563	0.46±0.04	0.770	
Ti^{9+}	0.430	0.43±0.08	0.852	0.75±0.15
Fe^{13+}	0.0827	0.060±0.01	1.51	1.2 ±0.4
Ni^{15+}	0.0223		2.12	1.6 ±0.4

the eigenvector of the $3s^23d\ {}^2D_{5/2}$ level gives the $3s_{1/2}3s_{1/2}[0]3d_{5/2}$ state in the interval of Z=15-50 and the $3p_{3/2}3p_{3/2}[2]3s_{1/2}$ state for Z >50. The contribution of the third state, $3p_{1/2}3p_{1/2}[0]3d_{5/2}$, becomes the largest one for the eigenvector of the $3s^23d\ {}^2D_{5/2}$ level for Z >84. The inclusion of the $3p_{1/2}3p_{1/2}[0]3d_{5/2}$ state brings so sharp change in the curve for lifetime data of the $3s^23d\ {}^2D_{5/2}$ level shown in Fig. 20.

5 Conclusion

We have presented a systematic second-order relativistic MBPT study of reduced matrix elements, oscillator strengths, and transition rates for $3s$-$3p$ and $3p$-$3d$ electric dipole transitions in aluminiumlike ions with the nuclear charges Z ranging from 15 to 100. Our retarded E_1 matrix elements included correlation corrections from Coulomb and Breit interactions; contributions from negative energy states were also included to insure gauge independence. Both length and velocity forms of the matrix elements were evaluated and small differences, caused by the non locality of the starting HF potential, were found between the two forms. Second-order MBPT transition energies were used in our evaluation of oscillator strengths and transition rates. These calculations were compared with other calculations and with available experimental data. For $Z \geq 20$, we believe that the present theoretical data is more accurate than other theoretical or experimental data for transitions between n = 3 states in Al-like ions. We hope that these results will be useful in analyzing older experiments and planning new ones. Additionally, these calculations provide basic theoretical input amplitudes for calculations of reduced matrix elements, oscillator strengths, and transition rates in four-valence atomic systems.

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References

[1] K.-N. Huang, At. Data Nucl. Data Tables **34**, 1 (1986).

[2] C. Froese Fisher, Phys. Rev. **22**, 551 (1980).

[3] C. Froese Fisher, Physica Scripta **23**, 38 (1981).

[4] B. C. Fawcett, At. Data Nucl. Data Tables **28**, 557 (1983).

[5] C. Froese Fisher and B. Liu, At. Data Nucl. Data Tables **34**, 261 (1986).

[6] L. Özdemir and H. Karal , J. Quant. Spectrosc. Radiat. Transfer, **62**, 655 (1999).

[7] C. Mendoza, W. Eissner, M. Le Dourneuf, and C. J. Zeippen, J. Phys. B **28**, 3485 (1995).

[8] M. Farrag, E. Luc-Koenig, and J. Sincelle, J. Phys. B **14**, 3325 (1981).

[9] K. Aashamar, T. M. Luke, and J. D. Talman, Physica Scripta **30**, 121 (1984).

[10] M. Hjorth-Jensen and K. Aashamar, Physica Scripta **42**, 309 (1990).

[11] A. K. Bhatia and S. O. Kastner, J. Quant. Spectrosc. Radiat. Transfer **49**, 609 (1993).

[12] R. Marcinek and J. Migdalek, J. Phys. B **26**, 1391 (1993).

[13] C. Lavin, A. B. Alvarez, and I. Martin, J. Quant. Spectrosc. Radiat. Transfer **57**, 831 (1997).

[14] L. Engström, N. Reistad, C. Jupén, and M. Westerlind, Physica Scripta **39**, 66 (1989).

[15] L. Engström, M. Kirm, P. Bengtsson, S. T. Maniak, L. J. Curtis, E. Träbert, J. Doerfert, and J. Granzow, Physica Scripta **52**, 516 (1995).

[16] E. Träbert, R. Hutton, and I. Martinson, Z. Phys. D **5**, 125 (1987).

[17] E. H. Pinnington, W. Ansbacher, E. Träbert, P. H. Heckmann, H. M. Hellmann, and G. Möller, Z. Phys. D **6**, 241 (1987).

[18] E. H. Pinnington, W. Ansbacher, A. Tauheed, E. Träbert, P. H. Heckmann, G. Möller, and J. H. Blanke, Z. Phys. D **17**, 5 (1990).

[19] E. Träbert, C. Wagner, P. H. Heckmann, G. Möller, and T. Brage, Physica Scripta **48**, 593 (1993).

[20] E. Träbert, J. Suleiman, S. Cheng, H. G. Berry, R. W. Dunford, E. P. Kanter, C. Kurtz, A. E. Livingston, K. W. Kukla, F. G. Serpa, and L. J. Curtis, Phys. Rev. A **47**, 3805 (1993).

[21] E. Träbert, J. Doerfert, J. Granzow, R. Bütner, U. Staude, K.-H. Schartner, R. Rymuza, L. Engström, and R. Hutton, Z. Phys. D **32**, 295 (1995).

[22] E. Träbert, U. Staude, P. Bosselmann, K. H. Schartner, P. H. Mokler, and X. Tordoir, Eur. Phys. J. D **2**, 117 (1998).

[23] G. A. Martin, J. R. Fuhr and W. L. Wiese, J. Phys. Chem. Ref. Data, **17**, Suppl. 3 (1988).

[24] K. Mori, W. L. Wiese, T. Shirai, Y. Nakai, K. Ozawa, and T. Kato, At. Data Nucl. Data Tables **34**, 79 (1986).

[25] T. Shirai, T. Nakagaki, J. Sugar and W. L. Wiese, J. Phys. Chem. Ref. Data **21**, 273 (1992).

[26] T. Shirai, Y. Nakai, T. Nakagaki , J. Sugar and W. L. Wiese, J. Phys. Chem. Ref. Data **22**, 1279 (1993).

[27] T. Shirai, T. Nakagaki, K. Okazaki, J. Sugar and W. L. Wiese, J. Phys. Chem. Ref. Data **23**, 179 (1994).

[28] T. Shirai, Y. Funatake, K. Mori, J. Sugar, W.L. Wiese and Y. Nakai, J. Phys. Chem. Ref. Data **19**, 127 (1990).

[29] T. Shirai, A. Mengoni, Y. Nakai, K. Mori, J. Sugar, W. L. Wiese, K. Mori and N. Sakai, J. Phys. Chem. Ref. Data **21**, 23 (1992).

[30] U. I. Safronova, W. R. Johnson, and A. E. Livingston, Phys. Rev. A **60**, 996 (1999).

[31] U. I. Safronova, W. R. Johnson, and H. G. Berry, Phys. Rev. A **61**, 052503 (1999).

[32] M. S. Safronova, W. R. Johnson, and U. I. Safronova, Phys. Rev. A **54**, 2850 (1996).

[33] U.I Safronova, W.R Johnson, and M.S. Safronova, At. Data Nucl. Data Tables **69**, 183 (1998).

[34] U. I. Safronova, W. R. Johnson, M. S. Safronova, and A. Derevianko, Phys. Scr. **59**, 286 (1999).

[35] W. L. Wiese, J. R. Fuhr, and T. M. Deters, J. Phys. Chem. Ref. Data, Monograph No. 7 (1996).

Table 10: Wavelengths (λ in Å) , transition rates (A in s^{-1}), oscillator strengths (f), and line strengths (S in a.u.) for Al-like ions with nuclear charge Z=15-100 . Numbers in brackets represent powers of 10.

Lower level	Upper level	λ	A	f	S	λ	A	f	S
			Z=15				Z=16		
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	1144.737	1.74[09]	4.56[-1]	1.03[1]	901.173	3.46[09]	5.63[-1]	1.00[1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	1143.095	1.63[09]	4.78[-1]	7.23[0]	899.337	3.26[09]	5.96[-1]	7.04[0]
$p^2(^1D)s\ ^2D_{5/2}$	$p^2(^3P)p\ ^2P_{3/2}$	1108.233	1.27[09]	1.55[-1]	3.41[0]	842.376	2.16[09]	1.53[-1]	2.55[0]
$p^2(^1D)s\ ^2D_{3/2}$	$p^2(^3P)p\ ^2P_{1/2}$	1108.060	1.40[09]	1.29[-1]	1.89[0]	842.241	2.41[09]	1.29[-1]	1.43[0]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	1063.192	5.54[08]	4.72[-2]	6.60[-1]	761.875	1.10[09]	4.78[-2]	4.80[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	1063.026	1.40[09]	2.37[-1]	3.33[0]	761.985	2.75[09]	2.39[-1]	2.40[0]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^1S)s\ ^2S_{1/2}$	1059.560	1.13[09]	9.47[-2]	1.32[0]	794.524	1.81[09]	8.58[-2]	8.98[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	1059.384	1.24[09]	2.09[-1]	1.46[0]	758.384	2.58[09]	2.22[-1]	1.11[0]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	1053.270	6.84[08]	1.14[-1]	7.92[-1]	788.571	1.23[09]	1.15[-1]	5.96[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$p^2(^3P)p\ ^4S_{3/2}$	989.096	2.63[09]	2.58[-1]	5.03[0]	799.699	3.69[09]	2.36[-1]	3.73[0]
$p^2(^3P)s\ ^4P_{3/2}$	$p^2(^3P)p\ ^4S_{3/2}$	985.980	1.78[09]	2.59[-1]	3.36[0]	796.346	2.50[09]	2.37[-1]	2.49[0]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	984.054	8.94[08]	2.60[-1]	1.68[0]	794.252	1.26[09]	2.38[-1]	1.24[0]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{3/2}$	957.431	3.31[08]	4.55[-2]	5.74[-1]	790.479	4.30[08]	4.04[-2]	4.20[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	957.074	3.38[09]	3.10[-1]	5.85[0]	790.458	4.75[09]	2.96[-1]	4.62[0]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	955.837	3.66[09]	2.51[-1]	3.15[0]	789.310	5.13[09]	2.40[-1]	2.49[0]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	933.498	2.16[09]	2.82[-1]	3.47[0]	764.657	3.40[09]	2.98[-1]	3.00[0]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	932.553	2.18[09]	2.85[-1]	5.25[0]	763.860	3.40[09]	2.97[-1]	4.49[0]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{3/2}$	909.232	2.51[09]	3.11[-1]	3.73[0]	696.949	3.82[09]	2.79[-1]	2.56[0]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	907.795	1.11[09]	6.84[-2]	8.18[-1]	696.040	1.74[09]	6.33[-2]	5.79[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	906.446	6.84[08]	1.69[-1]	1.01[0]	694.026	1.21[09]	1.73[-1]	7.93[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	905.018	2.09[09]	2.58[-1]	1.54[0]	693.125	3.20[09]	2.30[-1]	1.05[0]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	903.971	1.95[09]	1.19[-1]	1.42[0]	751.821	2.85[09]	1.21[-1]	1.20[0]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	903.843	4.20[09]	5.14[-1]	3.06[0]	719.382	6.30[09]	4.90[-1]	2.32[0]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	903.723	4.45[09]	1.09[0]	6.48[0]	719.480	6.86[09]	1.06[0]	5.02[0]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{3/2}$	901.217	4.59[09]	5.58[-1]	6.64[0]	748.421	6.63[09]	5.59[-1]	5.49[0]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{1/2}$	899.389	3.58[09]	4.34[-1]	2.57[0]	746.489	5.10[09]	4.27[-1]	2.10[0]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	896.662	9.56[08]	2.31[-1]	1.36[0]	743.137	1.38[09]	2.28[-1]	1.12[0]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{3/2}$	892.498	5.47[08]	4.35[-2]	7.66[-1]	713.846	7.93[08]	4.03[-2]	5.69[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	892.471	5.23[09]	6.25[-1]	1.10[1]	713.947	7.67[09]	5.87[-1]	8.26[0]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	892.275	5.04[09]	6.06[-1]	7.10[0]	713.656	7.45[09]	5.71[-1]	5.35[0]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	887.621	1.48[09]	1.75[-1]	2.05[0]	676.797	2.57[09]	1.77[-1]	1.58[0]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	887.073	7.96[09]	1.41[0]	1.64[1]	676.189	1.32[10]	1.36[0]	1.21[1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2D_{3/2}$	884.965	6.49[09]	1.52[0]	8.86[0]	674.041	1.06[10]	1.45[0]	6.41[0]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	879.340	1.87[09]	3.25[-1]	3.77[0]	683.711	2.89[09]	3.03[-1]	2.73[0]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	875.977	2.01[09]	3.09[-1]	5.37[0]	680.265	3.12[09]	2.88[-1]	3.87[0]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	858.672	5.83[09]	9.63[-1]	1.10[1]	664.063	9.20[09]	9.14[-1]	7.99[0]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	858.385	9.99[08]	1.11[-1]	1.25[0]	664.047	1.58[09]	1.05[-1]	9.14[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{5/2}$	855.610	2.35[09]	2.58[-1]	4.37[0]	670.209	3.36[09]	2.26[-1]	2.99[0]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{3/2}$	854.268	1.61[09]	1.18[-1]	1.98[0]	668.883	2.36[09]	1.06[-1]	1.39[0]
$s^2(^1S)p\ ^2P_{1/2}$	$s^2(^1S)d\ ^2D_{3/2}$	854.253	4.91[09]	1.08[0]	6.04[0]	659.884	7.73[09]	1.01[0]	4.40[0]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	853.277	1.44[09]	2.37[-1]	2.66[0]	667.853	2.41[09]	2.43[-1]	2.13[0]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	851.078	3.05[09]	1.66[-1]	1.86[0]	665.642	4.51[09]	1.50[-1]	1.32[0]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	850.504	1.86[09]	4.02[-1]	2.25[0]	665.068	3.02[09]	4.00[-1]	1.75[0]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	849.642	7.79[08]	8.45[-2]	4.72[-1]	664.179	1.31[09]	8.69[-2]	3.80[-1]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	841.946	4.27[08]	3.02[-2]	5.02[-1]	659.233	7.24[08]	3.14[-2]	4.09[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	841.512	2.28[09]	2.42[-1]	4.02[0]	658.784	3.64[09]	2.37[-1]	3.08[0]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	841.151	6.61[09]	9.38[-1]	1.55[1]	658.441	9.96[09]	8.60[-1]	1.12[1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	840.039	1.24[09]	6.57[-2]	7.28[-1]	657.340	1.99[09]	6.48[-2]	5.60[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	839.688	3.69[09]	3.90[-1]	4.32[0]	656.953	5.67[09]	3.67[-1]	3.17[0]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	839.256	4.33[09]	6.85[-1]	7.60[0]	656.507	6.30[09]	6.11[-1]	5.28[0]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
		Z=17				Z=18			
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	738.759	5.06[09]	5.50[-1]	8.06[0]	636.428	6.53[09]	5.28[-1]	6.64[0]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	736.811	4.80[09]	5.85[-1]	5.68[0]	634.254	6.21[09]	5.64[-1]	4.70[0]
$p^2(^1D)s\ ^2D_{5/2}$	$p^2(^3P)p\ ^2P_{3/2}$	716.930	2.80[09]	1.44[-1]	2.04[0]	620.929	3.52[09]	1.36[-1]	1.66[0]
$p^2(^1D)s\ ^2D_{3/2}$	$p^2(^3P)p\ ^2P_{1/2}$	716.354	3.14[09]	1.21[-1]	1.14[0]	620.439	3.98[09]	1.15[-1]	9.39[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^1S)s\ ^2S_{1/2}$	686.474	2.15[09]	7.60[-2]	6.88[-1]	596.643	2.56[09]	6.81[-2]	5.37[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$p^2(^3P)p\ ^4S_{3/2}$	683.868	4.72[09]	2.22[-1]	2.99[0]	595.150	5.86[09]	2.08[-1]	2.44[0]
$p^2(^3P)s\ ^4P_{3/2}$	$p^2(^3P)p\ ^4S_{3/2}$	679.963	3.22[09]	2.23[-1]	2.00[0]	590.822	4.00[09]	2.09[-1]	1.63[0]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	679.509	1.67[09]	1.16[-1]	5.18[-1]	588.883	2.29[09]	1.19[-1]	4.62[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	677.494	1.63[09]	2.24[-1]	1.00[0]	588.050	2.03[09]	2.11[-1]	8.15[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	673.314	6.17[09]	2.81[-1]	3.73[0]	581.182	8.08[09]	2.73[-1]	3.13[0]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	673.127	6.64[09]	2.26[-1]	2.00[0]	580.699	8.63[09]	2.18[-1]	1.66[0]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	649.587	4.59[09]	2.92[-1]	2.50[0]	564.487	5.95[09]	2.84[-1]	2.11[0]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	648.779	4.55[09]	2.88[-1]	3.69[0]	563.672	5.76[09]	2.75[-1]	3.06[0]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	639.709	3.84[09]	1.18[-1]	9.93[-1]	556.395	4.92[09]	1.14[-1]	8.36[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{3/2}$	635.827	8.66[09]	5.27[-1]	4.41[0]	552.132	1.08[10]	4.91[-1]	3.57[0]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{1/2}$	633.657	6.57[09]	3.95[-1]	1.65[0]	549.640	7.94[09]	3.60[-1]	1.30[0]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	629.848	1.81[09]	2.16[-1]	8.97[-1]	545.480	2.26[09]	2.02[-1]	7.25[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	617.557	4.11[09]	2.36[-1]	1.92[0]	519.099	5.22[09]	2.12[-1]	1.44[0]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	616.283	1.66[09]	4.73[-2]	3.85[-1]	517.823	2.13[09]	4.28[-2]	2.92[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	613.939	7.79[08]	8.78[-2]	3.55[-1]	515.386	9.57[08]	7.64[-2]	2.59[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	612.680	4.09[09]	2.30[-1]	9.29[-1]	514.128	5.56[09]	2.21[-1]	7.46[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	597.842	9.93[09]	5.30[-1]	6.26[0]	508.492	1.21[10]	4.70[-1]	4.72[0]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{3/2}$	597.734	1.02[09]	3.62[-2]	4.29[-1]	508.379	1.23[09]	3.18[-2]	3.20[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	597.611	7.51[08]	6.05[-2]	4.74[-1]	508.226	9.35[08]	5.45[-2]	3.64[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	597.504	9.67[09]	5.14[-1]	4.06[0]	508.113	1.19[10]	4.57[-1]	3.06[0]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	576.264	9.43[09]	9.40[-1]	3.57[0]	485.076	1.20[10]	8.43[-1]	2.69[0]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	575.154	8.36[09]	4.16[-1]	1.58[0]	483.961	1.01[10]	3.56[-1]	1.13[0]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{3/2}$	574.803	4.95[09]	2.46[-1]	1.86[0]	483.633	5.29[09]	1.86[-1]	1.18[0]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	574.708	2.36[09]	5.85[-2]	4.42[-1]	483.416	2.75[09]	4.82[-2]	3.07[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	571.667	1.86[09]	1.81[-1]	6.84[-1]	480.409	2.69[09]	1.85[-1]	5.88[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	571.573	4.22[09]	2.07[-1]	7.78[-1]	480.195	4.66[09]	1.61[-1]	5.10[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	562.832	3.97[09]	2.82[-1]	2.09[0]	473.279	4.89[09]	2.47[-1]	1.54[0]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	559.264	4.31[09]	2.69[-1]	2.97[0]	469.602	5.35[09]	2.36[-1]	2.19[0]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	557.461	3.80[09]	1.77[-1]	1.30[0]	472.128	5.11[09]	1.70[-1]	1.06[0]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	556.826	1.81[10]	1.27[0]	9.27[0]	471.446	2.22[10]	1.12[0]	6.92[0]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2D_{3/2}$	554.511	1.43[10]	1.32[0]	4.82[0]	469.055	1.71[10]	1.13[0]	3.48[0]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{5/2}$	549.961	4.07[09]	1.85[-1]	2.01[0]	468.713	4.48[09]	1.48[-1]	1.37[0]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{3/2}$	548.618	2.95[09]	8.89[-2]	9.64[-1]	467.337	3.36[09]	7.36[-2]	6.78[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	547.433	3.61[09]	2.44[-1]	1.75[0]	466.024	5.16[09]	2.52[-1]	1.54[0]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	547.297	2.16[09]	9.65[-2]	6.98[-1]	463.454	2.67[09]	8.57[-2]	5.24[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	547.259	1.25[10]	8.41[-1]	6.07[0]	463.346	1.53[10]	7.40[-1]	4.52[0]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	545.151	5.74[09]	1.28[-1]	9.19[-1]	463.619	6.61[09]	1.07[-1]	6.51[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	544.509	4.41[09]	3.93[-1]	1.41[0]	462.948	6.21[09]	4.00[-1]	1.22[0]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	543.563	2.03[09]	9.01[-2]	3.23[-1]	461.910	3.17[09]	1.01[-1]	3.09[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$s^2(^1S)d\ ^2D_{3/2}$	542.861	1.06[10]	9.39[-1]	3.35[0]	458.758	1.30[10]	8.24[-1]	2.49[0]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	541.297	1.12[09]	3.31[-2]	3.53[-1]	461.639	1.71[09]	3.62[-2]	3.31[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	540.823	5.22[09]	2.29[-1]	2.44[0]	461.136	7.03[09]	2.24[-1]	2.04[0]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	540.504	1.32[10]	7.69[-1]	8.22[0]	460.855	1.63[10]	6.93[-1]	6.31[0]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	539.297	2.92[09]	6.38[-2]	4.52[-1]	459.576	4.17[09]	6.63[-2]	4.01[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	538.862	2.18[09]	1.90[-1]	6.73[-1]	453.967	3.09[09]	1.90[-1]	5.70[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	538.848	7.70[09]	3.36[-1]	2.39[0]	459.030	9.90[09]	3.11[-1]	1.88[0]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
				Z=19				Z=20	
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	554.799	8.19[09]	5.06[-1]	5.53[0]	484.034	1.02[10]	4.76[-1]	4.54[0]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	552.418	7.84[09]	5.37[-1]	3.92[0]	481.935	9.79[09]	5.11[-1]	3.24[0]
$p^2(^1D)s\ ^2D_{5/2}$	$p^2(^3P)p\ ^2P_{3/2}$	547.040	4.28[09]	1.28[-1]	1.38[0]	485.907	6.49[09]	1.53[-1]	1.47[0]
$p^2(^1D)s\ ^2D_{3/2}$	$p^2(^3P)p\ ^2P_{1/2}$	546.661	4.88[09]	1.10[-1]	7.87[-1]	492.263	7.18[09]	1.30[-1]	8.46[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^1S)s\ ^2S_{1/2}$	526.655	2.92[09]	6.07[-2]	4.21[-1]	461.961	5.09[09]	8.17[-2]	4.96[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$p^2(^3P)p\ ^4S_{3/2}$	526.564	7.02[09]	1.95[-1]	2.03[0]	472.055	8.23[09]	1.84[-1]	1.72[0]
$p^2(^3P)s\ ^4P_{3/2}$	$p^2(^3P)p\ ^4S_{3/2}$	521.810	4.81[09]	1.97[-1]	1.35[0]	466.867	5.69[09]	1.86[-1]	1.14[0]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	518.720	2.46[09]	1.99[-1]	6.78[-1]	463.434	2.92[09]	1.88[-1]	5.73[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	518.102	3.09[09]	1.24[-1]	4.25[-1]	452.774	5.54[09]	1.71[-1]	5.09[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	511.811	1.00[10]	2.63[-1]	2.66[0]	449.142	1.22[10]	2.45[-1]	2.17[0]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	511.588	1.05[10]	2.06[-1]	1.39[0]	449.330	1.25[10]	1.89[-1]	1.12[0]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	498.770	7.48[09]	2.79[-1]	1.83[0]	440.195	9.37[09]	2.72[-1]	1.57[0]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	497.963	7.06[09]	2.63[-1]	2.58[0]	439.083	8.49[09]	2.46[-1]	2.13[0]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	492.047	6.18[09]	1.12[-1]	7.27[-1]	431.702	7.99[09]	1.12[-1]	6.35[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{3/2}$	487.432	1.30[10]	4.62[-1]	2.97[0]	426.944	1.53[10]	4.17[-1]	2.35[0]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{1/2}$	484.574	9.32[09]	3.28[-1]	1.04[0]	423.669	1.01[10]	2.74[-1]	7.65[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	480.097	2.76[09]	1.91[-1]	6.02[-1]	419.086	3.27[09]	1.72[-1]	4.75[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	451.282	6.42[09]	1.96[-1]	1.17[0]	400.118	9.40[09]	2.26[-1]	1.19[0]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	449.576	2.64[09]	4.01[-2]	2.37[-1]	397.863	3.85[09]	4.57[-2]	2.39[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	447.396	1.14[09]	6.82[-2]	2.01[-1]	396.027	1.64[09]	7.74[-2]	2.02[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	446.187	1.43[10]	4.29[-1]	3.78[0]	396.731	1.65[10]	3.89[-1]	3.06[0]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{3/2}$	446.116	1.45[09]	2.87[-2]	2.53[-1]	396.704	1.64[09]	2.58[-2]	2.02[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	445.867	1.14[09]	5.13[-2]	3.00[-1]	396.395	1.36[09]	4.80[-2]	2.51[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	445.796	1.40[10]	4.18[-1]	2.46[0]	396.368	1.63[10]	3.83[-1]	2.00[0]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	445.720	7.38[09]	2.20[-1]	6.46[-1]	393.819	1.12[10]	2.59[-1]	6.71[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	422.172	1.45[10]	7.78[-1]	2.16[0]	373.580	1.65[10]	6.92[-1]	1.70[0]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	421.868	3.37[09]	4.51[-2]	2.50[-1]	374.239	3.69[09]	3.88[-2]	1.91[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{3/2}$	421.822	5.71[09]	1.52[-1]	8.47[-1]	374.083	4.80[09]	1.01[-1]	4.95[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	420.679	1.16[10]	3.08[-1]	8.53[-1]	371.614	1.17[10]	2.43[-1]	5.93[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	418.470	5.44[09]	1.43[-1]	3.94[-1]	370.658	5.60[09]	1.15[-1]	2.82[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	418.425	4.25[09]	2.23[-1]	6.16[-1]	370.505	6.90[09]	2.85[-1]	6.94[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	413.973	5.93[09]	2.29[-1]	1.25[0]	367.735	6.89[09]	2.10[-1]	1.01[0]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	413.113	6.96[09]	1.79[-1]	9.70[-1]	367.880	9.64[09]	1.96[-1]	9.48[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	412.371	2.68[10]	1.02[0]	5.57[0]	367.079	3.10[10]	9.42[-1]	4.56[0]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	410.027	6.53[09]	2.19[-1]	1.78[0]	363.462	7.63[09]	2.02[-1]	1.45[0]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2D_{3/2}$	409.855	1.95[10]	9.74[-1]	2.64[0]	364.420	2.02[10]	8.02[-1]	1.93[0]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{5/2}$	409.583	4.58[09]	1.15[-1]	9.31[-1]	364.480	4.37[09]	8.68[-2]	6.25[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{3/2}$	408.178	3.49[09]	5.79[-2]	4.68[-1]	363.072	3.25[09]	4.27[-2]	3.07[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	406.701	7.07[09]	2.64[-1]	1.41[0]	361.379	9.43[09]	2.76[-1]	1.31[0]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	405.304	3.22[09]	7.94[-2]	4.23[-1]	358.580	3.76[09]	7.27[-2]	3.43[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	405.122	1.84[10]	6.80[-1]	3.62[0]	358.557	2.12[10]	6.17[-1]	2.90[0]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	404.159	6.74[09]	8.27[-2]	4.40[-1]	358.771	5.48[09]	5.31[-2]	2.50[-1]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	403.526	2.55[09]	4.15[-2]	3.31[-1]	358.982	3.72[09]	4.79[-2]	3.39[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	403.449	8.53[09]	4.17[-1]	1.11[0]	357.951	1.14[10]	4.38[-1]	1.03[0]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	403.013	9.10[09]	2.23[-1]	1.77[0]	358.496	1.15[10]	2.21[-1]	1.57[0]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	402.791	1.93[10]	6.26[-1]	4.99[0]	358.355	2.22[10]	5.71[-1]	4.04[0]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	402.303	5.23[09]	1.27[-1]	3.37[-1]	356.740	9.27[09]	1.78[-1]	4.17[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	401.380	6.14[09]	7.44[-2]	3.92[-1]	356.689	9.50[09]	9.06[-2]	4.25[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	400.728	1.19[10]	2.88[-1]	1.52[0]	355.974	1.39[10]	2.64[-1]	1.24[0]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	400.223	9.91[09]	3.56[-1]	1.88[0]	355.496	1.01[10]	2.88[-1]	1.35[0]
$s^2(^1S)p\ ^2P_{1/2}$	$s^2(^1S)d\ ^2D_{3/2}$	400.220	1.57[10]	7.56[-1]	1.99[0]	353.020	1.84[10]	6.86[-1]	1.59[0]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
			Z=21				Z=22		
$p^2(^1D)s\ ^2D_{5/2}$	$p^2(^3P)p\ ^2D_{5/2}$	546.636	1.31[09]	5.85[-2]	6.32[-1]	495.805	1.57[09]	5.82[-2]	5.69[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	443.824	1.17[10]	4.63[-1]	4.05[0]	402.848	1.35[10]	4.40[-1]	3.51[0]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	440.932	1.14[10]	5.00[-1]	2.89[0]	399.692	1.33[10]	4.78[-1]	2.52[0]
$p^2(^1D)s\ ^2D_{3/2}$	$p^2(^3P)p\ ^2P_{1/2}$	439.392	6.30[09]	9.14[-2]	5.28[-1]	400.277	7.39[09]	8.90[-2]	4.68[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$p^2(^3P)p\ ^2P_{3/2}$	437.749	5.49[09]	1.05[-1]	9.10[-1]	397.807	6.39[09]	1.01[-1]	7.95[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^1S)s\ ^2S_{1/2}$	427.531	2.76[09]	3.78[-2]	2.13[-1]	390.142	2.80[09]	3.20[-2]	1.64[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$p^2(^3P)p\ ^4S_{3/2}$	427.512	9.50[09]	1.74[-1]	1.47[0]	390.535	1.08[10]	1.64[-1]	1.27[0]
$p^2(^3P)s\ ^4P_{3/2}$	$p^2(^3P)p\ ^4S_{3/2}$	421.885	6.59[09]	1.76[-1]	9.79[-1]	384.467	7.53[09]	1.67[-1]	8.47[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	418.099	3.40[09]	1.78[-1]	4.91[-1]	380.298	3.91[09]	1.69[-1]	4.25[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	417.264	4.90[09]	1.28[-1]	3.51[-1]	379.003	6.50[09]	1.40[-1]	3.50[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	413.010	1.41[10]	2.40[-1]	1.96[0]	375.583	1.40[10]	1.96[-1]	1.46[0]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	412.940	1.48[10]	1.89[-1]	1.03[0]	375.570	1.70[10]	1.80[-1]	8.90[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	405.213	1.11[10]	2.73[-1]	1.46[0]	369.597	1.19[10]	2.44[-1]	1.18[0]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	404.547	9.87[09]	2.42[-1]	1.93[0]	369.064	1.14[10]	2.31[-1]	1.69[0]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	401.366	9.16[09]	1.10[-1]	5.83[-1]	366.566	1.09[10]	1.11[-1]	5.33[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{3/2}$	396.105	1.79[10]	4.22[-1]	2.20[0]	361.066	2.04[10]	3.99[-1]	1.90[0]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{1/2}$	392.305	1.19[10]	2.75[-1]	7.10[-1]	356.715	1.28[10]	2.44[-1]	5.72[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	387.277	3.87[09]	1.74[-1]	4.44[-1]	351.504	4.46[09]	1.65[-1]	3.82[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	360.460	7.73[09]	1.51[-1]	7.16[-1]	328.285	8.60[09]	1.40[-1]	6.02[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{3/2}$	358.668	1.85[09]	2.37[-2]	1.68[-1]	326.724	2.03[09]	2.16[-2]	1.40[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	358.646	1.88[10]	3.63[-1]	2.57[0]	326.646	2.10[10]	3.34[-1]	2.17[0]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	358.194	1.86[10]	3.57[-1]	1.69[0]	326.144	2.08[10]	3.32[-1]	1.43[0]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	358.172	1.61[09]	4.66[-2]	2.20[-1]	326.066	1.89[09]	4.52[-2]	1.94[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	358.077	3.25[09]	3.13[-2]	1.48[-1]	325.499	3.68[09]	2.92[-2]	1.25[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	353.883	1.10[10]	2.07[-1]	4.81[-1]	321.155	1.36[10]	2.11[-1]	4.47[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	337.860	2.03[10]	6.95[-1]	1.55[0]	307.452	2.33[10]	6.60[-1]	1.34[0]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	337.180	4.78[09]	4.08[-2]	1.81[-1]	306.777	5.49[09]	3.88[-2]	1.57[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	335.766	1.40[10]	2.37[-1]	5.25[-1]	305.007	1.44[10]	2.02[-1]	4.05[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	333.459	6.70[09]	1.12[-1]	2.45[-1]	302.915	7.03[09]	9.71[-2]	1.93[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	333.127	1.36[10]	4.52[-1]	9.92[-1]	302.441	2.44[10]	6.69[-1]	1.33[0]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	332.357	7.97[09]	1.98[-1]	8.68[-1]	302.981	8.93[09]	1.85[-1]	7.39[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	332.011	1.40[10]	2.30[-1]	1.01[0]	302.780	1.92[10]	2.63[-1]	1.05[0]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	331.190	3.52[10]	8.70[-1]	3.80[0]	301.941	3.96[10]	8.11[-1]	3.22[0]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{5/2}$	328.867	3.98[09]	6.45[-2]	4.18[-1]	299.981	3.53[09]	4.78[-2]	2.83[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2D_{3/2}$	328.403	1.73[10]	5.59[-1]	1.21[0]	299.018	9.72[09]	2.61[-1]	5.13[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	327.789	8.92[09]	1.92[-1]	1.25[0]	298.080	1.02[10]	1.82[-1]	1.07[0]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{3/2}$	327.491	2.76[09]	2.96[-2]	1.91[-1]	298.655	2.19[09]	1.95[-2]	1.15[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	325.871	4.34[09]	6.92[-2]	2.96[-1]	297.031	4.89[09]	6.52[-2]	2.54[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	325.527	1.20[10]	2.86[-1]	1.22[0]	296.388	1.46[10]	2.89[-1]	1.13[0]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	325.510	2.41[10]	5.78[-1]	2.47[0]	296.567	2.69[10]	5.32[-1]	2.08[0]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	323.576	5.11[09]	5.39[-2]	3.43[-1]	294.643	6.62[09]	5.72[-2]	3.34[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	323.155	1.39[10]	2.19[-1]	1.40[0]	294.313	1.64[10]	2.13[-1]	1.24[0]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	323.110	2.51[10]	5.22[-1]	3.34[0]	294.370	2.78[10]	4.82[-1]	2.80[0]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	321.939	1.45[10]	4.51[-1]	9.57[-1]	292.631	1.76[10]	4.50[-1]	8.67[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	321.011	1.43[10]	1.11[-1]	4.68[-1]	291.719	1.86[10]	1.18[-1]	4.55[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	320.773	1.62[10]	2.51[-1]	5.30[-1]	291.585	2.33[10]	2.98[-1]	5.72[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	320.343	1.54[10]	2.37[-1]	1.00[0]	291.176	1.66[10]	2.10[-1]	8.04[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	319.930	1.01[10]	2.32[-1]	9.78[-1]	290.854	9.87[09]	1.88[-1]	7.18[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$s^2(^1S)d\ ^2D_{3/2}$	319.873	2.09[10]	6.42[-1]	1.35[0]	290.530	2.35[10]	5.95[-1]	1.14[0]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4D_{1/2}$	318.814	7.86[09]	1.20[-1]	2.52[-1]	289.312	3.57[09]	4.48[-2]	8.52[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4D_{3/2}$	318.155	2.49[09]	7.55[-2]	1.58[-1]	288.778	1.46[09]	3.65[-2]	6.94[-2]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
				Z=23				Z=24	
$p^2(^3P)s\ ^2P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	503.096	1.85[09]	7.04[-2]	2.33[-1]	461.162	2.25[09]	7.19[-2]	2.18[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$p^2(^3P)p\ ^2D_{5/2}$	453.257	1.85[09]	5.71[-2]	5.12[-1]	417.063	2.15[09]	5.61[-2]	4.61[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	368.677	1.55[10]	4.22[-1]	3.07[0]	339.623	1.76[10]	4.04[-1]	2.72[0]
$p^2(^1D)s\ ^2D_{3/2}$	$p^2(^3P)p\ ^2P_{1/2}$	367.013	8.46[09]	8.52[-2]	4.13[-1]	338.429	9.56[09]	8.24[-2]	3.67[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	365.254	1.53[10]	4.60[-1]	2.22[0]	335.934	1.75[10]	4.45[-1]	1.97[0]
$p^2(^1D)s\ ^2D_{5/2}$	$p^2(^3P)p\ ^2P_{3/2}$	364.920	7.20[09]	9.57[-2]	6.90[-1]	337.284	7.96[09]	9.03[-2]	6.03[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$p^2(^3P)p\ ^4S_{3/2}$	359.269	1.21[10]	1.56[-1]	1.11[0]	332.451	1.34[10]	1.48[-1]	9.72[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^1S)s\ ^2S_{1/2}$	358.848	2.62[09]	2.54[-2]	1.20[-1]	332.240	2.29[09]	1.90[-2]	8.32[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$p^2(^3P)p\ ^4S_{3/2}$	352.762	8.53[09]	1.60[-1]	7.40[-1]	325.513	9.53[09]	1.52[-1]	6.50[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	348.185	4.44[09]	1.62[-1]	3.71[-1]	320.503	5.01[09]	1.54[-1]	3.26[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	346.799	8.42[09]	1.52[-1]	3.47[-1]	319.250	1.07[10]	1.65[-1]	3.46[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	344.192	1.18[10]	1.39[-1]	9.47[-1]	317.406	1.00[10]	1.01[-1]	6.36[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	344.169	1.94[10]	1.71[-1]	7.79[-1]	317.312	2.17[10]	1.64[-1]	6.86[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{3/2}$	343.279	3.42[09]	6.04[-2]	2.73[-1]	316.315	6.01[09]	9.04[-2]	3.77[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{3/2}$	340.299	7.29[09]	8.45[-2]	5.69[-1]	314.412	1.15[10]	1.13[-1]	7.02[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{3/2}$	340.299	7.29[09]	8.45[-2]	5.69[-1]	314.412	1.15[10]	1.13[-1]	7.02[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	339.406	1.10[10]	1.90[-1]	8.47[-1]	313.341	1.01[10]	1.50[-1]	6.17[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	339.066	1.29[10]	2.23[-1]	1.49[0]	313.267	1.46[10]	2.15[-1]	1.33[0]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	337.281	1.30[10]	1.11[-1]	4.92[-1]	312.123	1.52[10]	1.11[-1]	4.57[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{3/2}$	331.603	2.31[10]	3.81[-1]	1.66[0]	306.341	2.59[10]	3.64[-1]	1.47[0]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{1/2}$	326.616	1.34[10]	2.14[-1]	4.61[-1]	300.632	1.37[10]	1.86[-1]	3.68[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	321.288	5.09[09]	1.58[-1]	3.34[-1]	295.264	5.81[09]	1.52[-1]	2.95[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	301.727	9.29[09]	1.28[-1]	5.04[-1]	279.395	9.83[09]	1.15[-1]	4.24[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{3/2}$	300.028	2.20[09]	1.98[-2]	1.17[-1]	277.336	2.36[09]	1.82[-2]	9.95[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	299.887	2.31[10]	3.12[-1]	1.85[0]	277.126	2.52[10]	2.91[-1]	1.59[0]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	299.317	2.32[10]	3.11[-1]	1.23[0]	276.467	2.55[10]	2.92[-1]	1.07[0]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	299.178	2.21[09]	4.45[-2]	1.75[-1]	276.259	2.57[09]	4.43[-2]	1.61[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	298.527	4.02[09]	2.69[-2]	1.06[-1]	275.755	4.32[09]	2.47[-2]	8.95[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	294.070	1.66[10]	2.16[-1]	4.16[-1]	271.232	1.99[10]	2.19[-1]	3.91[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	282.230	2.65[10]	6.34[-1]	1.18[0]	260.850	3.00[10]	6.13[-1]	1.05[0]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	281.596	6.29[09]	3.75[-2]	1.39[-1]	260.356	7.17[09]	3.65[-2]	1.25[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	279.428	1.45[10]	1.70[-1]	3.13[-1]	257.675	1.43[10]	1.42[-1]	2.41[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	278.585	9.92[09]	1.73[-1]	6.36[-1]	257.948	1.08[10]	1.62[-1]	5.52[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	278.585	9.92[09]	1.73[-1]	6.36[-1]	257.948	1.08[10]	1.62[-1]	5.52[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	278.400	2.22[10]	2.58[-1]	9.45[-1]	257.676	2.35[10]	2.33[-1]	7.93[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	277.627	7.23[09]	8.36[-2]	1.53[-1]	256.320	7.28[09]	7.17[-2]	1.21[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	277.575	4.36[10]	7.56[-1]	2.76[0]	256.906	4.78[10]	7.10[-1]	2.40[0]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	277.048	3.42[10]	7.88[-1]	1.44[0]	255.669	3.99[10]	7.84[-1]	1.32[0]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{5/2}$	276.043	3.15[09]	3.60[-2]	1.97[-1]	255.854	2.88[09]	2.82[-2]	1.43[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	273.347	1.15[10]	1.72[-1]	9.25[-1]	252.376	1.27[10]	1.62[-1]	8.11[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	273.127	5.52[09]	6.16[-2]	2.22[-1]	252.923	6.15[09]	5.88[-2]	1.97[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	272.552	2.97[10]	4.96[-1]	1.78[0]	252.230	3.24[10]	4.65[-1]	1.54[0]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	272.186	1.73[10]	2.88[-1]	1.03[0]	251.725	1.97[10]	2.82[-1]	9.33[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	270.947	2.22[09]	2.44[-2]	8.69[-2]	250.534	3.35[09]	3.16[-2]	1.04[-1]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	270.487	8.00[09]	5.83[-2]	3.12[-1]	249.969	9.21[09]	5.78[-2]	2.85[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	270.413	3.06[10]	4.47[-1]	2.39[0]	250.079	3.33[10]	4.16[-1]	2.05[0]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	270.257	1.89[10]	2.07[-1]	1.11[0]	249.836	2.13[10]	1.99[-1]	9.83[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	268.239	2.03[10]	4.36[-1]	7.70[-1]	247.556	2.26[10]	4.15[-1]	6.77[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	267.316	2.83[10]	3.04[-1]	5.35[-1]	246.733	3.21[10]	2.93[-1]	4.76[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	267.198	2.12[10]	1.14[-1]	4.00[-1]	246.338	2.33[10]	1.05[-1]	3.44[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	266.782	1.73[10]	1.85[-1]	6.48[-1]	246.026	1.81[10]	1.64[-1]	5.30[-1]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
		Z=25				Z=26			
$p^2(^3P)s\ ^2P_{3/2}$	$p^2(^3P)p\ ^2P_{3/2}$	433.643	2.25[09]	6.33[-2]	3.62[-1]	401.297	2.57[09]	6.18[-2]	3.27[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	425.276	2.68[09]	7.29[-2]	2.04[-1]	394.261	3.13[09]	7.30[-2]	1.90[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$p^2(^3P)p\ ^2D_{5/2}$	385.871	2.43[09]	5.43[-2]	4.15[-1]	358.699	2.74[09]	5.27[-2]	3.74[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1D)s\ ^2D_{3/2}$	362.171	1.78[09]	6.99[-2]	1.67[-1]	334.557	2.11[09]	7.08[-2]	1.56[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	314.554	1.97[10]	3.89[-1]	2.42[0]	292.657	2.20[10]	3.77[-1]	2.18[0]
$p^2(^1D)s\ ^2D_{3/2}$	$p^2(^3P)p\ ^2P_{1/2}$	313.572	1.08[10]	7.96[-2]	3.28[-1]	291.721	1.21[10]	7.67[-2]	2.96[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$p^2(^3P)p\ ^2P_{3/2}$	312.692	8.75[09]	8.58[-2]	5.29[-1]	290.599	9.67[09]	8.16[-2]	4.68[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	310.606	1.98[10]	4.31[-1]	1.76[0]	288.461	2.23[10]	4.18[-1]	1.59[0]
$p^2(^3P)s\ ^4P_{5/2}$	$p^2(^3P)p\ ^4S_{3/2}$	309.156	1.47[10]	1.40[-1]	8.57[-1]	288.690	1.59[10]	1.33[-1]	7.56[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$p^2(^3P)p\ ^4S_{3/2}$	301.800	1.06[10]	1.44[-1]	5.75[-1]	280.935	1.16[10]	1.38[-1]	5.10[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	296.332	5.58[09]	1.47[-1]	2.87[-1]	274.984	6.16[09]	1.41[-1]	2.54[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	295.395	1.35[10]	1.77[-1]	3.45[-1]	274.524	1.68[10]	1.89[-1]	3.43[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	294.260	9.33[09]	8.07[-2]	4.70[-1]	274.025	9.23[09]	6.93[-2]	3.74[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	294.034	2.43[10]	1.58[-1]	6.09[-1]	273.628	2.68[10]	1.51[-1]	5.43[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{3/2}$	292.983	8.09[09]	1.04[-1]	4.03[-1]	272.560	9.79[09]	1.09[-1]	3.92[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{3/2}$	291.772	1.46[10]	1.24[-1]	7.20[-1]	271.751	1.74[10]	1.28[-1]	6.89[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	290.786	1.64[10]	2.07[-1]	1.19[0]	270.980	1.83[10]	2.02[-1]	1.08[0]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	290.517	9.99[09]	1.26[-1]	4.84[-1]	270.309	1.04[10]	1.13[-1]	4.05[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	290.192	1.77[10]	1.11[-1]	4.26[-1]	270.837	2.02[10]	1.11[-1]	3.97[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{3/2}$	284.389	2.87[10]	3.48[-1]	1.31[0]	265.097	3.18[10]	3.34[-1]	1.17[0]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{1/2}$	277.872	1.38[10]	1.59[-1]	2.91[-1]	257.694	1.34[10]	1.34[-1]	2.27[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	272.547	6.57[09]	1.46[-1]	2.62[-1]	252.492	7.38[09]	1.42[-1]	2.35[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	260.334	1.03[10]	1.04[-1]	3.58[-1]	243.866	1.06[10]	9.49[-2]	3.04[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{3/2}$	257.778	2.51[09]	1.66[-2]	8.49[-2]	240.725	2.64[09]	1.53[-2]	7.28[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	257.494	2.73[10]	2.72[-1]	1.38[0]	240.364	2.93[10]	2.54[-1]	1.21[0]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	256.721	2.80[10]	2.76[-1]	9.34[-1]	239.444	3.04[10]	2.62[-1]	8.25[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	256.439	3.02[09]	4.47[-2]	1.51[-1]	239.086	3.56[09]	4.57[-2]	1.44[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	256.224	4.58[09]	2.25[-2]	7.61[-2]	239.254	4.78[09]	2.05[-2]	6.47[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	251.689	2.35[10]	2.23[-1]	3.70[-1]	234.763	2.73[10]	2.26[-1]	3.49[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	242.423	3.38[10]	5.95[-1]	9.51[-1]	226.324	3.78[10]	5.81[-1]	8.65[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	242.170	8.16[09]	3.59[-2]	1.14[-1]	226.404	9.23[09]	3.57[-2]	1.06[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{3/2}$	241.457	2.67[09]	2.33[-2]	7.42[-2]	225.673	3.99[09]	3.05[-2]	9.04[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	240.224	1.17[10]	1.53[-1]	4.82[-1]	224.805	1.25[10]	1.43[-1]	4.23[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	239.779	2.46[10]	2.13[-1]	6.71[-1]	224.128	2.61[10]	1.96[-1]	5.80[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	239.113	5.18[10]	6.68[-1]	2.10[0]	223.603	5.60[10]	6.31[-1]	1.86[0]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	238.856	1.37[10]	1.17[-1]	1.83[-1]	222.345	1.27[10]	9.46[-2]	1.38[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{5/2}$	238.575	2.71[09]	2.31[-2]	1.09[-1]	223.600	2.65[09]	1.99[-2]	8.78[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	238.115	7.19[09]	6.12[-2]	9.59[-2]	222.379	7.02[09]	5.21[-2]	7.62[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	237.426	4.36[10]	7.37[-1]	1.15[0]	221.673	4.62[10]	6.84[-1]	9.98[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	235.589	6.83[09]	5.71[-2]	1.77[-1]	220.532	7.60[09]	5.52[-2]	1.61[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	234.771	3.53[10]	4.37[-1]	1.35[0]	219.582	3.80[10]	4.13[-1]	1.19[0]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	234.330	1.41[10]	1.55[-1]	7.18[-1]	218.608	1.55[10]	1.49[-1]	6.40[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	234.170	2.20[10]	2.72[-1]	8.39[-1]	218.919	2.42[10]	2.61[-1]	7.52[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	233.015	4.43[09]	3.61[-2]	1.11[-1]	217.788	5.41[09]	3.85[-2]	1.10[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	232.556	3.60[10]	3.87[-1]	1.78[0]	217.261	3.85[10]	3.65[-1]	1.56[0]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	232.287	1.03[10]	5.59[-2]	2.56[-1]	216.859	1.14[10]	5.35[-2]	2.29[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	232.244	2.35[10]	1.90[-1]	8.74[-1]	216.897	2.58[10]	1.82[-1]	7.78[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	229.742	2.48[10]	3.93[-1]	5.94[-1]	214.195	2.70[10]	3.71[-1]	5.23[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	228.995	3.53[10]	2.78[-1]	4.19[-1]	213.506	3.85[10]	2.64[-1]	3.70[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	228.343	2.53[10]	9.87[-2]	2.97[-1]	212.627	2.73[10]	9.25[-2]	2.59[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	228.109	1.89[10]	1.47[-1]	4.42[-1]	212.453	1.98[10]	1.35[-1]	3.76[-1]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
		Z=27				Z=28			
$p^2(^3P)s\ ^2P_{3/2}$	$p^2(^3P)p\ ^2P_{3/2}$	372.591	2.89[09]	6.03[-2]	2.96[-1]	346.919	3.24[09]	5.83[-2]	2.67[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	367.218	3.59[09]	7.26[-2]	1.75[-1]	343.450	4.04[09]	7.15[-2]	1.62[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$p^2(^3P)p\ ^2D_{5/2}$	334.813	3.03[09]	5.10[-2]	3.37[-1]	313.656	3.31[09]	4.89[-2]	3.04[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	273.329	2.44[10]	3.65[-1]	1.97[0]	256.111	2.70[10]	3.52[-1]	1.79[0]
$p^2(^1D)s\ ^2D_{3/2}$	$p^2(^3P)p\ ^2P_{1/2}$	272.329	1.34[10]	7.49[-2]	2.68[-1]	254.971	1.49[10]	7.25[-2]	2.44[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$p^2(^3P)p\ ^2P_{3/2}$	270.913	1.06[10]	7.77[-2]	4.16[-1]	253.251	1.16[10]	7.43[-2]	3.72[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$p^2(^3P)p\ ^4S_{3/2}$	270.521	1.71[10]	1.25[-1]	6.67[-1]	254.239	1.80[10]	1.16[-1]	5.86[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	268.899	2.50[10]	4.06[-1]	1.44[0]	251.468	2.78[10]	3.95[-1]	1.31[0]
$p^2(^3P)s\ ^4P_{3/2}$	$p^2(^3P)p\ ^4S_{3/2}$	262.394	1.27[10]	1.32[-1]	4.53[-1]	245.775	1.38[10]	1.25[-1]	4.03[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	256.133	9.47[09]	6.20[-2]	3.14[-1]	240.139	1.01[10]	5.76[-2]	2.74[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	256.098	2.03[10]	2.00[-1]	3.38[-1]	239.695	2.43[10]	2.09[-1]	3.31[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	255.939	6.79[09]	1.33[-1]	2.24[-1]	238.792	7.33[09]	1.25[-1]	1.98[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	255.564	2.94[10]	1.44[-1]	4.86[-1]	239.433	3.21[10]	1.38[-1]	4.36[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{3/2}$	254.475	1.12[10]	1.10[-1]	3.66[-1]	238.290	1.25[10]	1.07[-1]	3.34[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{3/2}$	253.900	1.99[10]	1.28[-1]	6.42[-1]	237.880	2.21[10]	1.26[-1]	5.89[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	253.577	2.29[10]	1.11[-1]	3.69[-1]	238.046	2.56[10]	1.09[-1]	3.41[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	253.364	2.03[10]	1.95[-1]	9.79[-1]	237.563	2.25[10]	1.91[-1]	8.94[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	252.271	1.11[10]	1.06[-1]	3.53[-1]	236.065	1.23[10]	1.02[-1]	3.18[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{3/2}$	247.980	3.49[10]	3.22[-1]	1.05[0]	232.663	3.82[10]	3.10[-1]	9.50[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{1/2}$	239.624	1.29[10]	1.11[-1]	1.75[-1]	223.305	1.21[10]	9.10[-2]	1.34[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	234.620	8.33[09]	1.37[-1]	2.13[-1]	218.562	9.43[09]	1.34[-1]	1.93[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	229.494	1.09[10]	8.58[-2]	2.60[-1]	216.843	1.11[10]	7.81[-2]	2.23[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{3/2}$	225.710	2.76[09]	1.41[-2]	6.27[-2]	212.380	2.86[09]	1.30[-2]	5.42[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	225.272	3.12[10]	2.37[-1]	1.06[0]	211.871	3.29[10]	2.21[-1]	9.26[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	224.346	4.93[09]	1.86[-2]	5.50[-2]	211.128	5.01[09]	1.68[-2]	4.66[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	224.165	3.30[10]	2.49[-1]	7.34[-1]	210.526	3.56[10]	2.37[-1]	6.57[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	223.732	4.19[09]	4.74[-2]	1.40[-1]	210.027	5.03[09]	5.01[-2]	1.38[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	219.954	3.13[10]	2.27[-1]	3.29[-1]	206.882	3.53[10]	2.27[-1]	3.09[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{5/2}$	212.610	2.91[09]	1.97[-2]	8.29[-2]	200.837	3.71[09]	2.26[-2]	8.96[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	212.589	1.06[10]	3.57[-2]	9.99[-2]	200.370	1.20[10]	3.61[-2]	9.51[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	212.096	4.20[10]	5.68[-1]	7.92[-1]	199.401	4.65[10]	5.55[-1]	7.29[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{3/2}$	211.836	5.16[09]	3.46[-2]	9.66[-2]	199.569	6.15[09]	3.67[-2]	9.65[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	211.238	1.33[10]	1.34[-1]	3.72[-1]	199.179	1.40[10]	1.25[-1]	3.26[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{5/2}$	210.481	2.69[09]	1.79[-2]	7.43[-2]	198.879	2.81[09]	1.67[-2]	6.57[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	210.306	2.78[10]	1.84[-1]	5.10[-1]	198.006	2.97[10]	1.75[-1]	4.55[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	209.938	6.00[10]	5.98[-1]	1.65[0]	197.787	6.44[10]	5.65[-1]	1.48[0]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	208.641	6.80[09]	4.45[-2]	6.10[-2]	196.542	6.62[09]	3.83[-2]	4.97[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	207.915	4.88[10]	6.33[-1]	8.66[-1]	195.772	5.10[10]	5.87[-1]	7.57[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	207.691	1.17[10]	7.58[-2]	1.04[-1]	194.558	1.06[10]	6.06[-2]	7.76[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	207.315	8.41[09]	5.44[-2]	1.49[-1]	195.607	9.37[09]	5.40[-2]	1.39[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	206.228	4.10[10]	3.92[-1]	1.06[0]	194.378	4.39[10]	3.73[-1]	9.54[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	205.529	2.61[10]	2.48[-1]	6.73[-1]	193.662	2.80[10]	2.36[-1]	6.02[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	204.769	1.69[10]	1.42[-1]	5.75[-1]	192.479	1.84[10]	1.36[-1]	5.19[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	204.411	6.27[09]	3.94[-2]	1.06[-1]	192.552	7.09[09]	3.95[-2]	1.00[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	203.757	4.12[10]	3.43[-1]	1.38[0]	191.717	4.38[10]	3.21[-1]	1.22[0]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	203.361	2.79[10]	1.73[-1]	6.96[-1]	191.307	3.00[10]	1.65[-1]	6.24[-1]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	203.250	1.24[10]	5.12[-2]	2.05[-1]	191.130	1.33[10]	4.87[-2]	1.83[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	200.472	2.91[10]	3.51[-1]	4.63[-1]	188.239	3.13[10]	3.32[-1]	4.11[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	199.831	4.17[10]	2.50[-1]	3.29[-1]	187.638	4.50[10]	2.38[-1]	2.94[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	198.755	2.93[10]	8.67[-2]	2.28[-1]	186.396	3.15[10]	8.24[-2]	2.02[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	198.734	1.03[10]	9.20[-2]	2.40[-1]	186.475	1.09[10]	8.58[-2]	2.11[-1]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
			Z=29				Z=30		
$p^2(^3P)s\ ^2P_{3/2}$	$p^2(^3P)p\ ^2P_{3/2}$	323.790	3.58[09]	5.63[-2]	2.40[-1]	302.819	3.92[09]	5.38[-2]	2.15[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	322.408	4.48[09]	6.98[-2]	1.48[-1]	303.652	4.91[09]	6.79[-2]	1.36[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$p^2(^3P)p\ ^2D_{5/2}$	294.795	3.61[09]	4.72[-2]	2.74[-1]	277.894	3.87[09]	4.49[-2]	2.47[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1D)s\ ^2D_{3/2}$	268.809	3.38[09]	7.33[-2]	1.30[-1]	251.129	3.93[09]	7.42[-2]	1.23[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	240.649	2.97[10]	3.43[-1]	1.63[0]	226.662	3.26[10]	3.34[-1]	1.50[0]
$p^2(^3P)s\ ^4P_{5/2}$	$p^2(^3P)p\ ^4S_{3/2}$	239.523	1.89[10]	1.09[-1]	5.14[-1]	226.121	1.97[10]	9.99[-2]	4.48[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$p^2(^3P)p\ ^2P_{1/2}$	239.318	1.65[10]	7.11[-2]	2.23[-1]	225.106	1.82[10]	6.92[-2]	2.06[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$p^2(^3P)p\ ^2P_{3/2}$	237.305	1.27[10]	7.14[-2]	3.34[-1]	222.828	1.38[10]	6.85[-2]	3.02[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	235.814	3.07[10]	3.86[-1]	1.20[0]	221.662	3.39[10]	3.76[-1]	1.10[0]
$p^2(^3P)s\ ^4P_{3/2}$	$p^2(^3P)p\ ^4S_{3/2}$	230.764	1.47[10]	1.18[-1]	3.58[-1]	217.116	1.58[10]	1.12[-1]	3.19[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	225.710	1.08[10]	5.51[-2]	2.46[-1]	212.589	1.19[10]	5.38[-2]	2.26[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	224.980	2.85[10]	2.16[-1]	3.21[-1]	211.685	3.30[10]	2.22[-1]	3.09[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	224.917	3.49[10]	1.33[-1]	3.92[-1]	211.763	3.75[10]	1.26[-1]	3.52[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	223.966	2.84[10]	1.07[-1]	3.15[-1]	211.116	3.12[10]	1.04[-1]	2.90[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{3/2}$	223.671	1.36[10]	1.01[-1]	3.00[-1]	210.366	1.45[10]	9.60[-2]	2.67[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{3/2}$	223.415	2.44[10]	1.21[-1]	5.37[-1]	210.277	2.64[10]	1.17[-1]	4.86[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	223.288	2.48[10]	1.86[-1]	8.19[-1]	210.304	2.73[10]	1.81[-1]	7.53[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	223.234	7.93[09]	1.19[-1]	1.74[-1]	209.022	8.48[09]	1.11[-1]	1.53[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	221.417	1.37[10]	1.01[-1]	2.94[-1]	208.102	1.56[10]	1.01[-1]	2.78[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{3/2}$	218.855	4.16[10]	2.99[-1]	8.61[-1]	206.324	4.51[10]	2.87[-1]	7.82[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{1/2}$	208.464	1.13[10]	7.42[-2]	1.02[-1]	194.889	1.05[10]	6.02[-2]	7.72[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	205.624	1.12[10]	7.09[-2]	1.92[-1]	195.608	1.14[10]	6.51[-2]	1.67[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	204.030	1.06[10]	1.32[-1]	1.77[-1]	190.798	1.19[10]	1.31[-1]	1.64[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	199.899	3.42[10]	2.05[-1]	8.10[-1]	189.159	3.51[10]	1.89[-1]	7.05[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	199.313	5.01[09]	1.50[-2]	3.92[-2]	188.677	4.90[09]	1.31[-2]	3.25[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	198.253	3.84[10]	2.26[-1]	5.90[-1]	187.127	4.11[10]	2.16[-1]	5.33[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	197.703	6.12[09]	5.36[-2]	1.40[-1]	186.560	7.56[09]	5.91[-2]	1.46[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	195.255	3.93[10]	2.25[-1]	2.89[-1]	184.840	4.31[10]	2.21[-1]	2.69[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{5/2}$	190.348	4.88[09]	2.65[-2]	9.98[-2]	180.928	6.57[09]	3.22[-2]	1.15[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	189.473	1.36[10]	3.68[-2]	9.17[-2]	179.683	1.56[10]	3.79[-2]	8.95[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{3/2}$	188.588	6.97[09]	3.72[-2]	9.24[-2]	178.676	7.56[09]	3.63[-2]	8.54[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{5/2}$	188.531	3.04[09]	1.62[-2]	6.03[-2]	179.228	3.33[09]	1.62[-2]	5.71[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	188.356	1.43[10]	1.14[-1]	2.84[-1]	178.549	1.45[10]	1.04[-1]	2.43[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	187.982	5.10[10]	5.43[-1]	6.72[-1]	177.639	5.59[10]	5.32[-1]	6.22[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	186.983	3.19[10]	1.67[-1]	4.12[-1]	177.040	3.43[10]	1.61[-1]	3.76[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	186.894	6.86[10]	5.41[-1]	1.33[0]	177.059	7.29[10]	5.13[-1]	1.20[0]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	185.802	6.53[09]	3.38[-2]	4.14[-2]	176.200	6.58[09]	3.07[-2]	3.56[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	185.153	1.05[10]	5.40[-2]	1.31[-1]	175.752	1.18[10]	5.46[-2]	1.26[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	184.951	5.30[10]	5.46[-1]	6.66[-1]	175.232	5.56[10]	5.12[-1]	5.91[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	183.779	4.69[10]	3.56[-1]	8.61[-1]	174.230	4.99[10]	3.40[-1]	7.81[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	183.062	2.98[10]	2.24[-1]	5.40[-1]	173.524	3.13[10]	2.12[-1]	4.86[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	182.693	9.66[09]	4.86[-2]	5.84[-2]	171.904	8.88[09]	3.94[-2]	4.46[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	181.952	7.86[09]	3.90[-2]	9.34[-2]	172.411	8.59[09]	3.83[-2]	8.68[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	181.484	2.00[10]	1.32[-1]	4.71[-1]	171.583	2.15[10]	1.27[-1]	4.29[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	180.884	4.63[10]	3.03[-1]	1.08[0]	171.058	4.88[10]	2.86[-1]	9.67[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	180.478	3.21[10]	1.58[-1]	5.62[-1]	170.674	3.44[10]	1.50[-1]	5.07[-1]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	180.241	1.43[10]	4.61[-2]	1.64[-1]	170.380	1.51[10]	4.39[-2]	1.48[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	177.238	3.35[10]	3.15[-1]	3.67[-1]	167.268	3.57[10]	2.99[-1]	3.29[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	176.676	4.84[10]	2.27[-1]	2.64[-1]	166.745	5.20[10]	2.17[-1]	2.38[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	175.460	1.18[10]	8.14[-2]	1.88[-1]	165.493	1.27[10]	7.86[-2]	1.71[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	175.295	3.39[10]	7.81[-2]	1.80[-1]	165.251	3.64[10]	7.47[-2]	1.62[-1]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
				Z=31				Z=32	
$p^2(^3P)s\ ^2P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	286.829	5.33[09]	6.58[-2]	1.24[-1]	271.656	5.73[09]	6.35[-2]	1.14[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$p^2(^3P)p\ ^2P_{3/2}$	283.712	4.24[09]	5.12[-2]	1.91[-1]	266.250	4.51[09]	4.79[-2]	1.68[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$p^2(^3P)p\ ^2D_{5/2}$	262.681	4.13[09]	4.29[-2]	2.22[-1]	248.942	4.35[09]	4.06[-2]	1.99[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1D)s\ ^2D_{3/2}$	235.057	4.54[09]	7.52[-2]	1.16[-1]	220.377	5.26[09]	7.63[-2]	1.11[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	213.926	3.56[10]	3.25[-1]	1.38[0]	202.261	3.90[10]	3.19[-1]	1.28[0]
$p^2(^3P)s\ ^4P_{5/2}$	$p^2(^3P)p\ ^4S_{3/2}$	213.835	2.02[10]	9.25[-2]	3.90[-1]	202.508	2.07[10]	8.51[-2]	3.40[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$p^2(^3P)p\ ^2P_{1/2}$	212.122	2.02[10]	6.77[-2]	1.90[-1]	200.196	2.22[10]	6.68[-2]	1.76[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$p^2(^3P)p\ ^2P_{3/2}$	209.631	1.51[10]	6.59[-2]	2.73[-1]	197.573	1.62[10]	6.33[-2]	2.47[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	208.793	3.74[10]	3.67[-1]	1.01[0]	197.030	4.10[10]	3.56[-1]	9.27[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$p^2(^3P)p\ ^4S_{3/2}$	204.638	1.68[10]	1.05[-1]	2.84[-1]	193.178	1.78[10]	1.00[-1]	2.53[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	200.579	1.34[10]	5.39[-2]	2.13[-1]	189.526	1.52[10]	5.46[-2]	2.05[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	199.769	4.01[10]	1.20[-1]	3.16[-1]	188.773	4.26[10]	1.14[-1]	2.83[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	199.592	3.75[10]	2.25[-1]	2.95[-1]	188.524	4.24[10]	2.26[-1]	2.80[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	199.323	3.40[10]	1.01[-1]	2.66[-1]	188.447	3.70[10]	9.87[-2]	2.45[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	198.427	3.00[10]	1.77[-1]	6.94[-1]	187.505	3.29[10]	1.73[-1]	6.42[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{3/2}$	198.274	2.84[10]	1.12[-1]	4.37[-1]	187.251	3.01[10]	1.06[-1]	3.91[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{3/2}$	198.182	1.52[10]	8.98[-2]	2.34[-1]	186.968	1.57[10]	8.21[-2]	2.03[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	195.967	9.03[09]	1.04[-1]	1.34[-1]	183.918	9.63[09]	9.74[-2]	1.18[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	195.932	1.81[10]	1.04[-1]	2.68[-1]	184.754	2.12[10]	1.08[-1]	2.63[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{3/2}$	194.886	4.87[10]	2.77[-1]	7.12[-1]	184.390	5.21[10]	2.67[-1]	6.48[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	186.613	1.15[10]	5.98[-2]	1.47[-1]	178.487	1.17[10]	5.59[-2]	1.31[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{1/2}$	182.409	9.75[09]	4.88[-2]	5.86[-2]	170.892	9.06[09]	3.97[-2]	4.47[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	179.504	3.52[10]	1.70[-1]	6.04[-1]	170.835	3.39[10]	1.49[-1]	5.03[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	179.043	4.68[09]	1.13[-2]	2.65[-2]	170.268	4.31[09]	9.38[-3]	2.10[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	178.686	1.36[10]	1.30[-1]	1.53[-1]	167.549	1.55[10]	1.30[-1]	1.44[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	176.978	4.41[10]	2.07[-1]	4.83[-1]	167.669	4.71[10]	1.99[-1]	4.38[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	176.446	9.55[09]	6.70[-2]	1.55[-1]	167.258	1.22[10]	7.73[-2]	1.70[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	175.455	4.66[10]	2.16[-1]	2.49[-1]	166.949	4.99[10]	2.09[-1]	2.29[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{5/2}$	172.394	9.08[09]	4.04[-2]	1.38[-1]	164.581	1.29[10]	5.26[-2]	1.70[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	170.827	1.80[10]	3.93[-2]	8.84[-2]	162.765	2.07[10]	4.12[-2]	8.84[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{3/2}$	169.665	7.91[09]	3.42[-2]	7.63[-2]	161.422	7.89[09]	3.09[-2]	6.56[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	169.572	1.41[10]	9.10[-2]	2.03[-1]	161.259	1.29[10]	7.60[-2]	1.61[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	168.212	6.13[10]	5.21[-1]	5.77[-1]	159.573	6.67[10]	5.10[-1]	5.35[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	168.122	7.69[10]	4.89[-1]	1.08[0]	159.953	8.12[10]	4.67[-1]	9.84[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	168.013	3.70[10]	1.57[-1]	3.47[-1]	159.769	3.99[10]	1.53[-1]	3.21[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	167.557	6.82[09]	2.87[-2]	3.17[-2]	159.730	7.30[09]	2.79[-2]	2.94[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	167.243	1.33[10]	5.56[-2]	1.22[-1]	159.497	1.50[10]	5.71[-2]	1.20[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	166.439	5.81[10]	4.82[-1]	5.29[-1]	158.436	6.06[10]	4.58[-1]	4.77[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	165.573	5.28[10]	3.27[-1]	7.12[-1]	157.681	5.61[10]	3.15[-1]	6.52[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	164.887	3.28[10]	2.01[-1]	4.38[-1]	157.022	3.44[10]	1.92[-1]	3.96[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	163.766	9.37[09]	3.76[-2]	8.11[-2]	155.880	1.03[10]	3.75[-2]	7.69[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	162.618	2.31[10]	1.22[-1]	3.92[-1]	154.462	2.47[10]	1.18[-1]	3.60[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	162.079	5.13[10]	2.70[-1]	8.65[-1]	153.819	5.39[10]	2.55[-1]	7.75[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	162.037	8.28[09]	3.26[-2]	3.48[-2]	152.972	7.90[09]	2.77[-2]	2.79[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	161.732	3.67[10]	1.44[-1]	4.60[-1]	153.524	3.90[10]	1.38[-1]	4.19[-1]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	161.385	1.60[10]	4.16[-2]	1.33[-1]	153.127	1.68[10]	3.94[-2]	1.19[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	158.165	3.78[10]	2.83[-1]	2.95[-1]	149.795	3.97[10]	2.68[-1]	2.64[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	157.689	5.58[10]	2.08[-1]	2.16[-1]	149.381	5.98[10]	2.01[-1]	1.97[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	156.415	1.39[10]	7.62[-2]	1.57[-1]	148.101	1.50[10]	7.43[-2]	1.45[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	156.105	3.90[10]	7.13[-2]	1.47[-1]	147.728	4.19[10]	6.84[-2]	1.33[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	156.091	2.73[10]	1.00[-1]	2.05[-1]	147.731	2.92[10]	9.55[-2]	1.86[-1]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
			Z=35				Z=36		
$p^2(^3P)s\ ^2P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	233.911	6.91[09]	5.68[-2]	8.74[-2]	223.614	7.27[09]	5.46[-2]	8.04[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$p^2(^3P)p\ ^2D_{3/2}$	189.404	8.72[09]	3.13[-2]	1.17[-1]	182.195	1.00[10]	3.34[-2]	1.20[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1D)s\ ^2D_{3/2}$	183.061	7.94[09]	7.97[-2]	9.61[-2]	172.577	9.05[09]	8.09[-2]	9.19[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$p^2(^3P)p\ ^4S_{3/2}$	173.146	2.20[10]	6.60[-2]	2.25[-1]	164.766	2.23[10]	6.04[-2]	1.97[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	172.338	5.09[10]	3.02[-1]	1.03[0]	163.833	5.54[10]	2.98[-1]	9.64[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$p^2(^3P)p\ ^2P_{1/2}$	169.487	2.96[10]	6.35[-2]	1.42[-1]	160.739	3.23[10]	6.25[-2]	1.33[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$p^2(^3P)p\ ^2P_{3/2}$	168.441	7.98[09]	2.27[-2]	7.54[-2]	162.350	2.57[09]	6.74[-3]	2.17[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	167.084	5.17[10]	3.25[-1]	7.15[-1]	158.673	5.48[10]	3.11[-1]	6.49[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^4P_{3/2}$	165.146	1.33[10]	3.62[-2]	1.18[-1]	157.222	2.04[10]	5.03[-2]	1.56[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$p^2(^3P)p\ ^4S_{3/2}$	163.776	2.08[10]	8.37[-2]	1.80[-1]	155.478	2.14[10]	7.73[-2]	1.59[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	160.974	2.48[10]	6.43[-2]	2.05[-1]	152.825	2.99[10]	6.98[-2]	2.10[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	160.558	4.72[10]	9.14[-2]	1.93[-1]	152.557	4.69[10]	8.17[-2]	1.65[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	160.257	4.66[10]	9.01[-2]	1.90[-1]	152.184	5.02[10]	8.72[-2]	1.75[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	160.155	5.81[10]	2.23[-1]	2.36[-1]	152.096	6.38[10]	2.21[-1]	2.22[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	159.340	4.29[10]	1.64[-1]	5.14[-1]	151.313	4.67[10]	1.60[-1]	4.78[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{3/2}$	158.833	3.29[10]	8.30[-2]	2.60[-1]	150.715	3.25[10]	7.40[-2]	2.20[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	158.123	1.32[10]	4.91[-2]	1.02[-1]	152.376	1.41[10]	4.91[-2]	9.88[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{3/2}$	158.062	1.49[10]	5.58[-2]	1.16[-1]	149.847	1.36[10]	4.55[-2]	8.97[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{3/2}$	157.462	6.28[10]	2.33[-1]	4.83[-1]	149.846	6.52[10]	2.20[-1]	4.33[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	155.997	3.70[10]	1.35[-1]	2.77[-1]	147.819	4.54[10]	1.49[-1]	2.90[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	152.725	1.17[10]	8.20[-2]	8.25[-2]	143.809	1.26[10]	7.82[-2]	7.40[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	150.034	1.99[10]	6.70[-2]	1.99[-1]	144.541	1.41[10]	4.42[-2]	1.26[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	147.369	8.53[09]	4.16[-2]	8.08[-2]	141.269	1.17[10]	5.24[-2]	9.77[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	145.624	5.74[10]	1.83[-1]	1.75[-1]	139.653	5.88[10]	1.72[-1]	1.58[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	144.478	2.47[10]	1.16[-1]	2.21[-1]	138.168	2.80[10]	1.20[-1]	2.19[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{5/2}$	144.149	3.55[10]	1.11[-1]	3.15[-1]	138.111	4.42[10]	1.27[-1]	3.46[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	143.775	5.67[10]	1.76[-1]	3.33[-1]	136.939	6.01[10]	1.69[-1]	3.04[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{5/2}$	143.578	6.43[09]	1.99[-2]	5.64[-2]	137.977	7.39[09]	2.12[-2]	5.76[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	142.268	3.32[10]	5.04[-2]	9.45[-2]	136.400	3.94[10]	5.48[-2]	9.87[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{1/2}$	141.089	7.34[09]	2.19[-2]	2.04[-2]	132.559	6.90[09]	1.82[-2]	1.59[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	140.061	1.08[10]	3.19[-2]	2.94[-2]	134.519	1.30[10]	3.53[-2]	3.13[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	139.832	2.36[10]	6.95[-2]	1.28[-1]	134.229	2.84[10]	7.69[-2]	1.36[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	139.062	9.25[10]	4.03[-1]	7.38[-1]	133.063	9.55[10]	3.81[-1]	6.68[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	138.918	2.44[10]	1.41[-1]	1.29[-1]	130.782	2.92[10]	1.49[-1]	1.29[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	138.676	4.92[10]	1.41[-1]	2.58[-1]	132.600	5.12[10]	1.36[-1]	2.37[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	138.158	6.99[10]	4.00[-1]	3.65[-1]	132.408	7.29[10]	3.84[-1]	3.34[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	137.629	6.66[10]	2.83[-1]	5.14[-1]	131.927	7.05[10]	2.76[-1]	4.79[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	137.387	8.39[10]	4.74[-1]	4.29[-1]	130.989	8.94[10]	4.61[-1]	3.98[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	137.076	3.91[10]	1.65[-1]	2.98[-1]	131.404	4.04[10]	1.58[-1]	2.72[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	134.917	1.49[10]	4.07[-2]	7.23[-2]	127.662	1.36[10]	3.33[-2]	5.59[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	133.884	3.00[10]	1.07[-1]	2.83[-1]	128.089	3.16[10]	1.04[-1]	2.63[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	132.402	6.14[10]	2.15[-1]	5.62[-1]	126.154	6.39[10]	2.04[-1]	5.06[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	132.372	4.63[10]	1.22[-1]	3.19[-1]	126.298	4.82[10]	1.15[-1]	2.88[-1]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	131.789	1.92[10]	3.33[-2]	8.67[-2]	125.584	1.99[10]	3.13[-2]	7.78[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	129.689	8.54[09]	2.16[-2]	1.84[-2]	123.007	9.51[09]	2.16[-2]	1.75[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{3/2}$	129.277	3.74[10]	1.87[-1]	1.59[-1]	122.637	5.24[10]	2.37[-1]	1.91[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	128.006	7.38[10]	1.81[-1]	1.53[-1]	121.830	7.90[10]	1.76[-1]	1.41[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	127.327	1.43[10]	6.93[-2]	5.81[-2]	119.688	3.15[09]	1.35[-2]	1.07[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	126.825	1.94[10]	7.05[-2]	1.17[-1]	120.768	2.07[10]	6.80[-2]	1.08[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	126.289	3.55[10]	8.48[-2]	1.41[-1]	120.115	3.75[10]	8.09[-2]	1.28[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	126.258	5.16[10]	6.17[-2]	1.03[-1]	120.084	5.54[10]	5.97[-2]	9.47[-2]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
		Z=39				Z=40			
$p^2(^3P)s\ ^4P_{5/2}$	$p^2(^3P)p\ ^2D_{3/2}$	163.081	1.39[10]	3.70[-2]	1.19[-1]	157.512	1.52[10]	3.76[-2]	1.17[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1D)s\ ^2D_{3/2}$	144.980	1.34[10]	8.46[-2]	8.08[-2]	136.980	1.53[10]	8.58[-2]	7.74[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$p^2(^3P)p\ ^4S_{3/2}$	143.170	1.62[10]	3.33[-2]	9.40[-2]	137.730	1.09[10]	2.08[-2]	5.66[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	141.009	7.26[10]	2.90[-1]	8.05[-1]	134.252	7.96[10]	2.88[-1]	7.62[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$p^2(^3P)p\ ^2P_{1/2}$	137.444	2.08[10]	2.94[-2]	5.33[-2]	131.808	2.42[09]	3.15[-3]	5.47[-3]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	136.771	2.06[10]	5.76[-2]	1.04[-1]	131.832	2.45[10]	6.36[-2]	1.11[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	136.723	5.87[10]	2.46[-1]	4.44[-1]	130.533	5.57[10]	2.13[-1]	3.67[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	136.523	1.61[10]	2.25[-2]	4.04[-2]	130.165	1.94[10]	2.46[-2]	4.22[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	136.205	2.28[10]	3.18[-2]	5.70[-2]	130.072	4.53[10]	5.72[-2]	9.84[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^4P_{3/2}$	135.228	2.57[10]	4.71[-2]	1.25[-1]	129.068	2.44[10]	4.05[-2]	1.03[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$p^2(^3P)p\ ^4S_{3/2}$	134.339	1.13[10]	3.04[-2]	5.37[-2]	129.006	5.01[09]	1.25[-2]	2.13[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	131.383	3.51[10]	4.54[-2]	7.85[-2]	125.310	2.67[10]	3.14[-2]	5.19[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	131.014	5.13[10]	8.85[-2]	2.29[-1]	124.596	6.04[10]	9.39[-2]	2.31[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2D_{3/2}$	130.846	1.16[10]	5.92[-2]	5.10[-2]	124.339	1.44[10]	6.67[-2]	5.46[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4F_{3/2}$	130.730	1.97[10]	5.08[-2]	8.71[-2]	124.967	2.85[10]	6.66[-2]	1.10[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	130.458	8.36[10]	2.14[-1]	1.83[-1]	124.052	9.12[10]	2.11[-1]	1.72[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	130.438	6.29[10]	8.05[-2]	1.38[-1]	123.991	6.80[10]	7.86[-2]	1.28[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	129.792	6.02[10]	1.52[-1]	3.90[-1]	123.445	6.53[10]	1.50[-1]	3.65[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{3/2}$	129.780	6.47[10]	1.64[-1]	2.79[-1]	124.073	5.91[10]	1.37[-1]	2.23[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{3/2}$	128.769	2.74[10]	4.54[-2]	1.15[-1]	122.216	2.49[10]	3.73[-2]	8.97[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	127.097	1.51[10]	5.51[-2]	9.21[-2]	121.031	2.43[10]	8.02[-2]	1.28[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	126.115	8.84[10]	2.11[-1]	3.50[-1]	119.849	1.10[11]	2.36[-1]	3.72[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	125.049	3.12[10]	1.10[-1]	1.81[-1]	120.112	4.36[10]	1.40[-1]	2.23[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	124.279	5.84[10]	1.36[-1]	1.11[-1]	119.877	5.65[10]	1.22[-1]	9.62[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{5/2}$	123.096	1.13[10]	2.57[-2]	6.24[-2]	118.658	1.30[10]	2.75[-2]	6.44[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	122.909	3.66[10]	1.25[-1]	2.02[-1]	118.167	4.58[10]	1.44[-1]	2.24[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{5/2}$	121.937	6.34[10]	1.41[-1]	3.41[-1]	117.163	6.83[10]	1.40[-1]	3.25[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	120.785	1.22[10]	5.31[-2]	4.22[-2]	114.677	9.37[09]	3.69[-2]	2.79[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	120.567	6.70[10]	7.31[-2]	1.16[-1]	115.676	7.92[10]	7.96[-2]	1.21[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	120.005	2.44[10]	5.28[-2]	4.17[-2]	115.747	3.02[10]	6.07[-2]	4.62[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	119.216	5.52[10]	1.17[-1]	1.84[-1]	114.621	7.09[10]	1.39[-1]	2.10[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	118.900	6.93[10]	1.47[-1]	2.30[-1]	113.594	7.23[10]	1.40[-1]	2.10[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	117.402	7.84[10]	3.25[-1]	2.51[-1]	113.035	7.90[10]	3.02[-1]	2.25[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	116.949	9.69[10]	2.99[-1]	4.61[-1]	112.020	9.30[10]	2.63[-1]	3.88[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	116.939	8.28[10]	2.55[-1]	3.93[-1]	112.537	8.77[10]	2.50[-1]	3.70[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	116.510	4.51[10]	1.38[-1]	2.11[-1]	112.126	4.64[10]	1.31[-1]	1.94[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	116.117	4.73[10]	9.57[-2]	1.46[-1]	111.007	4.00[10]	7.41[-2]	1.08[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	113.856	1.07[11]	4.16[-1]	3.12[-1]	108.695	1.13[11]	3.98[-1]	2.85[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	113.057	3.79[10]	9.73[-2]	2.17[-1]	108.704	4.06[10]	9.56[-2]	2.06[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	111.213	1.79[10]	3.31[-2]	7.29[-2]	107.055	6.99[09]	1.20[-2]	2.54[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	109.447	5.59[10]	2.01[-1]	1.45[-1]	103.351	7.13[10]	2.29[-1]	1.56[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	109.408	7.21[10]	1.72[-1]	3.73[-1]	104.393	7.54[10]	1.64[-1]	3.39[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	109.213	4.34[10]	7.81[-2]	1.68[-1]	104.344	5.94[10]	9.70[-2]	2.00[-1]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	108.902	2.12[10]	2.51[-2]	5.40[-2]	103.820	2.08[10]	2.24[-2]	4.59[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	107.644	2.40[10]	4.17[-2]	5.92[-2]	101.911	3.36[10]	5.23[-2]	7.01[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	106.092	4.38[10]	7.39[-2]	5.17[-2]	100.759	9.58[10]	1.46[-1]	9.68[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{3/2}$	105.937	6.97[10]	2.34[-1]	1.63[-1]	101.026	7.56[10]	2.32[-1]	1.54[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	105.496	1.62[10]	2.71[-2]	1.88[-2]	100.384	2.02[10]	3.06[-2]	2.02[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	105.352	5.33[10]	8.88[-2]	6.16[-2]	99.741	9.06[09]	1.35[-2]	8.88[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	104.198	3.00[10]	6.51[-2]	1.34[-1]	100.453	2.88[10]	5.83[-2]	1.15[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	103.998	1.90[10]	4.62[-2]	6.33[-2]	99.259	2.68[10]	5.93[-2]	7.76[-2]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
		Z=41				Z=42			
$p^2(^3P)s\ ^4P_{5/2}$	$p^2(^3P)p\ ^2D_{3/2}$	152.276	1.65[10]	3.80[-2]	1.15[-1]	147.340	1.77[10]	3.83[-2]	1.12[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1D)s\ ^2D_{3/2}$	129.491	1.73[10]	8.71[-2]	7.42[-2]	122.471	1.97[10]	8.83[-2]	7.12[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	127.857	8.77[10]	2.86[-1]	7.23[-1]	121.795	9.61[10]	2.85[-1]	6.87[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4F_{3/2}$	127.091	1.81[10]	2.91[-2]	7.30[-2]	121.181	2.05[10]	3.00[-2]	7.18[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	126.862	2.93[10]	7.05[-2]	1.18[-1]	121.790	3.49[10]	7.75[-2]	1.25[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	124.901	4.97[10]	1.74[-1]	2.87[-1]	119.824	4.16[10]	1.35[-1]	2.12[-1]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	124.400	2.14[10]	2.49[-2]	4.08[-2]	119.216	2.15[10]	2.29[-2]	3.59[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^4P_{3/2}$	123.629	2.04[10]	3.11[-2]	7.60[-2]	118.996	1.50[10]	2.13[-2]	5.01[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	123.607	5.16[10]	5.92[-2]	9.63[-2]	117.424	5.73[10]	5.92[-2]	9.17[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2D_{3/2}$	121.834	1.03[10]	4.57[-2]	3.67[-2]	115.919	1.17[10]	4.72[-2]	3.60[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	119.729	1.73[10]	1.87[-2]	2.94[-2]	114.638	8.89[09]	8.77[-3]	1.32[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	119.389	2.24[10]	3.18[-2]	7.50[-2]	115.476	1.06[10]	1.41[-2]	3.22[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4F_{3/2}$	119.178	3.43[10]	7.30[-2]	1.15[-1]	113.565	3.86[10]	7.45[-2]	1.12[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{3/2}$	118.859	5.07[10]	1.08[-1]	1.68[-1]	114.137	4.02[10]	7.86[-2]	1.18[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	118.547	6.95[10]	9.79[-2]	2.29[-1]	112.838	7.86[10]	1.00[-1]	2.24[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2D_{3/2}$	118.065	1.58[10]	6.58[-2]	5.12[-2]	111.385	4.51[09]	1.68[-2]	1.23[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	117.989	9.96[10]	2.08[-1]	1.62[-1]	112.241	1.08[11]	2.05[-1]	1.52[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	117.891	7.34[10]	7.67[-2]	1.19[-1]	112.112	7.95[10]	7.47[-2]	1.11[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	117.456	7.12[10]	1.47[-1]	3.42[-1]	111.798	7.76[10]	1.46[-1]	3.21[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{3/2}$	115.985	2.27[10]	3.05[-2]	6.98[-2]	110.049	2.08[10]	2.52[-2]	5.48[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	115.780	5.36[10]	1.08[-1]	8.22[-2]	111.959	4.99[10]	9.40[-2]	6.93[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	115.477	3.70[10]	1.11[-1]	1.69[-1]	110.426	5.29[10]	1.45[-1]	2.11[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	115.289	5.95[10]	1.78[-1]	2.71[-1]	110.527	7.91[10]	2.17[-1]	3.16[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{5/2}$	114.428	1.50[10]	2.94[-2]	6.66[-2]	110.379	1.74[10]	3.17[-2]	6.92[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	114.054	1.33[11]	2.61[-1]	3.91[-1]	108.719	1.58[11]	2.80[-1]	4.01[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	113.721	5.06[10]	1.47[-1]	2.21[-1]	109.510	5.47[10]	1.48[-1]	2.13[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{5/2}$	112.660	7.29[10]	1.38[-1]	3.08[-1]	108.406	7.71[10]	1.36[-1]	2.91[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	111.724	3.70[10]	6.92[-2]	5.09[-2]	107.912	4.46[10]	7.79[-2]	5.53[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	110.868	9.10[10]	8.41[-2]	1.23[-1]	106.100	1.01[11]	8.51[-2]	1.19[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	110.122	9.03[10]	1.65[-1]	2.39[-1]	105.671	1.14[11]	1.90[-1]	2.64[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	108.934	7.91[10]	2.81[-1]	2.02[-1]	105.074	7.88[10]	2.61[-1]	1.81[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	108.667	2.38[10]	4.21[-2]	6.02[-2]	103.797	3.06[10]	4.95[-2]	6.76[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	108.427	7.55[10]	1.34[-1]	1.90[-1]	102.859	3.81[10]	6.05[-2]	8.20[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	108.381	9.26[10]	2.45[-1]	3.49[-1]	104.444	9.82[10]	2.40[-1]	3.31[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	107.974	4.78[10]	1.25[-1]	1.78[-1]	104.024	4.88[10]	1.18[-1]	1.62[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	107.213	8.54[10]	2.21[-1]	3.12[-1]	102.482	7.47[10]	1.76[-1]	2.38[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2D_{3/2}$	106.767	1.50[10]	5.13[-2]	3.60[-2]	102.651	2.04[10]	6.45[-2]	4.36[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	105.985	3.01[10]	5.06[-2]	7.07[-2]	101.010	1.95[10]	2.99[-2]	3.97[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	104.623	4.32[10]	9.47[-2]	1.96[-1]	100.785	4.64[10]	9.41[-2]	1.88[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	103.749	1.17[11]	3.79[-1]	2.59[-1]	98.991	1.21[11]	3.58[-1]	2.33[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	99.679	6.80[10]	1.01[-1]	2.00[-1]	95.223	7.50[10]	1.02[-1]	1.92[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	99.622	7.89[10]	1.57[-1]	3.09[-1]	95.079	8.30[10]	1.50[-1]	2.82[-1]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	98.969	1.99[10]	1.95[-2]	3.82[-2]	94.697	1.29[10]	1.16[-2]	2.16[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	97.738	9.07[10]	2.60[-1]	1.67[-1]	92.589	1.13[11]	2.90[-1]	1.77[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	96.926	2.73[10]	5.15[-2]	9.85[-2]	93.593	2.55[10]	4.47[-2]	8.28[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	96.718	4.63[10]	6.52[-2]	8.28[-2]	92.104	5.77[10]	7.31[-2]	8.88[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{3/2}$	96.376	8.20[10]	2.29[-1]	1.45[-1]	91.965	8.94[10]	2.27[-1]	1.38[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	96.233	1.60[10]	2.23[-2]	2.82[-2]	92.199	2.25[10]	2.86[-2]	3.47[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	96.111	1.09[11]	1.50[-1]	9.52[-2]	91.740	1.18[11]	1.50[-1]	9.04[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	95.582	2.54[10]	3.48[-2]	2.19[-2]	91.065	3.18[10]	3.95[-2]	2.37[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	94.746	3.12[10]	6.28[-2]	7.85[-2]	90.456	3.46[10]	6.38[-2]	7.61[-2]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
				Z=47				Z=48	
$p^2(^3P)s\ ^4P_{5/2}$	$p^2(^3P)p\ ^2D_{3/2}$	126.330	2.34[10]	3.73[-2]	9.31[-2]	122.735	2.44[10]	3.66[-2]	8.93[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	96.141	2.95[10]	4.09[-2]	2.59[-2]	93.496	2.61[10]	3.43[-2]	2.11[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	95.784	1.58[11]	2.89[-1]	5.47[-1]	91.358	1.73[11]	2.90[-1]	5.23[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4F_{3/2}$	95.554	2.80[10]	2.55[-2]	4.82[-2]	91.890	1.88[09]	1.58[-3]	2.88[-3]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	95.440	6.56[10]	8.96[-2]	1.13[-1]	90.339	7.15[10]	8.72[-2]	1.04[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$p^2(^3P)p\ ^2P_{3/2}$	94.627	7.40[07]	6.62[-5]	1.24[-4]	91.264	2.73[10]	2.28[-2]	4.10[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4F_{7/2}$	94.330	1.95[10]	3.47[-2]	6.48[-2]	91.070	2.18[10]	3.60[-2]	6.50[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1D)s\ ^2D_{3/2}$	93.201	3.60[10]	9.39[-2]	5.76[-2]	88.323	4.06[10]	9.50[-2]	5.52[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{3/2}$	92.324	5.51[10]	4.68[-2]	8.56[-2]	88.664	5.66[10]	4.45[-2]	7.79[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{5/2}$	91.958	3.50[10]	4.43[-2]	8.04[-2]	88.553	3.82[10]	4.49[-2]	7.86[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4F_{5/2}$	91.833	2.79[10]	5.30[-2]	6.41[-2]	88.433	3.53[10]	6.24[-2]	7.28[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	91.807	8.09[10]	2.04[-1]	1.24[-1]	87.981	9.58[10]	2.23[-1]	1.29[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	91.435	8.67[10]	1.09[-1]	6.55[-2]	88.569	9.49[10]	1.12[-1]	6.51[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	91.069	1.27[11]	2.37[-1]	2.85[-1]	87.987	1.38[11]	2.40[-1]	2.78[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	90.875	9.46[10]	5.88[-2]	7.02[-2]	86.335	1.05[11]	5.88[-2]	6.66[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	90.702	8.10[10]	1.50[-1]	1.80[-1]	87.187	8.76[10]	1.50[-1]	1.72[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2D_{3/2}$	90.392	2.18[10]	5.33[-2]	3.17[-2]	85.987	2.45[10]	5.42[-2]	3.07[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{5/2}$	90.054	1.01[11]	1.24[-1]	2.19[-1]	86.816	1.07[11]	1.21[-1]	2.08[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4F_{3/2}$	89.549	5.99[10]	7.21[-2]	8.51[-2]	86.110	1.51[10]	1.68[-2]	1.90[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$p^2(^3P)p\ ^2P_{3/2}$	88.734	5.10[09]	6.02[-3]	7.04[-3]	85.561	5.31[10]	5.83[-2]	6.58[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	88.653	8.13[10]	1.92[-1]	1.12[-1]	85.832	8.28[10]	1.83[-1]	1.04[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	88.643	1.26[11]	9.95[-2]	1.74[-1]	84.573	1.35[11]	9.66[-2]	1.61[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	87.800	1.17[11]	1.35[-1]	2.34[-1]	83.766	1.26[11]	1.32[-1]	2.18[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	87.774	1.88[11]	3.27[-1]	3.77[-1]	83.620	2.11[11]	3.34[-1]	3.67[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	87.501	1.68[11]	1.93[-1]	1.11[-1]	83.244	1.84[11]	1.91[-1]	1.05[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	87.306	1.31[11]	2.26[-1]	2.60[-1]	84.252	1.40[11]	2.24[-1]	2.48[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	87.296	1.21[11]	6.90[-2]	7.93[-2]	83.040	1.31[11]	6.80[-2]	7.45[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	87.146	2.64[11]	3.00[-1]	3.44[-1]	83.454	2.85[11]	2.98[-1]	3.28[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	87.106	1.14[11]	6.51[-2]	7.46[-2]	82.955	1.38[11]	7.10[-2]	7.77[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	86.383	4.06[10]	6.82[-2]	7.76[-2]	83.174	3.58[10]	5.59[-2]	6.11[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	86.271	7.23[10]	8.08[-2]	9.17[-2]	82.940	7.60[10]	7.83[-2]	8.57[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	84.362	6.78[10]	9.65[-2]	1.61[-1]	81.478	7.31[10]	9.72[-2]	1.56[-1]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	84.297	2.32[11]	2.47[-1]	2.74[-1]	80.374	2.57[11]	2.48[-1]	2.63[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2D_{3/2}$	84.156	5.20[10]	1.11[-1]	6.14[-2]	80.762	5.92[10]	1.16[-1]	6.18[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{3/2}$	84.147	1.96[10]	1.39[-2]	2.31[-2]	79.647	2.12[10]	1.35[-2]	2.12[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	83.225	1.00[11]	5.23[-2]	5.71[-2]	79.054	9.64[10]	4.53[-2]	4.71[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	80.211	2.99[10]	4.33[-2]	4.57[-2]	76.198	2.58[10]	3.37[-2]	3.38[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	77.544	1.37[11]	2.48[-1]	1.27[-1]	73.686	1.40[11]	2.28[-1]	1.10[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	75.744	1.14[11]	9.83[-2]	1.47[-1]	72.346	1.25[11]	9.77[-2]	1.40[-1]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	75.662	2.70[10]	1.55[-2]	2.31[-2]	72.294	2.96[10]	1.55[-2]	2.21[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	75.326	1.13[11]	1.28[-1]	1.91[-1]	71.898	1.22[11]	1.26[-1]	1.79[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	74.920	4.08[10]	3.44[-2]	3.39[-2]	72.106	4.11[10]	3.20[-2]	3.04[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	74.153	2.31[10]	1.26[-2]	1.86[-2]	71.673	2.97[10]	1.53[-2]	2.16[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	73.558	8.03[10]	6.53[-2]	6.31[-2]	70.117	9.40[10]	6.98[-2]	6.42[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4F_{3/2}$	73.462	2.16[10]	3.50[-2]	1.69[-2]	69.615	1.35[11]	1.97[-1]	9.00[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	72.930	1.77[11]	1.41[-1]	6.77[-2]	69.679	1.92[11]	1.40[-1]	6.40[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{3/2}$	72.913	1.53[11]	2.43[-1]	1.17[-1]	69.256	5.94[10]	8.55[-2]	3.90[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{3/2}$	72.913	1.53[11]	2.43[-1]	1.17[-1]	69.256	5.94[10]	8.55[-2]	3.90[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	72.221	2.26[11]	3.52[-1]	1.68[-1]	68.896	2.49[11]	3.54[-1]	1.61[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	71.951	8.15[10]	6.34[-2]	3.00[-2]	68.698	9.51[10]	6.73[-2]	3.04[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	71.920	5.36[10]	6.25[-2]	5.92[-2]	68.715	5.86[10]	6.20[-2]	5.62[-2]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
				Z=53				Z=54	
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4F_{7/2}$	76.904	3.57[10]	4.20[-2]	6.40[-2]	74.434	3.89[10]	4.30[-2]	6.35[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	75.900	1.33[11]	1.16[-1]	5.76[-2]	73.649	1.41[11]	1.15[-1]	5.56[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	74.811	1.86[11]	2.33[-1]	2.30[-1]	72.523	1.95[11]	2.31[-1]	2.20[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4F_{5/2}$	74.593	7.15[10]	8.92[-2]	8.79[-2]	72.263	7.77[10]	9.12[-2]	8.69[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{5/2}$	73.810	4.21[10]	3.44[-2]	5.02[-2]	71.357	4.15[10]	3.18[-2]	4.49[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$p^2(^3P)p\ ^2P_{3/2}$	73.787	3.12[10]	1.70[-2]	2.48[-2]	71.026	3.07[10]	1.55[-2]	2.18[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	73.425	9.53[10]	1.54[-1]	7.45[-2]	71.230	9.93[10]	1.50[-1]	7.04[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{3/2}$	73.011	4.61[10]	2.45[-2]	3.54[-2]	70.117	4.24[10]	2.09[-2]	2.89[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	72.977	2.55[11]	2.71[-1]	3.90[-1]	70.071	2.61[11]	2.56[-1]	3.55[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	71.865	3.77[10]	2.92[-2]	2.77[-2]	67.900	5.09[10]	3.51[-2]	3.13[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{5/2}$	71.568	1.34[11]	1.03[-1]	1.45[-1]	68.564	1.37[11]	9.63[-2]	1.31[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	70.700	1.72[11]	2.57[-1]	1.20[-1]	67.477	1.87[11]	2.55[-1]	1.13[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	69.997	1.19[11]	1.32[-1]	1.21[-1]	66.705	1.26[11]	1.27[-1]	1.11[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	69.872	2.55[10]	1.87[-2]	8.59[-3]	66.203	2.91[10]	1.92[-2]	8.36[-3]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	69.766	1.85[11]	2.02[-1]	1.86[-1]	66.893	1.92[11]	1.94[-1]	1.70[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$p^2(^3P)p\ ^2P_{3/2}$	69.335	6.52[10]	4.70[-2]	4.29[-2]	66.769	6.37[10]	4.25[-2]	3.74[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2P_{3/2}$	68.694	3.33[10]	1.58[-2]	2.13[-2]	65.789	3.81[10]	1.65[-2]	2.14[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	67.869	9.61[10]	8.85[-2]	1.19[-1]	65.168	9.72[10]	8.22[-2]	1.06[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	67.769	1.47[11]	6.74[-2]	9.03[-2]	65.117	1.38[11]	5.83[-2]	7.51[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1D)s\ ^2D_{3/2}$	67.703	7.21[10]	9.91[-2]	4.43[-2]	64.228	8.08[10]	1.00[-1]	4.24[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	67.678	8.61[10]	5.91[-2]	5.27[-2]	63.833	8.72[10]	5.31[-2]	4.48[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	67.544	8.53[10]	5.87[-2]	5.21[-2]	64.610	8.69[10]	5.47[-2]	4.64[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	67.127	1.48[11]	9.97[-2]	1.33[-1]	64.505	1.42[11]	8.92[-2]	1.14[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2D_{3/2}$	66.865	4.26[10]	5.72[-2]	2.52[-2]	63.566	4.74[10]	5.74[-2]	2.40[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	66.788	1.76[11]	5.88[-2]	5.18[-2]	63.441	1.95[11]	5.93[-2]	4.94[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	66.638	4.34[11]	2.89[-1]	2.54[-1]	63.572	4.74[11]	2.87[-1]	2.40[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	65.334	3.68[11]	3.53[-1]	3.04[-1]	62.156	4.11[11]	3.56[-1]	2.92[-1]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2D_{3/2}$	64.936	1.04[11]	1.30[-1]	5.59[-2]	62.011	1.14[11]	1.32[-1]	5.39[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	64.804	2.93[11]	1.85[-1]	7.88[-2]	61.626	3.23[11]	1.84[-1]	7.47[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	64.742	2.83[11]	8.94[-2]	7.60[-2]	61.583	3.21[11]	9.14[-2]	7.41[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	64.640	2.10[11]	6.57[-2]	5.59[-2]	61.474	2.31[11]	6.57[-2]	5.30[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	64.504	2.83[10]	1.77[-2]	2.26[-2]	61.595	3.52[10]	2.00[-2]	2.43[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	63.037	4.18[11]	2.49[-1]	2.07[-1]	60.013	4.63[11]	2.50[-1]	1.97[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	60.815	8.40[10]	2.34[-2]	1.87[-2]	57.674	8.29[10]	2.07[-2]	1.57[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{3/2}$	60.472	4.63[10]	1.69[-2]	2.02[-2]	57.326	5.62[10]	1.86[-2]	2.10[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	59.993	1.22[11]	4.39[-2]	5.19[-2]	57.690	1.59[11]	5.28[-2]	6.02[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2D_{3/2}$	59.585	5.75[10]	6.14[-2]	2.41[-2]	56.622	7.29[10]	7.01[-2]	2.61[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	59.489	7.27[10]	3.86[-2]	4.54[-2]	57.208	1.02[11]	4.98[-2]	5.63[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	59.200	8.20[10]	4.33[-2]	3.37[-2]	56.758	9.83[10]	4.76[-2]	3.55[-2]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	57.505	4.24[10]	1.40[-2]	1.59[-2]	54.919	4.55[10]	1.37[-2]	1.49[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	57.446	1.99[11]	9.82[-2]	1.12[-1]	54.843	2.20[11]	9.88[-2]	1.07[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	57.327	5.28[10]	2.60[-2]	1.96[-2]	54.590	7.50[10]	3.35[-2]	2.40[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	56.943	1.86[11]	1.20[-1]	1.36[-1]	54.345	2.04[11]	1.20[-1]	1.30[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	56.678	1.38[11]	1.33[-1]	4.93[-2]	53.766	1.37[11]	1.18[-1]	4.18[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	55.477	2.92[11]	1.35[-1]	4.94[-2]	53.001	3.20[11]	1.35[-1]	4.70[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4F_{3/2}$	55.243	2.69[11]	2.47[-1]	8.97[-2]	52.744	3.03[11]	2.53[-1]	8.77[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	54.765	1.91[11]	8.65[-2]	6.22[-2]	52.338	2.13[11]	8.75[-2]	6.03[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	54.711	8.98[10]	6.06[-2]	4.36[-2]	52.269	9.80[10]	6.06[-2]	4.16[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	54.648	4.01[11]	3.59[-1]	1.29[-1]	52.192	4.42[11]	3.61[-1]	1.24[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	54.631	1.35[11]	6.01[-2]	4.33[-2]	51.930	1.37[11]	5.51[-2]	3.78[-2]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
				Z=55				Z=56	
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4F_{7/2}$	72.066	4.26[10]	4.44[-2]	6.29[-2]	69.795	4.63[10]	4.50[-2]	6.23[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	71.480	1.48[11]	1.14[-1]	5.36[-2]	69.387	1.56[11]	1.13[-1]	5.16[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	70.327	2.04[11]	2.29[-1]	2.11[-1]	68.218	2.15[11]	2.26[-1]	2.02[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4F_{5/2}$	70.038	8.39[10]	9.27[-2]	8.53[-2]	67.905	8.98[10]	9.32[-2]	8.35[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	69.115	1.02[11]	1.46[-1]	6.67[-2]	67.076	1.06[11]	1.43[-1]	6.33[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	67.408	2.61[11]	2.38[-1]	3.18[-1]	64.967	2.60[11]	2.19[-1]	2.81[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2D_{3/2}$	67.238	3.89[10]	1.76[-2]	2.33[-2]	64.379	3.55[10]	1.47[-2]	1.87[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{5/2}$	65.557	1.39[11]	8.94[-2]	1.16[-1]	62.566	1.39[11]	8.19[-2]	1.01[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$p^2(^3P)p\ ^2P_{3/2}$	64.391	6.13[10]	3.82[-2]	3.24[-2]	62.180	5.89[10]	3.42[-2]	2.80[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	64.325	2.01[11]	2.51[-1]	1.06[-1]	61.255	2.17[11]	2.45[-1]	9.87[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	64.187	6.52[10]	4.04[-2]	3.42[-2]	60.704	8.19[10]	4.53[-2]	3.62[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	64.013	1.97[11]	1.81[-1]	1.53[-1]	61.141	2.01[11]	1.69[-1]	1.36[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	63.503	1.34[11]	1.21[-1]	1.02[-1]	60.407	1.42[11]	1.17[-1]	9.31[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	62.687	1.25[11]	4.94[-2]	6.10[-2]	60.457	1.12[11]	4.08[-2]	4.87[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	62.455	9.57[10]	7.48[-2]	9.22[-2]	59.742	9.31[10]	6.65[-2]	7.86[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	62.101	1.34[11]	7.77[-2]	9.52[-2]	59.897	1.23[11]	6.64[-2]	7.86[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	61.724	8.84[10]	5.08[-2]	4.12[-2]	58.897	9.05[10]	4.71[-2]	3.65[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1D)s\ ^2D_{3/2}$	60.939	9.06[10]	1.01[-1]	4.05[-2]	57.826	1.01[11]	1.02[-1]	3.87[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	60.607	5.17[11]	2.86[-1]	2.28[-1]	57.746	5.66[11]	2.84[-1]	2.16[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2D_{3/2}$	60.424	5.26[10]	5.75[-2]	2.29[-2]	57.434	5.79[10]	5.74[-2]	2.17[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	60.260	2.18[11]	5.94[-2]	4.71[-2]	57.238	2.42[11]	5.94[-2]	4.49[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	60.217	8.82[10]	4.80[-2]	3.80[-2]	56.822	8.88[10]	4.31[-2]	3.22[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2D_{3/2}$	59.173	1.26[11]	1.32[-1]	5.17[-2]	56.429	1.40[11]	1.33[-1]	4.96[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	59.124	4.56[11]	3.59[-1]	2.80[-1]	56.235	5.11[11]	3.63[-1]	2.69[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	59.035	5.33[10]	3.71[-2]	4.34[-2]	56.523	8.60[10]	5.49[-2]	6.14[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	58.763	4.24[10]	2.19[-2]	2.54[-2]	56.019	4.98[10]	2.35[-2]	2.60[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	58.600	3.56[11]	1.84[-1]	7.09[-2]	55.720	3.94[11]	1.84[-1]	6.73[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	58.572	3.62[11]	9.34[-2]	7.19[-2]	55.704	4.07[11]	9.49[-2]	6.96[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	58.461	2.54[11]	6.52[-2]	5.03[-2]	55.593	2.82[11]	6.52[-2]	4.78[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{3/2}$	57.236	1.58[10]	5.20[-3]	5.86[-3]	54.717	2.08[10]	6.22[-3]	6.71[-3]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	57.125	5.09[11]	2.51[-1]	1.88[-1]	54.371	5.67[11]	2.51[-1]	1.80[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	56.581	2.16[10]	2.07[-2]	7.72[-3]	53.946	2.48[10]	2.16[-2]	7.69[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	56.083	1.50[10]	1.07[-2]	7.86[-3]	53.435	1.80[10]	1.16[-2]	8.13[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	55.974	1.27[10]	2.99[-3]	2.21[-3]	53.350	1.51[10]	3.22[-3]	2.26[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	55.381	2.03[11]	6.20[-2]	6.79[-2]	53.078	2.51[11]	7.09[-2]	7.41[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	54.924	1.37[11]	6.20[-2]	6.71[-2]	52.646	1.77[11]	7.35[-2]	7.65[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	54.690	8.22[10]	1.85[-2]	1.33[-2]	51.856	8.18[10]	1.65[-2]	1.13[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{3/2}$	54.397	6.83[10]	2.02[-2]	2.18[-2]	51.670	8.22[10]	2.20[-2]	2.25[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	54.358	1.18[11]	5.17[-2]	3.72[-2]	52.006	1.39[11]	5.62[-2]	3.84[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2D_{3/2}$	53.833	8.93[10]	7.78[-2]	2.76[-2]	51.202	1.08[11]	8.49[-2]	2.86[-2]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	52.444	4.89[10]	1.34[-2]	1.39[-2]	50.077	5.24[10]	1.31[-2]	1.30[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	52.353	2.42[11]	9.95[-2]	1.03[-1]	49.972	2.68[11]	1.01[-1]	9.93[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	52.000	1.01[11]	4.07[-2]	2.79[-2]	49.544	1.29[11]	4.76[-2]	3.10[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	51.865	2.24[11]	1.20[-1]	1.24[-1]	49.498	2.47[11]	1.22[-1]	1.18[-1]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	51.013	1.36[11]	1.06[-1]	3.56[-2]	48.412	1.36[11]	9.53[-2]	3.04[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	50.633	3.50[11]	1.34[-1]	4.49[-2]	48.369	3.83[11]	1.34[-1]	4.28[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4F_{3/2}$	50.357	3.41[11]	2.59[-1]	8.58[-2]	48.077	3.83[11]	2.66[-1]	8.40[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	50.017	2.37[11]	8.90[-2]	5.85[-2]	47.796	2.63[11]	9.00[-2]	5.67[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	49.934	1.07[11]	6.01[-2]	3.96[-2]	47.701	1.18[11]	6.01[-2]	3.78[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	49.848	4.87[11]	3.63[-1]	1.19[-1]	47.610	5.37[11]	3.65[-1]	1.15[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	49.848	2.42[11]	4.51[-2]	2.96[-2]	47.633	2.64[11]	4.49[-2]	2.81[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	49.827	2.39[11]	8.92[-2]	2.93[-2]	47.598	2.71[11]	9.20[-2]	2.88[-2]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
				Z=59				Z=60	
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{5/2}$	65.556	5.81[10]	3.75[-2]	4.84[-2]	63.544	6.67[10]	4.04[-2]	5.07[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^1D)s\ ^2D_{5/2}$	63.923	6.98[10]	6.40[-2]	5.40[-2]	61.809	8.33[10]	7.15[-2]	5.82[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	63.523	1.81[11]	1.10[-1]	4.58[-2]	61.323	1.93[11]	1.09[-1]	4.40[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4F_{7/2}$	63.503	5.95[10]	4.80[-2]	6.01[-2]	61.420	6.49[10]	4.88[-2]	5.93[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	62.486	7.50[10]	5.85[-2]	7.23[-2]	60.690	8.75[10]	6.43[-2]	7.72[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	62.349	2.48[11]	2.16[-1]	1.78[-1]	60.249	2.63[11]	2.15[-1]	1.70[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4F_{5/2}$	61.989	1.09[11]	9.43[-2]	7.70[-2]	60.168	1.16[11]	9.43[-2]	7.48[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	61.371	1.20[11]	1.36[-1]	5.48[-2]	59.586	1.25[11]	1.34[-1]	5.23[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	58.678	2.37[11]	1.63[-1]	1.89[-1]	57.054	2.28[11]	1.48[-1]	1.67[-1]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	54.707	7.47[10]	2.24[-2]	2.42[-2]	53.159	6.55[10]	1.85[-2]	1.95[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	54.216	9.21[10]	4.05[-2]	4.35[-2]	52.546	8.38[10]	3.49[-2]	3.61[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{5/2}$	53.924	1.43[11]	6.25[-2]	6.66[-2]	51.163	1.47[11]	5.76[-2]	5.83[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	52.814	2.15[11]	1.36[-1]	9.43[-2]	50.032	2.27[11]	1.28[-1]	8.40[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	52.641	2.72[11]	2.26[-1]	7.84[-2]	49.839	2.97[11]	2.22[-1]	7.27[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	51.833	1.78[11]	1.07[-1]	7.31[-2]	49.239	1.92[11]	1.04[-1]	6.79[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	51.830	8.41[10]	4.52[-2]	4.63[-2]	49.296	8.21[10]	3.99[-2]	3.89[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2P_{3/2}$	51.813	5.65[10]	1.52[-2]	1.56[-2]	49.383	6.05[10]	1.48[-2]	1.44[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	51.465	1.44[11]	5.72[-2]	3.88[-2]	48.951	1.68[11]	6.04[-2]	3.88[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	50.886	9.94[10]	3.85[-2]	2.58[-2]	48.090	1.05[11]	3.66[-2]	2.32[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	50.683	5.53[10]	2.13[-2]	7.11[-3]	48.256	6.17[10]	2.16[-2]	6.86[-3]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	49.809	7.56[11]	2.81[-1]	1.84[-1]	47.083	8.50[11]	2.82[-1]	1.75[-1]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1D)s\ ^2D_{3/2}$	49.447	1.41[11]	1.04[-1]	3.37[-2]	47.137	1.56[11]	1.04[-1]	3.22[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2D_{3/2}$	49.309	7.71[10]	5.63[-2]	1.83[-2]	47.109	8.31[10]	5.54[-2]	1.72[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	49.182	2.20[11]	1.07[-1]	1.04[-1]	46.870	2.74[11]	1.21[-1]	1.12[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	49.053	3.35[11]	6.04[-2]	3.91[-2]	46.615	3.73[11]	6.08[-2]	3.73[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2D_{3/2}$	48.786	1.89[11]	1.34[-1]	4.33[-2]	46.204	2.12[11]	1.36[-1]	4.13[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	48.384	7.60[10]	2.67[-2]	2.55[-2]	46.204	8.49[10]	2.72[-2]	2.48[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	48.362	7.08[11]	3.73[-1]	2.37[-1]	46.059	7.79[11]	3.73[-1]	2.26[-1]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	47.900	5.77[11]	9.99[-2]	6.27[-2]	45.668	6.43[11]	1.01[-1]	6.05[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	47.895	5.35[11]	1.84[-1]	5.80[-2]	45.569	5.93[11]	1.85[-1]	5.54[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	47.831	9.08[10]	3.13[-2]	1.97[-2]	45.483	9.01[10]	2.80[-2]	1.67[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	47.802	3.83[11]	6.57[-2]	4.13[-2]	45.421	4.26[11]	6.58[-2]	3.94[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	46.859	7.70[11]	2.55[-1]	1.57[-1]	44.603	8.57[11]	2.56[-1]	1.50[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	46.361	4.20[11]	9.00[-2]	8.26[-2]	44.209	4.85[11]	9.47[-2]	8.26[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	46.008	3.23[11]	1.03[-1]	9.29[-2]	43.784	3.80[11]	1.10[-1]	9.47[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	45.326	2.16[11]	6.66[-2]	3.97[-2]	43.186	2.48[11]	6.92[-2]	3.94[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{3/2}$	44.479	1.36[11]	2.68[-2]	2.35[-2]	42.244	1.58[11]	2.82[-2]	2.35[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	44.200	8.29[10]	1.22[-2]	7.07[-3]	41.874	8.41[10]	1.11[-2]	6.10[-3]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2D_{3/2}$	44.133	1.76[11]	1.03[-1]	2.99[-2]	41.988	2.05[11]	1.08[-1]	2.99[-2]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	43.576	6.58[10]	1.25[-2]	1.07[-2]	41.525	7.11[10]	1.23[-2]	1.01[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	43.440	3.68[11]	1.05[-1]	8.94[-2]	41.346	4.15[11]	1.06[-1]	8.66[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	43.022	3.31[11]	1.23[-1]	1.05[-1]	40.988	3.71[11]	1.24[-1]	1.00[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	42.893	2.39[11]	6.57[-2]	3.72[-2]	40.740	2.87[11]	7.14[-2]	3.83[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	42.153	5.06[11]	1.35[-1]	3.74[-2]	40.251	5.56[11]	1.35[-1]	3.59[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4F_{3/2}$	41.834	5.47[11]	2.88[-1]	7.92[-2]	39.906	6.18[11]	2.96[-1]	7.77[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	41.695	3.62[11]	9.45[-2]	5.18[-2]	39.826	4.04[11]	9.61[-2]	5.03[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	41.570	1.54[11]	6.02[-2]	3.28[-2]	39.662	1.70[11]	6.02[-2]	3.14[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	41.551	3.43[11]	4.45[-2]	2.43[-2]	39.686	3.76[11]	4.44[-2]	2.32[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	41.486	3.87[11]	1.00[-1]	2.73[-2]	39.549	4.39[11]	1.03[-1]	2.68[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	41.482	7.29[11]	3.76[-1]	1.03[-1]	39.475	8.17[11]	3.82[-1]	9.93[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	41.434	1.38[11]	7.08[-2]	1.93[-2]	39.410	1.39[11]	6.44[-2]	1.67[-2]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
				Z=65				Z=66	
$p^2(^1S)s\ ^2S_{1/2}$	$p^2(^3P)p\ ^2P_{3/2}$	56.063	9.71[10]	9.14[-2]	3.37[-2]	54.349	1.07[11]	9.43[-2]	3.37[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{5/2}$	53.953	1.02[11]	4.47[-2]	4.76[-2]	52.329	1.19[11]	4.87[-2]	5.02[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	53.366	2.39[11]	1.02[-1]	3.59[-2]	51.846	2.51[11]	1.01[-1]	3.45[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4F_{7/2}$	52.904	9.42[10]	5.26[-2]	5.50[-2]	51.330	1.02[11]	5.36[-2]	5.42[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^1D)s\ ^2D_{5/2}$	52.833	1.48[11]	9.28[-2]	6.46[-2]	51.252	1.60[11]	9.53[-2]	6.42[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	52.280	3.28[11]	2.02[-1]	1.39[-1]	50.786	3.44[11]	2.00[-1]	1.34[-1]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4F_{5/2}$	51.891	1.56[11]	9.43[-2]	6.44[-2]	50.389	1.64[11]	9.43[-2]	6.25[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	51.876	1.54[11]	8.32[-2]	8.51[-2]	50.374	1.68[11]	8.52[-2]	8.48[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	51.520	1.57[11]	1.25[-1]	4.24[-2]	50.050	1.64[11]	1.24[-1]	4.07[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	48.764	2.14[11]	1.01[-1]	9.78[-2]	47.355	2.14[11]	9.55[-2]	8.94[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{5/2}$	39.311	1.59[11]	3.70[-2]	2.86[-2]	37.285	1.85[11]	3.87[-2]	2.84[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	38.713	3.03[11]	1.02[-1]	5.20[-2]	36.735	3.28[11]	9.91[-2]	4.81[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	38.484	4.60[11]	2.04[-1]	5.17[-2]	36.514	5.08[11]	2.02[-1]	4.87[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2P_{3/2}$	38.059	9.52[10]	1.38[-2]	1.04[-2]	36.133	1.05[11]	1.38[-2]	9.79[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	37.944	3.01[11]	9.77[-2]	4.87[-2]	36.017	3.32[11]	9.67[-2]	4.58[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	37.492	1.40[11]	2.96[-2]	1.46[-2]	35.608	1.51[11]	2.88[-2]	1.35[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	37.286	3.48[11]	7.25[-2]	3.57[-2]	35.367	3.97[11]	7.45[-2]	3.47[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	36.975	1.13[11]	2.30[-2]	5.61[-3]	35.101	1.25[11]	2.32[-2]	5.36[-3]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	36.791	1.40[12]	2.83[-1]	1.37[-1]	34.965	1.55[12]	2.85[-1]	1.31[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	36.483	6.41[11]	1.71[-1]	1.23[-1]	34.689	7.41[11]	1.78[-1]	1.22[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2D_{3/2}$	36.347	1.24[11]	4.93[-2]	1.18[-2]	34.550	1.32[11]	4.74[-2]	1.08[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1D)s\ ^2D_{3/2}$	36.268	2.69[11]	1.06[-1]	2.53[-2]	34.456	2.99[11]	1.06[-1]	2.41[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2D_{3/2}$	36.171	3.54[11]	1.39[-1]	3.31[-2]	34.395	3.94[11]	1.40[-1]	3.17[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	36.059	6.42[11]	6.29[-2]	2.97[-2]	34.263	7.15[11]	6.29[-2]	2.84[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	35.874	1.48[11]	2.85[-2]	2.02[-2]	34.120	1.62[11]	2.84[-2]	1.91[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	35.774	1.25[12]	3.60[-1]	1.70[-1]	34.016	1.50[12]	3.91[-1]	1.75[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{3/2}$	35.470	9.64[10]	1.22[-2]	8.52[-3]	33.753	1.11[11]	1.26[-2]	8.40[-3]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	35.409	1.14[12]	1.08[-1]	5.03[-2]	33.672	1.29[12]	1.10[-1]	4.85[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	35.386	1.02[12]	1.90[-1]	4.43[-2]	33.649	1.13[12]	1.92[-1]	4.25[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	35.346	7.27[11]	6.83[-2]	3.17[-2]	33.615	8.12[11]	6.88[-2]	3.04[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2F_{5/2}$	35.148	1.79[11]	4.97[-2]	2.30[-2]	33.224	9.97[10]	2.49[-2]	1.09[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	34.958	9.61[10]	3.52[-2]	8.10[-3]	33.302	1.12[11]	3.73[-2]	8.18[-3]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	34.774	1.48[12]	2.68[-1]	1.22[-1]	33.087	1.64[12]	2.71[-1]	1.18[-1]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	34.754	8.97[11]	1.09[-1]	7.46[-2]	33.093	1.01[12]	1.11[-1]	7.24[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	34.534	7.45[11]	1.33[-1]	9.10[-2]	32.892	8.46[11]	1.37[-1]	8.91[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{3/2}$	34.144	9.40[10]	1.64[-2]	7.38[-3]	32.306	9.45[10]	1.48[-2]	6.28[-3]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	34.018	4.56[11]	7.91[-2]	3.54[-2]	32.406	5.13[11]	8.06[-2]	3.44[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{3/2}$	33.215	3.09[11]	3.39[-2]	2.23[-2]	31.644	3.50[11]	3.53[-2]	2.19[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2D_{3/2}$	32.965	4.04[11]	1.32[-1]	2.86[-2]	31.416	4.60[11]	1.36[-1]	2.82[-2]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	32.937	1.06[11]	1.15[-2]	7.47[-3]	31.430	1.15[11]	1.14[-2]	7.05[-3]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	32.781	7.13[11]	1.15[-1]	7.47[-2]	31.271	8.02[11]	1.17[-1]	7.26[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	32.508	6.13[11]	1.30[-1]	8.33[-2]	31.021	6.81[11]	1.32[-1]	8.04[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	32.235	6.07[11]	9.41[-2]	4.00[-2]	30.743	6.95[11]	9.85[-2]	3.98[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^1P)d\ ^2P_{1/2}$	32.138	9.35[10]	7.25[-3]	3.07[-3]	30.485	9.64[10]	6.70[-3]	2.70[-3]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	31.974	9.07[11]	1.39[-1]	2.93[-2]	30.530	9.98[11]	1.40[-1]	2.82[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	31.681	7.02[11]	1.06[-1]	4.39[-2]	30.259	7.81[11]	1.08[-1]	4.29[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4F_{3/2}$	31.661	1.14[12]	3.40[-1]	7.09[-2]	30.223	1.27[12]	3.50[-1]	6.96[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	31.575	5.89[11]	4.41[-2]	1.83[-2]	30.158	6.45[11]	4.40[-2]	1.75[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	31.537	2.70[11]	6.07[-2]	2.51[-2]	30.112	2.97[11]	6.07[-2]	2.40[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	31.489	7.86[11]	1.17[-1]	2.42[-2]	30.071	8.84[11]	1.20[-1]	2.38[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	31.471	1.37[12]	4.08[-1]	8.47[-2]	30.052	1.53[12]	4.15[-1]	8.23[-2]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
				Z=73				Z=74	
$p^2(^1S)s\ ^2S_{1/2}$	$p^2(^3P)p\ ^2P_{3/2}$	43.932	1.82[11]	1.05[-1]	3.05[-2]	42.632	1.95[11]	1.06[-1]	2.98[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	43.180	1.40[11]	5.90[-2]	3.34[-2]	41.890	1.50[11]	5.90[-2]	3.26[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{5/2}$	42.399	2.00[11]	5.40[-2]	4.51[-2]	41.157	2.13[11]	5.40[-2]	4.39[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	42.359	3.49[11]	9.39[-2]	2.62[-2]	41.151	3.67[11]	9.31[-2]	2.52[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4F_{7/2}$	41.624	1.69[11]	5.86[-2]	4.83[-2]	40.411	1.82[11]	5.96[-2]	4.75[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^1D)s\ ^2D_{5/2}$	41.606	2.66[11]	1.03[-1]	5.67[-2]	40.398	2.84[11]	1.04[-1]	5.54[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{5/2}$	41.480	4.85[11]	1.89[-1]	1.03[-1]	40.080	4.38[11]	1.58[-1]	8.36[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	41.169	2.77[11]	9.40[-2]	7.65[-2]	39.994	2.97[11]	9.50[-2]	7.50[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4F_{5/2}$	41.067	2.48[11]	9.44[-2]	5.09[-2]	39.889	2.64[11]	9.44[-2]	4.95[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	40.896	2.34[11]	1.17[-1]	3.16[-2]	39.734	2.47[11]	1.17[-1]	3.05[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	38.747	2.33[11]	7.00[-2]	5.37[-2]	37.653	2.39[11]	6.81[-2]	5.05[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{5/2}$	25.776	3.64[11]	3.60[-2]	1.84[-2]	24.464	4.00[11]	3.60[-2]	1.74[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	25.481	6.26[11]	9.17[-2]	3.08[-2]	24.194	6.95[11]	9.17[-2]	2.92[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	25.332	1.04[12]	1.99[-1]	3.33[-2]	24.055	1.15[12]	2.00[-1]	3.17[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	25.316	1.19[11]	1.53[-2]	7.62[-3]	24.048	1.27[11]	1.47[-2]	6.98[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2P_{3/2}$	25.152	2.18[11]	1.38[-2]	6.84[-3]	23.892	2.42[11]	1.39[-2]	6.53[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	25.068	6.48[11]	9.18[-2]	3.02[-2]	23.814	7.11[11]	9.08[-2]	2.85[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	24.834	2.81[11]	2.60[-2]	8.50[-3]	23.595	3.09[11]	2.58[-2]	8.03[-3]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	24.588	9.11[11]	8.29[-2]	2.68[-2]	23.364	1.02[12]	8.34[-2]	2.57[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	24.496	2.57[11]	2.30[-2]	3.72[-3]	23.284	2.80[11]	2.28[-2]	3.50[-3]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	24.494	3.36[12]	3.02[-1]	9.75[-2]	23.213	3.25[12]	2.63[-1]	8.04[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	24.379	1.85[12]	2.21[-1]	1.06[-1]	23.182	2.11[12]	2.26[-1]	1.03[-1]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2D_{3/2}$	24.295	1.68[11]	2.96[-2]	4.73[-3]	23.114	1.68[11]	2.68[-2]	4.08[-3]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2D_{3/2}$	24.181	8.59[11]	1.51[-1]	2.40[-2]	22.999	9.62[11]	1.53[-1]	2.31[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1D)s\ ^2D_{3/2}$	24.157	5.96[11]	1.04[-1]	1.66[-2]	22.975	6.55[11]	1.03[-1]	1.57[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	24.051	2.93[11]	2.54[-2]	1.21[-2]	22.886	3.15[11]	2.47[-2]	1.12[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	24.030	1.44[12]	6.24[-2]	1.98[-2]	22.853	1.58[12]	6.14[-2]	1.85[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	23.971	3.63[12]	4.68[-1]	1.48[-1]	22.808	4.09[12]	4.78[-1]	1.43[-1]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{3/2}$	23.836	2.74[11]	1.56[-2]	7.34[-3]	22.683	3.12[11]	1.60[-2]	7.20[-3]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	23.729	2.88[12]	1.22[-1]	3.80[-2]	22.580	3.23[12]	1.24[-1]	3.68[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	23.703	2.45[12]	2.07[-1]	3.23[-2]	22.555	2.75[12]	2.10[-1]	3.12[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	23.697	1.78[12]	7.48[-2]	2.33[-2]	22.550	1.98[12]	7.58[-2]	2.25[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	23.696	3.17[11]	5.34[-2]	8.33[-3]	22.571	3.63[11]	5.54[-2]	8.24[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	23.465	2.26[12]	1.25[-1]	5.76[-2]	22.342	2.53[12]	1.27[-1]	5.57[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	23.450	3.70[11]	1.54[-2]	4.72[-3]	22.344	4.63[11]	1.74[-2]	5.11[-3]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{3/2}$	23.404	3.57[12]	2.94[-1]	9.05[-2]	22.348	3.37[12]	2.53[-1]	7.43[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	23.364	1.96[12]	1.60[-1]	7.41[-2]	22.251	2.21[12]	1.64[-1]	7.21[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	23.357	2.98[11]	3.66[-2]	1.13[-2]	22.250	3.48[11]	3.89[-2]	1.14[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	23.049	1.09[12]	8.66[-2]	2.63[-2]	21.955	1.20[12]	8.71[-2]	2.52[-2]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	22.629	2.04[11]	1.05[-2]	4.67[-3]	21.590	2.21[11]	1.03[-2]	4.40[-3]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{3/2}$	22.569	8.32[11]	4.22[-2]	1.89[-2]	21.509	9.39[11]	4.32[-2]	1.84[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2D_{3/2}$	22.493	1.10[12]	1.68[-1]	2.48[-2]	21.452	1.25[12]	1.73[-1]	2.43[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	22.472	1.81[12]	1.37[-1]	6.09[-2]	21.437	2.03[12]	1.40[-1]	5.94[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	22.354	3.63[11]	1.36[-2]	4.00[-3]	21.311	4.48[11]	1.53[-2]	4.28[-3]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	22.353	1.44[12]	1.44[-1]	6.33[-2]	21.333	1.60[12]	1.46[-1]	6.13[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	22.100	1.72[12]	1.26[-1]	3.66[-2]	21.086	1.95[12]	1.30[-1]	3.61[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	22.079	2.06[12]	1.51[-1]	2.19[-2]	21.079	2.29[12]	1.53[-1]	2.12[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	21.918	1.78[12]	1.29[-1]	3.71[-2]	20.930	2.02[12]	1.33[-1]	3.65[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	21.852	1.16[12]	4.15[-2]	1.19[-2]	20.868	1.24[12]	4.06[-2]	1.11[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4F_{3/2}$	21.833	2.98[12]	4.26[-1]	6.13[-2]	20.843	3.37[12]	4.39[-1]	6.02[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	21.772	2.01[12]	1.43[-1]	2.06[-2]	20.789	2.27[12]	1.47[-1]	2.01[-2]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
				Z=79				Z=80	
$p^2(^1S)s\ ^2S_{1/2}$	$p^2(^3P)p\ ^2P_{3/2}$	36.705	2.71[11]	1.09[-1]	2.64[-2]	35.625	2.88[11]	1.09[-1]	2.57[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	35.994	2.07[11]	6.04[-2]	2.86[-2]	34.918	2.20[11]	6.04[-2]	2.78[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	35.597	4.70[11]	8.94[-2]	2.10[-2]	34.576	4.96[11]	8.89[-2]	2.02[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{5/2}$	35.491	2.88[11]	5.46[-2]	3.83[-2]	34.457	3.07[11]	5.46[-2]	3.72[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^1D)s\ ^2D_{5/2}$	34.883	3.88[11]	1.06[-1]	4.90[-2]	33.876	4.14[11]	1.07[-1]	4.78[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4F_{7/2}$	34.871	2.59[11]	6.35[-2]	4.37[-2]	33.860	2.79[11]	6.42[-2]	4.29[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	34.606	4.11[11]	9.86[-2]	6.73[-2]	33.618	4.39[11]	9.93[-2]	6.59[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4F_{5/2}$	34.488	3.55[11]	9.53[-2]	4.32[-2]	33.499	3.79[11]	9.53[-2]	4.21[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	34.398	3.24[11]	1.15[-1]	2.60[-2]	33.419	3.42[11]	1.15[-1]	2.52[-2]
$s^2(^1S)d\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	32.644	2.80[11]	5.98[-2]	3.85[-2]	31.727	2.90[11]	5.85[-2]	3.66[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{5/2}$	18.884	6.64[11]	3.54[-2]	1.33[-2]	17.941	7.35[11]	3.57[-2]	1.26[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$s^2(^1S)d\ ^2D_{5/2}$	18.711	1.19[12]	9.37[-2]	2.30[-2]	17.782	1.33[12]	9.42[-2]	2.21[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	18.631	1.82[11]	1.27[-2]	4.66[-3]	17.711	1.97[11]	1.24[-2]	4.32[-3]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	18.617	1.97[12]	2.03[-1]	2.50[-2]	17.695	2.18[12]	2.04[-1]	2.38[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2P_{3/2}$	18.514	4.18[11]	1.43[-2]	5.24[-3]	17.602	4.66[11]	1.45[-2]	5.02[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	18.467	1.13[12]	8.64[-2]	2.10[-2]	17.560	1.22[12]	8.49[-2]	1.97[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	18.302	5.10[11]	2.56[-2]	6.18[-3]	17.403	5.63[11]	2.56[-2]	5.88[-3]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	18.146	1.72[12]	8.49[-2]	2.03[-2]	17.261	1.91[12]	8.54[-2]	1.94[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	18.106	3.92[11]	1.93[-2]	2.30[-3]	17.226	4.04[11]	1.80[-2]	2.04[-3]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2D_{3/2}$	18.053	1.47[11]	1.44[-2]	1.71[-3]	17.190	1.40[11]	1.24[-2]	1.40[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	18.047	3.89[12]	2.54[-1]	9.06[-2]	17.171	4.41[12]	2.60[-1]	8.81[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1D)s\ ^2D_{3/2}$	17.911	1.02[12]	9.79[-2]	1.15[-2]	17.048	1.11[12]	9.62[-2]	1.08[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	17.880	4.22[11]	2.03[-2]	7.16[-3]	17.024	4.42[11]	1.93[-2]	6.47[-3]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	17.811	7.44[12]	5.30[-1]	1.24[-1]	16.957	8.38[12]	5.40[-1]	1.21[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	17.808	2.08[12]	4.94[-2]	1.16[-2]	16.948	2.08[12]	4.48[-2]	1.00[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{3/2}$	17.725	5.99[11]	1.88[-2]	6.60[-3]	16.877	6.87[11]	1.95[-2]	6.51[-3]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	17.706	6.54[11]	6.18[-2]	7.20[-3]	16.869	7.28[11]	6.20[-2]	6.88[-3]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	17.642	5.76[12]	1.35[-1]	3.13[-2]	16.798	6.48[12]	1.38[-1]	3.03[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	17.622	3.51[12]	8.17[-2]	1.89[-2]	16.780	3.93[12]	8.32[-2]	1.83[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	17.620	4.85[12]	2.26[-1]	2.62[-2]	16.776	5.42[12]	2.29[-1]	2.53[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	17.561	1.57[12]	3.63[-2]	8.39[-3]	16.738	2.01[12]	4.23[-2]	9.32[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	17.497	4.47[12]	1.37[-1]	4.73[-2]	16.667	5.00[12]	1.40[-1]	4.58[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	17.466	7.58[11]	5.22[-2]	1.20[-2]	16.644	8.83[11]	5.52[-2]	1.21[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	17.442	3.98[12]	1.81[-1]	6.25[-2]	16.617	4.46[12]	1.85[-1]	6.08[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	17.379	2.67[11]	1.82[-2]	4.15[-3]	16.562	3.14[11]	1.94[-2]	4.22[-3]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	17.233	1.92[12]	8.52[-2]	1.94[-2]	16.422	2.08[12]	8.42[-2]	1.82[-2]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	17.074	3.21[11]	9.35[-3]	3.15[-3]	16.293	3.42[11]	9.08[-3]	2.92[-3]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2D_{3/2}$	16.945	2.30[12]	1.98[-1]	2.21[-2]	16.167	2.60[12]	2.03[-1]	2.17[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	16.940	3.65[12]	1.57[-1]	5.27[-2]	16.162	4.12[12]	1.61[-1]	5.15[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	16.895	2.76[12]	1.57[-1]	5.23[-2]	16.126	3.06[12]	1.60[-1]	5.08[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	16.795	1.40[12]	2.95[-2]	6.52[-3]	16.017	1.75[12]	3.39[-2]	7.13[-3]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	16.722	3.91[12]	1.64[-1]	1.80[-2]	15.966	4.34[12]	1.67[-1]	1.75[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	16.683	3.62[12]	1.50[-1]	3.32[-2]	15.922	4.09[12]	1.55[-1]	3.26[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	16.665	5.80[12]	2.41[-1]	5.31[-2]	15.912	6.45[12]	2.45[-1]	5.15[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	16.618	3.77[12]	1.56[-1]	3.42[-2]	15.869	4.30[12]	1.62[-1]	3.39[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	16.574	1.48[12]	3.06[-2]	6.66[-3]	15.829	1.44[12]	2.72[-2]	5.66[-3]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4F_{3/2}$	16.532	6.18[12]	5.06[-1]	5.51[-2]	15.784	6.97[12]	5.21[-1]	5.41[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	16.505	4.10[12]	1.67[-1]	1.82[-2]	15.761	4.62[12]	1.72[-1]	1.79[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	16.490	1.01[12]	6.12[-2]	1.33[-2]	15.745	1.09[12]	6.12[-2]	1.27[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	16.485	6.69[12]	5.47[-1]	5.94[-2]	15.741	7.53[12]	5.60[-1]	5.81[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	16.400	9.22[11]	5.56[-2]	1.20[-2]	15.664	1.00[12]	5.51[-2]	1.14[-2]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
		Z=83				Z=84			
$p^2(^1S)s\ ^2S_{1/2}$	$p^2(^3P)p\ ^2P_{3/2}$	32.571	3.49[11]	1.11[-1]	2.38[-2]	31.613	3.71[11]	1.11[-1]	2.32[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	31.880	2.64[11]	6.03[-2]	2.54[-2]	30.926	2.80[11]	6.03[-2]	2.46[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	31.683	5.80[11]	8.74[-2]	1.82[-2]	30.772	6.12[11]	8.69[-2]	1.76[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^1D)s\ ^2D_{5/2}$	31.027	4.99[11]	1.08[-1]	4.43[-2]	30.133	5.31[11]	1.09[-1]	4.31[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4F_{7/2}$	31.003	3.47[11]	6.65[-2]	4.08[-2]	30.106	3.71[11]	6.75[-2]	4.01[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4F_{5/2}$	30.698	4.53[11]	9.63[-2]	3.89[-2]	29.818	4.82[11]	9.68[-2]	3.80[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	30.645	4.06[11]	1.14[-1]	2.31[-2]	29.773	4.30[11]	1.14[-1]	2.24[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	15.523	1.71[11]	9.28[-3]	1.90[-3]	14.751	2.04[11]	1.00[-2]	1.94[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{5/2}$	15.400	1.01[12]	3.60[-2]	1.09[-2]	14.641	1.12[12]	3.60[-2]	1.05[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	15.227	2.49[11]	1.16[-2]	3.49[-3]	14.483	2.71[11]	1.14[-2]	3.25[-3]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	15.211	2.97[12]	2.06[-1]	2.06[-2]	14.468	3.28[12]	2.07[-1]	1.96[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2P_{3/2}$	15.137	6.48[11]	1.49[-2]	4.44[-3]	14.399	7.22[11]	1.50[-2]	4.27[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	15.110	1.58[12]	8.09[-2]	1.61[-2]	14.376	1.71[12]	7.94[-2]	1.51[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	14.974	7.63[11]	2.57[-2]	5.05[-3]	14.246	8.36[11]	2.56[-2]	4.79[-3]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	14.871	2.56[12]	8.49[-2]	1.66[-2]	14.154	2.81[12]	8.44[-2]	1.57[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	14.848	4.01[11]	1.32[-2]	1.30[-3]	14.135	3.87[11]	1.16[-2]	1.08[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	14.803	6.33[12]	2.77[-1]	8.12[-2]	14.091	7.15[12]	2.83[-1]	7.90[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4D_{1/2}$	14.720	2.55[11]	8.30[-3]	8.05[-4]	14.029	3.20[11]	9.44[-3]	8.72[-4]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1D)s\ ^2D_{3/2}$	14.713	1.39[12]	9.04[-2]	8.75[-3]	14.012	1.50[12]	8.80[-2]	8.12[-3]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	14.705	4.92[11]	1.59[-2]	4.63[-3]	14.008	5.02[11]	1.48[-2]	4.09[-3]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	14.643	1.20[13]	5.80[-1]	1.12[-1]	13.947	1.36[13]	5.90[-1]	1.09[-1]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	14.621	1.73[12]	2.79[-2]	5.37[-3]	13.923	1.53[12]	2.23[-2]	4.08[-3]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	14.591	9.48[11]	6.05[-2]	5.82[-3]	13.904	1.02[12]	5.93[-2]	5.44[-3]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{3/2}$	14.577	1.03[12]	2.18[-2]	6.29[-3]	13.885	1.18[12]	2.27[-2]	6.23[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	14.532	2.56[11]	8.12[-3]	1.55[-3]	13.853	3.09[11]	8.91[-3]	1.63[-3]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	14.511	9.17[12]	1.45[-1]	2.77[-2]	13.823	1.03[13]	1.48[-1]	2.69[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	14.491	7.63[12]	2.41[-1]	2.29[-2]	13.804	8.55[12]	2.45[-1]	2.22[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	14.495	5.54[12]	8.72[-2]	1.66[-2]	13.808	6.20[12]	8.87[-2]	1.61[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	14.498	4.04[12]	6.36[-2]	1.22[-2]	13.821	4.94[12]	7.10[-2]	1.29[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	14.411	7.05[12]	1.47[-1]	4.17[-2]	13.732	7.92[12]	1.49[-1]	4.04[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	14.408	1.39[12]	6.46[-2]	1.23[-2]	13.733	1.61[12]	6.81[-2]	1.23[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	14.374	6.34[12]	1.96[-1]	5.58[-2]	13.698	7.12[12]	2.00[-1]	5.43[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	14.341	5.11[11]	2.37[-2]	4.46[-3]	13.671	5.99[11]	2.52[-2]	4.55[-3]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	14.218	2.58[12]	7.83[-2]	1.46[-2]	13.554	2.74[12]	7.54[-2]	1.34[-2]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	14.158	4.04[11]	8.11[-3]	2.26[-3]	13.511	4.21[11]	7.68[-3]	2.05[-3]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2D_{3/2}$	14.047	3.75[12]	2.21[-1]	2.05[-2]	13.405	4.24[12]	2.28[-1]	2.02[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	14.040	5.82[12]	1.72[-1]	4.78[-2]	13.397	6.54[12]	1.76[-1]	4.66[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	14.026	4.27[12]	1.68[-1]	4.64[-2]	13.389	4.76[12]	1.71[-1]	4.51[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	13.900	3.36[12]	4.88[-2]	8.92[-3]	13.261	4.06[12]	5.37[-2]	9.36[-3]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	13.898	6.01[12]	1.75[-1]	1.59[-2]	13.271	6.70[12]	1.78[-1]	1.55[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	13.853	8.98[12]	2.58[-1]	4.71[-2]	13.228	1.00[13]	2.63[-1]	4.58[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	13.844	5.91[12]	1.70[-1]	3.09[-2]	13.215	6.65[12]	1.74[-1]	3.04[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	13.819	6.39[12]	1.83[-1]	3.33[-2]	13.197	7.33[12]	1.91[-1]	3.33[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	13.788	1.07[12]	1.53[-2]	2.78[-3]	13.168	8.94[11]	1.16[-2]	2.02[-3]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4F_{3/2}$	13.740	1.01[13]	5.67[-1]	5.13[-2]	13.120	1.14[13]	5.84[-1]	5.04[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	13.725	6.60[12]	1.86[-1]	1.69[-2]	13.107	7.43[12]	1.91[-1]	1.65[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	13.707	1.07[13]	6.04[-1]	5.45[-2]	13.090	1.21[13]	6.20[-1]	5.34[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	13.707	1.42[12]	6.02[-2]	1.09[-2]	13.089	1.55[12]	5.97[-2]	1.03[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	13.647	1.26[12]	5.27[-2]	9.49[-3]	13.034	1.36[12]	5.22[-2]	8.92[-3]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^2F_{5/2}$	13.316	1.02[12]	2.72[-2]	7.15[-3]	12.730	1.20[12]	2.92[-2]	7.33[-3]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	13.196	1.66[11]	4.32[-3]	7.51[-4]	12.617	1.95[11]	4.64[-3]	7.71[-4]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
				Z=89				Z=90	
$p^2(^1S)s\ ^2S_{1/2}$	$p^2(^3P)p\ ^2P_{3/2}$	27.230	5.09[11]	1.13[-1]	2.03[-2]	26.430	5.43[11]	1.14[-1]	1.98[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	26.587	8.06[11]	8.54[-2]	1.50[-2]	25.820	8.52[11]	8.53[-2]	1.45[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	26.573	3.79[11]	5.98[-2]	2.10[-2]	25.780	4.01[11]	5.97[-2]	2.03[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^1D)s\ ^2D_{5/2}$	26.034	7.29[11]	1.11[-1]	3.80[-2]	25.285	7.74[11]	1.12[-1]	3.71[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4F_{7/2}$	26.002	5.30[11]	7.17[-2]	3.69[-2]	25.252	5.71[11]	7.27[-2]	3.63[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4F_{5/2}$	25.782	6.61[11]	9.87[-2]	3.35[-2]	25.043	7.03[11]	9.92[-2]	3.27[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	25.766	5.80[11]	1.15[-1]	1.95[-2]	25.032	6.14[11]	1.15[-1]	1.90[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	11.465	4.91[11]	1.46[-2]	2.20[-3]	10.908	5.89[11]	1.58[-2]	2.26[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{5/2}$	11.401	1.92[12]	3.74[-2]	8.45[-3]	10.850	2.14[12]	3.77[-2]	8.11[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	11.301	4.08[11]	1.04[-2]	2.33[-3]	10.759	4.44[11]	1.03[-2]	2.18[-3]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	11.290	5.25[12]	2.01[-1]	1.50[-2]	10.749	5.74[12]	1.99[-1]	1.41[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2P_{3/2}$	11.242	1.26[12]	1.59[-2]	3.52[-3]	10.703	1.41[12]	1.61[-2]	3.40[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	11.235	2.50[12]	7.10[-2]	1.05[-2]	10.699	2.68[12]	6.90[-2]	9.73[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	11.131	1.29[12]	2.42[-2]	3.54[-3]	10.600	1.40[12]	2.36[-2]	3.29[-3]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	11.084	4.41[12]	8.15[-2]	1.19[-2]	10.560	4.82[12]	8.05[-2]	1.12[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	11.088	3.11[11]	5.74[-3]	4.19[-4]	10.569	3.04[11]	5.09[-3]	3.54[-4]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4D_{3/2}$	11.068	3.51[11]	1.29[-2]	9.38[-4]	10.553	4.79[11]	1.61[-2]	1.11[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	11.038	1.30[13]	3.16[-1]	6.89[-2]	10.516	1.46[13]	3.23[-1]	6.71[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4D_{1/2}$	11.033	6.57[11]	1.20[-2]	8.72[-4]	10.517	7.17[11]	1.19[-2]	8.24[-4]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	11.006	5.05[11]	9.22[-3]	2.00[-3]	10.491	4.96[11]	8.19[-3]	1.70[-3]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1D)s\ ^2D_{3/2}$	10.997	2.06[12]	7.45[-2]	5.40[-3]	10.481	2.18[12]	7.15[-2]	4.94[-3]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	10.952	2.45[13]	6.60[-1]	9.53[-2]	10.438	2.76[13]	6.75[-1]	9.28[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	10.936	1.37[12]	4.94[-2]	3.56[-3]	10.426	1.43[12]	4.68[-2]	3.21[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	10.935	5.64[11]	5.08[-3]	7.29[-4]	10.424	4.36[11]	3.55[-3]	4.88[-4]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	10.915	8.33[11]	1.49[-2]	2.14[-3]	10.409	1.02[12]	1.66[-2]	2.27[-3]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{3/2}$	10.907	2.36[12]	2.80[-2]	6.04[-3]	10.396	2.71[12]	2.93[-2]	6.01[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	10.881	1.08[13]	9.57[-2]	1.38[-2]	10.374	1.23[13]	9.92[-2]	1.35[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	10.861	1.83[13]	1.63[-1]	2.32[-2]	10.353	2.06[13]	1.66[-1]	2.26[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	10.850	1.09[13]	9.67[-2]	1.38[-2]	10.343	1.23[13]	9.86[-2]	1.34[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	10.846	1.51[13]	2.66[-1]	1.90[-2]	10.339	1.68[13]	2.71[-1]	1.84[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	10.818	3.31[12]	8.74[-2]	1.24[-2]	10.316	3.83[12]	9.14[-2]	1.24[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	10.803	1.39[13]	1.63[-1]	3.47[-2]	10.300	1.57[13]	1.66[-1]	3.37[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	10.782	1.27[13]	2.21[-1]	4.72[-2]	10.281	1.42[13]	2.26[-1]	4.59[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	10.779	1.33[12]	3.46[-2]	4.91[-3]	10.282	1.55[12]	3.68[-2]	4.97[-3]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	10.699	4.31[11]	4.91[-3]	1.04[-3]	10.213	4.09[11]	4.26[-3]	8.61[-4]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	10.684	3.08[12]	5.26[-2]	7.42[-3]	10.190	3.00[12]	4.68[-2]	6.27[-3]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2D_{3/2}$	10.619	7.83[12]	2.65[-1]	1.85[-2]	10.137	8.88[12]	2.73[-1]	1.83[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	10.619	8.27[12]	1.87[-1]	3.91[-2]	10.139	9.23[12]	1.90[-1]	3.80[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	10.606	1.14[13]	1.93[-1]	4.05[-2]	10.123	1.28[13]	1.97[-1]	3.94[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	10.538	1.16[13]	1.92[-1]	1.34[-2]	10.064	1.29[13]	1.96[-1]	1.30[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	10.507	1.74[13]	2.87[-1]	3.97[-2]	10.034	1.94[13]	2.92[-1]	3.86[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	10.503	8.46[12]	7.02[-2]	9.68[-3]	10.028	9.55[12]	7.22[-2]	9.52[-3]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	10.485	1.47[13]	2.42[-1]	3.34[-2]	10.014	1.69[13]	2.54[-1]	3.35[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	10.478	1.22[13]	2.02[-1]	2.78[-2]	10.004	1.38[13]	2.07[-1]	2.73[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4F_{3/2}$	10.420	2.06[13]	6.71[-1]	4.60[-2]	9.952	2.32[13]	6.89[-1]	4.52[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	10.414	1.34[13]	2.19[-1]	1.50[-2]	9.947	1.51[13]	2.25[-1]	1.47[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	10.400	2.17[13]	7.03[-1]	4.82[-2]	9.933	2.44[13]	7.22[-1]	4.72[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	10.395	2.32[12]	5.67[-2]	7.75[-3]	9.928	2.51[12]	5.57[-2]	7.29[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	10.360	1.97[12]	4.77[-2]	6.51[-3]	9.895	2.13[12]	4.69[-2]	6.11[-3]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^2F_{5/2}$	10.165	2.65[12]	4.11[-2]	8.25[-3]	9.717	3.10[12]	4.38[-2]	8.43[-3]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	10.081	4.32[11]	6.57[-3]	8.73[-4]	9.639	5.04[11]	7.02[-3]	8.93[-4]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
				Z=91				Z=92	
$p^2(^1S)s\ ^2S_{1/2}$	$p^2(^3P)p\ ^2P_{3/2}$	25.654	5.77[11]	1.14[-1]	1.93[-2]	24.900	6.15[11]	1.15[-1]	1.88[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	25.075	9.02[11]	8.51[-2]	1.41[-2]	24.351	9.55[11]	8.50[-2]	1.36[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	25.010	4.23[11]	5.97[-2]	1.96[-2]	24.265	4.49[11]	5.92[-2]	1.90[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^1D)s\ ^2D_{5/2}$	24.558	8.26[11]	1.12[-1]	3.62[-2]	23.851	8.78[11]	1.13[-1]	3.53[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4F_{7/2}$	24.524	6.13[11]	7.37[-2]	3.57[-2]	23.818	6.56[11]	7.47[-2]	3.51[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4F_{5/2}$	24.326	7.48[11]	1.00[-1]	3.20[-2]	23.629	8.00[11]	1.00[-1]	3.12[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	24.319	6.52[11]	1.16[-1]	1.85[-2]	23.626	6.91[11]	1.16[-1]	1.81[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	10.665	2.25[11]	3.84[-3]	5.39[-4]	10.136	2.64[11]	4.07[-3]	5.43[-4]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	10.379	7.04[11]	1.71[-2]	2.34[-3]	9.878	8.40[11]	1.85[-2]	2.40[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{5/2}$	10.327	2.39[12]	3.84[-2]	7.80[-3]	9.831	2.67[12]	3.87[-2]	7.50[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	10.243	4.81[11]	1.01[-2]	2.05[-3]	9.755	5.23[11]	9.92[-3]	1.92[-3]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	10.235	6.19[12]	1.95[-1]	1.32[-2]	9.747	6.73[12]	1.92[-1]	1.23[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2P_{3/2}$	10.191	1.57[12]	1.63[-2]	3.27[-3]	9.706	1.75[12]	1.65[-2]	3.16[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	10.189	2.86[12]	6.71[-2]	8.99[-3]	9.706	3.07[12]	6.51[-2]	8.32[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	10.095	1.49[12]	2.28[-2]	3.03[-3]	9.616	1.59[12]	2.20[-2]	2.78[-3]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{1/2}$	10.075	2.97[11]	4.52[-3]	3.00[-4]	9.605	2.96[11]	4.10[-3]	2.59[-4]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	10.061	5.25[12]	7.95[-2]	1.05[-2]	9.587	5.69[12]	7.90[-2]	9.94[-3]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4D_{3/2}$	10.062	6.55[11]	1.99[-2]	1.32[-3]	9.595	8.77[11]	2.42[-2]	1.53[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	10.020	1.65[13]	3.30[-1]	6.53[-2]	9.548	1.85[13]	3.37[-1]	6.35[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4D_{1/2}$	10.024	7.71[11]	1.16[-2]	7.67[-4]	9.556	8.22[11]	1.12[-2]	7.09[-4]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{5/2}$	10.001	4.76[11]	7.17[-3]	1.42[-3]	9.535	4.60[11]	6.27[-3]	1.18[-3]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1D)s\ ^2D_{3/2}$	9.989	2.29[12]	6.83[-2]	4.49[-3]	9.523	2.40[12]	6.53[-2]	4.09[-3]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	9.949	3.10[13]	6.90[-1]	9.04[-2]	9.485	3.49[13]	7.05[-1]	8.81[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	9.940	1.48[12]	4.39[-2]	2.87[-3]	9.478	1.53[12]	4.12[-2]	2.57[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	9.939	3.20[11]	2.37[-3]	3.10[-4]	9.477	2.33[11]	1.57[-3]	1.96[-4]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	9.927	1.26[12]	1.86[-2]	2.43[-3]	9.467	1.53[12]	2.07[-2]	2.57[-3]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{3/2}$	9.910	3.12[12]	3.06[-2]	5.98[-3]	9.448	3.56[12]	3.18[-2]	5.93[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	9.889	1.40[13]	1.02[-1]	1.33[-2]	9.429	1.57[13]	1.04[-1]	1.30[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	9.870	2.31[13]	1.69[-1]	2.19[-2]	9.410	2.59[13]	1.72[-1]	2.13[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	9.860	1.37[13]	1.00[-1]	1.30[-2]	9.401	1.54[13]	1.02[-1]	1.26[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	9.856	1.89[13]	2.76[-1]	1.79[-2]	9.397	2.11[13]	2.81[-1]	1.73[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	9.838	4.38[12]	9.59[-2]	1.24[-2]	9.383	5.03[12]	1.00[-1]	1.23[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	9.821	1.75[13]	1.69[-1]	3.27[-2]	9.366	1.96[13]	1.71[-1]	3.17[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	9.804	1.60[13]	2.30[-1]	4.46[-2]	9.350	1.79[13]	2.35[-1]	4.34[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	9.808	1.80[12]	3.90[-2]	5.04[-3]	9.357	2.10[12]	4.13[-2]	5.08[-3]
$p^2[^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{3/2}$	9.748	3.74[11]	3.56[-3]	6.84[-4]	9.305	3.34[11]	2.89[-3]	5.32[-4]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	9.720	2.83[12]	4.01[-2]	5.12[-3]	9.273	2.61[12]	3.38[-2]	4.12[-3]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	9.680	1.03[13]	1.94[-1]	3.70[-2]	9.243	1.15[13]	1.98[-1]	3.60[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2D_{3/2}$	9.677	1.01[13]	2.82[-1]	1.80[-2]	9.239	1.14[13]	2.91[-1]	1.77[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	9.663	1.43[13]	2.00[-1]	3.82[-2]	9.224	1.59[13]	2.03[-1]	3.70[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	9.611	1.44[13]	2.00[-1]	1.27[-2]	9.179	1.61[13]	2.03[-1]	1.23[-2]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	9.583	2.16[13]	2.97[-1]	3.76[-2]	9.153	2.41[13]	3.03[-1]	3.66[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	9.575	1.08[13]	7.38[-2]	9.32[-3]	9.144	1.21[13]	7.58[-2]	9.11[-3]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	9.564	1.95[13]	2.67[-1]	3.36[-2]	9.135	2.23[13]	2.79[-1]	3.35[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	9.552	1.56[13]	2.13[-1]	2.68[-2]	9.120	1.75[13]	2.19[-1]	2.63[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	9.500	1.71[13]	2.31[-1]	1.44[-2]	9.074	1.91[13]	2.37[-1]	1.42[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4F_{3/2}$	9.505	2.62[13]	7.09[-1]	4.43[-2]	9.078	2.94[13]	7.28[-1]	4.35[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	9.487	2.75[13]	7.41[-1]	4.63[-2]	9.062	3.08[13]	7.60[-1]	4.53[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	9.482	2.71[12]	5.47[-2]	6.85[-3]	9.056	2.92[12]	5.42[-2]	6.44[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	9.451	2.29[12]	4.59[-2]	5.71[-3]	9.028	2.46[12]	4.52[-2]	5.37[-3]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^2F_{5/2}$	9.289	3.62[12]	4.71[-2]	8.62[-3]	8.880	4.24[12]	5.01[-2]	8.79[-3]

Lower level	Upper level	λ	A	f	S	λ	A	f	S
			Z=99				Z=100		
$p^2(^1S)s\ ^2S_{1/2}$	$p^2(^3P)p\ ^2P_{3/2}$	20.222	9.68[11]	1.19[-1]	1.58[-2]	19.632	1.03[12]	1.19[-1]	1.54[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{1/2}$	19.841	1.44[12]	8.49[-2]	1.11[-2]	19.270	1.53[12]	8.51[-2]	1.08[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{5/2}$	19.652	6.61[11]	5.76[-2]	1.49[-2]	19.074	6.99[11]	5.76[-2]	1.44[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^1D)s\ ^2D_{5/2}$	19.456	1.37[12]	1.17[-1]	2.99[-2]	18.900	1.46[12]	1.17[-1]	2.92[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4F_{7/2}$	19.425	1.08[12]	8.15[-2]	3.12[-2]	18.870	1.16[12]	8.25[-2]	3.07[-2]
$p^2(^3P)s\ ^2P_{1/2}$	$sp(^1P)d\ ^2P_{3/2}$	19.308	1.07[12]	1.20[-1]	1.52[-2]	18.760	1.14[12]	1.20[-1]	1.48[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4F_{5/2}$	19.293	1.25[12]	1.04[-1]	2.66[-2]	18.744	1.33[12]	1.05[-1]	2.60[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	7.211	4.51[11]	5.26[-3]	5.02[-4]	6.864	5.17[11]	5.46[-3]	4.94[-4]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	7.143	7.19[11]	5.51[-3]	5.18[-4]	6.800	8.12[11]	5.66[-3]	5.05[-4]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	7.014	2.92[12]	3.23[-2]	2.98[-3]	6.683	3.46[12]	3.48[-2]	3.06[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{5/2}$	6.990	5.74[12]	4.20[-2]	5.82[-3]	6.661	6.43[12]	4.27[-2]	5.62[-3]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4P_{3/2}$	6.949	1.03[13]	1.49[-1]	6.81[-3]	6.624	1.09[13]	1.43[-1]	6.24[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2F_{7/2}$	6.949	9.19[11]	8.90[-3]	1.22[-3]	6.623	9.97[11]	8.73[-3]	1.14[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^3P)d\ ^2P_{3/2}$	6.920	3.78[12]	1.81[-2]	2.47[-3]	6.596	4.22[12]	1.84[-2]	2.39[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	6.927	4.81[12]	5.17[-2]	4.72[-3]	6.604	5.10[12]	5.02[-2]	4.37[-3]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4D_{3/2}$	6.886	4.64[12]	6.59[-2]	2.99[-3]	6.567	5.52[12]	7.13[-2]	3.08[-3]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	6.860	1.02[13]	7.16[-2]	6.47[-3]	6.541	1.11[13]	7.06[-2]	6.10[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4P_{3/2}$	6.864	1.97[12]	1.39[-2]	1.25[-3]	6.545	2.01[12]	1.29[-2]	1.11[-3]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^4D_{1/2}$	6.847	1.01[12]	7.10[-3]	3.20[-4]	6.530	1.01[12]	6.50[-3]	2.80[-4]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2F_{7/2}$	6.832	4.18[13]	3.90[-1]	5.25[-2]	6.515	4.69[13]	3.97[-1]	5.11[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1D)s\ ^2D_{3/2}$	6.828	3.12[12]	4.35[-2]	1.96[-3]	6.513	3.22[12]	4.11[-2]	1.76[-3]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	6.802	7.83[13]	8.14[-1]	7.30[-2]	6.489	8.78[13]	8.29[-1]	7.10[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^4S_{3/2}$	6.805	1.52[12]	2.12[-2]	9.48[-4]	6.492	1.49[12]	1.88[-2]	8.05[-4]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	6.803	5.68[12]	3.95[-2]	3.54[-3]	6.490	6.71[12]	4.23[-2]	3.61[-3]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4P_{3/2}$	6.780	8.52[12]	3.91[-2]	5.26[-3]	6.469	9.56[12]	4.01[-2]	5.11[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^4D_{1/2}$	6.765	3.48[13]	1.19[-1]	1.07[-2]	6.453	3.89[13]	1.21[-1]	1.03[-2]
$p^2(^3P)s\ ^2P_{3/2}$	$sp(^3P)d\ ^2P_{1/2}$	6.755	5.75[13]	1.98[-1]	1.75[-2]	6.444	6.44[13]	2.01[-1]	1.70[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^1S)s\ ^2S_{1/2}$	6.746	4.64[13]	3.17[-1]	1.41[-2]	6.436	5.19[13]	3.23[-1]	1.37[-2]
$s^2(^1S)p\ ^2P_{3/2}$	$p^2(^3P)s\ ^2P_{1/2}$	6.748	3.40[13]	1.16[-1]	1.03[-2]	6.438	3.80[13]	1.18[-1]	1.00[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	6.746	1.28[13]	1.31[-1]	1.17[-2]	6.436	1.45[13]	1.36[-1]	1.15[-2]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2P_{3/2}$	6.730	4.29[13]	1.94[-1]	2.59[-2]	6.422	4.80[13]	1.98[-1]	2.51[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{5/2}$	6.739	5.75[12]	5.87[-2]	5.23[-3]	6.432	6.61[12]	6.17[-2]	5.21[-3]
$p^2(^1D)s\ ^2D_{5/2}$	$sp(^1P)d\ ^2D_{5/2}$	6.722	3.97[13]	2.69[-1]	3.57[-2]	6.414	4.46[13]	2.74[-1]	3.47[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2D_{3/2}$	6.680	2.71[13]	3.64[-1]	1.60[-2]	6.378	3.07[13]	3.75[-1]	1.57[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^4D_{7/2}$	6.688	2.53[13]	2.26[-1]	2.99[-2]	6.386	2.83[13]	2.30[-1]	2.91[-2]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^2D_{5/2}$	6.665	3.32[13]	2.21[-1]	2.91[-2]	6.363	3.68[13]	2.23[-1]	2.80[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$p^2(^3P)p\ ^2P_{1/2}$	6.652	3.50[13]	2.32[-1]	1.02[-2]	6.352	3.92[13]	2.37[-1]	9.92[-3]
$s^2(^1S)d\ ^2D_{3/2}$	$sp(^1P)d\ ^2D_{3/2}$	6.635	5.26[13]	3.47[-1]	3.03[-2]	6.337	5.85[13]	3.54[-1]	2.95[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4P_{1/2}$	6.626	2.62[13]	8.62[-2]	7.52[-3]	6.328	2.92[13]	8.77[-2]	7.31[-3]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^4D_{3/2}$	6.622	5.41[13]	3.57[-1]	3.12[-2]	6.324	6.10[13]	3.65[-1]	3.04[-2]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	6.602	3.99[13]	2.62[-1]	2.27[-2]	6.305	4.47[13]	2.68[-1]	2.22[-2]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{1/2}$	6.581	4.36[13]	2.83[-1]	1.23[-2]	6.286	4.89[13]	2.90[-1]	1.20[-2]
$p^2(^3P)s\ ^4P_{1/2}$	$sp(^3P)d\ ^4F_{3/2}$	6.582	6.70[13]	8.71[-1]	3.78[-2]	6.287	7.54[13]	8.93[-1]	3.69[-2]
$s^2(^1S)p\ ^2P_{1/2}$	$p^2(^3P)s\ ^2P_{3/2}$	6.573	6.94[13]	9.02[-1]	3.91[-2]	6.278	7.82[13]	9.24[-1]	3.82[-2]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^2D_{5/2}$	6.568	4.82[12]	4.69[-2]	4.05[-3]	6.273	5.19[12]	4.59[-2]	3.79[-3]
$p^2(^1D)s\ ^2D_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	6.549	4.19[12]	4.05[-2]	3.50[-3]	6.256	4.58[12]	4.03[-2]	3.32[-3]
$p^2(^3P)s\ ^4P_{5/2}$	$sp(^3P)d\ ^2F_{5/2}$	6.473	1.22[13]	7.69[-2]	9.85[-3]	6.186	1.42[13]	8.13[-2]	9.94[-3]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^2D_{3/2}$	6.432	2.06[12]	1.27[-2]	1.08[-3]	6.148	2.38[12]	1.35[-2]	1.09[-3]
$p^2(^3P)s\ ^4P_{3/2}$	$sp(^3P)d\ ^2F_{5/2}$	6.381	7.26[11]	6.67[-3]	5.58[-4]	6.101	8.37[11]	7.01[-3]	5.65[-4]
$p^2(^1S)s\ ^2S_{1/2}$	$sp(^3P)d\ ^2P_{3/2}$	5.818	5.53[11]	5.60[-3]	2.15[-4]	5.552	5.83[11]	5.37[-3]	1.97[-4]

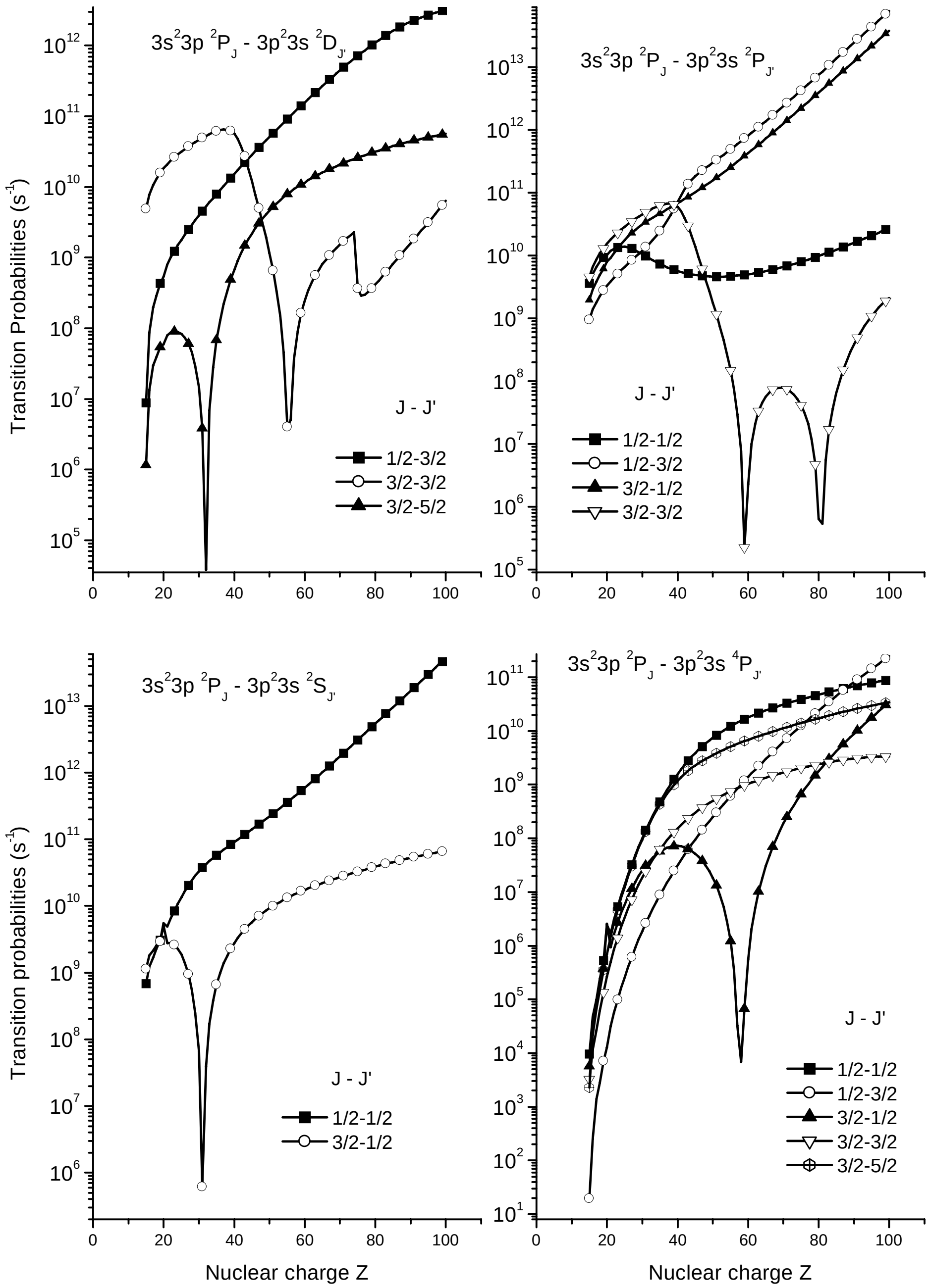

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Figure 4: Transition rates $A[3s^2 3p(LSJ) - 3p^2 3s(L'S'J')]$ as function of Z.

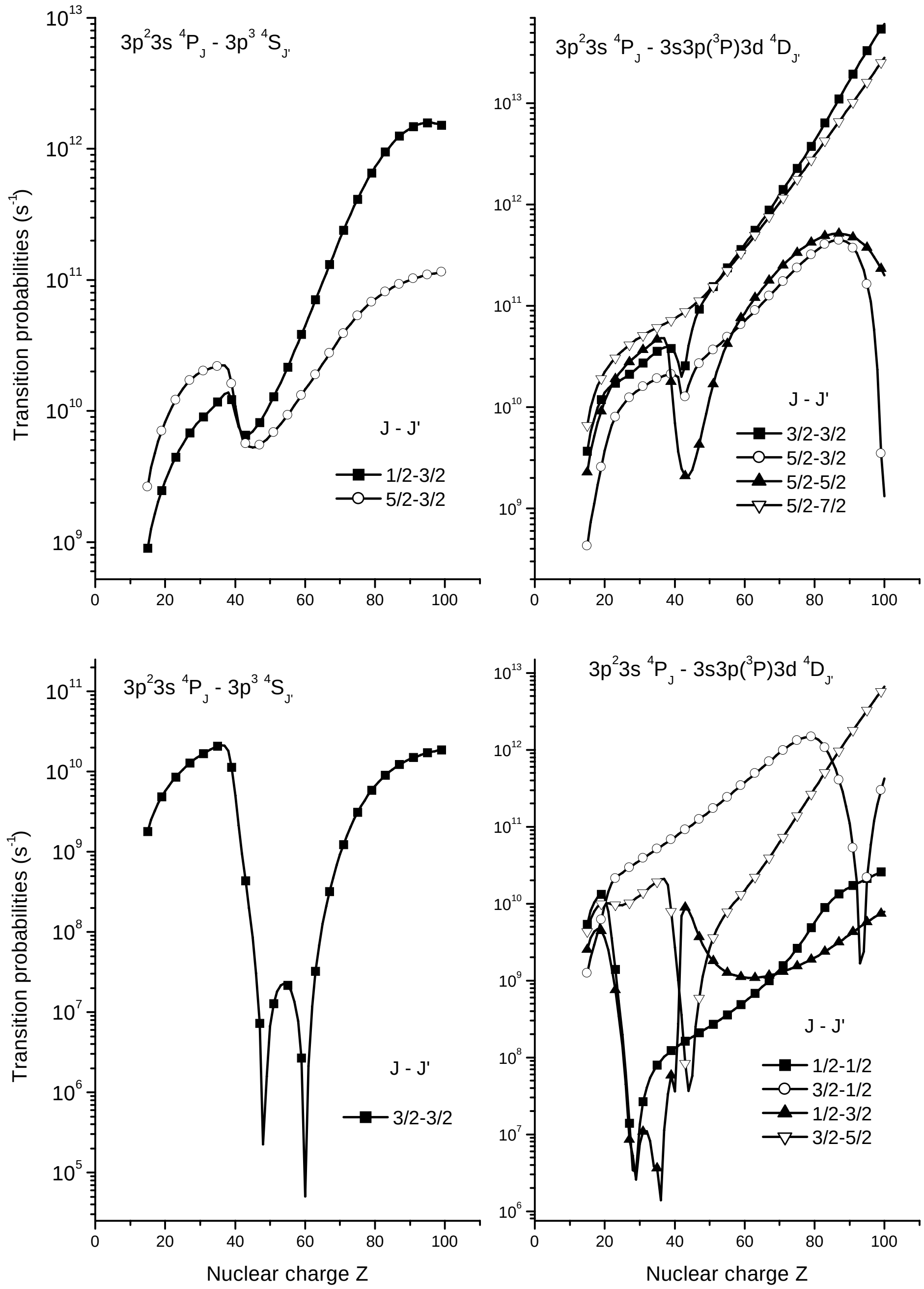

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Figure 5: Transition rates $A[3p^23s(^4P_J) - 3p^3(^4S_{J'})]$, $A[3p^23s(^4P_J) - 3s3p(^3P)3d(^4D_{J'})]$ as function of Z.

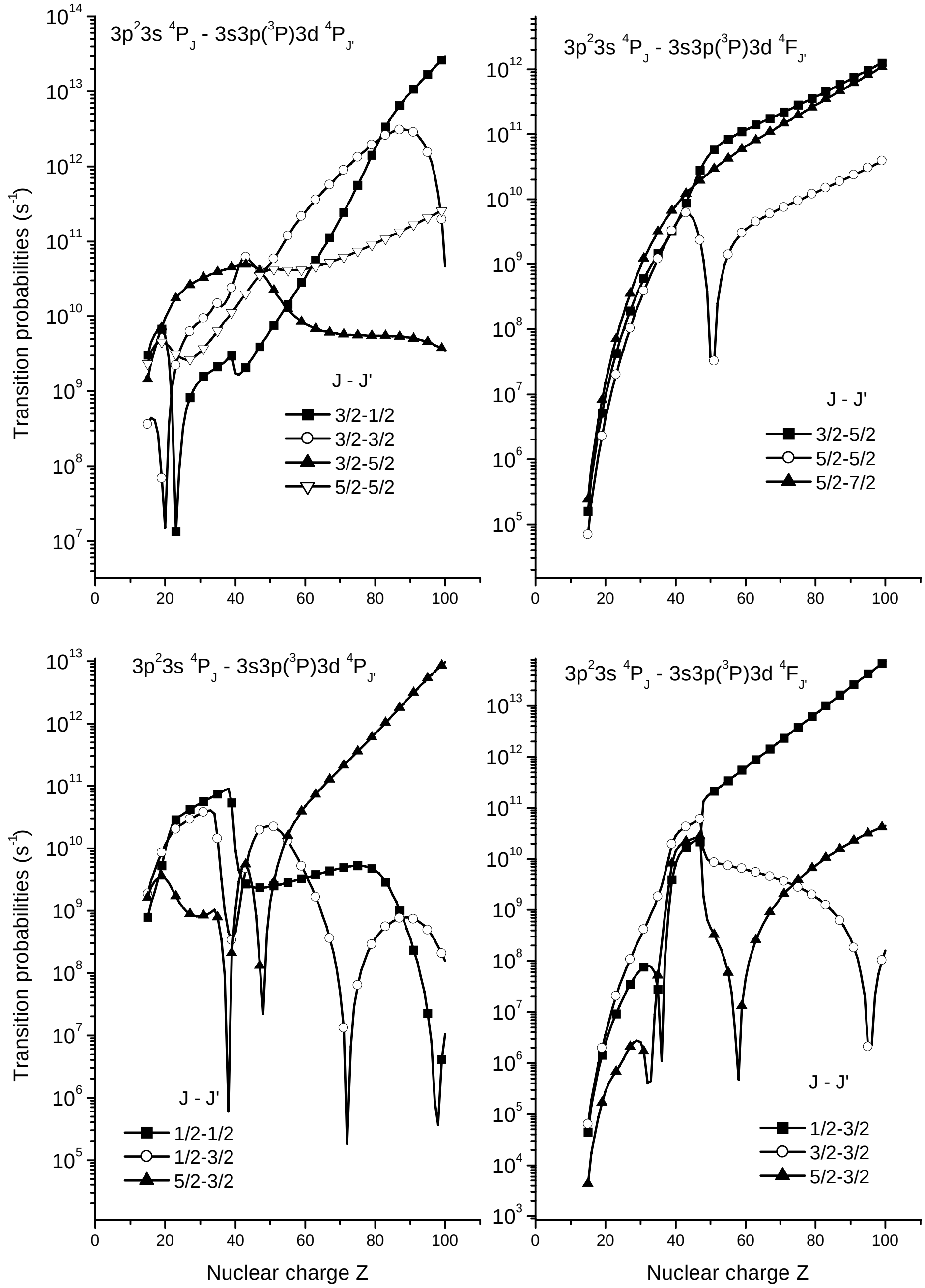

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Figure 6: Transition rates $A[3p^23s(^4P_J) - 3s3p(^3P)3d(^4P_{J'})]$, $A[3p^23s(^4P_J) - 3s3p(^3P)3d(^4F_{J'})]$ as function of Z.

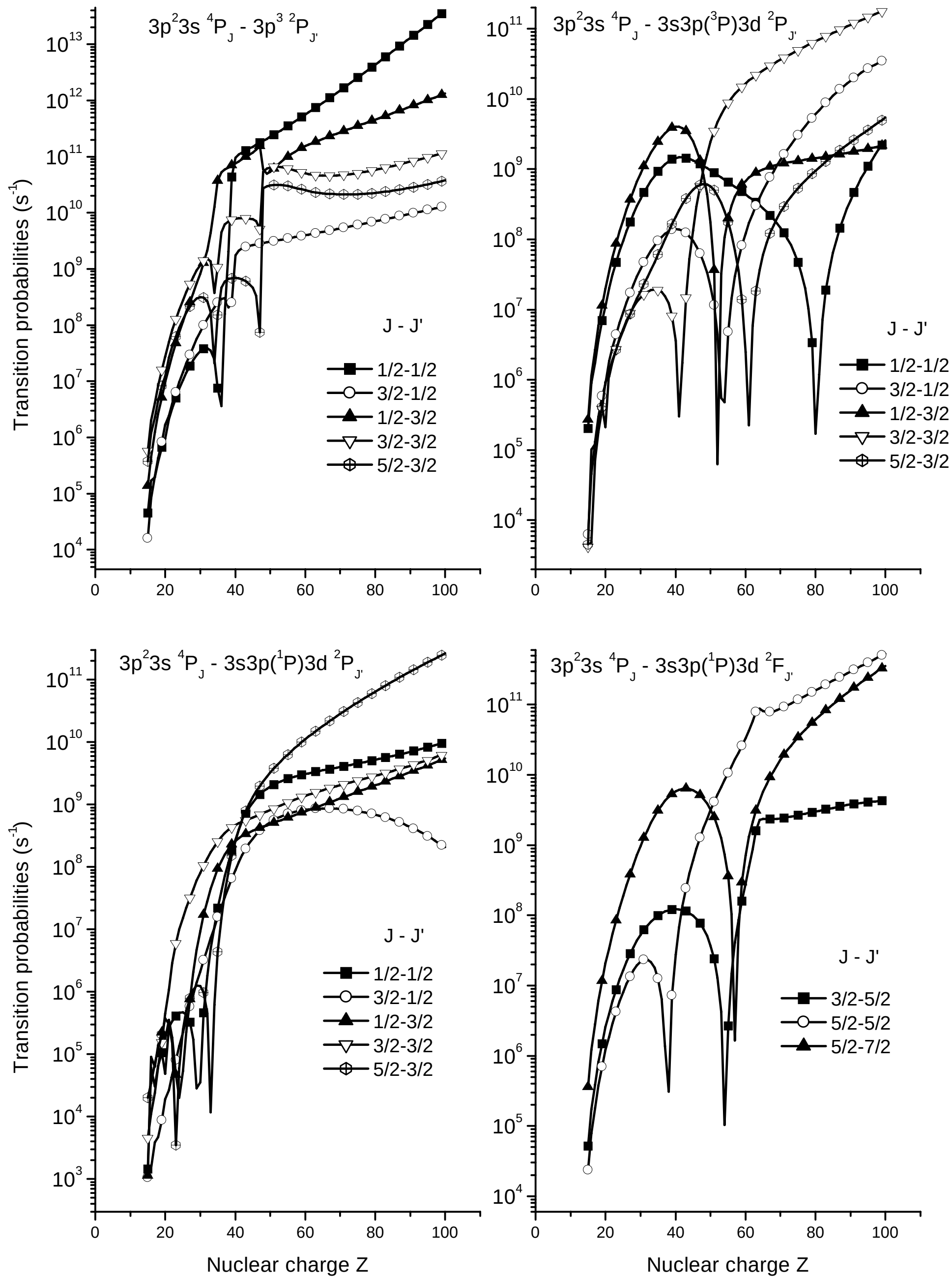

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Figure 7: Transition rates $A[3p^2 3s(^4P_J) - 3p^3(^2P_{J'})$, $A[3p^2 3s(^4P_J) - 3s3p(^{1,3}P)3d(^2L_{J'})$ as function of Z.

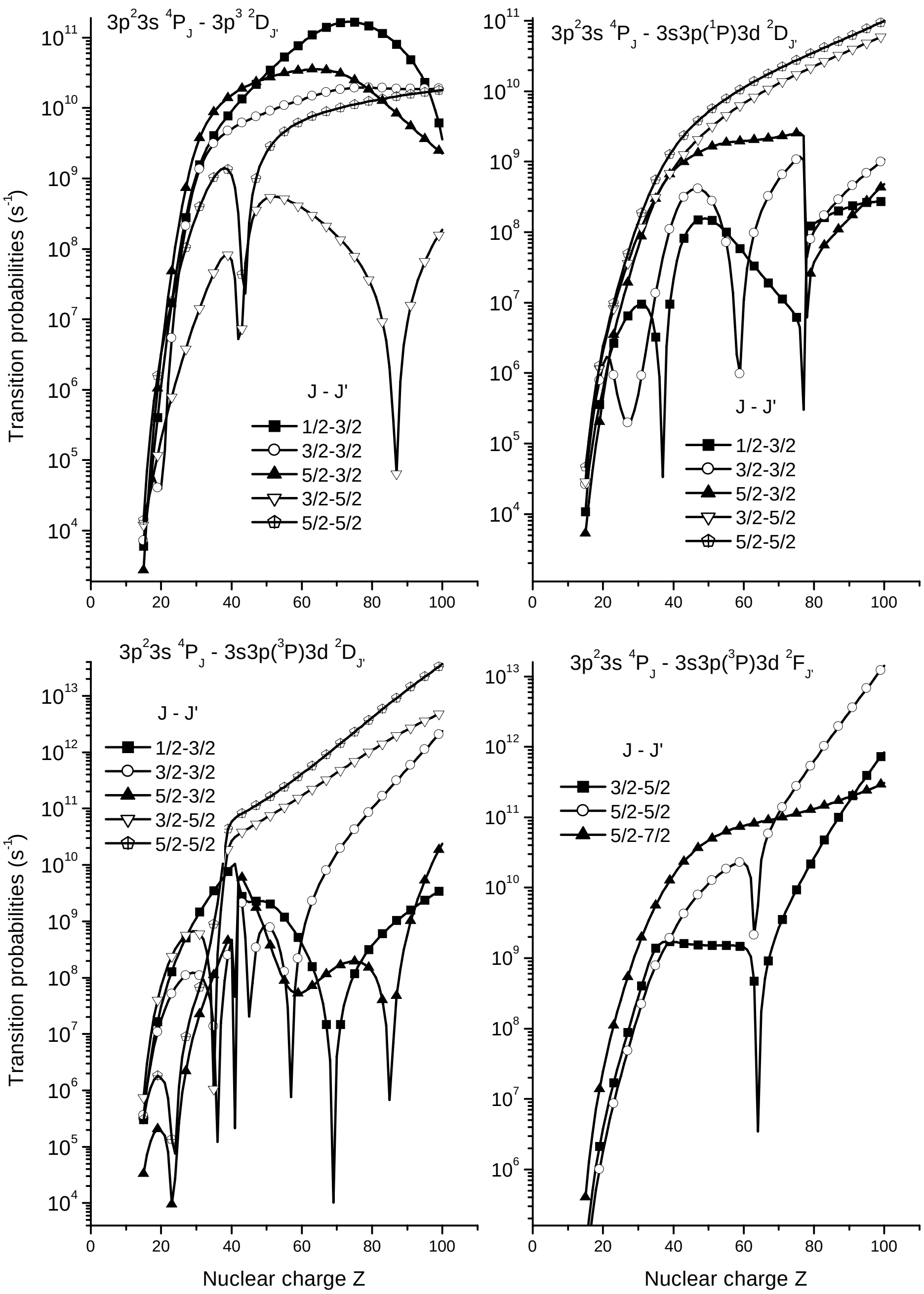

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Figure 8: Transition rates $A[3p^2 3s(^4P_J) - 3p^3(^2D_{J'})]$, $A[3p^2 3s(^4P_J) - 3s3p(^{1,3}P)3d(^2L_{J'})]$ as function of Z.

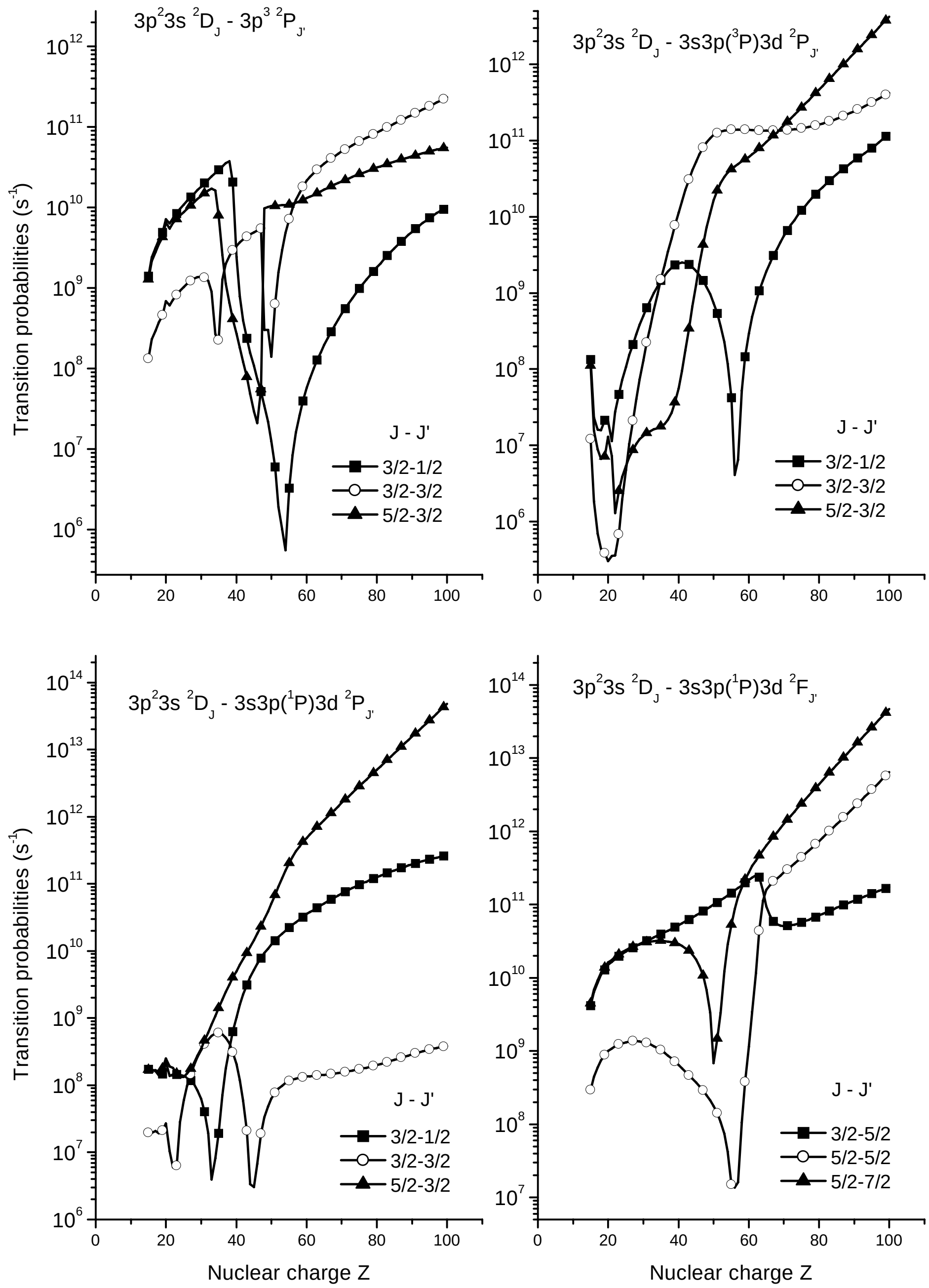

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Figure 9: Transition rates $A[3p^2 3s(^2D_J) - 3p^3(^2P_{J'})]$, $A[3p^2 3s(^2D_J) - 3s3p(^{1,3}P)3d(^2P_{J'})]$, and $A[3p^2 3s(^2D_J) - 3s3p(^1P)3d(^2F_{J'})]$ as function of Z.

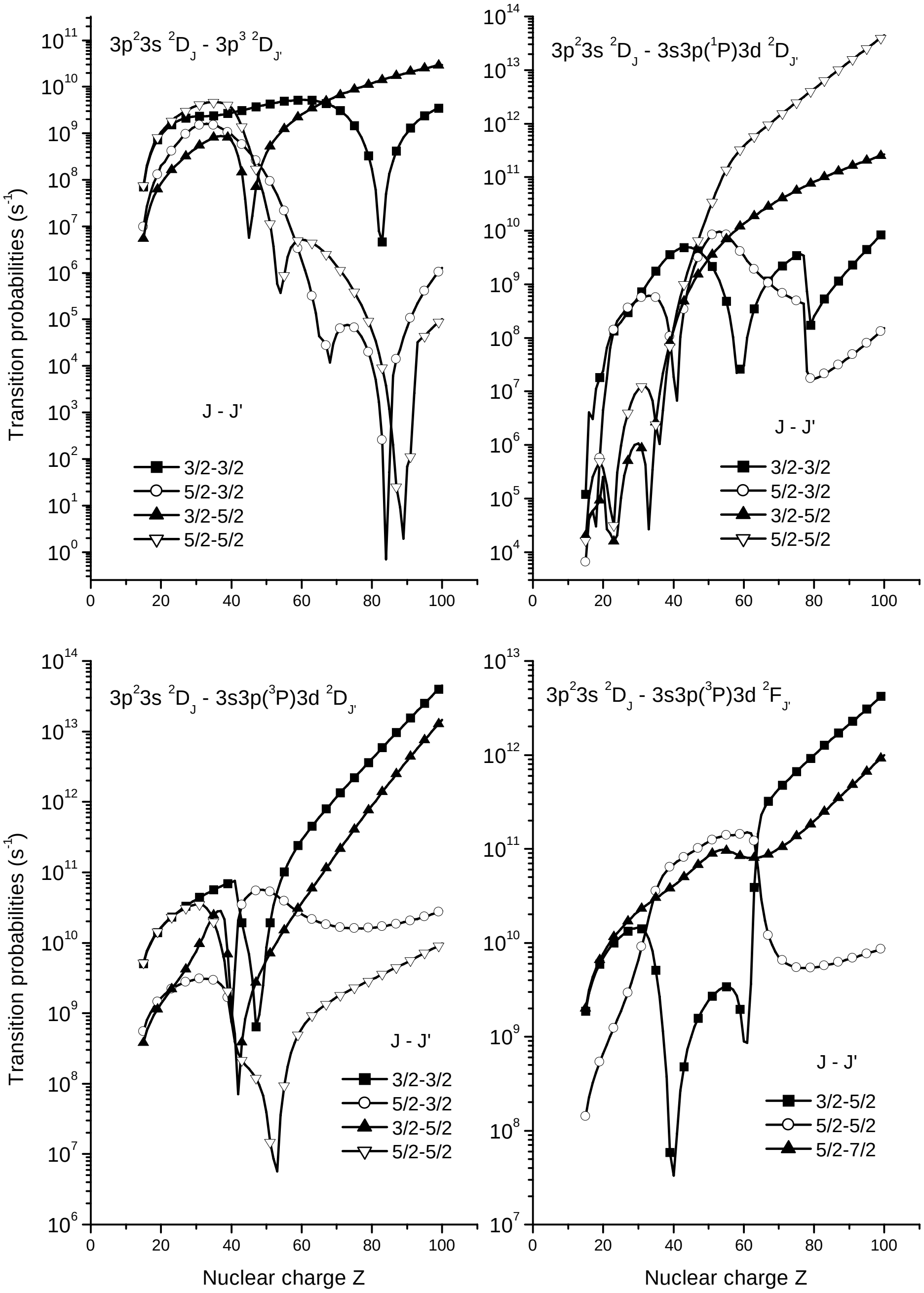

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Figure 10: Transition rates $A[3p^2 3s(^2D_J) - 3p^3(^2D_{J'})]$, $A[3p^2 3s(^2D_J) - 3s3p(^{1,3}P)3d(^2D_{J'})]$, and $A[3p^2 3s(^2D_J) - 3s3p(^3P)3d(^2F_{J'})]$ as function of Z.

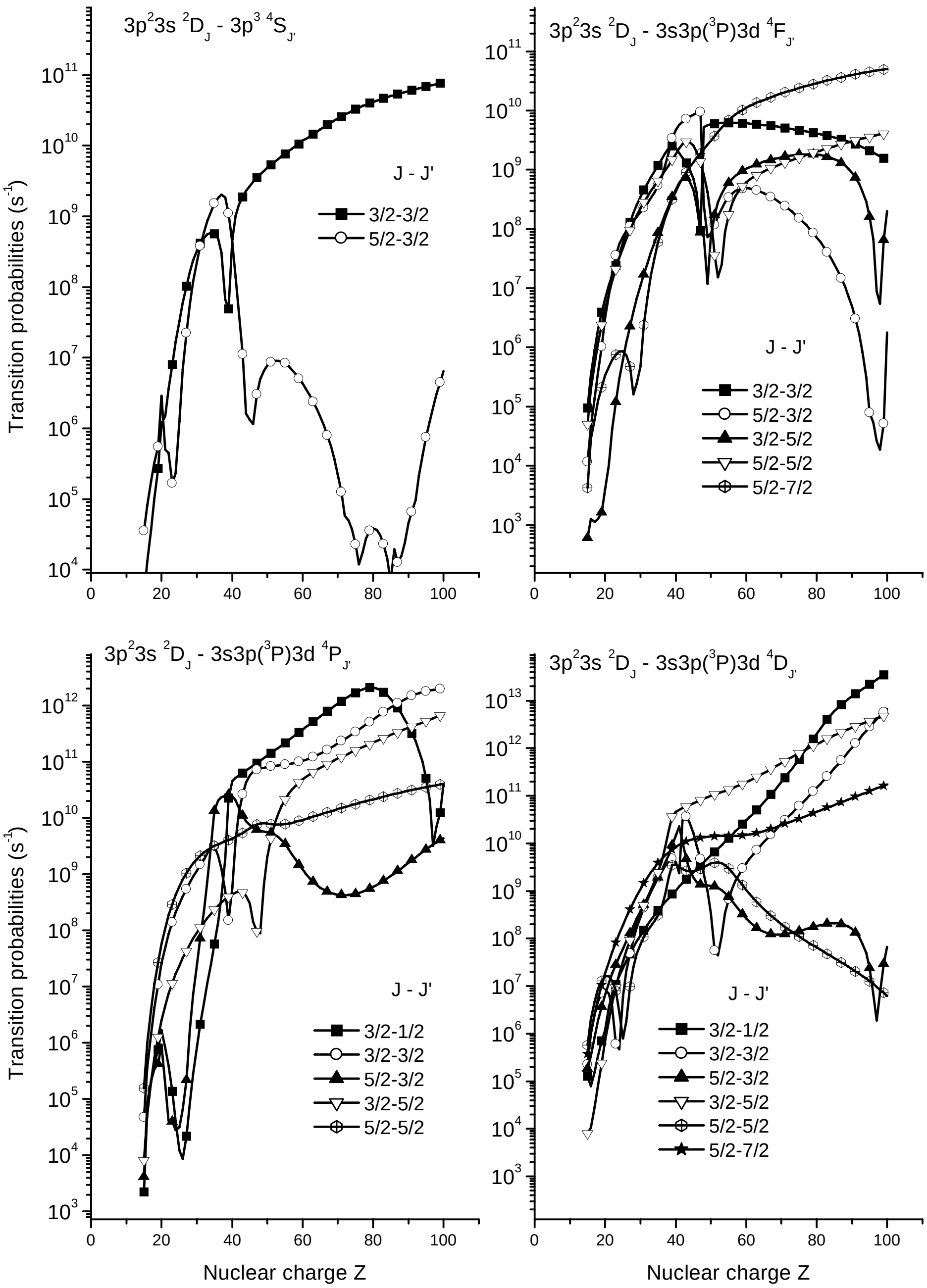

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Figure 11: Transition rates $A[3p^23s(^2D_J) - 3p^3(^4S_{J'})]$, $A[3p^23s(^2D_J) - 3s3p(^3P)3d(^4L_{J'})]$ as function of Z.

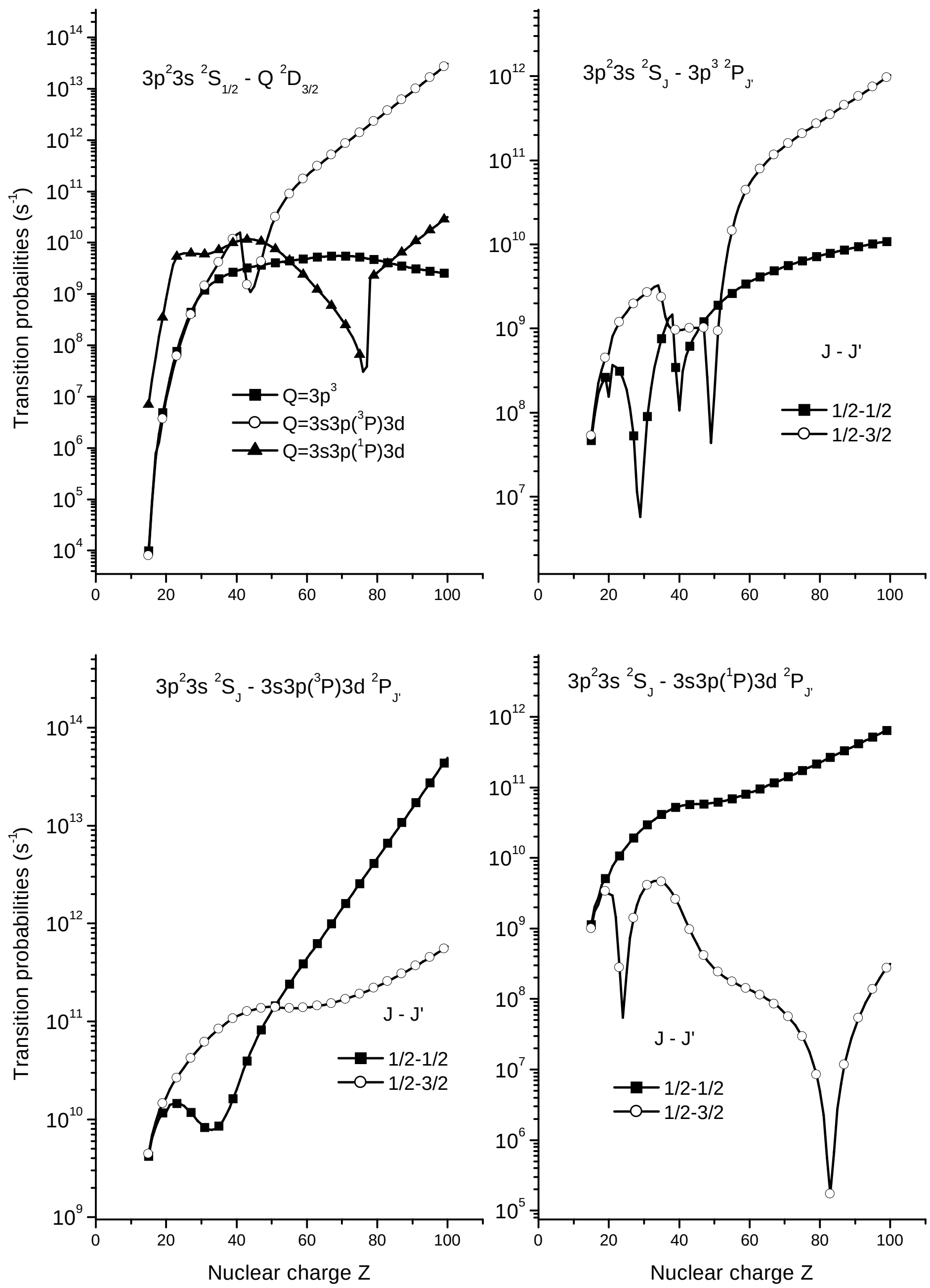

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Figure 12: Transition rates $A[3p^23s(^2S_J) - 3p^3(^2D_{J'},\ ^2P_{J'})]$ and $A[3p^23s(^2S_J) - 3s3p(^{1,3}P)3d(^2D_{J'},\ ^2P_{J'})]$ as function of Z.

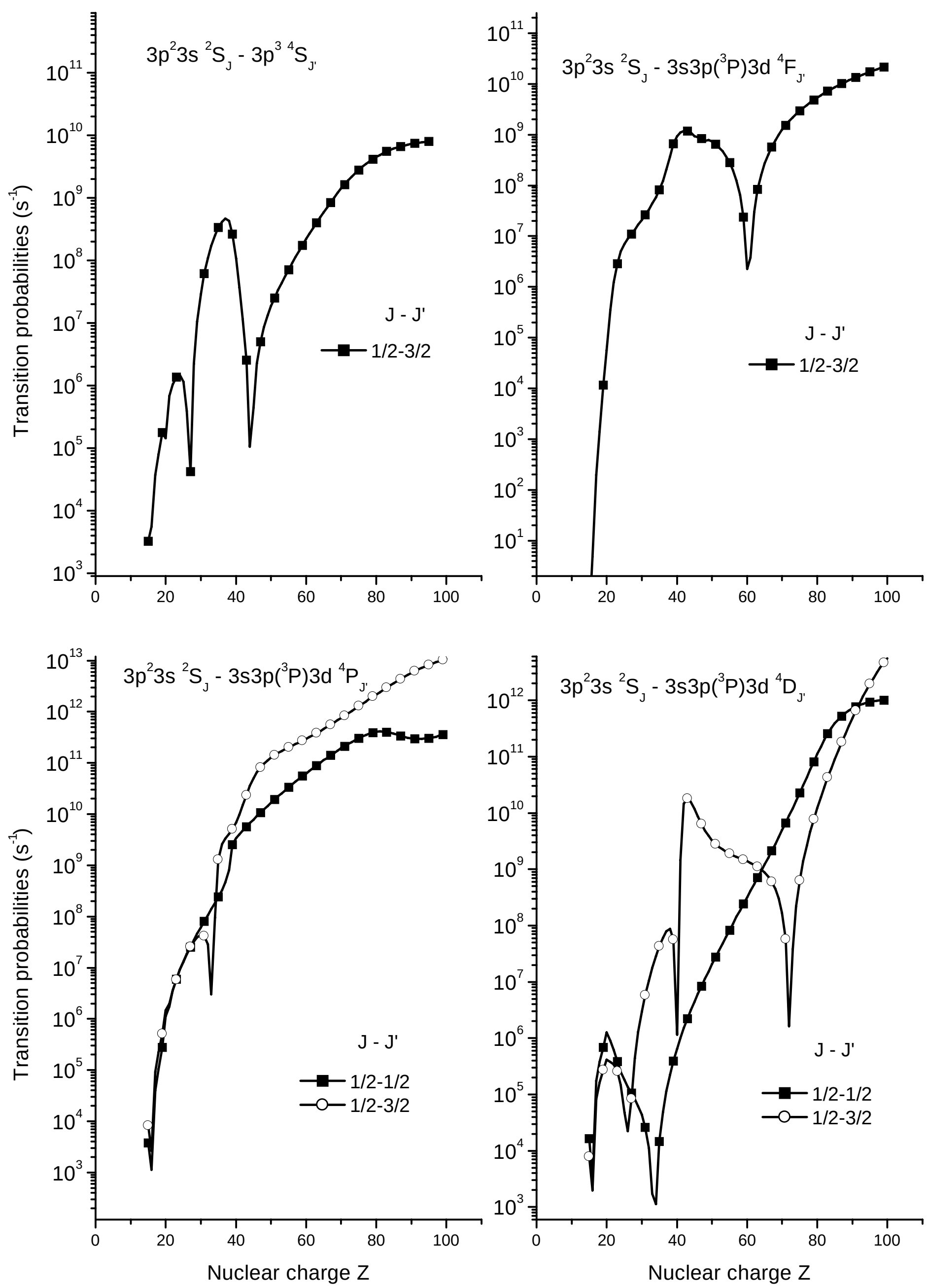

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Figure 13: Transition rates $A[3p^23s(^2S_J) - 3p^3(^4S_{J'})]$, $A[3p^23s(^2S_J) - 3s3p(^3P)3d(^4L_{J'})]$ as function of Z.

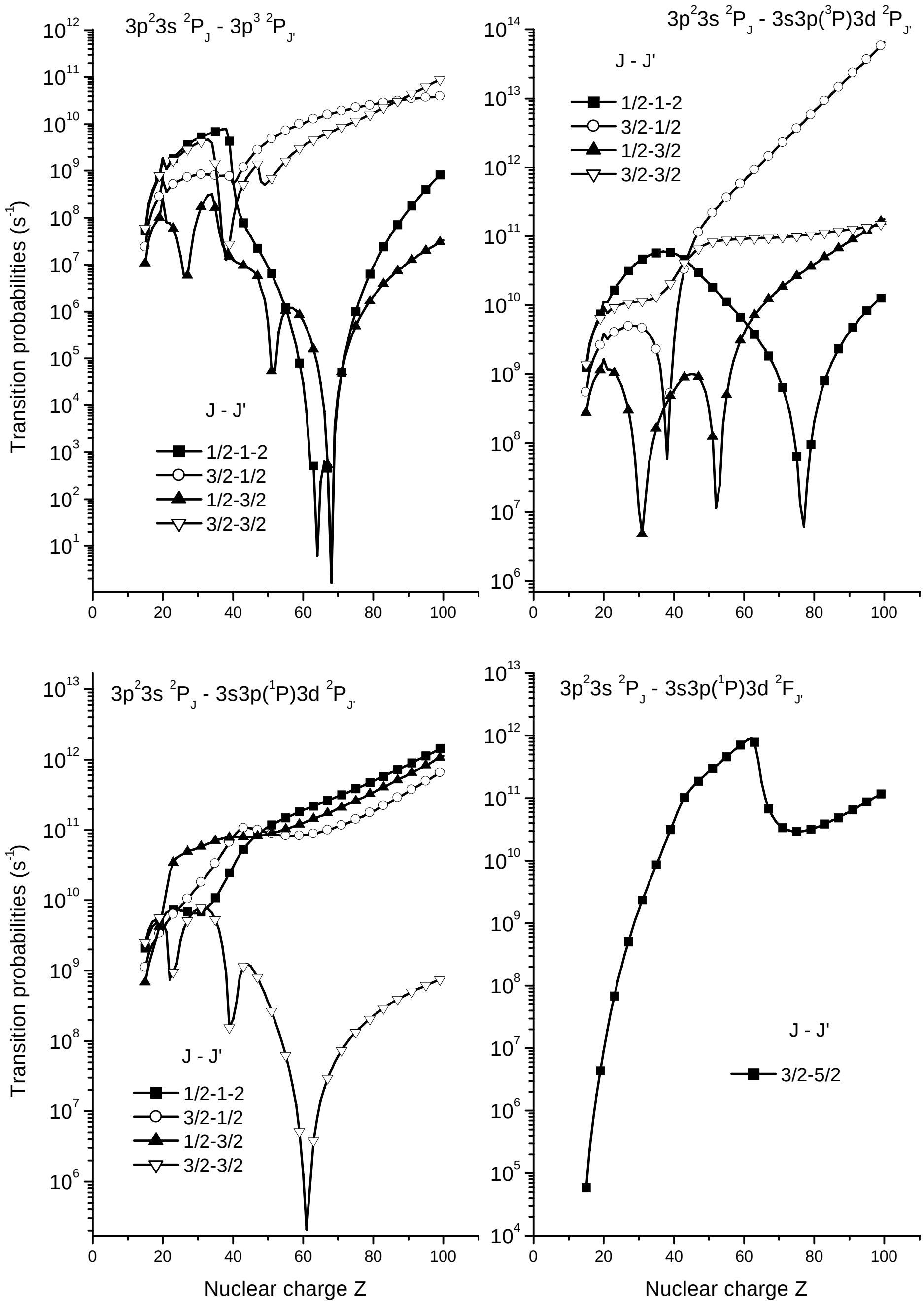

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Figure 14: Transition rates $A[3p^2 3s(^2P_J) - 3p^3(^2P_{J'})]$, $A[3p^2 3s(^2P_J) - 3s3p(^{1,3}P)3d(^2P_{J'})]$, and $A[3p^2 3s(^2P_J) - 3s3p(^1P)3d(^2F_{J'})]$ as function of Z.

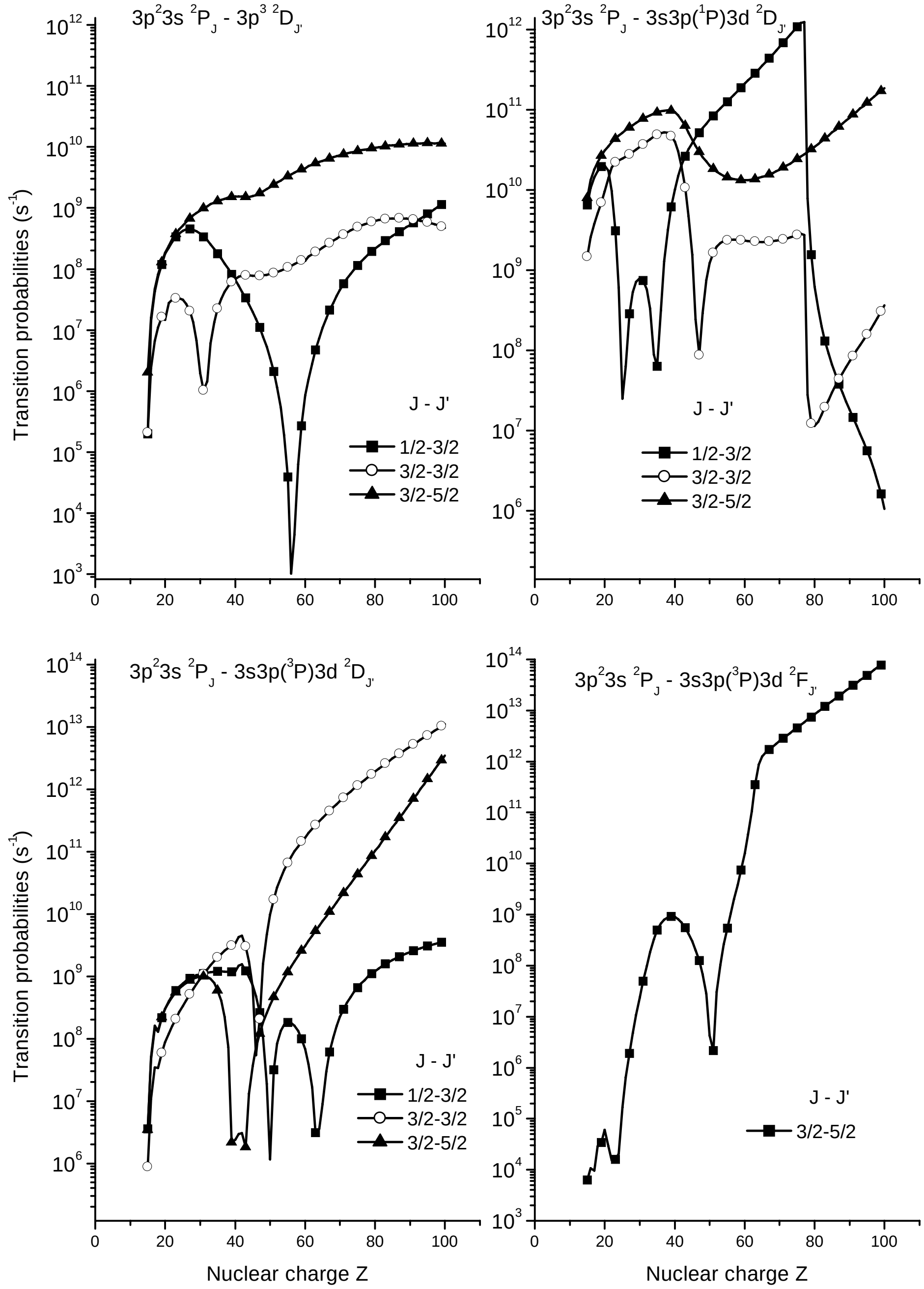

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Figure 15: Transition rates $A[3p^2 3s(^2P_J) - 3p^3(^2D_{J'})]$, $A[3p^2 3s(^2P_J) - 3s3p(^{1,3}P)3d(^2D_{J'})]$, and $A[3p^2 3s(^2P_J) - 3s3p(^3P)3d(^2F_{J'})]$ as function of Z.

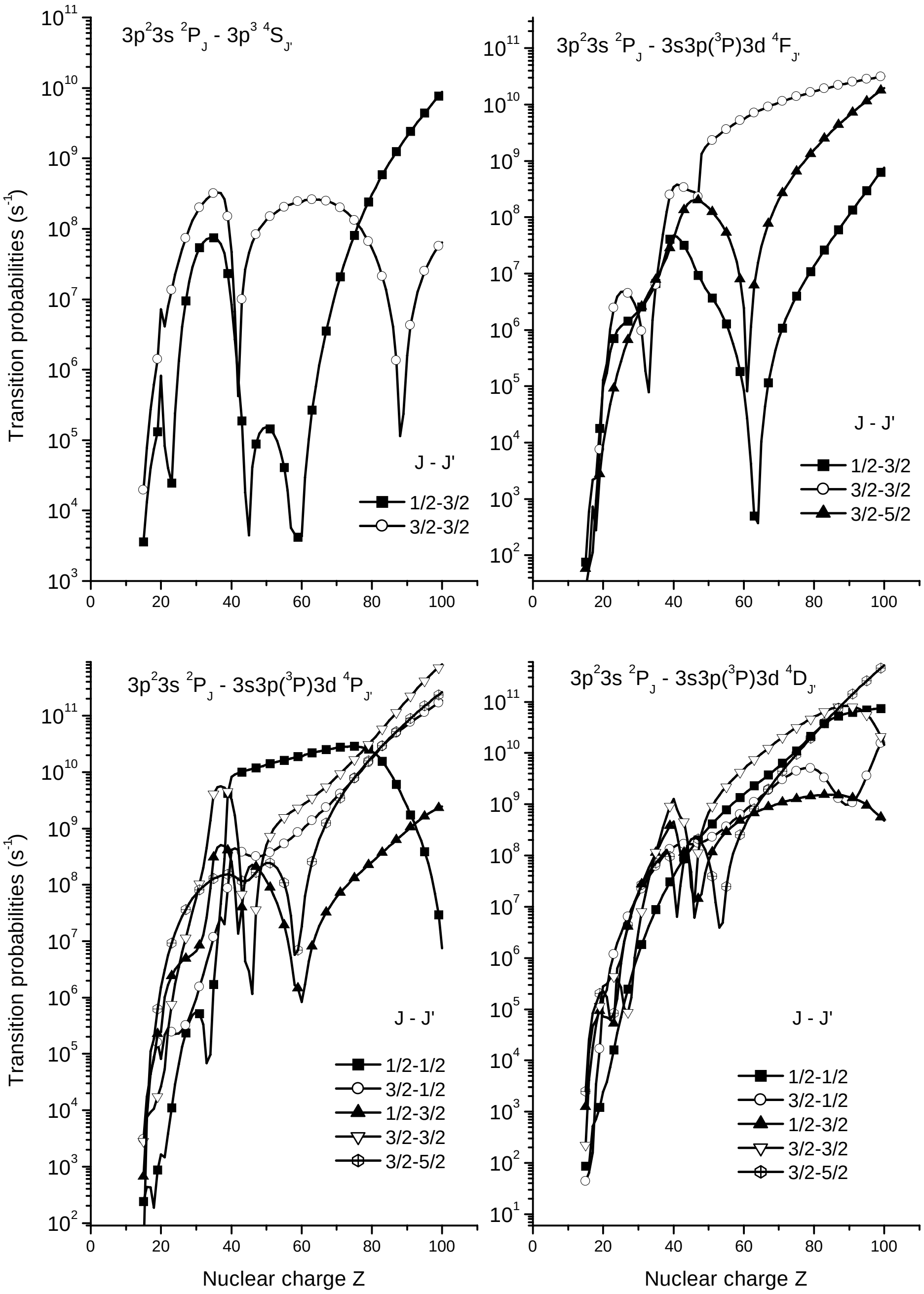

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Figure 16: Transition rates $A[3p^23s(^2P_J) - 3p^3(^4S_{J'})]$, $A[3p^23s(^2P_J) - 3s3p(^3P)3d(^4L_{J'})]$ as function of Z.

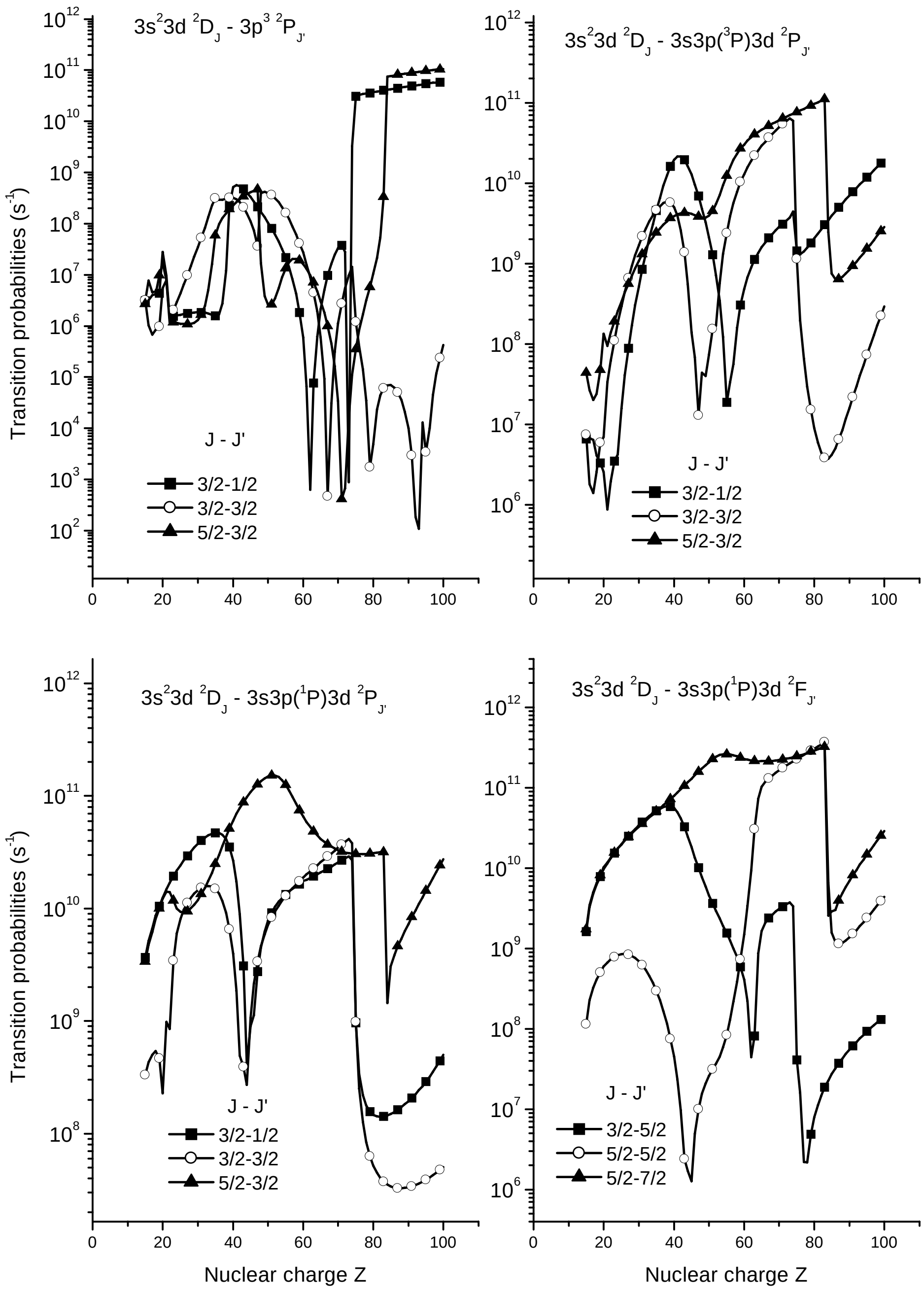

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Figure 17: Transition rates $A[3s^23d(^2D_J)-3p^3(^2P_{J'})]$, $A[3s^23d(^2D_J)-3s3p(^{1,3}P)3d(^2P_{J'})]$, and $A[3s^23d(^2D_J)-3s3p(^1P)3d(^2F_{J'})]$ as function of Z.

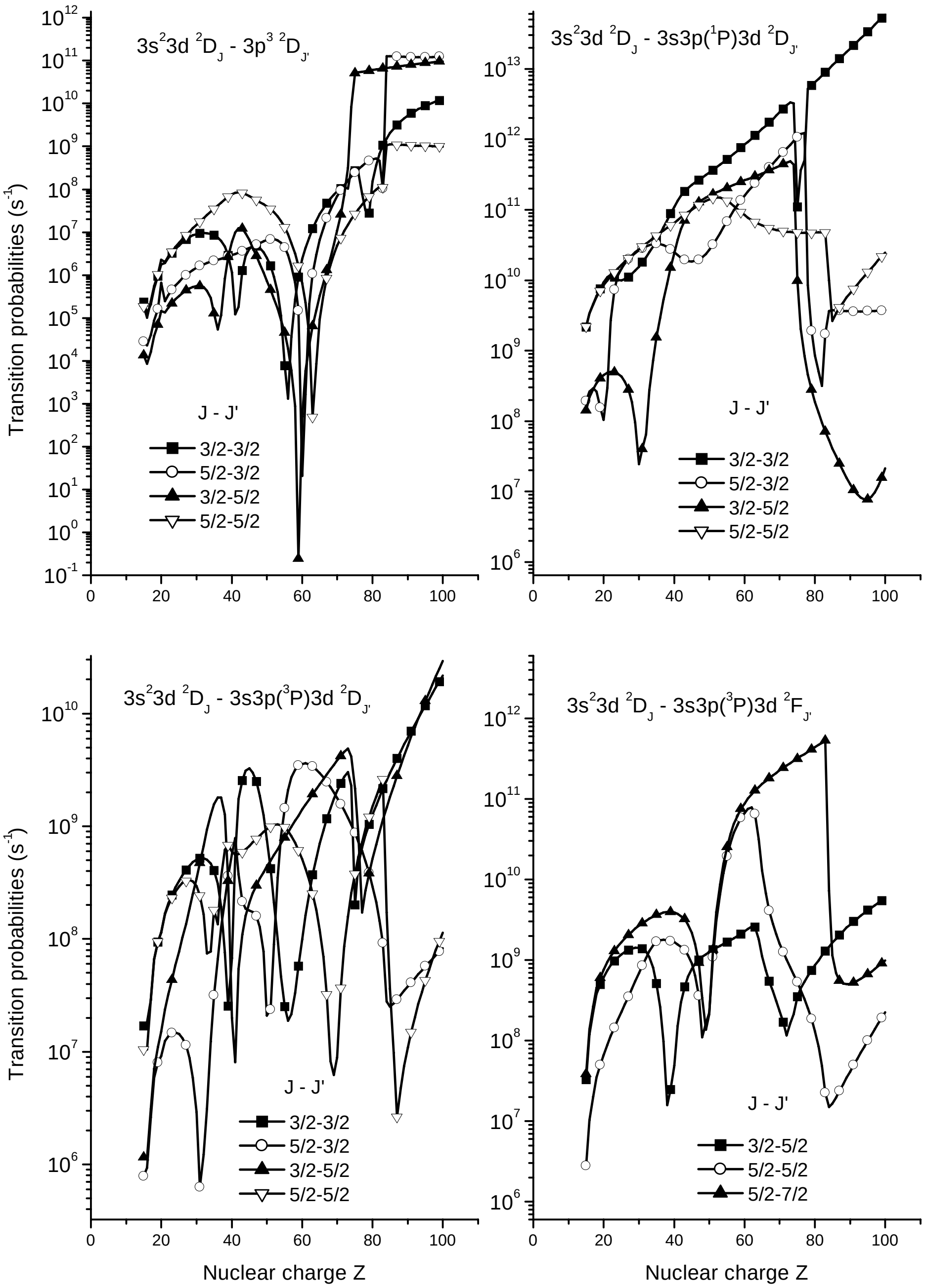

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Figure 18: Transition rates $A[3s^2 3d(^2D_J) - 3p^3(^2D_{J'})]$, $A[3s^2 3d(^2D_J) - 3s3p(^{1,3}P)3d(^2D_{J'})]$, and $A[3s^2 3d(^2D_J) - 3s3p(^3P)3d(^2F_{J'})]$ as function of Z.

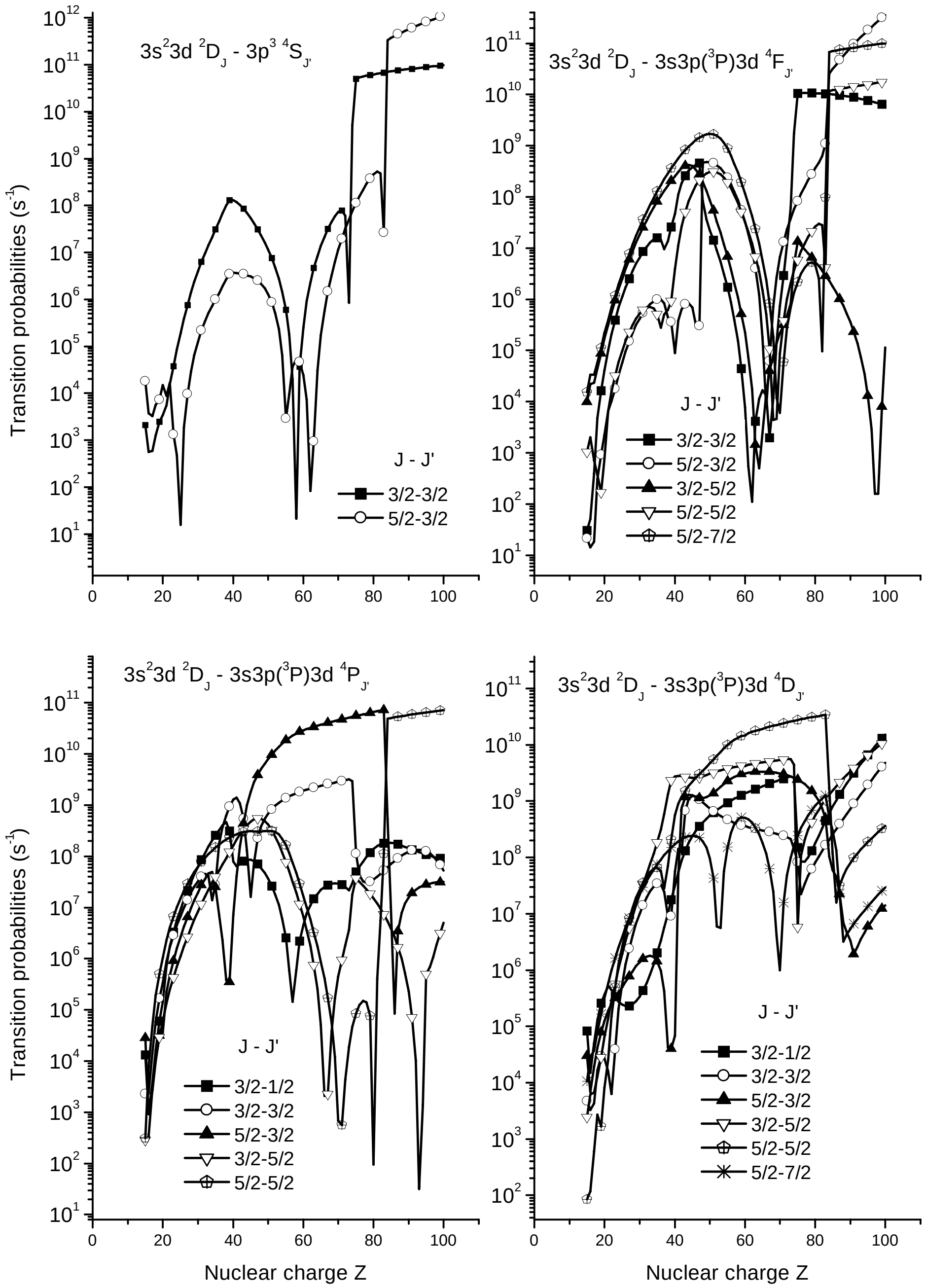

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Figure 19: Transition rates $A[3s^2 3d(^2D_J) - 3p^3(^4S_{J'})]$, $A[3s^2 3d(^2D_J) - 3s3p(^3P)3d(^4L_{J'})]$ as function of Z.

Table 11: Lifetime data (10^{-9} sec) for excited levels in Al-like ions, Z=15-100. Numbers in brackets represent powers of 10.

Z	$3p^2(^3P)3s$			$3p^2(^1D)3s$		$3p^2(^1S)3s$	$3p^2(^3P)3s$		$3s^2(^1S)3d$	
	$^4P_{1/2}$	$^4P_{3/2}$	$^4P_{5/2}$	$^2D_{3/2}$	$^2D_{5/2}$	$^2S_{1/2}$	$^2P_{1/2}$	$^2P_{3/2}$	$^2D_{3/2}$	$^2D_{5/2}$
15	6.57[4]	3.06[5]	4.39[5]	1.01[2]	1.09[2]	5.51[-1]	1.81[-1]	1.80[-1]	1.69[-1]	1.72[-1]
16	1.13[4]	8.51[4]	4.61[4]	9.98[0]	1.03[1]	3.29[-1]	1.26[-1]	1.25[-1]	1.07[-1]	1.09[-1]
17	5.60[3]	3.53[4]	1.50[4]	4.42[0]	4.63[0]	2.62[-1]	9.61[-2]	9.55[-2]	7.84[-2]	8.00[-2]
18	2.40[3]	1.54[4]	6.71[3]	3.06[0]	3.26[0]	2.06[-1]	7.78[-2]	7.66[-2]	6.38[-2]	6.54[-2]
19	1.11[3]	6.99[3]	2.85[3]	2.07[0]	2.22[0]	1.66[-1]	6.45[-2]	6.35[-2]	5.29[-2]	5.43[-2]
20	1.98[2]	3.60[3]	1.45[3]	1.68[0]	1.83[0]	9.41[-2]	5.53[-2]	5.39[-2]	4.51[-2]	4.72[-2]
21	3.82[2]	1.88[3]	6.76[2]	1.14[0]	1.27[0]	1.31[-1]	4.75[-2]	4.59[-2]	3.96[-2]	4.15[-2]
22	2.12[2]	1.09[3]	3.75[2]	9.21[-1]	1.05[0]	1.08[-1]	4.22[-2]	4.02[-2]	3.52[-2]	3.72[-2]
23	1.26[2]	6.63[2]	2.16[2]	7.64[-1]	8.85[-1]	9.06[-2]	3.79[-2]	3.55[-2]	3.16[-2]	3.37[-2]
24	7.86[1]	4.19[2]	1.29[2]	6.34[-1]	7.58[-1]	7.70[-2]	3.46[-2]	3.15[-2]	2.86[-2]	3.09[-2]
25	5.07[1]	2.75[2]	8.00[1]	5.37[-1]	6.62[-1]	6.51[-2]	3.17[-2]	2.84[-2]	2.61[-2]	2.83[-2]
26	3.34[1]	1.85[2]	5.08[1]	4.58[-1]	5.81[-1]	5.50[-2]	2.98[-2]	2.55[-2]	2.39[-2]	2.63[-2]
27	2.27[1]	1.29[2]	3.30[1]	3.94[-1]	5.24[-1]	4.71[-2]	2.79[-2]	2.31[-2]	2.19[-2]	2.44[-2]
28	1.57[1]	9.09[1]	2.20[1]	3.40[-1]	4.72[-1]	4.03[-2]	2.65[-2]	2.10[-2]	2.02[-2]	2.28[-2]
29	1.11[1]	6.62[1]	1.51[1]	2.93[-1]	4.29[-1]	3.48[-2]	2.52[-2]	1.92[-2]	1.86[-2]	2.13[-2]
30	7.98[0]	4.91[1]	1.05[1]	2.54[-1]	3.95[-1]	3.02[-2]	2.40[-2]	1.75[-2]	1.72[-2]	2.00[-2]
31	5.81[0]	3.72[1]	7.46[0]	2.20[-1]	3.66[-1]	2.67[-2]	2.29[-2]	1.61[-2]	1.59[-2]	1.89[-2]
32	4.30[0]	2.84[1]	5.41[0]	1.90[-1]	3.41[-1]	2.36[-2]	2.17[-2]	1.48[-2]	1.48[-2]	1.78[-2]
33	3.22[0]	2.22[1]	4.02[0]	1.65[-1]	3.21[-1]	2.10[-2]	2.07[-2]	1.36[-2]	1.36[-2]	1.69[-2]
34	2.45[0]	1.75[1]	3.04[0]	1.44[-1]	3.04[-1]	1.89[-2]	1.96[-2]	1.25[-2]	1.27[-2]	1.59[-2]
35	1.88[0]	1.41[1]	2.34[0]	1.25[-1]	2.90[-1]	1.70[-2]	1.85[-2]	1.15[-2]	1.17[-2]	1.50[-2]
36	1.47[0]	1.14[1]	1.86[0]	1.09[-1]	2.79[-1]	1.54[-2]	1.75[-2]	1.06[-2]	1.09[-2]	1.42[-2]
37	1.16[0]	9.33[0]	1.49[0]	9.51[-2]	2.72[-1]	1.40[-2]	1.65[-2]	9.78[-3]	1.00[-2]	1.34[-2]
38	9.26[-1]	7.74[0]	1.21[0]	8.24[-2]	2.67[-1]	1.28[-2]	1.55[-2]	9.00[-3]	9.29[-3]	1.27[-2]
39	7.51[-1]	6.42[0]	1.01[0]	7.20[-2]	2.64[-1]	1.16[-2]	1.45[-2]	8.29[-3]	8.53[-3]	1.21[-2]
40	6.09[-1]	5.40[0]	8.47[-1]	6.26[-2]	2.64[-1]	1.06[-2]	1.36[-2]	7.67[-3]	7.86[-3]	1.14[-2]
41	5.02[-1]	4.60[0]	7.30[-1]	5.50[-2]	2.66[-1]	9.72[-3]	1.27[-2]	7.07[-3]	7.25[-3]	1.08[-2]
42	4.17[-1]	3.93[0]	6.33[-1]	4.79[-2]	2.75[-1]	8.94[-3]	1.18[-2]	6.53[-3]	6.61[-3]	1.02[-2]
43	3.52[-1]	3.38[0]	5.56[-1]	4.22[-2]	2.88[-1]	8.17[-3]	1.10[-2]	6.01[-3]	6.10[-3]	9.62[-3]
44	2.98[-1]	2.92[0]	4.93[-1]	3.72[-2]	3.14[-1]	7.46[-3]	1.02[-2]	5.57[-3]	5.57[-3]	9.09[-3]
45	2.56[-1]	2.54[0]	4.41[-1]	3.28[-2]	3.57[-1]	6.82[-3]	9.44[-3]	5.10[-3]	5.07[-3]	8.55[-3]
46	2.21[-1]	2.21[0]	3.98[-1]	2.89[-2]	4.35[-1]	6.24[-3]	8.63[-3]	4.71[-3]	4.63[-3]	8.13[-3]
47	1.93[-1]	1.94[0]	3.61[-1]	2.56[-2]	5.92[-1]	5.71[-3]	7.95[-3]	4.31[-3]	4.22[-3]	7.63[-3]
48	1.69[-1]	1.71[0]	3.30[-1]	2.27[-2]	9.80[-1]	5.21[-3]	7.37[-3]	3.95[-3]	3.84[-3]	7.14[-3]
49	1.50[-1]	1.51[0]	3.04[-1]	2.01[-2]	2.60[0]	4.77[-3]	6.73[-3]	3.61[-3]	3.51[-3]	6.71[-3]
50	1.34[-1]	1.34[0]	2.80[-1]	1.79[-2]	8.06[1]	4.34[-3]	6.19[-3]	3.30[-3]	3.19[-3]	6.33[-3]
51	1.20[-1]	1.18[0]	2.60[-1]	1.59[-2]	3.44[0]	3.97[-3]	5.63[-3]	3.01[-3]	2.90[-3]	5.95[-3]
52	1.08[-1]	1.05[0]	2.42[-1]	1.43[-2]	5.56[-1]	3.61[-3]	5.14[-3]	2.74[-3]	2.64[-3]	5.65[-3]
53	9.80[-2]	9.32[-1]	2.25[-1]	1.27[-2]	1.91[-1]	3.28[-3]	4.66[-3]	2.49[-3]	2.39[-3]	5.41[-3]
54	8.93[-2]	8.30[-1]	2.11[-1]	1.14[-2]	8.93[-2]	2.98[-3]	4.24[-3]	2.26[-3]	2.16[-3]	5.21[-3]
55	8.20[-2]	7.39[-1]	1.96[-1]	1.02[-2]	5.05[-2]	2.71[-3]	3.87[-3]	2.05[-3]	1.96[-3]	5.08[-3]
56	7.58[-2]	6.57[-1]	1.86[-1]	9.13[-3]	3.26[-2]	2.45[-3]	3.49[-3]	1.86[-3]	1.76[-3]	4.98[-3]
57	6.99[-2]	5.87[-1]	1.75[-1]	8.11[-3]	2.32[-2]	2.22[-3]	3.16[-3]	1.68[-3]	1.60[-3]	4.88[-3]
58	6.49[-2]	5.21[-1]	1.64[-1]	7.29[-3]	1.77[-2]	2.01[-3]	2.85[-3]	1.53[-3]	1.44[-3]	4.78[-3]
59	6.02[-2]	4.62[-1]	1.55[-1]	6.59[-3]	1.43[-2]	1.81[-3]	2.58[-3]	1.37[-3]	1.30[-3]	4.65[-3]
60	5.59[-2]	4.13[-1]	1.47[-1]	5.97[-3]	1.20[-2]	1.64[-3]	2.32[-3]	1.22[-3]	1.17[-3]	4.41[-3]
61	5.26[-2]	3.68[-1]	1.39[-1]	5.33[-3]	1.04[-2]	1.48[-3]	2.09[-3]	1.12[-3]	1.05[-3]	4.27[-3]
62	4.95[-2]	3.28[-1]	1.32[-1]	4.78[-3]	9.09[-3]	1.33[-3]	1.89[-3]	1.00[-3]	9.43[-4]	4.05[-3]
63	4.65[-2]	2.92[-1]	1.25[-1]	4.33[-3]	8.20[-3]	1.20[-3]	1.69[-3]	9.01[-4]	8.40[-4]	3.80[-3]
64	4.41[-2]	2.59[-1]	1.19[-1]	3.89[-3]	7.41[-3]	1.08[-3]	1.52[-3]	8.06[-4]	7.57[-4]	3.56[-3]
65	4.15[-2]	2.30[-1]	1.13[-1]	3.51[-3]	6.76[-3]	9.60[-4]	1.36[-3]	7.30[-4]	6.75[-4]	3.30[-3]

Z	$3p^2(^3P)3s$			$3p^2(^1D)3s$		$3p^2(^1S)3s$	$3p^2(^3P)3s$		$3s^2(^1S)3d$	
	$^4P_{1/2}$	$^4P_{3/2}$	$^4P_{5/2}$	$^2D_{3/2}$	$^2D_{5/2}$	$^2S_{1/2}$	$^2P_{1/2}$	$^2P_{3/2}$	$^2D_{3/2}$	$^2D_{5/2}$
66	3.94[-2]	2.04[-1]	1.08[-1]	3.17[-3]	6.25[-3]	8.67[-4]	1.22[-3]	6.54[-4]	6.09[-4]	3.05[-3]
67	3.73[-2]	1.81[-1]	1.02[-1]	2.87[-3]	5.75[-3]	7.79[-4]	1.10[-3]	5.81[-4]	5.43[-4]	2.80[-3]
68	3.55[-2]	1.61[-1]	9.80[-2]	2.60[-3]	5.32[-3]	7.02[-4]	9.84[-4]	5.21[-4]	4.85[-4]	2.57[-3]
69	3.38[-2]	1.43[-1]	9.35[-2]	2.36[-3]	4.95[-3]	6.27[-4]	8.80[-4]	4.67[-4]	4.34[-4]	2.35[-3]
70	3.22[-2]	1.27[-1]	8.85[-2]	2.14[-3]	4.61[-3]	5.63[-4]	7.90[-4]	4.18[-4]	3.89[-4]	2.14[-3]
71	3.06[-2]	1.12[-1]	8.47[-2]	1.94[-3]	4.29[-3]	5.00[-4]	7.01[-4]	3.75[-4]	3.47[-4]	1.95[-3]
72	2.93[-2]	9.93[-2]	8.13[-2]	1.77[-3]	4.02[-3]	4.51[-4]	6.30[-4]	3.33[-4]	3.10[-4]	1.76[-3]
73	2.80[-2]	8.80[-2]	7.75[-2]	1.61[-3]	3.76[-3]	4.03[-4]	5.59[-4]	2.98[-4]	2.80[-4]	1.60[-3]
74	2.68[-2]	7.84[-2]	7.46[-2]	1.47[-3]	3.52[-3]	3.60[-4]	5.03[-4]	2.65[-4]	2.95[-4]	1.44[-3]
75	2.57[-2]	6.93[-2]	7.14[-2]	1.34[-3]	3.31[-3]	3.21[-4]	4.49[-4]	2.37[-4]	4.77[-3]	1.29[-3]
76	2.46[-2]	6.09[-2]	6.80[-2]	1.23[-3]	3.11[-3]	2.87[-4]	4.00[-4]	2.11[-4]	6.22[-3]	1.16[-3]
77	2.36[-2]	5.44[-2]	6.54[-2]	1.13[-3]	2.92[-3]	2.57[-4]	3.57[-4]	1.88[-4]	6.37[-3]	1.05[-3]
78	2.27[-2]	4.79[-2]	6.29[-2]	1.04[-3]	2.74[-3]	2.30[-4]	3.19[-4]	1.68[-4]	6.28[-3]	9.43[-4]
79	2.18[-2]	4.27[-2]	6.02[-2]	9.52[-4]	2.58[-3]	2.05[-4]	2.84[-4]	1.49[-4]	6.18[-3]	8.40[-4]
80	2.10[-2]	3.79[-2]	5.78[-2]	8.76[-4]	2.42[-3]	1.83[-4]	2.54[-4]	1.33[-4]	6.05[-3]	7.51[-4]
81	2.02[-2]	3.37[-2]	5.56[-2]	8.18[-4]	2.27[-3]	1.64[-4]	2.26[-4]	1.18[-4]	5.89[-3]	6.75[-4]
82	1.95[-2]	2.98[-2]	5.35[-2]	7.55[-4]	2.13[-3]	1.46[-4]	2.02[-4]	1.05[-4]	5.73[-3]	6.06[-4]
83	1.88[-2]	2.65[-2]	5.13[-2]	7.02[-4]	2.00[-3]	1.30[-4]	1.80[-4]	9.35[-5]	5.60[-3]	5.46[-4]
84	1.81[-2]	2.36[-2]	4.93[-2]	6.51[-4]	1.88[-3]	1.16[-4]	1.61[-4]	8.26[-5]	5.45[-3]	1.85[-3]
85	1.75[-2]	2.10[-2]	4.76[-2]	6.07[-4]	1.76[-3]	1.04[-4]	1.44[-4]	7.35[-5]	5.31[-3]	1.77[-3]
86	1.69[-2]	1.86[-2]	4.59[-2]	5.72[-4]	1.66[-3]	9.31[-5]	1.28[-4]	6.54[-5]	5.17[-3]	1.67[-3]
87	1.63[-2]	1.67[-2]	4.42[-2]	5.35[-4]	1.56[-3]	8.30[-5]	1.15[-4]	5.85[-5]	5.06[-3]	1.58[-3]
88	1.58[-2]	1.48[-2]	4.26[-2]	5.05[-4]	1.46[-3]	7.44[-5]	1.03[-4]	5.18[-5]	4.89[-3]	1.49[-3]
89	1.53[-2]	1.33[-2]	4.12[-2]	4.76[-4]	1.37[-3]	6.60[-5]	9.16[-5]	4.61[-5]	4.79[-3]	1.41[-3]
90	1.48[-2]	1.19[-2]	3.97[-2]	4.50[-4]	1.29[-3]	5.93[-5]	8.12[-5]	4.10[-5]	4.67[-3]	1.33[-3]
91	1.43[-2]	1.06[-2]	3.83[-2]	4.28[-4]	1.21[-3]	5.28[-5]	7.29[-5]	3.64[-5]	4.56[-3]	1.26[-3]
92	1.39[-2]	9.42[-3]	3.70[-2]	4.09[-4]	1.14[-3]	4.73[-5]	6.49[-5]	3.25[-5]	4.46[-3]	1.18[-3]
93	1.35[-2]	8.53[-3]	3.58[-2]	3.92[-4]	1.07[-3]	4.21[-5]	5.77[-5]	2.89[-5]	4.33[-3]	1.12[-3]
94	1.31[-2]	7.62[-3]	3.47[-2]	3.75[-4]	1.01[-3]	3.77[-5]	5.18[-5]	2.56[-5]	4.24[-3]	1.05[-3]
95	1.28[-2]	6.84[-3]	3.38[-2]	3.62[-4]	9.43[-4]	3.37[-5]	4.60[-5]	2.28[-5]	4.14[-3]	9.90[-4]
96	1.24[-2]	6.12[-3]	3.28[-2]	3.48[-4]	8.85[-4]	3.01[-5]	4.13[-5]	2.03[-5]	4.03[-3]	9.35[-4]
97	1.21[-2]	5.52[-3]	3.16[-2]	3.38[-4]	8.26[-4]	2.68[-5]	3.69[-5]	1.81[-5]	3.96[-3]	8.77[-4]
98	1.18[-2]	4.94[-3]	3.10[-2]	3.25[-4]	7.81[-4]	2.40[-5]	3.29[-5]	1.61[-5]	3.89[-3]	8.26[-4]
99	1.15[-2]	4.46[-3]	3.01[-2]	3.15[-4]	7.30[-4]	2.15[-5]	2.94[-5]	1.44[-5]	3.79[-3]	7.81[-4]
100	1.12[-2]	3.99[-3]	2.95[-2]	3.05[-4]	6.85[-4]	1.92[-5]	2.63[-5]	1.28[-5]	3.72[-3]	7.35[-4]

Z	$3s3p(^3P)3d$			$3s3p(^3P)3d$			$3s3p(^3P)3d$			
	$^4F_{3/2}$	$^4F_{5/2}$	$^4F_{7/2}$	$^4P_{1/2}$	$^4P_{3/2}$	$^4P_{5/2}$	$^4D_{1/2}$	$^4D_{3/2}$	$^4D_{5/2}$	$^4D_{7/2}$
15	4.60[3]	3.45[3]	3.82[3]	2.61[-1]	2.61[-1]	2.64[-1]	1.51[-1]	1.51[-1]	1.51[-1]	1.51[-1]
16	1.35[3]	1.06[3]	1.20[3]	1.72[-1]	1.72[-1]	1.73[-1]	9.99[-2]	1.00[-1]	1.01[-1]	1.00[-1]
17	5.31[2]	4.41[2]	5.12[2]	1.29[-1]	1.29[-1]	1.30[-1]	7.51[-2]	7.59[-2]	7.60[-2]	7.57[-2]
18	2.39[2]	2.02[2]	2.36[2]	1.02[-1]	1.02[-1]	1.04[-1]	6.11[-2]	6.13[-2]	6.19[-2]	6.13[-2]
19	1.16[2]	1.01[2]	1.19[2]	8.35[-2]	8.26[-2]	8.56[-2]	5.17[-2]	5.29[-2]	5.26[-2]	5.18[-2]
20	6.13[1]	5.47[1]	6.43[1]	6.78[-2]	6.81[-2]	7.21[-2]	4.67[-2]	4.70[-2]	4.63[-2]	4.50[-2]
21	3.24[1]	3.13[1]	3.67[1]	5.28[-2]	5.66[-2]	6.21[-2]	4.51[-2]	4.34[-2]	4.16[-2]	3.98[-2]
22	1.77[1]	1.88[1]	2.20[1]	4.18[-2]	4.76[-2]	5.45[-2]	4.51[-2]	4.05[-2]	3.80[-2]	3.59[-2]
23	1.03[1]	1.18[1]	1.37[1]	3.53[-2]	4.10[-2]	4.81[-2]	4.42[-2]	3.83[-2]	3.50[-2]	3.26[-2]
24	6.61[0]	7.67[0]	8.86[0]	3.11[-2]	3.63[-2]	4.34[-2]	4.19[-2]	3.61[-2]	3.24[-2]	2.99[-2]
25	4.58[0]	5.15[0]	5.85[0]	2.81[-2]	3.26[-2]	3.94[-2]	3.92[-2]	3.40[-2]	3.02[-2]	2.76[-2]
26	3.32[0]	3.55[0]	4.00[0]	2.56[-2]	2.96[-2]	3.60[-2]	3.65[-2]	3.19[-2]	2.80[-2]	2.58[-2]
27	2.46[0]	2.50[0]	2.78[0]	2.35[-2]	2.71[-2]	3.34[-2]	3.41[-2]	2.97[-2]	2.61[-2]	2.40[-2]

Z	$3s3p(^3P)3d$			$3s3p(^3P)3d$			$3s3p(^3P)3d$			
	$^4F_{3/2}$	$^4F_{5/2}$	$^4F_{7/2}$	$^4P_{1/2}$	$^4P_{3/2}$	$^4P_{5/2}$	$^4D_{1/2}$	$^4D_{3/2}$	$^4D_{5/2}$	$^4D_{7/2}$
28	1.84[0]	1.81[0]	1.98[0]	2.17[-2]	2.50[-2]	3.10[-2]	3.17[-2]	2.78[-2]	2.43[-2]	2.25[-2]
29	1.39[0]	1.33[0]	1.43[0]	2.01[-2]	2.31[-2]	2.89[-2]	2.94[-2]	2.59[-2]	2.26[-2]	2.12[-2]
30	1.07[0]	9.98[-1]	1.06[0]	1.87[-2]	2.15[-2]	2.72[-2]	2.74[-2]	2.42[-2]	2.10[-2]	2.00[-2]
31	8.22[-1]	7.60[-1]	7.95[-1]	1.74[-2]	2.01[-2]	2.57[-2]	2.55[-2]	2.26[-2]	1.95[-2]	1.89[-2]
32	6.34[-1]	5.87[-1]	6.07[-1]	1.62[-2]	1.88[-2]	2.41[-2]	2.37[-2]	2.11[-2]	1.82[-2]	1.79[-2]
33	4.87[-1]	4.59[-1]	4.72[-1]	1.51[-2]	1.76[-2]	2.27[-2]	2.21[-2]	1.96[-2]	1.69[-2]	1.70[-2]
34	3.68[-1]	3.63[-1]	3.72[-1]	1.41[-2]	1.71[-2]	2.15[-2]	2.06[-2]	1.83[-2]	1.56[-2]	1.61[-2]
35	2.66[-1]	2.87[-1]	2.96[-1]	1.31[-2]	1.91[-2]	2.03[-2]	1.92[-2]	1.70[-2]	1.45[-2]	1.53[-2]
36	1.78[-1]	2.29[-1]	2.39[-1]	1.22[-2]	2.07[-2]	1.93[-2]	1.78[-2]	1.58[-2]	1.35[-2]	1.46[-2]
37	1.05[-1]	1.84[-1]	1.95[-1]	1.13[-2]	1.99[-2]	1.82[-2]	1.66[-2]	1.48[-2]	1.27[-2]	1.39[-2]
38	5.20[-2]	1.46[-1]	1.61[-1]	1.05[-2]	1.83[-2]	1.73[-2]	1.54[-2]	1.40[-2]	1.27[-2]	1.32[-2]
39	2.59[-2]	1.17[-1]	1.35[-1]	1.16[-2]	1.63[-2]	1.63[-2]	1.44[-2]	1.34[-2]	1.46[-2]	1.25[-2]
40	1.69[-2]	9.29[-2]	1.14[-1]	1.46[-2]	1.39[-2]	1.55[-2]	1.33[-2]	1.33[-2]	1.60[-2]	1.19[-2]
41	1.36[-2]	7.45[-2]	9.72[-2]	1.40[-2]	1.14[-2]	1.46[-2]	1.24[-2]	1.32[-2]	1.61[-2]	1.13[-2]
42	1.20[-2]	6.13[-2]	8.40[-2]	1.30[-2]	9.16[-3]	1.38[-2]	1.15[-2]	1.03[-2]	1.55[-2]	1.07[-2]
43	1.09[-2]	5.22[-2]	7.23[-2]	1.19[-2]	7.49[-3]	1.32[-2]	1.06[-2]	9.22[-3]	1.46[-2]	1.01[-2]
44	9.99[-3]	4.58[-2]	6.30[-2]	1.08[-2]	6.34[-3]	1.26[-2]	9.89[-3]	8.85[-3]	1.37[-2]	9.56[-3]
45	9.27[-3]	4.08[-2]	5.57[-2]	9.83[-3]	5.52[-3]	1.22[-2]	9.16[-3]	8.44[-3]	1.27[-2]	8.98[-3]
46	8.63[-3]	3.60[-2]	4.91[-2]	8.91[-3]	4.93[-3]	1.19[-2]	8.42[-3]	7.88[-3]	1.16[-2]	8.41[-3]
47	8.29[-3]	3.09[-2]	4.38[-2]	8.08[-3]	4.46[-3]	1.19[-2]	7.73[-3]	7.24[-3]	1.06[-2]	7.92[-3]
48	6.24[-3]	2.63[-2]	3.91[-2]	7.29[-3]	4.07[-3]	1.20[-2]	7.14[-3]	6.61[-3]	9.58[-3]	7.38[-3]
49	5.31[-3]	2.23[-2]	3.51[-2]	6.60[-3]	3.70[-3]	1.23[-2]	6.58[-3]	6.02[-3]	8.67[-3]	6.86[-3]
50	4.79[-3]	1.93[-2]	3.17[-2]	5.97[-3]	3.39[-3]	1.26[-2]	6.02[-3]	5.49[-3]	7.90[-3]	6.33[-3]
51	4.30[-3]	1.70[-2]	2.86[-2]	5.36[-3]	3.09[-3]	1.28[-2]	5.52[-3]	4.98[-3]	7.13[-3]	5.88[-3]
52	3.87[-3]	1.52[-2]	2.60[-2]	4.81[-3]	2.83[-3]	1.29[-2]	5.06[-3]	4.52[-3]	6.51[-3]	5.40[-3]
53	3.48[-3]	1.37[-2]	2.37[-2]	4.34[-3]	2.59[-3]	1.27[-2]	4.67[-3]	4.13[-3]	5.96[-3]	4.99[-3]
54	3.11[-3]	1.26[-2]	2.17[-2]	3.92[-3]	2.37[-3]	1.25[-2]	4.25[-3]	3.74[-3]	5.44[-3]	4.58[-3]
55	2.78[-3]	1.16[-2]	1.99[-2]	3.50[-3]	2.17[-3]	1.20[-2]	3.89[-3]	3.38[-3]	4.98[-3]	4.19[-3]
56	2.49[-3]	1.08[-2]	1.83[-2]	3.15[-3]	1.98[-3]	1.15[-2]	3.55[-3]	3.07[-3]	4.58[-3]	3.82[-3]
57	2.23[-3]	1.01[-2]	1.69[-2]	2.82[-3]	1.81[-3]	1.09[-2]	3.24[-3]	2.78[-3]	4.17[-3]	3.50[-3]
58	1.98[-3]	9.34[-3]	1.55[-2]	2.53[-3]	1.66[-3]	1.03[-2]	2.95[-3]	2.51[-3]	3.82[-3]	3.16[-3]
59	1.77[-3]	8.80[-3]	1.43[-2]	2.26[-3]	1.51[-3]	9.78[-3]	2.69[-3]	2.26[-3]	3.48[-3]	2.89[-3]
60	1.57[-3]	8.26[-3]	1.31[-2]	2.04[-3]	1.36[-3]	9.16[-3]	2.43[-3]	2.04[-3]	3.21[-3]	2.59[-3]
61	1.40[-3]	7.78[-3]	1.23[-2]	1.81[-3]	1.24[-3]	8.71[-3]	2.21[-3]	1.84[-3]	2.90[-3]	2.37[-3]
62	1.25[-3]	7.30[-3]	1.14[-2]	1.62[-3]	1.13[-3]	8.20[-3]	2.01[-3]	1.67[-3]	2.64[-3]	2.14[-3]
63	1.10[-3]	6.87[-3]	1.06[-2]	1.45[-3]	1.02[-3]	7.73[-3]	1.82[-3]	1.49[-3]	2.40[-3]	1.93[-3]
64	9.71[-4]	6.49[-3]	9.80[-3]	1.30[-3]	9.24[-4]	7.28[-3]	1.65[-3]	1.34[-3]	2.19[-3]	1.75[-3]
65	8.62[-4]	6.11[-3]	9.15[-3]	1.16[-3]	8.35[-4]	6.88[-3]	1.49[-3]	1.20[-3]	1.98[-3]	1.58[-3]
66	7.75[-4]	5.81[-3]	8.48[-3]	1.04[-3]	7.52[-4]	6.48[-3]	1.35[-3]	1.08[-3]	1.80[-3]	1.43[-3]
67	6.84[-4]	5.48[-3]	7.88[-3]	9.28[-4]	6.82[-4]	6.10[-3]	1.22[-3]	9.62[-4]	1.64[-3]	1.28[-3]
68	6.05[-4]	5.15[-3]	7.42[-3]	8.29[-4]	6.14[-4]	5.75[-3]	1.10[-3]	8.63[-4]	1.49[-3]	1.16[-3]
69	5.37[-4]	4.86[-3]	6.87[-3]	7.40[-4]	5.53[-4]	5.41[-3]	9.88[-4]	7.68[-4]	1.36[-3]	1.04[-3]
70	4.78[-4]	4.58[-3]	6.44[-3]	6.64[-4]	4.98[-4]	5.09[-3]	8.90[-4]	6.85[-4]	1.23[-3]	9.40[-4]
71	4.23[-4]	4.33[-3]	5.97[-3]	5.91[-4]	4.49[-4]	4.81[-3]	8.00[-4]	6.10[-4]	1.12[-3]	8.43[-4]
72	3.74[-4]	4.07[-3]	5.58[-3]	5.33[-4]	4.04[-4]	4.53[-3]	7.19[-4]	5.45[-4]	1.02[-3]	7.59[-4]
73	3.33[-4]	3.84[-3]	5.23[-3]	4.76[-4]	3.63[-4]	4.25[-3]	6.41[-4]	4.86[-4]	9.26[-4]	6.81[-4]
74	2.94[-4]	3.61[-3]	4.88[-3]	4.26[-4]	3.29[-4]	4.00[-3]	5.75[-4]	4.30[-4]	8.45[-4]	6.13[-4]
75	2.61[-4]	3.42[-3]	4.54[-3]	3.84[-4]	2.95[-4]	3.78[-3]	5.14[-4]	3.82[-4]	7.73[-4]	5.52[-4]
76	2.32[-4]	3.21[-3]	4.26[-3]	3.46[-4]	2.66[-4]	3.55[-3]	4.57[-4]	3.39[-4]	7.03[-4]	4.96[-4]
77	2.05[-4]	3.03[-3]	3.97[-3]	3.12[-4]	2.41[-4]	3.34[-3]	4.07[-4]	3.00[-4]	6.43[-4]	4.45[-4]
78	1.81[-4]	2.86[-3]	3.70[-3]	2.82[-4]	2.17[-4]	3.14[-3]	3.59[-4]	2.65[-4]	5.87[-4]	4.00[-4]

Z	$3s3p(^3P)3d$			$3s3p(^3P)3d$			$3s3p(^3P)3d$			
	$^4F_{3/2}$	$^4F_{5/2}$	$^4F_{7/2}$	$^4P_{1/2}$	$^4P_{3/2}$	$^4P_{5/2}$	$^4D_{1/2}$	$^4D_{3/2}$	$^4D_{5/2}$	$^4D_{7/2}$
79	1.61[-4]	2.69[-3]	3.49[-3]	2.55[-4]	1.96[-4]	2.95[-3]	3.16[-4]	2.34[-4]	5.35[-4]	3.57[-4]
80	1.43[-4]	2.52[-3]	3.25[-3]	2.34[-4]	1.78[-4]	2.78[-3]	2.78[-4]	2.06[-4]	4.92[-4]	3.22[-4]
81	1.27[-4]	2.38[-3]	3.02[-3]	2.14[-4]	1.61[-4]	2.62[-3]	2.43[-4]	1.81[-4]	4.50[-4]	2.88[-4]
82	1.13[-4]	2.23[-3]	2.82[-3]	1.95[-4]	1.47[-4]	2.46[-3]	2.12[-4]	1.59[-4]	4.11[-4]	2.58[-4]
83	9.86[-5]	2.11[-3]	2.64[-3]	1.81[-4]	1.34[-4]	2.31[-3]	1.85[-4]	1.40[-4]	3.76[-4]	2.31[-4]
84	8.74[-5]	1.98[-3]	2.47[-3]	1.66[-4]	1.23[-4]	2.18[-3]	1.61[-4]	1.22[-4]	3.50[-4]	2.07[-4]
85	7.85[-5]	1.85[-3]	2.31[-3]	1.52[-4]	1.13[-4]	2.04[-3]	1.41[-4]	1.07[-4]	3.20[-4]	1.86[-4]
86	6.92[-5]	1.74[-3]	2.15[-3]	1.40[-4]	1.04[-4]	1.92[-3]	1.24[-4]	9.29[-5]	2.93[-4]	1.66[-4]
87	6.15[-5]	1.64[-3]	2.01[-3]	1.28[-4]	9.54[-5]	1.80[-3]	1.09[-4]	8.08[-5]	2.69[-4]	1.49[-4]
88	5.45[-5]	1.55[-3]	1.87[-3]	1.17[-4]	8.84[-5]	1.69[-3]	9.62[-5]	7.01[-5]	2.47[-4]	1.34[-4]
89	4.84[-5]	1.45[-3]	1.76[-3]	1.06[-4]	8.23[-5]	1.58[-3]	8.53[-5]	6.10[-5]	2.25[-4]	1.20[-4]
90	4.30[-5]	1.36[-3]	1.64[-3]	9.65[-5]	7.67[-5]	1.49[-3]	7.57[-5]	5.29[-5]	2.06[-4]	1.07[-4]
91	3.81[-5]	1.28[-3]	1.53[-3]	8.70[-5]	7.22[-5]	1.40[-3]	6.71[-5]	4.57[-5]	1.89[-4]	9.62[-5]
92	3.39[-5]	1.19[-3]	1.43[-3]	7.86[-5]	6.78[-5]	1.31[-3]	6.01[-5]	3.98[-5]	1.72[-4]	8.62[-5]
93	3.01[-5]	1.12[-3]	1.34[-3]	7.12[-5]	6.42[-5]	1.23[-3]	5.36[-5]	3.44[-5]	1.58[-4]	7.69[-5]
94	2.68[-5]	1.05[-3]	1.25[-3]	6.41[-5]	6.09[-5]	1.15[-3]	4.81[-5]	3.00[-5]	1.44[-4]	6.89[-5]
95	2.38[-5]	9.88[-4]	1.16[-3]	5.79[-5]	5.78[-5]	1.08[-3]	4.30[-5]	2.61[-5]	1.31[-4]	6.13[-5]
96	2.11[-5]	9.27[-4]	1.09[-3]	5.19[-5]	5.49[-5]	1.01[-3]	3.84[-5]	2.28[-5]	1.19[-4]	5.48[-5]
97	1.87[-5]	8.68[-4]	1.02[-3]	4.66[-5]	5.20[-5]	9.50[-4]	3.43[-5]	1.99[-5]	1.08[-4]	4.92[-5]
98	1.67[-5]	8.16[-4]	9.45[-4]	4.17[-5]	4.91[-5]	8.89[-4]	3.08[-5]	1.75[-5]	9.82[-5]	4.40[-5]
99	1.49[-5]	7.63[-4]	8.85[-4]	3.74[-5]	4.61[-5]	8.35[-4]	2.76[-5]	1.55[-5]	8.88[-5]	3.93[-5]
100	1.32[-5]	7.17[-4]	8.26[-4]	3.35[-5]	4.29[-5]	7.83[-4]	2.47[-5]	1.37[-5]	8.04[-5]	3.51[-5]

Z	$3s3p(^3P)3d$		$3s3p(^3P)3d$		$3s3p(^3P)3d$		$3p^2(^3P)3p$		$3p^2(^3P)3p$	
	$^2D_{3/2}$	$^2D_{5/2}$	$^2F_{5/2}$	$^2F_{7/2}$	$^2P_{1/2}$	$^2P_{3/2}$	$^2D_{3/2}$	$^2D_{5/2}$	$^2P_{1/2}$	$^2P_{3/2}$
15	1.78[-1]	1.78[-1]	4.88[-1]	4.88[-1]	1.63[-1]	1.59[-1]	1.23[1]	1.20[1]	6.44[-1]	6.42[-1]
16	1.20[-1]	1.20[-1]	3.08[-1]	3.07[-1]	9.99[-2]	9.83[-2]	4.36[0]	4.30[0]	3.62[-1]	3.64[-1]
17	9.17[-2]	9.19[-2]	2.20[-1]	2.18[-1]	7.08[-2]	6.97[-2]	2.21[0]	2.18[0]	2.63[-1]	2.65[-1]
18	7.47[-2]	7.54[-2]	1.75[-1]	1.72[-1]	5.61[-2]	5.49[-2]	1.43[0]	1.41[0]	2.03[-1]	2.05[-1]
19	6.31[-2]	6.33[-2]	1.43[-1]	1.40[-1]	4.62[-2]	4.52[-2]	1.01[0]	1.00[0]	1.62[-1]	1.64[-1]
20	5.40[-2]	5.45[-2]	1.22[-1]	1.19[-1]	3.73[-2]	3.61[-2]	7.58[-1]	7.50[-1]	1.04[-1]	1.01[-1]
21	4.71[-2]	4.74[-2]	1.04[-1]	1.01[-1]	3.54[-2]	3.41[-2]	6.06[-1]	6.00[-1]	1.23[-1]	1.23[-1]
22	4.19[-2]	4.21[-2]	9.15[-2]	8.78[-2]	3.15[-2]	3.00[-2]	4.91[-1]	4.94[-1]	1.03[-1]	1.03[-1]
23	3.75[-2]	3.79[-2]	8.14[-2]	7.75[-2]	2.84[-2]	2.69[-2]	4.08[-1]	4.15[-1]	8.97[-2]	8.93[-2]
24	3.39[-2]	3.44[-2]	7.35[-2]	6.97[-2]	2.59[-2]	2.42[-2]	3.40[-1]	3.54[-1]	7.90[-2]	7.94[-2]
25	3.08[-2]	3.14[-2]	6.66[-2]	6.24[-2]	2.38[-2]	2.19[-2]	2.83[-1]	3.09[-1]	6.98[-2]	7.08[-2]
26	2.82[-2]	2.89[-2]	6.08[-2]	5.64[-2]	2.22[-2]	2.00[-2]	2.34[-1]	2.71[-1]	6.22[-2]	6.29[-2]
27	2.59[-2]	2.68[-2]	5.55[-2]	5.13[-2]	2.07[-2]	1.82[-2]	1.91[-1]	2.42[-1]	5.61[-2]	5.65[-2]
28	2.39[-2]	2.50[-2]	5.07[-2]	4.67[-2]	1.94[-2]	1.67[-2]	1.54[-1]	2.17[-1]	5.05[-2]	5.08[-2]
29	2.20[-2]	2.35[-2]	4.66[-2]	4.25[-2]	1.82[-2]	1.53[-2]	1.24[-1]	1.96[-1]	4.57[-2]	4.58[-2]
30	2.04[-2]	2.22[-2]	4.23[-2]	3.90[-2]	1.71[-2]	1.41[-2]	1.01[-1]	1.79[-1]	4.15[-2]	4.15[-2]
31	1.89[-2]	2.12[-2]	3.83[-2]	3.58[-2]	1.62[-2]	1.29[-2]	8.30[-2]	1.64[-1]	3.76[-2]	3.76[-2]
32	1.75[-2]	2.06[-2]	3.43[-2]	3.29[-2]	1.54[-2]	1.18[-2]	6.95[-2]	1.52[-1]	3.43[-2]	3.44[-2]
33	1.63[-2]	2.02[-2]	2.99[-2]	3.03[-2]	1.47[-2]	1.09[-2]	5.93[-2]	1.41[-1]	3.13[-2]	3.11[-2]
34	1.52[-2]	2.04[-2]	2.57[-2]	2.78[-2]	1.40[-2]	1.00[-2]	5.15[-2]	1.33[-1]	2.86[-2]	2.68[-2]
35	1.41[-2]	2.09[-2]	2.20[-2]	2.55[-2]	1.33[-2]	9.23[-3]	4.54[-2]	1.26[-1]	2.61[-2]	1.95[-2]
36	1.30[-2]	2.14[-2]	1.92[-2]	2.36[-2]	1.26[-2]	8.55[-3]	4.06[-2]	1.22[-1]	2.40[-2]	1.58[-2]
37	1.22[-2]	2.11[-2]	1.70[-2]	2.16[-2]	1.20[-2]	7.88[-3]	3.65[-2]	1.20[-1]	2.20[-2]	1.42[-2]
38	1.13[-2]	1.86[-2]	1.55[-2]	1.99[-2]	1.13[-2]	7.23[-3]	3.32[-2]	1.21[-1]	2.01[-2]	1.31[-2]
39	1.05[-2]	1.38[-2]	1.43[-2]	1.83[-2]	1.05[-2]	6.70[-3]	3.04[-2]	1.27[-1]	1.42[-2]	1.21[-2]
40	9.73[-3]	1.13[-2]	1.33[-2]	1.68[-2]	9.69[-3]	6.15[-3]	2.79[-2]	1.42[-1]	9.83[-3]	1.12[-2]
41	8.85[-3]	9.93[-3]	1.25[-2]	1.55[-2]	8.82[-3]	5.70[-3]	2.57[-2]	1.73[-1]	8.80[-3]	1.04[-2]

Z	$3s3p(^3P)3d$		$3s3p(^3P)3d$		$3s3p(^3P)3d$		$3p^2(^3P)3p$		$3p^2(^3P)3p$	
	$^2D_{3/2}$	$^2D_{5/2}$	$^2F_{5/2}$	$^2F_{7/2}$	$^2P_{1/2}$	$^2P_{3/2}$	$^2D_{3/2}$	$^2D_{5/2}$	$^2P_{1/2}$	$^2P_{3/2}$
42	1.17[-2]	9.04[-3]	1.18[-2]	1.42[-2]	7.93[-3]	5.25[-3]	2.38[-2]	2.28[-1]	8.15[-3]	9.60[-3]
43	1.37[-2]	8.26[-3]	1.11[-2]	1.31[-2]	7.07[-3]	4.80[-3]	2.20[-2]	3.11[-1]	7.52[-3]	8.82[-3]
44	1.46[-2]	7.58[-3]	1.05[-2]	1.21[-2]	6.24[-3]	4.41[-3]	2.05[-2]	3.86[-1]	6.92[-3]	8.10[-3]
45	1.50[-2]	6.95[-3]	9.86[-3]	1.11[-2]	5.50[-3]	4.04[-3]	1.91[-2]	3.94[-1]	6.41[-3]	7.43[-3]
46	1.51[-2]	6.35[-3]	9.32[-3]	1.03[-2]	4.84[-3]	3.69[-3]	1.78[-2]	3.51[-1]	5.90[-3]	6.74[-3]
47	1.48[-2]	5.83[-3]	8.81[-3]	9.49[-3]	4.26[-3]	3.40[-3]	1.65[-2]	2.96[-1]	5.43[-3]	6.00[-3]
48	1.36[-2]	5.30[-3]	8.29[-3]	8.81[-3]	3.75[-3]	3.13[-3]	1.55[-2]	2.46[-1]	5.01[-3]	6.62[-3]
49	1.21[-2]	4.86[-3]	7.81[-3]	8.15[-3]	3.32[-3]	2.92[-3]	1.44[-2]	2.09[-1]	4.62[-3]	6.58[-3]
50	1.01[-2]	4.43[-3]	7.37[-3]	7.60[-3]	2.95[-3]	2.76[-3]	1.35[-2]	1.81[-1]	4.25[-3]	6.25[-3]
51	8.03[-3]	4.02[-3]	6.93[-3]	7.09[-3]	2.61[-3]	2.63[-3]	1.26[-2]	1.58[-1]	3.91[-3]	5.83[-3]
52	6.35[-3]	3.66[-3]	6.54[-3]	6.61[-3]	2.31[-3]	2.55[-3]	1.18[-2]	1.40[-1]	3.57[-3]	5.47[-3]
53	5.08[-3]	3.32[-3]	6.16[-3]	6.20[-3]	2.06[-3]	2.46[-3]	1.10[-2]	1.25[-1]	3.29[-3]	5.09[-3]
54	4.10[-3]	3.00[-3]	5.80[-3]	5.78[-3]	1.83[-3]	2.39[-3]	1.03[-2]	1.13[-1]	3.01[-3]	4.75[-3]
55	3.36[-3]	2.72[-3]	5.44[-3]	5.44[-3]	1.63[-3]	2.33[-3]	9.61[-3]	1.04[-1]	2.75[-3]	4.43[-3]
56	2.80[-3]	2.45[-3]	5.14[-3]	5.12[-3]	1.45[-3]	2.27[-3]	9.03[-3]	9.54[-2]	2.52[-3]	4.12[-3]
57	2.34[-3]	2.22[-3]	4.81[-3]	4.79[-3]	1.29[-3]	2.21[-3]	8.46[-3]	8.82[-2]	2.30[-3]	3.85[-3]
58	1.98[-3]	1.99[-3]	4.52[-3]	4.56[-3]	1.15[-3]	2.14[-3]	7.95[-3]	8.19[-2]	2.10[-3]	3.59[-3]
59	1.69[-3]	1.79[-3]	4.22[-3]	4.30[-3]	1.03[-3]	2.09[-3]	7.47[-3]	7.64[-2]	1.91[-3]	3.36[-3]
60	1.45[-3]	1.59[-3]	3.90[-3]	4.08[-3]	9.18[-4]	2.03[-3]	7.14[-3]	7.18[-2]	1.74[-3]	3.13[-3]
61	1.25[-3]	1.45[-3]	3.50[-3]	3.84[-3]	8.16[-4]	1.96[-3]	6.63[-3]	6.72[-2]	1.58[-3]	2.95[-3]
62	1.09[-3]	1.30[-3]	2.85[-3]	3.65[-3]	7.28[-4]	1.90[-3]	6.26[-3]	6.33[-2]	1.44[-3]	2.78[-3]
63	9.45[-4]	1.16[-3]	1.71[-3]	3.46[-3]	6.49[-4]	1.84[-3]	5.89[-3]	5.98[-2]	1.31[-3]	2.61[-3]
64	8.27[-4]	1.04[-3]	8.94[-4]	3.28[-3]	5.76[-4]	1.78[-3]	5.64[-3]	5.67[-2]	1.18[-3]	2.46[-3]
65	7.21[-4]	9.29[-4]	6.46[-4]	3.10[-3]	5.17[-4]	1.72[-3]	5.39[-3]	5.39[-2]	1.07[-3]	2.33[-3]
66	6.33[-4]	8.27[-4]	5.41[-4]	2.93[-3]	4.58[-4]	1.65[-3]	5.16[-3]	5.12[-2]	9.78[-4]	2.20[-3]
67	5.56[-4]	7.37[-4]	4.70[-4]	2.79[-3]	4.08[-4]	1.59[-3]	4.96[-3]	4.87[-2]	8.81[-4]	2.09[-3]
68	4.90[-4]	6.58[-4]	4.14[-4]	2.63[-3]	3.64[-4]	1.52[-3]	4.80[-3]	4.65[-2]	7.96[-4]	1.97[-3]
69	4.31[-4]	5.84[-4]	3.68[-4]	2.50[-3]	3.24[-4]	1.45[-3]	4.68[-3]	4.45[-2]	7.15[-4]	1.87[-3]
70	3.83[-4]	5.23[-4]	3.25[-4]	2.35[-3]	2.88[-4]	1.39[-3]	4.58[-3]	4.26[-2]	6.54[-4]	1.77[-3]
71	3.37[-4]	4.65[-4]	2.89[-4]	2.23[-3]	2.57[-4]	1.32[-3]	4.52[-3]	4.09[-2]	5.88[-4]	1.68[-3]
72	2.98[-4]	4.13[-4]	2.56[-4]	2.11[-3]	2.29[-4]	1.26[-3]	4.50[-3]	3.92[-2]	5.29[-4]	1.59[-3]
73	2.64[-4]	3.68[-4]	2.27[-4]	1.99[-3]	2.04[-4]	1.19[-3]	4.48[-3]	3.77[-2]	4.78[-4]	1.51[-3]
74	2.34[-4]	3.27[-4]	2.02[-4]	1.88[-3]	1.81[-4]	1.15[-3]	4.51[-3]	3.62[-2]	4.30[-4]	1.43[-3]
75	2.07[-4]	2.91[-4]	1.80[-4]	1.77[-3]	1.61[-4]	1.16[-3]	4.60[-3]	3.49[-2]	3.87[-4]	1.36[-3]
76	1.85[-4]	2.58[-4]	1.60[-4]	1.66[-3]	1.44[-4]	1.10[-3]	4.70[-3]	3.36[-2]	3.49[-4]	1.29[-3]
77	1.64[-4]	2.30[-4]	1.42[-4]	1.57[-3]	1.28[-4]	1.04[-3]	4.84[-3]	3.24[-2]	3.14[-4]	1.22[-3]
78	1.45[-4]	2.04[-4]	1.26[-4]	1.48[-3]	1.14[-4]	9.76[-4]	5.03[-3]	3.13[-2]	2.82[-4]	1.16[-3]
79	1.29[-4]	1.82[-4]	1.12[-4]	1.39[-3]	1.01[-4]	9.14[-4]	5.25[-3]	3.02[-2]	2.53[-4]	1.10[-3]
80	1.15[-4]	1.61[-4]	9.96[-5]	1.30[-3]	8.98[-5]	8.57[-4]	5.50[-3]	2.92[-2]	2.28[-4]	1.04[-3]
81	1.02[-4]	1.44[-4]	8.83[-5]	1.22[-3]	8.00[-5]	7.99[-4]	5.82[-3]	2.82[-2]	2.05[-4]	9.89[-4]
82	9.08[-5]	1.28[-4]	7.88[-5]	1.15[-3]	7.11[-5]	7.48[-4]	6.16[-3]	2.72[-2]	1.84[-4]	9.37[-4]
83	8.06[-5]	1.14[-4]	6.98[-5]	1.08[-3]	6.32[-5]	6.96[-4]	6.59[-3]	2.64[-2]	1.65[-4]	8.89[-4]
84	7.19[-5]	1.01[-4]	6.16[-5]	2.32[-3]	5.63[-5]	7.00[-4]	7.07[-3]	2.56[-2]	1.48[-4]	8.42[-4]
85	6.38[-5]	8.99[-5]	5.51[-5]	2.20[-3]	4.99[-5]	6.47[-4]	7.58[-3]	2.49[-2]	1.33[-4]	7.98[-4]
86	5.68[-5]	8.02[-5]	4.87[-5]	2.06[-3]	4.45[-5]	5.99[-4]	8.17[-3]	2.40[-2]	1.19[-4]	7.55[-4]
87	5.06[-5]	7.14[-5]	4.34[-5]	1.93[-3]	3.96[-5]	5.54[-4]	8.89[-3]	2.34[-2]	1.07[-4]	7.14[-4]
88	4.51[-5]	6.35[-5]	3.84[-5]	1.80[-3]	3.52[-5]	5.10[-4]	9.63[-3]	2.27[-2]	9.57[-5]	6.76[-4]
89	4.02[-5]	5.70[-5]	3.42[-5]	1.68[-3]	3.15[-5]	4.67[-4]	1.06[-2]	2.20[-2]	8.58[-5]	6.39[-4]
90	3.57[-5]	5.07[-5]	3.03[-5]	1.57[-3]	2.79[-5]	4.29[-4]	1.16[-2]	2.15[-2]	7.72[-5]	6.05[-4]
91	3.17[-5]	4.52[-5]	2.69[-5]	1.46[-3]	2.48[-5]	3.94[-4]	1.28[-2]	2.08[-2]	6.92[-5]	5.74[-4]
92	2.83[-5]	4.05[-5]	2.39[-5]	1.36[-3]	2.22[-5]	3.62[-4]	1.41[-2]	2.03[-2]	6.19[-5]	5.43[-4]

Z	$3s3p(^1P)3d$		$3s3p(^1P)3d$		$3s3p(^1P)3d$		$3p^2(^3P)3p$
	$^2D_{3/2}$	$^2D_{5/2}$	$^2F_{5/2}$	$^2F_{7/2}$	$^2P_{1/2}$	$^2P_{3/2}$	$^4S_{3/2}$
15	9.68[-2]	9.73[-2]	1.61[-1]	1.61[-1]	1.99[-1]	2.02[-1]	1.89[-1]
16	5.93[-2]	5.95[-2]	9.70[-2]	9.68[-2]	1.32[-1]	1.36[-1]	1.34[-1]
17	4.34[-2]	4.36[-2]	6.97[-2]	6.98[-2]	9.99[-2]	1.05[-1]	1.04[-1]
18	3.50[-2]	3.53[-2]	5.44[-2]	5.45[-2]	7.37[-2]	7.99[-2]	8.41[-2]
19	2.90[-2]	2.92[-2]	4.52[-2]	4.52[-2]	5.97[-2]	6.69[-2]	7.00[-2]
20	2.49[-2]	2.50[-2]	3.77[-2]	3.78[-2]	4.85[-2]	5.57[-2]	5.93[-2]
21	2.24[-2]	2.19[-2]	3.37[-2]	3.41[-2]	4.16[-2]	5.17[-2]	5.13[-2]
22	2.11[-2]	1.94[-2]	3.00[-2]	3.03[-2]	3.57[-2]	5.56[-2]	4.49[-2]
23	2.03[-2]	1.75[-2]	2.70[-2]	2.74[-2]	3.07[-2]	5.74[-2]	3.99[-2]
24	1.92[-2]	1.59[-2]	2.44[-2]	2.49[-2]	2.70[-2]	5.48[-2]	3.57[-2]
25	1.79[-2]	1.46[-2]	2.22[-2]	2.28[-2]	2.37[-2]	4.97[-2]	3.23[-2]
26	1.65[-2]	1.34[-2]	2.03[-2]	2.10[-2]	2.11[-2]	4.42[-2]	2.96[-2]
27	1.52[-2]	1.24[-2]	1.87[-2]	1.95[-2]	1.89[-2]	3.95[-2]	2.72[-2]
28	1.40[-2]	1.15[-2]	1.72[-2]	1.81[-2]	1.71[-2]	3.51[-2]	2.53[-2]
29	1.29[-2]	1.07[-2]	1.59[-2]	1.69[-2]	1.55[-2]	3.17[-2]	2.38[-2]
30	1.19[-2]	9.95[-3]	1.47[-2]	1.58[-2]	1.43[-2]	2.88[-2]	2.23[-2]
31	1.09[-2]	9.32[-3]	1.35[-2]	1.48[-2]	1.32[-2]	2.62[-2]	2.12[-2]
32	1.00[-2]	8.73[-3]	1.25[-2]	1.39[-2]	1.23[-2]	2.42[-2]	2.01[-2]
33	9.23[-3]	8.21[-3]	1.15[-2]	1.31[-2]	1.15[-2]	2.23[-2]	1.92[-2]
34	8.48[-3]	7.69[-3]	1.07[-2]	1.23[-2]	1.09[-2]	2.11[-2]	1.82[-2]
35	7.75[-3]	7.26[-3]	9.86[-3]	1.16[-2]	1.04[-2]	2.07[-2]	1.74[-2]
36	7.13[-3]	6.84[-3]	9.13[-3]	1.10[-2]	1.01[-2]	1.96[-2]	1.68[-2]
37	6.53[-3]	6.44[-3]	8.42[-3]	1.04[-2]	9.94[-3]	1.82[-2]	1.67[-2]
38	5.95[-3]	6.06[-3]	7.75[-3]	9.81[-3]	1.00[-2]	1.67[-2]	1.81[-2]
39	5.45[-3]	5.74[-3]	7.13[-3]	9.26[-3]	1.08[-2]	1.52[-2]	2.41[-2]
40	4.98[-3]	5.40[-3]	6.56[-3]	8.76[-3]	1.20[-2]	1.37[-2]	3.78[-2]
41	4.60[-3]	5.08[-3]	6.04[-3]	8.25[-3]	1.32[-2]	1.24[-2]	5.30[-2]
42	4.23[-3]	4.78[-3]	5.53[-3]	7.82[-3]	1.44[-2]	1.11[-2]	6.36[-2]
43	3.90[-3]	4.49[-3]	5.07[-3]	7.36[-3]	1.52[-2]	9.88[-3]	6.84[-2]
44	3.59[-3]	4.22[-3]	4.67[-3]	6.94[-3]	1.54[-2]	8.83[-3]	6.85[-2]
45	3.31[-3]	3.97[-3]	4.26[-3]	6.54[-3]	1.49[-2]	7.85[-3]	6.61[-2]
46	3.06[-3]	3.72[-3]	3.90[-3]	6.13[-3]	1.44[-2]	7.06[-3]	6.23[-2]
47	2.81[-3]	3.47[-3]	3.56[-3]	5.75[-3]	1.36[-2]	6.35[-3]	5.78[-2]
48	2.59[-3]	3.24[-3]	3.25[-3]	5.42[-3]	1.28[-2]	5.75[-3]	5.30[-2]
49	2.37[-3]	3.04[-3]	2.94[-3]	5.04[-3]	1.21[-2]	5.19[-3]	4.83[-2]
50	2.17[-3]	2.84[-3]	2.68[-3]	4.72[-3]	1.14[-2]	4.69[-3]	4.39[-2]
51	1.99[-3]	2.65[-3]	2.43[-3]	4.35[-3]	1.08[-2]	4.26[-3]	3.96[-2]
52	1.82[-3]	2.46[-3]	2.21[-3]	4.05[-3]	1.02[-2]	3.84[-3]	3.57[-2]
53	1.65[-3]	2.28[-3]	2.00[-3]	3.72[-3]	9.68[-3]	3.48[-3]	3.22[-2]
54	1.51[-3]	2.12[-3]	1.80[-3]	3.44[-3]	9.19[-3]	3.15[-3]	2.88[-2]
55	1.37[-3]	1.97[-3]	1.63[-3]	3.18[-3]	8.70[-3]	2.85[-3]	2.57[-2]
56	1.24[-3]	1.82[-3]	1.47[-3]	2.89[-3]	8.24[-3]	2.58[-3]	2.30[-2]
57	1.12[-3]	1.67[-3]	1.32[-3]	2.62[-3]	7.82[-3]	2.33[-3]	2.03[-2]
58	1.01[-3]	1.54[-3]	1.19[-3]	2.40[-3]	7.42[-3]	2.10[-3]	1.80[-2]
59	9.16[-4]	1.42[-3]	1.07[-3]	2.19[-3]	7.03[-3]	1.90[-3]	1.60[-2]
60	8.13[-4]	1.30[-3]	9.67[-4]	1.99[-3]	6.58[-3]	1.71[-3]	1.40[-2]
61	7.45[-4]	1.20[-3]	8.73[-4]	1.78[-3]	6.32[-3]	1.54[-3]	1.24[-2]
62	6.70[-4]	1.10[-3]	8.12[-4]	1.61[-3]	6.00[-3]	1.39[-3]	1.09[-2]
63	5.98[-4]	1.00[-3]	8.48[-4]	1.45[-3]	5.69[-3]	1.25[-3]	9.57[-3]

Z	$3s3p(^1P)3d$		$3s3p(^1P)3d$		$3s3p(^1P)3d$		$3p^2(^3P)3p$
	$^2D_{3/2}$	$^2D_{5/2}$	$^2F_{5/2}$	$^2F_{7/2}$	$^2P_{1/2}$	$^2P_{3/2}$	$^4S_{3/2}$
64	5.39[-4]	9.15[-4]	1.20[-3]	1.30[-3]	5.39[-3]	1.12[-3]	8.35[-3]
65	4.83[-4]	8.36[-4]	1.61[-3]	1.16[-3]	5.11[-3]	1.01[-3]	7.31[-3]
66	4.35[-4]	7.61[-4]	1.80[-3]	1.04[-3]	4.85[-3]	9.05[-4]	6.39[-3]
67	3.87[-4]	6.93[-4]	1.83[-3]	9.34[-4]	4.61[-3]	8.08[-4]	5.57[-3]
68	3.47[-4]	6.29[-4]	1.78[-3]	8.37[-4]	4.37[-3]	7.24[-4]	4.88[-3]
69	3.10[-4]	5.70[-4]	1.71[-3]	7.46[-4]	4.15[-3]	6.52[-4]	4.24[-3]
70	2.77[-4]	5.18[-4]	1.62[-3]	6.68[-4]	3.93[-3]	5.82[-4]	3.71[-3]
71	2.48[-4]	4.68[-4]	1.52[-3]	5.94[-4]	3.73[-3]	5.23[-4]	3.26[-3]
72	2.21[-4]	4.25[-4]	1.42[-3]	5.31[-4]	3.55[-3]	4.70[-4]	2.86[-3]
73	1.98[-4]	3.84[-4]	1.32[-3]	4.74[-4]	3.37[-3]	4.20[-4]	2.52[-3]
74	1.94[-4]	3.56[-4]	1.23[-3]	4.20[-4]	3.24[-3]	3.77[-4]	2.23[-3]
75	4.43[-4]	3.76[-4]	1.14[-3]	3.76[-4]	3.35[-3]	3.41[-4]	1.98[-3]
76	3.62[-4]	3.36[-4]	1.06[-3]	3.33[-4]	3.18[-3]	3.05[-4]	1.77[-3]
77	3.35[-4]	3.00[-4]	9.77[-4]	2.97[-4]	3.03[-3]	2.73[-4]	1.58[-3]
78	1.91[-4]	2.69[-4]	9.01[-4]	2.65[-4]	2.88[-3]	2.44[-4]	1.43[-3]
79	1.72[-4]	2.39[-4]	8.30[-4]	2.37[-4]	2.72[-3]	2.18[-4]	1.30[-3]
80	1.55[-4]	2.14[-4]	7.64[-4]	2.10[-4]	2.60[-3]	1.95[-4]	1.17[-3]
81	1.39[-4]	1.90[-4]	7.01[-4]	1.87[-4]	2.47[-3]	1.74[-4]	1.08[-3]
82	1.24[-4]	1.70[-4]	6.44[-4]	1.66[-4]	2.35[-3]	1.55[-4]	9.88[-4]
83	1.11[-4]	1.52[-4]	5.90[-4]	1.48[-4]	2.23[-3]	1.39[-4]	9.16[-4]
84	9.99[-5]	1.36[-4]	6.84[-4]	1.38[-4]	2.13[-3]	1.24[-4]	8.55[-4]
85	8.92[-5]	1.21[-4]	6.22[-4]	1.22[-4]	2.03[-3]	1.11[-4]	7.97[-4]
86	7.99[-5]	1.08[-4]	5.66[-4]	1.09[-4]	1.93[-3]	9.94[-5]	7.46[-4]
87	7.19[-5]	9.64[-5]	5.13[-4]	9.68[-5]	1.84[-3]	8.89[-5]	7.06[-4]
88	6.40[-5]	8.62[-5]	4.64[-4]	8.59[-5]	1.75[-3]	7.90[-5]	6.70[-4]
89	5.74[-5]	7.68[-5]	4.22[-4]	7.60[-5]	1.67[-3]	7.10[-5]	6.46[-4]
90	5.15[-5]	6.88[-5]	3.82[-4]	6.77[-5]	1.60[-3]	6.29[-5]	6.20[-4]
91	4.63[-5]	6.11[-5]	3.45[-4]	5.99[-5]	1.52[-3]	5.65[-5]	6.00[-4]
92	4.15[-5]	5.47[-5]	3.12[-4]	5.35[-5]	1.45[-3]	5.05[-5]	5.80[-4]
93	3.70[-5]	4.88[-5]	2.83[-4]	4.76[-5]	1.38[-3]	4.52[-5]	5.72[-4]
94	3.31[-5]	4.36[-5]	2.55[-4]	4.25[-5]	1.32[-3]	4.02[-5]	5.61[-4]
95	2.97[-5]	3.90[-5]	2.30[-4]	3.77[-5]	1.26[-3]	3.60[-5]	5.60[-4]
96	2.66[-5]	3.47[-5]	2.08[-4]	3.35[-5]	1.20[-3]	3.23[-5]	5.55[-4]
97	2.37[-5]	3.10[-5]	1.89[-4]	2.98[-5]	1.15[-3]	2.89[-5]	5.60[-4]
98	2.13[-5]	2.78[-5]	1.69[-4]	2.67[-5]	1.10[-3]	2.58[-5]	5.65[-4]
99	1.90[-5]	2.48[-5]	1.53[-4]	2.37[-5]	1.05[-3]	2.31[-5]	5.73[-4]
100	1.71[-5]	2.21[-5]	1.38[-4]	2.11[-5]	1.00[-3]	2.07[-5]	5.82[-4]

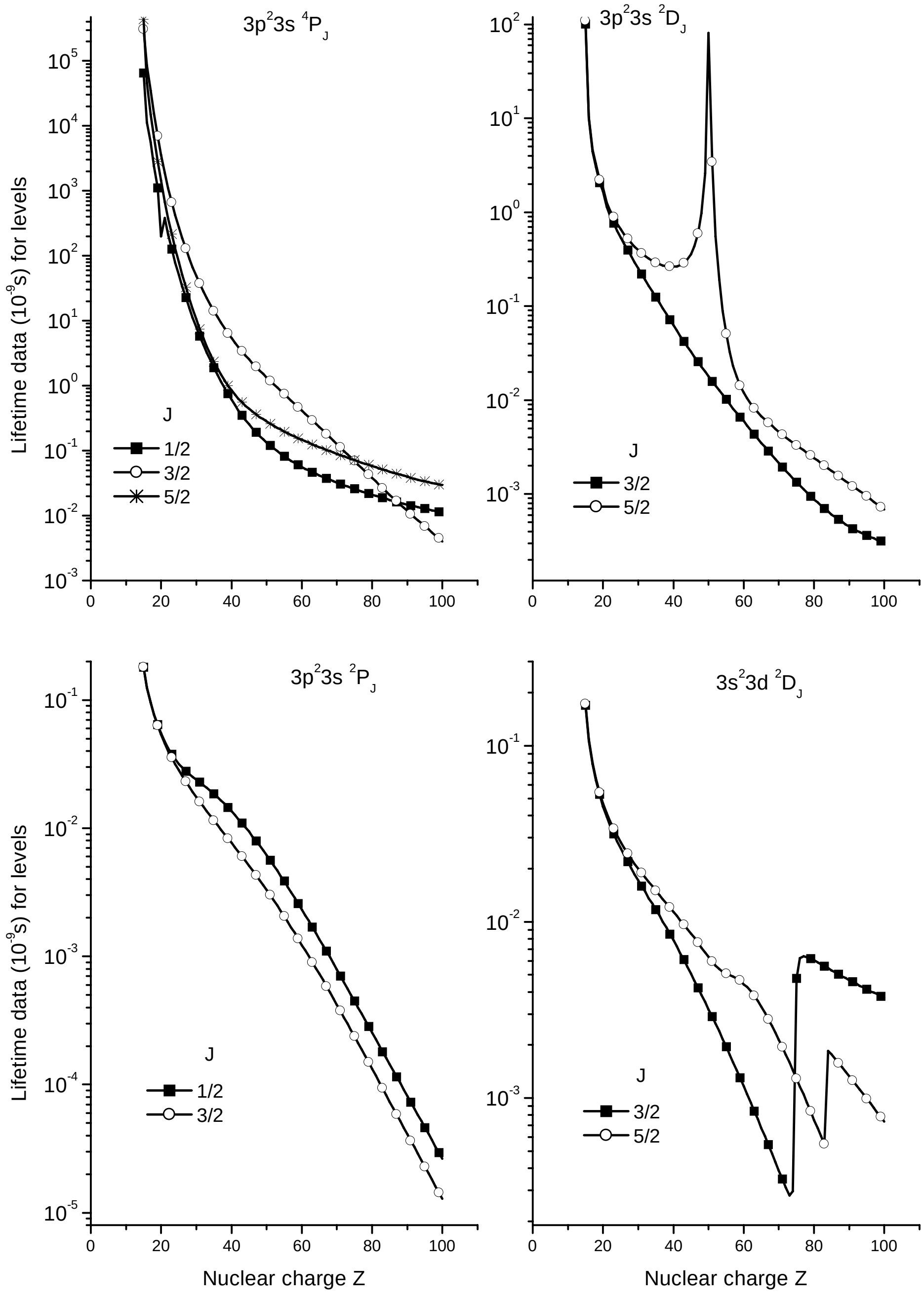

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Figure 20: Lifetime data (10^{-9}s) for $3p^2 3s\ ^{2S+1}L_J$ levels as function of Z in Al-like ions

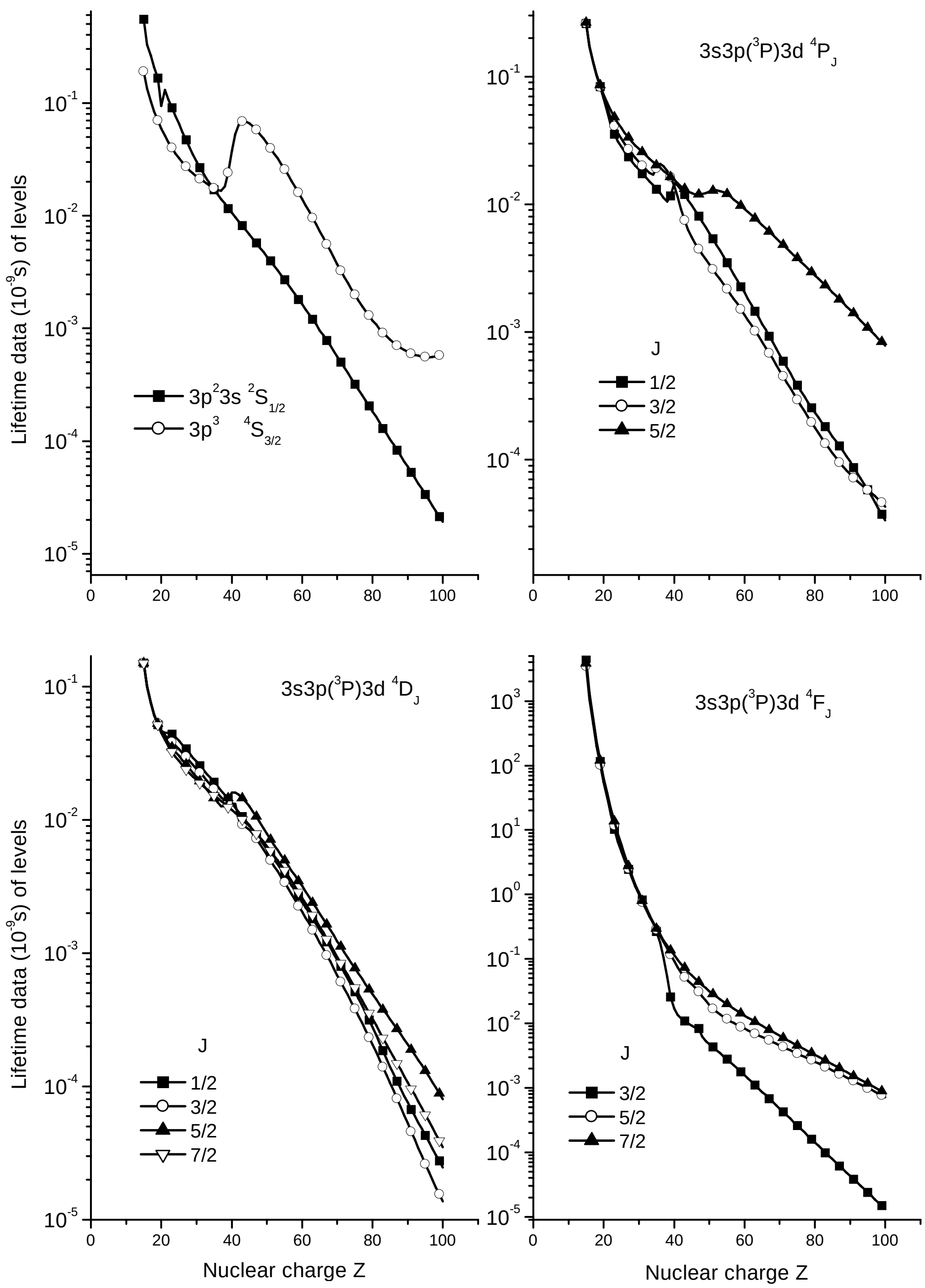

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Figure 21: Lifetime data (10^{-9}s) for $3p^3\ ^4S_{3/2}$ and $3s3p(^3P)3d\ ^4L_J$ levels as function of Z in Al-like ions